Federal Energy Regulatory Commission
Office of Energy Projects
888 First Street, NE, Washington, DC 20426

FERC/FEIS-0272F **June 2017**

Mountain Valley Project and Equitrans Expansion Project

Final Environmental Impact Statement

Mountain Valley Pipeline, LLC and Equitrans, LP
FERC Docket Nos.: CP16-10-000 and CP16-13-000

Cooperating Agencies:

U.S. Forest Service

U.S. Army Corps of Engineers

U.S. Bureau of Land Management

U.S. Environmental Protection Agency

Pipeline Hazardous Materials Safety Administration

U.S. Fish & Wildlife Service

West Virginia Field Office

West Virginia Department of Environmental Protection

West Virginia Division of Natural Resources

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FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas 3
Mountain Valley Pipeline LLC
Docket No. CP16-10-000
Equitrans LP
Docket No. CP16-13-000

FERC/FEIS-0272F

TO THE PARTY ADDRESSED:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared a final environmental impact statement (EIS) for the projects proposed by Mountain Valley Pipeline LLC (Mountain Valley) and Equitrans LP (Equitrans) in the above-referenced dockets. Mountain Valley requests authorization to construct and operate certain interstate natural gas facilities in West Virginia and Virginia, known as the Mountain Valley Project (MVP) in Docket Number CP16-10-000, designed to transport about 2 billion cubic feet per day (Bcf/d) of natural gas from production areas in the Appalachian Basin to markets in the Mid-Atlantic and Southeastern United States. Equitrans requests authorization to construct and operate certain natural gas facilities in Pennsylvania and West Virginia, known as the Equitrans Expansion Project (EEP) in Docket No. CP16-13-000, designed to transport about 0.4 Bcf/d of natural gas north-south on its system, to improve system flexibility and reliability, and serve markets in the Northeast, Mid-Atlantic, and Southeast, through interconnections with various other interstate systems, including the proposed MVP. Because the MVP and EEP are interrelated and connected actions, we are analyzing them both together in this single comprehensive EIS.

The final EIS assesses the potential environmental effects of the construction and operation of the MVP and EEP in accordance with the requirements of the National Environmental Policy Act (NEPA). The FERC staff concludes that approval of the MVP and EEP would have some adverse environmental impacts; however, these impacts would be reduced with the implementation Mountain Valley's and Equitrans' proposed mitigation measures, and the additional measures recommended by the FERC staff in this final EIS.

The United States Department of Agriculture's Forest Service (FS); U.S. Army Corps of Engineers (COE); U.S. Environmental Protection Agency (EPA); U.S. Department of the Interior's Bureau of Land Management (BLM); the U.S. Fish and Wildlife Service (FWS), West Virginia Field Office; U.S. Department of Transportation; West Virginia Department of Environmental Protection; and West Virginia Division of Natural Resources participated as cooperating agencies in the preparation of the final

EIS. Cooperating agencies have jurisdiction by law or special expertise with respect to resources potentially affected by the proposals and participate in the NEPA analysis. Although the cooperating agencies provided input to the conclusions and recommendations presented in the final EIS, the agencies will present their own conclusions and recommendations in their respective permit authorizations and Records of Decision for the projects.

The final EIS addresses the potential environmental effects of the construction and operation of the proposed facilities. For the MVP those facilities include:

- about 304 miles of new 42-inch-diameter pipeline extending from the new Mobley Interconnect in Wetzel County, West Virginia to the existing Transcontinental Gas Pipe Line Company LLC (Transco) Station 165 in Pittsylvania County, Virginia;
- 3 new compressor stations (Bradshaw, Harris, Stallworth) in West Virginia totaling about 171,600 horsepower (hp);
- 4 new meter and regulation stations and interconnections (Mobley, Sherwood, WB, and Transco);
- 3 new taps (Webster, Roanoke Gas Lafayette, and Roanoke Gas Franklin);
- 8 pig[1] launchers and receivers at 5 locations; and
- 36 mainline block valves.

For the EEP those facilities include:

- about 7 miles total of new various diameter pipelines in six segments;
- new Redhook Compressor Station, in Greene County, Pennsylvania, with 31,300 hp of compression;
- 4 new taps (Mobley, H-148, H-302, H-306) and 1 new interconnection (Webster);
- 4 pig launchers and receivers; and
- decommissioning and abandonment of the existing 4,800 hp Pratt Compressor Station in Greene County, Pennsylvania

The FERC staff mailed copies of the final EIS to federal, state, and local government representatives and agencies; elected officials; regional environmental groups and non-governmental organizations; Native Americans and Indian tribes; potentially affected landowners; newspapers and libraries in the project areas; and other interested individuals and groups, including members of the public who submitted comments about the projects. Paper copy versions of this final EIS were mailed to those specifically requesting them; all others received a CD version. In addition, the final EIS is available for public viewing on the FERC's website (www.ferc.gov).[2]

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[1] A "pig" is a device used to clean or inspect the interior of a pipeline.

[2] Go to "Documents & Filings," click on "eLibrary," use "General Search" and put in the Docket numbers (CP16-10 or CP16-13) and date of issuance (06/23/17).

A limited number of copies are available for distribution and public inspection at:

Federal Energy Regulatory Commission
Public Reference Room
888 First Street NE, Room 2A
Washington, DC 20426
(202) 502-8371

Questions?

Additional information about the projects is available from the Commission's Office of External Affairs, at **(866) 208-FERC,** or on the FERC website (www.ferc.gov) using the eLibrary link. Click on the eLibrary link, click on "General Search," and enter the docket number excluding the last three digits in the Docket Number field (i.e., CP16-10 and CP16-13). Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FercOnlineSupport@ferc.gov or toll free at (866) 208-3676; for TTY, contact (202) 502-8659. The eLibrary link also provides access to the texts of formal documents issued by the Commission, such as orders, notices, and rulemakings.

In addition, the Commission offers a free service called eSubscription that allows you to keep track of all formal issuances and submittals in specific dockets. This can reduce the amount of time you spend researching proceedings by automatically providing you with notification of these filings, document summaries, and direct links to the documents. Go to www.ferc.gov/docs-filing/esubscription.asp to subscribe.

BLM Record of Decision

The BLM, COE, and FS may adopt and use the EIS when they consider the issuance of a Right-of-Way Grant to Mountain Valley for the portion of the MVP that would cross federal lands. Further, the FS may use the EIS when it considers amendments to its Land and Resource Management Plan for the Jefferson National Forest to allow the MVP to cross federal lands. The BLM is soliciting comments specific to impacts to COE and FS federal lands for consideration in its Record of Decision. If you wish to submit written comments to the BLM, they must be submitted within thirty (30) calendar days from the date that the EPA publishes the *Notice of Availability of the Environmental Impact Statement for the Proposed Mountain Valley Project and Equitrans Expansion Project* in the Federal Register. You may use any of the following methods to submit comments to the BLM: E-planning MVP Comment Submission Web Page at http://bit.ly/2qByLlw; mail to Vicki Craft, Bureau of Land Management, Southeastern State District Office, 273 Market Street, Flowood, MS 39232; or call (601) 919-4655.

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ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
μg	micrograms
μg/l	micrograms per liter
μPa	micro Pascal
AADT	annual average daily traffic
ACE	Applied Cultural Ecology
ACEP	Agricultural Conservation Easement Program
ACHP	Advisory Council on Historic Preservation
ACP	Atlantic Coast Pipeline
AEP	American Electric Power
amsl	above mean sea level
ANST	Appalachian National Scenic Trail
APE	area of potential effect
Appalachian LCC	Appalachian Landscape Conservation Cooperative
AQCR	Air Quality Control Region
ARPA	Archaelogical Resources Protection Act
ATC	Appalachian Trail Conservancy
ATV	all-terrain vehicles
ATWS	additional temporary workspaces
BA	biological assessment
BAT	best available technology
BCC	Birds of Conservation Concern
Bcf/d	billion cubic feet per day
BE	Biological Evaluation
BGEPA	Bald and Golden Eagle Protection Act
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
BO	Biological Opinion
BRP	Blue Ridge Parkway
CAA	Clean Air Act
CAT	Caterpillar
Celanese	Celanese Acetate LLC
CEQ	Council on Environmental Quality
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
CGV	Columbia Gas of Virginia
CH_4	methane
CI	Chief Inspector
CI ICE	Compression Ignition Internal Combustion Engines
CLG	Certified Local Governments
CLS	Eastern Region Community Liaison Services
CO	carbon monoxide
CO_2	carbon dioxide
$CO_{2\text{-eq}}$	carbon dioxide equivalents

Abbreviation	**Definition**
COE	U.S. Army Corps of Engineers
Columbia	Columbia Gas Transmission
Commission	Federal Energy Regulatory Commission
CPP	Clean Power Plan
CR	County Road
CRED	Conversations for Responsible Economic Development
CRP	Conservation Reserve Program
CSR	Code of State Regulations
CWA	Clean Water Act
dB	unweighted decibel
dBA	decibels on the A weighted decibel scale
Discovery Plan	Plan for Unanticipated Historic Properties and Human Remains
Dominion	Dominion Transmission Inc.
DOT	U.S. Department of Transportation
DR	Data Request
Dth/d	dekatherms per day
DWWM	Division of Water and Waste Management
EA	Environmental Assessment
East Tennessee	East Tennessee Natural Gas
ECA	Ecological Core Area
ECM	Erosion Control Matting
EEP	Equitrans Expansion Project
eGRID	EPA's Emissions & Generation Resource Integrated Database
EI	Environmental Inspector
EIR	environmental information request
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act of 2005
Equitrans	Equitrans, L.P.
ESA	Endangered Species Act
ESD	emergency shutdown
ESRI	Environmental Systems Research Institute
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FERC Plan	*Upland Erosion Control, Revegetation and Maintenance Plan*
FERC Procedures	*Wetland and Waterbody Construction and Mitigation Procedures*
FHWA	Federal Highway Administration
FLPMA	Federal Land Policy and Management Act

ACRONYMS AND ABBREVIATIONS (CONTINUED)

Abbreviation	**Definition**
FS	Forest Service
FSA	Farm Service Agency
FWS	U.S. Fish and Wildlife
g	force of gravity
GCCC	Governor's Commission on Climate Change
GCSZ	Giles County Seismic Zone
GHG	greenhouse gas
GHGRP	Greenhouse Gases Rule
GIS	Geographic Information System
gpm	gallons per minute
GWJeff	George Washington and Jefferson National Forests
GWP	global warming potential
HAER	Historic American Engineering Record
HAP	hazardous air pollutant
HCA	High Consequence Area
HCHO	Formaldehyde
HDD	horizontal directional drill
HMZ	historical migration zone
hp	horsepower
HPSA	Health Professional Shortage Areas
HUC	Hydrologic Unit Code
Hz	hertz
IBA	Important Bird Area
IMP	Integrity Management Plan
INGAA	Interstate Natural Gas Association of America
IPaC	Information for Planning and Conservation
IPCC	Intergovernmental Panel on Climate Change
IRA	Inventoried Roadless Area
IRR	Interga Reality Resources
ISO	International Organization for Standardization
JKA	James Kent Associates
KeyLog	KeyLog Economics
KOP	Key Observation Point
lb a.e.	pounds acid equivalent
LDB	left decending bank
LDC	local distribution companies
L_{dn}	day-night sound level
$L_{eq(24)}$	24-hour equivalent sound level
LiDAR	Light Detecting and Ranging
L_{max}	maximum noise level
LNG	liquefied natural gas
LOD	Limit of Disturbance
LPG	liquefied petroleum gas
LRMP	Land and Resource Management Plan

Abbreviation	**Definition**
M&R	meter and regulation
m/s	meters per second
m^3	cubic meters
MACT	Maximum Achievable Control Technology
MAOP	maximum allowable operating pressure
MBTA	Migratory Bird Treaty Act
mg	milligrams
mg/L	milligrams per liter
MGD	million gallons per day
MIS	management indicator species
MLA	Mineral Leasing Act
MLV	mainline block valve
MMBtu/hr	million British thermal units per hour
MMcf/d	million cubic feet per day
MMI	Modified Mercalli Intensity
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
Mountain Valley	Mountain Valley Pipeline, LLC
MP	milepost
MUA/P	Medically Underserved Areas/Populations
MUSYA	Multiple-Use Sustained-Yield Act of 1960
MVP	Mountain Valley Project
MW	megawatt
MXP	Mountaineer Xpress Project
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NCHA	National Coal Heritage Area
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Polutants for Source Categories
NFMA	National Forest Management Act of 1976
NFS	National Forest System
NGA	Natural Gas Act
NGO	non-governmental organizations
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NLCD	National Land Cover Database
NNSR	Nonattainment New Source Review
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration

Abbreviation	**Definition**
NOI	*Notice of Intent to Prepare and Environmental Impact Statement for the Planned Mountain Valley Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings*
NO_x	nitrogen oxides
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRC	New River Conservancy
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	National Rivers Inventory
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
NTSA	National Trails System Act
NWI	National Wetlands Inventory
O_3	ozone
OEP	Office of Energy Projects
^{o}F	degrees Fahrenheit
OFPP	Organic Farm Protection Plan
OHV	off-highway vehicle
OLS	Office of Lands and Streams
ORV	off-road vehicle
OTR	Ozone Transport Region
PABHP	Pennsylvania Bureau of Historic Properties
PAC	Pennsylvania Code
PADCNR	Pennsylvania Department of Conservation and Natural Resources
PADEP	Pennsylvania Department of Environmental Protection
PADEP BMR	Pennsylvania Department of Environmental Protection Bureau of Mining
PADEP DMO	Pennsylvania Department of Environmental Protection District Mining Operations
PAFBC	Pennsylvania Fish and Boat Commission
PAGC	Pennsylvania Game Commission
PAPUC	Pennsylvania Public Utility Commission
PASHPO	Pennsylvania State Historic Preservation Office
Pb	lead
PBDB	Paleobiology Database
PCB	polychlorinated biphenyl
pCi/L	picoCuries/liter
PEM	palustrine emergent
PFO	palustrine forested

Abbreviation	**Definition**
PGA	peak horizontal ground acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration
PI	point of intersection
PILT	Payments in Lieu of Taxes
PIR	potential impact radius
PM_{10}	particulate matter less than 10 microns
$PM_{2.5}$	particulate matter less than 2.5 microns
POD	Plan of Development
POWHR Coalition	Protect Our Water, Heritage, Rights
ppb	parts per billion
PPCEP	Preparedness, Prevention, and Contingency and Emergency Action Plans
ppm	parts per million
PSD	Prevention of Significant Deterioration
psig	pounds per square inch
PSS	palustrine scrub-shrub
PTE	potential-to-emit
RACR	Roadless Area Conservation Rule
RCNM	Roadway Construction Noise Model
RCRIS	Resource and Conservation Recovery Act Information System
RDB	right descending bank
RHA	River and Harbors Act of 1899
RICE	Reciprocating Internal Combustion Engines
RMP	risk management plan
Roanoke Gas	Roanoke Gas Company, LLC
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RR	Resource Report
RV	recreational vehicle
Rx	management prescription
SCADA	supervisory control and data acquisition system
SDWA	Safe Drinking Water Act
Secretary	Secretary of the Commission
SFHA	Special Flood Hazard Areas
SHPO	State Historic Preservation Officer
SIO	Scenic Integrity Objectives
SIP	State Implementation Plan
SLM	Sound Level Meter
SMPE	South Mist Pipeline Extension
SMS	Scenery Management System
SO_2	sulfur dioxide
SPCCP	Spill Prevention Controls and Countermeasures Plan

Abbreviation	Definition
SPL	Sound Pressure Level
SR	State Route
SSA	sole source aquifer
SSURGO	Soil Survey Geographic Database
STC	Sound Transmission Class
SWPPP	Stormwater Pollution Prevention Plan
Tcf	trillion cubic feet
TEG	tri-ethylene glycol
Texas Eastern	Texas Eastern Tranmission, LP
THPO	Tribal Historic Preservation Officer
TNC	The Nature Conservancy
tpy	tons per year
Transco	Transcontinental Gas Pipe Line Company LLC
TSS	total suspended solids
U.S.	United States
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of the Interior
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VAC	Virginia Administrative Code
VADCR-DNH	Virginia Department of Conservation and Recreation, Division of Natural Heritage
VADEQ	Virginia Department of Environmental Quality
VADGIF	Virginia Department of Game and Inland Fisheries
VADH	Virginia Department of Health
VADHR	Virginia Department of Historic Resources
VADMME	Virginia Department of Mines, Minerals, and Energy
VADOT	Virginia Department of Transporation
VaNLA	Virginia Natural Landscape Assessment
VdB	velocity decibel
VIA	Visual Impact Analysis
VOC	volatile organic compounds
VOF	Virginia Outdoors Foundation
VSAT	very small aperature terminal
WMA	Wildlife Management Area
WPCA	Water Pollution Control Act
WQC	Water Quality Certification
WRS	Wildlife Resources Section
WVDCH	West Virginia Division of Culture and History
WVDEP	West Virginia Department of Environmental Protection
WVDHHR	West Virginia Department of Health and Human Resources
WVDNR	West Virginia Department of Natural Resources

ACRONYMS AND ABBREVIATIONS (CONTINUED)

Abbreviation	Definition
WVDOT	West Virginia Department of Transporation
WVGES	West Virginia Geological and Economic Survey
WVGIS	West Virginia Geographic Information System
WVSPF	West Virginia State Park and Forest
yards	contractor and storage yards
ZCC	Zones of Critical Concern
ZPC	Zones of Peripheral Concern

EXECUTIVE SUMMARY

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared this final Environmental Impact Statement (EIS) to fulfill requirements of the National Environmental Policy Act (NEPA) and the Commission's implementing regulations under Title 18 of the Code of Federal Regulations (CFR) Part 380. On October 23, 2015, Mountain Valley Pipeline, LLC (Mountain Valley),[1] filed an application with the FERC under Section 7(c) of the Natural Gas Act and Part 157 of the Commission's regulations to construct and operate certain interstate natural gas pipeline facilities in West Virginia and Virginia. In the same month, Equitrans, L.P. (Equitrans)[2] filed its application with the FERC to construct and operate certain interstate natural gas pipeline facilities in Pennsylvania and West Virginia.

The FERC is the federal agency responsible for authorizing interstate natural gas transmission facilities under the National Gas Act and is the lead federal agency for preparation of this EIS in compliance with the requirements of NEPA. The United States (U.S.) Department of Agriculture's Forest Service (FS); the U.S. Environmental Protection Agency (EPA); the U.S. Army Corps of Engineers (COE); the U.S. Department of Interior's Bureau of Land Management (BLM); the U.S. Fish and Wildlife Service (FWS), West Virginia Field Office; the Pipeline and Hazardous Materials Safety Administration within the U.S. Department of Transportation; the West Virginia Department of Environmental Protection (WVDEP), and the West Virginia Division of Natural Resources (WVDNR) participated as cooperating agencies in preparation of the EIS. A cooperating agency has jurisdiction by law or has special expertise with respect to environmental resource issues associated with a project.

In February 2016, Mountain Valley notified the FERC that the Mountain Valley Project (MVP) would cross federally owned lands managed separately by both the FS (as part of the Jefferson National Forest) and the COE (as part of the Weston and Gauley Bridge Turnpike Trail). Under the Mineral Leasing Act (MLA, 30 U.S.C. 185 et seq.), the BLM is the federal agency responsible for issuing Right-of-Way Grants for natural gas pipelines across federal lands under the jurisdiction of the BLM or under the jurisdiction of two or more federal agencies. Therefore, the BLM would be responsible for the issuance of a Right-of-Way Grant to Mountain Valley for a pipeline easement over federal lands, dependent on concurrence from the FS and the COE. The MVP pipeline route would cross about 3.5 miles (82.7 acres or 1.2 percent of the total MVP acreage) of the Jefferson National Forest (managed by the FS) in Monroe County, West Virginia and Giles and Montgomery Counties, Virginia. The MVP pipeline route would cross about 60 feet of the Weston and Gauley Bridge Turnpike Trail, managed by the COE, in Braxton County, West Virginia. Additional mitigation may be required as a result of the Right-of-Way Grant.

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1 Mountain Valley is a joint venture between affiliates of EQT Midstream Partners, LP; NextEra Energy US Gas Assets, LLC; WGL Midstream, Inc.; RGC Midstream, LLC; and Con Edison Gas Midstream, LLC.

2 Equitrans is a limited partnership, with about 97.25 percent owned by Equitrans Investments, LLC and 2.75 percent owned by Equitrans Services, LLC, both subsidiaries of EQT Midstream Partners LP.

PROPOSED ACTION

Mountain Valley's proposal (the Mountain Valley Project [MVP]) would involve construction and operation of about 303.5 miles of new 42-inch-diameter natural gas pipeline and associated facilities in West Virginia and Virginia. Mountain Valley also proposes to construct and operate 3 new compressor stations, 4 new meter stations and interconnects, 3 taps, 36 mainline valves, 8 pig[3] launchers/receivers at 5 locations, and 31 cathodic protection beds.

Equitrans' proposal (the Equitrans Expansion Project [EEP]) would involve construction and operation of a total of about 7.4 miles of various diameter natural gas pipelines (H-158, H-305, H-316, H-318, H-319, and M-80), 1 new compressor station, 2 interconnects, 4 pig launcher and receiver sites, cathodic protection beds, and the decommissioning of an existing compressor station, in Pennsylvania and West Virginia. No meter stations or mainline valves are associated with the EEP.

In this document, Mountain Valley and Equitrans are collectively referred to as the "Applicants." As described by the Applicants, the purpose of both the MVP and the EEP is to transport natural gas produced in the Appalachian Basin to markets in the Northeast, Mid-Atlantic, and Southeastern United States. The MVP is designed to transport about 2.0 million dekatherms per day (Dth/d, equivalent to about 2.0 billion cubic feet per day [Bcf/d]) of contracted volumes of natural gas. The EEP would transport up to 400,000 Dth/d (about 0.4 Bcf/d) of contracted firm capacity of natural gas.

On October 27, 2014, Mountain Valley filed a request with the FERC to initiate the Commission's pre-filing environmental review process for the MVP. On October 31, 2014, the FERC granted Mountain Valley's request and established temporary pre-filing docket number PF15-3-000 to place information related to the MVP into the public record. The intent of our[4] pre-filing process is to encourage the early involvement of interested stakeholders, facilitate interagency cooperation, and identify and resolve issues before an application is filed.

On April 1, 2015, Equitrans requested to use our pre-filing environmental review process for the EEP, and the FERC accepted that request on April 9, 2015. The Commission established the pre-filing temporary docket number of PF15-22-000 for the EEP.

PUBLIC INVOLVEMENT

During pre-filing, the Applicants sponsored 18 open house meetings held at various locations throughout the project areas to explain their projects to the public. Representatives of the FERC staff also attended those open house meetings to answer questions from the public about our environmental review process. We estimate that about 1,100 people attended all the open houses combined.

On April 17, 2015, the Commission issued a *Notice of Intent* (NOI) *to Prepare an Environmental Impact Statement for the Planned Mountain Valley Pipeline Project, Request for*

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3 A pig is an internal tool that can be used to clean and dry a pipeline and/or to inspect it for damage or corrosion.

4 "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

Comments on Environmental Issues, and Notice of Public Scoping Meetings. The NOI was published in the *Federal Register* on April 28, 2015, and mailed to more than 2,800 interested parties on our environmental list. The NOI briefly described the MVP, summarized the FERC's environmental review process, provided a preliminary list of issues identified by us, invited comments on the environmental issues that should be addressed in the draft EIS, listed the dates, times, and locations of six public scoping meetings to be held in the area of the MVP, and established a closing date for receipt of comments of June 16, 2015.

We issued our NOI for the EEP on August 11, 2015, that was published in the *Federal Register* on August 17, 2015. The scoping period for the EEP ended on September 14, 2015.

The scoping meetings were held in Pine Grove, Weston, Summersville, and Lindside, West Virginia; and Ellison and Chatham, Virginia between May 4 and 13, 2015. About 650 people in total attended the meetings; with 169 people providing verbal comments. During the scoping period, we received 964 comments on the MVP and 5 comments on the EEP. Transcripts of the scoping meetings were placed into the public record for this proceeding.

We issued a Notice of Availability for the draft EIS on September 16, 2016, that listed the dates, times, and locations of seven public sessions to take verbal comments on the draft EIS, and established a closing date for receipt of written comments on the draft EIS of December 22, 2016. The sessions were held in Chatham, Rocky Mount, and Roanoke, Virginia; Peterstown, Summersville, and Weston, West Virginia; and Coal Center, Pennsylvania between November 1 and 9, 2016. About 627 people attended the sessions in total; with 261 people providing verbal comments. Transcripts of the sessions to take comments on the draft EIS were placed into the public record for the proceedings. Between September 16 and December 22, 2016, we received 1,237 written letters or electronic filings commenting on the draft EIS or about the projects, not including repeats and petitions.

During the pre-filing period, Mountain Valley and Equitrans assessed numerous route alternatives; Mountain Valley adopted 11 route alternative segments and 571 minor route variations into its proposed project design for various reasons including landowner requests, avoidance of sensitive environmental resources, or engineering considerations. On October 14, 2016, Mountain Valley adopted two route variations that were recommended in the FERC's September 2016 draft EIS. That same filing documented 130 additional minor route variations that modified the draft EIS proposed pipeline route to account for landowner requests, avoidance of specific sensitive environmental resources (such as archaeological sites or wetlands), avoidance of areas of steep terrain or side slopes, and engineering adjustments.

Copies of this final EIS were mailed to our environmental list, including elected officials, government agencies, Native Americans and Indian tribes, regional environmental groups and non-governmental organizations, affected landowners, local newspapers and libraries, and other interested individuals, including attendees of FERC-sponsored public meetings and sessions, and individuals who submitted comments on the projects. The EIS has been filed with the EPA, and a formal Notice of Availability will be issued in the *Federal Register*.

PROJECT IMPACTS AND MITIGATION

Construction and operation of the projects could result in impacts on environmental resources, including on geology, soils, groundwater, surface water, wetlands, vegetation, wildlife, fisheries, special-status species, land use, visual resources, socioeconomics, cultural resources, air quality, noise, and safety. In section 3 of this EIS, we include an evaluation of alternatives to the projects, including the no-action alternative, system alternatives, and route alternatives. In section 4.13, we assess the cumulative impacts of the projects added to other known actions within the same geographic area and in the same timeframe.

We evaluate the impacts of the projects, taking into consideration the Applicants' proposed avoidance, minimization, and mitigation measures. Our analysis of impacts on environmental resources is summarized below and is discussed in detail in section 4 of this EIS. Where necessary, we recommend additional mitigation measures to reduce impacts on specific resources. Section 5.2 of this EIS contains a compilation of our recommended mitigation measures.

Geology and Soils

The MVP pipeline route would be within 0.25-mile of 67 mines and 227 active oil and gas wells. The EEP would be in proximity to 18 inactive mines and 39 active oil and gas wells. Mountain Valley developed a *Mining Area Construction Plan*. Equitrans developed a *Mine Subsidence Plan*. The Applicants would flag and install safety fence around oil and gas wells near the construction right-of-way.

Peak ground accelerations (2 percent chance of exceedance in 50 years) along the MVP would range between 0.4 g and 0.14 g (low to high probability of a seismic event). The EEP is in an area identified to have a low probability of a significant seismic event, with a peak ground acceleration of 4 percent g. Mountain Valley would use Class 2 pipe in areas where seismic hazards exist.

About 32 percent of the MVP pipeline route and 45 percent of the EEP pipelines would cross topography with slopes greater than 15 percent grade. About 67 percent of the MVP pipeline route, and all of the EEP pipelines, would cross areas susceptible to landslides. The Applicants would implement specific construction methods for crossing steep topography. Mountain Valley developed a *Revised Landslide Mitigation Plan* in March 2017. However, we recommend that the plan be revised further to include several additional industry best management practices to further reduce the potential for landslides and extend the LiDAR monitoring program that would be used within the Jefferson National Forest for all potential landslide areas project wide.

The MVP pipeline route would cross about 67 miles of karst terrain. The EEP pipelines would not cross karst terrain. Mountain Valley developed a *Karst Mitigation Plan*. Due to a significant number of public comments regarding pipeline integrity and safety in areas of potential karst collapse and subsidence and since monitoring is a key element to providing safe operation of the pipeline over its lifetime, we recommend that Mountain Valley adopt a LiDAR monitoring program to detect subsidence along the MVP pipeline route during operation.

The projects would traverse a variety of soil types and conditions. Permanent impacts on soils would occur only at the aboveground facilities, where the sites would be covered with gravel and converted to industrial use. Most impacts on soils would be temporary or short-term during pipeline construction. After pipeline installation, the right-of-way would be restored and revegetated, in accordance with the FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) for MVP, and Equitrans' project-specific Plan for the EEP.

Construction of the MVP would disturb about 5,053 acres of soils that are classified as having the potential for severe water erosion. Construction of the EEP would affect about 193 acres of soils rated as being prone to erosion by water. Mountain Valley would reduce erosion by installing the sediment controls outlined in its project-specific *Erosion and Sediment Control Plan* and following the measures outlined in the FERC Plan. Equitrans would reduce erosion by following the measures outlined in its *Erosion and Sediment Control Plan* and its project-specific Plan. Mountain Valley would revegetate the right-of-way after pipeline installation using seed mixes recommended by the Wildlife Habitat Council, while Equitrans would follow the Pennsylvania Department of Environmental Protection's (PADEP) *Erosion and Sediment Pollution Control Program Manual*.

Construction of the MVP would disturb about 2,829 acres of prime farmland or farmland of statewide importance. Construction of the EEP would affect a total of 136 acres of prime farmland and farmland of statewide importance combined. The Applicants would reduce impacts on agricultural lands by repairing or replacing irrigation systems and/or drain tiles, segregating topsoil, removing rocks, and decompacting soils.

The MVP pipeline route would traverse about 216 miles of shallow bedrock. About 1 mile along the routes of the EEP pipelines has been identified as having shallow depth to bedrock. If bedrock is encountered during trenching, the Applicants would first attempt to rip the bedrock using standard trenching techniques. If the bedrock is unrippable, the Applicants would consider using rock-trenching machines, rock saws, hydraulic rams, jack hammers and the like. If blasting becomes necessary, it would be done in accordance with Mountain Valley's project-specific *General Blasting Plan*. Should blasting be required for EEP, Equitrans would provide a blasting plan to the FERC for approval prior to any blasting activities.

Groundwater, Surface Waterbody Crossings, and Wetlands

Neither of the projects would cross any designated sole source aquifers, and no state-designated aquifers have been identified in the project areas. The MVP would cross two groundwater wellhead protection areas and 20 surface water protection areas (14 Zones of Peripheral Concern and 6 Zones of Critical Concern). EEP would not cross any source water protection areas for groundwater resources. As Mountain Valley has not yet filed contingency plans for nearby public surface water supplies, we recommend that Mountain Valley file plans which outline minimization and mitigation measures for public surface water supplies with intakes within 3 miles downstream of construction workspaces and Zones of Critical Concern within 0.5 miles of construction workspaces.

Because the Applicants, in part due to lack of access, have not completed field surveys to identify water wells and springs within 150 feet of construction workspaces (500 feet in karst terrain[5]), we recommend that Mountain Valley and Equitrans provide the location of all water wells, springs, and other drinking water sources identified during pre-construction surveys after access is obtained. The Applicants have agreed to perform pre-construction monitoring of water quality and yield for drinking water resources, and would evaluate any complaints or damage associated with construction of the projects and identify suitable settlements with landowners, including providing alternative sources of potable water during repair or replacement of the damaged water supply. However, we recommend that the Applicants agree to conduct post-construction water quality/yield sampling for drinking water sources within 150 feet of construction (500 feet in karst). In addition, the Applicants have developed *Spill Prevention, Containment, and Counter Measure Plans* (SPCCP) to protect water resources from accidental spills of hazardous materials, such as fuel and oil, during construction and operation.

The MVP would result in 1,108 waterbody crossings and the EEP would result in 38 waterbody crossings. Of these crossings, 407 would be perennial waterbodies that could support fisheries. Equitrans would use horizontal directional drills (HDD) to cross under nine waterbodies; the others would be crossed using dry crossing methods (such as flumes or dam-and-pump). In the event of a release of drilling mud during an HDD, Equitrans developed a *HDD Contingency Plan*. Mountain Valley would cross all waterbodies using dry crossing construction methods. These measures should reduce downstream turbidity and sedimentation. Impacts on streams should be temporary or short-term, as typical crossings would be completed in less than 48 hours, and sediment controls would be in place. In addition, due to engineering feasibility and favorable geotechnical cores, we recommend that Mountain Valley adopt an alternative route alignment and HDD crossing methodology for the Pigg River at milepost (MP) 289.2.

Construction of the MVP and the EEP would impact a total of 32.1 acres of wetlands, including 4.6 acres of forested wetlands, 24.9 acres of emergent wetlands, and 2.5 acres of scrub-shrub wetlands. The Applicants would minimize impacts on wetlands by reducing the construction right-of-way width to 75 feet through wetlands, and following the measures outlined in their project-specific *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures). The Applicants also submitted applications to the COE to obtain permits to cross Waters of the United States and wetlands under Section 404 of the Clean Water Act. Impacts on wetlands from pipeline construction could involve a conversion of vegetation type but would not involve a conversion from wetland to upland; thus, there would be no net wetland losses. However, to compensate for conversions of wetland types, especially the permanent conversion of about 4.6 acres of forested wetlands to shrub or emergent wetlands within the pipeline operational easement and along permanent access roads, the Applicants propose to purchase credits, if necessary, from approved wetland mitigation banks in the West Virginia, Virginia, and Pennsylvania.

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[5] Longer distances may be necessary if dye traces, cave maps, or other information provided in the enhanced karst management plan required by WVDEP's Special Condition 16 of the Conditional 401 Water Quality Certificate depict distant underground connectivity.

Vegetation, Wildlife, Fisheries, and Federally Listed and State-sensitive Species

The MVP pipeline would cross about 235 miles of forest, 2.7 miles of shrublands, and 7.5 miles of grasslands. The EEP pipelines would cross about 4 miles of forest and less than 0.1 mile of grasslands. Impacts on shrublands and grasslands would be short-term, as the Applicants would revegetate the right-of-way after pipeline installation, and shrubs and grasses would be reestablished in a few years. While forest would be allowed to regenerate in temporary workspaces, this would be a long-term impact because it would take many years for trees to mature. The 50-foot-wide operational easement for the pipelines in uplands would be kept clear of trees, which would represent a permanent impact. Construction of the MVP and the EEP would affect about 4,527 acres of upland forest. The construction and operation of aboveground facilities would also have permanent impacts on vegetation, as those sites would be converted to industrial use and maintained as gravel yards without vegetation. Operation of the aboveground facilities for the MVP and EEP combined would impact 25 acres of upland forest. The MVP would impact about 2,428 acres of contiguous interior forest designated as Large Core (greater than 500 acres) forest areas in West Virginia. In Virginia, the MVP would impact about 547 acres of contiguous interior forest during construction classified as High to Outstanding quality. The result of the establishment of a new corridor through interior forest would be the conversion of about 17,194 acres of interior forest in West Virginia and 4,579 acres of interior forest in Virginia into edge habitat based on the extension of forest edge for an estimated 300 feet on either side of the MVP right-of-way. In considering the total acres of forest affected, the quality and use of forest for wildlife habitat, and the time required for full restoration in temporary workspaces, we conclude that the MVP would have significant impacts on forest.

A variety of wildlife species occupy the habitats crossed by Mountain Valley's and Equitrans' pipelines. Construction of the MVP and the EEP may result in mortality for less mobile animals, such as small rodents, reptiles, amphibians, and invertebrates, which are unable to escape equipment. More mobile animals would likely be displaced to adjacent similar habitats during construction and restoration. Additionally, constructing the projects could disrupt bird courting, breeding, or nesting behaviors. In shrublands and grasslands, impacts would be short-term. Once the right-of-way is revegetated, it would be reoccupied by animals.

Impacts on forest-dwelling species would be greater because forest would take a long time to regenerate in temporary workspaces and trees would be permanently removed from the operational pipeline easement. The removal of forest would contribute to edge effects and habitat fragmentation within core forest tracts. In West Virginia, the MVP would pass through 24 core forest areas, and result in permanent impacts on about 892 acres within those forest core tracts. In Virginia, the MVP would pass through 17 high to outstanding ecological core areas, with permanent impacts on about 209 acres of forest within those core tracts. Construction of the EEP H-318 pipeline in Pennsylvania would affect one tract of interior forest of about 50 acres. The MVP and the EEP would collocate their pipeline facilities adjacent to existing rights-of-way for about 30 percent and 32 percent of the routes, respectively, which would reduce forest fragmentation and new edges.

Migratory birds, including Birds of Conservation Concern, are associated with the habitats that would be affected by the MVP and the EEP. The proposed MVP would impact two

Important Bird Areas. Both Mountain Valley and Equitrans developed *Migratory Bird Habitat Conservation Plans* to minimize impacts on bird species. In addition, Equitrans has agreed to conduct tree clearing outside of the migratory bird nesting season (i.e., from August 2 to April 14). Mountain Valley would potentially conduct tree clearing in select areas during the migratory bird nesting season (during April, May, and August).

Mountain Valley filed an updated version of its *Migratory Bird Conservation Plan* on May 11, 2017 to address concerns of the EPA, FWS, Virginia Department of Environmental Quality, WVDNR, and other consulting agencies regarding the impacts on large acreages of upland forest. The plan includes updated avoidance, minimization, and restoration measures for impacts resulting from the MVP, including additional tree and shrub plantings to restore right-of-way sections within riparian areas, forested wetlands, and loggerhead shrike nesting habitat. The updated plan includes a revised tree felling and vegetation clearing schedule and therefore also includes expanded protocols for migratory bird nest surveys prior to tree felling and vegetation clearing. However, we understand that the May 11, 2017 version of the *Migratory Bird Conservation Plan* is not the final plan, as Mountain Valley continues to coordinate with the consulting agencies to finalize the plan. Therefore, we recommend Mountain Valley file a final Migratory Bird Conservation Plan prepared in coordination with the FWS, WVDNR, and Virginia Department of Game and Inland Fisheries to ensure that impacts on migratory birds, resulting from the significant impacts on upland forest are adequately avoided, minimized, mitigated, and/or restored.

The MVP would entail 136 crossings (including fill, temporary fill, and culverts) of waterbodies classified as fisheries of special concern. None of the waterbodies that would be crossed by the EEP are classified as fisheries of special concern. Mountain Valley indicated that it would cross all waterbodies classified as fisheries of special concern within state-designated construction windows. In addition, Mountain Valley would follow the measures outlined in its project-specific Procedures; using dry techniques to cross all waterbodies.

Based on our review of existing records, and Mountain Valley's and Equitrans' informal consultations with the FWS, we identified 23 federally listed threatened or endangered species (or federal candidate species or federal species of concern) that would be potentially present in the vicinity of the projects[6]. We have concluded that the MVP would have *no effect* on 2 of the species, would be *not likely to adversely affect* 8 species, would have *no adverse impacts anticipated* for 2 species, would be *not likely to contribute to a trend toward federal listing* for 3 species, and would be *likely to adversely affect* 7 species (Indiana bat, northern long-eared bat, Roanoke logperch, running buffalo clover, shale barren rock cress, small whorled pogonia, and Virginia spiraea). Our *likely to adversely affect* determination for the latter four of these species is based on our assumption that these species are present in portions of the MVP corridor that Mountain Valley was not granted land access to survey. We conclude that the EEP would be *not likely to adversely affect* the two endangered bats assumed to be present in the vicinity of the EEP. The conclusion was based in part upon Equitrans implementing effects avoidance and minimization measures outlined in the FWS-approved EEP Myotid Bat Conservation Plan. We are currently preparing a Biological Assessment (BA), which will be submitted separately to the

[6] One species, the bog turtle, is not subject to Section 7 consultation.

FWS and will include our detailed assessment regarding the effects of the projects on federally listed species. Section 4.7 of the EIS summarizes our BA, and presents our findings of effects for each federally listed species that may be affected by the projects. We recommend that construction not begin until after the FERC completes the process of complying with the Endangered Species Act (ESA).

The projects could also affect 20 species that are state-listed as threatened, endangered, or were noted by the applicable state agencies as being of special concern not counting those species already counted as federally listed. Based on our review, we have concluded that the MVP and EEP *would not significantly impact* all 20 of these species.

Land Use and Visual Resources

The MVP pipeline route would mostly cross forest (76.6 percent), followed by agricultural land (14.6 percent), and open land (8.7 percent). Land affected by EEP construction is mostly agricultural (46.3 percent), followed by forest (37.6 percent), and open land (12.5 percent).

Mountain Valley identified 118 residences within 50 feet of its proposed construction right-of-way. Site-specific residential mitigation plans are included as appendix H of this EIS. In the draft EIS we asked affected landowners to review and comment on those plans. In addition, we recommend that Mountain Valley file landowner concurrence with the plans for all residences that would be within 10 feet of the construction work area.

Equitrans identified four residences within the boundary of the proposed Redhook Compressor Station. Equitrans has negotiated agreements with all of the property owners.

Mountain Valley identified five organic farms that would be affected. To reduce impacts on organic farms, Mountain Valley developed an *Organic Farm Protection Plan*. No orchards, tree farms, specialty crops, or organic farms were identified along the EEP.

Federally owned or managed recreational and special use areas that would be crossed by the MVP pipeline route include the Weston and Gauley Bridge Turnpike Trail, the Blue Ridge Parkway, and the Jefferson National Forest. Within the Jefferson National Forest, the pipeline would cross the Appalachian National Scenic Trail (ANST) and the Brush Mountain Inventoried Roadless Area. Mountain Valley proposes to cross under the ANST using a bore. After the issuance of the draft EIS several comments were received on the Visual Impact Assessment and, after additional coordination with the FS, Mountain Valley submitted additional Visual Impact Assessments using several new Key Observation Points. Mountain Valley is also proposing to bore under the Weston and Gauley Bridge Turnpike Trail and the Blue Ridge Parkway.

About 3.5 miles of the MVP pipeline route would cross the Jefferson National Forest. On the Jefferson National Forest, construction of the MVP would directly impact a total of about 83 acres. Impacts on National Forest resources would be minimized by Mountain Valley following the measures outlined in the Plan of Development (POD), including the various resource-specific mitigation plans attached to the POD as appendices, that must be approved by the FS and BLM, and in a Right-of-Way Grant that must be approved by the BLM. The FS operates under a multi-year Land and Resource Management Plan (LRMP) for the Jefferson

National Forest. The route of the MVP pipeline through the Jefferson National Forest would cross five separate management prescriptions outlined in the LRMP: ANST Corridor (Rx4A); Mix of Successional Habitats in Forested Landscapes (Rx8A1); Old Growth Forest Communities-Disturbance Associated (Rx6C); Urban/Suburban Interface (Rx4J); and Riparian Corridors (Rx11). Construction of the MVP would result in a long-term impact on about 14.1 acres within Rx4J and 58.7 acres within Rx8A1. Construction would also result in the loss of 13.2 acres of the Dry-Mesic Oak Forest and 1.7 acres of the Dry and Dry-Mesic Oak-Pine Forest old growth community types. Operation of the MVP would result in a permanent loss of timber of about 31.1 acres, including 5.7 acres of Rx4J and 25.4 acres of Rx8A1. In this EIS, the FS analyzed amending its LRMP to allow for the MVP within the Jefferson National Forest, which includes five project-specific amendment parts that exempt LRMP standards to allow for the construction and operation of the MVP. Mountain Valley and the FS have worked to develop project design criteria, mitigation measures, and monitoring actions to meet the intent of the exempted LRMP standards.

Mountain Valley performed a visual resources analysis of its entire pipeline route (see appendix S). It identified nine Key Observation Points where visual impacts may be high because the pipeline corridor may stand out from the surrounding landscape and would be visible to viewers. After the issuance of the draft EIS several comments were received on the Visual Impact Assessment. In response, Mountain Valley expanded its analysis to include several additional Key Observation Points and it submitted separate Visual Impact Assessments for the crossings of the Weston and Gauley Bridge Turnpike Trail (which is administered by the COE), the Blue Ridge Parkway (which is administered by the National Park Service [NPS]), and the Jefferson National Forest (which is administered by the National Forest System [NFS]). In appendix S of this EIS we reproduce visual simulations for the highly sensitive Key Observation Points.

The Jefferson National Forest Visual Impact Assessment identified 47 Key Observation Points on or adjacent to NFS lands that include specific viewing locations associated with the ANST, on Craig Creek Road, on Pocahontas Road, on U.S. 219, and the town of Pearisburg, Virginia. Mitigation measures for revegetation and restoration identified in section 4.8.2.6 would be required to meet the Scenic Integrity Objectives on NFS lands within 5 years of project construction.

Compressor stations and meter stations would have high potential for visual impacts, as these are permanent aboveground structures. Operation of new aboveground facilities would result in conversion of 43 acres of forest, agricultural, and open land into industrial land. Most of the facilities are located in rural areas, some distance from residences. Visual impacts for the aboveground structures would generally be reduced by topography and vegetation surrounding the sites, which screen the facilities from most viewers.

Socioeconomics and Transportation

The projects would have temporary impacts on local populations and housing. Peak non-local employees working on the MVP would average between 536 and 671 people per construction spread (construction spreads and discrete segments of the pipeline that are constructed concurrently or separately from other portions of the route). For MVP, the construction spreads would range in length from 22.2 miles to 39.2 miles. The total peak workforce for the EEP, including pipelines and aboveground facilities, would be about 400 people. The Applicants would not build any temporary "man-camps" or project housing complexes. Instead, non-local construction workers would need to find housing in vacant rental units, including houses, apartments, mobile home parks, hotels/motels, and campgrounds and recreational vehicle (RV) parks. The influx of non-local construction workers could affect local housing availability, as they compete with visitors for limited accommodations in rural areas with few hotels. In those counties where housing is limited, workers would likely find accommodations at adjacent larger communities that are within commuting distance, bring their own lodgings in the form of RVs, or share units. For the MVP, construction workers would be spread out along 11 separate pipeline spreads and 7 aboveground facilities across 17 counties. While it would take about 2.5 years to build the MVP, the average worker would only be on the job for about 10 months for the pipeline and 8 months for aboveground facilities.

There is no evidence that the projects would cause significant adverse health or environmental harm to any community with a disproportionate number of minorities, low income, or other vulnerable populations. Our analysis of environmental justice found that in the counties that contain MVP facilities in West Virginia, minorities represent between 0.7 to 7.0 percent of the population, compared to the statewide average of 6.4 percent. In the affected counties of Virginia, minorities comprise between 4 and 25.2 percent of the population, compared to the Virginia-wide average of 31 percent. In the Pennsylvania counties that contain EEP facilities, minorities comprise between 6.0 and 19.2 percent of the population, compared to the Pennsylvania-wide average of 18.4 percent. Eight of the 17 counties in the MVP area have poverty rates that are higher than the respective statewide levels. For the EEP, two of the four counties crossed have poverty rates that are higher than the respective state averages. The projects would mitigate for impacts on low income communities through temporary employment opportunities, spending on commodities, and generation of tax revenues that would stimulate the local economy.

We received comments regarding potential adverse effects of the projects on property values, mortgages, and insurance policies. The value of a tract of land, with or without a dwelling, would be related to many variables, including the size of the tract, improvements, land use, views, location, nearby amenities, and the values of adjacent properties. The presence of a pipeline, and the restrictions associated with an easement, may influence a potential buyer's decision whether or not to purchase that property. Multiple studies indicate that the presence of a natural gas pipeline would not significantly reduce property values. One recent study conducted for the Interstate Natural Gas Association of America found that there was little difference in adjusted sale prices for houses adjacent to a pipeline easement and those further away in the same subdivision. Also, there is unsubstantiated evidence that buyers of land with pipeline easements were unable to obtain mortgages. We are unaware of an example where an insurance company considered the presence of a pipeline when underwriting homeowner policies.

Mountain Valley proposes to use 393 roads to access the construction right-of-way, including 355 existing roads, 37 new access roads, and 1 access road that is both existing and new. The status of one road is unknown due to lack of survey access permissions. Equitrans proposes to use 29 access roads during construction for access to the right-of-way during construction of the EEP, including 17 existing roads and 12 new roads. Construction equipment is required to stay on the right-of-way and approved access roads. The Applicants would minimize impacts on local road users by following the measures outlined in their project-specific *Traffic and Transportation Management Plans*. After construction, the Applicants would repair all roads to their original condition.

Cultural Resources

Section 101 of the National Historic Preservation Act (NHPA) requires that the FERC consult with Indian tribes that may attach religious or cultural significance to historic properties in the area of potential effect (APE). Historic properties include pre-contact or historic sites, districts, buildings, structures, objects, or properties of traditional religious or cultural importance that are listed or eligible for listing on the National Register of Historic Places (NRHP). We consulted with Indian tribes that may have an interest in the projects (37 tribes for the MVP and 18 tribes for the EEP). One tribe responded with no objections to the MVP; no tribes responded to the EEP contact program.

Section 106 of the NHPA requires that the FERC take into account the effects of its undertakings on historic properties, and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. The steps in the process to comply with Section 106, outlined in the implementing regulations at Title 36 CFR Part 800, include consultations, identification of historic properties, assessment of effects, and resolution of adverse effects. Mountain Valley and Equitrans conducted archaeological and historic architectural surveys of the APE to identify historic properties. Mountain Valley defined its direct APE as a 300-foot-wide corridor.

The proposed pipeline route would cross through seven recorded Historic Districts (Big Stony Creek Historic District, Greater Newport Rural Historic District, North Fork Valley Rural Historic District, Bent Mountain Rural Historic District, Blue Ridge Parkway Historic District, Coles-Terry Rural Historic District, and the Lynchburg and Danville Railroad Historic District). Project effects on those Historic Districts have not yet been officially determined at this time. FERC is continuing to consult with federal land managing agencies, SHPOs, interested Indian tribes, and other consulting parties to complete determinations of project effects, which may require the development of a Memorandum of Agreement pursuant to 36 CFR 800.4(b)(2).

Mountain Valley identified 11 previously recorded archaeological sites and three previously recorded architectural sites in the direct APE in West Virginia. The pipeline route would cross the NRHP-listed Weston and Gauley Bridge Turnpike Trail in Braxton County, but use of a bore under the trail would mitigate adverse effects. In Virginia, there are 42 previously recorded archaeological sites within the direct APE, as well as the NRHP-eligible ANST. Mountain Valley would mitigate adverse effects on the NRHP-eligible ANST by boring under the trail.

As of July 2016, surveys had covered about 292 miles of the MVP pipeline route (96 percent). Within the direct APE, Mountain Valley identified 282 new archaeological sites and 116 new historic architectural sites. Of these, 220 of the archaeological sites and 107 of the historic architectural sites are not eligible for the NRHP, thus requiring no further work. A total of 46 archaeological sites are unevaluated, and avoidance was recommended. Eleven newly recorded archaeological sites and nine historic architectural sites have been evaluated as eligible for nomination to the NRHP. Additional investigations are still necessary at some of the sites to determine NRHP eligibility or project effects.

Equitrans identified two previously recorded historic properties in the direct APE for the H-318 pipeline: the Monongahela River Navigation System and the Pittsburgh & Lake Erie Railroad. Equitrans intends to avoid impacts on these two historic properties by using an HDD to cross under the Monongahela River. Seven new archaeological sites were identified along EEP pipelines. All of the newly identified archaeological sites along the EEP pipelines were evaluated as not eligible for the NRHP.

To ensure that our responsibilities under the NHPA are met, we recommend that the Applicants not begin any construction until after any additional required surveys and evaluative research are completed, any necessary treatment plans have been reviewed by the appropriate parties, and an agreement document has been executed to resolve adverse effects.

Air Quality and Noise

Air quality impacts associated with construction of the proposed projects would include emissions from construction equipment and fugitive dust. Such air quality impacts would generally be temporary and localized, and are not expected to cause or contribute to a violation of applicable air quality standards. Mountain Valley would implement the measures from its *Fugitive Dust Control Plan* while Equitrans would implement the measures in its *Dust Suppression Plan* to reduce construction impacts on air quality. Once construction activities in an area are completed, fugitive dust and construction equipment emissions would subside, and the impact on air quality due to construction would go away completely. Further, MVP would occur in areas classified as attainment or unclassifiable, while EEP's construction emissions would not exceed the General Conformity thresholds in areas of degraded air quality. Therefore, we conclude that the projects' construction-related impacts would not result in a significant impact on local or regional air quality.

Mountain Valley submitted applications for construction and operation of the Bradshaw, Harris, and Stallworth Compressor Stations to the WVDEP and were issued Permits to Construct. The new Bradshaw Compressor Station would exceed the Title V major source threshold for nitrogen oxide (NO_x) and carbon monoxide (CO). Therefore, Mountain Valley is required to file a Title V permit application with the WVDEP within 12 months of startup of operations of the Bradshaw Compressor Station. EEP submitted an application for construction and operation of the Redhook Compressor Station to the PADEP. The Harris, Stallworth, and Redhook Compressor Stations would not exceed the major source emissions thresholds to be subject to Title V operating permit. All compressor stations would be minor sources with respect to Prevention of Significant Deterioration and New Source Review under the Clean Air Act.

Minimization of operational air pollutant emissions, including greenhouse gases, would be achieved by operating the most efficient turbines, installing $SoLoNO_x$ system for larger turbines, installing best available technology (BAT), adhering to good operating and maintenance practices on turbines and combustion engines, and adhering to applicable federal and state regulations designed to reduce emissions. The screening analyses conducted for Mountain Valley's and Equitrans' compressor stations show criteria air pollutant concentrations are below the applicable National Ambient Air Quality Standards. We conclude that emissions resulting from operation of the compressor stations would not result in significant impacts on local or regional air quality.

Noise Sensitive Areas (NSA) near the construction areas may experience an increase in perceptible noise, but the effect would be temporary and local. Noise mitigation measures that would be implemented during construction include the use of sound-muffling devices on engines and installation of barriers between construction activity and NSAs, as well as, limiting the great majority of construction to daytime hours. Additional noise mitigation measures could be implemented to further reduce construction noise disturbances at NSAs. In addition we have included recommendations for an HDD noise mitigation plan (for Equitrans), an HDD noise analysis (for MVP), and noise surveys for compressor stations. Based on modeled noise levels, mitigation measures proposed, and the temporary nature of construction, we conclude that construction of the projects would not result in significant noise impacts on residents and the surrounding communities.

Noise impacts on NSAs due to operations of the pipeline facilities, compressor stations and meter stations would be negligible to barely perceptible. Noise from planned or unplanned blowdown events could exceed the noise criteria but would be infrequent and of relatively short duration. Based on the analyses conducted, mitigation measures proposed, and our recommendations, we conclude that operation of MVP and EEP would not result in significant noise impacts on residents and the surrounding communities.

Reliability and Safety

The projects would be designed, constructed, operated, and maintained to meet the U.S. Department of Transportation's Minimum Federal Safety Standards in 49 CFR 192 and other applicable federal and state regulations. These regulations include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion.

Mountain Valley and Equitrans would implement their own management plan for pipeline facilities. The pipeline system would be inspected to observe right-of-way conditions and identify soil erosion that may expose the pipe, dead vegetation that may indicate a leak in the pipeline, conditions of the vegetative cover and erosion control measures, unauthorized encroachment on the right-of-way such as buildings and other structures, and other conditions that could present a safety hazard or require preventive maintenance or repairs. Mountain Valley and Equitrans would use data acquisition systems that would allow for continuous monitoring and control of the projects.

Mountain Valley and Equitrans would prepare project-specific emergency response plans that would provide procedures to be followed in the event of an emergency that would meet the requirements of 49 CFR 192.615. The plans would include the procedures for communicating with emergency services departments, prompt responses for each type of emergency, logistics, emergency shut down and pressure reduction, emergency service department notification, and service restoration. We conclude that the Applicants' implementation of the above measures would protect public safety and the integrity of the proposed facilities.

Installation of the MVP pipeline within the Jefferson National Forest would not prevent FS personnel from suppressing wildland fires or conducting prescribed burns, near or over the pipeline. However, Mountain Valley would require landowners to coordinate with Mountain Valley regarding the operation of heavy equipment within the right-of-way to ensure the integrity of the pipeline is maintained.

Cumulative Impacts

We analyzed cumulative impacts of the MVP and EEP, in addition to other projects that may occur within the same area of geographic scope and timeframe. The other projects we examined include oil and gas wells, gathering lines, and related facilities; mining and other energy projects; other FERC-jurisdictional natural gas transportation projects (such as the Atlantic Coast Pipeline [ACP] Project and the Columbia WB XPress Project); residential or commercial developments; and road improvement projects.

We considered other projects within the geographic scope for cumulative impacts on water resources, wetlands, vegetation, land use, and wildlife using the hydrologic unit code (HUC) 10 sub-watersheds crossed by the MVP and EEP. Construction impacts on air quality were considered based on a 0.25-mile buffer and operational air quality impacts were considered at the air quality control region level where compressor stations would be located as well as any other air quality control regions within 31.1 miles (50 km) of Mountain Valley's or Equitrans' proposed compressor stations. For cultural resources, the county was the area of geographic scope.

The MVP pipeline would cross 31 HUC10 watersheds and the EEP pipelines would cross 3 HUC10 watersheds. The 33 HUC10 watersheds (the projects share one HUC 10 watershed) combined total 4,557,727 acres. The MVP and the EEP would account for about 6,487 acres of impacts (0.1 percent) of these watersheds, while other projects located within the same watersheds account for 82,607 acres (1.8 percent) of impact. Combined, the 20 counties crossed by the MVP and EEP cover about 6,972,384 acres. For all resources analyzed, and in consideration of the Applicants' proposed measures and our recommendations for additional measures intended to result in the further avoidance, minimization, and/or mitigation of effects, we conclude that the effects of adding the impacts of the MVP and EEP with the impacts of other projects would not be significant.

Alternatives Considered

The no-action alternative was considered for the projects. While the no-action alternative would eliminate the environmental impacts identified in the EIS, the stated objectives of the Applicants' proposals would not be met. Further, the natural gas shippers could seek alternative transportation infrastructure that would impact similar resources as the projects.

Our analysis of system alternatives included an evaluation of whether existing or proposed natural gas pipeline systems could meet the projects' objectives. We could not identify any existing interstate natural gas transmission systems that fully extend from the Applicants' proposed starting points (in southwestern Pennsylvania and northern West Virginia) to the termini of their pipelines (in the case of MVP this would be at Transcontinental Gas Pipe Line Company LLC's Station 165 in southeast Virginia). Because existing systems have their capacities already subscribed, there would not be enough space available on those systems for the additional volumes proposed by Equitrans (0.4 Bcf/d) and Mountain Valley (2 Bcf/d).

We evaluated four major route alternatives for the MVP; collocation of the MVP along the ACP project route, a major route alternative largely collocated with an electric transmission line (Alternative 1), and two hybrid routes combining major elements of the proposed route and Alternative 1. None of the major route alternatives offers a significant environmental advantage over the proposed pipeline route. We also evaluated merging the ACP and the MVP into one project (one pipeline alternative; using a variety of engineering options) along the ACP route. We determined that the one-pipe alternative would not be technically feasible or practical.

Mountain Valley adopted into its proposed pipeline route two route variations recommended in the FERC's September 16, 2016 draft EIS. Subsequent to issuance of the draft EIS, Mountain Valley documented that it adopted numerous other route variations and minor route variations that modified the route that was proposed in the October 2015 application to account for landowner requests, avoidance or minimization of impacts on specific sensitive environmental resources (such as karst terrain, the Blackwater River, the Blue Ridge Parkway, caves, and archaeological sites), avoidance of areas of steep terrain or side slopes, and engineering adjustments. Equitrans also adopted a minor route variation into its proposed H-318 pipeline following our recommendation in the draft EIS for additional study.

MAJOR CONCLUSIONS

We determined that construction and operation of the projects would result in limited adverse environmental impacts, with the exception of impacts on forest. This determination is based on our review of the information provided by the Applicants and further developed from environmental information requests; field reconnaissance; scoping; literature research; alternatives analyses; and contacts with federal, state, and local agencies, and other stakeholders.

We conclude that approval of the projects would result in some adverse environmental impacts, but the majority of these impacts would be reduced to less-than-significant levels. Although many factors were considered in this determination, the principal reasons are:

- Mountain Valley would implement the measures outlined in our Plan, its project-specific *Erosion and Sediment Control Plan*, and its project-specific Procedures.
- In addition, Mountain Valley would implement the measures outlined in its various resource-specific mitigation plans filed with its application to the FERC, or included in various supplemental filings, including its *Karst Mitigation Plan, Revised Karst Hazards Assessment,* and *Karst-specific Erosion and Sediment Control Plan* to reduce impacts when crossing karst terrain; its *Revised Landslide Mitigation Plan* for reducing impacts when crossing steep topography; its *Mining Area Construction Plan* to reduce impacts when crossing coal mine areas; its *Unanticipated Mine Pool Mitigation Plan* to reduce impacts from mine pools; its *Acid Forming Materials Identification and Mitigation Plan* to reduce impacts from acid forming rocks; its *General Blasting Plan* to reduce impacts when crossing areas of shallow bedrock; its *Organic Farm Protection Plan* to reduce impacts when crossing organic farms; its *Water Resources Identification and Testing Plan*, *Vertical Scour and Lateral Channel Erosion Analysis*, *Spill Prevention Controls and Countermeasures Plan*, *Stormwater*

Pollution and Prevention Plan, and *Unanticipated Discovery of Contamination Plan for Construction Activities in West Virginia and Virginia* to reduce impacts on water resources; its *Compensatory Wetland Mitigation Plan* to mitigate for the conversion of forested wetlands to shrub or herbaceous wetlands; its *Revised Migratory Bird Habitat Conservation Plan* and *Exotic and Invasive Species Control Plan* to reduce impacts on birds, other animals, and plants; its *Fire Prevention and Suppression Plan* to reduce the chance of wildfires; its *Traffic and Transportation Management Plan* to reduce impacts on local road users; its *Fugitive Dust Control Plan* to reduce air quality impacts during construction; and its *Winter Construction Plan*.

- Equitrans would follow its project-specific Plan and Procedures, its Erosion and Sediment Control Plans, and the PADEP *Erosion and Sediment Pollution Control Program Manual*.
- In addition, Equitrans would implement the measures outlined in its various resource-specific mitigation plans filed with its application to the FERC, or included in various supplemental filings, including its *Mine Subsidence Plan* to protect its pipelines while crossing abandoned coal mine areas; its *Slip Mitigation Report* for reducing impacts when crossing steep topography; its project-specific *Spill Prevention Controls and Countermeasures Plan, Preparedness, Prevention, and Contingency and Emergency Action Plan,* and *Unanticipated Discovery of Contamination Plan* to reduce potential impacts on water resources; its *HDD Contingency Plan* to handle a failure or inadvertent return of drilling fluid while crossing under the Monongahela River and South Fork Tenmile Creek; its *Migratory Bird Conservation Plan* to minimize impacts on bird species of concern; its *Traffic and Transportation Management Plan* to reduce impacts on other local road users; its *Dust Suppression Plan* to reduce air quality impacts during construction; and its *Winterization Plan*.
- The Applicants would cross sensitive waterbodies and coldwater fisheries using dry crossing methods during state-mandated construction windows.
- The Applicants would be required to obtain permits from the COE and applicable state resource agencies prior to crossing waterbodies and wetlands.
- For the portion of the MVP within the Jefferson National Forest:
    - The right-of-way would be maintained in accordance with FERC's Procedures, such that for the entire length of the right-of-way a 10-foot-wide area of the corridor would be maintained in herbaceous cover and the remainder of the corridor would be replanted according to specifications in the POD and resource plans[7] (although Mountain Valley has not committed to these maintenance features for the permanent right-of-way, the FS has indicated that it will require such features as part of its separate FS permitting process);
    - Mountain Valley would avoid impacts on the ANST footpath by crossing under the ANST using a 600-foot-long conventional bore; and

[7] As stated in the Procedures, trees that would be located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way.

  - Mountain Valley would follow the measures outlined in the POD, including the various resource-specific mitigation plans attached to the POD as appendices and in the approved Right-of-Way Grant.
- We will complete formal consultations with the FWS under Section 7 of the Endangered Species Act prior to allowing any construction to begin that could adversely affect federally listed threatened or endangered species.
- We will complete the process of complying with the NHPA prior to allowing any construction to begin that could adversely affect historic properties.
- We will provide oversight for an environmental inspection and mitigation monitoring program to ensure compliance with all mitigation measures that become conditions of the FERC authorizations.

In addition, we developed site-specific mitigation measures that we recommend be included in any authorization issued by the Commission, to further reduce the environmental impacts that would otherwise result from construction and operations of the Mountain Valley and Equitrans' projects. We determined that these measures are necessary to reduce the adverse impacts associated with the projects, and in part, are basing our conclusions on implementation of these measures. These recommended mitigation measures are presented in section 5.2 of the final EIS.

1.0 INTRODUCTION

The vertical line in the margin identifies text that has been modified in this final Environmental Impact Statement (EIS) and differs materially from the corresponding text in the draft EIS. Changes were made to address comments from cooperating agencies and other stakeholders on the draft EIS; incorporate modifications to the projects after publication of the draft EIS; update information included in the draft EIS; and incorporate supplemental information filed by Mountain Valley Pipeline, LLC and Equitrans, L.P. in response to recommendations in the draft EIS, and in response to our post-draft EIS environmental information requests. As a result of the changes, some recommendations identified in the draft EIS are no longer applicable to the projects and do not appear in the final EIS, while some recommendations identified in the draft EIS have been substantively modified in the final EIS, and some new recommendations have been added to the final EIS.

In accordance with the Natural Gas Act (NGA, Title 15 United States Code [U.S.C.] § 717), the Federal Energy Regulatory Commission (FERC or Commission) is responsible for deciding whether to authorize the construction and operation of interstate natural gas transmission facilities. The National Environmental Policy Act (NEPA, 42 U.S.C. § 4321 et seq.) requires that the Commission consider the environmental impacts of a proposed project prior to making a decision. The Commission's natural gas program's environmental staff[1] has prepared this EIS so that the FERC can comply with NEPA, and to assess the potential environmental impacts that could result from the construction and operation of two separate, but related, projects. One project is a proposal from Mountain Valley Pipeline, LLC (Mountain Valley)[2] in Docket No. CP16-10-000; while the other project is a proposal from Equitrans, L.P. (Equitrans)[3] in Docket No. CP16-13-000. Throughout this EIS, these two companies are collectively referred to as the Applicants.

On October 23, 2015, Mountain Valley filed its formal application with the FERC in Docket No. CP16-10-000, pursuant to section 7(c) of the NGA. Mountain Valley is seeking a Certificate of Public Convenience and Necessity (Certificate) from the Commission authorizing the proposed Mountain Valley Project (MVP), with facilities located in the State of West Virginia and the Commonwealth of Virginia. The MVP would involve constructing and operating about 303.5 miles of 42-inch-diameter pipeline; 3 compressor stations totaling about 171,600 International Organization for Standardization (ISO) horsepower (hp); 4 meter and regulation (M&R) stations; 8 pig[4] launchers and receivers at 5 locations; 36 mainline block valves (MLV); and 31 cathodic protection beds. Mountain Valley is currently proposing three

1 Commission staff was assisted in the preparation of this EIS by a third party environmental contractor, Cardno.

2 Mountain Valley is a joint venture between affiliates of EQT Midstream Partners, LP; NextEra Energy US Gas Assets, LLC; WGL Midstream, Inc.; RGC Midstream, LLC; and Con Edison Gas Midstream, LLC. MVP facilities would be operated by an affiliate of the EQT Corporation.

3 Equitrans is a limited partnership, with about 97.25 percent owned by Equitrans Investments, LLC and 2.75 percent owned by Equitrans Services, LLC, both subsidiaries of EQT Midstream Partners LP.

4 A "pig" is a device used to clean or inspect the interior of a pipeline.

taps for the MVP: two taps to serve the Roanoke Gas Company, LLC (Roanoke Gas) and one tap at the Webster Interconnect. The MVP includes four interconnections or tie-ins with facilities operated by Equitrans, Columbia Gas Transmission LLC (Columbia),[5] and Transcontinental Gas Pipe Line Company LLC (Transco). The MVP facilities would be designed to transport about 2.0 million dekatherms per day (Dth/d, equivalent to about 2.0 billion cubic feet per day [Bcf/d]) of natural gas.

Mountain Valley also requested that the Commission issue it a Blanket Certificate to allow for the construction, operation, and abandonment of certain eligible unspecified future facilities and related services under the Commission's regulations at Subpart F of Title 18 Code of Federal Regulations (CFR) Part 157, and a Blanket Certificate to allow for open access transportation services and pre-granted abandonment approval under Subpart G of Part 284. Mountain Valley would have to document minor future actions performed under the Blanket Certificate program in either annual reports or as Prior Notice applications, subject to our[6] environmental review in accordance with the FERC's regulations at Part 157.206.

On October 27, 2015, Equitrans filed its formal application with the FERC in Docket No. CP16-13-000, pursuant to Sections 7(b) and (c) of the NGA. Equitrans is seeking a Certificate authorizing the proposed Equitrans Expansion Project (EEP), with facilities located in the Commonwealth of Pennsylvania and the State of West Virginia. The EEP would involve construction and operation of a total of about 7 miles of various diameter pipelines; a new 31,300 nominal hp compressor station; and 3 pig launcher and receiver sites. There would be four tap locations and one interconnection. The EEP facilities would transport up to 400,000 Dth/d (about 0.4 Bcf/d) of contracted firm capacity of natural gas. In addition, Equitrans proposes as part of the EEP to abandon, by dismantlement and removal, the existing 4,800 hp Pratt Compressor Station. The EEP would connect with the MVP at the Webster Interconnect and Mobley Tap in Wetzel County, West Virginia. Therefore, we are conducting an environmental analysis of both projects combined in this single comprehensive EIS, as they are related and connected actions.

A detailed description of both projects is presented in section 2.0 of this EIS. Figures 1-1 and 1-2 provide overview maps of the MVP and the EEP, respectively.

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5 Columbia Gas Transmission LLC is an affiliate of the Columbia Pipeline Group. In this EIS, all of the Columbia Pipeline Group affiliates are referred to as "Columbia."

6 The pronouns "we," "us," and "our" refer to the environmental staff within the FERC's Office of Energy Projects, Division of Gas, Environment, and Engineering.

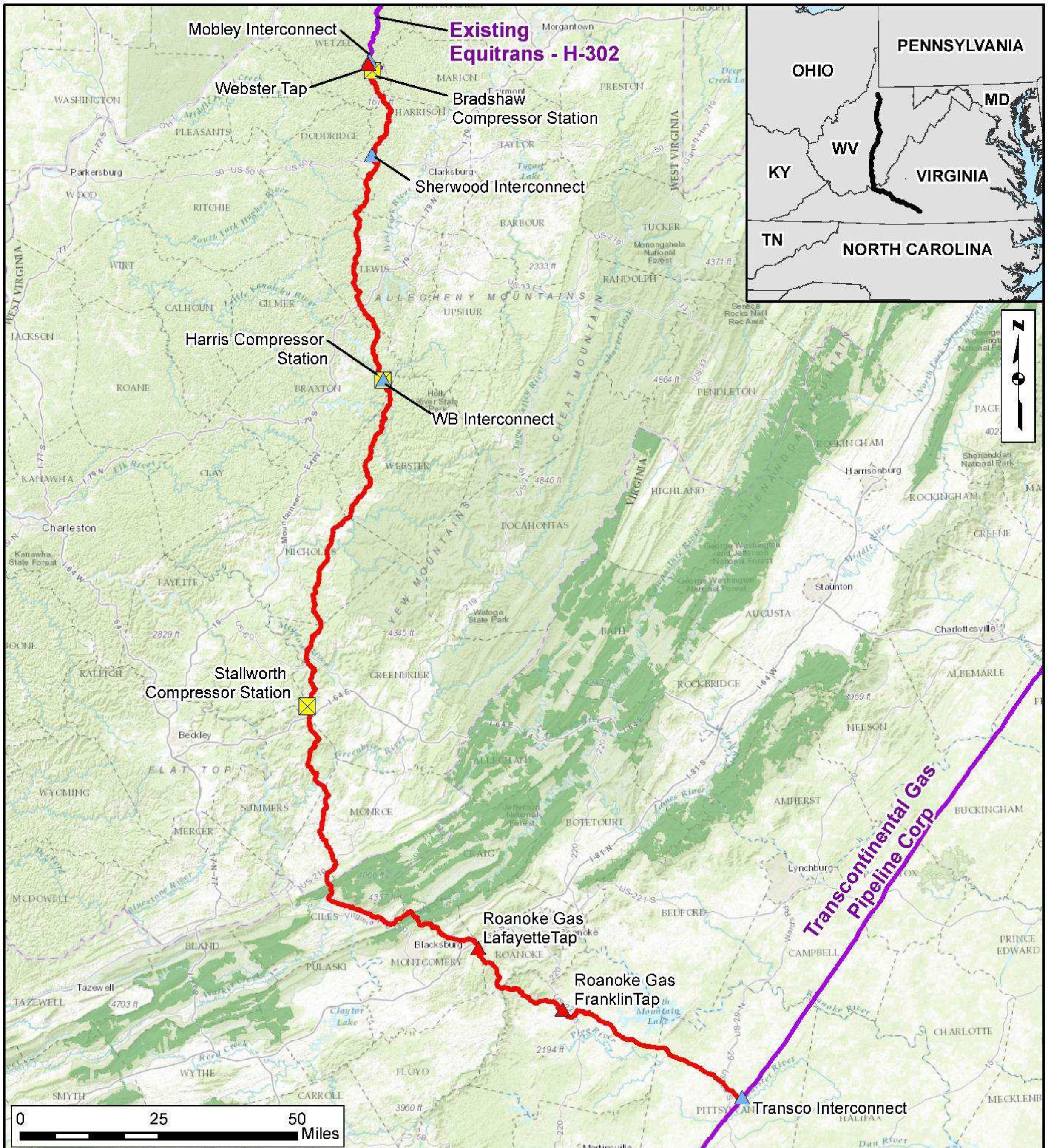

Figure 1-1

Mountain Valley & Equitrans Expansion Projects

Mountain Valley Pipeline Overview Map

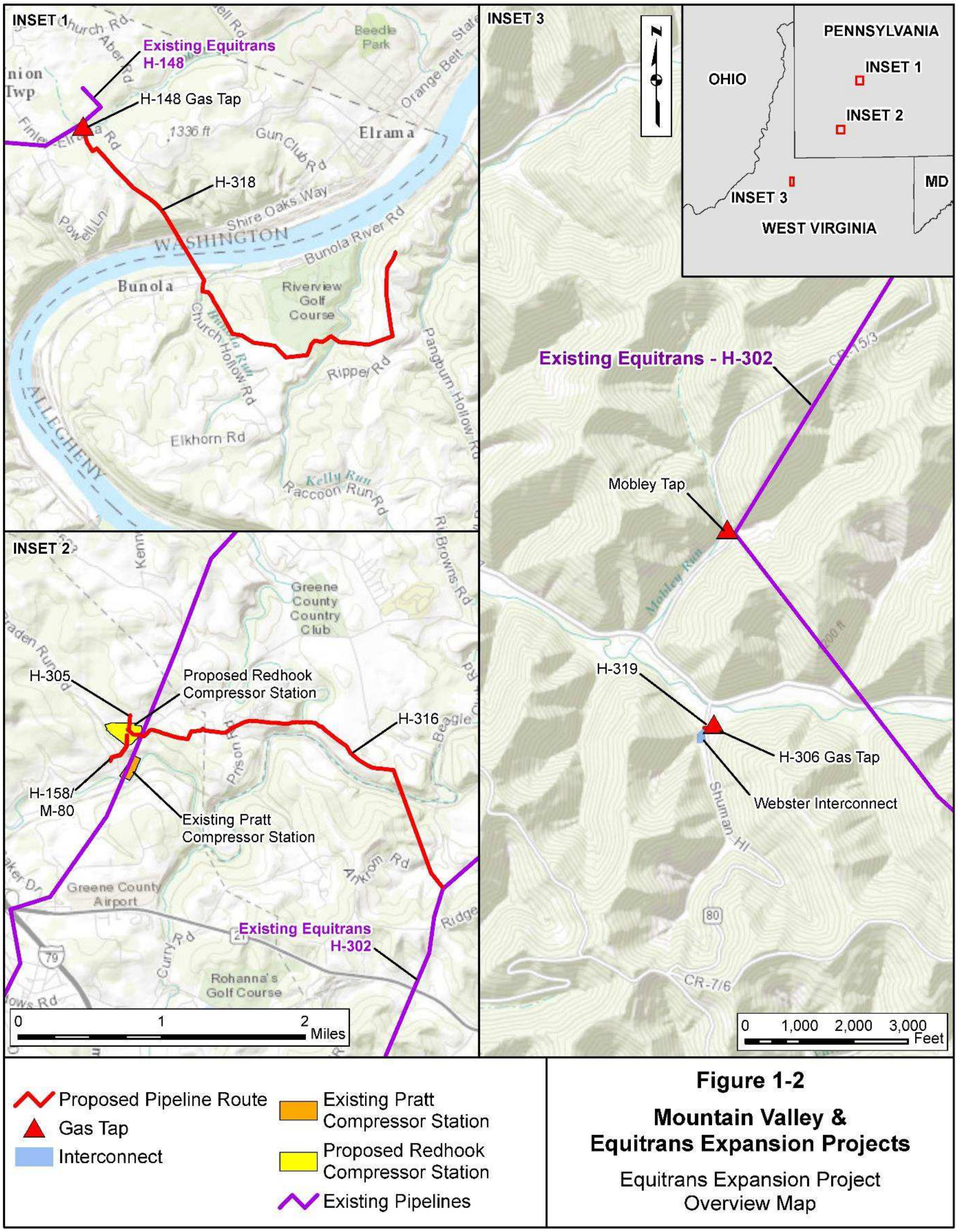

Figure 1-2

Mountain Valley & Equitrans Expansion Projects

Equitrans Expansion Project Overview Map

1.1 BACKGROUND AND THE PRE-FILING REVIEW PROCESS

The Energy Policy Act of 2005 (EPAct) details the voluntary process by which FERC-jurisdictional companies seeking authority under Section 7 of the NGA can participate in the FERC's pre-filing environmental review process. Procedures for our pre-filing environmental review process are outlined in the FERC regulations at 18 CFR 157.21. The purpose of pre-filing is to encourage the early involvement of stakeholders, facilitate interagency cooperation, and identify and attempt to resolve environmental issues, including facility locations and route alternatives, before the filing of a formal application with the Commission.

1.1.1 Mountain Valley Project

On October 27, 2014, Mountain Valley filed a request to enter into the Commission's pre-filing environmental process for the MVP. The FERC granted Mountain Valley's request on October 31, 2014, and established pre-filing Docket No. PF15-3-000. At that time, we selected Cardno as our third-party environmental contractor to assist us in the preparation of this EIS.[7] Cardno staff also attended open houses, public meetings, reviewed Resource Reports, and drafted environmental information request (EIR) questions.

As part of the pre-filing process, Mountain Valley initially hosted 14 public open house meetings at various locations in West Virginia and Virginia between December 2014 and January 2015. The purpose of the open house meetings was to inform the public about the MVP, and for company representatives to answer questions about the location of planned facilities. The FERC staff participated in the open house meetings and provided information about our environmental review process. A total of about 800 people attended those 14 open house meetings (see table 1.1-1).

On February 18, 2015, Mountain Valley filed several revisions to its planned pipeline routing. Accordingly, Mountain Valley held two additional open house meetings in April 2015 (see table 1.1-1) to inform the public and answer questions regarding these newly developed routes; about 200 people attended. The FERC staff also participated in these two open house meetings.

[7] Third-party contractors are selected by Commission staff and funded by Applicants. Third-party contractors work solely under the direction of the FERC staff, who directs the scope, content, quality, and schedule of the contractor's work. The FERC staff independently evaluates the results of the third-party contractor's work, and the Commission, through its staff, bears ultimate responsibility for full compliance with the requirements of NEPA.

TABLE 1.1-1 **Open House Locations for the Mountain Valley Project**	
Date	**Location**
December 15, 2014	Hampton Inn Gretna/Alta Vista/Chatham; Gretna / VA
December 16, 2014	Harvester Performance Center; Rocky Mount / VA
December 17, 2014	Salem Civic Center; Salem / VA
December 18, 2014	Days Inn Blacksburg; Blacksburg / VA
January 12, 2015	Pearisburg Community Center; Pearisburg / VA
January 13, 2015	Lindside United Methodist Church; Lindside / WV
January 14, 2015	Summers County Courthouse; Hinton / WV
January 15, 2015	Rupert Community Center; Rupert / WV
January 20, 2105	Summersville Arena and Conference Center; Summersville / WV
January 21, 2015	Webster Springs Municipal Building; Webster Springs / WV
January 22, 2015	Burnsville Community Center; Burnsville / WV
January 26, 2015	Plantation Inn and Suites; Jane Lew / WV
January 27, 2015	Progressive Women's Association; Clarksburg / WV
January 28, 2015	Jacksonburg Fire Department; Jacksonburg / WV
April 6, 2015	Union Church of God; Union / WV
April 7, 2015	Craig County High School; New Castle / VA

On February 27, 2015, we sent letters to various federal and state resource agencies that might have an interest in cooperating in the production of the EIS for the MVP.[8] On April 17, 2015, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Mountain Valley Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings* (NOI). The NOI was published in the Federal Register and sent to the parties on our environmental mailing list, which included federal and state resource agencies; elected officials; environmental groups and non-governmental organizations (NGO); Native Americans and Indian tribes; potentially affected landowners; local libraries and newspapers; and other stakeholders who had indicated an interest in the MVP. The NOI also announced the date, time, and location of six public scoping meetings sponsored by the FERC in the project area (see the Public Review section 1.4 below).

The NOI contained a paragraph requesting agencies with jurisdiction or expertise to cooperate with us in the preparation of the EIS. The United States (U.S.) Department of Agriculture (USDA) Forest Service (FS), Jefferson National Forest; U.S. Army Corps of

8 The FERC sent letters to the Jefferson National Forest in Roanoke, Virginia; the U.S. Army Corps of Engineers District Officers in Huntington, West Virginia, and Norfolk, Virginia; Region 3 of the U.S. Environmental Protection Agency in Philadelphia, Pennsylvania; the Appalachian Trail Park Office of the National Park Service in Harpers Ferry, West Virginia; the Virginia and West Virginia Field Offices of the U.S. Fish and Wildlife Service; the Eastern Office of Pipeline and Hazardous Materials Safety Administration of the U.S. Department of Transportation; the West Virginia Department of Environmental Protection; the West Virginia Division of Natural Resources; the Virginia Department of Game and Inland Fisheries; and the Virginia Department of Environmental Quality, requesting their participation as cooperating agencies.

Engineers (COE), Huntington and Norfolk Districts; U.S. Department of the Interior (USDOI), Bureau of Land Management (BLM); and Fish and Wildlife Service (FWS)[9]; U.S. Environmental Protection Agency (EPA), Region 3; Pipeline and Hazardous Materials Safety Administration (PHMSA) within the U.S. Department of Transportation (DOT); West Virginia Department of Environmental Protection (WVDEP); and West Virginia Division of Natural Resources (WVDNR) all agreed to be cooperating agencies. See section 1.3.2 below for details on cooperating agency roles and responsibilities.

During pre-filing, Mountain Valley filed draft environmental Resource Reports to meet the requirements of 18 CFR 380.12. Mountain Valley filed first drafts of Resource Reports 1 (Project Description) and 10 (Summary of Alternatives) on December 1, 2014. We issued an EIR for those first draft reports on March 13, 2015. Mountain Valley filed drafts of Resource Reports 2 through 9 and 12 in rolling submittals between March 27 and May 22, 2015. Mountain Valley filed second drafts of Resource Reports 1 and 10 on March 27, 2015 and April 14, 2015, respectively. We issued another EIR for those draft reports on August 11, 2015. Mountain Valley addressed many of our EIR questions in the revised Resource Reports attached to its formal application filed with the FERC on October 23, 2015.

1.1.2 Equitrans Expansion Project

Equitrans requested to use our pre-filing review process on April 1, 2015. The FERC accepted that request on April 9, 2015, and assigned the EEP pre-filing Docket No. PF15-22-000. We stated that the analysis of the EEP would be included in the EIS for the MVP, and indicated that Cardno would also serve as our third-party environmental contractor for the EEP.

On May 20, 2015 and May 21, 2015, Equitrans hosted two open house meetings for its planned project.[10] Cardno staff, representing the FERC, participated in the EEP open house meetings. An estimated total of 40 people attended these two meetings.

On August 11, 2015, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Equitrans Expansion Project, and Request for Comments on Environmental Issues* and opened a scoping period to solicit comments and environmental concerns regarding Equitrans' planned project. This scoping period ended on September 14, 2015.

Equitrans filed its first draft Resource Reports 1 and 10 on May 15, 2015. The FERC issued an EIR for these first draft reports on July 2, 2015. Equitrans filed all other draft Resource Reports, including second drafts of Resource Reports 1 and 10, on July 10, 24, 27, and 31, 2015. The FERC issued a second EIR for the EEP on September 28, 2015. Equitrans addressed many of our EIR questions in the revised Resource Reports attached to its formal application filed with the FERC on October 27, 2015.

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9 The West Virginia field office of the FWS became a cooperating agency on January 10, 2017, following issuance of the draft EIS.

10 Equitrans held two open house meetings at the Forward Township Municipal Office on May 20, 2015 and at the Jefferson Volunteer Fire Company on May 21, 2015.

1.2 PURPOSE AND NEED OF THE PROJECTS

The Council on Environmental Quality's (CEQ) regulations for implementing NEPA at 40 CFR 1502.13 recommends that an EIS should briefly address the underlying purpose and need for a project. In general, as described by the Applicants, the purpose of both the MVP and the EEP is to transport natural gas produced in the Appalachian Basin to markets in the Northeast, Mid-Atlantic, and Southeastern United States. Specifically, the MVP would deliver the identified gas volumes (2 Bcf/d) to five contracted shippers via a pooling point at Transco Station 165 in Pittsylvania County, Virginia; while the EEP would deliver contracted volumes of 0.4 Bcf/d (with potential for an additional 0.2 Bcf/d) to various end users via a connection with the MVP in Wetzel County, West Virginia. Further details are presented below.

During scoping and the draft EIS comment period, we received comments asserting that the purpose of the MVP is to export natural gas overseas as liquefied natural gas (LNG).[11] As explained by the FERC staff at the public scoping meetings, there is nothing in the record to support that contention. Mountain Valley states in its application that it did not design its facilities to transport natural gas to an LNG export terminal. The nearest LNG export terminal to the terminus of the MVP pipeline at the inland Transco Station 165 would be the existing Cove Point LNG terminal on the Chesapeake Bay in Calvert County, Maryland about 190 miles away. There is no direct connection from the Transco Station 165 to the Cove Point terminal. Mountain Valley stated that it does not intend to seek permission to export natural gas overseas as LNG from either the U.S. Department of Energy or the FERC.

1.2.1 Mountain Valley Project

In its formal application with the FERC, Mountain Valley explained that historically the Mid-Atlantic and Southeastern United States have been supplied with natural gas from the Gulf Coast. Recently, Gulf Coast supplies have been declining, while Mid-Atlantic and Southeastern market demands have been growing. In the Southeast, many electric generating utilities are switching from a fuel source of coal to natural gas (EIA, 2015). In addition, the population of the East Coast is expected to rise in the future. At the same time, natural gas production from shale formations in the Appalachian Basin has been increasing; from 2 Bcf/d in 2010 to 15 Bcf/d in 2014. According to Mountain Valley, the MVP would alleviate some of the constraints on this natural gas production by adding infrastructure to transport lower-priced natural gas from the Appalachian Basin to industrial users and power generators in the Mid-Atlantic and Southeastern United States, as well as to local distribution companies (LDC). The terminus for the MVP pipeline at Transco Station 165 is the existing pooling point for Zone 5 on Transco's system and a gas trading hub for the Mid-Atlantic market. Along its route, the MVP pipeline would also be tapped to supply natural gas to Roanoke Gas, an LDC serving southwestern Virginia and a partner in the MVP.

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11 See, for example, the written comments of Paul Washburn dated November 9, 2014 (accession number 20141110-5077) Carl Zipper dated May 3, 2015 (accession number 20150504-5046), and Blue Ridge Environmental Defense League dated December 22, 2016 (accession number 20161222-5404), and the oral comments of Sidney Johnson and Barbara Rea at the public scoping meeting held at Lindside, West Virginia on May 4, 2015 (accession number 20150504-4003).

1.2.2 Equitrans Expansion Project

According to Equitrans, the EEP would provide additional volumes of firm capacity of natural gas to be transported north-south on its existing system. The creation of expansion capacity on Equitrans' system would allow shippers to transport natural gas produced in the Appalachian Basin to markets in the Northeast, Mid-Atlantic, and Southeastern United States, mainly through an interconnection with the MVP. However, the EEP would also interconnect with the existing systems of Texas Eastern Transmission, LP (Texas Eastern); Dominion Transmission, Inc. (Dominion); and Columbia. End users could include LDCs, industry, and electric power generators. Equitrans stated that the EEP would increase system reliability, efficiency, and operational flexibility for its customers.

1.2.3 Project Need

During scoping and the draft EIS comment period, we received comments questioning the need for the MVP on the grounds that it would not directly benefit the citizens of West Virginia and Virginia, and stating that pipeline construction and operation would be a burden on affected landowners.[12] Some individuals suggested that there is no need for additional volumes of natural gas in the region,[13] and advocated for increased development of renewable resources to replace the MVP.[14] In this EIS, we partly address these comments in either the Alternatives section (see section 3) or in the Socioeconomics section (see section 4.9). Above, we note that in fact the MVP would provide additional volumes of natural gas to local consumers, as Mountain Valley would have two taps for Roanoke Gas, an LDC serving communities in southwest Virginia. However, this EIS is not a decision document, and it does not address in detail the need or public benefits of either the MVP or the EEP. The Commission will more fully explain its opinions on project benefits and need in its Orders for the MVP and the EEP.[15]

Under Section 7(c) of the NGA, the Commission determines whether interstate natural gas transportation facilities are in the public convenience and necessity and, if so, grants a Certificate to construct and operate them. The Commission bases its decisions on technical competence, financing, rates, market demand, gas supply, environmental impact, long-term feasibility, and other issues concerning a proposed project. The Commission has developed a

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[12] See, for examples, the March 6, 2015 written comment of Beth Covington (accession number 20150306-0027), and the oral statements by Virginia Wise at the May 5, 2015 public meeting in Elliston, Virginia (accession number 20150520-4002) and Sandy Arthur at the public meeting in Chatham, Virginia (accession number 20150611-4003). See also the December 21, 2016 written comments of the EPA (accession number 20161221-5087).

[13] See the comments of Cathy Kunkel and Tom Sanzillo filed on September 12, 2016 (accession number 20160912-0036).

[14] See, for examples, the June 4, 2015 written comment of Christy Mackie (accession number 20150604-5066), the May 31, 2015 written comment of Nancy Schimmel (accession number 20150601-5207), the April 15, 2015 written comment of Christopher Swan (accession number 20150415-5215), and the December 18, 2016 written comment of the Sierra Club (accession number 20161223-0010).

[15] The Commission issues an Order either approving or denying the projects.

"Certificate Policy Statement"[16] that established criteria for determining whether there is a need for a proposed project and whether the proposed project would serve the public interest.

Section 7(b) of the NGA specifies that no natural gas company shall abandon any portion of its facilities subject to the Commission's jurisdiction without the Commission first finding that the abandonment will not negatively affect the present or future public convenience and necessity.

1.2.3.1 Mountain Valley Project

From June 12 to July 10, 2014, Mountain Valley held a non-binding open season for firm transportation capacity on its planned pipeline. A binding open season was held from September 2 to October 21, 2014, after which Mountain Valley executed long-term precedent agreements with four shippers for 2 Bcf/d of natural gas firm transportation capacity. On January 27, 2016, Mountain Valley informed the FERC that it executed another long-term precedent agreement with a fifth shipper.[17] Therefore, the project now has five shippers and is fully subscribed (see table 1.2-1).

TABLE 1.2-1

Shippers for the Mountain Valley Project

Shipper	Capacity (Dth/d)
EQT Energy, LLC	1,290,000
WGL Midstream, Inc.	200,000
Roanoke Gas Company	10,000
USG Properties Marcellus Holdings, LLC	250,000
Consolidated Edison Company of New York, Inc.	250,000
Total	**2,000,000**

1.2.3.2 Equitrans Expansion Project

From March 5 to March 20, 2015, Equitrans held a non-binding open season for natural gas firm transportation on its system. Ultimately, it signed a long-term precedent agreement with a single shipper (EQT Energy, LLC) for 400,000 Dth/d of firm transportation service.[18]

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16 See *Certification of New Interstate Natural Gas Pipeline Facilities*, 88 FERC ¶ 61,227 (1999), clarified in 90 FERC ¶ 61,128, and further clarified in 92 ¶ 61,094 (2000).

17 Mountain Valley filed copies of the precedent agreements in its application to the FERC and on January 27, 2016. The original four shippers were EQT Energy, LLC; Roanoke Gas Company; USG Properties Marcellus Holdings, LLC; and WGL Midstream, Inc. The fifth shipper is Consolidated Edison Company of New York, Inc., which committed to 250,000 Dth/d, while USG Properties Marcellus Holdings agreed to reduce its firm capacity commitment from 500,000 Dth/d to 250,000 Dth/d.

18 A copy of the precedent agreement for the EEP is attached to Equitrans' application to the FERC.

1.3 PURPOSE AND SCOPE OF THIS EIS

Our principal purposes in preparing this EIS are to:

- identify and assess potential impacts on the natural and human environment that would result from the construction and operation of the proposed projects;
- describe and evaluate reasonable alternatives to the proposed projects that would avoid or minimize adverse impacts on locations of specific environmental resources;
- recommend mitigation measures, as necessary, that could be implemented by the Applicants to reduce impacts on specific environmental resources; and
- encourage and facilitate involvement by the public and interested agencies in the environmental review process.

The EIS is organized into five main sections: 1) Introduction, 2) Description of the Proposed Action, 3) Alternatives, 4) Environmental Analysis, and 5) Conclusions and Recommendations. In section 3 we compare the environmental impacts associated with constructing and operating facilities at the locations proposed by the Applicants with a range of alternatives, including the no-action alternative, system alternatives, route alternatives, and aboveground facility location alternatives. In section 4 we present our environmental analysis for various resource areas such as geology; soils; water resources and wetlands; vegetation; fish and wildlife; threatened, endangered, and other special status species; land use, recreation, and visual resources; socioeconomics, including environmental justice; cultural resources; air quality and noise; reliability and safety; and cumulative impacts. Within each resource discussion, we describe the affected environment as it currently exists and address the environmental consequences associated with the construction and operation of the MVP and the EEP. We also evaluate any Applicant-proposed measures that would reduce impacts on specific resources, and present any additional recommendations we have to further reduce resource impacts. Section 5 summarizes our overall conclusions and presents all our recommended mitigation measures.

Below we discuss the scope of the actions of the FERC and cooperating agencies in the analysis of the proposed projects.

1.3.1 Federal Energy Regulatory Commission

Originally known as the Federal Power Commission when first created by Congress in 1920, the agency was reorganized and renamed the FERC under the administration of President Jimmy Carter. The FERC is an independent federal regulatory agency[19] that regulates the interstate transportation of natural gas, among other industries, in accordance with the NGA of 1938 as amended.

The FERC is responsible for authorizing interstate natural gas transmission facilities, as specified in Section 311(e)(1) of EPAct and the NGA. Pursuant to EPAct Section 313(b)(1), the

[19] The decision makers at the agency are five Commissioners (at full contingent) appointed by the President and confirmed by the Senate. The decisions of the Commission cannot be challenged by the President or Congress, but may be reviewed in federal court.

FERC is the lead federal agency for the coordination of all applicable federal authorizations. Thus, the FERC is the lead federal agency for preparation of this EIS to comply with NEPA, as described in the CEQ's regulations at 40 CFR 1501.5 and in keeping with our May 2002 Interagency Agreement with other federal agencies.[20]

As the lead federal agency, we prepared this EIS to assess the environmental impacts that could result from constructing and operating the MVP and the EEP. This document was prepared in compliance with the requirements of the CEQ's regulations at 40 CFR 1500-1508, and the FERC's regulations for implementing NEPA at 18 CFR 380. As applicable, this EIS is also intended to fulfill the cooperating federal agencies obligations under NEPA (see section 1.3.2 below) and to support subsequent conclusions and decisions made by the Commission and the cooperating agencies.

The Commission will consider the findings contained herein, as well as non-environmental issues, in its review of Mountain Valley's and Equitrans' applications. The identification of environmental impacts related to the construction and operation of the projects, and the mitigation of those impacts, as disclosed in this EIS, would be components of the Commission's decision-making process. The Commission would issue its decision in an Order. If the projects are approved, the Commission would issue a Certificate to Mountain Valley and Equitrans. The Commission may accept the applications in whole or in part, and can attach engineering and environmental conditions to the Order that would be enforceable actions to assure that the proper mitigation measures are implemented prior to a project going into service. Further, the Applicants would be required to implement the construction procedures and mitigation measures proposed in their filings with the FERC, unless specifically modified by other Certificate conditions.

1.3.2 Cooperating Agencies

The BLM, COE, EPA, FS, FWS, DOT, WVDEP, and WVDNR are all cooperating agencies, as defined in 40 CFR 1501.6, for the development of this final EIS. The FS, COE, BLM, FWS, EPA, and DOT are cooperating in a manner consistent with the May 2002 Interagency Agreement with the FERC. The scope of the actions of the individual cooperating agencies with regards to the review of the projects are further summarized below.

A cooperating agency has jurisdiction by law over part of a project and/or has special expertise with respect to environmental issues. Cooperating agencies play a role in the environmental analyses of these projects and assist in developing mitigation plans or other measures. They participate in the NEPA process by reviewing the applications and related materials, and by reviewing administrative drafts of the overall EIS or the specific portions related to agency permitting or special expertise. The various cooperating agencies anticipate

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[20] May 2002 *Interagency Agreement on Early Coordination of Required Environmental and Historic Preservation Reviews Conducted in Conjunction With the Issuance of Authorizations to Construct and Operate Interstate Natural Gas Pipelines Certificated by the Federal Energy Regulatory Commission*, signed by the FERC, Advisory Council on Historic Preservation, CEQ, USDA, U.S. Department of the Army, U.S. Department of Commerce, U.S. Department of Energy, EPA, USDOI, and DOT.

adopting this EIS, pursuant to 40 CFR 1506.3(c), to support their decisions in issuing their own permits, licenses, or authorizations for the projects.

We recognize that the cooperating agencies will use the information and analysis contained in this EIS in reaching their own independent conclusions regarding the environmental impacts of the projects on the lands and resources they administer. Nothing in this EIS should be read to affect the ability of another agency to reach a conclusion or impose a requirement that is different from that recommended by the Commission staff. Additionally, nothing in this EIS should be read to affect in any way an agency's authority to monitor, enforce, or modify any requirement it imposes on the Applicants within its jurisdiction. Other regulatory agencies also may include their own terms and conditions or stipulations as part of their permits or approvals. While there would be jurisdictional differences between the FERC's and other agencies' conditions, the FERC's post-Certificate monitoring program for the MVP and the EEP would address all environmental or construction-related conditions or other permit requirements placed on Mountain Valley and Equitrans by the regulatory agencies.

1.3.2.1 U.S. Department of Agriculture - Forest Service

The FS is a civilian federal agency within the USDA, and can trace its roots back to 1876 when Congress assigned the Office of Special Agent within the USDA the responsibility of assessing the quality of forests in the country. With the Forest Reserve Act of 1891, Congress established the process for designating western public domain lands that later became National Forests. In 1905, President Theodore Roosevelt established the FS to provide quality water and timber for the nation's benefit, and transferred the care of the National Forests to the new agency. The Weeks Act of 1911 authorized the FS to purchase privately owned lands in the eastern United States for the protection of water supplies and navigable rivers.

In 1936, President Franklin Roosevelt established the Jefferson National Forest in southwestern Virginia from lands that formerly belonged to the Natural Bridge National Forest (created in 1916). In 1995, the Jefferson National Forest was administratively combined with the George Washington National Forest (established in 1932) in west central Virginia. Together the Jefferson National Forest and the George Washington National Forest (GWJeff) are nearly 1.8 million acres, with the Forest Supervisor's Office located in Roanoke, Virginia. The GWJeff are a part of the Southern Region (Region 8) of the FS, headquartered in Atlanta, Georgia.

The GWJeff are two of 154 National Forests and 20 national grasslands in 44 states and Puerto Rico. It is the responsibility of the FS to manage the National Forests for multiple uses of resources such as water, forage, wildlife, wood, recreation, minerals, and wilderness; and to provide products and benefits to benefit the American people while ensuring the productivity of the land and protecting the quality of the environment.

The mission of the FS is to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations. The agency carries out this mission through four main activities: international assistance in forest management; domestic community assistance to help protect and manage non-federal forest lands; forestry research; and the protection and management of National Forest System (NFS) lands.

The MVP pipeline route would cross about 3.5 miles of the Jefferson National Forest in Monroe County, West Virginia and Giles and Montgomery Counties, Virginia. The proposed pipeline route would cross Peters Mountain between mileposts (MP) 196.2 and 197.8 (1.6 miles), Sinking Creek Mountain between MPs 218.5 and 219.4 (0.9 mile), and Brush Mountain between MPs 219.8 and 220.8 (1 mile). Table 1.3-1 identifies construction and operation impacts of the project in the Jefferson National Forest. There are no significant aboveground facilities (such as compressor stations, M&R stations, or MLVs) proposed by Mountain Valley within the Jefferson National Forest, although there would be minor appurtenances that include test stations and line markers, which would be entirely contained within the operational right-of-way as required by PHMSA safety regulations.

TABLE 1.3-1

Land Requirements for the Mountain Valley Project in the Jefferson National Forest

Facility	Land Required for Construction (acres)	Land Required for Operation (acres)
Pipeline a/	50.8	21.3
Additional temporary workspaces (ATWS)	0.8	0.0
Access roads b/	31.1	20.4
Totals	**82.7**	**41.7**

a/ Acreage based on 125-foot-wide construction right-of-way and 50-foot-wide permanent right-of-way. Does not account for reduced workspace in sensitive areas.

b/ Access roads are existing Jefferson National Forest roads. No construction of additional access roads is proposed.

In November 2014, Mountain Valley submitted its *Application for Transportation and Utility Systems and Facilities on Federal Lands* (SF-299) to the FS, to allow for environmental surveys of the proposed crossing of the National Forest. On May 8, 2015, the FS issued a one-year temporary special use permit for Mountain Valley to conduct surveys within the Jefferson National Forest. On April 29, 2016, the FS issued another temporary special use permit for Mountain Valley to continue survey activities within the Forest.

In February 2016, Mountain Valley notified the FERC that the MVP would cross federally owned lands managed separately by both the FS (as part of the Jefferson National Forest) and the COE (as part of Weston and Gauley Bridge Turnpike Trail). Under the Mineral Leasing Act (MLA, 30 U.S.C. 185 et seq.), the BLM is the federal agency responsible for issuing Right-of-Way Grants for natural gas pipelines across federal lands under the jurisdiction of the BLM or under the jurisdiction of two or more federal agencies. Therefore, the BLM would be responsible for the issuance of a Right-of-Way Grant to Mountain Valley for a pipeline easement over federal lands, dependent on concurrence from the FS and the COE. Additional mitigation may be required as a result of the Right-of-Way Grant.

Mountain Valley submitted its Right-of-Way Grant application to the BLM and FS on April 5, 2016, to cross federal lands. An updated form SF-299 Right-of-Way Grant Application was submitted to the BLM and FS in March 2017. The decision for a Right-of-Way Grant across federal lands would be documented in a Record of Decision (ROD) issued by the BLM.

FS land management planning requirements were established by the National Forest Management Act and regulations at 36 CFR 219. These laws and regulations require a Forest-specific, multi-year Land and Resource Management Plan (LRMP). The LRMP for the Jefferson National Forest was first developed in 1985, and revised in 2004. All projects or activities within a National Forest must be consistent with the governing LRMP, pursuant to 36 CFR 219.15. Additionally, all projects or activities within a National Forest must be approved using the NEPA process.

The FS has determined that the MVP, as proposed, would not be consistent with certain plan components of the Jefferson National Forest LRMP. If the FS decides to concur with a Right-of-Way Grant for crossing the Jefferson National Forest, the FS would be required to amend the Jefferson National Forest LRMP. The FS intends to adopt this EIS in its assessment of potential amendments to its LRMP that would then make the MVP pipeline a conforming use of the Jefferson National Forest LRMP (additional detail is in section 4.8 of this EIS). The FS would issue its own ROD for these amendments to its LRMP using the analysis from this EIS. This would be a separate action from the issuance of the ROD for the Right-of-Way Grant issued by the BLM for crossing the Jefferson National Forest. The LRMP amendments proposed are in accordance to 36 CFR 219 (2012 version) regulations.

One of the many partnerships that the FS participates in for the management of certain NFS lands is the unique cooperative management system partnership for the Appalachian National Scenic Trail (ANST). The ANST, first envisioned in 1921 and first completed as a footpath through 14 states in 1937, became the first National Scenic Trail in the United States with the passage of the National Trails System Act (NTSA) in 1968. This federal law designates the entire 2,190-mile ANST as a National Scenic Trail; designates the National Park Service (NPS) as the lead federal agency for the administration of the entire ANST; recognizes the rights of the other federal and state public land managers whose lands are crossed by the ANST; and requires the consistent cooperative management of the unique ANST resource by the NPS; working formally with the non-profit Appalachian Trail Conservancy (ATC), with ATC-affiliated local clubs, and with all the public land managing agencies that the ANST traverses – notably and specifically, the FS. More of the ANST is on FS lands than any of more than 75 other public land ownerships trail-wide.

Both the NPS and FS have acquired private lands in the name of the U.S. government specifically for the protection of the ANST. In the vicinity of the MVP proposed route, because of the location of the official proclamation boundary of the Jefferson National Forest, the NPS and FS have each separately acquired several land parcels since 1978. Under the authority of NTSA, ongoing management of the NPS-acquired parcels in this area has been administratively transferred to the FS through a Memorandum of Agreement (MOA). The NPS retains only those specific rights and responsibilities for these NPS-acquired transfer lands that are expressly reserved in the MOA, which includes any future authorization of oil or gas pipeline crossings. Otherwise, these NPS-acquired transfer lands are subject exclusively to FS regulations and management authority under the terms of the MOA and are in all other respects NFS lands for the duration of the MOA. NPS-acquired transfer lands near the MVP are shown on figure 1-3 and labeled as “National Park Service Land.” Although the entire ANST is a unit of the NPS, lands acquired by the FS for the ANST under the authority of the NTSA are solely NFS lands and subject exclusively to FS regulations and management authority. Since the NPS has stated that it does not have the authority to grant oil or gas pipeline authorizations across NPS-acquired ANST lands, this difference is a factor in the MVP route crossing the ANST on FS-acquired lands.

After issuance of the draft EIS, the FS GWJeff office filed several letters into the FERC docket regarding the MVP (table 1.3-2).

1.3.2.2 U.S. Army Corps of Engineers

The U.S. Army separated out the COE in 1802. While originally tasked to construct military installations, the COE evolved into a builder of federal dams and waterways for flood control. With the River and Harbors Appropriation Act of 1899, commonly known as the Rivers and Harbors Act (RHA, 33 U.S.C. § 403), Congress gave the COE the power to control obstructions to navigation. Under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (later incorporated into the Clean Water Act [CWA] 33 U.S.C. § 1344) the COE was given authority over the discharge of dredged or fill materials into the Waters of the United States.

The MVP would cross three COE Districts, including the Huntington District, Pittsburgh District, and Norfolk District. The EEP would cross two COE Districts, including the Huntington District and Pittsburgh District. The MVP pipeline route would cross about 60 feet of the Weston and Gauley Bridge Turnpike Trail, owned in fee by the COE, in Braxton County, West Virginia.

In a May 5, 2015 letter to the FERC, the Norfolk District agreed to be a cooperating agency in the production of this EIS. On March 18, 2015, the Huntington District also agreed to be a cooperating agency. As a cooperating agency, the COE may adopt this EIS for the purposes of exercising its regulatory authorities.

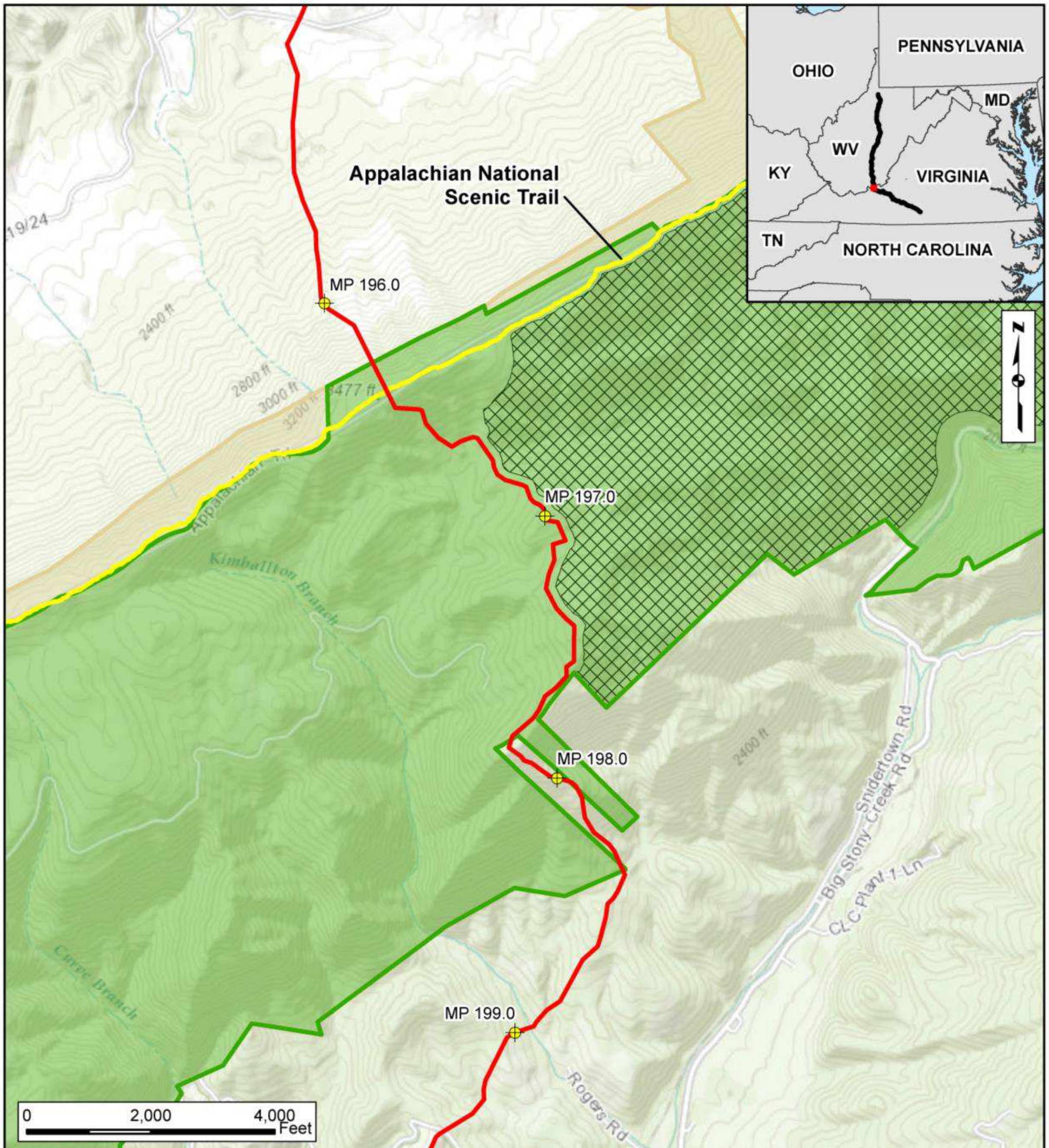

Figure 1-3

Mountain Valley Project

Federal Land Ownership
Near Peter's Mountain

TABLE 1.3-2

Forest Service Letters Filed with the FERC for the Mountain Valley Project

File Date a/	Accession Number	After the Issuance of the Draft Environmental Impact Statement
October 25, 2016	20161025-5044	FS requested site-specific designs for high hazard stabilization
November 15, 2016	20161115-5013	FS submitted comments on the Plan of Development (POD)
November 16, 2016	20161116-5006	FS data request for MVP
December 12, 2016	20161212-5205	FS requested additional information about visual analyses
December 15, 2016	20161215-5127	FS recommendations for seeding mixes
December 20, 2016	20161221-5287	FS data request for MVP
December 20, 2016	20161221-5281	FS provided comments on the draft EIS
January 11, 2017	20170111-5072	FS requested that Mountain Valley survey property boundaries in the Jefferson National Forest
February 27, 2017	20170227-5074	FS requested information regarding the Visual Impact Analysis (VIA)
March 6, 2017	20170306-5054	FS submitted information regarding the location of the ANST
March 10, 2017	20170310-5283	FS commented on Mountain Valley's responses to the FERC's January 26, 2017 EIR
March 20, 2017	20170320-5222	FS submitted tree and shrub planting guidelines for pipeline rights of way and associated disturbances in the national forests
March 24, 2017	20170324-5024	FS comments on FAST-41
April 3, 2017	20170403-5058	FS comments Mountain Valley's additional VIA
April 17, 2017	20170417-5289	FS commented on Mountain Valley's Soil Report for the Jefferson National Forest
April 17, 2017	20170417-5285	FS provides boundaries of FS lands
April 21, 2017	20170421-5236	Status of cultural resource surveys on Jefferson National Forest
April 24, 2017	20170424-5112	FS comments on Mountain Valley's Biological Evaluation for the Jefferson National Forest
April 24, 2017	20170424-5122	FS comments on maps and figures showing NFS lands in the vicinity of Peters Mountain which were developed using incorrect ownership data
April 25, 2017	20170425-5353	FS reviewed Mountain Valley's revised contingency plans for crossing the ANST
April 25, 2017	20170425-5356	Requesting reports from Mountain Valley on Management Indicator Species (MIS) and Locally Rare Species
April 26, 2017	20170426-5200	FS commented on Mountain Valley's hydrologic analysis of sedimentation for the Jefferson National Forest
April 27, 2017	20170427-5433	FS request for evaluation of potential effects of herbicide use and topsoil segregation on species occurring within the Jefferson National Forest
May 3, 2017	20170503-5005	FS comments Mountain Valley's revised VIA
May 15, 2017	20170515-5039	FS comments Mountain Valley's POD for the Jefferson National Forest

a/ Includes letters filed following issuance of the draft EIS.

Mountain Valley filed its permit applications with the Pittsburgh, Huntington, and Norfolk Districts of the COE in February 2016. Mountain Valley updated these applications in February and March 2017. Equitrans stated that it filed applications under Section 404 of the CWA and Section 10 of the RHA with the Pittsburgh and Huntington Districts of the COE on November 25, 2015 followed by a joint permit in June 2016. Equitrans filed copies of its COE permit applications with the FERC on July 14, 2016.

The COE's regulations for permits under Section 10 of the RHA can be found at 33 CFR 322, while regulations for permits under Section 404 of the CWA are at 33 CFR 323, and processing of permits is at 33 CFR 325. Once the COE determines a permit application to be complete, it would issue a public notice. The COE notice is not the same as the FERC NOI. However, comments received by the COE in response to its notice should be submitted or summarized in a filing with the FERC, as the Commission is the keeper of the consolidated record for the proceedings in accordance with EPAct Section 313(d).

As an element of its review, the COE must consider whether the proposed projects represent the least environmentally damaging practicable alternative pursuant to the CWA Section 404(b)(1) guidelines. The term practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall purpose of the projects.

In June 2005, the FERC and the COE entered into a Memorandum of Understanding (MOU) that specified that the FERC, as lead federal agency, would be responsible for determining the purpose and need of a project for the NEPA document and the Commission's authorization; and further, that the COE would give deference, to the maximum extent allowed by law, to the range of alternatives that FERC determines to be appropriate for a project. Although the COE should exercise its independent judgment while carrying out its regulatory responsibilities, it should give deference, to the maximum extent allowed by law, to the FERC's determinations of project purpose, need, and alternatives.[21]

The District Engineer cannot make a decision on a permit application until the requirements of NEPA are fulfilled. After the publication of an EIS, the COE permit decision can be issued as a ROD. In communications with FERC staff, representatives of the COE indicated that individual COE Districts would not finalize their permit processes for the MVP and EEP until after the FERC has documented completion of the National Historic Preservation Act (NHPA) Section 106 and Endangered Species Act (ESA) Section 7 consultations.[22]

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21 *Memorandum of Understanding between the U.S. Army Corps of Engineers and the Federal Energy Regulatory Commission Supplementing the Interagency Agreement on Early Coordination of Required Environmental and Historic Preservation Reviews Conducted in Conjunction with the Issuance of Authorizations to Construct and Operate Interstate Natural Gas Pipelines Certificated by the Federal Energy Regulatory Commission,* executed 30 June 2005.

22 1 November 2016 letter from K. Bumgardner Chief Real Estate Division COE Huntington District, to K. Bose, Secretary of FERC (accession number 20161107-0096). 20 October 2016 letter from J. Frye, Chief Western Virginia Regulatory Section COE Norfolk District, to K. Brose, Secretary of FERC (accession number 20161027-0011). 1 March 2017 emails from J. Shaffer, Senior Regulatory Specialist COE Pittsburgh District, and C. Carson, Regulatory Project Manager COE Huntington District to FERC staff.

The Huntington District of the COE provided the FERC with its comments about potential MVP impacts on the Burnsville Lake Project in a letter dated November 1, 2016. In a letter dated October 20, 2016 from the Norfolk District of the COE, the FERC was designated as the lead federal agency for consultations under Section 106 of the NHPA and Section 7 of the ESA for the MVP on behalf of the COE, in keeping with the 2002 Interagency Agreement.

1.3.2.3 U.S. Bureau of Land Management

In 1812, Congress created the General Land Office within the Department of Treasury to oversee federal lands. The U.S. Grazing Service was created by the Taylor Grazing Act of 1934 to manage federal rangelands. In 1946, the Grazing Service was merged with the General Land Office, to create the BLM within the USDOI. The BLM lacked a unified legislative mandate until the passage of the Federal Land Policy and Management Act (FLPMA) by Congress in 1976. The FLPMA stated that federal lands should be managed for multiple uses. Today, the BLM oversees more than 245 million acres of public lands. The BLM can authorize the leasing of federal lands for the selected extraction of resources under the MLA of 1920.

In February 2016, Mountain Valley notified the FERC that the MVP would cross federally owned lands managed separately by both the FS (as part of the Jefferson National Forest) and the COE (as part of the Weston and Gauley Bridge Turnpike Trail). Pursuant to the MLA, and in accordance with 43 CFR 2880, the BLM is the federal agency responsible for issuing Right-of-Way Grants for natural gas pipelines across federal lands under the jurisdiction of the BLM or under the jurisdiction of two or more federal agencies. Mountain Valley has applied to the BLM for a Right-of-Way Grant to cross lands managed by the FS and the COE. Thus, the BLM agreed to be a cooperating agency.

The BLM will consider whether to issue a Right-of-Way Grant that provides terms and conditions for construction and operation of the MVP on federal lands in accordance with 43 CFR 2880 and relevant BLM manual and handbook direction. For example, the BLM would seek to ensure that any grant protects the natural resources associated with federal lands and adjacent lands and prevents unnecessary or undue degradation to public lands. In making a decision whether to issue a Right-of-way Grant for the MVP, the BLM would consider several factors including this EIS, conformance with the FS LRMP, and impacts on resources and programs. Following adoption of this EIS and receipt of concurrence from the FS and COE, the BLM would issue a ROD that documents the decision whether to grant, grant with conditions, or deny the Temporary Use Permit and the Right-of-Way Grant to Mountain Valley.

The BLM, FS, and COE are also using this EIS process to identify specific stipulations (including design features and mitigation measures) related to resources within their respective jurisdictions for inclusion in the Right-of-Way Grant. Mountain Valley submitted a Right-of-Way Grant application to the BLM on April 5, 2016, and filed a copy with the FERC on April 8, 2016. It updated its form SF-299 Right-of-Way Application in March 2017. Mountain Valley's Right-of-Way Grant application to the BLM included a Plan of Development (POD). The POD is a detailed description of the proposed action on federally administered lands and facilities and would be made a part of the Right-of-Way Grant. The POD includes attachments that were developed in cooperation with the FS and the COE that are individual plans detailing Mountain Valley's proposed method for construction and operation of the pipeline, mitigation measures, stipulations, and other specific standards that would apply on federal lands. On June 24, 2016, Mountain Valley filed with the FERC its revised POD. The POD was further revised and resubmitted with the FERC, BLM, and FS on March 23, 2017. The POD may be further refined in the future based on reviews by the BLM, FS, and COE.

After the issuance of our draft EIS, the Eastern States Office of the BLM provided comments on the MVP to the FERC in letters dated October 4 and November 30, 2016. On December 22, 2016, the Office of the Secretary of the USDOI provided BLM's comments on the draft EIS. Copies of these letters are included in appendix AA of this final EIS.

1.3.2.4 U.S. Fish and Wildlife Service

The FWS was legislatively created by the passage of the Fish and Wildlife Act of 1956 (70 Stat. 1119). The mission of the FWS is to conserve, protect, and enhance, fish, wildlife, and plants and their habitats. Towards that goal, the FWS works to enforce federal wildlife laws, protect endangered species, manage migratory birds, conserve habitats including wetlands, and restore fisheries. The FWS cares for about 150 million acres in more than 500 National Wildlife Refuges.

The FERC, as the lead federal agency for the MVP and the EEP, is required to consult with the FWS to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitats would be affected by the projects. Based on consultations with the FWS and findings of project-related effects on specific listed species or their habitats, the FERC staff must prepare a biological assessment (BA) to identify the nature and extent of adverse impacts, and to recommend measures that would avoid, reduce, or mitigate impacts on habitats and/or species. The consultation process under Section 7 of the ESA is outlined in regulations at 50 CFR 402. The ESA is further discussed in sections 1.5.1.4 and 4.7 of this EIS.

In addition, the FWS has statutory authority and responsibilities for enforcing the Migratory Bird Treaty Act (MBTA), the Fish and Wildlife Improvement Act, and the Fish and Wildlife Act. The FWS may issue permits under the MBTA in accordance with 50 CFR 21. On March 30, 2011, the FERC and the FWS entered into an MOU regarding compliance with the MBTA. The MBTA is further discussed in sections 1.5.1.5 and 4.5 of this EIS. The FWS also has the authority to issue permits under the Bald and Golden Eagle Protection Act (BGEPA), in accordance with regulations at 50 CFR 22. The BGEPA is further discussed in sections 1.5.1.1 and 4.5 of this EIS.

The West Virginia Field Office of the FWS requested and we accepted its participation as a cooperating agency in the production of the final EIS for the MVP. Both the Virginia and West Virginia Field Office of the FWS reviewed the Applicants' second draft BA, and provided comments to the FERC staff. Additional information regarding the BA can be found in section 4.7.

1.3.2.5 U.S. Environmental Protection Agency

Established in 1970, the EPA is an independent federal agency responsible for protecting human health and safeguarding the natural environment. The EPA has responsibilities under NEPA, the Clean Air Act (CAA, 42 U.S.C. 7401 et seq.), and the CWA. The EPA shares responsibility for administering and enforcing Section 404 of the CWA with the COE, and has authority to veto the COE permit decisions.

The EPA has delegated water quality certification, under Section 401 of the CWA, to the jurisdiction of individual state agencies. The EPA may assume Section 401 authority if no state program exists, if the state program is not functioning adequately, or at the request of the state. The EPA also oversees the issuance of a National Pollutant Discharge Elimination System (NPDES) permit by the state agency, under Section 402 of the CWA, for point-source discharge of water used for hydrostatic testing of pipelines into waterbodies.

The EPA has jurisdictional authority under the CAA to control air pollution by developing and enforcing rules and regulations for all entities that emit toxic substances into the air. Under this authority, the EPA has developed regulations for major sources of air pollution, and has delegated the authority to implement these regulations to state and local agencies. State and local agencies are allowed to develop and implement their own regulations for non-major sources of air pollutants. The EPA also establishes general conformity applicability thresholds that a federal agency can utilize to determine whether a specific action requires a general conformity assessment.

In addition to its permitting responsibilities, the EPA is required under Section 309 of the CAA to review and publicly comment on the environmental impacts of major federal actions, including actions that are the subject of draft and final EISs, and is responsible for implementing certain procedural provisions of NEPA (e.g., publishing Notices of Availability of the draft and final EISs in the Federal Register) to establish statutory timeframes for the environmental review process.

Region 3 of the EPA agreed to be a cooperating agency in the production of this EIS (letter to the FERC dated April 13, 2015). The EPA indicated it could assist the FERC with compliance with NEPA, assess compliance with the CWA, and provide technical assistance for the analysis of alternatives, environmental justice, and cumulative impacts.

On June 16, 2015, EPA Region 3 provided comments to the FERC in response to the NOI for the MVP. Among other issues, the EPA made recommendations that the EIS address the Section 401 and 404 CWA permitting processes, wetland conversions, karst terrain, hydrostatic testing of the pipeline, biological resources, environmental justice, and air quality. On December 12, 2016, the EPA provided its comments on the draft EIS to the FERC. A copy of that letter is reproduced in appendix AA of this final EIS.

1.3.2.6 U.S. Department of Transportation – Pipeline and Hazardous Materials Safety Administration

PHMSA was created under the Norman Y. Mineta Research and Special Programs Improvement Act of 2004 as an agency under the DOT. PHMSA is responsible for advancing the safe transportation of natural gas, petroleum, and other hazardous materials by pipeline through the development and enforcement of pipeline safety regulations pursuant to 49 U.S.C. 601. Included in PHMSA's authority is the development and enforcement of regulations and standards related to the design, construction, operation, and maintenance of natural gas pipelines, under the Natural Gas Pipeline Safety Act (49 U.S.C. 1671 et seq.). Accordingly, the Applicants must design, construct, operate, and maintain their natural gas pipeline facilities in compliance with the pipeline safety standards, which are contained in 49 CFR 192.

The DOT agreed to be a cooperating agency in the production of this EIS (letter to the FERC dated March 26, 2015). The Eastern Region Community Liaison Services (CLS) managers reviewed the EIS text as it pertains to pipeline safety to ensure that the information contained within does not violate or contradict the federal pipeline safety regulations. A CLS representative made presentations at three of the FERC's public scoping meetings for the MVP held from May 11 - 13, 2015.

1.3.2.7 West Virginia Department of Environmental Protection

The WVDEP is a state agency responsible for implementing and enforcing West Virginia's environmental regulations with respect to managing the state's air, land, and water resources. The Division of Water and Waste Management's (DWWM) mission is to preserve, protect, and enhance the state's watersheds for the benefit and safety of all its citizens through implementation of programs controlling hazardous waste, solid waste, and surface and groundwater pollution, from any source. The DWWM may grant, grant with conditions, waive, or deny a Water Quality Certificate application under Section 401 of the CWA and operates in accordance with 47CSR5A. Section 401 Water Quality Certification (WQC) is required for each permit or license issued by a federal agency to ensure that projects will not violate the state's water quality standards or stream designated uses. WVDEP-DWWM issued a Conditional WQC for MVP on March 23, 2017 depending upon the terms of the FERC Certificate which, as part of the Special Conditions of the Conditional WQC, MVP is to supply to WVDEP-DWWM no later than 10 days after the issuance of the FERC Certificate.

The WVDEP's Division of Air Quality implements the permit program established under the West Virginia's Air Pollution Control Act. Major sources are primarily permitted under the new source review rules found at 45CSR14 and 45CSR19. Under 45CSR30, the Division issues Operating Permits for Title V of the CAA.

In a letter to the FERC dated March 31, 2015, the WVDEP agreed to be a cooperating agency in the development of this EIS. In addition to serving as a regulatory role for the proposed project, the WVDEP has requested to be a cooperating agency in order to lend experience and insight concerning environmental impacts relative to this type of activity, and to provide recommendations on assessment, minimization, and mitigation of potential environmental impacts.

1.3.2.8 West Virginia Division of Natural Resources

The statutory mission of the WVDNR is to provide and administer a long-range comprehensive program for the exploration, conservation, development, protection, enjoyment, and use of the natural resources of the State of West Virginia. The Division is composed of Wildlife Resources, Parks and Forests, Law Enforcement Sections and the Office of Lands and Streams.

Under State Code §20-2-1, "It is declared to be the public policy of the State of West Virginia that the wildlife resources of this state shall be protected for the use and enjoyment of all the citizens of the State. All species of wildlife shall be maintained for values which may be either intrinsic or ecological or of benefit to man. Such benefits shall include (1) hunting, fishing, and other diversified recreational uses; (2) economic contributions in the best interests of the people of this state and (3) scientific and educational uses."

The Wildlife Resources Section (WRS) of the WVDNR is responsible for management of the state's wildlife resources. The primary objective of the WRS is to maintain and perpetuate fish and wildlife at levels compatible with the available habitat while providing maximum opportunities for recreation, research, and education. The WRS is comprised of Game Management, Fisheries, Wildlife Diversity, Technical Support, and Environmental Coordination Units.

The WRS Environmental Coordination Unit reviews numerous projects that potentially impact wildlife, fisheries, and their respective habitats. Primary concerns are road construction, stream alteration, hydropower projects, power line rights-of-way, gas line construction, oil/gas well sites, surface mines, and other construction projects. In numerous cases, recommendations have been made to alter projects, thus reducing detrimental impacts on wildlife and fisheries. The Technical Support unit provides Geographic Information System (GIS) and computer support to all biologists in the agency. The WVDNR is currently discussing Mountain Valley's proposal to mitigate for forest fragmentation as mentioned in section 4.4.

Currently, the Game Management Unit conducts management activities on 105 Wildlife Management Areas (WMA) and 8 State Forests totaling 1,415,839 acres. The MVP pipeline route would cross a small segment of the Burnsville Lake WMA, as further discussed in section 4.8. Black bear, white-tailed deer, and wild turkey are some of the most important hunted game species. Impacts on property managed by the WRS may be subject to review by the USDOI FWS for concurrence under the authority established in 50 CFR 80.

Fisheries management programs are designed to provide a variety of fishing opportunities and experiences for the enjoyment of anglers. These programs consist of efforts focused on warmwater species (e.g., walleye and channel catfish), and coldwater species (e.g., trout), that are stocked in rivers, lakes, reservoirs, and streams throughout the state. Research, stocking, public access development, regulations, and outreach combined with habitat protection, improvement, and restoration form the foundation of management of the state's fishery resources.

The Wildlife Diversity and Natural Heritage Program is responsible for those species listed by the federal government as threatened or endangered, and nongame wildlife, nongame fish, mussels, birds, and their habitats. It also administers outreach programs and provides vital assessment information.

The State Parks and Forests Section promotes conservation by preserving and protecting natural areas of unique or exceptional scenic, scientific, cultural, archaeological, or historical significance and to provide outdoor recreational opportunities for the citizens of this state and its visitors. The system is composed of 35 parks, 7 forests, 5 WMAs, the Greenbrier River Trail, and North Bend Rail Trail.

The Office of Lands and Streams (OLS) preserves, protects, and enhances the State's title to its recreation lands. Currently, the WVDNR holds title to the beds of the state's rivers, creeks, and streams totaling some 34,000 miles or some 5,000 named waterways in the state. The OLS grants right-of-entry letters to governmental agencies, companies, and individuals to conduct construction activities in the state's rivers, creeks, and streams as well as right-of-way licenses for pipelines, underground or underwater cables, and overhead power and telephone lines crossing the state's waterways.

The Law Enforcement Section is responsible for the prompt, orderly, and effective enforcement of all laws of Chapter 20, Code of West Virginia, and rules promulgated under that authority. Of primary importance is the protection of West Virginia's wildlife to the degree that they are not endangered by unlawful activities.

In a letter to the FERC dated March 12, 2015, the WRS of the WVDNR agreed to be a cooperating agency in the development of this EIS.

1.3.3 Out-of-Scope Issues

During scoping and the draft EIS comment period, we received comments that raised issues that are outside the scope of this EIS. For example, some commenters requested that the FERC combine a number of both jurisdictional and non-jurisdictional pipeline projects proposed, or in the early planning stage, to be located in West Virginia or Virginia into a single "programmatic" EIS.[23] However, there is no Commission plan or program for the development of natural gas infrastructure.[24] The FERC's review and approval of individual projects under the NGA does not constitute a coordinated federal program. In a previous case, the Commission stated that it "does not direct the development of the gas industry's infrastructure, either on a broad regional basis, or in the design of specific projects."[25] Nor does the FERC engage in regional planning exercises that would result in the selection of one project over another.[26]

[23] See, for examples, the June 16, 2015 letters from the Nature Conservancy (accession number 20150617-5045), the Appalachian Mountain Advocates (accession number 20150617-5044), and the December 22, 2106 letter from Roanoke County (accession number 20161222-5459).

[24] *Texas Eastern Transmission, LP*, 149 FERC ¶ 61,259, at PP 38-47 (2014); *Columbia Gas Transmission, LLC*, 149 FERC ¶ 61,255 (2014).

[25] Texas Eastern Transmission, LP & Algonquin Gas Transmission, LLC (2012) 141 FERC § 61,043, page 25.

[26] 124 FERC § 61,257, Section D, pages 29-30.

Rather, the Commission acts on individual applications filed by entities proposing to construct interstate natural gas pipelines.

Companies select the location of their proposed facilities based on market forces and other factors, and the Commission staff analyzes the environmental impacts of construction and operation of those facilities at the locations selected by the applicants, and of an appropriate range of alternatives. However, under cumulative impacts in section 4.13 of this EIS, we consider other projects that may be built during the same timeframe as the MVP and the EEP within the same area of geographic scope.

We received comments suggesting that the MVP would lead to additional exploration and production of natural gas in the Marcellus shale region. According to some, this increased or "induced" production would correspondently result in more hydraulic drilling or "fracking."[27] The FERC does not regulate activities associated with the exploration and production of natural gas, including fracking. Those activities are regulated by individual states. While we know generally that natural gas is produced in the Appalachian Basin, there is no reasonable way to determine the exact wells providing gas transported in the MVP and the EEP pipelines, nor is there a reasonable way to identify the well-specific exploration and production methods used to obtain those gas supplies.[28]

Because a natural gas transportation project is proposed before the FERC, it is not likely that it would lead to additional drilling and production. In fact, the opposite causal relationship is more likely, i.e., once production begins in an area, shippers or end users will support the development of a pipeline to move the natural gas to markets. In past proceedings, the Commission concluded that the environmental effects resulting from natural gas production are not reasonably foreseeable or causally-related to the proposed pipeline projects.[29] Therefore, induced or additional natural gas production is not a "reasonably foreseeable" indirect effect resulting from the proposed MVP and the EEP, and this topic need not be addressed in this EIS except as a potential cumulative impact.

Some comments were of an administrative nature. There were requests to hold more public scoping meetings, and requests to extend the scoping period.[30] Our NOI for the MVP announced six public scoping meetings that were held in West Virginia and Virginia, in the vicinity of the proposed MVP pipeline route. Additional public sessions were held in November 2016 at seven locations in the project area to take verbal comments on this draft EIS. In

[27] See, for examples, the June 16, 2015 letters from the Appalachian Mountain Advocates (accession number 20150617-5044) and the Chesapeake Climate Action Network (accession number 20150616-5356), and the April 1, 2015 letter from Cari Cohen (accession number 20150407-0014).

[28] The Commission addressed this issue in its *Order Granting Section 3 Authorization* to Sabine in Docket No. CP11-72-000 (139 FERC ¶ 61,039 [2012], IV, pages 31-33).

[29] *Central New York* Oil and Gas Co., LLC, 137 FERC ¶ 61,121, at PP 81-101 (2011), Order on Rehearing 138 FERC ¶ 61,104, at PP 33-49 (2012), Petition for Review Dismissed sub nom. Coalition for Responsible Growth v. FERC, 485 Fed. Appx. 472, 474-75 (2012) (unpublished opinion).

[30] See, for examples, the April 22, 2015 letter from David Werner (accession number 20150422-5189) and the April 26, 2015 letter from Pat Leonard (accession number 20150427-5049).

response to the draft EIS issued in September 2016, we received comments about the format of those public sessions, that we respond to below and in appendix AA.

The public scoping meetings and draft EIS comment session locations were fairly evenly spaced apart and selected within reasonable driving distance for most citizens in the project area, given facility and staff constraints. The format for the sessions to take comments on the draft EIS allowed staff to accept an expanded number of comments within the available timeframes. Transcripts of the meetings and sessions were placed in the public file for these dockets.

Our NOI for the MVP established a 60-day scoping period that concluded on July 16, 2015. Our NOI for the EEP established a 35-day scoping period that ended on September 14, 2015. Our Notice of Availability for the draft EIS established a 90-day comment period, ending December 22, 2016. In addition, we allowed landowners along route modifications filed in October 2016 up until February 21, 2017 to comment on the new alignments. We continued to consider comments received up until the time we drafted this final EIS. All comments filed with the FERC about the MVP and EEP are part of the consolidated record for these proceedings. The Commission will take the entire record into account prior to making its decision whether or not to authorize the projects.

A number of commenters object to the Applicants' potential use of eminent domain (if the projects are certificated by the Commission).[31] The Commission urges applicants to reach mutual agreements with landowners, and eminent domain should only be used as a last resort. In cases where agreements between a company and a landowner cannot be reached, compensation for an easement would be determined by local courts, not by the FERC or the Applicants. The topic of property rights is briefly discussed in this EIS under Socioeconomics (see section 4.9).

1.4 PUBLIC REVIEW

Prior to and during the pre-filing process, the Applicants contacted federal, state, and local governmental agencies to inform them about their respective projects and discuss project-specific issues. The Applicants also contacted affected landowners, to inform them about the projects, and to obtain permission to perform environmental surveys. Each company also developed a public participation plan (Public, Stakeholder, and Agency Participation Plan for the MVP and Public Participation Plan for the EEP) to facilitate stakeholder communications and make information available to the public and regulatory agencies.[32] These public participation plans established a single point of contact within each company for the public or agencies to call or e-mail with questions or concerns; a publicly accessible website with information about their

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31 See, for examples, the March 16, 2015 letter from Anita Bevins (accession number 20150317-5004), the April 1, 2015 letter from Frankie Garman (accession number 20150406-0063), the verbal comments of Ian Reily, Kate Dunnagan, and Brache Rauchle from the May 7, 2015 public meeting at Chatham, Virginia (accession number 20150611-4003) and the September 19, 2016 letter from Nancy Bouldin (accession number 20160919-5042).

32 Mountain Valley's public participation plan was filed with its October 27, 2014 request to the FERC to initiate the pre-filing review process. Equitrans' public participation plan was filed with its April 1, 2015 request to the FERC to initiate our pre-filing review.

projects (including maps) and project status; and regular newsletter mailings for affected landowners and other interested parties.

On April 17, 2015, the FERC issued an NOI that described the planned MVP; requested comments from the public; and announced the time and location of public scoping comment meetings. The NOI was sent to 2,846 parties, including federal, state, and local government agencies; elected officials; environmental groups and NGOs; Native Americans and Indian tribes; affected landowners; local libraries and newspapers; and other stakeholders who had indicated an interest in the MVP. The NOI was also published in the Federal Register on April 28, 2015.[33] Issuance of the NOI opened a 60-day formal scoping period that ended June 16, 2015.

The FERC sponsored six public scoping meetings in the project area during the formal scoping period to provide the public with the opportunity to comment orally on the MVP. The scoping meetings were held in Lindside, West Virginia on May 4, 2015; Ellison, Virginia on May 5, 2015; Chatham, Virginia on May 7, 2015; Pine Grove, West Virginia on May 11, 2015; Weston, West Virginia on May 12, 2015; and Summersville, West Virginia on May 13, 2015. Approximately 650 people in total attended the public scoping meetings. A total of 169 attendees provided oral comments at the meetings. Transcripts of each scoping meeting were placed into the FERC's public record for the MVP and are available for viewing electronically through the Internet.[34]

In addition to our formal notices, on March 25, 2015 and April 11, 2016, we issued Project Update brochures for the MVP to provide stakeholders current information on the FERC's environmental review process. The brochures were sent to all parties on our environmental mailing list.

On August 11, 2015, the FERC issued an NOI for the EEP. The NOI stated that Commission staff would evaluate the EEP jointly with the MVP in a single comprehensive EIS because the two projects are interconnected. The EEP NOI was sent to 575 parties and was published in the Federal Register on August 17, 2015.[35] Issuance of the EEP NOI opened a 35-day formal scoping period for filing written comments on the EEP that closed on September 14, 2015. We received a total of five comments in response to the EEP NOI.

During the pre-filing period, the FERC staff visited the project area and inspected portions of the MVP route, by automobile on public roads, and by use of a helicopter flyover of the portion in Virginia. In addition, the FERC staff attended a meeting with representatives of Mountain Valley, the FS, the NPS, and the ATC at the headquarters office of the GWJeff in Roanoke, Virginia on April 8, 2015. On May 6, 2015, the FERC staff met with representatives

[33] 80 FR 23535 (2015).

[34] To access the public record for this proceeding, go to the FERC's Internet website (http://www.ferc.gov), click on "Documents & Filings" and select the "eLibrary" feature. Click on "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the field (i.e., PF15-3, PF15-22, CP16-10, or CP16-13). Select an appropriate data range.

[35] 80 FR 49217 (2015).

of the Red Sulphur Public Service District and the Town of Union at the district office in Peterstown, West Virginia. Notes summarizing these meetings were placed into the FERC's public record for the proceeding.[36]

During the pre-filing periods, FERC staff participated in conference calls on an approximately bi-weekly basis with representatives from Mountain Valley and Equitrans and federal and state cooperating governmental agencies to discuss the projects' progress and issues. Summaries of the telephone calls were placed in the public record. After the filing of Mountain Valley and Equitrans' applications with the FERC, company representatives were barred from the bi-weekly calls because of the FERC's ex-parte rules, although the cooperating agencies continued to participate.

On November 5, 2015, the FERC issued a combined Notice of Application announcing that Mountain Valley had filed its formal application for the MVP on October 23, 2015, and Equitrans had filed its formal application for the EEP on October 27, 2015. Our notice stated there are two ways to become involved in the Commission's review of the projects. One way is to become an intervenor, or party to the proceeding. This is a legal position that carries certain rights and responsibilities, and gives parties legal standing to request a rehearing and challenge a Commission decision in court. The second way to participate is to file comments with the Secretary of the Commission (Secretary). A person does not have to become an intervenor to have their comments considered. However, filing of comments does not make the person a party to the proceeding. The comment period to respond to the Notice of Application closed on November 27, 2015. Between the filing of Mountain Valley's application, and the end of the Notice of Application comment period, 220 parties filed for intervenor status for the MVP. For the same period, 21 parties filed for intervenor status for the EEP.

From the time we accepted Mountain Valley's request to start the pre-filing process on October 31, 2014 to April 16, 2015, we received 597 comments on the record about the MVP. The issuance of our NOI for the MVP on April 17, 2015, marked the start of the official scoping period. During the official scoping period, from April 17 to June 16, 2015, we received 964 comment letters. This includes 2 letters from members of Congress; 11 letters from federal agencies; 1 letter from an Indian tribe; 8 letters from state agencies; 25 letters from county governments; 1 letter from a local government; 56 letters from NGOs; 175 letters from affected landowners; and 685 letters from the general public. These counts do not include the 393 form letters we received. After the close of scoping up until June 16, 2016 (when we started production of the draft EIS), we received an additional 428 comment letters.

From the time we accepted Equitrans' request to start the pre-filing process on April 9, 2015, to August 10, 2015, we received three comments regarding the EEP. The issuance of our NOI for the EEP on August 11, 2015 marked the start of the official scoping period. During the official scoping period, from August 11 to September 14, 2015, we received five comments. This includes two letters from state agencies; one letter from an NGO; one letter from an affected

[36] See filings on April 17, 2015 in accession number 20150420-0013, and on May 21, 2015 in accession number 20150521-0009.

landowner, and one letter from the general public. For the EEP, we received 17 letters after the close of the pre-filing period up until the time we started production of the draft EIS.

Table 1.4-1 lists the environmental topics raised in comments received on the projects during the scoping period. The most common comments were on socioeconomic topics.

Our draft EIS was issued on September 16, 2016, and sent to about 4,400 parties on our environmental mailing list.[37] Our Notice of Availability for the draft EIS was filed with the EPA and published in the Federal Register.[38] Among other things, it disclosed a 90-day period for the public to comment on the draft EIS, ending December 22, 2016, and explained how electronic or written comments could be filed with the Commission. It also listed the dates, times, and locations of seven public sessions to take verbal comments on the draft EIS. These sessions were held in Weston, West Virginia and Chatham, Virginia on November 1, 2016; Summersville, West Virginia and Rocky Mount, Virginia on November 2, 2016; Peterstown, West Virginia and Roanoke, Virginia on November 3, 2016; and Coal Center, Pennsylvania on November 9, 2016. In total, 261 people presented verbal comments at the sessions. Transcripts of the comments were placed into the public record of these proceedings, through the FERC's eLibrary system.[39] We have reprinted the transcripts in appendix AA of this final EIS, and included staff responses to individual comments.

Between the issuance of our draft EIS on September 16, 2016 and the end of the comment period on December 22, 2016 we received 1,237 written individual letters or electronic filings commenting on the draft EIS or about the projects, not including repeats and petitions. Those letters included 3 from elected officials, 17 from federal government agencies, 3 from state agencies, 16 from local governments, 115 from companies and NGOs, and 1,083 from members of the public. In table 1.4-2 we list topics raised in comments on the draft EIS. All comments received by the end of the comment period, whether verbal, electronic, or written (not including repeats or petitions) are reprinted in appendix AA of this final EIS, together with staff responses.

Comments received after December 22, 2016 are still part of the consolidated record for this proceeding. From December 23, 2016, up until the time staff completed writing the draft of the final EIS, on May 11, 2017, we received 275 additional comment letters either in writing or electronically, that can be viewed on eLibrary, not counting repeats, form letters, and petitions. In general, late comment letters reiterated concerns presented by stakeholders throughout our review process and are consistent with the topics summarized in table 1.4-2. To the extent possible, we have generally addressed the environmental issues raised after December 22, 2016 in the narrative text of this final EIS, topically under specific resources discussed in section 4.

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37 Appendix A of the draft EIS contained our distribution list.

38 81 FR 66268 (2016).

39 See the filings on November 3 (accession number 20161103-4005) and November 16, 2016 (accession number 20161116-4001).

TABLE 1.4-1

Issues Identified During the Scoping Process a/

Issues	Percentage of all Comments Received b/	EIS Section Addressing Issue
General	**4**	
Project purpose and need		1.2
Coordination of NEPA reviews by cooperating agencies		1.3.2
Pre-filing process		1.1
Compliance with environmental permits		1.5
Right-of-way width		1.5
Depth of cover		2.4.2
Non-jurisdictional facilities		2.2
Timeframes and project schedules		1.4, 2.5
Future project expansion		2.7
Mitigation measures		4.0
Production of natural gas from the Marcellus Shale		1.3.3, 4.13
Exportation of natural gas		1.2
Alternatives	**4**	**3.0**
No-action alternative		3.1
Energy conservation		3.0
Non-gas energy alternatives		3.0
Consideration of renewable energy alternatives		3.0
Use of other natural gas systems		3.3
Consideration of alternative routes to avoid populated areas and sensitive resources		3.3, 3.4, 3.5
Geology	**9**	**4.1**
Potential for seismic activity (earthquakes)		4.1.1.5, 4.1.2.3
Impacts from landslides		4.1.1.5, 4.1.2.4
Impacts from blasting		4.1.1.6, 4.1.2.7
Impacts due to construction in karst terrain		4.1.1.5, 4.1.2.5
Soils	**(included in Geology)**	**4.2**
Erosion and sediment control		4.2.1, 4.2.2
Contaminated soils		4.2.1.3, 4.2.2.2
Soil compaction		4.2.2

TABLE 1.4-1 (continued)

Issues Identified During the Scoping Process a/

Issues	Percentage of all Comments Received b/	EIS Section Addressing Issue
Water Quality and Aquatic Resources	**11**	**4.3, 4.7**
Storage of hazardous materials		4.3
Impacts on groundwater and drinking water supplies		4.3.1
Dewatering methods		2.4, 4.3.1
Waterbody crossings		4.3.2
Impacts of horizontal directional drill crossings		4.3.2
Impacts on the pipeline from a flood event		4.3.2
Impacts on fishery resources		4.6
Wetlands	**(included in Water and Aquatic resources)**	**4.3.3**
Impacts on wetlands		4.3.3
Vegetation	**8**	**4.4**
Impacts on forest		4.4.1.5
Revegetation of areas cleared during construction		4.4.2
Plans for invasive species control		4.4.1.3
Wildlife	**6**	**4.5**
Compliance with the Migratory Bird Treaty Act		4.5.3
Impacts on wildlife from forest fragmentation/forest edge effect		4.4.1, 4.5.8
Special Status Species	**4**	**4.7**
Agency coordination and requirements		4.7.1.1
Evaluation of potential impacts on threatened or endangered species and their habitat		4.7.1, 4.7.2
Land Use	**7**	**4.8**
Impacts on future development plans		2.7, 4.8.1.5
Eminent domain and compensation process		4.8.2.2
Compatibility with federally and state-owned lands		4.8.1.6, 4.8.2.4
Impacts on existing residences and structures during construction and operation		4.8.1.5, 4.8.2.2
Impacts on recreational and special interest areas		4.8.1.6, 4.8.2.4
Visual impacts of cleared rights-of-way & aboveground facilities		4.8.1.10, 4.8.2.5
Impacts on landowners from removal of lands from conservation programs with potential tax implications		4.8.1, 4.8.2
Impacts on transportation infrastructure (roads, highways, railroads)		4.9.1.5, 4.9.2.5
Increased impacts on landowners from trespassers		4.8.2
Impacts due to crossing of the Appalachian National Scenic Trail, the Jefferson National Forest, and the Blue Ridge Parkway		4.8.1, 4.8.2

TABLE 1.4-1 (continued) **Issues Identified During the Scoping Process a/**		
Issues	**Percentage of all Comments Received b/**	**EIS Section Addressing Issue**
Socioeconomics	**12**	**4.9**
Employment opportunities for local contractors and laborers and increased tax revenues		4.9.1.6, 4.9.2.7
Impacts on community public safety resources		4.9.1.3., 4.9.2.3
Traffic impacts		4.9.1.5, 4.9.2.5
Impacts on environmental justice communities		4.9.1.8, 4.9.2.8
Impacts on homes, businesses, and land values		4.9.1.6, 4.9.2.6
Impacts on mortgage rates		4.9.1.6, 4.9.2.6
Impacts on ability to obtain and afford homeowner's insurance		4.9.1.6, 4.9.2.6
Impacts on tourism		4.9.1.4, 4.9.2.4
Cultural Resources	**6**	**4.10**
Tribal consultations		4.10.1
Impacts on culturally and historically significant properties		4.10.2
Air Quality	**3**	**4.11.1**
Consistency with the emissions limits and standards		4.11.1
Impacts on air quality		4.11.1
Greenhouse gas emissions		4.11.1
Radon		4.11.1.4
Impacts from crossing lands containing uranium		4.1.1.4
Noise	**(included in Air Quality)**	**4.11.2**
Potential noise impacts on residences		4.11.2
Reliability and Safety	**8**	**4.12**
Emergency response		4.12.1
Remote detection of pipeline leaks		4.12.1
Safety and reliability of constructing and maintaining the pipeline		4.12.1
Pipeline damage from accidental third-party or terrorist actions		4.12.2
Cumulative Impacts	**3**	**4.13**
Analysis of cumulative impacts		4.13.1

a/ Based on non-form letters filed during the formal scoping period from April 17, 2015 through June 16, 2015 for the MVP and from August 11, 2015 to September 14, 2015 for the EEP.

b/ Percentages will not sum to 100 percent because most letters include more than one category

TABLE 1.4-2

Issues Identified in Comments on the Draft Environmental Impact Statement

Issues	Percentage of all Comments Received a/	Final EIS Section Addressing Issue
General	**9**	
Project purpose and need		1.2
No benefits to community		Appendix AA
Need		1.2
Programmatic EIS		1.3.3
Coordination of NEPA reviews by cooperating agencies		1.3.2
Compliance with environmental permits		1.5
Right-of-way width		1.5
Depth of cover		2.4.2
Non-jurisdictional facilities		2.2
Timeframes and project schedules		1.4, 2.5
Future project expansion		2.7
Mitigation measures		4.0
Production of natural gas from the Marcellus Shale		1.3.3, 4.13
Impacts from hydraulic fracturing		1.3.3
Exportation of natural gas		1.2
Lack of existing 42-inch natural gas pipelines		Appendix AA
500-foot-wide right-of-way on FS lands		1.5
Amendments to the LRMP for Jefferson National Forest		1.3.2
Amendments to the FMP		1.3.2
Criticism of the draft EIS Comment Sessions		1.4
Criticism of the draft EIS comment period		1.4
Financial responsibility		Appendix AA
Alternatives	**4**	**3.0**
No-action alternative		3.1
Energy conservation		3.0
Non-gas energy alternatives		3.0
Consideration of renewable energy alternatives		3.0
Use of other natural gas systems		3.3
Consideration of alternative routes to avoid populated areas and sensitive resources		3.3, 3.4, 3.5
Hybrid 1A Alternative		3.5
Mount Tabor Variation and the Slussers Chapel Conservation Site Avoidance		3.5.1.7
Synapse Report		3.0
Geology	**10**	**4.1**
Potential for seismic activity (earthquakes)		4.1.1.5, 4.1.2.3
Impacts from landslides		4.1.1.5, 4.1.2.4
Impacts from blasting		4.1.1.6, 4.1.2.7
Impacts due to construction in karst terrain		4.1.1.5, 4.1.2.5

TABLE 1.4-2 (continued)

Issues Identified in Comments on the Draft Environmental Impact Statement

Issues	Percentage <u>a/</u>	Final EIS Section Addressing Issue
Soils	**(included in Geology)**	**4.2**
Erosion and sediment controls		4.2.1, 4.2.2
Contaminated soils		4.2.1.3, 4.2.2.2
Soil compaction		4.2.2
Water Quality and Aquatic Resources	**12**	**4.3, 4.7**
Storage of hazardous materials		4.3
Comprehensive hydrogeological study needed		Appendix AA
Impacts on groundwater and drinking water supplies		4.3.1
Identification of drinking water sources		4.3.1
Inadequate consideration of Dr. Kastning's report		4.3.1, 4.3.2
Dewatering methods		2.4, 4.3.1
Waterbody crossings		4.3.2
Sedimentation and turbidity from waterbody crossings		Appendix AA
Scour analysis		4.3.2.2
Impacts of horizontal directional drill crossings		4.3.2
Impacts on the pipeline from a flood event		4.3.2
Impacts from hydrostatic testing		4.3.2
Impacts on fishery resources		4.6
Wetlands	**(included in Water and Aquatic Resources)**	**4.3.3**
Impacts on wetlands		4.3.3
Permanent fill of wetlands		4.3.3
Vegetation	**7**	**4.4**
Impacts on forest		4.4.1.5
Revegetation of areas cleared during construction		4.4.2
Mitigation for forest removal missing		4.4.2
Plans for invasive species control		4.4.1.3
Herbicide/Pesticide use		4.1.2.5
Wildlife	**6**	**4.5**
Compliance with the Migratory Bird Treaty Act		4.5.3
Impacts on wildlife from forest fragmentation/forest edge effect		4.4.1, 4.5.8
Special Status Species	**2**	**4.7**
Agency coordination and requirements		4.7.1.1
Evaluation of potential impacts on threatened or endangered species and their habitat		4.7.1, 4.7.2
Land Use	**6**	**4.8**
Impacts on future development plans		2.7, 4.8.1.5
Eminent domain and compensation process		4.8.2.2

TABLE 1.4-2 (continued)

Issues Identified in Comments on the Draft Environmental Impact Statement

Issues	Percentage a/	Final EIS Section Addressing Issue
Compatibility with federally and state-owned lands		4.8.1.6, 4.8.2.4
Impacts on existing residences and structures during construction and operation		4.8.1.5, 4.8.2.2
Impacts on recreational and special interest areas		4.8.1.6, 4.8.2.4
Visual impacts of cleared rights-of-way & aboveground facilities		4.8.1.10, 4.8.2.5
Visual impacts on the Appalachian National Scenic Trail and Blue Ridge Parkway		4.8.1.10, 4.8.2.5
Impacts on transportation infrastructure (roads, highways, railroads)		4.9.1.5, 4.9.2.5
Increased impacts on landowners from trespassers		4.8.2
Impacts due to crossing of the Appalachian National Scenic Trail, the Jefferson National Forest, and the Blue Ridge Parkway		4.8.1, 4.8.2
Impacts from access roads		4.8.1.2, 4.9.1.5
Impacts on Brush Mountain Inventoried Roadless Area		4.8.1.6, 4.8.2.4
Impacts on Brush Mountain Wilderness Area		4.8.1.6, 4.8.2.4
Socioeconomics	**7**	**4.9**
Employment opportunities for local contractors and laborers and increased tax revenues		4.9.1.6, 4.9.2.7
Impacts on community public safety resources		4.9.1.3., 4.9.2.3
Traffic impacts		4.9.1.5, 4.9.2.5
Road repairs		4.9.2.5
Impacts on environmental justice communities		4.9.1.8, 4.9.2.8
Impacts on homes, businesses, and land values		4.9.1.6, 4.9.2.6
Impacts on mortgage rates		4.9.1.6, 4.9.2.6
Impacts on ability to obtain and afford homeowner's insurance		4.9.1.6, 4.9.2.6
Impacts on tourism		4.9.1.4, 4.9.2.4
KeyLog report		4.9.2
Cultural Resources	**9**	**4.10**
Tribal consultations		4.10.1
Impacts on culturally and historically significant properties		4.10.2
Consulting party status		4.10.2
Cultural attachment		4.10.8
Air Quality	**1**	**4.11.1**
Consistency with the emissions limits and standards		4.11.1
Impacts on air quality		4.11.1
Greenhouse gas emissions		4.11.1
Climate change		4.11.1, 4.13.2.7
Lifecycle Emissions		4.13.2.7

TABLE 1.4-2 (continued)

Issues Identified in Comments on the Draft Environmental Impact Statement

Issues	Percentage a/	Final EIS Section Addressing Issue
Radon		4.11.1.4
Impacts from crossing lands containing uranium		4.1.1.4
Impacts from dust		4.11.1.3
Social cost of carbon		Appendix AA
Noise	**(included in Air Quality)**	**4.11.2**
Potential noise impacts on residences		4.11.2
Reliability and Safety	**7**	**4.12**
Emergency response		4.12.1
Remote detection of pipeline leaks		4.12.1
Safety and reliability of constructing and maintaining the pipeline		4.12.1
Pipeline damage from accidental third-party or terrorist actions		4.12.2
Cumulative Impacts	**3**	**4.13**
Analysis of cumulative impacts		4.13.1
Cumulative impacts on ANST		4.13.2.5
Induced development of natural gas production		Appendix AA

a/ Percentages will not sum to 100 percent because most letters include more than one category

On October 14, 2016, Mountain Valley filed a number of minor pipeline route modifications to address FERC recommendations in the draft EIS, landowner requests, and engineering issues. Those pipeline route modifications totaled about 67 miles, and affected about 45 new landowners. On October 20, 2016, Mountain Valley notified the FERC that it had sent letters dated October 14, 2016 to those 45 newly affected landowners informing them about the MVP. On January 17, 2017, the FERC issued letters to the 45 newly affected landowners along the route modifications, informing them about our environmental review process, explaining that their mailing addresses were now placed into our environmental mailing list, and they would receive future FERC issuances including copies of the final EIS. We also provided them an opportunity to comment on the route modifications, with a new comment period that extended until February 21, 2017.

In response to our January 17, 2017 letter, we received comments from three landowners affected by the October 14, 2016 route modifications. Issues raised included the crossing of the Pulaski fault, and Mill Creek along the Mount Tabor Variation adopted by Mountain Valley into its proposed route on October 14, 2016.[40] Issues related to seismic zones are addressed in section 4.1 (Geology) of this EIS and waterbodies are discussed in section 4.3. Concerns were also raised about karst features along both the October 2015 application route and the Mount Tabor

[40] Accession number 29170221-5129.

Variation. We address karst terrain in section 4.1 of this EIS and related groundwater and surface water resources are discussed in section 4.3.

This final EIS is being mailed to federal, state, and local agencies; elected officials; Native American tribes; newspapers; public libraries; intervenors; and other interested parties (i.e., affected landowners, miscellaneous individuals, and environmental groups), and will be filed with the EPA for issuance of a formal public notice of availability in the Federal Register. In accordance with CEQ's regulations implementing NEPA, no agency decision on a proposed action may be made until 30 days after the EPA publishes a notice of availability for a final EIS. However, the CEQ regulations provide an exception to this rule when an agency decision is subject to a formal internal process that allows other agencies or the public to make their views known. In such cases, the agency decision may be made at the same time the notice of the final EIS is published, allowing both periods to run concurrently. Should the Commission issue Mountain Valley and Equitrans Certificates for their respective actions, it would be subject to a 30-day rehearing period. Therefore, the Commission could issue its decision concurrently with issuance of the final EIS.

1.5 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

1.5.1 Federal Laws Other than the National Environmental Policy Act

The FERC and the other federal agencies that must make a decision on the MVP and the EEP are required to comply with numerous federal statutes in addition to NEPA, including the BGEPA, CAA, CWA, ESA, MBTA, NHPA, NTSA, RHA, and the Wilderness Act. Each of these statutes has been taken into account in the preparation of this EIS, as discussed below.

1.5.1.1 Bald Eagle and Golden Eagle Protection Act

The Bald Eagle Protection Act (16 U.S.C. § 668) was originally passed by Congress in 1940, and amended in 1962 to also protect golden eagles. The 1972 amendment increased penalties for violation of the Act. The 1978 amendment allowed taking of golden eagle nests that interfere with resource development, with permission from the Secretary of the Interior. The BGEPA prohibits taking without a permit, or taking with wanton disregard for the consequences of an activity, any bald or golden eagle or their body parts, nests, chicks, or eggs, which includes collection, molestation, disturbance, or killing. The BGEPA protections include provisions not included in the MBTA, such as the protection of unoccupied nests and a prohibition on disturbing eagles. The BGEPA includes limited exceptions to its prohibitions through a permitting process. This EIS discusses compliance with the BGEPA in section 4.5.

1.5.1.2 Clean Air Act

Congress originally passed the CAA (42 U.S.C. § 85) in 1963, and made major revisions to it in 1970, 1977, and 1990. The primary objective of the CAA, as amended, is to establish federal standards for various pollutants from both stationary and mobile sources, and to provide for the regulation of polluting emissions via state implementation plans. In addition, the CAA was established to prevent significant deterioration in certain areas where air pollutants exceed national standards and to provide for improved air quality in areas that do not meet federal standards (nonattainment areas).

The EPA has regulatory authority under the CAA. Section 309 of the CAA directs the EPA to review and comment in writing on environmental impacts associated with all major federal actions.

Ambient air quality is protected by federal regulations under the CAA. These regulations include compliance under the New Source Performance Standards (NSPS) and requirements for the Prevention of Significant Deterioration (PSD). The EPA has delegated the federal permitting process for the CAA to each state where the MVP and the EEP facilities are proposed. Although applications are reviewed by both the state and the EPA, the state would determine the need for a NSPS or a PSD permit. Mountain Valley submitted an air quality permit application to the WVDEP on October 21, 2015. Mountain Valley received approvals from the WVDEP in March and April 2016. Section 4.11.1 of this EIS has a detailed discussion of air quality issues.

1.5.1.3 Clean Water Act

The CWA got its legislative start as the Federal Water Pollution Control Act of 1948, but the Act was amended and renamed in 1972. The CWA (33 U.S.C. § 1251 et seq.) establishes the basic structure for regulating discharges of pollutants into the Waters of the United States and regulating quality standards for surface waters. Section 404 of the CWA outlines procedures by which the COE can issue permits for the discharge of dredged or fill material into Waters of the United States, including wetlands. The EPA also independently reviews Section 404 CWA applications and has veto power for permits issued by the COE.

Mountain Valley submitted its original Section 404 CWA permit applications to the Huntington and Norfolk Districts of the COE from February 21-24, 2016. Mountain Valley submitted updated permit applications to the Pittsburgh and Huntington Districts on February 17, 2017 and submitted an updated permit application to the Norfolk District in March 2017. Equitrans submitted its original Section 404 CWA permit applications to the Huntington and Pittsburgh Districts on November 25, 2015, followed by a joint permit in June 2016.

The EPA has also delegated WQC under CWA Section 401 and NPDES permitting under CWA Section 402 to state agencies (i.e., the Virginia Department of Environmental Quality [VADEQ] and the WVDEP) in states crossed by the MVP and the EEP. The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. The NPDES permit program controls stormwater discharges.

Mountain Valley submitted its Section 401 and Section 402 applications to the WVDEP and the VADEQ in February 2016. WVDEP issued a Conditional 401 WQC for the MVP on March 23, 2017 although an appeal is pending. Section 4.3 of this EIS discusses impacts on water resources that may be applicable to compliance with the CWA.

1.5.1.4 Endangered Species Act

The Endangered Species Preservation Act of 1966 was amended in 1969, and evolved into the ESA (16 U.S.C. § 1531-1544) in 1973. Section 7 of the ESA states that any project authorized, funded, or conducted by any federal agency (in this case, the FERC) should not "…jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical…." As previously stated, the FERC, as the lead federal agency for the MVP and the EEP, is required to consult with the FWS to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitats would be affected by the projects. Based on consultations with the FWS and findings of project-related effects on specific listed species or their habitats, the FERC staff will prepare a BA to identify the nature and extent of adverse impacts, and to recommend measures that would avoid, reduce, or mitigate impacts on habitats and/or species. Additional information regarding the BA can be found in section 4.7. The FWS must respond with its Biological Opinion (BO) on whether any federally listed species or habitats would be placed in jeopardy because of the projects.

1.5.1.5 Migratory Bird Treaty Act

The MBTA (16 U.S.C. § 703-712) dates back to 1918, but has been amended many times. The MBTA implements various treaties and conventions between the United States, Mexico, Canada, Japan, and Russia for the protection of migratory birds. Birds protected under the MBTA include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, swallows, and others, including their body parts (feathers, plumes, etc.), nests, and eggs. The MBTA makes it unlawful to pursue, hunt, take, capture, or kill; attempt to take, capture, or kill; possess, offer to or sell, barter, purchase, deliver, or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product, manufactured or not.

On March 30, 2011, the FERC and the FWS entered into an MOU that focuses on migratory birds and strengthening conservation through enhanced collaboration between the agencies. This voluntary MOU does not waive legal requirements under the MBTA, the BGEPA, the ESA, or any other statutes, and does not authorize the take of migratory birds. This EIS discusses compliance with the MBTA in section 4.5.

1.5.1.6 National Historic Preservation Act

Congress passed the NHPA in 1966 (54 U.S.C. § 3001 et seq.), which has been amended multiple times, most recently in 2014. The NHPA created the National Register of Historic Places (NRHP), established the Advisory Council on Historic Preservation (ACHP), and directed states to appoint State Historic Preservation Officers (SHPO).

Section 101(d)(6) of the NHPA states that properties of religious and cultural importance to an Indian tribe may be determined to be eligible for the NRHP. In meeting our responsibilities under the NHPA, and our tribal trust obligations, the FERC consulted on a government-to-government basis with Indian tribes that may have an interest in the projects and their potential effects on traditional cultural properties. The current status of government-to-government consultations regarding the identification of historic properties in the area of potential effect (APE) that may have religious or cultural significance to Indian tribes is further discussed in section 4.10 of this final EIS.

Section 106 of the NHPA requires the FERC to take into account the effects of its undertakings on historic properties, and afford the ACHP an opportunity to comment. Historic properties include prehistoric or historic sites, districts, buildings, structures, objects, or properties of traditional religious or cultural importance that are listed or eligible for listing on the NRHP. In accordance with the regulations for implementing Section 106 at 36 CFR 800, the FERC, as the lead agency, is required to consult with the appropriate SHPOs, interested Indian tribes, and other consulting parties; identify historic properties in the APE; assess project effects on historic properties; and resolve adverse effects. The Applicants, as non-federal parties, are assisting the FERC in meeting its obligations under Section 106 by preparing the necessary information and analyses as allowed under Part 800.2(a)(3). However, the FERC remains responsible for all final determinations.

The ACHP has indicated it would participate in the Section 106 consultation process. At this point, the process of complying with Section 106 has not been completed. If after the completion of cultural resources surveys and evaluative investigations, the FERC staff determines, in consultations with the SHPOs, that the projects may have adverse effects on historic properties, we would execute an agreement document with the appropriate consulting parties. The current status of our compliance with the NHPA is further discussed in section 4.10 of this final EIS.

1.5.1.7 National Trails System Act

The NTSA of 1968 (16 U.S.C. § 1241 et seq.) authorized a national system of trails. The National Trails System has four classes of trails: national scenic trails, national historic trails, national recreation trails, and connecting or side trails (Johnson, 2016). Currently the National Trails System includes 11 national scenic trails (including the ANST), 19 national historic trails, more than 1,200 national recreation trails, and six connecting and side trails. The scenic and historic trails total more than 54,000 miles of trail. The MVP pipeline route would cross one federally-designated National Scenic Trail (ANST) within the Jefferson National Forest. We discuss the ANST in section 4.8 of this EIS.

1.5.1.8 Rivers and Harbors Act

The RHA (33 U.S.C. § 407) is the oldest federal environmental law (Makuch and Pereira, 2012). Section 10 of the RHA requires approval by the COE for regulated activities conducted below the ordinary high water line of navigable Waters of the United States. Regulated actives include the placement/removal of structures, work involving dredging, disposal of dredged material, filling, excavation, or any other disturbance of soils/sediments or modification of a navigable waterway. We address compliance with the RHA under our discussion of water resources in section 4.3 of this EIS.

1.5.1.9 Wilderness Act

The Wilderness Act (16 U.S.C. § 1131 et seq.), signed into law in 1964, created the National Wilderness Preservation System and recognized wilderness as "an area where earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." The Wilderness Act further defined wilderness as "an area of undeveloped federal land and retaining its primeval character and influence without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions…" Currently over 109 million acres of federal public lands have been designated by Congress as Wilderness (NPS, 2016). The MVP pipeline route would not cross any designated Wilderness areas, but would be located adjacent to the Peters Mountain Wilderness and the Brush Mountain Wilderness within the Jefferson National Forest.

1.5.2 State and Local Laws

In some cases, Mountain Valley and Equitrans would obtain applicable state and local permits or authorizations, as required under specific state and county laws and regulations in order to allow the MVP and EEP to move forward. The FERC encourages cooperation between applicants and state and local authorities; however, state and local agencies, through the application of state and local laws, may not prohibit or unreasonably delay the construction or operation of facilities approved by the FERC. Any state or local permits issued with respect to jurisdictional facilities must be consistent with the conditions of any authorization issued by the FERC.[41]

A list of major federal and state environmental permits, approvals, and consultations for the MVP and the EEP is provided in table 1.5-1. The Applicants would be responsible for obtaining all permits and approvals required to construct and operate the MVP and the EEP, regardless of whether or not they appear in this table.

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[41] *See* 15 U.S.C. § 717r(d) (2019) (state or federal agency's failure to act on a permit considered to be inconsistent with Federal law); *see also, Schneidewind v. ANR Pipeline Co.,* 485 U.S. 293, 310 (1988) (state regulation that interferes with FERC's regulatory authority over the transportation of natural gas is preempted) and *Dominion Transmission, Inc. v. Summers*, 723 F.3d 238, 243 (D.C. Cir. 2013) (noting that state and local regulation is preempted by the NGA to the extent it conflicts with federal regulation, or would delay the construction and operation of facilities approved by the Commission).

TABLE 1.5-1

Major Environmental Permits, Licenses, Approvals, and Consultations Applicable to the Proposed Projects

Agency	Permit/ Consultation/ Regulations	Mountain Valley Project		Equitrans Expansion Project	
		Submittal Date	Receipt Date	Submittal Date	Receipt Date
Federal					
FERC	Certificate under Section 7 of the NGA; 18 CFR 380	October 23, 2015 application filed with the FERC	Pending	October 27, 2015 application filed with the FERC	Pending
BLM - Eastern States Office	Right-of-way Grant for COE and FS lands under MLA; 43 CFR 2880	April 5, 2016; updated February 2017	Pending	N/A	N/A
ACHP	Comment on undertakings under Section 106 of the NHPA; 36 CFR 800	Pending – FERC staff's assessment of adverse effects	October 14, 2016 letter from ACHP to FERC stated it would participate in the Section 106 consultation process. December 21, 2916 ACHP comments on draft EIS	Pending – FERC staff's assessment of adverse effects	Pending
FS – Jefferson National Forest	Survey permission under the Forestwide Standard, FW-244 and consideration of Temporary Use Permits	November 2014, March 2015, August 2015. September 22, 2016	Temporary Use Permits issued May 8, 2015, and April 29, 2016	N/A	N/A
	Concurrence with BLM's issuance of a Right-of-Way Grant under Section 28 of the MLA	April 5, 2016; updated February 2017	Pending	N/A	N/A
FS - Jefferson National Forest	ROD for LRMP Amendments under the National Forest Management Act; 36 CFR 219	FERC to issue final EIS in June 2017	Pending	NA	NA

TABLE 1.5-1 (continued)

Major Environmental Permits, Licenses, Approvals, and Consultations Applicable to the Proposed Projects

Agency	Permit/ Consultation	Mountain Valley Project		Equitrans Expansion Project	
		Submittal Date	Receipt Date	Submittal Date	Receipt Date
COE - Huntington District, Norfolk District, Pittsburgh District	Permits under Section 10 of RHA, 33 CFR 320 & 322; and Section 404 of CWA, 33 CFR 323	February 21-24, 2016; Updated permit applications to Pittsburgh and Huntington Districts February 17, 2017, and to Norfolk District March 2017	Pending	October 2015	Pending
	Joint Permit Application	N/A	N/A	June 2016	Pending
FWS – Virginia and West Virginia Field Offices	Consultations under Section 7 of ESA, 50 CFR 402; BGEPA, 50 CFR 22; and MBTA, 50 CFR 21	Informal communications initiated by Applicant September 2014.	Pending	Informal communication Initiated by Applicant June 2015	Letter from PA FWS February 18, 2016; WV FWS February 2, 2016
USDOI – NPS Blue Ridge Parkway Office	Survey permission	Requested by Applicant November 2015 & October 17, 2016	Pending	N/A	N/A
NPS - Blue Ridge Parkway (BRP) Office	Right-of-Way Grant to cross the BRP under the NPS Organic Act and General Authorities Act; 36 CFR 14	Application Pending	Pending	N/A	N/A
State of West Virginia					
West Virginia Division of Culture and History	Section 106 NHPA Consultations	Reports submitted August 12, October 12, & December 24, 2015; & February 24, April 21, June 13, July 8, November 8 & 11, & December 4 & 13, 2016; & January 30 & February 2, 14 & 16, 2017	SHPO comments October 6 & November 16, 2015; & January 27, February 8 & 12, March 22, April 4, May 2, July 14, & August 15 & 23 & December 7 & 8, 2016; & January 17, 2017	January 28, 2016 survey report submitted	March 22, 2016 SHPO review letter

TABLE 1.5-1 (continued)

Major Environmental Permits, Licenses, Approvals, and Consultations Applicable to the Proposed Projects

Agency	Permit/ Consultation	Mountain Valley Project		Equitrans Expansion Project	
		Submittal Date	**Receipt Date**	**Submittal Date**	**Receipt Date**
WVDEP, Division of Air Quality	CAA permit for air emissions for the Bradshaw, Harris, and Stallworth Compressor Stations	Application filed October 21, 2015	Permits approved March 4 & 14, & April 11, 2016	N/A	N/A
WVDEP, Division of Water and Waste Management	Section 401 CWA Water Quality Certification	Application filed February 25, 2016; updated December 23, 2016	March 23, 2017	N/A	N/A
	Section 402 CWA NPDES Permit – Construction Stormwater General Permit for Oil and Gas Related Construction Activities	Application filed February 23, 2016; updated December 1, 2016	Pending	Anticipated Spring 2017	Pending
	Section 402 CWA NPDES Hydrostatic Test Discharge Permit	Pending (Anticipated Spring 2017)	Pending	Anticipated November 2017	Pending
	Natural Streams Preservation Act Permit	Application filed January 27, 2017	Pending	N/A	N/A
WVDNR, Office of Land and Streams	Permit for construction in or across a stream under WV Code Chapter 5A, Article 11	Applications filed second quarter 2016 and 2017 ongoing	Received third & fourth quarters 2016 and 2017 pending	Anticipated Spring 2017	Pending
West Virginia Department of Transportation	Road Crossings & Encroachment Permits under Section 6, Article 16, Chapter 17; Section 9, Article 16, Chapter 17; Section 8, Article 4, Chapter 17, West Virginia Code 1931	Applications filed second, third & fourth quarters 2016 and 2017 ongoing	Received third & fourth quarters 2016 and 2017 pending	Application Pending	Pending

TABLE 1.5-1 (continued)

Major Environmental Permits, Licenses, Approvals, and Consultations Applicable to the Proposed Projects

Agency	Permit/ Consultation	Mountain Valley Project		Equitrans Expansion Project	
		Submittal Date	Receipt Date	Submittal Date	Receipt Date
State of Virginia					
VADEQ – Water Division	Section 401 CWA – Water Quality Certificate	N/A – covered by COE permit application	Pending	N/A	N/A
	Section 402 CWA NPDES Permit – Construction Stormwater General Permit	February 11, 2016, June 27, 2016, updated submission March 2017	Pending	N/A	N/A
Virginia Department of Historic Resources	Section 106 NHPA Consultations	Reports submitted August 11 & 12, September 11, October 8, & December 1, 2015; & January 14, March 10 & 15, June 7 & 24, & July 12, 18, & 19, August 9 & 31, September 20 & December 12, 20, & 21, 2016; January 9, 16 & 24, February 15 & 16, 2017	SHPO comments October 22 & 27, & December 30 & 31, 2015 & January 6, February 18, April 21, May 25, August 4, & September 27, 2016	N/A	N/A
Virginia Department of Transportation	Road bonds and crossing permits under Code of Virginia 33.1-12	Application filed first quarter 2017; ongoing	Pending	N/A	N/A
Virginia Marine Resources Commission	Submerged Lands License under Virginia Administrative Code 4 VAC 20-120-10 ET SEQ.	February 24, 2016	Pending	N/A	N/A
Virginia Outdoors Foundation	Conversion/ Diversion of Open Space Access or Utility Easement Application under Virginia Code Section 10.1-1704	January 22, 2016	Pending	N/A	N/A

TABLE 1.5-1 (continued)

Major Environmental Permits, Licenses, Approvals, and Consultations Applicable to the Proposed Projects

Agency	Permit/ Consultation	Mountain Valley Project		Equitrans Expansion Project	
		Submittal Date	Receipt Date	Submittal Date	Receipt Date
State of Pennsylvania					
Pennsylvania State Historic Preservation Office (PASHPO)	Section 106 NHPA Consultations	N/A	N/A	January 28, February 17, September 23, & 26, 2016; October 25, 2016 survey reports submitted	March 22, 2016 SHPO review letter
Pennsylvania Department of Conservation and Natural Resources	ESA Consultations	N/A	N/A	Communications initiated by Applicant in April 27, 2015 and revised on June 24, 2015	Letter from PA-DCNR October 4, 2016
Pennsylvania Department of Environmental Protection (PADEP), Air Permits Division	Chapter 127 Minor Source Permit Title V or Minor Source Operating Permit under CAA	N/A	N/A	October 2015	Pending
PADEP	ESCGP-2; General Permit for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing, or treatment operations or transmission facilities under 25 Pa. Code 102.5 (c) and (m)	N/A	N/A	March 2016	Pending (anticipated June 2017)
	PAG-10 General Permit; Hydrostatic Testing of Tanks and Pipelines under CWA	N/A	N/A	Permit application submitted March 2016	N/A

TABLE 1.5-1 (continued)

Major Environmental Permits, Licenses, Approvals, and Consultations Applicable to the Proposed Projects

Agency	Permit/ Consultation	Mountain Valley Project		Equitrans Expansion Project	
		Submittal Date	**Receipt Date**	**Submittal Date**	**Receipt Date**
PADEP, Division of Waterways, Wetlands, and Stormwater Management	Chapter 105 Water Obstruction and Encroachment Permit; CWA Section 401 Water Quality Certification (jointly with COE Section 404) Submerged Lands License Agreement	N/A	N/A	Communications initiated by Applicant in April 27, 2015 and revised on June 24, 2015	January 5, 2016
Pennsylvania Fish and Boat Commission (PAFBC)	ESA Consultations	N/A	N/A	Communications initiated by Applicant in April 27, 2015 and revised on June 2015	Letter from PAFBC January 5, 2016
Pennsylvania Game Commission (PAGC)	ESA Consultations	N/A	N/A	Communications initiated by Applicant in June 2015	Letter from PAGC October 4, 2016
Pennsylvania Department of Transportation	Highway Occupancy Permit under Sections 411 and 420 of the State Highway Law	N/A	N/A	Application anticipated July 2017	Pending

N/A = Not applicable

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 PROPOSED FACILITIES

The MVP and the EEP would involve the construction and operation of underground natural gas transmission pipelines and associated aboveground facilities in West Virginia, Virginia, and Pennsylvania. Figures 1-1 and 1-2 show the MVP and the EEP, respectively, and appendix B depicts the facilities locations on U.S. Geological Survey (USGS) topographic base maps. Both Applicants also provided larger-scale aerial photographic base maps, referred to as alignment sheets, depicting the pipeline facilities and associated construction and operation rights-of-way. The alignment sheets can be accessed through the FERC's eLibrary system on our Internet website at www.ferc.gov.[1]

The MVP and the EEP combined would consist of about 311 miles of natural gas transmission pipelines. Aboveground facilities would consist of 4 new compressor stations; 1 existing compressor station to be decommissioned; 12 new M&R stations; interconnects, and taps; 12 pig launchers and receivers at 9 locations; and 36 MLVs for the MVP (see table 2.1-1).

The pipeline facilities would be constructed of steel and installed underground for their entire length using the methods described in sections 2.4.2 and 2.4.3. The basic functions of the various aboveground facilities are summarized in the following bullets, and additional details regarding each Applicants' individual facilities are provided below in sections 2.1.1 and 2.1.2.

Compressor stations utilize engines to maintain pressure within the pipeline in order to deliver the contracted volumes of natural gas to specific points at specific pressures. Compressors are housed in buildings that are designed to attenuate noise and allow for operation and maintenance activities (see figure 2.1-1). Compressor stations also typically include administrative, maintenance, storage, and communications buildings, and can include metering and pig launcher/receiver facilities as discussed below. Most stations consist of a developed, fenced area within a larger parcel of land that remains undeveloped. The location of the compressor station and amount of compression needed are determined primarily by hydraulic modeling although typically there is some level of flexibility regarding the siting of compressor stations. The general construction and operation procedures for the compressor stations are discussed in sections 2.4.3 and 2.6.2. Regulatory requirements and impacts on air quality and noise associated with the new compressor stations are discussed in section 4.11.1.

[1] The eLibrary link can be found under "Documents & Filings" on the FERC Internet webpage. Alignment sheets for the MVP (accession numbers 20161014-5022, 20161222-5442, 20170217-5199, and 20170330-5339) are under Docket No. CP16-10-000, and alignment sheets for the EEP (accession number 20161031-5278 and 20170330-5378) are under Docket No. CP16-13-000.

TABLE 2.1-1

Proposed Facilities for the Mountain Valley Project and the Equitrans Expansion Project

Facility/Project	West Virginia	Virginia	Pennsylvania	Total
PIPELINE (MILES)				
MVP	196.3	107.1	N/A	303.5
EEP	<0.1	N/A	7.3	7.4
Pipeline Subtotal	*196.3*	*107.1*	*7.3*	*310.9*
ABOVEGROUND FACILITIES				
New Compressor Stations (Number)				
MVP	3	0	N/A	3
EEP	0	N/A	1	1
New Compressor Stations Subtotal	*3*	*0*	*1*	*4*
Compressor Station Decommissioning (Number)				
MVP	0	0	N/A	N/A
EEP	0	N/A	1	1
Compressor Station Decommissioning Subtotal	*0*	*0*	*1*	*1*
M&R STATIONS, INTERCONNECTS, & TAPS (NUMBER)				
MVP	4	3	N/A	7
EEP	3	N/A	2	5
Total of New M&R Stations, Interconnects, & Taps	**7**	**3**	**2**	**12**
MLVs (NUMBER)				
MVP	22	13	N/A	36
EEP	N/A	N/A	N/A	N/A
Total of MLVs	**22**	**13**	**N/A**	**36**

N/A = Not applicable

Note: Totals may not sum correctly due to rounding.

- M&R stations measure the volume of gas removed from or added to a pipeline system. Most M&R stations consist of a small graveled area with small building(s) that enclose the measurement equipment (see figure 2.1-2). Mountain Valley would construct and operate M&R stations within some compressor station boundaries, at customer delivery points, and at interconnections with other interstate transmission systems.
- Interconnections connect the MVP pipeline with other natural gas systems operated by other companies. The interconnections would be designed, installed, operated, and maintained by Mountain Valley. An interconnect would consist of station piping, gas conditioning equipment, custody transfer flow meters, flow control valves, overpressure protection control valves, isolation block valves, and an electronics building to house instrumentation and communication equipment.
- Taps also connect the MVP pipeline with other natural gas systems operated by other companies. For a tap, Mountain Valley would design and install the pipeline tap, tap

valve, and appurtenant piping to the edge of the MVP permanent operational right-of-way. The other interconnecting company, such as Roanoke Gas, would be responsible for the interconnect design, installation, and costs, including for land and permits.

- MLVs consist of a small system of aboveground and underground piping and valves that control the flow of gas within the pipeline and can also be used to vacate, or blow-off, the gas within a pipeline segment, if necessary (see figure 2.1-3). MLVs would be installed within the operational rights-of-way of the pipeline facilities. MLVs can be located at interconnections within a transmission system (i.e., between a mainline pipeline and a loop) and at locations based on the DOT Class designation of the pipeline; in general, the distance between MLVs is reduced in areas of higher human population (see section 4.12).
- Launchers and receivers are facilities where internal pipeline cleaning and inspection tools, referred to as "pigs," could be inserted or retrieved from the pipeline. Pig launchers/receivers consist of an aboveground group of piping within the pipeline's permanent right-of-way or other aboveground facility boundaries (see figure 2.1-4).
- Cathodic protection systems help prevent corrosion of underground facilities. These systems typically include a small, aboveground transformer-rectifier unit and an associated anode groundbed located on the surface or underground (see figure 2.1-5). Cathodic protection facilities are typically located within the pipeline's permanent right-of-way but may be adjacent to the permanent right-of-way – such is the case for the MVP and the EEP.

2.1.1 Pipeline Facilities

The general purpose of the MVP is to transport about 2.0 Bcf/d of natural gas from production areas in southern Pennsylvania and northern West Virginia via a new 42-inch-diameter 303.5-mile-long pipeline, beginning at the Mobley Interconnect and receipt M&R station in Wetzel County, West Virginia and terminating at the Transco Interconnect and delivery M&R station, at the existing Transco Station 165, in Pittsylvania County, Virginia. Shippers would be able to take the gas from the Transco Station 165 to markets along the east coast.

The general purpose of the six newly proposed EEP pipelines is to transport natural gas from production areas in southern Pennsylvania to northern West Virginia, where the EEP would interconnect with the MVP pipeline at the Webster Interconnect and Mobley Tap in Wetzel County, West Virginia. The EEP pipelines could transport the project's contracted capacity of a total of 0.4 Bcf/d of natural gas. Through interconnections with other existing pipeline systems in southern Pennsylvania, the EEP would be able to provide natural gas to markets in the Northeast. The north-south EEP pipelines would provide Equitrans with increased system reliability and flexibility. The six new EEP pipelines would total about 7 miles combined, with segments located in Greene, Washington, and Allegany Counties, Pennsylvania and Wetzel County, West Virginia.

Typical Compressor Station

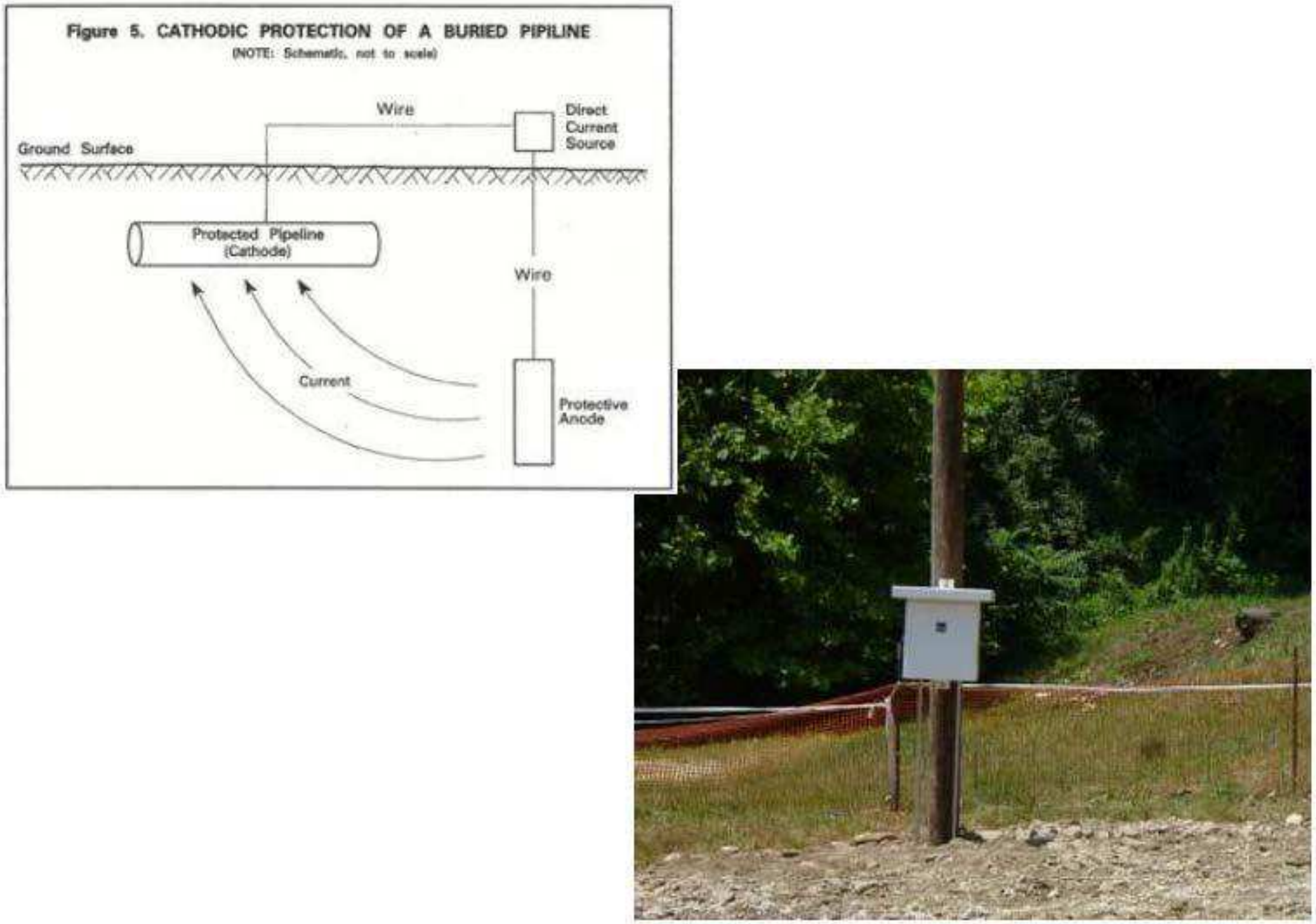
Figure 2.1-1

Mountain Valley &
Equitrans Expansion Projects

Typical M&R Station	**Figure 2.1-2** **Mountain Valley & Equitrans Expansion Projects**

Typical MLV	Figure 2.1-3 Mountain Valley & Equitrans Expansion Projects

Typical Pig Launcher and Receiver	Figure 2.1-4 Mountain Valley & Equitrans Expansion Projects



Typical Cathodic Protection System

Figure 2.1-5

Mountain Valley &
Equitrans Expansion Projects

2.1.1.1 Mountain Valley Project

The proposed MVP pipeline consists of about 304 miles of 42-inch-diameter pipe located in the counties listed on table 2.1-2 and as described in detail below. The pipeline route begins at an interconnection with Equitrans' existing H-302 pipeline at the Mobley Interconnect and Tap in Wetzel County, West Virginia and proceeds in a general southeasterly direction to Transco's existing Station 165 in Pittsylvania County, Virginia. The pipeline has been designed to transport about 2.0 Bcf/d of natural gas. The maximum allowable operating pressure (MAOP) for the new pipeline would be 1,480 pounds per square inch gauge (psig). For about 90 miles (30 percent of the route), the MVP pipeline would follow other existing rights-of-away (see table 2.1-3).

TABLE 2.1-2

Pipeline Facilities for the Mountain Valley Project

State/County	MP Range	Length (miles)
West Virginia		
Wetzel County	0.0-9.5	9.5
Harrison County	9.5-31.5 32.6-33.7 37.4-38.0	23.7
Doddridge County	31.5-32.6 33.7-37.4	4.8
Lewis County	38.0-65.5	27.5
Braxton County	65.5-80.2	14.7
Webster County	80.2-110.8	30.4
Nicholas County	110.8-135.3	24.8
Greenbrier County	135.3-154.2 154.7-157.1	21.3
Fayette County	154.2-154.7	0.5
Summers County	157.1-174.3	17.1
Monroe County	174.3-196.3	22.1
	West Virginia (subtotal)	*196.3*
Virginia		
Giles County	196.3-216.8	20.4
Craig County	216.8-218.5	1.7
Montgomery County	218.5-238.1	19.6
Roanoke County	238.1-246.5	8.4
Franklin County	246.5-283.9	37.4
Pittsylvania County	283.9-303.5	19.5
	Virginia (subtotal)	*107.1*
	Mountain Valley Project Total	**303.5**

Note: Totals may not sum correctly due to rounding.

TABLE 2.1-3 **Summary of Pipeline Collocated with Existing Rights-of-Way** **Mountain Valley Project**		
Collocation Type	**Distance (miles)**	**Percent**
Field Road Rights-of-Way	29.5	9.7
Underground Electric/Telephone Lines/Fiber Optics Rights-of-Way	0.8	0.3
Local Private/Public Road Rights-of-Way	0.8	0.3
Overhead Power Lines/Electric Transmission Line Rights-of-Way	26.3	8.7
Pipeline Rights-of-Way	9.4	3.1
Field Trail Rights-of-Way	17.0	5.6
State/County Road Rights-of-Way	5.7	1.9
Total	**89.5**	**29.5**
Note: Totals may not sum correctly due to rounding. Note: Not all collocated features are directly adjacent to the pipeline.		

2.1.1.2 Equitrans Expansion Project

The pipelines for the EEP total about 7 miles of varying diameter pipe located in three counties in Pennsylvania and one county in West Virginia (listed on table 2.1-4). The EEP was designed to transport about 600,000 Dth/d (600 million cubic feet per day [MMcf/d]) but is currently only contracted for 400,000 Dth/d (400 MMcf/d). The EEP pipelines would be adjacent to existing rights-of-way for about 2.4 miles (or 32 percent of the route).

TABLE 2.1-4 **Pipeline Facilities for the Equitrans Expansion Project**				
State/Pipeline Segment	**County**	**MP Range**	**Pipeline Diameter (inches)**	**Length (miles)**
Pennsylvania				
H-318	Allegheny	0.0 – 2.6	20	2.6
H-318	Washington	2.6 – 3.8	20	1.2
H-316	Greene	0.0 – 3.0	30	3.0
H-158	Greene	0.0 – 0.2	12	0.2
M-80	Greene	0.0 – 0.2	6	0.2
H-305	Greene	0.0 – 0.1	24	0.1
			Pennsylvania (subtotal)	*7.3*
West Virginia				
H-319	Wetzel	0.0 – <0.1	16	<0.1
			West Virginia (subtotal)	*<0.1*
			Equitrans Expansion Project Total	**7.4**
Note: Totals may not sum correctly due to rounding.				

The EEP consists of two larger pipeline segments (the H-316 and H-318 pipelines) and four shorter secondary pipeline segments (the M-80, the H-158, the H-305, and the H-319 pipelines). The new H-316 pipeline would extend about 3 miles in an east-to-west direction in Greene County, Pennsylvania. The H-316 pipeline would move natural gas from the new Redhook Compressor Station to Equitrans' existing H-302 24-inch-diameter pipeline for delivery to Texas Eastern, or south to the MVP pipeline. The MAOP for the H-316 pipeline would be 1,200 psig.

The new H-318 pipeline would extend about 3.8 miles in an east-to-west direction in Allegheny and Washington Counties, Pennsylvania. The H-318 pipeline would connect the existing Applegate Gathering System, operated by EQT Gathering LLC, to Equitrans' existing H-148 20-inch-diameter pipeline for transport of natural gas south. The MAOP for the H-318 pipeline would be 1,200 psig.

The new H-158 and M-80 pipelines currently move gas to the existing Pratt Compressor Station. These pipelines would be extended to transport gas to the proposed Redhook Compressor Station. The MAOP for the H-158 and M-80 pipelines would be 1,000 psig.

The new H-305 pipeline would extend about 540 feet to move gas from the Redhook Compressor Station to Equitrans' existing H-305 pipeline. The MAOP for the H-305 pipeline would be 1,200 psig.

The new H-319 pipeline would extend about 200 feet to connect Equitrans' H-306 pipeline to the Webster Interconnect with the MVP. The MAOP for the H-319 pipeline would be 1,200 psig.

2.1.2 Aboveground Facilities

Aboveground facilities include compressor stations, M&R stations, taps, MLVs, and pig launchers/receivers.

2.1.2.1 Mountain Valley Project

The MVP would include the construction of 3 new compressor stations; 4 M&R stations and interconnects; 3 taps; 8 pig launchers and receivers at 5 locations; and 36 MLVs (as listed on table 2.1-5).

TABLE 2.1-5

Aboveground Facilities for the Mountain Valley Project

Facility	MP	County, State
Compressor Stations		
Bradshaw Compressor Station (with MLV 2 & pig launcher and receiver)	2.7	Wetzel, West Virginia
Harris Compressor Station (with MLV 9 & pig launcher and receiver)	77.4	Braxton, West Virginia
Stallworth Compressor Station (with MLV 19 & pig launcher and receiver)	154.5	Fayette, West Virginia
M&R Stations, Interconnections, and Taps		
Mobley Interconnect (receipt with MLV 1 and pig launcher)	0.0	Wetzel, West Virginia
Webster Tap	0.8	Wetzel, West Virginia
Sherwood Interconnect (receipt)	23.6	Harrison, West Virginia
WB Interconnect (delivery)	77.5	Braxton, West Virginia
Roanoke Gas Lafayette Tap	235.7	Montgomery, Virginia
Roanoke Gas Franklin Tap	261.4	Franklin, Virginia
Transco Interconnect (delivery with pig receiver & MLV 36)	303.5	Pittsylvania, Virginia
Mainline Valves		
MLV 3	15.3	Harrison, West Virginia
MLV 4	15.4	Harrison, West Virginia
MLV 5	34.8	Doddridge, West Virginia
MLV 6	53.0	Lewis, West Virginia
MLV 7	64.5	Lewis, West Virginia
MLV 8	65.4	Lewis, West Virginia
MLV 9 (collocated within Harris Compressor Station)	77.3	Braxton, West Virginia
MLV 10	93.1	Webster, West Virginia
MLV 11	98.6	Webster, West Virginia
MLV 12	102.2	Webster, West Virginia
MLV 13	111.3	Nicholas, West Virginia
MLV 14	120.2	Nicholas, West Virginia
MLV 15	138.7	Greenbrier, West Virginia
MLV 16	140.9	Greenbrier, West Virginia
MLV 17	143.9	Greenbrier, West Virginia
MLV 18	144.2	Greenbrier, West Virginia
MLV 19 (collocated within Stallworth Compressor Station)	154.4	Fayette, West Virginia
MLV 20	170.0	Summers, West Virginia
MLV 21	171.9	Summers, West Virginia
MLV 22	186.1	Monroe, West Virginia
MLV 23	199.4	Giles, Virginia
MLV 24	201.5	Giles, Virginia
MLV 25	212.4	Giles, Virginia
MLV 26	222.8	Montgomery, Virginia

TABLE 2.1-5 (continued) **Aboveground Facilities for the Mountain Valley Project**		
Facility	**MP**	**County, State**
MLV 27	235.0	Montgomery, Virginia
MLV 28	236.4	Montgomery, Virginia
MLV 29	249.8	Franklin, Virginia
MLV 30	259.2	Franklin, Virginia
MLV 31	265.4	Franklin, Virginia
MLV 32	269.5	Franklin, Virginia
MLV 33	283.6	Franklin, Virginia
MLV 34	296.3	Pittsylvania, Virginia
MLV-35	299.7	Pittsylvania, Virginia

The Bradshaw Compressor Station would be located at MP 2.7 along the MVP pipeline in Wetzel County, West Virginia. The four gas-driven turbine units at the station combined would generate about 89,600 hp of compression. The station has been designed to raise pipeline pressure from 765 psig to 1,450 psig. The station would contain five structures (compressor building, air compressor building, two electrical control buildings, and an office), with a gravel yard surrounded by a chain link fence. Other equipment at the station would include gas filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, auxiliary micro-turbines, and a pig receiver. Dual 42-inch-diameter, 550-foot-long suction and discharge pipelines would connect the MVP pipeline with the Bradshaw pig receiver and launcher.

The Harris Compressor Station would be located at MP 77.4 along the MVP pipeline in Braxton County, West Virginia. The two gas-driven turbine units at the station combined would be capable of generating about 41,000 hp of compression. The station has been designed to raise the natural gas pressure in the pipeline from 1,100 psig to 1,450 psig. The Harris Compressor Station would contain similar buildings and equipment to the Bradshaw Compressor Station. Dual 42-inch-diameter, 100-foot-long suction and discharge pipelines would connect the MVP pipeline with the Harris pig receiver and launcher.

The Stallworth Compressor Station would be located at MP 154.5 along the MVP pipeline in Fayette County, West Virginia. The two gas-driven turbine units at the station combined would be capable of generating about 41,000 hp of compression. The station has been designed to raise the natural gas pressure in the pipeline from 1,060 psig to 1,450 psig. The Stallworth Compressor Station would contain similar buildings and equipment to the Bradshaw and Harris Compressor Stations. Dual 42-inch-diameter, 100-foot-long suction and discharge pipelines would connect the MVP pipeline with the Stallworth pig receiver and launcher.

The Mobley Interconnect and receipt M&R station would be located at MP 0.0 at the beginning of the MVP pipeline, in Wetzel County, West Virginia. The site would include a gravel yard surrounded by a chain link fence. At the Mobley Interconnect, Mountain Valley would receive natural gas from Equitrans through its existing 24-inch-diameter H-302 pipeline, via a new 36-inch-pipeline installed by Equitrans to discharge into the new 42-inch-diameter MVP pipeline. The new station would contain an electronics building (used to house gas chromatographs, flow computers, and communication equipment). Other components of the interconnection would be four gas filter separators, three 20-inch ultrasonic gas meters runs, two 20-inch flow control valve runs, and a pig launcher.

The Sherwood Interconnect and receipt M&R station would be located at MP 23.6 along the MVP pipeline in Harrison County, West Virginia. The site would include a gravel yard surrounded by a chain link fence. The Sherwood Interconnect would receive natural gas from a third-party upstream pipeline and discharge at the Sherwood Gas Processing Plant into the MVP pipeline. Components of the interconnection would include two gas filter separators, one 12-inch ultrasonic gas meter run, and one 10-inch overpressure protection/flow control valve run. The discharge from the M&R station into the 42-inch-diameter MVP pipeline would be through a 16-inch-diameter pipeline, 50 feet long. This station would also contain two electronics buildings.

The WB Interconnect and delivery M&R station would be located at MP 77.6 along the MVP pipeline in Braxton County, West Virginia. The site would include a gravel yard surrounded by a chain link fence. The WB Interconnect would be located directly adjacent to the Harris Compressor Station. The WB Interconnect would deliver gas from the MVP pipeline into Columbia Lines WB and WB-5. In order to access Columbia's approved tap location, about 1,000 feet of 24-inch-diameter pipeline would be installed from the MVP pipeline. Components of the interconnection and M&R station would include two gas filter separators, two 16-inch gas ultrasonic meter runs, and three 12-inch overpressure protection/flow control values runs. There would be a canopy installed over the meter runs, and another over the control value runs. There would be one electronics building for Columbia and one for Mountain Valley at the site.

The Transco Interconnect and delivery M&R station would be located at MP 303.5, at the terminus of the MVP pipeline in Pittsylvania County, Virginia. The site would include a gravel yard enclosed by a chain link fence. Mountain Valley proposes to interconnect with four existing Transco pipelines at existing Station 165 (Pipelines A and B are 30 inches in diameter; Pipeline C is 36 inches in diameter; and Pipeline D is 42 inches in diameter). Components of the Transco Interconnect and M&R station would include five gas filter separators, six 16-inch ultrasonic gas meter runs, four 16-inch overpressure protection/flow control meter runs, two 26-inch overpressure protection security valve runs, and a pig receiver. The pig receiver would attach directly to the MVP pipeline. A meter building would enclose the meter runs and a control valve building would enclose the control valve runs. One electronics building would be erected for Transco's equipment, and another for Mountain Valley's.

Three taps would be constructed as part of the MVP: one at Webster and two for Roanoke Gas. The Webster Tap would be located about MP 0.8 along the MVP pipeline, in Wetzel County, West Virginia, and would be adjacent to the Webster Interconnect planned by Equitrans for its EEP (see section 2.1.2.2). The Webster Tap would have a delivery capacity of about 630,000 Dth/day (630 MMcf/d).

The Roanoke Gas Lafayette Tap would be located at about MP 235.7 along the MVP pipeline route in Montgomery County, Virginia. The tap is preliminarily sized for about 10,000 Dth/day (10 MMcf/d) of natural gas.

The Roanoke Franklin Tap would be located at about MP 261.4 along the MVP pipeline route in Franklin County, Virginia. It would be sized to handle about 10,000 Dth/day (10 MMcf/d) of natural gas.

Mountain Valley would install very small aperture terminal (VSAT) equipment at all 3 compressor stations, all 4 interconnections, and all 36 MLV sites for primary telecommunications service. Each VSAT site would include a 4-foot-diameter dish antenna attached to a 2.5-inch metal pole about 6.5 feet above the ground. The VSAT dish would be connected to a modem using coaxial cable.

Mountain Valley proposes to use remotely controlled MLVs along the pipeline route at 36 locations. One MLV would be within each of the three compressor stations; one would be installed at the Mobley Interconnect; and one would be installed at the Transco Interconnect. The rest of the MLVs would be constructed along the new pipeline, as listed on table 2.1-5. A combination of two of the following methods would be installed for telecommunications at each of the MLV sites: VSAT, Cellular, Telephone System, and/or T1. The MLVs would be continuously monitored at Mountain Valley's gas control center and could be controlled both locally and remotely. In the event of an incident, an electronic command for valve closure can be sent, with the MLV closing within 2 minutes following issuance of a remote signal.

Pig launchers and receivers would be installed at all three of the new compressor stations and two of the interconnections (Mobley and Transco). Pig launchers would be installed at MP 0.0 and on the discharge side of each compressor station. Pig receivers would be installed at MP 303.5 and on the suction side of each compressor station.

2.1.2.2 Equitrans Expansion Project

The EEP would include the construction of one new compressor station, five interconnects and taps, and four pig launchers and receivers; and the decommissioning of an existing compressor station (see table 2.1-6).

TABLE 2.1-6 **Aboveground Facilities for the Equitrans Expansion Project**		
Facility	**Pipeline Segment - MP**	**County, State**
Compressor Stations		
Redhook Compressor Station (with one 60-foot-tall communication tower and one pig launcher/receiver)	H-316 – 0.0 H-158/M-80 – 0.2	Greene, Pennsylvania
Decommissioning of the existing Pratt Compressor Station	N/A	Greene, Pennsylvania
Tap Sites & Interconnects		
Webster Interconnect	H-319 – <0.1	Wetzel, West Virginia
Mobley Tap	H-302 – 0.6	Wetzel, West Virginia
H-302 Tap (with pig launcher/receiver)	H-316 – 3.0	Greene, Pennsylvania
H-306 Tap	H-319 – 0.0	Wetzel, West Virginia
H-148 Tap	H-318 – 3.8	Washington, Pennsylvania
Pig Launcher/Receiver Facilities		
Applegate	H-318 – 0.0	Allegheny, Pennsylvania
Hartson	H-318 – 3.8	Washington, Pennsylvania
N/A = Not Applicable		

The new Redhook Compressor Station would be located on a “green field” site in Greene County, Pennsylvania. The station would use two natural gas-fired reciprocating engines and two natural gas-fired turbine engines to produce about 31,300 hp of compression. It would have a capacity of 878.5 MMcf/d.

The existing Pratt Compressor Station, in Greene County, Pennsylvania, would be abandoned, decommissioned, and demolished once the new Redhook Compressor Station is operational. The 6-inch-diameter M-80 and 12-inch-diamenter H-158 pipelines would be re-routed from the Pratt Compressor Station to the Redhook Compressor Station. During operation, Equitrans would use the abandoned compressor station site as a storage yard.

Equitrans would utilize best management practices (BMPs) to remove old compressor station equipment from the abandoned Pratt Compressor Station. All removed equipment would be salvaged or disposed of properly. According to Equitrans, several facilities would remain at the Pratt Compressor Station site, including:

- the H-147 pipeline receiver;
- the H-147 pipeline ultrasonic meter;
- two Dominion interconnects with control valves, filter/separators, regulation runs, and ultrasonic meter runs/chromatographs (in a building);
- an Equitrans electronics building;
- a Dominion dekatherm building;
- overpressure protection equipment; and
- a tap valve.

During decommissioning of the Pratt Compressor Station, Equitrans anticipates removing and disposing of the following hazardous materials:

- petroleum (oil) contaminated soil;
- lead paint;
- asbestos (coal-tar wrap);
- liquid hydrocarbons in various pipes;
- mercury meters; and
- a polychlorinated biphenyl (PCB) transformer.

Equitrans would handle all hazardous materials in accordance with state and federal regulatory requirements. Equitrans would also follow its *Spill Prevention Controls and Countermeasures Plan* (SPCCP) and *Preparedness, Prevention and Contingency and Emergency Action Plans* (see table 2.4-2). Equitrans would collect and analyze samples to determine the proper disposal method for potentially contaminated soil and coal tar or asbestos wrapped pipe. These materials would be stored at the Pratt Compressor Station until sample analysis has been completed.

Additionally, Equitrans would construct new regulator and meter runs to supply the existing Peoples Natural Gas, LLC system; a new pre-fabricated gas chromatograph/instrument/remote terminal unit building; and join ("tie-in") multiple existing pipelines. The tie-ins would join:

- the H-147 pipeline to the H-148 pipeline;
- the H-137 pipeline to the H-106 pipeline;
- the H-117 pipeline to the H-108 pipeline;
- the GSF-360 to Dominion Pratt II Interconnect;
- GSF-360 to Dominion Pratt I Interconnect; and
- H-137 to H-136.

The tie-ins would also require removal of small segments of existing pipelines, specifically:

- a portion of the existing 12-inch-diameter H-136 pipeline;
- a portion of the existing 16-inch-diameter GSF-360 pipeline;
- portions of the existing 10-inch-diameter M-80 pipeline;
- a portion of the existing 16-inch-diameter H-106 pipeline; and
- a portion of the existing 16-inch-diameter H-108 pipeline.

Equitrans would construct the new regulator and meter runs and tie-in removals within the existing station boundary and would install all new equipment within the currently disturbed site. Equitrans would use the Pratt Compressor Station site as a yard to store materials during construction of the EEP. Therefore, environmental resources associated the Pratt Compressor Station are discussed throughout this EIS in the context of a storage yard.

The Webster Interconnect would be located in Wetzel County, West Virginia, at the terminus of the new H-319 pipeline. The site would include a gravel yard surrounded by a fence. The interconnection would consist of meters, pressure/flow control valves, isolation block valves, and associated instrumentation and controls to measure and control the flow of gas between the EEP and the MVP pipeline. The Webster Interconnect would join Equitrans' existing H-306 16-inch-diameter pipeline and the planned H-319 pipeline.

The Mobley Tap would be located in Wetzel County, West Virginia at the terminus of the existing H-302 pipeline, and would include a gravel yard surrounded by a fence. The facilities would include two taps, a riser, valves, and associated piping between the existing 24-inch-diameter Equitrans H-302 pipeline and the new 42-inch-diameter MVP pipeline. The anticipated flow from the south from the existing Mobley Plant through the Mobley Tap would range from 300 to 920 MMcf/d, while the flow from the north from Pennsylvania would range from 300 to 600 MMcf/d.

The EEP would not require any MLVs. The pig launchers and receivers at the beginning and end of each pipeline segment would contain the required shutoff valves. Equitrans would install one of the pig launcher/receivers at the Applegate site, at MP 0.0 of the new H-318 pipeline, in Allegheny County, Pennsylvania. Another pig launcher/receiver would be constructed at the Hartson site, at MP 3.8 of the new H-318 pipeline in Washington County, Pennsylvania. The third pig launcher/receiver would be installed at the H-302 Tap site, at MP 3.0 along the new H-316 pipeline, in Greene County, Pennsylvania. The fourth pig launcher/receiver would be installed within the Redhook Compressor Station, at MP 0.0 of the new H-316 pipeline in Greene County, Pennsylvania.

2.1.3 Cathodic Protection

Cathodic protection units would include both aboveground and underground components. These units, typically installed after the pipeline, are meant to decrease or prevent corrosion of the pipe, by running a low electric current. Protection units typically consist of underground negative connection cables welded to the pipeline. The negative connection cables would connect to underground linear anode cable systems tied into an aboveground junction box and rectifier that operate the system.

2.1.3.1 Mountain Valley Project

Mountain Valley would install cathodic protection at 31 locations along the MVP pipeline route (see table 2.1-7).

TABLE 2.1-7

Cathodic Protection Units
Along the Route of the Mountain Valley Project

Facility	MP	County, State
01A	2.3	Wetzel, West Virginia
01B	6.5	Wetzel, West Virginia
2	15.4	Harrison, West Virginia
3	23.0	Harrison, West Virginia
4	34.8	Harrison, West Virginia
5	45.8	Lewis, West Virginia
6	55.1	Lewis, West Virginia
7	62.2	Lewis, West Virginia
8	73.7	Braxton, West Virginia
9	84.1	Webster, West Virginia
10	93.1	Webster, West Virginia
11	98.6	Webster, West Virginia
12	107.0	Webster, West Virginia
13	122.4	Nicholas, West Virginia
14	128.2	Nicholas, West Virginia
15	138.3	Greenbrier, West Virginia
16	149.5	Greenbrier, West Virginia
17	159.5	Summers, West Virginia
18	171.9	Summers, West Virginia
19	182.3	Monroe, West Virginia
20	191.4	Monroe, Virginia
21	200.5	Giles, Virginia
22	211.1	Giles, Virginia
23	227.4	Montgomery, Virginia
24	235.6	Montgomery, Virginia
25	246.1	Roanoke, Virginia
26	255.5	Franklin, Virginia
27	264.2	Franklin, Virginia
28	275.0	Franklin, Virginia
29	285.5	Pittsylvania, Virginia
30	297.1	Pittsylvania, Virginia

According to Mountain Valley, the permanent footprint of cathodic surface groundbeds would be perpendicular to the right-of-way and vary from about 25 feet wide and 377 feet long to 25 feet wide and 972 feet long. Most surface groundbeds would also require a temporary workspace adjacent to the permanent footprint; this workspace would be 25 feet wide and run the length of the groundbed. The permanent footprint of deep well groundbeds would be within the permanent right-of-way or adjacent to the right-of-way in a workspace of 25 feet by 25 feet (0.014 acre each). A temporary workspace for deep well groundbeds would not be needed.

Mountain Valley would install four deep well groundbeds, permanently affecting a total of about 0.06 acre, and 27 surface groundbeds, affecting a total of about 18 acres during construction and 10 acres during operation.

Mountain Valley has not completed surveys at three proposed groundbeds due a lack of survey permission. Therefore, we are recommending in section 4.8.1 that Mountain Valley file the results for environmental surveys for all cathodic protection groundbeds prior to construction.

2.1.3.2 Equitrans Expansion Project

Equitrans would install cathodic protection at two locations along the EEP pipeline routes (see table 2.1-8). Magnesium anodes installed within the right-of-way would protect the M-80 pipeline from corrosion. The H-158, the H-305, and the H-319 pipelines would be protected by cathodic protection systems along Equitrans' existing M-82 pipeline, H-106 pipeline, and the H-306 pipeline, respectively.

TABLE 2.1-8

Cathodic Protection Units
Along the Route of the Equitrans Expansion Project

Facility	MP	County, State
H-316 Site	0.8	Greene, Pennsylvania
H-318 Site	2.8	Allegheny, Pennsylvania

2.2 NON-JURISDICTIONAL FACILITIES

Under Section 7 of the NGA, the FERC is required to consider, as part of its decision to authorize interstate natural gas facilities, all factors bearing on the public convenience and necessity. Occasionally, proposed projects have associated facilities that do not come under the jurisdiction of the FERC. These "non-jurisdictional" facilities may be integral to the project objective (e.g., a new or expanded power plant that is not under the jurisdiction of the FERC at the end of a pipeline) or they may be merely associated as minor, non-integral components of the jurisdictional facilities that would be constructed and operated with the proposed facilities (e.g., a meter station constructed by a customer of the pipeline to measure gas offtake). In this EIS, we consider the potential environmental impacts associated with the construction and operation of non-jurisdictional facilities that are directly connected to the projects. In many cases, those non-jurisdictional facilities would be built, operated, and owned by third parties other than Mountain Valley and Equitrans, such as local electric utility companies. No non-jurisdictional facilities are proposed on FS lands.

2.2.1 Mountain Valley Project

The non-jurisdictional facilities associated with the MVP would include installation of aboveground and underground powerlines and telecommunications from existing nearby power poles to the interconnects, taps, compressor stations, and MLVs. All of the MLVs associated with the MVP would require the local electric distributor to extend aboveground power and telecommunications from an existing power pole to the MLV site. These extensions would range from 30 feet to 2,212 feet in length. Telecommunications would be radio and/or cellular with VSAT service as a backup (see section 2.1.2). Impacts associated with these non-jurisdictional facilities are addressed in section 4.13.

2.2.2 Equitrans Expansion Project

According to Equitrans, there are no non-jurisdictional facilities associated with the EEP.

2.3 LAND REQUIREMENTS

Construction of the MVP and the EEP combined would disturb a total of about 6,560 acres of land. This includes the pipeline construction right-of-way, additional temporary workspaces (ATWS), aboveground facilities, staging areas, contractor and storage yards (yards), cathodic protection areas, and new and improved access roads (see table 2.3-1). Operation of both the MVP and the EEP combined would utilize a total of about 2,187 acres. This includes the permanent pipeline easements, aboveground facilities, and permanent access roads.

TABLE 2.3-1

Land Requirements Associated with the Mountain Valley Project and the Equitrans Expansion Project

Project Component/State	Land Affected During Construction (acres)	Land Affected During Operation (acres)
PIPELINE FACILITIES		
West Virginia		
Pipeline Right-of-Way (MVP)	2,889.7	1,190.4
ATWS (MVP)	458.8	0.0
Pipeline Right-of-Way (EEP)	0.7	0.4
ATWS (EEP)	2.4	0.0
Virginia		
Pipeline Right-of-Way (MVP)	1,572.1	655.7
ATWS (MVP)	199.0	0.0
Pennsylvania		
Pipeline Right-of-Way (EEP)	88.0	44.5
ATWS (EEP)	56.5	0.0
Subtotal Pipeline Facilities – MVP	*5,119.6*	*1,846.1*
Subtotal Pipeline Facilities - EEP	*147.6*	*44.9*
Combined MVP and EEP Pipeline Facilities Total	***5,267.2***	***1,891.0***

TABLE 2.3-1 (continued)

Land Requirements Associated with the Mountain Valley Project and the Equitrans Expansion Project

Project Component/State	Land Affected During Construction (acres)	Land Affected During Operation (acres)
ABOVEGROUND FACILITIES		
West Virginia		
Mobley Interconnect (MVP)	3.2	1.1
Bradshaw Compressor Station (MVP)	36.5	6.3
Sherwood Interconnect (MVP)	12.0	1.1
Harris Compressor Station (MVP)	16.5	5.6
WB Interconnect (MVP)	9.9	1.2
Stallworth Compressor Station (MVP)	29.9	7.2
Webster Interconnect (EEP)	0.8	0.8
Mobley Tap (EEP)	0.4	0.2
H-306 Tap (EEP)	<0.1	<0.1
H-148 Tap (EEP)	<0.1	<0.1
Virginia		
Transco Interconnect & North/South Launcher Receiver Sites (MVP)	41.0	2.5
Pennsylvania		
Redhook Compressor Station (EEP)	17.2	8.8
Pratt Compressor Station Decommissioning (EEP)	7.5	7.5
Applegate Pig Launcher/Receiver (EEP)	0.4	0.4
Hartson Pig Launcher/Receiver (EEP)	0.1	0.1
H-302 Tap & Pig Launcher/Receiver (EEP)	0.1	0.1
Subtotal Aboveground Facilities – MVP	149.0	25.0
Subtotal Aboveground Facilities - EEP	26.5	17.9
Combined MVP and EEP Aboveground Facilities Total	**175.5**	**42.9**
YARDS		
West Virginia (MVP)	132.6	0.0
West Virginia (EEP)	0.3	0.0
Virginia (MVP)	37.8	0.0
Pennsylvania (EEP)	18.8	0.0
Subtotal Yards – MVP	170.4	0.0
Subtotal Yards - EEP	19.1	0.0
Combined MVP and EEP Yards Total	**189.5**	**0.0**
ACCESS ROADS (acres for improvement of existing roads and new road construction)		
West Virginia (MVP)	647.5	173.6
West Virginia (EEP)	0.1	0.1
Virginia (MVP)	258.3	63.9
Pennsylvania (EEP)	10.7	5.1
Subtotal Access Roads – MVP	905.8	237.5

TABLE 2.3-1 (continued) **Land Requirements Associated with the Mountain Valley Project and the Equitrans Expansion Project**		
Project Component/State	**Land Affected During Construction (acres)**	**Land Affected During Operation (acres)**
Subtotal Access Roads - EEP	10.8	5.2
Combined MVP and EEP Access Roads Total	**916.6**	**242.7**
CATHODIC PROTECTION BEDS		
West Virginia (MVP)	11.3	6.1
West Virginia (EEP)	0.0	0.0
Virginia (MVP)	6.4	3.5
Pennsylvania (EEP)	1.1	1.1
Subtotal Cathodic Protection Beds – MVP	17.7	9.6
Subtotal Cathodic Protection Beds - EEP	1.1	1.1
Combined MVP and EEP Cathodic Protection Beds Total	**18.8**	**10.7**
MVP Totals	6,362.5	2,116.5
EEP Totals	205.1	69.1
COMBINED TOTALS FOR BOTH PROJECTS	**6,567.6**	**2,187.3**

Note: The totals shown in this table are rounded.
Note: Land Requirements associated with the Jefferson National Forest crossing are provided in section 4.8.1.
Note: The acreages for the Pratt Compressor Station are counted in both the Aboveground Facilities and Yards sections due to the fact that the lot would be used for pipe storage after the buildings are demolished.

2.3.1 Pipelines

Both the MVP and the EEP pipelines combined would total about 311 miles in three states. This would include about 7.3 miles of pipeline route in Pennsylvania, 196.3 miles in West Virginia, and 107.1 miles in Virginia.

Combined, construction of the pipelines for the MVP and the EEP would affect a total of about 5,267 acres, including ATWS, but excluding staging areas, yards, access roads, and cathodic protection beds. Pipeline construction would affect about 145 acres of land in Pennsylvania, 3,352 acres in West Virginia, and 1,771 acres in Virginia. The temporary work areas used during construction of the pipelines would be restored to their pre-construction condition and use after the facilities are built.

The operational permanent easement for the MVP and EEP pipelines combined would cover a total of about 1,891 acres. Operation of the pipelines would affect 45 acres in Pennsylvania, 1,191 acres in West Virginia, and 656 acres in Virginia.

2.3.1.1 Mountain Valley Project

Mountain Valley would generally use a 125-foot-wide construction right-of-way to install the pipeline in uplands and a 75-foot-wide construction right-of-way through wetlands. Right-of-way configurations proposed by Mountain Valley for its pipeline are included in appendix C. Construction of the MVP pipeline would affect about 5,120 acres; affecting 3,349 acres in West Virginia, and 1,771 acres in Virginia.

Following construction, Mountain Valley would retain a 50-foot-wide permanent right-of-way to operate the pipeline. Operation of the pipeline would affect a total of about 1,846 acres, including 1,190 acres in West Virginia, and 656 acres in Virginia.

2.3.1.2 Equitrans Expansion Project

The width of the construction right-of-way for the EEP pipelines would vary between 85 feet and 125 feet in uplands, depending on the segment (see table 2.3-2). The typical right-of-way configurations proposed by Equitrans for its pipelines are included in appendix C. Equitrans would use a 75-foot-wide construction right-of-way to cross most wetlands. The construction rights-of-way for the EEP pipelines, excluding ATWS, yards, and access roads; would cover a total of about 88.7 acres; about 88.0 acres in Pennsylvania and about 0.7 acre in West Virginia.

TABLE 2.3-2

Temporary and Permanent Right-of-Way Widths for the Equitrans Expansion Project

Facility	Pipeline Diameter (inches)	Temporary Construction Right-of-Way Width (feet)	Permanent Operational Right-of-Way Width (feet)
H-318	20	100	50
H-316	30	125	50
H-158	12	125 a/	50
M-80	6	125 a/	50
H-305	24	100	50
H-319	16	85	50

a/ The H-158 and M-80 pipelines would share one 125-foot-wide construction right-of-way. The pipelines would be separated by 15 feet.

The new H-318 20-inch-diameter pipeline would extend about 3.8 miles in an east-west direction in Allegheny and Washington Counties, Pennsylvania. Equitrans would use a nominal 100-foot-wide construction right-of-way for the H-318 pipeline in uplands. Construction of the new H-318 pipeline, excluding ATWS, yards, and access roads; would affect about 41 acres.

The new H-316 30-inch-diameter pipeline would extend about 3 miles in an east-west direction, following an existing Texas Eastern corridor in Greene County, Pennsylvania. Equitrans would use a nominal 125-foot-wide construction right-of-way in uplands to install the H-316 pipeline. Construction of the new H-316 pipeline, excluding ATWS, yards, and access roads; would affect about 38 acres.

Both the new 6-inch-diameter M-80 pipeline and the new 12-inch-diameter H-158 pipeline would be about 0.2 mile long. The M-80 and H-158 pipelines would be installed adjacent to each other in the same 125-foot-wide construction right-of-way in uplands. Construction of those two pipelines combined, excluding ATWS, yards, and access roads; would impact about 3.8 acres total.

The new 24-inch-diameter H-305 pipeline would extend about 540 feet, with a 100-foot-wide construction right-of-way in uplands. Construction of the new H-305 pipeline, excluding ATWS, yards, and access roads; would affect about 1.2 acres.

The new 16-inch-diameter H-319 pipeline would extend for 200 feet, with an 85-foot-wide construction right-of-way in uplands. Construction of the new H-319 pipeline, excluding ATWS, yards, and access roads; would affect about 0.4 acre.

Following construction, Equitrans would retain a 50-foot-wide permanent right-of-way to operate the pipeline segments. Operation of the EEP pipelines would affect a total of about 44.9 acres (44.5 acres in Pennsylvania and less than 1 acre in West Virginia). Operation of the new H-318 pipeline would require about 23 acres. Operation of the new H-316 pipeline would utilize about 18 acres. The new adjacent H-158 and M-80 pipelines would share a permanent easement that covers about 1.6 acres total. The new H-305 pipeline would require about 0.6 acre for its permanent easement. The operational easement for the new H-319 pipeline would cover about 0.3 acre.

2.3.2 Aboveground Facilities

Combined, about 176 acres would be affected by construction of aboveground facilities for both projects. Operation of aboveground facilities would utilize a total of about 43 acres. The temporary work areas used during construction of the aboveground facilities would be restored to their pre-construction condition and use after the facilities are built.

2.3.2.1 Mountain Valley Project

The proposed aboveground facilities for the MVP include 3 new compressor stations, 4 new M&R stations and interconnects, 3 taps, 36 MLVs, and 8 pig launcher and receivers at 5 locations. Construction of the new MVP compressor stations would affect a total of about 83 acres all in West Virginia. Operation of the MVP compressor stations would require about 19 acres in total.

Construction of the Bradshaw Compressor Station would affect about 36.5 acres. Operation of the Bradshaw Compressor Station would use just over 6 acres.

Construction of the Harris Compressor Station would require about 16.5 acres. Operation of the station would utilize about 5.6 acres.

Construction of the Stallworth Compressor Station would affect about 30 acres. Operation of the station would utilize about 7 acres.

Construction of the new M&R stations, interconnections, and taps would affect a total of about 68.1 acres (27.1 acres in West Virginia and 41 acres in Virginia). Operation of the M&R stations would utilize a total of less than 6 acres.

Construction of the Mobley Interconnect and receipt M&R station would require about 3 acres. This facility would have an operational footprint of about 1 acre.

Construction of the Sherwood Interconnect and receipt M&R station would affect about 12 acres. The operational footprint for the Sherwood Interconnect would be about 1.1 acres.

Construction of the WB Interconnect and delivery M&R station would affect about 10 acres. The operational footprint for the WB Interconnect would cover just over 1 acre.

Construction of the Transco Interconnect and delivery M&R station would affect about 41 acres. The operational footprint for the Transco Interconnect and M&R station would cover about 3 acres.

The Webster Tap and two Roanoke Gas taps would occupy about 2 acres. Mountain Valley would design and install the pipeline tap, valve, and piping. The interconnection company would be responsible for the interconnect design, installation, land acquisition, permits, and cost.

A typical MLV would occupy a 50-foot by 50-foot parcel (0.6 acre) within the permanent right-of-way or aboveground facility footprint. Pig launchers and receivers would be installed at all three of the new compressor stations and two of the interconnections (Mobley and Transco).

2.3.2.2 Equitrans Expansion Project

The proposed aboveground facilities for the EEP include a new compressor station, one interconnect, four taps, four pig launcher and receiver sites, and cathodic protection beds; and the decommissioning of an existing compressor station. No M&R Stations or MLVs are associated with the EEP. A 60-foot communication tower would be contained completely within the new Redhook Compressor Station. The communication tower would be a single lattice structure and would not emit any light or noise.

Construction of the EEP aboveground facilities would require a total of about 26 acres. Operation of the aboveground facilities would utilize a total of about 18 acres. Table 2.3-1 lists the land required for each aboveground facility.

Construction of the Redhook Compressor Station would affect about 17 acres at a new site in Greene County, Pennsylvania. Operation of the station would utilize about 9 acres.

Once the new Redhook Compressor Station is built, the existing Pratt Compressor Station, in Greene County, Pennsylvania, would be abandoned, decommissioned, and demolished. The 7.5-acre site would then be used by Equitrans as a storage yard.

Construction of the Webster Interconnect would affect less than 1 acre at a new location in Wetzel County, West Virginia. The operational footprint of the interconnection would cover less than 1 acre.

Construction of the Mobley Tap would affect about 0.4 acre at a new site in Wetzel County, West Virginia. The operational footprint would occupy about 0.2 acre.

Equitrans proposes to install four new pig launcher and receivers, occupying a total of about 0.6 acre combined, excluding the one at the Redhook Compressor Station.

2.3.3 Additional Temporary Workspaces

In constructing the pipeline facilities, ATWS would be required in areas such as the following:

- adjacent to crossings of roadways, railroads, waterbodies, wetlands, or other utilities;
- construction constraints that require special construction techniques, such as horizontal directional drill (HDD) entry and exit locations;
- HDD pullbacks;
- areas requiring extra trench depth;
- certain pipe bends;
- areas for extra spoil storage;
- areas for temporary storage of segregated topsoil;
- locations with soil stability concerns;
- truck turnarounds;
- equipment passing lanes;
- hydrostatic test water withdrawal and discharge locations; and
- staging and fabrication areas.

ATWS would be used only during construction of the projects. After pipeline installations, all of the ATWS would be restored to their pre-construction condition and use, to the extent possible. In open, agricultural, and developed and residential land use areas, construction impacts from use of ATWS would be short-term, as these areas would be revegetated in a few years. However, in forest, impacts from use of ATWS would be long-term, as it would take many years for trees to re-establish and mature.

2.3.3.1 Mountain Valley Project

Mountain Valley would use 1,336 ATWS along its pipeline route, affecting a total of about 658 acres combined. Appendix D identifies where Mountain Valley has proposed ATWS.

2.3.3.2 Equitrans Expansion Project

Equitrans would use a total of 40 ATWS during construction of the EEP facilities, affecting a total of about 59 acres. Appendix D identifies where Equitrans has proposed ATWS.

2.3.4 Yards

Both Mountain Valley and Equitrans would temporarily use yards during construction to store pipe, materials, and equipment; set up offices; and mobilize workers. The Applicants would grade, modify drainage, import gravel or crushed rock, install buildings (usually pre-fabricated mobile homes), and construct internal roadways within some of the yards. After pipeline installation, all yards would be restored to their pre-construction conditions and use; unless the landowner requests otherwise. Most of the yards are classified as having an open land use. However, some of the yards contain limited forested areas. Any forested areas at the yards, except at MVP-LY-002, would be cleared during construction. Yard MVP-LY-002 is an existing yard and Mountain Valley would not alter the landscape of this yard. In the case of open, agricultural, grasslands-rangelands, or developed land use at yards, impacts would be short-term, with vegetation re-established in a few years after restoration is finished. In the cases where forest would be cleared at a yard, trees would not be replanted after construction; therefore, impacts would be long-term.

2.3.4.1 Mountain Valley Project

During pipeline construction, Mountain Valley would use 20 yards in West Virginia and 2 yards in Virginia (see table 4.8.1-3). Four yards in West Virginia would be used to accommodate truck turn radii. The yards would temporarily occupy about 171 acres. These yards are depicted on the maps in appendix B.

2.3.4.2 Equitrans Expansion Project

Equitrans would use six yards in Pennsylvania and one in West Virginia (see table 4.8.1-6). The yards would temporarily occupy a total of about 19.1 acres combined. These yards are depicted on the maps in appendix B.

2.3.5 Access Roads

The Applicants would mostly use existing public and private roads to gain access to their respective rights-of-way. However, many existing roads are not suitable for construction traffic. Where necessary, the Applicants would improve existing roads, through widening and/or grading. In addition, some new roads would be built for the projects. After pipeline installation, the Applicants would remove new temporary roads and restore the land to its pre-construction condition and use. Additional information regarding access roads can be found in appendix E and section 4.8.1.

2.3.5.1 Mountain Valley Project

Outside of public roads, Mountain Valley would use 393 new or existing roads to access the construction right-of-way. Of the 393 access roads that would be used during construction, 355 (totaling 203.3 miles) would be existing roads. Virtually all of the existing access roads (353) would require improvements for pipeline construction traffic. Mountain Valley would build 37 new roads for construction access. Mountain Valley would use 161 roads for permanent access to the right-of-way and aboveground facilities, including 131 existing roads, 27 new roads, and 1 road that is partially existing and partially would be new. Additionally, 1 road that has not been surveyed has been identified by Mountain Valley as a temporary access road. Access roads would total 906 acres of impacts during construction. Permanent use of access roads would utilize 237 acres. Appendix E identifies each road improvement proposed for the MVP.

2.3.5.2 Equitrans Expansion Project

In addition to public roads, Equitrans proposes to use 28 private roads and 1 public road for access to the construction right-of-way. Twenty-four of the private roads are in Pennsylvania and four are in West Virginia (see the table in appendix E and maps in appendix B). Most of these private access roads are graveled, dirt, or grass; only three are paved. Seventeen of the access roads for the EEP are existing, while 11 would be new roads built by Equitrans for the EEP. Equitrans has identified 26 existing roads that would need to be improved or modified to handle construction equipment and traffic. Six of the existing roads would be permanently used during project operations. All of the new roads would be used temporarily during project construction. After pipeline installation, Equitrans would restore the temporary new roads to their original condition and use. About 10.8 acres would be affected by access roads during project construction and 5.2 acres during operation. Appendix E identifies each road improvement proposed for the EEP.

2.3.6 Cathodic Protection

After installation of the pipeline, the companies would install cathodic protection rectifiers and groundbeds. For both projects combined, these facilities would affect about 19 acres for construction and about 11 acres for operation.

2.3.6.1 Mountain Valley Project

Mountain Valley would install cathodic protection at 32 locations along the MVP pipeline route that would impact about 18 acres during construction and about 10 acres during operation (see table 2.1-7).

2.3.6.2 Equitrans Expansion Project

For the EEP, installation of cathodic protection rectifiers and groundbeds would affect a total of about 1.0 acre, for both construction and operation.

2.4 CONSTRUCTION PROCEDURES

The Applicants would design, construct, operate, and maintain their respective pipelines and facilities in accordance with DOT regulations under 49 CFR 192 (Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards) and other applicable federal and state regulations. DOT regulations specify pipeline material selection; minimum design requirements; protection from internal, external, and atmospheric corrosion; and qualification procedures for welders and operations personnel, in addition to other design standards. The Applicants would also comply with the siting and maintenance requirements under 18 CFR

380.15 and other applicable federal and state regulations, including the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration. These safety regulations are intended to ensure adequate protection of the public, pipeline workers, contractors, and employees, and to prevent natural gas pipeline accidents and failures. Pipeline safety is discussed further in section 4.12 of this EIS.

2.4.1 Mitigation

Various forms of mitigation are defined by the CEQ in 40 CFR 1508.20, including:

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- compensating for the impact by replacing or providing substitute resources or environments.

Section 4 of this EIS describes the resource-specific measures the Applicants have proposed to minimize environmental impacts, and also includes our additional recommended mitigation measures as well as those recommended or that may be required by other agencies. General approaches to mitigation applicable to the projects are presented below.

2.4.1.1 General Federal Energy Regulatory Commission Mitigation Measures

Mountain Valley agreed to adopt the FERC's general construction, restoration, and operational mitigation measures outlined in our *Upland Erosion Control, Revegetation and Maintenance Plan* (FERC Plan). Equitrans has proposed one modification to our Plan (see table 2.4-1). Mountain Valley and Equitrans have also proposed modifications to our *Wetland and Waterbody Construction and Mitigation Procedures* (FERC Procedures).[2] These plans and procedures include measures that:

- minimize impacts on agricultural lands, including segregation of topsoil, repairing irrigation and drainage systems, rock removal, and relief of compaction;
- minimize impacts on residential areas, including restoration of landscaping;
- maximize erosion control, including the use of slope breakers, and sediment barriers;
- minimize impacts on wetlands, through reduction of workspace size, removal of stumps in the trenchline only, and requiring equipment to work off mats or timbers;
- minimize impacts on waterbodies and aquatic species, through timing restrictions, and promotion of dry-crossing techniques;
- enhance revegetation by use of seeding and mulch (except not in wetlands); and

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[2] Our Plan and Procedures are available on the FERC Internet website at http://www.ferc.gov/industries/gas/enviro/guidelines.asp.

- minimize impacts on vegetation during operation by limiting maintenance mowing.

Table 2.4-1 lists Mountain Valley and Equitrans's proposed modifications to our Plan and Procedures, their description, and status.

TABLE 2.4-1

Summary of Proposed Modifications to the FERC's Plan and Procedures

Applicable FERC Plan/ Procedures Section	Requested by	Resource Issue	Description	Status	Section Discussed
Plan at Section IV.F.1.b	Equitrans	Spacing of temporary slope breakers	Proposal to use PADEP's and WVDEP's slope breaker spacing which is more stringent than the FERC's spacing.	Acceptable	2.4.2.8
Procedures at Sections II.A.1, VI.B.1.a, and V.B.2.b	Mountain Valley/Equitrans	Extra workspace positioning relative to waterbodies and wetlands	Proposal to utilize extra workspace within 50 feet of waterbodies and wetlands at specific locations as listed in appendix D.	Acceptable	4.3.2.2
Procedures at Section V.B.3.c	Mountain Valley	Distance between a parallel waterbody and the pipeline	Proposal to site the pipeline closer than 15 feet when paralleling a waterbody at 12 locations as listed on table 4.3.2-11 (see section 4.3.2.2).	Acceptable / Not Acceptable	4.3.2.2
Procedures at Section II.A.2 and VI.A.3	Mountain Valley	Construction right-of-way width in wetlands	Proposal to use a construction right-of-way width greater than 75 feet in wetlands at specific locations as listed in appendix G.	Acceptable	4.3.3.3

In their respective applications, Mountain Valley and Equitrans provided plans describing how they would construct and maintain their respective projects (see table 2.4-2). These plans also include measures to avoid and minimize potential impacts on the environment.

TABLE 2.4-2

Construction, Restoration, and Mitigation Plans for the Mountain Valley Project and the Equitrans Expansion Project

Mountain Valley Project	Equitrans Expansion Project
Adopted FERC Plan	Modifications from the FERC Plan as discussed in table 2.4-1.
Modifications from the FERC Procedures as discussed in table 2.4-1.	Modifications from the FERC Procedures as discussed in table 2.4-1.
Erosion and Sediment Control Plan (Attachment General 1a-1 and 1a-2) a/	*Erosion and Sediment Control Plans* (Section 11) b/
N/A	*HDD Contingency Plan* c/
Revised Karst Hazards Assessment Report (Attachment RR2-4a) d/	N/A
Karst Mitigation Plan (RR 6, Appendix 6-D) e/, r/	N/A
Karst-specific Erosion and Sediment Control Plan a/	N/A
Revised Landslide Mitigation Plan (Attachment Data Request [DR] 4 General 2c) f/	*Landslide Mitigation Plan* g/
Water Resources Identification and Testing Plan (Attachment DR4 Water Resources 5) h/	N/A
Vertical Scour and Lateral Channel Erosion Analysis (Attachment DR4 Water Resources 13e) h/	N/A
Site-Specific Residential Construction and Mitigation Plans (Attachment DR5 Land Use 8) i/	N/A
Organic Farm Protection Plan (OFPP) (Attachment DR2 RR8-4) j/	N/A
Spill Prevention, Control, and Countermeasures Plan (SPCCP) and Unanticipated Discovery of Contamination Plan for Construction Activities in West Virginia and Virginia (Attachment DR5 General 1e-1 and General 1e-2) i/	*SPCCP* (Attachment General-3) b/
N/A	*Preparedness, Prevention, and Contingency and Emergency Action Plans (PPCEP)* (Attachment General-3) b/
General Blasting Plan (Attachment DR4 Geology 13) h/	N/A
Compensatory Wetland Mitigation Plan (Attachments General 1e-1, 1e-2, and 1e-3) a/	N/A
Revised Migratory Bird Conservation Plan (Attachment DR5 General 1b1) t/	*Migratory Bird Conservation Plan* (Attachment 3-21) l/
Exotic and Invasive Species Control Plan (Attachment DR3 Vegetation-5) m/	N/A
Revised Traffic and Transportation Management Plan (Attachment DR5 Land Use 1) i/	*Traffic and Transportation Management Plan* (Attachment 5-13) l/
Fire Prevention and Suppression Plan (Attachment RR1-4) n/	N/A

TABLE 2.4-2 (continued)

Construction, Restoration, and Mitigation Plans for the Mountain Valley Project and the Equitrans Expansion Project

Mountain Valley Project	Equitrans Expansion Project
Mining Area Construction Plan (Attachment DR2 General-5b) j/	*Mine Subsidence Plan* (Attachment 6-15) l/
Avoidance Plans filed July 18, 2016. Individual Site Testing Plans for West Virginia included in county survey reports, variously filed. Testing Plans for Virginia archaeological sites filed July 22, 2016. Treatment Plans pending	Avoidance Plan for site 36WH1706 submitted to PA-SHPO on September 23, 2016
Plan for Unanticipated Historic Properties and Human Remains (Attachment 4-M) e/	*Plan for Unanticipated Historic Properties and Human Remains, Pennsylvania and West Virginia* (Discovery Plan- Appendix 4-B)
Plan for Unanticipated Discovery of Paleontological Resources (Attachment 1-m) n/	N/A
N/A	*Unanticipated Discovery of Contamination Plan* (Attachment 4 of the PPCEP) b/
Fugitive Dust Control Plan (Attachment 1-g) n/	*Dust Suppression Plan* (RR1, appendix 1-K) o/
Winter Construction Plan (Attachment RR1-30) n/	*Winterization Plan* (RR1, appendix 1-J) o/
POD (Attachment DR General 2b) f/	N/A
Unanticipated Mine Pool Mitigation Plan (Attachment DR4 Geology 12) p/	N/A
Stormwater Pollution Prevention Plan (SWPPP) (Appendix F of Attachment F) q/	N/A
Annual Standards and Specifications for Virginia (Appendix G) q/ *(Revision expected Fall 2017)*	N/A
Acid Forming Materials Mitigation Plan (Attachment DR5 General 1c) s/	N/A
Habitat Mitigation Plan (Attachment DR5 Vegetation) t/	N/A

TABLE 2.4-2 (continued)	
Construction, Restoration, and Mitigation Plans for the Mountain Valley Project and the Equitrans Expansion Project	
Mountain Valley Project	**Equitrans Expansion Project**

a/ Mountain Valley's supplemental filing filed February 26, 2016 (accession number 20160226-5404).
b/ Equitrans' supplemental filing filed July 14, 2016 (accession number 20160714-5016).
c/ Equitrans' supplemental filing filed April 20, 2016 (accession number 20160421-5019).
d/ Mountain Valley's supplemental filing filed October 14, 2016 (accession number 20161014-5022).
e/ Mountain Valley's Application filed October 23, 2015 (accession number 20151023-5035).
f/ Mountain Valley's supplemental filing filed March 3, 2017 (accession number 20170303-5014).
g/ Equitrans' supplemental filing filed May 5, 2017 (accession number 20170505-5038).
h/ Mountain Valley's supplemental filing filed February 9, 2017 (accession number 20170209-5249).
i/ Mountain Valley's supplemental filing filed March 30, 2017 (accession number 20170330-5339)
j/ Mountain Valley's supplemental filing filed April 21, 2016 (accession number 20160422-5012).
k/ Mountain Valley's supplemental filing filed May 11, 2017 (accession number 20170511-5018).
l/ Equitrans' supplemental filing filed February 5, 2016 (accession number 20160205-5192).
m/ Mountain Valley's supplemental filing filed July 18, 2016 (accession number 20160718-5161).
n/ Mountain Valley's supplemental filing filed January 15, 2016 (accession number 20160119-5076).
o/ Equitrans' Application filed October 27, 2015 (accession number 20151027-5125).
p/ Mountain Valley's supplemental filing filed February 17, 2017 (accession number 20170217-5199).
q/ Mountain Valley's supplemental filing filed June 24, 2016 (accession number 20160624-5244).
r/ As part of the Conditional WQC issued by WVDEP, Special Condition 16 requires the applicant to provide an enhanced Karst Management Plan to WVDEP for concurrence prior to pipeline construction in karst areas.
s/ Mountain Valley's supplemental filing filed May 9, 2017 (accession number 20170509-5108).
t/ Mountain Valley's supplemental filing filed May 11, 2017 (accession number 20170511-5018).
N/A = Not Applicable

2.4.1.2 General Forest Service Mitigation

The FS has a responsibility to manage public lands within National Forests for multiple uses and sustained yield. The effective use of mitigation allows the FS to support a wide variety of resources and land uses across the landscape. According to the FS, mitigation of the impacts from land uses ensures that the varied resources of the public's land continue to provide values, services, and functions for present and future generations.

Mitigation may include measures to avoid, reduce, repair, and compensate for unavoidable impacts on all NFS resource values, including but not limited to: biological, ecological, cultural, recreational, wilderness, roadless, socioeconomic, and aesthetic values. Mitigation practices for the MVP would be developed and implemented to offset direct, indirect, and cumulative impacts. Mitigation may use the best science to implement landscape-scale mitigation planning, banking, in-lieu fee arrangements and other practical measures, both on-site and off-site. The FS is committed to maintaining a sustainable resource base.

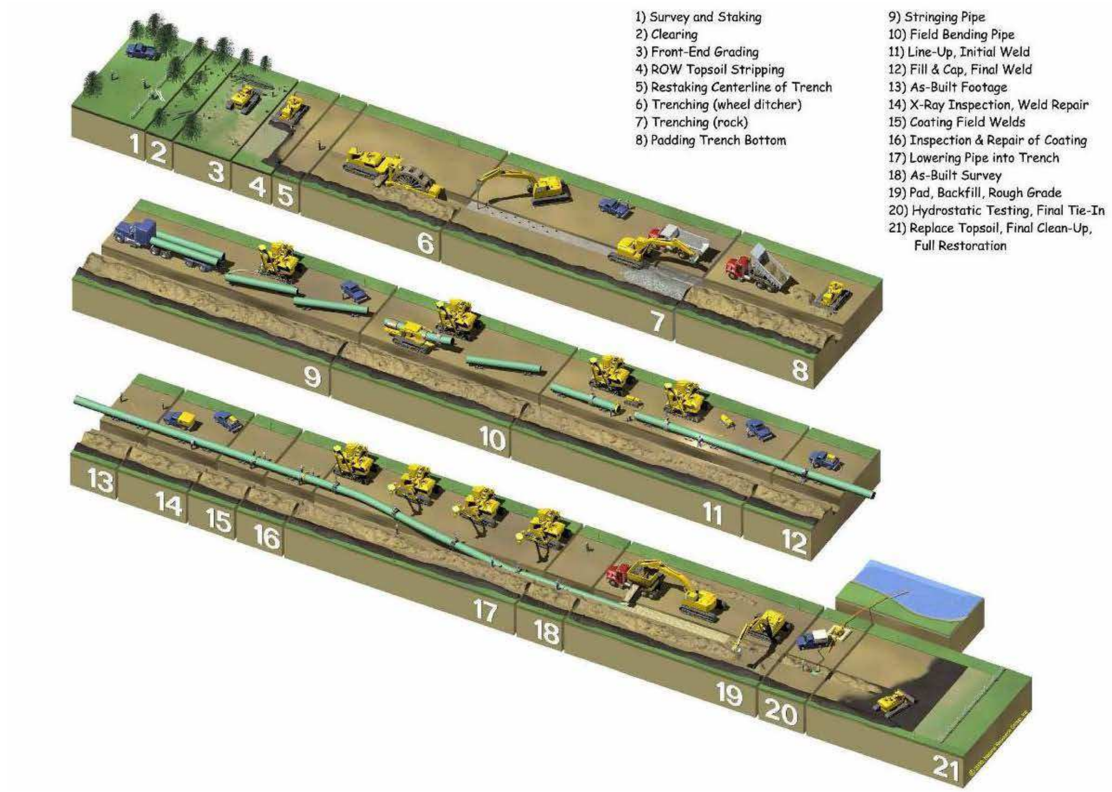
The FS would strive through mitigation to address adverse impacts of the proposed action on natural resources and their function within the Jefferson National Forest. This may include applying measures deemed necessary to replace or compensate for residual adverse impacts on key Forest resources. The extent to which any of the mitigation elements are used would depend on what is effective and practicable in addressing the impacts of the MVP.

The BLM's Right-of-Way Grant would incorporate mitigation measures through stipulations, terms and conditions, and conditions of approval as of the authorization. The decision document may expressly condition approval on the Applicant's commitment to implement all mitigation measures as described in the decision document. To guarantee implementation of the mitigation obligations, financial assurances may be required.

2.4.2 General Upland Overland Pipeline Construction Methods

Constructing the MVP and the EEP pipelines would generally be completed using typical upland overland sequential pipeline construction techniques, which include survey and staking; clearing and grading; trenching; pipe stringing, bending, and welding; lowering-in and backfilling; hydrostatic testing; commissioning; and cleanup and restoration (see figure 2.4.2-1). These construction techniques would generally proceed in an assembly line fashion with construction crews moving down the construction right-of-way as work progresses. Construction and restoration at any particular point along the pipeline route would take about 3 weeks to complete; although progress could be delayed by topography, weather, or other factors.

Typical Pipeline Construction Sequence



Source: NRG, 2000

Typical Pipeline Construction Sequence	Figure 2.4.2-1 Mountain Valley & Equitrans Expansion Projects

2.4.2.1 Survey and Staking

The first step of construction involves engineering and land survey crews staking the limits of the construction right-of-way, the centerline of the proposed trench, ATWS, and other approved work areas. The Applicants would mark approved access roads using temporary signs or flagging, and the limits of approved disturbance on any access roads requiring widening. The Applicants would fence off environmentally sensitive areas (e.g., waterbodies and wetlands, special status species habitat, and historic properties) where the construction right-of-way may be constricted. Property markers and old survey monuments would be referenced and marked, and replaced during restoration. The Applicants would contact the One-Call system for each county and state to locate, identify, and flag existing underground utilities to prevent accidental damage during pipeline construction. Typically, land surveying is done using all-terrain vehicles (ATV) and pick-up trucks.

2.4.2.2 Clearing and Grading

Clearing and grading would remove trees, shrubs, brush, roots, and large rocks from the construction work area and would level the right-of-way surface to allow operation of construction equipment. The specified construction right-of-way widths would be cleared, including ATWS. Existing fences may not be removed, but new gates may be cut, and fences reinforced.

Vegetation would generally be cut or scraped flush with the surface of the ground, leaving rootstock in place where possible. Merchantable timber would be cut to useable lengths and stacked on the edge of the right-of-way. Typically, cut timber would be disposed in accordance with landowner wishes; unless the Applicants purchase the timber as part of their compensation agreements.

Brush cleared from the construction corridor would be open burned (MVP only), windrowed, or chipped/mulched. According to Mountain Valley, chipped brush would be blown off of the right-of-way with landowner approval. Chips would not be blown into environmentally sensitive areas (i.e., waterbodies, wetlands, and habitat for special status species). Any open burning would be conducted on a site-specific basis, in accordance with applicable state and local regulations and Mountain Valley's *Fire Prevention and Suppression Plan*. Burning of cleared slash would only take place in upland areas, away from residences, waterbodies, and wetlands. No burning would be done within the Jefferson National Forest. Impacts on air quality during burning are discussed in section 4.11.1.

Grading would be conducted where necessary to provide a reasonably level work surface. More extensive grading, referred to as two-tone construction, would be required in uneven terrain and where the right-of-way traverses side slopes. Equipment used for clearing and grading activities could include grinding machines, motor-graders, bulldozers, track-hoes, and dump trucks.

The Applicants have indicated that they would separate topsoil from subsoil in residential and agricultural areas. Mountain Valley would also segregate topsoil within the Jefferson National Forest. The Applicants would segregate at least the top 12 inches of topsoil where 12 or more inches of topsoil is present. In soils with less than 12 inches of topsoil, the Applicants would segregate the entire topsoil layer. See section 4.2 for additional information regarding topsoil segregation.

Temporary erosion controls would be installed along the construction right-of-way immediately after initial disturbance of the soil and would be maintained throughout construction. Temporary erosion control measures would remain in place until permanent erosion controls are installed or restoration is completed. Each Applicant has committed to employing Environmental Inspectors (EIs) during construction to help determine the need for erosion controls and ensure that they are properly installed and maintained. Additional discussion of EI responsibilities is provided in section 2.4.4.

2.4.2.3 Trenching

Soil and bedrock would be removed to create a trench into which the pipeline would be placed. A track-mounted excavator/backhoe or similar equipment would be used to dig the pipeline trench. When rock is encountered, tractor-mounted mechanical rippers or rock trenchers would be used to fracture the rock prior to excavation. Blasting may be used in specific areas where hard bedrock is close to the surface. Blasting is more fully discussed in section 4.1 of this EIS.

Excavated soils would be stockpiled along the right-of-way on the side of the trench away from the construction traffic ("spoil side"). Subsoil would not be allowed to mix with the previously stockpiled topsoil. In accordance with Pennsylvania laws and in order to deter invasive species, Equitrans would temporarily stabilize spoil piles and areas left undisturbed for 4 days or longer with temporary seed and mulch. Excess rock would be trucked to approved disposal areas.

The trench would be dug at least 12 inches wider than the diameter of the pipeline and excavated to a depth of 5.5 feet to 9 feet (for the MVP) and 5 feet to 6 feet (for the EEP) in order to provide sufficient cover over the pipeline in accordance with DOT standards in 49 CFR 192.327 (see table 2.4-3). There would generally be 36 inches of cover over the top of the pipeline in deep soils and 18 inches of cover in areas of consolidated rock. At waterbody crossings, the pipe would be more deeply buried; with a minimum of 4 feet of cover at navigable waterways and a minimum of 2 feet of cover at waterbodies with consolidated rock. As discussed in section 4.3, the pipeline would be buried deeper than the DOT standards for several waterbodies in order to prevent exposure of the pipeline due to scour. Mountain Valley would install its uncased pipeline with a minimum of 10 feet of cover under railroads; and a minimum of 5.5 feet of cover for cased pipe under a railroad.

TABLE 2.4-3 **Minimum DOT Specifications for Depth of Cover over Natural Gas Pipelines**		
Location a/	**Normal Soil (cover depth in inches)**	**Consolidated Rock (cover depth in inches)**
DOT PHMSA Class 1	36	18
DOT PHMSA Class 2, 3, and 4	36	24
Actively cultivated agriculture	48	24
Drainage ditches of public roads	36	24
Navigable river, stream, or harbor	48	24
Minor stream crossings	36	24

a/ As defined in 49 CFR 192.5.
Class 1: offshore areas and areas within 220 yards of a pipeline with ≤10 buildings intended for human occupancy.
Class 2: areas within 220 yards of a pipeline with >10 but <46 buildings intended for human occupancy.
Class 3: areas within 220 yards of a pipeline with >46 buildings intended for human occupancy and areas within 100 yards of either a building or a small, well defined outside area (such as a playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period.
Class 4: areas within 220 yards of a pipeline where buildings with four or more stories are prevalent.

2.4.2.4 Pipe Stringing, Bending, Welding, and Coating

After trenching, sections of pipe typically between 40 and 60 feet long (also referred to as "joints") would be transported to the right-of-way by truck, off-loaded by track-hoes or side-boom tractors, and strung beside the trench in a continuous line. The pipe would be delivered to the job site with a protective coating of fusion-bonded epoxy or other approved coating that would inhibit corrosion by preventing moisture from coming into direct contact with the steel.

Individual sections of pipe would be bent using a track-mounted, hydraulic pipe-bending machine to conform to the contours of the ground after the joints of pipe sections are strung alongside the trench. Where multiple or complex bends are required, bending may be conducted at the pipe fabrication factory, and the pipe would be shipped to the MVP and the EEP areas pre-bent.

After the pipe joints are bent, they would be aligned, welded together into a long segment, and placed on temporary supports at the edge of the trench. The Applicants would use welders who are qualified according to applicable standards in 49 CFR 192 Subpart E, American Petroleum Standard 1104, and other requirements. Automated welding may be used by Mountain Valley in areas of flat terrain.

Every completed weld would be examined by a welding inspector to determine its quality using radiographic or other approved methods as outlined in 49 CFR 192. Radiographic examination is a non-destructive method of inspecting the inner structure of welds and determining the presence of defects. Welds that do not meet the regulatory standards would be repaired or removed.

After a weld is approved, a coating crew would coat the area around the weld before the pipeline is lowered into the trench. Prior to application, the coating crew would thoroughly clean the bare pipe with a power wire brush or sandblast machine to remove dirt, mill scale, and debris. The crew would then apply the coating and allow the coating to dry. The pipeline would be inspected electronically (also referred to as "jeeped" because of the sound of the alarm on the testing equipment) for faults or voids in the coating and would be visually inspected for scratches, and other defects. The Applicants would repair damage to the coating before the pipeline is lowered into the trench. The welded pipe would be placed on wooden skids next to the trench.

2.4.2.5 Lowering-in and Backfilling

The trench would be inspected to be sure it is free of rocks and other debris that could damage the pipe or protective coating before the pipe is lowered into the trench. Trench dewatering may be necessary to inspect the bottom of the trench in areas where water has accumulated. Trench water would be discharged through sediment removal devices in well-vegetated upland areas away from waterbodies and wetlands. The pipeline would then be lowered into the trench by side-boom tractors. Trench breakers (such as sand bags or foam) would then be installed in the trench on slopes at specified intervals to prevent subsurface water movement along the pipeline.

Sandbags may be placed on top of the pipe at the bottom of the trench to protect it from rocks. The first 12 inches at the bottom of the trench above the pipe would be clean fill, absent of rocks. Limestone dust may be brought in and used as padding material only when other local suitable fill is unavailable. The trench would then be backfilled using the excavated material; first with subsoil, then with topsoil. Backfilling could be done by track-hoes, bulldozers, graders, or backfilling machines. A crown of soil may extend above the trench in agricultural, grasslands-rangelands, and open lands, to account for settling. Any excess soils would be spread evenly over the right-of-way.

2.4.2.6 Hydrostatic Testing

The Applicants would hydrostatically test the pipeline after backfilling to ensure the system is capable of withstanding the operating pressure for which it was designed. Hydrostatic testing involves filling the pipeline with water to a designated test pressure and maintaining that pressure for about 8 hours. Actual test pressures and durations would be consistent with the requirements of 49 CFR 192. Any leaks would be repaired and the section of pipe retested until the required specifications were met.

Water for hydrostatic testing would be obtained from mostly municipal water sources for the MVP and the EEP. The Applicants would collect baseline water samples prior to withdrawal and discharge of the hydrostatic test water. In West Virginia, Mountain Valley would analyze baseline sampling data for oil and grease, total suspended solids, and pH. In Virginia, baseline sampling data would be taken for total petroleum hydrocarbons, total organic carbon, total suspended solids, pH, and total residual chlorine. The samples would also be tested for chloroform if the discharge is to be released to a waterbody. Equitrans would analyze baseline water samples in Pennsylvania for suspended solids, oil and grease, iron, total residual chlorine (if chlorinated water was used), dissolved oxygen, and pH. Equitrans' baseline water samples in West Virginia would be analyzed for suspended solids and oil and grease. Mountain Valley would add a biocide to surface waters used for hydrostatic testing. Prior to discharge, a biocide deactivating agent would be added so the test water could be discharge to a vegetated upland area. Equitrans has not proposed to use biocides.

The pipeline would be tested in segments, with the water moved through each sequential segment along the route. The hydrostatic test water would be discharged through sediment filters in vegetated uplands away from waterbodies and wetlands. Section 4.3.2 provides more information on hydrostatic testing. There would be no discharging of hydrostatic test water on FS lands or on lands upstream from FS lands.

2.4.2.7 Commissioning

Test manifolds would be removed and final pipeline tie-ins would be completed after hydrostatic testing. The pipeline then would be cleaned and dried using mechanical tools (pigs) that are moved through the pipeline with pressurized dry air. Mountain Valley would not use a desiccant to dry the pipe while Equitrans may use nitrogen slugs to dry the pipe. Pigs also would be used to internally inspect the pipeline to detect whether any abnormalities or damage exists. Any problems or concerns would be addressed as appropriate.

Pipeline commissioning would then commence. Commissioning involves verifying that equipment has been properly installed and is working, verifying that controls and communications systems are functioning, and confirming that the pipeline is ready for service. In the final step, the pipeline would be prepared for service by purging the pipeline of air and loading it with natural gas. The Applicants would not be authorized to place the pipeline facilities into service until after they have documented to the FERC that restoration activities are proceeding in a satisfactory manner, and the companies have received written permission from the Director of the Office of Energy Projects (OEP).

2.4.2.8 Cleanup and Restoration

Within 20 days of backfilling the trench (10 days in residential areas), all work areas would be graded and restored. If seasonal or other weather conditions prevent compliance with these timeframes, temporary erosion controls would be maintained until conditions allow completion of final cleanup. Surplus construction material and debris would be removed from the right-of-way unless that landowner or land-managing agency approves otherwise. Excess rock/stone would be disposed of within the construction right-of-way with landowner approval or at an approved landfill.

After backfilling the trench, the topographic contours would be restored to their original pre-construction condition as close as possible, using graders and bulldozers; except where drainage patterns may cause erosion. Permanent erosion control features, such as slope breakers (waterbars), would be installed on steep terrain. Fences and gates would be repaired. In addition, driveways and access roads would be restored to pre-construction conditions. Markers showing the location of the pipeline would be installed at fence and road crossings in order to identify the owner of the pipeline and convey emergency information in accordance with applicable governmental regulations, including DOT safety requirements. The Applicants would conduct restoration activities in accordance with landowner agreements, permit requirements, and written recommendations on seeding mixes, rates, and dates obtained from the Wildlife Habitat Council (for the MVP) or the PADEP's *Erosion and Sediment Pollution Control Program Manual* (for the EEP) and in accordance with the Applicants' construction and restoration plans.

The right-of-way would be seeded within 6 working days following final grading, weather and soil conditions permitting, although seeding would not be required in actively cultivated croplands unless requested by the landowner. Alternative seed mixes specifically requested by the landowner or required by agencies may be used. Any soil disturbance that takes place outside the permanent seeding season or any bare soil left unstabilized by vegetation would be mulched in accordance with the FERC Plan and Equitrans' Plan (see section 4.4).

2.4.2.9 Special Pipeline Construction Procedures

Special construction techniques are required when a pipeline is installed across waterbodies, wetlands, roads and railroads, foreign utilities, steep slopes, residences, agricultural lands, and other sensitive environmental resources, such as the ANST. These procedures are further discussed as they apply to specific resources in section 4.0.

2.4.2.10 Waterbody Crossings

Waterbody crossings would be completed in accordance with the Mountain Valley and Equitrans Procedures, with exceptions from the FERC Procedures as identified in table 2.4-1, and measures required in other federal or state issued permits. The MVP pipeline route would require 1,109 waterbody crossings. The EEP pipelines would require 38 waterbody crossings. The waterbodies that would be crossed and the Applicants' proposed crossing methods for each are listed in appendix F. Waterbody crossings are discussed in more detail in section 4.3.2 of this EIS.

ATWS necessary for waterbody crossings would be placed a minimum of 50 feet from the waterbody edge. The 50-foot setback would be maintained unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies (see section 4.3.2).

To prevent sedimentation caused by equipment traffic crossing through waterbodies, the Applicants would install temporary equipment bridges. Bridges may include clean rock fill over culverts, equipment pads, wooden mats, free-spanning bridges, and other types of spans. Equipment bridges would be maintained throughout construction. Each bridge would be designed to accommodate normal to high streamflow (storm events) and would be maintained to prevent soil from entering the waterbody and to prevent restriction of flow during the period of time the bridge is in use.

Sediment barriers, such as silt fence and straw/hay bales, would be installed immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers would be properly maintained throughout construction, until replaced by permanent erosion controls or restoration of adjacent upland areas is complete and revegetation has stabilized the disturbed areas. Trench plugs, consisting of compacted earth of similar low permeability material would be installed at the entry and exit points of wetlands and waterbodies to prevent water from the stream or wetland from moving along the trench. After backfilling, streambanks would be re-established to approximate pre-construction contours and stabilized.

The pipelines would be installed below scour depth (see section 4.3.2) for each waterbody crossed. In most cases, the Applicants would place at least 4 feet of cover over the pipeline at waterbody crossings; except in consolidated rock, where there would be a minimum of 2 feet of cover. See section 4.3.2 for additional information regarding scour depths and proposed mitigation measures such as installation of armor layers and revetment mats. Trench spoil would be placed on the banks above the high water mark for use during backfilling. In some cases, the pipeline would be coated with concrete for negative buoyancy. In accordance with the Applicants' Procedures, construction of minor (10 feet wide or less) waterbody crossings would be completed within 24 hours; while 48 hours would be used for intermediate crossings (between 10 and 100 feet wide).

All waterbody crossings for the MVP would be dry open-cut crossings (flume, dam-and-pump, or cofferdam). In section 4.3, we are recommending Mountain Valley cross the Pigg River via an HDD. For the EEP, either HDD, flume, or dam-and-pump techniques would be used. These measures are briefly described below.

Flume Construction Method

The flume method is a type of dry open-cut crossing that involves diverting the flow of water across the construction work area through one or more flume pipes placed in the waterbody. The first step in the flume crossing method involves placing a sufficient number of adequately sized flume pipes in the waterbody to accommodate the highest anticipated flow during construction. After placing the pipe in the waterbody, sand bags or equivalent dam diversion structures are placed in the waterbody upstream and downstream of the trench area. These devices serve to dam the stream and divert the water flow through the flume pipes, thereby isolating the water flow from the construction area between the dams. Flume pipes are typically left in place during pipeline installation until trenching under the flumes, pipe installation, and final cleanup of the streambed is complete. Once the pipeline is installed, and the streambed and banks restored, the flume pipes are removed, allowing water flow to return to pre-construction conditions.

Dam-and-Pump Construction Method

The dam-and-pump method is similar to the flume crossing method except that pumps and hoses are used instead of flumes to move water across the construction work area. Temporary dams are installed across the waterbody on both the upstream and downstream sides of the construction right-of-way, usually using sandbags or plastic sheeting. Pumps are then set up at the upstream dam with the discharge line (or hoses) routed through the construction area to discharge water immediately downstream of the downstream dam. At the request of the Virginia Department of Game and Inland Fisheries (VADGIF), fish and other aquatic wildlife would be removed from the de-watered area between the dams in Virginia waterbodies. An energy dissipation device is typically used to prevent scouring of the streambed at the discharge location. The pipeline is then installed and the trench backfilled, allowing water flow to be reestablished to pre-construction conditions. After backfilling, the dams are removed and the banks restored and stabilized.

Cofferdam Construction Method

In its original October 2015 application to the FERC, Mountain Valley indicated it would use wet open-cut measures to cross three major waterbodies (Elk, Gauley, and Greenbrier Rivers). Following issuance of the draft EIS, Mountain Valley changed the crossing method for these three rivers to dry open-cut methods (including the use of cofferdams).

A cofferdam is a temporary structure that would be installed within waterbodies to isolate a portion of the work area during construction, thereby allowing pipeline installation and construction to proceed under dry conditions. Cofferdams are typically used for waterbody crossings with larger high flow volumes that may be unsuitable for flume or dam-and-pump methods. A cofferdam consists of installing the pipeline across the waterbody in stages, using the cofferdam to divert the water around the workspace (i.e., a portion of the stream's width) in each stage. This process allows work to proceed under dry conditions during each stage after the work area is dewatered, and it could take two or more stages to complete the crossing. Cofferdam construction methods may include but not be limited to inflatable dams, sand bags, steel A-frame supports, waterproof membranes, silt booms, and turbidity curtains.

Cofferdam crossings would be designed in accordance with all applicable federal and state permits to ensure that the cofferdam could withstand elevated waterbody flows during the course of the work. Dewatering operations of the work areas isolated by the cofferdam would require silt-laden water to be pumped and discharged to an appropriate dewatering device (e.g., filter bags) in a vegetated upland area before it would be allowed to flow back towards the waterbody.

Mountain Valley would use temporary cofferdams from Portadam, Inc. (see appendix C). First, steel A-frame supports would be placed around the perimeter of the area to be isolated. These supports would be anchored to the streambed using instream bolts installed via a diver operated pneumatic hand-held hammer. Next, a waterproof membrane would be installed over the steel frame. Once the membrane is in place, water within the work area would be pumped through sediment filter bags to an upland dewatering structure. In order to reduce sedimentation, Mountain Valley would use a turbidity curtain along the waterbody bank adjacent to the dewatering structure. Mountain Valley would relocate, as practicable, aquatic species within the work area prior to dewatering. Additional information regarding the cofferdams is presented in section 4.3.

HDD Construction Method

An HDD involves drilling a hole under the waterbody (or other sensitive feature) and installing a pre-fabricated pipe segment through the hole. Mountain Valley is not proposing to use the HDD method, however, in section 4.3 we are recommending Mountain Valley cross the Pigg River via the HDD method. Equitrans proposes to use the HDD method at two locations: 1) the Monongahela River (along pipeline H-318); and 2) the South Fork Ten Mile Creek (along the H-316 pipeline).

The first step in an HDD is to drill a small-diameter pilot hole from one side of the crossing to the other using a drill rig. As the pilot hole progresses, segments of drill pipe are inserted into the hole to extend the length of the drill. The drill bit is steered and monitored throughout the process until the desired pilot hole has been completed. The pilot hole is then enlarged using several passes of successively larger reaming tools. Once reamed to a sufficient size, a pre-fabricated segment of pipe is attached to the drill string on the exit side of the hole and pulled back through the drill hole towards the drill rig. Depending on the substrate and length, drilling and pullback can last anywhere from a few days to a few weeks. Additional information regarding the HDD method is presented in section 4.3.

2.4.2.11 Wetland Crossings

Wetland crossings would be completed in accordance with the Mountain Valley and Equitrans Procedures, and other federal and state permits. For the MVP, about 183 wetlands would be crossed by the pipeline, and 520 wetlands would be crossed by other project components (including access roads). The EEP pipelines would cross a total of 17 wetlands. The wetlands that would be crossed are listed in appendix G and are discussed further in section 4.3.3.

The Applicants would typically use a 75-foot-wide construction right-of-way through wetlands unless site-specific approval for an increased right-of-way width is granted by the FERC and other jurisdictional agencies (see section 4.3.3). Mountain Valley has requested a right-of-way greater than 75 feet in wetlands at several specific locations as listed in appendix G. ATWS may be required on both sides of wetlands to stage construction equipment, fabricate the pipeline, and store materials. ATWS for wetland crossings would be located in upland areas a minimum of 50 feet from the wetland edge unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies (see section 4.3). The Applicants proposal to utilize extra workspace within 50 feet of waterbodies and wetlands at specific locations are listed in appendix D.

Clearing of vegetation in wetlands would be limited to trees and shrubs, which would be cut flush with the surface of the ground and removed from the wetland. Stump removal, topsoil segregation, and excavation would be limited to the area immediately over the trenchline. A limited amount of stump removal and grading may be conducted in other areas to ensure a safe working environment. During clearing, sediment barriers, such as silt fence and staked straw bales, would be installed and maintained adjacent to wetlands and within temporary extra workspaces as necessary to minimize sediment runoff.

Construction equipment working in wetlands would be limited to that essential for right-of-way clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the right-of-way. The method of pipeline construction used in wetlands would depend largely on the stability of the soils at the time of construction. Wetlands would be crossed by wet or dry open trench lay, or open ditch push-pull methods.

Where wetland soils are saturated and/or inundated, the pipeline may be installed using the push-pull technique, which involves stringing and welding the pipeline outside of the wetland and excavating the trench through the wetland using a backhoe supported by equipment mats.

The water that seeps into the trench is used to "float" the pipeline into place, aided by a winch and flotation devices attached to the pipe. After the pipeline is floated into place, the floats are removed, allowing the pipeline to sink into place. Pipe installed in saturated wetlands is typically coated with concrete or equipped with set-on weights to provide negative buoyancy. Mountain Valley has proposed to use aggregate-filled sacks to decrease buoyancy. After the pipeline sinks into position, trench breakers are installed where necessary to prevent the subsurface drainage of water out of the wetland. Then the wetland is backfilled and cleanup completed. Where topsoil has been segregated from subsoil, the subsoil is backfilled first followed by the topsoil. Topsoil is not segregated in saturated wetlands due to the unconsolidated nature of the soils. Equipment mats and timber riprap would be removed from wetlands following backfilling.

For the proposed projects, construction through unsaturated wetlands would be similar to dry upland methods, with one exception; only one travel lane would be used. Up to 1 foot of topsoil from the trench would be segregated where hydrologic conditions allow.

2.4.2.12 Road and Railroad Crossings

The MVP pipeline would cross 263 roads and 12 railroads. The EEP pipelines would cross 12 roads and 5 railroads. The pipelines would be installed at least 3 feet beneath all roads, and at least 10 feet below all railroads for uncased pipe (about 5.5 feet deep for cased pipe).

Construction across roads and railroads would be conducted in accordance with the permits obtained by the Applicants and applicable laws and regulations, including DOT safety standards. Traffic control measures would be coordinated with appropriate state and county transportation and road agencies. The Applicants have developed project-specific *Transportation Management Plans*, as more fully discussed in section 4.9 of this EIS.

According to a December 22, 2016 filing by the Norfolk Southern Railway Company (Norfolk Southern), the proposed MVP pipeline route would cross at least 2 active railroads and 6 rights-of-way managed by Norfolk Southern. Norfolk Southern requested that Mountain Valley's construction contractors be aware of and follow the Federal Railroad Administration safety-related requirements and procedures, and coordinate with Norfolk Southern when crossing their railroads. In a February 9, 2017 filing, Mountain Valley agreed to adhere to the applicable Federal Railroad Administration safety-related requirements when crossing railroad property.

All railroads would be crossed with a bore. In general, crossings of paved roads would also be bored, so not to disrupt traffic. Boring involves excavating a pit on each side of the road or railroad, placing the boring equipment in the pit, and then boring a hole under the road or railroad that is at least equal to the diameter of the pipe. Once the hole is bored, a pre-fabricated section of pipe is pushed through the borehole. At particularly long crossings, pipe sections may be welded onto the pipe string just before being pushed through. If a paved road is open-cut, any asphalt removed during a road crossing would be disposed of at an approved facility. Mountain Valley and Equitrans would not recycle used asphalt.

Most gravel, dirt, and grass roads would be crossed by the open-cut method. Traffic on roads would be maintained during construction by the use of steel plates or detours. At least one lane of the road being crossed would be kept open to traffic except for brief periods when it would be essential to close the road to install the pipeline. Road users would be notified via signage and flagmen. Most open-cut road crossings require only one or 2 days to complete. After pipeline installation, all open-cut road crossings would be restored to pre-construction conditions.

2.4.2.13 Residential Areas

Construction work areas would be within 50 feet of 118 residential structures for the MVP. Mountain Valley filed site-specific Residential Construction Plans, as discussed in section 4.8 of this EIS and provided in appendix H.

Measures that the Applicants would implement to minimize impacts on residences located within 50 feet of the construction right-of-way, include, but are not limited to:

- installing safety fence at the edge of the construction right-of-way for a distance of 100 feet on either side of the residence or business establishment;
- installing safety fence around all buildings;
- installing safety fence and temporary end caps on the pipeline at the end of each work day to prevent overnight access to the trench and pipeline;
- fencing the boundary of the construction work area to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area;
- leaving mature trees and landscaping intact within the construction work area unless the trees and landscaping interfere with the installation techniques or present unsafe working conditions;
- reducing temporary workspaces where possible;
- maintaining access, including putting steel plates over the trench;
- using "drag-line" or "stove-pipe" construction methods where feasible;
- ensuring piping is welded and installed as quickly as reasonably possible to minimize the amount of time a neighborhood is affected by construction;
- backfilling the trench as soon as possible after the pipe is installed; and
- completing final cleanup, grading, and installation of permanent erosion control devices within 10 days after backfilling the trench, weather permitting.

No residences appear to be within 50 feet of the construction rights-of-way for the EEP pipelines. There are four existing residences within the boundary of the newly proposed Redhook Compressor Station parcel. Equitrans stated that it has negotiated purchase agreements with all four of these property owners (see section 4.8).

2.4.2.14 Foreign Utilities

The proposed MVP pipeline route crosses about 319 existing buried pipelines and other foreign utilities (including fiber optic lines, telephone lines, power lines, sewer lines, water lines, etc.) The EEP pipelines would cross about 30 existing buried pipelines and other foreign utilities (see section 4.8).

In most cases, the Applicants would prefer to install their pipelines below existing pipelines and other foreign utilities. The Applicants would install their pipelines with at least 12 inches of clearance from any other underground utilities as required by DOT standards at 49 CFR 192.325. Larger spoil piles resulting from greater depth of excavation at the crossing of foreign utilities would be stored within ATWS at each crossing. Construction of those crossings would be monitored by the Applicants, and sometimes by representatives of the owner/operator of the other pipeline or utility. Appropriate safety measures would be implemented that meet the standards of the Occupational Safety and Health Administration. To ensure that existing pipelines and other foreign utilities are properly identified, and crossed without damage, the Applicants would:

- contact "One-Call" to locate existing known buried pipelines and other foreign utilities;
- locate existing buried pipelines using a hand-held magnetometer or by probing, as appropriate for the conditions encountered;
- scanning the edges of the right-of-way with passive inductive locating equipment;
- providing advance notice to the owner/operators of the foreign pipelines prior to construction, and allowing representatives to be present during work around their pipelines;
- not use mechanized excavation equipment within 3 feet of another buried foreign pipeline, with the excavations completed by hand shoveling;
- keep construction equipment and spoil piles off the centerline of the foreign pipeline;
- support the foreign pipeline for the length of the span exposed;
- inspect the foreign pipeline before and after the Applicants' pipelines are installed;
- maintain DOT minimum separation distances;
- follow the foreign pipeline operator's requirements; and
- keep a working combustible gas indicator on-site.

2.4.2.15 Agricultural Lands

The proposed MVP pipeline route would cross about 749 acres of agricultural lands, and the EEP pipelines combined would cross a total of about 36 acres of agricultural lands. Impacts and mitigation on prime farmland soils are discussed in section 4.2 of this EIS; while impacts and mitigation for agricultural land use are discussed in section 4.8.

Prior to construction, the Applicants would conduct surveys to identify and flag existing irrigation systems and drainage tiles. The pipeline would typically be installed below drain titles. During restoration, the Applicants would repair or replace any irrigation systems or drain tiles damaged during construction.

The pipelines would be buried deep enough to allow for 48 inches of cover in actively cultivated lands. A minimum of 12 inches of topsoil would be segregated from the full right-of-way in agricultural lands, in accordance with the FERC Plan and Equitrans' Plan. Where topsoil is less than 12 inches deep, the actual depth of the topsoil layer would be removed and segregated. If topsoil fill is necessary, it would be locally sourced to prevent invasive species. Other mitigation measures in agricultural lands would include relief from compaction and removal of rocks from topsoil. Where the MVP pipeline would cross organic farms, Mountain Valley has developed an *Organic Farm Protection Plan* (OFPP).

2.4.2.16 Rugged Topography

The MVP pipeline would cross 22.3 miles of slopes between 15 and 30 percent grade, and 75.4 miles of slopes greater than 30 percent. The EEP pipelines would cross 3.0 miles of slopes between 15 and 30 percent grade and 0.3 mile of slopes greater than 30 percent. The Applicants have developed construction methods for rugged terrain, to allow for the safe operation of equipment, and prevention of severe erosion.

In rugged terrain, temporary sediment barriers would be installed, including silt socks and reinforced "super" silt fence, to keep soils and rolling rocks within the construction right-of-way. Temporary slope breakers would be installed during grading, to divert water into off-right-of-way vegetated areas, through hay bales, or aggregate (all aggregate would be removed during removal of the temporary slope breaker). Temporary slope breakers would remain in place until permanent erosion controls were installed. Sand trench breakers would be installed in the trench to prevent the movement of water. Mountain Valley may also use trench drains to divert water away from the ditch. The drains would consist of perforated tile or pipe surrounded by stone or rock. The drains would extend to a vegetated area at the base of the steep slope, a wooded area off of the right-of-way, or a riprap pad placed at a low point near the edge of the right-of-way. EEP would adhere to PADEP's slope breaker requirements, which are more stringent than the FERC's Procedures.

In areas where the pipeline route crosses laterally along a slope, cut and fill grading, or "two-tone" construction techniques, may be used to create a relatively flat working surface. This would require expanded ATWS (see appendix D). Spoil piles, separated every 50 feet by temporary water bars, may be compacted by bulldozers, then covered by mulch.

Equipment on steep slopes would be suspended from a series of winch tractors. Pipe joints would be stockpiled at the top or bottom of a slope. A side-boom tractor suspended from a winch would carry the pipe up the hill one joint at a time. Joints would be welded together in the trench. The trench would be padded and backfilled by equipment tethered to the winch tractors. After backfilling, contours would be re-established and permanent slope breakers installed. Erosion control blankets would be placed on the slopes, or hydroseed would be sprayed, to provide stabilization for revegetation.

We received comments stating that steep ridge tops often form property boundaries and these boundaries could be affected by post-restoration changes in topography (i.e., steep ridgelines could be rounded off). Mountain Valley would document property markers, monuments, and/or fencing prior to construction and replace these items following restoration. Mountain Valley would work with landowners to resolve any impacts on property boundaries due to construction of the MVP.

2.4.2.17 Karst Terrain

The MVP would cross areas of karst geology in West Virginia and Virginia. Areas of karst terrain were identified between MPs 172 and 174 and MPs 191 to 239. Mountain Valley developed a *Karst Mitigation Plan* (see section 4.1 of this EIS). Key elements of the *Karst Mitigation Plan* include:

- deployment of a karst specialist to evaluate areas of potential karst prior to and during construction;
- completion of inspections to document any subsidence, rock collapse, sediment filling or other morphologies at identified karst features on a weekly basis;
- coordination with the appropriate state agencies for larger previously unidentified karst features or caves identified during construction; and
- monitoring during and post-construction for any subsidence or karst hazards.

No areas of karst terrain were identified along the EEP pipeline routes. Additional information regarding karst can be found in section 4.1.

2.4.2.18 Winter Construction

Mountain Valley developed a *Winter Construction Plan* and Equitrans developed a *Winterization Plan* to address specialized methods and procedures to protect resources during the winter season. The key elements of these plans include:

- use of special snow plowing equipment to prevent mixing of snow and underlying soil;
- clearing of snow from roads without blocking driveways or other access points;
- use of safety fencing around open trenches in areas used for snowmobiling, hiking, and similar activities;
- suspension of backfill and topsoil replacement if unfeasible due to frozen conditions;
- use of mulch and erosion control devices to stabilize topsoil and subsoil piles; and
- delaying final cleanup activities until soils have thawed.

2.4.3 Aboveground Facility Construction

Construction activities at the proposed compressor stations, M&R stations, interconnects, and tap sites would include access road construction; site clearing; grading; putting in foundations; erecting buildings; installing equipment such as compressors and metering facilities; restoration and laying gravel in the yards; and erecting security fencing. Initial work at the aboveground facilities would focus on excavations for reinforced concrete foundations. Subsurface friction piles may be required to support foundations. Forms would be set, rebar installed, and concrete poured and cured according to industry stations. Concrete batches would be tested. Backfill would be compacted.

Equipment and piping would be transported to the sites by truck and off-loaded by cranes and/or front-end loaders. The equipment and piping would then be placed on the foundations, leveled, and secured. Piping would be welded, and welds inspected using radiography, ultrasound, or other non-destructive examination methods. Aboveground piping would be painted. Piping would be hydrostatically tested prior to being put into service. Safety equipment and controls, including emergency shutdown, relief valves, gas and fire detection, and engine overspeed and vibration protection would be calibrated and tested. Pig launchers and receivers and MLVs would be installed.

2.4.4 Monitoring

2.4.4.1 Construction Monitoring and Quality Control

During construction, the Applicants would provide contractors with all project design documents, including environmental alignment sheets, and copies of all applicable federal, state, and local permits. Construction would be supervised by a company Chief Inspector (CI). At least one EI would be hired per spread, who would report to the CI, and whose duties would be consistent with Section II.B of the FERC Plan and Equitrans' Plan, including:

- the EI would be a full-time position, separate from other activity inspectors;
- the EI would be responsible for ensuring that the company complies with its construction and environmental mitigation plans, complies with all environmental conditions of the Commission Order, and complies with the environmental conditions of other relevant federal and state permits;
- the EI would have immediate "stop-work" authority for all activities, and would be empowered to take corrective actions to remedy instances of non-compliance; and
- the EI would conduct environmental training for company employees, maintain records, and write reports.

In section 5.2 of this EIS, we are including a recommendation (environmental condition 7) that the Applicants employ a team of EIs, with a list of explicit duties. We are also recommending that if the projects are authorized, the Commission Order should include a requirement (environmental condition 8) that the Applicants file with the FERC weekly status reports that address construction and restoration activities. These weekly reports would be available to the public on our eLibrary system.

Other regulatory agencies also may include terms and conditions or stipulations as part of their permits or approvals. While there would be jurisdictional differences between the FERC's and other agencies' conditions, the EI construction monitoring program would address all conditions placed on the project by all regulatory agencies.

The Applicants have agreed to fund a FERC third-party compliance monitoring program during the MVP and EEP construction phase. Under this program, a contractor is selected by, managed by, and reports solely to the FERC staff to provide environmental compliance monitoring services. The FERC Compliance Monitor would provide daily reports to the FERC Project Manager on compliance issues and make recommendations on how to deal with compliance issues and construction changes, should they arise. In addition to this program, FERC staff would also conduct periodic compliance inspections during all phases of construction and throughout restoration, as necessary.

2.4.4.2 Post-Approval Variance Review Process

The pipeline alignment and work areas identified in this EIS should be sufficient for construction and operation (including maintenance) of the projects. However, minor route realignments and other workspace refinements sometimes continue past the project planning phase and into the construction phase. These changes could involve minor route realignments, shifting or adding new extra workspaces or staging areas, adding additional access roads, or modifications to construction methods. We have developed a procedure for assessing impacts on those areas that have not been evaluated in this final EIS and for approving or denying their use following any Certificate issuance. In general, environmental surveys were conducted using a corridor (300-feet-wide) larger than that necessary to construct the facilities. In areas where access was previously denied, environmental surveys would be conducted, pending an approval by the Commission. The results of those environmental surveys would be filed with the FERC post-Order.

It is possible that newly requested workspaces may fall within the previously surveyed area. Minor modifications within the previously surveyed corridor that would not impact sensitive resources, and have landowner acceptance, could be reviewed by the third-party compliance monitor and could be approved in the field if deemed necessary and acceptable.

For larger or more complex variance requests, the FERC staff would take the lead on reviewing and making a final determination on the request. We have included a recommendation (environmental condition 5) in section 5.2 of this EIS that spells out the circumstance when the Applicants must file a formal variance request with the FERC for new route realignments and facility location changes.

For newly identified work areas outside the environmental survey corridor, the Applicants would have to document surveys for waterbodies and wetlands, biological resources, and cultural resources, and document approval of the survey reports by appropriate resource agencies. The Applicants would also need to identify any avoidance or minimization measures necessary and provide landowner approval.

Any variance activity by any of the Applicants (whether submitted through the third-party compliance monitoring program or directly to the FERC), environmental data filed to support a variance request, and subsequent FERC action would be part of the public record, and would be available through the FERC's eLibrary system, under the docket number for the respective project (CP16-10 or CP16-13).

2.4.4.3 Post-Construction Monitoring

The Applicants would conduct follow-up inspections and monitor disturbed areas for at least the first and second growing seasons, including until revegetation thresholds are met and temporary erosion control devices are removed. The Applicants would submit quarterly monitoring reports for at least 2 years following construction. Restoration is deemed complete when the density and cover of non-nuisance vegetation are similar in density and cover to adjacent, undisturbed areas.

The FERC staff would conduct post-construction restoration inspections to monitor for vegetation cover, invasive species, soil settling, soil compaction, excessively rocky soils, drainage problems, and erosion. Those inspections would continue until the problems are corrected and the right-of-way is stable and revegetated.

Other regulatory agencies also may include terms and conditions or stipulations related to post-construction monitoring as part of their permits or approvals.

We recognize that during and after construction, issues or complaints may develop that were not addressed during the environmental proceedings at the Commission, and it is important that landowners have an avenue to contact the Applicants' representatives. Should the Commission approve the MVP and the EEP, we are interested in ensuring that landowner issues and complaints received during and after construction are resolved in a timely and efficient manner. As such, we recommend in section 5.2 (in environmental condition 9) that Mountain Valley and Equitrans file detailed environmental complaint resolution procedures and identify related issues in their weekly status reports.

2.4.4.4 Monitoring of the Right-of-Way Grant for Federal Lands

Monitoring is an essential element of project implementation. If the BLM issues a Temporary Use Permit and a Right-of-Way Grant for the MVP, those authorizations would provide the terms and conditions for construction, operation, maintenance, and eventual termination of the facility on federal lands. As cooperating agencies with jurisdiction by law for activities that occur on lands they administer, the FS and the COE also have a responsibility to monitor implementation of the MVP mitigation measures to assure that the terms and conditions of the Right-of-Way Grant are carried out (40 CFR 1505.3) and that negative impacts from construction and operation of the pipeline are minimized to the extent possible. Appendix M of the POD contains the Environmental Compliance Management Plan that would be the primary guidance document between Mountain Valley, the FS, and the COE for adherence, documentation and management for compliance with the Right-of-Way Grant and all federal permits. The Environmental Compliance Management Plan describes the roles and responsibilities of FERC, Mountain Valley, FS, and COE; a comprehensive inspection and monitoring program; corrective procedures in the event of non-compliance; standard protocol for variance requests, exceptions and other deviations; communications; and reporting procedures. The FS would have an Authorized Officer, Project Manager, and Compliance Monitors to oversee all project activities on the Forest during pre-construction, construction and post-construction (including reclamation) phases to ensure compliance.

CEQ regulations (40 CFR 1505.2(c)) require that a monitoring and enforcement program be adopted for any project requirements adopted as part of the decision to implement the project. Many POD requirements that are a part of a BLM Right-of-Way Grant on federal lands are project design measures that reduce the environmental consequences of the project on-site. The FS and COE may also propose an off-site mitigation program. In addition to monitoring implementation of the Temporary Use Permit and the Right-of-Way Grant, the FS and COE also have a responsibility to monitor authorized actions, whether they are described in the POD or off-site mitigation measures included in FS and COE mitigation programs.

There are two types of monitoring associated with administering a Right-of-Way Grant. “Implementation monitoring” seeks to verify that the project was implemented according to the terms of the Right-of-Way Grant. Implementation monitoring is typically a checklist to verify that a project is implemented as planned and that requirements, terms, and conditions associated with the project are met. Many of these elements would also be addressed by the FERC in the construction monitoring and inspection processes. As needed for the proposed MVP, agency representatives of the FS and COE would also assure that agency priorities and stipulations are accomplished and agency obligations are fulfilled.

“Effectiveness monitoring” is the second type of monitoring. Effectiveness monitoring seeks to verify that the specific requirements in the POD and in the off-site mitigation plans accomplished the desired objective. While virtually every important aspect of the project is subject to implementation monitoring, effectiveness monitoring is typically done on a smaller subset of actions. Where the outcomes of an action are well known and likely to be accomplished merely through implementation, effectiveness monitoring may not be needed, or may only be done on a sample basis. For example, the effects of surfacing roads are well known and not in question, so little if any effectiveness monitoring would be required for this activity. Conversely, some POD requirements or mitigation projects may have less certain outcomes or may be associated with thresholds such as water temperature. In those cases, effectiveness monitoring would be appropriate to ensure that the desired outcome is achieved. This also provides a trigger for adaptive management if the proposed mitigation is not entirely effective. Effectiveness monitoring requires interpretation of land management plan direction and objectives. Therefore, most effectiveness monitoring on federal lands would be accomplished by the agency having jurisdiction over the land being monitored.

Reporting results is a key element of a monitoring plan. The monitoring plan developed by the FS and COE should include a reporting schedule and detailed criteria for judging completion and success of the actions being monitored. Implementation monitoring is typically deemed complete when the action being monitored has been completely implemented. Effectiveness monitoring would not be complete until the project objectives have been accomplished on NFS lands, and could occur in perpetuity, for the life of the project.

The POD developed by Mountain Valley is part of the Right-of-Way Grant application and includes extensive monitoring requirements to ensure that impacts from construction and operation of the project are minimized and that objectives of the federal agencies are accomplished. Ongoing discussion between Mountain Valley and the agencies are expected to result in revisions to the POD (see table 2.4-2).

2.5 CONSTRUCTION SCHEDULE AND WORKFORCE

Mountain Valley estimated that it would take up to 29 months to construct and reclaim its entire project. Construction of Mountain Valley’s pipeline would be completed using 11 construction spreads ranging in length from 22.1 miles to 39.2 miles (see table 2.5-1). In addition, there would be seven separate spreads for construction of the aboveground facilities. The peak construction workforce would be 7,865 people for the pipeline and 460 people for the aboveground facilities. Peak construction worker employment would average about 1,320 people per pipeline spread.

TABLE 2.5-1

Construction Spreads for the Mountain Valley Project and the Equitrans Expansion Project

Project/Spread Number	Start MP	End MP	Spread Length (miles)
Mountain Valley Project			
1	0	25.9	25.9
2	25.9	48.0	22.1
3	48.0	77.6	29.6
4	77.6	104.4	26.8
5	104.4	128.2	23.8
6	128.2	154.5	26.3
7	154.5	182.7	28.2
8 a/	182.7	205.9	23.2
9 a/	205.9	235.8	29.9
10	235.8	264.2	28.4
11	264.2	303.5	39.2
Equitrans Expansion Project			
H-316	0.0	3.0	3.0
H-318	0.0	4.3	4.3
Redhook Compressor Station, M-80, H-158, and H-305	N/A	N/A	N/A
Pratt Compressor Station Decommissioning	N/A	N/A	N/A
Webster Interconnect, H-319, Mobley Tap	0.0	<0.1	<0.1

N/A = Not Applicable
a/ = Spread includes work on FS lands.

Equitrans estimated that construction and restoration for its pipelines would take about one year, with an additional 4 months needed to put the new Redhook Compressor Station into service, and 8 more months to complete the demolition of the existing Pratt Compressor Station (2 years total construction period for the entire EEP). The total peak workforce for the EEP, including pipelines and aboveground facilities, would be about 400 people. Equitrans would have five construction spreads (see table 2.5-1).

Construction crews would typically work 10 hours per day, 6 days per week. Work would be conducted during daylight hours, except where the pipe would be installed using the HDD and bore methods, which require around-the-clock operations and typically last a few days to a few weeks. The rate of pipeline construction would average about 19 days per mile; although progress could be delayed by topography, weather, or other factors.

2.6 OPERATION AND MAINTENANCE

Mountain Valley and Equitrans would maintain and operate their pipelines and aboveground facilities in accordance with the DOT/PHMSA regulations at 49 CFR 192, the FERC regulations at 18 CFR 380.15, and the maintenance provisions found in the FERC Plan (the MVP), Equitrans' Plan, and both Applicants' Procedures. As required by 49 CFR 192.615, the Applicants would establish an Operation and Maintenance Plan and an Emergency Plan for each project that includes procedures to minimize the hazards in a natural gas pipeline emergency.

The Applicants would also maintain a liaison with the appropriate fire, police, and public officials as part of each Applicants' emergency operating procedures. Communications with these parties would include informational meetings and trainings, periodic emergency response drills and desktop exercises, and emergency contact phone numbers. Pipeline safety measures are outlined in section 4.12 of this EIS. Mountain Valley stated that it would hire 25 new permanent employees for operation and maintenance of the project facilities. These employees would be stationed at various locations along the pipeline or in Equitrans' headquarters.

No additional employees would be added to operate the EEP facilities. The proposed new Redhook Compressor Station would be remotely monitored from Equitrans' Waynesburg, Pennsylvania office. The pipelines, Mobley Tap, and Webster Interconnect would be operated, monitored, and maintained by existing Equitrans staff stationed at its Manning and Logansport offices in West Virginia.

2.6.1 Pipelines

The Applicants would maintain a 50-foot-wide permanent operational easement for their pipelines. In accordance with the FERC Plan and Equitrans' Plan, vegetation removal within the operational easement would not be done more frequently than every 3 years. To facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained annually in an herbaceous state. The Applicants would also selectively cut trees within 15 feet of the centerline in wetlands. In no case would routine vegetation maintenance occur between April 15 and August 1 of any year. Vegetation management is discussed further in section 4.4.

Besides vegetation maintenance, other operational activities on the pipeline right-of-way would include inspections and repairs. Periodic aerial and ground inspections may identify pipeline leaks, erosion or loss of vegetation cover on the right-of-way, and unauthorized encroachment. The cathodic protection system would also be inspected periodically to ensure that it is functioning properly. In addition, pigs are regularly sent through the pipeline to check for corrosion and irregularities in the pipe in accordance with DOT requirements.

In addition, the Applicants would install a supervisory control and data acquisition system, commonly referred to as SCADA, on each pipeline system, which would continuously monitor gas pressure and flow at specific locations along the pipeline. These systems would be continuously monitored for both projects from Equitrans' Gas Control headquarters in Pittsburgh, Pennsylvania. The systems would provide continuous information to the control center operators and have threshold and alarm values set such that warnings are provided to the operators if critical parameters are exceeded. According to Equitrans, a secondary gas control center is located in Jefferson Hills, Pennsylvania. Representatives from either gas control center would respond immediately to an incident. Primary permanent operational staff for the EEP would be located in Mannington, West Virginia, Logansport, West Virginia, and Waynesburg, Pennsylvania. These staff would conduct inspections, perform maintenance, and respond to safety and operational issues.

Mountain Valley and Equitrans would manage unauthorized off-road vehicle (ORV) and ATV use on their operational rights-of-way by adhering to Section VI of the FERC Plan and Equitrans' Plan, which includes measures such as signs, fences/gates, and slash, timber, and boulder barriers. In addition, Mountain Valley would adhere to FS requirements regarding ORV and ATV use on FS managed lands.

2.6.2 Aboveground Facilities

The Applicants would perform routine inspections of and maintain all equipment at aboveground facilities, including compressor stations, M&R stations, taps and interconnects, MLVs, and pig launchers and receivers. Routine maintenance checks would include calibration of equipment and instrumentation. Safety equipment, such as pressure relief devices and fire and gas detection systems, would be tested for proper operation. Corrective actions would be taken if problems are noted.

The aboveground facilities would be unmanned, with start/stop capabilities controlled from corporate headquarters. A telemetry system would notify operational personal at local offices and the gas control headquarters of the activation of safety systems or alarms. Maintenance personnel would be dispatched to investigate and take corrective actions.

2.7 FUTURE PLANS AND ABANDONMENT

Mountain Valley stated that it has no plans at this time to either expand or abandon the proposed MVP facilities. Currently, the MVP is fully subscribed at 2.0 Bcf/d; and the facilities were designed accordingly. However, in the future, if market conditions change, Mountain Valley may seek to expand or modify its facilities. For example, additional interconnections or taps may be proposed to provide natural gas to other LDCs, in keeping with the stated purpose of the MVP. For any future expansion, Mountain Valley would either have to file an amendment to its application in CP16-10-000, or file a new application.

The EEP facilities would transport up to about 0.4 Bcf/d of contracted firm capacity of natural gas. Because the EEP facilities have a design capacity of up to 0.6 Bcf/d, Equitrans will continue to search for customers for the unsubscribed capacity that remains. Equitrans would only seek to expand its facilities if it negotiates future contracts in excess of 0.6 Bcf/d of natural gas. Again, to handle any additional capacity, Equitrans would either have to file an amendment to its application in CP16-13-000, or file a new application requesting Commission approval of an expansion.

The Applicants stated that the expected useful lifespan of the projects would be about 50 years. While there is no termination date for a FERC natural gas Certificate, at the end of the 50-year period, the Applicants may need to repair, replace, or abandon facilities. Any of those actions would require permission from the Commission in response to new applications. Abandonment activities would require an application to the FERC under Section 7(b) of the NGA. Facilities could either be abandoned in place or by removal. Typically, the Commission would conduct a separate environmental review under NEPA for a new application. The public would have the opportunity to comment on these applications.

3.0 ALTERNATIVES

Introduction

In this section, we evaluate a range of reasonable alternatives, as required by NEPA (at 40 CFR 1502.14) and Commission po1icy. We also discuss other alternatives that were eliminated from detailed review because they were not reasonable or practicable. The alternatives may have been presented by the Applicants, cooperating and other governmental resource agencies, affected landowners, the public, and FERC staff. The range of alternative we evaluated include the no action alternative, system alternatives, pipeline route alternatives, route variations, and compressor station equipment alternatives.

Each of the cooperating agencies with obligations under NEPA can use this alternatives analysis as part of their decision making process. Individual agencies would ensure consistency with their own administrative procedures prior to accepting the conclusions in this EIS.

Public Comments

Prior to the issuance of our draft EIS, we received 240 comments for the MVP and 3 comments for the EEP, respectively, requesting that we evaluate alternatives. In response to the draft EIS issued September 16, 2016, we received 219 comments by the December 22, 2016 comment deadline about our alternatives analyses. In response to these comments, we requested that the Applicants provide additional environmental information to enable us to compare alternatives to the proposed action. In some cases, in response to stakeholder, agency, and FERC staff comments, and their own assessments, the Applicants revised their proposals. Our analysis of the Applicants' data and assessment of the alternatives can be found below.

Renewable Energy Alternatives

The Commission also received comments during scoping and regarding the draft EIS suggesting that electricity generated from solar panels, wind farms, and/or other renewable energy sources could eliminate the need for the MVP and the EEP. As stated previously, the MVP and the EEP are designed to move natural gas through pipelines from areas of production in the Appalachian Basin to customers, including LDCs and power plants, in the Northeast, Mid-Atlantic, and Southeastern United States. The generation of electricity from renewable energy sources is a reasonable alternative for a review of power generating facilities, and states or federal entities that are contemplating new fossil-fuel based power plants may indeed decide to consider alternate forms of energy for a comparison of overall impacts and benefits. However, authorizations related to how the markets will meet demands for electricity are not part of the application before the Commission and their consideration is outside the scope of this EIS. Therefore, because the purpose of the MVP and the EEP is to transport natural gas, and the generation of electricity from renewable energy sources or the gains realized from increased energy efficiency and conservation are not transportation alternatives, they cannot function as a substitute for the projects. These alternatives cannot meet the purpose for the projects and are not considered or evaluated further in this analysis.

Evaluation Process

The purpose of this evaluation is to determine whether an alternative would be preferable to the proposed action. We generally consider an alternative to be preferable to a proposed action using three evaluation criteria, as discussed in greater detail below. These criteria include:

1. the alternative meets the stated purpose of the project;
   - i.e., for the MVP, to alleviate some of the constraints on transporting natural gas production by adding infrastructure to transport lower-priced natural gas from the Appalachian Basin to industrial users and power generators in the Mid-Atlantic and Southeastern United States, as well as to LDCs;
   - i.e., for the EEP, to provide additional volumes of firm capacity of natural gas to be transported north-south on Equitrans' existing system. The creation of expansion capacity on Equitrans' system would allow shippers to transport natural gas produced in the Appalachian Basin to markets in the Northeast, Mid-Atlantic, and Southeastern United States, mainly through an interconnection with the MVP. The EEP would also interconnect with the existing systems of Texas Eastern; Dominion; and Columbia. End-users could include LDCs, industry, and electric power generators;
2. is technically and economically feasible and practical; and
3. offers a significant environmental advantage over a proposed action.

The first consideration for including an alternative in our analysis is whether or not it could satisfy the stated purpose of the project. An alternative that cannot achieve the purpose for the project cannot be considered as an acceptable replacement for the project. All of the alternatives considered here are able to meet the project purpose stated in section 1.0 of this EIS.

For further consideration, an alternative has to be technically and economically feasible. Technically practical alternatives, with exceptions, would generally require the use of common construction methods. An alternative that would require the use of a new, unique, or experimental construction method may not be technically practical because the required technology is not available or is unproven. Economically practical alternatives would result in an action that generally maintains the price competitive nature of the proposed action. Generally, we do not consider the cost of an alternative as a critical factor unless the added cost to design, permit, and construct the alternative would render the project economically impractical.

Determining if an alternative provides a significant environmental advantage requires a comparison of the impacts on each resource as well as an analysis of impacts on resources that are not common to the alternatives being considered. The determination must then balance the overall impacts and all other relevant considerations. In comparing the impact between resources (factors), we also considered the degree of impact anticipated on each resource. Ultimately, an alternative that results in equal or minor advantages in terms of environmental impact would not compel us to shift the impacts from the current set of landowners to a new set of landowners.

We considered a range of alternatives in light of each project's objectives, feasibility, and environmental consequences. Through environmental comparison and application of our professional judgment, each alternative is considered to a point where it becomes clear if the alternative could or could not meet the three evaluation criteria. To ensure a consistent environmental comparison and to normalize the comparison factors, we generally used desktop sources of information (e.g., publicly available data, aerial imagery) and assumed the same right-of-way widths and general workspace requirements. We evaluated data collected in the field if surveys were completed for both the proposed route and its corresponding alternative. Where appropriate, we also used site-specific information (e.g., detailed designs). Our environmental analysis and this evaluation considers quantitative data (e.g., counts, acreage, or mileage) and uses common comparative factors such as total length, amount of collocation, and land requirements. Where an alternative analysis involves a comparison of only a portion of the proposed route and not the entire proposed route, then the data comparison presented and analyses are limited to only the subject corresponding sections of the alternative route and the proposed route.

The existing Equitrans H-302 pipeline and the EEP would connect with the MVP at the Webster Interconnect and Mobley Tap in Wetzel County, West Virginia. Therefore, the alternatives considered below generally use that point as the MVP's originating location. According to Mountain Valley's FERC application, the shippers for the project requested that Transco Compressor Station 165 be the delivery point to meet the demands of the market. Transco Station 165 is the existing pooling point for Zone 5 on Transco's system and a gas trading hub for the Mid-Atlantic market. As such, the alternatives considered below generally use that point as the MVP's terminus.

Our evaluation also considers impacts on both the natural and human environments. The natural environment includes water resources and wetlands, vegetation and forested lands, farmland soils, and karst geology. The human environment includes landowners, residences, utilities, and industrial and commercial development near construction workspaces. In recognition of the competing interests and the different nature of impacts resulting from an alternative that sometimes exists (i.e., impacts on the natural environment versus impacts on the human environment), we also consider other factors that are relevant to a particular alternative or discount or eliminate factors that are not relevant or may have less weight or significance. In our alternatives analyses, we often have to weigh impacts on one kind of resource (i.e., habitat for a species) against another resource (i.e., residential construction).

In conducting a reasonable analysis, we considered environmental advantages and disadvantages, and focused the assessment on those alternatives that may minimize impacts on specific resources. In general, an alternative that is shorter in length has less impacts. For example, 1 mile of a 125-foot-wide construction corridor would impact about 15 acres. Other elements that may influence the selection of an alternative route could include the avoidance of historic properties or habitat for federally listed threatened or endangered species, avoidance of geological hazards, distances from residences, and lessening of forest clearing, or impacts on agricultural land and specialty crops. Some evaluation factors can be relatively more important on a project-specific basis in helping to serve as key decision criteria. Some of these factors for the MVP include forest and interior forest (see also sections 4.4 and 4.6), karst terrain (see section 4.1), and side slopes (see sections 2 and 4.1). Forest impacts are typically long-term, or permanent in the operational right-of-way, and interior forest provides habitat for certain species such as migratory birds. Karst terrain results in elevated connectivity between surface water and groundwater resources, and was the subject of numerous stakeholder and agency comments. Construction along side slopes can result in instability during construction, restoration, and operation, and as noted in section 4.1 could be a source of debris flows.

Below we evaluate the no action alternative (see section 3.1), alternative modes of natural gas transportation (see section 3.2), system alternatives (see section 3.3), route alternatives (see section 3.4), route variations (see section 3.5), and compressor station equipment alternatives (see section 3.6).

3.1 NO ACTION ALTERNATIVE

The CEQ regulations for implementing NEPA (at Part 1502.14(d)) requires the Commission to consider and evaluate the no action alternative. According to the CEQ,[1] in instances involving federal decisions on proposals for projects, no action would mean the proposed activity would not take place and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity. If the Commission selects the no action alternative, it may deny the application. In that case, the stated objectives of the project would not be achieved.

3.1.1 Mountain Valley Project

If the MVP is not authorized or not constructed, then there would be no impact on the environment along the proposed pipeline route in West Virginia and Virginia. Compared to the proposed action, the no action alternative would offer a significant environmental advantage. However, if the MVP is not authorized or not constructed, shippers may seek other means of transporting the proposed volumes of natural gas from production areas in the Appalachian Basin to markets in the Mid-Atlantic and Southeast United States. This may result in the expansion of existing natural gas transportation systems or the construction of new infrastructure; both of which may result in equal or greater environmental impacts in comparison to the MVP. Given consideration of these factors, we conclude that the no action alternative does not meet the stated purpose of the MVP and likely would not offer a significant environmental advantage if another similar project took its place.

3.1.2 Equitrans Expansion Project

If the EEP is not authorized or not constructed, then there would be no impact on the environment along the proposed pipeline routes in Pennsylvania and West Virginia. Compared to the proposed action, the no action alternative would offer a significant environmental advantage. However, if the EEP is not authorized or not constructed, shippers may seek other means of transporting the proposed volumes of natural gas from the Appalachian Basin production areas to markets in the Northeast, Mid-Atlantic, and Southeast United States; and Equitrans would lose some north-south system flexibility. The no action alternative may result

1 "NEPA's Forty Most Asked Questions."

in the expansion of existing systems or construction of new infrastructure to meet market demands, which may cause equal or greater environmental impacts in comparison to the EEP. Given consideration of these factors, we conclude that the no action alternative does not meet the stated purpose of the EEP and likely would not offer a significant environmental advantage if another similar project took its place.

3.2 ALTERNATIVE MODES OF NATURAL GAS TRANSPORTATION

Besides transportation of natural gas in underground steel pipelines, as proposed for both the MVP and the EEP, we considered alternative means of transportation, as suggested by stakeholders in comments on the MVP. These alternative means of transportation include using ships, trucks, and railroads to transport LNG.

3.2.1 LNG Vessels

LNG is natural gas that has been cooled to about -260 degrees Fahrenheit (°F), which turns the gas into a liquid. As a liquid, LNG is about 600 times more compact than its equivalent amount of gas vapors. Once liquefied, it can be stored in cryogenic containers and transported across oceans in specially designed ships. After receipt at an import terminal, the LNG can be warmed and vaporized back into a gaseous state and put into pipelines. LNG stored domestically in tanks is referred to as a "peak shaving plant," with natural gas usually sent to and from the plants via pipelines.

The closest LNG import/export terminal to the MVP is the Dominion Cove Point terminal in Calvert County, Maryland. Theoretically, LNG could be shipped out of Cove Point to potential MVP natural gas end users up and down the Atlantic coast. A new pipeline between where the MVP pipeline begins and the Cove Point terminal would be about 310 miles long. Also, the send out capacity of the Cove Point terminal is currently fully accounted for (Richmond Times-Dispatch, 2013). Therefore, to handle the additional volumes of the MVP (2 Bcf/d) the Cove Point terminal would have to be significantly expanded, with the requirement of adding significant additional infrastructure along with environmental impacts. Further, although the end users of the natural gas transported by the MVP are only generally described by Mountain Valley as LDCs, industry, and power generation companies located in the Mid-Atlantic, and Southeastern United States, the known delivery points (WB Interconnect, Transco Interconnect, and two Roanoke Gas Taps) are all located well inland inaccessible to cargo ships. Therefore, we do not consider the Cove Point LNG alternative to be technically and economically feasible and practical.

The only other existing LNG import terminal on the eastern seaboard is Kinder Morgan's Elba Island Terminal, in Georgia. For LNG to be received there, several things would need to occur. Import facilities would have to receive the additional volumes proposed by Mountain Valley (2 Bcf/d), delivered by LNG carriers from Cove Point if the natural gas originated in the natural gas production area of West Virginia-Pennsylvania. Then, existing pipelines would have to be expanded or new pipelines constructed to transport natural gas from the Elba Island terminal to Mountain Valley's customers, a minimum (straight line) distance of about 350 miles, with actual conceptual pipeline lengths likely far exceeding 350 miles. We conclude that transporting Mountain Valley's proposed volumes by LNG vessels would not provide a significant environmental advantage and is not technically feasible and practicable.

3.2.2 Truck Delivery

Another potential transportation alternative would involve using trucks to transport LNG on existing roadways. LNG in relatively small volumes is already transported via truck in many locations throughout the United States. Commercially available LNG tanker trucks have storage capacities ranging between 7,500 gallons and 16,000 gallons. To replace the MVP, new liquefaction facilities would have to be constructed in the area of natural gas production in West Virginia-Pennsylvania, and new regasification facilities would need to be constructed at the delivery points. The conversion of the MVP's contracted natural gas volume of 2.0 Bcf/d would yield a production of 23,865,200 gallons of LNG per day. Assuming a truck tanker capacity of 10,850 gallons, 2,201 trucks would be required to transport this volume of LNG per day. The trucks would have to travel over 300 miles on public highways from the area of natural gas production to the end users.

Assuming an average fuel economy of 6 miles per gallon for a tractor trailer (Oak Ridge National Laboratory, 2016) and a 600-mile-long round trip, each truck would consume an estimated 100 gallons of fuel per round trip (220,100 gallons of truck fuel per day) and each truck would also emit air pollutants. Further, the liquefaction and re-gasification facilities would also consume energy and/or fuel during their processes, also emitting air pollutants either directly on-site or indirectly via obtaining power from an off-site source.

The environmental impacts associated with the construction and operation of the new liquefaction and regasification facilities for this alternative would be substantial. Therefore, we do not consider the truck delivery alternative to provide a significant environmental advantage.

3.2.3 Railroad Delivery

LNG could also be transported by railroad tanker cars along existing tracks. In this case, again, new liquefaction facilities would need to be constructed in the production area, and new regasification facilities constructed at the delivery points. Assuming a rail car capacity of 30,680 gallons, 779 rail cars would be required to transport this volume of LNG per day.

Assuming an average fuel economy of 1 ton of cargo (i.e., LNG) moved 300 miles per 1 gallon of fuel consumed for a freight train (actual mileage estimate is 436 miles per 1 gallon of fuel; University of Connecticut, 2013) and a 600-mile-long round trip, each daily delivery of trains totaling 779 rail cars would consume an estimated 95,600 gallons of fuel and each train would also emit air pollutants. Further, the liquefaction and re-gasification facilities would also consume energy and/or fuel during their processes, also emitting air pollutants either directly on-site or indirectly via obtaining power from an off-site source.

The environmental impacts associated with the construction and operation of new liquefaction and regasification facilities would be substantial. Based on our review of aerial photography, other than the newly proposed Roanoke Gas Lafayette Tap (where an existing railroad is located near MP 235.7), there are no existing rail lines located near any of the MVP's other three proposed delivery points, with the closest existing railway located approximately 3.5 miles from Transco Station 165. Any new railway extension, if feasible, would require years to design, permit, and build and would come with its own set of environmental impacts. Therefore, we find the railroad delivery alternative would not provide a significant environmental advantage.

3.3 SYSTEM ALTERNATIVES

System alternatives to the proposed action would make use of existing or other proposed natural gas transmission systems/facilities to meet the stated purpose of the projects. Implementing a system alternative would make it unnecessary to construct all or part of the MVP and/or the EEP, although some modifications or additions to an existing transmission system/facility or other proposed transmission system/facility may be necessary.

Existing FERC-jurisdictional natural gas transportation systems in the MVP area include those operated by Texas Eastern, East Tennessee Natural Gas (East Tennessee), Columbia, and Transco. A separate proposal in the region currently being reviewed by the FERC is the inter-related Atlantic Coast Pipeline (ACP) and the Supply Header Pipeline projects. Existing FERC-jurisdictional natural gas transportation systems in the area near the EEP includes those operated by Texas Eastern, Columbia, and Dominion.

Existing pipeline systems and major interstate highways are depicted on figure 3.3-1 and figure 3.3-2 for the MVP and the EEP, respectively. We identified and evaluated several system alternatives as described below.

3.3.1 Existing Natural Gas Pipeline Systems

We evaluated existing pipeline system alternatives based on the economic and technical feasibility, the ability of the alternative to meet the MVP and the EEP stated purposes, and to examine potential environmental advantages of the system alternatives.

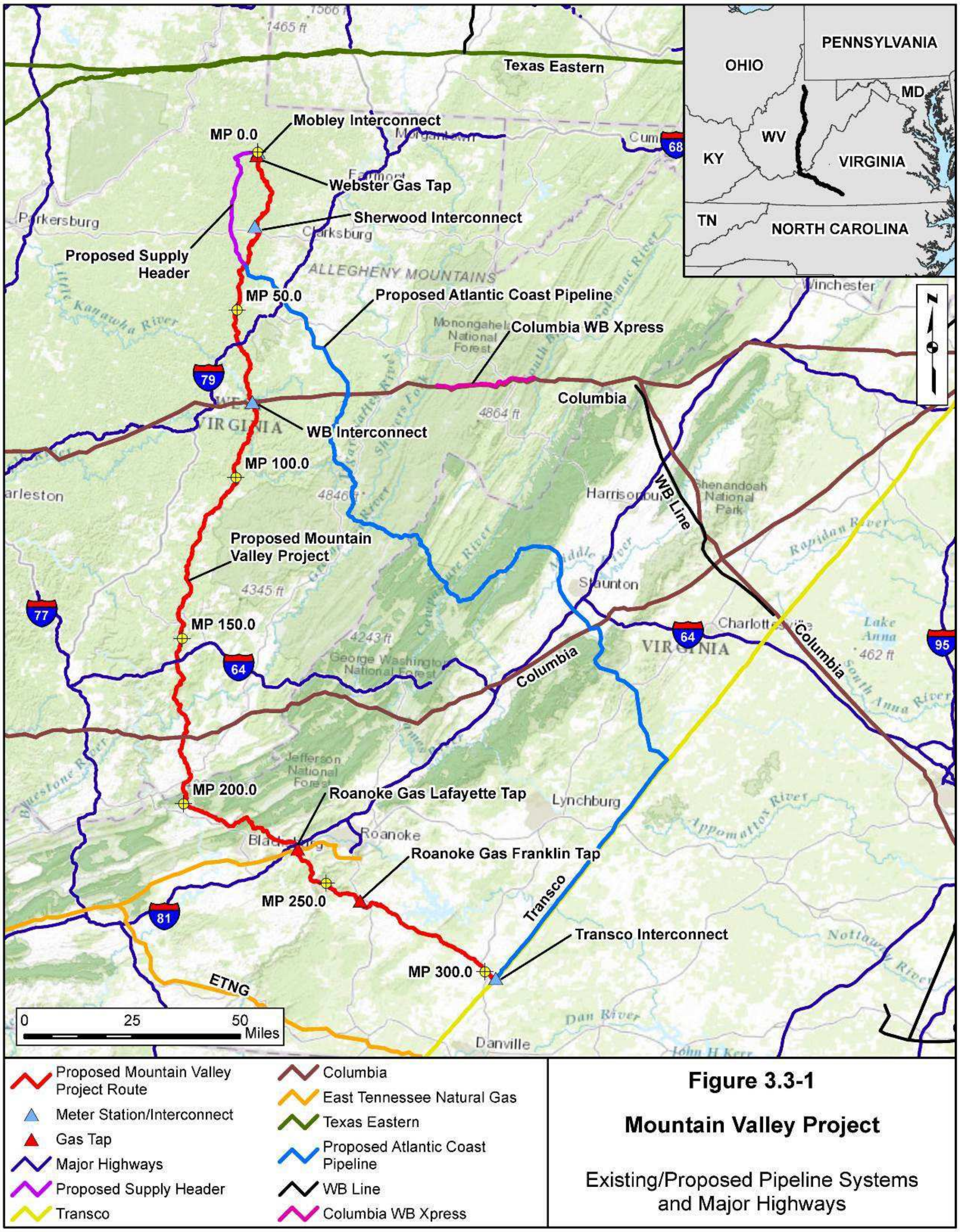
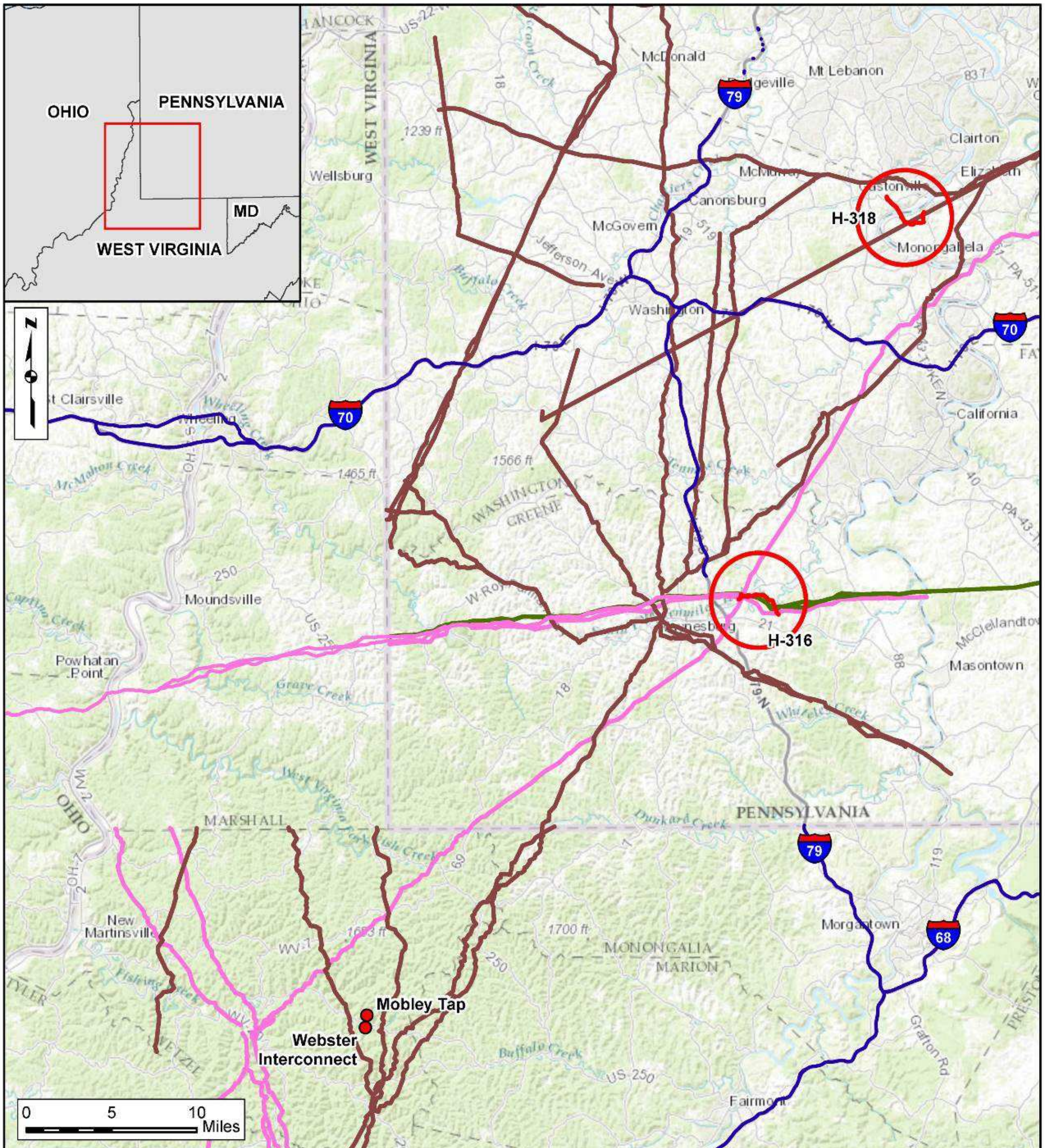


Figure 3.3-1

Mountain Valley Project

Existing/Proposed Pipeline Systems and Major Highways



- Proposed Equitrans Expansion Project Pipeline Routes
- Major Highways
- NiSource/Columbia Gas Pipeline
- Dominion Transmission, Inc. Pipeline
- Texas Eastern Transmission Pipeline

Figure 3.3-2

Equitrans Expansion Project

Existing Pipeline Systems
and Major Highways

3.3.1.1 Mountain Valley Project

Mountain Valley is a new company that does not own or operate existing pipeline systems capable of meeting the natural gas delivery capacity that the proposed pipeline project would provide to service downstream markets in the Mid-Atlantic and Southeast United States. However, there are other existing natural gas pipeline systems operating in the vicinity of the MVP area. These include FERC-jurisdictional interstate transportation pipelines operated by Texas Eastern, East Tennessee, Columbia, and Transco. Below we discuss those other systems as system alternatives to the MVP. There are no existing pipelines that transport natural gas in a northwest-to-southeast alignment from northern West Virginia to southern Virginia as proposed by Mountain Valley.

Texas Eastern Pipeline System Alternative

The Texas Eastern pipeline system consists of about 9,100 miles of various diameter pipelines, extending from Texas to New York, and crossing Pennsylvania. At Uniontown, Pennsylvania the Texas Eastern pipeline system west-to-east mainline splits, with the Penn-Jersey system to the north and the Capacity Restoration Project system to the south. The two pipelines rejoin in Lambertville, New Jersey. Texas Eastern's system can transport up to about 10.5 Bcf/d of natural gas. Given its current contracted capacity, the FERC staff has determined that Texas Eastern's existing mainline in Pennsylvania could not transport the additional Mountain Valley volumes of 2 Bcf/d without substantial looping and compression. In addition, the Texas Eastern mainline route does not go to Mountain Valley's proposed terminus at the Transco Station 165 in Pittsylvania County, Virginia nor does it connect (and is not located near) with MVP's proposed interconnections or taps. A new 435-mile-long pipeline extension from Lambertville, New Jersey to Martinsville, Virginia would have to be constructed to transport natural gas from the Texas Eastern mainline to the proposed Mountain Valley terminus. We estimate the pipeline alone, without necessary aboveground facilities, yards, additional temporary workspace and access roads would impact at least 6,500 acres of land, well more than the approximately 4,450 acres that would be affected by the MVP. Therefore, the Texas Eastern pipeline system alternative would not provide a significant environmental advantage and is not studied further.

Columbia System Pipeline Alternative

Columbia operates a 12,000-mile-long pipeline network in the Northeastern United States, crossing portions of Pennsylvania and West Virginia. The existing Columbia system extends south/southwest from the Mobley area to Clay County, West Virginia, where Columbia's WB Line begins and flows southeasterly into Virginia where it interconnects with the Transco system[2] (see figure 3.3-1).

The Columbia system has a capacity to transport an average of about 3 Bcf/d of natural gas. The FERC staff has determined that this capacity is currently contracted, as evidenced by

[2] Columbia's WB and VB lines, originally authorized by the Commission in 1949, consist of about 268 miles of 26-inch-diameter pipelines in West Virginia, Virginia, and Maryland.

Columbia's own proposal for expansion in the area as described in Docket CP16-38 (WB XPress Project). The addition of the MVP volumes of 2 Bcf/d would result in looping, new pipeline construction, and compression (estimated two to three new or modified compressor stations similar in scope as described in section 2 of this EIS and with air emissions as estimated in section 4.11 of this EIS) along the Columbia system. Since the Columbia system is not located close to either the Mobley Interconnect (MVP origin) or the Transco Interconnect (MVP terminus) and because the Columbia system does not generally proceed south/southeasterly in the area between those two points, then either Columbia would have to develop a new greenfield project similar to the MVP or loop its existing pipeline system with extensive greenfield laterals needed to access Mountain Valley's proposed receipt and delivery points. Regardless, either option would involve construction similar to or greater than what is proposed by Mountain Valley. Therefore, we do not consider the Columbia pipeline system to be a reasonable or practicable alternative to the MVP nor would it offer significant environmental advantage, and so that alternative is not studied further in this EIS.

East Tennessee Pipeline System Alternative

East Tennessee operates a system of 1,525 miles of various diameter pipelines between Georgia and North Carolina, through Virginia. The pipeline mainline extends from Nashville, Tennessee to Roanoke, Virginia. A 95-mile-long pipeline extension then connects with Transco near Eden, North Carolina. The existing East Tennessee system runs northeasterly and generally parallels I-81 in southeast Virginia where it intersects the proposed MVP route in the vicinity of Roanoke, Virginia.

East Tennessee has the capacity to transport almost 1.9 Bcf/d of natural gas. The FERC staff has determined that this capacity is currently contracted, and the addition of the MVP volumes of 2 Bcf/d would result in looping, new pipeline construction, and compression along the East Tennessee system. In order to be a reasonable alternative to the MVP, the East Tennessee system would have to be modified in several ways. First, a new pipeline would have to be built from the production area of West Virginia, where the MVP pipeline is proposed to begin, to the existing East Tennessee mainline near Roanoke, Virginia, a distance of about 263 miles. Second, if the MVP volumes of natural gas could then be transported through a loop of East Tennessee's 95-mile-long pipeline between Roanoke, Virginia and Eden, North Carolina, where it could interconnect with the Transco system, the gas could be sent through the Transco system to Mountain Valley's customers. It is about 20 miles from the terminus of the East Tennessee pipeline at Eden, North Carolina to the Transco Station 165 north of Martinsville, Virginia. The construction of the additional facilities for the East Tennessee pipeline system alternative would be nearly equal to the construction of the MVP. Therefore, the East Tennessee pipeline system would not provide a significant environmental advantage to the MVP, and so that alternative is not studied further in this EIS.

Later in this section, we discuss a major route alternative that would be adjacent to a portion of the existing East Tennessee system.

Transco Pipeline System Alternative

The existing Transco system consists of various diameter pipelines extending approximately 10,200 miles between Texas and New York, including through Virginia. The system has a peak design capacity of almost 11 Bcf/d of natural gas. Mountain Valley proposes to interconnect with Transco at Station 165 north of Martinsville, Virginia. However, the Transco system does not extend to the natural gas production areas of West Virginia. That is the purpose of the MVP pipeline. Therefore, use of the Transco pipeline system alternative would require construction of facilities similar to the MVP that would affect some of the same resources. Therefore, it would not provide a significant environmental advantage.

3.3.1.2 Equitrans Expansion Project

In order to be a viable system alternative, any existing pipeline system or combination would have to be capable of transporting up to 0.6 Bcf/d of natural gas, in addition to their currently contracted volumes, from the existing Equitrans pipeline system in Pennsylvania to the proposed Webster Interconnect in Wetzel County, West Virginia. According to our information, there are no existing pipeline systems in the vicinity that could handle the additional volumes proposed for the EEP.

There are other existing jurisdictional natural pipeline transportation systems in the vicinity of the EEP area. These existing systems include pipelines operated by Dominion, Columbia, and Texas Eastern. Below we discuss modifications to those existing systems (see figure 3.3-2) as alternatives to the EEP. We conclude, however, that none of the existing systems could accomplish the objective of the EEP as stated above in section 3.0. Therefore, we did not find any existing interstate natural gas transportation systems in the project area that can be reasonable or practicable alternatives to the EEP, or would provide significant environmental advantages over the proposed action.

Dominion Pipeline System Alternative

Dominion operates about 7,800 miles of various diameter pipelines in Ohio, West Virginia, Pennsylvania, New York, Maryland, and Virginia. One of Dominion’s 24-inch-diameter pipelines extends from West Virginia across Greene and Washington Counties, Pennsylvania, in the vicinity of both the proposed H-316 and H-318 pipelines. However, the FERC staff has determined that there is no capacity on the existing Dominion system that could handle the additional volumes of the EEP, without construction of new laterals and compression that would result in environmental impacts similar to or greater than those that would occur as proposed by EEP. For those reasons, we conclude that the Dominion system would not offer a significant environmental advantage over the proposed action, and it is not studied further.

Columbia Pipeline System Alternative

There is an existing 20-inch-diameter Columbia pipeline that runs southeast-to-northeast and another 24-inch-diamter existing Columbia pipeline that runs west-to-east in the vicinity of Equitrans’ proposed H-318 pipeline in Washington County, Pennsylvania. However, the Columbia pipelines do not currently connect the existing Applegate Gathering System with

Equitrans' existing H-148 pipeline. To make that connection would necessitate the construction of new pipelines by Columbia that would be similar to or greater in length than the proposed H-318 pipeline resulting in similar or greater environmental impacts. Therefore, we do not consider the Columbia system to offer a significant environmental advantage over the proposed H-318 pipeline, and it is not studied further.

The FERC staff has determined there is no current capacity on the Columbia system to transport the additional EEP volumes without the construction of new mainline, laterals, and compression that would result in similar or greater environmental impacts on the proposed action. For these reasons, we do not consider the Columbia system to offer a significant environmental advantage to the EEP, and it is not studied further.

Texas Eastern Pipeline System Alternative

A portion of the Texas Eastern system includes a pipeline that extends west-to-east from the Pennsylvania border to near the town of Hibbs, in Greene County, near Equitrans' proposed pipeline H-316 (see figure 3.3-2). The FERC staff has determined that Texas Eastern does not have the existing capacity or operating pressure to transport the volumes of the EEP. The Texas Eastern pipeline does not transport natural gas from north-to-south, to the beginning point of the MVP pipeline, which is the main purpose of the EEP. The EEP can accomplish its purpose with about 7 miles of pipeline and compression. At least 25 miles of additional pipeline and compression infrastructure would be required to modify the Texas Eastern system to serve as an alternative to the EEP, even if it were able to handle the capacity. Therefore, we conclude that the Texas Eastern pipeline system would not provide a significant environmental advantage to the EEP, and it was not studied further.

3.3.2 Proposed Natural Gas Pipeline Systems

We also considered modification of other proposed natural gas pipeline systems that potentially could be reconfigured in a manner to accommodate the transportation needs of both the MVP and the EEP. These are projects currently under study by the FERC, but have not yet been authorized.

3.3.2.1 Proposed Projects in the Vicinity of the Mountain Valley Project

There are three proposed FERC-jurisdictional natural gas pipeline projects in the vicinity of the MVP: the Supply Header Project, the ACP Project, and the WB Xpress Project.[3] These projects are discussed below.

[3] Stakeholders have mentioned a project called the Appalachian Connector, which was being considered by Williams. However, Williams has not yet come to the FERC with this proposal. The company webpage for this project (formerly at http:/co.williams.com/expansionprojects/Appalachian-connector) has been deleted, but previously disclosed that this project was in the preliminary stage without a route fully developed. We consider this proposal to be speculative and as such do not study it as an alternative to the MVP.

Supply Header and Atlantic Coast Pipeline Projects / Single Pipeline Alternative

On September 18, 2015, the FERC received an application pursuant to Section 7 of the NGA for the ACP Project (a joint venture comprised of subsidiaries of Dominion, Duke Energy, Piedmont Natural Gas, and AGL Resources), that as of issuance of the draft EIS in December 2016 would consist of approximately 604 miles of natural gas pipeline in West Virginia, Virginia, and North Carolina with the purpose of delivering natural gas from supply areas in West Virginia to markets in Virginia and North Carolina (Docket No. CP15-554-000). On this same date, the FERC also received a Section 7(c) certificate application from Dominion for the Supply Header Project (Docket No. CP-15-555-000), that would construct approximately 38 miles of natural gas pipeline and modified compression facilities in West Virginia and Pennsylvania with the purpose of transporting natural gas from supply areas in Ohio, Pennsylvania, and West Virginia to markets in Virginia and North Carolina via a direct connection with the ACP. On March 11, 2016 Dominion filed with the FERC an amendment to the ACP application. The FERC is analyzing both the ACP Project and the Supply Header Project together in one joint EIS (see figure 3.3-1). The draft EIS for the ACP-Supply Header Projects was issued on December 30, 2016; but the Commission has not made a decision about the projects.

We considered combining the natural gas volumes of the MVP with the Supply Header-ACP Projects, as one single pipeline system alternative to the MVP, along the route of the Supply Header and ACP.[4] This has also been referred to as the "one pipe-one route" alternative. This alternative route would follow the 38 miles of the Supply Header pipeline, then about 192 miles of the ACP route to its interconnect with Transco, at ACP Compressor Station 2 in Buckingham County, Virginia. The MVP volumes of natural gas could then in theory be backhauled in the Transco pipelines to Transco Station 165, which is the proposed terminus for the MVP pipeline. This would include approximately 65 miles of new pipeline from the ACP Transco Interconnect at ACP Compressor Station 2, following the existing Transco pipeline route south to Transco Station 165 in Pittsylvania County, Virginia, to reach the terminus of the MVP and access the delivery points requested by Mountain Valley's shippers. The combined length for the Supply Header-ACP Alternative would be approximately 353 miles (including 38 miles for the Supply Header pipeline, 192 miles of the ACP route to Compressor Station 2, 65 miles to Transco Station 165, approximately 38 miles [straight line distance] to the Roanoke Gas Franklin Tap, and then another estimated 20 miles [straight line distance] to the Roanoke Gas Lafayette Tap).

One of the benefits of the Supply Header-ACP Alternative would be the use of a single pipeline to transport all the natural gas volumes of MVP and ACP combined in a single right-of-way. This would essentially eliminate all environmental impacts on resources along the currently proposed MVP pipeline route. A single pipeline within a 125-foot-wide construction right-of-way along the Supply Header-ACP Alternative route (described above) would impact

[4] The "one pipe-one route" putting the ACP Project volumes through the MVP pipeline is not considered an alternative in this EIS, because the MVP pipeline route is the proposed action analyzed in this EIS and should not be viewed as an alternative to itself.

about 5,318 acres; excluding ATWS, yards, access roads, aboveground facilities, and other ancillary work areas. If the MVP pipeline and the ACP were built separately, along different routes, as currently proposed, the combined construction areas would disturb about 9,645 acres total.[5]

The Supply Header-ACP Alternative would require new pipeline construction and additional compression. The one pipe alternative following the Supply Header-ACP route could only serve Mountain Valley's customers through additional construction of multiple laterals to accommodate Mountain Valley's proposed receipt and delivery points. This conceptual alternative would have the disadvantages of bypassing the Mountain Valley's proposed Sherwood Meter (receipt) Station, the two delivery taps to Roanoke Gas, and relocating the WB Meter Station (delivery) to a different point, if that is feasible. Modifying the locations of Mountain Valley's receipt or delivery points may impact Mountain Valley's existing agreements with its customers and may limit the ability of contracted shippers to move natural gas to regional markets.

Next is the problem of combining the volumes of both the MVP and the Supply Header-ACP Projects, totaling about 3.44 Bcf/d, into a single pipeline. To move this amount of natural gas in a single 42-inch-diameter pipeline would require a total of about 873,015 hp of compression, at eight new stations along the single route. This would include two new greenfield compressor station sites and a total of 583,870 hp of new compression more than the current proposals by Mountain Valley and Dominion combined. We estimate that the additional compression could triple air quality impacts in comparison to the MVP and ACP considered individually.

Alternately, a larger diameter pipeline (up to about 48 inches in diameter) could be utilized. However, utilization of a larger diameter pipeline would require additional construction right-of-way width and additional temporary workspaces to accommodate construction issues such as heavier equipment, additional spoil storage, and safety considerations.

A 48-inch-diameter pipeline would encompass an area in the pipeline trench about 30 percent larger than a 42-inch pipeline, thereby displacing at least 30 percent more spoil. Although the Interstate Natural Gas Association of America (GIE, 1999) did not estimate construction right-of-way widths for a 48-inch-diameter pipeline, which is non-typical, they did estimate that an additional 15 feet of construction right-of-way width would be needed for a 40- to 42-inch-diameter pipeline compared to a 30- to 36-inch-diameter pipeline. This information is useful for comparative purposes. GIE (1999) further noted that other factors such as vertical slopes and side slopes, special erosion control requirements in steep areas, stockpiling of excess rock, typically would increase construction right-of-way widths further. These conditions would be found along the ACP route and we estimate that an additional 30 feet or more of extra construction right-of-way width would be needed for a theoretical 48-inch-diameter pipeline.

5 This calculation is based on a 303.5-mile-long MVP pipeline along its proposed route and a 333-mile-long ACP along its March 11, 2016 amended route in Virginia, using a 125-foot-wide construction right-of-way for each pipeline, without adding in ATWS and other facilities or work areas (such as access roads and yards).

Based on our review of data, aerial photography, and topography, we conclude that in many areas such as in Lewis and Upshur Counties, West Virginia and Augusta and Nelson Counties, Virginia, there is insufficient extra space available along the ridgelines of the ACP route to accommodate the additional construction right-of-way width and additional temporary workspaces that would be required for a larger diameter pipeline. Given consideration of these factors, we find the Supply Header-ACP Alternative is not technically feasible or practical.

WB XPress Pipeline Alternative

On December 30, 2015, Columbia filed a Section 7 NGA application with the FERC for its WB XPress Project in Docket No. CP16-38-000. This project would consist mainly of construction of about 29 miles of various diameter pipelines in multiple segments, modifications at seven existing compressor stations, and construction of two new compressor stations in West Virginia and Virginia (see figure 3.3-1). The longest single pipeline segment would be 25.4 miles of 26-inch-diameter replacement pipeline in Randolph and Pendleton Counties, West Virginia. Most of the new pipeline segments would be constructed adjacent to Columbia's existing pipelines. The project is fully contracted for 1.3 Bcf/d of natural gas capacity. The Commission issued an Environmental Assessment for the WB XPress Project on March 24, 2017, but no decision about the project has been made.

The WB XPress Project could obviously not take the MVP volumes of 2 Bcf/d without a major redesign. The location of the WB XPress pipeline does not match up with the receipt and delivery points for the MVP. The proposed MVP pipeline would run northwest-to-southeast, while the proposed WB XPress pipeline would follow Columbia's existing WB pipeline route west-to-east. To meet the stated purpose of the MVP, the WB XPress pipeline alternative would require the construction of significant lengths of new pipelines. Since the WB XPress system is not close to either the Mobley Interconnect (MVP origin) or the Transco Interconnect (MVP terminus) and because the WB XPress system does not generally proceed south/southeasterly in the area between those two points, then either WB XPress would have to develop a new greenfield project similar to the MVP or loop its existing sister company Columbia pipeline system with extensive greenfield laterals needed to access Mountain Valley's proposed receipt and delivery points. Regardless, either option would involve construction disturbance similar to or greater than what is proposed by Mountain Valley. For these reasons, we conclude that the WB XPress pipeline alternative would not offer a significant environmental advantage relative to the MVP.

3.3.2.2 Proposed Projects in the Vicinity of the Equitrans Expansion Project

There are no proposed natural gas transmission pipeline projects in the immediate vicinity of the EEP that would allow for the proposed interconnections with the MVP or comparable existing interconnections on the southern portion of the Equitrans system.

3.4 ROUTE ALTERNATIVES

Early in the development of the MVP, Mountain Valley considered a pipeline route that was largely collocated with an existing powerline, as described further below. Upon more detailed route evaluation and after the determination of the presence of significant side slope conditions along the powerline right-of-way as well as other constraints such as residential subdivisions, Mountain Valley subsequently developed a different pipeline route that is similar to the current proposed route. During the course of the pre-filing process, Mountain Valley adopted at least 11 route revisions into the MVP to further minimize environmental impacts. Additionally, Mountain Valley incorporated at least 571 minor route variations into the MVP during initial route development to avoid and/or minimize impacts on specific resources at the request of landowners and stakeholders. Our draft EIS evaluated route alternatives in comparison to the proposed route filed with Mountain Valley's application to the FERC in October 2015. Mountain Valley continued to evaluate route alternatives, route variations, and minor route variations after issuance of the draft EIS, and in some cases incorporated changes into the proposed route, as discussed further below.

We evaluated route alternatives and variations as compared to Mountain Valley's filed proposed route to determine whether their implementation would be preferable to the proposed corresponding action. We have defined major route alternatives as being greater than 50 miles in length; these can deviate from the proposed route by a significant distance. Route variations (see section 3.5, below) are less than 50 miles in length and typically deviate from the proposed route to a lesser degree than a major route alternative. Such variations are often designed to avoid environmental resources or engineering constraints, typically remain within the same general area as the proposed route; minor route variations are typically site-specific and may allow for avoidance of certain localized features such as a home or wetland.

Our assessment of the environmental consequences of the project revisions already incorporated by the Applicants into their proposed routes prior to and after issuance of the draft EIS are included as part of our environmental analysis of the proposed projects in section 4.0 and are generally not repeated here. However, in some cases, based on comments received and/or our own assessments, we considered whether the originally planned routing was preferable to that eventually proposed. Such cases are included in our evaluation of alternatives below.

3.4.1 Major Alternative Route Concepts Not Evaluated in Detail

3.4.1.1 Mountain Valley Project

We considered one major alternative concept for the MVP pipeline route: a pipeline routing alternative that would be collocated with roadways. This alternative concept is not evaluated in detail below due to the associated construction challenges, logistical constraints, and environmental impacts which we determined render it technically infeasible and/or as not providing a significant environmentally advantage compared to the proposed action. This concept is briefly discussed below.

Highway Collocation Alternative

Stakeholders during scoping suggested that the MVP pipeline could reduce impacts on private landowners if it followed public roads or highways for its entire route. Mountain Valley stated that its proposed pipeline route did not follow highways in general because most major roads trend either north-south or east-west, making it difficult to connect the proposed starting point in the production area of northern West Virginia with the Mountain Valley terminus at Transco Station 165 in Virginia. Further, certain federal and state restrictions have been established for utilities along the rights-of-way of access-controlled freeways. For example, the Federal Highway Administration (FHWA) of the DOT has historically discouraged installation of utilities within medians and rights-of-way of access-controlled highways. However, FHWA policy has been revised recently, and now permits states to determine if utility facilities can be placed within these rights-of-way (FHWA, 2014). In West Virginia, the West Virginia Department of Transportation (WVDOT) has established a policy that utilities, except for telecommunications facilities, cannot longitudinally cross controlled access highway rights-of-way (WVDOT, 2007). Similarly, in Virginia, the Virginia Department of Transportation (VADOT) has instituted policies that prohibit the longitudinal installation of utilities within controlled access highway rights-of-way except in strictly defined situations that would likely not apply to natural gas pipelines (i.e., parallel installations which do not involve tree removal or severe tree trimming) (VADOT, 2011).

While there are no federal restrictions for placement of natural gas pipelines adjacent to, but outside of, the right-of-way, the highway alternative route would likely present numerous and substantive construction challenges, including traversing roadway overpasses and underpasses, large interchanges, elevated sections of roadway including bridges, areas congested with development and homes, and narrow valleys where the most suitable terrain (i.e., flat) is already partially or fully encumbered by the roadway.

Nevertheless, we asked Mountain Valley to explore a route alternative that followed highways. Mountain Valley developed a conceptual alternative route following interstate highways where feasible due to their generally wider rights-of-way corridors and medians that would start at the Webster Interconnect in Wetzel County, West Virginia following U.S Highway 250 and head generally southeast, following U.S. Highway 19, Interstate 79, Interstate 77, U.S. Highway 58, and U.S. Highway 29 to Mountain Valley's proposed terminus at the Transco Station 165 in Pittsylvania County, Virginia (see figure 3.4.1-1).

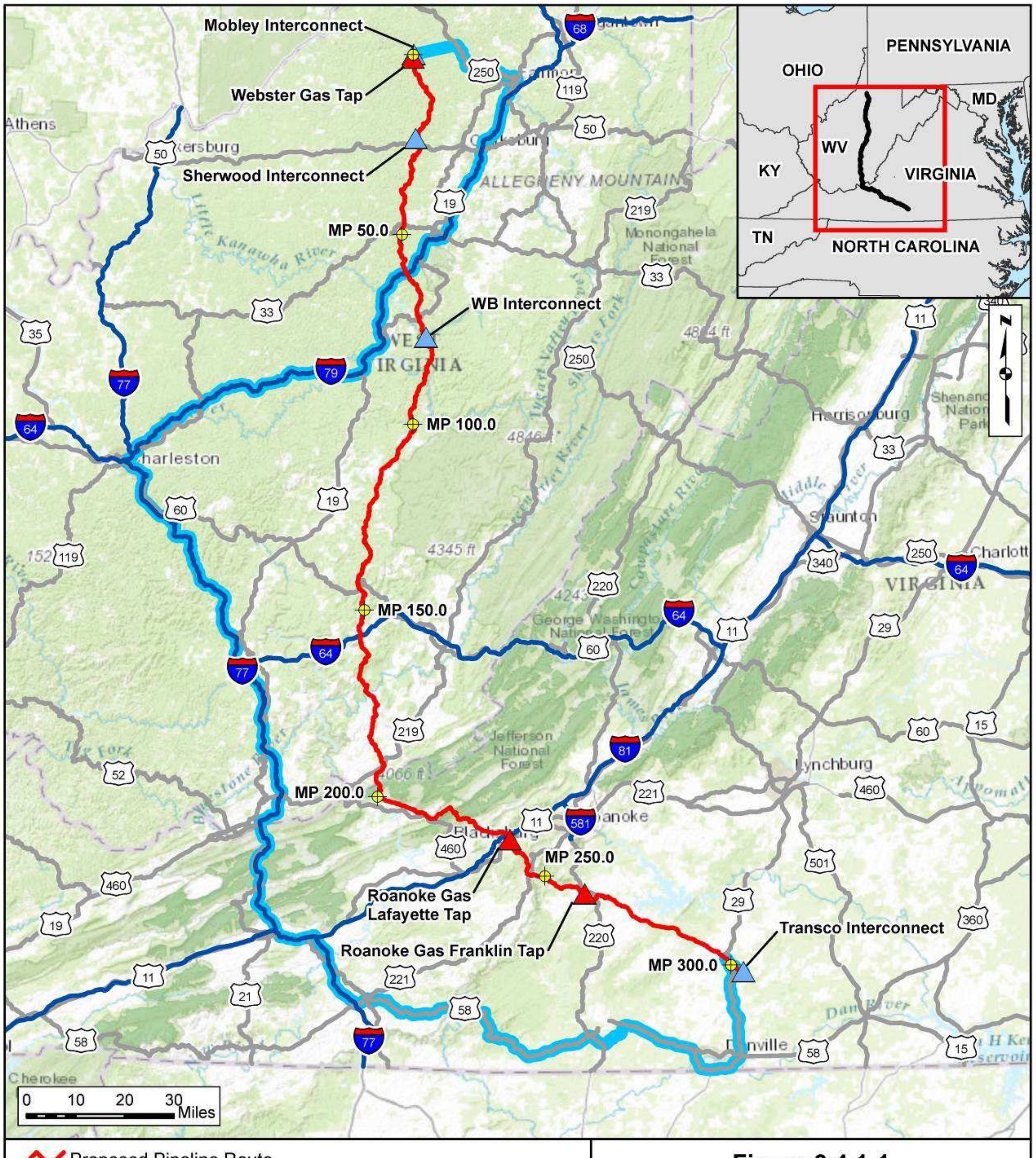


Figure 3.4.1-1

Mountain Valley Project

Highway Collocation Alternative

The highway alternative route would be over 95 percent collocated with existing highways compared to only about 7 percent[6] for the proposed route. However, the highway alternative route would be about 446 miles long and affect about 6,751 acres, in comparison to the 303.5 mile long proposed MVP pipeline route that would affect about 4,556 acres. The highway alternative would cross 2,144 parcels, including 21 miles of NFS lands, while the proposed MVP pipeline route would cross 1,334 parcels, and 3.5 miles of the Jefferson National Forest. The construction right-of-way for the highway alternative would be within 50 feet of 255 residences, while the proposed route would be near 66 residences. The highway alternative route would cross 199 perennial waterbodies, while the proposed route would cross 95. About 209 miles of the highway alternative route would cross side slopes and 351 miles would have landslide potential, while about 158 miles of the proposed route would cross side slopes with 226 miles of high landslide potential.[7] Based on the above, it is clear that the highway alternative does not provide a significant environmental advantage and is not considered further.

3.4.1.2 Equitrans Expansion Project

Because the EEP consists of multiple short pipeline segments, we did not identify conceptual major route alternatives. Below, we discuss smaller scale route variations as alternatives to the individual pipeline segments proposed by Equitrans (see section 3.5.2).

3.4.2 Major Route Alternatives

3.4.2.1 Mountain Valley Project

We evaluated four major route alternatives to the MVP proposed pipeline route or major portions (i.e., exceeding 50 miles in length) of the routes (see figure 3.4.2-1): Alternative 1, Hybrid 1A and Hybrid 1B Alternatives, and the Northern Pipeline – ACP Collocation Alternative. These alternatives included the potential for increased collocation of the proposed pipeline project with existing powerlines, existing pipelines, or other proposed pipelines thereby generally reducing impacts overall (such as to forest interiors) and potentially eliminating new corridors in greenfield areas. Alternative 1 would be located adjacent to an existing powerline for 101 miles (31 percent). The Hybrid 1A and Hybrid 1B Alternatives would be substantially collocated with existing powerlines and involve combining components of Alterative 1 with components of the proposed route. The Northern Pipeline Alternative – ACP Collocation major route alternative would be generally be located adjacent to the proposed ACP route.

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6 Collocation, for the purposes of this alternatives section and analysis, is defined as the proposed route abutting or adjacent to a major linear corridor such as a pipeline or electric transmission line. Note that the extent of collocation reported in this section (7 percent) may differ from data (e.g., 29 percent) presented elsewhere in this EIS, where minor features (such as field roads, trails, local service overhead powerlines, and telephone lines) may also be included.

7 See table RR10-5 filed by Mountain Valley with the FERC on January 27, 2016.

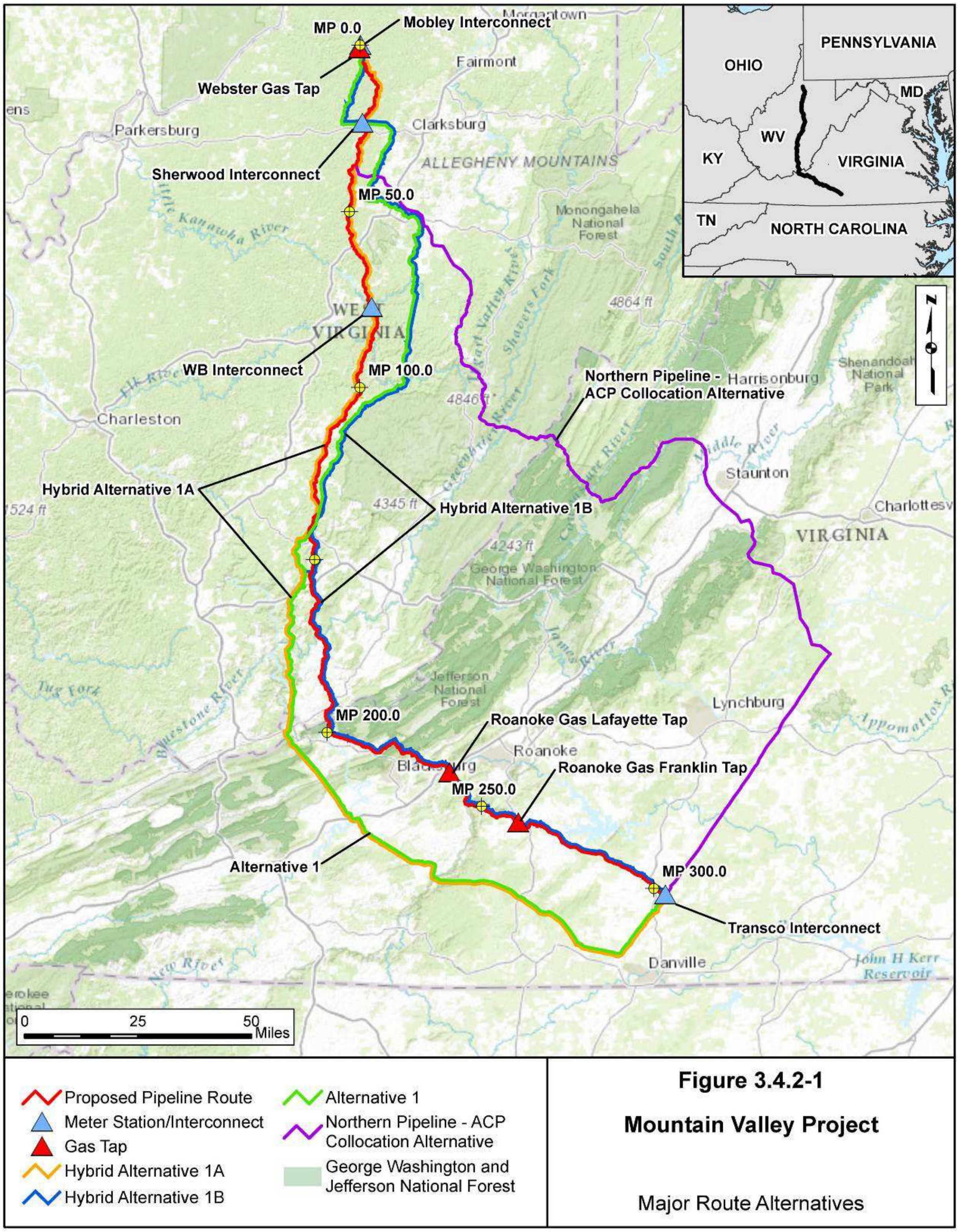


Figure 3.4.2-1

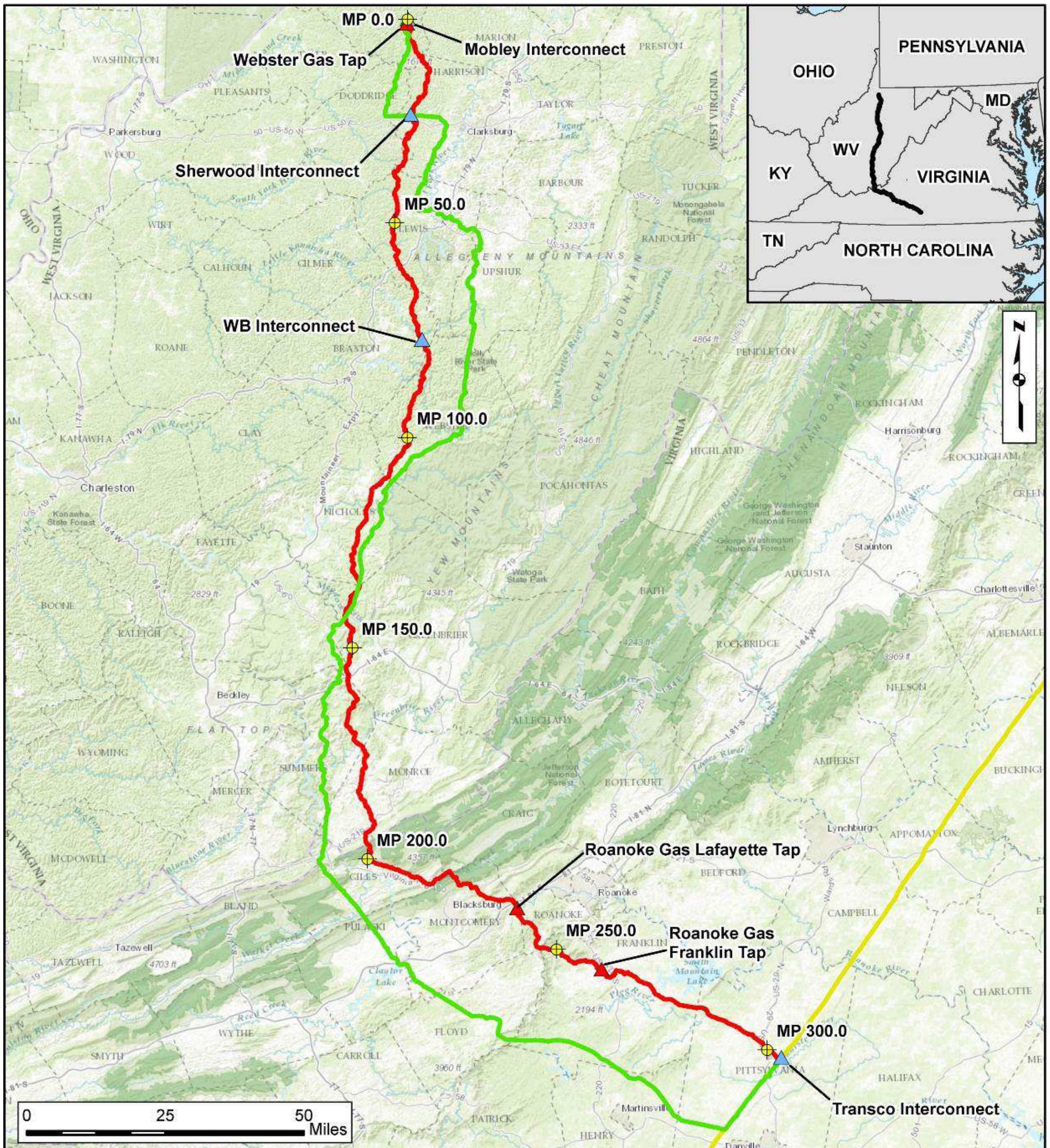
Mountain Valley Project

Major Route Alternatives

Alternative 1

As with the proposed route, Alternative 1 would begin at the proposed Webster Interconnect in Wetzel County, West Virginia and end at the Transco Station 165 in Pittsylvania County, Virginia. Alternative 1 (see figure 3.4.2-2) was considered to maximize collocation with existing rights-of-way. Alternative 1 would be collocated primarily with existing electric transmission lines for approximately 101 miles, or about 31 percent of its total length. The pipeline could be installed as close as 25 feet away from powerline infrastructure, with temporary workspace located even closer, but other configurations would also be required based on soil type and working conditions where the pipeline would be located much further away. For comparison, the proposed route would be collocated with existing rights-of-way for 29 miles, or about 10 percent of its total length. A comparative analysis of environmental impacts of the proposed route and Alternative 1 is presented in table 3.4.2-1.

Alternative 1 crosses 1.9 miles less NFS lands, and less FS-designated old growth forest, roadless areas, and semi-primitive areas, and would impact less interior forest in comparison to the proposed route. However, Alternative 1 is 20 miles longer, potentially disturbing 336 more acres, and 90 more parcels. The alternative crosses approximately 1,924 feet more of wetlands and 38 more perennial waterbodies compared to the proposed route. Alternative 1 also crosses the New River twice, as well as Radford University Conservancy property, all of which would be avoided by the proposed MVP pipeline route. Additionally, Alternative 1 crosses about 43 more miles of steep slopes, 7 more miles of side slopes, and 14 more miles of karst terrain. Given consideration of these factors, we conclude that Alternative 1 does not offer a significant environmental advantage when compared to the proposed route.



Proposed Pipeline Route
Alternative 1
Gas Tap
Meter Station/Interconnect
Existing Transco Pipeline

Figure 3.4.2-2

Mountain Valley Project

Alternative 1

TABLE 3.4.2-1

Comparison of Route Alternative 1 and the Proposed Route

Feature	Route Alternative 1	Proposed Route
General		
Total length (miles)	323.8	303.4
Length adjacent to existing right-of-way (miles)	101.0	29.4
Land disturbed within construction right-of-way (acres) a/	4,892	4,556
Federal Lands and Federally Managed Areas		
National Forest System lands crossed (miles)	1.6	3.5
National Forest Wilderness Areas crossed (miles)	0.0	0.0
Appalachian National Scenic Trail crossings (number)	1	1
Blue Ridge Parkway crossings (number)	1	1
FS-designated old growth forest crossed (feet)	0	1,710
FS-designated old growth forest affected by construction (acres)	0	4.9
FS-designated trails crossed (number)	15	2
FS-designated inventoried roadless areas crossed (feet)	0	5,030
FS-designated inventoried semi-primitive areas crossed (feet)	8,660	14,170
NRHP designated or eligible historic districts crossed (miles)	5.0	10.0
Human Environment		
Populated areas within 0.5 mile (number) b/	11	8
Landowner parcels crossed (number)	1,424 c/	1,334
Residences within 50 feet of construction workspace (number)	65	66
Resources		
Forested land crossed (miles)	237.6	248.7
Forested land affected during construction (acres)	3,608.7	3,771.9
Forested land affected during operation (acres)	1,441.2	1,507.1
Interior forest crossed (acres)	1,565.2	2,463.6
Wetlands crossed (feet) d/	5,525	3,601
Forested wetlands crossed (feet) d/	1,657	1,721
Forested wetlands affected by construction (acres)	2.9	3.0
Forested wetlands affected by operation (acres)	1.9	2.0
Perennial waterbody crossings (number) d/	133	95
Major (>100 feet) waterbodies crossed	7	5
New River crossings (number)	2	0
Shallow bedrock crossed (miles)	217.3	216.4
Steep slope (>20 percent) crossed (miles)	171.4	128.6
Side slope crossed (miles)	165.1	158.2
Landslide potential crossed (miles)	232.2	225.6
Karst area crossed (miles)	56.2	41.7

a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ Estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of Proposed Route.
d/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

Hybrid 1A and Hybrid 1B Alternatives

Based on stakeholder comments that we received on the draft EIS, we evaluated the potential for hybridizing Alternative 1 with the proposed route in two ways: the northern half of the proposed route combined with the southern half of Alternative 1 (Hybrid 1A) and the northern half of Alternative 1 combined with the southern half of the proposed route (Hybrid 1B). The purpose of the analyses was to determine if utilizing major components of Alternative 1 in combination with major components with the proposed route could increase collocation, decrease environmental impacts, and substantially reduce constructability concerns about side slope construction associated with Alternative 1 (see figure 3.4.2-3).

Hybrid 1A

Hybrid 1A would follow the proposed route from its origin to about MP 135, where it would then switch over to the route for Alternative 1 and then proceed to the project terminus (see figure 3.4.2-3). Hybrid 1A south of MP 135 would be substantially collocated with various overhead electric transmission lines. Hybrid 1A would cross many of the same features as the proposed route such as the ANST, Blue Ridge Parkway (BRP), and the Jefferson National Forest, but would cross them in a different location and in a different setting (e.g., adjacent to an existing powerline).

Hybrid 1A would have certain environmental advantages over the proposed route such as avoiding the Slussers Chapel Conservation Site and known karst features, and crossing 1.8 miles less of the Jefferson National Forest, 68 less springs and wells, 11.3 miles less of forested lands, and about 5 miles less of areas with landslide potential (see table 3.4.2-2). Hybrid 1A would cross one Historic District, while the comparable portion of the proposed route would cross five Historic Districts. In addition, Hybrid 1A would be more collocated with existing corridors by almost 52 miles, thereby reducing greenfield construction.

However, Hybrid 1A would also have some environmental disadvantages compared to the proposed route, including increased length by over 6 miles, thereby increasing the area of overall project disturbance by at least 138 acres, affecting 28 more landowners, crossing 22 more perennial streams, and crossing two more major waterbodies, including 2 crossings of the New River. Further, Hybrid 1A would cross about 0.4 more miles of wetlands and affect about 335 more acres of agricultural land. Finally, Hybrid 1A would cross 12.2 more miles of steep slopes and 19 more miles of side slopes compared to the proposed route, presenting substantially more obstacles to safe construction, increasing extra workspace requirements, and potentially affecting worksite stability during construction and after restoration.

Overall, land requirements and resource impacts associated with the Hybrid 1A alternative are not significantly different than the corresponding proposed route. In balancing the factors evaluated, we find both advantages and disadvantages to the alternative compared with proposed route. Consequently, we are not compelled to shift the impacts from the current set of landowners to a new set of landowners. Therefore, we determined that the Hybrid 1A alternative does not offer a significant environmental advantage when compared to the proposed route.

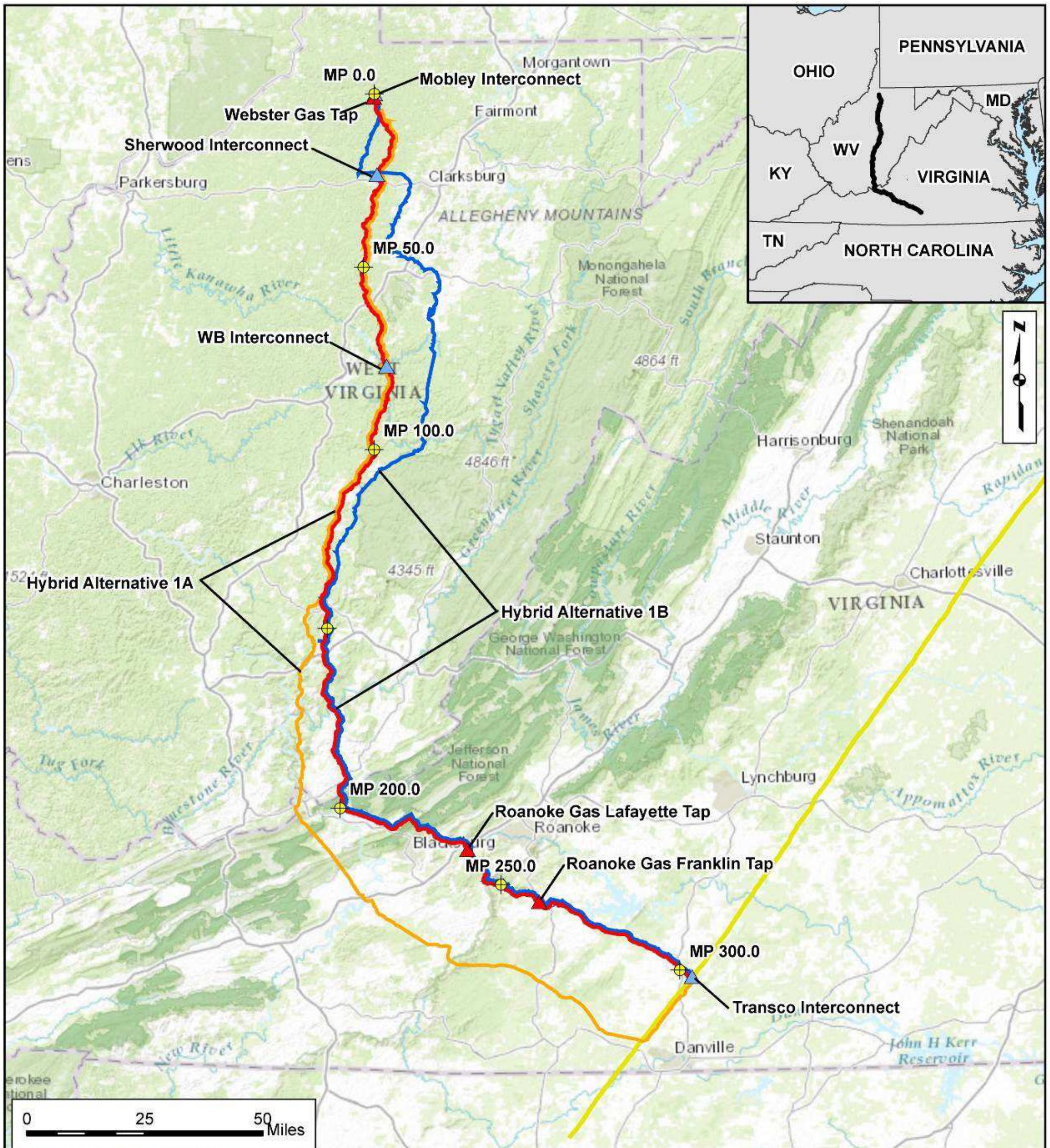


Figure 3.4.2-3

Mountain Valley Project

Hybrid 1A and Hybrid 1B Alternatives

TABLE 3.4.2-2

Comparison of Hybrid Alternative 1A, Hybrid Alternative 1B, and the Proposed Route (April 2016)

Feature	Hybrid Alternative 1A	Hybrid Alternative 1B	Proposed Route
General			
Total length (miles)	309.7	318.0	303.4
Length adjacent to existing right-of-way (miles)	81.3	86.1	29.4
Land disturbed within construction right-of-way (acres) a/	4,687.8	4,814.9	4,556
Land disturbed within operation right-of-way (acres) a/	1,876.0	1,926.9	1,838.8
Federal/State Lands and Federally/State Managed Areas			
VADCR Slussers Chapel Conservation Site crossed (miles)	0.0	3.0	2.4
National Forest System lands crossed (miles)	1.6	3.4	3.4
National Forest Wilderness Areas crossed (miles)	0	0	0
Appalachian National Scenic Trail crossings (number)	1	1	1
Blue Ridge Parkway crossings (number)	1	1	1
NRHP designated or eligible historic districts crossed (number)	1	5	5
Human Environment			
Populated areas within 0.5 mile (number) b/	12	15	8
Landowner parcels crossed (number)	1,362 c/	11,398 c/	1,334
Residences within 50 feet of construction work space (number)	72	60	66
Agricultural land affected (acres)	683.8	528.9	349.0
Resources			
Forested land crossed (miles)	237.0	249.8	248.3
Forested land affected during construction (acres)	3,595.4	3,791.6	3,762.1
Forested land affected during operation (acres)	1,436.6	1,513.9	1,504.8
Known habitat for federally listed species (acres) f/	319.3	280.5	263.1
Known archaeological or historic sites (number)	0 g/	0 g/	0
Wetlands crossed (number) d/	30	27	20
Wetlands crossed (feet) d/	5,924	4,484	3,601
Forested wetlands crossed (feet) d/	1,518	1,935	1,721
Forested wetlands affected by construction (acres)	2.6	3.2	3.0
Forested wetlands affected by operation (acres)	1.7	2.2	2.0
Perennial waterbody crossings (number) d/	117	115	95
Total length of all waterbody crossings (feet) h/	2,340	2,300	1,900
Springs and domestic water supply wells within 150 feet of the centerline (number) h/	32	72	100
Major (> 100 feet) waterbodies crossed (number)	7	7	5

TABLE 3.4.2-2 (continued)

Comparison of Hybrid Alternative 1A, Hybrid Alternative 1B, and the Proposed Route (April 2016)

Feature	Hybrid Alternative 1A	Hybrid Alternative 1B	Proposed Route
New River crossings (number)	2	0	0
Shallow bedrock crossed (miles)	117.7	109.8	202.5
Steep slope (>20 percent) crossed (miles)	140.8	157.3	128.6
Side slope crossed (miles)	177.2	180.4	158.2
Landslide potential crossed (miles) e/	220.8	235.6	225.6
Karst area crossed (miles)	33.9	42.6	41.7
Known karst features, sinkholes, or caves within 50 feet of the construction right-of-way (number)	0 g/	134	130

a/ Assuming 125-foot-wide construction right-of-way and 50-foot-wide operation right-of-way.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ Estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of Proposed Route.
d/ NWI and NHD data used in order to provide a common comparison between the routes since field surveys were not conducted along the alternatives. Public data on waters with drinking water designation not available.
e/ Areas mapped as High Incidence and/or High Susceptibility from GODT, 2014.
f/ Potential Indiana bat and Virginia Tier 1 Habitats.
g/ But not delineated.
h/ From survey of proposed route sections only.
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory
VADCR = Virginia Department of Conservation and Recreation

Hybrid 1B

Hybrid 1B would follow the Alternative 1 route from the project origin to about MP 135, where it would then switch over to the proposed route and then proceed to the project terminus (see figure 3.4.2-3). Hybrid 1B north of MP 135 would be substantially collocated with various overhead electric transmission lines. Hybrid 1B would cross many of the same features as the proposed route such as the ANST, BRP, and the Jefferson National Forest.

Hybrid 1B would have certain environmental advantages over the proposed route such as affecting 28 less springs and wells, 6 less residences within 50 feet of construction, and 93 less miles of shallow bedrock (see table 3.4.2-2). In addition, it would be more collocated with existing corridors by almost 57 miles, thereby reducing greenfield construction.

However, Hybrid 1B would also have some environmental disadvantages compared to the proposed route, including increased length by almost 15 miles, thereby increasing the area of overall project disturbance by about 259 acres, affecting 7 more wetlands, crossing 20 more perennial streams, and crossing two more major waterbodies. Further, Hybrid 1B would cross 28.7 more miles of steep slopes and 22 more miles of side slopes compared to the proposed route, presenting substantially more obstacles to safe construction, increasing extra workspace requirements, and potentially affecting worksite stability during construction and after restoration. Given consideration of these factors, we conclude that Hybrid 1B does not offer a significant environmental advantage when compared to the corresponding proposed route.

Northern Pipeline – ACP Collocation Alternative

The Northern Pipeline - ACP Collocation Alternative (see figure 3.4.2-4) was developed by FERC staff to evaluate a pipeline route that would be collocated with the proposed ACP. This has also been called the "two pipelines – one route" alternative. The Northern Pipeline Alternative - ACP Collocation Alternative would involve the installation of a 42-inch-diameter pipeline for the MVP adjacent to a separate 42-inch-diameter pipeline for the ACP Project, following the ACP route.[8] Conceptually this alternative would begin at about MP 37 of the proposed MVP pipeline route where it would begin paralleling the proposed ACP at its point of origin. The alternative would then generally be routed parallel to the proposed ACP for about 205 miles in a south-easterly direction before intersecting the existing Transco pipeline. Then it would generally parallel the Transco pipeline corridor to the southwest for about 65 miles to reach Transco Station 165. A comparative analysis of environmental impacts of the proposed MVP route and the Northern Pipeline – ACP Collocation Alternative is presented in table 3.4.2-3.

The alternative would provide some environmental benefits. One benefit of the Northern Pipeline - ACP Collocation Alternative would be the use of a single construction right-of-way to install two parallel adjacent pipelines. The alternative would collocate the MVP pipeline with the ACP (assuming the ACP would be authorized and constructed) for about 205 miles, compared to the MVP pipeline being collocated adjacent to existing rights-of-way for just 25.4 miles along its corresponding segment of proposed route. If the MVP pipeline and ACP were built separately, along different routes, as currently proposed, the combined construction areas would disturb about 9,645 acres total.[9] If the MVP pipeline and the ACP were built parallel and adjacent to each other along the route of just of the ACP, using a 250-foot-wide construction right-of-way for both pipelines combined (excluding ATWS), about 8,288 acres in total would be disturbed. In the absence of a route-specific evaluation by both proponents to determine where construction space could be shared, we have evaluated the proposed workspaces as proposed by the applicants.

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[8] An analysis of the "two pipe-one route" alternative following the MVP pipeline route was not included in this EIS because the MVP pipeline route is the proposed action analyzed in this EIS and should not be viewed as an alternative to itself.

[9] This calculation is based on a 303.5-mile-long MVP pipeline along its proposed route and a 333-mile-long ACP along its March 11, 2016 amended route in Virginia, using a 125-foot-wide construction right-of-way for each pipeline, without adding in ATWS and other facilities or work areas (such as access roads and yards).

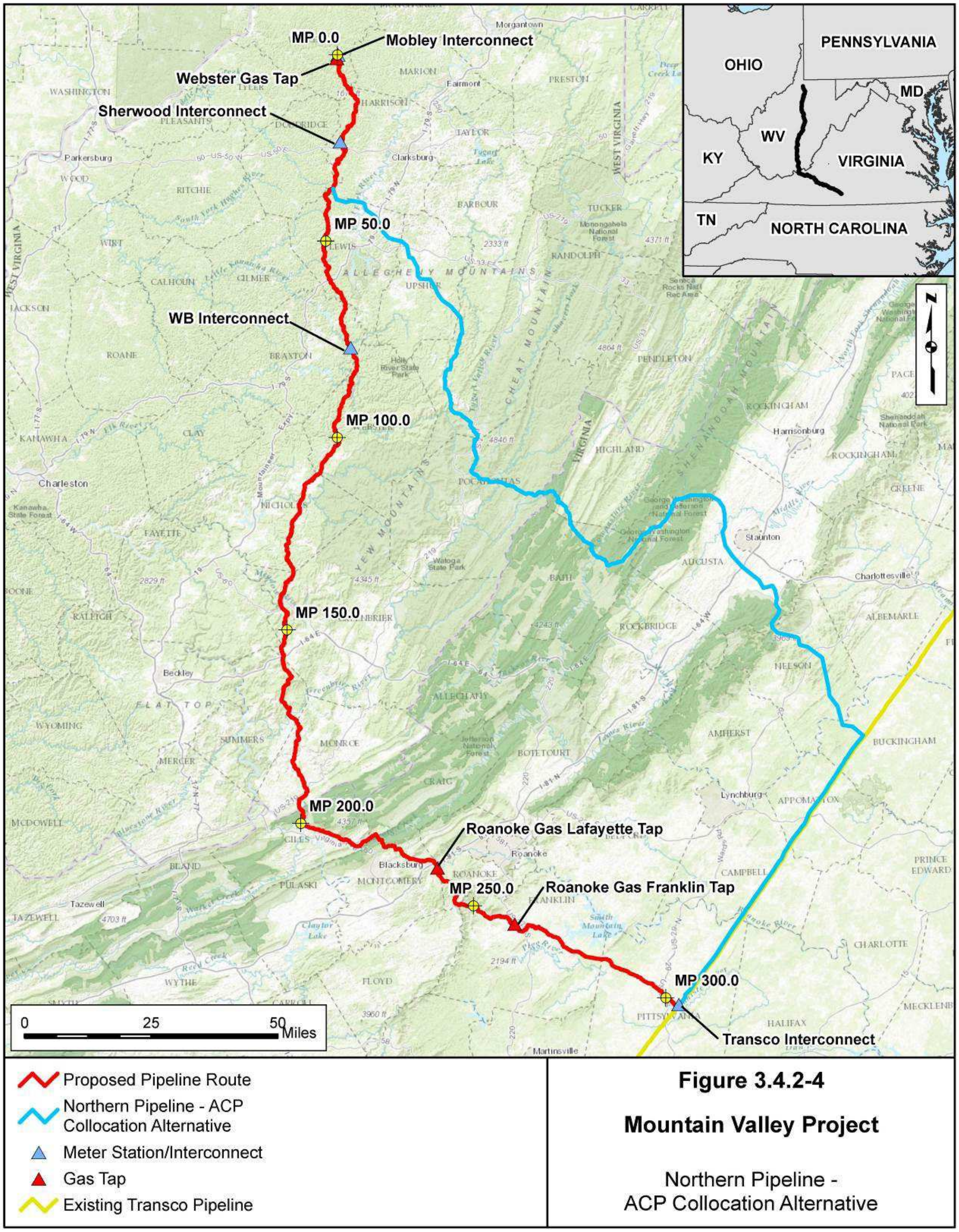

MP 0.0
Mobley Interconnect
Webster Gas Tap
Sherwood Interconnect
MP 50.0
WB Interconnect
MP 100.0
MP 150.0
MP 200.0
Roanoke Gas Lafayette Tap
MP 250.0
Roanoke Gas Franklin Tap
MP 300.0
Transco Interconnect
PENNSYLVANIA
OHIO
MD
WV
KY
VIRGINIA
TN
NORTH CAROLINA
0
25
50
Miles
Proposed Pipeline Route
Northern Pipeline - ACP Collocation Alternative
Meter Station/Interconnect
Gas Tap
Existing Transco Pipeline
Figure 3.4.2-4
Mountain Valley Project
Northern Pipeline - ACP Collocation Alternative

TABLE 3.4.2-3

Comparison of the Northern Pipeline Alternative and the Proposed Route

Feature	Northern Pipeline – ACP Collocation Alternative	Proposed Route
General		
Total length (miles)	273.5	267.1
Length adjacent to other existing rights-of-way (miles)	77.3	25.4
Land disturbed within construction right-of-way (acres) a/	4,144.3	4,043.8
Federal Lands and Federally Managed Areas		
National Forest System lands crossed – Total (miles)	19.1	3.5
Monongahela National Forest (miles)	5.5	0.0
George Washington and Jefferson National Forests (miles)	13.6	3.5
National Forest Wilderness Areas crossed (miles)	0.0	0.0
Appalachian National Scenic Trail crossings (number)	1	1
Blue Ridge Parkway crossings (number)	1	1
FS-designated old growth forest crossed (feet)	0	1,710
FS-designated old growth forest affected by constr. (acres)	0	4.9
FS-designated trails crossed (number)	5	2
FS-designated inventoried roadless areas crossed (feet)	0	5,030
FS-designated inventoried semi-primitive areas crossed (feet)	0	14,170
NRHP designated or eligible historic districts crossed (miles)	0.0	10.0
Human Environment		
Populated areas within 0.5 mile (number) b/	9	7
Landowner parcels crossed (number)	1,160 c/	1,132
Residences within 50 feet of construction workspace (number)	47	44
Resources		
Forested land affected during construction (acres)	2,794.8	3,256.9
Forested land affected during operation (acres)	1,117.2	1,301.0
Interior forest affected (acres)	1,616.2	2,064.5
Wetlands crossed (feet) d/	4,941	3,529
Forested wetlands crossed (feet) d/	2,977	1,721
Forested wetlands affected by construction (acres)	5.1	3.0
Forested wetlands affected by operation (acres)	3.4	2.0
Perennial waterbody crossings (number) d/	120	84
Major (> 100 feet) waterbodies crossed	14	5
Karst area crossed (miles)	51.2	41.8

a/ Assuming a 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.
c/ Estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of proposed route.
d/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

The Northern Pipeline – ACP Collocation Alternative would cross less FS-designated old growth forest, less FS-designated inventoried roadless areas, less FS-designated semi-primitive areas than the corresponding segment of the proposed MVP pipeline route. The Northern Pipeline - ACP Collocation Alternative also would affect less forest, including less interior forest compared to the proposed route.

However, the Northern Pipeline – ACP Collocation Alternative would be about 7 miles longer, would disturb about 101 acres more during construction, and affect 28 more parcels than the corresponding segment of the MVP pipeline proposed route. The alternative would cross 15.6 more miles of NFS lands, 36 more perennial waterbodies, and more wetlands, including 1,256 more feet of forested wetlands. In addition, the Northern Pipeline – ACP Collocation Alternative would cross 9 more major waterbodies, and 9 more miles of karst terrain.

Another major disadvantage of the Northern Pipeline – ACP Collocation Alternative route is the necessity to construct two parallel pipelines along approximately 205 miles of the ACP route, much of which presents significant constructability issues related to topography and space. The Northern Pipeline – ACP Collocation Alternative would have about 22 more miles of side slope than the MVP pipeline route. Based on our review of aerial photography and topographic maps, we conclude that in many areas, such as in Lewis and Upshur Counties, West Virginia and Augusta and Nelson Counties, Virginia, there is insufficient space along the narrow ridgelines to accommodate two parallel 42-inch-diameter parallel pipelines. This would result in side slope (i.e., side-hill) or two-tone construction techniques, with additional acres of disturbance required for ATWS, given the space needed to safely accommodate equipment and personnel, as well as spoil storage. The constructability issues alone are likely to render this alternative technically infeasible. Consequently, we conclude that the Northern Pipeline – ACP Collocation Alternative does not provide a significant environmental advantage over the MVP pipeline route and we do not consider it further.

3.4.2.2 Equitrans Expansion Project

Because of the short length of the individual pipeline segments for the EEP, we did not identify any major route alternatives.

3.5 ROUTE VARIATIONS

Route variations are shorter than major route alternatives, but are generally longer and more substantial than minor route deviations designed to avoid or further reduce impacts on specific localized resources. In our draft EIS, issued September 16, 2016, we considered route variations that were developed by the Applicants during initial project planning and throughout the pre-filing processes in 13 cases, generally in response to stakeholder or FERC staff comments, including 10 cases associated with the MVP and 3 cases associated with the EEP. Since issuance of the draft EIS, Mountain Valley has submitted multiple filings adopting routing changes.

3.5.1 Mountain Valley Project Route Variations

Below, we evaluate route variations for the MVP (see figure 3.5.1-1). Two of these alternatives (Burnsville Lake WMA and Elk River WMA) were routes originally considered by Mountain Valley during pre-filing, but were not included with the proposed route filed as part of the application with the FERC in October 2015. However, based on stakeholder input we are assessing the original routing as variations. Two route alternatives discussed below (Canoe Cave and Blackwater River) were originally part of the route proposed by Mountain Valley in its October 2015 application to the FERC, but were replaced by modifications adopted by Mountain Valley into its currently proposed route in October 2016. One variation assessed in the draft EIS, the Blake Preserve Variation, has been removed from the discussion below because the new routing adopted by Mountain Valley in October 2016 now avoids the Blake Preserve.

3.5.1.1 Supply Header Collocation Alternative

In September 2015, the FERC received an application from Dominion for its proposed Supply Header Project that would transport natural gas from supply areas in Ohio, Pennsylvania, and West Virginia to market areas in Virginia and North Carolina via a 30-inch-diameter pipeline that would provide a direct connection with the proposed ACP Project. The FERC staff issued a draft EIS for the Supply Header Project (CP15-555-000) in December 2016. We evaluated a route variation alternative that would collocate the northern 36.7 miles of the MVP pipeline with the proposed Supply Header pipeline route in order to increase the amount of collocation of the proposed route.

This alternative would begin at the start of the proposed MVP pipeline at the Webster Interconnect in Wetzel County, West Virginia, and continue southwest along an existing pipeline for approximately 4.5 miles where it would intersect with the Supply Header pipeline. At this point, Mountain Valley's proposed 42-inch-diameter pipeline would be collocated with the proposed 30-inch-diameter Supply Header pipeline for approximately 28.5 miles and would reconnect with the proposed MVP pipeline route near MP 36.7 (see figure 3.5.1-2). A comparative analysis of environmental impacts of the proposed route and the Supply Header Collocation Alternative is presented in table 3.5.1-1.

One benefit of the alternative would be the use of a single construction right-of-way to install two parallel adjacent pipelines, increasing collocation. If the MVP pipeline and Supply Header pipeline were built separately, along different routes, as currently proposed, the combined construction areas would disturb about 1,055 acres total. If the MVP pipeline and Supply Header pipeline were built parallel and adjacent to each other along the route of just of Supply Header pipeline, using a theoretical 250-foot-wide construction right-of-way, about 1,000 acres would be disturbed. In the absence of a route-specific evaluation by both proponents to determine where construction space could be shared, we have evaluated the proposed workspaces as proposed by the applicants.

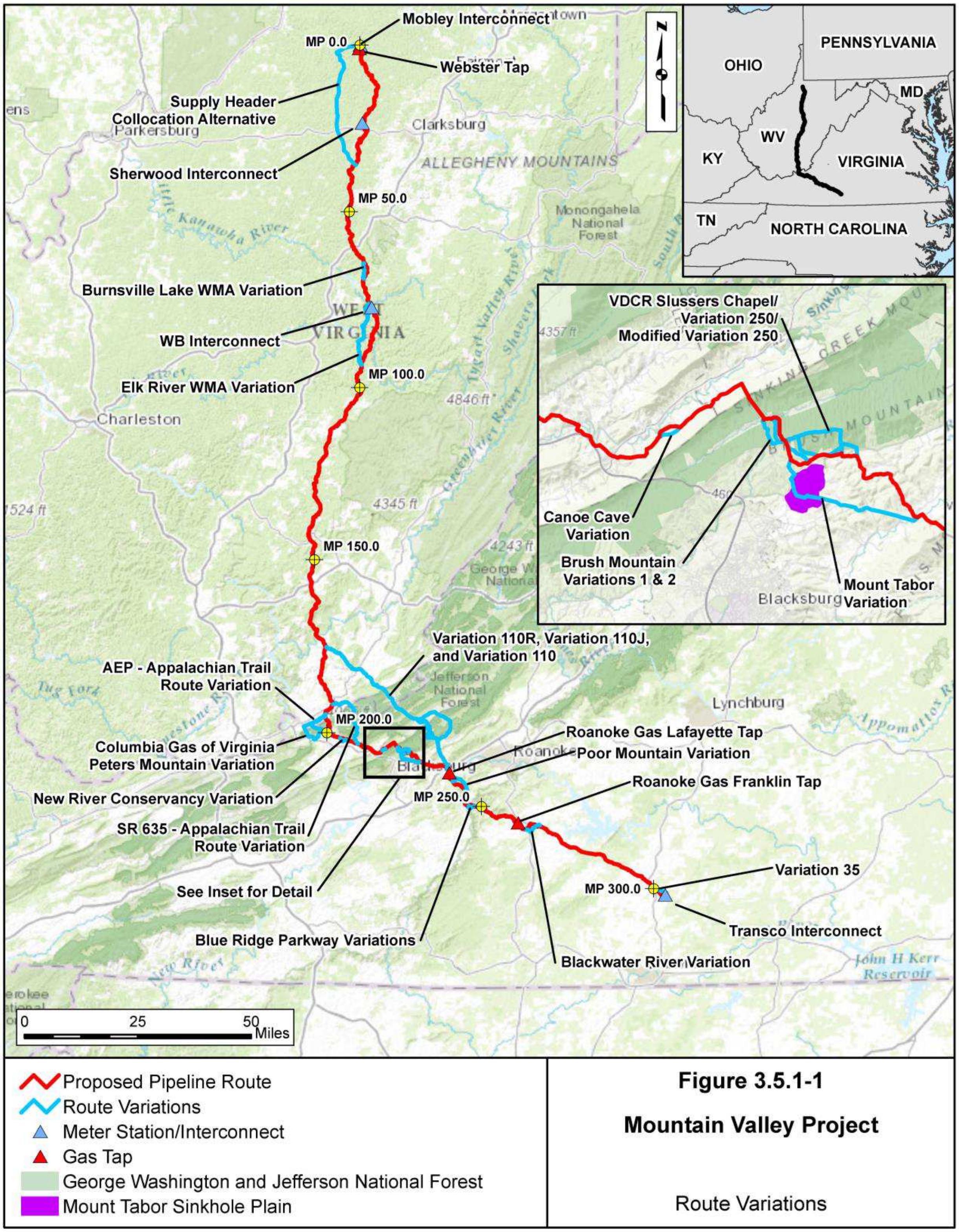


Figure 3.5.1-1

Mountain Valley Project

Route Variations

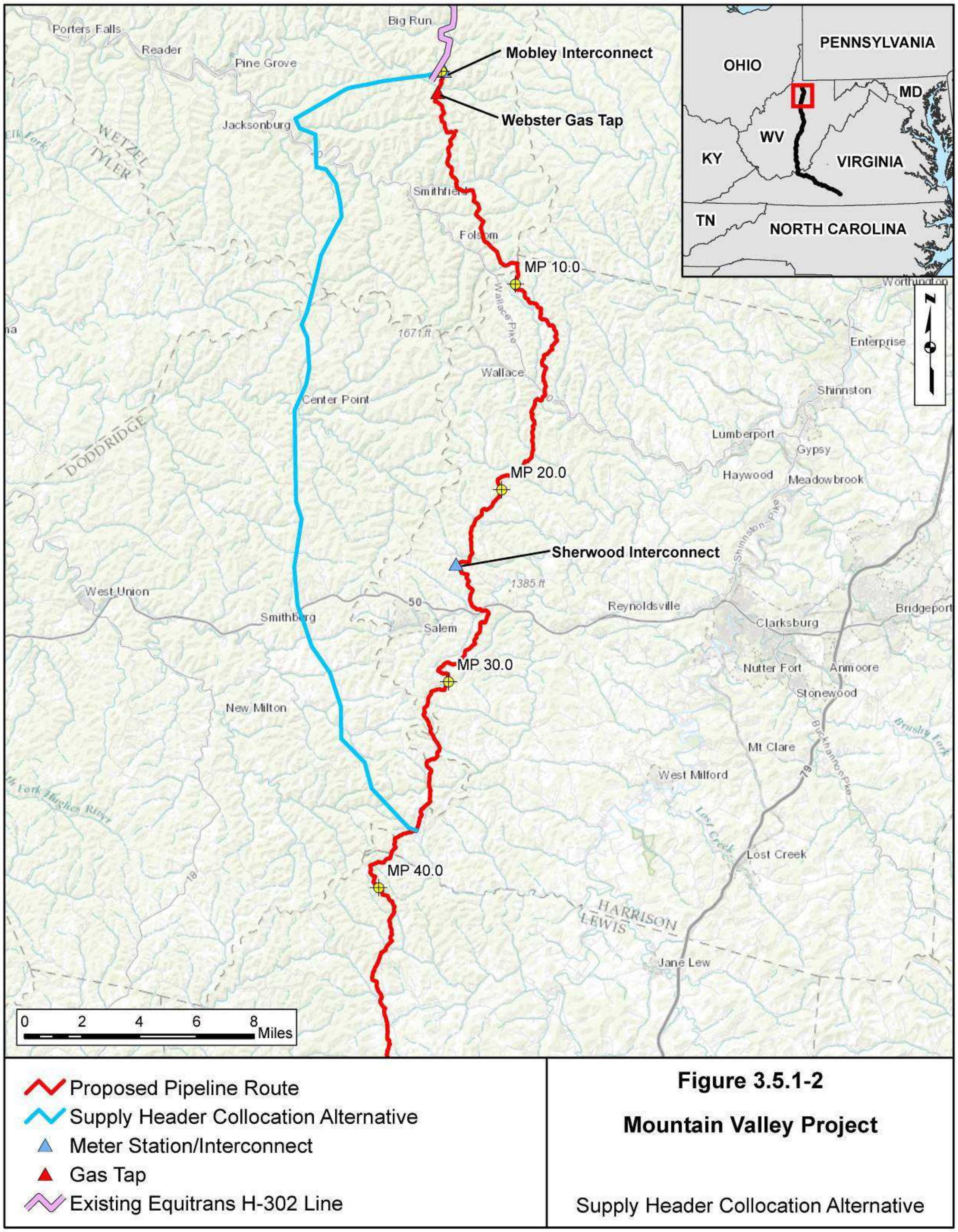


Figure 3.5.1-2

Mountain Valley Project

Supply Header Collocation Alternative

TABLE 3.5.1-1

Comparison of the Supply Header Collocation Alternative and the Proposed Route

Feature	Supply Header Collocation Alternative	Proposed Route
General		
Total length (miles)	33.0	36.6
Length adjacent to existing right-of-way (miles)	4.5	2.0
Land disturbed within construction right-of-way (acres) a/	499.5	553.4
Land Use		
Populated areas within 0.5 mile (number) b/	0	1
National Forest System lands crossed (miles)	0.0	0.0
National Forest Wilderness Areas crossed (miles)	0.0	0.0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0.0	0.0
Landowner parcels crossed (number)	181 c/	201
Residences within 50 feet of construction workspace (number)	3	22
Resources		
Forested land crossed (miles)	30.6	34.0
Forested land affected during construction (acres)	462.9	515.2
Forested land affected during operation (acres)	185.3	206.1
Interior forest crossed (acres)	310.6	397.4
Wetlands crossed (feet)	295	72
Forested wetlands crossed (feet)	0.0	0.0
Perennial waterbody crossings (number) d/	14	11
Major (> 100 feet) waterbodies crossed	0	0
Shallow bedrock crossed (miles)	30.2	36.1
Steep slope (>20 percent) crossed (miles)	29.4	19.7
Side slope crossed (miles)	25.8	24.6
Landslide potential crossed (miles)	33.0	36.6
Karst area crossed (miles)	0.0	0.0

a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.
c/ Estimated assuming similar size and number of landowner parcels would be crossed by the alternative as those crossed by the corresponding segment of Proposed Route.
d/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

The Supply Header Collocation Alternative would have several environmental advantages compared to the corresponding segment of the proposed MVP route, including being approximately 3.6 miles shorter, and disturbing less area during construction. The alternative route would impact 20 fewer parcels and be close to fewer residences. The alternative would cross 3.4 miles less of forested land, affect 87 fewer acres of interior forest, 6 miles less of shallow bedrock, and 3.6 miles less of landslide-prone areas. However, the Supply Header Collocation Alternative would cross 223 feet more wetlands and 3 more perennial waterbodies compared to the proposed route. The alternative would also cross almost 10 more miles of steep terrain, as well as 1.2 miles more of side slopes. Use of the alternative would also constrain Mountain Valley's ability to pick-up additional supplies of natural gas at the Sherwood Interconnect receipt point unless an additional lateral pipeline at least 6 miles long (assuming a straight line distance) were added.

Despite certain resource advantages, collocating the MVP pipeline with the Supply Header pipeline in the areas of steep terrain would present constructability issues for two pipelines located adjacent to each other on the same ridgetop. Examples of difficult terrain along the Supply Header Collocation Alternative, as determined through our review of aerial photography and topographic maps, include the vicinities of MPs 0, 4, 8, 12, 21, 23, 28, and 31. Some of the ridgetops in this area are less than 50 feet wide, without enough room for two side-by-side pipelines. Construction would require considerable cut and fill, and would require side-slope installation of at least one of the two pipelines. Based on the constructability challenges resulting from installing two parallel pipelines in steep terrain, we conclude that the Supply Header Collocation Alternative is not technically feasible from an engineering standpoint and do not consider it further.

3.5.1.2 Burnsville Lake Wildlife Management Area Variation

During pre-filing, Mountain Valley initially identified this variation as the original route through the Burnsville Lake WMA in Braxton County, West Virginia. The WMA is managed by the WVDNR in a program designed to conserve high quality habitats for wildlife species. Accordingly, in its October 2015 application to the FERC, Mountain Valley revised its proposed pipeline route to avoid crossing the Burnsville Lake WMA, except for a small segment of about 177 feet. We are considering the original pre-filing route segment as an alternative to the October 2016 proposed pipeline route[10] because the proposed route would affect a new suite of landowners different from the pre-filing route and because we received comments, including a letter filed on December 21, 2016 from a landowner at about MP 69 along the October 2016 proposed route. [11]

The Burnsville Lake WMA Variation would begin at about MP 65.1 along Mountain Valley's proposed pipeline route, would turn southwest from the proposed route for approximately 0.2-mile, would then turn south for about 3.5 miles, would cross the eastern

[10] In a filing with the FERC on October 14, 2016, Mountain Valley presented its updated proposed pipeline route, including revised MPs and maps. Revised figures and tables for the updated proposed route were filed on October 20, 2016.

[11] See the letter from Vicki Pierson (accession number 20161221-5374).

portion of the Burnsville Lake WMA, and would rejoin the proposed route at about MP 69.4 (see figure 3.5.1-3). A comparative analysis of environmental impacts of the proposed route and the Burnsville Lake WMA Variation alternative is presented in table 3.5.1-2.

In a letter filed on December 21, 2016, a landowner at about MP 69 along the October 2016 proposed route suggested that the pipeline should follow the variation, to reduce impacts on private property owners. [12]

The Burnsville Lake WMA Variation would be about 0.2 mile shorter than the comparable segment of the proposed route, disturb less land, affect 5 fewer parcels, and cross 1 fewer perennial waterbody. However, the variation would affect more interior forest and cross 0.7 mile more steep terrain than the proposed route. Both the proposed route and the variation would cross the NRHP-listed Weston and Gauley Bridge Turnpike Trail. The variation would cross 1.8 miles of the Burnsville Lake WMA, while the proposed route would cross less than 0.1 mile of this WMA. Because the Burnsville Lake WMA Variation would affect more high quality habitat managed by the WVDNR and for the other reasons mentioned above, we conclude it would not offer significant environmental advantages over the corresponding segment of proposed route, and we do not consider it further.

[12] See accession numbers 20161221-5374 and 20161221-5574.

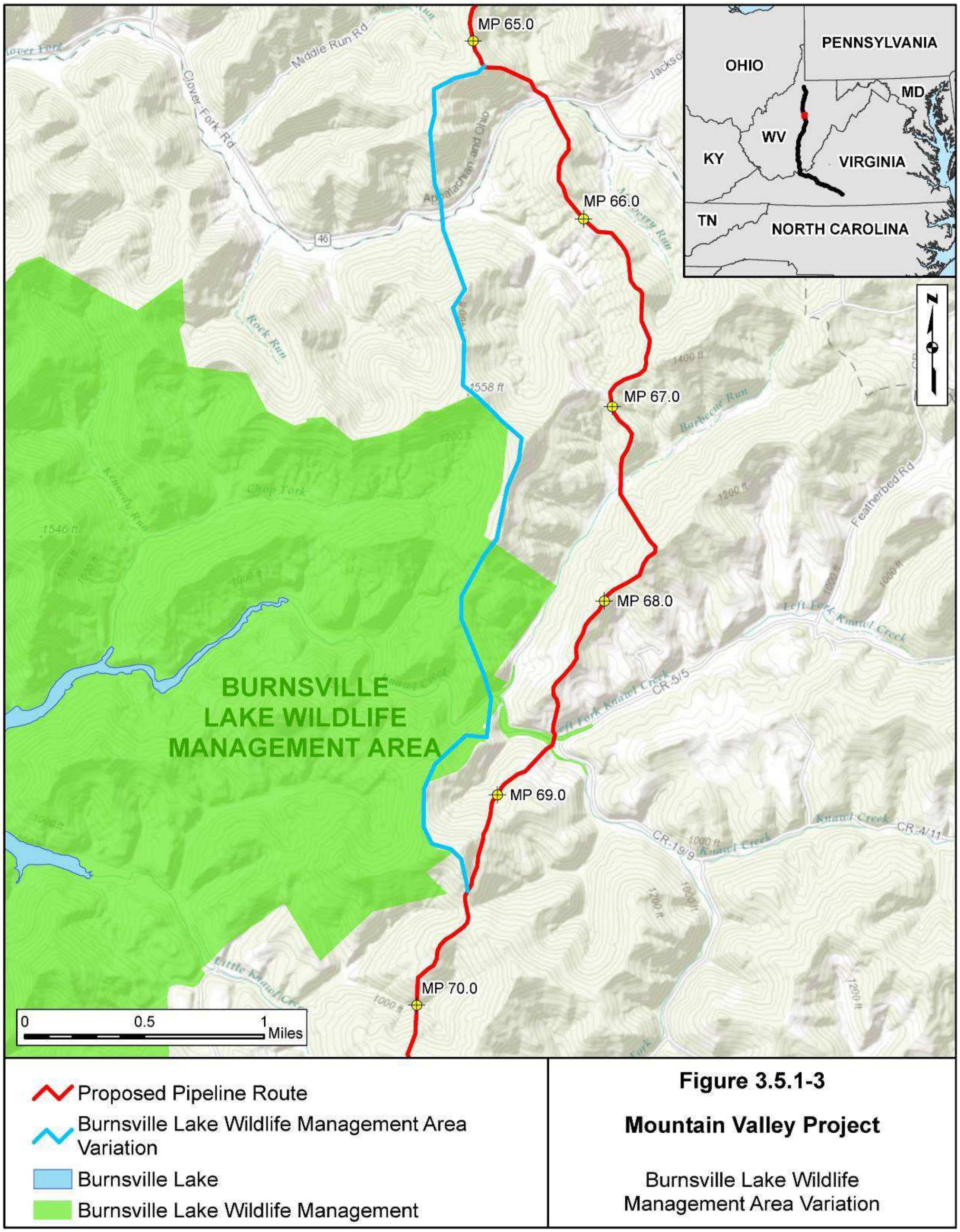


Figure 3.5.1-3

Mountain Valley Project

Burnsville Lake Wildlife Management Area Variation

TABLE 3.5.1-2

Comparison of the Burnsville Lake Wildlife Management Area Variation and the Proposed Route

Feature	Burnsville Lake WMA Variation	Proposed Route
General		
Total length (miles)	4.1	4.3
Length adjacent to existing right-of-way (miles)	0.0	0.0
Land disturbed within construction right-of-way (acres) a/	61.7	65.2
Land Use		
Populated areas within 0.5 mile (number) b/	0	0
National Forest System lands crossed (miles)	0.0	0.0
National Forest Wilderness Areas crossed (miles)	0.0	0.0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0.0	0.0
Landowner parcels crossed (number)	15	20
Residences within 50 feet of construction workspace (number)	0	0
WMA lands crossed (miles)	1.8	<0.1
Resources		
Forested land crossed (miles)	4.0	4.0
Forested land affected during construction (acres)	61.1	60.9
Forested land affected during operation (acres)	24.5	24.3
Interior forest affected (acres)	56.1	48.5
Wetlands crossed (feet) c/	0	0
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0.0	0.0
Forested wetlands affected by operation (acres)	0.0	0.0
Perennial waterbody crossings (number)	2	3
Major (> 100 feet) waterbodies crossed	0	0
Shallow bedrock crossed (miles)	4.0	3.9
Steep slope (>20 percent) crossed (miles)	2.9	2.2
Side slope crossed (miles)	2.8	2.7
Landslide potential crossed (miles)	4.1	4.3
Karst area crossed (miles)	0.0	0.0

a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.
c/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

3.5.1.3 Elk River Wildlife Management Area Variation

This variation reflects Mountain Valley's originally considered route during pre-filing, which would cross the Elk River WMA in Braxton County, West Virginia. This WMA is part of the WVDNR's statewide program to conserve high quality habitats for wildlife species. Accordingly, in its October 2015 application to the FERC, Mountain Valley revised its pipeline route through this area to avoid the Elk River WMA. We considered the original pre-filing route as a variation to the October 2016 proposed route, because the proposed route change would affect a new suite of landowners different from the pre-filing route, and because the alternative route has a comparable length.

The Elk River WMA Variation would begin at about MP 76.1 along the October 2016 proposed route in Braxton County, West Virginia, then turn southwest from the proposed route for approximately 16.9 miles, crossing two segments of the Elk River WMA, and then rejoining the proposed route at about MP 93.5 in Webster County (see figure 3.5.1-4). A comparative analysis of environmental impacts of the proposed route and the Elk River WMA Variation alternative is presented in table 3.5.1-3.

The proposed route would be 0.8 mile longer than the Elk River WMA Variation, disturbing more land and parcels, 0.5 mile more forest, and 1 additional perennial waterbody. Both the proposed route and the Elk River WMA Variation would cross the Elk River. The variation would cross more wetlands, affect more interior forest, and cross more steep and side slopes than the proposed route. The variation would cross the Elk River WMA for a distance of 3.2 miles, which is completely avoided by the proposed route. For the reasons listed above, we conclude the Elk River WMA Variation would not offer significant environmental advantages over the corresponding segment of proposed route, and we do not consider it further.

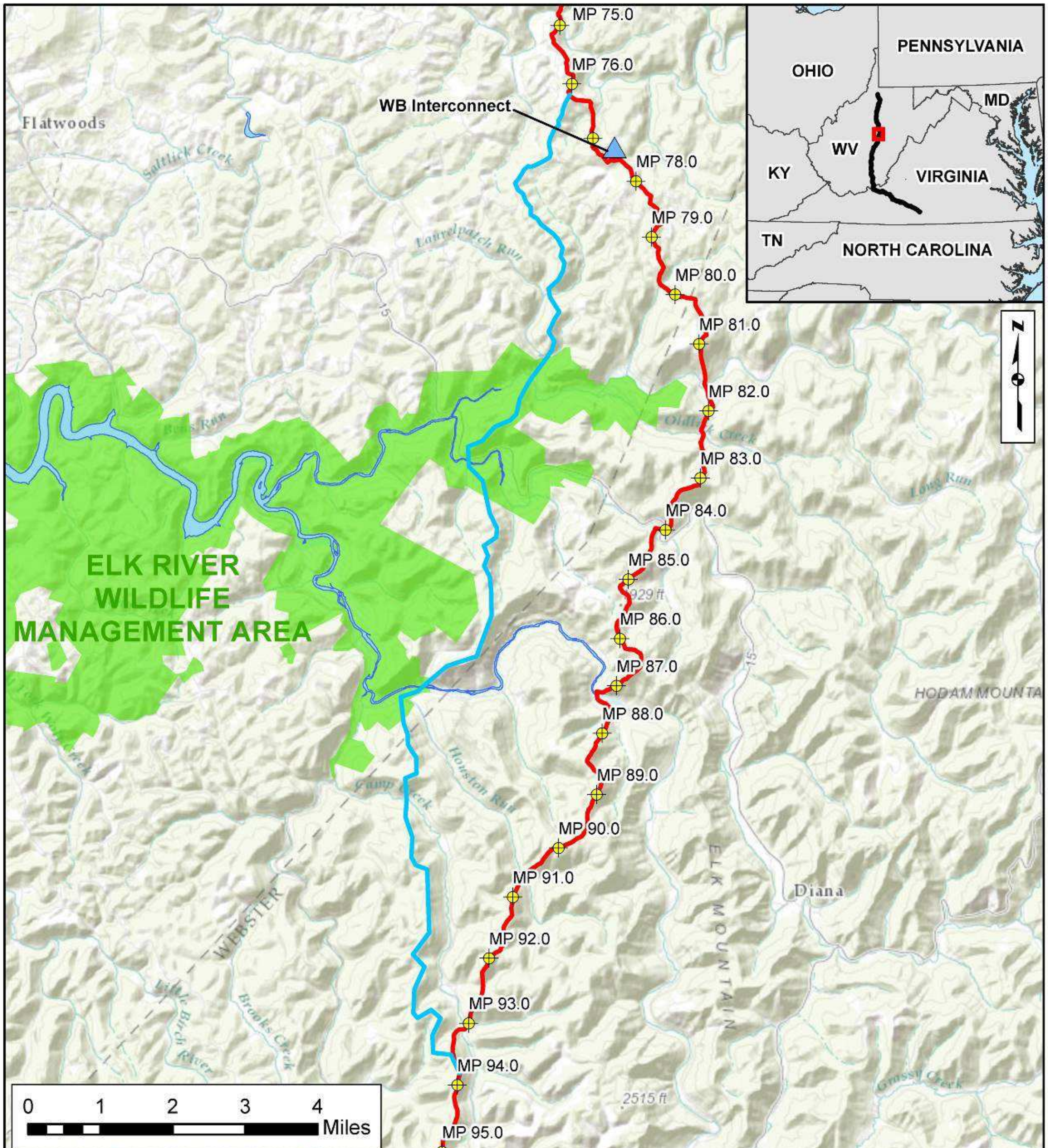


Figure 3.5.1-4

Mountain Valley Project

Elk River Wildlife Management Area Variation

TABLE 3.5.1-3

Comparison of the Elk River Wildlife Management Area Variation and the Proposed Route

Feature	Elk River WMA Variation	Proposed Route
General		
Total length (miles)	16.9	17.7
Length adjacent to existing right-of-way (miles)	0.8	0.2
Land disturbed within construction right-of-way (acres) a/	256.0	267.5
Land Use		
Populated areas within 0.5 mile (number) b/	0	0
National Forest System lands crossed (miles)	0.0	0.0
National Forest Wilderness Areas crossed (miles)	0.0	0.0
Appalachian National Scenic Trail crossings (number)	0	0
Blue Ridge Parkway crossings (number)	0	0
NRHP designated or eligible historic districts crossed (miles)	0.0	0.0
Landowner parcels crossed (number)	39	55
Residences within 50 feet of construction workspace (number)	7	8
WMA lands crossed (miles)	3.2	0.0
Resources		
Forested land crossed (miles)	16.3	16.8
Forested land affected during construction (acres)	246.7	254.5
Forested land affected during operation (acres)	98.7	101.8
Interior forest crossed (acres)	221.2	219.0
Wetlands crossed (feet) c/	135	102
Forested wetlands crossed (feet)	0	0
Forested wetlands affected by construction (acres)	0.0	0.0
Forested wetlands affected by operation (acres)	0.0	0.0
Perennial waterbody crossings (number)	4	5
Major (> 100 feet) waterbodies crossed	2	2
Shallow bedrock crossed (miles)	15.4	15.8
Steep slope (>20 percent) crossed (miles)	11.5	10.5
Side slope crossed (miles)	12.3	11.5
Landslide potential crossed (miles)	16.9	17.7
Karst area crossed (miles)	0.0	0.0

a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.
c/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

3.5.1.4 Variations 110, 110R, and 110J

Variation 110 and modifications to this variation called Variation 110R and Variation 110J were developed by Mountain Valley during pre-filing as alternatives that include different crossing locations of the ANST and Jefferson National Forest. Additionally, these variations would avoid specific resources and areas of concern raised by stakeholders. Some of the concerns that Mountain Valley sought to avoid through exploration of Variations 110, 110R, and 110J included:

- karst terrain in the Pembroke and Newport areas;
- mapped caves (including Pig Hole Cave, Smoke Hole Cave, and Tawney Cave);
- the Greater Newport Rural Historic District and North Fork Valley Rural Historic District;
- the Mercer Angler's Club;
- the Red Sulfur Public Utility District watershed;
- Big Stony Creek Road (Virginia Scenic Byway); and
- Peters Mountain and Mountain Lake Wilderness Areas.

Variation 110 is about 43.4 miles long (see figure 3.5.1-5). It would leave the proposed route filed by Mountain Valley in October 2016 at about MP 175.9 in Monroe County, West Virginia turning southeast passing south of Swoopes Knob, going between Little Mountain and Gap Mountain. It then crosses over Peters Mountain near Waiteville, West Virginia, through the Jefferson National Forest. Variation 110 would go over John Creek Mountain, Sinking Creek Mountain, Brush Mountain, and Paris Mountain in Giles County, Virginia, crossing through the Brush Mountain Wilderness Area within the Jefferson National Forest. The variation would cross the North Fork of the Roanoke River before rejoining the proposed route at about MP 234 near I-81, west of Elliston, Virginia.

Variation 110J is about 49.5 miles long. This variation would leave Variation 110 on the east side of John Creek Mountain, heading northeast, cross State Route 42 (Cumberland Gap Turnpike), and eventually rejoins Variation 110 on the east side of Brush Mountain. Variation 110J avoids the Brush Mountain Wilderness.

Variation 110R is about 44.3 miles long. It leaves Variation 110 at the same place as Variation 110J, but generally parallels Variation 110, with a jog to the east, before rejoining Variation 110 at the same terminus as Variation 110J. A comparative analysis of environmental impacts of the proposed route and the Variations 110, 110R, and 110J alternatives is presented in table 3.5.1-4.

We received comments on these alternatives from the public, county governments (Craig County), and state agencies. The comments note the impacts these alternatives may have on the Brush Mountain East Wilderness, 6C-Old Growth and 8C-Black Bear Habitat management areas within the Jefferson National Forest, the ANST near the Dragon Tooth overlook, cultural attachment, and a federally listed endangered aquatic mussel, the James spinymussel.

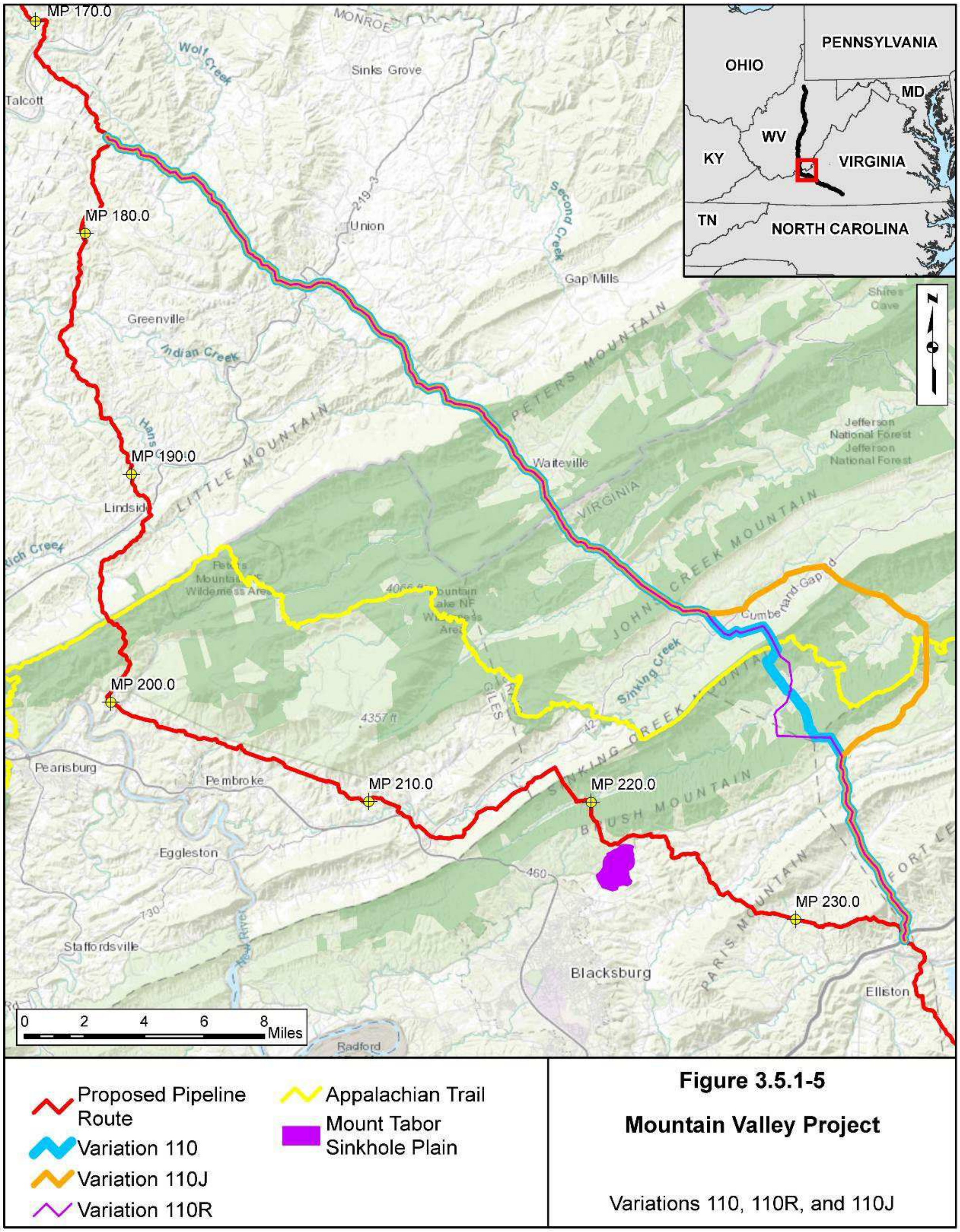


Figure 3.5.1-5

Mountain Valley Project

Variations 110, 110R, and 110J

TABLE 3.5.1-4

Comparison of Variations 110, 110R, and 110J and the Proposed Route

Feature	Variation 110	Variation 110R	Variation 110J	Proposed Route
General				
Total length (miles)	43.4	44.3	49.5	58.7
Length adjacent to existing right-of-way (miles)	0.6	0.6	1.3	9.7
Land disturbed within construction right-of-way (acres) a/	656.5	670.5	749.6	888.8
Federal Lands and Federally Managed Areas				
National Forest System lands crossed (miles)	6.2	6.2	5.3	3.5
National Forest Wilderness Areas crossed (miles)	1.1	0.0	0.0	0.0
Appalachian National Scenic Trail crossings (number)	1	1	1	1
Blue Ridge Parkway crossings (number)	0	0	0	0
FS -designated old growth forest crossed (feet)	4,550	4,240	4,260	1,710
FS -designated old growth forest affected by construction (acres)	13.0	12.1	12.2	4.9
FS-designated trails crossed (number)	3	3	3	0
FS-designated inventoried roadless areas crossed (feet)	5,900	40	210	5,030
FS-designated inventoried semi-primitive areas crossed (feet)	7,150	7,100	210	14,170
NRHP designated or eligible historic districts crossed (miles)	0.0	0.0	0.0	10.0
Human Environment				
Populated areas within 0.5 mile (number) b/	1	1	1	1
Landowner parcels crossed (number)	181	198	250	245
Residences within 50 feet of construction workspace (number)	0	3	9	8
Resources				
Forested land crossed (miles)	31.8	32.2	35.3	46.9
Forested land affected during construction (acres)	482.0	487.6	535.2	7.11.9
Forested land affected during operation (acres)	192.9	195.2	214.1	284.5
Interior forest crossed (acres)	368.2	372.7	395.5	478.1
Wetlands crossed (feet) c/	446	446	765	44
Forested wetlands crossed (feet)	223	223	223	0
Forested wetlands affected by construction (acres)	0.4	0.4	0.4	0.0
Forested wetlands affected by operation (acres)	0.3	0.3	0.3	0.0
Perennial waterbody crossings (number)	19	19	25	20
Major (> 100 feet) waterbodies crossed	0	0	0	0
Shallow bedrock crossed (miles)	26.6	27.9	28.1	22.4
Steep slope (>20 percent) crossed (miles)	21.3	22.4	24.8	29.1
Side slope crossed (miles)	21.1	22.0	26.2	33.0
Landslide potential crossed (miles)	20.9	21.7	24.6	19.7
Karst area crossed (miles)	26.3	25.8	32.0	29.6

a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.
c/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

In a letter dated April 6, 2015, the Virginia Department of Conservation and Recreation (VADCR) provided comments on Variation 110, stating that the alternative route would cross the Mudlick Branch Woodland Conservation Site, which has a very high biodiversity ranking (B2), because it contains elements of the Central Appalachian Shale Barren community. The alternative route would also cross the Craig Creek-Johns Creek Stream Conservation Unit, which is ranked as having outstanding biodiversity (B1). Species which inhabit streams in the unit include Yellow lance, Atlantic pigtoe, orangefin madtom, and James spinymussel. The alternative would cross the Sinking Mountain Conservation Site, which has a biodiversity significance ranking of B2, containing Central Appalachian Montane Oak-Hickory Forest and Central Appalachian Xeric Chestnut Oak-Virginia Pine Woodland Forest. The alternative would cross the Lynn Hollow Conservation Site, with a biodiversity ranking of B2, containing box huckleberry. The alternative would cross the Fort Lewis Mountain Slopes Conservation Site, with a biodiversity ranking of B5 (of general biodiversity significance), which contains common snowberry.

The VADCR indicated that Alternative 110J would cross the Sinking Creek Mountain Conservation Site, as well as the Trout Creek Barren and Pickles Branch Conservation Sites. The Trout Creek Barren Conservation Site has a biodiversity ranking of B3 (high significance) and contains the Central Appalachian Xeric Shale Woodland (Chestnut Oak, Mixed Herbs Type). The Pickles Branch Conservation Site has a biodiversity ranking of B4 (moderate significance).

The VADCR indicated that Alternative 110R would cross the Sugar Bottom Hollow Conservation Site, which has a biodiversity ranking of B3.

Variation 110 is about 15.3 miles shorter than the corresponding segment of the proposed route and would cross much less FS-designated semi-primitive areas; however, it crosses about 1.1 mile of designated Wilderness that would be avoided by the proposed route. Variation 110 would affect 110 acres less of interior forest and 7.8 fewer miles of steep slopes and 12 fewer miles of side slopes compared to the proposed route. This variation would also cross the only known population of the James spinymussel in West Virginia at the South Fork of Potts Creek. Additionally, this variation would cross almost three times more distance of mapped old growth forest within the Jefferson National Forest (including designated black bear habitat management areas) and three more FS-designated trails and more inventoried roadless areas compared to the proposed route. During environmental surveys, two FS-designated sensitive plants, American barberry and rock skullcap, were found along this variation. This alternative would also cross the Alleghany Trail, which is a 330-mile-long hiking trail, that would not be crossed by the proposed route. Variation 110 would cross the Mudlick Branch Woodland, Craig Creek-Johns Creek, Sinking Creek Mountain, Lynn Hollow, and Fort Lewis Mountain Conservation Sites. Given consideration of all of these factors, we conclude that Variation 110 does not provide a significant environmental advantage over the proposed route.

Variation 110R is about 14.4 miles shorter than the corresponding segment of the proposed route filed on October 14, 2016. However, Variation 110R crosses about 2.7 more miles of the Jefferson National Forest (including designated black bear habitat management areas). This variation would also cross about 0.5 mile more of FS-designated old growth forest and three more FS-designated trails than the corresponding segment of the proposed route. The proposed route would cross more FS-designated inventoried roadless and semi-primitive areas. Alternative 110R would cross the Sugar Bottom Hollow Conservation Site. We conclude that Variation 110R does not provide a significant environmental advantage over the proposed route.

Variation 110J is about 9.2 miles shorter than the corresponding segment of the proposed route. However, Variation 110J would cross about 1.8 more miles of the Jefferson National Forest (including designated black bear habitat management areas). This variation would also cross about 0.5-mile more of FS-designated old growth forest and more FS trails than the corresponding segment of the proposed route. Variation 110J would cross almost 5 more miles of landslide prone topography and 2.4 more miles of karst terrain in comparison to the proposed route. The variation also would cross the VADCR-designated Sinking Creek Mountain, Trout Creek Barren, and Pickles Branch Conservation Sites. The proposed route would cross more forest, interior forest, steep slopes, side slopes, FS-designated inventoried roadless and semi-primitive areas. We conclude that Variation 110J does not provide a significant environmental advantage over the proposed route.

3.5.1.5 Columbia Gas of Virginia Pipelines Peters Mountain Variation

In order to increase the amount of collocation and to address comments raised by stakeholders, we requested that Mountain Valley develop an alternative route for crossing the Jefferson National Forest and the ANST that would follow existing rights-of-way. Columbia Gas of Virginia (CGV) operates two parallel pipelines leading to the Celanese Acetate LLC (Celanese) facility in Narrows, Virginia, that cross approximately 0.8 mile of the Jefferson National Forest. Recently the FS and Celanese achieved an easement agreement for a relocation of the ANST near the CGV pipelines. The CGV Peters Mountain Variation was developed to examine if the MVP pipeline could follow the CGV pipelines and cross the recently relocated portion of the ANST outside of the Jefferson National Forest near Narrows, Virginia.

The CGV Peters Mountain Variation would leave the October 2016 proposed route at about MP 195 at Painter Run on the south side of Little Mountain, north of Peters Mountain in Monroe County, West Virginia. The variation would head west parallel to County Road 219/24 for about 5 miles, then turn south along Scott Branch, and go over Peters Mountain into Giles County, Virginia. The alternative route would turn east on the north side of the New River, follow Clendenin Road and the Norfolk and Western Railroad, and rejoin the proposed route at about MP 200, northwest of the community of Kimballton (see figure 3.5.1-6). A comparative analysis of environmental impacts of the proposed route and the CGV Peters Mountain Variation is presented in table 3.5.1-5.

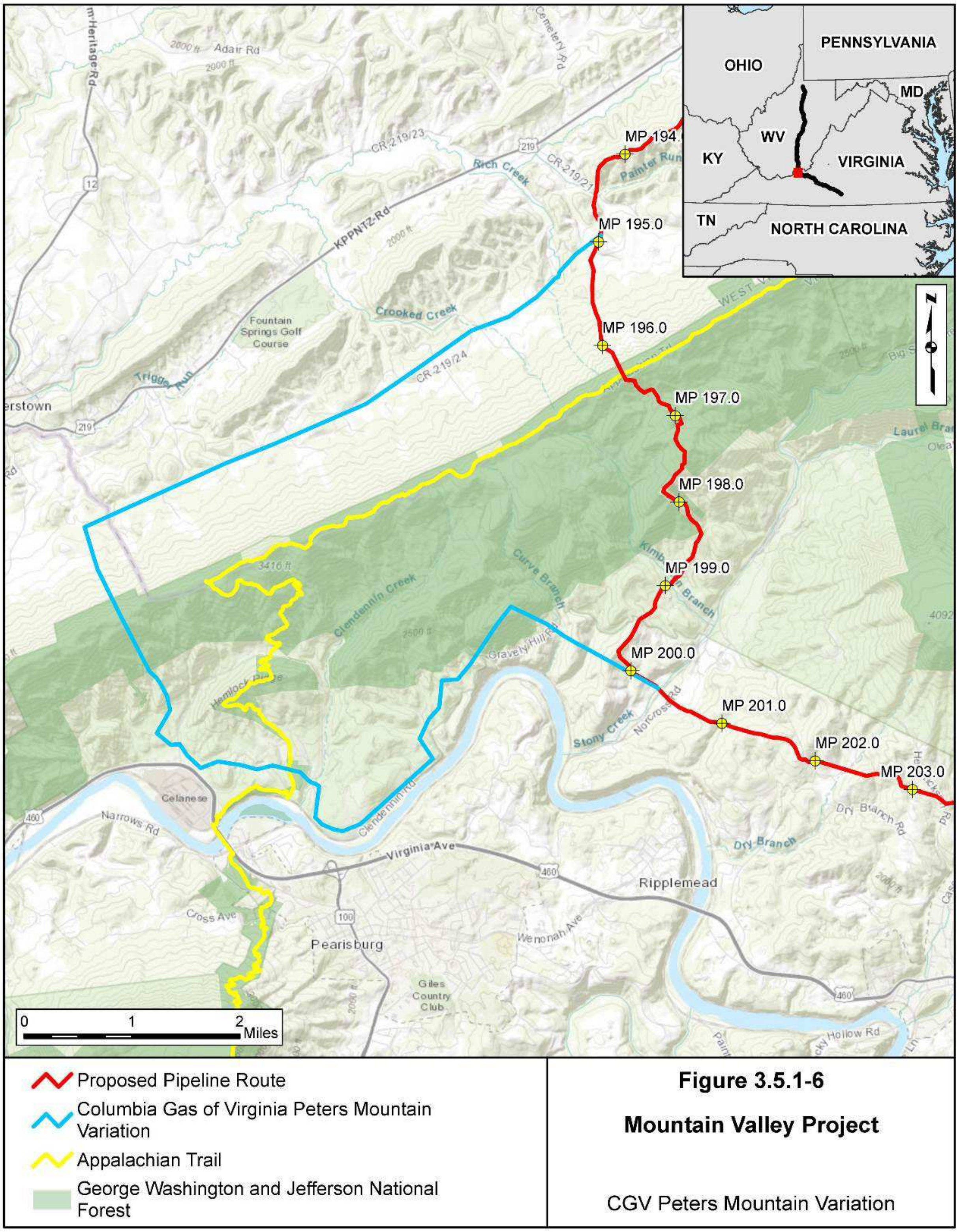


Figure 3.5.1-6

Mountain Valley Project

CGV Peters Mountain Variation

TABLE 3.5.1-5

Comparison of the CGV Peters Mountain Variation and the Proposed Route

Feature	CGV Peters Mountain Variation	Proposed Route
General		
Total length (miles)	14.5	5.5
Length adjacent to existing right-of-way (miles)	1.6	0.0
Land disturbed within construction (acres) a/	219.4	83.1
Federal Lands and Federally Managed Areas		
National Forest System lands crossed (miles)	1.6	1.7
National Forest Wilderness Areas crossed (miles)	0.0	0.0
Appalachian National Scenic Trail crossings (number)	1	1
FS-designated inventoried roadless areas crossed (feet)	0	120
FS-designated inventoried semi-primitive areas crossed (feet)	0	9,130
Human Environment		
Populated areas within 0.5 mile (number) b/	1	0
Landowner parcels crossed (number)	53	20
Residences within 50 feet of construction workspace (number)	2	3
Resources		
Forested land crossed (miles)	8.7	4.8
Forested land affected during construction (acres)	132.4	71.6
Forested land affected during operation (acres)	52.7	28.9
Interior forest crossed (acres)	24.2	104.6
Wetlands crossed (feet) c/	103	0
Forested wetlands crossed (feet)	0	0
Perennial waterbody crossings (number) c/	1	1
Major (> 100 feet) waterbodies crossed	0	0
Shallow bedrock crossed (miles)	4.1	1.6
Steep slope (>20 percent) crossed (miles)	7.3	3.2
Side slope crossed (miles)	7.5	2.9
Landslide potential crossed (miles)	1.3	0.8
Karst area crossed (miles)	11.1	3.8

a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.
c/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

The CGV Peters Mountain Variation would be about 9 miles longer than the comparable portion of the proposed route, and would result in approximately 136 additional acres of construction disturbance. The CGV Peters Mountain Variation would cross almost 4 more miles of forested land, affect more wetlands, and cross about 4 more miles of steep slopes, 4.6 more miles of side slopes, 0.5-mile more of landslide areas, and 7.3 more miles of karst terrain than the proposed route. The variation would cross the ANST in the area of an existing right-of-way; however this area is subject to the restrictions of the recently executed easement agreement between the FS and Celanese. The proposed route would cross more FS-designated inventoried roadless and semi-primitive areas, and affect more acres of interior forest than the alternative. these reasons, we conclude that the CGV Peters Mountain Variation alternative does not offer a significant environmental advantage when compared to the corresponding proposed route.

3.5.1.6 Alternatives for Crossing the Appalachian National Scenic Trail

Alternatives for crossing of the ANST include both construction methods as well as different crossing locations. Alternatives were evaluated based on comments received from the FS and other stakeholders, such as the ATC, indicating concerns for disruption for hikers using the trail, as well as potential visual impacts from the MVP both at the ANST crossing location and from more distant viewpoints.

Alternative Crossing Methods for the Appalachian National Scenic Trail

Mountain Valley proposes to cross the ANST using a conventional bore. Generalized descriptions of pipeline construction methods (including using a bore) are discussed in section 2.4 of this EIS. Mountain Valley stated in its updated contingency plan for crossing the ANST, filed after issuance of the draft EIS on February 9, 2017, that open-cut trenching was assumed not to be an option for crossing the ANST. Mountain Valley indicated that the conventional bore would be re-attempted if the initial try failed, and that other trenchless options such as micro-tunneling or direct pipe methods would be utilized if the convention bore proved to be unfeasible (see section 4.8.2).

Another ANST alternative crossing method mentioned by stakeholders is a HDD. HDD is a trenchless option that can utilize drilling lengths of up to several thousand feet (see section 2.4.2 for additional discussion of the HDD method). Mountain Valley assessed the feasibility of using a HDD at the proposed ANST crossing location, and reported that due to the topography of the area, the drill entry and exit areas exceeded recommended angles, thereby increasing the chance of HDD failure. Mountain Valley's conceptual adjustment (at both immediate and broader locations) of the entry and exit points in the vicinity of the proposed crossing location did not improve overall feasibility. Substantial issues associated the topography and with a safe bending radius during pullback of the pipeline section (either in whole or in sub-sections) back through the bore hole also would increase the likelihood of HDD failure. Further, given the geology of the area, the use of drilling fluids under high pressure, and the likelihood of a high rock content and potential issues with keeping the borehole open prior to pipeline pullback, Mountain Valley concluded that HDD at this location was too likely to fail. We concur.

A conventional bore, typically used to cross lengths of up to several hundred feet, in the case of the ANST would be installed straight through and underneath the upper ridgeline without concern for entry and exit angles, pullback bending angles, or inadvertent loss of drilling fluids. The risk of bore hole collapse would be reduced with the shorter crossing and the nature of the bore itself compared to an HDD. We agree with Mountain Valley's proposal to cross under the ANST using a conventional bore.

Alternative Crossing Locations for the Appalachian National Scenic Trail

The MVP pipeline would cross the ANST at about MP 196.3 along the proposed route filed on October 14, 2016, within the Jefferson National Forest in Monroe County, West Virginia. This route segment was previously identified in a June 24, 2016 filing as Route Modification FS78. In response to FS comments about the ANST crossing, to expand the length of the bore under the trail, and to increase the forested buffer zones on each side of the trail, Mountain Valley adopted Route Modification FS78 as its proposed route in a filing on July 18, 2016. Route Modification FS78 would also avoid the Peters Mountain Wilderness by adjusting the pipeline route to the west of Mystery Ridge Road.

The MVP pipeline would cross the ANST at the crest of Peters Mountain at an area that is predominantly forested. Mountain Valley intends to cross under the ANST using a 600-foot-long horizontal bore. This would allow for a 300-foot-wide forested buffer on each side of the trail. The bore pits would be moved downslope from the trail (a vertical drop of 70 to 90 feet on each side). This buffer of undisturbed forest on either side of the trail would prevent direct impacts on the surface of the trail itself and would substantially reduce visual impacts on users of the ANST. This construction technique would result in noise that may be audible to hikers but these impacts would vary based on the presence of hikers at the time of construction. The crossing and potential visual impacts on the ANST are discussed in more detail in section 4.8.

We evaluated two route variations for crossing of the ANST along existing rights-of-way, to minimize impacts on users of the ANST. These route variations are the State Route (SR) 635-ANST Variation and the American Electric Power (AEP) -ANST Variation (see figure 3.5.1-7). A comparative analysis of environmental impacts of the proposed route and the SR 635-ANST and AEP-ANST Variations is presented in table 3.5.1-6.

SR 635 is the nearest road crossing of the ANST, located about 7 miles to the east of Mountain Valley's proposed crossing of the ANST. The SR 635-ANST Variation would deviate from Mountain Valley's proposed route at about MP 191.7, southeast of the community of Lindside in Monroe County, West Virginia. It would proceed east, crossing Dry Creek and going over Little Mountain, crossing County Road (CR) 29/2, then turning south over Peters Mountain to Giles County, Virginia. It would go through the Jefferson National Forest on the east side of the Peters Mountain Wilderness Area boundary, and cross the ANST near SR 635 (Big Stony Creek Road). The variation would continue south through the Jefferson National Forest, going over Big Mountain. It would exit Jefferson National Forest and cross Laurel Creek, Little Stony Creek, go over Doe Mountain, and cross Doe Creek and CR 813 north of the town of Hoges Chapel before rejoining the proposed route near MP 207.8.

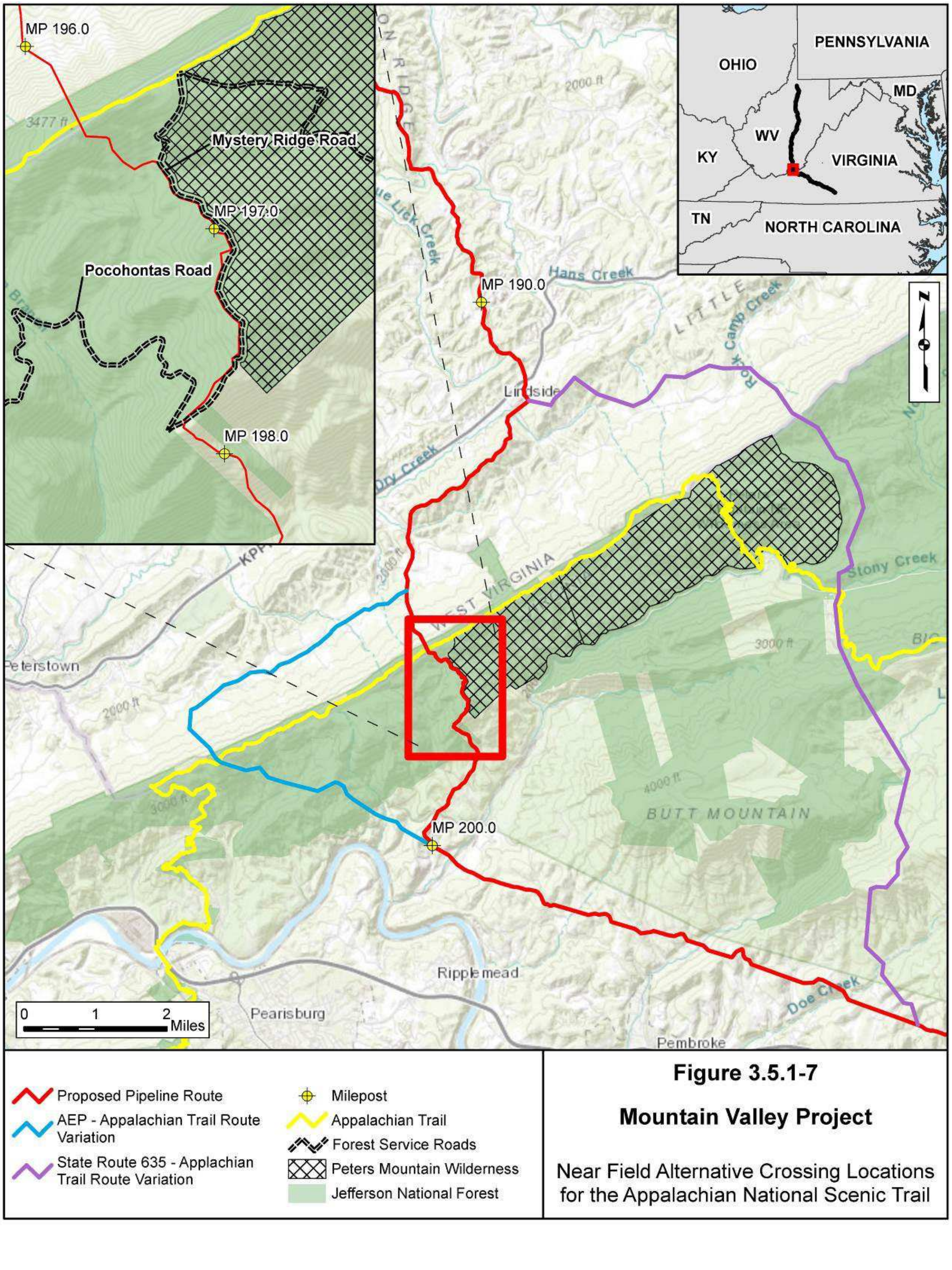


Figure 3.5.1-7

Mountain Valley Project

Near Field Alternative Crossing Locations for the Appalachian National Scenic Trail

TABLE 3.5.1-6

Comparison of the SR 635-ANST and the AEP-ANST Variations and the Proposed Route

Feature	SR 635-ANST Variation	Proposed Route	AEP-ANST Variation	Proposed Route
General				
Total length (miles)	14.6	16.1	7.9	4.7
Length adjacent to existing right-of-way (miles)	0.0	4.3	1.8	0
Land disturbed within construction (acres) a/	221.6	244.8	120.0	71.1
Federal Lands and Federally Managed Areas				
National Forest System lands crossed (miles)	4.6	1.7	2.6	1.7
National Forest Wilderness Areas crossed (miles)	0.0	0.0	0.0	0.0
Appalachian National Scenic Trail crossings (number)	1	1	1	1
FS-designated old growth forest crossed (feet)	490	0	0	0
FS-designated old growth forest affected by construction (acres)	1.4	0	0	0
FS-designated trails crossed (number)	6	0	0	0
FS-designated inventoried roadless areas crossed (feet)	8,420	120	0	120
FS-designated inventoried semi-primitive areas crossed (feet)	8,420	9,130	0	9,130
NRHP designated or eligible historic districts crossed (miles)	0.7	0.6	0	0
Human Environment				
Landowner parcels crossed (number)	50	71	26	16
Residences within 50 feet of construction workspace (number)	3	7	2	4
Resources				
Forested land crossed (miles)	13.6	13.3	5.2	4.5
Forested land affected during construction (acres)	206.3	202.1	79.3	67.0
Forested land affected during operation (acres)	82.6	80.8	31.7	27.1
Interior forest affected (acres)	59.1	148.3	39.4	104.6
Wetlands crossed (feet) c/	97	0	0	0
Forested wetlands crossed (feet)	0	0	0	0
Perennial waterbody crossings (number) c/	18	5	17	1
Major (> 100 feet) waterbodies crossed	0	0	0	0
Shallow bedrock crossed (miles)	6.7	5.3	1.5	0.5
Steep slope (>20 percent) crossed (miles)	8.6	9.6	3.9	3.0
Side slope crossed (miles)	7.9	10.0	5.9	2.7
Landslide potential crossed (miles)	14.6	8.4	7.9	0.3
Karst area crossed (miles)	7.8	8.3	2.9	3.4

a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.
c/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative.

The SR 635-ANST Variation would be about 1.5 miles shorter than the corresponding segment of the proposed route, and would affect 21 less parcels and 4 fewer residences. The variation would also affect about 89 less acres of interior forest and somewhat less steep slopes, side slopes, and karst terrain. The variation would also collocate the ANST crossing with an existing corridor.

The proposed route would, overall, be more collocated with existing corridors by about 4 miles, and would cross about 3 miles less of the Jefferson National Forest. In addition, the proposed route would affect less FS-designated old growth forest, less FS inventoried roadless areas, 13 fewer perennial waterbodies, 1.4 miles less shallow bedrock, and about 6 miles less of landslide prone areas. For these reasons, we conclude that the SR 635-ANST Variation alternative does not offer a significant environmental advantage when compared to the corresponding proposed route.

The AEP electrical powerline is the nearest utility crossing of the ANST, located about 3.3 miles to the west of Mountain Valley's proposed ANST crossing. The AEP-ANST Variation would deviate from Mountain Valley's October 2016 proposed pipeline route near MP 195.4 on the south side of Peters Mountain in Monroe County, West Virginia. The variation would proceed west parallel to CR 219/24, crossing Crooked Creek. It would then turn south to meet with the AEP electrical powerline. The variation would cross the ANST and Jefferson National Forest on the south side of Peters Mountain in Giles County, Virginia following the powerline. It would continue southeast along the powerline and rejoin the proposed route at about MP 200 northwest of the community of Kimballton.

The AEP-ANST Variation offers a crossing of the ANST collocated with an existing utility right-of-way, and overall the variation would be collocated with an existing corridor for 1.8 miles. The AEP-ANST Variation would affect less FS-designated roadless areas and semi-primitive areas, 2 less residences, 65 acres less of interior forest, and about 0.5-mile less of karst terrain. However, the proposed route would be 3.2 miles shorter than the corresponding segment of the proposed route, disturbing about 49 less acres during construction, would cross 1 less mile of the Jefferson National Forest, cross 10 less parcels, 0.7-mile less forest, 16 less perennial waterbodies, and less shallow bedrock, side slopes, and less areas with landslide potential. For these reasons, we conclude that the AEP-ANST Variation alternative does not offer a significant environmental advantage when compared to the corresponding proposed route.

3.5.1.7 New River Conservancy Route Variation

We received comments regarding potential impacts on a parcel located near MP 204.2, in Giles County, Virginia, that is subject to a conservation easement held by the New River Conservancy for a tract of land owned by Sizemore Inc.[13] The conservation easement protects natural resources, and the parcel is intended to be a buffer zone between developments and the nearby Cascades National Recreation Trail, an administrative unit of the NPS. It is the position of the New River Conservancy that the terms of its conservation easement would prevent it from granting an agreement with Mountain Valley allowing the pipeline to cross the parcel.

In a June 28, 2016 letter to the FERC, an attorney representing the New River Conservancy requested an alternative route that would not impact the conservation easement. In a December 20, 2016 letter to the FERC, the New River Conservancy suggested that the SR 635-ANST Variation, discussed above, could avoid the Sizemore conservation easement parcel.

In a letter to the FERC dated August 19, 2016, an attorney representing Sizemore Inc., the owner of the parcel who conveyed the conservation easement to the New River Conservancy, stated that while it objects to the MVP in general, it found the New River Conservancy Variation much more destructive.

Mountain Valley explored the New River Route Variation (also called Variation 82) to avoid the parcel. Our assessment of the variation, in comparison to the corresponding segment of the proposed route is given below.

The New River Conservancy Route Variation would deviate from the proposed route at MP 203.3 turning south, then east, and then south through fields and forest around the subject parcel (see figure 3.5.1-8). It would then turn northeast primarily through wooded hills and would rejoin the proposed route at MP 204.7.

The New River Conservancy Route Variation would avoid crossing the conservation easement and would affect 2 fewer parcels, 1 less perennial waterbody, and 0.2 mile less of shallow bedrock (see table 3.5.1-7). The proposed route would cross the conservation easement for 0.4 mile, but would be 0.4 mile shorter than the alternative affecting about 7 acres less of land. The proposed route would be mostly collocated with an existing powerline corridor, including through the conservation easement itself, for about 1.0 mile (about 71 percent collocation) compared to the alternative that would not be collocated with any corridor. The proposed route would also affect 2.5 acres less of agricultural land, 6 acres less of forest, 0.6 mile less of steep slopes, 0.4 mile less of side slopes, 0.4 mile less of landslide prone areas, and 0.2 mile less of karst terrain.

[13] See letters from the New River Conservancy dated May 31, 2016 (accession number 20160601-5121), June 28, 2016 (accession number 20160628-5252), September 21, 2016 (accession number 20160922-5060), and December 20, 2016 (accession number 2016121-5350), and letter from the Buckland Law Firm representing Sizemore Inc. dated August 19, 2016 (accession number 20160819-5278).

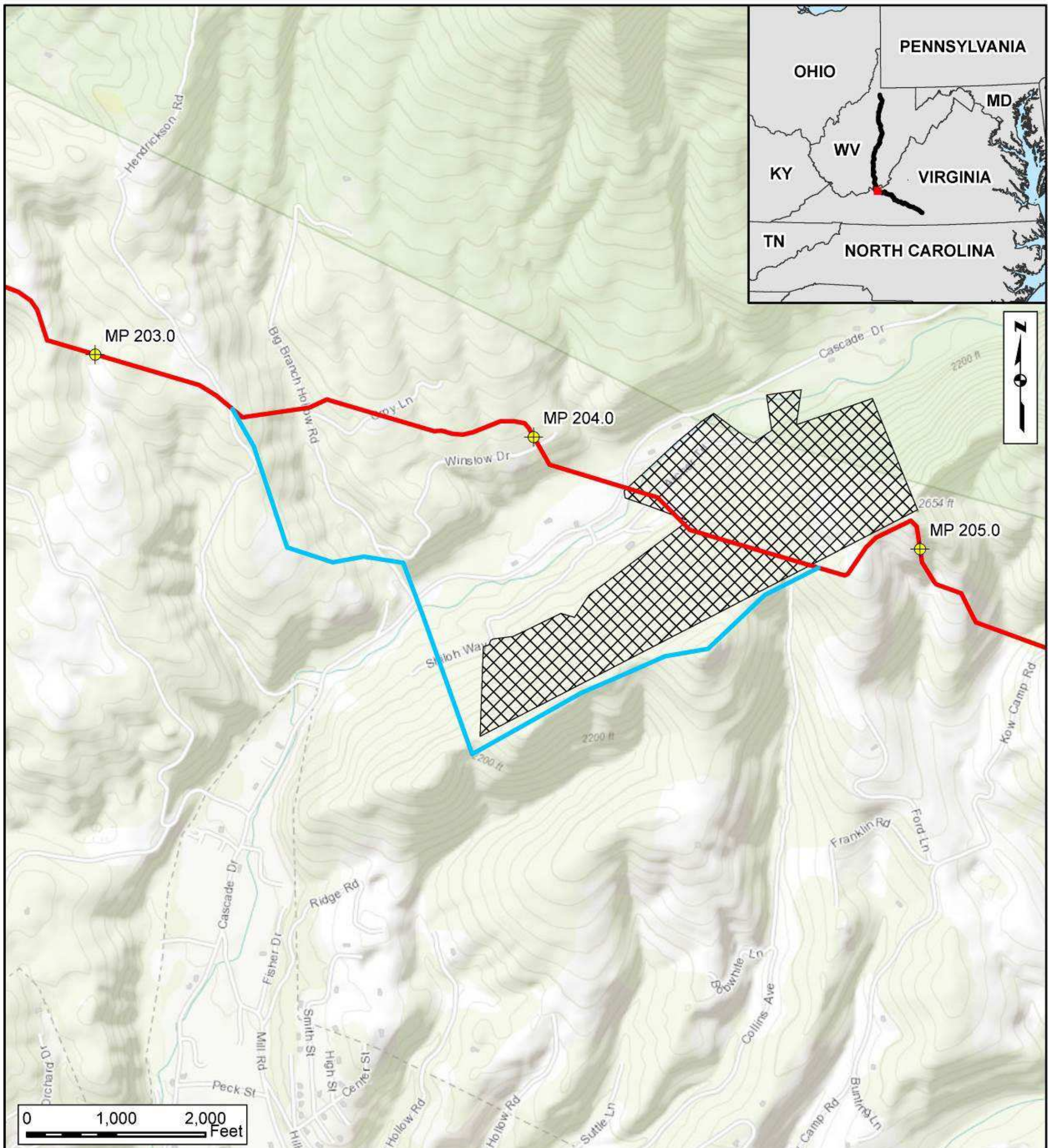


Figure 3.5.1-8

Mountain Valley Project

New River Conservancy Route Variation

TABLE 3.5.1-7

Comparison of New River Conservancy Route Variation (Variation 82) and the Proposed Route

Feature	New River Conservancy Minor Route Variation	Proposed Route
General		
Total length (miles)	1.8	1.4
Length adjacent to existing right-of-way (miles)	0	1.0
Land disturbed within construction right-of-way (acres) a/	27.9	20.8
Land within operational right-of-way (acres) a/	11.2	8.3
Additional Temporary Work Space and Staging Areas (number)	4	4
Additional Temporary Work Space and Staging Areas (acres)	1.8	1.8
Land Use		
Populated areas within ½ mile (number) b/	1	0
New River Conservancy easement crossed (miles)	0	0.4
National Forest System lands crossed – Total (miles)	0	0
Agricultural land affected within construction right-of-way (acres)	2.8	0.3
Agricultural land affected within operation right-of-way (acres)	1.1	0.1
NRHP designated or eligible historic districts crossed (miles)	0	0
Landowner parcels crossed (number)	12	14
Residences within 50 feet of construction work space (number)	0	1
Resources		
Forested land crossed (miles)	1.6	1.2
Forested land affected during construction (acres)	24.0	18.1
Forested land affected during operation (acres)	9.6	7.2
Interior forest crossed (miles)	0	0
Wetlands crossed (feet) d/	0	0
Forested wetlands crossed (feet) d/	0	0
Forested wetlands affected by construction (acres)	0	0
Forested wetlands affected by operation (acres)	0	0
Perennial waterbody crossings (number) d/	2	3
Perennial waterbody crossings, total width (feet)	37	62
Major (> 100 feet) waterbodies crossed (number)	0	0
Shallow bedrock crossed (miles)	0.4	0.6
Steep slope (>20 percent) crossed (miles)	1.4	0.8
Side slope crossed (miles)	1.3	0.9
Landslide potential crossed (miles) e/	1.8	1.4
Karst area crossed (miles)	0.2	0
Habitat for federally listed species (acres) f/	0	0

TABLE 3.5.1-7 (continued)
Comparison of New River Conservancy Route Variation (Variation 82) and the Proposed Route
a/ Assuming 125-foot-wide construction right-of-way and 50-foot-wide operational right-of-way.
b/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
c/ not used in this table but retained for consistency with other alternative tables.
d/ NWI and NHD data used in order to provide a common comparison between the two routes since field surveys were not conducted along the alternative. Public data on waters with drinking water designation not available.
e/ areas mapped as High Incidence and/or High Susceptibility from Godt, 2014.
f/ based on publicly-available data.
NRHP = National Register of Historic Places
NHD = U.S. Geological Survey National Hydrography Dataset
NWI = U.S. Fish and Wildlife Service National Wetland Inventory

For these reasons, we conclude that the New River Conservancy Variation does not offer a significant environmental advantage when compared to the corresponding proposed route segment.

3.5.1.8 Canoe Cave Variation

We received comments regarding the sensitive nature of Canoe Cave, located near MP 215 in Giles County, Virginia, and its designation by VADCR as a hibernacula for federally threatened northern long-eared bats. In response, in October 2016, after issuance of the draft EIS, Mountain Valley adopted into its currently proposed pipeline route a modification that would avoid Canoe Cave. Because this is a substantial route change, almost a mile long, that was adopted after issuance of the draft EIS, we discuss, below, the original October 2015 application route in this vicinity, now identified as the Canoe Cave Variation, as an alternative to the corresponding segment of the proposed route.

The Canoe Cave Variation would deviate from the proposed route near MP 214.7 proceeding north then northeast through agricultural fields before turning east and rejoining the proposed route at MP 215.6 (see figure 3.5.1-9). The proposed route would be slightly longer than the Canoe Cave Variation, affecting about 1.3 acres more land, and crossing about 0.3 mile more side slopes (see table 3.5.1-8). However, the October 2016 proposed route would be located approximately 800 feet north of the mapped extent of the cave system and about 900 feet from the nearest cave entrance, avoiding Canoe Cave and not affecting any new landowners. The new route would also be topographically and hydraulically downgradient of the cave. The Canoe Cave Variation would affect 2 more parcels, and about 7.6 more acres of interior forest. For the reasons discussed above, we conclude that Mountain Valley's adoption of a new route avoiding Canoe Cave was appropriate, and that the Canoe Cave Variation does not offer a significant environmental advantage when compared to the corresponding proposed route segment.

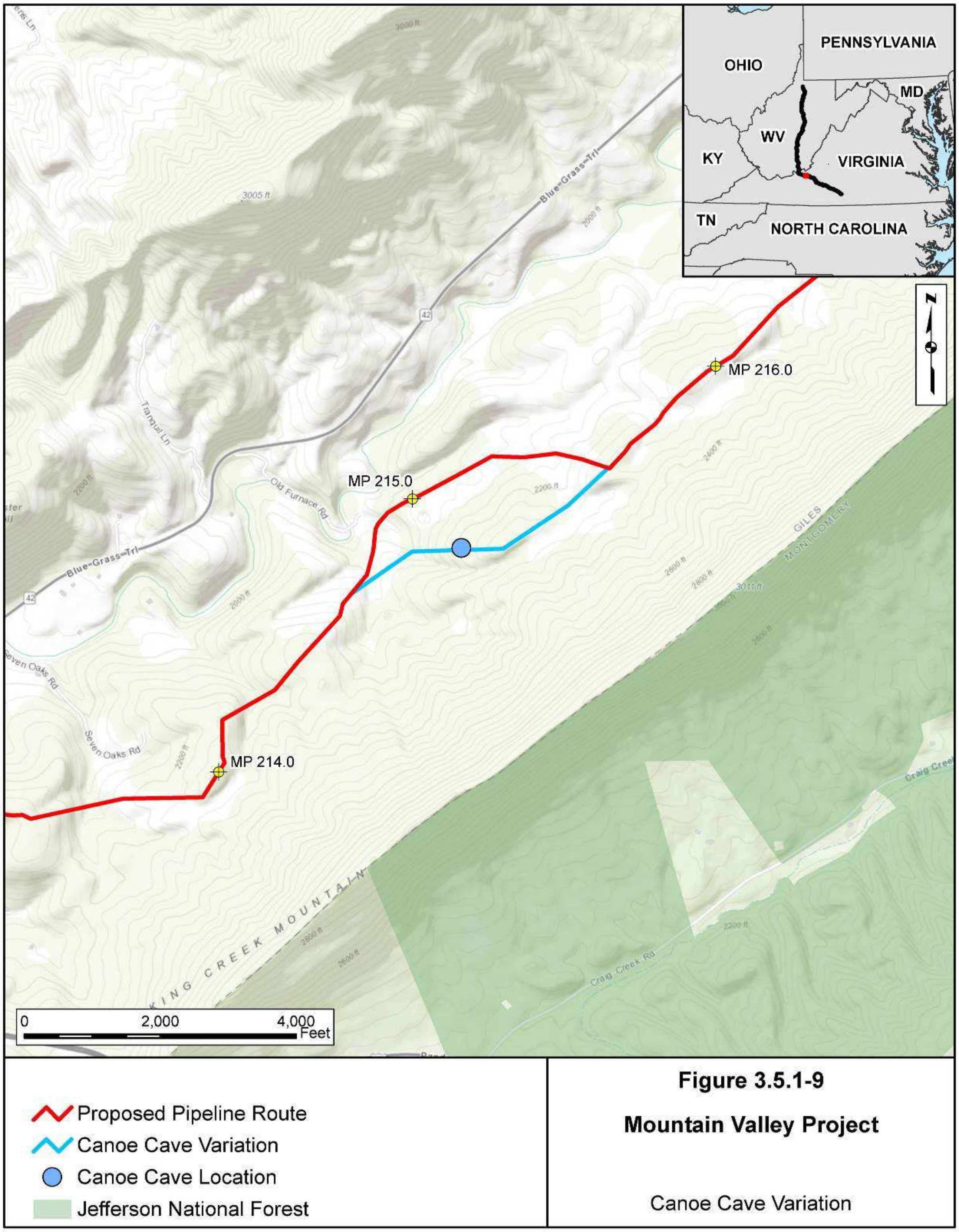


Figure 3.5.1-9

Mountain Valley Project

Canoe Cave Variation

TABLE 3.5.1-8 **Comparison of the Current Proposed Route and the Canoe Cave Variation (October 2015 Route)**		
Feature	**Canoe Cave Variation (October 2015)**	**Current Proposed Route (October 2016)**
General		
Total length (miles)	0.8	0.9
Length adjacent to existing right-of-way (miles)	0	0.1
Land disturbed within construction (acres) a/	12.6	13.9
Federal Lands and Federally Managed Areas		
National Forest System lands crossed (miles)	0	0
National Forest Wilderness Areas crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
National Forest – inventoried roadless areas crossed (feet)	0	0
National Forest – inventoried semi-primitive areas crossed (feet)	0	0
Human Environment		
Populated areas within 0.5 mile (number) b/	0	0
Landowner parcels crossed (number)	5	3
Residences within 50 feet of construction workspace (number)	0	0
Resources		
Forested land crossed (miles)	0.6	0.2
Forested land affected during construction (acres)	9.1	3.0
Forested land affected during operation (acres)	3.6	1.2
Interior forest crossed (acres)	7.6	0
Wetlands (NWI) crossed (feet) c/	0	0
Forested wetlands crossed (feet)	0	0
Perennial waterbody crossings (number) c/	0	0
Major (> 100 feet) waterbodies crossed	0	0
Shallow bedrock crossed (miles)	0.1	0
Steep slope (>20 percent) crossed (miles)	0.5	0.5
Side slope crossed (miles)	0.4	0.7
Landslide potential crossed (miles)	0	0
Karst area crossed (miles)	0.8	0.9

a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.
c/ NWI and NHD data.

3.5.1.9 Brush Mountain Route Variations

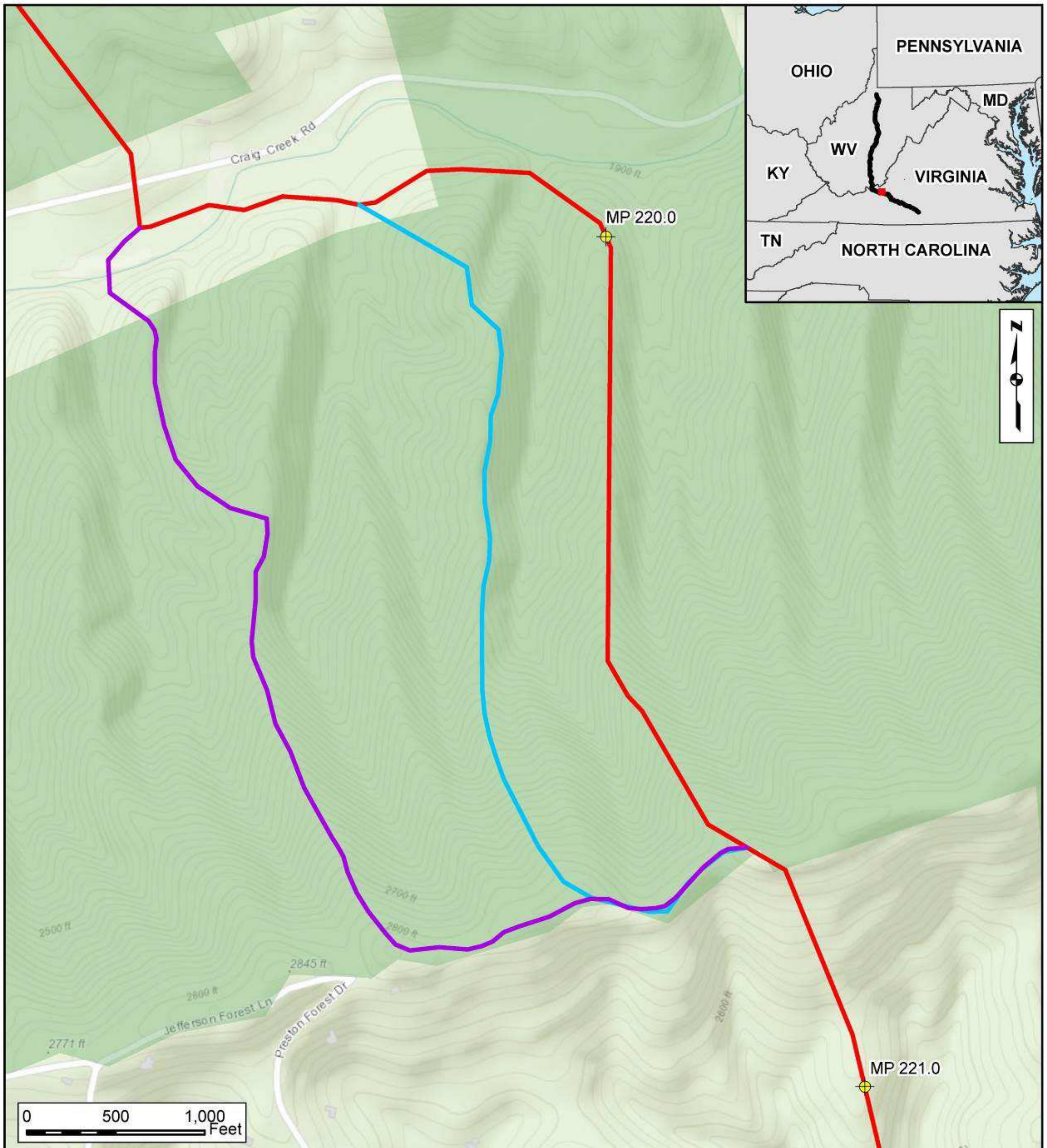
In June 2016, Mountain Valley, adopted a modification (originally labeled FS 71) into its proposed route to reduce the number of crossings of Craig Creek from three to one. Subsequently, in September 2016, the FS asked Mountain Valley to develop and evaluate additional route variations in the same area on Brush Mountain, within the Jefferson National Forest, to minimize workspaces parallel to Craig Creek, reduce sedimentation impacts, preserve a FS-designated 100-foot-wide riparian buffer, and to avoid an unnamed tributary to Craig Creek. After consideration of many routing factors and constraints in the area, Mountain Valley developed Brush Mountain Alternatives 1 and 2 (see figure 3.5.1-10). The proposed route and both alternatives would all still cross Craig Creek. Although the three routes would cross the Brush Mountain Inventoried Roadless Area (IRA) on different ridges, the impacts on the IRA would remain essentially the same, with the exception that Brush Mountain Alternative 1 would require an ATWS near the top of the mountain. All routes would cross the IRA for approximately 1 mile.

Brush Mountain Alternative 1 would depart from the proposed route at MP 219.7 heading southeast and then primarily south along a ridgeline, before turning east and rejoining the proposed route at MP 220.7. This alternative would be located on the ridgeline adjacent to and about 0.1 mile west of the proposed route.

Brush Mountain Alternative 1 would be located about 640 feet farther away from the Brush Mountain Wilderness, would affect one less waterbody (a tributary to Craig Creek), and would move some workspaces about 0.2 mile farther way from the vicinity of Craig Creek compared to the proposed route (see table 3.5.1-9). However, the corresponding segment of the proposed route would be slightly (0.1 mile) shorter, affecting about 1 less acre of land during construction, 1 acre less of forest, and 0.2 mile less of landslide prone areas than Brush Mountain Alternative 1. The proposed route would avoid extended impacts on Brush Mountain Road, used for recreational purposes and by FS vehicles, unlike Brush Mountain Alternative 1 where road closures could last for about 4 weeks. Mountain Valley also stated that adoption of Brush Mountain Alternative 1 would involve adding an area steeper (44 percent grade) than anywhere else along the MVP, thereby requiring winch construction (i.e., heavy equipment working on steep slopes supported by cables), increasing safety and landslide risks, and preventing the ability for trucks to drive along the right-of-way. Sediment loading in the watershed would be similar between the two alternatives. Mountain Valley also committed to limiting construction in the vicinity of Craig Creek to a dry or low flow period, and to coordinate closely with the VADEQ and FS regarding BMPs for sediment and erosion control. For these reasons, we conclude that Brush Mountain Alternative 1 does not offer a significant environmental advantage when compared to the corresponding proposed route segment.

Brush Mountain Alternative 2 would depart from the proposed route at MP 219.5 heading primarily south along a ridgeline, before turning east and rejoining the proposed route at MP 220.7. This alternative would be located on a ridgeline about 0.25 mile west of Brush Mountain Alternative 1 and about 0.45 mile west of the proposed route.

Brush Mountain Alternative 2 would be located about 2,000 feet farther away from the Brush Mountain Wilderness, would affect 1 less waterbody (a tributary to Craig Creek), and would be more collocated with existing corridors by about 0.2 mile compared to the proposed route (see table 3.5.1-9). The alternative would also eliminate the need to parallel Craig Creek for 0.4 mile, as would occur with the proposed route.



Proposed Pipeline Route
Brush Mountain 1 Variation
Brush Mountain 2 Variation
Jefferson National Forest

Figure 3.5.1-10

Mountain Valley Project

Brush Mountain Route Variations

TABLE 3.5.1-9

Comparison of the Brush Mountain Alternatives and the Proposed Route

Feature	Brush Mountain Alternative 1	Brush Mountain Alternative 2	Proposed Route
General			
Total length (miles)	1.1	1.3	1.0
Length adjacent to existing right-of-way (miles)	0.2	0.4	0.2
Land disturbed within construction right-of-way (acres)a/	16.4	20.5	15.5
Land Use			
Residences within 0.5 mile (number)	13	26	10
NRHP-designated or eligible historic districts crossed (miles)	0	0	0
National Forest System lands crossed (miles)	1.0	1.3	1.0
National Forest Wilderness Areas crossed (miles)	0	0	0
Distance to Brush Mountain Wilderness at closest point (feet)	1,670	3,040	1,030
Length adjacent to Brush Mountain Wilderness (miles)	0.7	0.7	0.7
Residences within 50 feet of construction workspace (number)	0	0	0
Landowner parcels crossed (number)	2	2	2
Resources			
Forested land crossed (miles)	1.1	1.1	1.0
Forested land affected during construction (acres)	16.4	17.4	15.2
Forested land affected during operation (acres)	6.5	6.9	6.1
Interior forest crossed (acres)	0.9	1.3	1.0
Forested wetlands crossed (feet)	0.0	0.0	0.0
Wetlands crossed (feet) b/	0.0	0.0	0.0
Perennial waterbody crossings (number)b/	1	1	1
All streams crossed (number)	2	2	3
Shallow bedrock crossed (miles)	1.1	1.2	1.0
Steep slope (> 20 percent) crossed (miles)	0.7	0.8	0.7
Side slope crossed (miles)	0.7	1.0	0.6
Landslide potential crossed (miles) c/	0.5	0.6	0.3
Karst area crossed (miles)	0.0	0.0	0.0

a/ Assuming 125-foot-wide construction right-of-way.
b/ NWI and NHD data used in order to provide a common comparison between the variations and Proposed Route since field surveys were not conducted along the variations.
c/ Areas mapped as High Incidence and/or High Susceptibility from Godt, 2014.
NRHP = National Register of Historic Places
NWI = National Wetland Inventory
NHD = National Hydrography Dataset

However, the corresponding segment of the proposed route would be shorter by 0.3 mile affecting about 5 less acres of land during construction, would generally be farther away from more residences, and would affect 0.3 mile less of FS lands, 0.3 acres less of interior forest, 0.4 mile less of side slope, and 0.3 mile less of landslide prone areas than Brush Mountain Alternative 2. The proposed route would avoid extended impacts on Brush Mountain Road used for recreational purposes and by FS vehicles, unlike Brush Mountain Alternative 2 where road closures could last for about 4 weeks. Mountain Valley stated it anticipated that winch construction would not be required for Alternative 2 and that construction vehicles could drive along the right-of-way as with the proposed route. This alternative would also be located within 370 feet of a home in the Preston Forest subdivision, which would be avoided by at least 2,000 feet with the proposed route. The proposed route was modified during the pre-filing process to be much farther away from the Preston Forest subdivision due to multiple stakeholder comments. Sediment loading in the watershed would also be similar between the two alternatives and Mountain Valley committed to installing proper sediment and erosion control BMPs developed in coordination with the VADEQ and FS. For these reasons, we conclude that Brush Mountain Alternative 2 does not offer a significant environmental advantage when compared to the corresponding proposed route segment.

3.5.1.10 October 2015 Route Over the Mount Tabor Sinkhole Plain Variation

Mountain Valley identified a concentration of sinkholes and karst terrain in the vicinity of the Mount Tabor Sinkhole Plain in Montgomery County, Virginia in pre-filing, and provided additional information about geological hazards after submittal of its application. We requested that Mountain Valley explore the feasibility of alternative routes avoiding or minimizing potential effects to karst features around the Mount Tabor Sinkhole Plain. Mountain Valley developed the Mount Tabor Variation and filed an assessment in April 2016.

As part of our draft EIS, we recommended that Mountain Valley continue on-site surveys of the variation to assess constructability and identify karst features that should be avoided if the alternative were to be adopted into the proposed pipeline route. We also indicated that Mountain Valley should report those findings prior to the end of the draft EIS comment period. Mountain Valley surveyed the draft EIS recommended route using electrical resistivity methods and field assessments, and adopted the Mount Tabor Variation into its proposed route on October 14, 2016. Since this change affected 10 new landowners, we issued a public notice to these newly affected landowners on January 13, 2017; and provided an additional comment period extending to February 21, 2017 (see also section 1.4).

Recognizing that the Mount Tabor Variation is a substantial route modification (more than 6 miles long) adopted after we issued the draft EIS, that affects new landowners, in this final EIS we compare the corresponding segment of the proposed route with the October 2015 application route over the Mount Tabor Sinkhole Plain (see figure 3.5.1-11). The October 2015 Route Over the Mount Tabor Sinkhole Plain Variation would leave the currently proposed route at about MP 221.4, where the variation would turn south from the proposed route for about 1.2 miles crossing Mount Tabor Road (CR 624), then turn southeasterly for about 3.9 miles, then northeast for about 0.2 mile to rejoin the proposed route near Catawba Road at about MP 227.2.

A comparative analysis of environmental impacts of the proposed route and the October 2015 Route Over the Mount Tabor Sinkhole Plain Variation is presented in table 3.5.1-10. The variation route would be slightly (0.2-mile) shorter, be more collocated with existing utility corridors by 2.5 miles, and would cross 2.2 less miles of forest, 48 less acres of interior forest, and 0.7-mile less of steep slopes. However, the proposed route segment would cross 7 fewer parcels, and 0.5-mile less of karst terrain. The proposed route also would reduce impacts on the North Fork Rural Historic District, and would avoid Virginia Outdoors Foundation (VOF) parcels and easements protected by The Nature Conservancy (TNC). Both the proposed route and variation cross the VADCR-designated Slussers Chapel and Old Mill Conservation Sites; however, the proposed route would cross less of the conservation sites. For these reasons, we conclude that the October 2015 Route Over the Mount Tabor Sinkhole Plain Variation does not offer a significant environmental advantage when compared to the corresponding segment of the proposed route adopted in October 2016.

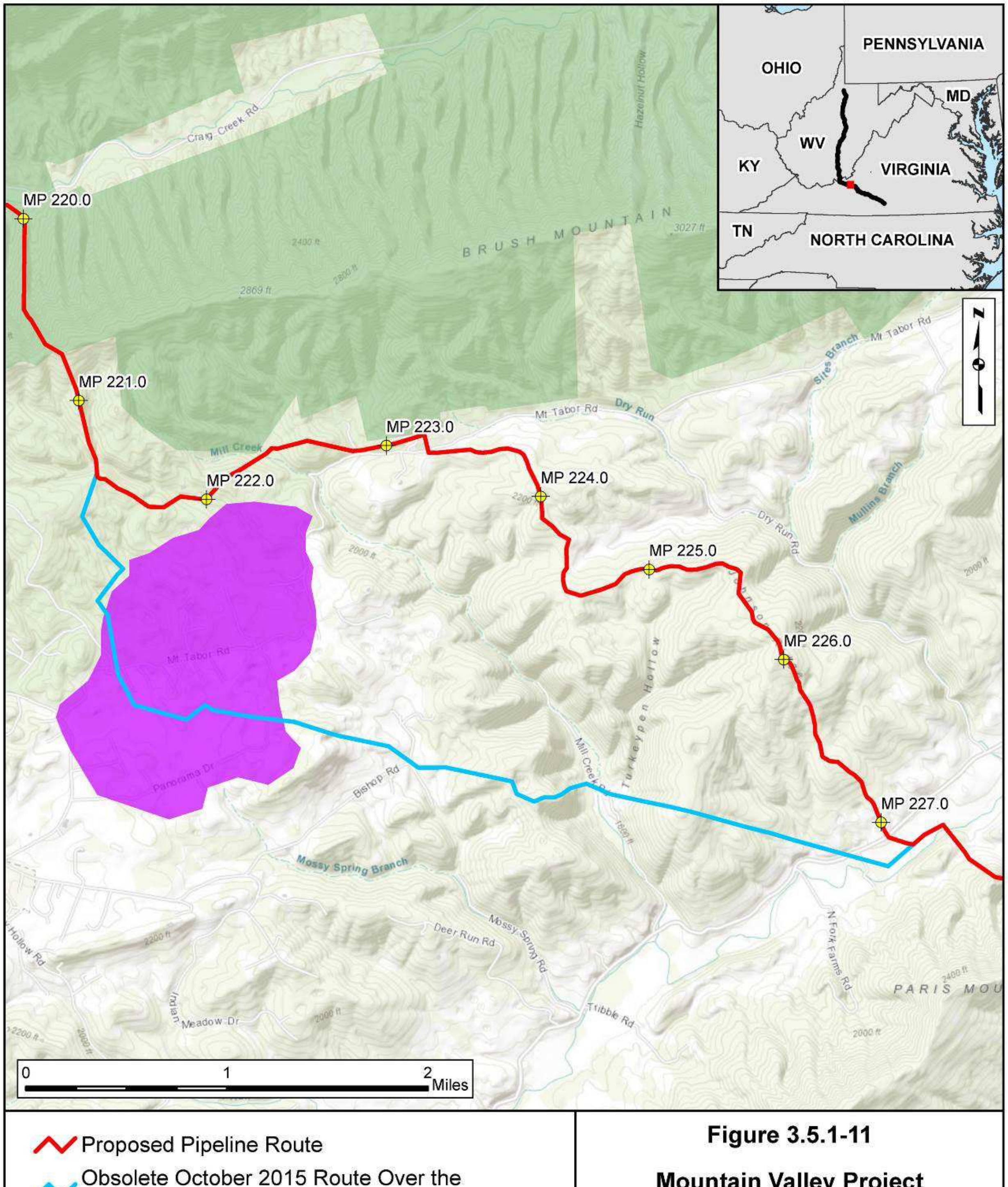


Figure 3.5.1-11

Mountain Valley Project

Mount Tabor Variation

TABLE 3.5.1-10

Comparison of the October 2015 Route and the October 2016 Proposed Route Over the Mount Tabor Sinkhole Plain Variation

Feature	October 2015 Route Over the Mount Tabor Sinkhole Plain Variation	Proposed Route (Includes the Adopted Draft EIS Mount Tabor Variation)
General		
Total length (miles)	5.6	5.8
Length adjacent to existing right-of-way (miles)	2.5	0
Land disturbed within construction right-of-way (acres) a/	85.2	88.4
Land Use		
Populated areas within 0.5 mile (number) b/	1	0
NRHP designated or eligible historic districts crossed (miles)	2.4	1.8
Landowner parcels crossed (number)	29	22
Residences within 50 feet of construction workspace (number)	0	0
Resources		
Forested land crossed (miles)	2.9	5.1
Forested land affected during construction (acres)	44.1	77.3
Forested land affected during operation (acres)	17.6	30.9
Interior forest crossed (acres)	24.2	72.3
Wetlands crossed (feet)	44	0
Forested wetlands crossed (feet)	0	0
Perennial waterbody crossings (number)	0	4
Shallow bedrock crossed (miles)	2.2	2.5
Steep slope (>20 percent) crossed (miles)	1.7	2.4
Side slope crossed (miles)	1.8	2.0
Landslide potential crossed (miles)	5.6	5.8
Karst area crossed (miles)	1.2	0.7

a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.

3.5.1.11 Slussers Chapel Conservation Site Avoidance Variations

The VADCR identified a route alternative intended to avoid the Slussers Chapel Conservation Site, in its comment letter filed on September 9, 2016, after our draft EIS was in the final production phase. In response to the VADCR letter, we asked Mountain Valley to investigate and consider this route variation, and they filed information on February 17, 2017. In addition, Mountain Valley also considered and filed information for another alternative route to reduce impacts on the Slussers Chapel Conservation Site, that it labeled Variation 250. Finally, the FERC staff developed an adjustment to Variation 250 called Modified Variation 250, intended to further minimize potential impacts on karst, caves, and groundwater. Below, we compare the corresponding segment of the October 2016 proposed route, with the VADCR's Slussers Chapel Conservation Site Avoidance Variation, Mountain Valley's Variation 250, and the Modified Variation 250 (see figure 3.5.1-12). We received multiple comments from the public regarding these variations including support for the VADCR's Slussers Chapel Conservation Site Avoidance Variation, Variation 250, and/or Modified Variation 250 based primarily on a stated reduction in impacts on water quality and karst features.

The VADCR's Slussers Chapel Conservation Site Avoidance Variation would begin at about MP 220.7 of the proposed route, turning east and following the ridge on top of Brush Mountain for about 1.9 miles, then turning south for about 0.8 mile, and rejoining the proposed route at about MP 223.2, just north of Mount Tabor Road. The first 2.7 miles of the variation would be within the Jefferson National Forest, and about 1.6 miles of the variation along the ridgeline would be located directly adjacent to the southern boundary of the Brush Mountain Wilderness. This variation would be along the northern boundary of the Slussers Chapel Conservation Site on the ridgetop of Brush Mountain, and just inside the eastern boundary of the site south to Mount Tabor Road. The October 2016 proposed route would also be inside the Slussers Chapel Conservation Site's eastern boundary after it is rejoined by the VADCR's variation from about MP 223.3 to about MP 223.7, and then the proposed route would be just outside the eastern boundary of the site to about MP 224.7.

The VADCR's Slussers Chapel Conservation Site Avoidance Variation would be slightly (0.2-mile) longer than the corresponding segment of the proposed route, but more collocated with existing corridors by about 1.6 miles and it would cross about 0.7-mile less of the Slussers Chapel Conservation Site, 9 less parcels, 8 less acres of forest, 2 less perennial waterbodies, and 14 less karst features such as sinkholes (see table 3.5.1-11a – note that data presented represent alternative route termini near MP 227.3 to facilitate a consistent comparison relative to alternatives near the Mount Tabor Sinkhole Plain). However, the corresponding segment of the proposed route would affect about 2.5 miles less of NFS lands, 1.1 miles less of side slope, about 25 less acres of interior forest, and 1 mile less of shallow bedrock. Along the VADCR's Slussers Chapel Conservation Site Avoidance Variation on the ridgetop of Brush Mountain, Mountain Valley would have to maintain a 50-foot-wide buffer zone from the edge of the Brush Mountain Wilderness boundary. The 125-foot-wide construction right-of-way would overlap Forest Road 188, necessitating its temporary closure to the public during construction. In addition, there would be side-slopes to contend with on the south side of the road. The VADCR's Slussers Chapel Conservation Site Avoidance Variation provides both advantages and disadvantages when compared with the proposed route. For most factors, the difference is not significant. In balancing the factors evaluated, we do not find an overall significant environmental advantage for the alternative when compared to the proposed route.

The VADCR expressed concerns about the proposed route crossing two waterbodies within the Slussers Chapel Conservation Site, including a stream the flows into a karst feature in the vicinity of MP 221.9, so Mountain Valley developed Variation 250 in a February 17, 2017 filing responding to our January 26, 2017 EIR. Variation 250 would leave the proposed route near MP 221.0 proceeding southeast before rejoining the proposed route near MP 222.2 and then following the proposed route to MP 227.3. The variation would avoid construction near, and parallel to, an intermittent drainage located near MP 221.9 by moving approximately 1,000 feet to the northeast.

Variation 250 would be 0.3 mile shorter than the proposed route and would affect 2 less perennial waterbodies, 4.2 less acres of forest, and 6 less karst features (see table 3.5.1-11b). Otherwise, Variation 250 and the corresponding segment of the proposed route would generally affect similar resources in a similar way. No new landowners would be affected by Variation 250.

Consequently, our March 20, 2017 EIR requested that Mountain Valley consider a modification to the variation to locate the route north of the Pulaski Thrust Fault between about MPs 222.05 and 222.25, to reduce impacts on karst terrain. In response, in a filing on March 30, 2017, Mountain Valley developed Modified Variation 250. Modified Variation 250 would depart from the proposed route near MP 220.75 turning east and entering the Jefferson National Forest before turning southeast and east, exiting and re-entering the Jefferson National Forest again while located just north of the Pulaski Thrust Fault, and then turning southeast and south re-joining the proposed route near MP 223.7.

Modified Variation 250 would be more collocated with existing corridors by 0.5 mile, and would cross 0.5 mile less of the Slussers Chapel Conservation Site, 7 fewer parcels, and an estimated 21 less known karst features (see table 3.5.1-11b). However, the proposed route would be 0.2 mile shorter, would avoid the 2.3 miles of NFS lands that would be crossed by Modified Variation 250, and would affect 0.6 mile less of steep slopes, and 0.8 mile less of side slopes. Modified Variation 250 would also affect one new landowner, and cross between two residences located along Mount Tabor Road. Further, Mountain Valley indicated that it had already performed electrical resistivity studies on its proposed route located south of the Pulaski Thrust Fault and based on the results, it did not anticipate unstable working conditions along the proposed route.

Similar to the VADCR's Slussers Chapel Conservation Site Avoidance Variation, the Modified Variation 250 provides both advantages and disadvantages when compared with the proposed route. For most factors, the difference is not significant. In balancing the factors evaluated, we do not find an overall significant environmental advantage for the alternative when compared to the proposed route.

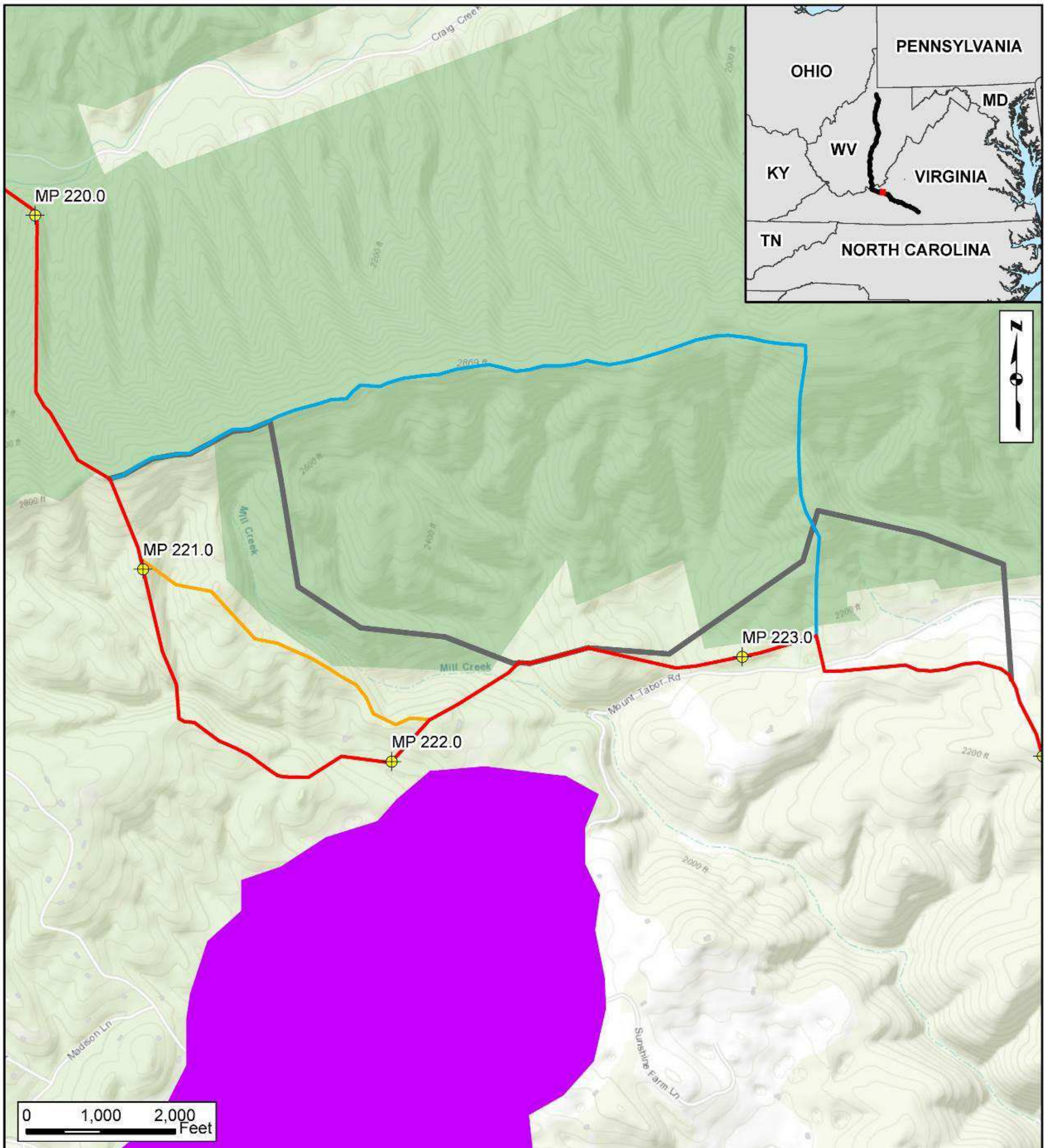


Figure 3.5.1-12

Mountain Valley Project

VADCR Slussers Chapel Variations

TABLE 3.5.1-11a

Comparison of the Proposed Route to the VADCR's Slussers Chapel Conservation Site Avoidance Variation and Variation 250

Feature	VADCR's Slussers Chapel Conservation Site Avoidance Variation	Variation 250	Proposed Route
General			
Total length (miles)	6.8	6.3	6.6
Length adjacent to existing right-of-way (miles)	1.6	0.1	0.1
Land disturbed within construction right-of-way (acres) a/	102.5	95.7	99.9
Land disturbed within operation right-of-way (acres) a/	41.0	38.3	40.0
Non-typical work areas required (acres)	0.0	0.0	0.0
Land Use			
Slussers Chapel Conservation Site crossed (miles)	2.3	2.7	3.0
National Forest System lands crossed (miles)	2.54	0.04	0.04
National Forest Wilderness Areas crossed (miles)	0.0	0.0	0.0
Residences within 50 feet of construction workspace (number)	0	0	0
Agricultural land affected within construction right-of-way (acres)	9.6	9.6	9.6
Populated areas within 0.5 mile (number) g/	0	0	0
Landowner parcels crossed (number)	14	21	23
Resources			
Forested land crossed (miles)	5.1	5.5	5.7
Forested land affected during construction (acres)	78.5	82.3	86.5
Interior Forest affected during construction (acres)	39.4	13.6	14.2
Known habitat for federally listed species (acres) b/	0.1	0.1	0.1
Known archaeological or historic sites within 0.5 mile (number)	8	9	9
Wetlands crossed (number) c/	1	1	1
Wetlands crossed (feet) c/	44	44	44
Forested wetlands crossed (number) c/	0	0	0
Forested wetlands affected (acres) c/	0.0	0.0	0.0
Perennial waterbody crossings (number) c/	0	0	2
Intermittent waterbody crossings (number) c/	2	3	6
Major waterbody crossings (crossing width > 100 feet) (number)	0	0	0
Total length of all waterbody crossings (feet) d/	40	30	60
Surface waterbodies designated as public drinking water supply crossed (number)	0	0	0
Springs and domestic water supply wells within 150 feet of the centerline (number)	0 e/	1 e/	1
Steep slope crossed (miles)	1.6	1.9	1.9
Side slope crossed (miles)	3.3	2.1	2.2

TABLE 3.5.1-11a (continued)

Comparison of the Proposed Route to the VADCR's Slussers Chapel Conservation Site Avoidance Variation and Variation 250

Feature	VADCR's Slussers Chapel Conservation Site Avoidance Variation	Variation 250	Proposed Route
Shallow bedrock crossed (miles)	4.5	3.5	3.5
Landslide potential crossed (miles)	6.8	6.3	6.6
Karst (miles) f/	0.0	0.0	0.0
Known karst features, sinkholes, or caves within 50 feet of the construction right-of-way (number)	70	78	84

Notes:

a/ Assuming 125-foot-wide construction right-of-way and 50-foot-wide operation right-of-way.

b/ Potential Indiana bat and Virginia Tier 1 Habitats.

c/ NWI and NHD data used in order to provide a common comparison between the route adjustments and proposed route since field surveys were not conducted along the route adjustments. Exception is for perennial waterbodies crossed by the October 2016 Proposed Route which is based on field survey data.

d/ Using estimated average crossing length of 10 feet for NHD waterbodies.

e/ Field survey only conducted for the portion of alternative that shares same route as Proposed Route.

f/ USGS, 2014. Mineral Resources Program data available at https://mrdata.usgs.gov/geology/state.

g/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.

TABLE 3.5.1-11b

Comparison of Modified Variation 250 and the Proposed Route

Feature	Modified Variation 250	Proposed Route
General		
Total length (miles)	3.2	3.0
Length adjacent to existing right-of-way (miles)	0.5	0.0
Land disturbed within construction right-of-way (acres) a/	48.6	45.9
Land disturbed within operation right-of-way (acres) a/	19.5	18.4
Non-typical work areas required (acres)	0.0	0.0
Land Use		
VADCR Slussers Chapel Conservation Site crossed (miles)	2.4	2.9
National Forest System lands crossed (miles)	2.3	0.0
National Forest Wilderness Areas crossed (miles)	0.0	0.0
Residences within 50 feet of construction workspace (number)	0	0
Agricultural land affected (acres)	0.0	0.0
Populated areas within 0.5 mile (number) g/	0	0
Landowner parcels crossed (number)	9	16
Resources		
Forested land crossed (miles)	2.7	2.7
Forested land affected during construction (acres)	41.3	41.2
Interior Forest affected during construction (acres)	44.6	36.4
Known habitat for federally listed species (acres) e/	0.0	0.0
Known archaeological or historic sites within 0.5 mile (number) h/	4	4
Wetlands (NWI) crossed (number) b/	0	0
Forested wetlands (NWI) crossed (number) c/	0	0
Forested wetlands (NWI) affected (acres) c/	0.0	0.0
Perennial waterbody crossings (number) b/	0	0
Intermittent waterbody crossings (number) b/	3	4
Major waterbody crossings (crossing width > 100 feet) (number)	0	0
Total length of all perennial waterbody crossings (feet) f/	0	0
Surface waters designated as public drinking water supply crossed (number)	0	0
Springs and domestic water supply wells within 150 feet of the centerline (number)	0 d/	1
Steep slope crossed (miles)	2.0	1.4
Side slope crossed (miles)	2.4	1.6
Shallow bedrock crossed (miles)	1.6	1.5
Landslide potential crossed (miles)	3.2	3.0
Karst (miles) c/	0	0

TABLE 3.5.1-11b (continued) **Comparison of Modified Variation 250 and the Proposed Route**		
Feature	**Modified Variation 250**	**Proposed Route**
Known karst features, sinkholes, or caves within 50 feet of the construction right-of- way (number)	1 d/	22

Notes:
- a/ Assuming 125-foot-wide construction right-of-way and 50-foot-wide operation right-of-way.
- b/ NWI and NHD data used in order to provide a common comparison between the route adjustment and proposed route since field surveys were not conducted along the route adjustment.
- c/ National Atlas map: Engineering aspects of karst, by William E. Davies and others, 1984.
- d/ Not field delineated, except where variation is within the study area of the proposed route.
- e/ Potential Indiana bat and Virginia Tier 1 Habitats.
- f/ Using estimated average crossing length of 20 feet for NHD perennial waterbodies.
- g/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
- h/ Sites identified during project-specific field surveys, which includes only the very start and end of the variation route.

However, given the modest yet multiple environmental benefits that could be obtained through adoption of Variation 250, and in consideration that it would also avoid impacts on waterbodies of concern to VADCR, **we recommend that:**

- **Prior to construction, Mountain Valley should adopt Variation 250 into its proposed route. As part of its Implementation Plan, Mountain Valley should file with the Secretary the results of all environmental surveys, an updated 7.5-minute USGS topographic quadrangle map, and a large-scale alignment sheet that illustrates this route change.**

3.5.1.12 Poor Mountain Variation

We received comments about a conservation easement granted to the VOF by a private landowner (Grace Terry) in Roanoke County, Virginia.[14] In particular, Mountain Valley proposes to use an access road (MVP-RO-279.01) located near MP 239.3, that would cross the VOF easement (ROA-2563/MON-2563).

In our January 26, 2017 EIR, we asked Mountain Valley to address the landowner concerns raised in accession number 20161223-5085 (Grace Terry letter dated December 22, 2016), and evaluate alternatives to using proposed access road MVP-RO-279.01. Mountain Valley responded, in a February 17, 2017 filing, that stated that the permanent access road was needed to provide proper access during both construction and operation to a 2-mile-long segment of proposed right-of-way between MPs 237.6 and 239.7 where other access options would be constrained by the presence of waterbodies and wetlands. The proposed pipeline would not affect the parcel with the conservation easement, except that the existing dirt road would need to

14 See letters from Grace Terry dated November 24, 2015 (accession number 20151125-5085) and December 22, 2016 (accession number 20161223-5085), and from VOF dated December 19, 2016 (accession number 20161219-5102) and January 10, 2017 (accession number 20170110-5207).

be widened from its current 10 foot width to approximately 40-feet-wide for a length of 675 feet. The proposed road improvement would affect approximately 0.5 acre of land and would involve grading, forest vegetation removal or tree trimming, and installation of gravel. Alternatives to proposed access road MVP-RO-279.01 could potentially involve impacts on wetlands and waterbodies or construction of a new road through a forested area. Mountain Valley stated that it was coordinating with the VOF and would pursue a permanent easement through the "Conversion of Open Space" application process relative to Virginia Code 10.1-1704.

Based on our review of aerial photography and topographic maps, we evaluated the possibility of utilizing other access points in consideration of constraints caused by the presence of 5 perennial streams, 1 ephemeral stream, and 1 forested wetland located between MP 237.6 and MP 240.3 at Honeysuckle Road. We assessed potential access to the pipeline route near MP 238.4 from both the north and south along a powerline corridor, but given road lengths, affects to forest, and involvement of new landowners, we conclude that use of new access roads would not provide a significant environmental advantage. However, we determined that Mountain Valley could use the right-of-way for access in this area in lieu of access road MVP-RO-279.01, although we acknowledge that special provisions may need to be made to accommodate suitable access during construction and operation given the presence of waterbodies and wetlands. In addition, while Mountain Valley provided some of the information requested in our January 26, 2017 EIR, Mountain Valley did not provide adequate information to justify use of the access road. Based on the information provided, we determined that the apparent impacts of widening the access road outweigh the demonstrated need. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, for review and approval by the Director of OEP, a segment-specific construction and operation access plan for the area between MP 237.6 and 240.3, that does not include access road MVP-RO-279.01.**

We also received comments from TNC and the owners of Mountain Cove Farm regarding potential impacts on the TNC's Poor Mountain Conservation Easements (discussed further in section 4.8), and the headwaters of Bottom Creek (discussed in section 4.3) along the proposed MVP pipeline route.[15] In response, our January 26, 2017 EIR asked Mountain Valley to assess an alternative pipeline routing concept to the eastward between about MPs 238 and 242, that we designed to minimize impacts on conservation easements, water resources, forest, and agricultural activities associated with the Terry parcels and the Mountain Cove Farm. We label this the Poor Mountain Variation. Our assessment of information filed by Mountain Valley on February 17, 2017 about the Poor Mountain Variation is provided below.

The Poor Mountain Variation would depart from the proposed route near MP 238.2 heading east and north to avoid the steepest part of Poor Mountain and passing to the south of Spring Hollow Reservoir and Camp Roanoke. It would then proceed southeast and east intersecting with an existing powerline corridor and heading south along the corridor for about 2.8 miles before turning west along another existing powerline for 0.6 mile and rejoining the

[15] See December 19, 2016 letter from TNC (accession number 20161219-5368) and letters from James Scott filed March 15 (accession number 20170315-5063) and March 24, 2017 (accession number 20170324-5140)

proposed route at MP 242.1 (see figure 3.5.1-13). The Poor Mountain Variation would avoid the subject Terry family parcels by bypassing them to the east. It would also avoid TNC conservation easements located on both sides of Honeysuckle Road at MPs 239.7 to 241.0.

The Poor Mountain Variation would be more collocated with existing utilities by 3.4 miles, and affect 2 fewer waterbodies, 4.5 acres less of interior forest, and an estimated 14 fewer wells than the corresponding segment of the proposed route (see table 3.5.1-12). However, the proposed route would be 2.1 miles shorter, affecting 32 less acres of land, 28 less acres of forest, 14 less parcels, 1.3 miles less steep slopes, 1.5 less miles of side slopes, 1.6 miles less of shallow bedrock, 1.1 miles less of landslide-prone areas, and 0.7-mile less of karst terrain. The Poor Mountain Variation would also be closer to Spring Hollow Reservoir and Camp Roanoke, which were the subject of prior rerouting efforts during the pre-filing process based on multiple stakeholder comments. For these reasons, we conclude that the Poor Mountain Variation does not offer a significant environmental advantage when compared to the corresponding proposed route segment.

In an attempt to address comments from TNC and another landowner, our March 20, 2017 EIR asked Mountain Valley to examine the possibility of a different route variation to the west of Poor Mountain that would avoid the Terry family parcels, the Mountain Cove Farm, and TNC easements. In their March 30, 2017 response, Mountain Valley labeled this Alternative 682 (see figure 3.5.1-14).

Alternative 682 would leave the proposed route at about MP 239.3, heading southwest over Poor Mountain into Montgomery County, through a forested area for about 2.2 miles, skirting the western side of a VOF easement (MON-VOF-2564) for about 1.5 miles. The variation with then turn southeast for about 3.6 miles before rejoining the proposed route at about 244.5 back in Roanoke County, after again crossing Bottom Creek. This portion of the variation is also mostly forested, and would go through about 2.5 miles of two parcels with TNC easements.

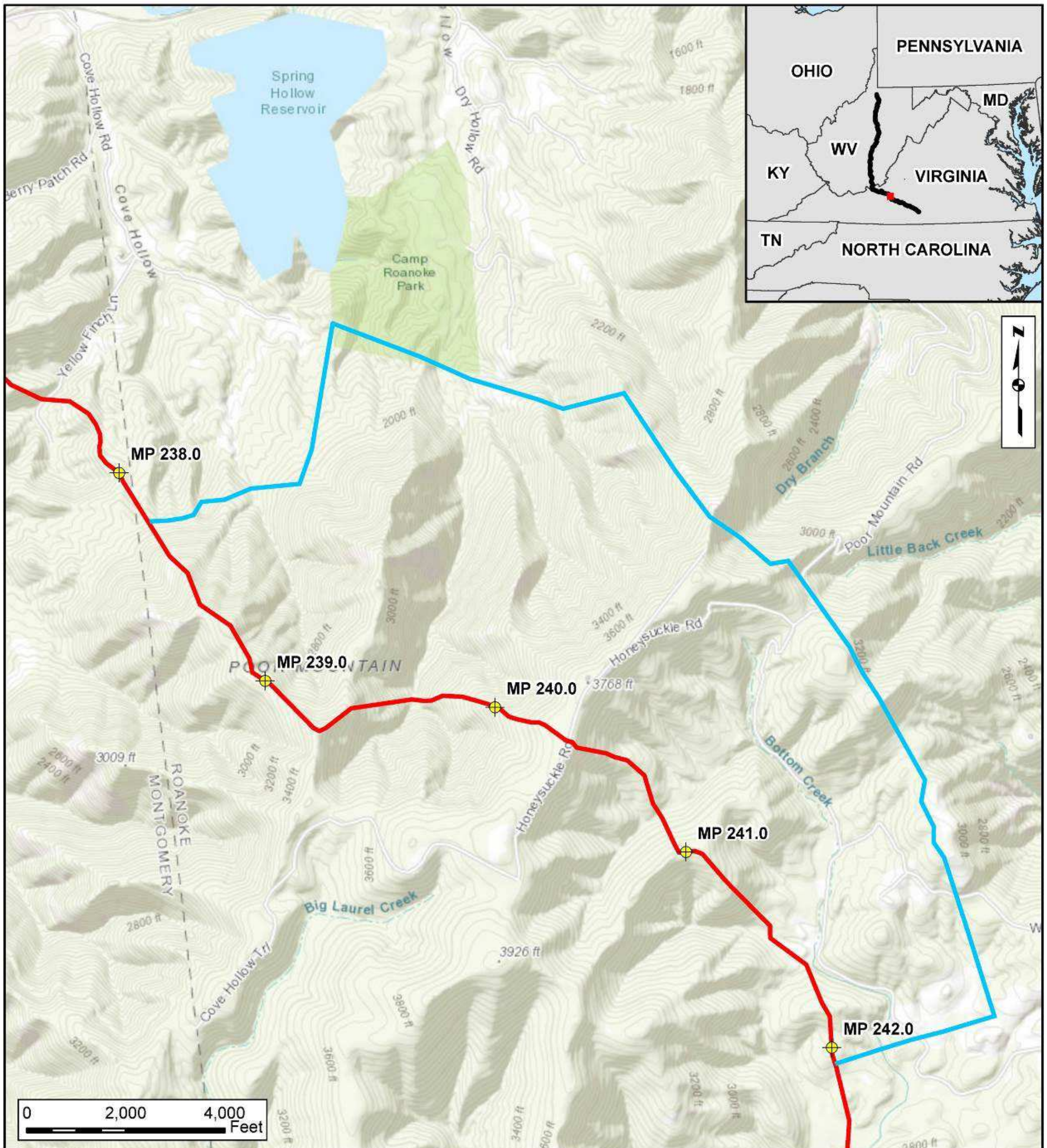


Figure 3.5.1-13

Mountain Valley Project

Poor Mountain Route Variation

TABLE 3.5.1-12

Comparison of the Poor Mountain Variation and the Proposed Route

Feature	Poor Mountain Variation	Proposed Route
General		
Total length (miles)	5.9	3.8
Length adjacent to existing right-of-way (miles)	3.4	0.0
Land disturbed within construction right-of-way (acres) a/	89.5	57.9
Land disturbed within operation right-of-way (acres) a/	35.0	23.2
Non-typical work areas required (acres)	0.0	0.0
Land Use		
VADCR Slussers Chapel Conservation Site crossed (miles)	0	0
National Forest System lands crossed (miles)	0.0	0.0
National Forest Wilderness Areas crossed (miles)	0.0	0.0
Residences within 50 feet of construction workspace (number)	1	0
Agricultural land affected (acres)	4.0	0.0
Populated areas within 0.5 mile (number) g/	0	0
Landowner parcels crossed (number)	24	10
Resources		
Forested land crossed (miles)	5.2	3.0
Forested land affected during construction (acres)	79.5	51.8
Interior Forest affected during construction (acres)	50.2	54.7
Known habitat for federally listed species (acres) e/	0	0
Known archaeological or historic sites within 0.5 mile (number)	0	0
Wetlands crossed (number) b/	0	0
Forested wetlands crossed (number) c/	0	0
Forested wetlands affected (acres) c/	0.0	0.0
Perennial waterbody crossings (number) b/	1	3
Major waterbody crossings (crossing width > 100 feet) (number)	0	0
Total length of all waterbody crossings (feet) f/	20	60
Surface waterbodies designated as public drinking water supply crossed (number)	0	0
Springs and domestic water supply wells within 150 feet of the centerline (number)	0 d/	14
Steep slope crossed (miles)	4.3	3.0
Side slope crossed (miles)	4.2	2.7
Shallow bedrock crossed (miles)	4.3	2.7
Landslide potential crossed (miles)	1.1	0.0
Karst (miles) c/	0.7	0.0
Known karst features, sinkholes, or caves within 50 feet of the construction right-of-way (number)	0	0

TABLE 3.5.1-12 (continued)
Comparison of the FERC Poor Mountain Minor Route Variation and the Proposed Route
a/ Assuming 125-foot-wide construction right-of-way and 50-foot-wide operation right-of-way.
b/ NWI and NHD data used in order to provide a common comparison between the route adjustment and proposed route since field surveys were not conducted along the route adjustment.
c/ USGS, 2014. Mineral Resources Program data available at https://mrdata.usgs.gov/geology/state.
d/ None known, but not field delineated.
e/ Potential Indiana bat and Virginia Tier 1 Habitats.
f/ Using estimated average crossing length of 20 feet for NHD waterbodies.
g/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.

We compared environmental variables for Alternative 682 with the corresponding segment of the proposed route between MPs. 239.3 and 244.5 (see table 3.5.1-13). The proposed route would cross about 1.3 miles of TNC easements, while Alternative 682 would cross a total of about 2.5 miles of TNC easements. The proposed route is about 0.7 mile shorter, and would affect less forest, and less interior forest, and would cross less steep and side slopes than the alternative. Mountain Valley deemed Alternative 682 not constructible because it would cross about 10,600 feet of extreme side slope terrain and severe rock outcroppings along the northwestern edge of the VOF easement. Slopes in this area range from 70 to 90 percent grade that would require winch hill construction techniques. For these reasons, we conclude that Alternative 682, to the west of Poor Mountain, is not feasible or practical.

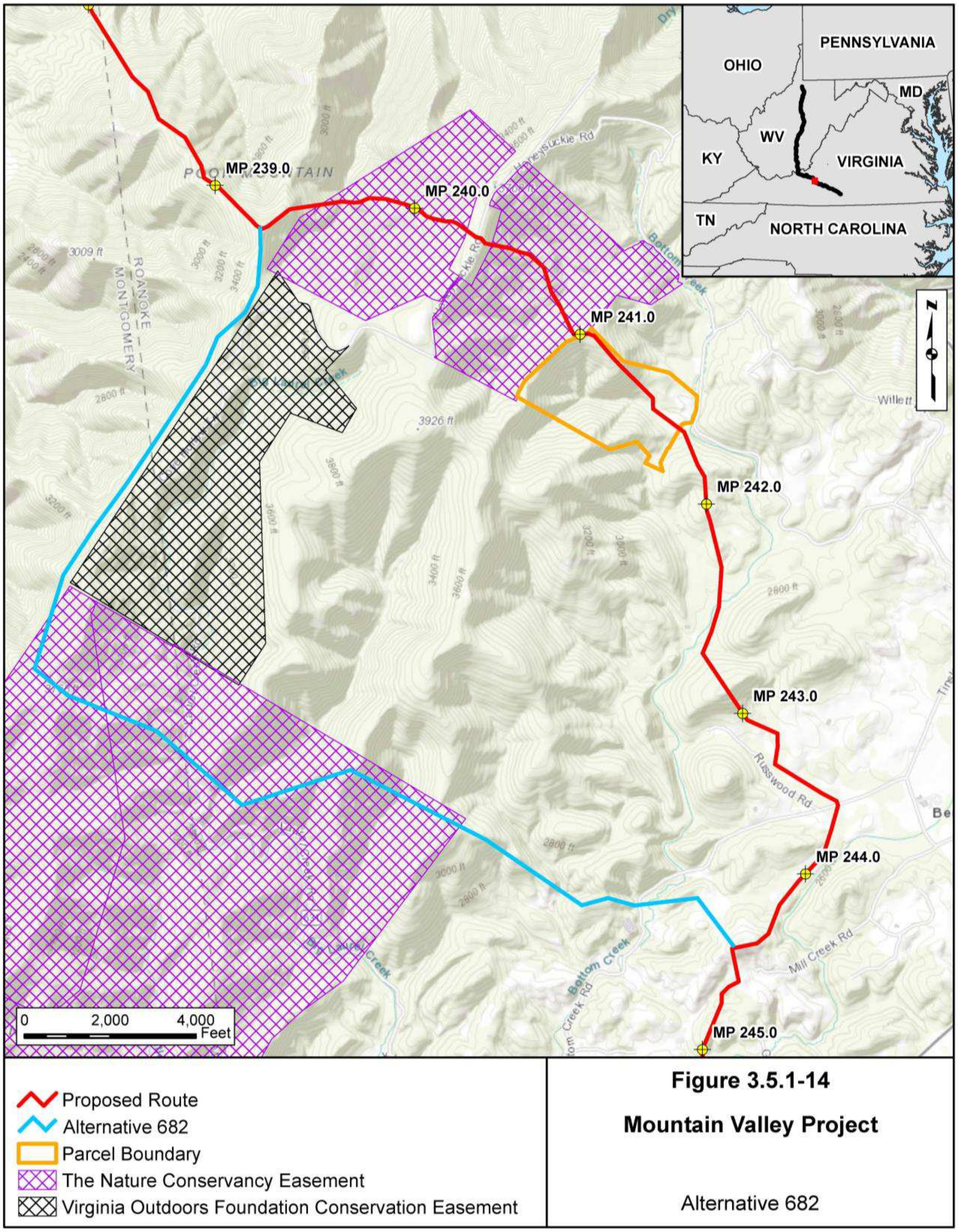


Figure 3.5.1-14

Mountain Valley Project

Alternative 682

TABLE 3.5.1-13

Comparison of the Alternative 682 and the Proposed Route

Feature	Alternative 682	Proposed Route
General		
Total length (miles)	5.9	5.2
Length adjacent to existing right-of-way (miles)	0.0	0.0
Land disturbed within construction right-of-way (acres) a/	89.0	79.3
Land disturbed within operation right-of-way (acres) a/	35.6	31.7
Non-typical work areas required (acres)	0.0	0.0
Land Use		
TNC Poor Mountain Easements crossed (miles)	2.5	1.3
Virginia Outdoors Foundation easements crossed (miles)	0.0	0.0
James Scott properties crossed (miles)	0.0	0.6
National Forest System lands crossed (miles)	0.0	0.0
National Forest Wilderness Areas crossed (miles)	0.0	0.0
Residences within 50 feet of construction workspace (number)	0	0
Agricultural land affected (acres)	3.4	13.9
Populated areas within 0.5 mile (number) g/	0	0
Landowner parcels crossed (number)	11	20
Resources		
Forested land crossed (miles)	5.3	4.0
Forested land affected during construction (acres)	81.0	59.6
Interior Forest affected during construction (acres)	79.9	56.2
Known habitat for federally listed species (acres) e/	0	0
Known archaeological or historic sites within 0.5 mile (number) h/	5	18
Wetlands crossed (number) b/	0	1
Forested wetlands crossed (number) c/	0	1
Forested wetlands affected (acres) c/	0.0	0.2
Perennial waterbody crossings (number) b/	1	2
Major waterbody crossings (crossing width > 100 feet) (number)	0	0
Total length of all waterbody crossings (feet) f/	20	40

TABLE 3.5.1-13 (continued) **Comparison of the Alternative 682 and the Proposed Route**		
Feature	**Alternative 682**	**Proposed Route**
Surface waterbodies designated as public drinking water supply crossed (number)	0	0
Springs and domestic water supply wells within 150 feet of the centerline (number)	0 d/	14
Steep slope crossed (miles)	4.6	2.8
Side slope crossed (miles)	5.0	2.5
Shallow bedrock crossed (miles)	4.4	1.8
Landslide potential crossed (miles)	1.3	2.4
Karst (miles) c/	0.0	0.0
Known karst features, sinkholes, or caves within 50 feet of the construction right-of-way (number)	0	0

a/ Assuming 125-foot-wide construction right-of-way and 50-foot-wide operation right-of-way.
b/ NWI and NHD data used in order to provide a common comparison between the route adjustment and proposed route since field surveys were not conducted along the route adjustment.
c/ USGS, 2014. Mineral Resources Program data available at https://mrdata.usgs.gov/geology/state.
d/ None known, but not field delineated.
e/ Potential Indiana bat and Virginia Tier 1 Habitats.
f/ using estimated average crossing length of 20 feet for NHD waterbodies.
g/ City or town limits as shown in Environmental Systems Research Institute (ESRI) data.
h/ Sites identified during project-specific field surveys, which includes only the very start and end of the variation route.

3.5.1.13 Blue Ridge Parkway Variations

In the draft EIS, we assessed a Blue Ridge Parkway Variation that was developed by Mountain Valley in response to stakeholder comments that visual and other impacts on the BRP should be reduced. Mountain Valley's proposed route at the BRP has changed since issuance of the draft EIS rendering the original variation obsolete and it has been dismissed from further evaluation.

Mountain Valley continued to coordinate with the NPS regarding the proposed crossing of the BRP after issuance of the draft EIS. As part of this coordination, Mountain Valley prepared a Visual Impact Analysis (VIA) report for the BRP filed on February 17, 2017, and this report contained new information for different alternative routes across the BRP (see section 4.8.2). Also on February 17, 2017, Mountain Valley filed an archaeological survey report for crossing the BRP (Maskevich et al., January 2017) that illustrated four potential routes alternatives: the October 2015 proposed route, Alternative 1, Alternative 2, and Alternative 3 (see figure 3.5.1-15). Mountain Valley clarified in a March 30, 2017 filing, in response to our March 20, 2017 EIR, that it had adopted "Alternative 3" as its proposed route, developed with NPS staff during field visits. Table 3.5.1-14 compares the environmental impacts associated with March 2017 proposed route (Alternative 3) crossing the BRP with the October 2015 route (analyzed in the draft EIS), and NPS Alternative routes 1 and 2.

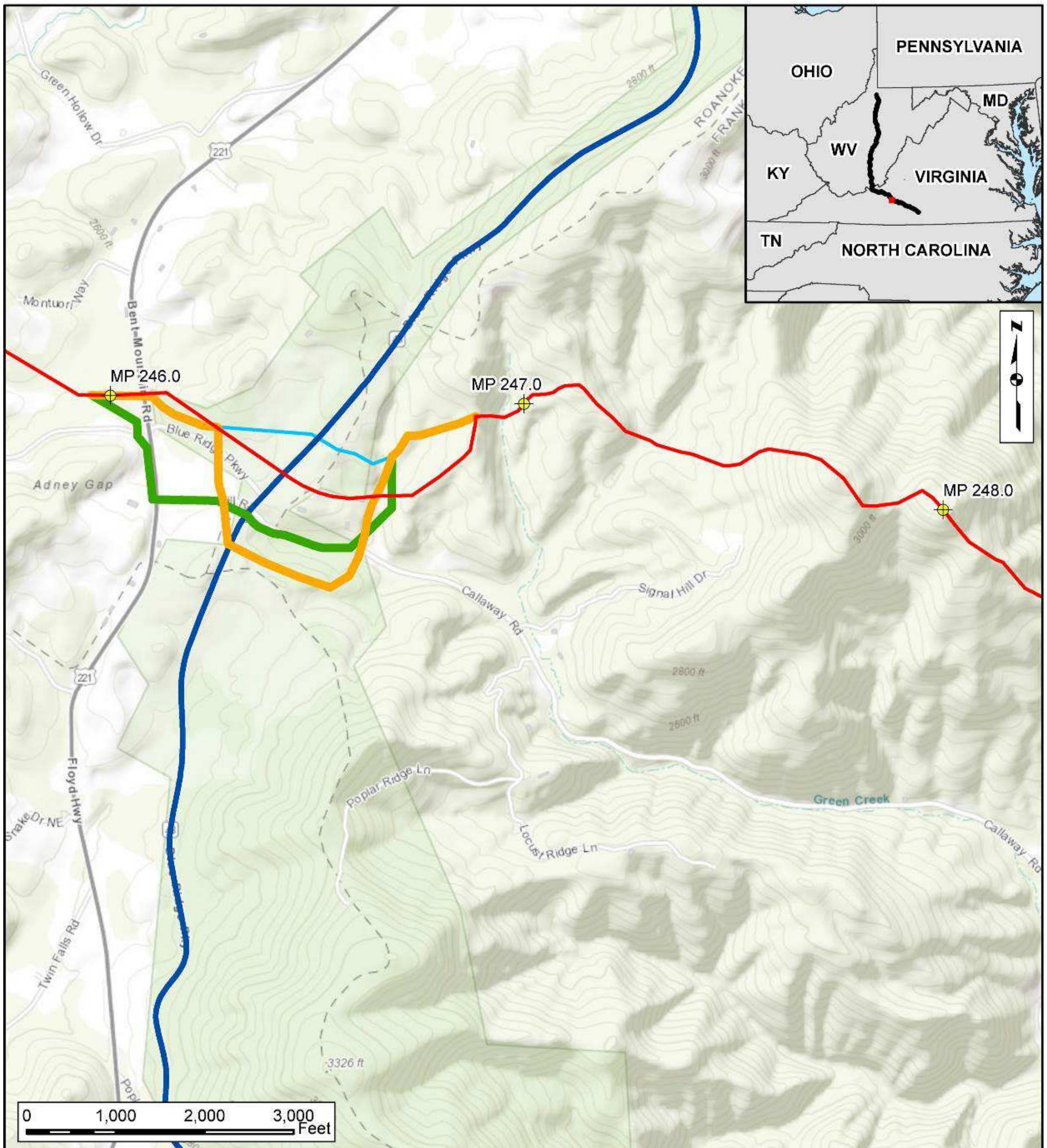


Figure 3.5.1-15

Mountain Valley Project

Blue Ridge Parkway Variations

TABLE 3.5.1-14

Comparison of National Park Service Alternatives for the Crossing of the Blue Ridge Parkway and the Proposed Route

Feature	October 2015 Application Route	Alternative 1	Alternative 2	Currently Proposed Route (Alternative 3)
General				
Total length in miles (feet)	0.9 (4,674)	1.3 (6,868)	1.2 (6,184)	1.0 (5,211)
Length adjacent to existing right-of-way in miles (feet)	0.0 (0)	0.0 (0)	0.5 (2,427)	0.0 (0)
Land disturbed within construction right-of-way (acres) a/	13.4	19.7	17.7	15.0
Federal Lands				
National Park Service lands crossed in miles (feet)	0.5 (2,533)	0.6 (3,327)	0.1 (685)	0.4 (2,225)
Blue Ridge Parkway crossings (number)	1	1	1	1
Human Environment				
Landowner parcels crossed (number)	11	15	11	10
Residences within 50 feet of construction workspace (number)	0	0	2	0
Cultural resources	2	4	5	4
Natural Resources				
Forested land crossed in miles (feet)	0.4 (2,345)	0.8 (4,256)	0.6 (2,956)	0.5 (2,835)
Forested land affected during construction in acres	6.7	11.9	8.6	8.5
Forested land affected during operation in acres	2.7	4.9	3.4	3.3
Interior forest crossed in miles (feet)	0.3 (1,511)	0.3 (1,808)	0.4 (2,040)	0.3 (1,720)
Shallow bedrock crossed in miles (feet)	0.3 (1,806)	0.6 (2,957)	0.6 (3,391)	0.2 (1,277)
Steep slope (>20 percent) crossed in miles (feet)	0.2 (789)	0.4 (2,207)	0.2 (1,176)	0.1 (427)
Side slope (>20 percent) crossed in miles (feet)	0.3 (1,640)	0.6 (3,281)	0.6 (2,953)	0.1 (656

a/ Assuming 125-foot-wide construction right-of-way.

The October 2015 route segment crossing the BRP analyzed in the draft EIS would deviate from the March 2017 proposed route at MP 246.1 on the south sited of Highway 221 (Bent Mountain Road), trending southeast and rejoining the proposed route at about MP 246.9. The October 2015 route would be about 0.1 mile shorter than the currently proposed route, affect about 1.6 less acres during construction, and slightly less forest, and impact the fewest number of cultural resources (two). However, the March 2017 proposed route would reduce visual resources impacts, and affect about 300 feet less of NPS lands, 1 less landowner parcel, and less shallow bedrock, steep slopes, and side slopes. For these reasons, we conclude that the October 2015 route crossing of the BRP from the draft EIS does not offer a significant environmental advantage when compared to the corresponding segment of the March 2017 proposed route.

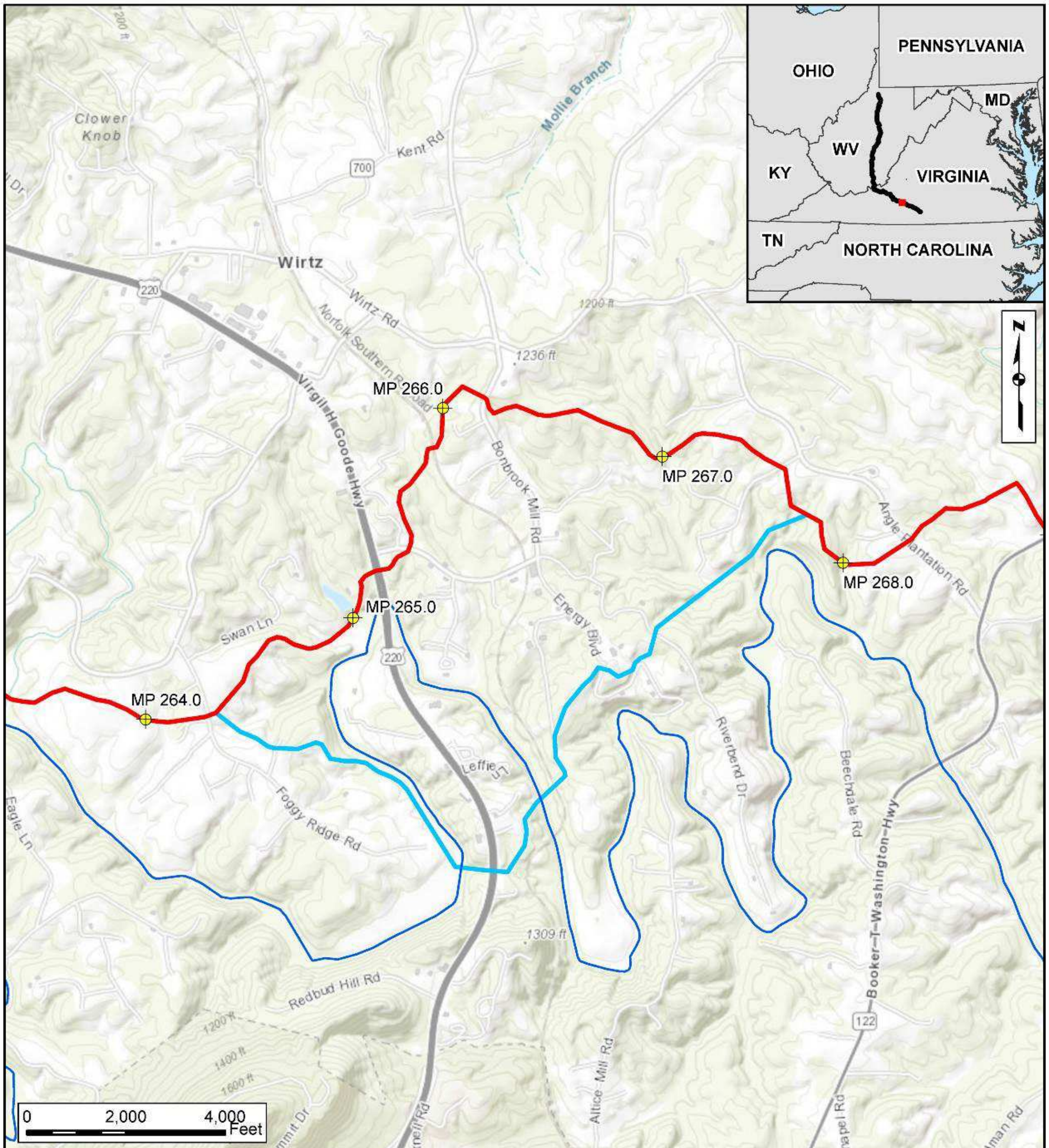
Alternative 1 would leave the proposed route near the BRP at about MP 246.3, heading south for about 1,200 feet, crossing Clover Hill Road, on the east side of the reservoir, crossing the BRP, turning southeast for about another 1,200 feet, before turning north for about 1,000 feet, crossing County Road 602, and rejoining the proposed route at about MP 246.6. Alternative 1 would be about 0.3 mile longer than the proposed route disturbing about 4.7 more acres, would cross about 0.2 mile more of NPS lands, 5 additional parcels, and 0.3 acre more forest, and affect 4 cultural resources (see table 3.5.1-14). It would also cross more shallow bedrock, steep slopes, and side slopes. Tree clearing would be required both east and west of the BRP and visual impacts on two nearby homes would occur. For these reasons, we conclude that the BRP Alternative 1 does not offer a significant environmental advantage when compared to the corresponding proposed route segment.

Alternative 2 would diverge from the proposed route near MP 245.9, west of Bent Mountain Road (Highway 221), heading south for about 1,500 feet parallel to the road, then turning east, crossing the road, going about 2,200 feet before turning north for about 800 feet, and rejoining the proposed route at about MP 246.7. Alternative 2 would be about 0.2-mile longer than the proposed route disturbing about 2.7 more acres, but would also be more collocated with existing corridors compared to the proposed route by about 0.5 mile (see table 3.5.1-14). Alternative 2 would cross about 0.3 mile less of NPS lands, but be located closer to two residences, and would affect 5 cultural resources. The alternative would also cross slightly more forest, and more shallow bedrock, steep slopes, and side slopes. Tree clearing would be required on both sides of Callaway Road and due to limitations on workspace due to topography and an adjacent waterbody, Callaway Road could be affected by needed workspace. Visual impacts on nearby homes would occur. For these reasons, we conclude that the BRP Alternative 2 does not offer a significant environmental advantage when compared to the corresponding proposed route segment.

3.5.1.14 Blackwater River Variation

After issuance of the draft EIS, Mountain Valley developed a route modification intended to avoid two crossings of the Blackwater River in Franklin County, Virginia. Mountain Valley stated that it had adopted a new route in the vicinity of the Blackwater River in its filing dated October 14, 2016, to address recommendations in the draft EIS. Because this is a substantial route change, over 3 miles long, that was adopted after issuance of the draft EIS and affecting new landowners, we assess the corresponding segment of the October 2016 proposed route in comparison to the October 2015 route that was evaluated in the draft EIS (the Blackwater River Variation) below.

The Blackwater River Variation would deviate from the proposed route near MP 264.3, proceeding east then southeast through fields and forests, crossing Highway 220 and then turning northeast before rejoining the proposed route at MP 267.7 (see figure 3.5.1-16). The proposed route and the Blackwater River Variation would generally affect environmental resources in similar ways except that the variation would be more collocated with existing corridors, and the proposed route would cross somewhat less shallow bedrock, steep slopes, and side slopes (see table 3.5.1-15). The October 2016 proposed route would affect 24 new landowners. The main benefit of the proposed route is that it would avoid two crossings of the Blackwater River. The crossing locations would have been located upstream of a drinking water intake for the City of Rocky Mount. For the reasons discussed above, we conclude that Mountain Valley's adoption of a route avoiding the Blackwater River was appropriate, and that the Blackwater River Variation does not offer a significant environmental advantage when compared to the corresponding proposed route segment.



Proposed Pipeline Route
Blackwater River Variation
Blackwater River

Figure 3.5.1-16

Mountain Valley Project

Blackwater River Variation

TABLE 3.5.1-15

Comparison of the October 2016 Proposed Route and the Blackwater River Variation (October 2015 Route)

Feature	Blackwater River Variation (October 2015 Route)	October 2016 Currently Proposed Route
General		
Total length (miles)	3.4	3.5
Length adjacent to existing right-of-way (miles)	0.9	0.3
Land disturbed within construction (acres) a/	51.4	52.6
Federal Lands and Federally Managed Areas		
National Forest System lands crossed (miles)	0	0
National Forest Wilderness Areas crossed (miles)	0	0
Appalachian National Scenic Trail crossings (number)	0	0
National Forest – inventoried roadless areas crossed (feet)	0	0
National Forest – inventoried semi-primitive areas crossed (feet)	0	0
Human Environment		
Populated areas within 0.5 mile (number) b/	0	0
Landowner parcels crossed (number)	25	26
Residences within 50 feet of construction workspace (number)	0	1
Resources		
Forested land crossed (miles)	2.0	2.0
Forested land affected during construction (acres)	30.3	30.3
Forested land affected during operation (acres)	12.1	12.1
Interior forest crossed (acres)	0	0
Wetlands (NWI) crossed (feet) c/	219	0
Forested wetlands crossed (feet)	0	0
Perennial waterbody crossings (number) c/	4	5
Major (> 100 feet) waterbodies crossed	0	0
Shallow bedrock crossed (miles)	0.8	0.4
Steep slope (>20 percent) crossed (miles)	1.6	1.1
Side slope crossed (miles)	1.8	1.5
Landslide potential crossed (miles)	3.4	3.5
Karst area crossed (miles)	0	0

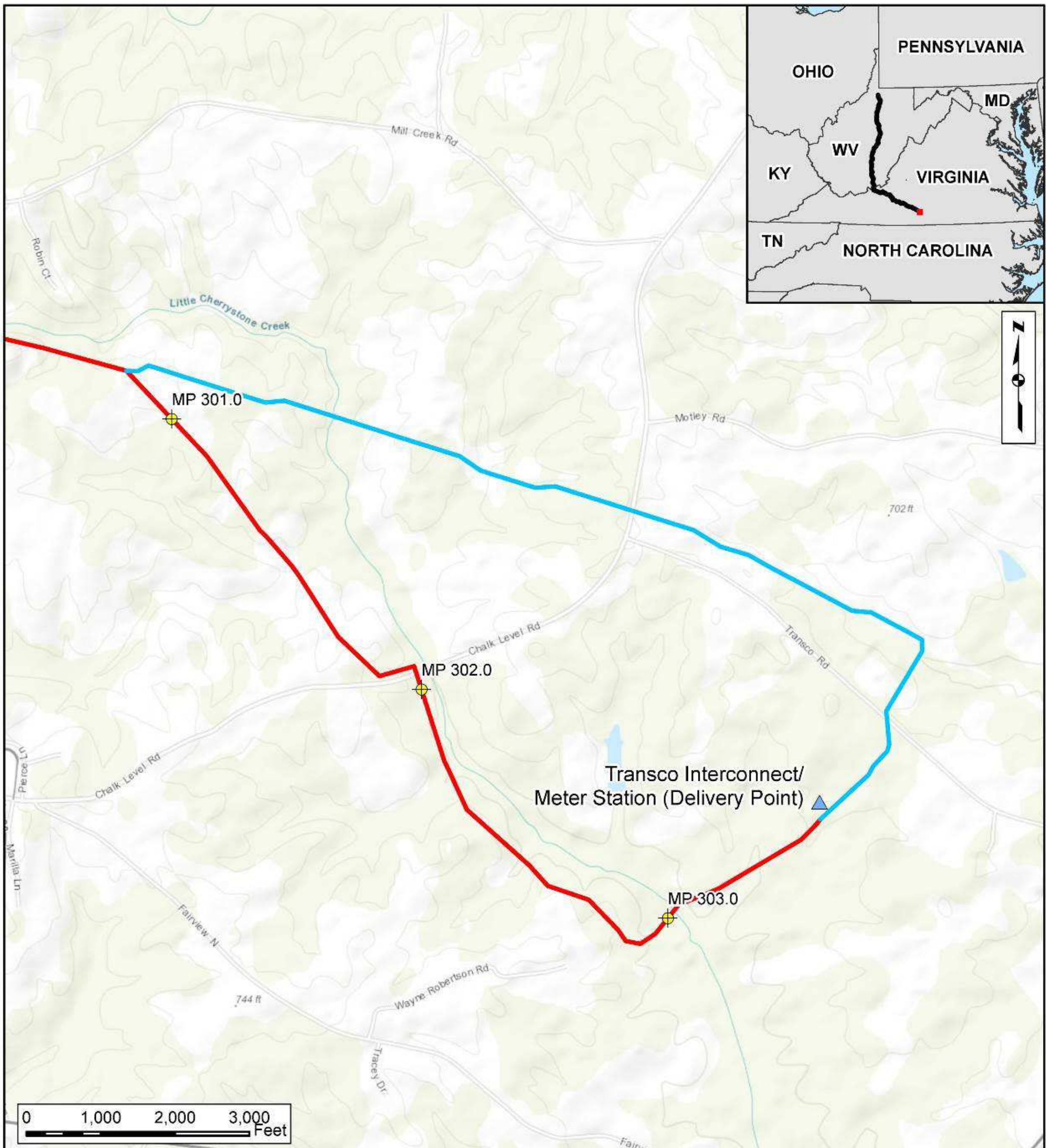
a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.
c/ NWI and NHD data.

3.5.1.15 Route Variation 35

Route Variation 35 was developed by the FERC staff in response to stakeholder comments that the pipeline route in the vicinity of Transco Station 165, in Pittsylvania County, Virginia, should follow existing rights-of-way. Route Variation 35 would begin at about MP 300.8 along the proposed route, head east across Little Cherrystone Creek and Chalk Level Road, and continue parallel to the north side of Transco Road, then turn south to rejoin the proposed route at MP 303.4 at Station 165 (see figure 3.5.1-17). A comparative analysis of environmental impacts of the proposed route and Route Variation 35 is presented in table 3.5.1-16.

Route Variation 35 would be 0.3-mile longer and affect 2 more parcels than the corresponding segment of the proposed route. However, it would be much more collocated with existing corridors by 2.2 miles, and would affect about 16 acres less forest, 4 less wetlands, and 2 fewer perennial waterbodies. The alternative route would be mostly collocated with an existing powerline right-of-way. In our September 2016 draft EIS, we recommended that Mountain Valley adopt Route Variation 35 into its proposed route.

In a filing with the FERC on October 14, 2016, Mountain Valley stated reasons why Route Variation 35 should not be adopted into its proposed route. The alternative route would affect more cultural resources, cross more parcels, and cross a pond. No ponds would be crossed by the proposed route. Mountain Valley conducted field surveys for Variation 35 and discovered three archaeological sites recommended for further Phase 2 study, potentially resulting in either site avoidance (i.e., a reroute) or a need for data recovery (i.e., excavation) of artifacts at the site. Conversely, the proposed route did not have any archaeological sites determined to be eligible for listing on the NRHP. A large segment of the route variation would parallel a stream and a powerline. Mountain Valley contends it would have to reduce the construction right-of-way to accommodate for the powerline without impacting the stream. In addition, modification of the route to avoid the above-mentioned pond would result in side slope construction. For these reasons, we conclude that Variation 35 does not offer a significant environmental advantage when compared to the corresponding proposed route segment.



Proposed Pipeline Route
Variation 35

Figure 3.5.1-17

Mountain Valley Project

Variation 35

TABLE 3.5.1-16

Comparison of the Variation 35 and the Proposed Route

Feature	Variation 35	Proposed Route
General		
Total length (miles)	3.0	2.6
Length adjacent to existing right-of-way (miles)	2.2	0.1
Land disturbed within construction right-of-way (acres) a/	39.6	39.9
Land Use		
Populated areas within 0.5 mile (number) b/	0	0
National Forest System lands crossed (miles)	0.0	0.0
Landowner parcels crossed (number)	14	12
Residences within 50 feet of construction workspace (number)	0	0
Resources		
Forested land crossed (miles)	0.4	1.5
Forested land affected during construction (acres)	6.9	22.7
Forested land affected during operation (acres)	2.5	9.1
Interior forest crossed (acres)	0.0	0.0
Wetlands crossed (number) c/	2	6
Ponds	1	0
Perennial waterbody crossings (number) c/		6
Major (> 100 feet) waterbodies crossed	0	0
Side slope crossed (miles)	0.2	0.1
Landslide potential crossed (miles)	2.6	2.6
Karst area crossed (miles)	0.0	0.1

a/ Assuming 125-foot-wide construction right-of-way.
b/ City or town limits as shown in ESRI data.
c/ NWI and NHD data used for Alternative 35 unsurveyed areas.

3.5.2 Equitrans Expansion Project Variations

We evaluated six route variations for the EEP as discussed below. Alternative routes were evaluated for each project facility except the H-305 and H-319 pipelines. The H-305 (550 feet) and H-319 (200 feet) pipelines are short in length and have a set position determined by fixed starting and ending points, therefore we did not evaluate route alternatives for them.

3.5.2.1 H-316 Route Variations

We evaluated two route variations for the H-316 pipeline that would connect the proposed new Redhook Compressor Station with Equitrans' existing H-302 pipeline (see figure 3.5.2-1). The purpose of developing and evaluating these alternatives was to increase collocation with existing utilities if possible. Alternative 1 would head south from the compressor station, cross the South Fork of Tenmile Creek, follow an existing pipeline to Coal Lick Run, then turn east and parallel Highway 21 to H-302 near the Pollock Cemetery. Alternative 2 would head east from the compressor station, cross the South Fork of Tenmile Creek, and follow an existing pipeline southeast to H-302. A comparative analysis of environmental impacts of the proposed route and Alternatives 1 and 2 is presented in table 3.5.2-1.

Alternatives 1 and 2 would have increased collocation with existing rights-of-way and would affect fewer landowners and less Natural Heritage Inventory Core Habitat than the proposed route; however, these routes are slightly longer than the proposed routes and cross more side slopes. Further, both of the route variations cross more forested land, with Alternative 2 crossing over a mile of interior forest. Due to workspace limitations rendering an HDD infeasible, construction of Alternatives 1 and 2 would both likely require an open-cut crossing of South Fork Tenmile Creek. However, this impact would be avoided by the proposed route as it exits the proposed Redhook Compressor Station to the east at a position conducive to an HDD. Given consideration of all of these factors, we conclude that Alternatives 1 and 2 do not offer a significant environmental advantage when compared to the corresponding proposed route.

3.5.2.2 H-318 Variation

The proposed H-318 pipeline would transport natural gas from Equitrans' Applegate Gathering System to the existing Equitrans H-148 pipeline. In order to avoid and/or minimize impacts on a variety of environmental resources, we sought to identify a more direct alternative route in the draft EIS since the proposed route was almost 80 percent longer than the straight line distance between the Applegate Gathering System and the H-148 pipeline. Since issuance of the draft EIS, Equitrans adopted a partial reroute for the H-318 pipeline as described further below. However, the current proposed route is still about 60 percent longer than the straight line distance between the Applegate Gathering System and the H-148 pipeline. We evaluate below one alternative to the updated H-318 pipeline proposed route in order to evaluate a more direct route: the Elrama Variation.

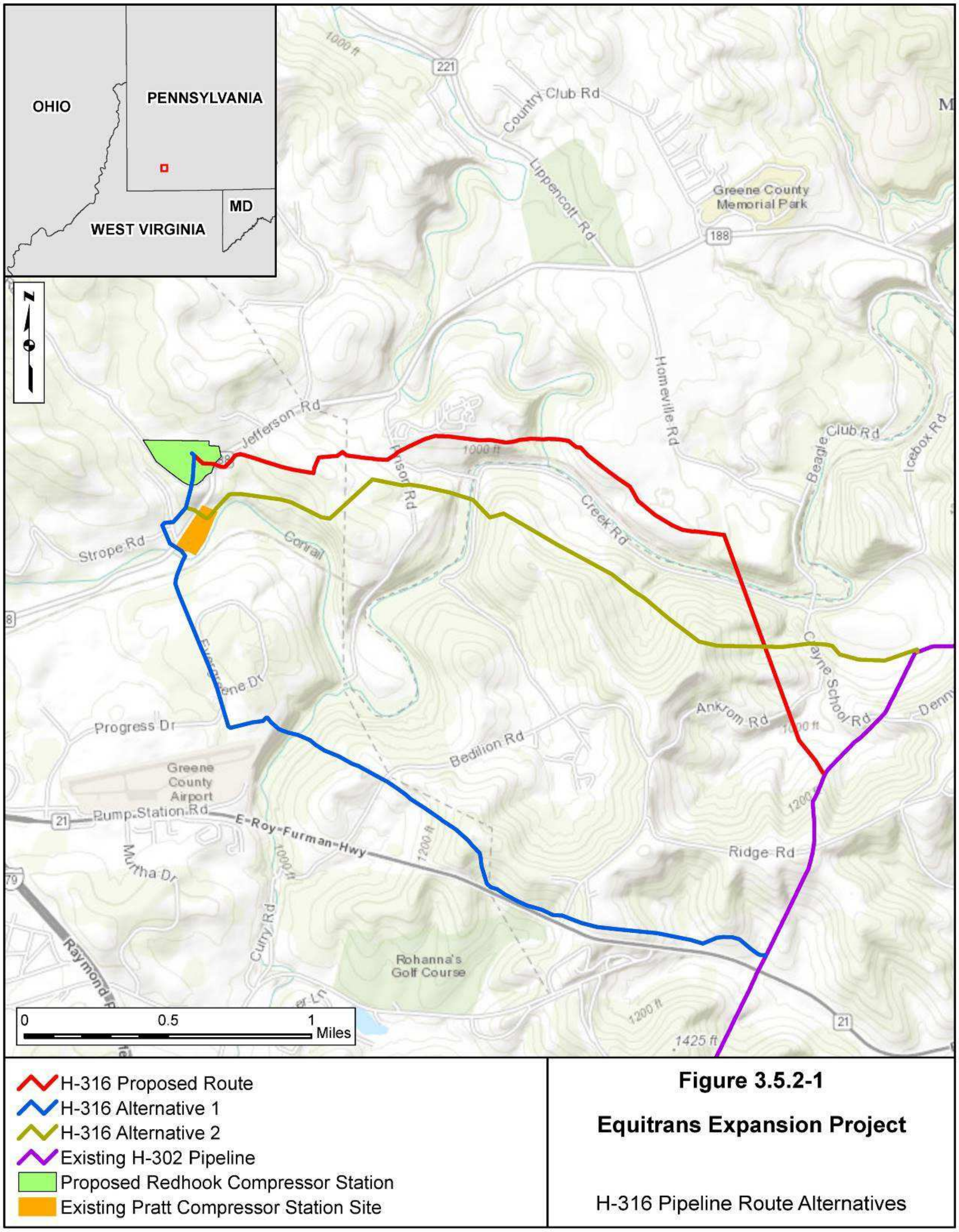


Figure 3.5.2-1

Equitrans Expansion Project

H-316 Pipeline Route Alternatives

TABLE 3.5.2-1

Comparison of Alternatives 1 and 2 to the H-316 Proposed Route

Feature	Alternative 1	Alternative 2	Proposed Route
General			
Total length (miles)	3.3	3.1	3.0
Length adjacent to existing right-of-way (miles)	2.8	2.8	0.6
Land disturbed within construction right-of-way (acres) a/ c/	45.0	43.6	34.1
Land Use			
Populated areas within 0.5 mile (number) b/	1	1	1
NRHP designated or eligible historic properties within 0.5 mile (number)	0	0	0
Landowner parcels crossed (number)	29	29	41
Residences within 50 feet of construction workspace (number)	1	0	2
Resources			
Interior forest crossed (miles)	0	1.1	0
Forested Wetlands (miles) c/	0.0	0.0	0.0
Forested Wetlands (acres) c/	0.0	0.1	0.0
Forests (miles) c/, d/	1.3	2.2	0.9
Forests (acres) c/	19.6	33.7	12.9
Cropland crossed (miles)	0.7	0.4	1.3
Wetlands crossed (feet)	131	86	199
Perennial waterbody (source) crossings (number)	1	1	2
Streams with drinking water designation (number) e/	0	0	0
Major River crossings (number)	0	0	0
Habitat of listed threatened and endangered species crossed (miles)	0.0	0.0	0.0
Natural Heritage Inventory Core Habitat crossed (feet)	835	1,250	1,948
Steep slopes (>20%) crossed (feet)	2,398	3,576	1,515
Side slopes crossed (feet)	9,383	10,236	8,694
Shallow bedrock crossed (miles)	0.1	0.2	0.1
Karst geology crossed (miles)	0.0	0.0	0.0
Landslide-prone soils crossed (miles)	3.3	3.1	3.0

a/ Assuming 125-foot-wide construction right-of-way.
b/ City, town, village center, or dense residential development.
c/ Does not include area of HDD.
d/ Forested Land based on following National Land Cover Dataset Land Use Types: Forested Upland, Deciduous Forest, Evergreen Forest, Mixed Forest, Woody Wetlands, Palustrine Forested Wetland, Estuarine Forested Wetland
e/ No data were identified that associate drinking water designations to streams.

Elrama Variation

The Elrama Variation would begin at the Applegate Gathering System and would proceed north along an existing right-of-way to a location across from the Elrama power plant, cross under the Monongahela River, and then follow an existing right-of-way to Lobbs Road before rejoining the proposed route at MP 3.8 (see figure 3.5.2-2). A comparative analysis of environmental impacts of the proposed route and the Elrama Variation is presented in table 3.5.2-2.

The Elrama Variation alternative would be 0.2-mile shorter and much more collocated by 2.9 miles than the proposed route. The variation would also cross 1.2 miles less cropland, 0.8 mile less shallow bedrock, 0.7 mile less of karst terrain, and 0.7 mile less areas of landslide-prone soils compared to the corresponding segment of the proposed route. However, the proposed route would affect fewer populated areas, 15 less landowner parcels, 1.6 acres less forest, 0.5 mile less side slopes, and 0.4 mile less of steep slopes compared to the variation. Given consideration of all of these factors, we conclude that the Elrama Variation does not offer a significant environmental advantage when compared to the corresponding proposed route.

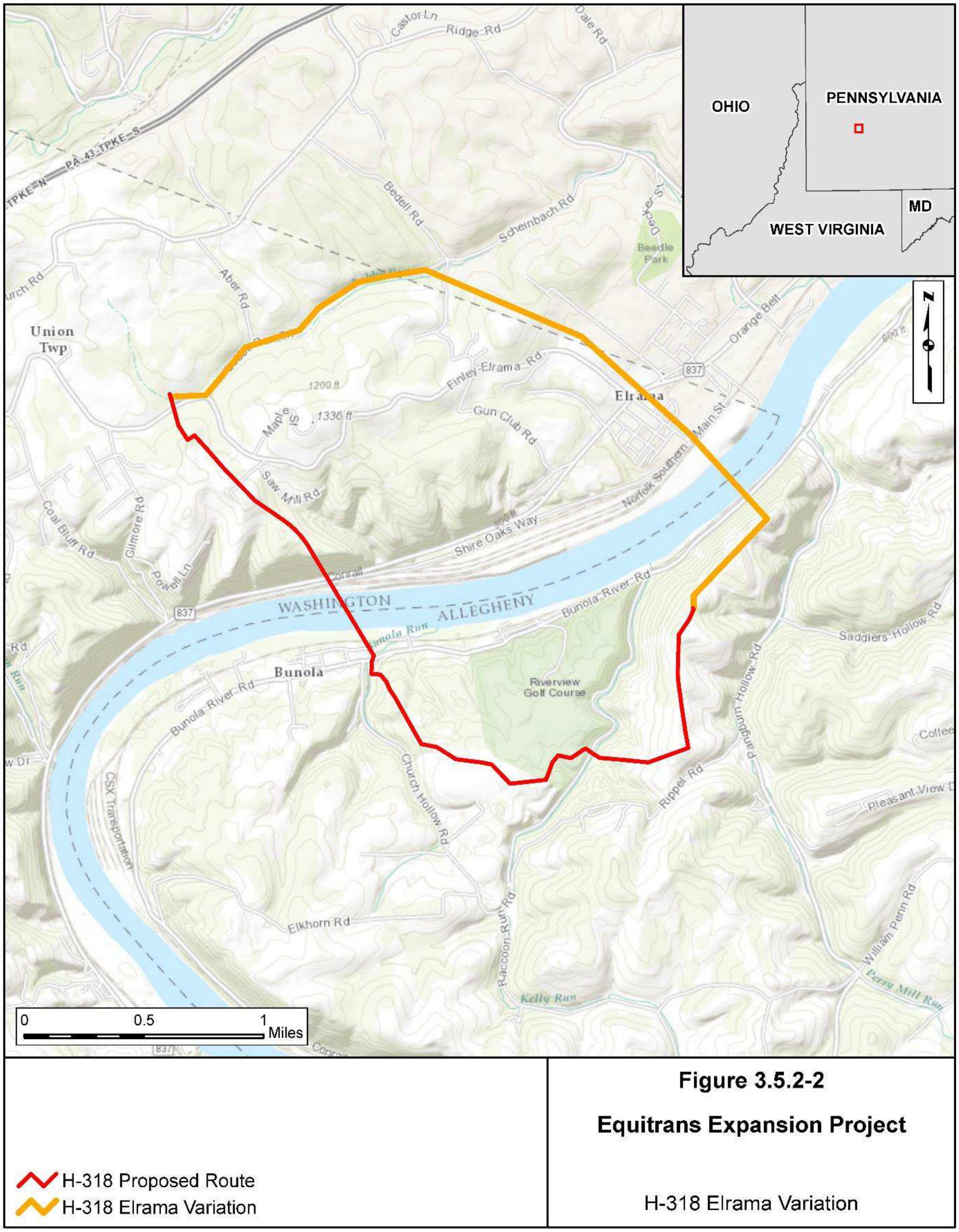


Figure 3.5.2-2

Equitrans Expansion Project

H-318 Elrama Variation

TABLE 3.5.2-2

Comparison of the Elrama Variation and the Proposed H-318 Pipeline Route

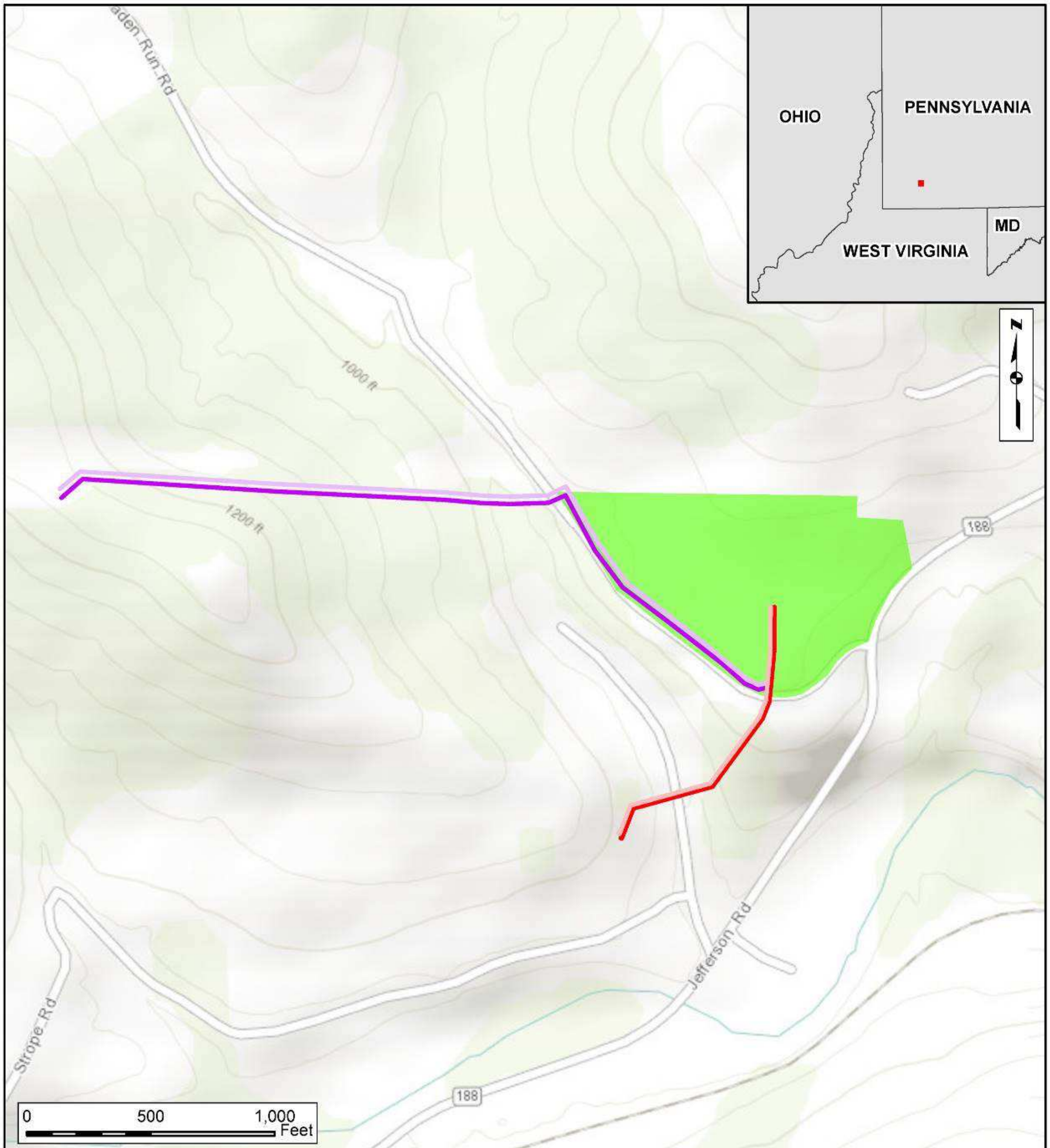
Feature	Elrama Variation	Proposed Route
General		
Total length (miles)	3.6	3.8
Length adjacent to existing right-of-way (miles)	2.9	0
Land disturbed within construction right-of-way (acres) a/ c/	37.3	37.2
Land Use		
Populated areas within 0.5 mile (number) b/	5	3
NRHP designated or eligible historic properties within 0.5 mile (number)	0	1
Landowner parcels crossed (number)	44	29
Residences within 50 feet of construction workspace (number)	10	0
Resources		
Interior Forested Land crossed (miles) c/ d/	0	0
Forested Wetlands (miles) c/	0.0	0.0
Forests (miles) c/	1.6	1.3
Forests (acres) c/	19.5	17.9
Cropland crossed (miles)	0.1	1.3
Wetlands crossed (feet)	902	884
Perennial waterbody (source) crossings (number)	2	1
Streams with drinking water designation (number) e/	0	0
Major River crossings (number)	1	1
Habitat of listed threatened and endangered species crossed (miles)	0.0	0.0
Natural Heritage Inventory Core Habitat crossed (feet)	0.0	0.0
Steep slopes (>20%) crossed (feet)	3,283	1,142
Side slopes crossed (feet)	9,777	7,128
Shallow bedrock crossed (miles)	0.1	0.9
Karst geology crossed (miles)	3.6	4.3
Landslide-prone soils crossed (miles)	3.6	4.3

a/ Assuming 125-foot-wide construction right-of-way.
b/ City, town, village center, or dense residential development.
c/ Crossing is adjacent to existing utility corridor.
d/ Forested Land based on following National Land Cover Dataset Land Use Types: Forested Upland, Deciduous Forest, Evergreen Forest, Mixed Forest, Woody Wetlands, Palustrine Forested Wetland, Estuarine Forested Wetland
e/ No data were identified that associate drinking water designations to streams.

3.5.2.3 M-80 and H-158 Variations

The existing M-80 and H-158 pipelines transfer natural gas to the Pratt Compressor Station and would require modification in order to move gas to the proposed Redhook Compressor Station. We asked Equitrans to develop alternatives in order to increase collocation with existing utilities, if possible. Equitrans developed the M-80 and H-158 Variations that would begin approximately 0.5 mile west of the proposed realignment point of these lines, where these alternatives would continue adjacent to the existing Texas Eastern pipeline right-of-way, would follow Braden Run Road, and would turn north along the same alignment as the proposed route (see figure 3.5.2-3). The M-80 and H-158 Variations would be located adjacent to each other in a common corridor and are analyzed together below. A comparative analysis of environmental impacts of the proposed route and the M-80 and H-158 Variations is presented in table 3.5.2-3.

While the M-80 and H-158 Variations are more collocated with existing right-of-way, the proposed route would be much shorter, would affect fewer landowners, and less forest. Additionally, these variations would cross about 1,246 more feet of steep slopes and more than 2,600 feet of side slopes compared to zero steep slopes and side slopes for the proposed route. Given consideration of all of these factors, we conclude that these alternatives do not offer a significant environmental advantage when compared to the corresponding proposed route.



M-80 Proposed Route
H-158 Proposed Route
M-80 Variation
H-158 Variation
Proposed Redhook Compressor Station Site

Figure 3.5.2-3

Equitrans Expansion Project

M-80 and H-158 Variations

TABLE 3.5.2-3

Comparison of the M-80 and H-158 Variations to the Proposed Route

Feature	M-80 and H-158 Variations e/	M-80 and H-158 Proposed Route e/
General		
Total length (miles)	0.7	0.2
Length adjacent to existing right-of-way (miles)	0.7	0.0
Land disturbed within construction right-of-way (acres) a/	8.4	3.8
Land Use		
Populated areas within 0.5 mile (number) b/	0	0
NRHP designated or eligible historic properties within 0.5 mile (number)	0	0
Landowner parcels crossed (number)	11	5
Residences within 50 feet of construction workspace (number)	2	0
Resources		
Interior Forested Land crossed (miles) c/	0	0
Forested Wetlands (miles)	0.0	0.0
Forests (miles)	0.5	0.1
Forests (acres)	5.9	2.2
Cropland crossed (miles)	0.1	0.0
Wetlands crossed (feet)	0	0
Perennial waterbody (source) crossings (number)	1	1
Major River crossings (number)	0	0
Steep slopes (>20%) crossed (feet)	1,495	254
Steep Side Slopes (feet)	2,625	0
Shallow bedrock crossed (miles)	0.0	0.0
Karst geology crossed (miles)	0.0	0.0
Landslide-prone soils crossed (miles)	0.7	0.2

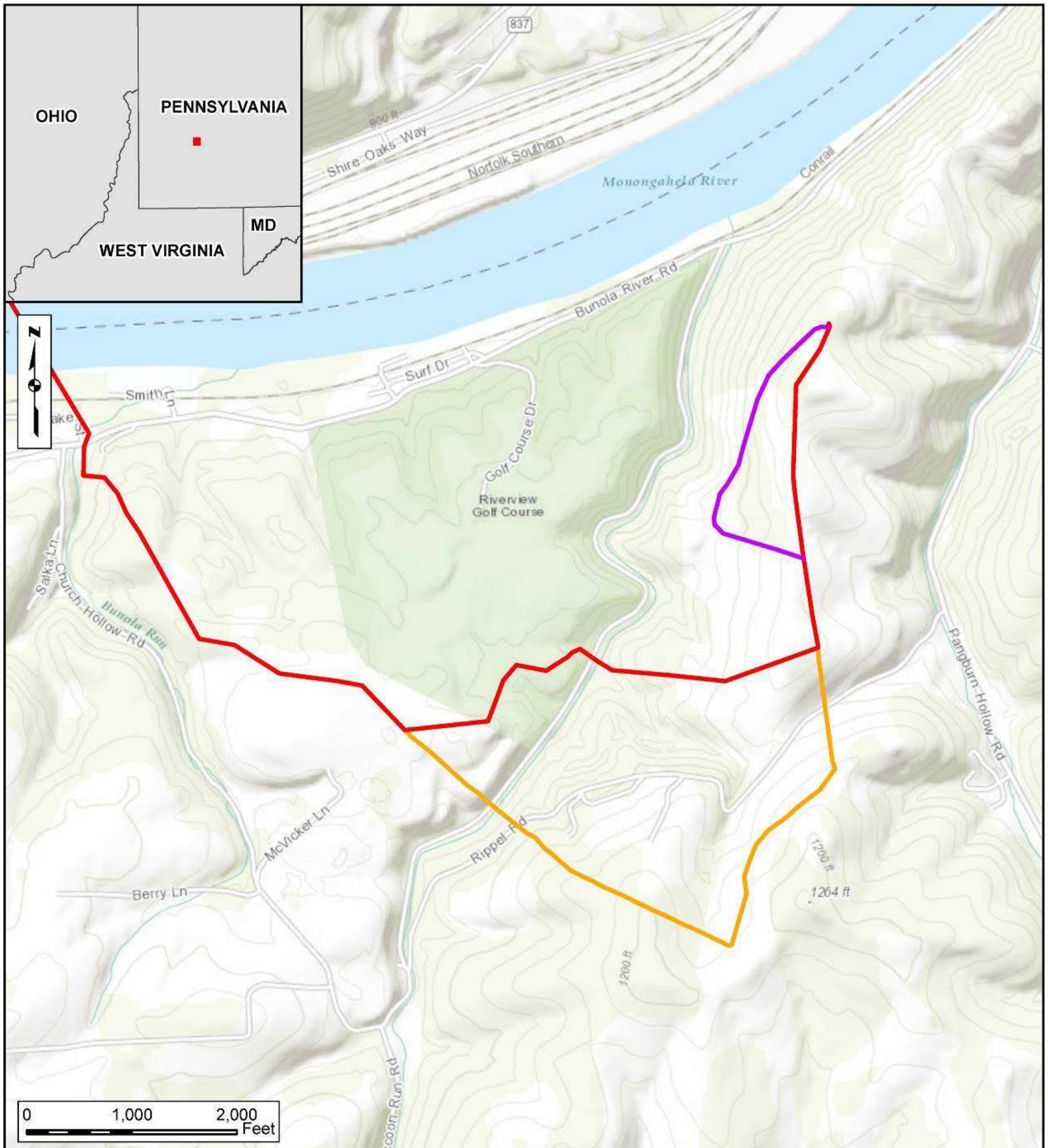
a/ Assuming 100-foot-wide construction right-of-way.
b/ City, town, village center, or dense residential development.
c/ Forested Land based on following National Land Cover Dataset Land Use Types: Forested Upland, Deciduous Forest, Evergreen Forest, Mixed Forest, Woody Wetlands, Palustrine Forested Wetland, Estuarine Forested Wetland.
d / No data were identified that associate drinking water designations to streams.
e/ Based on H-158 pipeline route, which is slightly longer than M-80 route.

3.5.2.4 Headley Route Variation

Based on comments filed with us by a stakeholder, we evaluated a route variation for the H-318 pipeline in Alleghany County, Pennsylvania that avoids a landowner parcel by collocating the EEP with the proposed NIAP-S001 gathering line, which is part of the proposed expansion of the existing Applegate Gathering System. The landowner listed protected easements, a spring, a pond, pipeline construction-related storm water runoff, and loss of use of farm fields as the reasons for concern.

The Headley Route Variation would begin at MP 0.0 of the H-318 proposed route, would run west and generally parallel to the corresponding segment of the proposed route, and would rejoin the proposed route at approximately MP 0.5 (see figure 3.5.2-4). A comparative analysis of environmental impacts of the corresponding segment of the H-318 proposed route and the Headley Route Variation is presented in table 3.5.2-4.

The Headley Route Variation would be longer, cross substantially more steep slopes, side slopes, and landslide-prone areas, and would affect about three times more forest land compared to the proposed route. The proposed route also would be collocated with an existing right-of-way for the entire length of the segment whereas the variation would not be collocated. The amount of side slope construction that would be necessary to construct the variation would result in much more disturbance to create a safe and viable working area, and the area would be more prone to future slope failure in general and upslope of a gathering pipeline in particular. Given consideration of all of these factors, we conclude that the Headley Route Variation does not offer a significant environmental advantage when compared to the corresponding segment of the proposed H-318 pipeline route.



H-318 Proposed Route (Incorporates the New Cline Variation)
Obsolete October 2015 Route Variation
Headley Minor Route Variation

Figure 3.5.2-4

Equitrans Expansion Project

Headley and Cline Route Variations

TABLE 3.5.2-4

Comparison of the Headley Minor Route Variation and the Proposed Route

Feature	Headley Minor Route Variation	Proposed Route
General		
Total length (miles)	0.6	0.4
Length adjacent to existing right-of-way (miles)	0.0	0.4
Land disturbed within construction right-of-way (acres) a/ c/	7.8	5.7
Land Use		
Populated areas within 0.5 mile (number) b/	2	2
NRHP designated or eligible historic properties within 0.5 mile (number)	0	0
Landowner parcels crossed (number)	4	3
Residences within 50 feet of construction workspace (number)	0	0
Resources		
Interior forest land crossed (miles)	0.0	0.2
Forests crossed (miles) c/ d/	0.6	0.2
Forests (acres) c/	6.8	2.3
Cropland crossed (miles)	0.1	0.3
Wetlands (NWI) crossed (feet)	0	0
Perennial waterbody (source) crossings (number)	0	0
Steep slopes (>20%) crossed (feet)	1,676	0
Steep side slopes crossed (feet)	2,112	739
Shallow bedrock crossed (miles)	0.0	0.0
Karst geology crossed (miles)	0.6	0.4
Landslide-prone soils crossed (miles)	0.6	0.4

a/ Assuming 100-foot-wide construction right-of-way.
b/ City, town, village center, or dense residential development.
c/ Does not include area of HDD.
d/ Forested Land based on following National Land Cover Dataset Land Use Types: Forested Upland, Deciduous Forest, Evergreen Forest, Mixed Forest, Woody Wetlands, Palustrine Forested Wetland, Estuarine Forested Wetland.
e/ No data were identified that associate drinking water designations to streams.

3.5.2.5 October 2015 H-318 Pipeline Route Variation

Based on comments filed with us by stakeholders, we evaluated a minor route variation for the H-318 pipeline in Alleghany County, Pennsylvania in the draft EIS. The stakeholder indicated that the October 2015 route would affect mine lands, impact streams and wetlands, and would cross steep side slopes in landslide-prone areas. The Cline Route Variation as assessed in the draft EIS would avoid the landowner parcel. We included a recommendation in the draft EIS that Equitrans study the variation further because if issues regarding constructability at a road crossing could be satisfactorily addressed, then the variation had potential to not only address landowner concerns, but to also be shorter and affect fewer environmental resources.

Equitrans staff performed a field reconnaissance of the area and as a result, slightly modified the Cline Minor Route Variation assessed in the draft EIS to better avoid potential landslides both during and after construction. Equitrans then adopted the "New Cline Variation" into its proposed route in a filing dated December 22, 2016. Below, we assess the corresponding segment of the current proposed route in comparison to the H-318 pipeline route segment filed by Equitrans in its October 2015 application with the FERC as a variation, because the newly adopted proposed route in final form was not assessed in the draft EIS, and since it would affect one new landowner (Riverside Golf Course).

The October 2015 H-318 Route Variation would depart from the current proposed route near MP 0.6, running south along an existing utility corridor, before turning southwest along the edge of forest and through open fields, before turning northwest for approximately 0.7 mile along another existing utility corridor and rejoining the proposed route at MP 1.45 (see above figure 3.5.2-4). A listing of environmental impacts of the corresponding segment of the current proposed route (adopted New Cline Variation) and the October 2015 H-318 Route Variation is presented in table 3.5.2-5.

The October 2015 H-318 Route Variation would be more collocated with existing utility corridors by about 0.9 mile in comparison to the corresponding segment of the proposed route. However, the proposed route would be responsive to landowner concerns, would be 0.5 mile shorter overall, and would affect 3.6 acres less forest, 3.1 acres less interior forest, one less perennial waterbody, and less steep slopes, side slopes, shallow bedrock, and landslide-prone areas. Equitrans noted that there were constructability issues associated with both routes.

TABLE 3.5.2-5

Comparison of the October 2015 H-318 Pipeline Route Variation and the Proposed Route Incorporating the New Cline Variation

Feature	October 2015 H-318 Pipeline Route Variation	Proposed Route Incorporating the New Cline Variation
General		
Total length (miles)	1.3	0.8
Length adjacent to existing right-of-way (miles)	0.9	0.0
Land disturbed within construction right-of-way (acres) a/	16.1	10.2
Land Use		
Populated areas within ½ mile (number) b/	3	3
NRHP designated or eligible properties within ½ mile of full route (number)	0	0
Landowner parcels crossed (number)	4	5
Residences within 50 feet of construction work space (number)	0	0
Resources		
Forested land crossed (miles) c/	0.7	0.3
Interior Forest Crossed (miles)	0.3	0.0
Interior Forest (acres)	3.1	0.0
Forested Wetlands (miles)	0	0.0
Forested Wetlands (acres)	0	0.0
Forests (miles)	0.7	0.3
Forests (acres)	7.8	4.2
Cropland crossed (miles)	0.2	0.3
Wetlands (NWI) crossed (feet)	0.0	0.0
Perennial waterbody (source) crossings (number)	1	0
Streams with drinking water designation (number) d/	0	0
Major River crossings (number)	0	0
Habitat of listed threatened and endangered species crossed (miles)	0.0	0.0
Steep slopes (>20%) crossed (feet)	663.6	269.5
Steep side-slopes crossed (feet)	3,748.8	2,112.0
Shallow bedrock crossed (miles)	1.3	0.0
Karst geology crossed (miles)	1.3	0.8
Landslide prone soils crossed (miles)	1.3	0.8

a/ Assuming 100-foot-wide construction right-of-way, or surveyed Workspace (HEI)
b/ City, town, village center, or dense residential development
c/ Forested Land based on following National Land Cover Database Land Use Types: Forested Upland, Deciduous Forest, Evergreen Forest, Mixed Forest, Woody Wetlands, Palustrine Forested Wetland, Estuarine Forested Wetland
d/ No data was identified that associates drinking water designations to streams
NRHP = National Register of Historic Places

In a November 10, 2016 filing, a landowner[16] stated his support for the newly adopted proposed route (formerly the Cline Variation). He indicated that the proposed route would be shorter, and impact less forest than the October 2015 H-318 Pipeline Route Variation; and would affect one less landowner. The October 2015 H-318 Pipeline Route Variation would follow an existing Applegate pipeline and Sunoco right-of-way, where there were constructability issues on steep slopes, and stability and landslide issues at the crossings of Rippel Road and Raccoon Run Road. Given consideration of these factors, we conclude that Equitrans' adoption of the New Cline Variation into the proposed route is acceptable, and that the corresponding October 2015 H-318 Pipeline Route Variation does not offer significant environmental advantages when compared to the new proposed route.

3.5.3 Minor Route Variations

Minor route variations are relatively short deviations (typically less than 1 mile in length and generally in close proximity to the proposed route) that are designed to avoid or further reduce impacts on specific localized resources based on requests from potentially affected landowners, agencies, and other stakeholders.

3.5.3.1 Mountain Valley Project Minor Route Variations

During pre-filing and early on-going route development, Mountain Valley incorporated 571 minor route modifications into the MVP based on topographic considerations and to avoid or minimize impacts on resources such as roads, waterbodies, wetlands, cultural resources, and specifically identified landowner concerns. We continued to receive landowner comments after Mountain Valley filed its application, and Mountain Valley was able to successfully resolve many of those concerns prior to issuance of the draft EIS (see appendix I-1). In a filing with the FERC on October 14, 2016, Mountain Valley incorporated three route modifications (Mount Tabor, Canoe Cave, and Blackwater River Variations as discussed above) into its proposed route, together with 133 minor route modifications that addressed landowner concerns (in at least 28 instances), engineering considerations identified during centerline surveys after access was obtained, and to avoid specific sensitive environmental resources (in at least 45 instances), such as archaeological sites or wetlands. The route modifications adopted by Mountain Valley after issuance of the draft EIS are listed in appendix I-2.

Of the minor route modifications adopted by Mountain Valley into its proposed route in October 2016, two were recommended by the FERC staff in the draft EIS: 1) the Mayapple School Variation; and 2) the Sunshine Valley School Variation. Because these two former variations discussed in the draft EIS are now a part of Mountain Valley's proposed route, environmental resources along them are included in our assessment of the proposed action project impacts in section 4 of this final EIS. Since we recommended that Mountain Valley adopt the Mayapple School and the Sunshine Valley School Variations in the draft EIS, and Mountain Valley agreed, those variations are no longer discussed in this section of the final EIS.

[16] See letter from Timothy Detwiler (accession number 20161110-5147).

We asked Mountain Valley, in two post-draft EIS EIRs, to further coordinate with the landowners identified in the draft EIS as having unresolved issues and to develop measures to eliminate or minimize these concerns, if possible. Table 3.5.3-1 in the draft EIS listed those unresolved landowner-reported issues. On October 14, 2016, February 17, 2017, and March 30, 2017 Mountain Valley filed responses and/or updates to the recommendations and information requests. Since new information regarding many of these stakeholder-identified issues were filed following issuance of the draft EIS, we have updated table 3.5.3-1 in this final EIS below, where applicable. For the stakeholder-identified issues listed on table 3.5.3-1, we conclude that they have been adequately addressed to the extent practical by Mountain Valley.

Stakeholders filed new and/or updated concerns about other routing issues on their property after issuance of the draft EIS in September 2016. In our two post-draft EIS EIRs we asked Mountain Valley to provide additional information about the resolution of these new landowner concerns. On February 17, 2017 and March 30, 2017, Mountain Valley filed responses regarding these new stakeholder issues. A summary of those post-draft EIS identified stakeholder concerns, and Mountain Valley's responses, is provided in table 3.5.3-2.

TABLE 3.5.3-1

Status of Minor Route Variations Reported by Stakeholders Before Issuance of the Draft EIS

FERC ID / Accession Number	Parcel Number	MP	Summary of Issues	Mountain Valley's Response / Current Status
20150316-5023, 20150609-5017	WV-WB- 23.01, WV- WB-024, WV- WB-025, WV- WB-025.01, MVP-WB-128, MVP-ATWS- 956	97.7, 97.9, 98.1, 98.2, 98.3	Proposed pipeline route cuts property in half and landowner requested that alignment either be re-routed off property or move alignment to one side of property. Landowner concerned about proximity of pipeline alignment to residence and family cemetery on property. Landowner requested re-route to minimize impacts on timber production on property and family cemetery.	Mountain Valley stated that the proposed route follows contours that are most conducive to pipeline construction. The route cannot be moved due to unsuitable terrain in the nearby area such as side slopes to the east and west. Residences and the cemetery mentioned in the landowner's comments have been avoided. The landowner is actively negotiating an easement with Mountain Valley.
20150615-5054, 20150610-5243	WV-NI-004, WV-NI- 005, WV-NI-006, WV- NI-007	111.5	Landowner requested a re-route to avoid an area experiencing development in the town of Craigsville.	Mountain Valley stated that it reached an agreeable minor route adjustment with this landowner that was incorporated into the October 2016 Proposed Route. The landowner is actively negotiating an easement with Mountain Valley.
20150615-5185	WV-GR-022	140.83	Coal mining company concerned that Mountain Valley is not aware that proposed route is within their mining permit space and requests a re-route.	Mountain Valley stated that it evaluated the suggested re-routes and determined that they are not viable due to stream and wetland impacts and constructability concerns. Mountain Valley has consulted with mining engineers to verify that the current route is viable as per the guidelines of the Mining Area Construction Plan. Any adverse effects the pipeline may have on the coal reserves would be addressed with the property owner at the time mining occurs.
20150120-0096	WV-SU-028	167.1	Landowner requested a re-route to avoid area of potential future residence and to minimize impacts on timber production.	Mountain Valley stated that it reached an agreeable minor route adjustment with this landowner that was incorporated into the October 2016 Proposed Route. The landowner is actively negotiating an easement with Mountain Valley.

TABLE 3.5.3-1 (continued)

Status of Minor Route Variations Reported by Stakeholders Before Issuance of the Draft EIS

FERC ID / Accession Number	Parcel Number	MP	Summary of Issues	Mountain Valley's Response / Current Status
20150428-0056	WV-SU-029	167.9	Landowner requested a re-route to avoid cutting the property in half and reducing the amount of timber available for heating source.	Mountain Valley stated that it reached an agreeable minor route adjustment with this landowner that was incorporated into the October 2016 Proposed Route. The landowner is actively negotiating an easement with Mountain Valley.
20160223-5034	WV-SU-046	171.3	Landowner requested a re-route to minimize impacts on shallow wells, streams, and residential septic systems on the property.	Mountain Valley stated that it conducted a desktop analysis and field reviews (where accessible) of the FERC-proposed route variation to avoid parcel WV- SU-046 adjacent to the Greenbrier River crossing. Mountain Valley found obstacles that create construction issues with the FERC's proposed variation. The first obstacle is WV Route 3. Mountain Valley currently plans to cross WV Route 3 via conventional bore due to it being the main thoroughfare between the towns of Hinton and Alderson. At the FERC-proposed crossing, a conventional bore is not feasible due to a rock high wall immediately to the north and the Greenbrier River immediately to the south such that adequate workspaces for the required bore pits are not present. Therefore, an open-cut crossing would be required. The second construction issue is the hillside to the north of WV Route 3. Desktop evaluation shows the slope to be about 70%, which would require winch-hill construction techniques. Mountain Valley would require a new access road for equipment access from either WV Route 3 or WV Route 6 (East Clayton Rd.) which is not feasible given the terrain in the area.
20160219-5147	VA-MO-030	N/A	Landowner requested a re-route to avoid property proposed for a future residence.	Due to the incorporation of the Mount Tabor Variation into the October 2016 Proposed Route, this parcel is no longer affected by the project.
20150615-5061	VA-MO-054	N/A	Landowner requested a re-route to minimize impacts on a naturally reproducing population of brown trout downstream of the proposed route.	Due to the incorporation of the Mount Tabor Variation into the October 2016 Proposed Route, this parcel is no longer affected by the project.

TABLE 3.5.3-1 (continued)

Status of Minor Route Variations Reported by Stakeholders Before Issuance of the Draft EIS

FERC ID / Accession Number	Parcel Number	MP	Summary of Issues	Mountain Valley's Response / Current Status
20160406-5119	VA-RO-040, VA-RO-042, VA-RO-043, VA- RO-030 (AR-RO-281)	241.0 – 241.7	Landowner requested a re-route to avoid impacts on a residential driveway, bridge, family cemetery, creek, and children play area.	Mountain Valley conducted surveys on the parcel and evaluated a minor route deviation that addresses the landowner's concerns. Desktop analysis shows a minor route deviation to address the landowner's concerns is feasible, but would shift the route onto the properties of adjacent landowners. See Poor Mountain Variation in section 3.5.1.12
20150615-5089	VA-FR-017.12	253.5	Landowner concerned about pipeline route impacts on water resources, geology, and cultural resources including the use of existing easements.	Mountain Valley stated that its current alignment follows the ridge-top at the edge of the property. In order to avoid this parcel, Mountain Valley would have to shift east, which is not feasible because it would require severe side-slope construction. Mountain Valley would perform all necessary surveys and avoid or mitigate resources on this parcel. Collocation is not possible due to the lack of an existing corridor in the vicinity of the proposed route.
20151127-5073	VA-FR- 017.11; VA-FR- 017.15	253.1 – 254.6	Landowner requested re-route to avoid impacts on property including the use of existing easements.	Mountain Valley stated that its current alignment follows the ridge-top across these properties. In order to avoid this parcel, Mountain Valley would have to shift its alignment, which is not feasible because it would require severe side-slope construction. In addition, shifting the alignment would bring it closer to the residences to the west of VA-FR-017.11. Mountain Valley has routed the pipeline through an area on VA-FR-017.15 that has been previously clear-cut, which minimizes environmental impacts.
20150129-5217	VA-PI-099	300.9	Landowner requested a re-route to minimize impacts on farmland on the property.	Mountain Valley has addressed the landowner's concerns and signed an easement agreement.
20151127-5076	VA-PI-100; 101; 102	301.4 – 301.7	Landowner requested a re-route to avoid impacts on family farm operations including the use of existing easements.	Mountain Valley has reached an agreeable route with the landowner and has acquired a right of way easement. No further coordination is required.

TABLE 3.5.3-2

Status of Minor Route Variations / Issues Reported by Stakeholders After Issuance of the Draft EIS

FERC ID/ Accession Number	Parcel Number	MP	Summary Of Issues	Mountain Valley's Response / Current Status
20161220-0010, 20161221-5574, Vicki Pierson (Nov 1, 2016 public comment session)	WV-BR-008	69.2 - 69.5	Landowner is concerned about pipeline location with regards to proximity of the Burnsville WMA property, prefers that the pipeline be more on public land. Landowner requested a review of collocating the pipeline in the same right of way as the 36-inch Stonewall Gathering Pipeline near the landowner's property.	See the discussion of the Burnsville Lake WMA Variation in section 3.5.1.2. The 36-inch Stonewall Gathering Pipeline is located approximately 0.7 mile to the east of the landowner's property from the proposed route. Due to the terrain in this area, Mountain Valley stated that it is not possible to collocate a 42-inch-diameter pipeline due to the narrow nature of the ridgeline that the 36-inch-diameter Stonewall Gathering Pipeline runs atop. Collocation would put the MVP pipeline in side-slope conditions that are not suitable for construction.
20161201-5118	WV-WB-023.01, WV-WB-024, WV-WB- 025, WV-WB-025.01, WV-WB-4010, WV-WB- 5675, WV-WB-5648, MVP-WB-128	97.7-98.1	The landowner has concerns regarding cultural resources, including old home sites. Additional concerns regarding bisecting property, landslides damaging timber, and impacts on timber harvesting.	Mountain Valley stated that it has routed the proposed pipeline in topography most conducive to pipeline construction through these properties and there are side slopes to the east and west. Mountain Valley has developed a *Landslide Mitigation Plan* and erosion control devices would be placed according to Mountain Valley's *Erosion and Sediment Control Plan*. Mountain Valley includes compensation for surface damages including damages to timber and/or crops as part of its offer in an easement package. Mountain Valley is also willing to discuss heavy machinery access during pipeline operation for timber harvesting activities.
20161220-0051	WV-SU-041	170.7 - 171.2	Landowner is concerned about impacts on a potential future housing development	Per landowner request, Mountain Valley stated that it had incorporated a reroute into its October 2016 Proposed Route that avoided the area mentioned for a possible future housing development.

TABLE 3.5.3-2 (continued)

Status of Minor Route Variations / Issues Reported by Stakeholders After Issuance of the Draft EIS

FERC ID/ Accession Number	Parcel Number	MP	Summary Of Issues	Mountain Valley's Response / Current Status
20161228-0073	WV-MO-012.210, WV-MO-012.220, WV-MO-012.225	188.2 - 189.2	Landowner concerned about pipeline impacts on water resources, cultural resources, and soil erosion. Also concerns about impacts on a water line serving a campground and a well- used for cattle operations.	Mountain Valley stated that it routed the pipeline in terrain and topography most conducive to pipeline construction and that impacts on aquatic resources would be mitigated and all crossings would adhere to both state and federal guidelines.
20161110-5022	VA-GI- 049	206.7 - 207.3	Landowner concerned about pipeline route impacts on farm and associated businesses.	Mountain Valley stated that it routed the pipeline through topography that is most conducive to pipeline construction. In addition, Mountain Valley stated that it collocated with an existing utility corridor through the subject landowner's property which reduces the overall environmental footprint. If Mountain Valley were to reroute to the edge of the landowner(s) property, rather than its current proposed location, constructability concerns increase and additional impacts would result. Topography on the north and on the south end of the parcel would require side slope construction, additional tree clearing, and collocation would be lost.
20161017-0031	VA-GI-5673	216.6	Landowner is concerned with proximity of an MVP access road to his home and his front yard tree and flower bed. Landowner suggests alternative road on his neighbor's property.	Mountain Valley stated that it would limit its use of this access road to the minimum width necessary, which would result in no disturbance to the flower bed and only minor disturbance to the tree such as trimming.
20161212-5046	VA-MO-3370	221.6	Landowner has concerns about impacts on steep ravines on the subject property.	The issue of steep ravines was not addressed by Mountain Valley.
20161024- 5011	VA-MO-5511, VA-MO-5512	222.2	Landowner is concerned about impacts on a well.	The issue of the well was not addressed by Mountain Valley.
20160920-5007	VA-MO-5522	223.3	Landowner stated that the pipeline route is too close to his well and house.	Mountain Valley stated that it would perform field adjustments to avoid a sinkhole and a well on the property. With these field adjustments, the limit-of-disturbance would be approximately 200 feet from the house.

TABLE 3.5.3-2 (continued)

Status of Minor Route Variations / Issues Reported by Stakeholders After Issuance of the Draft EIS

FERC ID/ Accession Number	Parcel Number	MP	Summary Of Issues	Mountain Valley's Response / Current Status
20161213-5021	VA-MO-5528	224.1, 225.4	Landowner is concerned about impacts on cattle and hay operations.	The issue of cattle and hay operations was not addressed by Mountain Valley.
20161222-5538	VA-MO-005, VA-MO-084, VA-RO-033	233.5 – 234.3	Landowner concerned about pipeline route and permanent access road impacts on property.	Mountain Valley stated that it selected the best constructible route possible across this property and that landowners would have access to their property during and after construction. Mountain Valley requested a permanent access road to maintain access to the ridge for right-of-way monitoring and maintenance.
20170324- 5140	VA-RO-040, VA-RO- 042, VA-RO-043	241.05 - 241.65	Landowner is concerned about a historic cemetery, new home under construction and impacts on an associated septic system.	The issues of the historic cemetery, new home under construction and impacts on an associated septic system were not addressed by Mountain Valley.

TABLE 3.5.3-2 (continued)

Status of Minor Route Variations / Issues Reported by Stakeholders After Issuance of the Draft EIS

FERC ID/ Accession Number	Parcel Number	MP	Summary Of Issues	Mountain Valley's Response / Current Status
20161212-5034, 20161212-5040, 20161212-5044, (James Chandler (11/2/16 public comment session)	VA-RO-060, VA-RO-061	245.1 – 245.5	Landowner is concerned with proximity to home, proximity to water well, interruption of cattle grazing, impact to wetlands and waterbodies on access road, and hindered ingress and egress to landowner's residence.	Mountain Valley stated that it routed the pipeline in topography most conducive to pipeline construction through these properties. Impacts on waterbodies and wetlands have been reduced to the maximum extent practicable through limits of disturbance reduction and erosion control devices would be placed according to Mountain Valley's *Erosion and Sediment Control Plan*. Mountain Valley stated that the proposed pipeline route would neither encroach nor restrict use of the landowner's yard. In addition, farming should not be hindered as Mountain Valley does not propose crossing the landowner's fields. Mountain Valley would install temporary fencing and temporary livestock crossings to conform to the landowners farming operations. Mountain Valley would ensure access is not obstructed to residents through use of Green Hollow Road during construction. Mountain Valley includes compensation for surface damages including damages to timber and/or crops as part of its offer in an easement package. Mountain Valley stated that the proposed route alignment throughout the subject parcels follows contours which are most conducive to pipeline construction. Mountain Valley has assessed a route that borders the subject property line and has concluded it is not feasible due to contour change requiring side-slope construction techniques, additional drainage feature crossings, and additional stream crossings.

TABLE 3.5.3-2 (continued)

Status of Minor Route Variations / Issues Reported by Stakeholders After Issuance of the Draft EIS

FERC ID/ Accession Number	Parcel Number	MP	Summary Of Issues	Mountain Valley's Response / Current Status
20161207-035, 20161216-5043	VA-FR-017, VA-FR- 017.02	251.3 – 252.1	Landowner is concerned with pipeline bisects their property. Landowner is concerned of impact to family farm, aquifers, and wells on property. Negative impact to cattle production during construction and post-construction by not allowing heavy equipment or certain types of farming over the pipeline permanent easement.	Mountain Valley stated that due to topography and side slopes, the proposed pipeline route provides the safest and most constructible route. Mountain Valley stated that it routed the proposed pipeline in an area which avoids residential areas to the north-east, and side-slope topography to the west. Mountain Valley would work with landowner with temporary fencing and livestock crossings to reduce impact on farming operations. Additionally, Mountain Valley would work with the landowner to allow heavy equipment to cross the pipeline. Mountain Valley would also send letters to the stakeholder requesting permission to pre-test water wells in accordance with their well testing plan.
Glen Frith (11/2/16 public comment session)	VA-FR-017.24	255.8	Landowner stated the proposed pipeline route divides up his property. Landowner is concerned about the proximity of pipeline to residence, and impacts of access road.	Mountain Valley stated that it routed the pipeline in terrain and topography most conducive to pipeline construction. Mountain Valley's proposed route bisects the subject parcels at a location which is a center point between residences to the northwest and south of the pipeline. The distance from the commenter's home is over 1,600 feet. Limiting factors that prevent an alternative route on the edges of the subject property include: residences, farm structures, and ponds. In addition, Mountain Valley stated that existing roadways utilized as access roads for the project would be left in as good, or better condition once the project is complete.
20161220-5182	VA-FR-017.44	257.8	Landowner is opposed to the use of Labellevue Drive as an access road to pipeline route, and questions its necessity.	Mountain Valley proposes to utilize this existing road as an access point to the ridgetop between Teels Creek at the Leaning Oak Road crossing to the east, and Monty Road to the west. Using this existing road would eliminate unnecessary tree clearing and minimize environmental impacts. Mountain Valley has committed to restoring Labellevue Drive to as good or better condition post-construction.

TABLE 3.5.3-2 (continued)

Status of Minor Route Variations / Issues Reported by Stakeholders After Issuance of the Draft EIS

FERC ID/ Accession Number	Parcel Number	MP	Summary Of Issues	Mountain Valley's Response / Current Status
20160919-0013	VA-FR-046.01	Privileged (cultural resources)	Concerns regarding a cultural resources site and a historic house.	The landowner was concerned about potential impacts on cultural resources sites #44FR0190 and #44FR0191. Cultural resources concerns are covered in section 4.10 of the EIS.
20161212-5234	VA-FR-5498	266.2	Landowner has questioned whether Mountain Valley has considered a different route near his property in Rocky Mount, VA that could use fields instead of woods, also concerned about impacts across extended road frontage.	Mountain Valley affected the subject landowner because of the Blackwater River Variation, which was incorporated into the project in October 2016. See section 3.5.1.14.
20161223-0033	VA-FR-115	267.9 - 268.4	The Beckner Irrevocable Trust requests that an access to ATWS via a gravel road and location of ATWS be reconfigured. In addition, the Trust asks to relocate the pipeline. Also concerned about sediment and erosion control and cultural resources sites (an alleged Native American structure).	The proposed relocation would place the pipeline in a closer proximity to Sunshine Valley School, which was the subject or prior routing efforts to move the pipeline farther away. Sediment and erosion control are discussed in sections 2, 4.1, 4.2, and 4.3 of the EIS.
20161213-0057, Ginger Smithers (emails to FERC staff dated 2/ 21-23/17)	VA-FR-117, VA-FR- 119, VA-FR-5151	268.4 - 269.1	Landowner concerned about location of the pipeline on her property.	Mountain Valley stated that it met with the landowner in late February 2017 and found an agreeable route on her property. Mountain Valley has surveyed the new proposed route and expects to adopt the route variation at a later date and is in negotiations for the purchase of right of way easement.
Martin Morrison (11/3/16 Public comment session, Roanoke, VA)	VA-RO-5786, VA-RO-4115	NA	An access road (MVP-MN-277.02) would cross these parcels, landowner concerned about the project filling the landowner's pond.	Mountain Valley stated that they would not fill the subject pond.

For the stakeholder-identified issues listed on table 3.5.3-2, we conclude that in certain cases, Mountain Valley did not adequately or completely address the concerns identified by affected landowners. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley should file landowner-specific crossing plans developed in coordination with the affected landowners which contain impact avoidance, minimization, or mitigation measures, as appropriate, for review and written approval of the Director of OEP. The landowner-specific crossing plans should be prepared in relation to the draft EIS comments in the following accession numbers: 20161024-5011 (water well), 20161212-5046 (steep ravines), 20161212-5234 (forest impacts, road frontage), 20161213-5021 (cattle and hay operations), 20161223-0033 (gravel road, reconfigure ATWS), 20161228-0073 (water well, waterline for the campground), and 20170324-5140 (home under construction, septic system).**

Aboveground Facility Alternatives

We did not evaluate alternative locations for M&R stations because the locations of those facilities are largely determined by interconnections with other pipeline systems and delivery points, and the facilities have a relatively small footprint. Similarly, the locations of proposed MLVs are based in part on PHMSA regulations, and MLVs and other appurtenant aboveground facilities generally occupy only a small footprint within existing or proposed pipeline rights-of-way.

We found the proposed locations of the compressor stations to be acceptable, and we did not receive comments from affected stakeholders concerning their siting. Given these factors, we did not evaluate any alternative sites for the MVP or EEP compressor stations.

3.5.3.2 Electric-driven Compression Alternatives

We evaluated the feasibility of using electric motor-driven compressors at the MVP's Bradshaw, Harris, and Stallworth Compressor Stations as an alternative to the proposed natural gas-fired reciprocating engines and natural gas-fired turbines. The electricity requirements for the Bradshaw, Harris, and Stallworth Compressor Stations would be 70 megawatts (MW), 35 MW, and 35 MW, respectively, to utilize electric motors to provide the compression needed for the MVP. In all cases, the existing electric transmission system that provides 138-kV would need to be extended by at least several miles to provide service to these compressor stations. The extensions of multiple powerlines for miles for each proposed compressor station would have the disadvantages of its own set of environmental impacts with likely clearing of forest, modification of wildlife habitat, ground disturbance for installation of power poles, changes to visual setting, and permanent maintenance of a linear corridor in a grassy or scrub-shrub condition.

The energy needed to run the electric-driven compressors would be generated in the region, which includes a variety of power generation sources. We utilized the EPA's Emissions & Generation Resource Integrated Database (eGRID) to estimate the hypothetical regional CO_2, CH_4, and N_2O emissions that would occur if electric-driven compressor units were installed rather than natural gas-fired compressor units. The eGRID integrates many different federal data sources on power plants to allow for direct comparison of environmental attributes of electric generation within defined regions of the United States. The analysis found that the use of electric-driven compressors would result in an increase of CO_2 (1,379 pounds per MW-hour), CH_4 (0.02 pounds per MW-hour), and N_2O (0.02 pounds per MW-hour) emissions in the region. Lastly, the use of natural gas to power compressors is more reliable than electric service, which can be more readily interrupted by storms or extreme power demands.

For these reasons we have determined that the use of electric-driven compressors at Mountain Valley's proposed compressor stations does not offer a significant environmental advantage when compared to the use of natural gas-fired compressors.

We also evaluated the feasibility of using electric motor-driven compressors at the proposed Redhook Compressor Station as an alternative to the natural gas-fired reciprocating engines and natural gas-fired turbines proposed to provide the compression needed for the EEP.

Equitrans proposes to utilize four natural gas-fired compressors at the Redhook Compressor Station with a combined 31,700 hp capacity. In order to utilize electric-powered compressors instead, a new, 5.25-mile-long 138 kV powerline and a new substation would be required. This electric-related infrastructure would result in additional environmental impacts. The extensions of the powerlines for over 5 miles would have the disadvantages of its own set of environmental impacts with likely clearing of forest, modification of wildlife habitat, ground disturbance for installation of power poles, changes to visual setting, and permanent maintenance of a linear corridor in a grassy or scrub-shrub condition.

As noted above for the MVP, we utilized the EPA's eGRID to estimate the hypothetical regional CO_2 (1,379 pounds per MW-hour), CH_4 (0.02 pounds per MW-hour), and N_2O (0.02 pounds per MW-hour) emissions that would occur if electric-driven compressor units were installed rather than natural gas-fired compressor units. The analysis found that the use of electric- driven compressors would result in an increase of CO_2, CH_4, and N_2O emissions in the region. Lastly, the use of natural gas to power compressors is more reliable than electric service, which can be more readily interrupted by storms or extreme power demands.

Given consideration of all of these factors, we conclude that the use of electric-powered compressors at the Redhook Compressor Station is not practical and does not offer a significant environmental advantage when compared to the corresponding proposed system.

3.6 CONCLUSION

We reviewed alternatives to the Applicant's proposals based on our independent analysis and comments received. Although the majority of the alternatives appear to be technically feasible, no system alternatives provide a significant environmental advantage over the Project. However, we did recommend adoption of Variation 250, changes for a proposed temporary access road, and landowner-specific crossing plans. Based on these findings we conclude that the proposed project, as modified by our recommended mitigation measures, is the preferred alternative than can meet the project objectives.

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4.0 ENVIRONMENTAL ANALYSIS

This section of the EIS primarily provides our analysis of impacts associated with construction and operation of the MVP and the EEP. This section describes the affected environment as it currently exists and discusses the environmental consequences of the proposed projects. The discussion is organized by the following major resource topics: geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; special status species; land use, recreation, special interest areas, and visual resources; socioeconomics (including transportation and traffic); cultural resources; air quality and noise; reliability and safety; and cumulative impacts.

The environmental consequences of constructing and operating the projects would vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impacts generally occur during construction with the resource returning to pre-construction condition almost immediately afterward. Short-term impacts could continue for up to 3 years following construction. This could include the time it takes for herbaceous/shrub vegetation to grow on the right-of-way after restoration. Impacts were considered long-term if the resource would require more than 3 years to recover. For example, although trees would be allowed to regenerate in temporary work areas, it would take many years for them to mature. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to pre-construction conditions during the life of the projects (more than 50 years). The construction and operation of aboveground facilities would have permanent impacts.

In this EIS, we considered whether an impact would be direct or indirect, as defined in the CEQ regulations for implementing NEPA at 40 CFR 1508.8. Direct effects "…are caused by the action and occur at the same time and place." An example of a direct impact would be the clearing of the right-of-way. Indirect effects "…are caused by the action and are later in time or farther removed in distance…." An example of an indirect effect would be visual or audible impacts that adversely modify the setting or character of an NRHP-listed or eligible historic architectural structure that is located nearby but off the right-of-way.

We considered an impact to be significant if it would result in a substantial adverse change in the physical environment. Examples of significant impacts could include the removal of critical habitat for a federally listed threatened or endangered species, or direct construction impacts on an historic property. In most cases, the Applicants have proposed measures that would avoid, minimize, or mitigate adverse effects from construction of the projects so that those impacts would not be significant.

The Applicants, as part of their proposals, developed certain mitigation measures to reduce the impact of the projects. In some cases, we determined that additional mitigation measures could further reduce the projects' impacts. Our additional mitigation measures appear as bulleted, boldfaced paragraphs in the text of this section and are also included in section 5.2. We will recommend to the Commission that these measures be included as specific conditions in any Order the Commission may issue authorizing these projects. The conclusions in the EIS are based on our analysis of the environmental impact and the following assumptions:

- the Applicants would comply with all applicable laws and regulations;
- the proposed facilities would be constructed and operated as described in section 2.0 of the EIS;
- the Applicants would implement the mitigation measures included in their applications and supplemental submittals to the FERC;
- the Applicants would follow the mitigation measures included in other agencies' permits and approvals; and
- the Applicants would comply with our recommended mitigation measures, listed in section 5.2.

In February 2016, Mountain Valley notified the FERC that the MVP would cross federally owned lands managed separately by both the FS (as part of the Jefferson National Forest) and the COE (as part of the Weston and Gauley Bridge Turnpike Trail). Under the MLA, the BLM is the federal agency responsible for issuing Right-of-Way Grants for natural gas pipelines across federal lands under the jurisdiction of the BLM or under the jurisdiction of two or more federal agencies. Therefore, the BLM would be responsible for the issuance of a Right-of-Way Grant to Mountain Valley for a pipeline easement over federal lands, dependent on concurrence from the FS and the COE. The MVP pipeline route would cross about 3.5 miles (82.7 acres or 1.2 percent of the total MVP) of the Jefferson National Forest (managed by the FS) in Monroe County, West Virginia and Giles and Montgomery Counties, Virginia. The MVP pipeline route would cross about 60 feet of the Weston and Gauley Bridge Turnpike Trail, owned by the COE, in Braxton County, West Virginia. Additional mitigation may be required as a result of the Right-of-Way Grant. To facilitate the consideration of environmental impacts on NFS lands, we have included summaries within applicable resource sections that address resources found on NFS lands.

General Environmental Setting

The MVP would cross five EPA Level III ecoregions: 1) Western Allegheny Plateau (MPs 0.0 to 71.1); 2) Central Appalachians (MPs 71.1 to 191.3); 3) Ridge and Valley (MPs 191.3 to 238.1); 4) Blue Ridge (MPs 238.1 to 251.7 and 252.0 to 253.5); and 5) Piedmont (MPs 251.7 to 252.0 and 253.5 to 303.5) (EPA, 2015). The Western Allegheny Plateau ecoregion extends from Pennsylvania south to Kentucky. The region is mostly forested, with pasture, cropland, urban development, coal mining, and oil-gas fields influencing the landscape. The terrain is an unglaciated plateau with rugged hills underlain by Carboniferous rock. The MVP pipeline route across the Western Allegheny Plateau would cross through the Little Muskingum-Middle Island, West Fork, and Little Kanawha River watersheds.

The Central Appalachians ecoregion extends from central Pennsylvania south into Tennessee. It is mostly forested, with mining operations, small areas of pasture, and croplands. The terrain is rugged with large hills and low mountains comprised of sandstone, shale, conglomerate, and coal deposits. The MVP pipeline route across the Central Appalachian physiographic region would cross through the Elk, Gauley, Lower and Middle New, and Greenbrier River watersheds.

The Ridge and Valley ecoregion is a diverse and extensive region extending from New York south into Alabama. The landscape is a mix of forest, pasture, and cropland. The terrain is northeast-southwest oriented with roughly parallel ridges, rolling valleys, and irregular hills composed of sandstone, shale, limestone, and dolomite. The MVP pipeline route across the Ridge and Valley physiographic region would cross through the Middle New, Upper James, and Upper Roanoke River watersheds.

The Blue Ridge ecoregion is a narrow region that extends from southern Pennsylvania south into northern Georgia. The terrain is generally rugged with a variety of features including narrow ridges, hilly plateaus, and massive mountainous areas with a landscape a mix of forest, small pasture, fruit orchards, and tree farms. The MVP pipeline route across the Blue Ridge physiographic region would cross through the Upper Roanoke River watershed.

The Piedmont ecoregion is a transitional area between the mountainous Appalachians and the relatively flat coastal plain. The area is comprised of oak-hickory-pine forests with rolling hills and plains dominating the landscape. Much of the region is urbanized with a mix of planted pine, pasture, and cropland (Woods et al., 1999). The MVP pipeline route across the Piedmont physiographic region would cross through the Upper Roanoke River and Bannister watersheds.

All components for the EEP would be within the Western Allegheny Plateau ecoregion, described above. The EEP facilities would be located within the Lower Monongahela and Little Muskingum-Middle Island watersheds.

4.1 GEOLOGY

4.1.1 Affected Environment

4.1.1.1 Geologic Setting

Mountain Valley Project

The MVP would be located in four physiographic provinces: 1) the Appalachian Plateau; 2) Valley and Ridge; 3) Blue Ridge; and 4) Piedmont (Fenneman and Johnson, 1946). The proposed pipeline would cross the Appalachian Plateau province from approximate MPs 0.0 to 189.6. This province consists mainly of steep sloped ridges and level valleys considered to be deeply dissected, rugged terrain. Bedrock underling this province generally consists of sandstone, siltstone, shale, coal, and some limestone from the Carboniferous (Pennsylvanian) period (West Virginia Geological and Economic Survey [WVGES], 2015; USGS, 1997).

The Valley and Ridge province would be crossed from approximate MPs 189.6 to 240.8. This province consists of folded sedimentary bedrock that comprise linear mountain ridges and valleys that trend to the northeast. The underlying bedrock geology includes sandstone, shale, and carbonate bedrock. Karst features such as sinkholes, swallets, caves, and springs can be found in the carbonate formations in this province. Section 4.1.1.5 below provides a discussion of karst features located along the MVP pipeline route.

The Blue Ridge province would be crossed from approximate MPs 240.8 to 267.5. It consists of the Blue Ridge Mountains, which climb to a higher elevation than the ridges of the Valley and Ridge province. The bedrock geology of the Blue Ridge Mountains consists of crystalline bedrock from the Mesoproterozoic to Early Paleozoic eras comprised of granitic gneiss, granite, biotite gneiss, and schist.

Lastly, the Piedmont province would be crossed from approximate MPs 267.5 to 303.5. Here the terrain transitions to gently sloping rounded hills that are underlain by deeply weathered bedrock. Ridges are rare in the Piedmont province. Partially weathered to competent bedrock is typically found at depths of 6 to 65 feet below ground surface and consists of igneous and metamorphic rocks including schists, gneiss, and granite ranging in age from the Proterozoic to Paleozoic eras.

Elevations and relief along the MVP pipeline route vary and are presented by county in table 4.1.1-1. The maximum elevation crossed by the MVP is 3,741 feet above mean sea level (amsl) in Roanoke County, Virginia. The greatest topographic relief along the proposed pipeline route (2,375 feet) occurs within Franklin County, Virginia.

TABLE 4.1.1-1 **Elevations along the Mountain Valley Project**		
State / County	**Minimum Elevation (feet amsl)**	**Maximum Elevation (feet amsl)**
West Virginia		
Wetzel	863	1,660
Harrison	997	1,653
Doddridge	942	1,502
Lewis	808	1,631
Braxton	830	1,871
Webster	996	2,769
Nicholas	1,748	3,202
Greenbrier	2,388	3,478
Fayette	2,661	2,804
Summers	1,502	3,734
Monroe	1,567	3,467
Virginia		
Giles	1,645	3,476
Craig	2,145	2,999
Montgomery	1,177	3,003
Roanoke	1,923	3,741
Franklin	792	3,167
Pittsylvania	566	950

Source: USGS, 2016a
amsl = Above Mean Sea Level

Equitrans Expansion Project

The EEP would be located solely in the Appalachian Plateau physiographic province, which is discussed above (Fenneman and Johnson, 1946; WVGES, 2015a). Elevations along the EEP are presented in table 4.1.1-2 by project component. The maximum topographic elevation change for the EEP is 510 feet amsl along the H-318 pipeline, which has a maximum elevation of 1,238 feet.

TABLE 4.1.1-2 **Elevations at Equitrans Expansion Project Facilities**		
Facility	**Minimum (feet amsl)**	**Maximum (feet amsl)**
H-158/M-80	920	1,051
H-305	1,062	1,147
H-316	876	1,135
H-318	728	1,238
H-319	893	899
Pratt Compressor Station	895	950
Redhook Compressor Station	1,034	1,077
Webster Interconnect	899	933
H-306 Tap Site	893	894
Mobley Tap	933	942
Applegate L/R Site	1,102	1,129
H-148 Tap Site/Hartson L/R Site	1,048	1,078
H-302 Tap L/R Site	1,129	1,139
Source: USGS, 2016a amsl = above mean sea level		

4.1.1.2 Bedrock Geology

Mountain Valley Project

The bedrock geology along the MVP was described in data researched at the Virginia Department of Mines, Minerals, and Energy (VADMME), and the West Virginia Geographic Information System (WVGIS) Technical Center (VADMME, 2015a; WVGIS Technical Center, 2015a**)**. Bedrock geology is summarized in table 4.1.1-3.

TABLE 4.1.1-3

Bedrock Geology Crossed by the Mountain Valley Project

County	Start MP	End MP	Distance	Group	Formation	Age	Rock Types
West Virginia							
Wetzel, Harrison, Doddridge, Lewis	0.0	42.5	42.5	Dunkard	Greene, Washington, Waynesburg	Pennsylvanian and Permian	sandstone, potential coal seams
Lewis, Braxton	42.5	65.2	22.7	Monongahela and Dunkard	Uniontown, Pittsburgh; Greene, Washington, Waynesburg		
				Conemaugh a/	Casselman, Glenshaw	Pennsylvanian	shale, potential coal seams
Braxton	65.2	80.2	15.0	Conemaugh b/	Allegheny, Casselman, Glenshaw	Pennsylvanian	sandstone, shale, potential coal seams
				Monongahela a/	Uniontown, Pittsburgh		sandstone, potential coal seams
				Pottsville	Kanawha		
Webster	80.2	109.7	29.5	Conemaugh	Allegheny, Casselman, Glenshaw		sandstone, shale, potential coal seams
				Pottsville	Kanawha, New River		sandstone, potential coal seams
Nicholas	109.7	110.0	0.3				
Webster	110.0	110.9	0.9				
Nicholas	110.9	135.3	24.4				
Greenbrier	135.3	154.2	18.9		Kanawha, New River, Pocahontas		
				Mauch Chunk	Bluestone, Princeton	Mississippian	shale/ sandstone, potential coal seams
Fayette	154.2	154.7	0.5				
Greenbrier	154.7	157.2	2.5				
Summers	157.2	174.3	17.1	Pottsville	Pocahontas	Pennsylvanian	sandstone, potential coal seams
				Mauch Chunk	Bluestone, Princeton, Hinton	Mississippian	shale/ sandstone, shale
Monroe	174.3	192.4	18.1		Hinton, Bluefield		shale
				Greenbrier	N/A		limestone
				Pocono	Maccrady		shale
	192.4	194.8	2.4	Chemung	N/A	Devonian	
				N/A	Brallier		

TABLE 4.1.1-3 (continued)

Bedrock Geology Crossed by the Mountain Valley Project

County	Start MP	End MP	Distance	Group	Formation	Age	Rock Types
	194.8	196.3	1.5	Beekmantown	N/A	Ordovician	limestone
				St. Paul	N/A		
				Trenton, Black River	N/A		
				Martinsburg	N/A		shale
				Juniata, Oswego	N/A		sandstone
Virginia							
Giles	196.3	198.0	1.7	Lower Devonian and Silurian Formations - undivided		Lower Devonian and Silurian	sandstone, limestone
	198.0	216.8	18.8	Knox Group		Cambrian - Ordovician	shale, mudstone
				Moccasin Formation, Bays Formation, Unit C, Unit B, Unit A		Ordovician	dolostone (dolomite), limestone
				Juniata Formation, Reedsville Shale, Trenton Limestone, Eggleston Formation		Ordovician	shale, mudstone
				Knox Group		Cambrian - Ordovician	dolostone (dolomite), limestone
Craig	216.8	218.5	1.7	Juniata Formation, Reedsville Shale, Trenton Limestone, Eggleston Formation		Ordovician	shale, mudstone
Montgomery	218.5	219.1	0.6	Lower Devonian and Silurian Formations - undivided		Lower Devonian and Silurian	sandstone, limestone
	219.1	220.7	1.6	Millboro Shale and Needmore Formation		Devonian	black shale, shale
				Brallier Formation			shale, siltstone
				Chemung Formation			shale, sandstone
	220.7	221.5	0.8	Price Formation		Mississippian	sandstone, shale
	221.5	226.8	5.3	Elbrook Formation		Cambrian, Upper Cambrian - Lower Ordovician	dolostone (dolomite), limestone
				Lower Ordovician and Upper Cambrian Formations - undivided			limestone, dolostone (dolomite)
	226.8	228.1	1.3	Moccasin Formation, Bays Formation, Unit C, Unit B, Unit A		Ordovician	shale, mudstone
				Juniata Formation, Reedsville Shale, Trenton Limestone, Eggleston Formation			

TABLE 4.1.1-3 (continued)

Bedrock Geology Crossed by the Mountain Valley Project

County	Start MP	End MP	Distance	Group Formation	Age	Rock Types
	228.1	228.9	0.8	Lower Devonian and Silurian Formations - undivided	Lower Devonian and Silurian	sandstone, limestone
	228.9	234.2	5.3	Millboro Shale and Needmore Formation	Devonian	black shale, shale
				Brallier Formation		shale, siltstone
				Chemung Formation		shale, sandstone
Roanoke	234.2	238.1	3.9	Elbrook Formation	Cambrian	dolostone (dolomite), limestone
				Pumpkin Valley Shale and Rome Formation; Chilhowee Group		shale, siltstone; quartzite, conglomerate
	238.1	241.2	3.1	Chilhowee Group		quartzite, conglomerate
	241.2	246.5	5.3	layered pyroxene granulite	Proterozoic Y	granulite
				charnockite		granitic gneiss
				porphyritic leucocharnockite		granite
Franklin	246.5	259.1	12.6	layered biotite granulite and gneiss		gneiss, granulite
				porphyroblastic biotite-plagioclase augen gneiss		augen gneiss
				layered quartzofeldspathic augen gneiss and flaser gneiss		felsic gneiss, flaser gneiss
	259.1	260.3	1.2	Ashe Formation - biotite gneiss	Proterozoic Z	biotite gneiss
	260.3	261.5	1.2	layered quartzofeldspathic augen gneiss and flaser gneiss	Proterozoic Y	felsic gneiss, flaser gneiss
	261.5	283.9	22.4	Ashe Formation - biotite gneiss	Proterozoic Z, Proterozoic Z – Cambrian, Cambrian	biotite gneiss
				Alligator Back Formation - feldspathic metagraywacke		meta-argillite, schist
				Alligator Back Formation - actinolite schist; Candler Formation; Bassett Formation; Alligator Black Formation – feldspathic metagraywacke		Schist, phyllite, meta-argilite, amphibolite, biotite gneiss
					Proterozoic Z – Cambrian, Cambrian, Proterozoic Z	schist
Pittsylvania	283.9	296.5	12.6			meta-argillite, schist
						phyllite, schist
						amphibolite, gneiss

TABLE 4.1.1-3 (continued) Bedrock Geology Crossed by the Mountain Valley Project							
County	**Start MP**	**End MP**	**Distance**	**Group**	**Formation**	**Age**	**Rock Types**
							biotite gneiss, gneiss
							mica schist, gneiss
	296.5	303.1	6.6	Leatherwood Granite		Cambrian, Proterozoic Z - Cambrian	granite
				Fork Mountain Formation			mica schist, gneiss
	303.1	303.5	0.4	Newark Supergroup - sandstone, siltstone and shale, interbedded		Upper Triassic	sandstone, siltstone
WV GIS Technical Center, 2015a; VADMME, 2015a N/A = Not Applicable							

The bedrock along the MVP varies but typically consists of Paleozoic Era bedrock comprised of sandstone, shale, limestone, and coal. Folded bedrock consisting of the Dunkard and Monongahela sandstone occurs from MPs 0 to 65. Between MPs 65 to 154 the route generally crosses the Conemaugh and Pottsville Groups made up of sandstone and shale formations; and between MPs 154 to 192 consists of shale, sandstone, and limestone bedrock consisting of the Mauch Chunk, Greenbrier, and Pocono Groups deposited during the Middle Mississippian Period. The project then moves into older geologic formations deposited during the Devonian, Ordovician, and Silurian Periods from MPs 192 to 217. These bedrock formations consist of limestone, dolostone, shale, and sandstone from the Knox Group, Moccasin Formation, Bays Formation, Juniata Formation, and others. Karst terrain also occurs in the carbonate (limestone and dolostone) rocks found in the project area from approximate MPs 172 to 239. During the Cambrian and Ordovician Periods, a rising marine sea deposited marine limestone, shale, siltstone, and sandstone, which makes up the Moccasin, Bays, Juniata, Lower Devonian, Silurian, Brallier, Chemung, and other formations crossed from MPs 217 to 234. The bedrock then transitions to Cambrian and Proterozoic granite, gneiss, and schist from MPs 234 to 304 and generally includes rocks from the Ashe Formation (biotite gneiss), Alligator Back Formation (schist), Candler Formation (phyllite and schist), Bassett Formation (biotite gneiss), and others.

Equitrans Expansion Project

Bedrock geology along the EEP consists of sedimentary bedrock from the Pennsylvania and Permian Periods. Table 4.1.1-4 identifies the formations and rock types that would be crossed by the EEP pipelines. The H-158/M-80, H-305, and H-316 pipelines are generally underlain by the Monongahela Group and Waynesburg Formation, which consists of sandstone, limestone, shale, and coal. MPs 2.9 to 3.0 of the H-316 pipeline is underlain by the Washington Formation, which also consists of sandstone, shale, limestone, and coal (Dicken et al., 2005a; 2005b). Aboveground facilities associated with the EEP, including compressor stations and tap sites, are underlain by similar geologic units.

TABLE 4.1.1-4 **Bedrock Geology Crossed by the Equitrans Expansion Project**						
Line	**Start MP**	**End MP**	**Age**	**Map Units**	**Geologic Formation/Unit**	**Description/Rock Type**
H-158/ M-80	0	0.2	Permian and Pennsylvanian	PPw, Pm	Waynesburg Formation and Monongahela Group	Sandstone; Shale; Limestone; Coal
H-305	0	0.1	Permian and Pennsylvanian	PPw	Waynesburg Formation	Sandstone; Shale; Limestone; Coal
H-316	0	3.0	Permian and Pennsylvanian	PPw, Pm, Pw	Waynesburg Formation, Monongahela Group, Washington Formation	Sandstone; Shale; Limestone; Coal
H-318	0	3.8	Permian and Pennsylvanian	Pm, PPw, Pcc,	Monongahela Group, Waynesburg Formation, Casselman Formation,	Limestone; Shale; Sandstone; Coal; Siltstone
H-319	0	<0.1	Permian and Pennsylvanian	Pd	Greene, Washington, Waynesburg	Sandstone; Siltstone; Shale; Limestone; Coal
Sources: Dicken et al., 2005a; 2005b						

4.1.1.3 Surficial Geology

Mountain Valley Project

Surficial geology that would be crossed by the MVP has not been mapped in detail in the project area. However the USGS map Surficial Materials in the Conterminous United States (Soller et al., 2009) depicts the project area as mass-movement sediments consisting of colluvium, alluvial sediments, loess, as well as residual materials formed from the weathering of metamorphic, sedimentary, and carbonate bedrock. Figure 4.1-1 presents the surficial geology that would be crossed by the MVP.

Equitrans Expansion Project

Surficial geology that would be crossed by the EEP has not been mapped in detail. However, a review of the Surficial Materials in the Conterminous United States (Soller et al., 2009) shows that the proposed EEP is located in mostly colluvial sediments. Figure 4.1-2 presents the surficial geology that would be crossed by the EEP.

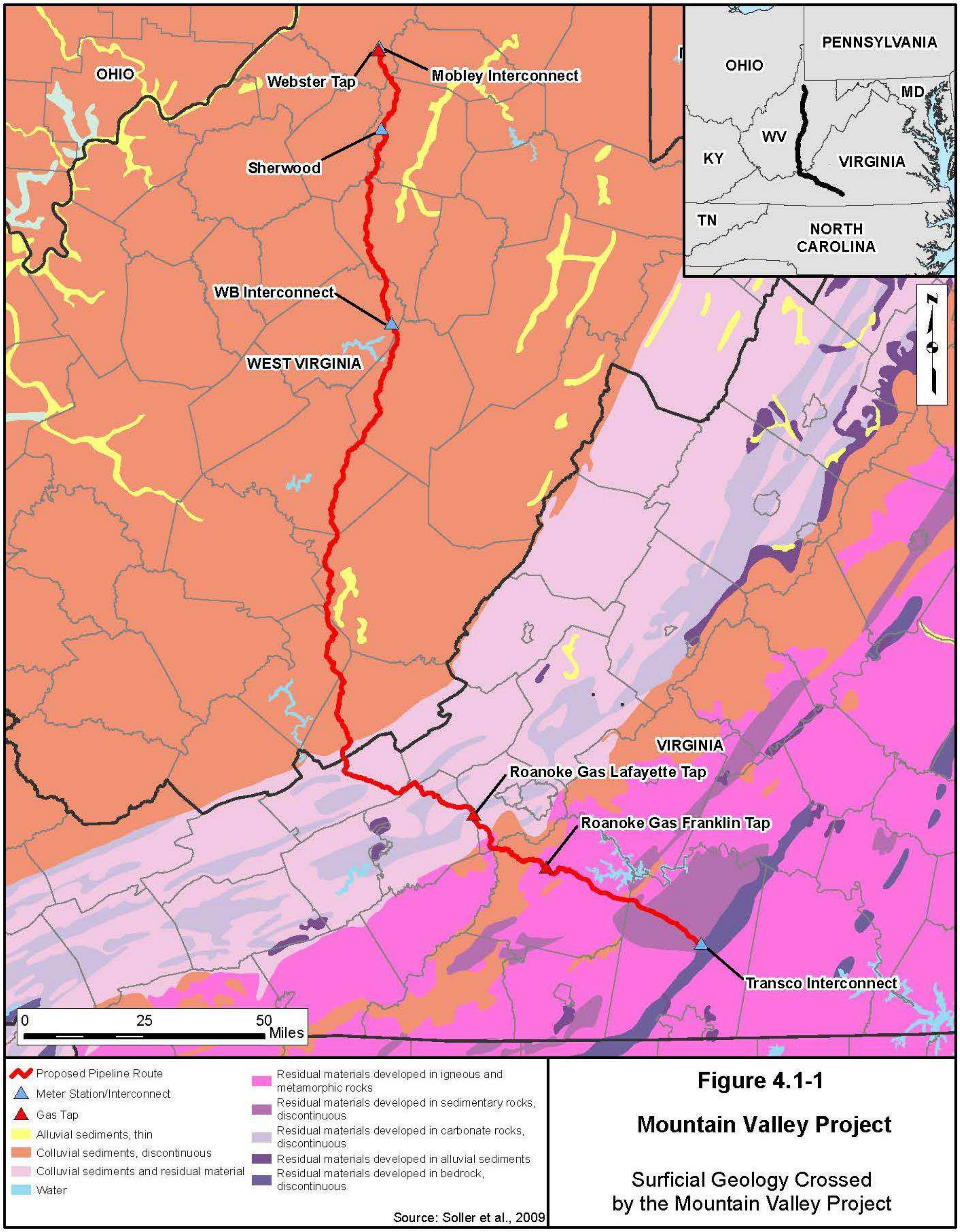

Figure 4.1-1

Mountain Valley Project

Surficial Geology Crossed by the Mountain Valley Project

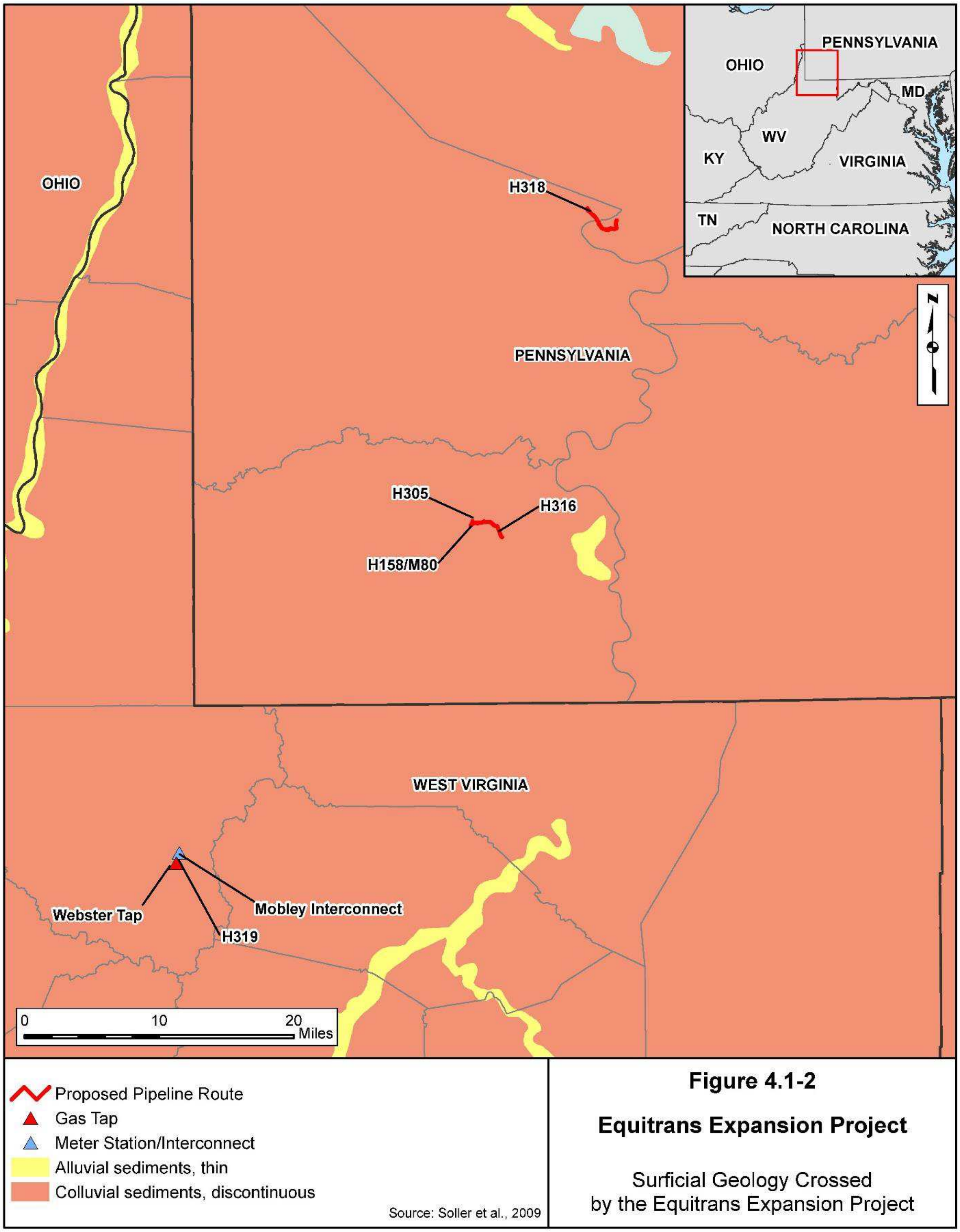

Figure 4.1-2

Equitrans Expansion Project

Surficial Geology Crossed
by the Equitrans Expansion Project

4.1.1.4 Mineral Resources

Information regarding mineral resources in West Virginia and Virginia was obtained though the WVGIS Technical Center (2015b), the VADMME (2015b), and the USGS (USGS, 2015b). Mineral resources identified in the vicinity of the proposed projects include non-fuel mineral resources consisting of clay, sand, gravel, and limestone, as well as fuel mineral resources including coal, oil, and natural gas. Several metal ore mines are located in proximity to the MVP in Virginia. No mineral resources were identified within 0.25 mile of any MVP aboveground facilities sites, aside from the location of certain MLVs, which would be located within the pipeline right-of-way.

Information on oil and natural gas wells in proximity to the MVP was provided by the WVGES (2015b), the West Virginia Department of Environmental Protection (WVDEP, 2015), and the VADMME (2015c). Information regarding oil and gas wells near the EEP was provided by the WVDEP Oil and Gas wells dataset (WVDEP, 2015) and the Pennsylvania Department of Environmental Protection (PADEP) Oil and Gas Mapping (PADEP, 2015a). Information on proposed mining operations near the EEP was provided by the PADEP Bureau of Mining (PADEP BMR, 2015), PADEP abandoned mining data (PADEP, 2015b; 2015c), and the PADEP Bureau of District Mining Operations (PADEP DMO, 2015) underground permit boundaries. No non-fuel mining operations were identified within 0.25 mile of the EEP in West Virginia (WVDEP, 2016a; 2016b).

Mining

<u>Mountain Valley Project</u>

In total, 67 mining operations were identified in proximity of the MVP (see appendix J) The MVP pipeline route would cross 10 underground mines, 17 surface mines, and 2 unknown mine types. Of the mining areas that would be crossed, only 5 were identified as active (active, new, renewed); however, the status of 12 mines that would be crossed by the MVP was not available (see table 4.1.1-5). The remaining 12 are classified as inactive/not started or closed/revoked. Mining operations in West Virginia consist mainly of coal mines, while the mines in Virginia consist of clay, sand and gravel, limestone, iron, and nickel. Underground coal mines that would be crossed by the MVP could be longwall mines where subsidence occurs as part of the mining process or room and pillar mines where supports are left in place. Appendix J-3 shows mined areas identified along the MVP.

TABLE 4.1.1-5

Mines in Proximity to the Mountain Valley Project

County	MP / Facility	Mineral Resource / Mine Name	Mine Type a/	Distance (miles)	Status b/
West Virginia					
Wetzel	3.5-7.6	Coal/Consolidated Coal	Surface	0.3	Unknown
Harrison	16.1	Sand and gravel/ Quarry	Surface	0.3	Unknown
	16.8 – 17.8	Coal / American Mountaineer Mine	Underground	Crossed	Unknown
	19.0 – 25.3	Coal / American Mountaineer Mine	Underground	Crossed	Unknown
	28.0 – 28.5	Coal / Pittsburgh	Underground	Crossed	Unknown
Lewis	45.9	Coal / Strip mine area	Surface	0.3	Unknown
	47.3 – 47.8	Coal / Strip mine area	Surface	0.3	Unknown
	48.0 – 48.3	Coal / Strip mine area	Surface	0.1	Unknown
	48.7	Coal / Strip mine area	Surface	0.3	Unknown
	50.5 - 50.7	Coal / Mid-Southern Energy Corp.	Unknown	0.2	Revoked
Webster	92.9 – 93.1	Coal / Juliana Mining Company Inc. (Lower Laurel Surface Mine)	Surface	<0.1	Renewed
	93.8 – 95.0	Coal / Strip mine area	Surface	0.4	Unknown
	93.9 – 95.3 / MLV-10	Coal / Juliana Mining Company Inc. (Lower Laurel Surface Mine)	Surface	0.1	Unknown
	102.1 – 102.4 / MLV 12	Coal / 82 East Surface Mine	Surface	0.1	Not started, permit expires 2017
	102.6 – 103.4	Coal / 82 East Surface Mine	Surface	Crossed	Not started, permit expires 2017
	103.3	Coal surface mine / ICG Eastern, LLC (82 East Surface Mine)	Surface	0.2	Inactive and not started
	103.4 – 103.5	Coal surface mine / ICG Eastern, LLC	Surface	Crossed	Inactive and not started
	103.5 – 103.6	Coal / Abandoned Mine	Unknown	0.2	Abandoned
	107.4	Coal / Tammie Lynn Coal Co Inc.	Unknown	0.2	Completely released
Nicholas	109.9 – 110.0	Surface coal mine / K & B Coal Co	Surface	Crossed	Closed/revoked
	111.2	Surface coal mine / K & B Coal Co	Surface	0.2	Revoked
	111.3 / MLV 13	Surface coal mine / K & B Coal Co	Surface	Crossed	Revoked

TABLE 4.1.1-5 (continued)

Mines in Proximity to the Mountain Valley Project

County	MP / Facility	Mineral Resource / Mine Name	Mine Type a/	Distance (miles)	Status b/
	118.1 – 118.2	Coal / Donegan 10 Plant, Falcon Land Co Inc.	Unknown	Crossed	Closed, Phase 2 release, revegetated
	118.2 – 118.3	Coal / Strip mine area	Surface	Crossed	Unknown
	118.1 – 118.2	Coal / Mining area	Surface	0.2	Unknown
	118.7 – 118.8	Coal / Mining area	Surface	Crossed	Unknown
	120.1 – 120.3	Coal / Strip mine area	Surface	0.1	Unknown
	120.3 / MLV 14	Coal / Green Valley Coal Company	Unknown	0.1	Renewed
	120.0	Coal / Green Valley Coal Company	Unknown	<0.1	Completely released
	122.1 – 126.2	Coal / Quinwood No. 7 Mine	Underground	Crossed	Unknown
	126.5 – 126.7	Coal / Green Valley Coal Company, Potato Hole Knob Deep Mine	Underground	Crossed	New
	127.0 – 131.4	Coal / unknown	Underground	Crossed	Unknown
	132.2	Coal / Strip mine area	Surface	0.2	Unknown
	132.4	Coal / Strip mine area	Surface	Crossed	Unknown
	133.4	Coal / Strip mine area	Surface	0.3	Unknown
	134.0	Coal / unknown	Underground	0.2	Unknown
	134.3 – 134.6	Coal / Strip mine area	Surface	0.1	Unknown
	134.5 – 136.0	Coal / Strip mine area	Surface	0.2	Unknown
Greenbrier	135.3 – 136.0	Underground coal mine / Green Valley Coal Company	Underground	Crossed	Active, reclamation only, numerous outfalls
	136.8	Surface coal mine / Alex Energy Inc.	Surface	Crossed	Active, reclaimed
	138.7 / MLV 15	Underground coal mine, Green Valley Coal Company / Sewell Valley #1 MineAlex Energy Inc.	Underground	Crossed	Renewed
	138.7 / MLV 15	Sewell Valley #1 Mine / Underground coal mine, Green Valley Coal Company	Underground	Crossed	Renewed
	138.7 – 139.2	Surface coal mine/ Green Valley Coal Company	Surface	0.01	Active, reclamation only, numerous outfalls
	138.8	Surface coal mine, Sewell Valley #1 Mine, Warrior Energy Resources LLC	Surface	0.02	Active, reclamation only, numerous outfalls
	138.5 – 139.8	Coal / Strip mine area	Surface	0.3	Unknown
	139.8 – 139.9	Coal / Strip mine area	Surface	Crossed	Unknown

TABLE 4.1.1-5 (continued)

Mines in Proximity to the Mountain Valley Project

County	MP / Facility	Mineral Resource / Mine Name	Mine Type a/	Distance (miles)	Status b/
	142.3 – 142.6	Coal / Strip mine area	Surface	0.3	Unknown
	144.4 – 144.5	Coal / Strip mine area	Surface	Crossed	Unknown
	144.5 – 144.6	Coal / Strip mine area	Surface	0.1	Unknown
	144.5 – 144.6	Underground Coal mine / Lynn Dale Coal Co	Underground	0.1	Revoked
	145.2 – 146.1	Underground coal mine (room and pillar) / Little Sewell No. 1 Deep Mine, Midland Trail Resources LLC	Underground	Crossed	Inactive, one historic outfall
	146.1 – 146.6	Coal / Strip mine area	Surface	0.2	Unknown
	146.1 – 146.7	Surface coal / Double N Mining Co, Inc.	Surface	Crossed	Closed, no coal removed
	147.3 – 147.4	Coal / Strip mine area	Surface	Crossed	Unknown
	147.4 – 148.8	Coal / Strip mine area	Surface	0.1	Unknown
	148.8 – 148.9	Coal / Strip mine area	Surface	Crossed	Unknown
Virginia					
Giles	200.6	Unknown / Quarry	Surface	0.4	Unknown
	210.0 -210.1	Limestone / Quarry	Surface	Crossed	Inactive
	212.2 / MLV 25	Iron / Price Prospect	Unknown	0.1	Inactive
Montgomery	221.4	Coal/Slayton – tunnel area	Underground	0.3	Inactive
	236.0 – 236.1	Clay / Number 2 Pit Old Virginia Brick Company	Surface	Crossed	Inactive
	236.4 / MLV 28	Unknown / Quarry	Surface	Crossed	Inactive
	236.2 – 236.3	Unknown / Quarry	Surface	0.2	Active
Franklin	254.4	Nickel / Lick Fork Mine (Mackusick Mine/Flat Run Mine; John Light's Mine)	Unknown	Crossed	Inactive
	277.2	Iron pit / unknown	Surface	Crossed	Inactive
Pittsylvania	281.8	Unknown / Underground mine	Underground	<0.1	Inactive
	295.5	Sand and gravel pit (granite) / unknown	Surface	<0.1	Inactive

Sources: USGS, 2015b; USGS, 2015b; VADMME, 2015b; WV GIS Technical Center, 2015b; Draper Aden Associates, 2015a

a/ Some distances may be shown as 0 due to rounding.

b/ Unknown – status of mine and permit is not available from search of public records; Revoked – permit has been revoked; Renewed – permit has been renewed and is still active; Inactive and not started – permit issued but no activity initiated; Abandoned – mine is abandoned; Completely released – permit has been completely released; Closed/revoked – mine is closed and permit has been revoked; Closed – mine is closed; Phase 2 release – the mine is in the reclamation phase and has been revegetated, permit partially released; Revegetated – mine is closed and surface restored and revegetated; New – permit is recently approved, additional activity has not been initiated; Active, but reclamation only – mine and permit are still active but coal is no longer being removed, the site is in the reclamation phase; Numerous outfalls - the mine is permitted for NPDES discharges; Historic outfall – permitted for NPDES discharges, current status unknown.

Equitrans Expansion Project

Mining operations in proximity to the EEP include sand, gravel, coal, crushed stone, and lime quarries (USGS, 2015b; PADEP BMR, 2014). No non-fuel mining operations were identified within 0.25 mile of the EEP in West Virginia (WVDEP, 2016a; 2016b). However, one proposed (prospect) quarry was identified with 0.25 mile of the EEP in Pennsylvania. The remaining coal mines that would be crossed or would be within 0.25 mile of the EEP are no longer considered active. EEP facilities would be within 0.25 mile of 18 previous mining operations. The EEP pipelines would cross 12 closed or abandoned coal mines. Table 4.1.1-6 lists the closed coal mines crossed and within 0.25 mile of the EEP facilities. Appendix J-4 shows mined areas along the EEP.

TABLE 4.1.1-6

Closed Coal Mines Crossed and Within 0.25 Mile of the Equitrans Expansion Project

County	Feature	MP a/	Name b/	Type	Status
Greene	H-316	1.0 – 1.2	Gateway Mine	Underground Mine	Closed
Greene	H-316	1.3 – 3.0	Mather Mine	Underground Mine	Closed
Greene	H-302 Tap Site	3.0	Mather Mine	Underground Mine	Closed
Greene	H-316 ATWS 05	1.5	Mather Mine	Underground Mine	Closed
Greene	H-316 ATWS 06	2.1	Mather Mine	Underground Mine	Closed
Greene	H-316 ATWS 07	2.8	Mather Mine	Underground Mine	Closed
Greene	H-316 Access Road ROW 05A/B	1.5	Mather Mine	Underground Mine	Closed
Greene	H-316 Access Road ROW 06A/B	2.1	Mather Mine	Underground Mine	Closed
Greene	H-316 Access Road ROW 07A/B	2.8	Mather Mine	Underground Mine	Closed
Allegheny	H-318	0.0 – <0.1	Redstone No. 1 Mine	Underground Mine	Closed
Allegheny	H-318	0.0	Wright Mine	Underground Mine	Closed
Allegheny	H-318	N/A	Howe Mine	Underground Mine	Closed
Allegheny	H-318	0.1 – 0.2	Redstone No. 2 Mine	Underground Mine	Closed
Allegheny	H-318	0.4 – 0.8	Williams Mine	Underground Mine	Closed
Allegheny	H-318	0.4 – 1.0	Mongah Mine	Underground Mine	Closed

TABLE 4.1.1-6 (continued)

Closed Coal Mines Crossed and Within 0.25-Mile of the Equitrans Expansion Project

County	Feature	MP a/	Name b/	Type	Status
Allegheny	H-318	0.9	S.B. Tressler Pit	Underground Mine	Closed
Allegheny	H-318	0.8 – 1.3	Abandoned Mine Land 3808	Surface Mine	Closed
Allegheny	H-318	1.3 – 1.9	Abandoned Mine Land 0129-02	Surface Mine	Reclaimed
Allegheny	H-318	1.1 – 2.2	Mongah Mine	Underground Mine	Closed
Allegheny	H-318	2.1	GW Peterson No.1 Pit	N/A	N/A
Allegheny	H-318	1.9 – 2.3	Abandoned Mine Land 3808	Surface Mine	Closed
Allegheny	H-318	1.3 – 1.9	Abandoned Mine Land 3808	Surface Mine	Closed
Washington	H-318	2.7 – 2.8	Unknown Mine	Underground Mine	Closed
Washington	H-318	2.7 – 2.8	Pitt Mine	Underground Mine	Closed
Washington	H-318	3.1 – 3.8	Coal Bluff	Underground Mine	Closed
Washington	H-318	3.8	Banner	Underground Mine	Closed
Washington	H-318	3.8	Cliff Mine	Underground Mine	Closed
Allegheny	Applegate L/R Site	0.0	Redstone No. 1 Mine	Underground Mine	Closed
Washington	Hartson L/R Site & H-148 Tap Site	4.3	Coal Bluff	Underground Mine	Closed
Allegheny	H-318 ATWS 1A-D	0.4 – 0.8	Williams Mine	Underground Mine	Closed
Allegheny	H-318 ATWS 1A-D	0.4 – 0.8	Mongah Mine	Underground Mine	Closed
Allegheny	H-318 ATWS 2A/B, E/F	1.6 – 1.8	Sylvia	Underground Mine	Closed
Allegheny	H-318 ATWS 2A/B, E/F	1.6 – 1.8	Mongah Mine	Underground Mine	Closed
Allegheny	H-318 ATWS 3	1.9	Mongah Mine	Underground Mine	Closed
Allegheny	H-318 ATWS 4A/B	2.0 – 2.3	Mongah Mine	Underground Mine	Closed
Washington	H-318 ATWS 6B/C/D, 7, 8	3.5 – 4.3	Coal Bluff	Underground Mine	Closed
Allegheny	H-318 Access Road 01	0.0	Redstone No. 1 Mine	Underground Mine	Closed

TABLE 4.1.1-6 (continued)

Closed Coal Mines Crossed and Within 0.25-Mile of the Equitrans Expansion Project

County	Feature	MP a/	Name b/	Type	Status
Allegheny	H-318 Access Road 01	0.0	Wright Mine	Underground Mine	Closed
Allegheny	H-318 Access Road 02	0.7	Williams Mine	Underground Mine	Closed
Allegheny	H-318 Access Road 02	0.7	Mongah Mine	Underground Mine	Closed
Allegheny	H-318 Access Road 03	1.0	Mongah Mine	Underground Mine	Closed
Allegheny	H-318 Access Road 04A/B	1.9	Mongah Mine	Underground Mine	Closed
Washington	H-318 Access Road 06	3.6	Coal Bluff	Underground Mine	Closed
Washington	H-318 Access Road 08	4.2	Coal Bluff	Underground Mine	Closed

Sources: PADEP, 2015b; 2015c; WVDEP, 2016a; 2016b

a/ Presents the approximate milepost range crossing the identified mine or single milepost in proximity to the mine if not crossed

b/ Mines are listed multiple times due to being in proximity or crossed by the pipeline and other associated facilities.

N/A – Not available

Acid Producing Rocks

Acid rock drainage, also known as acid mine drainage, occurs when water interacts with sulfide minerals in the rock and soils to create sulfuric acid. The sulfuric acid lowers the pH of the water allowing for the dissolution of metals into water. Acid mine drainage waters can have high concentrations of dissolved metals, which can be harmful to the environment (Fraser Institute, 2012). Typically the conditions necessary for acid mine drainage are encountered in areas where mining is occurring or has occurred previously.

Mountain Valley Project

Table 4.1.1-4 above lists mines located along the MVP. The Millboro shale, Needmore Formation (of which about 1 mile would be crossed in Montgomery County), and the Ashe Formation (of which about 13 miles would be crossed in Franklin County) are also known to create acid drainage. On May 9, 2017, Mountain Valley filed an *Acid Forming Materials Mitigation Plan*. The plan identifies potential acid forming materials characterized as generally occurring in Valley and Ridge Devonian Shales and certain Blue Ridge and Piedmont rock units. These rock types could be found between MPs 219.1 to 219.5, 220.7 to 221.5, 228.9 to 229.7, 259 to 260, 261.5 to 266.3, 267.5 to 273.8, and 275.5 to 277.

General measures that would be implemented when crossing areas of acid producing rocks are discussed below in section 4.1.2. Procedures regarding contaminated groundwater are discussed in section 4.3.1.2.

Equitrans Expansion Project

Acid rock drainage is also of concern in mining areas crossed by the EEP, including abandoned mine lands (see table 4.1.1-6 above). Construction of the Redhook Compressor Station would cross a coal seam during site excavation. Measures that would be implemented when crossing areas of acid producing rocks are discussed below in section 4.1.2. Procedures regarding contaminated groundwater are discussed in section 4.3.1.2.

Oil and Gas Wells

Mountain Valley Project

The data on oil and gas wells described below were derived from records accessed at the WVDEP (2015) and WVGES (2015a). According to the WVDEP, there are 227 active, 93 inactive, and 7 unknown status oil and gas operations within 0.25 mile of the MVP in West Virginia (see appendix J). The closest well is 26.4 feet from the pipeline centerline. No oil and gas wells were identified within 0.25 mile of the MVP in Virginia (VADMME, 2015c). There are an additional 42 records for wells that were never issued or drilled within the publically available data.

Equitrans Expansion Project

The closest active oil and gas well in proximity to the H-316 pipeline would be located within the construction work area. In total, 39 active, 28 inactive, and 12 proposed but not drilled oil and gas wells have been identified within the 0.25 mile of the EEP facilities in Pennsylvania and West Virginia (see appendix J) (PADEP, 2015a; WVDEP, 2015).

Uranium

Mountain Valley Project

We received several comments regarding uranium enriched bedrock and mines in Virginia that may pose a hazard if disturbed by construction of the MVP. Mountain Valley conducted an evaluation of uranium enriched bedrock and historic and active uranium mines in the project area (Draper Aden Associates, 2015b; VADMME, 2015d). The closest uranium deposit to the MVP is located at Coles Hill in Pittsylvania County, about 3.8 miles away from the pipeline route.

Equitrans Expansion Project

No areas containing uranium were identified along the EEP.

4.1.1.5 Geologic Hazards

Geologic hazards evaluated for the proposed projects include seismicity (e.g., earthquakes), surface faults, soil liquefaction, landslides, karst terrain, subsidence, shallow bedrock, and acid producing rocks and soils. The conditions necessary for the development of other geologic hazards, including avalanches and volcanism, are not present in the area of the projects and therefore not discussed below.

Seismicity

The majority of significant earthquakes around the world are associated with tectonic subduction zones, where one crustal plate is overriding another (e.g., the Japanese islands), where tectonic plates are sliding past each other (such as in California), or where tectonic plates are converging (e.g., the Indian Sub-Continent). Unlike these highly active tectonic regions, the east coast of the United States is a passive tectonic plate boundary located on the "trailing edge" of the North American continental plate, which is relatively seismically quiet when compared with active plate boundaries in the United States, such as the San Andreas fault, a transformative plate boundary, and the Juan de Fuca convergent (subduction) plate boundary, both along the western coast of the United States. Earthquakes, however, do occur in the eastern United States, primarily due to trailing edge tectonics and residual stress released from past, mountain-building events.

The shaking during an earthquake can be expressed in terms of the acceleration as a percent of gravity (g). The modified Mercalli scale (Modified Mercalli Intensity or MMI) measures the intensity of an earthquake at a particular location while the Richter scale measures the size of the earthquake at its source (USGS, 2016b). Slight damage is not typically experienced until MMI VI and considerable damage not experience until MMI IX (USGS, 2013). The Richter magnitude of an earthquake can be equated to an MMI scale measurement (USGS, 2014c). MMIs of VI and IX are associated with Richter magnitudes of 5.0 to 5.9 (USGS, 2017a).

Earthquake shaking alone does not pose a significant threat to the integrity of modern buried welded steel pipelines. In general, modern electric arc welded steel pipelines have not sustained damage during seismic events except due to permanent ground deformation, or traveling ground-wave propagation greater than or equal to an MMI of VIII (O'Rourke and Palmer, 1994). However, the level of ground shaking is a factor in determining potential for permanent ground displacement hazards that can threaten a pipeline integrity such as liquefaction, settlement, slope instability (particularly along steep sided slopes), lateral spread displacement, and dynamic compaction.

Mountain Valley Project

Based on the USGS seismic hazard mapping, the MVP is in an area where peak horizontal ground accelerations (PGA) range from 4 to 14 percent g and have a 2 percent chance of being exceeded in 50 years (USGS, 2014a). PGA along the MVP with a 10 percent chance of being exceeded in 50 years is less than 10 percent g and in the range from 4 to 8 percent g (USGS, 2014b). An earthquake with a PGA of 14 percent g could have an equivalent MMI magnitude of VI depending on site conditions. A MMI VI earthquake would be characterized by strong perceived shaking but would only be expected to cause light damage (USGS, 2011).

Table 4.1.1-7 presents earthquakes of Richter magnitude 4 or greater that have occurred within 100 miles of the MVP. Relatively few large magnitude earthquakes have occurred along the MVP pipeline route. Project-specific seismic hazard modeling for the MVP was conducted by

D.G. Honegger Consulting (2015a).[1] Calculations were conducted to determine the potential for hazards from lateral spreading and triggered slope movement. D.G. Honegger Consulting determined that there is a less than 1 percent probability for the occurrence of an earthquake exceeding magnitude 6.0 and only a 4 percent probability of occurrence for an earthquake exceeding magnitude 5.0 occurring within 50 kilometer of the MVP within a 50-year period.

TABLE 4.1.1-7

Earthquakes of Magnitude 4 or Greater within 100 Miles of the Mountain Valley Project and the Equitrans Expansion Project

State	Year	Richter Magnitude	Potential MMI	Distance Away	Nearest MP/ Project Facility
Mountain Valley Project a/					
WV	1976	4.7	IV-V	51.3 miles	MP 195
VA	1988	4.1	IV-V	72.0 miles	MP 199
VA	2006	4.3	IV-V	68.7 miles	MP 199
VA	2006	4.3	IV-V	72.3 miles	MP 199
VA	1989	4.3	IV-V	77.6 miles	MP 199
Equitrans Expansion Project					
OH	1952	4.0	IV-V	79.1 miles	H-319
WV	1824	4.1	IV-V	10.4 miles	H-319
OH	2000	4.2	IV-V	79.4 miles	H-318
OH	1927	4.2	IV-V	78.9 miles	H-318
PA	1998	4.5	IV-V	88.5 miles	H-318
VA	1853	4.6	IV-V	91.9 miles	H-319
PA	1998	5.1	VI-VII	86.9 miles	H-318
PA	1998	5.1	VI-VII	86.6 miles	H-318
PA	1998	5.1	VI-VII	86.2 miles	H-318
PA	1998	5.1	VI-VII	86.4 miles	H-318
PA	1998	5.1	VI-VII	86.3 miles	H-318
PA	1998	5.1	VI-VII	86.3 miles	H-318
PA	1873	Unknown	N/A	71.1 miles	H-318
OH	1776	Unknown	N/A	72.4 miles	H-319

Source (USGS, 2015c; PADCNR, 2003; USGS, 2014c)
MMI = Modified Mercalli Intensity
Note: The 1998 PA earthquakes occurred in close succession in mid-October to Early November 1998.
a/ Includes earthquakes since 1976.

The Giles County Seismic Zone (GCSZ) is located in the western part of the Valley and Ridge province, south of the Appalachian bend near Roanoke, Virginia. The area is underlain by Early Cambrian to Late Mississippian bedrock of the east Appalachian basin which occur in linear

[1] Seismic hazard modeling is provided in a letter entitled *Review of Potential Seismic Hazards Along the Proposed Route of the MVP pipeline* included in Resource Report 6 Appendix D of the MVP application (accession number 20151023-5035).

folds cut by thrust faults (McDowell et al., 1989). Seismicity from the GCSZ is considered to occur due to the reactivation of a series of Late Proterozoic to Early Paleozoic compressional faults (Bollinger and Wheeler, 1988). The GCSZ is considered seismically active and is defined by Bollinger and Wheeler (1988) by 12 earthquakes that span 4 orders of magnitude and 2 decades of time from 1959 through 1980. The largest earthquake known to originate from the GCSZ is a magnitude 5.8 (on the Richter scale) event that occurred on May 31, 1897. An event of magnitude 4.3 also occurred near Elgood, West Virginia on November 20, 1969. In addition, numerous microearthquakes (magnitude 2 or less) have occurred in the area of the GCSZ. The MVP pipeline would be in close proximity to the GCSZ, where PGAs could be greater than 14 percent g between MPs 192 to 210. PGAs could be above 12 percent g but below 14 percent g from MPs 161 to 192 and MPs 210 to 239.

The Virginia Seismic Zone is about 85-miles east-northeast of the MVP. The Virginia Seismic Zone, known for a recent (2011) seismic event of magnitude 5.8 near Mineral, Virginia, is considered to be associated with the Spotsylvania high-strain zone. This is the boundary between two bedrock terranes that are currently considered zones of weakness. It has the potential for future earthquakes that relieve stresses that build up within the bedrock of Virginia as the North American Plate drifts westward.

Equitrans Expansion Project

According the USGS Seismic Hazard Maps the proposed EEP would cross areas with PGA of 4 percent g with a 2 percent chance of being exceeded in 50 years (USGS, 2014a). PGAs with a 10 percent chance of exceedance in 50 years would range from 1 to 2 percent g along the EEP facilities. An earthquake with a PGA of 4 percent g could be equivalent to an earthquake with an MMI V and would be characterized by moderate shaking and the potential for very light damage (USGS, 2011). The largest seismic event to occur within 100 miles of the EEP is a series of 5.1 magnitude earthquakes that occurred in Pennsylvania in 1998. All other seismic events were magnitude 4.6 or less and below the threshold to cause damage or other hazards to the pipeline (see table 4.1.1-7) (PADCNR, 2015a; USGS, 2015c).

Active Faults

Quaternary faults where there has been displacement in the last 2.6 million years (USGS, 2015d), are believed to be to most likely to demonstrate displacement again. Although recent active tectonic faulting is not known to occur in the project area, as discussed above, seismic events have been recorded.

Mountain Valley Project

The MVP would be within 85 miles of seven USGS-identified Quaternary Period faults (2.6 million year faults [see table 4.1.1-8]). The USGS classifies these faults from A to C. Class A faults have geologic evidence that demonstrates the existence of a Quaternary fault of tectonic origin either exposed by mapping or inferred from deformational features. The only Class A faults in the vicinity of the project are within the Central Virginia Seismic Zone, 85 miles from the pipeline alignment.

TABLE 4.1.1-8

Faults and Fault Zones within 100 Miles of the Mountain Valley Project

Fault or Zone Name	Class	Distance Away from MVP	Last Active Period/Era
Central Virginia Seismic Zone	A	85 miles	Quaternary (late Pleistocene) (15 ka)
Pembroke Fault	B	5-20 miles	Undifferentiated Quaternary (<1.6 ma)
Linside Fault Zone	C	1-10 miles	No Quaternary Movement Demonstrated
Everona Fault	C	125 miles	No Quaternary Movement Demonstrated
Lebanon Church Fault	C	85 miles	No Quaternary Movement Demonstrated
Old Hickory Faults	C	85 miles	No Quaternary Movement Demonstrated
Stanleytown Fault	C	25 miles	Unknown

Ka = thousand years ago
Ma = million years ago.
Source: USGS, 2015d

Class B faults have geologic evidence that is indicative of Quaternary deformation but the fault is not deep enough to be a potential source for earthquakes, or the evidence available is insufficient to assign a fault as either Class C or Class A (USGS, 2015d). There is one Class B fault, the Pembroke fault, which is 5 to 20 miles from the pipeline alignment. The Pembroke fault is considered to be of non-tectonic origin, evidenced by fault trace fillings containing delicate grain-scale textures precluding sudden slip along a fault plane. The evolution for this fault is thought to be caused by dissolution of underlying carbonate bedrock or by subsidence induced by collapse of subsurface karst, and not a seismic event (Crone and Wheeler, 2000; Wheeler, 2006).

Class C features are classified as having insufficient evidence to demonstrate the existence of tectonic origin, or slip and deformation. There are five Class C features between 1 and 125 miles from the pipeline alignment (see table 4.1.1-8).

We received several comments regarding the St. Clair fault. The MVP would cross the St. Clair fault around MP 194.8. The St. Clair thrust fault represents the boundary of the Allegheny Structural Front and is one of the few major thrust faults that are exposed at the surface in the Appalachians of West Virginia (Sturms, 2008). The St. Clair fault is associated with the Alleghenian Orogeny which occurred about 325 to 260 million years ago during the Carboniferous through Permian Period. The St. Clair fault is not listed by the USGS as being an active fault, and therefore is not considered to be source of significant seismicity (USGS, 2015d).

Equitrans Expansion Project

The EEP would not cross any USGS mapped Quaternary faults (USGS, 2015d).

Soil Liquefaction

Soil liquefaction is a phenomenon often associated with seismic activity in which saturated, non-cohesive soils temporarily lose their strength and liquefy (i.e., behave like viscous liquid) when subjected to forces such as intense and prolonged ground shaking. Areas susceptible to liquefaction may include soils that are generally sandy or silty and are generally located along rivers, streams, lakes, and shorelines or in areas with shallow groundwater (University of Washington, 2000).

Mountain Valley Project

There have been no documented occurrences of soil liquefaction from seismicity in the MVP area. Generally, soil liquefaction has not typically been observed during earthquakes with a magnitude less than 5 on the Richter scale (D.G. Honegger Consulting, 2015a). The potential for soil liquefaction in the areas north and south of MPs 161 to 239 can be ruled out due to the low potential for a significant seismic event. However, soil liquefaction and lateral spreading hazards do exist along the MVP in the general area of the GCSZ where peak ground acceleration greater than 12 percent g could occur. A PGA greater than 12 percent g depending on site conditions could be equivalent to a magnitude 5.0 earthquake. There is a 4 percent chance that an earthquake with a magnitude greater than 5 on the Richter scale could occur within 50 years, and a 1 percent chance that an earthquake with a magnitude greater than 6 could occur within 50 years (D.G. Honegger Consulting, 2015a).

Calculations conducted by D.G. Honegger Consulting showed that damage to Class 1 pipe[2] due to soil liquefaction could be ruled out if depth of cover over the pipe would be less than 10 feet.

Table 4.1.1-9 identifies flood zones that would be crossed by the MVP where soil liquefaction could occur due to saturated soils and the potential for a significant seismic event. This table also identifies the class of pipe and depth of cover for each of the potential liquefaction areas. There are 7.8 miles of Class 1 pipe in proximity to the GCSZ (MPs 178 to 186). PGAs in this area of the MVP are on the order of 12 percent g. The remaining pipe in proximity to the GCSZ would be Class 2 or greater and thus have a thicker pipe wall than Class 1 pipe. Mountain Valley has stated that cover over Class 1 pipe between MPs 178 and 222 would not be greater than 10 feet. Additionally, to prevent buoyancy of the pipeline, Mountain Valley would use aggregate filled sacks to weight the pipeline in flood zone areas.

Equitrans Expansion Project

The EEP is in an area identified to have a low probability of a significant seismic event, with a PGA of 4 percent g. Of the earthquakes that have occurred within 100 miles of the EEP area all have been under a Richter magnitude of 4.6; except for a series of 5.1 magnitude earthquakes in Pennsylvania in 1998, over 86 miles from the EEP area.

2 Pipe class is based upon population density in the vicinity of the pipeline facilities and is incorporated into the DOT pipeline safety regulations. A higher population density means a higher class location and translates to more robust design characteristics with regards to pipe thickness, depth of cover, and operating pressure. Section 4.12.1 provides additional information on location classes and class of pipe.

TABLE 4.1.1-9					
Flood Zone and Class of Pipe Crossed by the Mountain Valley Project in Areas of High Potential Seismicity					
MP	**County**	**Floodplain Waterbody**	**Crossing Length (feet) a/**	**Pipe Class**	**Minimum Depth of Cover (feet)**
169.9	Summers	Hungard Creek	172	2	4
171.4	Summers	Greenbrier River	2,258	3	3
172.6	Summers	Kelly Creek	172	1	3
182.8	Monroe	Indian Creek	110	1, 2	4
187.6	Monroe	Hans Creek	260	2	3
192.0	Monroe	Dry Creek	328	2	4
200.3	Giles	Stony Creek	734	2, 3	3
204.3	Giles	Little Stony Creek	313	2, 3	3
211.1	Giles	Sinking Creek	126	2	3
212.9	Giles	Greenbrier Branch	163	2, 3	3
219.5	Montgomery	Craig Creek	981	2	4
227.2	Montgomery	North Fork Roanoke River	60	2	4
227.3	Montgomery	North Fork Roanoke River	116	2	4
227.4	Montgomery	North Fork Roanoke River	428	2	4
230.9	Montgomery	Bradshaw Creek	291	2	4
235.5	Montgomery	Roanoke River	1,228	2,3	3

Note: Table 4.1.1-9 includes flood zones located in areas where peak ground acceleration are greater 12 percent g with a 2% chance of exceedance in 50 years.
a/ Identifies the flood zone crossing length which does not necessarily coincide with waterbody crossing length.

Due to the low potential for significant ground shaking, soil liquefaction in the area of the EEP is unlikely; however, saturated soils would be crossed by the H-318 and H-316 pipelines. Soils prone to liquefaction include silty and sandy soils in high water table areas. Areas where these conditions may exist include the crossings of the Monongahela River, Bunola Run, and Kelly Run by the H-318 pipeline and the South Fork Tenmile Creek that would be crossed by the H-316 pipeline. Both the Monongahela River and South Fork Tenmile Creek would be crossed with HDDs. Where HDDs would not be used to cross under streams, Equitrans would use weights or concrete coating to prevent buoyancy of the pipeline in areas with a high potential for soil liquefaction or flooding events.

Landslides

Landslides are defined as the movement of rock, debris, or soil down a slope. Slope failure causing a landslide can be initiated by precipitation, seismic activity, slope disturbance due to construction, or a change in groundwater conditions, such as a seasonal high groundwater table, and soil characteristics. Natural landslides could occur during the construction, operation, and maintenance of the projects and could have the potential to cause damage. Potential natural landslides include a variety of mass movements such as debris slides, debris flow, rockslides, and slumps. Some landslides develop and move slowly and cause damage progressively over a period of many years. Some landslides move rapidly and can cause damage suddenly. Construction factors that may increase the potential for slope failure could include trenching along slopes and the burden of construction equipment on unstable surfaces. An overview of landslide incidence and susceptibility was derived from the digitally compiled Landslide Overview Map of the Conterminous United States (Godt, 2014), USGS topographic maps (USGS, 2015a), publically available aerial imagery (Google Earth), as well as a review of remote sensing platforms including aerial photos, and Light Imaging Detection and Ranging (LiDAR) data. Field surveys were conducted along the planned pipeline alignment where access was granted.

Studies conducted by the West Virginia Geological Survey (Lessing and Erwin, 1977) indicate that common situations that could foster rock falls and landslides in West Virginia and the Appalachian Plateau are along areas comprised of moderate to steep slopes within the range of 15 to 45 percent and consisting of Pennsylvanian to Permian Period red shale bedrock of the Conemaugh, Monongahela, Mauch Chunk and Dunkard Groups. Red shale also known as red beds easily weather into thick mud. Impervious layers can be located under red beds and are known to trap water resulting in saturated conditions that can increase the potential for landslides to occur. Bedrock geology along the MVP pipeline route is shown in table 4.1.1-3 and steep slopes are presented by milepost in appendix K.

Although many types of landslides occur throughout the southern Appalachian Highlands, debris flow is the dominant landslide process in the southern Appalachian Highlands in Virginia (Wooten et al., 2015). Debris flows (also referred to as mudslides, mudflows, or debris avalanches) are a common type of fast-moving landslide that are comprised of soil and rock moving along a shallow sliding surface within soil or weathered, foliated and jointed rock material. Debris flows are often associated with steep gullies and may be triggered by intense and/or prolonged rainfall events. Cut slopes and fill slopes along the pipeline right-of-way could be a source of debris flow in the project area (Collins 2008; Wooten et al., 2009; Latham et al., 2009; Wooten et al., 2014; Wooten et al., 2015, USGS, 1996).

Mountain Valley Project

Several locations were identified as having a high incidence of and high susceptibility for landslides within the vicinity of the MVP. About 152 miles (77 percent) of the MVP pipeline route in West Virginia is considered to have a high incidence of and high susceptibility to landslides. In Virginia, about 51 miles (48 percent) of the proposed alignment has a high incidence of and high susceptibility to landslides (see table 4.1.1-10). Ground failure and slope movement are typically associated with steep slopes. The MVP would cross 22.3 miles of slopes ranging from 15 percent to 30 percent and 75.4 miles of slopes greater than 30 percent (see appendix K). Mountain Valley identified areas of potential landslide concern along the proposed MVP route (see table 4.1.1-11).

TABLE 4.1.1-10

Landslide Incidence and Susceptibility along the Mountain Valley Project

State/ County	Total Crossing Length (miles)	High Incidence / High Susceptibility	Moderate Incidence / High Susceptibility	Moderate Incidence / Moderate Susceptibility	Low Incidence / High Susceptibility	Low Incidence / Moderate Susceptibility	Low Incidence / Low Susceptibility
West Virginia							
Wetzel	9.5	9.5	0.0	0.0	0.0	0.0	0.0
Harrison	23.7	23.7	0.0	0.0	0.0	0.0	0.0
Doddridge	4.8	4.8	0.0	0.0	0.0	0.0	0.0
Lewis	27.5	27.5	0.0	0.0	0.0	0.0	0.0
Braxton	14.7	14.7	0.0	0.0	0.0	0.0	0.0
Webster	30.4	30.4	0.0	0.0	0.0	0.0	0.0
Nicholas	24.8	24.8	0.0	0.0	0.0	0.0	0.0
Greenbrier	21.3	9.2	0.0	0.0	0.0	0.0	12.1
Fayette	0.5	0.0	0.0	0.0	0.0	0.0	0.5
Summers	17.1	0.0	0.0	0.0	0.0	0.0	17.1
Monroe	22.1	7.4	0.0	0.0	0.0	0.6	14.0
West Virginia Total	**196.3**	**152.0**	**0.0**	**0.0**	**0.0**	**0.6**	**43.7**
Virginia							
Giles	20.5	5.2	0.0	0.0	0.0	15.3	0.0
Craig	1.7	0.0	0.0	0.0	0.0	1.7	0.0
Montgomery	19.6	7.1	0.0	0.0	0.0	12.53	0.0
Roanoke	8.4	4.4	0.0	0.0	0.0	4.0	0.0
Franklin	37.47	34.7	2.7	0.0	0.0	0.0	0.0
Pittsylvania	19.5	0.0	19.5	0.0	0.0	0.0	0.0
Virginia Total	**107.1**	**51.3**	**22.2**	**0.0**	**0.0**	**33.50**	**0.0**
MVP Total	**303.5**	**203.4**	**22.2**	**0.0**	**0.0**	**34.1**	**43.7**

Source: Godt, 2014

TABLE 4.1.1-11

Areas of Landslide Concern along the Mountain Valley Project

Start MP	End MP	Distance	Percent Slope a/	Slope Movement b/	Notes c/
3.3	3.8	2,147	33	No	Dormant slide and/or soil prone to movement. Intersects at least three natural drains.
28.0	28.2	967	29	No	Near well appurtenances. Side cut would run across at least three natural drains.
32.4	32.6	749	32	No	Dormant slide and/or soil prone to movement. Located at toe of slope. Hillside previously cleared.
33.4	33.6	570	42	No	Dormant slide and/or soil prone to movement. Located at toe of slope. Hillside previously cleared.
34.2	34.4	377	28	No	Moderate side slope, includes slight pipe bend. Cuts across at least one natural drain.
34.4	34.6	907	28	No	Downslope of ridge. Cuts across at least three, possibly four or five natural drains and one or two four-wheeler paths.
35.1	35.3	869	40	No	Construction equipment may need to be staged on sidehill here. Southeastern side less steep, may be better to stage.
43.3	43.5	494	30	No	Steep side slope, but ridge within right-of-way.
46.2	46.5	1113	15-33	Yes	Gravitropism and natural drains on moderate side slope
46.6	46.8	448	36	Yes	Existing dormant slide possibly upslope, and active within past 20 years. Cuts across at least one natural drain, possibly two.
53.0	53.3	872	22	No	Adjacent slopes composed of dormant slides. Moderate side slope directly below cemetery. Cuts across some kind of existing right-of-way or road, and at least two natural drains.
55.1	55.2	224	35	No	Moderate side slope, cuts across slope. No signs of recent movement.
57.2	57.7	806	18-40	No	Right-of-way would run alongside hill with 32% grade and a 40% grade directly below it.
66.8	67.0	826	15-34	No	Moderate side slope subjacent to the Weston and Gauley Bridge Turnpike Trail.
69.2	69.5	1,128	29	No	Cuts across one large natural drainage. No signs of recent movement.
81.8	82.1	1,462	35	No	Route crosses dormant slide area. Moderate side slope. No natural drains, but is directly above house or farm structure. Landowner issues may force it to be on the east side below the road, intersecting at least three natural drains.

TABLE 4.1.1-11 (continued)

Areas of Landslide Concern along the Mountain Valley Project

Start MP	**End MP**	**Distance**	**Percent Slope a/**	**Slope Movement b/**	**Notes c/**
82.5	82.6	602	45	No	Route cuts through a colluvial slope, which is very prone to sliding. Very steep side slope, right above ravine, possibly crossing one natural drain.
122.5	123.0	2,547	7 – 43	No	Crosses at least 5 streams or natural drains. Cuts through dormant slide or material prone to sliding.
123.1	123.2	362	22	No	Route crosses soil prone to movement. Mild side slope directly below power line right-of-way. Cuts across one natural drain.
124.3	124.8	648	15-20	Yes	Possible recent landslides, and this portion of route crosses through soil prone to movement.
127.2	127.4	631	12 – 39	No	Moderately steep slope below ridge. Cuts through dormant slide or material prone to sliding. Crosses an existing logging road.
127.9	128.0	423	10 – 60	No	Moderately steep slope below ridge. Cuts through dormant slide or material prone to sliding.
132.0	132.1	646	25	No	Portion of route is adjacent to soil prone to movement to the west and a dormant slide to the east. Moderate side slope. Cuts across at least one natural drain.
145.3	146.1	8000	30-35	No	Steep and very long side slope. Cuts across at least three natural drains. Two hard 90's one after the other in route.
164.6	165.1	1320	33-43	No	Steep slide slopes outside of construction right-of-way. Two gullies at saddles are outside of the construction right-of-way.
182.4	182.8	808	18-28	Yes	Some slope movement is indicated on historical imagery within the past 20 years.
197.4	197.6	1800	18-26	No	Jefferson National Forest.
198.4	199.1	2300	18-35	No	Very steep slopes with little cover. Active erosion occurring onsite with intermittent streams nearby.
204.4	204.8	1,120	39	No	Lateral slope side cut, paralleling transmission power line.
211.53	211.8	1,184	32 – 53	No	Very steep slope, centerline may or may not be on ridge. Directly above U.S. 460.
219.9	220.9	1200	25-40	No	Jefferson National Forest.
229.2	229.3	640	28	No	Slight sidehill. Crosses stream.
261.2	261.2	179	40	No	Steep side slope, but just for small section. Running just below ridge line through a gulley. Crosses one natural drain.

TABLE 4.1.1-11 (continued)					
Areas of Landslide Concern along the Mountain Valley Project					
Start MP	**End MP**	**Distance**	**Percent Slope a/**	**Slope Movement b/**	**Notes c/**
a/ Design slope is based on desktop and field review, or range from map analysis of alignment.					
b/ Based on historical imagery.					
c/ Based on available landslide mapping.					
Source: Godt, 2014					

Equitrans Expansion Project

The entirety of the EEP facilities would be in an area identified as having a high susceptibility to landslides (Godt, 2014). The EEP would cross about 3.0 miles of 15 percent to 30 percent slopes and about 0.3 mile of slopes greater than 30 percent (see table 4.1.1-12).

TABLE 4.1.1-12

Steep Slopes crossed by the Equitrans Expansion Project

Component	15-30% Slope (miles)	Slope Greater than 30% (miles)
H-158	0.1	0.0
M80	0.1	0.0
H-316	1.5	0.2
H-318	1.2	0.1
H-305	0.1	0.0
H-319	0.0	0.0
Source: USGS, 2015a		

Additionally, landslides that have occurred within areas crossed by the EEP were identified. Four landslide areas would be crossed by the H-316 pipeline, and seven landslide areas would be crossed by the H-318 pipeline. Table 4.1.1-13 identifies landslide areas crossed by the EEP.

TABLE 4.1.1-13 **Landslide Areas Crossed by the Equitrans Expansion Project**						
Facility	**Start MP**	**End MP**	**Crossing Distance (feet)**	**Side Slope**	**Steep Slope**	**Previous Landslide**
H-316	1.0	1.2	1,024	Yes	No	Yes
H-316	1.3	1.3	92	Unknown	Yes	No
H-316	1.3	1.4	332	Yes	No	No
H-316	1.4	1.5	401	Yes	No	Yes
H-318	0.4	0.6	821	Yes	No	No
H-318	0.9	0.99	658	No	No	Yes
H-318	1.1	1.14	287	No	No	Yes
H-318	1.9	1.9	125	No	No	Yes
H-318	2.1	2.17	197	No	No	Yes
H-318	2.2	2.24	151	No	Yes	No
H-318	3.3	3.37	548	No	No	Yes
Source: USGS, 1979; USGS 1978, Google Earth, 2017						

Karst Topography

Karst features, such as sinkholes, caves, and caverns, can form as a result of the long-term action of groundwater on soluble carbonate rocks (e.g., limestone and dolostone). These features could present a hazard to the pipeline due to cave or sinkhole collapse. Because karst features provide a direct connection to groundwater, there exists the potential for pipeline construction to impact groundwater from increased turbidity due to runoff of sediment into karst features or contaminate groundwater resources by inadvertent spills of fuel or other hazardous materials from construction equipment (see section 4.3.1.2). Karst areas are also associated with seeps and springs, which could experience temporary changes in flow characteristics from construction of the pipeline. Seeps and springs along steep slopes could likewise contribute to and be the cause of landslides or other earth movements.

Mountain Valley Project

Mountain Valley hired a geotechnical consulting firm to provide an assessment of karst for the entire MVP. Mountain Valley's geotechnical firm identified several areas as being prone to karst development and identified karst features located in proximity to the MVP pipeline route (Draper Aden Associates, 2015a). Mountain Valley's geotechnical firm used field surveys and publically available sources to identify karst features and develop site-specific construction recommendations. Sources consulted included: Classification and Geo-referencing Cave/Karst Resources across the Appalachian Landscape Conservation Cooperative (Appalachian LCC); Classification and Mapping of Karst Resources; as well as various resources from the WVGES;

Natural Resources Conservation Service (NRCS)[4]; Virginia Cave Survey; the VADMME; Virginia Division of Mineral Resources; Karst Water Institute; Virginia Cave Board[5]; USGS; WVDEP[6]; Virginia Division of Natural Heritage; Virginia Speleological Survey; the National Speleological Society. Citations and the specific sources used to conduct the karst desktop review are presented in Mountain Valley's *Karst Hazard Assessment*.[7]

Karst terrain would be crossed in the southern portion of the pipeline route. Areas of minor karst development have been identified from about MPs 172 to 174 and significant karst development from about MPs 191 to 239. The majority of features along the proposed route are sinkholes, although several caves are located in the vicinity of the MVP pipeline. Table 4.1.1-14 identifies caves within about 0.25-mile of the MVP pipeline. Karst terrain in the MVP area is illustrated below in figure 4.1-3.

We received comments from the Virginia Cave Board (accession number 20161222-5394) on December 22, 2016 concerning specific karst features located along the proposed MVP pipeline route, dye trace studies to determine groundwater flow paths, and channels ending in swallets. The Virginia Cave Board's primary focus was to encourage dye trace studies for many if not all of the karst areas crossed by the pipeline to determine subterranean flow paths. Mountain Valley has addressed these concerns in its Responses to Data Requests (accession number 20170314-5145) filed March 14, 2017. Groundwater flow paths and the potential for impacts were evaluated at several karst resources locations along the MVP pipeline route.

Typically, surface water will flow overland down slope to recharge features such as swallets. Groundwater will flow vertically through the unsaturated zone along interconnected fractures, and conduits, and along preferential paths downslope until reaching the saturated (phreatic) zone where groundwater will flow from areas of high hydraulic head (recharge locations) to areas of low hydraulic head (discharge locations). Mountain Valley has identified the potential groundwater flow paths for the features and locations discussed above. Their analysis included evaluating recharge features (swallets, sinkholes, and sinking streams), resurgence features (spring and seeps), topography, bedrock structure (strike and dip) as well as the results of the fracture trace-lineament analysis, and the results of previous dye trace studies. Using these data, groundwater flow paths can be extrapolated and additional dye testing at these locations would not significantly change the understanding of groundwater flow, and the need to dye trace every sinkhole or sink point along the pipeline alignment is not feasible or necessary.

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4 Such as NRCS, 2010.

5 Such as VADCR-VCB, 2015.

6 Such as WVDEP, 2005.

7 *Karst Hazards Assessment Report* [Draper Aden Associates, 2015a; 2016)] filed with the FERC on October 14, 2016 as Attachment RR2-4a.

TABLE 4.1.1-14

Known Named Caves Within About 0.25-Mile of the Mountain Valley Pipeline

Cave Name	Distance from Pipeline (feet)	County	State	Known to be Used Recreationally
Greenville Glenray Cave	827	Monroe	WV	Unknown
Bobcat Cave	1,053	Monroe	WV	No
Rich Creek Cave	1,509	Monroe	WV	No
Lhoist Cave	336	Giles	VA	No
Crooks Crevice	800	Giles	VA	No
Eight Point Pit	250	Giles	VA	No
Williams Contact Shaft	242	Giles	VA	No
High Voltage Cave	103	Giles	VA	No
Conklin Sink Cave	457	Giles	VA	No
Pighole Cave	1,638	Giles	VA	Yes / limited access
Echols Cave	7	Giles	VA	No
Tawney’s Cave	131	Giles	VA	Yes / limited access
Hog Hole Cave	73	Giles	VA	No
Canoe Cave	902	Giles	VA	No / closed
Newport Cave	454	Giles	VA	Unknown
Mahaffey Trash Cave	625	Giles	VA	Unknown
Plumb Bob Pit	632	Giles	VA	Unknown
Hoges Farm Cave	824	Giles	VA	Unknown
Missing Link Cave	950	Giles	VA	Unknown
Big Stony Canyon Cave	967	Giles	VA	Unknown
Jimzuther Cave	996	Giles	VA	Unknown
Links Cave	1,004	Giles	VA	Unknown
Kimballton Cave	1,145	Giles	VA	Unknown
Smokehole Cave	1,331	Giles	VA	Unknown
Conklin Air Hole	1,443	Giles	VA	Unknown
Kanodes Pit	1,555	Giles	VA	Unknown
Terrible Tortoise Cave	1,577	Giles	VA	Unknown
Jones Cave	126	Giles/Craig	VA	No
Mill Creek Pit	176	Montgomery	VA	Unknown
Slussers Chapel Cave	541	Montgomery	VA	No / closed
Johnson’s Cave	403	Montgomery	VA	No

Source: Draper Aden Associates , 2016, NSS, 2017

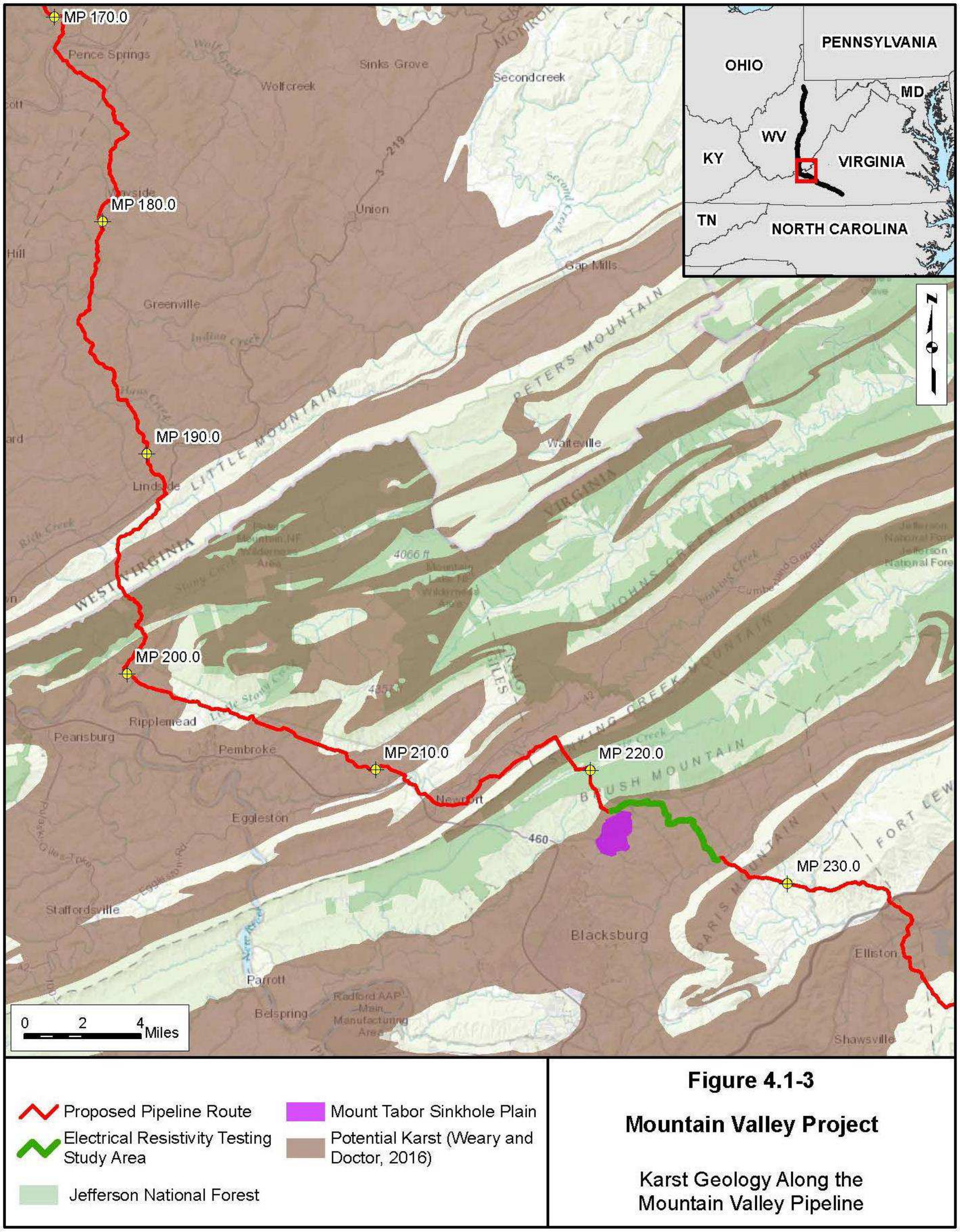


Figure 4.1-3

Mountain Valley Project

Karst Geology Along the Mountain Valley Pipeline

Mountain Valley also identified downgradient karst swallets from 500 feet to 3 miles from the proposed alignment and spring outlets to identify channels terminating in swallets. These data are summarized in table 4.1.1-15.

TABLE 4.1.1-15

Downgradient Karst Swallets Over 500 feet from the Proposed Mountain Valley Pipeline

State	County	Name / Description	Nearest Mile Post	Distance (miles)	Spring / Resurgence
VA	Giles	Sink on Dry Branch	202.3	0.6	Klotz Spring
VA	Giles	Loosing stream and/or sinks	207.2	1.0	Bell Spring
VA	Giles	Loosing stream and/or sinks	207.4	0.8	Bell Spring
VA	Giles	Loosing stream and/or sinks	207.8	1.0	Bell Spring
VA	Giles	Sinks of Sinking Creek	211.1	3.0	Rise of Sinking Creek
VA	Giles	Swallet in sinkhole filled with farm refuse	216.5	0.1	Spring at Steele Acres Road
VA	Montgomery	Slussers Chapel Cave	221.9	0.6	Mill Creek Spring
VA	Montgomery	Mill Creek Sink point 1	222.4	0.4	Mill Creek Spring
VA	Montgomery	Mill Creek Sink point 2	222.9	0.1	Mill Creek Spring
VA	Montgomery	Swallet near Johnsons Cave	227.7	0.2	Johnsons Cave Spring

Sources: Draper Aden Associates, 2015a; 2016

The *Karst Hazard Assessment* produced by Mountain Valley's consultant identified a total of 99 karst features in Summers and Monroe Counties, West Virginia and Giles, Craig, and Montgomery Counties, Virginia.[8]

The October 2015 application pipeline route was located in proximity to subterranean portions of Canoe Cave. Canoe Cave is privately owned (Dowdy Farm) and closed to the public (NSS, 1971; Hypes, 2016). Canoe Cave has been state-designed as a significant cave by the VA Cave Board and the VA Speleological Survey (Kastning, 2016), and is surrounded by the Canoe Cave Conservation Site designated by the VADCR. Canoe Cave has been subject to several investigations. A portion of the cave was mapped in 1943, surveyed in February 1982 by Dr. Gary Nussbaum of Radford University, biologically inventoried by the VADCR in November 2015, and is currently being resurveyed by the VA Speleological Survey. Inspections by Mountain Valley's Karst Team suggest that the cave is located close to the ground surface. Historical mapping of Canoe Cave indicated underground stream flow coming from the upland mountain ridge to the northeast. On October 14, 2016, Mountain Valley adopted a realignment into its proposed route, shifting the pipeline 1,300 feet north of the October 2015 route to avoid the Canoe Cave Conservation Site and Canoe Cave, as recommended in our draft EIS. The pipeline would be about 902 feet away from the nearest entrance to Canoe Cave.

8 Overview and detail maps that display karst features in proximity to the MVP pipeline are provided in the *Karst Hazards Assessment Report.*

The October 2015 application pipeline route crossed a portion of the Mount Tabor Sinkhole Plain in Montgomery County, Virginia. This area is known for significant karst development, including a high density of caves, sinkholes, and springs (see appendix L). The Slussers Chapel Conservation Site and Old Mill Conservation Site, designated by the VADCR, including Slussers Chapel Cave and Old Mill Cave, are located within the Mount Tabor Sinkhole Plain. Pipeline construction across the Mount Tabor Sinkhole Plain could encounter karst features or caves, resulting in differential settlement and pipeline instability, and potentially impacting groundwater quality and flow.

On October 14, 2016, Mountain Valley adopted the Mount Tabor Variation into its proposed route, as recommended in our draft EIS, to reduce impacts on karst features within the Mount Tabor Sinkhole Plain. The proposed pipeline route would be about 541 feet away from Slussers Chapel Cave, and about 0.9-mile northeast of the entrance for the Old Mill Cave.

Mountain Valley conducted a fracture trace-lineament analysis[9] along the proposed pipeline route through karst areas (approximate MPs 172 to 239) using aerial photographs and publically available LiDAR imagery, in addition to an electrical resistivity study[10] conducted to identify potential karst features along the Mount Tabor Variation that has been adopted into its proposed route. Figure 4.1-4 below presents the results of Mountain Valley's fracture trace-lineament analysis. The Mount Tabor Variation avoids a large concentration of sinkholes and fault traces located to the south of the currently proposed route. However, the Mount Tabor Variation does come within close proximity to a concentration of karst features that exhibit a subterranean connection with Slussers Cave. The results of Mountain Valley's lineament/fracture trace analysis coupled with published dye trace studies show a direct subsurface connection from the pipeline alignment to Slussers Chapel and Old Mill Caves.

The electrical resistivity study conducted by Mountain Valley along the Mount Tabor Variation identified 15 areas that likely contain karst features. Five of these features are considered to be soil-filled cutters or relatively limited soil-filled sinkhole throats while the remaining features are considered to be vertically extensive soil-filled sinkhole throats. These features are also reflected in Mountain Valley's revised *Karst Hazard Assessment* and are presented in appendix L.

We received comments on the draft EIS from landowners along the Mount Tabor Variation who stated that the currently proposed route may not avoid sinkholes, karst features, springs, and waterbodies.[11] The VADCR submitted a letter to the FERC, dated September 9, 2016, requesting an analysis of another alternative route (the Slussers Chapel Conservation Site Avoidance Alternative Route) that would avoid the Slussers Chapel Conservation Site. That alternative route is discussed in section 3.5. Figure 4.1-5 identifies the MVP proposed route and the VADCR alternative route, superimposed against karst features and bedrock. In addition, figure 4.1-6 illustrates the October 2015 application route, the Mount Tabor Variation (proposed route), the

[9] Fracture Trace and Sinkhole Lineaments Mount Tabor Area filed with the FERC February 17, 2017 (accession number 20170217-5199).

[10] Electrical Resistivity Imaging Study, October 2016 Proposed Alignment Milepost 221.8 to 227.2 (accession number 20170217-5199).

[11] See for example, the letter dated October 4, 2016 from Robert Jones (accession number 20161011-5180) and letter dated November 11, 2016 from Lynda Majors (accession number 20161103-5017).

VADCR's suggested Slussers Chapel Conservation Site Avoidance Alternative Route, the boundaries of the Slussers Chapel Conservation Site, with cave locations in the conservation site, and underground water flow between the caves. As stated in section 3.5, we do not find an overall significant environmental advantage for the Slussers Chapel Conservation Site Avoidance Alternative Route when compared to the proposed route.

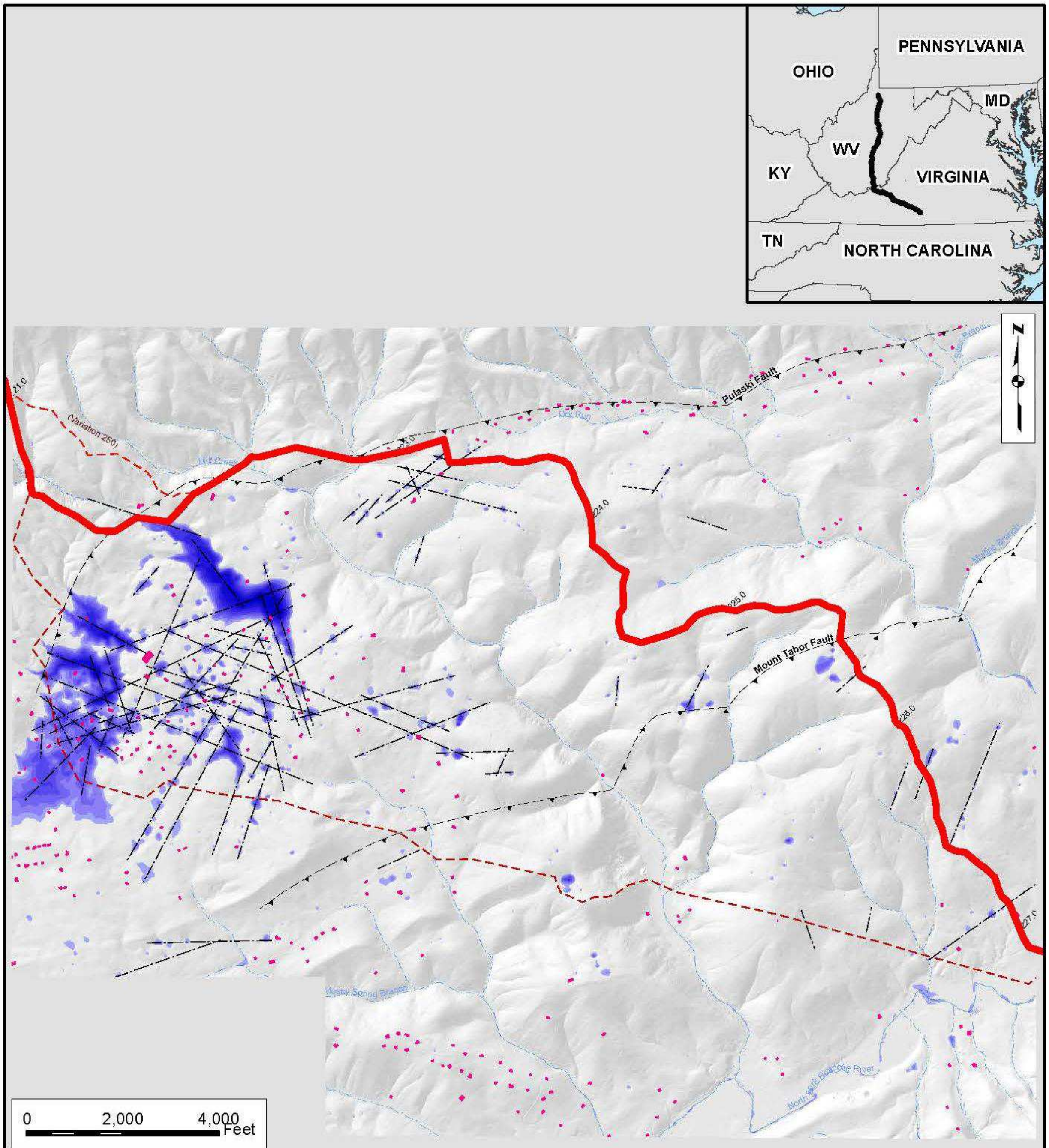
Equitrans Expansion Project

The EEP facilities would not be located in any areas known to contain karst features (PADCNR, 2015b; WVGES, 1968).

Shallow Bedrock

Mountain Valley Project

Mountain Valley would have to dig a trench about 10 feet deep to install its 42-inch diameter pipeline. Therefore, bedrock within 7 feet of the ground surface is considered shallow. Areas with shallow bedrock classifications were identified using the USDA NRCS's Soil Survey Geographic Database (SSURGO) (USDA, 2015). The MVP pipeline route would traverse about 216 miles of shallow bedrock. Areas of shallow depth to bedrock are summarized in table 4.1.1-16 and listed in detail by milepost in appendix M.



Proposed Pipeline Route
Fracture Traces
Sinkhole
No Data

Figure 4.1-4

Mountain Valley Project

Fracture Trace and Sinkhole Lineaments for the Mount Tabor Sinkhole Plain

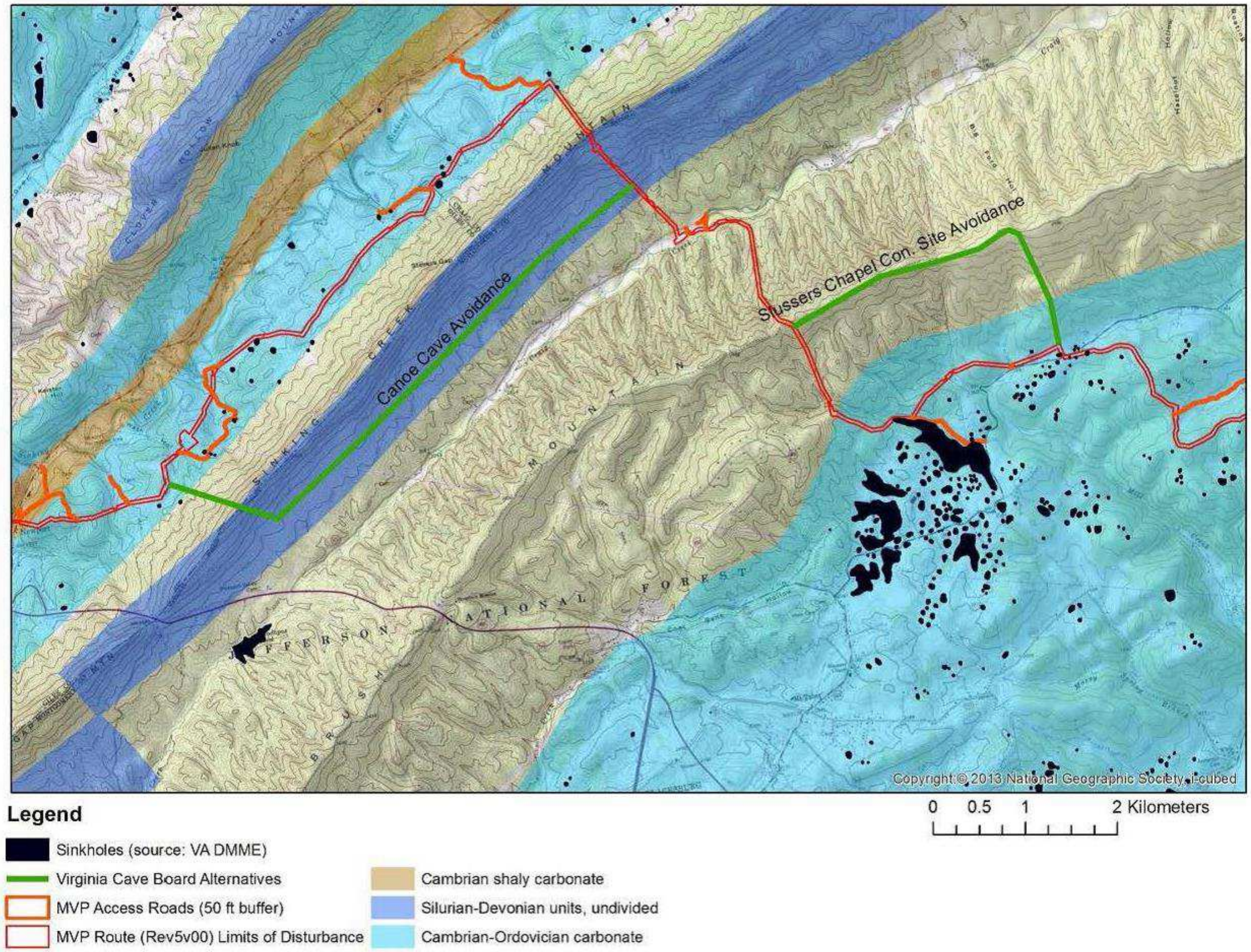


Figure 4.1-5 Mountain Valley Pipeline – Karst Avoidance Alternative Routes

Source: VADCR, 2016a

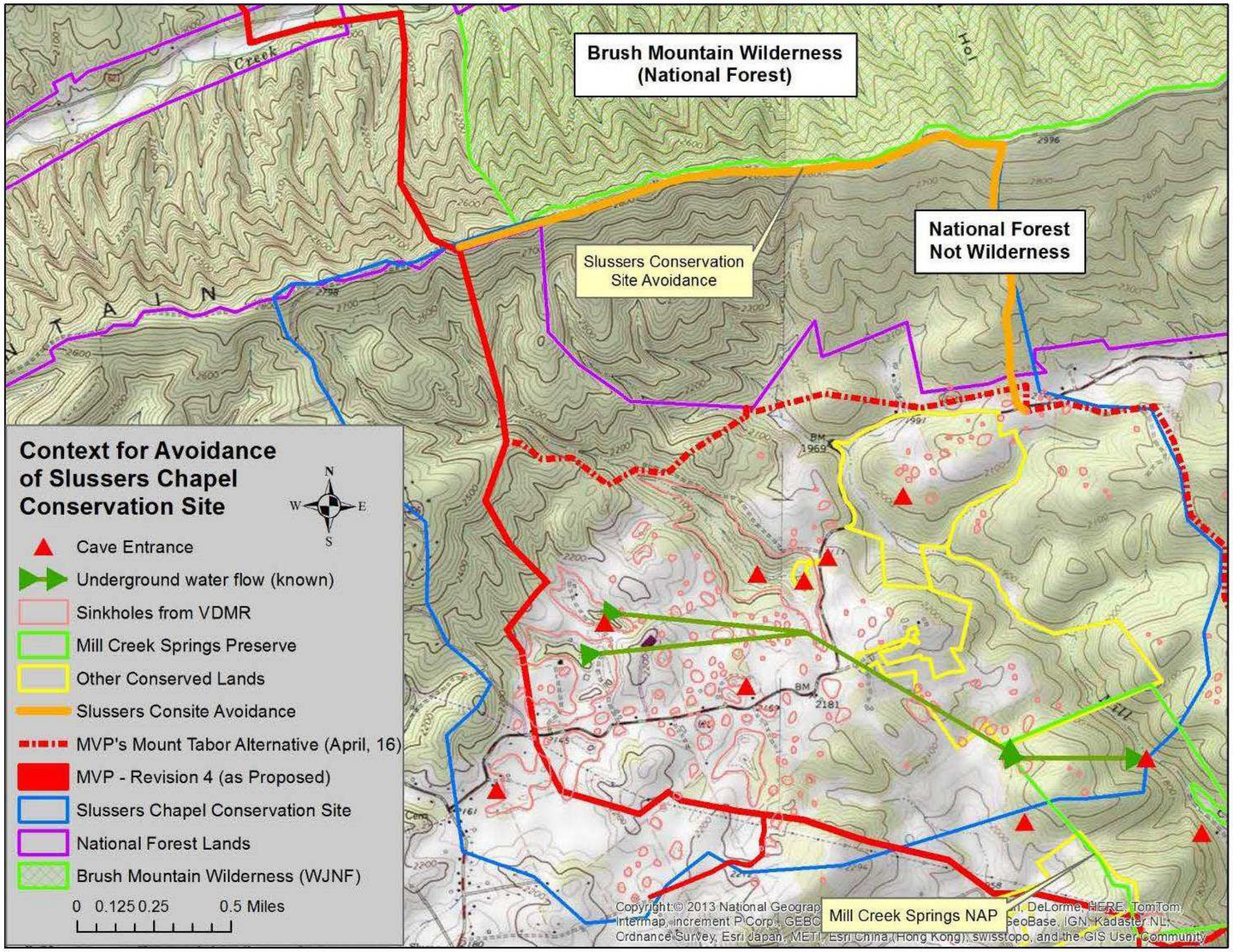


Figure 4.1-6 Mountain Valley Pipeline – Mount Tabor Area Alternative Routes

Source: VADCR, 2016b

TABLE 4.1.1-16

Summary of Shallow Bedrock along the Mountain Valley Project

State/County	Miles of Shallow Bedrock
West Virginia	**180.0**
Wetzel	9.0
Harrison	22.2
Doddridge	4.6
Lewis	25.6
Braxton	13.1
Webster	28.4
Nicholas	21.4
Greenbrier	20.2
Fayette	0.5
Summers	15.1
Monroe	19.9
Virginia	**36.4**
Giles	6.8
Craig	0.6
Montgomery	13.0
Roanoke	3.1
Franklin	12.3
Pittsylvania	0.6
Mountain Valley Project Total	**216.4**

Source: USDA, 2015
Note: Columns may not total correctly due to difference cause by rounding.

Equitrans Expansion Project

Equitrans identified areas with a shallow depth to bedrock as indicated by the SSURGO database (USDA, 2015). About 1 mile of ground that would be excavated for pipeline installation has been identified as shallow depth to bedrock. The majority of shallow bedrock occurs sporadically along the proposed H-318 pipeline (4,711 feet) with small amounts (158 feet and 391 feet, respectively) along the H-151/M-80 and H-316 pipelines.

Blasting

The potential for blasting exists at all locations where shallow bedrock may be encountered.

Mountain Valley Project

The MVP pipeline route would cross 216 miles of shallow depth to bedrock. Mountain Valley would first attempt to rip bedrock. If unrippable bedrock is encountered, Mountain Valley would consider using rock trenching machines, rock saws, hydraulic rams, jack hammers, and the like. If blasting does become necessary, it typically involves a small scale, controlled, rolling detonation procedure resulting in limited ground upheaval. These blasts do not typically result in large, aboveground explosions. Any required blasting would be conducted in accordance with all federal, state, and local regulations.

Blasting in areas of karst topography could temporarily change groundwater flow, increase the potential for turbidity in nearby springs and wells, and affect their yield. Potential impacts on water wells, springs, wetlands, steep slopes, paleontological resources, nearby aboveground facilities, and adjacent pipelines and utility lines could result from blasting. Potential impacts on water wells and springs are discussed in section 4.3.

Equitrans Expansion Project

The EEP would cross about 1 mile of shallow bedrock. However due to the small amount of shallow bedrock, Equitrans anticipates that bedrock would be removed by conventional methods such as ripping, chipping, or grinding. Equitrans does not anticipate the need for blasting. However, should blasting be required, Equitrans would provide a blasting plan to the FERC for approval prior to any blasting activities.

4.1.1.6 Paleontological Resources

Paleontological resources including plant, invertebrates, and vertebrate fossils may be found in a variety of geologic formations. Typically, fossils are found in bedrock; therefore, areas with shallow bedrock, mentioned above, have the potential for containing paleontological resources. Those resources may be impacted by construction activities, including trenching. The Antiquities Act of 1906 and the Paleontological Resources Preservation Act of 2009 protect objects of antiquity and fossils, respectively, on federal lands. No such protection for paleontological resources exists in laws or regulations for non-federal lands.

Mountain Valley Project

There is the potential for the discovery of fossils along the MVP pipeline route in areas of shallow sedimentary bedrock. Fossils are known to exist in the Cambrian, Ordovician, Silurian, and Devonian bedrock crossed by the MVP in the Appalachian Plateau and Valley and Ridge Provinces. These fossils include marine species for rock types from the Cambrian, Ordovician, and Silurian Periods. The coal seams that formed in the area during the Mississippian and Pennsylvanian periods are the remains of swamps and forests from the Carboniferous, which over time were transformed to coal. Several formations including the Greene, Washington, Waynesburg, Uniontown, Pittsburg, and Casselman formations are considered to be transitional to the Permian Period and may contain Permian aged fossils. There have not been any dinosaur fossils discovered proximal to the MVP area (William and Mary University, 2015). Mammoths, mastodons, and giant ground sloths inhabited the project area during the ice age. In 1993 giant ground sloth shoulder blade pieces were found in Haynes Cave in Monroe County, West Virginia (Grady, 1997).

Equitrans Expansion Project

A search of the bedrock formations that underlie the EEP area in the Paleobiology Database (PBDB, 2016) identified 902 fossil occurrence records within the Conemaugh (Casselman Formation), Dunkard (Washington, Greene, and Waynesburg Formations), and Monongahela Groups. However, none of these fossil records were identified along the EEP pipeline routes.

4.1.1.7 Jefferson National Forest

The area of the Jefferson National Forest that would be crossed by the MVP is underlain by mainly Devonian and Silurian Period sedimentary rock (such as sandstone, quartzite, and shale) and by Quaternary deposits (such as alluvium and colluvium). Surface geology and bedrock geology maps in the area include maps by Schultz and Stanley (2001); Schultz, Bartholomew, and Schultz, et al. (1991); Miller and Hubbard (1986); and Schultz et al. (1986).

Landslides (such as debris slides, debris flows, rockslides, slumps and rockfalls) are geologic processes shaping Peters Mountain, Sinking Creek Mountain, and Brush Mountain. As discussed in section 4.1.1.5, debris flows are a dominant landslide process in the southern Appalachian Highlands in Virginia and West Virginia (Hack and Goodlett, 1960; Clark, 1987; USGS 1996, Morgan et al., 1999; Eaton et al., 2003; Wieczorek et al., 2004; Sas and Eaton, 2008; Wieczorek et al., 2009; Wooten et al., 2015). Debris flows are a dominant natural landslide process in Giles and Montgomery Counties (New River Valley Regional Commission, 2011). Debris flows can also result from failure of constructed slopes, where excavated material is placed on steep slopes (Collins, 2008; Wooten et al., 2015). For example, in 2014, storm-triggered debris flows occurred along the CGV pipeline construction corridor located on the south and north sides of Peters Mountain within the Jefferson National Forest. The proposed MVP pipeline would be located within a similar geologic setting on Peters Mountain approximately 5 miles northeast of the CGV pipeline.

The largest known landslides in eastern North America are on the south flank of Sinking Creek Mountain where the pipeline route would cross the Jefferson National Forest (Schultz et al., 1986; Schultz and Southworth, 1989). Schultz and Southworth (1989) note: "The apparent clustering of large landslides near the Giles County, Virginia seismic zone suggests that seismic shaking may have been an important triggering mechanism." The pipeline route on Sinking Creek Mountain ([between 2,500 and 2,800 feet elevation] MPs 218.5 to 218.9) crosses one of the large bedrock landslides mapped by Schultz (1993).

The MVP would cross the Jefferson National Forest within the GCSZ. The GCSZ is a seismically active area known for small local seismic events and one historic quake that took place in 1897 before modern seismic monitoring equipment but was estimated to be magnitude 5.8 (Bollinger et al., 1988).

Streams where flooding and other hazards are present are found along the pipeline route at Craig Creek; at the tributaries to Craig Creek between MPs 218.8 and 219.2 and MPs 219.9 and 213.0; and at the tributary to Kimballton Branch at MP 197.8.

Depth to bedrock may be 5 feet or less over most of proposed route on the Jefferson National Forest based on a review of data from soil pits dug along the proposed route and SSURGO data. According to Mountain Valley, most of the layered sedimentary bedrock formations would be excavated without blasting. Mountain Valley anticipates that blasting within the Jefferson National Forest would be minimal. The USGS map *Karst in the United States: a Digital Map Compilation and Database* includes the south side of Peters and Sinking Creek Mountain potentially karst forming areas (Weary and Doctor, 2014). However, no karst features were identified within these areas during Mountain Valley's *Karst Hazard Assessment*. The areas that would be crossed within the Jefferson National Forest by the MVP contain slopes greater than 30 percent and the potential for landslides within the Jefferson National Forest would be moderate to high.

A review of geologic hazards (landslides, karst and earthquakes) in Giles and Montgomery Counties including the portion of the Jefferson National Forest traversed by the MVP project is in the 2011 Hazard Mitigation Plan prepared by the New River Valley Regional Commission (2011).

Fossils may be present in some of Devonian and Silurian sedimentary bedrock along the proposed route. There are no known paleontological collection sites along the proposed route within the Jefferson National Forest.

4.1.2 Environmental Consequences

Geological hazards, such as seismic activity or landslides, may affect the operational integrity of the pipelines. The crossing of steep topography would present construction challenges; as would the crossing of shallow bedrock, acid producing rocks, and karst terrain. Special construction techniques for crossing rugged topography are summarized in section 2. Likewise, the pipelines may have impacts on geologic resources, including mines and oil and gas wells.

We received filings from stakeholders, including the Indian Creek Watershed Association, Appalachian Mountain Advocates, Preserve Craig, and Giles County, and other entities or individuals who either attached reports or provided comments on the geological discussion in our draft EIS.[12] Some of these reports focused on rugged topography (steep and unstable slopes), karst terrain, seismicity associated with the GCSZ, and shallow bedrock and the effects of blasting. The EPA provided comments on the draft EIS concerning bedrock blasting in combination with steep slopes, karst terrain, as well as active and abandoned mines and quarries (EPA, 2016c). Outside

[12] For examples see letters at accession numbers: 20161123-5080 (Dr. Robert M. Jones); 20161128-5050 (Dr. Pamela L. Ferrante); 20161212-5032 (Dr. Ernst Kasting); 20160815-5135 (Dr. Pamela C. Dodds); 20160902-5165 (Indian Creek Watershed Association); 20161221-5434 (Indian Creek Watershed Association); 20161220-5368 (Dr. Pamela L. Ferrante); 20161222-5305 (Mode A. Johnson); 20161222-5458 (Giles and Roanoke Counties); 20161223-5058 (Appalachian Mountain Advocates); 20170127-5019 (Carl E. Zipper); 20170221-5189 (Indian Creek Watershed Associates); 20170221-5116 (Save Monroe, Inc. and Preserve Craig, Inc.); 20170221-5288 (Mode A. Johnson); 20170221-5298 (Dr. Robert M. Jones); 20170221-5129 (Thomas W. Triplett); 20170302-5043 (Carl E. Zipper); 20170310-5024 (Dr. Robert M. Jones); and 20170320-5106 (Dr. Robert M. Jones).

reports likewise addressed the degree of subsurface karst interconnectivity as demonstrated by published dye trace results in the Slussers Chapel Conservation Site and Old Mill Conservation Site. Comments included the project's potential to negatively impact caves and cave fauna, impacts on groundwater quantity and quality, and impacts on sources of drinking water provided by local districts, as well as downstream surface water users. One commenter opined that Mountain Valley's planned route through karst terrain should be considered as "a no build zone" (Kastning, 2016).

Below, we address these concerns and discuss construction and post-construction monitoring measures that the Applicants would implement to avoid, reduce, or mitigate impacts from these geologic hazards, or on geologic resources in the project area; as well as our own recommendations to minimize potential landslides, karst hazards, and impact to water resources.

4.1.2.1 Mines

<u>Mountain Valley Project</u>

The MVP pipeline was routed to avoid mines to the extent possible. However, potential hazards from active and historic underground mining could affect the MVP. The MVP would cross 10 underground mines, 17 surface mines, and 2 unknown mine types. Mountain Valley would monitor longwall mines crossed by the project and mitigate any hazards through methods described in its *Mining Area Construction Plan* including:

- implementing (via the FERC variance process) minor route variations to avoid problem areas discovered during construction;
- inspecting the pipeline for potential settlement including uncovering of the pipeline in surface mining areas;
- constructing the pipeline on a pad or "floating foundation" so that the weight of the pipeline is spread across a greater area in surface mining areas;
- limiting blasting within 500 feet of the pipeline in surface mining areas;
- employing a mining consultant such as a geotechnical engineer to conduct site-specific investigation during construction or operation in areas where subsidence is suspected to determine potential hazards in underground mining areas; and
- meeting with and communicating with mine operators in proximity to the proposed MVP.

For historical underground mines, Mountain Valley would conduct an initial review of the mine to determine if it meets one of the three following criteria: 1) mines where the extraction was 50 percent or less; 2) non-longwall mines at a depth of greater than 1,000 feet; and 3) any mines with 80 percent or less extraction where the mining occurred more than 1 year ago. Should the mine to be crossed meet these criteria no further action would be required. However, if a mine does not meet this criteria, Mountain Valley would develop a minor route variation or conduct a site-specific evaluation of the area to determine potential or expected subsidence. Site-specific investigation would be conducted by a mining consultant. If hazards are discovered in areas of prior surface mining, construction methods such excavation and filling would be used to stabilize the working area and pipeline trench.

We received comments from Murray Energy, Alpha Companies, Coronado Coal, and Rex Coal regarding coal mining in the project area and the potential loss of coal assets due to the MVP's construction. On February 1, 2016, Murray Energy filed a letter removing its objections to the MVP.[13] On August 4, 2016, Coronado Coal filed with the FERC an objection to Mountain Valley's *Mining Area Construction Plan*, claiming a loss of coal it would be unable to mine because it is located under the proposed pipeline.

Mountain Valley would coordinate with mine owners and operators (e.g., Alpha Natural Resources, Coronado Coal, Warrior Energy, Murray Energy, Rex Coal, and Arch Coal), communicating both verbally and in writing regarding the MVP, including updates on the status of construction and blasting near mines. We included a recommendation in the draft EIS for Mountain Valley to file either a plan for avoidance of active mines or copies of agreements with the coal companies. Mountain Valley filed a response agreeing to comply with the draft EIS recommendation, therefore, it was removed from the final EIS.

Mountain Valley would also consult with the West Virginia Mine Health and Safety and Abandoned Mine Lands, as well as the WVDEP, and would follow recommendations provided by the agencies. Based on those communications, Mountain Valley would revise its *Mining Area Construction Plan* as necessary.

Equitrans Expansion Project

EEP facilities would be within 0.25 mile of 44 previously mined areas made up of 18 mines and 1 prospect quarry. The EEP pipelines would cross 10 closed underground mines and 2 closed/reclaimed surface mines. To minimize impacts from crossing closed and abandoned coal mines, Equitrans would follow the procedures provided in its project-specific *Mine Subsidence Plan* (discussed below).

Mine Subsidence

Mountain Valley Project

Subsidence can be a result of active underground mining (planned subsidence) or from historic underground mines where voids exist under the ground. Eight underground mines would be crossed by the MVP. Of those, four are of unknown status, two are new or renewed, and two are no longer being mined. Mountain Valley would also supplement its *Mining Area Construction Plan* through consultation with the WVDEP and mine operators with regards to potential hazards to the MVP.

In some cases, such as future longwall mining, allowing ground subsidence may become necessary as part of the mining process. In these cases, the pipeline would be uncovered allowing the ground to subside around the pipeline without affecting or damaging it. The pipeline could then be lowered and reburied post subsidence. Mountain Valley would monitor areas that could potentially experience subsidence once per week and after rain events where greater than 0.5 inch

[13] Murray Energy letter filed February 1, 2016 (accession number 20160201-5299).

of precipitation occurs within a 24-hour period during the revegetation of the right-of-way and then once per year after revegetation is completed.

Equitrans Expansion Project

Equitrans specifically designed the EEP facilities to avoid active underground mines. Equitrans has provided a *Mine Subsidence Plan*, which evaluates hazards from mines that would be crossed by the EEP and identifies mitigation measures that would be used by Equitrans. Hazards to the EEP from active underground mines would be mitigated by limiting the extraction of resources underneath and in close proximity to the pipeline. In some cases such as future longwall mining, subsidence may be necessary. In these cases, the pipeline would be uncovered allowing the ground to move around the pipeline without affecting it. The pipeline could then be lowered and reburied post subsidence. Equitrans proposes different methods for mines that have already been extracted. All of the mines that would be crossed by the EEP meet one of the three following criteria for no further action with regards to subsidence mitigation: 1) mines where the extraction was 50 percent or less; 2) non-longwall mines at a depth of greater than 1,000 feet; and 3) any mines with 80 percent or less extraction where the mining occurred more than 1 year ago.

Acid Producing Rocks

Mountain Valley Project

Acid producing rock and soils could be encountered along the pipeline in areas of active or previous mining activities and along coal distributions where sulfide minerals could occur and be exposed to runoff. Specifically, Mountain Valley identified the Millboro and Needmore shales in Montgomery County in addition to the Ashe Formation in Franklin County as being formations that could potentially generate acid drainage during construction. Mountain Valley would coat the pipe in fusion bonded epoxy to prevent any damage or deterioration to the pipeline. Mountain Valley would segregate excavated bedrock that could potentially produce acid conditions, limiting the amount of time the materials would be exposed. Mountain Valley would also conduct periodic inspections of the cathodic corrosion prevention system to ensure proper function of corrosion mitigation. Mountain Valley also prepared an *Acid Forming Materials Mitigation Plan* that identifies potential acid forming material locations and presents mitigation measures that Mountain Valley would use should acid forming materials be encountered including:

- employing environmental inspectors to be onsite and conduct field observations during construction in the areas identified in the *Acid Forming Materials Mitigation Plan*;
- managing spoils and applying neutralization amendments to excavated trench materials;
- creating logs detailing excavated materials encountered which note depth, strata, soil horizon, color, depth, and thickness;
- conducting, when necessary, qualitative field analytical procedures using a hydrogen peroxide test to identify moderate to high risk acid forming materials and determining the limits of lime application;
- applying lime, in lieu of testing, at the rate specified by Virginia Sulfide Hazard Risk Map (Soil and Landscape Rehabilitation, 2017);

- compacting trench backfill, where possible, to limit internal permeability while leaving the top 12 to 18 inches of backfill loose to promote plant growth; and
- bulk blending excess trench fill material with lime at the moderate or high risk rate and placed in accordance with Mountain Valley's standard excess fill standard practice.

Equitrans Expansion Project

Acid producing rock and soils could be encountered along the pipeline in areas of active or previous mining activities where sulfide minerals are exposed to runoff. Equitrans would coat the pipe in fusion bonded epoxy to prevent any damage or deterioration to the pipeline. Excavation required to construct the Redhook Compressor Station would disturb a coal seam and could potentially create acid producing conditions. Equitrans has developed site-specific mitigation measures as included in its project-specific *Erosion and Sediment Control Plan* for the Redhook Compressor Station. The measures include segregating carbonaceous material, covering any carbonaceous material with tarps to prevent water draining through the material, applying 12 inches of top soil to slopes after excavation, and liming, seeding, and mulching to stabilize the slope. Equitrans would follow the procedures outline in section 4.3.1.2 with regards to contaminated groundwater and may use measures identified by the PADEP (2012) to mitigate acid producing conditions identified along the EEP, including:

- applying limestone to neutralize the acidity in soil at rates indicated by the PADEP;
- using other soil amendments such as compost or mulch to improve soil absorption and prevent water runoff;
- coating the pipe in fusion bonded epoxy to prevent corrosion; and
- restoring original topography and contour to maintain original water flow patterns.

4.1.2.2 Oil and Gas Wells

Mountain Valley Project

The MVP would come within 0.25 mile of 327 oil and gas wells plus an additional 42 records for wells that were not completed and are listed as never issued or never drilled. Mountain Valley has aligned its pipeline to avoid known existing oil and gas wells to the extent possible. Oil and gas wells located in proximity to construction would be fenced with orange safety fencing for identification purposes. Should a previously unidentified oil and gas well be discovered during construction, Mountain Valley would secure the area around the well; research and contact the owner regarding securing the well; or, if no owner can be found, coordinate with state agencies for guidance regarding the proper handling of the well during construction. The MVP would not affect future oil and gas exploration or production, as the use of unconventional (directional) drilling techniques would allow for oil and gas wells to be drilled outside of the pipeline right-of-way.

Equitrans Expansion Project

There are 79 oil and gas wells located within 0.25 mile of the proposed EEP work areas. Wells in close proximity to the right-of-way would be flagged and safety fence would be installed around the well. Equitrans would also use its *Hot Work Safety Program* to assess any hazards prior to welding and other hot work. Additional methods that may be used, depending on the location of oil and gas wells, include using soft digging techniques, hydro vacuuming, and installation of physical barriers.

4.1.2.3 Seismicity and Potential for Soil Liquefaction

Mountain Valley Project

The majority of the MVP is sited in an area with low probability of localized earth movements. However, in the area of the GCSZ, between about MPs 161 to 239, peak ground accelerations are greater than 12 percent g, and the potential for a magnitude 5.8 earthquake exists. The MVP would be able to withstand seismic events of the historical and projected magnitude experienced in the GCSZ. Specifically the MVP would be designed according to 49 CFR 192 Subpart C, ASME B31.8-2014 Paragraph 840, and PRCI – Guidelines for the Seismic Design and Assessment of Natural Gas and Liquid Hydrocarbon Pipelines, which includes procedures and guidelines for quantifying seismic hazards, pipeline performance criteria, pipeline analysis procedures, and potential mitigation options with regards to pipeline design.

Maintained pipelines constructed using modern arc-welding techniques have performed well in seismically active areas of the United States, such as California. A review of gas transmission line performance after a 1994 seismic event in Northridge showed that 91 percent of all pipeline damage occurred in areas with earthquakes of MII greater than or equal to VIII (O'Rourke and Palmer, 1994b). Only large, abrupt ground displacements have caused serious impacts on pipeline facilities.

Soil liquefaction could also result if a significant seismic event were to occur. The potential for soil liquefaction exists mainly in the area of the GCSZ between MPs 161 and 239. PGAs in this area are greater than 12 percent g, and could produce an earthquake of magnitude MMI VI. Non-cohesive or saturated soils such as at waterbody crossing locations may be susceptible to soil liquefaction. The majority of pipe in the seismically active area near the GCSZ would be Class 2 or Class 3 thickness. Mountain Valley would not would not adopt all Class 2 specifications in these areas such as frequency of patrols and block valve spacing. A small amount of Class 1 pipe would be used at the outside range of the GCSZ area (MPs 178 to 186). According to calculations conducted by Mountain Valley's specialist, D.G. Honegger Consulting, strain from ground settlement would not affect Class 1 pipe should depth of cover be less than 10 feet. The depth of cover would not exceed 10 feet in proximity to the GCSZ thereby limiting potential hazards from soil liquefaction. Additionally, aggregate sacks would be used in potential flood zone areas to prevent buoyancy of the pipeline due to flooding or soil liquefaction.

Calculations by D.G. Honegger Consulting indicate that potential hazards exist for triggered slope displacement due to a higher potential for seismicity between MPs 161 and 239 should the length of soil displacement over the pipeline exceed 1,580 feet for parallel slopes. Mountain Valley has committed to using thicker Class 2 pipe in these areas in order to mitigate hazards from potential slope movement. Additionally, Mountain Valley has committed to a post-construction monitoring program utilizing sequentially acquired LiDAR imagery to detect slope movement in high landslide hazard areas, including those areas where the pipeline traverses through the GCSZ (see section 4.1.2.4).

Equitrans Expansion Project

The EEP would not be in an area where significant earthquakes are likely to occur. Peak ground acceleration as reported by the USGS for the EEP areas are 4 percent g with a 2 percent chance being exceeded in 50 years and range from 1 to 2 percent g with a 10 percent chance of being exceed in 50 years.

Soil liquefaction caused by seismic activity is most likely to occur in sandy and silty sediments, in areas with a high water table, or at waterbody crossings where there is the potential for ground shaking. Equitrans would use concrete coating or weights to prevent buoyancy of the pipeline at waterbodies crossing areas where saturated sediments may occur.

4.1.2.4 Slopes and Landslide Potential

Mountain Valley Project

Several steep slopes along Mountain Valley's proposed pipeline route have experienced landslide activity in the past. Additionally, there are areas along the pipeline route that are characterized by both steep slopes and red shale bedrock, which as discussed in section 4.1.1.5 are prone to landslides. As noted above, construction and operation of Mountain Valley's proposed pipeline could result in unstable slopes including cut slope failures and fill slope failures. Cut slopes are the slopes excavated for the project, and can be created by pipeline trenches and access roads. Fill slopes are slopes composed of excavated material or material imported from off-site sources. Fill slopes include access road fill slopes, corridor road or passageway fill slopes, temporary spoils, trench backfill, bore pads fills, excess excavation or excess fill disposal areas, and fill slopes created for restoration (restoration backfill). The potential for landslides or slope failure could be triggered by seismicity from the GCSZ or from intense and/or prolonged rainfall events. The USGS identified a clustering of landslides near the GCSZ suggesting that recent seismic shaking may have triggered these landslides, and that topographic effects on seismic shaking may have been amplified on mountain crests by a factor of 1.7 to 3.4 (Schultz and Southworth, 1989).

Construction of the MVP could alter the surface and near surface drainage along the pipeline trench, which could increase pre-existing landslide hazard potential on natural slopes. The stability of cut slopes and fill slopes during construction and operation of the pipeline would depend on many geologic/geotechnical factors, such as the bedrock structure (orientation of bedrock bedding and distribution of bedrock fractures); the mass strength properties of in-place bedrock and slope deposits; the nature of the contact between in-place bedrock and slope; the nature of the contact between in-place bedrock and fill; rainfall quantity and intensity; surface and near surface drainage, including groundwater, seeps, and springs. As discussed above, debris flow is the dominant landslide process in the southern Appalachian Highlands. Cut slopes and fill slopes along the pipeline right-of-way could be a source of debris flow in the project area triggered by intense and/or prolonged rainfall events.

Calculations by D.G. Honegger Consulting (2015a) indicate that the potential exists for triggered slope displacement should the length of soil displacement over the pipeline exceed 1,580 feet for parallel slopes. Except for one area located between MPs 162.3 and 162.9 of the proposed route (discussed in section 4.1.2.3), no other slopes were identified along the MVP pipeline route that would exceed the 1,580-foot limit. Mountain Valley also identified two places where the pipeline would run perpendicular to a potential triggered slope displacement hazard: 1) between MPs 196.4 and 196.5; and 2) at approximate MP 197.0. In these areas Mountain Valley would use thicker Class 2 pipe to mitigate hazards to the pipeline from triggered slop displacement.

Mountain Valley has provided an updated *Landslide Mitigation Plan* that includes the results of field inspections conducted in steep slopes, slope evaluations, a discussion of red shale bedrock that are prone to landslides in the project area, potential mitigation measures, maintenance and monitoring measures, sidehill construction procedures, site-specific mitigation measures for the 33 areas of concern identified in table 4.1.1-11 above, site-specific discussion of hazards and mitigation for Peters, Mountain, Sinking Creek Mountain, Brush Mountain, and the potential for debris flow along Kimballton Branch, and has provided site-specific design and stabilization measures in high-hazard portions of the route through the Jefferson National Forrest (see section 4.1.2.8).

In areas of steep slopes, Mountain Valley would staff geotechnical personnel during construction to prescribe mitigation for hazards that may arise, and would employ site drainage, sediment and erosion control BMPs as needed to control water flow in the working area. Minor field route modifications to the pipeline route would be made if needed to maximize slope stability. Generally, landslide mitigation during pipeline construction and right-of-way reclamation would depend heavily on the installation of appropriate drainage and erosion control measures. Mountain Valley provided a discussion of the efficacy of the proposed landslide mitigation measures including examples.[14] The measures proposed by Mountain Valley for landslide and steep slope mitigation follow those prescribed by the INGAA Foundation, Inc. *Mitigation of Land Movement in Steep and Rugged Terrain for Pipeline Projects: Lessons Learned from Constructing Pipelines in West Virginia* (INGAA, 2016). This document specifically addresses and provides tested mitigation measures for multiple types of unstable slopes in the Appalachian region. Consistent with this document, BMPs to be employed by Mountain Valley along steep perpendicular slopes and steep side slopes may include the following measures depending on the steepness of the slope and other field conditions:

- dewatering of the slope and working area using trench drains, berms, riprap, side hill low-point drains, water bars, water stops (trench breakers), and hard armor, especially along the toe of slopes;
- excavation and regrading of soils in steep slopes areas;
- installation of the pipeline within bedrock;
- minor route adjustments to avoid landslide prone areas that may be identified during construction; and
- slope monitoring utilizing LiDAR imagery during operation of the pipeline installation and monitoring utilizing strain gauges, where necessary on the pipe during operation.

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14 See Attachment DR4 Geology 15 (accession number 20170217-5199) for documented examples of proposed MVP landslide mitigation measure efficacy.

Additional mitigation measures to be used on both steep perpendicular and side slopes include:

- buttressing;
- reinforced soil slope;
- rock fall protection; and
- soil-nail stabilizations.

Construction along side slopes would utilize the following measures in addition to the measures identified above:

- use transvers trench drains, cutoff drains, or similar to direct water from seeps and springs out of the pipeline ditch;
- exclude organic material, frozen material, and rocks lager than 3 inches in diameter in backfill;
- limit backfill operations to times when soil moisture is suitable for compaction;
- place backfill material in compacted lifts not more than 12 inches thick;
- repair any ground fractures that form near temporary cut-and-fill surfaces to prevent water infiltration; and
- recontour all streams, gullies, natural drains, field roads, or trails, such that the right-of-way does not provide preferential flow.

We received a number of comments regarding steep slopes and the potential for landslides in areas of rugged terrain that would be crossed by the MVP. Mountain Valley has committed to certain BMPs for steep side slopes but not steep slopes perpendicular to the slope contour. Additionally there are several industry BMPs that could further reduce the potential for landslides in steep slope areas. Due to these concerns and the high potential for landslides and soil slips along the MVP **we recommend that**:

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, for review and written approval by the Director of OEP, a revised *Landslide Mitigation Plan* that includes the following BMPs and measures:**

  a. describe methods that would ensure backfill, compaction, and restoration activities occur only during suitable soil moisture content conditions for steep (greater than 15 percent) slopes perpendicular to the slope contour, not just for steep (greater than 15 percent) side slopes;

  b. as identified for steep side slopes, place backfill material in compacted lifts no greater than 12 inches thick and compact using an excavator bucket, sheep's foot, roller, or similar for all steep slopes;

  c. geotechnical personnel that would be employed and onsite to prescribe additional mitigation measures for steep slopes should have regional experience for constructing in and mitigating steep slopes and associated hazards; and

d. **monitoring of all landslide hazard areas identified within this EIS in addition to any hazard areas identified during construction using the methods prescribed for the Jefferson National Forest.**

There is the potential for debris flow along the Kimballton Branch between MPs 195.7 and 195.8, triggered by pipeline construction. In this area, Mountain Valley would employ an engineering geologist or geotechnical engineer to observe trench materials and to conduct and evaluate the Kimballton Branch crossing. Based on these observations Mountain Valley would determine the need for a minor route adjustment or other mitigation measures, which may include drains, soil reinforcement, and other measures.

Mountain Valley would use specialized construction techniques on steep slopes, including cut-and-fill two-tone grading and winches to stabilize equipment. Mountain Valley would employ geotechnical inspectors who would conduct daily inspections during construction in areas of potential subsidence or landslide concern. Technical experts would be onsite during construction in areas of steep slopes and would be hired based on target skill sets. Mountain Valley would conduct additional analysis of a work area should an inspector document tension cracks, slumping, erosion, or seeps during construction or restoration. A geologist or geotechnical engineer would determine the need for additional slope monitoring in areas of previous landslides in proximity to the MVP and at areas where some uncertainty remains regarding landslide risk. At a minimum, monitoring and inspections would follow the schedule provided in table 4.1.2-1 below.

TABLE 4.1.2-1

Natural Gas Pipeline Maximum Inspection Interval

Class Location of Line	At Highway and Railroad Crossings	At All Other Locations
1	7.5 months; but at least twice each calendar year	15 months; but at least once each calendar year.
2	4.5 months; but at least two times each calendar year	15 months; but at least once each calendar year.
3	4.5 months; but at least four times each calendar year	7.5 months; but at least twice each calendar year.

Note: Methods can include walking, driving, flying, or other means of traversing the right-of-way. These inspections would be conducted by appropriate personnel for the entire pipeline route.

Monitoring in landslide hazard areas along the pipeline route following construction and restoration would be a key element in providing a safe operational lifetime for the pipeline. Mountain Valley would implement an operational monitoring program to verify slope stability and provide Mountain Valley with early-warning detection of subtle ground movement that could indicate incipient slope failure. Mountain Valley would conduct semiannual aerial LiDAR monitoring during an initial 2-year period following construction for high-hazard landslide potential areas particularly those areas within close proximity to the GCSZ along Peters Mountain, Sinking Creek Mountain, Brush Mountain, and along the Kimballton Branch in the Jefferson National Forest (see section 4.1.2.8) to confirm that land restoration/reclamation is established, and that slopes are stable through two freeze-thaw cycles.

If it is found that slopes are stable as demonstrated by sequential LiDAR monitoring for the initial 2 years, the frequency of LiDAR surveys would be reduced to annually for another 2 consecutive years, providing six LiDAR monitoring events over a span of 4 years in order to detect potential subtle slope movement. If slopes remain stable following the 4 sequential years of monitoring, then the frequency of LiDAR surveys would be reduced to a five-year period for the lifetime of the pipeline.

Evaluation and comparison of sequential LiDAR surveys would produce a record of slope movement over time. If slope repairs are required, Mountain Valley would remediate the area per the landslide inspection team's recommendations, and restart the six-month/annual/five-year monitoring frequency to document that slope stability is achieved.

The WVDEP has requested that Mountain Valley use enhanced BMPs and bleeder drains on slopes greater than 3:1 and in slip prone areas due to conditions made within its WQC.

We received several comments regarding compounding hazards with regards to landslides, karst, near surface drainage, and seismicity. As discussed above seismic events that could potentially occur in Virginia and West Virginia would not be of such a magnitude to solely pose a hazard to the pipeline. While seismic events have the potential to trigger landslides and other earth movements the mitigation measures discussed above involve reducing other landslide risk factors by dewatering, re-contouring, and stabilizing potential landslides areas. Similarly, in karst areas where there is a high potential for seeps and springs to occur, mitigation would involve removing water from the pipeline right-of-way and trench to prevent saturation of soil. The measures discussed above, minor route changes, monitoring of pipeline construction by geotechnical professionals, and periodic operational inspections would mitigate compounding hazards.

Due to a number of public comments regarding pipeline integrity and safety in landslide hazard areas and since monitoring in landslide hazard areas is a key element to providing safe operation of the pipeline over its lifetime we have included a recommendation above that Mountain Valley revise its *Landslide Mitigation Plan* to include additional monitoring and LiDAR data collection.

Upon completion of construction, Mountain Valley would restore the disturbed area to the original contours and conditions to the extent possible. Additionally, Mountain Valley would use hydro seeding or erosion control blankets instead of mulch in steep slope areas to improve revegetation.

We received several comments regarding the effect of the freeze-thaw cycle and how it could potentially affect landslide prone areas along the MVP. The freeze-thaw cycle is mostly associated with creep an extremely slow movement of land down slope that occurs within the frost depth. The frost depth can be as deep as 3 feet in the northern reaches of the MVP. Creep alone would not pose a hazard to the pipeline. Inspections of the project post-construction would allow areas of creep to be identified and remediated.

Equitrans Expansion Project

All of the EEP facilities would be constructed in areas of high susceptibility to landslides. The EEP pipeline segments would be close to 11 previous landslides, 3 of which would be within the construction workspace (USGS, 1979). Steep slopes that would be crossed by the EEP pipeline routes include 3.0 miles of slopes ranging from 15 to 30 percent, and 0.3 mile of slopes greater than 30 percent.

Equitrans has routed its pipelines to avoid areas of probable rock falls. Geotechnical engineers would be employed to inspect the right-of-way in areas of steep slopes and provide construction recommendations.

Equitrans has also developed a *Landslide Mitigation Plan*[15] that identifies areas of landslide concern along the EEP facilities, mitigation measures for areas of concern, and monitoring. In total, there are 11 areas of landslide concern, 4 along the H-316 pipeline and 7 along the H-318 pipeline. Equitrans evaluated areas of concern through desktop review of publically available materials and further conducted field reviews in March and April of 2017. The majority of these areas of concerns are associated with previous landslides, previously mined areas, and steep side slopes. The *Landslide Mitigation Plan* lists the following potential mitigation measures:

- regrading or excavating upgradient soils to create a more stable slope;
- installing the pipeline within a bedrock trench which would protect the pipeline from surficial flows;
- using drains to direct subsurface water away from the potentially unstable slope.
- using typical erosion control and stormwater BMPs such as berms, rock outlet protection, side hill low-point drains, trench drains, water bars, trench breakers, and hard armor;
- rerouting to avoid landslide prone areas identified during construction;
- buttressing using earth rock, or riprap in front of an unstable slope;
- using multiple layers of geogrid or other geo-synthetics between compacted lifts to decrease the potential for slope movement;
- fencing for rock fall protection; and
- using soil-nail stabilization to stabilize steep slopes or safely over steepen slopes if needed.

Construction would be monitored by geotechnical personnel. In areas where previous landslides would be in close proximity to the EEP or where some uncertainty remains about a slopes stability slope monitoring would be conducted. The type of monitoring and requirements of the monitoring would be established for each location depending on the nature of slope and/or instability following construction. Equitrans has also provided site-specific mitigation measures for the 11 areas of landslide concern identified along the H-316 and H-318 pipelines. The site specific mitigation measures are available in section 7.0 of *Equitrans' Landslide Mitigation Plan*.

[15] Equitrans' *Landslide Mitigation Plan* can be found in their May 5, 2017 filing accession No. 20170505-5038

The *Landslide Mitigation Plan* also lists side hill construction measures that would be used for steep side slopes including:

- using transverse trench drains, cutoff drains, or similar;
- excluding organic material from backfill and rocks larger than 3 inches in diameter;
- performing back fill procedures when soil moisture is suitable;
- placing backfill material in compacted lifts no greater than 12 inches;
- compacting backfill with an excavator buckets, sheep's foot, roller, or similar;
- repairing ground fractures that form near temporary cut-and-fill surfaces to prevent water infiltration; and
- recontouring streams, gullies, natural drains, field roads, trails, or other water conveying features to protect the permanent right-of-way from water accumulation and infiltration.

Prior to construction, Equitrans would conduct surveys to identify seeps along the pipelines. During construction, water from seeps would be diverted away from the trench and working areas.

Equitrans would use the following construction methods to prevent hazards posed by landslides:

- use of temporary slope breakers, trench breakers, silt fence, super silt fence, and other erosion control devices to reduce erosion and direct water off of the right-of-way;
- installation of underdrains in the areas of seeps;
- installation of permanent slope breakers;
- stabilization of spoil piles;
- restoration of original contours as practicable; and
- reseeding and vegetation of the right-of-way as soon as practicable following the completion of construction.

4.1.2.5 Karst Terrain

Mountain Valley Project

Karst features, such as sinkholes, caves, and caverns, can form as a result of the long-term action of groundwater on soluble carbonate rocks (e.g., limestone and dolostone). The risk of the development of sinkholes along the pipeline is relatively high between about MPs 172 and 239. Mountain Valley has developed a *Karst Hazard Assessment* identifying karst features and hazards in the project area and measures for crossing those features. Mountain Valley would deploy a karst specialist to evaluate areas of potential karst prior to and during construction.

Mountain Valley has also developed a *Karst Mitigation Plan*, which details inspections that would take place during construction, procedures for unanticipated karst discoveries, mitigation options for karst features encountered during construction, and procedures for coordination with state agencies. Mountain Valley has committed to monitoring existing karst features as well as assessing and continuing to monitor unmapped/unknown karst features. If a significant previously unknown karst feature is discovered during construction Mountain Valley would first attempt to avoid the feature through minor route changes before attempting to stabilize and mitigate any discovered features.

The *Karst Mitigation Plan* outlines inspection criteria for known karst features in proximity to the right-of-way as well as those identified during construction. If a karst feature is identified, Mountain Valley would conduct a weekly Level 1 inspection and document soil subsidence, rock collapse, sediment filling, swallets, springs, seeps, caves, voids, and morphology. If any changes are identified during the weekly Level 1 inspection Mountain Valley would then conduct a more in-depth Level 2 inspection. A Level 2 inspection would include visual assessment, geophysical survey, track drill probes, infiltration, or dye tracing. If a feature is found to have a direct connection to a subterranean environment or groundwater flow system, Mountain Valley would work with the karst specialist and appropriate state agencies to develop mitigation measures for the karst features.

Mountain Valley's *Karst Mitigation Plan* also provides measures for mitigation of karst features such as sinkholes. Mitigation of sinkholes would for example involve reverse gradient backfilling of the sinkhole to stabilize the sinkhole from collapse, while maintaining groundwater recharge function of the feature. If larger or more continuous (coalescing) karst features or a cave is identified during construction, the karst inspector would coordinate with the appropriate state agencies regarding mitigation and/or avoidance of the discovered feature. Mountain Valley modeled the pipeline's ability to span a sinkhole. According to Mountain Valley, a pipe with a wall thickness of 0.7 inch (the minimum that would be used in a karst area), could span a sinkhole from 57 feet, with 10 feet of cover, to 145 feet with 3 feet of cover. Mountain Valley would use thicker Class 2 pipe in all karst areas.

Mountain Valley has prepared *Karst-specific Erosion and Sediment Control Plans*[16] for West Virginia and Virginia. These plans identify the BMPs and mitigation measures that would be used in karst areas crossed by the MVP. The BMPs for karst areas would include, but are not limited to, the following:

- minimizing construction-related storm water runoff;
- preventing uncontrolled release of storm water or sediment to karst features;
- installing a double line of sediment control fencing and straw bales up gradient of karst features;
- stock piling trench materials a minimum 100 feet from waterbodies.
- refueling and maintaining construction equipment at least 100 feet from a waterbody or karst feature;
- limiting the removal of riparian vegetation;
- using trench breakers along the trench to prevent subsurface flow; and

[16] These plans can be found in Mountain Valley's February 26, 2016 supplemental filing (accession number 20160226-5404).

- prohibiting the use of fertilizers, herbicides, and pesticides within 100 feet of a waterbody or karst feature.[17]

As part of Mountain Valley's 401 WQC for West Virginia the WVDEP has conditioned Mountain Valley to provide an enhance karst management plan, which would, at a minimum, include provisions for:

- a pre-plan meeting with the WVDEP to discuss agency expectations;
- access to the final right-of-way and access road areas for WVDEP staff to conduct inspections;
- field reviews with WVDEP Division of Water and Waste Management staff;
- the identification of all karst features that would be within, or receive drainage from access roads and right-of-way;
- depictions of karst drainage patterns;
- use of construction designs that would minimize disturbed areas, and temporal disturbances;
- avoidance of construction during wetter times of the year;
- typical construction drawings for mitigation of encountered unanticipated karst features;
- mitigation measures to be used if a water supply's quality is affected;
- mitigation measures to be used if a water supply's quantity is diminished or lost; and
- re-examination of setback distances for equipment storage and fueling areas.

Mountain Valley has developed procedures that it would follow should blasting be required to construct the MVP in karst terrain. These procedures, contained in Mountain Valley's *General Blasting Plan*, include:

- exploring all other reasonable potential means of excavations;
- employing karst specialists during blasting activities in karst areas;
- obtaining federal, state, and local authority approval prior to blasting;
- inspecting excavated areas for voids and remediating voids (karst features) prior to blasting; and
- using low force charges designed to only affect the rock to be removed.

Mountain Valley has committed to monitor once per week and following rainfall events where precipitation of 0.5 inch occurs in a 24-hour period during the revegetation of the right-of-way. Mountain Valley would also conduct post-construction monitoring for any subsidence or karst hazards. Monitoring would be conducted as per the guidance provided in 49 CFR 192.705 (see table 4.1.2-1).

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[17] Mountain Valley does not propose the wide-scale use of pesticides and/or herbicides in karst areas, but would consider them for localized use, only after a request from a landowner or land management agency. However, in the case of any request, Mountain Valley would not apply fertilizers, herbicides, and pesticides within 100 feet of a waterbody or karst feature.

Because monitoring is a key element to providing safe operation of the pipeline over its lifetime, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, for review and written approval by the Director of OEP, a revised *Karst Mitigation Plan* that includes monitoring of all potential karst areas for subsidence and collapse using the same LiDAR monitoring methods and procedures currently proposed to monitor for earth movements at landslide hazard areas within the Jefferson National Forest. LiDAR data should be provided in a form that is conducive to comparison of repeat surveys, such as a Digital Elevation Model or Digital Terrain Model.**

Stakeholder comments included the filings of geological reports (Kastning, 2016; Jones, 2016) which state that the degree of subsurface karst interconnectivity clearly shows the project's potential to impact water quantity and quality to area groundwater users (springs and wells); to negatively impact caves and cave fauna, as well as surface water during pipeline construction through mature karst areas. Commenters state that the presence of the pipeline during its operational life would provide for long-term vulnerability to groundwater contamination due to the potential for spills and/or releases that may occur from a pipeline rupture caused by increased rates of corrosion due to oxygenated recharging groundwater flowing preferentially along the completed backfilled trench line. Comments provided further suggest that the pipeline trench would function as a "zone of low hydraulic head" effectively acting as an interceptor trench that would preferentially "shunt" shallow groundwater flow into and along the trench increasing the likelihood of subsidence, collapse and pipeline failure.[18] Groundwater is further addressed in section 4.3.

Dr. Ernst Kastning prepared a geologic report on behalf of Protect Our Water, Heritage, Rights (The POWHR Coalition), that stated that Mountain Valley's proposed BMPs through karst areas are inconsistent with industry standards, and suggested that Mountain Valley should review his publications for information pertaining to karst environments (Kastning, 2016). We reviewed Dr. Kastning reports, together with many of his cited sources, as part of our environmental analysis of karst and other geologic hazards in the project area. Some of Dr. Kastning's publications are informative regarding the development, hydrology, and ecology of karst systems, particularly those systems developed in the belt of folded and faulted bedrock characteristic of Appalachian terrain. Dr. Kastning and other commenters claim that large diameter natural gas pipelines have never been installed in karst terrain in this region, and such pipelines are not capable of being safely supported in the fragile karst environment characteristic of the project area.

In the Appalachian Mountains of West Virginia and Virginia, existing pipelines that cross karst terrain include the Columbia and East Tennessee natural gas pipeline systems. In the southeast portion of the United States, a large diameter natural gas pipeline is currently being constructed, without major compliance issues, through 259 miles of potential karst terrain, some

18 For an example see Giles and Roanoke Counties' submittal of Mr. Paul Rubin's assessment at accession number 20161222-5458.

of which is highly developed and mature in southern Georgia and northern Florida, and which is underlain by the Floridan Aquifer system.

Specific to karst in Georgia and Florida, PHMSA regulates about 4,560 miles of natural gas transmission line in Georgia and 5,400 miles of natural gas transmission line in Florida. In addition, Georgia and Florida have about 83,200 miles and 40,500 miles of natural gas distribution pipeline, respectively. Many miles of these pipeline facilities have operated for decades in karst sensitive areas in both Georgia and Florida without reported earth movement incidents. We also contacted the PHMSA and pipeline safety representatives from the Georgia Public Service Commission and Florida Public Service Commission and none of these individuals were aware of any pipeline incidents related to sinkholes or other karst activity in their respective jurisdictions.

Of the 27 Virginia counties that contain karst features, 20 of them (74 percent) appear to have at least one existing natural gas transmission pipeline that traverses the county and is likely located on karst. Virginia law (the Virginia Cave Protection Act, Code of Virginia Section 10.1-1000 to 1008) protects caves and cave communities from disturbance, vandalism, and pollution; however, there is no corresponding state law that addresses or restricts construction within karst terrain (Virginia Cave Board, 2017). Also, DOT regulations do not specifically address pipeline design and construction in karst terrain.

In order to characterize the potential for karst to affect construction and the operational integrity of the MVP pipeline, we reviewed PHMSA natural gas pipeline incident data for Virginia and West Virginia. Incident reporting to PHMSA has changed over the years, and several datasets exist from 1970 to present. From 1970 to 1984, there were a total of 53 reported incidents that were categorized as “damage by earth movement” sub-categories “subsidence” and “other.” Note that for these records it is not indicated if the subsidence was due to karst and no narrative describing the incident exists for this timeframe. From 1985 to 2001, three records were identified as “damage by outside force,” “earth movement,” sub-categories “subsidence” and “other.” From 2002 to 2009 there was one record identified as damage caused by “natural forces,” “earth movement,” subsidence. From 2010 to present, only one record was identified as due to “natural force damage,” “earth movement,” not due to heavy rains/floods. All of the records identified were within West Virginia and none of the narratives, when they were available, described the incidents as being attributed to karst feature collapse (PHMSA, 2016).

In March 2017, Mountain Valley filed the results of their ongoing surface geophysical investigation between MPs 221.8 and 227.2 south of the Pulaski Fault within the Mount Tabor Sinkhole Plain; and additionally filed the results of their fracture trace/lineament analysis, as requested by the Commission. We received comments regarding Mountain Valley’s geophysical analysis, and fracture trace/lineament analysis, that were supportive, but which pointed out the presence of additional lineaments that correlated with existing karst features (Draper Aden Associates, 2016; 2017a; 2017b). These data, along with existing dye trace studies conducted within the Mount Tabor Sinkhole Plain, showed correlation and connectivity of bedrock fractures and lineaments with karst development (sinkholes), and defined subsurface groundwater flow directions within subsurface karst toward Slussers Cave and Old Mill Cave. As discussed above in section 4.1.1, Mountain Valley has characterized groundwater flow in proximity to karst features within the Mount Tabor Sinkhole Plain.

We agree that mature karst systems are characteristic of a subsurface interconnected flow system that may allow for the rapid transport of contaminates including sediment over large distances; can impact groundwater users (wells and springs) over a large area; and which the direction of groundwater flow to these users cannot be generally inferred from surface topography. We address groundwater concerns above and in section 4.3.

Compounding hazards from weak soils, groundwater, karst terrain, and seismicity would be mitigated by the measures identified for landslides, erosion, and steep slopes above, in addition to utilizing appropriate pipeline design such as using thicker-walled pipe in areas of potential seismic, landslide, and subsidence hazards. Mountain Valley would employ engineering geologists, geotechnical engineers, or other specialists, depending on the hazard, to monitor construction in areas where hazards have been identified and provide construction recommendations and mitigation measures including minor route adjustments, should they be required.

Equitrans Expansion Project

No karst terrain has been identified along the EEP pipelines.

4.1.2.6 Shallow Bedrock and Blasting

For both the MVP and the EEP, if shallow bedrock is encountered during construction, the Applicants would first attempt to rip the bedrock. If the bedrock is deemed to be unrippable, other methods of bedrock removal, such as rock trenching machines, rock saws, hydraulic rams, jack hammerers, or blasting would be considered.

Mountain Valley Project

Blasting would only be used in areas of shallow bedrock after all other means of trench excavation have been considered. In addition, Mountain Valley would not conduct blasting in karst areas without a karst specialist and approval of the karst blasting plan by federal, state, and local agencies.

In order to minimize potential impacts from blasting, Mountain Valley would comply with all federal, state, and local regulations for blasting. On February 9, 2017, Mountain Valley filed a revised *General Blasting Plan*, that describes the measures and BMPs it would implement during pipeline construction to reduce and mitigate impacts from blasting. The measures in Mountain Valley's *General Blasting Plan* were developed in accordance with the U.S. Department of Justice (2012), in addition to applicable West Virginia and Virginia regulations. As outlined in the *General Blasting Plan*, Mountain Valley would:

- limit the charge size and stagger charge detonations;
- use heavy mats or other suitable cover to prevent the scattering of debris;
- use seismograph equipment to monitor the velocity of the blasts at select monitoring locations including closest adjacent facilities;
- conduct pre-and post-blast testing and inspections of wells and structures;

- man valves at adjacent pipelines in case of an emergency arising from nearby blasting activities;
- notify residents and owners of structures within 150 feet of blasting activities a minimum of 24 hours before blasting activities would begin;
- notify the COE or FS regarding blasting that would occur within 0.25 mile of COE or FS property;
- use warning signals, flags, and barricades;
- conduct pre-blast and post-blast surveys at locations within 150 feet of the blasting activity; and
- use excess rock from blasting to restore the right-of-way, placed as per landowner agreements, or hauled offsite to an approved disposal site.

In addition, Mountain Valley's *General Blasting Plan* requires the blasting contractor to also prepare a site-specific blasting plan that includes site-specific details and blasting procedures. Mountain Valley would investigate damage claims associated with blasting and would repair or mitigate damage through agreements with landowners. See section 4.3.1 for a discussion of pre- and post-construction testing of drinking water supplies. If any wells/springs or spring are damaged from blasting activities Mountain Valley would repair or compensate the affected landowner.

Equitrans Expansion Project

Equitrans does not anticipate that blasting would be needed to construct the EEP. About 1 mile of shallow bedrock exists along the EEP. Equitrans would use rock trenching machines, rock saws, hydraulic rams, and jack hammerers to remove bedrock. Should blasting be required, Equitrans would provide a blasting plan to the FERC for review and approval prior to any blasting activities. Excess rock from blasting activities would be disposed of within the right-of-way as approved by the landowner, or excess rock would be taken to an approved offsite landfill.

4.1.2.7 Paleontology

Mountain Valley Project

Although the discovery of a significant paleontological resource is unlikely, Mountain Valley would train EIs on how to respond to the discovery of a paleontological resource. Should a significant paleontological resource be discovered during construction of the MVP, Mountain Valley would follow the procedures provided in its *Plan for Unanticipated Discovery of Paleontological Resources*. Mountain Valley would stop work and notify the WVGES or the VADMME.

Equitrans Expansion Project

No fossil occurrence records were identified along the EEP pipeline routes. As such, impacts on paleontological resources from the EEP are not anticipated.

4.1.2.8 Jefferson National Forest

Seismicity

The MVP would cross the Jefferson National Forest within the GCSZ. The GCSZ is a seismically active area known for small local seismic events and one historic quake that took place in 1897 before modern seismic monitoring equipment but was estimated to be magnitude 5.8 (Bollinger et al., 1988).

There is potential for an earthquake to occur during the decades of operation and maintenance of the MVP. As stated in section 4.1.2.4, the MVP would be able to withstand probable seismic events that may be encountered in the project area. Specifically the MVP would be designed according to 49 CFR 192 Subpart C, ASME B31.8-2014 Paragraph 840, and PRCI – Guidelines for the Seismic Design and Assessment of Natural Gas and Liquid Hydrocarbon Pipelines which includes procedures and guidelines for quantifying seismic hazards, pipeline performance criteria, pipeline analysis procedures, and potential mitigation options with regards to pipeline design.

Flooding and Other Stream Hazards

Flooding and other stream hazards can impact pipeline stream crossings. Hazards including erosion of stream banks, movement of bedload, flooding, scour, aggradation, degradation, channel shifting and relocation; debris flows, and streamside landslides. Some stream channel changes are sudden and major due to a flood, landslide, or debris flow; some changes are gradual and cumulative due to natural channel processes over decades and centuries. Streams where flooding and other hazards are present are found along the pipeline route at Craig Creek; at the tributaries to Craig Creek between MPs 218.8 and 219.2 and MPs 219.9 and 213.0; and at the tributary to Kimballton Branch at MP 197.8. As discussed in section 4.1.2.3, aggregate sacks would be used in potential flood zone areas to prevent buoyancy of the pipeline due to flooding or soil liquefaction.

Karst Terrain

The USGS map *Karst in the United States: a Digital Map Compilation and Database* suggests that there is potential for karst features to occur on the south side of Peters and Sinking Creek Mountain as shown in figure 4.1-5 (Weary and Doctor, 2014). However, no karst features were identified within these areas during Mountain Valley's *Karst Hazard Assessment*.

Blasting

Mountain Valley has stated that only minimal blasting is expected for construction within the Jefferson National Forest. As stated in section 4.1.2.7, Mountain Valley would comply with all federal, state, and local regulations for blasting and has developed a *General Blasting Plan* summarizing the measures that would be implemented during construction.

Mines and Acid Producing Rocks

There are no known mines or acid producing rocks on the proposed pipeline route within the Jefferson National Forest. If acid producing rocks are encountered, Mountain Valley would coat the pipeline with a fusion bonded epoxy which would prevent any damage or deterioration of the pipeline from acid rock drainage. Mountain Valley would also use specific mitigation measures for acid producing bedrock as discussed in section 4.1.2.1.

Paleontology

Although the discovery of a significant paleontological resource is unlikely in the Jefferson National Forest, Mountain Valley would train environmental inspectors on how to respond to the discovery of a paleontological resource. Should a significant paleontological resource be discovered during construction of the MVP, Mountain Valley would follow the procedures provided in its *Plan for Unanticipated Discovery of Paleontological Resources*. Mountain Valley would stop work and notify the FS and the VADMME or the WV Geologic and Economic Survey. If a paleontological discovery is made within the Jefferson National Forest, the FS must make certain that measures are implemented that comply with the Antiquities Act of 1906 and the Paleontological Resources Preservation Act of 2009.

Landslides

Potential Project Effects

Natural landslides present a risk to public safety, infrastructure, and natural resources within the Jefferson National Forest. During operation of the MVP, a landslide would have the potential to damage sections of the pipeline.

Potential natural landslides in the project area include a variety of mass movements such as debris slides, debris flow, rockslides, and slumps. Some landslides develop and move slowly and cause damage progressively over a period of many years. Some landslides move rapidly, thus causing sudden damage. Intense rainstorms are the most likely source for rapid landslides such as debris flows. Debris flows (also referred to as mudslides, mudflows, or debris avalanches) are a common type of fast-moving landslide that generally occurs during intense rainfall in mountainous terrain. Strong earthquakes can also trigger landslides. The project is in the Pembroke Fault Zone, a seismically active area. Strong earthquakes are relatively rare occurrences, but have the potential to trigger shallow and deep-seated landslides over a wide area, and could damage the pipeline.

The pipeline route on south flank of Sinking Creek Mountain crosses one of the large bedrock landslides mapped by Schultz (1993). These landslides occurred thousands of years ago. The large bedrock landslides are enormous, massive blocks of bedrock that are unlikely to be moved or destabilized as a result of the shallow excavations for the pipeline project. However, this area would be further evaluated as part of Mountain Valleys *Landslide Mitigation Plan*.

Although many types of landslides occur throughout the southern Appalachian Highlands, debris flow is the dominant landslide process in Virginia and North Carolina (Wooten et al., 2015). Debris flows move rapidly downslope and are capable of damaging or destroying everything in their path. A typical debris flow pathway consists of an upper initiation site or source area, a main path down a slope and then into and down a stream channel, and then a lower depositional area or run out zone on an alluvial fan at the base of the mountain.

One overarching factor and driver of potential slope instability is the steepness of the slopes along the construction right-of-way (slope angle or slope gradient or slope grade). Slope percent classes (0-15 percent, 15-30 percent, greater than 30 percent) are used to indicate relative hazard of cut-and-fill slope instability along the pipeline route on the Jefferson National Forest. Table 4.1.2-2 list by milepost the slopes between 15 percent and 30 percent and the slopes greater than 30 percent along the MVP pipeline route on the Jefferson National Forest.

TABLE 4.1.2-2

Steep Slopes along the MVP Pipeline Route on the Jefferson National Forest

Start MP	End MP	Miles Crossed	Grade (%)	Max Slope (%)	Min Slope (%)	Mountain Flank (N)orth or (S)outh
196.2	196.7	0.3	>30	42.6	16.3	N/S flank Peters Mtn.
196.7	196.9	0.2	15-30	-27.6	15.1	S flank Peters Mtn.
196.9	197.0	0.1	>30	42.8	16.0	S flank Peters Mtn.
197.0	197.1	0.1	15-30	-27.1	-15.6	S flank Peters Mtn.
197.2	197.3	0.1	>30	31.7	15.7	S flank Peters Mtn.
197.4	197.5	0.1	15-30	-25.5	-15.1	S flank Peters Mtn.
197.5	197.8	0.3	>30	32.0	15.0	S flank Peters Mtn.
218.5	218.6	0.1	>30	-64.9	-30.4	S flank Sinking Creek Mtn.
218.6	219.1	0.5	>30	53.5	15.9	S flank Sinking Creek Mtn.
219.8	219.4	0.1	>30	-34.0	-17.7	N flank Brush Mtn.
219.9	220.0	0.1	>30	45.8	16.0	N flank Brush Mtn.
220.1	220.2	0.1	15-30	22.0	16.0	N flank Brush Mtn.
220.2	220.3	0.1	15-30	20.5	16.5	N flank Brush Mtn.
220.3	220.7	0.4	>30	44.5	16.3	N flank Brush Mtn.

Mtn. = Mountain

There is evidence of slope instability on both the north and south sides of Peters Mountain. Potential landslide hazards are indicated by the CGV pipeline construction in 2014 on the Jefferson National Forest about 5 miles southwest of the proposed MVP pipeline. The proposed MVP pipeline is in a similar geologic setting on Peters Mountain as the CGV pipeline.

Topographic position can indicate the relative hazard risks of natural landslides to the MVP pipeline within the Jefferson National Forest. Ridgeline or valley bottom would account for 2.0 miles of pipeline route crossed, while side slopes would account for the remaining 1.4 miles. Ridgeline or valley bottom topographic position is associated with a lower relative hazard while side slopes are associated with a higher relative hazard. For example, on the north flank of Brush Mountain the entire length of the proposed pipeline route is on a ridge descending from the top to the base of the mountain. This ridge location avoids the many hollows on the north flank of Brush Mountain.

In the southern Appalachian Highlands, historic debris flows have been noted in association with steep slopes in hollows high on a mountain. Debris slides/debris flows source areas that are a potential hazard to the MVP pipeline include: 1) steep colluvium-mantled side slopes, such as the slopes along or upslope from the corridor between the ANST crossing and Mystery Ridge in the Kimballton Branch watershed on Peters Mountain; and 2) steep colluvium-mantled hollows or drainages, such the steep headwater slopes upstream from the corridor crossing of intermittent stream on south flank of Sinking Creek Mountain.

There is a natural landslide hazard for debris flows to occur on the steep slopes in the Kimballton Branch watershed. Construction of the MVP pipeline, especially in the area between the ANST crossing and Mystery Ridge, would have two potential adverse effects on slope stability hazards in this area. First, the construction modified slopes would alter the natural surface and subsurface drainage in the areas of construction and in adjacent natural slopes along the pipeline. Changes in surface and subsurface drainage could increase pre-existing landslide hazard potential on natural slopes adjacent to the pipeline, and could create or contribute to failure of the natural slopes adjacent to the pipeline, and trigger a Kimballton Branch debris flow.

Secondly, the change from intact natural slopes to fill slopes of disturbed material placed on the steep slopes in this area would be a new and separate source for a potential Kimballton Branch debris flow. Debris flows initiated high on a mountain have a "snowball effect" that increases the debris flow volume and destructive power as it gouges downslope scraping off and incorporating colluvium, weathered bedrock, trees, stream banks and bedload (Collins, 2008). Construction of the MVP pipeline has the potential for these two types of adverse effects on slope stability hazards, to varying degrees, at other locations along the proposed route on the Jefferson National Forest.

The potential Kimballton Branch debris flow would be a risk to public safety and property on non-federal land along Kimballton Branch down to the junction with Stony Creek. In addition to the risks to public safety from the debris flow itself, the debris flow could damage the MVP pipeline at the crossing of Kimballton Branch. Other infrastructure at risk from such a debris flow event would be Forest Service Road 972 crossing of a Kimballton Creek. In a major debris flow, the road crossing likely would be affected.

The construction and operation of the MVP (pipeline and related facilities such as access roads) may result in unstable slopes that could result in cut slope failures or fill slope failures. Cut slopes and fill slopes are discussed above in section 4.1.1.

Fill slopes, especially inadequately constructed and maintained fill slopes, are a potential source of debris flows (Collins, 2008; Wooten et al., 2015). Based on the assessment by the FS, the MVP (pipeline and related facilities such as access roads) could result in fill slope failures which become debris flows that damage not only the pipeline corridor but also the slopes and stream channels hundreds or thousands of feet downslope from the corridor.

Cut slope or fill slope failures pose a risk to pipeline construction workers, the public, and natural resources within the Jefferson National Forest. If cut slope or fill slope failures resulted in a debris flow that traveled out of the pipeline corridor and downslope, it could result in sedimentation into stream channels. Such debris flows could also pose a risk to public safety, property, and infrastructure on and off the National Forest. Cut-and-fill slopes can be designed for slope stability by taking into account slope percent and other engineering geology and geotechnical engineering factors such as the orientation of the bedrock surface as well as geologic structure.

Another key factor in slope stability of the project area is the geologic control and influence of bedrock structure on mountain side slope stability. The south flank of Sinking Creek Mountain is a dip slope where the sedimentary bedrock layers are tilted downslope. When excavation into a dip slope removes support from the downslope tilted bedrock layers, the resulting cut slope may be prone to rockfall and rockslides as well as failure of the colluvium overlying the bedrock. The south flank of Peters Mountain also includes dip slopes, and the geology is complicated by thrust faults crossing the south flank including the Mystery Ridge area. The north flanks of Brush Mountain and Peters Mountain are anti-dip slopes (scarp slopes) which form steep slopes in a direction opposite to the dip of sedimentary bedrock layers. Engineering geologic and geotechnical engineering evaluations would consider these geologic structures for slope stability design of cut slopes and fill slopes.

The location of much of the corridor on the Jefferson National Forest along ridges perpendicular to slope contours is a preferred strategy for reducing the potential for natural landslides to damage the pipeline, and for reducing potential for cut slope and fill slope failures. However, even with this strategy on ridges, there remains the potential for fill slope instability on steep-sloping ridges and narrow ridges such as above the 2,300-foot amsl elevation on the ridges on the north flank of Brush Mountain. The fill slope failure hazard is increased when the corridor is on side slopes rather than ridges, for example, on the side slope part of the corridor on the south flank of Peters Mountain between the ANST crossing and Mystery Ridge, or the side slopes on Sinking Creek Mountain. The CGV pipeline construction in 2014 that resulted in a 1) temporary spoils failure creating a debris flow with a sediment path one-half downslope into drainage below the corridor, and 2) restoration backfill failure on the Jefferson National Forest was on side slopes rather than ridges.

Forest Service Road 972 (Pocahontas Road) on the south flank of Peters Creek Mountain would be upgraded to improve access to MVP pipeline corridor. Construction has the potential to improve some aspects of the road such as road drainage and culvert replacement. However, the excavation for road widening to accommodate transport of large construction equipment has the potential to adversely affect stability of cut slopes and fill slopes. Slope percent classes 0-15 percent (1 mile would be crossed), 15-30 percent (3.8 miles would be crossed), and greater that 30 percent (1.4 miles would crossed) are used to indicate relative slope stability hazard along the 6.15 miles of Forest Service Road 972.

In addition, construction of the MVP would alter the natural surface and subsurface drainage in the areas of construction and in adjacent natural slopes along the pipeline and access roads. Changes in surface and subsurface drainage could increase pre-existing landslide hazard potential on natural slopes adjacent to the pipeline and access roads, and could create or contribute to failure of the natural slopes adjacent to the pipeline and access roads. The effect of seeps and drainage and the potential for landslides is further discussed in section 4.1.1 above.

Considering risks more generally along proposed pipeline route on the Jefferson National Forest, there are short-term and long-term risks. During construction, large volumes of excavated materials would be placed in temporary spoil piles or temporary storage areas and would be vulnerable to slope failures, including debris flows, triggered by rainstorms.

FS indicates that one of the challenges for slope stability of the MVP on the Jefferson National Forest would be the management, control and storage of the excavated material (loose, fragmented bedrock and soil, silt, sand, boulders and other unconsolidated material), especially the temporary spoils during construction and the restoration backfill after construction.

Upon the completion of construction, Mountain Valley would restore the disturbed area to the original contours to the extent possible (restoration backfill). Based on the assessment by the FS, the end result is that the pipeline corridor would contain long fill slopes extending hundreds or thousands of feet downslope and would have a potential for fill slope failures triggered by rainstorms during the decades of pipeline operation and maintenance and beyond. This potential includes the potential that some fill slope failures could result in debris flows. The risk to public safety, resources, and infrastructure would be long-term risks. In addition, project-induced slope failures in the pipeline corridor could damage the pipeline.

Measures to Reduce or Mitigate Impacts

As discussed in section 4.1.2.4, construction and operation of the MVP could result in alterations to geologic conditions affecting steep slope stability. Mountain Valley has developed an updated *Landslide Mitigation Plan* that includes the results of field inspections conducted in steep slope areas by a geotechnical engineer and which outlines the characteristics of the inspected slip prone areas, potential mitigation measures, including the use of thicker-walled pipe in slip prone areas. Table 4.1.2-1 above summarizes the intervals for inspections that Mountain Valley would conduct during operation of the pipeline. Mountain Valley would also monitor for potential rock block slides along the southeast slopes of Peters Mountain, Sinking Creek Mountain, and Brush Mountain by using LiDAR to evaluate slope characteristics and potential movement (see section 4.1.2.4).

On December 22, 2016, Mountain Valley filed its *Site-Specific Design of Stabilization Measures in Selected High-Hazard Portions of the Route of the Proposed Mountain Valley Pipeline Project in Jefferson National Forest*, based on field inspections as well as slope stability and pipeline integrity analysis. During construction, Mountain Valley would deploy a landslide inspection team to identify geohazards and to develop mitigation schemes using landslide mitigation typical drawings developed for the project. However, if subsurface conditions are not conducive to the use of these typical mitigation schemes, additional mitigation would be developed for specific site conditions found.

Mitigation measures for project-induced landslide hazards and natural landslide hazards are discussed in section 4.1.2.4 above. The mitigation measures are based on engineering geology and geotechnical engineering, and go far beyond surface erosion and sediment control, soil stabilization and revegetation which all are beneficial to slope stability and are part of the mitigation measures. Based on the assessment by the FS, general surface erosion and sediment control, soil stabilization, and revegetation would be insufficient to deal with the deep-seated conditions of slope stability and project-induced landslide hazards (cut-and-fill slope failures).

Mitigation measures would reduce but not eliminate the potential project-induced landslide hazards. Staff of the FS conclude that restoring a slope to original contour is not restoring a slope to original condition, though it may appear so and create a false sense of security. Further, FS staff believe that the MVP on steep slopes could result in permanent, irreversible alterations of geologic conditions affecting slope stability such as changes in the quantity, spatial distribution, and mass strength properties of unconsolidated materials overlying bedrock; excavating and remolding intact colluvium, residuum and bedrock and placing the material back on the slope as fill; temporary cuts for work space creating a potential slip surface for failure of overlying restoration fill; changes in surface and subsurface drainage; excavating bedrock and replacing it with fill and thus increasing the depth and quantity of unconsolidated materials overlying bedrock when the site is restored to original contour. A key mitigation measure would be a long-term monitoring plan with periodic inspections to detect early-warning signs of cut-and-fill slope instability that could progress to massive slope failure.

In areas of steep slopes and potential landslides, Mountain Valley would staff geotechnical personnel during construction to prescribe mitigation for hazards that may arise, and would employ site drainage, sediment and erosion control BMPs as needed to control water flow in the working area. Minor field route modifications to the pipeline route would be made if needed to maximize slope stability. Generally, landslide mitigation during pipeline construction and right-of-way reclamation would depend heavily on the installation of appropriate drainage and erosion control measures. Mountain Valley has also provided an updated *Landslide Mitigation Plan* that includes the results of field inspections conducted in steep slopes, slope evaluations, a discussion of red shale bedrock prone to landslides, outlines potential mitigation measures, maintenance and monitoring measures, sidehill construction procedures, site-specific discussion of hazards and mitigation for Peters Mountain, Sinking Creek Mountain, Brush Mountain, and the potential for debris flow along Kimballton Branch, and has provided site-specific design and stabilization measures in high-hazard portions of the route through the Jefferson National Forrest (see section 4.1.2-9). The updated *Landslide Mitigation Plan* and landslide mitigation measures including post-construction LiDAR monitoring for landslide prone areas in the Jefferson National Forest are discussed in detail above in section 4.1.2.

4.1.3 Conclusion

The MVP and EEP would traverse a range of geologic conditions and resources, including karst sensitive areas. We conclude that constructing and operating MVP and EEP facilities in accordance with its *Mining Area Construction Plan* (MVP), *Mine Subsidence Plan* (EEP), A*cid Forming Materials Mitigation Plan* (MVP), and *Plan for Unanticipated Discovery of Paleontological Resources* (MVP), would not result in a significant impact on mines, mineral resources, acid producing rocks, or paleontological resources.

To reduce the potential for seismic activity to affect its pipeline, Mountain Valley has committed to using thicker Class 2 pipe at specific locations. Mountain Valley would reduce the potential for impacts from landslide by following the measures outlined in its *Landslide Mitigation Plan* and Equitrans would employ the measures outlines in the its *Landslide Mitigation Plan*. Adherence to the Applicants' plans and our recommendations would effectively mitigate impacts from seismicity and landslides.

Mountain Valley would implement the measures outlined in its *Karst Mitigation Plan* to reduce the potential for subsidence when crossing karst terrain. With the implementation of the Applicants' BMPs, as well as our additional recommendations regarding karst topography and mines, we conclude that impacts on geological resources would be adequately minimized.

4.2 SOILS

4.2.1 Affected Environment

The soils crossed by the MVP and the EEP were identified and assessed using various data sources including the publically available SSURGO database. The SSURGO database is a digital version of the original county soil surveys developed by the USDA and the NRCS for use with GIS (USDA, 2015a). It provides the most detailed level of soils information for general natural resource planning and management. The attribute data within the SSURGO database provide the proportionate extent of the component soils and their properties for each soil map unit allowing for an evaluation of potential hazards and soil limitations along the MVP and EEP. The publically available SSURGO data adequately characterized soils and their associated limitations along the proposed MVP and EEP. The MVP would cross 357 different soil map units in Virginia and West Virginia, primarily loams that have a wide variety of characteristics. The EEP pipeline segments would cross 40 soil types, the majority of which are loams having a variety of characteristics. Appendix N identifies by milepost the specific soil units that would be crossed.

4.2.1.1 Soil Limitations

Several soil characteristics have the potential to affect, or be affected by, construction and operation of the projects. These soil limitations include erosion potential, prime farmlands, hydric soils, compaction prone soils, rocky/droughty soils, and poor revegetation potential.

Table 4.2.1-1 lists soil limitations for the MVP while table 4.2.1-2 lists soil limitations for the EEP. The analysis in this EIS is based on the content presented in Mountain Valley's[19] and Equitrans' summary soil impact tables.[20]

Soil limitations for the Jefferson National Forest lands are discussed in section 4.2.1.5.

Erosion Potential

Erosion is a continuing natural process that can be accelerated by human disturbance. Factors such as soil texture, structure, slope, vegetation cover, rainfall intensity, and wind intensity can influence the degree of erosion. Soils most susceptible to erosion by water are typified by bare or sparse vegetation cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. Soils typically more resistant to erosion by water include those that occupy low relief areas, are well-vegetated, and have high infiltration capacity and internal permeability. Wind erosion processes are less affected by slope angles than water erosion processes. Wind-induced erosion often occurs on dry soil where vegetation cover is sparse and strong winds are prevalent.

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[19] Attachment RR7-2 Soil Impacts for the MVP pipeline project filed on July 18, 2016, in Docket No. CP16-10-000 (accession number 20160718-5161).

[20] Attachment 7-1 filed on July 14, 2016, in Docket No. CP16-13-000 (accession number 20160714-5016).

TABLE 4.2.1-1

Soil Limitations along the Mountain Valley Project (in Acres)

Facility	Water Erosion Potential a/		Wind Erosion Potential b/		Prime Farmland c/		Hydric Soils d/		Compaction Potential e/		Stony/Rocky Soils f/		Revegetation Potential g/		Poor Drainage Potential h/	
	Perm	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**
Pipeline Right-of-Way	-	3,717.0	-	0	-	1,916.8	-	82.3	-	24.5	-	1,245.2	-	247.4	-	31.3
Meter Stations	2.4	14.7	0	0	4.7	43.6	1	2.9	0	0	0	0	0	0	0	0
Compressor Stations	12.4	79.9	0	0	15.9	64.1	0	1.6	0	0	3.2	26.8	0	0	0	1.6
Yards	0	55.9	0	0	0	118.6	0	64.3	0	9	0	0	0	4.6	0	34.6
Temporary and Permanent Access Roads	189.2	732.1	0	0	78.4	286.1	19.9	61.8	2.7	17.9	100.3	354.8	9.8	38	11.4	27.7
Additional Temporary Workspace	0	450.7	0	0	0	393	0	66.9	0	26.0	0	154	0	31.7	0	16.3
Cathodic Protection Areas	0	2.9	0	0	0	7.0	0	3.7	0	1.3	0	0.3	0	0.5	0	1.1
Subtotal	*204*	*5,053.2*	*0*	*0*	*99.0*	*2,829.2*	*20.9*	*283.5*	*2.7*	*78.7*	*103.5*	*1,781.1*	*9.8*	*322.2*	*11.4*	*112.6*
Project Total i/	**5,053.2**		**0**		**2,829.2**		**283.5**		**78.7**		**1,781.1**		**322.2**		**112.6**	

Source: USDA, 2016d

Note: Totals may not sum correctly due to rounding.

a/ Areas identified as highly water erodible soils are ranked as “very severe” or “severe” by SSURGO erosion hazard (Off-Road, Off-Trail) criteria.

b/ Areas identified as highly wind erodible soils have a wind erodibility index of 1 or 2 as determined by SSURGO.

c/ Areas identified as prime farmland are identified as lands that meet the “all prime farmland” or “farmland of statewide and local importance” criteria as determined by NRCS, SSURGO.

d/ Areas identified to have a hydric rating include the “all” and “partial” criteria as determined by SSURGO.

e/ Areas identified to have a severe compaction potential are limited to silt loam or finer based on particle size and ranked “somewhat poor,” “poor,” and “very poor” drainage as determined by SSURGO.

f/ Areas identified to have stony/rocky soils are soils that as determined by SSURGO include stone, rocky, or cobbles in the soil name (does not include rock outcrops).

g/ Areas identified to have poor revegetation potential are lands that have a Capability Class 3 or greater, a low available water capacity and slopes greater than 8 percent as determined by SSURGO.

h/ Areas identified to have poor drainage potential are ranked as “poor” or “very poor” as determined by SSURGO.

i/ Temporary and total acreages include the subset of temporary that would be permanent acreage.

TABLE 4.2.1-2

Soil Limitations along the Equitrans Expansion Project in Acres a/

Facility b/	Water Erosion Potential c/		Wind Erosion Potential d/		Prime Farmland e/		Farmland of Statewide Importance e/		Compaction Potential f/		Stony / Rocky Soils e/		Revegetation Potential g/		Poor Drainage Potential e/	
	Perm	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**
H-305 Pipeline	0.6	1.8	0.0	0.0	0.0	0.0	0.6	1.8	0.7	3.9	0.0	0.0	0.7	3.9	0.0	0.0
H-316 Pipeline	11.2	33.5	0.0	0.0	3.1	10.5	3.8	8.6	10.1	27.8	0.3	0.5	12.9	53.2	0.3	0.5
H-318 Pipeline	17.6	89.4	0.0	0.0	4.9	13.6	6.3	38.1	10.2	84.8	6.1	10.4	5.6	96.2	0.3	0.5
H-319 Pipeline	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.8	0.0	0.0	0.6	0.8	0.0	0.0	0.0	0.0
H-158/M-80 Pipelines	2.9	5.6	0.0	0.0	0.7	0.8	1.5	1.8	0.9	7.0	0.0	0.3	5.7	7.7	0.0	0.0
Pratt Compressor Station	1.5	0.0	0.0	0.0	6.0	0.0	0.1	0.0	6.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0
Redhook Compressor Station	9.2	18.7	0.0	0.0	7.1	8.3	1.9	6.9	7.2	3.4	0.0	0.0	6.5	17.2	0.0	0.0
Webster Interconnect	0.0	0.0	0.0	0.0	0.0	0.0	0.8	3.4	0.0	0.0	0.8	3.4	0.0	0.0	0.0	0.0
Mobley Tap Site (H-306)	0.0	0.0	0.0	0.0	0.0	0.0	0.5	2.7	0.0	0.0	0.5	2.7	0.0	0.0	0.0	0.0
Applegate L/R Site	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0
Hartson L/R Site (H-148)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
H-302 Tap L/R Site	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Subtotal	***43.4***	***149.1***	***0.0***	***0.0***	***22.1***	***33.2***	***16.1***	***64.2***	***35.5***	***127.0***	***8.4***	***18.2***	***33.4***	***178.0***	***0.5***	***1.1***
Total Acres	**192.5**		**0.0**		**55.3**		**80.3**		**162.4**		**26.5**		**211.5**		**1.6**	

TABLE 4.2.1-2 (continued)

Soil Limitations along the Equitrans Expansion Project in Acres a/

Source: USDA, 2015a; 2015b

Note: The values in each row do not necessarily add up to the total acreage for each facility, because of minor rounding.

a/ The soil limitation impacts presented are the total impacts due to construction and operation of the EEP.

b/ The list of facilities includes the associated access roads, additional temporary workspaces, yards, and staging areas in the acreage calculations for each facility.

c/ Based on K factor for the whole soil (Kw), the representative slope, and the non-irrigated land capability rating; a Kw rating of “moderate” was elevated to “high” when associated with steep slopes and when the Non-irrigated Capability Subclass included an “e,” which indicates that erosion is a potential hazard for the soil type.

d/ Based on the Wind Erodibility Group scale; soils with a rating of 1 to 4 were ranked with a high potential for erosion due to wind.

e/ As designated by the NRCS.

f/ Based on 1) soils with poor drainage (somewhat poorly drained to poorly drained), 2) a high clay content (greater than 20 percent), or 3) a surface soil texture characterized as sandy clay loam or dominated by finer particles.

g/ Based on soils 1) that have a surface texture of sandy loam or coarser, 2) are somewhat excessively drained to excessively drained, 3) have slopes greater than 15 percent, or 4) have severe limitations (i.e., a Non-irrigated Capability Class of 3 or higher).

Soils were considered to be prone to erosion if soils were ranked as severe or very severe by SSURGO erosion hazard criteria. Soils are considered to be prone to wind erosion if they have a wind erodibility group of 1 or 2 as presented by SSURGO (USDA, 2015a).

Mountain Valley Project

Construction of the MVP pipeline and ATWS would disturb about 4,168 acres of soils that are classified as having the potential for severe water erosion. None of the soils that would be disturbed by construction of the MVP are prone to erosion by wind.

Aboveground facilities (meter stations, compressor stations, and cathodic protection areas) associated with the MVP would affect about 98 acres of soils that have a high potential to be eroded by water. The majority of soils (732 acres) with a high potential for erosion, not part of the pipeline right-of-way, would be associated with construction or modification of access roads.

Equitrans Expansion Project

Construction of the EEP would affect about 193 acres of soils rated as being prone to erosion by water of which 149 would be restored following construction. Construction of the Redhook Compressor Station would impact about 28 acres of soils prone to erosion by water. None of the soils that would be affected by the EEP have the potential to be eroded by wind.

Prime Farmlands

The USDA (2015b) defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops." This designation includes cultivated land and pasture, or other lands that are either used for food or fiber crops, or are available for these uses. Developed land and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent or prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating).

The NRCS also recognizes unique farmlands and farmlands of statewide importance. Unique farmlands are defined as lands other than prime farmland that are used for production of specific high value food and fiber crops. Unique farmlands have the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Farmland of statewide importance is similar to prime farmland but with minor differences such as greater slopes or less ability to store soil moisture.

Mountain Valley Project

Construction of the MVP pipeline and ATWS would disturb about 2,310 acres of prime farmland or farmland of statewide importance. Aboveground facilities associated with the MVP would affect about 115 acres of prime farmland soils. Additionally access roads and yards would disturb about 405 acres of farmland soils. The locations of prime farmland and farmland of statewide importance crossed by the proposed pipeline are listed in appendix N. Orchards, specialty crop farms, and organic farms are discussed in section 4.8.

Equitrans Expansion Project

Construction of the EEP would affect a total of 136 acres of prime farmland and farmland of statewide importance combined. Of this, about 38 acres of farmland soils would be disturbed at aboveground facilities.

Compaction Prone Soils

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. The degree of potential compaction was evaluated based on the soil texture and drainage class of the soils crossed by the projects. Compaction is typically of concern when the moisture content of the soils is high such as in hydric soils or during precipitation events.

Mountain Valley Project

Construction of the MVP pipeline and ATWS would impact a total of about 51 acres of soils considered to have a high potential for compaction. In addition, another 27 acres of soils prone to compaction would be affected by use of yards and access roads. Aboveground facilities would disturb 1 acre of soils prone to compaction.

Equitrans Expansion Project

The EEP would affect about 162 acres of soils considered to be prone to compaction. At the aboveground facilities, about 17 acres of compactible soils would be permanently affected by construction and operation of the EEP.

Stony or Rocky Soils

Soils with textural classifications including stony, cobbly, gravelly, shale, slate, and droughty in any layer, or with stones larger than 3 inches in the surface layer in greater than 15 percent of the area may be characterized as stony, rocky, or droughty soils. Typically, stony-rocky soils do not hold water well and exhibit a low revegetation potential due to low water content and higher seed mortality. Potential impacts from stony-rocky soils would be minimized on agricultural lands through the removal of rock fragments brought to the surface during construction. Topsoil removed from the trench line would be segregated and stockpiled during construction activities in non-saturated wetlands, croplands, pastures, hayfields, and in areas requested by the landowner. In residential areas, replacement soil may be used instead of topsoil segregation methods.

Mountain Valley Project

Construction of the MVP pipeline, including the right-of-way and ATWS, would affect about 1,399 acres of soils considered to be stony/rocky. Aboveground facilities associated with the MVP would affect 27 acres of soils considered to be stony/rocky. Access roads associated with the MVP would affect another 355 acres of stony/rocky soils.

Equitrans Expansion Project

The EEP would affect about 27 acres of rocky soils. Of this, about 7 acres of rocky soils would be affected at the aboveground facilities.

Poor Revegetation Potential

The revegetation potential of soils is based on the surface texture, drainage class, slope, and any severe limitations. Some soils have characteristics that cause a high seed mortality. These areas may need additional management, such as additional seeding or soil additives, and may be difficult to revegetate. The clearing and grading of soils with poor revegetation potential could result in a lack of adequate vegetation following construction and restoration of the right-of-way, which could lead to increased erosion, a reduction in wildlife habitat, and adverse visual impacts.

Mountain Valley Project

Construction of the MVP pipeline and ATWS would affect about 279 acres of soils classified as having poor revegetation potential. Aboveground facilities would only affect 0.5 acre of soils with poor revegetation potential. Access roads and yards associated with the MVP would disturb 43 acres of poor revegetation prone soils.

Equitrans Expansion Project

Construction of the EEP would disturb about 211 acres of soils classified as having poor revegetation potential. The majority of the soils with poor revegetation potential (168 acres) would be located along the H-316 and H-318 pipelines.

Poor Drainage Potential

The drainage potential is the degree, frequency, and duration of wetness for a given soil. Soils that are considered to be well drained do not hold water well for extensive periods during the growing season, will not pond, and dry quickly. Poorly drained soils are usually associated with high groundwater, will remain soggy, and do not conduct water well. Poorly drained soils are more likely to be compacted and are more prone to rutting than well-drained soils.

Mountain Valley Project

Construction of the MVP pipeline and ATWS would affect about 48 acres of soils classified as having poor drainage potential. Aboveground facilities associated with the MVP would disturb about 3 acres of soil with poor drainage potential. Access roads and yards associated with the MVP would disturb 62 acres of poor drainage prone soils.

Equitrans Expansion Project

Construction of the EEP would disturb about 2 acre of soils classified as having poor drainage potential, all of which would be located along the H-316 and H-318 pipelines.

4.2.1.2 Contaminated Soils

Mountain Valley Project

As discussed in section 4.3.1.1, Mountain Valley searched the EPA's Facility Registry System database, as well as the WVDEP and the VADEQ databases and identified 4 sites of potential contamination concern and 41 brine pits in proximity to the MVP. Mountain Valley has prepared an *Unanticipated Discovery of Contamination Plan*, which would be used in the event that unknown areas of contaminated soils are encountered during construction of the MVP.

Equitrans Expansion Project

No known contaminated soils have been identified in proximity to the EEP.

4.2.1.3 Ground Heaving

Ground heaving is the uplifting of soil, typically based on the development and growth of ice lenses underneath the upper soil layer. Ground heaving or frost heaving is based on soil saturation, soil characteristics, and freezing temperatures.

The projects would be buried below the frost line, and the likelihood of frost affecting soils completely surrounding the buried pipelines is low. According to NOAA (1978), frost depths in the MVP area are between 20 and 30 inches, and maximum frost depths in the areas of the EEP would range from 30 to 38 inches. Additionally, the ground surrounding the buried pipeline would be warmed by natural gas flow in the winter further preventing ice formation. Ground heaving has the potential to cause creep, which is the extremely slow, gravity-driven movement of soil due to the freeze-thaw cycle. The impact of creep and the freeze-thaw cycles on landslides is discussed in section 4.1. Signs of creep include pistol grip trees and tilted posts or poles. Due to the slow nature and minimal amount of movement associated with creep, inspections of the project post-construction would allow for areas of creep to be identified and remediated. Based on these circumstances the risk of ground heaving and associated potential impacts on or from a pipeline, from freeze-thaw action is low.

4.2.1.4 Slip-Prone Soils

Based on comments from the WVDEP slip-prone soils were evaluated. Slip-prone soils include the Gilpin-Peabody complex, 35 to 70 percent slopes, Carbo, Faywood, Frederick, Nolichucky, Poplimento, and Sequoia soils are considered to be slip-prone. Any soil complex in which the above soils were included in the name was counted as being a slip-prone soil.

4.2.1.5 Jefferson National Forest

The MVP would cross fifteen different soil types in the Jefferson National Forest, all of which are considered sandy loams and are well drained. Table 4.2.1-3 identifies that soils that would be crossed within the Jefferson National Forest and their limitations. Soil mapping, by the NRCS, for the Jefferson National Forest was completed by review of aerial imagery and was ground truthed by Mountain Valley. Table 4.2.1-4 summarizes the soil limitations that would be disturbed by construction of the MVP.

4.2.2 Environmental Consequences

Construction activities such as clearing, grading, trench excavation, backfilling, contouring, and the movement of construction equipment along the right-of-way would affect soil resources. Clearing removes the protective cover and exposes the soil to the effects of wind and rain, which increases the potential for soil erosion and sedimentation of sensitive areas. Grading, spoil storage, and equipment traffic can compact soil reducing porosity and increasing runoff potential. Excess rock or fill material brought to the surface during trenching operations could hinder restoration and revegetation of the right-of-way. Contaminated soils could pose hazards if disturbed and ground heaving due to freezing could pose hazards to the pipeline.

4.2.2.1 Soil Limitations

Erosion Potential

To prevent soil erosion, Mountain Valley and Equitrans would follow BMPs based on the FERC Plan, Equitrans' Plan, and Mountain Valley and Equitrans' Procedures. These BMPs include, but are not limited to:

- temporary and permanent slope breakers;
- installation of erosion control devices, such as silt fence and hay bales;
- restoration of soil layering;
- restoration of surface contours; and
- revegetation using seed mixes recommended by the Wildlife Habitat Council (for the MVP) and as per PADEP's *Erosion and Sediment Pollution Control Program Manual* (for the EEP) (see additional discussion regarding seed mixes in section 4.4).

Temporary erosion control devices would be installed immediately following soil disturbance. These would be inspected regularly and would only be removed following the successful revegetation of an affected area. The Applicants would also employ permanent erosion control devices such as installing trench breakers at the base of slopes greater than 5 percent and within 50 feet of waterbodies or wetland and by constructing slope breakers in all areas except for cultivated lands.

TABLE 4.2.1-3

Soil Limitations Along the Mountain Valley Project Pipeline Route Within the Jefferson National Forest (in Acres)

Soil	Prime Farmland a/	Rocky/ Stony Soils c/	Poor Drainage Potential d/	Water Erosion Potential e/	Wind Erosion Potential f/	Compaction Potential g/	Re-vegetation Potential h/
Bailegap sandy loam, 35 to 60 percent slopes	--	--	--	0.0	--	--	--
Berks and Weikert soils, 25 to 65 percent slopes	--	--	--	10.9	--	--	--
Berks and Weikert very stony soils, 15 to 35 percent slopes	--	2.0	--	2.0	--	--	--
Berks-Rock outcrop complex, 25 to 70 percent slopes	--	--	--	1.1	--	--	--
Berks-Weikert complex, 15 to 25 percent slopes	--	--	--	1.1	--	--	--
Calvin-Rough complex, 35 to 70 percent slopes, very stony	--	0.0	--	0.0	--	--	--
Craigsville soils	--	--	--	--	--	--	--
Dekalb channery loam, 55 to 70 percent slopes, very stony	--	0.7	--	0.7	--	--	0.7
Jefferson extremely stony soils, 7 to 25 percent slopes	--	9.1	--	9.1	--	--	--
Jefferson very stony soils, 7 to 15 percent slopes	1.9	1.9	--	--	--	--	--
Lehew and Wallen soils, very stony, 35 to 65 percent slopes	--	1.2	--	1.2	--	--	--
Lily-Bailegap complex, very stony, 15 to 35 percent slopes	--	2.7	--	2.7	--	--	--
Lily-Bailegap complex, very stony, 35 to 65 percent slopes	--	13.5	--	13.5	--	--	--
Nolichucky very stony sandy loam, 15 to 30 percent slopes	--	0.5	--	0.5	--	--	--

TABLE 4.2.1-3 (continued)

Soil Limitations Along the Mountain Valley Project Pipeline Route Within the Jefferson National Forest (in Acres)

Soil	Prime Farmland a/	/	Rocky/ Stony Soils c/	Poor Drainage Potential d/	Water Erosion Potential e/	Wind Erosion Potential f/	Compaction Potential g/	Re-vegetation Potential h/
Nolichucky very stony sandy loam, 30 to 65 percent slopes	--		6.0	--	6.0	--	--	--
Total	**1.9**		**37.6**	**0.0**	**48.9**	**0.0**	**0.0**	**0.7**

Sources: USDA, 2015a; 2015b; USDA, 2016d

Note: Totals may not sum correctly due to rounding.

a/ Areas identified as prime farmland are identified as lands that meet the “all prime farmland” or “farmland of statewide and local importance” criteria as determined by NRCS, SSURGO.

b/ Areas identified to have a hydric rating include the all and partial criteria as determined by SSURGO.

c/ Areas identified to have stony/rocky soils are soils that as determined by SSURGO. Include stone, rocky or cobbles in the soil name (does not include rock outcrops).

d/ Areas identified to have poor drainage potential are ranked as “poor” or “very poor” as determined by SSURGO.

e/ Areas identified as highly water erodible soils are ranked as “very severe” or “severe” by SSURGO erosion hazard (Off-Road, Off-Trail) criteria.

f/ Areas identified as highly wind erodible soils have a wind erodibility index of 1 or 2 as determined by SSURGO.

g/ Areas identified to have a severe compaction potential are limited to silt loam or finer based on particle size and ranked “somewhat poor,” “poor,” and “very poor” drainage as determined by SSURGO.

h/ Areas identified to have poor revegetation potential are lands that have a Capability Class 3 or greater, a low available water capacity and slopes greater than 8 percent as determined by SSURGO.

TABLE 4.2.1-4

Soil Limitations by Facility along the Mountain Valley Project in the Jefferson National Forest (in Acres)

Facility	Water Erosion Potential a/		Wind Erosion Potential b/		Prime Farmland c/		Compaction Potential e/		Stony/Rocky Soils f/		Revegetation Potential g/		Poor Drainage Potential h/	
	Perm	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**
Pipeline Right-of-Way	--	48.9	--	0	--	1.9	--	0	--	37.6	--	0.7	--	0
Temporary and Permanent Access Roads	18.1	27.5	0	0	0.5	0.9	0	0	8.2	11.7	0	0	0	0
Additional Temporary Workspace	0	0.8	0	0	0	0	0	0	0	0.1	0	0	0	0
Subtotal	*18.1*	*77.2*	*0*	*0*	*0.5*	*2.8*	*0*	*0*	*8.2*	*49.4*	*0*	*0.7*	*0*	*0*
Project Total i/	**77.2**		**0**		**2.8**		**0**		**49.4**		**0.7**		**0**	

Source: USDA, 2016

Note: Totals may not sum correctly due to rounding.

a/ Areas identified as highly water erodible soils are ranked as "very severe" or "severe" by SSURGO erosion hazard (Off-Road, Off-Trail) criteria.

b/ Areas identified as highly wind erodible soils have a wind erodibility index of 1 or 2 as determined by SSURGO.

c/ Areas identified as prime farmland are identified as lands that meet the "all prime farmland" or "farmland of statewide and local importance" criteria as determined by NRCS, SSURGO.

d/ Areas identified to have a hydric rating include the "all" and "partial" criteria as determined by SSURGO.

e/ Areas identified to have a severe compaction potential are limited to silt loam or finer based on particle size and ranked "somewhat poor," "poor," and "very poor" drainage as determined by SSURGO.

f/ Areas identified to have stony/rocky soils are soils that as determined by SSURGO include stone, rocky, or cobbles in the soil name (does not include rock outcrops).

g/ Areas identified to have poor revegetation potential are lands that have a Capability Class 3 or greater, a low available water capacity and slopes greater than 8 percent as determined by SSURGO.

h/ Areas identified to have poor drainage potential are ranked as "poor" or "very poor" as determined by SSURGO.

i/ Temporary and total acreages include the subset of temporary that would be permanent acreage.

Prime Farmlands

Operation of the MVP would permanently impact 16 acres of prime farmland soils at compressor station facilities, meter stations (5 acres), and at permanent access roads (78 acres). The EEP would affect 22 acres of farmland soils at aboveground facilities. Within temporary work areas for both projects, impacts on prime farmlands would be minimized by implementing BMPs based on the FERC Plan (for the MVP) and Equitrans' Plan (for the EEP). These BMPs include, but are not limited to:

- topsoil segregation;
- removal of rocks from the top 12 inches of soil in all cultivated lands, pastures, and hayfields crossed; and
- soil decompaction.

Compaction Prone Soils

Soils with moderate moisture content would typically be more prone to compaction associated with construction activities than dry soils. Potential impacts on compaction prone soils would be minimized by limiting construction traffic along the right-of-way. Mountain Valley would decompact all disturbed areas by discing. Compaction testing would be left to the discretion of the EI except for in agricultural and residential areas where Mountain Valley's EIs would conduct topsoil and subsoil compaction tests using a penetrometer or other appropriate device at regular intervals. The results of the compaction tests would be compared and matched to undisturbed soil under similar moisture conditions to ensure any affected soils are properly decompacted. If compaction is found to have occurred, the area would be tilled and retested. If additional decompaction of the area is required, deep tilling would be used. Due to the high potential for compaction, Equitrans has committed to performing topsoil segregation along the entire right-of-way. Should compaction occur Equitrans would use tilling to decompact the area.

Stony/Rocky Soils

The Applicants would remove excess rock, consistent with the Plan, in all disturbed cultivated and rotated croplands, hayfields, pastures, residential areas, and at the landowner's request. The Applicants would also remove stones and excess rock from disturbed soil so that the post-construction right-of-way would have the same distribution of size, density, and distribution of rock as similar undisturbed areas. Excess rock/stone would be disposed, according to section III.E of the Plan.[21] The trench may be backfilled with excavated material, but would only be filled to the height of the existing bedrock horizon. Mountain Valley does not intend to use imported topsoil for agricultural or residential lands. All additional topsoil for agricultural or residential lands would be locally sourced to prevent to introduction of foreign species (additional discussion regarding invasive species is provided in section 4.4).

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[21] Section III.E of the Plan states "Determine methods and locations for the regular collection, containment, and disposal of excess construction materials and debris (e.g., timber, slash, mats, garbage, drill cuttings and fluids, excess rock) throughout the construction process. Disposal of materials for beneficial reuse must not result in adverse environmental impact and is subject to compliance with all applicable survey, landowner or land management agency approval, and permit requirements."

Poor Revegetation Potential

In order to minimize and mitigate potential impacts on soils with poor revegetation potential, the Applicants would follow measures such as:

- reseeding the right-of-way according to the recommendations provided by the Wildlife Habitat Council for the MVP and PADEP's *Erosion and Sediment Pollution Control Program Manual* for the EEP;
- using mulch, tackifier, control fabric, or equivalent on stockpiled topsoil and after seeding on slopes as required; and
- conducting follow up inspections to determine the success of revegetation and address landowner concerns.

Section 2.0 of this EIS provides additional information regarding inspections, and seed mixes are discussed in section 4.4.

4.2.2.2 Contaminated Soils

As discussed in section 4.3.1.1, Mountain Valley searched the EPA's Facility Registry System database, as well as the WVDEP and the VADEQ databases and identified 4 sites of potential contamination concern and 41 brine pits in proximity to the MVP. Should contamination be discovered during construction, Mountain Valley would notify the affected landowner, coordinate with the appropriate agencies, and follow the procedures put forth in its *Unanticipated Discovery of Contamination Plan*. Mountain Valley's plan provides seven stages of response to be followed should contamination be discovered during construction:

- Stage 1 – suspend all work activities and movement of personnel to a safe area;
- Stage 2 – identify immediate threats, notify emergency response, and evacuate as necessary;
- Stage 3 – secure the contaminated area with fencing or flagging and provide site personnel to restrict access as needed;
- Stage 4 – the contractor would notify Mountain Valley and the WVDEP or VADEQ as appropriate;
- Stage 5 – document the discovery;
- Stage 6 – take remedial action including sampling, remedial action determination, remedial action implementation, and disposal; and
- Stage 7 – records of the unanticipated discover to disposal would be kept in accordance with record keeping requirements.

No contaminated soils have been identified in proximity to the EEP. However, if previously unknown contaminated soils were discovered, Equitrans would halt work until the contamination could be characterized, all applicable agencies notified, and cleanup of the contamination based on the type and extent of contamination, the responsible party, as well as federal, state, and local regulations could be conducted.

4.2.2.3 Ground Heaving

Ground heaving is not expected to affect the projects. The pipeline would be buried below the frost depths of 20 to 30 inches that would be crossed by the MVP and 30 to 38 inches that would be crossed by the EEP. In addition, natural gas passing through the pipeline would warm the ground immediately surrounding the pipeline. There is the potential, however, for ground heaving to temporarily affect early revegetation success along steep slopes. Mountain Valley would comply with our Plan for monitoring restoration for 2 years following construction and providing corrective actions, where necessary.

4.2.2.4 Slip-Prone Soils

Certain soil types such as shaley or clayey soils are more prone to slipping than other soils. Due to this increased potential for slipping, the probability of landslides is increased when constructing through slip-prone soils. The Gilpin-Peabody complex, 35 to 70 percent slopes, Carbo, Faywood, Frederick, Nolichucky, Poplimento, and Sequoia soils are considered to be slip-prone. Any soil complex in which the above soils were included in the name was counted as being a slip-prone soil. The MVP would affect about 56 acres of these soils between MPs 0 to 37 and 302 acres between MPs 172 and 235, in total affecting 358 acres of slip-prone soils. The EEP would not affect these soils. The Applicants would follow the measures described in section 4.1.2.4 to prevent hazards posed by potential landslides.

4.2.2.5 Jefferson National Forest

The MVP would cross fifteen different soil types in the Jefferson National Forest, all of which are considered well drained sandy loams. Measures that would be implemented by Mountain Valley for soils within the Jefferson National Forest are similar to those described above. In addition, Mountain Valley would incorporate requirements from the *Virginia Erosion and Sediment Control Handbook* into its *Erosion and Sediment Control Plans*.

The FS would require topsoil segregation on NFS lands per the FS's letter filed with FERC on November 15, 2016[22] and as discussed in the FS's comments on Mountain Valley's POD. Mountain Valley agreed to segregate topsoil along the right-of-way within the Jefferson National Forest in its December 15, 2016 response. [23]

Mountain Valley would utilize seed mixes[24] approved by the FS for use on NFS lands as provided in the FS's letter filed December 15, 2016 or as otherwise approved by the FS through subsequent consultation. Monitoring during and post-construction would follow the procedures outlined in section 2.4.4. Impacts on soil resources in the Jefferson National Forest managed lands would range in duration from temporary to permanent. As defined in FSH 2550, the detrimental changes to soil properties that result in loss of the inherent ecological capacity or hydrologic function of the soil is termed "Substantial Soil Impairment" when the changes last beyond the

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22 FS comments on the POD filed November 16, 2016 accession no. 20161116-5006.

23 Mountain Valley Response to request for topsoil segregation filed December 16, 2016 accession no. 20161216-5171.

24 FS letter listing approved seed mixes filed December 15, 2016 (accession number 20161215-5124).

scope, scale, or duration of the project causing the change. Construction activities along the right-of-way may affect soil resources with both temporary and permanent impacts unless mitigated. Most of the impacts on soil resources would be temporary to short term in duration, including soil erosion and sedimentation, soil compaction, reduction of soil porosity, increased runoff potential, effects on soil fertility, and effects on revegetation potential. Most of the ecological capacity and hydrologic function of the soil would eventually return following successful restoration and revegetation. Inadequate restoration of subsoil and topsoil could result in poor revegetation, decreased soil stabilization, increased erosion and sedimentation, settling over the buried pipeline, and loss of soil carbon. One permanent impact associated with the transition from a forested environment to a managed right-of-way is the alteration of the soil carbon budget. Successful revegetation would reduce the impact, but as long as the right-of-way is managed as a grassland/shrub environment, the soil carbon budget would be different from the adjacent forest. The FS believes the information provided is adequate for its review process and any impacts on soil related to the proposed project would be minimal. According to FSH 2551.3: Generally, soil management standards and guidelines are not applied to administrative sites or dedicated use areas. The 50 feet of permanent right-of-way would be considered a dedicated use on the Jefferson National Forest, such that the multiple use mission of the FS would not be applied to this right-of-way due to restrictions created by the installation of the pipeline.

4.2.3 Conclusion

To minimize general construction-related effects to soils, Mountain Valley and Equitrans would implement measures described in our Plan (for MVP), Equitrans Plan, and Mountain Valley and Equitrans Procedures. These measures would include inspection during construction, installation and maintenance of erosion control devices, spill prevention measures, topsoil segregation, soil compaction mitigation in restored areas, and revegetation.

Impacts of the projects during post-construction operations are expected to be minimal. Permanent impacts from the projects would include aboveground facilities, which would include 4 compressor stations, 14 M&R stations, interconnects, taps, and MLVs. However, as no additional ground would be excavated during operation of the projects, and disturbed soils would be stabilized through revegetation, no impacts are expected during operations. Based on the overall soil conditions present in the projects' area, the Applicant's proposed construction and operation methods, we conclude that construction of the projects would not significantly alter the soils of the region.

4.3 WATER RESOURCES

4.3.1 Groundwater

4.3.1.1 Affected Environment

Aquifers

Table 4.3.1-1 provides a list of aquifers crossed by the projects. A description of the major aquifer systems crossed by the projects is provided below.

Mountain Valley Project

Three major aquifer systems underlie the MVP area: the Appalachian Plateau Regional; the Valley and Ridge Regional; and the Blue Ridge and Piedmont Crystalline-Rock aquifer systems. The physiography, geology, and geologic structure of these provinces influence the water resources of the region.

Appalachian Plateau Regional Aquifer System. The Appalachian Plateau Regional Aquifer System consists of Devonian to Permian Period consolidated sedimentary bedrock. With the exception of the sandstone aquifers that partially comprise the system, primary porosity and permeability are for all practical purposes negligible, and groundwater flow is predominantly through secondary permeability such as bedding planes, bedrock fractures and joints, and in carbonate bedrock through fractures enlarged by dissolution of the bedrock (solution openings). The water quality throughout the Appalachian Plateau aquifer system is variable, but generally is suitable for municipal use. Approximately half of the groundwater in sedimentary bedrock aquifers of the Appalachian Plateaus system is used for domestic and commercial purposes; however, water is also used for agricultural, industry, mining, and thermoelectric power purposes. Wells within the system have yields that range from 5 to 300 gallons per minute (gpm); however, some wells yield as much as 600 gpm (USGS, 2001).

Valley and Ridge Regional Aquifer System. Within central Pennsylvania, West Virginia, and Virginia, the Valley and Ridge Regional Aquifer System trends in a southwest to northeast direction. The aquifer system is comprised of folded bedrock consisting of shales, sandstones, and limestones of Cambrian, Ordovician, Silurian, and Devonian Periods (USGS, 1997a). Large springs are characteristic of the Valley and Ridge Province. Three types of springs are common: contact springs, impermeable rock springs, and tubular springs, in which the water flows from underground caverns. Groundwater within the Valley and Ridge Province is used for both domestic and commercial purposes. The water quality in the Valley and Ridge Regional Aquifer System is variable, but is generally suitable for municipal use (USGS, 1997a). The water is characterized by a high hardness, derived from limestone dissolution. The dissolution of the limestone has formed extensive karst features throughout the region. Water-yields through carbonate rocks within this system depend on bedrock fracturing enlarged through the development of solution cavities in the rock, and can yield large volumes of water to wells and springs on the order of 25 to 250 gpm. (USGS, 1997a)

Blue Ridge and Piedmont Crystalline-Rock Aquifer System. The Blue Ridge and Piedmont Crystalline-Rock Aquifer System is underlain by crystalline bedrock and undifferentiated sedimentary bedrock aquifers. Most of the rocks that form this aquifer system are crystalline metamorphic and igneous rock types. Typically, they consist of coarse-grained gneiss and schist; however, fine-grained rocks such as phyllite and metamorphosed volcanic rock such as volcanic tuff, ash, and lava flows are also common. Regolith consisting of saprolite, colluvium, alluvium, and soil overlies the bedrock in most areas. Regolith and fractured bedrock make up the transmissive layers of the Blue Ridge and Piedmont Aquifers; and is where the most significant water supplies are found within a few hundred feet of the surface. Generally, the water is suitable for drinking; however, iron, manganese, and sulfate can occur locally in elevated concentrations. The Blue Ridge and Piedmont Aquifer System is generally used for domestic and commercial purposes, agriculture, industry, and public water supply by small communities with aquifer yields ranging from 12 to 75 gpm, some wells yield as much as 600 gpm (USGS, 1997a).

Equitrans Expansion Project

The EEP is underlain by the Appalachian Plateau Regional aquifer system, which is described above.

TABLE 4.3.1-1

Aquifers Crossed by the Mountain Valley Project and Equitrans Expansion Project

Project/State / County	Nearest Project MP(s)	Major Aquifer System Name	Bedrock Unit(s) a/	Dominant Lithology a/	Well Yields (gpm)
Mountain Valley Project					
West Virginia					
Wetzel	0.0 to 42.7	Appalachian Plateau	Upper Pennsylvanian (Monongahela Group) and Permian (Dunkard Group)	Sandstone, siltstone, shale	0.1 to 350 (some yield up to 400)
Harrison					
Doddridge					
Lewis	42.7 to 71.5	Appalachian Plateau	Lower Pennsylvanian (Conemaugh Group) (Allegheny, Kanawha, New River, and Pocahontas formations)	Siltstone, shale, limestone, coal, sandstone	
Braxton	71.5 to 80.3				
Webster	80.3 to 109.5; 109.8 to 110.6	Appalachian Plateau	Mississippian bedrock (Pottsville Group, Mauch Chunk Group, Hinton Formation, Bluefield, Bluestone, and Princeton Formations, Greenbrier Group, Maccrady Formation and Pocono Group)	Sandstone, shale, limestone	5 to 300 (some yield up to 600)

TABLE 4.3.1-1 (continued)

Aquifers Crossed by the Mountain Valley Project and Equitrans Expansion Project

Project/State/ County	Nearest Project MP(s)	Major Aquifer System Name	Bedrock Unit(s) a/	Dominant Lithology a/	Well Yields (gpm)
Nicholas	109.5 to 109.8; 110.6 to 135.0	Appalachian Plateau	Lower Pennsylvanian (Conemaugh Group) (Allegheny, Kanawha, New River, and Pocahontas formations)	Siltstone, shale, limestone, coal, sandstone	0.1 to 350 (some yield up to 400)
Greenbrier	135.0 to 153.8; 154.3 to 156.7	Appalachian Plateau	Mississippian bedrock (Pottsville Group, Mauch Chunk Group, Hinton Formation, Bluefield, Bluestone, and Princeton Formations, Greenbrier Group, Maccrady Formation and Pocono Group)	Sandstone, shale, limestone	5 to 300 (some yield up to 1,000)
Fayette	153.8 to 154.3				
Summers	156.7 to 173.4				
Monroe	173.4 to 195.5				
		Appalachian Plateau	Devonian and Silurian	Shales, sandstone, siltstone	<1 to 200
		Valley and Ridge	Ordovician	Sandstone, shale, limestone, dolomite	≤120
Virginia					
Giles	196.3 to 215.6	Valley and Ridge	Ordovician	Sandstone, shale, limestone, dolomite	≤120
Craig	215.6 to 217.2	Valley and Ridge			
Montgomery	217.2 to 236.1	Valley and Ridge	Mississippian-Devonian-Silurian aquifer system	Sandstone, shale, limestone	≤15
Roanoke	236.1 to 239.2	Valley and Ridge			
Roanoke	239.2 to 244.4	Valley and Ridge	Cambrian-Ordovician aquifer system	Sandstone, shale, limestone, dolomite	25 to 400
Franklin	244.4 to 279.2	Blue Ridge and Piedmont	Blue Ridge and Piedmont aquifer system	Undifferentiated sedimentary rock; gneiss, schist, metamorphic rock	1 to100
Pittsylvania	279.2 to 303.5	Blue Ridge and Piedmont	Piedmont aquifer System	Gneiss, schist, metamorphic rock	1 to 100

TABLE 4.3.1-1 (continued)

Aquifers Crossed by the Mountain Valley Project and Equitrans Expansion Project

Project/State/ County	Nearest Project MP(s)	Major Aquifer System Name	Bedrock Unit(s) a/	Dominant Lithology a/	Well Yields (gpm)
Equitrans Expansion Project					
Pennsylvania					
Greene	H-305, H-316, H-158, M-80	Appalachian Plateau	Pittsburgh Low Plateau	Sandstone	0.1 to 350 (some yield up to 400)
Allegheny	H-318, MPs 0.0 to 2.6				
Washington	H-318, MPs 2.6 to 3.8				
West Virginia					
Wetzel	H-319	Appalachian Plateau	Upper Pennsylvanian	Sandstone, siltstone, shale	0.1 to 350 (some yield up to 400)

a/ Information in this column pertains to the aquifer being described and does not necessarily coincide with bedrock that would be encountered at the surface.

Sources: USGS, 1995a; 1995b; 1997a; 2001; 2003; 2007

Surficial Aquifer System

The surficial aquifer system is comprised of areas where each principle aquifer or aquifer system is exposed at the land surface or is the shallowest major aquifer. The two principle types of unconsolidated sediments within the surficial aquifer system underling the projects are reworked Pleistocene-age glacial sediments transported and deposited in major streams along with recent (Holocene) alluvium. Alluvial sediments consist primarily of sand and gravel, and the reworked glacial sediments include clay, silt, sand, and gravel. Water quality within the surficial aquifer system is somewhat variable, but generally is suitable for municipal purposes. The surficial aquifer system is discontinuous, and as a result, has not been mapped by state agencies.

Sole Source Aquifers

The EPA defines a sole source aquifer (SSA) or principal source aquifer area as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. The EPA guidelines for SSAs stipulate that these areas can have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water (EPA, 2015a). Neither the MVP nor the EEP would cross any EPA-designated SSAs.

State Designated Aquifers

In addition to the EPA-designated SSA program, individual states may enact regulations protecting significant aquifer recharge areas, critical areas where excessive use of groundwater poses a threat to the long-term integrity of a water supply source, or preservation areas to protect natural resources including public water supply sources. The MVP and the EEP would not cross any state designated aquifers.

Groundwater in Karst Terrain

Where mature karst topography is developed, there is a discernable lack of perennial surface streams, as water is lost rapidly to the subsurface network of karst conduits. In karst areas there exists a duality of recharge to groundwater. Significant volumes of recharge waters originate as gaining streams in upland, non-karstic areas and recharge lower-lying karst groundwater system through swallets or infiltration through valley-train deposits (alluvium) along stream beds (allogenic recharge); recharge also occurs within karst terrain by autogenic means or direct infiltration of recharge waters through overburden soils/alluvium or funneled through swallets or sinkholes/sinkhole depressions. Allogenic recharge originating in non-karst terrain to the karst aquifers in the project area is common in Monroe County, West Virginia, Giles, Craig, Montgomery, and Roanoke, Virginia counties as a direct result of geologic structure and lithology where dense sandstone tend to form ridgetops. Water originating in these upland areas drain toward lower-lying karst terrain (Kastning, 2016) and provide a spectrum of recharge from diffuse recharge through the soil overburden through discrete recharge directly into sinkholes and swallets.

Karst areas are susceptible to a greater range of environmental impact because of the highly developed subterranean network and associated fragile ecosystems. Surface water flowing through karst openings such as swallets has little opportunity to be naturally filtered by sediment as water rapidly flows through karst conduits. Groundwater flow through a mature karst system of conduits is rapid and often turbulent, and discharge is normally manifested at perennial springs and surface waterbodies that are hydraulically downgradient and connect with the subterranean karst network.

Mountain Valley Project

Mountain Valley used field surveys (where access was granted) along with a review of historical data to conduct an initial assessment of springs and swallets near the project area. Additionally, as discussed in section 4.1.2.5, Mountain Valley conducted surface geophysics, where access was available and developed a fracture trace/lineament analysis utilizing LiDAR imagery to assess/correlate the development of surficial karst with geologic structure to identify and correlate connectivity with subsurface groundwater flow paths.

Mountain Valley also evaluated groundwater flow paths in proximity to several karst resources of concern that were identified in comments made by the Virginia Cave Board on September 9, 2016. Mountain Valley filed its response on March 14, 2017 as part of its responses to our January 27, 2017 EIR.[25] The evaluation considers recharge features, buffer zones, resurgence features, previous dye traces, topography and geologic structure in order to characterize likely groundwater flow direction and address potential impacts that could occur due to construction and operation of the MVP. Mountain Valley's evaluation is further discussed in section 4.1.1.5 of this EIS.

[25] See accession numbers 20161222-5394 and 20170314-5145.

Table 4.3.1-2 identifies springs and swallets (karst features) that were identified during the assessment as being crossed by or within 500 feet of the MVP. Groundwater in karst terrain is present along the MVP pipeline route in Summers and Monroe Counties of West Virginia, as well as in Giles, Craig, and Montgomery Counties of Virginia. Mountain Valley is in the process of directly contacting landowners of property within 150 feet (500 feet in karst terrain[26]) to request information about the location and characteristics of water sources on their land, including springs, swallets, and privately owned wells. Table 4.3.1-2 does not include the results of these communications. Therefore, we have included a recommendation below that Mountain Valley provide any new information acquired during its landowner outreach prior to the beginning of construction.

TABLE 4.3.1-2

Springs Identified within 150 feet (500 feet in karst terrain) of the Mountain Valley Project Construction Work Area a/

State / County	Name	MP	Direction / Location	Geologic Occurrence / Karst Influence? a/, b/
Mountain Valley Project				
West Virginia				
Lewis c/	Unnamed spring	45.8	20 feet east	Uniontown Sandstone / No
Lewis c/	Unnamed spring	58.6	130 feet northeast	Uniontown Sandstone / No
Webster c/	Unnamed spring	81.6	132 feet west	Kanawha Sandstone / No
Webster c/	Unnamed spring	81.7	46 feet west	Kanawha Sandstone / No
Webster c/	Unnamed spring	82.4	32 feet west	Kanawha Sandstone / No
Webster c/	Unnamed spring	82.4	72 feet west	Kanawha Sandstone / No
Nicholas c/	Unnamed spring	122.9	98 feet east	Kanawha Sandstone / No
Nicholas c	Unnamed spring	132.2	38 feet north	New River Sandstone / No
Greenbrier c/	Unnamed spring	155.3	45 feet east	Bluestone Shale / No
Summers d/	Unnamed spring	161.3	Located within access road	Bluestone Shale / No
Summers d/	Unnamed spring	173.2	30 feet southwest	Pickaway Limestone / Yes
Summers d/	Swallet	173.6	425 feet southwest	Pickaway Limestone / Yes
Summers d/	Unnamed spring	173.7	260 feet south	Pickaway Limestone / Yes
Monroe d/	Unnamed spring	185.4	58 feet southwest	Bluefield Shale / No

[26] Longer distances may be necessary if dye traces, cave maps, or other information provided in the enhanced karst management plan required by WVDEP's Special Condition 16 of the Conditional 401 WQC depict distant underground connectivity.

TABLE 4.3.1-2 (continued)

Springs Identified within 150 feet (500 feet in karst terrain) of the Mountain Valley Project Construction Work Area a/

State / County	Name	MP	Direction / Location	Geologic Occurrence / Karst Influence? a/, b/, c/
Monroe d/	Swallet	191.9	170 feet northwest	Union Limestone / Yes
Monroe d/	Unnamed spring	192.0	370 feet southeast	Union Limestone / Yes
Virginia				
Giles d/	Swallet or losing stream (dye traced to Bell Spring by the VADCR)	207.8	>330 feet south (not field-identified)	Undivided limestone / Yes
Giles d/	Tawneys Spring	211.1	530 feet northeast	Undivided limestone / Yes
Giles d/	Unnamed spring	214.2	100 feet northwest	Knox dolostone / Yes
Giles d/	Large unnamed spring near Canoe Cave	214.9	360 feet southwest	Knox dolostone / Yes
Giles d/	Stream insurgence	216.2	240 feet southeast	Undivided limestone / Yes
Giles d/	Stream insurgence	216.5	150 feet north	Knox dolomite or Undivided limestone (contact zone) / Yes
Giles d/	Steele Acres Road Spring	216.6	230 feet north	Knox dolomite or Undivided limestone (contact zone) / Yes
Giles d/	Swallet	216.6	450 feet north	Undivided limestone / Yes
Montgomery d/	Stream insurgence	218.2	140 feet east	Undivided limestone / Yes
Craig d/	Stream insurgence	221.9	150 feet northwest	Elbrook dolomite / Yes
Montgomery d/	Swallet (wet weather only)	223.4	220 feet north	Elbrook dolomite / Yes
Montgomery d/	Swallet	227.6	80 feet southwest	Stones River limestone / Yes
Montgomery d/	Swallet	234.4	140 feet southwest	Elbrook dolomite / Yes
Franklin c/	Unnamed spring	248.9	80 feet north	Biotite, Granulite, Gneiss / No
Franklin c/	Unnamed spring	252.9	102 feet south	Granitic Gneiss / No
Franklin c/	Unnamed spring	256.5	28 feet north	Alluvium / No

a/ Information on privately owned springs is not publically available for West Virginia, Virginia, and Pennsylvania. Therefore, springs on private property may not be represented in this table.

b/ Location refers to the distance from the spring to the nearest project workspace boundary.

c/ It is noted that specific groundwater direction and velocity information is not available for springs in the karst areas. Mountain Valley's Karst Mitigation Plan and Water Resources Identification and Testing Plan includes measures to ensure the protection of water resources in karst terrain – including additional field studies if necessary (see table 2.4-2 for the location of these plans).

d/ Holland, 2015

e/ Draper Aden Associates, 2015c

Equitrans Expansion Project

Karst terrain would not be crossed by the EEP.

Mine Pools

Flooded underground mines, or mine pools, are considered a potential source of groundwater for various uses including aquaculture, public supply, coal-to-liquid hydrocarbons, hydraulic fracturing for gas wells, and power plant cooling. In general, mine pool water becomes acidic from the reaction of oxygen and water with iron-sulfide bearing minerals; however, factors such as, mineralogy, mine design, oxygen availability, as well as quantity and circulation of water flowing through the mine, may influence the chemistry of mine pool water. Groundwater from mine pools typically requires treatment before it can be used.

Mountain Valley Project

The Mine Pool Atlas, produced by the West Virginia Geological and Economic Survey and the WVDEP, estimates the potential groundwater reserves within mine pools across West Virginia. An evaluation of the Mine Pool Atlas and WVDEP database records against the MVP pipeline route indicates that the pipeline route and access roads would cross 12 mine pools and is within one mile of 54 additional mine pools. These mine pools are associated with major coal beds including a small portion of the Pittsburgh Mine Pools in Harrison County, West Virginia; discontinuous areas of the Sewell Mine Pools in Nicholas and Greenbrier Counties, West Virginia; and the Pocahontas Coal Seam in Fayette County, West Virginia (WVGES, 2012). According to the Mine Pool Atlas, the Sewell and Pittsburgh seams offer a potential source of water for individual and community development. The estimated depth to the upper extent of the Pittsburgh and Sewell Mines is 250 and 230 feet, respectively. The Pocahontas Coal Seam is much deeper at a depth of 1,000 feet. Given the shallow nature of typical pipeline construction (depths less than 10 feet below ground surface) in comparison to the depths of the Pittsburgh and Sewell mine pools, impacts on these mine pools are not anticipated. According to Mountain Valley, the mines along the MVP in Virginia are small, shallow, and discontinuous excavations that do not support an extensive underground network or present a likelihood of retaining large amounts of water. Therefore, mine pools are not expected to be encountered along the Virginia portion of the project.

Equitrans Expansion Project

Equitrans would cross one mine pool, the Mather Mine Pool, in Greene County, Pennsylvania. The Mather Mine is located in the Pittsburgh seam; Pittsburgh mines are generally acidic with elevated levels of iron, aluminum, manganese, total dissolved solids, and sulfates. Construction activities associated with the EEP would be conducted at a minimum of 225 feet above the mine pool; as a result, no impacts on the mine pool are anticipated.

Public Water Supply Wells and Springs

The EPA (2012) defines a public water system as "a system that provides water via piping or other constructed conveyances for human consumption to at least 15 service connections or that serves an average of at least 25 people." Information on public wells located within 1 mile of the projects was obtained from the EPA's Safe Drinking Water Information System, the PADEP, the VADEQ, the WVDEP, and the West Virginia Department of Health and Human Resources (WVDHHR) (EPA, 2015b; VADEQ, 2015; WVDEP, 2015a). Information regarding privately owned wells and springs in West Virginia and Virginia is not publically available. Water well records for Pennsylvania are made publically available through the Pennsylvania Department of Conservation and Natural Resources' (PADCNR) website.

Mountain Valley Project

The MVP would be within 0.1 mile of two public water supplies: one well in Greenbrier County, West Virginia (the Greenbrier County Public Supply District #2), and the other in Pittsylvania County, Virginia (the Robin Court Subdivision). The project would also be within 0.3 mile of Rich Creek Spring, located near MP 195.2, which is used as a water supply by the Red Sulphur Public Service District. Table 4.3.1-2 identifies springs that would be crossed or within 500 feet of the MVP's construction workspace.

Because information is not available for private groundwater wells in West Virginia and Virginia, the Applicants have initiated field surveys and/or direct communication with landowners in these states to identify private wells and springs in the vicinity of the projects and to request permission to conduct pre-construction water quality testing. Field surveys have not been completed for the entire project due to lack of approved access, and landowner communications are ongoing. Therefore, we have included a recommendation in section 4.3.1.2 that the Applicants file with the Secretary an updated list of the locations of privately owned water resources prior to construction

Equitrans Expansion Project

No public water supply resources within 1 mile of the EEP have been identified in West Virginia or Pennsylvania. Three private water wells were identified within 150 feet of the EEP construction workspace in Pennsylvania.

Wellhead and Source Water Protection Areas

The 1986 amendment to the Safe Drinking Water Act (SDWA) requires each state to develop and implement a wellhead protection program. In 1996, the SDWA was amended to require the development of a broader-based source water assessment program. The intent of each state's source water assessment program is to assess contamination threats to all public drinking water sources (groundwater and surface water). In accordance with the 1996 amendment to the SDWA, the West Virginia Bureau for Public Health and the PADEP each state implements its own state-specific Source Water Assessment and Protection Program. In Virginia, the Virginia Department of Health-Office of Drinking Water implements the Source Water Protection Program. Under their respective water supply regulations, Virginia and West Virginia agencies use the terms "surface water protection areas" and "source water protection areas" in slightly different contexts. The MVP would intersect two groundwater wellhead protection areas, in West Virginia. In addition, the location of the MVP would be within 1 mile of 5 groundwater well protection areas and 5 public groundwater systems (WVDHHR, 2017).

EEP would not cross any source water protection areas for groundwater resources.

Mountain Valley Project

Based on information provided by WVDEP from the West Virginia Water Resources Management Plan online GIS mapper the MVP would cross two groundwater wellhead protection areas located in the Nettie-Leivasy Public Service District in Nicholas County, WV. In addition, the MVP would cross surface water protection areas as described in section 4.3.2 and table 4.3.2-3 including 6 Zones of Critical Concern (ZCC) and 14 Zones of Peripheral Concern (ZPC) in West Virginia. A ZCC and ZPC are generally established buffers mapped around all sources that contribute directly to a public water supply intake (WVDEP, 2017). The MVP would cross the Red Sulphur Public Service District's ZCC and ZPC at MP 195.4.

Equitrans Expansion Project

No groundwater source protection areas were identified in the vicinity of the EEP.

Septic Systems

Septic systems are self-contained, underground wastewater treatment systems that dispose of household wastewater onsite. When properly installed, used, and maintained, septic systems do not contribute to groundwater contamination. However, if a septic system is not adequately functioning and/or failing, wastewater from septic systems can contribute to groundwater contamination by introducing contaminants, such as nitrates, certain bacteria, and viruses (NESC, 2016).

Septic systems are common in rural areas, including those crossed by the projects. The locations of existing and planned septic systems are not available in a public database.

Mountain Valley Project

Mountain Valley worked with landowners during the preliminary phases of the project to determine the location of septic systems in the proposed project area. Mountain Valley also contacted the county government for each county crossed by the project and requested maps of all existing or planned septic systems within the project area. A total of 95 septic systems were identified within 150 feet the MVP construction area (49 in West Virginia and 46 in Virginia). Table 4.3.1-3 lists the septic systems that were identified with 150 feet of the MVP construction workspaces, as well as the project milepost at which they would be crossed and the project facility type (i.e., access road, pipeline, or ATWS) that is proposed at that crossing location.

TABLE 4.3.1-3

Septic Systems Located within 150 feet of the Mountain Valley Project Construction Limits

State	County	Location (Project MP)	Project Facility Type (Access Road/Pipeline/ATWS)
WV	Wetzel	0.0	ATWS
WV	Wetzel	1.3	Access Road
WV	Wetzel	1.5	Access Road
WV	Wetzel	1.7	Access Road
WV	Wetzel	1.8	Access Road
WV	Wetzel	2.3	ATWS
WV	Harrison	11.2	Pipeline
WV	Harrison	22.3	Pipeline
WV	Lewis	59.2	Access Road
WV	Lewis	59.6	Access Road
WV	Lewis	62.9	Access Road
WV	Lewis	65.5	Pipeline
WV	Lewis	73.5	Pipeline, ATWS
WV	Braxton	74.9	Access Road
WV	Braxton	77.3	ATWS
WV	Webster	80.8	Access Road
WV	Webster	83.9	Access Road
WV	Webster	83.9	Access Road
WV	Webster	93.2	Pipeline
WV	Webster	106.0	Pipeline
WV	Webster	106.1	Pipeline
WV	Nicholas	111.1	Pipeline
WV	Nicholas	113.8	Pipeline
WV	Nicholas	116.1	Access Road
WV	Nicholas	116.1	Access Road
WV	Nicholas	116.1	Access Road
WV	Nicholas	122.4	ATWS
WV	Nicholas	128.5	Access Road
WV	Greenbrier	137.4	Pipeline
WV	Greenbrier	140.5	Access Road
WV	Greenbrier	144.0	ATWS
WV	Greenbrier	149.5	Pipeline
WV	Greenbrier	149.9	Access Road
WV	Greenbrier	150.7	Access Road
WV	Greenbrier	151.4	Pipeline
WV	Greenbrier	156.5	Access Road
WV	Greenbrier	156.5	Access Road
WV	Greenbrier	156.9	Pipeline
WV	Summers	159.4	ATWS

TABLE 4.3.1-3 (continued)

Septic Systems Located within 150 feet of the Mountain Valley Project Construction Limits

State	County	Location (Project MP)	Project Facility Type (Access Road/Pipeline/ATWS)
WV	Summers	162.9	Access Road
WV	Summers	170.0	Pipeline
WV	Summers	171.3	Pipeline
WV	Summers	172.4	Access Road
WV	Summers	172.6	Pipeline
WV	Monroe	177.4	Pipeline
WV	Monroe	187.6	Access Road
WV	Monroe	187.6	Access Road
WV	Monroe	187.6	Access Road
WV	Monroe	190.6	Access Road
VA	Giles	198.6	Pipeline
VA	Giles	199.1	Access Road
VA	Giles	199.3	Access Road
VA	Giles	199.7	Access Road
VA	Giles	201.4	Access Road
VA	Giles	202.3	Access Road
VA	Giles	203.6	Pipeline
VA	Giles	203.7	Pipeline
VA	Giles	211.9	Pipeline
VA	Giles	212.9	Pipeline
VA	Giles	213.3	Access Road
VA	Giles	213.3	Access Road
VA	Giles	214.7	Access Road
VA	Giles	216.6	Access Road
VA	Montgomery	228.6	Access Road
VA	Montgomery	229.5	Pipeline
VA	Montgomery	229.9	Access Road
VA	Montgomery	230.8	ATWS
VA	Roanoke	234.1	Access Road
VA	Roanoke	245.4	Access Road
VA	Franklin	257.8	Access Road
VA	Franklin	257.8	Access Road
VA	Franklin	258.9	Pipeline, ATWS, Access Road
VA	Franklin	260.2	Pipeline
VA	Franklin	260.5	Access Road
VA	Franklin	260.5	Access Road
VA	Franklin	260.5	Access Road
VA	Franklin	260.5	Access Road
VA	Franklin	261.5	Access Road
VA	Franklin	261.5	Access Road

TABLE 4.3.1-3 (continued) **Septic Systems Located within 150 feet of the Mountain Valley Project Construction Limits**			
State	**County**	**Location (Project MP)**	**Project Facility Type (Access Road/Pipeline/ATWS)**
VA	Franklin	261.6	Pipeline
VA	Franklin	262.0	Pipeline
VA	Franklin	265.4	Pipeline
VA	Franklin	266.2	Pipeline
VA	Franklin	272.8	Access Road
VA	Franklin	278.5	Access Road, ATWS
VA	Franklin	278.6	Pipeline
VA	Franklin	278.7	Access Road
VA	Franklin	278.7	Access Road
VA	Franklin	280.0	Access Road
VA	Franklin	280.0	Access Road
VA	Franklin	280.7	Pipeline
VA	Pittsylvania	285.8	Pipeline
VA	Pittsylvania	296.4	Pipeline
VA	Pittsylvania	296.6	Access Road
VA	Pittsylvania	298.4	Access Road

Equitrans Expansion Project

Equitrans has not identified any septic systems along its EEP pipelines.

Contaminated Groundwater

Existing contaminated groundwater resources may be encountered during construction of the projects. Contaminated groundwater may pose health and safety concerns to construction workers and potentially elevate environmental risk. The Applicants searched the EPA's Facility Registry System database to identify documented contaminated sites located within the vicinity of the projects. Additionally, the Applicants queried digital databases provided by the WVDEP, PADEP, and the VADEQ to identify locations of potential contamination concern. The sites identified during the query were primarily NPDES, Resource and Conservation Recovery Act Information System (RCRIS), and state-registered storage tank sites. NPDES sites include regulated stormwater discharges to water drainages or sewer systems, and RCRIS sites indicate regulated entities that handle hazardous waste and materials. Table 4.3.1-4 lists sites of potential concern located within 200 feet of the projects' construction workspace.

TABLE 4.3.1-4

Sites with Potential for Contaminated Groundwater within 200 Feet of the Mountain Valley Project and the Equitrans Expansion Projects' Workspace

Site	Location (Nearest Project MP)	Distance from Project (feet)	Pollutant	Site Status
Mountain Valley Project				
Consolidation Coal Company	8.0	174	Chloride	Ongoing monitoring
Pike Coal Recovery	87.4	143	Water from coal operations	Reclamation completed in 1983
William D. Smith Trucking	210.1	160	NPDES discharge	Enforcement and reporting ongoing
Lafayette Church Property	235.6	150	Oil	In compliance with permits
Equitrans Expansion Project				
Iams Residential Sewage Treatment Plant	0.1 H-318	200	Raw sewage	In compliance with permits
Sources: EPA, 2015c; WVDEP, 2016; VADEQ, 2016				

Mountain Valley Project

Four sites of potential concern for contaminated groundwater were identified as being within 200 feet of the MVP construction workspace. Of the four sites, two are no longer being monitored for contamination by state or federal agencies.

Brine pits, associated with oil and gas production, may contain salts, minerals, or toxic substances and have the potential to impact groundwater resources. Based on a review of Google Earth imagery, one brine pit was identified within 150 feet of the MVP right-of-way, and a total of 41 potential brine pits are located within 0.25 mile of the MVP right-of-way.

Equitrans Expansion Project

The Iams Residential Sewage Treatment Plant is within 200 feet of the EEP. The treatment plant is in compliance with its environmental permits with no noted violations (EPA, 2015c). No brine pits were identified within 0.25 mile of the EEP right-of-way.

Jefferson National Forest

The portion of the project area within the Jefferson National Forest is underlain by the Valley and Ridge Regional Aquifer system. No springs or swallets were identified within 500 feet of the MVP pipeline route crossing the Jefferson National Forest. No mine pools identified within the vicinity of the project, or the sites with potential groundwater contamination, would be located along the pipeline route across the Jefferson National Forest. There are no public groundwater supplies or source water protection areas for groundwater resources crossed by the MVP within the Jefferson National Forest boundaries. No hydrostatic test water would be obtained from groundwater sources within the Jefferson National Forest.

4.3.1.2 Environmental Consequences

Aquifers

As discussed, bedrock aquifers predominate in the project areas with minor surficial alluvial aquifers occurring along streams. The pipeline trench would rarely exceed 10 feet in depth, and could encounter shallow groundwater along its route.

In areas of shallow groundwater, construction activities may temporarily affect shallow near-surface aquifers. Grading and clearing, trenching and blasting, trench dewatering, and hydrostatic test discharge activities could temporarily alter overland water flow and groundwater recharge, or could result in minor fluctuations in groundwater levels. Overland construction could potentially increase turbidity through erosion and sedimentation. Dewatering of the pipeline trench may require the temporary pumping of groundwater in areas where there is a near-surface water table. Construction activities may affect shallow aquifers and could cause minor temporary fluctuations in groundwater levels and/or increased turbidity.

As noted in section 4.1.2.5, stakeholder comments included the filings of geologic reports, such as that by Kastning (2016), which state that the degree of subsurface karst interconnectivity clearly shows the project's potential to impact water quantity and quality to area groundwater users (springs and wells). Comments further state that surface water would be affected during pipeline construction through mature karst areas; and the presence of the pipeline during its operational life would provide for long-term vulnerability to groundwater use in these areas from spills and/or releases due to pipeline rupture caused by increased rates of corrosion due to oxygenated recharging groundwater flowing preferentially along the completed backfilled trench line. Comments provided further state that the pipeline trench would function as a "zone of low hydraulic head" effectively acting as an interceptor trench that would preferentially "shunt" shallow groundwater flow into and along the trench increasing the likelihood of subsidence, collapse and pipeline failure.[27] Commenters also state that the pipeline would impede or act as a barrier to groundwater flow where the pipeline is installed below the water table; and would impede recharging groundwater where the pipeline lies above the water table.

Trenches would be backfilled immediately following pipeline installation with the same material that was excavated from the site. Therefore, with the exception of the space occupied by the pipe itself, pipeline trenches would not inhibit groundwater flow. For an operational pipeline to impede groundwater flow, the pipe would have to encompass an area within the aquifer that extends both vertically and laterally to impermeable barriers (i.e., it would have to 'seal off' the aquifer). Otherwise, groundwater flow would flow around the pipe. An aquifer's thickness and lateral extent varies, but is much greater than the space that would be occupied by the pipeline proposed for the projects. The physical pipeline would occupy only a negligible portion of the aquifer and have no influence on groundwater flow.

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[27] For an example see Giles and Roanoke Counties' submittal of Mr. Paul Rubin's assessment at accession number 20161222-5458.

Similarly, because of the pipeline's size relative to the aquifer and the fact that it would not be attached to an impermeable barrier above the aquifer, water infiltration would not be inhibited by the presence of a pipeline. The proposed rights-of-way, like subsurface pipe, only overlie a very small portion of the aquifers it crosses. Further, rights-of-way would be restored to pre-construction contours and would be either seeded or allowed to revegetate naturally. For these reasons, the projects restored rights-of-way would not cause a permanent reduction to infiltration of recharge waters.

Hydraulic head, or the level to which water rises in a well, is a measurement of the potential energy of water due to its elevation and additional energy from pressure (Pennsylvania State University, 2016). Due to the pipeline trench relatively small size relative to the larger aquifer system in which it traverses through, the pipeline trench would have no influence on groundwater elevation or the water's potential energy associated with pressure. Therefore, a pipeline or pipeline trench would not influence local groundwater's hydraulic head thereby altering groundwater flow.

Upon completion of construction, the Applicants would restore the ground surface as closely as practicable to original contours, and re-establish vegetation to facilitate restoration of pre-construction overland water flow and recharge patterns. The Applicants would minimize impacts by implementation of the construction practices and operational erosion controls outlined in the FERC Plan (for the MVP), Equitrans' Plan (for the EEP), and both Applicants' Procedures and their project-specific *Erosion and Sediment Control Plans* for West Virginia and Virginia.

Mountain Valley Project

Where the MVP pipeline traverses through mature karst terrain, the depth to groundwater may be significantly deeper as shown by observations from cave and spring elevations in the Mount Tabor Sinkhole Plain. However, Mountain Valley is cognizant of the rapid transmission/loss of surface water within mature karst terrain and has adopted several specialized construction techniques for crossing these areas to mitigate for sediment runoff into karst features while preserving the recharge function of these features.

Mountain Valley has also adjusted its proposed route within the Mount Tabor Sinkhole Plain based on the density of surficial karst features, correlation of these features with fractures/lineaments, and from information obtained from existing dye tracer tests. In response to public comments on the draft EIS regarding potential impacts on the Mount Tabor Sinkhole Plain, Mountain Valley conducted an additional karst assessment using surface geophysical (electrical resistivity) methods, aerial photograph and LiDAR imagery analysis, including an analysis of fracture trace/lineaments, along with an examination of the results of existing dye trace studies to obtain a more comprehensive understanding of the karst terrain and subsurface connectivity within the Mount Tabor Sinkhole Plain (see figures 4.1-3 and 4.1-5). Based on the results of this analysis, following issuance of the draft EIS, Mountain Valley adopted the Mount Tabor Variation, which would avoid areas of more densely distributed sensitive karst features that were present along the original route. As discussed in section 3.5, we are recommending that Mountain Valley adopt Variation 250 which would modify the Mount Tabor Variation to avoid the route's proximity to Slussers Chapel Cave, and to further avoid subsurface karst connectivity to Slussers Chapel Cave and Old Mill Cave, based on the results of and correlation with the fracture trace/lineament and existing dye trace results.

One spring at MP 161.3 is located within a proposed access road (MVP-SU-198). The spring flows through a culvert and under an existing dirt/rock logging road that is proposed for use as project access. Mountain Valley would widen, grade, and stabilize the road to allow for the mobilization of construction material and for use by project personnel. This spring could be affected by temporary increases in turbidity and sedimentation associated with project construction and could temporarily redirect the spring within the construction area until pre-construction contours are restored. However, these potential impacts would be minimized and/or avoided due to the fact that the project crosses over the spring at a point where it is contained within a culvert. If disturbed by construction, wells completed in near-surface aquifers would typically quickly re-establish equilibrium, and turbidity levels would rapidly subside, such that impacts would be localized and temporary.

Equitrans Expansion Project

Upon completion of construction, Equitrans would restore the ground surface as closely as practicable to original contours, and re-establish vegetation to facilitate restoration of pre-construction overland water flow and recharge patterns. Equitrans would minimize impacts by implementation of the construction practices and operational erosion controls outlined in Equitrans' Plan and Procedures and the project-specific *Erosion and Sediment Control Plans* for West Virginia and Pennsylvania.

Karst Terrain

Mountain Valley Project

The southern portion of the MVP pipeline route would cross areas of karst terrain. As discussed in section 4.1.1.5, Mountain Valley conducted a desktop evaluation along with field surveys (where access was granted) to identify the locations of karst terrain. Areas of minor karst development have been identified from about MPs 172 to 174, with significant karst development present from about MPs 191 to 239.

During construction activities, Mountain Valley would implement its *Karst Mitigation Plan*[28] and deploy a Karst Specialist Team to assist in limiting potential negative impacts on karst features, and would implement the measures contained in its *Karst-specific Erosion and Sediment Control Plan* for construction in karst terrain. The Karst Specialist Team would inspect karst features and assess the risk for impacting groundwater quality and recharge to the karst aquifer, as well as provide recommendations for karst feature stabilization and mitigation.

To minimize the potential for impacts from construction in karst, and to stabilize a karst feature and minimize connectivity and sediment transport to nearby water-resource receptors (wells, springs, surface water) during pipeline construction, Mountain Valley would implement enhanced industry erosion control BMPs to minimize construction impacts on groundwater. These include but are not limited to:

[28] See table 2.4-2 for the location of Mountain Valley and Equitrans' plans.

- conducting broad and shallow surface water flow dispersion so discharge is not concentrated in one specific area leading to raveling of soils through karst;
- preventing uncontrolled release of surface water and sediments to waterbodies;
- preventing routing of stormwater to, or storage of stormwater into karst features;
- preventing blockage of karst features;
- installing double lines of erosion controls upslope of a karst feature and, where possible, providing a minimum 100-foot natural vegetated buffer area around a waterbody or karst feature; and
- re-establishing ground surface contours and surface runoff patterns after construction.

Additionally, in areas where sediment-filled, pinnacled karst is encountered during construction, Mountain Valley would maximize construction BMPs to prevent soil raveling associated with the accumulation of precipitation in the trench line by:

- preventing stormwater overland flow from entering the trench;
- minimizing the time that construction occurs;
- isolating a karst feature in the trench with silt fencing and sandbags to prevent precipitation that falls within the trench from accumulating in the karst feature;
- dewatering the trench to prevent water from flowing into the karst feature; and
- mitigating and stabilizing karst features prone to soil raveling and sediment migration by construction of reverse-gradient aggregate fill, which arrests soil and sediment raveling and migration to the subsurface while maintaining the groundwater recharge integrity of these features.

Refueling, hazardous materials storage, and overnight equipment parking within 100 feet of streambeds, sinkholes, fissures, or areas draining into these or other karst features would be prohibited. Equipment service areas would be sited outside of flagged buffer areas surrounding karst features. All equipment would be checked daily by a construction inspector; if any leaks are observed during the inspection, drip pans and other containment would be deployed immediately.

Equitrans Expansion Project

No karst terrain was identified in the areas crossed by the EEP pipelines.

Mine Pools

Mountain Valley Project

As discussed in section 4.3.1.1, the MVP pipeline route would cross a small portion of the Pittsburgh Mine Pools, Sewell Mine Pools, and Pocahontas Coal Seam Mine Pools, but construction would be conducted more than 200 feet above any known mine pools. Mountain Valley contracted an engineering firm to conduct geotechnical evaluations (drill borings) in areas identified as having a potential for mine pools, to determine if underground mine pools were in the proposed project work areas and if so, to confirm that there would not be conflicts with these pools and project construction. The evaluations were conducted at three sites in Harrison and Nicholas Counties, West Virginia near areas where the potential mine pool elevations were at the shallowest. Groundwater was encountered at two of the three sites, and did not appear to be affected by the mines or mine water.[29] Based on the depths of the mine pools relative to project excavation depths and the findings of the geotechnical evaluations, it is unlikely that mine pool water would be encountered during project activities. However, if a concern is identified, Mountain Valley would follow its *Unanticipated Mine Pool Mitigation Plan*[30], which outlines procedures that would be used in the event that an unanticipated mine pool, that could pose a hazard or be affected during construction, is encountered. As detailed in this plan, Mountain Valley would implement the following procedures if unanticipated mine pool water is encountered during construction:

- stop work immediately;
- inform the Construction Superintendent and EI(s) of the mine water;
- use a qualified person to evaluate the water (by pH or mineral testing) to determine if it is related to mine drainage;
- if it is determined to be mine water, consult with the applicable state's environmental agency (WVDEP or VADEQ) to determine the appropriate way to handle the mine water; and
- return the water to its original path according to the state agency's guidelines during backfilling of the trench or site restoration.

Equitrans Expansion Project

The EEP would cross one mine pool, the Mather Mine Pool, but construction activities would be conducted approximately 225 feet above this pool. If mine pool water is discovered during construction of the EEP, Equitrans would pump the mine pool water through water filter bags onto grassy areas or up-gradient of compost filter socks. As discussed in section 4.3.1.1, mine pool water could contain contaminants that could require treatment prior to surface disposal.

Public Water Supply Wells and Springs

In areas where a public or private water supply well or spring is identified within 150 feet of the projects (500 feet in karst terrain[31]), the Applicants would flag the wellhead or spring as a precaution, and notify the owner or operator of the water resource. The Applicants would conduct two pre-construction water quality evaluations on water wells within 150 feet of the project (500 feet in karst terrain). One pre-construction evaluation would be conducted 6 months prior to construction; the second pre-construction evaluation would be conducted 3 months prior to construction.

Mountain Valley and Equitrans would evaluate any complaints of damage to water supply wells associated with construction of the projects and identify a suitable settlement with the landowner. If it is determined that suitable potable water is no longer available due to construction-related activities, Mountain Valley and Equitrans would provide adequate quantities of potable

[29] See accession number 20161014-5022.

[30] See table 2.4-2 for the location of Mountain Valley and Equitrans' plans.

[31] Longer distances may be necessary if dye traces, cave maps, or other information provided in the enhanced karst management plan required by WVDEP's Special Condition 16 of the Conditional 401 WQC depict distant underground connectivity.

water during repair or replacement of the damaged water supply. In the event that an impact occurs to a livestock well, Mountain Valley and Equitrans would provide a temporary water source to sustain livestock while a new water supply well is constructed. In the event that an impact occurs to an irrigation well, Mountain Valley and Equitrans would compensate landowners for losses in crops resulting from well damage.

Neither Mountain Valley nor Equitrans have identified all private domestic water supply wells within 150 feet (500 feet in karst terrain[32]) of the construction work areas, in part due to lack of access. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley and Equitrans should each file with the Secretary the location of all water wells, springs, and other drinking water sources within 150 feet (500 feet in karst terrain) of construction work areas and aboveground facilities.**

<u>Mountain Valley Project</u>

The MVP would be within 0.1 mile of two wells for public supplies: one in Greenbrier County, West Virginia (the Greenbrier County Public Supply District #2), and the other in Pittsylvania County, Virginia (the Robin Court Subdivision). The project would also be within 0.3 mile of Rich Creek Spring, located near MP 195.2, which is used as a water supply by the Red Sulphur Public Service District.

As described in Mountain Valley's *Water Resources Identification and Testing Plan*[33] (revised February 2017), Mountain Valley would send a letter to the property owner requesting permission to conduct pre-construction water sampling. If Mountain Valley does not receive a response to the first letter, a second letter would be sent about 4 weeks later. According to Mountain Valley, if no response from the landowner is received after two attempts, Mountain Valley would suspend further contact regarding water quality testing.

Mountain Valley's evaluation would include water quality analysis of the following: pH, specific conductance, temperature, turbidity, total and fecal coliform bacteria, total dissolved solids, total suspended solids (TSS), hardness, alkalinity, sulfate, chloride, nitrate, bicarbonate, calcium, magnesium, sodium, potassium, iron, and manganese. As discussed below, Equitrans is proposing to evaluate drinking water samples for three additional parameters: oil and grease, volatile organic compounds, and hydrocarbons. In order to be consistent between the two projects we are recommending below that Mountain Valley revise its *Water Resources Identification and Testing Plan* to include additional water quality testing.

Mountain Valley has also agreed to conduct water yield testing during the second pre-construction sampling.

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32 Longer distances may be necessary if dye traces, cave maps, or other information provided in the enhanced karst management plan required by WVDEP's Special Condition 16 of the Conditional 401 WQC depict distant underground connectivity.

33 See table 2.4-2 for the location of Mountain Valley and Equitrans' plans.

According to Mountain Valley, post-construction water quality/yield samples may be collected if the water supply owner lodges a complaint after construction. Mountain Valley would coordinate with the water supply owner to evaluate potential sources of impact. The evaluation would consider the timing of the complaint relative to the project construction timeline and would include the following:

- a physical evaluation of the water system;
- an interview with the landowner;
- potential resampling and analysis of the water supply; and
- a hydrogeological assessment.

Since Mountain Valley has not agreed to conduct pre-construction water quality test, we recommend that:

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, for review and written approval of the Director of OEP, a revised *Water Resources Identification and Testing Plan* which includes:**

  a. water quality testing for oil and grease, volatile organic compounds, and hydrocarbons; and

  b. post-construction monitoring, with the landowner's permission, of all water wells, springs, and other drinking water supply sources within 150 feet of construction workspaces or 500 feet of construction workspaces in karst terrain.

If this investigation confirms that pipeline construction was the source of impact, Mountain Valley would provide the owner with a temporary water supply (i.e., bottled water, treatment of the existing source to baseline conditions, and/or connecting to a secondary on-site water source) until a permanent supply is developed. Mountain Valley's *Water Resources Identification and Testing Plan* (revised February 2017) describes the protocols it would use to identify and assess water resources in the vicinity of the project (see table 2.4-2 for the location of the plan). Mountain Valley would conduct pre-construction water quality sampling in accordance with its Plan.

For public water suppliers, existing documentation of well production would be used to establish baseline yield, and a tailored analyte list that meets the requirements of the public supplier permit and is agreed upon by the public supplier would be incorporated into the pre-construction testing program. If it is determined that a long-term solution is required, Mountain Valley would restore the well's water quality and yield to pre-construction conditions by providing the affected landowner with either a new permanent treatment system, a new on-site well, or a combination of both.

<u>Equitrans Expansion Project</u>

Three water wells were identified within 150 feet of the EEP construction workspace in Pennsylvania

Equitrans' evaluation for both sampling events would include water quality analysis of the following: alkalinity, oil and grease, specific conductance, total dissolved solids, TSS, chloride, sulfate, hardness, nitrate, surfactants, total coliform, E. coli, turbidity, volatile organic compounds, hydrocarbons, and total metals. During the second pre-construction sampling event, Equitrans would also assess water yield. Landowners that decline Equitrans' pre-construction evaluations would be documented. Equitrans would only conduct post-construction water quality sampling for wells that were sampled prior to construction and at the specific request of the landowner. Similarly, Equitrans would conduct post-construction yield testing only for those wells that were assessed prior to construction and for which the landowner has a concern regarding potential project-related changes in the well's yield.

Since Equitrans has not agreed to conduct pre-construction water quality test, we recommend that:

- **<u>Prior to construction</u>, Equitrans should offer to conduct, with the landowner's permission, post-construction monitoring of all water wells, springs, and other drinking water supply sources within 150 feet of construction workspaces or 500 feet of construction workspaces in karst terrain.**

Septic Systems

Underground septic systems could be damaged by heavy equipment operating above the system or through accidental contact with machinery during excavation activities.

Mountain Valley Project

To avoid adverse impacts on septic systems in the construction area, Mountain Valley has worked with landowners and county officials to identify planned and existing septic systems. Mountain Valley identified 95 septic systems within 150 feet of the proposed MVP construction limits (see table 4.3.1-3). To identify any systems that may not have been identified during its investigation, Mountain Valley would contact landowners again prior to commencing construction on their property to determine if there are any previously unidentified septic systems within the right-of-way. If septic systems are present, Mountain Valley would work with landowners to avoid impacts on septic systems by implementing mitigation or avoidance measures, such as: placing timber mats over the system during construction; and incorporating minor pipeline shifts within the right-of-way. If a septic system is identified during construction, Mountain Valley would notify the landowner and appropriate agencies and repair the system to at least its pre-construction condition.

Equitrans Expansion Project

Equitrans has not identified any septic systems along its EEP pipelines. Equitrans has not provided procedures that would be followed if a septic system is identified during construction, therefore, **we recommend that**:

- **Prior to construction, Equitrans should file with the Secretary, for review and written approval by the Director of OEP, a plan to identify septic systems and avoidance, minimization, and mitigation measures.**

Wellhead and Source Water Protection Areas

As noted above, the MVP would cross two groundwater wellhead protection areas located in the Nettie-Leivasy Public Service District in Nicholas County, WV. In addition, MVP would cross surface water protection areas as described in section 4.3.2 and table 4.3.2-3. The MVP would cross the Red Sulphur Public Service District's ZCC and ZPC at MP 195.4. No groundwater source protection areas were identified in the vicinity of the EEP.

Mountain Valley Project

The MVP pipeline route would cross the Red Sulphur Public Service District's ZCC and ZPC. We received comments regarding potential impacts on the Red Sulphur Public Service District such as turbidity, contamination due to spills from construction equipment, and damage to aquifers due to trenching. Mountain Valley is working with the Red Sulphur Public Service District to develop a contingency plan for their water supply should project-related impacts occur. Mountain Valley indicated the contingency plan would be available mid-2017.

Equitrans Expansion Project

EEP would not cross any source water protection areas for groundwater public water supplies.

Contaminated Groundwater

Existing contaminated groundwater resources may be encountered during construction of the projects. Contaminated groundwater may pose health and safety concerns to construction workers and the public, and potentially elevate environmental risk.

Construction of facilities may cause groundwater contamination if hazardous waste or fluids such as oil and fuel were to be spilled or leak from equipment. Implementation of proper storage, containment, and handling procedures would minimize the chance of spills.

There is little chance of pipeline operations contaminating groundwater. Because methane is lighter than air, it would generally dissipate rapidly in the event of a pipeline leak, thereby causing little to no impact on karst conduits or cave systems or on groundwater resources. However, concern was raised regarding the potential impacts of natural gas being drawn into a cave, and methane dissolution into groundwater in the event of a leak. Methane has a solubility limit of 3.5 ml/100 ml of water at a temperature of 17°C, is highly evaporative and readily degasses from aqueous solution and is considered non-toxic when dissolved in water. As described in section 4.12 of the EIS, the pipelines would be monitored for signs of leaks.

Mountain Valley Project

A literature review identified 4 existing reported contamination sites within 200 feet of the MVP and 41 brine pits within 0.25 mile. To avoid or minimize potential impacts, Mountain Valley would implement the measures outlined in its *Unanticipated Discovery of Contamination Plan*. EIs would be trained to detect evidence of soil and groundwater contamination (e.g., visible sheen). If contaminated groundwater is encountered during construction, the Applicants would notify the affected landowner and the appropriate federal or state agency.

Prior to construction, Mountain Valley would evaluate brine pits within 150 feet of the construction right-of-way for potential leakage or local contamination.

Mountain Valley's *SPCCP* and *Unanticipated Discovery of Contamination Plan for Construction Activities in West Virginia* and its *SPCCP* and *Unanticipated Discovery of Contamination Plan for Construction Activities in Virginia* address the prevention and mitigation measures that would be implemented to avoid or minimize the potential impacts of a hazardous material spill during construction[34]. Measures outlined in these plans include, but are not limited to:

- identification, labeling, and reporting of all potential pollutant sources at the work site;
- regular inspection of containers and tanks for leaks;
- prohibition of fueling, lubricating activities, and hazardous material storage in or adjacent to sensitive areas;
- use of secondary containment for storage of fuels, oils, hazardous materials, and equipment;
- implementation of emergency response procedures, including spill reporting procedures; and
- use of standard procedures for excavation and disposal of any soils contaminated by spillage.

Equitrans Expansion Project

One site with the potential for contaminated groundwater was identified within 200 feet of the EEP; however, the facility is in compliance with its environmental permits and has no record of environmental violations.

Equitrans' *SPCCP* and *Preparedness, Prevention, and Contingency and Emergency Action Plans* should prevent groundwater contamination from hazardous materials that may leak from construction equipment.

Groundwater Use

Neither Mountain Valley nor Equitrans propose to use groundwater for hydrostatic testing. Some groundwater may be withdrawn by Mountain Valley for dust control during construction. However, groundwater removed from the trench, and water used for hydrostatic testing would be

[34] See table 2.4-2 for the location of Mountain Valley and Equitrans' plans.

released into vegetated uplands, in accordance with our Plan and Procedures, and as discussed above in karst areas discharge would not be concentrated in one specific area leading to raveling of soils through karst. Water pumped from the trench during dewatering activities would be released back into the same drainage basin thus not constituting a consumptive use of groundwater from the basin. The Applicants would comply with all federal, state, and local agencies permits and requirements for water procurement and water releases, so as to minimize impacts on groundwater resources. Considering the amount of water withdrawn and released during construction activities, and measures that would be implemented to reduce impacts from water withdrawals and release, the projects would not significantly change the availability of groundwater in the area.

Mountain Valley Project

Mountain Valley would obtain water from municipal, surface water, or groundwater sources for dust-control purposes. The amount of water that would be used for dust control is highly dependent on the conditions at the time of work (e.g., weather, soil type, vegetation cover). However, Mountain Valley estimates that 55,000 gallons per day would be required for dust control. If groundwater is used to suppress dust, Mountain Valley would adhere to the measures outlined in its *Water Resources Identification and Testing Plan* to minimize, avoid, and mitigate (if applicable) any impacts on groundwater resources.

Mountain Valley does not currently intend to use water from wells or groundwater sources for hydrostatic test water.

Equitrans Expansion Project

Equitrans would use approximately 3,000 gallons of municipal water per 200-foot-long portion of construction right-of-way (or 1,000 feet of access road) for dust control; no water would be obtained from groundwater or surface water sources for Equitrans' dust control efforts.

Equitrans is proposing to cross two rivers along the EEP using HDDs, neither of which is in karst terrain. Both crossings would be installed below the depth to seasonal high water table. During the HDD drilling process, a slurry of bentonite clay and water would be pressurized and pumped through the drilling head to lubricate the drill bit, remove drill cuttings, and hold the hole open. This slurry, referred to as "drilling mud," has the potential to be inadvertently released to the surface if there is a fracture in the underground drill hole. Inadvertent releases of drilling mud could impact groundwater quality at nearby water supply wells and springs (see section 4.3.1.1 for a discussion of water supply wells and springs in the project area). In the event of an inadvertent release, Equitrans would implement its *HDD Contingency Plan*. Additionally, Equitrans would comply with all applicable federal, state, and local permitting requirements.

Blasting

Blasting has the potential to impact groundwater quality through a short-term increase in turbidity at nearby wells and/or springs. Additionally, blasting may impact groundwater quantity by altering the discharge to springs in blasting areas. Vibrations caused by blasting also have the potential to locally affect bedrock fractures within the bedrock aquifer, which could temporarily result in diminished well yields and increased turbidity.

Mountain Valley Project

In areas of shallow bedrock, Mountain Valley would attempt to use specialized excavation methods, including ripping or the use of hydraulic hammers to break up rock. However, blasting may be necessary to achieve the required trench depth if these methods prove to be ineffective or inefficient. Mountain Valley would minimize or avoid impacts on groundwater during blasting by implementing the construction practices outlined in its *General Blasting Plan*. As stated in the *General Blasting Plan*, licensed blasting contractors would conduct the blasting activities in accordance with all applicable permits. As stated above, Mountain Valley would conduct pre-construction testing for groundwater supply resources within 150 feet of the project's construction workspace (500 feet in areas of karst terrain[35]). If it is determined that blasting activities caused an adverse effect to a specific groundwater supply, Mountain Valley would work with the supply's owner to ensure they have water until the damaged supply is repaired, at Mountain Valley's expense.

Equitrans Expansion Project

Blasting is not anticipated for construction of the EEP.

Jefferson National Forest

Potential impacts on groundwater along the MVP pipeline route across the Jefferson National Forest are expected to be limited to those associated with clearing, grading, and trenching during construction. Those impacts would be temporary or short-term. It is unlikely that the trench would be deep enough to significantly affect aquifers. There are no identified springs within 500 feet of the proposed MVP crossing of the Jefferson National Forest (see section 4.2.1.1). However, should a spring be encountered during construction, Mountain Valley would use daylight drains (open ended and drain out to the ground surface) located behind trench breakers to capture and direct the water to energy-dissipating devices located at the ground's surface within the right-of-way. Mountain Valley would then direct any resulting discharge downslope to prevent accumulation within the right-of-way. Mountain Valley would adhere to its *Erosion and Sediment Control Plan* as well as our Plan and Mountain Valley's Procedures to minimize potential adverse effects on groundwater. In addition, Mountain Valley would implement measures outlined in its POD to further reduce potential project-related impacts on groundwater resources within the Jefferson National Forest.

Conclusions Regarding Impacts on Groundwater and Mitigation

Temporary, minor, and localized impacts could result during trenching activities in areas with shallow groundwater (at depths less than 10 feet below the ground surface) crossed by the pipelines, and during construction through areas with developed karst. The Applicants would

[35] Longer distances may be necessary if dye traces, cave maps, or other information provided in the enhanced karst management plan required by WVDEP's Special Condition 16 of the Conditional 401 WQC depict distant underground connectivity.

implement BMPs to protect groundwater resources, including erosion controls, restoration of the right-of-way, revegetation, and enhanced mitigation BMPs as discussed above while working in karst terrain.

The Applicants would also adhere to all applicable local, state, and federal requirements to protect groundwater resources. As discussed in section 4.1.2.5 we received numerous stakeholder comments included the filings of geologic reports regarding concerns with subsurface karst interconnectivity and the project's potential to impact water quantity and quality to area groundwater users (springs and wells); and that mitigation BMPs through karst areas proposed by Mountain Valley are inconsistent with known industry standards. We reviewed these expert reports and the many citations provided within and agree with cited references that the goal of the BMPs is to conserve natural resources, including preservation of soil erosion and minimizing contaminants that could reach the groundwater system (American Geological Institute, 2001). We believe that the karst groundwater mitigation measures proposed by Mountain Valley are consistent with this goal; and conclude that the use of these measures along with the Applicant's implementation of our recommendations would adequately avoid or minimize potential impacts on groundwater resources. Therefore, we do not anticipate long-term or significant impacts on groundwater resources as a result of construction or operation of the projects.

4.3.2 Surface Water Resources

4.3.2.1 Affected Environment

Watersheds

Surface water resources that would be affected by construction of the MVP and the EEP include ponds, lakes, streams, and associated tributaries. Surface waters are protected at the federal, state, and local level. As identified in table 4.3.2-1, the projects would be located in 13 major watersheds.

TABLE 4.3.2-1

Watersheds Crossed by the Mountain Valley Project and Equitrans Expansion Project

State	Sub-basin (8-digit HUC) a/	Start MP	End MP
Mountain Valley Project			
West Virginia	Little Muskingum-Middle Island (05030201)	0.0	9.2
		31.4	32.6
		33.6	37.4
West Virginia	West Fork (05020002)	9.2	31.4
		32.6	33.8
		36.6	36.6
		36.8	36.9
		37.2	37.2
		37.4	43.2
		45.3	47.4
		48.3	49.9
West Virginia	Little Kanawha (05030203)	43.2	45.3
		47.0	47.0
		47.2	48.3
		48.5	48.5
		49.3	49.4
		49.9	78.4
West Virginia	Elk (05050007)	78.4	105.6
		105.8	107.5
West Virginia	Gauley (05050005)	105.1	105.4
		105.6	105.8
		107.4	158.8
		159.1	159.3
		159.5	159.8
		160.0	161.7
West Virginia	Lower New (05050004)	157.2	157.2
		157.7	159.1
		159.3	159.5
		159.8	160.0
		160.3	160.4
		160.8	161.4
		161.7	164.5
		164.7	164.8
West Virginia	Greenbrier (05050003)	163.7	163.8
		164.1	164.2
		164.5	180.3
		180.5	180.7
		180.1	180.1
West Virginia	Middle New (05050002)	180.0	180.1
		180.3	180.7
		181.1	181.1
		196.3	196.3
Virginia	Middle New (05050002)	195.3	218.5

TABLE 4.3.2-1 (continued) **Watersheds Crossed by the Mountain Valley Project and Equitrans Expansion Project**			
State	**Sub-basin (8-digit HUC) a/**	**Start MP**	**End MP**
Virginia	Upper James (02080201)	218.5	220.7
Virginia	Upper Roanoke (03010101)	220.7	293.4
Virginia	Banister (03010105)	293.4	303.5
Equitrans Expansion Project			
Pennsylvania	Lower Monongahela (05020005)	H-305 0.0	H-305 0.1
		H-318 0.0	H-318 3.8
		H-316 0.0	H-316 3.0
		H-158/M80 0.0	H-158/M80 0.2
West Virginia	Little Muskingum-Middle Island (05030201)	H-319 0.0	H-319 <0.1

Source: USGS, 2015

a/ Hydrologic Unit Code (HUC) is a classification system developed by the USGS to classify drainage basins from the regional level to individual watersheds.

Surface Waters

The FERC defines waterbodies as any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes. Perennial waterbodies are expected to contain water for most of the year. Intermittent streams include those that flow only seasonally or following rainfall events. Ephemeral waterbodies include those that only carry stormwater in direct response to precipitation, with water flowing only during and shortly after large precipitation events. The COE's definition of waters of the United States is based on the definitions contained in 33 CFR 328.3.

In accordance with our Procedures, waterbody crossings are defined as either minor, intermediate, or major crossings. Minor crossings are associated with waterbodies less than or equal to 10-feet-wide at the water's edge; and intermediate crossings are associated with waterbodies greater than 10-feet-wide but less than or equal to 100-feet-wide. Major crossings are associated with waterbodies that are greater than 100-feet-wide. Table 4.3.2-2 summarizes the waterbodies crossed by the MVP and the EEP. A complete list of waterbody crossings pending COE's field review can be found in appendix F.

TABLE 4.3.2-2

Number of Waterbody Crossings for the Mountain Valley Project and the Equitrans Expansion Project a/

Project/State	FERC Size Classification: Minor	Intermediate	Major	Total	Flow Type: Perennial	Intermittent	Ephemeral	Total
Mountain Valley Project								
West Virginia	595	112	4	711	219	270	222	711
Virginia	325	72	1	397	170	122	105	397
Subtotal	*920*	*184*	*5*	*1,108*	*389*	*392*	*327*	*1,108*
Equitrans Expansion Project								
West Virginia	2	2	0	4	3	1	0	4
Pennsylvania	25	8	1	34	15	8	11	34
Subtotal	*27*	*10*	*1*	*38*	*18*	*9*	*11*	*38*
Total	**947**	**194**	**6**	**1,146**	**407**	**401**	**338**	**1,146**

a/ Some waterbodies would be crossed at more than one location. This table accounts for each crossing of all affected waterbodies.

Mountain Valley Project

The MVP would require 389 crossings of perennial waterbodies, 5 of which are defined by FERC as major waterbodies (more than 100-feet-wide). Mountain Valley would cross all waterbodies using dry open-cut (flumed, dam-and-pump, or cofferdam) crossing methods. Waterbody crossing methods are discussed in section 2.4.2.10.

Prior to submittal of its application (during pre-filing), Mountain Valley proposed to cross some waterbodies using wet open-cut methods, including major waterbodies and waterbodies supporting sensitive species. Because open-cut crossings of waterbodies may have a greater impact on aquatic species, as well as interrupt potential recreational or boating activities, FERC requested that Mountain Valley investigate the feasibility of using a trenchless crossing method for proposed major waterbody crossings. In response to our request, Mountain Valley used geotechnical evaluations to assess the feasibility of using the HDD crossing method beneath six waterbodies:

- Left Fork of the Holly River at MP 81.7;
- Elk River at MP 87.4;
- Gauley River at MP 118.6;
- Greenbrier River at MP 170.6;
- Blackwater River at MPs 220.0 and 269.8 and
- Pigg River at MP 286.3.[36]

[36] See accession number 20160422-5012. Please note the MPs provided correspond to the October 2015 application route analyzed in our September 2016 draft EIS.

The evaluations determined that, when factoring in the amount of available workspace on both sides of the proposed crossing locations,[37] pipe grade and wall thickness, a 2,500-foot bending radius, entry and exit angles of 12 degrees and 6 degrees, respectively, and an alignment depth of 25 feet below the crossings, an HDD would have required a minimum length of 1,287 feet. For each of the evaluated waterbody crossings, Mountain Valley concluded that the HDD crossing method was not feasible. In all cases, the distance between the points-of-intersection (PIs) on either side of the crossing was not long enough to accommodate an HDD when elevation changes were taken into account.

The geotechnical evaluations also considered potential pipeline route adjustments to increase the feasibility of using an HDD at each location. Mountain Valley identified two locations (i.e., Blackwater River and Pigg River) at which an alternative alignments would provide lengths long enough to accommodate an HDD crossing method.

In a filing on October 14, 2016, Mountain Valley adopted a modification into its proposed route to avoid crossing at the Blackwater River. In section 3.5 of this final EIS we discuss the current proposed route in comparison to the October 2015 route alternative that would have crossed the Blackwater River upstream of the water intake for the town of Rocky Mount, Virginia. The new currently proposed crossing of the Blackwater River is about milepost 269.8, which is about 3.3 miles downstream of the Rocky Mount water intake.

The proposed crossing of the Pigg River along the October 2015 application route analyzed in our draft EIS was 710 feet from PI[38] to PI, an insufficient distance to accommodate an HDD. In its *Waterbody Crossing Review* (April 2016), Mountain Valley identified an alternative route, about 4,000 feet from PI to PI. The alternative route departed from the October 2015 route at about MP 289.0 and continued east for 3,973 feet before rejoining the route at about MP 289.8. While core drillings conducted by Mountain Valley indicated that a 3,417-foot-long HDD would be geologically feasible to cross under the Pigg River, there would be inherent risks associated with an HDD such as the potential for inadvertent release of drilling mud and potential failure of the HDD, therefore, Mountain Valley stated a dry crossing would be preferable.[39]

The October 2016 proposed route would cross five major rivers[40]:

- Little Kanawha River at MP 74.8;
- Elk River at MP 87.3;
- Gauley River at MP 118.9;
- Greenbrier River at MP 171.6; and
- Pigg River at MP 289.2.

The October 2015 application indicated that Mountain Valley intended to cross the Elk, Gauley, and Greenbrier Rivers using wet open-cut methods. Following issuance of the draft EIS,

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37 Workspace includes areas needed for operation of a drill rig and all associated equipment, pipe fabrication, and pullback areas. In areas with limited pullback space, the analysis included pullbacks with up to three sections.

38 PI means point of inflection. PIs are places that the pipeline changes direction.

39 See filing on October 14, 2016 – Attachment DR3-Water Resources-10 (accession number 20161014 5022).

40 Previously, we indicated that the FERC labels rivers more than 100-feet-wide as major crossings.

Mountain Valley changed the proposed crossing methods for these waterbodies to dry open-cuts, using cofferdams.

A study conducted by the USGS (Moyer and Hyer, 2009) investigating the effects of dry open-cut waterbody crossings on downstream sediment loading found that short-term increases in turbidity downstream of construction did occur, but the magnitude of the increase was small and considered to be minimal compared to increased turbidity associated with natural runoff events. Other literature (e.g., Reid et. al., 2004) assessing the magnitude and timing of suspended sediment produced from open-cut dry crossing methods indicates the duration of increased sedimentation would be mostly short-term (i.e., less than 1-4 days) and remain near the crossing location (i.e., an approximate downstream distance of a few hundred feet).

The MVP would also involve installation of 166 culverts within waterbodies along permanent access roads, at ancillary facilities, and temporary bridge crossings. Culverts would be removed from the ancillary facilities and temporary bridge crossings; therefore any impacts associated with culverts in these areas would be short-term and temporary. Culverts used along permanent access roads would remain in place after the project is completed and would result in 1.0 acre of permanent fill impacts on affected waterbodies. The size and installation methods for the culverts would vary based upon waterbody classification and would generally vary between 12 and 36 inches in diameter. In addition, Mountain Valley is currently evaluating using permanent fill (i.e., culverts and/or clean rock/gravel) at 64 wetlands along permanent access roads. In June 2016, we requested site-specific justification for the use of permanent fill within waterbodies and wetlands for permanent access roads. According to Mountain Valley, the permanent fill along access roads would be necessary to provide workers safe access to the pipeline and associated facilities during construction, operation, and maintenance. No permanent fill would be placed in streams within the proposed yards or other ancillary facilities. Mountain Valley would account for all impacts associated with permanent fill in waterbodies and wetlands in its permit applications to the COE and VADEQ.

The Little Kanawha River would also be crossed with using a dry open-cut method (see section 2.4).

Equitrans Expansion Project

The EEP would cross 15 perennial waterbodies. Of these, one would be a major river more than 100-feet-wide (the Monongahela River). Equitrans would cross all waterbodies using either the dry open-cut or HDD crossing methods. Nine waterbody crossings would be completed by HDD: the Monongahela River, South Fork Tenmile Creek, and seven crossings of unnamed tributaries of South Fork Tenmile Creek that would be crossed at the same time as the South Fork Tenmile Creek HDD crossing (see appendix F).

As of May 11, 2017, Equitrans has not completed environmental surveys for the newly adopted New Cline Variation. Equitrans has agreed to file environmental surveys for this variation with the FERC as part of its implementation plan. However, since the results of these surveys have not yet been provided, **we recommend that**:

- **<u>Prior to construction</u>, Equitrans should file with the Secretary the results of all environmental surveys (water resources, wetlands, cultural resources, and threatened and endangered species) for the New Cline Variation.**

Surface Water Use Classifications

CWA Section 303(d) requires that each state review, establish, and revise water quality standards for all surface waters within each state. State classification systems develop monitoring and migration programs to ensure that water standards are attained as designated. Waters that fail to meet their designated beneficial use are considered as impaired and are listed under a state's 303(d) list of impaired waters.

West Virginia

West Virginia state water classifications are implemented by the WVDEP, which has established five categories of designated use: public water supply; propagation and maintenance of fish and other aquatic life (subdivided into warm water fishery streams, trout waters, and wetlands); water contact recreation; agriculture and wildlife; and water supply for industrial, water transport, cooling, and power (Title 47 CSR2 Section 6.2-6.6). All waterbodies that have not been assigned a designated use are assigned the propagation and maintenance of fish and other aquatic life or water contact recreation designations. The WVDEP further designates surface waters into one of three tiers of antidegradation protection as set forth by the Antidegradation Policy. Tier III waterbodies are considered "outstanding natural resource waters."

Neither the MVP nor the EEP would cross Tier III waterbodies in West Virginia. Crossings of trout waters are addressed in section 4.6.2.1.

Virginia

Virginia state water classifications are implemented by the VADEQ. All state waters are designated for the following uses: recreational; propagation and growth of a balanced, indigenous population of aquatic life; wildlife; and the production of edible and marketable natural resources. All surface waters are further designated into one of three tiers of antidegradation protection as set forth by the Antidegradation Policy. Tier III waterbodies are considered "exceptional state waters."

The MVP pipeline route would not cross any Tier III waterbodies in Virginia. However, the proposed pipeline route would cross near two Tier III water segments: Bottom Creek and Little Stony Creek (VADEQ, 2014).

Bottom Creek – A 2.2-mile-long portion of Bottom Creek, a tributary of the Roanoke River, is designated an Exceptional State Water (Tier III) stream (VADEQ, 2014). Additionally, Bottom Creek and all of its tributaries in Roanoke and Montgomery Counties are designated as Wild Natural Trout streams. Although the MVP pipeline route would cross Bottom Creek, it would not cross the Tier III segment (the Tier III segment is over 3 miles downstream of the proposed crossing location). The MVP pipeline route would cross a separate segment of Bottom Creek at MP 245.1 that is listed in Virginia's 305(b)/303(d) Water Quality Assessment Integrated

Report as an impaired stream, due to violation of the Virginia Water Quality Standards for temperature. Mountain Valley would use the dry open-cut crossing methods to traverse Bottom Creek and its tributaries. To minimize or avoid impacts on Tier III and Wild Natural Trout streams, Mountain Valley would implement measures in its Procedures. Additionally, Mountain Valley would abide by the Commonwealth of Virginia's designated time-of-year-restrictions for in-stream construction (October 1 to June 30) to minimize impacts on fisheries.

Little Stony Creek – The 6.5-mile-long Tier III segment of Little Stony Creek is located more than one mile upstream from the proposed MVP pipeline crossing (VADEQ, 2014). The proposed pipeline would cross Little Stony Creek, using dry open-cut methods, at about MP 204.3. At that location, the creek is classified as a cold water, wild trout, and stocked trout stream. To reduce impacts on fisheries, Mountain Valley would implement the measures in its Procedures, and would cross Little Stony Creek during Virginia's designated time-of-year-restrictions for in-stream construction (October 1 to June 30).

Pennsylvania

Pennsylvania state water classifications, implemented by the PADEP, include: aquatic life; water supply; recreation and fish consumption; special protection; and other. Assigned by the Commonwealth of Pennsylvania, the Monongahela River has a Protected Use for warm water fish and navigation; the South Fork Tenmile Creek has a Protected Use for warm water fish and is a sensitive waterbody due to the presence of rare freshwater mussel species. All waterbodies that have not been assigned a designated use are assigned the water use of aquatic life, water supply, and recreation designations. The EEP would not cross any waterbody classified as "exceptional value" or "high quality."

Surface Water Protection Areas and Public Supply Intakes

Mountain Valley Project

The MVP would come within 0.25 mile of four WVDHHR-designated ZCC for surface water public supplies. Table 4.3.2-3 identifies the source water protection areas within 0.25 mile of the MVP as well as the distance from the source water intake associated with each protection area and the nearest project milepost. There are no Source Water Protection Areas for Public Surface Water Supplies within 0.25 mile of the Mountain Valley Project in Virginia.

TABLE 4.3.2-3 **Source Water Protection Areas for Public Surface Water Supplies within 0.25 Mile of the Mountain Valley Project**		
State/Feature	**Nearest MP**	**Distance to Intake from Pipeline (feet)**
West Virginia		
Burnsville Public Supply District	66.9	49,000
Craigsville Public Supply District	110.2	3,600
Summersville Public Supply District	119.3	46,000
Big Bend Public Supply District	171.4	19,800
Sources: WVDHHR, 2015; VADH ODW, 2015		

The MVP crosses surface water supply ZCCs for the Burnsville, Craigsville, Summersville, Big Bend, and WVAV-Gassaway Supply Districts, in West Virginia. The ZCC for the Burnsville Public Supply District includes the Little Kanawha River and numerous tributaries. The ZCC for the Craigsville Public Supply District is located in the Gauley River. The ZCC for the Summersville Public Supply District, includes the Gauley River and numerous tributaries. The ZCC for the Big Bend Public Supply District includes the Greenbrier River and numerous tributaries. The WVAV-Gassaway is located in the Elk River.

Mountain Valley consulted with the Virginia Department of Health (VADH) and the WVDHHR to identify public surface water supply intakes within 3 miles of the MVP. Ten public supply intakes were identified; seven in West Virginia and three in Virginia (see table 4.3.2-4).

Equitrans Expansion Project

The EEP would be located within 3 miles of three source water protection areas for surface water resources. The source water protection area for Pennsylvania American Water Company of Pittsburgh is located along the left descending bank of the Monongahela River and would be less than 1 mile downstream of the H-318 HDD crossing in Washington County, Pennsylvania. The second source water protection area is located around South Fork Tenmile Creek in Greene County, Pennsylvania. The nearest surface water intake associated with this source water protection area would be approximately 10 miles downstream of the Redhook Compressor Stations and the M-80/H-158 pipelines. In Wetzel County, West Virginia, EEP facilities would be located within a Zone of Peripheral Concern and a ZCC for two public water systems. Table 4.3.2-5 lists the surface water source water protection areas within 3 miles of the EEP.

TABLE 4.3.2-4

Public Water Supply Intakes within Three Miles of the Mountain Valley Project

State/ Surface Water	Nearest MP	Distance/Direction to Construction Right-of-Way a
West Virginia		
Jones Run Creek	15.3	0.4 mile south (downstream)
Lower Dog Run	25.3	1.0 mile east (downstream)
Gauley River	110.1	0.6 mile west (downstream)
Panther Creek/Impoundment/Jim’s Branch	117.2	1.8 miles southwest (downstream)
Panther Creek/Impoundment/Jim’s Branch	120.7	1.3 miles west (downstream)
Panther Creek/Impoundment/Jim’s Branch	120.8	0.3 mile west (downstream)
Greenbrier River	172.3	1.5 miles northeast (upstream)
Virginia		
WVWA Spring Hollow Reservoir	235.4	1.0 mile west (upstream)
Rocky Mount Intake	264.8	0.3 mile north (upstream)
Chatham Cherrystone Creek Intake	300.3	2.2 miles northeast (upstream)

a/ Indicates the MVP would cross waters that flow before the intake (upstream) or after the intake (downstream). This designation does not mean that MVP is directly upstream or downstream within the same waterbody of the intake.

TABLE 4.3.2-5

Source Water Protection Areas within Three Miles of the Equitrans Expansion Project

State/County	Nearest Project Feature	Public Water Supply ID	System	Source Water Protection Areas
West Virginia				
Wetzel	H-319, Mobley Webster	WV3304803	Sistersville Municipal Water	Zone of Peripheral Concern
Wetzel		WV3305205	Pine Grove Water	ZCC/Zone of Peripheral Concern
Pennsylvania				
Washington Allegheny	H-318	5020039	Pennsylvania American Water Company of Pittsburgh	Source Water Protection Area (Zone A) and Surface Water Intake one mile downstream of crossing
Greene	M-80/H-158, H-305, H-316, Redhook Compressor Station, Pratt Compressor Station	5630045	Tri-County Joint Municipal Authority	Source Water Protection Area (Zone B)

Sensitive Waterbodies

Sensitive surface waters include those that:

- do not meet the water quality standards associated with the water's designated beneficial use or have been designated for intensified water quality management and improvement;
- have impaired segments or contaminated sediments;
- contain sensitive aquatic organisms, threatened and endangered species, or critical habitat;
- are designated as national or state wild and scenic rivers;
- are state designated high quality, exceptional, or outstanding natural resource waters;
- are located in sensitive and protected watershed areas or source water protection areas; or
- are navigable waterbodies subject to COE permitting under the RHA.

Waterbodies that Do Not Meet Designated Uses

Biennially, each state is required, under Section 305(b) of the CWA, to submit a report to the EPA describing the status of surface waters in the state. Waterbodies are assessed to determine if their designated use is "fully supported," "fully supported but threatened," "partially supported," or "not supported" in accordance with its water quality standards. A use is said to be "impaired" when it is only partially supported or not supported at all. A list of waters that are impaired is required by Section 303(d) of the CWA and included in the 305(b) Water Quality Inventory Reports.

A review of the statewide 303(d) Impaired Waters databases through the WVDEP, VADEQ, and PADEP was conducted to identify impaired waters crossed by the MVP and the EEP. Some of the most common causes of impairment are elevated concentrations of metals (e.g., iron, manganese, mercury) and fecal coliforms.

Additionally, the Applicants reviewed the National Sediment Quality Survey to identify waterbodies containing contaminated sediments. Neither the MVP nor the EEP would cross waterbodies known to contain contaminated sediments.

Mountain Valley Project

According to each state's list of impaired waters, the MVP pipeline route would cross 39 impaired waterbodies; 26 in West Virginia and 13 in Virginia. A summary of impaired waterbodies that would be crossed by the MVP is included as appendix F.

Equitrans Expansion Project

The EEP would not cross any impaired waterbodies.

Waterbodies with Exceptional Quality or Importance

Federally Recognized Exceptional Waters – The Nationwide Rivers Inventory (NRI) designates free-flowing river segments in the United States that possess outstandingly remarkable natural or cultural values, which are considered to be of national significance (NPS, 2009). In addition, the NRI is maintained by the NPS as a list of river segments that potentially qualify as national wild, scenic, or recreational river areas. We reviewed the NRI to identify federally recognized exceptional waters crossed by the projects.

In addition to the NRI database, we reviewed the National Wild and Scenic River System database to identify federally designated wild, scenic, or recreational waterbodies. Neither the MVP nor the EEP would cross any federally designated wild, scenic, or recreational waterbodies.

Mountain Valley Project

The MVP pipeline route would cross four NRI-listed waterbodies (see table 4.3.2-6). As discussed in section 3.5, in response to FS concerns regarding the number of Craig Creek crossings, Mountain Valley's currently proposed route reduced the number of crossings from three to one (see section 3.5.1.9-1).

TABLE 4.3.2-6

Nationwide Rivers Inventory Waterbodies Crossed by the Mountain Valley Project

State/ County	Waterbody	Crossing Method	Nearest MP	Eligibility Value
West Virginia				
Webster	Left Fork Holly River	Dry Open-cut	81.6	S
Webster	Elk River	Dry Open-cut	87.3	O
Summers	Greenbrier River	Dry Open-cut	171.4	S, R, G, F, H
Virginia				
Montgomery	Craig Creek	Dry Open-cut	219.5	R, G, H, C

Note: No NRI waterbodies would be crossed by the EEP.
Source: NPS, 2009
Eligibility Values:
S-Scenery; R-Recreation; G-Geology; F-Fish; W-Wildlife; P-Prehistory; H-History; C-Cultural; O-Other (including, but not limited to, hydrology, paleontology, and botany resources)

Equitrans Expansion Project

The EEP pipelines would not cross any NRI-listed waterbodies

State Recognized Water – The State of West Virginia has a list of rivers protected under its Natural Streams Preservation Act. The Commonwealth of Virginia keeps a Scenic River List. Pennsylvania has a classification of Exceptional Value waters.

Mountain Valley Project

The MVP pipeline route would also cross one waterbody, the Greenbrier River, at a location at which it is protected under the Natural Streams Preservation Act of West Virginia. The MVP pipeline route would cross two waterbodies, the Blackwater River and the Pigg River, on the Virginia Scenic Rivers List.

As discussed in section 4.3.2.2, the MVP pipeline route would come in close proximity to two Tier III water segments in Virginia: Bottom Creek and Little Stony Creek.

Equitrans Expansion Project

The EEP pipelines would not cross any waterbodies identified as exceptional by West Virginia or the Pennsylvania.

Karst Terrain

As discussed in section 4.1.1, the MVP pipeline route would cross about 216 miles of areas with shallow bedrock. As previously discussed in section 4.3.1.1, the MVP pipeline route would cross areas of karst terrain from MPs 172.0 to 239.0 in both West Virginia and Virginia. In this karst region, the pipeline would cross a total of about 243 waterbodies (see appendix F). Surface waterbodies could act as conduits into subsurface karst features; therefore, potentially affecting groundwater supplies. Blasting of bedrock during pipeline trench excavations could also affect water resources in karst terrain.

The EEP pipelines would cross a total of about one mile of areas with shallow bedrock. However, no karst terrain would be crossed by the EEP pipelines.

Navigable Waters

The COE defines navigable waters as rivers or streams subject to the ebb and flow of the tide that are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Both Mountain Valley and Equitrans have filed permit applications with the COE seeking authorizations to cross navigable waterbodies under Section 10 of the RHA (see section 1.5).

Mountain Valley Project

The MVP pipeline route would cross three waterbodies that are considered navigable waters under Section 10 of the RHA: the Elk River at MP 87.3, the Gauley River at MP 118.9, and the Greenbrier River at MP 171.6. Mountain Valley is proposing to withdraw water from the Greenbrier River for hydrostatic testing of its pipeline. The MVP pipeline would also cross two waterbodies that have been studied for Section 10 status but for which official determinations have not yet been made by the COE: the Roanoke River at MP 235.6, and the Pigg River at MP 289.2.

Equitrans Expansion Project

The EEP pipeline would cross the Monongahela River, which is listed as Section 10 status for its entire length. Although Equitrans would to cross the Monongahela River via HDD, a Section 10 Permit from the COE would be required.

Designated Flood Zones

The Federal Emergency Management Agency (FEMA) has prepared Flood Insurance Rate Maps that delineate Special Flood Hazard Areas (SFHA). SFHA are defined as the area that would be inundated by a 100-year (1 percent annual chance of occurrence) flood event. SFHAs are further categorized into zones. According to the Rate Maps, both the MVP and the EEP would be located within Zones A and AE. Zone A is the FEMA designation for areas subject to inundation by the 1-percent-annual-chance flood and where predicted flood water elevations have not been established; Zone AE areas are subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods and where predicted flood water elevations above mean sea level have been established (FEMA, 2015). Table 4.3.2-7 identifies the FEMA flood zones crossed by the proposed projects.

TABLE 4.3.2-7

FEMA 100-year Floodplains Crossed by the Mountain Valley Project and Equitrans Expansion Project

Project/State/County	Floodplain Waterbody	Flood Zone	MP
Mountain Valley Project			
West Virginia			
Harrison	Little Tenmile Creek	AE	15.4
Doddridge	Laurel Run	AE	34.8
Webster	Camp Creek	A	93.0
Franklin	Blackwater River	AE	269.8
Equitrans Expansion Project			
Pennsylvania			
Allegheny	Perry Mill Run	AE	0.0
	Kelly Run	A	1.7
	Bunola Run	A	2.7
	Bunola Run	AE	2.8
	Monongahela River	AE	3.0

Source : FEMA, 2015

Flood Zone A = Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies.

Flood Zone AE = Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods.

The projects' pipelines would displace an indiscernible quantity of flood storage capacity. Aboveground facilities associated with the MVP would displace approximately 1 acre of storage capacity within the 100-year flood zone. Additionally, four MLVs and two new permanent access roads associated with the MVP would be installed within the 100-year flood zone. Each MLV would displace approximately 0.1 acre at MPs 15.3, 15.4, 34.8, and 93.1. The two permanent access roads, located at MPs 93.0 and 265.2 would displace 0.1 and 0.5 acre, respectively.

Moderate flood hazard areas are the areas between the limits of the 1-percent-annual chance flood and the 0.2-percent-annual-chance flood. Some aboveground facilities associated with the MVP would cross moderate flood hazard areas.

No permanent aboveground facilities associated with the EEP would be within the 100-year flood zone.

USGS Stream Gages

In a letter to the FERC (see accession number 201161223-5049), the USGS identified four stream gages in the vicinity of the MVP:

- Stream gage 02054500 at the Roanoke River in Montgomery County, Virginia located 0.5 miles from the project;
- Stream gage 02056900 at the Blackwater River in Franklin County, Virginia located 0.8 miles from the project;
- Stream gage 03151400 at the Little Kanawha River in Braxton County, West Virginia located 0.5 miles from the project; and
- Stream gage 0318700 at the Gauley River in Webster County, West Virginia located 0.6 miles from the project.

These gages, which are used to collect water data, are permanent infrastructure within waterbodies and are vulnerable to damage and/or disruption from nearby construction activities. Proposed crossings of waterbodies containing stream gages or direct tributaries of waterbodies containing gages, would not occur at or near the stream gage station sites (USGS, 2017b). No stream gages near the EEP were identified by the USGS. Therefore, no project-related impacts on USGS stream gages are expected to occur.

Water Appropriations

Mountain Valley Project

For the majority of its hydrostatic testing activities, Mountain Valley would purchase water from municipal sources and reuse that water to test adjacent segments of the pipeline. Mountain Valley is proposing to withdrawal hydrostatic test water from two nearby surface waters: the Meadow River at MP 144.0; and the Greenbrier River, at MP 171.6. Mountain Valley estimates about 58,422,382 gallons of water would be needed for hydrostatic testing; of this total, about 46,644,831 would be from municipal sources, and about 11,777,551 gallons would be from surface water sources (see table 4.3.2-8).

TABLE 4.3.2-8

Hydrostatic Test Water Sources and Discharge Locations for the Mountain Valley Project and the Equitrans Expansion Project

				Proposed Water Source			Proposed Test Water Discharge Location			
Segment/ Facility Name	**Start MP**	**End MP**	**Required Water (gallons)**	**MP**	**Proposed Water**	**Watershed**	**MP**	**Watershed**	**Volume (gallons)**	**Proposed Discharge Month**
Mountain Valley Project										
01A	0.0	12.1	4,331,561	N/A	Reuse from Test Section 1B	N/A	0.0	Fishing Creek	4,331,561	Oct/Nov 2018
01B	12.1	25.8	4,904,330	25.8	Municipal Water	N/A	12.1	Tenmile Creek	572,768	Oct/Nov 2018
02A	25.8	41.2	5,512,896	25.8	Municipal Water	N/A	25.8	Tenmile Creek	3,078,630	Oct/Nov 2018
02B	41.2	48.0	2,434,266	N/A	Reuse from Test Section 2A	N/A	41.2	Middle West Fork River	2,434,266	Oct/Nov 2018
03A	48.0	60.3	4,403,157	N/A	Reuse from Test Section 3B	N/A	48.0	Leading Creek	4,403,157	Oct/Nov 2018
03B	60.3	73.7	4,796,936	N/A	Reuse from Test Section 4A	N/A	60.3	Upper Little Kanawha	393,778	Oct/Nov 2018
04A	73.7	87.3	4,868,532	N/A	Reuse from Test Section 4B	N/A	73.7	Upper Little Kanawha	71,596	Oct/Nov 2018
04B	87.3	104.9	6,300,453	104.9	Municipal Water	N/A	104.9	Birch River	1,431,921	Oct/Nov 2018
05A	104.9	118.8	4,975,926	104.9	Municipal Water	N/A	104.9	Outlet Gauley River	1,610,911	Oct/Nov 2018
05B	118.8	128.2	3,365,015	N/A	Reuse from Test Section 5A	N/A	128.2	Hominy Creek	3,365,015	Oct/Nov 2018

TABLE 4.3.2-8 (continued)

Hydrostatic Test Water Sources and Discharge Locations for the Mountain Valley Project and the Equitrans Expansion Project

				Proposed Water Source			Proposed Test Water Discharge Location			
Segment/ Facility Name	**Start MP**	**End MP**	**Required Water (gallons)**	**MP**	**Proposed Water**	**Watershed**	**MP**	**Watershed**	**Volume (gallons)**	**Proposed Discharge Month**
06A	128.2	144.0	5,656,088	144.0	Meadow River	Upper Little Kanawha	144.0	Upper Little Kanawha	1,897,295	Oct/Nov 2018
06B	144.0	154.5	3,758,793	N/A	Reuse from Test Section 6A	N/A	144.0	Upper Little Kanawha	3,758,793	Oct/Nov 2018
07A	154.5	171.6	-6,121,463	171.6	Greenbrier River	Wolf Creek-Greenbrier River	171.6	Wolf Creek-Greenbrier	2,147,882	Oct/Nov 2018
07B	171.6	182.7	3,973,581	N/A	Reuse from Test Section 7A	N/A	171.6	Wolf Creek-Greenbrier River	3,973,581	Oct/Nov 2018
08A	182.7	191.4	3,114,428	N/A	Reuse from Test Section 8B	N/A	191.4	Bluestone River	3,114,428	Oct/Nov 2018
08B	191.4	204.3	4,617,946	191.4	Municipal Water	N/A	191.4	Bluestone River	1,503,517	Oct/Nov 2018
09A	204.3	211.4	2,541,660	211.4	Municipal	N/A	204.3	New River-Sinking Creek	2,541,660	Oct/Nov 2018
09B	211.4	227.3	5,691,886	211.4	Municipal	N/A	227.3	North Fork Roanoke River	2,649,054	Oct/Nov 2018
09C	227.3	235.8	3,042,832	N/A	Reuse from Test Section 9B	N/A	235.8	Roanoke River-Mason Creek	3,042,832	Oct/Nov 2018
10A	235.8	245.7	3,544,005	N/A	Reuse from Test Section 10B	N/A	235.8	Roanoke River-Mason Creek	3,544,005	Oct/Nov 2018

TABLE 4.3.2-8 (continued)

Hydrostatic Test Water Sources and Discharge Locations for the Mountain Valley Project and the Equitrans Expansion Project

				Proposed Water Source			Proposed Test Water Discharge Location			
Segment/ Facility Name	**Start MP**	**End MP**	**Required Water (gallons)**	**MP**	**Proposed Water**	**Watershed**	**MP**	**Watershed**	**Volume (gallons)**	**Proposed Discharge Month**
10B	245.7	258.3	4,510,552	258.3	Municipal	N/A	258.3	Walker Creek-Little Walker Creek	966,547	Oct/Nov 2018
10C	258.3	264.3	2,147,882	258.3	Municipal	N/A	264.3	Upper Blackwater River	2,147,882	Oct/Nov 2018
11A	264.3	275	3,830,389	N/A	Reuse from Test Section 11B	N/A	264.3	Upper Blackwater River	3,830,389	Oct/Nov 2018
11B	275.0	288.3	4,761,138	N/A	Reuse from Test Section 11C	N/A	275.0	Lower Blackwater River	930,749	Oct/Nov 2018
11C	288.3	303.5	5,441,300	303.5	Municipal	N/A	288.3	Lower Pigg River	680,163	Oct/Nov 2018
Equitrans Expansion Project										
H-158	0	0.2	7,085	N/A	Municipal	N/A	-	Lower Monongahela	7,085	Apr 2018
H-305	0	0.1	12,043	N/A	Municipal	N/A	-	Lower Monongahela	12,043	Apr 2018
H-316	0	3.0	551,423	N/A	Municipal	N/A	-	Lower Monongahela	551,423	May 2018
H-318	0	0.6	44,666	N/A	Municipal	N/A	-	Lower Monongahela	44,666	May 2018
H-318	0.6	4.3	304,613	N/A	Municipal	N/A	-	Lower Monongahela	304,613	May 2018
H-319	0	<0.1	1,900	N/A	Municipal	N/A	-	Little Muskingum-Middle Island	1,900	Mar 2018

TABLE 4.3.2-8 (continued)

Hydrostatic Test Water Sources and Discharge Locations for the Mountain Valley Project and the Equitrans Expansion Project

				Proposed Water Source			Proposed Test Water Discharge Location			
Segment/ Facility Name	**Start MP**	**End MP**	**Required Water (gallons)**	**MP**	**Proposed Water**	**Watershed**	**MP**	**Watershed**	**Volume (gallons)**	**Proposed Discharge Month**
M-80	0	<0.1	1,810	N/A	Municipal	N/A	-	Lower Monongahela	1,810	Apr 2018
Mobley Tap	N/A	N/A	1,174	N/A	Municipal	N/A	-	Little Muskingum-Middle Island	1,174	Jan 2018
Redhook Compressor Station	N/A	N/A	25,000	N/A	Municipal	N/A	-	Lower Monongahela	25,000	Sep 2018
Webster Interconnect	N/A	N/A	1,565	N/A	Municipal	N/A	-	Little Muskingum-Middle Island	1,565	Mar 2018

Note: Equitrans would either pump hydrostatic test water to the next segment for testing or discharge hydrostatic test water to uplands.
N/A = Not Applicable

Upon withdrawing hydrostatic test water, Mountain Valley would store the test water in tanks prior to pumping it into the pipe. To prevent residual organic matter and acid producing bacteria from entering the pipe, Mountain Valley would add biocides to any surface water sourced hydrostatic test water prior to conducting hydrostatic tests. Upon completion of the biocide treatment, a biocide-deactivating agent would be added to the water. Municipal water used for hydrostatic testing would not require biocide treatment or any other additives.

Baseline water samples would be taken at the water's source before it is withdrawn and prior to discharge. If chlorinated water is used, it would also be tested for residual chlorine. In West Virginia the water would be sampled for oil and grease, TSS, and pH. The actionable level for total residual chlorine is 11µg/l. There are no actionable levels for oil and grease, TSS, or pH. In Virginia, testing would be conducted for total petroleum hydrocarbons, total organic carbon, TSS, pH, and total residual chlorine. There are no actionable levels for total organic carbon or TSS. Petroleum hydrocarbons and total residual chlorine must be below 15 milligrams per liter (mg/l) and 11 micrograms per liter (µg/l), respectively, and pH and pH must be between 6.0 and 9.0.

Prior to construction, Mountain Valley would apply for agency approval for the discharge of hydrostatic test water. For segments that would be tested using surface water sources, the withdrawal and discharge of the hydrostatic test water would occur within the same watersheds.

Although the WVDEP does not regulate water withdrawals of less than 750,000 gallons/day, it has developed water withdrawal guidance and a tool to help determine when it is environmentally safe to withdraw water from a waterbody. The guidance is based on percentages of mean annual flow, based on a 10-year period that affords an appropriate flow to protect aquatic habitat. Mountain Valley would use the WVDEP's Water Withdrawal Guidance Tool during hydrostatic test water withdrawals. Mountain Valley would only conduct a withdrawal if the Water Withdrawal Guidance Tool indicates that the withdrawal is acceptable. Mountain Valley would limit surface water withdrawals to 10 percent of a stream's instantaneous flow and expects withdrawal rates of about 1,500 gpm.

Surface water may also be used, in addition to other water sources, for dust control purposes; Mountain Valley has not yet determined whether water for dust control would be obtained from surface water, groundwater, or municipal sources. Mountain Valley estimates that 55,000 gallons per day would be required for dust control for each spread. Since the source water for dust control has not been provided, **we recommend that**:

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, for review and written approval of the Director of OEP, source, location, and quantities of water which would be used for dust control.**

<u>Equitrans Expansion Project</u>

Equitrans would not withdrawal hydrostatic test water from surface water. All hydrostatic test water would be obtained from a municipal source. No additives or biocides would be required. Equitrans would discharge the hydrostatic test water at a controlled rate of approximately 35 gallons per minute, into holding tanks. Equitrans may use a nitrogen slug (nonreactive gas) to dry the pipeline following hydrostatic testing. The hydrostatic test water would be discharged in compliance with Equitrans' existing NPDES General Permit WV0113069. In Pennsylvania, Equitrans would comply with its NPDES General Permit PAG-10.

For dust control, Equitrans would use approximately 3,000 gallons of municipal water per 200-foot-long portion of construction right-of-way (or 1,000 feet of access road). Total water usage for dust control would depend on rainfall, temperature, wind speed, amount of direct sunlight, amount of disturbed area, and construction schedules. Watering trucks would spray only enough water to control fugitive dust or to create a surface crust. To minimize or avoid impacts, Equitrans would implement its *Dust Suppression Plan*[41].

As discussed in section 2.4, Equitrans would use the HDD method at two waterbody crossings (not including the seven unnamed tributaries to South Fork Tenmile Creek that would be crossed during the same HDD pass used to cross South Fork Tenmile Creek). Throughout the process of drilling and enlarging the hole, a slurry made of non-toxic/non-hazardous bentonite clay and water, referred to as drilling mud, would be circulated through the drilling tools to lubricate the drill bit remove drill cuttings, and hold the hole open. The volume of water necessary to conduct an HDD crossing method is difficult to estimate. During an HDD, the drilling contractor would adjust the amount of water in the drilling fluid to fit changing conditions during the HDD. Water used for the HDD method would be obtained from municipal sources. No permits would be required to use municipal water for HDD purposes.

Jefferson National Forest

The MVP within the Jefferson National Forest would cross four watersheds (Hydrological Unit Code [HUC]8): the Upper James; the Upper New; the Middle New; and the Upper Roanoke. The project would conduct 179 waterbody crossings within the Jefferson National Forest. All waterbodies would be crossed using dry open-cut methods (dam-and-pump or flume crossing). Table 4.3.2-9 lists the waterbodies that would be crossed within the Jefferson National Forest, along with the locations at which they would be crossed, their flow types, and FERC classifications. None of the waterbodies crossed within the Jefferson National Forest are listed as impaired. One waterbody that would be crossed, Craig Creek, is an NRI-listed waterbody and also contains habitat for threatened and endangered species. Threatened and endangered species are discussed in section 4.7. Mountain Valley would not withdraw or discharge any waters for hydrostatic testing activities on FS lands.

Water used for dust suppression in the Jefferson National Forest would be from municipal sources and supplemented by surface water not on the National Forest, if needed. Surface waterbodies that could be used as a source of water for dust suppression are either Indian Creek, upstream of the Jefferson National Forest, or the Roanoke River, downstream of the Jefferson National Forest. Mountain Valley estimates that 1,000 gallons of water per day could be required for dust control during construction within the Jefferson National Forest. No ATWS would be located within 150 feet of a waterbody within the Jefferson National Forest. Karst topography is not located along the MVP pipeline route in the Jefferson National Forest.

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41 See table 2.4-2 for the location of Mountain Valley and Equitrans' plans.

TABLE 4.3.2-9

Proposed Waterbody Crossings in the Jefferson National Forest for the Mountain Valley Project a/

Waterbody Name	Project MP	Flow Type	FERC Classification
Kimballton Branch b/	196.7	Perennial	Intermediate
UNT/Kimballton Branch b/	197.2	Perennial	Minor
UNT/New River b/	197.8	Intermittent	Minor
Curve Branch b/	197.8	Intermittent	Minor
UNT/Curve Branch b/	197.8	Intermittent	Minor
Clendennin Creek b/	197.8	Perennial	Minor
Clendennin Creek b/	197.8	Perennial	Minor
UNT/Clendennin Creek b/	197.8	Ephemeral	Minor
UNT/Clendennin Creek b/	197.8	Ephemeral	Minor
UNT/Clendennin Creek b/	197.8	Ephemeral	Minor
UNT/Clendennin Creek b/	197.8	Perennial	Minor
UNT/Clendennin Creek b/	197.8	Perennial	Minor
UNT/Craig Creek	218.8	Intermittent	Minor
UNT/Craig Creek	219.1	Ephemeral	Minor
UNT/Craig Creek	219.2	Intermittent	Minor
UNT/Craig Creek	219.7	Ephemeral	Minor
UNT/Craig Creek	219.9	Perennial	Minor

a/ All waterbodies listed in the table crossed by pipeline would be crossed using a dry open-cut method.
b/ Waterbodies crossed by access roads on National Forest.

4.3.2.2 Environmental Consequences

General Impacts and Mitigation

Impacts on waterbodies could occur as a result of construction activities in stream channels and on adjacent banks. Clearing and grading of stream banks, in-stream trenching, the installation and removal of temporary crossing structures (e.g., culverts, cofferdams), trench dewatering, and backfilling could each cause temporary, local modifications of aquatic habitat involving sedimentation, increased turbidity, and decreased dissolved oxygen concentrations; however, in almost all cases, these impacts would be limited to the period of in-stream construction. With the exception of waterbody crossings for which the Applicants requested a variance, the period of in-stream construction at each waterbody would be determined by the protocols set forth in our Procedures.

In-stream construction would cause a temporary increase in sediments mobilized downstream. The extent of the impact would depend on sediment loads, stream velocity, turbidity, bank composition, and sediment particle size. These factors would determine the density and downstream extent of the turbidity plume. In-stream construction could cause the dislodging and transport of channel bed sediments and the alteration of stream contours. Changes in the stream bottom contours could alter stream dynamics and increase downstream erosion or deposition. Turbidity resulting from the resuspension of sediments due to in-stream construction and erosion of cleared right-of-way areas could reduce light penetration and photosynthetic oxygen production. In-stream disturbance could also introduce chemical and nutrient pollutants from sediments. Resuspension of deposited organic material and inorganic sediments could cause an increase in biological and chemical use of oxygen, potentially resulting in a decrease of dissolved oxygen concentrations in the affected area. Lower dissolved oxygen concentrations could cause temporary displacement of motile organisms, such as fish, and may kill non-motile organisms within the affected area.

The clearing and grading of stream banks could expose soil to erosional forces and would reduce riparian vegetation along the cleared section of the waterbody. The use of heavy equipment for construction could cause compaction of near-surface soils, an effect that could result in increased runoff into surface waters in the immediate vicinity of the proposed construction right-of-way. Increased surface runoff could transport sediment into surface waters, resulting in increased turbidity levels and increased sedimentation rates in the receiving waterbody. Disturbances to stream channels and stream banks could also increase the likelihood of scour after construction.

In order to limit impacts on riparian zones, the Applicants would follow measures outlined in its Procedures. These measures allow a riparian strip at least 25 feet wide to permanently revegetate with native plant species across the entire construction right-of-way. A corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state; and trees that are located within 15 feet of the pipeline may be cut and removed from the permanent right-of-way. In addition, the riparian areas that are between HDD entry and exit point are not cleared during construction or mowed during operations.

Dewatering of the pipeline trench may require pumping of groundwater in areas where there is a high water table. Dewatering may cause minor temporary fluctuations in surface water turbidity. The Applicants would minimize or avoid impacts by implementation of the construction practices outlined in their *Erosion and Sediment Control Plans*, our Plan (for the MVP), Equitrans' Plan, their Procedures, and their *Stormwater Pollution Prevention Plans* for West Virginia and/or Virginia.[42] During construction, discharge of water removed from excavations would be directed to the vegetated land surfaces (where available) to control erosion and runoff. If adequate vegetation is absent, water would be filtered through haybale-lined dewatering structures. Because water removed from excavations would be reintroduced in the immediate proximity of excavations, potential dewatering impacts would be localized and temporary and would not impact surface waters.

As described in the previous section, the Applicants would hydrostatically test the pipeline to verify structural integrity prior to placing the project into service. To minimize or avoid impacts, each Applicant would implement its *Erosion and Sediment Control Plan* and comply with conditions of NPDES permits. Surface water used for testing would be drawn though a screened intake. The hydrostatic test water would be discharged through an energy dissipation device, typically in the same watershed as the source from which it was obtained. To minimize scour,

[42] See table 2.4-2 for the location of Mountain Valley and Equitrans' plans.

erosion, and sediment transport, hydrostatic test water would be discharged over vegetated land surfaces through energy dissipation devices, filter bags, or haybale-lined dewatering structures. Additionally, the discharge rate would be regulated using valves and energy dissipation devices.

The potential does exist for inadvertent spills from the refueling of vehicles and the storage of fuel, oil, or other hazardous materials near-surface waters. If a spill were to occur, immediate downstream users of the water could experience degradation in water quality, and acute and chronic toxic effects on aquatic organisms could occur. To avoid or minimize the potential impacts of inadvertent spills Mountain Valley would implement its *SPCCP*, and Equitrans would implement its *SPCCP* and/or *Preparedness, Prevention, and Contingency and Emergency Action Plan* (depending on the project location). The aforementioned plans include both preventative and mitigation measures such as personnel training, equipment inspection, refueling procedures, and spill cleanup and containment.

Seasonal and flash flooding hazards are a potential concern where the proposed pipeline would cross or be near major streams and small watersheds. Although flooding itself does not generally present a risk to pipeline facilities, bank erosion and/or scour could expose the pipeline or cause sections of pipe to become unsupported. All pipeline facilities are required to be designed and constructed in accordance with 49 CFR 192. These regulations include specifications for installing the pipeline at a sufficient depth to avoid possible scour at waterbody crossings. Mountain Valley conducted a scour analysis to determine, in part, the depth of trench that would be required at all perennial waterbody crossings with FERC classification of intermediate or major to avoid scour (see discussion below).

To minimize or prevent impacts resulting from flash flooding during construction, the Applicants would remove any equipment or loose material from the affected area prior to any anticipated significant rain event. Additionally, the Applicants would implement erosion and sedimentation control measures, such as installing trench breakers and water bars to inhibit water flow along the trench and right-of-way. Upon completion of construction, the Applicants would restore the ground surface as closely as practicable to original contours and re-establish vegetation to facilitate restoration of pre-construction overland flow. Mountain Valley would follow guidance from the WVDEP regarding natural streambank restoration and would consult with the WVDEP to identify design options for specified crossings.

A total of 67 stream crossings would require mitigation for permanent impacts due to access roads and the operational right-of-way. Mountain Valley proposes to compensate for permanent impacts on wetlands and waterbodies of West Virginia by purchasing credits from a COE-approved mitigation bank. If credits are not available, Mountain Valley would buy credits from the WVDEP In-Lieu Fee Program. WVDEP approved these mitigation measures for impacts within West Virginia when it granted a conditional CWA Section 401 WQC for the MVP on March 23, 2017.[43] Proposed mitigation for permanent waterbody impacts in Virginia will be included in Mountain Valley's Nationwide Permit 12 application to the COE Norfolk District.

The Applicants would acquire all required permits to construct and operate the proposed projects. Applications to all applicable local, state, and federal agencies for permits related to

[43] See accession number 20170324-5037.

water resources have been submitted, and consultation is ongoing (see table 1.5-1). Mountain Valley and Equitrans submitted applications to the COE for a CWA Section 404 Permit for impacts on waters of the United States. Mountain Valley also applied with the COE for a RHA Section 10 Permit for activities affecting navigable rivers. The COE has not yet responded to these applications.

Project-Specific Impacts and Mitigation

Mountain Valley Project

Wet Open-Cut Crossings of Major Waterbodies - Mountain Valley performed a quantitative modeling assessment for each of the three previously proposed wet open-cut crossings to quantify the amount of turbidity and sediment that would be expected downstream of the crossings. Results of the assessment estimate that monthly sediment loads would increase by 49 to 81 percent, 15 to 26 percent, and 19 to 52 percent for the Elk River, Gauley River, and Greenbrier River, respectively. Sedimentation and turbidity could also affect sensitive species, such as clubshell mussels which are found in the Elk River, as discussed in section 4.6.1.1. Mountain Valley has determined that a dry-ditch technique is a more viable option and would reduce the potential for downstream sedimentation and turbidity. Following issuance of the draft EIS, Mountain Valley changed the proposed crossing methods for these waterbodies to dry open-cuts, using cofferdam structures (or equivalent structured system). Major waterbody crossing plans are provided in appendix F. We have reviewed these and find them acceptable.

Materials for the cofferdam systems would be delivered by truck to each site, and the systems would be assembled onsite in temporary work space located on the waterbodies' banks. Each crossing would be conducted in two phases similar to cofferdam crossing methods (see section 2.4.2.10). Phase one would be comprised of installing approximately one half of the crossing, completing required stream restoration in that area and then switching to the other side of the project for phase two to install the system in the remaining half of the waterbody and complete the crossing accordingly. If it is necessary to move boulders to complete the crossing, Mountain Valley would record the location of the boulder before moving it so that it can be returned to its original location following construction. Mountain Valley would remove the cofferdam systems immediately after the completion of each phase. Silt booms/turbidity curtains shall be installed downstream of the proposed Portadam location.

Horizontal Directional Drill – As discussed in section 4.3.2.1, Mountain Valley identified an alternative route for the proposed crossing of the Pigg River (from about MP 289.0 to 289.8) for which geotechnical cores indicated using an HDD would be feasible. As stated in sections 4.7 and 4.8, the Pigg River is a State Scenic River and contains the federally endangered Roanoke logperch. Therefore, since an HDD under the Pigg River is technically feasible, and would have less impacts on the river and its aquatic environment than a dry open-cut crossing, **we recommend that**:

- **<u>Prior to construction,</u> Mountain Valley should adopt into its proposed pipeline route the alternative alignment for the crossing of the Pigg River and adopt an HDD as the crossing method. As part of its Implementation Plan, Mountain Valley should file with the Secretary a revised alignment sheet, a summary**

comparison of impacts between the HDD alignment and the original alignment, and an HDD Contingency Plan, for the review and approval of the Director of OEP.

Blasting – Mountain Valley would cross waterbodies using a dry open-cut method. During construction of the MVP, blasting may be required. In-stream blasting has the potential to injure or kill aquatic organisms, displace organisms during blast-hole drilling operations, and temporarily increase stream turbidity. Additionally, shock waves created by blasting may post a threat to aquatic organisms. Chemical by-products from the blasting materials could also be released and could potentially contaminate the water. Mountain Valley would minimize or avoid impacts on surface water by implementation of the construction practices outlined in its *General Blasting Plan*, *Karst Mitigation Plan*, and *SPCCP*. As stated in its *General Blasting Plan*, streams with flow at the time of construction, blasting would only occur within the stream after the flow has been redirected around the crossing site using dam-and-pump methods. For streams with no flow at the time of construction, blasting would occur within the streambed, and the site would be restored to its original contours within the same day of disturbance. Licensed blasting contractors would conduct blasting activities in accordance with all applicable federal, state, and local regulations. Mountain Valley would obtain all necessary permits if blasting were required within streams.

Scour – Mountain Valley conducted a stream scour analysis to determine the maximum scour depth of waterbodies crossed by the MVP.[44] In response to a public comments regarding errors, data gaps, and inconsistencies in the analysis, we asked Mountain Valley to provide a revised analysis. Mountain Valley provided a partial response in April 2016[45] and a complete version in October 2016.[46] FERC requested additional information about the October 2016 version, and in response, Mountain Valley filed another revised version of its *Vertical Scour and Lateral Channel Erosion Analyses* in February 2017.[47]

Vertical Scour - The *Mountain Valley Pipeline: Vertical Scour and Lateral Erosion Analyses* (revised February 2017) used design discharge; stream bed particle size; channel width, depth, and velocity; and depth to bedrock to estimate potential scour depth (i.e., vertical scour). Total potential vertical scour at a given location was estimated by two methods: general scour analysis; and component scour analysis. To be conservative, the analysis used the greater of the maximum values (greatest depth) produced by the two methods and added a 20 percent factor of safety to estimate the maximum vertical scour estimate at each proposed waterbody crossing. The maximum vertical scour estimates for major waterbody crossings ranged from 0.1 to 12.5 feet in depth, and estimates for intermediate waterbody crossings ranged from 0.4 to 22.3 feet in depth. These estimates assume that bedrock is not located near the ground's surface in theses area, as scour depth could not exceed bedrock depth. Shallow depth to bedrock (i.e., less than 7 feet below the ground's surface) underlying the project area is discussed in section 4.1.1. Mountain Valley would field-verify bedrock depths prior to placing the pipeline in the trench by performing

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44 See Mountain Valley's filing on April 21, 2016 (accession number 20160422-5012).

45 See Mountain Valley's filing on April 22, 2016 (accession number 20160422-5012).

46 See Mountain Valley's filing on October 14, 2016 (accession number 20161014-5022).

47 See Mountain Valley's filing on February 9, 2017 (accession number 20170209-5249).

exploratory digs within the open trench to determine bedrock depth in consultation with the on-site Geotechnical Inspector.

To mitigate potential vertical scour at waterbody crossings, Mountain Valley proposes to vary the pipeline burial depth based on the estimated vertical scour depth at each perennial waterbody crossing. Table 4.3.2-10 provides proposed burial depths for estimated scour depths up to 5.25 feet. Mountain Valley would use armor layers and/or revetment mats to restrict potential scour at waterbody crossings with estimated vertical scours depths greater than or equal to 5.25 feet and the depth to bedrock is greater than 7 feet. The depth and distances upstream and downstream of the crossing(s) at which armor layers would be placed would be determined by Mountain Valley on a case-by-case basis in accordance with COE and FHWA methods and in consultation with the FERC. Appendix F shows proposed pipeline burial depths for many of the perennial major and intermediate waterbody crossing.

TABLE 4.3.2-10

Proposed Pipeline Burial Depths Based on Vertical Scour Estimates

Vertical Scour Depth (feet) a/	Pipeline Burial Depth (feet) b/
<2.25	Minimum 4-foot depth of cover
≥2.25 and <3.00	Minimum 4-foot depth of cover
≥3.00 and <3.75	Minimum 5-foot depth of cover
≥3.75 and <4.50	Minimum 6-foot depth of cover
≥4.50 and <5.25	Minimum 7-foot depth of cover

a/ Mountain Valley would use alternative mitigation measures (e.g., revetment mats, armor layers) in areas with estimated vertical scour depths ≥ 5.25 feet and bedrock depth ≤7 feet (see section 4.3.2.2).

b/ Pipeline burial depths would be decreased to the bedrock surface if bedrock depth is less than 7 feet and shallower than the proposed burial depth.

Lateral Channel Erosion - Mountain Valley estimated lateral channel erosion by using topographic data and aerial imagery to delineate the historical migration zone (HMZ) at each waterbody crossing in order to predict areas at risk of future lateral channel erosion due to fluvial activities. Potential lateral channel erosion was estimated by measuring the length of the proposed pipeline within the HMZ as measured from the current channel centerline to the lateral extent of the left descending bank (LDB) and right descending bank (RDB). Potential lateral channel erosion estimates for intermediate waterbody crossings ranged from 5 feet to 505 feet and 3 feet to 463 feet for the LDB and RDB, respectively. Estimates for major waterbody crossings ranged from 58 feet to 220 feet and 53 feet to 215 feet for the LDB and RDB, respectively.

To minimize and prevent potential lateral channel erosion at proposed perennial waterbody crossings, Mountain Valley would add a safety factor of 5 feet or 20 percent of the HMZ width at the waterbody crossing (whichever is greater) to the erosion estimates to determine a horizontal setback at the crossing. Construction activities would not occur within this setback.

Water Protection Areas and Public Supply Intakes – We received several comments regarding the Rocky Mount Intake and potential impacts on the water supply in this area, due to the upstream crossing of the Blackwater River along the October 2015 application route. Mountain

Valley has modified its pipeline route, so that it would no longer cross the Blackwater River. Therefore, there will be no impacts on the Rocky Mount Intake water supply.

We received a comment stating similar concerns with regard to the MVP's proposed crossing of Big Bend Public Supply District's ZCC approximately 2 miles upstream of the District's intake.[48] Mountain Valley has committed to work with the Big Bend Public Supply District to update its Source Water Assessment Plan and conduct pre-construction water quality monitoring.

We received comments regarding potential impacts on the Spring Hollow Reservoir, Smith Mountain Lake, and Leesville Lake. The Spring Hollow Reservoir is a 158-acre reservoir that receives water from the Roanoke River. The MVP pipeline route would be within 0.8 mile of the Spring Hollow Reservoir.

The MVP pipeline route is 1.9 miles away from Smith Mountain Lake, and more than 5 miles away from Leesville Lake.

Mountain Valley would implement various BMPs to ensure that construction and operation of the MVP would not negatively impact water supplies and public supply districts. During construction, Mountain Valley would implement sediment controls, such as, silt fences, compost filters, and sediment booms in order to minimize sediment influx upstream of water intakes. To reduce the risk of barrier failure, monitors would check the sediment barriers for effectiveness. Mountain Valley would adhere to its *Erosion and Sediment Control Plans, Stormwater Pollution Prevention Plans*, and its Procedures. With the supply owner's permission, Mountain Valley would also conduct pre-construction baseline water quality testing in accordance with its *Water Resources Identification and Testing Plan*. Mountain Valley would cooperate and coordinate with water suppliers to develop contingency plans that contain measures, including the provision of temporary or permanent alternate water supplies, to ensure no water supply disruption occurs during construction and to minimize and mitigate potential impacts resulting from construction and operation of the MVP.

In the draft EIS we recommended that Mountain Valley provide a Water Supply Contingency Plan for public water supply intakes within 3 miles and ZCCs within 0.25 mile of the MVP in coordination Public Service Districts to be implemented in the unlikely event that the project would impact that water supply. In order to enhance protection of ZCCs located in proximity to the MVP and encompass a ZCC on the edge of the previous 0.25 mile buffer, we have expanded the range for ZCC contingency plans to 0.50 mile from any MVP workspaces. Mountain Valley continues to coordinate with public surface water suppliers; however, since contingency plans have not been filed to date, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, for review and written approval of the Director of OEP, water supply contingency plans, prepared in coordination with the Public Service/Supply Districts, outlining measures to minimize and mitigate potential impacts on public surface water supplies with intakes within 3 miles downstream of the workspace, and ZCC**

48 See filing on October 26, 2016 (accession number 20161026-5020).

within 0.5 mile of the workspace. The measures should include, but not be limited to, providing advance notification to water supply owners prior to the commencement of pipeline construction.

Due to the short-term nature of construction activities and with the implementation of our recommendation above, significant adverse impacts on surface water protection areas are not anticipated for the MVP.

Karst Terrain - To avoid or minimize potential impacts resulting from construction activities in karst areas, Mountain Valley would implement mitigation measures outlined in its *Karst Mitigation Plan* and *SPCCP*. During land clearing and all phases of pipeline construction, a Karst Specialist Team would assess karst hazards and provide recommendations to the construction team in order to minimize disturbance. The Karst Specialist Team would inspect karst features during construction and document any notable changes that may indicate soil raveling. If soil raveling was suspected, Mountain Valley would implement stabilization measures. In addition, no hydrostatic test water would be discharged in karst locations.

As part of the conditional WQC issued by WVDEP-DWWM, Special Condition 16 required the Applicant to provide an enhanced karst management plan to WVDEP-DWWM for concurrence prior to pipeline construction in karst areas.

First-order Streams - We received comments regarding potential project-related impacts associated with the crossing of first-order streams. Concerns were presented that the number, impacts, and crossing methods of first-order streams were not addressed. A first-order stream is the source (or headwaters) of a waterbody; the order level increases (i.e., second-order, third-order, etc.) downstream at each confluence with another waterbody (Strahler, 1952). A total of 262 crossings of first-order waterbodies would be crossed by the MVP (192 in West Virginia and 70 in Virginia). Of these crossings, 132 would be for pipeline installation, and the remaining would be required for ATWS and the construction of temporary and permanent access roads, compressor stations, and cathodic protection systems. Appendix F identifies all streams, including first-order streams, which would be crossed by the MVP construction area. All streams would be crossed using dry open-cut methods and would be restored to their original contours following construction. Mountain Valley would minimize impacts on first-order streams by adhering to its Procedures and its project-specific *Erosion and Sediment Control Plans* and *Stormwater Pollution Prevention Plans* for West Virginia and Virginia including mitigation measures such as reducing the construction corridor, implementing dry-crossing methods, limiting the timeframe allowed to complete the crossing, restoring bank and contours, and limiting the maintained areas of the right-of-way in the riparian zone.

Flood Zones and Flash Flooding – We received comments regarding specific flash flooding events that occurred in West Virginia area during the summer of 2016. Potential impacts and mitigation measures associated with seasonal and flash flood events are discussed above in section 4.3.2.2. In addition to the avoidance and minimization actions described earlier in this section, Mountain Valley has specifically agreed to monitor the National Weather Service for predicted significant rain events in the project area. Should such an event be predicted, Mountain Valley would immediately notify all personnel of the event; evacuate potentially affected personnel to safe locations; and confirm that all personnel are accounted for post-evacuation. In addition, to the greatest extent practicable, Mountain Valley would move construction equipment and materials out of the 100-year floodplain; check and stabilize all environmental controls, as necessary; and monitor environmental controls during the rain event. EIs would continue to monitor the area and Mountain Valley would repair and/or replace environmental controls as soon as practicable following the recession of the flood waters.

Greenbrier River Crossing – We also received comments about the non-perpendicular design of the proposed Greenbrier River crossing at MP 171.6 as well as the use of armor layers and revetment mats at the site to prevent scour. Mountain Valley's proposed crossing of the Greenbrier would not be perpendicular to its banks, which increases the crossing's length and thereby increases potential impacts on the waterbody. Mountain Valley has stated that the non-perpendicular crossing would be necessary to avoid impacts on a historical residence on the south side of the crossing that is eligible for listing on the NRHP.

Mountain Valley would primarily use concrete blocks to create revetment mats; other material could include wire cable, ropes to connect the blocks, and geotextiles or geogrids to serve as the mats' base. If used, Mountain Valley would place the revetment mats on top of the pipe for the entire length of the crossing. The mats would be no wider than the width of the permanent right-of-way (i.e., 50 feet). Mountain Valley has stated that it may also install the mats for, "….a continuous distance upstream and downstream of the crossing." The use of revetment mats could cause permanent impacts (i.e., decrease aquatic habitat and visual impacts) that would be limited to the area in which they are installed and require modifications to the COE Section 404 permit and the West Virginia Section 401 WQC.

Mountain Valley would adhere to COE requirements and use a minimum armor layer particle size of 24-inches for a 100-year peak discharge event at the Greenbrier River crossing. Mountain Valley does not anticipate using armor layers in areas with generally smooth streambeds.

Modification to the Procedures – As discussed in the draft EIS, Mountain Valley requested modification to our Procedures to accommodate construction at five locations where the pipeline route would parallel a waterbody within 15 feet. We have reviewed these and find them acceptable. However, we identified additional locations at which the project appeared to parallel waterbodies within 15 feet as well as some locations where the pipeline route appeared to travel within a waterbody channel. Therefore, in the draft EIS we recommended that Mountain Valley file with the Secretary a complete list of any locations not already found acceptable by FERC staff where the pipeline route or access road would parallel a waterbody within 15 feet or travels linearly within the waterbody channel.

In its October 2016 filing,[49] Mountain Valley provided a revised list of locations at which the project would parallel waterbodies within 15 feet and adjusted the alignment so that the pipeline route does not travel linearly within any waterbody channels (except to cross the waterbody). Table 4.3.2-11 identifies the twelve locations and provides Mountain Valley's site-specific justifications for 11 of the modifications. We have reviewed these and find them acceptable (see table 2.3-1).

49 See Mountain Valley's filing on October 20, 2016 (accession number 20161020-5175).

TABLE 4.3.2-11

Mountain Valley Project Locations Paralleling Waterbodies within 15 Feet

State/ County	Waterbody Name	MP	Closest Distance to Route (feet)	Acres Within 15 feet of Pipeline	Site-Specific Justification
West Virginia					
Wetzel	UNT/Stout Run	6.6	4.8	0.012	Routed along contours to avoid steep side-slope construction.
Lewis	UNT/Second Big Run	61.2	10.1	0.003	Routed to avoid steep slopes and winch hill construction.
Webster	UNT/Houston Run	89.6	0.1	0.022	Alignment follows contours to avoid steep side-slope construction.
Webster	UNT/Camp Creek	93.1	12.6	0.004	Routed to avoid homes and steep side-slope construction.
Webster	UNT/Amos Run	97.8	12.2	0.001	Alignment follows contours up a steep slope and avoids existing ponds. Each drain contains subsidence issues, therefore following the spur ridge was the most desirable route.
Greenbrier	UNT/Little Sewell Creek	147.0	12.6	0.007	Routed to follow contours, avoid homes, and avoid winch hill construction immediately above an inhabited residence (public safety concern)
Virginia					
Roanoke	UNT/Mill Creek	245.4	10.7	0.002	Routed to avoid impacts on homes. Right-of-way has been minimized to reduce impacts.
Roanoke	UNT/Mill Creek	246.0	6.6	0.010	Routed to avoid homes and ensure proper alignment for the crossing of Bent Mountain Road.
Franklin	UNT/North Fork Blackwater River	248.7	0.1	0.067	Routed to follow contours and avoid side-slope construction. Work space has been minimized to reduce impacts.
Franklin	UNT/Foul Ground Creek	271.7	0.1	0.017	Pending
Pittsylvania	UNT/Rocky Creek	286.6	3.2	0.003	Routed to follow contour and cross road. Right-of-way has been minimized to reduce impacts.

Mountain Valley has not provided a justification for paralleling the tributary to Foul Ground Creek at MP 271.7. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, for review and approval by the Director of OEP, either a plan to maintain a 15 foot buffer**

from the tributary to Foul Ground Creek or proposed mitigation measures to minimize impacts on the waterbody.

Additionally, the FERC Procedures specify that ATWS should be located at least 50 feet from waterbodies and wetlands. Appendix D lists the 366 ATWS that Mountain Valley has proposed within 50 feet of a waterbody and wetland. Mountain Valley is requesting the ATWS for use as a vehicle turning area, storage of excess spoil at feature crossings, material staging, and additional parking. We have reviewed these and find them acceptable (see table 2.3-1).

Jefferson National Forest – Within the Jefferson National Forest, the MVP would require 17 waterbody crossings, all of which would be done using dry open-cut methods. Of these 17 waterbody crossings, five would be pipeline crossings and 12 would be access road crossings (see table 4.3.2-9). The MVP crosses five HUC12 watersheds in the Jefferson National Forest: Trout Creek–Craig Creek; Stony Creek; Rich Creek; Dry Run-North Fork Roanoke River; and Clendennin Creek–Bluestone Lake. The Stony Creek subwatershed is part of the Upper New HUC8 watershed, the Trout Creek–Craig Creek subwatershed is part of the Upper James HUC8 watershed, the Clendennin Creek–Bluestone Lake and Rich Creek subwatersheds are in the Middle New HUC8 watershed, and the Dry Run-North Fork Roanoke River subwatershed is part of the Upper Roanoke River HUC8 watershed. The proposed project is largely confined to three of these subwatersheds: Stony Creek; Clendennin Creek–Bluestone Lake; and Trout Creek–Craig Creek.

The *Hydrologic Analysis of Sedimentation* (appendix O-3) analysis used the Revised Universal Soil Loss Equation to yield annual estimates of erosion rates and sediment loads at the subwatershed level (i.e., HUC12) based on soil type, climate, land use and management factors, and topography. The results indicate that these three subwatersheds would exhibit temporarily increases in sediment loads and yield due to project construction (years 1-2 of construction of each respective subwatershed). Approximately 29.3 miles of stream segments downstream of the MVP area within the Jefferson National Forest and within the study area are expected to have a 10 percent increase in sediment loads or more (appendix O-3). However, a large portion (nearly 13 miles) of stream impacts can partially be attributed to the pre-existing Pocahontas Road, the presence of which, due to several modeling factors, led to an underestimation of existing sediment load. The analysis estimates that sediment loads and yields would reach a new sediment equilibrium within 4 to 5 years after the completion of the project that for most streams would represent a 1 percent or less increase in sediment load over baseline conditions, with the exception of Kimballton Creek, Curve Branch, and Clendennin Creek. Although sedimentation is unavoidable during in-stream construction, associated impacts would be minimized by the use of temporary and permanent sediment and erosion controls designed to avoid the movement of upstream sediments into downstream portions of waterbodies.

As stated above, Mountain Valley has reduced the number of Craig Creek crossings from three to one (see table 3.5.3-1). In addition, Mountain Valley has committed to limit construction (including waterbody crossings) in the Craig Creek area to times of dry weather or low water flow. Mountain Valley will also continue to work with the FS and VADEQ during the development and implementation of high quality and multiple tiered erosion control measures at the proposed Craig Creek crossing to minimize potential erosion and subsequent water quality impacts. Mountain Valley conducted an analysis to determine the amount of sedimentation that could occur in the Jefferson National Forest as a result of in-stream construction.

In order to minimize impacts on water resources in the Jefferson National Forest, Mountain Valley would implement the general construction mitigation procedures discussed above in section 4.3.2.2. Additionally, Mountain Valley would work with the FS and appropriate agencies to develop a stream monitoring plan to be implemented during operation of the MVP. Mountain Valley would adhere to its *Erosion and Sediment Control Plan* and *Fugitive Dust Control Plan* to minimize impacts associated with the use of water to suppress dust. Mountain Valley would not site any ATWS within 100 feet of a stream within the Jefferson National Forest.

Mountain Valley's final POD would include its *Erosion and Sediment Control Plan* measures specific to the Jefferson National Forest. These measures would be developed in coordination with the FS. Mountain Valley would also adhere to the BMPs provided in our Plan and Mountain Valley's Procedures.

Equitrans Expansion Project

Blasting – Equitrans does not anticipate that blasting would be necessary to construct the EEP. As such Equitrans has not provide a blasting plan; however, should blasting become necessary Equitrans would submit the plan to the FERC for approval prior to any blasting activities. The blasting plan would include measures to protect water resources.

Scour - In order to minimize and prevent scour, Equitrans would bury the pipe to sufficient depth, restore the ground surface as closely as practicable to original contours, re-establish vegetation to facilitate restoration of pre-construction overland water flow, and implement construction practices and operational erosion controls outlined in Equitrans' Plan and Procedures including installing trench plugs and permanent slope breakers.

Flood Zones - In the event that a flooding event is forecast, to the greatest extent practicable, Equitrans would check and stabilize all environmental controls, as necessary; and monitor environmental controls during the rain event. EIs would continue to monitor the area and Equitrans would repair and/or replace environmental controls as soon as practicable following the recession of the flood waters.

First-order Streams - A total of 26 crossings of first-order waterbodies would be required for the EEP (2 in West Virginia and 24 in Pennsylvania). Of these crossings, 19 would be for pipeline installation, and the remaining would be required for ATWS and the construction of temporary and permanent access roads, compressor stations. Appendix F identifies streams that would be crossed by the EEP construction area. All streams would be crossed using dry open-cut methods and would be restored to their original contours following construction. Equitrans would minimize impacts on first-order streams by adhering to the Equitrans' Procedures and its project-specific *Erosion and Sediment Control Plans* and *Stormwater Pollution Prevention Plans* for West Virginia and Pennsylvania.

Water Protection Areas - The EEP pipelines would cross three source water protection areas for surface water resources (see table 4.3.2-5). No impacts resulting from the EEP are expected on the surface water intake for the source protection area located along the Monongahela River, because the crossing of the Monongahela River would be via an HDD. Should an inadvertent release of drilling mud occur during the HDD activities, Equitrans would follow the procedure in its *HDD Contingency Plan*. No impacts are expected to occur to the protection area around South Fork Tenmile Creek due to the distance between the nearest project component and the area's surface water intake (approximately 10 miles). Equitrans would provide advance notification to the operators of surface water intakes regarding waterbody construction schedules. Additionally, Equitrans would notify the operators of any accidental releases of hazardous materials that may affect their water supply. Equitrans would implement mitigation measures specified in its Plan and Procedures to protect public water supplies. Considering the characteristics of the proposed crossings and the measures that Equitrans would employ to avoid, minimize, and mitigate for potential impacts, impacts on surface water protection areas are not anticipated for the EEP.

Horizontal Directional Drill – Equitrans would cross nine waterbodies using HDD including: Monongahela River, South Fork Tenmile Creek, and seven unnamed tributaries to South Fork Tenmile Creek. All other waterbodies would be crossed using dry open-cut methods (flume or dam-and-pump). Proposed crossing methods for each waterbody that would be crossed by the EEP are provided in appendix F.

The HDD method utilizes a slurry referred to as drilling mud, which is composed of 95 percent water and bentonite, a naturally occurring clay mineral that can absorb up to 10 times its weight in water. Bentonite-based drilling mud is a non-toxic, non-hazardous material that is also used to construct potable water wells throughout the United States. The drilling mud is pumped under pressure through the inside of the drill pipe, and flows back (returns) to the drill entry point along the outside of the drill pipe. The purpose of the drilling mud is to lubricate the drill bit and convey the drill cuttings back to the drill entry point where the mud is reconditioned and re-used in a closed, circulating process. It also forms a cake on the rock surface of the borehole, which helps to keep the drill hole open and maintain circulation of the drilling mud system.

Because the drilling mud is pressurized, it can be lost, resulting in an inadvertent release if the drill path encounters fractures or fissures that offer a path of least resistance, or near the drill entry and exit points where the drill path has the least amount of ground cover. The potential for an inadvertent release is typically greatest during drilling of the initial pilot hole, and decreases once the pilot hole has been completed. The volume of mud lost would be dependent on a number of factors, including the size of the fault, the permeability of the geologic material, the viscosity of the drilling mud, and the pressure of the drilling system. A drop in drilling pressure would indicate that an inadvertent release may be occurring and if the mud moves laterally, the inadvertent release may not be evident from the ground surface. For a release to be evident there must be a fault or pathway extending vertically to the surface. Pits or containment structures could be constructed to contain drilling mud released to the surface of the ground, and a pump may be required to transfer the drilling mud from the pit or the structure to a containment vessel. A release underground would be more difficult to contain and would be addressed by thickening the drilling mud, stopping drilling all together, or continuing to drill past the fault or blockage to re-establish the bore hole as the path of least resistance.

During construction, the escape of drilling mud during an HDD could impact surface water quality. Potential impacts may include increased erosion, sedimentation, and turbidity. Additionally, large-scale drilling mud releases could alter water chemistry and habitat, thereby increasing the potential for fish kills. During construction, Equitrans would minimize or avoid impacts by implementation of the construction practices outlined in its Procedures and its *HDD Contingency Plan*. Additionally, Equitrans would comply with all applicable federal, state, and local permitting requirements.

Modifications to Procedures - Equitrans has proposed 17 ATWS within 50 feet of a waterbody or wetland (see appendix D). Equitrans requested the ATWS in order to have adequate space to perform various construction activities, such as equipment and material staging, vehicle turnaround areas, HDD pullback areas, and installation of cathodic protection systems. As stated in table 2.3-1, we have reviewed Equitrans' site-specific justifications and find them acceptable.

Conclusions Regarding Impacts on Surface Waterbodies and Mitigation

No long-term or significant impacts on surface waters are anticipated as a result of the projects, because Mountain Valley and Equitrans would not permanently affect the designated water uses, they would bury the pipeline beneath the bed of all waterbodies, implement erosion and sedimentation controls, adhere to crossing guidelines in their Procedures, and restore the streambanks and streambed contours as close as practical to pre-construction conditions. Temporary impacts would be avoided or minimized through the implementation of our recommendations, such as contingency plans for nearby source water supply sources and ZCC; and various plans, which would include *Erosion and Sediment Control Plans*, *SPCCP*s, *Preparedness*, *Prevention, and Contingency and Emergency Action Plans*, *Fugitive Dust Control Plans, Karst Mitigation Plan*, *Blasting Plan,* and *HDD Contingency Plan*, as well as our Plan (the MVP), Equitrans' Plan, and Mountain Valley and Equitrans' Procedures[50].

Operation of the projects would not cause impacts on any surface waters, unless maintenance activities involving pipe excavation and repair in or near streams are required in the future. For maintenance activities, if needed, Mountain Valley and Equitrans would employ protective measures similar to those proposed for use during construction. As a result, we conclude that any impacts derived from maintenance would be short-term and similar to those discussed above for the initial pipeline construction.

4.3.3 Wetlands

4.3.3.1 Affected Environment

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and in normal conditions do support, a prevalence of vegetation adapted for life in saturated soil conditions (COE, 1987). Wetlands serve several functions including, but not limited to flood control, groundwater recharge, maintenance of biodiversity, wildlife habitat, and maintenance of water quality.

Wetlands affected by the MVP and the EEP are federally and state-regulated. On the federal level, the COE regulates wetlands under Section 404 of the CWA and Section 10 of the RHA, and the EPA shares responsibility to administer and enforce the Section 404 program.

50 See table 2.4-2 for the location of Mountain Valley and Equitrans' plans.

Wetland activities under Section 401 of the CWA are delegated to the appropriate state agencies: the WVDEP in West Virginia, the VADEQ in Virginia, and the PADEP in Pennsylvania.

In accordance with the West Virginia Water Pollution Control Act (WPCA), the WVDEP has the responsibility to protect all waters of the state. The WPCA requires a permit for activities that may cause an alteration to the physical or biological integrity of the waters of the state. The WVDEP West Virginia State Waters Permit is authorized by West Virginia Code §22-11-8(b)(3).

In Virginia, the Virginia Marine Resources Commission also has authority to regulate wetlands under Code of Virginia Title 28.2, and the VADEQ has additional authority to regulate activities in wetlands under State Water Control Law (Code of Virginia Title 62.1) and Virginia Administrative Code Regulations (9VAC25).

Mountain Valley was unable to survey all parcels; therefore, the total acreages given below were determined through a combination of field survey data and a review of the NWI maps. All NWI wetlands were accounted for during the field surveys for the EEP where access was granted as of October 15, 2015. As of May 11, 2017, Equitrans has not completed environmental surveys for the newly adopted New Cline Variation. We included a recommendation in section 4.3.2.1 that Equitrans file completed environmental surveys for the New Cline Variation.

Existing Wetland Types

Three wetland types as described by Cowardin et al. (1979) would be crossed by the MVP and the EEP:

- Palustrine emergent wetlands – dominated by erect, rooted, herbaceous, perennial hydrophytic vegetation;
- Palustrine scrub-shrub wetlands – dominated by woody vegetation that is less than 20 feet tall, including tree shrubs, young trees, and trees or shrubs that are small due to environmental conditions, and
- Palustrine forested wetlands – dominated by woody vegetation that is equal to or greater than 20 feet tall with a tolerance to a seasonally high water table.

In natural systems, these three wetland classifications are often interspersed creating a mosaic landscape. These wetland types crossed by the projects are further described in the subsections below. Table 4.3.3-1 summarizes the wetland types crossed by the MVP and the EEP, and appendix G details each wetland crossing.

Emergent Wetlands

Emergent wetlands within the MVP area (West Virginia and Virginia) are typically dominated by sedges, jewelweed, Japanese stiltgrass, fowl managrass, soft rush, dark green bulrush, false nettle, sensitive fern, wingstem, arrow-leaved tearthumb, woolgrass, chuffa, and reed canary grass. Emergent wetlands within the EEP area (Pennsylvania) are dominated by sedges, jewelweed, green bulrush, swamp agrimony, creeping bentgrass, narrowleaf cattail, bluegrass, and rushes.

TABLE 4.3.3-1 **Wetland Impacts Associated with the Mountain Valley Project and the Equitrans Expansion Project**		
Type/State a/	**Construction (acres) b/**	**Operation (acres) b/**
PEM Wetlands		
West Virginia	19.6	0.71
Virginia	4.4	0.10
Pennsylvania	0.88	0.64
Total PEM Wetland Impacts	*24.9*	*1.5*
PSS Wetlands		
West Virginia	0.60	0.60
Virginia	1.9	1.9
Pennsylvania	0.0	0.0
Total PSS Wetland Impacts	*2.5*	*2.5*
PFO Wetlands		
West Virginia	2.6	2.6
Virginia	2.0	2.0
Pennsylvania	0.03	0.03
Total PFO Wetland Impacts	*4.6*	*4.6*
Total Wetland Impacts	*32.1*	*8.6*

Note: Totals may not sum correctly due to rounding.
a/ PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forested (Cowardin et al., 1979).
b/ Construction impacts include those within the operational footprint.

Scrub-Shrub Wetlands

Scrub-shrub wetlands within the MVP area are typically dominated by black willow, black elderberry, green ash, spicebush, silky dogwood, nannyberry, sedges, false nettle, sensitive fern, soft rush, Japanese stiltgrass, jewelweed, and golden ragwort. Scrub-shrub wetlands within the EEP area are associated with forested wetlands and further detailed in section 4.4.1.

Forested Wetlands

Forested wetlands within the MVP area are dominated by black willow, black elderberry, red maple, green ash, ironwood, yellow birch, American elm, Japanese stiltgrass, sensitive fern, jewelweed, and golden ragwort. Forested wetlands within the EEP area are typically dominated by black willow, red maple, hazel alder, Canadian clearweed, honeysuckle, and Japanese stiltgrass.

Sensitive Wetlands

Certain wetlands can be considered sensitive or of high or exceptional value because of their ecological quality and high level of functionality. However, no protected wetlands or wetlands of or exceptional value have been identified in the MVP or the EEP areas in West

Virginia or Virginia. Likewise, none of the wetlands crossed by the EEP in Pennsylvania are classified as wetlands of exceptional value or high quality.

Jefferson National Forest

No wetlands in the Jefferson National Forest would be affected by the MVP.

Wetlands Crossed by the Projects

Based on review of NWI data, West Virginia, Virginia, and Pennsylvania currently have a total of about 55,000, 1.4 million, and 477,000 acres of existing wetlands,[51] respectively. The Applicants hired consultants to conduct field surveys to identify and determine the extent of wetlands crossed by the projects. Wetlands were delineated in accordance with the COE 1987 Wetland Delineation Manual (COE, 1987) and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0) (COE, 2010; 2012). Where survey access had not been obtained, publicly available NWI wetland maps were used to approximate the locations and boundaries of wetlands within the project area.

Mountain Valley Project

As previously stated, if the project is authorized by the Commission, Mountain Valley would be required to complete all of the remaining field wetland surveys after access is obtained. The results of these surveys would be provided to the permitting agencies, including the FERC, COE, and appropriate state resource agencies (WVDEP and VADEQ). These outstanding surveys could result in a change in the overall total wetland impacts.

The MVP (including aboveground facilities, yards, and access roads) would cross a total of 520 wetlands, impacting 31.0 acres during construction and 7.9 acres during operation. About 181 wetlands, totaling 9,281 feet (1.8 miles) would be crossed along the proposed MVP pipeline route, impacting 16.4 acres during construction and 5.4 acres during operation. Wetland features along the MVP are denoted in appendix G.

Equitrans Expansion Project

All of the EEP was field-surveyed for wetlands where access was granted as of October 15, 2015. Environmental surveys have not yet been completed for the New Cline Variation along pipeline H-318, in Allegheny and Washington Counties, Pennsylvania, as of May 11, 2017. Equitrans updated wetland impact calculations using NWI data in October 2016 to include the New Cline Route Variation (which was adopted into the proposed route). Appendix G identifies the location, NWI classification, crossing length, and acreage of each wetland that the MVP and the EEP would affect.

The EEP (including aboveground facilities, yards, and access roads) would cross a total of 16 wetlands, impacting 1.1 acres during construction and 0.71 acre during operation. About 7

[51] Wetland acreage totals are based on NWI data, and include estuarine and marine wetlands, freshwater emergent wetlands, and freshwater forested/shrub wetlands.

wetlands, totaling 505 feet (0.1 mile) would be crossed along the proposed EEP route, impacting 0.83 acre during construction and 0.60 acre during operation.

4.3.3.2 Environmental Consequences

Construction of the MVP and the EEP would impact a combined total of 32.1 acres of wetlands, including 24.9 acres of emergent wetlands, 2.5 acres of scrub-shrub wetlands, and 4.6 acres of forested wetlands (see table 4.3.3-1). The pipeline construction right-of-way and ATWS for both projects would affect a total of 21.6 acres of wetlands, including 13.6 acres in West Virginia, 7.9 acres in Virginia, and 0.06 acres in Pennsylvania. Of the total impacts (21.6 acres), about 15.0 acres (10.7 acres in West Virginia, 4.0 acres in Virginia, and 0.25 acre in Pennsylvania) would be temporary; associated with construction of the projects, and 6.7 acres would be permanent within the operational footprint. A total of about 0.80 acre of wetlands would be temporarily affected at yards. Access roads would impact a total of about 9.0 acres of wetlands. A total of about 1.1 acres of wetlands would be affected at cathodic protection beds; and, a total of about 0.1 acre of wetlands would be affected at aboveground facilities combined.

Construction impacts include those within the operational footprint, as well as those within temporary workspaces. Following construction, affected wetlands (with the exception of forested wetlands within the permanent right-of-way) within temporary work areas would be restored and returned to pre-construction vegetation conditions and wetland functions.

Impacts on emergent and scrub-shrub wetlands within temporary workspaces would be temporary and short-term. After construction, those areas would be restored, and emergent and scrub-shrub wetlands returned in just a few years to their original condition and function, in accordance with the Mountain Valley and Equitrans' Procedures.

Forested wetlands within temporary workspaces would be subject to long-term impacts. While trees could regenerate in those areas, it would take decades for them to mature and return the forested wetlands to their original condition and function.

Operation of the MVP and the EEP combined would impact 8.6 acres of wetlands, including 3.7 acres of forested wetlands that would be permanently affected due to removal of trees within the operational easement. During operation of the pipeline, a 10-foot-wide strip centered on the pipeline would be maintained without trees; this would be considered a permanent impact. Additionally, 0.88 acre of forested wetlands would be permanently affected by permanent access roads. Permanent impacts would occur within the operational boundaries of aboveground facilities and along permanent access roads. The remaining acres of operational impacts on emergent and scrub-shrub wetlands would return to pre-construction vegetation conditions within a few years.

Project-Specific Impacts

Mountain Valley Project

As identified on table 4.3.3-2, constructing the MVP would impact about 31.0 acres of wetlands, including 23.9 acres of emergent wetlands, 2.5 acres of scrub-shrub wetlands, and 4.6

acres of forested wetlands. Operation of the MVP would impact approximately 7.9 acres of wetlands. Following construction, the operational easement would be restored, and emergent and scrub-shrub wetlands would return to their original condition and function. Forested wetlands within a 10-foot-wide strip centered on the pipeline would be kept cleared of trees and would be permanently converted to emergent wetlands. Vegetation maintenance during pipeline operations would also permanently convert the scrub-shrub wetlands within the 10-foot-wide corridor over the pipe to herbaceous emergent wetlands. Individual wetland impact information, including locations, are provided in appendix G.

The operational easement along the MVP pipeline route would overlap about 18.9 acres of wetlands, including 12.9 acres of emergent wetlands, 3.7 acres of forested wetlands, and 2.3 acres of scrub-shrub wetlands. All of the 3.7 acres of affected forested wetlands within the 50-foot-wide operational pipeline easement would be converted to either emergent or scrub-shrub wetland types, and 0.26 acre of the total 2.3 acre of scrub-shrub wetlands would be converted to herbaceous emergent wetlands within the 10-foot-wide corridor over the pipe. About 1.8 acres of wetlands would be permanently affected by access roads, including 0.76 acres of emergent wetlands, 0.19 acre of scrub-shrub wetlands, and 0.88 acre of forested wetlands.

Construction of the aboveground facilities for the MVP would impact a total of 0.02 acre of emergent wetlands. About 0.01 acre (wetlands W-EE6 and W-EE7) would be located within the construction area for the Stallworth Compressor Station and are, therefore, calculated as permanent wetland impacts. About 0.01 acre (wetland W-YZ8) would be temporarily affected at the Bradshaw Compressor Station.

TABLE 4.3.3-2

Mountain Valley Project Wetland Impacts

State/Facility	Type a/	Crossing Length (feet) b/	Total Wetland Area Affected During Construction (acres) c/	Total Wetland Area Affected During Operation (acres)
West Virginia				
Pipeline Facilities d/	PEM	4,026.5	10.6	0.00
	PSS	269.9	0.41	0.41
	PFO	924.2	1.7	1.7
Pipeline Facilities Subtotal		*5,220.6*	*12.8*	*2.1*
Aboveground Facilities	PEM	N/A	0.02	0.01
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00
Aboveground Facilities Subtotal		*N/A*	*0.02*	*0.01*
Cathodic Protection	PEM	N/A	0.55	0.00
	PSS	N/A	0.00	0.00
	PFO	N/A	0.01	0.01
Cathodic Protection Subtotal		*N/A*	*0.56*	*0.01*
Access Roads	PEM	172.8	7.6	0.66
	PSS	N/A	0.18	0.18
	PFO	N/A	0.84	0.84
Access Roads Subtotal		*172.8*	*8.6*	*1.7*
Yards	PEM	N/A	0.71	0.00
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00
Yards Subtotal		*N/A*	*0.71*	*0.00*
West Virginia Subtotal		*5,393.4*	*22.6*	*3.8*
Virginia				
Pipeline Facilities	PEM	2,195.1	4.0	0.00
	PSS	874.6	1.9	1.9
	PFO	990.7	2.0	2.0
Pipeline Facilities Subtotal		*4,060.4*	*7.9*	*3.9*
Aboveground Facilities	PEM	N/A	0.00	0.00
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00

TABLE 4.3.3-2 (continued)				
Mountain Valley Project Wetland Impacts				
State/Facility	**Type a/**	**Crossing Length (feet) b/**	**Total Wetland Area Affected During Construction (acres) c/**	**Total Wetland Area Affected During Operation (acres)**
Aboveground Facilities Subtotal		*N/A*	*0.00*	*0.00*
Cathodic Protection	PEM	N/A	0.00	0.00
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00
Cathodic Protection Subtotal		*N/A*	*0.00*	*0.00*
Access Roads	PEM	N/A	0.39	0.10
	PSS	N/A	0.01	0.01
	PFO	N/A	0.04	0.04
Access Roads Subtotal		*N/A*	*0.44*	*0.15*
Yards	PEM	N/A	0.00	0.00
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00
Yards Subtotal		*N/A*	*0.00*	*0.00*
Virginia Subtotal		*4,060.3*	*8.4*	*4.1*
MVP Total		**9,453.7**	**31.0**	**7.9**

Notes: N/A – Not Applicable; Totals may not sum correctly due to rounding.
a/ PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forested (Cowardin et al., 1979).
b/ N/A = wetlands not crossed by the centerline but within the construction workspace.
c/ Construction impacts include those within the operational footprint, as well as those within temporary workspaces.
d/ Pipeline facilities include the permanent right-of-way, temporary workspace, and additional temporary workspace.

According to Section VI.A.6 of our Procedures, aboveground facilities should not be sited within a wetland. Therefore, **we recommend that**:

- **<u>Prior to construction,</u> Mountain Valley should file with the Secretary, for review and written approval by the Director of OEP, site plans and maps that illustrate how permanent impacts on wetlands W-EE6 and W-EE7 will be avoided at the Stallworth Compressor Station.**

Previous filings from Mountain Valley also included impacts on 0.01 acre of wetlands (P-AA1, W-AA3 and W-AA4) due to the construction and operation of the WB Interconnect that are now being avoided.

The MVP would cross the federally-approved Kincheloe Wetland Mitigation Bank in Harrison and Lewis Counties, West Virginia. Mountain Valley would minimize impacts on the wetland by reducing the temporary right-of-way width to 75 feet, crossing the wetland at its narrowest point, and not widening an existing access road. Temporary wetland impacts would occur during construction due to pipeline installation and use of the access road. Areas adjacent to the construction area would be protected through the use of BMPs (i.e., compost filter sock). The affected wetland would be restored post-construction, therefore mitigation would not be necessary. Mountain Valley coordinated with representatives of the Kincheloe Mitigation Bank and the COE; the COE anticipates including special conditions for the crossing of this area within Mountain Valley's Nationwide Permit.

Equitrans Expansion Project

As identified in table 4.3.3-3, construction of the EEP would impact about 1.1 acres of wetlands, including 1.0 acres of emergent wetlands and 0.03 acre of forested wetlands. Operation of the EEP would impact approximately 0.71 acre of wetlands. Individual wetland impact information, including locations, are provided in appendix G.

The operational right-of-way for the EEP would overlap about 0.62 acre of wetlands, including 0.60 acre of emergent wetlands and 0.03 acre of forested wetlands. The 0.03 acre of forested wetlands in the 50-foot-wide pipeline operational easement would be converted to scrub-shrub and/or emergent wetlands. There are no scrub-shrub wetlands in the 50-foot-wide pipeline operational easement that would be affected by the 10-foot-wide corridor maintained as herbaceous vegetation over the pipe. Decommissioning of the Pratt Compressor Station would impact 0.08 acre of emergent wetlands (W-AA-5 [0.02 acre] and W-AA-6 [0.06 acre]). They would be located within the permanent workspace for the Pratt Compressor Station and are, therefore, calculated as permanent wetland impacts; however, impacts on these wetlands would be avoided through the use of BMPs, such as silt fence or compost filter sock, during construction and operation if practicable. One emergent wetland in both Pennsylvania (<0.01 acre) and West Virginia (0.09 acre) would be temporarily affected by yards. Additionally, one emergent wetland in Pennsylvania (<0.01 acre) would be temporarily affected by an access road.

TABLE 4.3.3-3

Equitrans Expansion Project Wetland Impacts

Facility	Type a/	Crossing Length (feet)	Total Wetland Area Affected During Construction (acres) b/	Total Wetland Area Affected During Operation (acres)
Pennsylvania				
Pipeline Facilities	PEM	465.9	0.80	0.56
	PSS	N/A	0.00	0.00
	PFO	N/A	0.03	0.03
Pipeline Facilities Subtotal		*465.9*	*0.83*	*0.59*
Aboveground Facilities	PEM	N/A	0.08	0.08
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00
Aboveground Facilities Subtotal		*N/A*	*0.08*	*0.08*
Access Roads	PEM	N/A	<0.01	0.00
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00
Access Roads Subtotal		*N/A*	*<0.01*	*0.00*
Yards	PEM	N/A	<0.01	0.00
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00
Yards Subtotal		*N/A*	*<0.01*	*0.00*
Pennsylvania Total		*465.9*	*0.91*	*0.67*
West Virginia				
Pipeline Facilities	PEM	39.05	0.06	0.04
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00
Pipeline Facilities Subtotal		*39.05*	*0.06*	*0.04*
Aboveground Facilities	PEM	N/A	0.00	0.00
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00
Aboveground Facilities Subtotal		*N/A*	*0.00*	*0.00*
Access Roads	PEM	N/A	0.00	0.00
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00
Access Roads Subtotal		*N/A*	*0.00*	*0.00*
Yards	PEM	N/A	0.09	0.00
	PSS	N/A	0.00	0.00
	PFO	N/A	0.00	0.00

TABLE 4.3.3-3 (continued)				
Equitrans Expansion Project Wetland Impacts				
Facility	**Type a/**	**Crossing Length (feet)**	**Total Wetland Area Affected During Construction (acres) b/**	**Total Wetland Area Affected During Operation (acres)**
Yards Subtotal		*N/A*	*0.09*	*0.00*
West Virginia Subtotal		*39.05*	*0.15*	*0.04*
EEP Total		**504.9**	**1.1**	**0.71**

Notes: N/A – Not Applicable; Totals may not sum correctly due to rounding.

a/ PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forested (Cowardin et al., 1979).

b/ N/A = wetlands not crossed by the centerline but within the construction workspace.

c/ Construction impacts include those within the operational footprint, as well as those within temporary workspaces.

d/ Pipeline facilities include the permanent right-of-way, temporary workspace, and additional temporary workspace.

Avoidance and Minimization

Consistent with federal and state guidelines and regulations, the Applicants attempted to avoid wetlands, minimize impacts on them, and as applicable, mitigate impacts on them. Federal and state agencies require that "sequencing" be followed when proposing a project that may impact wetlands. Sequencing involves three steps. First, wetlands must be avoided to the extent practicable. Second, if avoidance is not an option, impacts must be minimized to the extent practicable. Third, if wetland impacts are unavoidable, wetland replacement or compensatory mitigation is required via the CWA to replace lost wetland function.

The Applicants routed their respective pipelines and sited their associated aboveground facilities to avoid wetlands to the extent practicable. Several factors influence pipeline routing, and therefore wetland and other environmental impacts. First, the most direct route between receipt and delivery points generally reduces certain environmental impacts. Second, collocation of new pipeline facilities with existing linear infrastructure generally reduces impacts by using existing disturbed areas during construction and incrementally expanding existing rights-of-way for operation. As discussed in sections 3.4 and 3.5, we reviewed several potential route alternatives and variations to the Applicants' proposal, including the possibility of revising originally proposed routes in response to input from FERC staff, affected landowners, agencies, and other stakeholders to avoid or minimize impacts on environmental resources including, in many cases, wetlands. Based on the proposed and recommended pipeline routes and configuration of aboveground facilities, we have determined that wetland impacts have been avoided to the extent practicable.

Where wetland impacts could not be avoided, impacts would be minimized through adherence to Mountain Valley and Equitrans' Procedures. Measures that would reduce impacts on wetlands include:

- using a 75-foot-wide construction right-of-way through wetlands (unless a variance is requested and approved by the FERC);
- using dry open ditch overland construction methods in unsaturated wetlands, and the wet open ditch and push/pull method in saturated wetlands;

- cutting trees to grade, but only removing stumps within 15 feet of pipe trench, or where safety dictates;
- segregating topsoil (up to 12 inches) excavated from the trench in non-saturated wetlands and returning it to the appropriate horizon upon backfill of the trench;
- having equipment work off mats;
- using one traffic lane for construction equipment in non-saturated wetlands;
- using low-ground-pressure equipment;
- installing erosion control devices, including silt fences and hay bale structures, to minimize sedimentation within the wetland;
- sealing the trench line at upland/wetland boundaries to maintain wetland hydrology;
- storing all hazardous materials, including fuels, chemicals, and lubricating fluids, a minimum of 100 feet from any wetland boundary;
- prohibiting parking or refueling of vehicles within 100 feet of a wetland unless the onsite EI determines that there is no practicable alternative and secondary containment structures are used;
- restoring pre-construction contours to the extent practicable; and
- prohibiting the use of fertilizer, lime, or mulch in wetlands, unless required by permitting agencies.

The only construction equipment that would be allowed in wetlands is that necessary to clear the right-of-way, dig the pipe trench, fabricate and then install the pipe, backfill the trench, and restore the right-of-way. The Applicants would restore wetland vegetation in accordance with their Procedures. For the MVP, reseeding in wetlands would be in accordance with the recommendations from the Wildlife Habitat Council. Work in wetlands in Pennsylvania for the EEP would be in accordance with the PADEP's Erosion and Sediment Pollution Control Program Manual. Additional discussion of wetland crossing methods is provided in section 2.4.2.

General Impacts and Mitigation

Constructing and operating the MVP and the EEP would temporarily and permanently impact wetlands. Construction activities would temporarily and permanently impact wetland vegetation and habitats, and could temporarily impact wetland soils characteristics, hydrology, and water quality. The effects on wetland vegetation would be greatest during and immediately following construction.

Construction impacts on wetland communities may also include changes in the density, type, and biodiversity of vegetation, including the potential introduction of non-native invasive species. Impacts on habitats may occur due to fragmentation, loss of riparian vegetation, and microclimate changes associated with gaps in canopy.

During construction, topsoils could be mixed with subsoils. This could result in poor revegetation success, and reduced biological productivity. The modification of chemical conditions in wetland soils could affect the reestablishment and natural recruitment of native wetland vegetation. The movement of heavy machinery in the right-of-way could result in soil compaction and rutting. The alteration of natural hydrologic patterns could inhibit seed germination and regeneration of vegetation species. The discharge of stormwater, trench water, or hydrostatic test water could increase the potential for sediment-laden water to enter wetlands and cover native soils and vegetation. Impacts on water quality may include changes in temperature, biochemistry, or water chemistry; sedimentation or release of hazardous materials (e.g., fuels, lubricants); addition of nutrients; and turbidity. Finally, construction clearing activities and disturbance of wetland vegetation could also temporarily affect the wetland's capacity to buffer flood flows and/or control erosion.

Wetland soils would be restored to their original profile to the extent possible. Up to 12 inches of topsoil would be segregated during construction through unsaturated wetlands. The installation of trench breakers would protect wetland hydrology. To reduce compaction and rutting, equipment would work off of mats in wetlands, equipment would be limited to a single pass one a single travel land through wetlands, and low-ground-pressure equipment would be used for construction through wetlands. During restoration, topographic contours similar to pre-construction conditions would be reestablished without adding new drainage features that were not present prior to construction.

Secondary and indirect effects are impacts on adjacent or other nearby environmental resources, such as the sedimentation of water resources down-gradient of disturbed areas or habitat loss due to microclimate changes following clearing of forested vegetation that could result from the principal pipeline construction activities. To protect adjacent resources, the sensitive resources and limits of clearing would be clearly marked with signage and/or orange construction fence. The Applicants would prevent secondary and indirect impacts on adjacent wetland areas using BMPs that include: minimizing the length of open trench at any given time; installing trench breakers to protect hydrology; employing erosion and sediment control measures, such as silt fences, to prevent discharge of sediment into adjacent wetlands and waterbodies; and limiting refueling and storage of hazardous materials. In addition, where secondary and indirect effects cannot be avoided or minimized, they would be mitigated as part of applicable COE and state agency requirements as described below.

In general, after restoration most wetland vegetation would eventually transition back into a community with a function similar to that of the wetland before construction, assuming that soils and hydrology are not severely affected. Emergent wetlands are expected to recover to their pre-existing vegetation conditions in a relatively short period (typically within 2 years). Scrub-shrub wetlands could take up to 4 years after pipeline installation for vegetation to return to pre-construction conditions, and reach functionality similar to pre-construction conditions, depending on the age and complexity of the system. In forested wetlands restored within temporary work areas, the impact of construction would be much longer due to the time needed to regenerate a forest community. Given the species that dominate the forested wetlands crossed by the projects, regeneration to pre-construction conditions may take 30 years or longer.

During initial construction, trees would be removed from the 50-foot-wide operational pipeline easement. This would convert forested wetlands in the pipeline operational easement to either scrub-shrub or emergent wetlands; changing the type, character, and function of those wetlands until trees regenerate in the 20-foot-wide strips down either side of the operational right-of-way. During operation of the pipeline, a 10-foot-wide strip centered on the pipeline would be maintained without trees (in an herbaceous state); therefore, this would be a permanent impact, resulting in the permanent conversion of about 0.26 acre of scrub-shrub wetlands to emergent wetlands. We estimate that the MVP and EEP combined would result in the permanent conversion of 3.7 acres of forested wetlands within the pipeline operational easement.

4.3.3.3 Alternative Measures

Both Mountain Valley and Equitrans have requested specific modifications to our Procedures. The FERC Procedures specify that ATWS should be at least 50 feet from waterbodies and wetlands. Additional discussion regarding this modification can be found in section 4.3.2.2 and appendix D.

Additionally, the FERC Procedures specify that the construction right-of-way width in wetlands should be limited to 75 feet. However, Mountain Valley requested a right-of-way width greater than 75 feet in eight wetlands according to its filing dated July 18, 2016. Mountain Valley filed a supplemental Response to FERC Staff's Recommended Mitigation in Draft Environmental Impact Statement on December 22, 2016 stating that the proposed route only included seven wetlands, incorrectly reporting eight wetlands in the July 18, 2016 filing. We have reviewed the seven wetland locations and conclude that the use of a wider right-of-way has been adequately justified.

4.3.3.4 Compensatory Mitigation

The COE and designated state agencies require mitigation for unavoidable wetland impacts to preserve no net loss of wetland function. In consultation with the COE, the Applicants would create a project-specific wetland mitigation plan to address impacts in the watersheds where wetlands impacts would occur. The mitigation plan would also detail measures for restoring affected wetlands and monitoring restoration efforts. Written approval of the mitigation plan must be obtained from the COE prior to any wetland impacts. Mitigation amounts may change as field surveys are completed; any changes in mitigation will be submitted to the COE for approval.

Mountain Valley submitted their compensatory mitigation plan to the COE in February 2016. The COE is still reviewing Mountain Valley's plan and will continue to work with Mountain Valley to determine the appropriate type and amount of mitigation needed for the MVP's wetland impacts in West Virginia and Virginia. For unavoidable wetland impacts in West Virginia and Virginia, wetland and stream credits would be purchased from approved mitigation banks in the respective states. The in-lieu fee program may also be considered in West Virginia and Virginia. Proof of compensatory mitigation credit purchase would be provided to the COE prior to construction.

According to Mountain Valley's filing on March 30, 2017, there are 135 wetlands (7.7 acres) with permanent impacts requiring mitigation, 77 in West Virginia (3.8 acres) and 58 in Virginia (4.0 acres). These wetlands would be permanently affected by access roads, aboveground facilities, cathodic protection, and/or those within the operational easement, and are addressed in Mountain Valley's wetland permit applications to the COE districts. The wetlands are identified in appendix G.

Mountain Valley submitted its wetland permit application to the COE under Section 404 of the CWA and Section 10 of the RHA in February 2016. In a letter to Mountain Valley dated

June 15, 2016, the Norfolk District of the COE indicated it will not consider the application to be complete until after Mountain Valley provides:

- a complete delineation of the waters of the United States and a Preliminary Jurisdictional Determination for wetlands;
- the FERC's final EIS;
- documentation that the FERC completed Section 7 ESA consultations with the FWS; and
- documentation that the FERC completed compliance with Section 106 of the NHPA, including consultations with the SHPOs, production of an agreement document to resolve adverse effects at historic properties, and providing the ACHP with an opportunity to comment on the undertaking.

Mountain Valley submitted updated wetland permit applications to the Huntington and Pittsburgh Districts of the COE in February 2017 and the Norfolk District of the COE in March 2017. The proposed mitigation for the permanent wetland impacts in West Virginia have been addressed in Mountain Valley's granted Conditional 401 WQC from WVDEP and the updated COE wetland permit applications. The permanent wetland impacts in Virginia were included in the wetland permit application submitted to the Norfolk District of the COE in March 2017.

According to Equitrans, compensatory mitigation for the EEP will not be required by the COE.

4.3.3.5 Conclusions Regarding Wetland Impacts and Mitigation

Following construction, a majority of the wetlands in the temporary workspaces would be returned to pre-construction conditions and functions. This represents short-term impacts on emergent and scrub-shrub wetlands. Impacts on wetlands would be minimized by adherence to the measures outlined in Mountain Valley's and Equitrans' Procedures. Permanent impacts on wetlands would include the conversion of forested wetlands to scrub-shrub or emergent wetlands within the pipeline permanent easement, as well as the installation of culverts and permanent fill in wetlands for access roads. While adverse and long-term impacts on wetlands would occur, with the implementation of BMPs and mitigation proposed by the Applicants, as well as our recommendations, we conclude that impacts on wetlands would not be significant.

4.4 VEGETATION

4.4.1 Affected Environment

4.4.1.1 Vegetation Cover Types

The pipeline routes for the MVP and the EEP would cross through five primary natural upland vegetation cover types as identified and described in the 2011 National Land Cover Database (NLCD, Homer et al., 2015): 1) deciduous forest; 2) coniferous forest; 3) mixed forest; 4) scrub-shrub lands; and 5) herbaceous grasslands. Lists of vegetation species common to each upland cover type are provided on table 4.4.1-1. Wetland vegetation cover types are described in section 4.3.3. Agricultural vegetation is not included here, but is discussed in section 4.8.1. Discussion of the wildlife common to these vegetation cover types is provided in section 4.5. Threatened and endangered and special status plant species are discussed in section 4.7.

4.4.1.2 Interior Forest

We received comments expressing concerns regarding the potential impacts of the MVP and EEP on interior forest. Interior forest is defined as forested areas greater than 300 feet from the influence of forest edges or open habitat (Jones et al., 2001); and it provides habitat for a variety of wildlife and plant species, including food resources, brooding habitat for wildlife, and protection from disturbance and predation. Interior forest has a higher habitat value for some wildlife species, and is generally considered rarer than forest edges which have lower habitat value for many species and can be created immediately with disturbance (Landowner Resource Center, 2000; Sprague et al., 2006).

Interior forests were assessed by Mountain Valley in West Virginia using a dataset produced by the Natural Resource Analysis Center at West Virginia University (Strager and Maxwell, 2012) which determines core forest areas based upon the acreage of contiguous habitat. Core Forest Area rankings include patch (small forest fragments), edge (continuous forest periphery), perforated (core forest containing a small clearing(s) within the forest), small core (less than 250 acres), medium core (250 to 500 acres), and large core (greater than 500 acres). In Virginia, interior forests were assessed by Mountain Valley using data from the VADCR's Virginia Natural Landscape Assessment (VaNLA) project (VADCR-DNH, 2007). The VaNLA project ranks areas with at least 100 acres of interior forest and the associated forest fragments as Ecological Core Areas (ECA) into the five categories of Outstanding (C1), Very High (C2), High (C3), Moderate (C4), and General (C5). Figures 4.4.1-1 through 4.4.1-3 illustrate the sections of core forest and ECA that the MVP would pass through in West Virginia and Virginia.

Construction and operation of the EEP H-318 pipeline in Pennsylvania would affect one tract of interior forest of about 50 acres.

TABLE 4.4.1-1

Upland Vegetation Cover Types Crossed by the Mountain Valley Project and the Equitrans Expansion Project

Cover Type	Common Vegetation Species a\	Miles Crossed: Mountain Valley Project	Miles Crossed: Equitrans Expansion Project
Deciduous Forest	Northern red oak (*Quercus rubra*), chestnut oak (*Q. montana*), white oak (*Q. alba*), black oak (*Q. velutina*), scarlet oak (*Q. coccinea*), southern red oak (*Q. falcata*), post oak (*Q. stellata*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), yellow buckeye (*Aesculus flava*), American beech (*Fagus grandifolia*), yellow poplar (*Liriodendron tulipifera*), mockernut hickory (*Carya tomentosa*), shagbark hickory (*C. ovata*), white ash (*Fraxinus americana*), basswood (*Tilia americana*), buckeye (*Aesculus glabra*), birches (*Betula spp.*), American elm (*Ulmus Americana),* eastern hop-hornbeam (*Ostrya virginiana*), spruce (*Picea* spp.), hemlock (*Tsuga canadensis*), shortleaf pine (*Pinus echinata*), and loblolly pine (*P. taeda*).	206.8	3.5
Coniferous Forest	Table mountain pine (*Pinus pungens*), pitch pine (*Pinus rigida*), shortleaf pine, Virginia pine (*Pinus virginiana*), red pine (*Pinus resinosa)*, and white pine (*Pinus strobus).*	7.0	0.0
Mixed Forest	A mix of the above listed deciduous and coniferous tree species.	20.7	0.0
Scrub-Shrub Land	Mountain laurel (*Kalmia latifolia*), fetterbush (*Pieris floribunda*), rhododendron (*Rhododendron* spp.), blueberry (*Vaccinium* spp.), huckleberry (*Gaylussacia* spp.), autumn olive (*Elaeagnus umbellata),* hornbeam (*Carpinus caroliniana*), eastern hop-hornbeam, witch hazel (*Hamamelis virginiana*), balsam fir (*Abies balsamea)*, dogwoods (*Cornus spp.*), and spicebush (*Lindera benzoin*).	2.7	0.0
Herbaceous Grasslands	(Includes natural to semi-natural areas of open grasslands) Orchard grass (*Dactylis glomerata)*, poverty grass (*Danthonia spicata*), common hairgrass (*Deschampsia flexuosa*), red fescue (*Festuca rubra*), common velvet grass (*Holcus lanatus*), Japanese stilt grass (*Microstegium vimineum*), Kentucky blue grass (*Poa pratensis*), meadow false rye grass (*Schedonorus pratensis*), little bluestem (*Schizachyrium scoparium*), white clover (*Trifolium repens)*, wingstem (*Verbesina alternifolia*), giant ironweed (*Vernonia gigantea)*, and reed canary grass (*Phalaris arundinacea*).	7.5	0.1
Palustrine Forested Wetland	Black willow (Salix nigra), black elderberry (Sambucus canadensis), red maple (Acer rubrum), green ash (Fraxinus pennsylvanica), ironwood (Carpinus carolinia), yellow birch (Betula alleghaniensis), and American elm (*Ulmus americana*).	0.3	<0.1
Palustrine Scrub-Shrub Wetland	Black willow (*Salix nigra*), black elderberry (Sambucus canadensis), green ash, spicebush, silky dogwood (*Cornus amomum*), sedges (*Cyperaceae spp.*), false nettle (*Boehmeria cylindrical*), sensitive fern (*Onoclea sensibilis*), soft rush (*Juncus effusus*), Japanese stiltgrass, jewelweed (*Impatiens capensis*), and golden ragwort (*Packera aurea*).	0.2	<0.1
Palustrine Emergent Wetland	Jewelweed, Japanese stiltgrass, soft rush, dark green bulrush (Scirpus atrovirens), false nettle, sensitive fern, wingstem, woolgrass (*Scirpus cyperinus*), reed canary grass, and various rushes (*Juncus spp.*) and sedges.	1.3	0.1

a/ May include native and non-native common plant species.

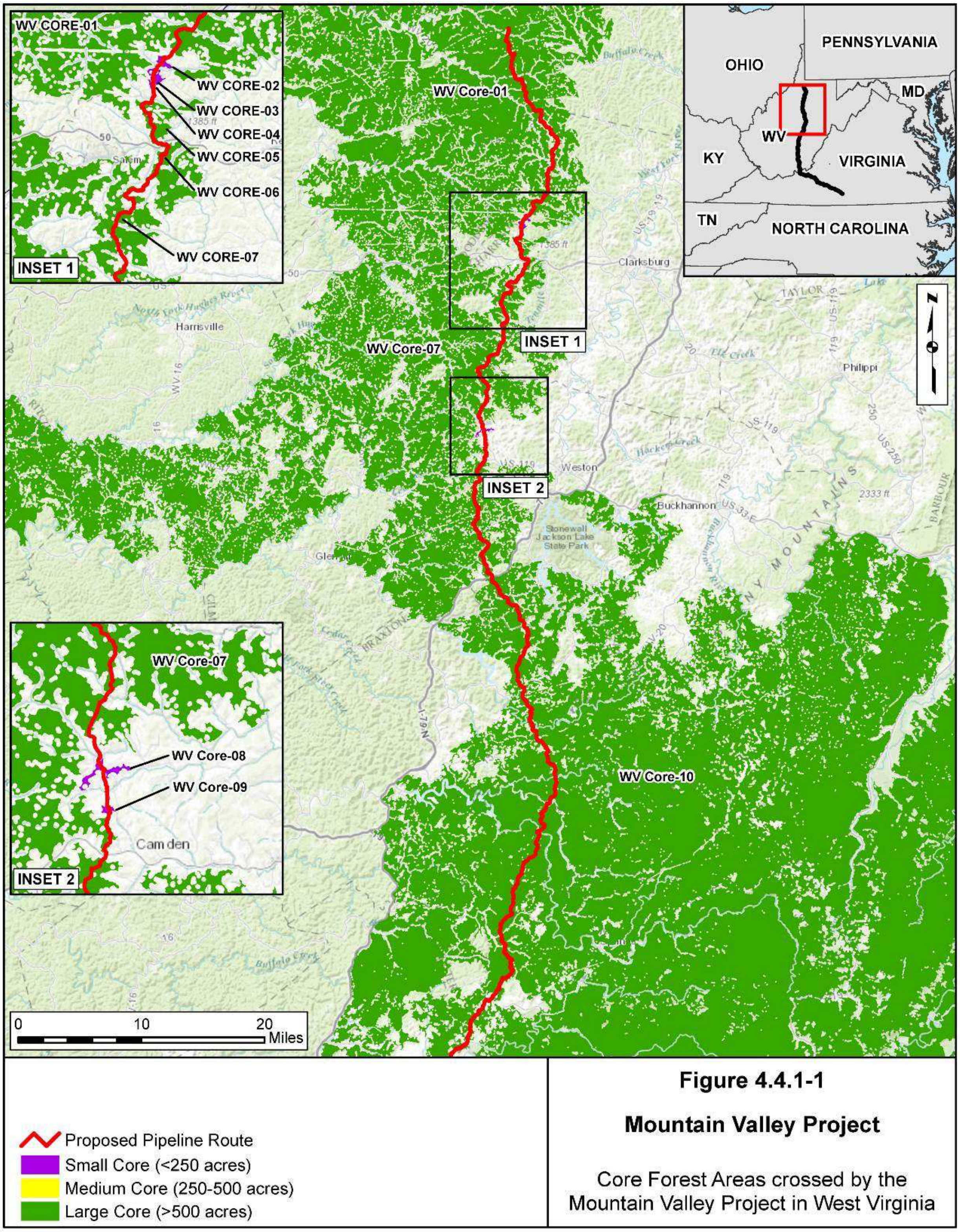

Figure 4.4.1-1

Mountain Valley Project

Core Forest Areas crossed by the Mountain Valley Project in West Virginia

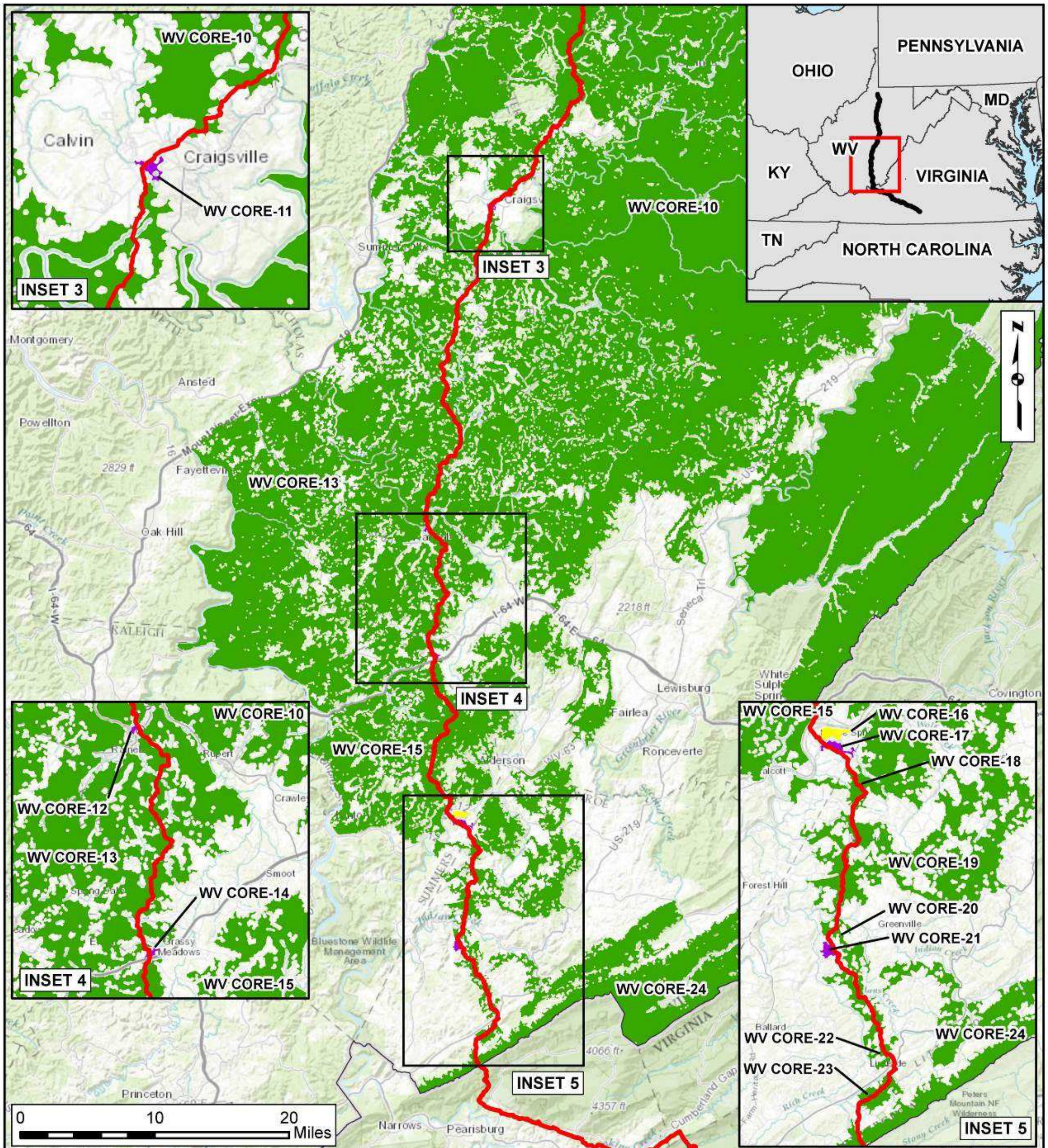

Figure 4.4.1-2

Mountain Valley Project

Core Forest Areas crossed by the Mountain Valley Project in West Virginia

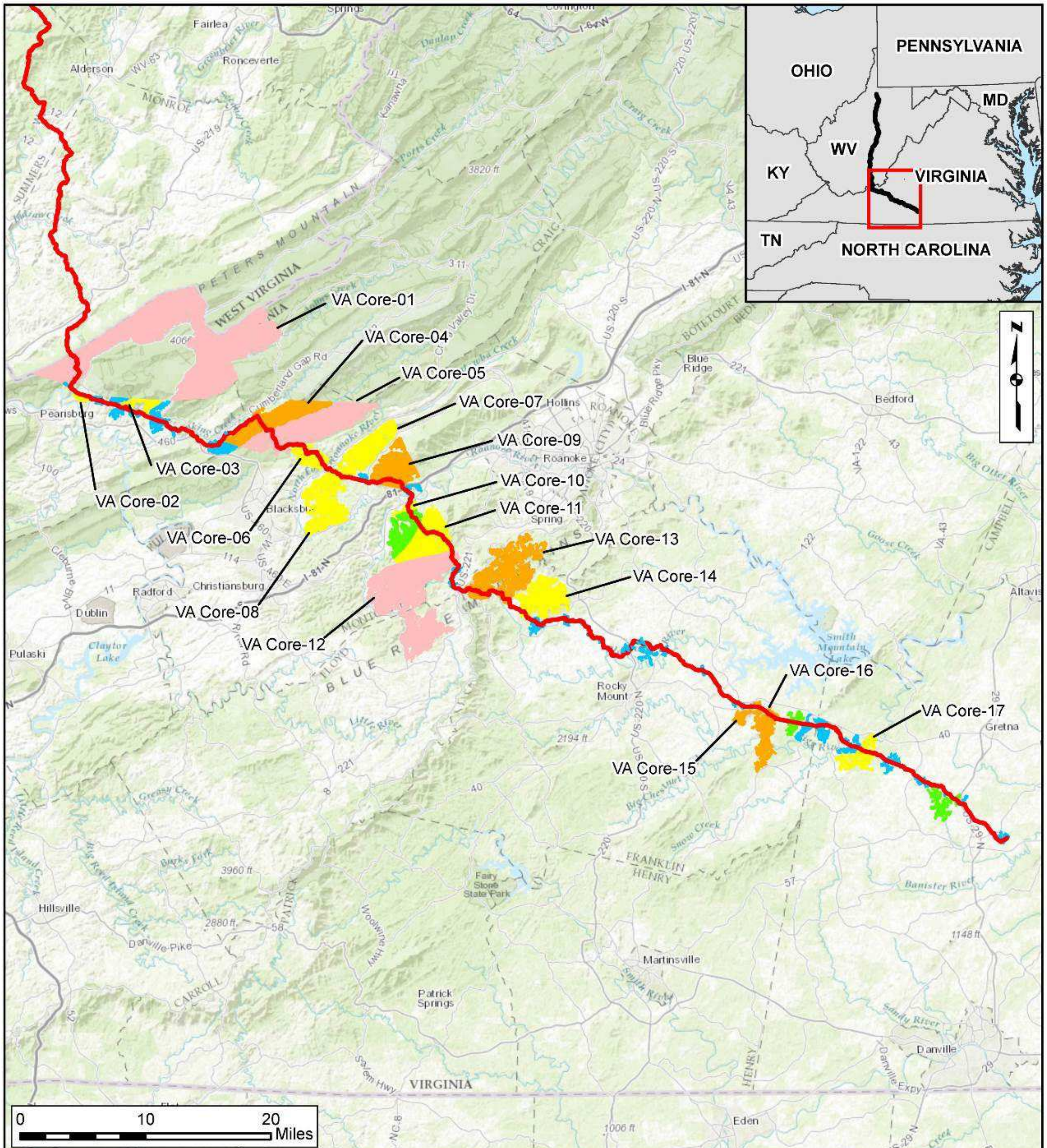

Figure 4.4.1-3

Mountain Valley Project

Ecological Core Areas crossed by the Mountain Valley Project in Virginia

4.4.1.3 Fire Regimes

Comments were received regarding concerns about wildfires during construction and operation of the MVP and the EEP. Fire plays an important role in maintaining the composition, structure, and distribution of vegetation communities. Landscapes can be grouped into fire regimes that have a distinct fire periodicity, seasonality, intensity, and size that influences vegetation development (Grissino-Mayer et al., 2005). The MVP and the EEP would cross diverse landscapes with multiple fire regimes (see table 4.4.1-2). Most of the MVP and the EEP region is intermixed evenly between Fire Regime Groups I and III. The MVP would cross scattered areas of Fire Regime Group V in West Virginia from MPs 0 to 60 and also in areas within Greenbrier and Summers County, West Virginia. The EEP would cross areas containing scattered Fire Regime Group V areas in Wetzel County, West Virginia.

TABLE 4.4.1-2

Fire Regime Groups Crossed by the Mountain Valley Project and the Equitrans Expansion Project

Fire Regime Group	Frequency	Severity
I	0 – 35 years	Low and Mixed
II	0 – 35 years	High
III	35 – 200 years	Low and Mixed
IV	35 – 200 years	High
V	200+ years	Any Severity

Source: LANDFIRE, 2012

4.4.1.4 Non-Timber Harvested Plants

Non-timber forest products are wild plants and fungi that people gather and use for food, medicine, crafts, and spiritual, aesthetic, and utilitarian purposes (USDA, 2010). These plants and fungi are found in a variety of forested and non-forested habitats, and many prefer to grow in forest edges which provides the appropriate conditions such as abundant light or shade.

Commercially gathered non-timber forest products in the project area include bloodroot, stoneroot, American ginseng, golden-seal, black cohosh, and blue cohosh, which are perennial herbs which are harvested for their roots. Pawpaw is a small tree that bears an edible fruit which can be harvested. Ramps (wild leeks) are onion-like plants which grow in forested areas. A variety of fungi including morels, chicken of the woods mushroom, oyster mushroom, and chanterelles are also potentially harvested.

4.4.1.5 Vegetation Communities of Special Concern or Management

Vegetation communities of special concern or management include national and state forest, parks, wildlife refuges, wildlife management areas, and reserve program lands. These locations are generally established to protect lands and waters of special interest to the public.

Mountain Valley Project

The MVP pipeline route would cross one identified sensitive vegetation community, managed by the WVDNR in West Virginia. In Virginia, sensitive vegetation communities that could be affected by the MVP pipeline include VADCR-designated Conservation Areas; a forested easement and an existing road managed by the VOF; an easement managed by the New River Conservancy; an easement managed by the TNC; and the Jefferson National Forest.

Burnsville Lake Wildlife Management Area

The MVP pipeline route would cross about 177 feet of the Burnsville WMA at about MP 68.7 in Braxton County, West Virginia. The WMA is managed by the WVDNR in a program designed to conserve high quality habitats for wildlife species. The Burnsville WMA is also mentioned in Alternatives (see section 3.5) and Recreation (see section 4.8).

New River Conservancy Easement

The MVP pipeline route would cross an easement held by the New River Conservancy between about MPs 203.4 and 203.6, in Giles County, Virginia. The New River Conservancy indicated that this easement is a buffer between federally-owned lands along the Cascades National Recreation Trail, managed by the NPS, and privately owned developed lands. The New River Conservancy easement was identified by the VADCR as a historical record, last recorded in 1937, for the purple fringeless orchid (*Platanthera peramoena*). This species has no legal status but is considered extremely rare by VADCR. The New River Conservancy easement is also discussed in Alternatives (see section 3.5) and Land Use (see section 4.8).

Virginia Department of Conservation and Recreation Conservation Area

Mountain Valley adopted a route modification in October 2016 that would cross Craig Creek at about MP 218.2 in Montgomery County, Virginia. The crossing is on private land. However, the crossing is within the VADCR-designated Craig Creek – Johns Creek Stream Conservation Unit. This conservation unit has been given a biodiversity ranking of B1 by the VADCR, representing a site with outstanding natural resources significance. Alternatives for crossing Craig Creek are discussed in the Brush Mountain Variations in section 3.5; and VADCR Conservation Units are further addressed in section 4.8 (Land Use).

Through the incorporation in October 2016 of the Mount Tabor Variation into the current proposed route between about MPs 221.4 and 227.2, the MVP pipeline route now avoids the Mill Creek Springs Natural Area Preserve and VOF open space easements in Montgomery County, Virginia. However, the Mount Tabor Variation would still cross portions of the VADCR's designated Slussers Chapel Conservation Site and the Old Mill Conservation Site. The Slusser Chapel Conservation Site, crossed between about MPs 220.8 and 224.4 along the currently proposed pipeline route, is of third-order significance (B3) to the VADCR, and protects caves and karst features that may contain habitat for rare terrestrial invertebrate species. The Old Mill Conservation Site, crossed by the currently proposed pipeline route between about MPs 224.6 and 226.9, is of third-order significance to the VADCR, and protects caves and karst features that may contain habitat for rare terrestrial invertebrate species. Both the Slussers Chapel Conservation Site and the Old Mill Conservation Site are discussed in Alternatives (see section 3.5), in Geology (see section 4.1), and in Land Use (see section 4.8).

Virginia Outdoor Foundation Easements

The MVP pipeline route would cross an open space easement managed by the VOF within a privately owned parcel (VA-MO-084) near MP 234.2 in Montgomery County, Virginia. The easement is an area of contiguous deciduous forest adjacent to Interstate-81 which is managed by the VOF as a forested vegetation community with scenic and recreational properties. In addition, Mountain Valley proposes to utilize an existing road for access that is within a forested area of a VOF easement (parcel ROA-VOF-2563) on privately owned land in Roanoke County, Virginia. The VOF easements are discussed under Alternatives (see section 3.5) in the Poor Mountain Variations, and under Land Use (see section 4.8).

The Nature Conservancy Easement

TNC manages conservation easements in the vicinity of Poor Mountain in Roanoke County, Virginia, that are intended to protect the headwaters of Bottom Creek. The currently proposed MVP pipeline route would cross through TNC easements on both sides of Honeysuckle Road between about MPs 239.5 and 241.0. TNC easements are also discussed in the Poor Mountain Variations under Alternatives (see section 3.5) and Land Use (see section 4.8).

Jefferson National Forest

Vegetation in the Jefferson National Forest is dominated by Appalachian Hardwood Forest, which is upland deciduous forest comprised primarily of Appalachian oak forest species such as red oak, chestnut oak, white oak, black oak, and scarlet oak. Over 60 tree species have been identified within the Jefferson National Forest. Construction of the MVP within the Jefferson National Forest would affect about 79.1 acres of forest spanning six major forest community types, including mixed mesophytic forest; dry-mesic oak forest; dry and dry-mesic oak-pine forest; dry and xeric oak forest, woodland, and savanna; conifer-northern hardwood; xeric pine and pine-oak forest and woodland.

Mixed mesophytic forests occur on lower north- and east-facing slopes and mesic coves at elevations of up to about 5,000 feet. They are considered among the most biologically diverse ecosystems in the United States, containing upwards of 25 to 30 characteristic species. Mesophytic forests are typically dominated by oaks but also contain many of the other species (USDA, 1997). Of these, the most common species present include sugar maple, beech, hemlock, yellow poplar, red maple, white oak, northern red oak, yellow buckeye, and basswood.

Dry-mesic oak forests are generally found on dry, upland sites on southern and western aspects and ridgetops. The species composition typical of this forest type varies substantially due to its wide geographic distribution. The primary species include chestnut oak, northern red oak, black oak, white oak, and scarlet oak. Other species present may include southern red oak, mockernut hickory, and red maple (USDA, 1997).

Dry and dry-mesic oak-pine forests are oak dominated forests with a substantial pine species component (USDA, 1997). Typical pine species present include white, shortleaf, Virginia pitch, and table mountain pines).

Dry and xeric oak forest, woodland, and savanna usually occur on very dry and infertile uplands, but can also occur on steep, south-facing slopes or rock outcrops. Soils are usually coarse textured, and dry soil conditions may prevail most of the year. Dominant species in this type include black oak, post oak, blackjack oak, chestnut oak, scarlet oak, and limited white oak. (USDA, 1997), although bluejack oak does not occur on the Jefferson National Forest. Bear oak, a shrubby species, is frequently found on dry to xeric sites where the forest canopy is thin to non-existent.

Conifer-northern hardwoods occurs on cooler sites found primarily on north- and east-facing slopes. Dominant species include sugar maple, American beech, yellow birch, red maple, white ash, hemlock, and red spruce (USDA, 1997). Red spruce is found at higher elevations in Virginia, but is not in the project area.

Xeric pine and pine-oak forests and woodlands typically occur on ridgetops and south-facing upper slopes in the mountains or on excessively-drained, sandy uplands in gentler terrain, such as in the Piedmont. Typical species include pitch pine, Virginia pine, shortleaf pine, and chestnut oak (USDA, 1997).

The MVP pipeline would cross a total of about 3.5 miles of the Jefferson National Forest in three segments between about MPs 196.3 and 220.7. Sections of secondary (all forest community types) and old growth forests (dry-mesic oak forest; dry and xeric oak forest, woodland, and savanna) would be cleared in order to install and maintain the MVP. Secondary forests are forests, or sections of forest, that have been previously disturbed or logged, but have fully recovered such that no apparent signs of the previous disturbance are visible.

Old growth forests are forests, or sections of forest, that have aged long enough to reach the latter stages of forest stand development for that given forest type. Forests are designated as old growth based on four criteria: (1) age, (2) disturbance, (3) basal area, and (4) tree size (USDA, 1997). The specific values of the four criteria vary by the community type of the forest assessed. For example, the minimum age and size required to be considered old growth vary by community type.

Mesophytic forest communities are typically characterized as low-disturbance systems, whereas pine-oak forest communities typically experience frequent fire-related disturbances. Table 4.4.1-3 discloses the approximate acres of the Jefferson National Forest affected by pipeline construction activities (including the pipeline right-of-way and access roads) by major forest community type. The table also discloses an estimate of the acres of old growth forest affected by these activities by major forest community type based on field surveys designed to address the four operational criteria defining old growth.

TABLE 4.4.1-3 **Acres of Major Forest Community Types Within the Jefferson National Forest Affected by the Mountain Valley Project**		
Major Forest Community Type	**Total Forest Acres**	**Old Growth Acres**
Mixed Mesophytic and Western Mesophytic Forest	1.5	0
Dry-Mesic Oak Forest	49.9	13.2
Dry and Dry-Mesic Oak-Pine Forest	6.6	1.7
Dry and Xeric Oak Forest, Woodland, and Savanna	19.6	0
Conifer-Northern Hardwood	1.2	
Xeric Pine and Pine-Oak Forest and Woodland	0.3	
Total	**79.1**	**14.9**

Within the 50-foot-wide operational pipeline easement within the Jefferson National Forest, about 28 acres of forests cleared during construction would be permanently converted to herbaceous grassland, including about 12.4 acres of old growth forest. Areas outside of the 50-foot-wide permanent right-of-way would be allowed to naturally revegetate; converting old growth and mature forest to an early successional condition. The result would be the conversion of 336 acres of interior forest to forest edge habitat in Jefferson National Forest based on the extension of forest edge an estimated 300 feet on either side of the MVP right-of-way.

Based on the assessment by the FS, existing species are unlikely to regenerate in the cleared areas since adequate advanced oak reproduction is lacking. While stump sprouting potential may be adequate in some areas that may not be graded such as wetland and waterbody buffers, the FS anticipates that the grading along the entire upland construction right-of-way would be quite heavy and would result in removal of most, if not all, stumps to an extent that seriously reduces or eliminates stump sprouting potential. These areas would likely be regenerated with light seeded species such as red maple, various pine species, and/or yellow poplar, depending upon site quality. Therefore, the FS expects a shift in forest stand composition on 79.1 acres away from the current oak dominated community in all areas outside of the 50-foot-wide permanent right-of-way.

Equitrans Expansion Project

The EEP would not impact any sensitive vegetation communities in Pennsylvania or West Virginia.

4.4.1.6 Noxious Weeds and Invasive Plants

Noxious weeds are defined as those plants that are injurious to commercial crops, livestock, or natural habitats and typically grow aggressively in the absence of natural controls (USDA, 2013b). Invasive species are those that display rapid growth and spread, becoming established over large areas (USDA, 2013a). Most commonly, they are non-native species that have been introduced from another part of the United States or another continent and may out-compete native species and take over micro-habitats, especially in disturbed areas where native vegetation may have been removed or altered. However, some weeds are native species that exhibit rapid growth and spread, and are also considered invasive. Noxious and invasive plant species can change or degrade natural vegetation communities.

Executive Order (EO) 13112 directs federal agencies to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that invasive species can cause. The EO further specifies that federal agencies should not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States, unless it has been determined that the benefits of such actions outweigh the potential harm caused by invasive species, and that all feasible and prudent measures to minimize the risk of harm would be taken in conjunction with the actions. To avoid and minimize the spread of noxious weeds and invasive plants, Mountain Valley and Equitrans have consulted with federal and state agencies regarding the revegetation of disturbed areas, and would conduct post-construction monitoring.

Mountain Valley Project

Mountain Valley identified invasive species classified as highly invasive by the VADCR and the WVDNR, during field surveys. These species are listed on table 4.4.1-4 (VADCR-DNH, 2015; WVDNR-NHP, 2009).

Equitrans Expansion Project

Equitrans identified plant species listed on the PADCNR invasive plant list and invasive plant watch list during 2016 rare plant field surveys. West Virginia portions of the EEP also included the presence of multiple invasive plant species. The most common invasive plant species observed on the EEP in Pennsylvania included Tatarian honeysuckle, Amur honeysuckle, Japanese honeysuckle, multiflora rose, garlic mustard, lesser celandine, autumn olive, oriental bittersweet, and tree-of-heaven. In West Virginia, invasive species noted during surveys included multiflora rose, Tatarian honeysuckle, Japanese honeysuckle, and Amur honeysuckle (PADCNR, 2017). These species are listed on table 4.4.1-4.

TABLE 4.4.1-4

Invasive Plant Species Identified Along the Mountain Valley Project and the Equitrans Expansion Project Routes

Scientific Name	Common Name	Location of Observation a/	
		Mountain Valley Project	Equitrans Expansion Project
Acer platanoides	Norway maple	unknown	unknown
Ailanthus altissima	tree-of-heaven	Giles, Montgomery, Roanoke, Franklin	unknown – Pennsylvania
Alliaria petiolata	garlic mustard	unknown	unknown
Berberis thunbergii	Japanese barberry	Roanoke	unknown
Bromus tectorum	cheatgrass	unknown	
Celastrus orbiculata	oriental bittersweet	Giles, Montgomery	unknown – Pennsylvania
Centaurea stoebe ssp. micranthos	spotted knapweed	Montgomery	unknown
Cirsium arvense	Canada thistle	Giles, Montgomery, Roanoke, Franklin, Pittsylvania	unknown
Cirsium vulgare	bull thistle		unknown
Conium maculatum	poison hemlock		unknown
Coronilla varia	purple crown vetch	Montgomery, Roanoke, Franklin	
Datura stramonium	jimsonweed		unknown
Elaeagnus umbellate var. parvifolia	autumn olive	Giles, Montgomery, Roanoke, Franklin	unknown – Pennsylvania
Euonymus alatus	winged burning bush		unknown
Iris pseudocorus	yellow flag	unknown	
Frangula alnus	glossy buckthorn		unknown
Hemerocallis fulva b/	orange daylily		unknown
Holcus lanatus b/	common velvetgrass		unknown
Lespedeza cuneate	Chinese bushclover	unknown	unknown
Ligustrum sinense	Chinese privet	unknown	
Ligustrum vulgare	European privet	unknown	unknown - Pennsylvania
Lonicera japonica	Japanese honeysuckle	Webster, Giles, Montgomery, Roanoke, Franklin, Pittsylvania	unknown
Lonicera maackii	Amur honeysuckle		unknown
Lonicera tatarica	Tatarian honeysuckle		unknown
Lysimachia nummularia	creeping Jenny		unknown

TABLE 4.4.1-4 (continued)

Invasive Plant Species Identified Along the Mountain Valley Project Route and the Equitrans Expansion Project Routes

		Location of Observation a/	
Scientific Name	**Common Name**	**Mountain Valley Project**	**Equitrans Expansion Project**
Microstegium vimineum	Japanese stiltgrass	Giles, Montgomery, Franklin	unknown
Miscanthus sinensis b/	Chinese silvergrass		unknown
Ornithogalum umbellatum	star of Bethlehem		unknown
Persicaria perfoliata	mile-a-minute weed	unknown	
Pastinaca sativa	wild parsnip		unknown
Phalaris arundinacea	reed canarygrass	Giles	unknown - Pennsylvania
Phragmites australis	common reed	unknown	
Polygonum cuspidatum	Japanese knotweed	Roanoke, Franklin	unknown
Polygonum perfoliatum	Asiatic tearthumb	unknown	
Pueraria montana var. lobate	kudzu	Roanoke, Franklin	
Pyrus calleryana	callery pear		unknown
Ranunculus ficaria	fig buttercup		unknown
Rosa multiflora	multiflora rose	Webster, Greenbrier, Summers, Monroe, Giles, Montgomery, Roanoke, Franklin	unknown
Securigera varia	crown vetch		unknown
Schedonorus phoenix	tall fescue	unknown	
Schedonorus pratensis	meadow fescue	unknown	
Sorghum halepense	Johnson grass	Montgomery	
Typha angustifolia	narrowleaf cattail		unknown
Vinca minor b/	common periwinkle		unknown

a/ General locations provided for areas where invasive species were identified during field surveys.

b/ Pennsylvania Department of Conservation and Natural Resources Watch List species, which identifies species that have the potential to be aggressive in certain areas or in surrounding states. These species could pose a threat to natural ecosystems if they become invasive; however, they may have value in certain situations where they are not considered invasive, but are not preferred in natural settings (PADCNR, no date).

Unknown – indicates that species was noted, but no specific location was provided.

4.4.2 Environmental Consequences

4.4.2.1 General Impacts on Vegetation Communities

Constructing the MVP and the EEP would impact 4,827 acres of vegetated lands. Table 4.4.2-1 summarizes the approximate acreage of vegetation communities that would be affected by constructing and operating the MVP and the EEP. For this section, we have combined upland deciduous forest, coniferous forest, and mixed forest into a single forest category, and we include forested wetlands in the wetland category. The clearing of vegetation would affect forest interiors, increase edge effects, and increase the potential for the introduction and spread of noxious and invasive plant species. Removal of vegetation could increase the potential for the spread of invasive species in areas of ground disturbance and routine vegetation mowing during operation.

The degree of impact would depend upon the type and amount of vegetation, the rate of vegetation regeneration, and the frequency of vegetation maintenance conducted on the rights-of-way during operation. Other local conditions such as rainfall amount, elevation, animal grazing, and soil characteristics would also influence the rate of vegetation regeneration.

Temporary workspaces that were originally scrub-shrub lands or herbaceous grasslands would be revegetated and restored to their pre-construction condition, use, and function. Construction in scrub-shrub lands and grasslands would result in only temporary and short-term impacts. Removal of vegetation could increase the potential for the spread of invasive species in areas of ground disturbance and routine vegetation mowing during operation. Trees would be cut across the entire construction right-of-way. The permanent 50-foot-wide operational pipeline easement would be kept clear of trees in uplands. In forested areas, the operational right-of-way would result in the permanent conversion of forest to scrub-shrub lands and grasslands. This conversion would be affect interior forests where the removal of trees would fragment forests and create new edges. Following construction, temporary workspaces would be allowed to regenerate. However, in forest the regeneration of trees would take many years, resulting in a long-term effect on forested vegetation.

TABLE 4.4.2-1

Vegetation Communities Affected by Construction and Operation of the Mountain Valley Project and the Equitrans Expansion Project

Project/ State/ Component	Upland Forest		Upland Scrub-Shrub		Upland Herbaceous		Wetland (forested, scrub- shrub, emergent) a/		Total	
	Const (acres)	Oper (acres)	Const (acres)	Oper (acres)	Const (acres)	Oper (acres)	Const (acres)	Oper (acres)	Const (acres)	Oper (acres)
Mountain Valley Project										
West Virginia										
Pipeline right-of-way	2,461.3	1,004.4	29.2	10.9	41.3	17.8	10.1	6.4	2,541.9	1,039.5
ATWS	239.4	0.0	5.1	0.0	8.4	0.0	10.1	0.0	263.0	0.0
Aboveground Facilities	94.3	21.6	0.0	0.0	0.0	0.0	0.2	0.0	94.5	21.6
Access Roads	411.5	108.7	15.8	3.6	7.4	2.7	6.0	0.7	440.7	115.7
Yards	24.4	0.0	0.0	0.0	2.9	0.0	4.4	0.0	31.7	0.0
Cathodic Protection	3.0	1.6	0.0	0.0	0.1	0.1	0.8	0.4	3.9	2.1
West Virginia Subtotal	*3,233.9*	*1,136.3*	*50.1*	*14.5*	*60.1*	*20.6*	*31.6*	*7.5*	*3,375.7*	*1,178.9*
Virginia										
Pipeline right-of-way	1,010.3	416.7	16.5	6.1	71.8	30.4	7.0	4.7	1,105.6	457.9
ATWS	52.5	0.0	1.0	0.0	5.0	0.0	2.2	0.0	60.7	0.0
Aboveground Facilities	0.7	0.0	0.3	0.3	2.1	2.1	0.0	0.0	3.1	2.4
Access Roads	153.2	43.8	0.8	0.5	9.1	1.6	0.4	0.1	163.5	46.0
Yards	2.3	0.0	3.0	0.0	36.9	0.0	0.0	0.0	42.2	0.0
Cathodic Protection	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1
Virginia Subtotal	*1,219.2*	*460.6*	*21.6*	*6.9*	*124.9*	*34.1*	*9.6*	*4.8*	*1,375.3*	*506.4*
Mountain Valley Project Subtotal	**4,453.1**	**1,596.9**	**71.4**	**21.4**	**173.8**	**54.7**	**41.2**	**12.3**	**4,751.0**	**1,685.3**
Equitrans Expansion Project										
West Virginia										
Pipeline right-of-way	0.3	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.2
ATWS	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Aboveground Facilities	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Access Roads	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Yards	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Cathodic Protection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 4.4.2-1

Vegetation Communities Affected by Construction and Operation of the Mountain Valley Project and the Equitrans Expansion Project

	Upland Forest		Upland Scrub-Shrub		Upland Herbaceous		Wetland (forested, scrub- shrub, emergent) a/		Total	
Project/ State/ Component	**Const (acres)**	**Oper (acres)**	**Const (acres)**	**Oper (acres)**	**Const (acres)**	**Oper (acres)**	**Const (acres)**	**Oper (acres)**	**Const (acres)**	**Oper (acres)**
West Virginia Subtotal	*1.8*	*0.5*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*1.9*	*0.5*
Pennsylvania										
Pipeline right-of-way	40.2	21.3	0.0	0.0	0.5	0.3	0.8	0.6	41.6	22.2
ATWS	20.3	0.0	0.0	0.0	0.1	0.0	0.1	0.0	20.4	0.0
Aboveground Facilities	4.9	3.2	0.0	0.0	0.2	0.2	0.1	0.1	5.2	3.5
Access Roads	5.1	3.6	0.0	0.0	0.1	0.0	0.0	0.0	5.2	0.8
Yards	1.5	0.0	0.0	0.0	0.1	0.0	0.0	0.0	1.5	0.0
Cathodic Protection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Pennsylvania Subtotal	*72.0*	*28.1*	*0.0*	*0.0*	*1.0*	*0.5*	*1.0*	*0.7*	*74.0*	*29.3*
Equitrans Expansion Project Subtotal	**73.8**	**28.5**	**0.0**	**0.0**	**1.0**	**1.0**	**1.1**	**0.7**	**75.9**	**29.8**
West Virginia Impacts	3,235.7	1,136.8	50.1	14.5	60.1	20.6	31.7	7.5	3,377.6	1179.4
Virginia Impacts	1,219.2	460.6	21.6	6.9	124.9	34.10	9.6	4.8	1,375.3	506.4
Pennsylvania Impacts	72.0	28.1	0.0	0.0	1.0	0.5	1.0	0.7	74.0	29.3
Project Total	**4,526.9**	**1,6225.5**	**71.7**	**21.4**	**186.0**	**55.2**	**42.3**	**13.0**	**4,826.9**	**1,715.1**

a/ Wetland numbers in this table derived from a database. Wetland impact estimates based on field delineations can be found in section 4.3.3

Mountain Valley Project

Constructing the MVP pipeline would affect about 4,331 acres of forest. Constructing the Mountain Valley aboveground facilities would affect about 95 acres of forest. Yards would affect about 27 acres of forest. Operating the pipeline would affect about 1,597 acres of forest. Operating the aboveground facilities would result in the permanent loss of about 22 acres of forest.

Equitrans Expansion Project

Construction of the EEP would affect about 74 acres of forest and 1 acre of grasslands. During surveys, two populations of golden-seal (*Hydrastis canadensis*) were identified in the proposed right-of-way on the EEP route in Pennsylvania. The PADCNR lists golden-seal as Vulnerable and strongly recommended either avoiding or transplanting the two populations of golden-seal; however, PADCNR's recommendations are voluntary. Equitrans does not intend to relocate or avoid these populations during construction.

4.4.2.2 Restoration of Vegetation

Impacts on vegetation can be minimized by utilizing special construction techniques, proper restoration measures, and post-construction monitoring. Topsoil would be segregated over the trench line and spoil storage areas in agricultural areas, residential areas, within the Jefferson National Forest, and in non-saturated wetlands. This would allow for the existing seed bank in the topsoil to be retained and promote increased vegetation success. In order to re-establish vegetation in upland areas disturbed during construction, Mountain Valley and Equitrans would amend soils with fertilizer as needed, de-compact soils as needed, apply grass seed mixes, and mulch. Mountain Valley would also apply shrub seeds to temporary workspaces in order to re-establish shrub species.

Revegetation of cleared areas would be considered successful when the cover and density of vegetation within the construction right-of-way is similar to the adjacent undisturbed land. Disturbed areas would be monitored for at least the first and second growing seasons after construction as specified in the FERC Plan (for the MVP) and Equitrans' Plan (for the EEP). The FERC staff and various land managing agencies, as appropriate, would also monitor restoration and revegetation success and would determine when restoration is successful.

Mountain Valley Project

Mountain Valley would conduct restoration activities in accordance with landowner agreements, permit requirements, and written recommendations on seeding mixes, rates, and dates obtained from the Wildlife Habitat Council and measures outlined in Mountain Valley's *Exotic and Invasive Species Control Plan* and *Migratory Bird Conservation Plan*. Disturbed areas would be seeded within 6 working days after final grading is complete, weather and soil conditions permitting. Mountain Valley would initially plant temporary cover species to control erosion until the permanent vegetation is established and to prevent unwanted vegetation from encroaching. As permanent cover, Mountain Valley would partner with the Wildlife Habitat Council to promote growth of ground cover species in upland areas that flower for long durations throughout the growing season in an attempt to create new habitat for native and domestic pollinators such as bees and butterflies. In forested areas, Mountain Valley would supplement the herbaceous seed mix with a woody seed mix comprised of native overstory, understory, and shrub oak-hickory forest species. In forested, emergent, and scrub-shrub wetland areas, Mountain Valley would plant an herbaceous seed mix comprised of facultative wetland species. Within the temporary right-of-way of forested wetland areas and perennial waterbody crossings, Mountain Valley would supplement the herbaceous seed mixture with a woody seed mixture comprised of forest species representative of the preexisting vegetative community, as commercially available. Mountain Valley would also plant native shrubs and saplings within the construction right-of-way except for the maintained portion of the permanent right-of-way (i.e., no closer than 15 feet of either side of the pipeline) within forested wetlands and at the crossings of waterbodies known to contain special status species or suitable habitat for such species. Appendix N provides proposed seed mixes from Mountain Valley's project-specific *Erosion and Sediment Control Plans*. Appendix D of Mountain Valley's *Migratory Bird Conservation Plan* provides specific details regarding the seed mix and shrub and tree plantings.

Equitrans Expansion Project

Equitrans would conduct restoration activities in accordance with landowner agreements, permit requirements, Equitrans' Plan, and approved seeding mixes, rates, and dates obtained from the Pennsylvania Erosion and Sediment Control Manuals and invasive species control measures outlined in Equitrans' invasive species control strategies discussed in section 4.4.2.5. Where practicable Equitrans would use Pennsylvania Bureau of Forestry guidelines to attract pollinators (see section 4.5). Seed mixes are provided in appendix N.

4.4.2.3 Interior Forest Fragmentation and Edge Effects

Constructing the MVP and the EEP would create a new, cleared corridor in areas of interior forest where the rights-of-way would not be collocated with existing linear corridors. Clearing or fragmentation of interior forests creates more edge habitat and smaller forested tracts which can impact characteristics of vegetation communities including their suitability for wildlife.

The removal of interior forest in order to create the necessary rights-of-way would result in the conversion of forest area to a different vegetation type. This would contribute to forest fragmentation and the creation of forest edges. The pipeline right-of-way through forest would result in the removal of habitat for interior species. The creation of a new corridor and forest edges could impact micro-climate factors such as wind, humidity, and solar exposure which could lead to a change in species composition. Forest edges also play a role in ecosystem functions, including the dispersal of plants and wildlife, the spreading of fire, movement of wildlife, and vegetation composition and structure. The new pipelines rights-of-way could also introduce non-native invasive species.

As previously noted, edge effects are estimated to extend from the edge of the open spaces up to 300 feet into the forested areas, on both sides of the right-of-way. Within this distance, forest impacts could include a change in available habitat for some species due to an increase in light and temperature levels on the forest floor and the subsequent reduction in soil moisture; such changes may result in habitat that would no longer be suitable for species that require these specific habitat conditions, such as salamanders and many types of plants. An alteration of habitat could affect the fitness of some species and increase competition both within and between species, possibly resulting in an overall change to the structure of the forest community.

The landscape along the route of the MVP and the EEP has already been fragmented in some places by existing roads, utility rights-of-way, residential and commercial development, pastures, and agriculture. In areas where the MVP and the EEP are collocated with existing corridors and development, new fragmentation would not occur; however, the amount of fragmentation would be extended as the width of the linear corridors are increased with the addition of the new rights-of-way. Additional discussion of interior forests in relation to habitat for migratory birds is included in section 4.5.

Mountain Valley Project

The MVP would pass through 24 core forest areas in West Virginia (see figures 4.4.1-1 and 4.4.1-2), which would result in temporary impacts from construction on about 2,428 acres of large core forest areas (greater than 500 acres) and permanent impacts from operations on about 872 acres of large core forest areas. Temporary impacts on medium (250 to 500 acres) and small core forest areas (less than 250 acres) combined would be about 59 acres and permanent impacts from operations on medium and small core forest areas combined would be about 20 acres (see table 4.4.2-2). In addition to these direct impacts, clearing of interior forest would also result in indirect effects to forest left standing along the edges of the new corridor. The result of these indirect effects would be the conversion of 17,194 acres of interior forest habitat to forest edge habitat in West Virginia based on the extension of forest edge an estimated 300 feet on either side of the MVP right-of-way. In Virginia, the MVP would pass through 17 ECA categorized as Outstanding, Very High, or High (see figure 4.4.1-3). Construction of the MVP in Virginia would result in temporary impacts on about 547 acres of ECA categorized as Outstanding to High and permanent impacts on about 209 acres of ECA categorized as Outstanding to High. Temporary impacts on ECA categorized as Moderate to General combined would be about 406 acres and permanent impacts on ECA categorized as Moderate to General combined would be about 142 acres (see table 4.4.2-3). In addition to these direct impacts, indirect impacts would involve the conversion of 4,579 acres of interior forest habitat to forest edge habitat in Virginia based on the extension of forest edge an estimated 300 feet on either side of the MVP right-of-way.

TABLE 4.4.2-2

Core Forest Areas Affected by the Mountain Valley Project and Equitrans Expansion Project in West Virginia

	Core Forest Area Ranking (acres)						
	Edge	**Patch**	**Perforated**	**Small Core (<250 ac)**	**Medium Core (250 – 500 ac)**	**Large Core (>500 ac)**	**Total (acres)**
Const. a/	261.6	12.0	822.1	57.7	1.0	2,427.6	3,582.1
Oper. b/	78.8	4.6	263.6	19.2	0.4	872.2	1,238.7

a/ Based on a 125-foot-wide construction right-of-way.
b/ Based on a 50-foot-wide permanent operational right-of-way.

TABLE 4.4.2-3

Ecological Core Areas Affected by the Mountain Valley Project in Virginia

	Ecological Integrity Category (acres)					
	General	**Moderate**	**High**	**Very High**	**Outstanding**	**Total (acres)**
Const. a/	350.5	55.8	197.6	200.8	149.3	954.0
Oper. b/	118.4	23.1	71.0	71.7	65.9	350.0

a/ Based on a 125-foot-wide construction right-of-way.
b/ Based on a 50-foot-wide permanent operational right-of-way.

To minimize forest fragmentation and edge effects, Mountain Valley has collocated about 30 percent of the pipeline route with existing linear corridors. In coordination with the Wildlife Habitat Council, Mountain Valley would plant seeds for native plant species during restoration and revegetation. Mountain Valley would minimize impacts with the implementation of the FERC Plan and Mountain Valley's project-specific *Erosion and Sediment Control Plans* (see section 2.0).

The MVP would cross five EPA Level III ecoregions: the Western Allegheny Plateau, the Central Appalachians, the Ridge and Valley, the Blue Ridge Mountains, and the Piedmont (EPA, 2015). Combined these ecoregions make up a total area of more than 164 million acres of which more than 100 million acres is forested. The MVP would directly impact about 4,453 acres of forest during construction which would represent about 0.005 percent of the forested area within these five ecoregions. While the impacts at an ecoregion level would be small, the permanent removal of forest areas for the operation of the MVP, as well as the time that would be needed for the forest to recover within the temporary right-of-way, would be long-term. Further, the indirect effects of converting 21,773 acres of interior forest to edge forest would also be permanent. Therefore, despite impacting a small percentage of the surrounding ecoregions, collocating a portion of the pipeline with existing utilities, and implementing right-of-way restoration measures, we have determined that the MVP would result in significant impacts on large acreages of upland forest. Further discussion regarding interior forest impacts is located in section 4.5.2.

Equitrans Expansion Project

The EEP would permanently convert about 21 acres of mostly fragmented upland forest to a maintained herbaceous right-of-way. Construction and operation of the EEP H-318 pipeline in Pennsylvania would affect one tract of interior forest of about 50 acres. Typically, interior forest tracts of about 50 acres or less would be expected to contain few to no species dependent on interior forest; rather, most species in a 50-acre forest tract would likely be generally tolerant of edge habitat (Environment Canada, 2013). About 32 percent of the EEP would be collocated with existing linear corridors. Equitrans would also allow workspaces necessary for construction to naturally revegetate and return to pre-construction vegetation communities. Equitrans would minimize impacts with the implementation of its Plan.

4.4.2.4 Fire Regimes

Constructing the MVP and the EEP could increase the risk of wildfires by altering the existing vegetation fuel-bed with increased amounts of dead-fuel vegetation in slash and windrows plus finer fuels in the grass-dominated rights-of-way. Specific activities that could increase the risk for wildfires include burning of brush and slash piles, refueling with flammable liquids, parking vehicles with hot mufflers or tailpipes on tall dry grass, or welding. The risk of wildfire would be dependent on local conditions and topography plus construction activities. Major climatic factors that influence the risk for wildfire are temperature and humidity. Areas that are hot and dry are at the greatest risk for fire and areas that are wet and cool are at the lowest risk for fire. Quarterly rainfall in the region is about 10 inches and about 42 inches on average per year (NOAA, 2011).

We received comments regarding the potential for forest fires to occur during construction and operation of the pipeline and about the difficulty for emergency responders to access remote areas crossed by the pipeline. In the most remote portion of the project, the maximum distance between a fire department and the pipeline is about 8 miles. Mountain Valley's emergency response plans developed in coordination with local emergency response officials would ensure an adequate response to a pipeline emergency. In addition, Mountain Valley has prepared a *Fire Prevention and Suppression Plan* that identifies BMPs for preventing wildfires and responding to fires that occur during construction. The plan provides an implementation strategy to suppress inadvertent fires and establishes protocols and lines of communication for reporting fires. Measures that would be taken to limit wildfire risk include training personnel, issuing fire danger ratings which would guide blasting and welding operations, and designating smoking areas.

Equitrans would not conduct open burning during the construction of the EEP and therefore has not prepared a fire suppression plan.

4.4.2.5 Non-Timber Harvested Species

Based on comments received, we reviewed the potential impacts on native fungi species and other non-timber forest products. The loss of forested vegetation would impact non-timber forest products such as mushrooms (fungus) and other plant communities utilized for medicinal or commercial products. The removal of forest canopy would have an effect on the amount of shade; air and soil temperatures; as well as, air and soil moisture content which could affect both fungal and plant communities. Plants and fungi that prefer forested and full shade habitats will not return to the maintained permanent right-of-way and could be affected, but given the availability of non-affected areas in the vicinity, we conclude that these impacts would not be significant. Other non-timber harvested species which prefer edge and open herbaceous habitats would benefit from the creation of these habitats from the construction of the project.

4.4.2.6 Special Areas

Where Mountain Valley crosses special areas, it would minimize impacts through implementation of the FERC Plan, Mountain Valley's Procedures, Mountain Valley's *Migratory Bird Conservation Plan,* and Mountain Valley's project-specific *Erosion and Sediment Control Plan*. Measures contained in these plans include the installation of BMPs to limit erosion and sedimentation during construction, the restoration of the right-of-way to pre-construction contours, restoration of the revegetation of temporary and permanent workspace with native seed mixes as directed by the Wildlife Habitat Council, monitoring of the right-of-way for revegetation, invasive species, and wetland recovery for at least 2 years following construction.

Field surveys conducted by Mountain Valley at the location of the Burnsville Lake WMA crossing did not observe any instances or suitable habitat for federal or state protected plants or wildlife.

Surveys conducted by Mountain Valley at the location of the New River Conservancy easement crossing during the flowering period in the summer 2016 did not result in observation of any instances or suitable habitat for the purple fringeless orchid.

Through the incorporation of the Mount Tabor Variation, the MVP proposed pipeline route would now avoid important vegetation communities at the Mill Creek Springs Natural Area Preserve (Blake Reserve) and several VOF open space easements mentioned in our September 2016 draft EIS. However, the MVP pipeline route would still cross the VADCR-designated Craig Creek Conservation Unit, Slussers Chapel Conservation Site, and the Old Mill Conservation Site.

Field surveys conducted by Mountain Valley at the location of the VOF easement crossing did not observe any instances or suitable habitat for federal or state protected plants or wildlife.

The MVP route would cross about 1.3 miles of conservation easement held by TNC in the vicinity of Poor Mountain in Roanoke County, Virginia. The easement is primarily forested land and is intended to help protect the headwaters of nearby Bottom Creek, which is designated as a Tier III stream in Virginia. We considered alternatives that would avoid the TNC Poor Mountain easement in section 3.5 of this final EIS. After looking at alternative routes on both the west and east side of Poor Mountain, we concluded that those alternatives would not provide a significant environmental advantage compared to the proposed route. Nonetheless, TNC believes that a pipeline through this property would violate the terms of its easement. In section 4.8.2.4, we recommend that Mountain Valley file documentation with the Secretary that its TNC Property Crossing Plan is provided to TNC for review and comment.

Jefferson National Forest

Mountain Valley would continue to coordinate with the FS, and follow the measures outlined in its Forest-specific POD, to minimize impacts on vegetation within the Jefferson National Forest.

The FS requested that Mountain Valley conduct an extensive vegetation survey to document stand age and height and species by 2-inch diameter class for all areas potentially affected by the pipeline right-of-way and construction access roads. The FS also recommended that site index should be measured and used for estimates of volume and value of potential commercial timber products. Mountain Valley conducted tree surveys in March 2016 within the MVP area in the Jefferson National Forest to determine dominant tree species, estimated trees per acre, height, and basal area of measured trees. The density of trees ranged from 0.5 to 114.6 trees per acre, and the age of trees ranged from 35 to 250 years.

Within the Jefferson National Forest, an estimated 336 acres of interior forest would be converted to forest edge habitat, based on the extension of forest edge an estimated 300 feet on either side of the MVP right-of-way. The FS requested that consideration be given to restoring and rehabilitating the permanent right-of-way to reduce the effects of forest fragmentation on FS lands and also reduce effects on visual resources. The FS requested that the permanent right-of-way be maintained consistent with Mountain Valley's Procedures for the entire length of the right-of-way on the Jefferson National Forest. According to the FS's request, the right-of-way would be maintained in an herbaceous state for a 10-foot-wide corridor centered over the pipeline and the remainder of the corridor would be seeded with seed mixes[52] and then replanted with shrubs and shallow rooted trees as approved by the FS[53] and consistent with Mountain Valley's Procedures. Trees that would be located within 15 feet of the pipeline with roots that could threaten pipeline integrity would be cut and processed in accordance with the POD. Although Mountain Valley has not committed to these maintenance features for the permanent right-of-way, the FS has indicated that it will require such features as part of its separate FS permitting process. Mountain Valley would consult with the FS to finalize plans for restoration and rehabilitation of the right-of-way included in the POD.

Construction activities can cause indirect impacts on vegetation, especially trees, beyond the project right-of-way by damaging root systems that extend into the pipeline trench. Depending on the species, age, and soil characteristics, trees can spread their root systems up to 2.9 times beyond the dripline (Gilman, 1988). A single trench can remove up to 50 percent of a tree's root system (Watson, 1998), resulting in tree decline, premature falling, or death. The pipeline trench would be offset within the 125-foot-wide construction right-of-way, so that where topsoil segregation would be used, as in the Jefferson National Forest, the edge of the pipeline trench would be approximately 52 feet from the closest standing trees along one edge of the construction right-of-way, and approximately 73 feet from the closest standing trees along the other edge.

Oaks tend to regenerate well on edges with adequate light and minimal litter cover. Because construction activities such as clearing, trenching, and backfilling associated with the

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[52] See accession no. 20161215-5124

[53] See accession no. 20170320-5222

pipeline are temporary and linear across the landscape, localized impacts on individual trees are possible. In a majority of the affected acreage, oak decline events are expected to occur due to the significant age of the oaks. .At the request of the FS, Mountain Valley would not utilize burning within the Jefferson National Forest during the clearing phase of construction. In accordance with the Jefferson National Forest Timber Removal Plan, Mountain Valley would purchase, cut, and remove all merchantable timber on Jefferson National Forest lands that is reasonably accessible. At the request of the FS, timber not utilized in this fashion would be windrowed in heights generally 6 to 8 feet along the edge of the right-of-way with wildlife breaks every 100 feet. Brush and slash would be windrowed or removed. All stumps would be disposed of in coordination with the FS. Mountain Valley would develop seed mixes for NFS lands in coordination with the FS.

Mountain Valley would minimize impacts on riparian zones by narrowing the width of its standard construction right-of-way at waterbody crossings to 75 feet (unless a variance is requested and approved by the FERC). Once construction is complete, streambeds and banks would be stabilized and restored to pre-construction conditions to the fullest extent possible in compliance with conditions in the COE Nationwide Permit 12, COE District regional conditions, CWA Section 401 water quality certifications, and Mountain Valley's Procedures. Streambed structure such as rock and gravel would be returned to the stream and the stream banks would be revegetated with native tree and shrub species recommended by the FS; only the permanent right-of-way centered on the pipeline would be maintained with herbaceous vegetation. Restricting the herbaceous vegetation area to a small portion of the total right-of-way clearing would allow much of the ecological function of the riparian conditions (e.g., bank stabilization, filtration, shade, future large wood, and organic input) to more quickly return.

Mountain Valley does not propose the wide-scale use of pesticides and/or herbicides; however, the FS has requested that pesticides or herbicides be incorporated into the management plan for maintenance of the right-of-way and treatment of invasive species on the Jefferson National Forest.[54] In its response to the FS's request, Mountain Valley agreed to use herbicides for the control of non-native invasive plants along the right-of-way on the Jefferson National Forest.[55] Herbicides would be applied in compliance with Mountain Valley's Herbicide Use Plan and the FS Standards and Guidelines; and would comply with all label instructions as well as applicable state and federal regulations.

Specific herbicides that could be used in the project area are listed below. Detailed descriptions of these chemicals, including comprehensive risk assessments for each (except fosamine ammonium) (see USDA FS, 1989)[56], are available from the FS. The environmental impacts of using these herbicides as described in these risk assessments are hereby incorporated by reference.

- **Clopyralid** is a selective herbicide that controls broadleaf herbs, primarily composites, legumes, and smartweeds. This chemical acts as a growth regulator and is typically applied as a direct foliar application. Typical application rate for FS programs is 0.35 lb a.e. (acid equivalent)/acre with a range of 0.1 to 0.5 lb a.e./acre.

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54 See accession no. 20161116-5006.

55 See accession no. 20161216-5171.

56 http://www.fs.fed.us/foresthealth/pesticide/risk.shtml

- **Dicamba** is a somewhat selective herbicide that controls most annual and perennial broadleaf herbs and some woody species, but has little to no effect on grasses. This chemical acts as a growth regulator and is typically applied as a direct foliar or cut-surface application. Typical application rate for FS programs is 0.3 lb a.e./acre with a range of 0.25 to 2.0 lb a.e./acre.
- **Fosamine ammonium** is a brush control agent that is diluted with water and applied as a foliar spray. It controls many woody species by inhibiting bud growth and treated plants will not leaf out or grow the season after treatment. Typical application rate for FS programs is 7.8 lb a.e./acre with a range of 6.0 to 12.0 lb a.e./acre.
- **Glyphosate** is a non-selective, broad spectrum herbicide that can be used to control many grasses, forbs, vines, shrubs, and tree species. Specific formulations of Glyphosate have been labeled for aquatic application. Formulations labeled for aquatic sites can be effective on both emergent aquatics and shoreline vegetation. This chemical is a growth inhibitor that can be applied through direct foliar application, stem injection, and cut-surface application. Typical application rate for FS programs is 2.0 lb a.e./acre with a range of 0.5 to 7.0 lb a.e./acre.
- **Hexazinone** is a photosynthetic inhibitor selective to most hardwood tree species, shrubs and some grasses. Most southern yellow pines are resistant. Typical application rate for FS programs is 2 lb a.e./acre with a range of 0.5 to 4.0 lb a.e./acre.
- **Imazapic** is a selective herbicide that is used primarily in and around populations of native, warm season grasses. Warm season grasses, many wildflower species, and legumes are resistant, while many cool season grasses (including non-native species of fescue) and broadleaf weeds are susceptible. Typical application rate for FS programs is 0.1 lb a.e./acre with a range of 0.03125 to 0.1875 lb a.e./acre.
- **Imazapyr** is a selective herbicide that is used primarily in the control of hardwood trees and some species of grasses. This chemical is a plant protein production inhibitor that can be absorbed either through roots or foliage, or injected directly into the stem, and works systemically throughout the target plant. Typical application rate for FS programs is 0.45 lb a.e./acre with a range of .03 to 1.25 lb a.e./acre.
- **Metsulfuron methyl** is a systemic herbicide that inhibits cell division and is selective to woody species, broadleaf weed species, and many annual grasses. Typical application rate for FS programs is 0.03 lb a.e./acre with a range of 0.0125 to 0.15 lb a.e./acre.
- **Triclopyr** is a selective herbicide that controls many species of herbaceous and woody broadleaf weeds, but has little to no effect on grasses. This chemical acts as a growth regulator and can be applied as a direct foliar application, basal spray, stem injection, or cut-surface treatments. Specific formulations of Triclopyr have been labeled for aquatic application. Formulations labeled for aquatic sites can be effective on both emergent aquatics and shoreline vegetation. Typical application rate for FS programs is 1.0 lb a.e./acre with a range of 0.05 to 10.0 lb a.e./acre.

Effects to soil and water resources may include some limited drift from fine mists during application. Once in the soils, some herbicides can migrate via gravity, leaching, and surface runoff to other soils, groundwater, or surface water. To determine the level of risk for accumulation of herbicide residues on soils and possible contamination of ground and surface water, factors such as persistence (measured in half-life), mobility, and mechanisms for degradation have been reviewed. However, many of the herbicide treatments would be applied directly to targeted species and relatively little herbicide would make contact with the soil. Due to the limited acreage and dispersed extent of the areas, and the short half-lives of the chemicals proposed for use, the effects would be temporary and minor.

For vegetation, the reduction in non-native invasive plants would benefit associated native plants helping to restore native plant communities to their natural associated species assemblage. Herbicide treatments may result in effects to non-target vegetation. However, these effects would be minimal since most treatments would be applied with either hand-held or backpack spray equipment. Any adverse effects to non-targeted plants would be localized and temporary.

For mammals, birds, terrestrial insects, and reptiles, all relevant hazard quotients meet the standard of 1.0 or less indicating a generally acceptable risk to terrestrial mammals. In the case of fosamine ammonium, the realistic estimated dose is well below the 1/5 of LD 50 risk level used by the EPA indicating a generally acceptable risk to terrestrial mammals. With regards to aquatic species, no herbicide would be directly applied to open water. Because all herbicide treatments would follow label directions, appropriate mitigations, and FS standards and guidelines, serious negative effects to this species group would not be expected.

Herbicide treatment methods would pose relatively little safety risk to workers or the public. All relevant hazard quotients meet the standard of 1.0 or less indicating a generally acceptable risk to both workers and the general public. In the case of fosamine ammonium, the realistic estimated dose is well below the 1/5 of LD 50 risk level used by the EPA indicating a generally acceptable risk to both workers and the general public.

Additional surveys for locally rare plant species within the Jefferson National Forest were conducted between May 2015 and November 2016 in order to conduct the surveys during their optimal survey windows as established by the FWS for FS lands crossed by the MVP. One FS Sensitive Species, rock skullcap (*Scutellaria saxatilis*) was identified within the MVP area. Another FS Sensitive Species, American barberry (*Berberis canadensis*) was identified on tracts no longer within the MVP route.

In order to minimize and mitigate the impacts on the rock skullcap population within the MVP area, Mountain Valley would reduce the construction corridor to 75 feet in this area. Mountain Valley would also collect seeds from the existing rock skullcap plants prior to construction and plant the seeds during the appropriate timeframe following construction in locations determined by the FS. The FS may require additional mitigation for the rock skullcap as part of its permitting process.

4.4.2.7 Non-Native Invasive Plants and Weeds

We received comments concerning the potential spread and introduction of invasive species due to vegetation clearing during construction of the projects; as well as seeding of the right-of-way during restoration. Mountain Valley and Equitrans would restore and reseed construction areas as quickly as possible which would promote establishment of native species within disturbed areas, which would tend to limit colonization by invasive plants. Invasive species could also spread during operation due to transmission of seeds or viable plant fragments from infested areas via mowing equipment. Mountain Valley and Equitrans have also committed to monitoring for invasive species for at least two growing seasons following construction.

Mountain Valley has developed an *Exotic and Invasive Species Control Plan*. Mountain Valley clarified in its filing on May 11, 2017 that no other revisions were necessary and that the *Exotic and Invasive Species Control Plan* has been finalized. Measures that would be implemented to reduce the introduction and spread of non-native invasive plants and weeds include:

- using certified weed-free mulch, straw, and hay bales;
- cleaning all equipment with high-pressure washing;
- establishing equipment cleaning stations;
- stripping and storing topsoil (including stabilization of topsoil piles) from the full width of the construction right-of-way in areas of high concentrations of invasive or noxious species;
- promptly reseeding disturbed areas with native seed mixes following final grading and restoration of the right-of-way;
- monitoring the right-of-way for at least two growing seasons; and
- using selective treatments of invasive or noxious species such as removal by manual or mechanical treatments. Mountain Valley does not propose the wide-scale use of pesticides and/or herbicides, but would consider their use on a local scale based on requests from landowners or land management agencies.

Equitrans would implement invasive species control strategies during and following construction to control invasive plant species. These measures include:

- avoiding use of organic materials with exotic and invasive species on the EEP;
- using certified weed-free mulch, straw, and hay bales when available;
- conduct routine inspections of equipment for mud and debris upon initial arrival on the EEP worksite;
- using construction techniques that would stage construction of the pipeline route in order to minimize the time bare soil is exposed and, therefore, minimize the opportunity for exotic species to become established;
- promptly reseeding disturbed areas with native seed mixes following final grading and restoration of the right-of-way, based on weather and soil conditions, in order to further limit the exposure time of bare soil and quickly establish ground cover of a stable vegetation that would resist invasion by invasive plant species;
- monitoring and selectively spot treating/eradicating exotic and invasive plant species by herbicide application or hand-cutting; and
- monitoring the right-of-way for at least the first and second growing seasons following construction to identify locations of concern for invasive and noxious species. In locations where exotic or invasive species are found in concentrations that are substantially greater than those existing nearby in off-right-of-way locations, Equitrans would selectively spot eradicate through herbicide application or hand-cutting of those species.

We noted that Mountain Valley's and Equitrans' proposed seed mixtures as listed in appendix N contained crown vetch which is listed as highly invasive by WVDNR, VADCR, and PADCNR; as well as tall fescue which is listed as highly invasive by WVDNR and is on the PADCNR invasive species watch list. In other filings, Mountain Valley and Equitrans stated that it would use seed mixes containing only native species. To resolve this discrepancy, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley and Equitrans should file with the Secretary, for review and written approval by the Director of OEP, revised erosion control plans that contain only native species.**

4.4.3 Conclusions Regarding Impacts on Vegetation and Mitigation

Based on our review of the potential impacts on vegetation as described above, we find that the most adverse impacts from construction and operation would be on forested vegetation crossed by the MVP, and that this would be a significant impact. This conclusion is based on the nature of both direct and indirect impacts, the acreages affected, and the long-term or permanent duration of the impacts. On May 11, 2016, Mountain Valley filed its updated *Migratory Bird Conservation Plan*, which addresses upland forest impacts due to the habitat requirements of many migratory birds, to address concerns of the EPA, VADEQ, WVDNR, FWS, and other consulting agencies regarding the impacts on large acreages of upland forest. The plan includes additional avoidance, minimization, and restoration measures for the impacts on the upland forest habitat. Further discussion of the *Migratory Bird Conservation Plan* is located in section 4.5.

The impact of the MVP on all vegetation types would be reduced by implementing the measures contained in the FERC Plan, Mountain Valley's project-specific *Erosion and Sediment Control Plans*, and revegetation of the right-of-way as directed by the Wildlife Habitat Council. Mountain Valley would reduce the potential introduction and spread of non-native invasive plant and weed species by following the measures outlined in its project-specific *Exotic and Invasive Species Control Plan*. The chance for wildfire caused by construction would be minimized by Mountain Valley following the measures outlined in its project-specific *Fire Prevention and Suppression Plan*. Also, the high rate of average precipitation in the project area would reduce the potential for fires. Mountain Valley would coordinate with the FS, and follow the measures outlined in its Forest-specific POD, to minimize impacts on vegetation within the Jefferson National Forest. Therefore, we have determined that the impacts on vegetation resulting from construction and operation of the MVP and the EEP would be adequately minimized.

4.5 WILDLIFE

4.5.1 Affected Environment

Lands that would be crossed by the MVP and the EEP contain diverse wildlife habitats suitable for commonly found large and small mammals, reptiles and amphibians, and birds (raptors, waterfowl, and songbirds) of the Mid-Atlantic region. Federal and state special status species (i.e., endangered, threatened, and species of concern) are described in section 4.7.

Wildlife is generally dependent on available habitat, which is typically directly linked to existing vegetation cover types. As described in sections 4.3.3, 4.4, and in the sections below, the MVP and the EEP would cross several upland and wetland vegetation cover types. These include forested, scrub-shrub, and herbaceous uplands; and palustrine emergent, forested, and scrub-shrub wetlands.

Upland forest comprises the majority (about 72 percent) of the wildlife habitat crossed by the MVP. Upland forests contain a wide variety of wildlife species, attributable to the diverse range of the types of habitat that forests provide, from the overhead canopy of the forest trees to the understory vegetation and forest-floor detritus. Tree and shrub layers provide food and cover for birds and larger mammals, such as white-tailed deer. Forest hardwood species such as oaks, beech, and poplar, produce acorns and seeds, which are important food sources for many bird and mammal species. Fallen trees and limbs give rise to insects, which also serve as important food sources, and the dense leaf litter and other detritus within the understory provide food and cover for invertebrates, amphibians, reptiles, and smaller mammals.

Agricultural and other open land combined comprise the majority (about 60 percent) of wildlife habitat crossed by the EEP. Agricultural land and other open lands, such as idled croplands, hayfields, and old fields and pastures provide nesting, denning, and foraging habitat for grassland birds, upland game birds, and small mammals. Utility rights-of-way maintained in early successional communities also provide valuable nesting and foraging habitats for grassland bird species and serve as grazing habitat for deer. These lands are, in turn, also prime hunting grounds for predator species such as foxes, coyotes, and raptors.

Table 4.5.1-1 identifies the terrestrial wildlife species commonly associated with the vegetation cover types that would be crossed by the MVP and EEP. Open water areas also provide wildlife habitat for several species of waterfowl, wading birds, fish, reptiles, and amphibians.

TABLE 4.5.1-1 **Wildlife Species Commonly Associated with Vegetation Communities Affected by the Mountain Valley Project and the Equitrans Expansion Project**	
Vegetation Cover Types Affected by the Projects	**Wildlife Species**
Upland Forest	American black bear a/, eastern chipmunk, eastern gray squirrel a/, fox squirrel a/, gray fox a/, hoary bat, little brown bat, red squirrel, southern flying squirrel, striped skunk a/, Virginia white-tailed deer a/, Acadian flycatcher, American redstart, American woodcock a/, barred owl, black-and-white warbler, Blackburnian warbler, black-throated blue warbler, black-throated green warbler, blue jay, blue-headed vireo, Carolina chickadee, common raven, downy woodpecker, great horned owl, hooded warbler, magnolia warbler, northern saw-whet owl, ovenbird, pileated woodpecker, pine siskin, red crossbill, red-bellied woodpecker, red-breasted nuthatch, red-shouldered hawk, ruffed grouse, scarlet tanager, veery, white-breasted nuthatch, wild turkey a/, wood thrush, yellow-bellied sapsucker, common five-lined skink, eastern box turtle, eastern fence lizard, eastern ratsnake, northern copperhead, northern ring-necked snake, wood frog, Allegheny mountain dusky, northern slimy salamander, northern spring salamander, red-backed salamander, spotted salamander
Scrub-Shrub Upland	eastern cottontail a/, red fox a/, white-footed mouse, American woodcock a/, blue-winged warbler, brown thrasher, Cooper's hawk, eastern screech owl, eastern towhee, indigo bunting, prairie warbler, song sparrow, white-eyed vireo, yellow-breasted chat, northern black racer, northern rough greensnake
Herbaceous Upland	coyote a/, groundhog a/, meadow vole, American kestrel, American woodcock a/, eastern bluebird, eastern meadowlark, grasshopper sparrow, vesper sparrow, eastern gartersnake, eastern milksnake, northern brownsnake
Palustrine Emergent Wetland	bobcat a/, common raccoon a/, muskrat, Virginia white-tailed deer a/, common grackle, common yellowthroat, green heron, killdeer, least bittern, red-winged blackbird, swamp sparrow, tree swallow, eastern box turtle, eastern painted turtle, queensnake, snapping turtle, American bullfrog, green frog, northern leopard frog, pickerel frog, four-toed salamander
Palustrine Forested Wetland	American beaver a/, bobcat a/, common raccoon a/, river otter a/, Virginia white-tailed deer a/, American crow, prothonotary warbler, wild turkey a/, wood duck, upland chorus frog, eastern red-spotted newt, Jefferson salamander
Palustrine Shrub-shrub Wetland	American beaver a/, bobcat a/, Virginia white-tailed deer a/, red-winged blackbird, tree swallow, yellow warbler, pickerel frog, spring peeper
a/ Indicates game species in the states of Pennsylvania, West Virginia, or Virginia.	

The MVP would cross about 235 miles of upland forest. The forests are broadly categorized into three forest types – upland deciduous forest, coniferous forest, and mixed deciduous-coniferous forest, as described in section 4.4.1. The West Virginia Natural Resource Analysis Center (Strager and Maxwell, 2012) assesses forested land in West Virginia and categorizes forest areas as large core (more than 500 acres); medium core (250 to 500 acres); and small core (less than 250 acres). It also categorizes the habitats adjacent to core forest areas as perforated (core forest containing a small clearing(s) within the forest); edge (the 300 feet-wide boundary between core forest area and non-forested area); and patch (small forested area that is entirely within 300 feet of a non-forested area). In section 4.4, figures 4.4.1-1 and 4.4.1-2 illustrate the sections of core forest and adjacent perforated, edge, and patch habitat that the MVP would pass through in West Virginia.

The Virginia Department of Conservation and Recreation, Division of Natural Heritage (VADCR-DNH) Virginia Natural Landscape Assessment (2007) collectively categorizes land with a minimum of 100 acres of interior forest cover and associated habitat fragments that provide connectivity between habitat patches as ECA. The ECA are categorized based on their general ecological value and the ecosystem services they provide. The categories are Outstanding; Very High; High; Moderate; and General. Figure 4.4.1-3 illustrates the ECA that the MVP would pass through in Virginia.

Construction and operation of the EEP H-318 pipeline in Pennsylvania would affect one tract of interior forest of about 50 acres.

4.5.1.1 Migratory Birds

A variety of migratory birds, including forest-interior birds, birds of conservation concern, and waterfowl use or could use the wildlife habitats crossed by the MVP and the EEP. These birds use these habitats for resting (stopover), sheltering, foraging, breeding, and nesting.

Migratory birds are protected under the MBTA (16 U.S.C. 703-711). The MBTA, as amended, prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, or nests unless authorized under a FWS permit. Bald and golden eagles are additionally protected under the BGEPA (16 U.S.C. 668-668d). EO 13186 (Federal Register, 2001) directs executive departments and agencies to identify where unintentional take is likely to have a measurable negative effect on migratory bird populations and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the FWS. The EO states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and that particular focus should be given to addressing population-level impacts.

On March 30, 2011, the FWS and the FERC entered into a Memorandum of Understanding that focuses on avoiding and minimizing adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration. This voluntary agreement does not waive legal requirements under the MBTA, BGEPA, ESA, Federal Power Act, NGA, or any other statutes and does not authorize the take of migratory birds.

The 1988 amendment to the Fish and Wildlife Conservation Act mandates that the FWS "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA of 1973." As a result of this mandate, the FWS created the Birds of Conservation Concern (BCC) list (FWS, 2007). The goal of the BCC list is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions and coordinating consultations in accordance with EO 13186.

A variety of migratory birds and birds of conservation concern use or could use the habitats affected by the MVP. These birds use these habitats for resting (stopover), sheltering, foraging, breeding, and/or nesting. MVP and the EEP are located in Bird Conservation Regions 28 (Appalachian Mountains for the MVP and the EEP) and 29 (Piedmont for the MVP). As outlined in table 4.5.1-2, suitable habitat exists for 32 BCC species within the MVP and the EEP areas. The MVP and the EEP areas overlap with the breeding ranges of 26 of these species.

TABLE 4.5.1-2

Birds of Conservation Concern Possibly Present within the Mountain Valley Project and the Equitrans Expansion Project Areas

Common Name	Habitat Type	Bird Conservation Region
Bird Conservation Region 28 (Appalachian Mountains) and Bird Conservation Region 29 (Piedmont)		
American Bittern	Marshes and reedy lakes	a/
Bald Eagle	Nests among forests adjacent to large water systems	28, 29
Bewick's Wren	Thickets, underbrush, gardens	28, 29
Black-billed Cuckoo	Forest edges, tree groves, and thickets often adjacent to wetlands	a/
Black-capped Chickadee c/	Mixed and deciduous forests, willow thickets, or groves	28
Black Rail	Freshwater marshes or marshy meadows	29
Blue-winged Warbler	Brushy hillsides, overgrown pastures, stream and woodland edges	28, 29
Canada Warbler	Mature hardwood forests preferably near streams and swamps	28
Cerulean Warbler	Deciduous forests, especially in river valleys	28, 29
Fox Sparrow	Wooded areas, undergrowth, brush	a/
Golden-winged Warbler	Open woodlands, brushy clearings, undergrowth	28
Henslow's Sparrow	Weedy fields and meadows	28, 29
Kentucky Warbler	Ravines in upland deciduous forests, deep shaded woods with dense, humid thickets, bottomlands near creeks and rivers	28, 29
Least Bittern	Freshwater marshes and reedy ponds	a/
Loggerhead Shrike	Semi-open fields with lookout posts and shrubby patches	28, 29
Louisiana Waterthrush	Brooks, ravines, wooded swamps	28
Northern Saw-whet Owl b/	Forests, conifer stands, groves	28
Olive-sided Flycatcher	Conifer forests, burns, clearings	28
Peregrine Falcon	Open country, cliffs	28, 29
Pied-billed Grebe	Ponds, lakes, marshes	a/
Prairie Warbler	Brushing slash, bush pastures, low pines	28, 29
Prothonotary Warbler	Wooded swamps, wetlands, river bottom hardwoods	a/
Red-headed Woodpecker	Groves, orchards, shade trees in towns, large scattered trees	28
Red Crossbill c/	Conifer forests and groves	28
Rusty Blackbird d/	River groves, wooded swamps, muskeg in summer	28, 29
Short-eared Owl d/	Prairies, meadows, stubble fields, marshes, dunes, tundra	29
Swainson's Warbler	Swamps and river floodplain forests	28, 29
Upland Sandpiper	Grassy prairies, open meadows, fields	28
Whip-poor-will	Woodlands	28, 29
Wood Thrush	Deciduous woodlands	28, 29
Worm-eating Warbler	Deciduous woodlands	28
Yellow-bellied Sapsucker b/	Woodlands and aspen groves	28

a/ Bird of Conservation Concern in a BCR other than Regions 28 or 29: Piedmont
b/ Southern Appalachian breeding population
c/ Southern Appalachian population
d/ Non-breeding in these BCR
Sources: VADGIF, 2015; Audubon, 2015a

Additionally, the MVP would pass through about 86 miles of the globally recognized Southern Allegheny Plateau Forest Block Complex Important Bird Area (IBA) and Allegheny Mountain IBA between MPs 0 and 141. The IBA Program is an international initiative developed to identify, protect, and manage critical areas associated with vital bird habitat and associated biodiversity (BirdLife International, 2015; Audubon, 2015b). The National Audubon Society administers the IBA program in the United States in partnership with BirdLife International. The Forest Block Complex IBAs were established as a means to protect viable populations of priority bird species, such as cerulean warblers, by establishing a network of forested landscapes along the Atlantic Flyway, which the MVP and EEP both cross[57]. The MVP corridor would also be located within 2.1 miles of the globally recognized Lewis Wetzel WMA IBA in Wetzel County, West Virginia and within 0.75 mile of the continentally recognized Virginia Piedmont Forest Block Complex IBA in Franklin and Pittsylvania counties. The EEP would not cross any IBAs.

Bald and Golden Eagles

The projects would not cross any known bald eagle concentration areas. Also, based on an assessment of the Center for Conservation Biology Virginia Bald Eagle Nest Locator and consultations with the FWS, the closest bald eagle nest to the proposed MVP and EEP corridors is in Craig County, Virginia over 10 miles away from the MVP corridor (Watts and Byrd, 2013; FWS, 2014a; 2015a).

Mountain Valley and Equitrans did not observe bald eagle nests in the surveyed areas of West Virginia, Virginia, or Pennsylvania (Equitrans, 2016; ESI, 2016a; ESI, 2016b). However, landowners denied Mountain Valley survey access to about 2.5 miles of linear area in West Virginia and 59 miles of right-of-way and access road areas in Virginia. Bald eagles were observed flying in two locations near Indian Creek, West Virginia and in three locations during ground surveys in Virginia. Surveyors in Virginia documented five bald eagles flying about 0.5 mile from the proposed right-of-way in Giles County; five bald eagles flying at high altitudes or circling over mountain ridges in Montgomery County; and one bald eagle flying in the vicinity of the proposed right-of-way in Pittsylvania County. Mountain Valley will continue attempts to gain access to areas where ground surveys have not been conducted in West Virginia and Virginia prior to the onset of construction.

Mountain Valley conducted an aerial survey in February 2017 along the MVP route within Giles, Craig, Montgomery, Roanoke, Franklin, and Pittsylvania Counties, Virginia. No bald eagle nests were observed, but Mountain Valley did document an adult and three juvenile eagles flying and/or perching during the survey. Additional surveys are planned for the winter 2017-2018, and further ground surveys are planned for portions of the project area that would intersect major waterbodies (primary nesting and roosting habitat for bald eagles) during the winter of 2017-2018.

Golden eagles (*Aguila chrysaetos*) may be present in the vicinity of the MVP during construction. While golden eagles are not known to breed in the United States east of the

[57] The Atlantic flyway is one of four broad areas (in addition to the Mississippi, Central, and Pacific flyways) that contain the routes of migrating birds from summer nesting sites throughout North America, including the Arctic, to their wintering grounds in southern North America, the Caribbean, and South America. In the United States, the Atlantic flyway generally consists of the states along the east coast, including Virginia, West Virginia, and Pennsylvania.

Mississippi River, they do migrate south from Canada in the fall and are known to overwinter in primarily forested habitat of the Appalachian high country (Katzner et al., 2012; USGS, 2016). Mountain Valley conducted surveys for golden eagles in tandem with bald eagle aerial and ground surveys in the spring of 2016 (ESI, 2016a). No golden eagles were observed during the aerial surveys. Two golden eagles were observed flying in the vicinity of the proposed right-of-way in Giles and Montgomery counties, respectively, during ground surveys. Survey and tracking data collected by the USGS in Virginia have documented migratory and overwintering golden eagles within Giles, Craig, and Roanoke counties in the vicinity of where the MVP corridor would be located (USGS, 2016).

4.5.1.2 Game Species

Big game species that may be present in the vicinity of both the MVP and the EEP include American black bear, white-tailed deer, and wild turkey.

Other game species, such as furbearers, game birds, and small game, may be found in the area of both the MVP and the EEP. Furbearers include American beaver, American mink, bobcat, common raccoon, gray fox, long-tailed weasel, muskrat, red fox, river otter, and striped skunk.

Game birds in the vicinity of the MVP and the EEP include both upland birds, such as the American woodcock, mourning dove, northern bobwhite quail, and ruffed grouse, as well as waterbirds, such as the American black duck, American coot, blue- and green-winged teal, Canada goose, northern pintail duck, and sora rail.

Small game species within both project areas include species such as eastern gray squirrel, eastern cottontail rabbit, fox squirrel, groundhog, and Virginia opossum.

The MVP would be located in the immediate vicinity of at least two private game farms and within 5 miles of two additional game farms. The pipeline route would cross a small portion of the Burnsville Lake WMA, managed by the WVDNR for wildlife conservation and recreational hunting opportunities.

4.5.1.3 Sensitive and Managed Wildlife Habitats

Sensitive or managed wildlife habitats such as national forests and wildlife refuges, state forests and parks, wildlife management areas, and reserve program lands are generally established to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. The MVP would cross about 2.3 miles of state or privately managed conservation lands and 3.5 miles of the Jefferson National Forest in Virginia. No privately managed conservation lands would be crossed by the MVP pipeline route in West Virginia. However, the MVP pipeline route would cross 177 feet within the Burnsville Lake WMA. The pipeline would be within 1 mile of the boundaries of the Smoke Camp, Elk River, and Big Ditch WMAs, and within 5 miles of the Bluestone Lake WMA, Cranberry WMA, Lewis Wetzel WMA, Meadow River WMA, Stonewall Jackson Lake WMA, and Summersville Lake WMA. Additionally, an MVP workspace would be located adjacent to the Meadow River WMA.

EEP would not cross any federal, state, or privately managed conservation lands, but three WMAs are in the general vicinity of the H-319 pipeline, Mobley Tap, and Webster Interconnect portions of the EEP. The Lewis Wetzel WMA, Lantz Farm and Nature Preserve, and Cecil H. Underwood WMA are each located between 4 and 10 miles from the EEP.

Wildlife expected to be present at these sites would consist of the species typically associated with the vegetation communities or habitat types present on the lands. All but the Big Ditch WMA allow hunting of white-tailed deer and wild turkey. The Jefferson National Forest and the Summersville Lake WMA also allow hunting of American black bear.

Virginia Department of Conservation and Recreation Conservation Areas

Through incorporation of the Mount Tabor Variation, the MVP pipeline route now avoids the Mill Creek Springs Natural Area Preserve (Blake Reserve) and VOF open space easements in Montgomery County, Virginia, previously discussed in our September 2016 draft EIS. Likewise, through incorporation of the Canoe Cave Variation, Mountain Valley indicated that the MVP pipeline route no longer crosses over the Canoe Cave Conservation Site in Giles County, Virginia. Canoe Cave is classified by the FWS as a known, occupied hibernaculum for the federally-threatened and state-endangered northern long-eared bat and has been documented as having contained the state-endangered tri-colored bat.

The MVP would cross the following conservation areas identified by the VADCR[58]:

- Craig Creek - Johns Creek Stream Conservation Unit;
- Slussers Chapel Conservation Site; and
- Old Mill Conservation Site.

The route for the MVP pipeline would cross Craig Creek on private land at about MP 218.2 in Montgomery County, Virginia. This crossing would be within the VADCR-designated Craig Creek-Johns Creek Stream Conservation Unit. This conservation unit contains habitat for yellow lance (*Elliptio lanceolate*), Atlantic pigtoe (*Fusconaia masoni*), orangefin madtom (*Noturus gilberti*), and James spinymussel (*Pleurobema collina*). Aquatic species are addressed in section 4.6.

The MVP pipeline route would cross the VADCR-designated Slussers Chapel Conservation Site between about MPs 220.8 and 224.4 in Montgomery County, Virginia. The conservation site is comprised of mixed upland forest, agriculture and pasture lands, and the Slussers Chapel Cave. The Slussers Chapel Cave contains potential habitat for the Ellett Valley millipede (*Pseudotremia cavernarum*), which is state-listed as threatened in Virginia; however, the cave is north of the confirmed range of this species. Slussers Chapel Cave also provides habitat for little brown, tricolored, and big brown bats. Mountain Valley's adoption of the Mount Tabor Variation adjusted the route of the pipeline across the Slussers Chapel Conservation Site to avoid the Slussers Chapel Cave.

58 See letters to the FERC from the VADCR dated June 10, 2015 (accession number 20160611-5170); March 17, 2016, (accession number 20160317-5126); and May 20, 2016 (accession number 20160520-5051).

The MVP pipeline route would cross the VADCR-designated Old Mill Conservation Site between about MPs 224.6 and 226.9 in Montgomery County, Virginia. The conservation site is comprised of upland forest and scrub-shrub habitat and the Old Mill Cave. Old Mill Cave provides habitat for three globally rare invertebrates, and a globally rare cave-dwelling beetle. Cave adapted species documented at Old Mill Cave include Vandel's cave isopod, Montgomery County cave amphipod, Packard's cave millipede, Roanoke Valley cave beetle, and cave springtail. In a 2014 survey by the VADCR, no bats were observed at Old Mill Cave.[59] Mountain Valley's adoption of the Mount Tabor Variation adjusted the route of the pipeline along the north side of the Old Mill Conservation Site to avoid the Old Mill Cave.

Jefferson National Forest

Habitats crossed by the MVP within the Jefferson National Forest consist primarily of deciduous forest with some coniferous forest species also present. The Forest provides habitats for at least 180 birds species, 60 mammals, 70 amphibians and reptiles, and 100 freshwater fish and mussels. Wildlife present within the Jefferson National Forest would generally be similar to that listed in the deciduous forest portion of section 4.5.1.1, including the American black bear, white-tailed deer, Acadian flycatcher, chestnut-sided warbler, eastern towhee, hooded warbler, ovenbird, pileated woodpecker, pine warbler, ruffed grouse, and wild turkey. The National Forest also contains federally listed special status species, FS Sensitive Species, FS Locally Rare species, and Management Indicator Species, that are addressed in section 4.7. Aquatic species in streams in Jefferson National Forest are discussed in section 4.6.

As part of the FWS BCC Bird Conservation Region 28, the portion of the Jefferson National Forest that would be crossed by the MVP may contain additional migratory birds, including BCCs such as the black-capped chickadee, Canada warbler, Kentucky warbler, olive-sided flycatcher, and red crossbill. Though not considered a BCC in this region, golden eagles are likely to be present in the Jefferson National Forest. As noted in section 4.5.1.2, survey and tracking data collected by the USGS have documented migratory and overwintering golden eagles within the Jefferson National Forest (USGS, 2016).

The Jefferson National Forest is managed cooperatively with the VADGIF to allow hunting by the public. Species commonly hunted within the Jefferson National Forest include black bear and ruffed-grouse, as well as white-tailed deer, wild turkey, and other species discussed in section 4.5.1.2.

4.5.2 Environmental Consequences

4.5.2.1 General Impacts on Wildlife

Constructing the MVP and the EEP would disturb about 6,490 acres of wildlife habitat. The temporary and permanent loss and/or conversion of habitat and the general disturbance created by the use of construction equipment would impact wildlife. This impact would vary depending

[59] See Orndoff, W., 8 August 2016, "Report on Old Mill Cave, a Designated State Significant Cave in Montgomery County, VA," VADCR, filed with the FERC on August 16, 2016 in accession number 20160816-5222.

on the type and quantity of habitat affected and the ability of species to leave project work areas and successfully utilize adjacent habitats.

Constructing the MVP and the EEP may result in limited mortality of less mobile animals, such as small rodents, reptiles, amphibians, and invertebrates, which may not be able to relocate from the immediate construction area. Construction of the projects could also disrupt bird courting, breeding, or nesting behaviors on and adjacent to construction work areas.

In addition, during pipeline installation, there is potential for wildlife to be injured by falling into an open trench. Open trenches containing standing water could prove hazardous to smaller, less mobile animals. The Applicants would maintain breaks in the trench and place gaps in the temporary spoil piles and pipe stringing to allow wildlife to migrate through the construction corridor. The Applicants would also install escape ramps about every 50 feet within the trench to provide a wildlife exit and install drift fencing along the trench in areas where protected species, such as timber rattlesnakes, may be present. Prior to the start of the construction day, the trench and construction equipment would be inspected and any wildlife encountered would be safely removed from the construction corridor.

We expect that mobile wildlife would relocate to similar adjacent habitats during project construction. However, displaced wildlife could experience inter- and intra-specific competition, lower reproductive success, and overall increased rates of stress, injury, and mortality if adequate adjacent habitat was not available. Where similar adjacent habitat is present, displacement impacts would generally be short-term. Wildlife would be expected to return and colonize successfully restored habitats that were temporarily affected by construction.Based on our restoration monitoring efforts for other natural gas infrastructure projects, we have found that wetland and upland herbaceous and shrub vegetation typically restore to pre-construction conditions in a relatively short time (i.e., between 1 to 5 years). Construction impacts on most mobile species occupying these habitats would be temporary.

The impacts on forest-dwelling wildlife species would be greater because forest habitat takes a comparatively longer time to regenerate within the revegetated temporary workspace. Restoring the temporary construction areas to forest habitats could take 30 years or longer, depending on site-specific conditions such as rainfall, elevation, grazing, and weed introduction. Forest would be permanently removed within the operational right-of-way. The fragmentation of forested habitat and edge effects of maintaining the pipeline rights-of-way through this habitat are further discussed in the following section.

4.5.2.2 Forest Fragmentation and Edge Effects on Wildlife

Constructing the MVP would fragment large forested tracts which provide habitat for a variety of wildlife. Fragmenting contiguous forested habitats into smaller units and creating edge habitat would impact wildlife. Specifically, wildlife may experience increased rates of predation, parasitism, and competition; reduced pairing, nesting, and reproductive success; and inhibited migration, dispersal, and foraging. These behavioral impacts would increase the rates of stress, injury, and mortality.

Mammals, birds, reptiles, amphibians, and plants may all be adversely affected by forest fragmentation and associated edge effects. Species that require large tracts of unbroken forest land would need to seek suitable habitat elsewhere. Smaller species such as reptiles and amphibians could experience greater impacts from habitat fragmentation, as they are relatively less mobile and generally more averse to crossing wide corridors due to the increased risk of predation. Fragmentation generally affects birds by creating dispersal barriers, resulting in smaller suitable microhabitats, smaller population sizes, and edge effects (Degraaf and Healy, 1990). Edge effects can cause interactions between species that nest in the interior of forests and species that inhabit surrounding landscapes, typically lowering the reproductive success of the interior species.

The loss of forest habitat, expansion of existing corridors, and the creation of open early successional and induced edge habitats could decrease the quality of habitat for forest interior wildlife species in a corridor much wider than the actual cleared right-of-way. The distance an edge effect extends into a woodland is variable, but most studies suggest at least 300 feet (Rodewald, 2001; Jones, et al., 2000; Ontario Ministry of Natural Resources, 2000; Robbins, 1988; Rosenberg, et al., 1999). Edge effects within this distance could include a change in available habitat for some species due to an increase in light and temperature levels on the forest floor and the subsequent reduction in soil moisture; such changes may result in habitat that would no longer be suitable for species that require these specific habitat conditions, such as salamanders and many types of plants. An alteration of habitat could affect the fitness of some species and increase competition both within and between species, possibly resulting in an overall change to the structure of the forest community.

Alternatively, the creation of permanently maintained, herbaceous and shrub open corridors following nearly the full length of the MVP and the EEP rights-of-way would also create new movement corridors for many species of wildlife. Species such as white-tailed deer often travel along a corridor or corridor edge to facilitate searches for food or shelter. Predator species, such as coyote and red fox, also tend to travel along open corridors in search of prey. Consequently, a permanently maintained open corridor through an interior forest area may lead to increased herbivory, including on threatened or endangered species such as small whorled pogonia and running buffalo clover, and predation of species (small mammals, birds, herptiles,) (Environment Canada, 2013).

Reviews of studies regarding the effects of forest fragmentation on mammals, birds, amphibians, and plants (e.g., Environmental Canada, 2013) bolster the principle that a positive correlation exists between species richness and the number of acres of intact interior forest habitat, or core forest area. The MVP and the EEP would collocate with existing utility corridors for about 30 percent and 20 percent, respectively. Collocating reduces the amount of fragmentation and new edges by shifting the existing forest edge as opposed to creating a completely new corridor.

In West Virginia, the MVP would permanently impact about 892 acres of contiguous interior forest ranging from Large Core (greater than 500 acres) to Small Core (less than 250 acres) forest areas. In Virginia, the MVP would permanently impact about 350 acres of contiguous interior forest classified as General to Outstanding quality (see the interior forest fragmentation analysis in section 4.4.2.3). Construction and operation of the EEP H-318 pipeline in Pennsylvania would affect one tract of interior forest of about 50 acres. Typically, interior forest tracts of about 50 acres or less may be expected to contain few to no species dependent on interior forest; rather, most species in a 50-acre forest tract would likely be generally tolerant of edge habitat (Environment Canada, 2013).

In total, the MVP and EEP would impact about 4,527 acres of forest habitat during construction. The majority of this impact would result from construction of the MVP. Permanent removal of forest habitat for the operation of the MVP, as well as the time that would be needed for wildlife habitat to recover within the temporary right-of-way, would be long-term. As previously stated, fragmenting the forest habitat would also impact adjacent forested habitat by converting the forest adjacent to the right-of-way from interior forest habitat to edge habitat. The MVP would convert about 17,000 acres of interior forest habitat in West Virginia and 4,579 acres of interior forest habitat in Virginia into edge habitat based on the extension of the edge effect an estimated 300 feet to either side of the MVP right-of-way. In section 4.4.2.3, we determined that the MVP would result in significant impacts on large acreages of upland forest. However, we conclude that impacts on most non-special status wildlife species would not result in long-term or significant population-level effects, given the stability of local populations and the abundance of available habitat outside the proposed right-of-way. We discuss the impacts on migratory birds specifically in section 4.5.2.6.

To increase the speed and success of restoration of wildlife habitat, Mountain Valley would implement right-of-way restoration measures contained in FERC's Plan and Mountain Valley's Procedures and *Migratory Bird Conservation Plan*, and solicit guidance from the Wildlife Habitat Council to restore the pipeline corridor using native seed mixes appropriate for each location, including diverse mixes of native flowering plant seeds in upland areas and oak-hickory forest woody seed mixes within forested areas (see section 4.4 for a discussion of seed mixes). Further, Mountain Valley would follow Integrated Vegetation Management techniques, in partnership with the Wildlife Habitat Council, to promote growth of ground cover species that flower for long durations throughout the growing season in an attempt to create new habitat for native and domestic pollinators such as bees and butterflies. In wetlands, the Applicants would allow the rights-of-way adjacent to a 10-foot-wide strip over the pipeline to grow as scrub-shrub habitat so as to provide a more gradual transition between the pipeline corridor and the surrounding forested habitat. Mountain Valley would plant seed mixes comprised of facultative wetland species throughout the right-of-way in forested, emergent, and scrub-shrub wetlands. In forested wetlands, Mountain Valley would supplement the seed mixes by planting native shrubs and saplings in all areas of the construction right-of-way except for the maintained portion of the permanent right-of-way (i.e., no closer than 15 feet from the pipeline). Mountain Valley would also plant native shrubs and saplings in riparian areas at crossings of waterbodies known to contain special status species or suitable habitat for such species (see section 4.6.2.2) and within affected loggerhead shrike foraging and nesting habitat (see section 4.7.2.1).

4.5.2.3 Noise Impacts on Wildlife

Noise would be generated by heavy equipment and machinery during construction of the MVP and the EEP. Most construction activities would be limited to daytime hours, with the exception of a limited number of 24-hour activities, such as water pump operation, road bores, and HDD installations. Construction is anticipated to occur throughout the year and would generally last 6 to 12 weeks at any given location. Noise levels along the construction right-of-way would vary depending on the phase of work, equipment in use, distance from noise receptors, and intervening topography and vegetation outside the right-of-way. We estimate that at a distance of 50 feet from the MVP and the EEP work areas, general construction would generate noise levels of about 85 decibels on the A weighted decibel scale (dBA), and about 92 dBA at 50 feet as a result of HDD operations (see section 4.11.2.3).

Mountain Valley has not determined whether blasting would be necessary for construction of the MVP. Equitrans does not anticipate a need for blasting during construction of the EEP. Generally, noise levels produced during blasting are instantaneous and vary based on a number of factors, including the type and amount of explosives used, the depth below-ground of the explosives, and whether noise mitigation is applied. Typical construction blasting operation noise levels have been documented at about 94 dBA at a distance of 50 feet (FHWA, 2006).

Wildlife relies on hearing for courtship and mating, prey location, predator detection, and/or homing. These behaviors and interactions could be affected by noise resulting from construction and operation of the projects. Specifically, construction noise could lead to nest abandonment, egg failure, reduced juvenile growth and survival, or malnutrition or starvation of the young. However, studies note that separating the effects of acute increases in noise levels from the optical stimulus that often accompany such noises (e.g., the loud noise of a low-flying aircraft and the observation of the approaching aircraft) can be difficult (Kempf and Hueppo, 1997). During construction, the effects of noise on wildlife would be greatest immediately adjacent to the construction right-of-way.

Should blasting be necessary during construction of the MVP, potential impacts would be similar to those from general construction noise. Blasting typically involves a small scale, controlled, rolling detonation procedure resulting in limited ground upheaval. The blasts do not typically result in large, above ground explosions. Nonetheless, blasting in proximity to bird nests, during sensitive periods, for example, may cause the adults to abandon the nests, which could lead to egg or fledging mortality. Mountain Valley has prepared a Project-specific General Blasting Plan and would coordinate with appropriate federal and state agencies prior to conducting blasting operations to minimize impacts related to blasting.

While pipelines have no operational noise associated with them, compressor stations would generate noise on a continuous basis once in operation. Continuous noise impacts associated with the compressor stations would be limited to the general vicinity of the facilities. Noise levels at 50 feet from the MVP and EEP compressor stations could range from 68 dBA to 80 dBA.[60] Noise levels for maintenance blowdowns and emergency shutdown blowdowns could range from 75 dBA to 85 dBA at 50 feet, respectively, but would occur infrequently and would be short-term in duration. Section 4.11.2.3 provides a more in-depth description of noise levels associated with compressor stations.

Effects on wildlife from chronic noise may vary by species (e.g., Barber et al., 2009; Francis et al., 2011a, b; Francis et al., 2012; Blickley et al., 2012). The number of individual birds present near oil and gas infrastructure has been shown to decline with proximity to the facility, but

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60 Predicted noise levels at 50 feet are based on extrapolations of the noise model programs used to assess noise levels at Noise Sensitive Areas as described in section 4.11.2.3. Extrapolations were calculated using the following equation: dBA2 = dBA1 + 20Log10(D1/D2); where dBA1 = noise level at a distance D1 from the point source and dBA2 = noise level at distance D2 from the same point source.

reproductive success was higher than expected, seemingly due to a proportionate decline in the presence of nest predators (Francis et al., 2011a). In other instances, increased noise levels from oil and gas infrastructure appeared to reduce reproductive success, potentially due to an inability of the females of the species to adequately hear male courtship songs (Habib et al., 2007). Another study concluded that species may be able to adjust to chronic noise by changing their vocalizations in ways that would allow them to be better heard (Francis et al., 2011b).

Noise levels decrease exponentially with distance from the source, and this decrease is accelerated within forested areas relative to the type of forest and the extent of understory present (Huisman and Attenborough, 1991). The MVP and EEP compressor stations are primarily surrounded by forested land. Mountain Valley and Equitrans would also employ noise mitigation measures at the compressor stations, such as compressor building walls, roof, doors, and ventilation systems designed to reduce noise emissions; turbine exhaust and intake silencers and breakouts; blowdown silencers; underground suction and discharge piping; and acoustically lagged aboveground main gas piping. The noise levels that wildlife would be exposed to beyond the compressor station property boundaries would vary based on the distance from the facility, but would be lower than the maximum noise levels provided above. A full description of the noise emissions associated with the compressor stations is provided in section 4.11.2.3. We conclude that in the years following initial construction birds and other wildlife would either become habituated to the operational noise associated with compressor station facilities or move into similar available habitat farther from the noise source. This would be considered a loss of habitat, if species are forced to relocate from the noise-affected areas.

During the operation of the pipeline, noise emissions also would be generated during monitoring and maintenance activities, such as vegetation clearing on the permanent right-of-way, or during ground or air surveillance of the pipeline, as required by regulations. Surveillance activities could cause startle effects in wildlife in proximity to the pipeline; however, these activities would be infrequent and short-term in duration. Overall, we conclude that effects on wildlife due to noise emissions would be minimal and highly localized.

4.5.2.4 Light Impacts on Wildlife

Artificial lighting used during construction and at the aboveground facilities of the MVP and EEP during operation would generate light pollution. Ecological light pollution refers to artificial lighting that affects natural patterns of light and dark in ecosystems, which in turn may affect wildlife (Longcore and Rich, 2004). The effects of ecological light pollution may include causing disorientation in nocturnal animals, disrupting migratory patterns of birds, altering seasonal day-length cues, which some wildlife may rely on as a trigger for critical behavior (e.g., migration).

Mountain Valley and Equitrans would only use artificial lighting as necessary during construction between the hours of 7:00 am and 7:00 pm, except for during emergencies or limited instances of 24-hour construction activities (e.g., HDD during construction along the EEP). Therefore, light pollution during construction would be minimal or, in the instances of the HDD activities, only for a relatively short duration.

At aboveground facilities during operation, the Applicants would generally orient lighting fixtures inward along the perimeters of the facilities and would use full cut-off style fixtures. Full cut-off lighting fixtures are directed downward and possess shielding around the fixture that prevents light from shining above 90 degrees from the lamp (i.e., light only shines directly downward from the fixture). Therefore, we conclude that the effects of artificial lighting on wildlife would be minimized and would likely only extend a short distance from the facilities.

4.5.2.5 Noxious and Invasive Species

Noxious weeds and invasive plant species can outcompete and displace native vegetation, resulting in habitat conversion. Such transformed habitat can be unsuitable for some wildlife. Often, as habitat quality degenerates, wildlife diversity declines. For example, kudzu and Chinese privet can form dense monocultures that inhibit the growth of native vegetation and cause a decrease in plant and wildlife species diversity. To avoid and minimize these potential impacts, the Applicants have committed to monitoring areas affected by construction for at least two growing seasons, as described in the their Plans and Procedures, and Mountain Valley's *Exotic and Invasive Species Control Plan*. Therefore, we conclude that impacts on wildlife from noxious and invasive species would not be significant.

4.5.2.6 Migratory Birds

The MVP and the EEP construction schedules would overlap migratory bird nesting seasons (generally between April 15 and August 1). Increased human presence and noise from construction activities could disturb actively nesting birds. Impacts would likely not be significant for non-nesting birds, as these individuals could temporarily relocate to avoid construction activities. However, construction activity near active nests during incubation or brood rearing could result in nest abandonment; which, in turn, could lead to overheating, chilling, or desiccation of unattended eggs or young; and subsequently nestling mortality; premature fledging; and/or ejection of eggs or young from the nest. Additionally, loss and/or conversion of existing habitat and the subsequent displacement of birds could affect mating, nesting, rearing, foraging, and predator avoidance behaviors. As a result, migratory birds could experience increased predation, competition, and rates of stress, injury, and mortality.

To address concerns regarding general impacts on migratory birds and migratory bird habitat, Mountain Valley and Equitrans coordinated with the FWS to develop mitigation measures that would avoid and adequately minimize impacts on migratory birds resulting from construction and operation of the MVP and the EEP. As a result of these discussions, the Applicants developed *Migratory Bird Conservation Plans* (Equitrans, 2016; ESI, 2017) and have committed to implementing the following preliminary general measures to protect migratory bird species:

- routing the pipelines to avoid sensitive resources and bird concentration areas where possible;
- maximizing the use of existing rights-of-way to reduce fragmentation;
- reducing the construction right-of-way width to 75 feet when crossing wetlands;
- prohibiting operational right-of-way maintenance during the migratory bird nesting season (April 15 to August 1); and
- following the measures outlined in their Plans and Procedures.

Equitrans would conduct construction-related tree felling and vegetation clearing between August 2 and April 14. Mountain Valley would conduct the majority of construction-related tree felling and clearing between September 1 and March 31. This date range would avoid the breeding date ranges for all except four of the BCC with the potential to breed in the vicinity of the project area (bald eagles, peregrine falcons, pied-billed grebes, and yellow-bellied sapsuckers). However, Mountain Valley has stated that conducting all tree felling and clearing outside of this date range is not feasible and, consequently, some felling and clearing would be necessary during April, May, and August. Additionally, Mountain Valley would conduct vegetation clearing and construction activities within grassland and scrub-shrub habitats between April 1 and August 31 though no clearing of any areas would occur between June 1 and July 31.

To avoid or minimize impacts on active migratory bird nests, Mountain Valley would conduct pre-construction avian nest surveys within forested, grassland, and scrub-shrub habitats prior to tree-felling or vegetation clearing between April 1 and August 31. The FWS Virginia Field Office also requested that Mountain Valley assign avian nest surveyors to each tree-felling spread between January 1 and March 31 to survey the construction corridor for nests of early season nesting forest raptor species, such as great-horned owls (*Bubo virginianus*) or bald eagles. In response, Mountain Valley stated that it would instead train construction crews in Virginia to locate raptor nests, which are typically relatively large and recognizable during the winter and spring prior to leaf-out. Avian survey teams would coordinate with the lead EI for each construction spread to plan the timing and locations of surveys. Survey teams would conduct surveys within 7 days of tree felling or vegetation clearing activities. If delays prevent the tree felling or vegetation clearing activities to proceed within the 7-day window, survey teams would be required to resurvey the construction spread before tree felling or vegetation clearing activities could proceed.

If avian survey teams discover an active nest for early season nesting raptors and BCC within the construction area, Mountain Valley would establish buffers (50 feet in forested habitat; 33 feet in scrub-shrub habitat) surrounding the nest using fencing and signage to prevent the nest from being directly disturbed by construction crews or equipment. Mountain Valley would not conduct tree felling or vegetation clearing activities within the buffer area until the nest is no longer active (e.g., nestlings have fledged). A qualified biologist would be required to confirm that a nest is no longer active for Mountain Valley to commence tree felling or vegetation clearing activities. A more detailed description of the avian surveys is provided in Mountain Valley's *Migratory Bird Conservation Plan.*

To ensure impacts on migratory birds were avoided and minimized to the extent practical, the FWS (2015b; 2016a) requested that Mountain Valley avoid fragmenting large continuous blocks of forest and ecologically important land. The temporary and permanent loss and conversion of forested habitat (fragmentation and edges) could specifically affect forest-dependent BCC species, such as the cerulean warbler, golden-winged warbler, Kentucky warbler, Louisiana waterthrush, northern saw-whet owl, whip-poor-will, wood thrush, and worm eating warbler. These are species that require forests for breeding, nesting, or overwintering. Of particular note is the cerulean warbler. The cerulean warbler is a Species of Greatest Conservation Need in the West Virginia State Wildlife Action Plan (WVDNR, 2015a) for which suitable breeding habitat consists of structurally diverse forest canopies within forest patches large enough to reduce the risk of nest parasitism and predation (FWS, 2017).

As described in section 4.5.1.1, the majority of the MVP pipeline route would be located within Bird Conservation Region 28. About 80 percent of the remaining population of the cerulean warbler occurs within Bird Conservation Region 28. Breeding areas for the cerulean warbler have been affected by clearing of over 50 percent of historical forests and cerulean warbler populations have steadily declined at a rate of about 3 percent per year since 1966. In 2006, the FWS estimated populations to be approximately 400,000 (FWS, 2017). Although the cerulean warbler makes use of canopy gaps and can be found using thin forest edges and small perforated areas near narrow roads or rights-of-way, they are less abundant near abrupt forest edges, and in West Virginia have been shown to avoid edges of powerlines with rights-of-way that are around 75 feet wide (Wood et al., 2013). The conversion of interior forest habitat to edge habitat as a result of the MVP could significantly affect the cerulean warbler population.

On October 20, 2016, Mountain Valley filed a revised *Migratory Bird Conservation Plan* that discussed limitations to forest habitat fragmentation. Mountain Valley filed an updated version of its *Migratory Bird Conservation Plan* on May 11, 2017 to address concerns of the EPA, FWS, VADEQ, WVDNR, and other consulting agencies regarding the impacts on large acreages of upland forest. The plan includes updated avoidance, minimization, and restoration measures for impacts resulting from the MVP, including additional tree and shrub plantings to restore right-of-way sections within riparian areas, forested wetlands, and loggerhead shrike nesting habitat. The updated plan includes a revised tree felling and vegetation clearing schedule and expanded protocols for nesting migratory bird surveys prior to tree felling and vegetation clearing. However, we understand that the May 11, 2017 version of the *Migratory Bird Conservation Plan* is not the final plan, as Mountain Valley continues to coordinate with the consulting agencies to finalize the plan. Therefore, to ensure that impacts on migratory birds, resulting from the significant impacts on upland forest described in section 4.4.2.3, are adequately avoided, minimized, mitigated, and/or restored, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary its final *Migratory Bird Conservation Plan*. The plan should include impact avoidance, minimization, restoration, and/or mitigation measures for the impacts on migratory birds and it should be prepared in coordination with the FWS, WVDNR, and VADGIF.**

Bald and Golden Eagles

Impacts on bald eagle nests from the MVP or the EEP are not expected based on survey results to date. If eagle nests are discovered during subsequent field surveys, the Applicants would follow measures adapted from the FWS National Bald Eagle Management Plan Guidelines (FWS, 2007) and the Virginia Department of Game and Inland Fisheries Bald Eagle Guidelines for Landowners (VADGIF, 2012) and consult, as appropriate, with federal and state agencies to avoid and minimize disturbance to nesting bald eagles. The measures the Applicants would follow include:

- restricting blasting or any use of explosives to greater than 0.5 mile (or 1 mile in open areas) from an active nest during the nesting season (December 15 through July 15);
- maintaining a buffer of at least 660 feet between project-related activities and the nest;

- restricting all vegetation clearing and ground disturbance within 660 feet of the nest to outside of the nesting season; and
- maintaining any established landscape buffers between project-related activities and active nests.

Impacts on overwintering golden eagles and non-breeding adult or juvenile bald eagles are not expected. Mountain Valley would notify the FWS and VADGIF if any golden eagle roosts or congregations were identified within the project area. Mountain Valley would implement the following measures as suggested by the FWS (2016b) to minimize and avoid impacts on overwintering individuals:

- maintaining construction sites and permanent aboveground facilities free of garbage to avoid attracting golden and/or bald eagles to the sites;
- avoiding winter tree clearing in areas known to contain large numbers of golden eagles (when tree clearing in other seasons does not conflict with tree clearing windows for special status species);
- retaining, when practical, old growth stands and potential roost trees and nest sites for bald eagles within 0.5 mile of major waterbodies; and
- providing environmental training for all construction and operations personnel to inform the personnel of pertinent guidelines that may prevent injury to eagles or contamination of eagle food sources such as: site-specific permit conditions; special status species restrictions; the *SPCCP;* and the *Unanticipated Discovery of Contamination Plan for Construction Activities in West Virginia and Virginia.*

As we noted for other wildlife species, impacts on non-special status migratory bird species (which do not have significantly reduced populations) would not result in long-term or significant population-level effects, given the stability of local populations and the abundance of available habitat outside the proposed right-of-way. Pipeline construction during the migratory bird breeding season could impact individual birds and/or nests and have a greater impact on BCC species due to their limited populations in the area. However, based on the nature of linear pipeline construction, the Applicants' proposed measures concerning eagles and other migratory birds, as well as our recommendation regarding the Mountain Valley Migratory Bird Conservation Plan, we conclude that the MVP and the EEP would not result in population-level impacts on migratory bird species, including BCCs.

4.5.2.7 Game Harvesting

Impacts on game species would be similar to the general impacts on wildlife discussed previously. Following construction, game species could utilize the newly established rights-of-way for foraging and travel. Restored pipeline rights-of-way generally provide an opportunity for developing high-quality feeding areas for game species, especially if noxious weeds are adequately controlled and native forage seeding is successful. In general, large and small game species would be expected to return to habitats they vacated after construction and restoration efforts are completed, and harvest success rates would likely be similar to pre-construction success rates.

Construction and operational activities would likely not impact hunting at the Summersville Lake WMA, Lewis Wetzel WMA, Lantz Farm and Nature Preserve, or Cecil H.

Underwood WMA due to their distance from the MVP and the EEP. However, construction activities that coincide with hunting seasons (which vary in project areas depending on species and location) may impact hunters' experiences and success in WMAs within one mile of the projects, the Jefferson National Forest, or other areas in the vicinity of the projects by temporarily restricting access to hunting areas (e.g., through road closures restricting access to hunter parking areas) and temporarily affecting the spatial distribution of game species (see section 4.8.2.4 for additional information regarding the effects of construction on hunting activities).

The new pipeline rights-of-way could increase access to remote or previously inaccessible hunting areas, which could result in increased hunting success. Increased public recreation along cleared rights-of-way in the hunting season, especially near crossings of existing access points, has been documented elsewhere (Crabtree, 1984). This increased access to previously inaccessible hunting areas could also result in trespassing on private lands, and an increase of poaching of game and non-game wildlife. This impact would be greater on smaller game species, such as grouse, rabbits, or squirrels, because they typically have smaller home ranges and movement areas than larger species and could experience greater population impacts from habitat loss and fragmentation. In section 4.9 (Transportation) we discuss measures that could be utilized to keep ATV or similar off road vehicles from using the right-of-way.

The overlap of construction activities and hunting seasons could lead to safety hazards for personnel in the construction corridors. Therefore, all personnel entering construction sites would be educated about hunting seasons prior to initiation of work and would be required to wear high visibility vests and hard hats. Local landowners would be contacted to identify areas where hunting activities may occur, and daily safety meetings would be conducted to inform construction site personnel of relevant conditions. The Applicants could also discuss with landowners the need to erect signage and fencing to discourage trespass by unauthorized hunters accessing private property.

4.5.2.8 Sensitive and Managed Wildlife Areas

The impacts on wildlife within the identified sensitive and managed wildlife areas would be consistent with those of the corresponding habitats in other portions of the MVP right-of-way. Mountain Valley would attempt to minimize impacts on these areas by implementing the measures outlined in the FERC Plan and Mountain Valley's Procedures; Mountain Valley's *Erosion and Sediment Control Plan*, *Karst Mitigation Plan*, *Migratory Bird Conservation Plan, Exotic and Invasive Species Control Plan*, and *SPCCP*; and by revegetating temporary and permanent workspaces with native seed mixes as directed by the Wildlife Habitat Council.

For example, Mountain Valley would adhere to its Procedures and *Erosion and Sediment Control Plan*, *Karst Mitigation Plan*, and *SPCCP*, to reduce sedimentation, turbidity, and run-off within the Craig Creek Conservation Unit, which in turn would reduce adverse effects on the aquatic life known to inhabit this area. Mountain Valley also would adhere to the measures outlined in the FERC Plan and its draft *Migratory Bird Habitat Conservation* and *Exotic and Invasive Species Control* plans, to minimize degradation to forested habitat used by migratory birds and other upland wildlife species.

Jefferson National Forest

The impacts on wildlife species within the Jefferson National Forest would be consistent with those described above for wildlife species in other portions of the MVP right-of-way (see sections 4.5.2.1 through 4.5.2.7). Mountain Valley would attempt to minimize impacts on the National Forest by implementing the various BMPs and plans described above, and by revegetating temporary and permanent workspaces with native seed mixes as directed by the Wildlife Habitat Council (see section 4.4 for a discussion on seed mixes).

Field surveys along the proposed corridor within the Jefferson National Forest have documented the presence of black bears, white-tailed deer, wild turkey, and numerous migratory birds. Constructing the MVP would fragment existing forested habitat and create new forest edges. About 336 acres of interior forest habitat would be converted to forest edge habitat, based on the extension of forest edge an estimated 300 feet on either side of the MVP right-of-way. Section 4.5.2.2 discusses habitat fragmentation and edge effects.

Some species may experience benefits from establishment of the right-of-way. Generally, species that use edge habitat or grassland/scrub-shrub habitat for foraging, nesting, or breeding, such as the prairie warbler, could benefit from the creation of smaller contiguous forested blocks and maintained rights-of-way. Species such as white-tailed deer often travel along corridors or corridor edges to facilitate searches for food or shelter. Pollinators such as butterflies and bees would likely benefit from opened corridors planted with native flowering plants.

To reduce the effects of forest fragmentation on FS lands and expedite the re-establishment of wildlife habitat after construction, the FS has indicated that it will require, as part of its separate FS permitting process, Mountain Valley to maintain the permanent right-of-way through all of the Jefferson National Forest consistent with Mountain Valley's Procedures. That is, the FS would require Mountain Valley to maintain the right-of-way in an herbaceous state along a 10-foot-wide corridor centered over the pipeline, with trees selectively removed within 15 feet as needed where root systems could threaten the pipeline, and the remainder of the corridor would be seeded with seed mixes[61] and then replanted with shrubs and shallow rooted trees as approved by the FS[62] and consistent with Mountain Valley's Procedures. Mountain Valley would consult with the FS to finalize plans for restoration and rehabilitation of the right-of-way included in the POD. Additionally, Mountain Valley would allow shrubby vegetation to grow within the temporary construction zones on the edges of the operating corridor in the Jefferson National Forest.

Restoration of the temporary construction right-of-way would provide early successional habitat adjacent to the forested landscape, as recommended for upland areas. Mountain Valley would revegetate temporary workspaces along waterbody crossings with seed mixes of native tree and shrub species and the permanent right-of-way would be seeded with herbaceous vegetation. Mountain Valley would also plant native shrubs and saplings representative of the pre-existing vegetative community within the construction right-of-way at crossings of waterbodies known to contain sensitive aquatic species. Restoration in the riparian areas would thus be comprised of regenerating stands of saplings with an herbaceous component, as recommended for riparian areas.

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[61] See accession no. 20161215-5124

[62] See accession no. 20170320-5222

Mountain Valley would adhere to its *Exotic and Invasive Species Control Plan* to ensure that invasive species are adequately controlled and native forage seeding is successful.

Mountain Valley does not propose the wide-scale use of pesticides and/or herbicides; however, the FS has requested that herbicides be incorporated into the management plan for treatment of invasive species on the Jefferson National Forest and maintenance of the right-of-way during operation.[63] Once in the soils, some herbicides can migrate via gravity, leaching, and surface runoff to other soils, groundwater, or surface water. Section 4.4.2.6 includes a description of specific herbicides that could be used in the project area and discusses the potential of herbicide residues accumulating in soils and possibly contaminating waterbodies within and downstream of the Jefferson National Forest. In short, due to the limited acreage and dispersed extent of the areas in which herbicides may be applied, and the short half-lives of the chemicals proposed for use, the effects on wildlife of any herbicide residue accumulation or migration would be temporary and minor. Short-term impacts on game species and hunting within Jefferson National Forest may occur during construction. As with other portions of the MVP right-of-way, game species would be temporarily displaced during construction. During construction, we would expect mobile species to move to nearby similar habitats outside of the right-of-way. Following construction, game species could utilize the newly established rights-of-way for foraging and travel.

Permanent impacts on game species would occur where herbaceous vegetation is maintained in place of forested habitat within the Jefferson National Forest. However, forage vegetation, such as shrubs and grasses, would be expected to recolonize quickly after restoration.

4.5.3 Conclusions Regarding Impacts on Wildlife and Mitigation

We conclude that constructing and operating the MVP and the EEP would not significantly affect wildlife at population levels. The Applicants would minimize impacts on wildlife and habitat by following the measures outlined in the their Plans and Procedures and other BMPs, routing the pipeline to minimize impacts on sensitive areas, collocating the pipeline with other rights-of-way where feasible, reducing the construction right-of-way through wetlands, and implementing their *Migratory Bird Conservation Plans*, which we recommended above that Mountain Valley finalize prior to construction.

[63] See accession no. 20161116-5006.

4.6 FISHERIES AND AQUATIC RESOURCES

4.6.1 Affected Environment

As described in section 4.3.2.1, constructing and operating the MVP and the EEP would require 1,147 waterbody crossings, many of which provide aquatic habitat and support fisheries. The MVP pipeline route would cross 389 perennial waterbodies; while the EEP pipelines would cross 18.

The character of fisheries and aquatic habitats are typically influenced by water temperature (warmwater or coldwater), salinity (freshwater, marine, or estuarine), fishing uses (commercial or recreational), and migration patterns (anadromous and catadromous fish species). Warmwater rivers and streams are generally capable of supporting a high diversity of fish assemblages, including suckers, sunfishes, and catfishes, and other species that are able to tolerate water temperatures greater than 68°F. Coldwater rivers and streams are generally capable of supporting year-round populations of coldwater aquatic life, such as trout and species that can tolerate a maximum monthly temperature that does not exceed 68°F. The waterbodies crossed by the MVP include both warmwater and coldwater fisheries. The EEP would only cross warmwater fisheries. In addition to supporting fisheries, crossed waterbodies support other aquatic species including mussels and other invertebrates. Fish and aquatic species commonly found in the waterbodies crossed by the projects are listed on table 4.6.1-1.

4.6.1.1 Fisheries of Special Concern

Federally or state-listed endangered, threatened, or candidate fish or aquatic species; coldwater fisheries, and fisheries with significant economic value resulting from the presence fish stocking programs, or commercial harvesting are all considered fisheries of special concern. In the Commonwealth of Pennsylvania, the PADEP has water classifications that include aquatic life and fish consumption. In the State of West Virginia, the WVDEP has categories of water use that include propagation and maintenance of fish and other aquatic life (including warm water fishery streams and trout waters). In the Commonwealth of Virginia, the VADEQ has water use classifications that include propagation and growth of a balanced indigenous population of aquatic life. Federally or state-listed endangered, threatened, or candidate fish and aquatic species are addressed in section 4.7.

Mountain Valley Project

The MVP would cross 136 perennial waterbodies containing fisheries of special concern; 71 in West Virginia, and 65 in Virginia. Appendix F summarizes these crossings and includes waterbody name, location, fishery of special concern, and crossing restrictions. Table 4.6.1-2 lists the dates during which in-stream construction for the MVP would be restricted (i.e., no in-stream work is to occur) for waterbodies that contain fisheries of special concern.

TABLE 4.6.1-1

Typical Fish and Aquatic Species within the Mountain Valley Project and the Equitrans Expansion Project Areas a/

MOUNTAIN VALLEY PROJECT

Fish

West Virginia:

appalachia darter, banded darter, bigeye chub, bigmouth, black redhorse, blackside darter, bluebreast darter, bluegill, bluehead chub, bluntnose minnow, brindled madtom, brook silverside, brook trout, brown trout, central stoneroller, channel darter, creek chub, fantail darter, flathead catfish, gizzard shad, golden redhorse, golden shiner, green sunfish, greenside darter, johnny darter, kanawha sculpin, largemouth bass, least brook lamprey, logperch, longear sunfish, longhead darter, longnose dace, mimic shiner, mottled sculpin, muskellunge, northern hogsucker, rainbow darter, rainbow trout, redbreast sunfish, redfin shiner, river chub, roanoke darter, rock bass, rosefin shiner, rosyface shiner, rosyside dace, sand shiner, sharpnose darter, silver redhorse, silver shiner, silverjaw minnow, smallmouth bass, spotfin shiner, spottail shiner, spotted bass, steelcolor shiner, streamline chub, striped shiner, telescope shiner, tennessee darter, tippecanoe darter, tonguetied minnow, variegate darter, western blacknose dace, western mosquitofish, white shiner, white sucker, whitetail shiner, yellow bullhead

Virginia:

alewife, banded darter, banded killifish, bigeye chub, black crappie, black redhorse, blacknose dace, blackside darter, blue catfish, bluebreast darter, bluegill, bluntnose minnow, bowfin, brook silverside, brook trout, brown trout, candy darter, central stoneroller, chain pickerel, channel darter, common shiner, creek chub, cutlips minnow, eastern silvery minnow, fantail darter, fathead minnow, flathead catfish, gizzard shad, golden redhorse, golden shiner, grass carp, green sunfish, greenside darter, hybrid tiger musky, johnny darter, largemouth bass, least brook lamprey, logperch, longear sunfish, longnose dace, margined madtom, mimic shiner, mottled sculpin, muskellunge, northern hogsucker, northern studfish, orangefin madtom, paddlefish, rainbow darter, rainbow trout, redbreast sunfish, redear sunfish, river chub, roanoke logperch, rock bass, rosyface shiner, rosyside dace, sand shiner, sauger, sharpnose darter, shorthead redhorse, silver shiner, silverjaw minnow, smallmouth bass, spotfin shiner, spottail shiner, spotted bass, steelcolor shiner, streamline chub, striped shiner, suckermouth minnow, telescope shiner, threadfin shad, tippecanoe darter, tonguetied minnow, trout-perch, variegate darter, warmouth, white catfish, white perch, white shiner, white sucker, whitetail shiner, yellow bullhead

Freshwater Mussels

West Virginia:

clubshell, elktoe, fragile papershell, green floater, James spinymussel, long-solid mussel, monkeyface, northern riffleshell, pistolgrip, purple wartyback, rainbow mussel, rayed bean, round pigtoe, salamander mussel, snuffbox, wavy-rayed lampmussel, yellow lampmussel

Virginia:

Atlantic pigtoe, dwarf wedgemussel, elktoe, fragile papershell, green floater, James spinymussel, long-solid mussel, pistolgrip, purple wartyback, rainbow mussel, round pigtoe, snuffbox, wavy-rayed lampmussel, yellow lampmussel

EQUITRANS EXPANSION PROJECT a/

Fish b/

alewife, american brook lamprey, american eel, banded darter, banded killifish, bigmouth chub, black crappie, blacknose shiner, bluegill, brook trout, brown bullhead, brown trout, channel catfish, eastern mosquitofish, emerald shiner, flathead catfish, freshwater drum, gizzard shad, green sunfish, kanawha minnow, largemouth bass, logperch, mottled sculpin, northern hogsucker, pumpkinseed, quillback, rainbow darter, sand shiner, smallmouth bass, spotted bass, striped bass, threadfin shad, trout-perch, white crappie, white perch, yellow bullhead, yellow perch

Freshwater Mussels b/

Pennsylvania:

elktoe, fatmucket, fluted shell, fragile papershell, giant floater, kidney shell, mucket, pigtoe, plain pocketbook, pocketbook, squawfoot, three-ridge mussel, Wabash, wavy-rayed lampmussel

a/ Typical fish and aquatic species; list is not intended to be comprehensive.

b/ Typical fish and mussel species listed for the EEP are those of the Ohio River watershed and include both the Pennsylvania and West Virginia portions of the project.

Sources: PAFBC, 2015; VADGIF, 2015a; WVDEP, 2015b; WVDNR, 2015a; 2015b

TABLE 4.6.1-2

Restricted In-Stream Construction Windows for Fisheries of Special Concern Crossed by the Mountain Valley Project

State	Fishery Type		Restricted In-Stream Construction Window a/	Number of Waterbodies Crossed by the MVP d/
WV	Coldwater streams		September 15 - March 31	4
VA	Coldwater streams		March 1 – June 30	39
WV	Warmwater streams		April 1 – June 30	35
VA	Warmwater streams		April 15 – July 15	1
WV	Freshwater mussels	All mussels	NA b/	16
VA	Freshwater mussels	Long-term brooders	April 15 – June 15; August 15 – September 30	2
VA	Freshwater mussels	Short-term brooders	May 15 – July 31	2
WV	Threatened and Endangered Species Stream	Snuffbox	April 1 – June 30	4
WV	Threatened and Endangered Species Stream	Clubshell	April 1 – June 30	1
VA	Threatened and Endangered Species Stream	Atlantic pigtoe	May 15 – July 31	2
VA	Threatened and Endangered Species Stream	Green floater	April 15 – June 15; August 15 – September 30	1
VA	Threatened and Endangered Species Stream	James spinymussel	May 15 – July 31	2
VA	Threatened and Endangered Species Stream	Orangefin madtom	March 15 – May 31	26
VA	Threatened and Endangered Species Stream	Roanoke logperch	March 15 – June 30	14
VA	Threatened and Endangered Species Stream	Yellow lampmussel	April 15 – June 15; August 15 – September 30	1
WV	Wild trout streams		September 15 – March 31	15
VA	Wild trout streams		October 1 – March 31	36
VA	Stocked trout streams c/		March 15 – May 15	3

a/ Restricted In-stream Construction Windows = The span of time during which construction cannot occur without specific permits or approval; these time-of-year restrictions are set forth by the COE's 401 Water Quality Certification for streams crossed in West Virginia and by the VADGIF for streams crossed in Virginia.

b/ The West Virginia Mussel Survey Protocols (Clayton et al., 2015) do not specify restricted in-stream construction windows; surveys for mussels must be completed between May 1 and October 1; mussel relocations must occur within the same field season as surveys.

c/ The MVP would cross waterbodies stocked by trout; however, the stocking extents would not be crossed by the MVP.

d/ Total counts of streams crossed are listed per fishery type; some waterbodies may have multiple fishery types; therefore, a sum the number of waterbodies listed in this column will be greater than the total number of waterbodies crossed by the MVP. Revised counts from the draft EIS reflect updated guidance from the VADGIF requiring all perennial tributaries to be assigned the same fishery type and time-of-year restriction as the receiving waterbody.

West Virginia

The MVP would cross 52 perennial non-stocked, sustainable trout waters. The WVDNR requires that no construction be completed in these streams between September 15 and March 31 unless a waiver is obtained. Additionally, all streams containing freshwater mussels are fisheries of special concern. The West Virginia Mussel Survey Protocol (Clayton et al., 2015) stipulates that crossings of waterbodies with upland drainage areas of greater than 10 square miles require surveys for the presence of freshwater mussels. Waterbodies with less than 10 square miles of upland drainage area are not considered to have sufficient resources to support freshwater mussel populations (Clayton et al., 2015). As identified in appendix F, the MVP would cross 23 perennial waterbodies in West Virginia that contain freshwater mussels and have upland drainage areas of greater than 10 square miles.

We received comments regarding whether the MVP would affect the newly named Meadow River mudbug (*Cambarus pauleyi*; Loughman et al, 2015). This species is a crayfish with a very limited geographic distribution. It is endemic to high elevation wetlands in the Meadow and Greenbrier River basins. The MVP pipeline route would not cross the known locations of this species, which are primarily limited to wetlands adjacent to the Meadow River at elevations between 2,395 and 2,590 feet. On May 15, 2017, the WVDNR notified the FERC that the Meadow River mudbug is designated as a Priority 1 Species of Greatest Conservation Need in West Virginia under a different species name and the WVDNR had only recently acquired data on the known locations of the species. The MVP route would affect about 5.3 acres of wetlands located between elevations of 2,395 and 2,590 feet in Monroe County West Virginia. About 0.07 acre of these acres are adjacent to the Meadow River. The WVDNR may require additional mitigation for potential impacts on the Meadow River mudbug as part of its permitting process.

Virginia

The MVP pipeline route would not cross any river segments that are classified by the VADEQ as Tier III waterbodies, considered to be exceptional by the Commonwealth. Tier III waterbodies are of outstanding scenic beauty, possessing exceptional aquatic communities, or having superior recreational opportunities. However, two streams crossed by the MVP pipeline route are designated as Tier III waterbody segments outside of the construction areas: 1) Little Stony Creek in Giles County; and 2) Bottom Creek in Montgomery and Roanoke Counties. The MVP pipeline route would cross Little Stony Creek more than 1 mile downstream of the segment of the creek that is designated as a Tier III stream. Bottom Creek would be crossed more than 3 miles upstream of the segment designated as Tier III.

Additionally, the project would cross 38 perennial waterbodies containing populations of wild brown and brook trout, and stocked rainbow trout. The VADGIF restricts construction (i.e., requests that no instream work occur) within waterbodies that contain wild brook and brown trout from October 1 through March 31 and in waterbodies that contain stocked trout from March 15 through May 15.

The VADGIF also restricts construction in streams that contain freshwater mussels characterized as long-term brooders, such as the yellow lampmussel and green floater, from April 15 through June 15 and August 15 through September 30. Further, in-stream construction also is restricted in streams that contain freshwater mussels characterized as short-term brooders, such as the James spinymussel and Atlantic pigtoe, from May 15 through July 31. As identified in appendix F, the MVP would require 10 crossings of perennial waterbodies in Virginia that contain freshwater mussels.

Equitrans Expansion Project

The WVDNR Wildlife Resources Section identified the North Fork Fishing Creek, located within 300 feet of workspaces for the H-319 pipeline, as a High Quality Stream potentially containing populations of state protected freshwater mussels. The WVDNR also noted the workspaces are upstream of a WVDEP restoration area on the North Fork Fishing Creek. However, since there would be no in-water work in this waterbody, the WVDNR has advised Equitrans that following sediment and erosion control BMPs would limit potential impacts on downstream aquatic life.

4.6.1.2 Jefferson National Forest

Within the Jefferson National Forest, the MVP would cross 17 waterbodies (see section 4.3.2, table 4.3.2-9). These waterbodies support warmwater and coldwater fisheries and other aquatic species. Three of the waterbodies are classified as containing fisheries of special concern. Kimballton Branch is an intermediate perennial stream, crossed at about MP 196.7, known to contain wild trout. Craig Creek would be crossed on private land at about MP 219.5 about 0.25 mile upstream of the Jefferson National Forest. Craig Creek is an NRI listed intermediate perennial stream, known to contain James spinymussel, Atlantic pigtoe, and orangefin madtom. An unnamed tributary to Craig Creek that would be crossed at MP 219.9 is a minor perennial stream classified by the VADGIF as containing James spinymussel, Atlantic pigtoe, and orangefin madtom.

4.6.2 Environmental Consequences

Constructing and operating the MVP and the EEP could temporarily and permanently impact fisheries and aquatic resources. As discussed in greater detail below, sedimentation and turbidity, alteration or removal of in-stream and stream bank cover, stream bank erosion, introduction of water pollutants, water depletions, and entrainment of small fishes during water withdrawals could increase the rates of stress, injury, and mortality experienced by fisheries and other aquatic life. In general, fish would migrate away from these activities. This displacement could lead to increased competition for habitat and food and could affect fish survival and health. The degree of impact on fisheries from construction activities would depend on the waterbody crossing method, the timing of construction, and the characteristics of aquatic species present.

4.6.2.1 Sedimentation and Turbidity

Increased sedimentation and turbidity resulting from in-stream and adjacent construction activities could displace and impact fisheries and aquatic resources. Sedimentation could smother fish eggs and other benthic biota and alter stream bottom characteristics, such as converting sand, gravel, or rock substrate to silt or mud. These habitat alterations could reduce juvenile fish survival, spawning habitat, and benthic community diversity and health. Increased turbidity could also temporarily reduce dissolved oxygen levels in the water column and reduce respiratory functions in-stream biota. Turbid conditions could also reduce the ability for biota to find food sources or avoid prey. The extent of impacts from sedimentation and turbidity would depend on sediment loads, stream flows, stream bank and stream bed composition, sediment particle size, and the duration of the disturbances. MVP proposes to cross all waterbodies using dry open-cut technique, which would limit downstream sedimentation and turbidity during construction; and limit the potential impacts on fisheries and aquatic resources. In addition, in section 4.3 we recommend Mountain Valley use the HDD method to cross the Pigg River.

Benthic invertebrates and freshwater mussels could also be affected by elevated turbidity and suspended sediments. Although freshwater mussels in the construction zone would be relocated by qualified biologists and in accordance with both West Virginia and Virginia mussel protocols, downstream sessile species could be affected. Aquatic invertebrates, including insect larvae, would generally be unable to avoid work areas. However, these areas would rapidly recolonize as a result of upstream drift and new egg deposition from adults within days to months (Brooks and Boulton, 1991; Matthaei and Townsend, 2000).

While several factors can influence the effectiveness of dry open-cut construction across waterbodies, if the crossings are properly installed and maintained during construction and restoration, the levels of sediment and turbidity produced are typically minor. A study conducted by the USGS (Moyer and Hyer, 2009) investigating the effects of dry open-cut waterbody crossings on downstream sediment loading found that short-term increases in turbidity downstream of construction did occur, but the magnitude of the increase was small and considered to be minimal compared to increased turbidity associated with natural runoff events. Other literature (e.g., Reid et. al., 2004) assessing the magnitude and timing of suspended sediment produced from open-cut dry crossing methods indicates the duration of increased sedimentation would be mostly short-term (i.e., less than 1-4 days) and remain near the crossing location (i.e., an approximate downstream distance of a few hundred feet). The likely range of effects on aquatic resources in the project area can be approximated by applying this predicted suspended sediment to the Newcombe and Jensen model (1996), which provides a framework for quantifying impacts on fishes exposed to suspended sediment in waterbodies. Results from this model suggest a very low probability of fish mortality from construction, with local crossing area impacts consisting of mostly sublethal effects (e.g., short-term physiological stress and reduction of feeding) and limited habitat degradation, though the authors of the model note the caveat that more information may be required to accurately predict sublethal effects thresholds of fishes at specific locations.

The HDD method could result in a release of drilling fluid into a waterbody. An inadvertent release of drilling fluid would result in sedimentation and turbidity, affecting aquatic biota as described previously. Equitrans developed an *HDD Contingency Plan* to handle failures and inadvertent releases. In section 4.3, we recommend that Mountain Valley use the HDD method to cross the Pigg River.

4.6.2.2 Loss of Stream Bank Cover

Stream bank vegetation, large woody debris, rocks, and undercut banks are known cumulatively as riparian habitat. Riparian habitat provides valuable structure and opportunities for fish and stream biota. Open-cut crossings would temporarily remove this habitat and potentially cause locally elevated water temperatures and reduced levels of dissolved oxygen, making the locations less suitable for aquatic biota. Consequently, fish and other stream biota would likely be displaced to similar habitat upstream or downstream of the pipeline crossing.

Mountain Valley and Equitrans would minimize clearing of trees and other riparian vegetation to include only what is necessary to construct and operate the projects safely. Mountain Valley and Equitrans would minimize impacts on riparian vegetation by narrowing the width of the standard construction rights-of-way at waterbody crossings to 75 feet, and by locating as many ATWS as possible at least 50 feet from waterbody banks. Once construction is complete, streambeds and banks would be stabilized and restored to pre-construction conditions to the fullest extent possible. Streambed structure such as rock and gravel would be returned to the stream. The FERC Procedures (at section V.C.1.) stipulates the use of clean gravel or native cobbles for the upper one foot of trench backfill in all waterbodies that are classified as coldwater fisheries.

Stream banks would be revegetated with native vegetation seed mixes based on the vegetative community present prior to construction. Mountain Valley would keep trees clear from a 10-foot-wide corridor directly over the pipeline, which would be mowed at a frequency sufficient to keep the corridor in an herbaceous state, and selectively remove trees as needed over a 30-foot-wide corridor to prevent tree roots from damaging the pipeline., However, trees could regenerate in the temporary construction work areas; allowing much of the ecological function of the riparian conditions (e.g., bank stabilization, filtration, shade, future large wood, and organic input) to return. Additionally, Mountain Valley would hand plant a mix of bare-root live shrubs and tree saplings within the temporary workspaces at the crossings of waterbodies known to contain special status species or potentially suitable habitat for such species. A minimum of six tree species and four shrub species would be planted within each stream crossing area. The specific species mix would be based on a combination of the species composition at the location prior to construction and nursery stock availability. The shrub and tree plantings would extend up to 100 feet, where possible, from the top of each side of the waterbody bank. Specific details of the plantings are provided in Mountain Valley's *Restoration and Rehabilitation Plan.*[64]

After construction and restoration, stream bank shrub and riparian tree species would be expected to recover over several months to a few years. Streambed biota, such as invertebrates that serve as food sources for fishes, would be expected to recolonize the affected areas within days to months (Brooks and Boulton, 1991; Matthaei and Townsend, 2000) or longer for some species (Wallace, 1990). Thus, impacts on stream banks should be mostly short-term, except for within the permanent operational pipeline easement where the conversion of forest to shrub vegetation would be permanent. The recovery of riparian habitat in forested areas of temporary construction workspaces would be long-term because of the time it would take for trees to regenerate and mature.

When crossing waterbodies in West Virginia, Mountain Valley would reduce impacts on stream banks by following the measures outlined in the *Stream Bank Restoration Plan* it developed for the WVDEQ. Mountain Valley must photo-document the channels of waterbodies upstream and downstream of the rights-of-way at waterbody crossing locations both prior to construction and then upon completion and restoration of the crossings. Subsequently, Mountain Valley must

64 See accession No. 20170511-5018a

monitor the waterbody crossings for at least 3 years and submit annual monitoring reports to the WVDEP and WVDNR that include up and downstream photographs of the waterbody channels, details of any slips that may have affected the waterbodies, and current evaluations of the conditions of each waterbody crossing. The WVDEP and WVDNR would review the annual monitoring reports to determine whether additional restoration or mitigation would be required at the waterbody crossings.

4.6.2.3 Fuel and Chemical Spills

An inadvertent release of fuel or oil or other hazardous materials from construction equipment into waterbodies could have impacts on fish and aquatic species. A leak of hazardous material into a waterbody could result in direct mortality to aquatic species, altered behavior, changes in physiological processes, or changes in food sources. In turn, ingestion of large numbers of contaminated fish or aquatic species could impact other species located higher in the food chain that prey on these biota.

Mountain Valley and Equitrans would implement their respective *SPCCP*s, which would include preventive measures such as personnel training, equipment inspection, and refueling procedures to reduce the likelihood of spills, as well as mitigation measures such as containment and cleanup to minimize potential impacts should a spill occur. Adherence to the *SPCCP* would largely prevent a large spill from occurring near surface waters because construction equipment fueling and bulk hazardous material storage would be prohibited within 100 feet of the waterbody banks. In addition, portable equipment such as water pumps would be placed in secondary containment structures in order to contain any leaks or spills.

4.6.2.4 Hydrostatic Testing and Water Withdrawals

Mountain Valley would mostly utilize municipal water for hydrostatic testing of the pipeline (see section 4.3.2.1) and dust control. Mountain Valley is proposing to withdraw hydrostatic test water from only two surface water sources: the Meadow River at MP 144.0; and the Greenbrier River, at MP 171.6; both in West Virginia. Mountain Valley estimates that about 11,777,551 gallons would be withdrawn from surface water sources for hydrostatic testing of the MVP pipeline (see section 4.3.2, table 4.3.2-8). Surface water withdrawals could reduce stream flows and water levels and entrain or impinge stream biota.

Mountain Valley would minimize impacts from water withdrawals by adhering to its Procedures and its *Erosion and Sediment Control Plan*. The measures outlined in the plans would include preventing water withdrawal from and discharges into exceptional value waters or waters that provide habitat for federally listed threatened and endangered species, unless approved by applicable resource and permitting agencies; screening and positioning water intakes at the water surface to prevent the entrainment of fish and other biota; maintaining adequate flow rates to protect aquatic species; placing water pumps in secondary containment devices to minimize the potential for fuel spills or leaks; regulating discharge rates; and using energy dissipating devices and sediment barriers to prevent erosion. Mountain Valley would obtain and comply with all state water withdrawal and discharge permits.

Equitrans would use only municipal sources for hydrostatic testing and water for dust control. Equitrans would comply with its NPDES permits for discharging hydrostatic test water and would implement its *Dust Suppression Plan* to minimize or avoid impacts related to discharging water for dust suppression.

4.6.2.5 Blasting

The effects of blasting on aquatic biota varies by species (Yelverton et al., 1975), but generally relatively small organisms and those close to the blast or near the sediment surface experience higher mortality (Yelverton et al., 1975; Munday, 1986). Non-lethal effects may include eye distension, hemorrhage, hematuria, and damage to bodily systems (Hastings and Popper, 2005; Godard et al., 2008; Carlson et al., 2011; Martinez et al., 2011).

The Applicants would attempt to avoid blasting during waterbody crossings. If blasting is deemed necessary, Mountain Valley would follow the measures outlined in its *General Blasting Plan*. That plan indicates that the Applicants would prepare and implement project-specific blasting plans, in coordination with federal and state agencies, to minimize impacts on aquatic species.

4.6.2.6 Jefferson National Forest

The impacts on fisheries and other aquatic resources within the Jefferson National Forest would be similar to those addressed in sections 4.6.2.1 through 4.6.2.5. The specific measures Mountain Valley would take to reduce potential impacts on riparian vegetation and restore streambed habitat to promote the rapid recolonization of the stream crossings are discussed in section 4.6.2.2. Mountain Valley would adhere to all in-stream construction time-of-year restrictions as stated by the VADGIF and would relocate any fish or freshwater mussels present within the construction zone. All fish and freshwater mussel relocations would be supervised by qualified, professional biologists in possession of pertinent federal and/or state permits.

Mountain Valley would use the dry open-cut method to cross the waterbodies within and near the Jefferson National Forest boundary, including Kimballton Branch, which is known to contain wild trout; Craig Creek, which is crossed 0.25 mile upstream of the Jefferson National Forest lands and is known to contain federally and state-listed aquatic species; and four unnamed tributaries to Craig Creek, one that is classified as containing federally and state-listed aquatic species by the VADGIF. We discuss the general impacts on fish and aquatic species that may result from using the dry open-cut method to cross waterbodies in section 4.6.2.1. The FS expressed concern regarding the potential for increased sedimentation caused by erosion of exposed soil in the pipeline corridor, access roads, and ATWS to affect the waterbodies crossed by the MVP within the Jefferson National Forest and impact downstream resources. In coordination with the FS and the Natural Resources Group, Mountain Valley commissioned a sedimentation model to assess the extent of sedimentation that could occur during construction within HUC12 subwatersheds that intersect the Jefferson National Forest boundaries and the project area. Details of the methods and results are included in the *Hydrologic Analysis of Sedimentation.*[65]

The proposed MVP pipeline route crosses the Jefferson National Forest through five separate subwatersheds belonging to the New River, James River, and Roanoke River drainages. Results from the *Hydrologic Analysis of Sedimentation* show that catchments within these subwatersheds would likely experience increases in sediment yield over baseline conditions during construction, restoration, and operation. The highest expected increases for most of the waterbodies would likely occur during construction. Sedimentation resulting from the construction, restoration, and operation portions of the MVP would likely be transported into downstream waterbodies; however, the *Hydrologic Analysis of Sedimentation* predicts that these impacts would largely be confined to tributary systems and not larger order rivers (e.g., New River, North Fork Roanoke River).

The results of the model indicate that construction could increase sedimentation, when accounting for Mountain Valley's erosion and sediment control methods, by more than 10 percent along sections of Craig Creek and one headwater stream within the Trout Creek-Craig Creek subwatershed; Mill Creek and an unnamed tributary above the confluence with the North Fork Roanoke River in the Dry Run-North Fork Roanoke River subwatershed; three headwater streams within the Stony Creek subwatershed (Kimballton Branch above the confluence with Stony Creek, and two unnamed tributaries); five headwater tributaries within the Clendennin Creek-Bluestone Lake subwatershed (including Curve Branch above the confluence with the New River; and Clendennin Creek above the confluence with the New River); and Rich Creek in the Rich Creek subwatershed. For most waterbodies studied in this analysis, expected impacts on streams were greatest during the active construction phase of the project. This pattern was also reflected in monitoring data for construction of a previous natural gas pipeline in southwest Virginia. Turbidity data collected during the active construction of the pipeline crossing indicate that short-term turbidity increases did occur downstream; however, these increases were shown to be minimal compared to the turbidity values measured during natural runoff events. The data indicated that upland runoff from the construction right-of-way was the primary source of increased turbidity but the increase did not adversely alter long-term water quality within the affected streams (Moyer and Hyer 2009).

Results of the sediment analysis suggest that sediment loads within the affected waterbodies would reach a new sediment equilibrium approximately 4 to 5 years after the start of the project. The new sediment equilibrium would represent a 1 percent or less increase in sediment load over baseline conditions for most of the waterbodies. Within the Roanoke and New River drainages, new sediment equilibriums in excess of 2 percent over baseline would be expected. Result of the model predict a new sediment equilibrium in excess of 10 percent over baseline for streams within the Stony Creek and Clendennin Creek-Bluestone Lake subwatersheds. However, these streams are below Pocahontas Road, an existing Forest Road that would be used as an access road for the MVP. This road is not included in the calculations of baseline sedimentation levels within the sedimentation model. Thus, sediment runoff associated with the existing Forest Road is attributed to construction of the project as though the full extent of the Forest Road was forested prior to construction. Additionally, the methods within the *Hydrologic Analysis of Sedimentation*

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65 Attachment DR4 Water Resources 26 filed on March 3, 2017 (accession number 20170303-5014).

note that sedimentation from the construction work area is likely overestimated during the tree clearing phase of construction because the model inaccurately treats the construction work area as being 100 percent bare soil without erosion and sediment controls employed. Consequently, though the subwatersheds crossed by the MVP within the Jefferson National Forest would likely experience some increases in sedimentation due to construction of the MVP, the increases would likely be lower than the values provided by the sedimentation model and primarily limited to smaller headwater streams as opposed to larger rivers.

Erosion Control Matting (ECM), also known as mulch control netting, erosion control blanket, landscape mesh or netting, is routinely used to stabilize seed and soil in road, stream, or sod projects. However, some ECM products contain a plastic monofilament mesh (same material as fishing line) and pose risks to several wildlife species. Nylon mesh netting of 1-inch square or more is often embedded in erosion control materials and has been exhibited to entangle wildlife, including mammals, birds, fish, reptiles, and amphibians. Some temporary erosion and sediment control products are commonly left in place permanently, particularly when used with seeding because the new vegetation grows up through the netting. When plastic netting degrades, plastic fragments may be blown or washed into waterways creating additional hazards to wildlife. Acceptable, cost effective biodegradable products exist that fulfill erosion control functions and do not persist in the environment; certain management practices can reduce the need for non-biodegradable products. A number of states and countries have cautioned, curtailed, or prohibited the use of non-biodegradable ECM due to risk and mortality to species. The FS has requested that Mountain Valley use only biodegradable ECM products that meet the need to reduce risk to wildlife and are acceptable to the FS and the type of ECM that would be used on FS lands would be determined during final FS permitting of the MVP. In addition, our Plan also prohibits use of synthetic monofilament mesh/netted erosion control materials in designated sensitive wildlife areas.

Mountain Valley does not propose the wide-scale use of pesticides and/or herbicides; however, the FS has requested that herbicides be incorporated into the management plan for treatment of invasive species on the Jefferson National Forest and maintenance of the right-of-way during operation.[66] Once in the soils, some herbicides can migrate via gravity, leaching, and surface runoff to other soils, groundwater, or surface water. Section 4.4.2.6 includes a description of specific herbicides that could be used in the project area and discusses the potential of herbicide residues accumulating in soils and possibly contaminating waterbodies within and downstream of the Jefferson National Forest. In short, due to the limited acreage and dispersed extent of the areas in which herbicides may be applied, and the short half-lives of the chemicals proposed for use, the effects on waterbodies containing aquatic species of any herbicide residue migration would be temporary and minor.

Mountain Valley would reduce the likelihood of a fuel, oil, chemical or other hazardous material spill from construction equipment reaching waterbodies within the Jefferson National Forest by implementing its *SPCCP*, which would include preventive measures such as personnel training, equipment inspection, and refueling procedures to reduce the likelihood of spills, as well as mitigation measures such as containment and cleanup to minimize potential impacts should a spill occur. Adherence to the *SPCCP* would prevent a large spill from occurring near surface

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[66] See accession no. 20161116-5006.

waters because construction equipment fueling and hazardous material storage would be prohibited within 100 feet of waterbody banks. Additionally, there would be no ATWS within 150 feet of waterbody banks; nor would there be any new access roads, ancillary facilities, yards, pipe storage locations, or other workspaces within the Jefferson National Forest.

Mountain Valley would not use waterbodies within the Jefferson National Forest for water withdrawal; nor would Mountain Valley discharge hydrostatic text water within the National Forest. The nearest water withdrawal location would be about 8 miles downstream of the National Forest in the Roanoke River subwatershed. The nearest water withdrawal location upstream of the National Forest would be about 10 miles away within the Indian Creek subwatershed. Water withdrawn from both locations would be discharged at upland locations within the same respective subwatershed as the withdrawals. Water used for dust suppression within the Jefferson National Forest would be obtained from a municipal source or from the same locations as the hydrostatic test water withdrawals. The water would be discharged along the construction right-of-way using sprayers at a rate low enough to forestall erosion or sedimentation within the construction corridor.

Mountain Valley is not currently planning to conduct blasting as part of the waterbody crossings within the Jefferson National Forest.

4.6.2.7 Fisheries of Special Concern

Mountain Valley Project

Mountain Valley would implement erosion and sediment control BMPs described in its *Erosion and Sediment Control Plan* and its Procedures at all crossings of waterbodies containing fisheries of special concern. Mountain Valley also would adhere to all federal and state permit conditions regarding the minimization of impacts on fisheries of special concern including adhering to recommended work windows for in-water construction (or requesting a work-window modification, if needed). Mountain Valley would attempt to minimize impacts on fisheries by relocating fishes from the construction areas following guidance from the VADGIF, who requested that fish be relocated during waterbody crossings in Virginia. Additionally, Mountain Valley would reduce impacts on freshwater mussels by relocating mussels in the construction zone in accordance with both West Virginia and Virginia mussel protocol documents. All fish and freshwater mussel relocations would be supervised by qualified, professional biologists in possession of pertinent federal and/or state permits.

Finally, aside from a temporary disruption of fishing in the vicinity of the waterbody crossings during construction, we do not expect the project to impact recreational fisheries in West Virginia or Virginia. In response to a comment from the VADEQ, Mountain Valley stated it would coordinate with the VADGIF to ensure avoidance of trout stocking and/or angling activities in Little Stony Creek in Giles County, Virginia during construction and operation of the MVP. Mountain Valley would use dry open-cut methods to traverse Bottom Creek in Virginia upstream of the segment of the creek designated as a Tier III waterbody. These methods, implementation of Mountain Valley's *Erosion and Sediment Control Plan* and its Procedures, and abiding by the time-of-year restrictions designated by the VADGIF for in-stream construction, would allow Mountain Valley to minimize effects due to sedimentation and turbidity on Bottom Creek.

4.6.2.8 Conclusions Regarding Impacts on Aquatic Resources and Mitigation

Based on our review of the potential impacts discussed above, we conclude that constructing and operating the MVP and the EEP would not significantly impact fisheries and aquatic resources. As described above, the Applicants have proposed several measures to avoid or minimize impacts on fisheries, and would be required to implement construction, mitigation, and restoration measures required by the COE and state permitting agencies that would further minimize impacts.

On March 23, 2017, the WVDEP conditionally granted Mountain Valley a CWA Section 401 WQC permit, for construction of the MVP. The certification is subject to Mountain Valley following a list of 19 special conditions along with standard CWA Section 401Water Quality conditions. Among the conditions that Mountain Valley must follow to comply with West Virginia's WQC and water quality standards regulations are that Mountain Valley must complete all stream crossings in accordance with the FERC Plan and its project-specific Procedures and the *Stream Bank Restoration Plan* that Mountain Valley submitted to the WVDEP in March of 2017.

4.7 THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES

Special status species are afforded protection by law, regulation, or policy by federal and/or state agencies. For the purposes of this EIS, special status species include federally listed species that are protected under the ESA or are under review as candidates for such listing by the FWS; federal species of concern; and species that are state-listed as threatened, endangered, or have been given certain other state designations.

Impacts on endangered, threatened, and other special status species would be similar as those listed in sections 4.5 and 4.6 for wildlife and aquatic species. Impacts on special status species may be greater than impacts on other wildlife and vegetation because these species may be more sensitive to disturbance; more specific to a habitat; and less able to move to unaffected suitable habitat since such habitat may not be available within a reasonable proximity, may not be available at all, or may exist only in small tracts. Potential impacts that could affect the conservation needs of a species or decrease the viability of a population include habitat fragmentation, loss, or degradation; decreased breeding or nesting success; increased predation or decreased food sources; and injury or mortality.

Federal agencies are required by the ESA Section 7(a)(2) to ensure that any action authorized, funded, or carried out by the agency would not jeopardize the continued existence of a federally listed threatened or endangered species or species proposed for listing, or result in the destruction or adverse modification of designated critical habitat. As the lead federal agency, the FERC is responsible for determining whether any federally listed endangered or threatened species or any of their designated critical habitats are near the proposed action, and to determine the proposed action's potential effects on those species or critical habitats. None of the waters crossed by the MVP and the EEP are managed by the NMFS. Consequently, consultation with the NMFS is not required.

Although candidate species do not receive federal protection under the ESA, we considered the potential effects on these species so that Section 7 consultation could be facilitated in the event one or more of these species become proposed for federal listing before or during construction of the MVP and the EEP. Should a federally listed, proposed, petitioned, or candidate species be identified during construction that has not been previously identified during field surveys or assessed through consultation, and project activities could adversely affect the species, the Applicants are required to suspend the construction activity and notify the Commission and the FWS of the potential affect. The construction activity could not resume until the Commission completes its consultation with the FWS.

For actions involving major construction activities with the potential to affect listed species or critical habitats, the lead federal agency must prepare a BA. The lead federal agency must submit its BA to the FWS and, if it is determined that the action may adversely affect a federally listed species, the lead agency must submit a request for formal consultation to comply with Section 7 of the ESA. In response, the FWS would issue a BO as to whether the proposed action would jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

Mountain Valley performed habitat and species surveys in 2015 and 2016 and filed survey reports which outlined the survey methodologies, locations where surveys were conducted, and the survey results. If a special status species was identified, the location was recorded and information about the species characteristics and habitat was documented. Mountain Valley is continuing efforts to obtain land access for surveys of about 21 miles of the MVP. The Applicants utilized the results of the botanical and biological surveys to develop a draft BA.

The FERC final BA will be based on Mountain Valley's Applicant-prepared draft BA. Mountain Valley previously submitted drafts of their BA to the FWS field offices in West Virginia and Virginia for comments. Mountain Valley filed a copy of its first draft BA with the FERC in June 2016. In response to comments from the FWS field offices, Mountain Valley revised the document. Mountain Valley filed the second version of their Applicant-prepared draft BA with the FERC in March 2017. On May 3, 2017, FWS staff from both the West Virginia and Virginia Field Offices provided FERC staff with their comments on Mountain Valley's second revised draft Applicant-Prepared BA. On May 10, 2017, FERC staff issued an EIR regarding comments from the FWS staff on Mountain Valley's second revised draft Applicant-Prepared BA, which Mountain Valley responded to on May 18, 2017.

We are currently preparing the final BA, which will be submitted to the FWS separately from this final EIS and will address the comments of the FWS on the Applicants' drafts. The BA will outline the life history information of all federally listed species with the potential to occur in the project area and detail our assessment of the effects of the projects on these species. Potential effects of the projects and conservation measures to avoid and/or minimize such effects will also be included in the BA. This section of the EIS summarizes our BA, and presents our findings of effects for each federally listed species that may be affected by the projects.

4.7.1 Federally Listed Threatened, Endangered, and Other Species of Concern

The Applicants informally coordinated with the FWS regarding federally listed species and designated critical habitat in the project areas. The Applicants also communicated with the FS, PAGC, PADCNR, WVDNR, VADCR DNH, and VADGIF. Based on these communications and a review of the FWS' Information for Planning and Conservation (IPaC) database and other publicly available information, the Applicants identified 23 federally listed or otherwise sensitive species as occurring or possibly occurring in the project areas. Tables 4.7.1-1 and 4.7.1-2 list the federally threatened, endangered, and other federal species of concern that are known to occur or could occur within the project areas. None of the identified species have designated Critical Habitat in the MVP or EEP areas.

TABLE 4.7.1-1

Federally Listed and Other Sensitive Species Known to Occur or Potentially Occurring in the Mountain Valley Project Area a/

Common Name	Scientific Name	Status b/	Determination of Effect
Mammals			
Gray bat	*Myotis grisescens*	E	Not Likely to Adversely Affect
Indiana bat	*Myotis sodalis*	E	**Likely to Adversely Affect**
Northern long-eared bat	*Myotis septentrionalis*	T	**Likely to Adversely Affect**
Virginia big-eared bat	*Corynorhinus townsendii virginianus*	E	Not Likely to Adversely Affect
Fish			
Candy darter	*Etheostoma osburni*	PC	Not Likely to Contribute to a Trend Toward Federal Listing
Orangefin madtom	*Noturus gilberti*	PC	Not Likely to Contribute to a Trend Toward Federal Listing
Roanoke logperch	*Percina rex*	E	**Likely to Adversely Affect**
Mussels			
Atlantic pigtoe	*Fusconaia masoni*	SOC	No Adverse Impacts Anticipated
Clubshell	*Pleurobema clava*	E	Not Likely to Adversely Affect
Green floater	*Lasmigona subviridis*	PC	Not Likely to Contribute to a Trend Toward Federal Listing
James spinymussel	*Pleurobema collina*	E	Not Likely to Adversely Affect
Snuffbox mussel	*Epioblasma triquetra*	E	Not Likely to Adversely Affect
Yellow lampmussel	*Lampsilis cariosa*	PT	Not Likely to Adversely Affect
Reptiles			
Bog turtle	*Glyptemys muhlenbergii* (southern population)	T(S/A)	Not Subject to Section 7 Consultation c/
Invertebrates			
Ellett Valley millipede	*Pseudotremia cavernarum*	SOC	No Adverse Impacts Anticipated
Mitchell satyr butterfly	*Neonympha mitchellii*	E	No Effect
Rusty patched bumble bee	*Bombus affinis*	E	Not Likely to Adversely Affect
Plants			
Northeastern bulrush	*Scirpus ancistrochaetus*	E	No Effect
Running buffalo clover	*Trifolium stoloniferum*	E	**Likely to Adversely Affect**
Shale barren rock cress	*Arabis serotina*	E	**Likely to Adversely Affect**
Small whorled pogonia	*Isotria medeoloides*	E	**Likely to Adversely Affect**
Smooth coneflower	*Echinacea laevigata*	E	Not Likely to Adversely Affect
Virginia spiraea	*Spiraea virginiana*	E	**Likely to Adversely Affect**

a/ We address the diamond darter (E), roughead shiner (SOC), pink mucket (E), and Cheat Mountain salamander (T) in the text in response to comments received; however, these species would not occur within the project area and are therefore not included in this table.

b/ E = Listed Endangered; T = Listed Threatened; PC = Potential Candidate for Listing (currently under FWS review); PT = Proposed Threatened; T(S/A) = Listed Threatened Due to Similarity of Appearance to the federally threatened northern population; SOC = Species of Concern

c/ By definition, a species that is threatened due to similarity of appearance is not biologically threatened and is not subject to ESA Section 7 consultation. Therefore, we do not provide an effect determination in this section. A determination at the state level is provided in section 4.7.2.

Sources: FWS, 2015; VADCR, 2015; VADGIF, 2015.

TABLE 4.7.1-2			
Federally Listed Species Known to Occur or Potentially Occurring in the Equitrans Expansion Project Area			
Common Name	**Scientific Name**	**Status a/**	**Effects Determination**
Mammals			
Indiana bat	*Myotis sodalis*	E	Not Likely to Adversely Affect
Northern long- eared bat	*Myotis septentrionalis*	T	Not Likely to Adversely Affect
a/ E = Federally Listed as Endangered; T = Federally Listed as Threatened			

4.7.1.1 Mountain Valley Project

Mammals

There are four federally threatened or endangered mammals that could be affected by the MVP: the gray, Indiana, northern long-eared, and Virginia big-eared bats. To assess potential impacts of the MVP on these species, Mountain Valley conducted searches for potential bat hibernacula and surveys to assess bat presence and habitat suitability along the MVP corridor. Mountain Valley received guidance and concurrence on its methods from the FWS Elkins, West Virginia and Gloucester, Virginia Field Offices, the WVDNR, and the VADGIF.

From November 2014 to October 2016, as advised by the FWS, Mountain Valley followed protocols within the Northern Long-Eared Bat Interim Conference and Planning Guidance (FWS, 2014a) and Draft Protocol for Assessing Abandoned Mines/Caves for Bat Use (FWS, 2011) to search for (within the bounds of access permission) and evaluate any voids and underground features that could serve as hibernacula. Mountain Valley then used harp traps and acoustic monitors to survey the potentially suitable portals in West Virginia and Virginia and assess whether bats used the features as hibernacula (ESI, 2016c; 2016d; 2016e, 2016f).

From May 2015 to August 2015 and again in May 2016, Mountain Valley conducted mist net surveys for bats along the entire proposed route of the MVP (ESI, 2015a; 2015b; 2016g). Mountain Valley followed protocols within the Range-wide Indiana Bat Summer Survey Guidelines, which is also applicable for northern long-eared bats for summer surveys, and guidance from the FWS Elkins Field Office and the WVDNR. A total of 1,476 bats were captured during the surveys, including 74 northern long-eared bats, 16 tri-colored bats (*Perimyotis subflavus*), and 3 little brown bats (*Myotis lucifugus*). No gray, Indiana, or Virginia big-eared bats were captured. Mountain Valley attached radio transmitters to the captured northern long-eared bats and tracked the bats to determine diurnal (i.e., daytime) roost locations in the vicinity of the MVP.

From February 2015 through November 2015, Mountain Valley conducted habitat assessment surveys for sections of the MVP that would overlap with protective buffers associated with historic bat captures, roosts, and hibernacula (ESI, 2016h; 2016i). The stated goal of the surveys was to assess habitat suitability in order to quantify potential impacts on special status species that could be caused by timber removal during construction of the project.

Experienced and permitted bat biologists surveyed the environmental survey corridor, centered on the pipeline (300 feet wide) and access roads (50 feet wide), and all additional temporary workspace and aboveground facilities. Mountain Valley identified trees and "habitat patches" that were biologically similar and suitable for use by roosting and foraging bats based on available literature, habitat models (3D/Environmental 1995), and experience with the species. The biologists noted the overall suitability of each habitat patch, mapped the location of each potential roost tree, and ranked the overall suitability (i.e., roosting potential) of each tree as high, moderate, or low.

Mountain Valley would implement measures to avoid or minimize potential adverse impacts on Indiana, northern long-eared, gray, and Virginia big-eared bats related to constructing and operating the MVP. Specific measures would include the following:

- avoiding felling of known roost trees, as possible;
- avoiding impacts on potentially suitable hibernacula in the vicinity of the MVP, as possible;
- suspending tree clearing operations from April 1 to November 15 within 5 miles of entrances to known Indiana bat hibernacula and within 0.25 mile of entrances to known northern long-eared bat hibernacula to prevent mortality to individuals engaging in autumn swarming or spring staging activities;
- suspending all tree clearing operations from June 1 through July 31 to prevent mortality to non-flying young; and
- clearly marking the project construction right-of-way to reduce the chance of cutting more trees than Mountain Valley plans and to maintain the maximum amount of suitable summer maternity habitat.

Indiana Bat

The Indiana bat is a federally listed endangered species and state-listed endangered species in Pennsylvania and Virginia. The Indiana bat is relatively small, weighing only 0.25 ounce, and has a wingspan of 9 to 11 inches. It hibernates during winter in caves or, occasionally, in abandoned mines from November through March. For hibernation, it requires cool, humid caves with stable temperatures, under 50 °F but above freezing. The hibernacula typically have large volumes of Indiana bats and often have large rooms and vertical or extensive passages (FWS, 2006).

When active, the Indiana bat roosts in dead trees, dying trees, or live trees with exfoliating bark. During the summer months, most reproductive females occupy roost sites that receive direct sunlight for more than half the day. Roost trees are generally found within canopy gaps in a forest, fence line, or along a wooded edge. Maternity roosts are found in riparian zones, bottomland and floodplain habitats, and wooded wetlands, as well as in upland communities. Indiana bats forage in semi-open to closed forested habitats, forest edges, and riparian areas (FWS, 2004). Threats to the species include anthropogenic disturbance and the spread of white-nose syndrome. White-nose syndrome is a contagious fungal disease affecting bats with a potentially high mortality rate and is known to be present in Pennsylvania, West Virginia, and Virginia.

Although no Indiana bats were observed during mist net and acoustic surveys, we are assuming presence of Indiana bats between MPs 0 and 10.3 of the MVP pipeline route based on documentation of a pregnant female Indiana bat occupying summer habitat in the vicinity during an unrelated study in 2010 (FWS 2013). Mountain Valley would therefore implement measures to avoid and minimize effects on Indiana bats including refraining from tree clearing activities between June 1 and July 31 to minimize take of adults and non-flying young. However, loss of habitat and the clearing of maternity roosts along with general construction disturbance would affect Indiana bats. Therefore, we have determined that the MVP *is likely to adversely affect* the Indiana bat. As such, we will request formal ESA Section 7 consultation with the FWS for the Indiana bat in our upcoming BA.

Northern Long-eared Bat

The northern long-eared bat is a federally listed threatened species and state-listed endangered species in Virginia. The northern long-eared bat is a medium-sized bat with a body length of 3 to 3.7 inches and a wingspan of 9 to 10 inches. Its fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in the genus *Myotis*. It hibernates during the winter in small crevices and cracks within caves and mines with constant temperatures, high humidity, and no air currents.

In the summer, the northern long-eared bat roosts singly or in colonies beneath the bark or in cavities or crevices of live and dead trees (snags). They seem to select roosts based on the suitability of the tree to retain bark or contain cavities and crevices rather than preferring specific tree species. Males and non-reproductive females may also roost in caves or mines. Pregnant bats roost in maternity colonies of 30 to 60 females and young bats. Most bats within a maternity colony give birth at the same time and young bats are flying by about 18 to 21 days post-birth. Northern long-eared bats forage at dusk on moths, flies, leafhoppers, caddisflies, and beetles by flying through the understory of forested areas using echolocation or catching motionless insects from vegetation. Threats to the species include anthropogenic disturbance during hibernation, loss and degradation of summer habitat, and the spread of white-nose syndrome.

Mist net, acoustic, and portal surveys confirmed the presence of northern long-eared bats and associated roost trees throughout both West Virginia and Virginia. Mountain Valley would therefore implement measures to avoid and minimize effects on northern long-eared bats including refraining from tree clearing activities between June 1 and July 31 to minimize take of adults and non-flying young. However, loss of habitat and the clearing of maternity roosts along with general construction disturbance would affect northern long-eared bats. Therefore, we have determined that the MVP *is likely to adversely affect* the northern long-eared bat. As such, we will request formal ESA Section 7 consultation with the FWS for the northern long-eared bat in our upcoming BA.

Gray Bat

The gray bat is a federally listed endangered species and state-listed endangered species in Virginia. The gray bat is the largest species in the *Myotis* genus in eastern North America with a wingspan of about 10 to 12 inches. Its fur is uniformly dark gray. The gray bat inhabits caves in both winter and summer, using colder hibernating caves or mines in the winter and warmer caves, mines, or other structures for roosting during the summer.

In the summer, maternity colonies may consist of a few hundred to many thousands of individuals and females give birth to a single pup in late May or early June. Young are flying by about 21 to 33 days post-birth. Gray bat feeding locations are strongly correlated with open water, including rivers, streams, lakes, and reservoirs, and most maternity colonies are located within 0.5 to 2.5 miles from feeding locations. They gray bat is strongly dependent upon aquatic insects, including mayflies, caddisflies, and stoneflies, as its food source though it will also feed on beetles and moths (FWS, 2009).

In August of 2016, a gray bat was captured during an unrelated mist net study in Logan County, West Virginia. At its easternmost point, Logan County is about 47 miles west of the closest point on the MVP pipeline route. As this would represent a range expansion of the gray bat within West Virginia, the FWS issued a statement advising potential presence of the gray bat within 13 West Virginia counties not previously known to contain summer occurrences of the species. This list included Fayette, Monroe, and Summers Counties. No gray bats were observed during mist net and acoustic surveys for the MVP. Additionally, no summer roosts are known to occur within the vicinity of the MVP and only fossil records note gray bats hibernating in counties crossed by the MVP. Therefore, we have determined that the MVP *is not likely to adversely affect* the gray bat.

Virginia Big-Eared Bat

The Virginia big-eared bat is a federally listed endangered species and state-listed endangered species in Virginia. The Virginia big-eared bat is one of five subspecies of the Townsend's big-eared bat (*Corynorhinus townsendii*) and the only subspecies known to occur east of the Mississippi River. It is a medium sized bat with light brown or buff fur. It has large ears greater than 1 inch in length and two mitten-shaped glandular masses on each side of its nose.

The Virginia big-eared bat inhabits caves in both winter and summer, using cooler, better ventilated portions of caves during the winter and migrating less than 20 miles to reach summer roosting caves. Maternity colonies also occur in the warmer portions of caves where females give birth to young in early spring. Young are flying by about 21 days post-birth. The Virginia big-eared bat feeds on moths and other insects by flying along forest edges and detecting prey using sonar (FWS, 2011b).

No Virginia big-eared bats were observed during mist net and acoustic surveys for the MVP. Additionally, no summer roosts or winter hibernacula are known to occur within the vicinity of the MVP. However, the known range of the species extends within Fayette County and there are abandoned mines known to be occupied by Virginia big-eared bats within 20 miles of the MVP; therefore there is a small potential that Virginia big-eared bats migrating between winter and summer roosts could be affected by the MVP. We deemed this potential to be very low; therefore we have determined that the MVP *is not likely to adversely affect* the Virginia big-eared bat.

Birds

The MVP would not affect any federally threatened, endangered, or special status species of birds. Bald and golden eagles are not listed species under the ESA; however, they are protected under the MBTA and BGEPA. Federal protection of bald and golden eagles and their presence in the vicinity of the MVP and EEP are discussed in sections 4.5.1.1 and 4.5.2.6.

Fish

Three fishes comprise the federally endangered and sensitive species that could be affected by the MVP: the Roanoke logperch, candy darter, and orangefin madtom. We received comments regarding two other species, the diamond darter and roughead shiner that would not occur within the project area.

Roanoke Logperch

The Roanoke logperch (*Percina rex*) is a federally listed endangered species and a state-listed endangered species in Virginia. It is a large darter, growing up to 6.5 inches in length. Its markings are described as 8 to 11 lateral dark-green vertical blotches interspersed between dorsal saddles, speckled fins with the first dorsal fin having an orange band, and a bulbous snout. It can be found in larger streams in the upper Roanoke, Smith, Pigg, Otter, Nottoway river systems, and Goose Creek in Virginia

Roanoke logperch typically exist in low density populations and inhabit medium-to-large sized warm, clear streams and small rivers of moderate to low gradient. Adults usually occupy riffles, runs, and pools containing sand, gravel, or boulders that are free of silt. Young-of-year congregate in mixed-species schools in shallow habitat underlain by sand and gravel along stream margins. They actively feed during the warmer months by utilizing their snout to overturn gravel to forage on aquatic organisms on and in the streambed.

Roanoke logperch spawn in April or May in deep runs over gravel and small cobble, and they typically bury their eggs with no subsequent parental care. Roanoke logperch reach maturity by 2 to 3 years of age and commonly live 5 to 6 years (FWS, 2015c).

The MVP pipeline route would cross three waterbodies known to contain the federally endangered Roanoke logperch (Roanoke River, Pigg River, and North Fork Roanoke River). Mountain Valley surveyed 42 additional streams in 2015 and 2016 to assess whether they contained suitable habitat for Roanoke logperch, and determined 11 of these streams do contain suitable habitat (ESI, 2015c; 2016j). However, we are unaware of any documented records of Roanoke logperch within these 11 streams. Based on suitable habitat and to facilitate the development of mitigation measures, we are assuming potential presence of Roanoke logperch within these 11 streams. As such, Mountain Valley has conducted site-occupancy modeling to estimate the number of individuals that could be harassed, injured, or killed during construction and operation.

Mountain Valley has committed to adhering to time-of-year-restrictions for crossings of these 14 waterbodies with known or assumed presence of Roanoke logperch (i.e., VADGIF requests that no construction take place between March 15 and June 30). In section 4.3 we recommend that Mountain Valley use an HDD as the crossing method for the Pigg River. Mountain Valley would relocate any Roanoke logperch encountered during pre-construction fish surveys at waterbody crossings, per direction from the VADGIF. However, any Roanoke logperch encountered during the fish surveys would be considered harassed based on the definition of take within the ESA, and relocation efforts would present inherent risks of injury or mortality to individual fish. Therefore, based on the known and assumed presence of Roanoke logperch, and the expected impacts on fish, we have determined that the MVP *is likely to adversely affect* this species. Accordingly, we will request formal Section 7 consultation with the FWS for the Roanoke logperch in our upcoming BA.

Candy Darter

The candy darter (*Etheostoma osburni)* is a potential candidate species under review by the FWS for listing as federally threatened or endangered under the ESA (Federal Register, 2011). It typically grows to 3 to 4 inches in length and its males are colored blue-green with 9 to 10 vertical red bars surrounded in white along its sides. It has two dorsal fins, a spiny anterior fin and a soft-rayed posterior find, and large pectoral fins. The candy darter is found only within the Kanawha River drainage above the Kanawha Falls in West Virginia and Virginia. Its habitat is comprised of fast riffles over rubble, stones, or boulders within small to medium cold or warm rivers. The candy darter feeds on insects and spawning typically peaks in middle to late May (NatureServe, 2015).

The candy darter may occur in three waterbodies (Gauley River, the Greenbrier River, and Indian Creek) that the MVP pipeline route would cross in West Virginia, and one stream (Stony Creek) in Virginia. Neither the WVDNR nor the VADGIF requested Mountain Valley to conduct surveys for the candy darter in the respective states. In West Virginia, Mountain Valley would cross each of the waterbodies using the dry open-cut method and would abide by the time-of-year restriction for construction in warm waters (i.e., no construction between April 1 and June 30). Within Virginia, Mountain Valley has agreed, at the request of the VADGIF, to assume the presence of the candy darter within Stony Creek. The VADGIF requested that construction only occur in Stony Creek between July 31 and August 15 as a result of successive time-of-year restrictions of other special status species or fisheries of concern (such as coldwater fisheries, wild trout, stocked trout, and mussels). Based on the measures Mountain Valley would implement to avoid or minimize impacts on fisheries (as discussed in section 4.6.2), including using the dry open-cut crossing method, adhering to time-of-year restrictions for construction in West Virginia and Virginia, and relocating fishes from the construction areas in Virginia following guidance from the VADGIF and under supervision of qualified, professional biologists in possession of pertinent federal and/or state permits, we conclude that the MVP is not likely to contribute to a trend toward federal listing for the candy darter.

Orangefin Madtom

The orangefin madtom (*Noturus gilbert*) is a potential candidate species under review by the FWS for listing as federally threatened or endangered under the ESA (Federal Register, 2011) and is listed as threatened in Virginia. The range of this fish includes the Roanoke and James River drainages in Virginia It typically grows to approximately 2 to 3 inches in length and is brown or olive colored on its dorsal side and pale yellow or white on its ventral side. It has a slender body and a flat head, similar to a catfish, with short barbels surrounding its mouth. Its habitat is comprised of fast riffles over small cobble without much sand or silt. The orangefin madtom inhabits the interstitial space between the cobbles. It feeds on insects and spawns in late-April through June (NatureServe, 2015).

The orangefin madtom is known to occur in three waterbodies (Roanoke River, Craig Creek, and Mill Creek) crossed by the MVP pipeline route in Virginia. Surveys for the orangefin madtom were conducted by Mountain Valley in tandem with surveys for the Roanoke logperch in 2015. Communications between Mountain Valley and VADGIF staff in March 2016 indicated presence/absence surveys for the orangefin madtom would not be effective due to its cryptic nature. The VADGIF further stated that surveys would not be necessary as long as Mountain Valley would abide by the time-of-year restrictions for orangefin madtom. The VADGIF requested that no in-water construction take place between March 15 and May 31 in perennial streams within the Roanoke and Pigg River basins. Mountain Valley asserted in its application to the FERC that it would abide by all time-of-year-restrictions as provided by the VADGIF for in-stream work. Therefore, we conclude that the MVP is not likely to contribute to a trend toward federal listing for the orangefin madtom.

Diamond Darter

We received comments regarding effects of the MVP on the federally endangered diamond darter (*Crystallaria cincotta*), given that the MVP would cross the Elk River, the only river in West Virginia in which the diamond darter is known to occur. The diamond darter is of the perch family and inhabits medium to large, warmwater streams with moderate current and clean sand and gravel substrates. In the Elk River, the diamond darter has been collected from riffles and pools where swift currents result in clean-swept, predominately sand and gravel substrates that lack silty depositions (Federal Register, 2013).

Historical records of the species indicate that the diamond darter was distributed throughout the Ohio River Basin. However, the diamond darter is currently known to occur only within the lower Elk River in Kanawha and Clay Counties, West Virginia, more than 110 miles downstream of the construction work area of the MVP pipeline. Additionally, the MVP would cross the Elk River upstream of Sutton Lake, a reservoir on the Elk River in Braxton County. This reservoir would prevent any potential upstream movement of the diamond darter to within the construction work areas of the MVP. Therefore, the MVP would have *no effect* on the diamond darter.

Roughead Shiner

We also received comments regarding the effects of the MVP on the roughhead shiner (*Notropis semperasper*), a federal species of concern. This species is listed as a FS Sensitive Species in section 4.7.3.1. The roughhead shiner is a species of freshwater fish in the family *Cyprinidae*. It is found only in the upper James River drainage of Virginia. The species is not known to occur within any counties or sub-watersheds through which the MVP pipeline route would pass (NatureServe, 2015). Craig Creek is known to contain populations of roughhead shiner, but all known records of the species are located at least 17 miles downstream of where the

MVP would cross Craig Creek. The time-of-year restriction from in-water construction that Mountain Valley would adhere to for crossing Craig Creek, March 1 to July 31, encompasses the VADGIF recommended time-of-year restriction for the roughhead shiner (March 15 to June 30) and, given Mountain Valley's commitment to implement its Procedures during waterbody crossings, increased sedimentation within Craig Creek as a result of construction activities would be unlikely to extend downstream to the previously documented locations of the roughhead shiner populations. Therefore, we would not anticipate any adverse impacts on the roughhead shiner.

Mussels

The MVP pipeline would cross several waterbodies potentially containing federally listed and otherwise sensitive mussel species, including the Elk River, Leading Creek, and the Little Kanawha River in West Virginia; and Craig Creek, Mill Creek, and Stony Creek in Virginia. Mountain Valley's surveys conducted in 2015 and 2016 did not document the presence of any federally sensitive freshwater mussels (ESI, 2015d; ESI, 2015e; ESI, 2016k; ESI, 2016l). The Gauley River, in Nicholas County, West Virginia was not surveyed due to unsafe conditions resulting from high flow velocities (i.e., rapids). This river is known to contain freshwater mussels but is considered a Group 1 stream in the West Virginia Mussel Survey Protocols, which means in part that it is not known to contain federally listed species (Clayton et. al., 2015). The WVDNR waived the requirement to survey this river for state-listed species due to the conditions, and no further surveys are planned.

Based on the absence of federally listed and sensitive mussels and Mountain Valley's commitment to implement its Procedures during the crossings, we have determined that the MVP *is not likely to adversely affect* the clubshell, James spinymussel, and snuffbox. We will be requesting concurrence from the FWS for this determination in our forthcoming BA. We further conclude that the MVP would not have adverse impacts on the Atlantic pigtoe and yellow lampmussel, and that the project would not contribute to a trend toward federal listing for the green floater.

The FWS announced on April 4, 2017 (Federal Register, 2017a) that it is proposing to list the yellow lance mussel (*Elliptio lanceolate*) as federally threatened under the ESA. This species is currently listed as a FS Sensitive Species in section 4.7.3 of this EIS. Mussel surveys for the MVP did not document yellow lance mussels at any of the waterbody crossings. The closest known population of yellow lance mussel to the MVP is within a portion of Craig Creek about 36 miles downstream of the MVP pipeline crossing. As with the other listed and sensitive mussel species, we conclude that based on Mountain Valley's commitment to implement its Procedures during crossing of Craig Creek and all waterbodies, the MVP is *not likely to adversely affect* the yellow lance mussel should it be listed as threatened.

We received a comment regarding the effects of the MVP on the pink mucket (*Lampsilis abrupta)*, a mussel federally listed as endangered and known to occur in West Virginia and Virginia. However, Scott County, in which the pink mucket has been known to occur in Virginia, is southwest of the MVP pipeline route. Similarly, Kanawha, and Wood Counties in West Virginia, in which the pink mucket has been known to occur, are west of the MVP pipeline route. The pink mucket has also been known to occur in Fayette County, West Virginia, which the MVP pipeline route does cross; however, the pink mucket is only known to occur within the Kanawha

River in Fayette County, which the MVP pipeline route does not cross (NatureServe, 2015). Therefore, we conclude the MVP would have *no effect* on the pink mucket.

Reptiles

Bog Turtle

The southern population of the bog turtle (*Glyptemys muhlenbergii*) is federally listed as threatened due to similarity in appearance to the federally listed threatened northern population. The bog turtle also is state-listed as endangered in Virginia. The range for the bog turtle extends from Vermont to Georgia, and west to Ohio. It is one of the smallest turtles in the North America, with a carapace width of up to 3.1 to 4.5 inches. Its carapace may be light brown to black and may have a radiating pattern of light-colored lines or be uniformly dark. It is characterized by a bright yellow, orange, or red blotch on each side of its head. The bog turtle is typically found in small, discrete populations within open-canopied wetlands consisting of herbaceous sedge meadows and fens surrounded by wooded areas. It requires mixed habitat wetlands consisting of dry areas, saturated areas, and areas that are periodically flooded to provide habitat for foraging, nesting, basking, sheltering, and hibernating (FWS, 2001).

The bog turtle may occur along affected segments of Bottom Creek in Virginia. Mountain Valley conducted Phase I bog turtle habitat surveys in 2015 and 2016 (ESI, 2016m). The surveys completed to date indicate that there is no suitable habitat present within the MVP area. However, due to access restrictions, habitat assessments are not complete for one parcel of about 22 acres along the MVP in Roanoke County. Mountain Valley intends to conduct a Phase I bog turtle habitat survey on this parcel once access is obtained.

By definition, a species that is threatened due to similarity of appearance is not biologically threatened and is not subject to ESA Section 7 consultation. Therefore, we do not provide an effect determination in this section. A determination at the state level is provided in section 4.7.2.

Amphibians

We received a comment regarding the effect of the MVP on the Cheat Mountain salamander (*Plethodon nettingi)*, a federally listed threatened species. The remaining habitat of the Cheat Mountain salamander is primarily within the Monongahela National Forest and counties well east of the MVP pipeline route in West Virginia. The MVP would not cross any locations known to contain the Cheat Mountain salamander; therefore, we conclude the MVP would have *no effect* on the species.

Terrestrial Invertebrates

There are three special status species of terrestrial invertebrates that were considered to be potentially affected by the MVP: the Ellett Valley millipede, Mitchell satyr butterfly, and the rusty patched bumble bee.

Ellett Valley Millipede

The Ellett Valley millipede (*Pseudotremia cavernarum*) is a cave-dwelling federal species of concern and state-listed as threatened in Virginia. Its known range is restricted to Montgomery County, Virginia. As of 1995, the millipede had been found in at least five caves (Eruart Cave, Aunt Nellies Hole, Daves Cave, Heartbeat Cave, and Unnamed Cave A). Individuals were noted from May to July; indicating that this millipede apparently emerges in early spring for mating. All specimens were found on damp organic material, usually wood, which may be a food source (Simon, 1997).

The VADCR believes that the Ellett Valley millipede may exist in Slussers Chapel Cave and Old Mill Cave in the vicinity of the MVP. However, in March 2017 the VADCR informed Mountain Valley that surveys for the Ellett Valley millipede are not warranted at this time, because the adoption of the Mount Tabor Variation into the proposed route would avoid impacts on Slussers Chapel Cave and Old Mill Cave (VADGIF, 2017a). If unknown or undocumented caves or karst features are discovered along the MVP pipeline route, then the VADGIF may then require surveys for the Ellett Valley millipede prior to construction. Based on the currently known conditions and best available information, we conclude that the MVP would not have adverse impacts on this species.

Mitchell Satyr Butterfly

Initial reviews of the pipeline route indicated the MVP may affect the federally endangered Mitchell satyr butterfly (*Neonympha mitchellii mitchellii)*. This is a rare butterfly found in Michigan and Indiana. However, multiple new populations of what appears to be Mitchell’s satyr continue to be discovered in the southeastern United States (Alabama, Mississippi, and Virginia). The FWS no longer considers this species present in the counties crossed by the MVP. No surveys were required for this species by either federal or state agencies. Therefore, we conclude that the MVP will have *no effect* on the Mitchell satyr butterfly.

Rusty Patched Bumble Bee

The rusty patched bumble bee (*Bombus affinis*), was listed as federally endangered on March 21, 2017 (Federal Register, 2017b). Rusty patched bumble bees appear similar to other bumble bees, having large, round bodies with black and yellow coloration. All rusty patched bumble bees have entirely black heads and the workers and males have a rusty reddish patch centrally located on the abdomen.

The rusty patched bumble bee has been documented inhabiting woodlands, marshes, agricultural landscapes, and residential parks and gardens. The species requires areas that support sufficient food (nectar and pollen from diverse and abundant flowers), undisturbed nesting sites in proximity to floral resources, and overwintering sites for hibernating queens. Nests are typically in abandoned rodent nests or other similar cavities and colonies may consist of up to 1,000 individual workers in a season.

Prior to the 1990s, the rusty patched bumble bee was present in 28 states throughout the eastern and midwestern United States. Since 2000, the rusty patched bumble bee has been documented in just 13 states. Historical data indicate populations of the rusty patched bumble bee were present in Giles and Montgomery Counties, Virginia, and Braxton, Fayette, Lewis, and Nicholas Counties, West Virginia. The closest known population of the rusty patched bumble bee appears to have been more than 3 miles from the MVP within Lewis County, West Virginia. The last known population in Virginia was in Fauquier County, which is in northern Virginia about 140 miles from the MVP. Therefore, we conclude that the MVP *is not likely to adversely affect* the rusty patched bumble bee.

Plants

There are six federally endangered plants that could be affected by the MVP: the northeastern bulrush; running buffalo clover, shale barren rock cress, small whorled pogonia, smooth coneflower, and Virginia spiraea. Plant surveys were conducted in 2015 and 2016 by a FWS-approved botanist to document the presence or absence of these species in the vicinity of the MVP. To date, surveys of the MVP corridor have not documented any of the endangered plants (ESI, 2015f; ESI, 2015g; ESI, 2016n; ESI, 2016o).

Northeastern Bulrush

The northeastern bulrush (*Scirpus ancistrochaetus*) is a member of the sedge family (*Cyperaceae*) and is native to the northeastern United States. It is a leafy, perennial herb that grows to approximately 31.5 to 47.2 inches in height and is primarily found in ponds, wet depressions, or shallow sinkholes within small (generally less than one acre) wetland complexes characterized by seasonally variable water levels (FWS, 1993). Populations of northeastern bulrush are present in Maryland, Massachusetts, New Hampshire, Pennsylvania, Vermont, Virginia, and West Virginia.

Mountain Valley conducted field surveys for northeastern bulrush and its habitat in August 2015. Northeastern bulrush was not observed during the surveys; nor was potential habitat for the species. Therefore, we conclude that the MVP would have *no effect* on the northeastern bulrush.

Running Buffalo Clover

Running buffalo clover (*Trifolium stoloniferum*) is a perennial herb with erect flowering stalks that have two large trifoliate leaves at their summit. Its flowering stalks are typically 3.0 to 6.0 inches tall. The round flowering heads occur in mid-April to June with wilted flowering heads persisting for a short time thereafter. It grows in relatively moist, fertile soils in regions with limestone or other calcareous bedrock. It is often found in semi-shaded, moist openings, and edge habitats maintained by some form of long-term disturbance, such as footpaths, logging trails, and grazed, semi-wooded terraces along stream corridors. Running buffalo clover currently grows in limited portions of Arkansas, Indiana, Kentucky, Missouri, Ohio, and West Virginia. In West Virginia, most populations grow in regions of limestone-underlain substrate of the east-central part of the state (FWS, 2007b).

Mountain Valley conducted field surveys for running buffalo clover and its habitat in July 2015. Neither running buffalo clover nor its habitat were observed during the surveys. Additional surveys were conducted in May, August, and September of 2016 due to proposed route realignments. No individuals of running buffalo clover were observed during the 2016 surveys; however, habitat for the species was documented. Mountain Valley was not provided land access to about 0.1 mile of survey corridor for the 2016 surveys. To be conservative, we are assuming that running buffalo clover is present within this unsurveyed section; therefore, we conclude that the MVP would be *likely to adversely affect* running buffalo clover. As such, we will request formal ESA Section 7 consultation with the FWS for running buffalo clover in our upcoming BA.

Shale Barren Rock Cress

The shale barren rock cress (*Arabis serotina*) is a biennial plant species within the mustard family. Young, non-reproductive individuals have leaves in a basal rosette that range in size from 0.6 to 1.4 inches in diameter. Potentially reproductive individuals are erect flowering plants that lack the basal rosette and range in size from 16.1 to 38.2 inches in height. It flowers from mid-July to September. The shale barren rock cress is very habitat restricted. It is only known to occur at low densities among scattered mid-Appalachian shale barrens in West Virginia and Virginia. Shale barrens are open, scrubby growths of pine, oak, red cedar, or other woody species adapted to dry conditions and found most frequently on eroding slopes undercut by streams (FWS ECOS, 2016).

Mountain Valley conducted field surveys for shale barren rock cress and its habitat in August 2015 and again in August and September 2016. Neither shale barren rock cress nor its habitat were observed during the surveys. However, Mountain Valley was not provided land access to about 0.1 mile of survey corridor for the 2016 surveys. To be conservative, we are assuming that shale barren rock cress is present within this unsurveyed section; therefore, we conclude that the MVP would be *likely to adversely affect* shale barren rock cress. As such, we will request formal ESA Section 7 consultation with the FWS for shale barren rock cress in our upcoming BA.

Small Whorled Pogonia

The small whorled pogonia (*Isotria medeoloides*) is a member of the orchid family and is characterized by a single gray-green stem up to 11.8 inches tall with a whorl of five to six leaves at the top of the stem. The leaves are gray-green, oblong, and reach 1.6 to 3.1 inches in length. A single or pair of green-yellow flowers appears in May or June. It occurs on upland sites in mixed-deciduous or mixed-deciduous/coniferous forests that are generally in second- or third-growth successional stages. Characteristics common to most small whorled pogonia sites include sparse to moderate ground cover in the species' microhabitat, a relatively open understory canopy, and proximity to features that create long persisting breaks in the forest canopy. The small whorled pogonia is a widely distributed, but rare species. It is found throughout the eastern U. S. but are typically small, consisting of less than 20 plants (FWS, 1992; FWS, 2016d).

Mountain Valley conducted field surveys for small whorled pogonia and its habitat in August 2015 and again in May, June, August, and September 2016 due to proposed route realignments. Potential habitat for the species was documented within the MVP area but no individuals of small whorled pogonia were observed during the 2015 or 2016 surveys. However, Mountain Valley was not provided land access to about 0.1 mile of survey corridor for the 2016 surveys. To be conservative, we are assuming that small whorled pogonia is present within this unsurveyed section; therefore, we conclude that the MVP would be *likely to adversely affect* small whorled pogonia. As such, we will request formal ESA Section 7 consultation with the FWS for small whorled pogonia in our upcoming BA.

Smooth Coneflower

The smooth coneflower (*Echinacea laevigata)* grows up to 59.0 inches tall from a vertical root stock. It has smooth stems with few leaves. The largest leaves are the basal leaves, which are elliptically shaped and reach 7.8 inches in length and 2.9 inches in width, with long stalks joining the leaves to the stem. It is currently only known from Georgia, North Carolina, South Carolina, and Virginia. In Virginia, smooth coneflower occurs in dolomite woodlands or glades that are generally open and dry. It has also been found in open woods, cedar barrens, roadsides, clearcuts, utility line rights-of-way, and dry limestone bluffs. It is believed that periodic disturbance, common to these habitats, is needed to maintain high light conditions and low level of herbaceous competition required for the species to thrive (FWS 1995).

Mountain Valley conducted field surveys for smooth coneflower and its habitat in August 2015 and again in June, July, August, September, and October 2016 due to proposed route realignments and previously inaccessible parcels. Potential habitat for the species was documented within the MVP area; however, no individuals of smooth coneflower were observed during the 2015 or 2016 surveys. Therefore, we have determined that the MVP *is not likely to adversely affect* the smooth coneflower.

Virginia Spiraea

The Virginia Spiraea (*Spiraea virginiana*), a member of the rose family, is a perennial shrub with many branches. It grows 3.0 to 10.0 feet tall with single-tooth serrated leaves that are 1.0 to 6.0 inches long and 1.0 to 2.0 inches wide. It produces flowers that are yellowish-green to pale-white from late May to late July, but flower production is sparse and does not begin until after the first year of establishment. The Virginia spiraea occurs along scoured banks of second and third order streams, or on meander scrolls, point bars, natural levees, and other braided features of lower reaches of streams. In Virginia, it is located along flood scour zones in crevices of sandstone cobbles, boulders, and large rock outcrops. In West Virginia, it occurs along scoured streamsides among large boulders, flatrock, and flood debris (FWS, 2011c).

Mountain Valley conducted field surveys for Virginia spiraea and its habitat in August 2015. Potential habitat for the species was documented within the MVP area but no individuals were observed during the surveys. However, Mountain Valley was not provided land access to about 0.1 mile of survey corridor for the 2015 surveys and was not able to obtain access in 2016. To be conservative, we are assuming that Virginia spiraea is present within this unsurveyed section; therefore, we conclude that the MVP would be *likely to adversely affect* Virginia spiraea. As such, we will request formal ESA Section 7 consultation with the FWS for Virginia spiraea in our upcoming BA.

4.7.1.2 Equitrans Expansion Project

Mammals

There are two federally threatened or endangered mammals that could be affected by the EEP: the Indiana bat and northern long-eared bat. To assess potential impacts of the EEP on these species in Pennsylvania, Equitrans conducted searches for potential bat hibernacula and surveys to assess bat presence and habitat suitability along the Pennsylvania portion of the EEP from July to October 2015 (ESI, 2015h). Equitrans conducted the surveys in accordance with the FWS Range-wide Indiana bat Summer Survey Guidelines, Northern Long-Eared Bat Interim Conference and Planning Guidance, and Pennsylvania Game Commission Standard and Minimum Effort Requirements for Qualified Bat Survey or Netting within the Commonwealth of Pennsylvania (see the *Mammals* sub-section of 4.7.1.1 for a description of comparable methods).

Equitrans received concurrence from the FWS on February 18, 2016 that the Pennsylvania portion of the EEP *is not likely to adversely affect* the Indiana bat. Additionally, in light of the January 14, 2016 final rule that tailors protections for the northern long-eared bat under the ESA, the FWS further noted that because the Pennsylvania portion of the EEP is not located within 0.25-mile of a known northern long-eared bat hibernaculum or within 150 feet from a known, occupied maternity roost tree, any incidental take that might result from tree removal is not prohibited and no further consultation regarding the northern long-eared bat would be necessary in Pennsylvania.

Equitrans would assume the presence of the Indiana bat and northern long-eared bat within the West Virginia portion of the EEP area and anticipates being able to clear forest from the project area during the winter months (November 15 through March 31) when neither bat species would be present. The FWS required Equitrans to complete specific surveys, including an assessment of the quality and quantity of suitable habitat within the project area; a thorough search for hibernacula within the project area; and to develop a *Myotid Bat Conservation Plan* based on the data from these surveys. Equitrans completed the requested surveys and habitat assessments in October through December of 2015 (ESI, 2016p). The survey results indicated the presence of habitat of varied quality and quantity, but identified no potential bat hibernacula.

Equitrans also completed its *Myotid Bat Conservation Plan* and filed it with the FWS and WVDNR on January 7, 2016, and subsequently with the FERC on January 22, 2016 (ESI, 2016p). As described in the Conservation Plan, Equitrans would implement the following avoidance, minimization, and conservation measures for the Indiana bat and northern long-eared bat:

- avoid impacts on all potential roosts;
- locate more than 40 percent of the project construction workspaces within areas that will already have been cleared for other projects in the vicinity of the EEP at the time of construction;[67]
- use existing unforested area to the greatest extent possible;
- clear all timber from the project area during the period between November 15 and March 31;

[67] Three natural gas pipeline projects are in operation (Sunrise Pipeline Project), construction (Ohio Valley Connector), or are proposed (the MVP) within 2 miles of the portions of the EEP in West Virginia.

- plant maintained areas to include native vegetation and habitat types that would provide foraging habitat for bats;
- implement stringent erosion and sediment control measures throughout the construction process; and
- implement the EEP *SPCCP*.

Equitrans received a concurrence form from the FWS West Virginia Field Office in February 2016 stating that based on the commitment of Equitrans to implement the above measures, the FWS concurred that the EEP *is not likely to adversely affect* the Indiana bat within West Virginia. The FWS further noted that the West Virginia portion of the EEP is not within 0.25 mile of a known northern long-eared bat hibernaculum or within 150 feet from a known occupied maternity roost tree, therefore any incidental take that might result from tree removal is not prohibited and no further consultation regarding the northern long-eared bat would be necessary.

We agree with the conclusions of the FWS pertaining to endangered and threatened bats in both the Pennsylvania and West Virginia portions of the EEP; thus, no further ESA Section 7 consultation is necessary for the Indiana bat and northern long-eared bat regarding the EEP.

4.7.1.3 Conclusion for Federally Listed Threatened, Endangered, and Other Species of Concern

Constructing and operating the MVP would have varied effects on the federally threatened and endangered species and species of concern present or with habitat in the vicinity of the MVP. We are currently preparing a BA, which will be submitted separately to the FWS and which will include our detailed assessments regarding the effects of the MVP on these species. We will request concurrence from the FWS for our conclusions where the MVP would have no effect or would be unlikely to adversely affect the respective species. For the conclusions in which we deem that the MVP would be likely to adversely affect the respective species, we will request formal ESA Section 7 consultation with the FWS. Because ESA Section 7 consultation with the FWS is not complete, **we recommend that:**

- **Mountain Valley should <u>not begin</u> construction of the proposed facilities <u>until</u>:**

  a. all outstanding and required biological surveys for federally listed species are completed and filed with the Secretary;

  b. the FERC staff completes any necessary ESA Section 7 informal and formal consultation with the FWS; and

  c. Mountain Valley has received written notification from the Director of OEP that construction and/or use of mitigation (including implementation of conservation measures) may begin.

Regarding the effects of constructing and operating the EEP on the Indiana bat and the northern long-eared bat, we conclude that based on Equitrans' implementation of its *Myotid Bat Conservation Plan* and other commitments, no further ESA Section 7 consultation is necessary.

4.7.2 State-Listed and Special Concern Species

As identified in tables 4.7.2-1 and 4.7.2-2, 28 state-listed or other concern species were identified as occurring or potentially occurring in the MVP area, and 11 were identified as occurring or potentially occurring in the EEP area. A number of these (17 for the MVP and 2 for the EEP) are also federally listed. These federally listed species were analyzed in the preceding section.

West Virginia lists 319 Priority 1 Species of Greatest Conservation Need in the West Virginia State Wildlife Action Plan (WVDNR, 2015). Virginia lists 93 Tier I Species of Greatest Conservation Need in Virginia's Comprehensive Wildlife Conservation Strategy document (VADGIF, 2005). These are species that are not specifically protected by federal or state regulations, but which are acknowledged to be at risk for decline as a result of habitat degradation and loss. Implementation of the FERC's Plan, Mountain Valley's Procedures, the project-specific *Erosion and Sedimentation Control Plan*, and other BMPs discussed in this EIS would provide sufficient protection for these species and their associated habitat; therefore, these species will not be discussed further.

TABLE 4.7.2-1

State-Listed Fish, Plant, and Wildlife Species Occurring or Potentially Occurring in the Mountain Valley Project Area

Common Name	Scientific Name	Status VA a/	Status WV b/	Impact
Mammals				
Gray bat	*Myotis grisescens*	SE	FE	Would Not Significantly Impact
Indiana bat	*Myotis sodalis*	SE	FE	May Significantly Impact
Little brown bat	*Myotis lucifugus*	SE	-	Would Not Significantly Impact
Northern long-eared bat	*Myotis septentrionalis*	SE	FT	May Significantly Impact
Tri-colored bat	*Perimyotis subflavus*	SE	-	Would Not Significantly Impact
Virginia big-eared bat	*Corynorhinus townsendii virginianus*	SE	FE	Would Not Significantly Impact
Birds				
Loggerhead shrike	*Lanius ludovicianus*	ST	-	Would Not Significantly Impact
Peregrine falcon	*Falco peregrinus*	ST	-	Would Not Significantly Impact
Fish				
Orangefin madtom	*Noturus gilberti*	ST	-	Would Not Significantly Impact
Roanoke logperch	*Percina rex*	SE	-	May Significantly Impact
Mussels				
Atlantic pigtoe	*Fusconaia masoni*	ST	-	Would Not Significantly Impact
Clubshell	*Pleurobema clava*	-	FE	Would Not Significantly Impact
Green floater	*Lasmigona subviridis*	ST	-	Would Not Significantly Impact
James spinymussel	*Pleurobema collina*	SE	FE	Would Not Significantly Impact
Pistolgrip	*Tritogonia verrucosa*	ST	-	Would Not Significantly Impact
Snuffbox mussel	*Epioblasma triquetra*	SE	FE	Would Not Significantly Impact
Reptiles				
Bog turtle	*Glyptemys muhlenbergii*	SE	-	May Significantly Impact
Timber rattlesnake c\	*Crotalus horridus*	SE	-	Would Not Significantly Impact
Terrestrial Invertebrates				
Ellett Valley millipede	*Pseudotremia cavernarum*	ST	-	Would Not Significantly Impact

TABLE 4.7.2-1 (continued)

State-Listed Fish, Plant, and Wildlife Species Occurring or Potentially Occurring in the Mountain Valley Project Area

Common Name	Scientific Name	Status VA a/	Status WV b/	Impact
Plants				
Addison's leatherflower	*Clematis addisonii*	ROC	-	Would Not Significantly Impact
Canby's mountain-lover	*Paxistima canbyi*	ROC	-	Would Not Significantly Impact
Chestnut lip fern	*Cheilanthes castanea*	ROC	-	Would Not Significantly Impact
Pinnate-lobed coneflower	*Rudbeckia triloba var. beadli*	ROC	-	Would Not Significantly Impact
Running buffalo clover	*Trifolium stoloniferum*	-	FE	May Significantly Impact
Shale barren rock cress	*Arabis serotina*	SE	FE	May Significantly Impact
Small whorled pogonia	*Isotria medeoloides*	SE	FE	May Significantly Impact
Sweet-shrub	*Calycanthus floridus*	ROC	-	Would Not Significantly Impact
Virginia spiraea	*Spiraea virginiana*	SE	FE	Would Not Significantly Impact

a/ FE = Federally Endangered; FT = Federally Threatened; SE = State Endangered; ST = State Threatened; ROC = Resources of Concern (VADCR DNH)

b/ West Virginia does not have state threatened and endangered species legislation, the species listed as either threatened or endangered in the State are those found on the FWS list of federally threatened and endangered species; FE = Federally Endangered; FT = Federally Threatened

c/ Coastal populations of the state endangered timber rattlesnake are listed as state endangered; however, the MVP does not cross coastal counties of Virginia.

TABLE 4.7.2-2

State-Listed Fish, Plant, and Wildlife Species Occurring or Potentially Occurring in the Equitrans Expansion Project Area

Common Name	Scientific Name	PA Status a/	PA Rank b/	WV Status c/	Impact
Mammals					
Indiana bat	*Myotis sodalis*	PE	SUB, S1N	FE	Would Not Significantly Impact
Northern long-eared bat	*Myotis septentrionalis*	-	S1	FT	Would Not Significantly Impact
Mussels					
Round pigtoe	*Pleurobema sintoxia*	SOC	S3S4	-	Would Not Significantly Impact
Three-ridge	*Amblema plicata*	SOC	S2S3	-	Would Not Significantly Impact
Wabash pigtoe	*Fusconaia flava*	SOC	S2S3	-	Would Not Significantly Impact
Plants					
Blue false-indigo	*Baptisia australis*	N (proposed PT)	S2	-	Would Not Significantly Impact
Cranefly orchid	*Tipularia discolor*	PR	S3	-	Would Not Significantly Impact
Purple rocket	*Iodanthus pinnatifidus*	PE	S1	-	Would Not Significantly Impact
Rock skullcap	*Scutellaria saxatilis*	PE	S1	-	Would Not Significantly Impact
Snow trillium	*Trillium nivale*	PR	S3	-	Would Not Significantly Impact
White trout-lily	*Erythronium albidum*	N (proposed PR)	S3	-	Would Not Significantly Impact

a/ SOC = Species of Concern N = No current legal status exists, but is under review for future listing PE = Pennsylvania Endangered; PT = Pennsylvania Threatened PR = Pennsylvania Rare TU = Tentatively Undetermined

b/ S#S# = Range Rank (indicates any range of uncertainty about the status of the species or ecosystem); SUB = Applicable to breeding population; S#N = Applicable to non-breeding population; S1 = Critically Imperiled (extreme rarity [often five or fewer populations] in the nation or state, or due to some factor(s) such as very steep declines, making it vulnerable to extirpation in the state); S2 = Imperiled (rarity due to very restricted range, very few populations [often 20 or fewer], steep declines, or other factors making it very vulnerable to extirpation from the nation or state); S3 = Vulnerable (restricted range in the nation or state, relatively few populations [often 80 or fewer], recent and widespread declines, or other factors making it vulnerable to extirpation)

c/ West Virginia does not have state threatened and endangered species legislation, the species listed as either threatened or endangered in the State are those found on the FWS list of federally threatened and endangered species; FE = Federally Listed as Endangered; FT = Federally Listed as Threatened

4.7.2.1 Mountain Valley Project

Mammals

There are six state endangered mammals that could be affected by the MVP: the gray bat, Indiana bat, little brown bat, northern long-eared bat, tri-colored bat, and Virginia big-eared bat. The gray, Indiana, northern long-eared, and Virginia big-eared bats are also listed at the federal level and are discussed in section 4.7.1.1. The Virginia endangered little brown bat and tri-colored bat have been identified as potentially occurring in the MVP area. During mist net sampling in 2015, Mountain Valley captured one adult male little brown bat and six tri-colored bats, including two pregnant females (ESI, 2015b). No individuals of either species were captured during sampling efforts in April and May 2016.

Based on the VADGIF's Little Brown Bat and Tri-colored Bat Winter Habitat & Roosts Application (VADGIF, 2017b), the MVP would not cross within 0.5 mile of a known little brown or tri-colored bat hibernacula. As of February 2016, the VADGIF had not tracked and was not aware of any little brown or tri-colored bat roost trees in Virginia (VADGIF, 2016). Nonetheless, since mist-netting efforts indicate both species may be present in the vicinity of the MVP, Mountain Valley would follow conservation measures within the VADGIF Guidance Document on Best Management Practices for Conservation of Little Brown Bats and Tri-Colored Bats (VADGIF, 2016) and refrain from clearing timber for construction of the MVP between June 1 and July 31 so as to avoid impacts on maternity colonies and non-flying juvenile bats. Following these measures would lead the VADGIF to anticipate little to no lethal take of little brown or tri-colored bats. We also conclude that sub-lethal effects, such as habitat changes, would not be significant for little brown or tri-colored bats. Therefore, we do not anticipate significant impacts on little brown or tri-colored bats.

Birds

There are two state threatened birds that could be affected by the MVP, the loggerhead shrike and peregrine falcon. Mountain Valley conducted habitat surveys for the state threatened loggerhead shrike in 2015 and 2016 (ESI, 2015i; ESI, 2016q). The habitat assessments documented about 141.0 acres of habitat suitable for loggerhead shrike foraging and nesting and an additional 3.6 acres of habitat suitable for foraging only. About 39.6 acres of the nesting and foraging habitat and about 1.0 acre of the foraging only habitat would be permanently affected by the MVP. Tree and shrub clearing during the loggerhead shrike nesting season could adversely affect nesting shrikes and their eggs or young. At the suggestion of the VADGIF, Mountain Valley would attempt to avoid affecting nesting loggerhead shrikes by clearing all suitable nesting vegetation (i.e., trees and shrubs) from the MVP construction right-of-way that falls within loggerhead shrike habitat prior to April 1 or after July 31. All vegetation clearing efforts would be overseen by a qualified avian biologist. If clearing of an area with suitable foraging or nesting habitat could not be completed prior to April 1 or after July 31, Mountain Valley would follow protocols detailed in its *Migratory Bird Conservation Plan* to avoid or minimize impacts on foraging or nesting loggerhead shrikes. After construction, Mountain Valley would plant a seed mix of native herbaceous vegetation of the same species composition, if available, as was present pre-construction in the areas disturbed by construction. Mountain Valley would also replace all shrubs and trees removed from habitat suitable for nesting and/or foraging by the loggerhead shrike. Mountain Valley would replace native shrub and tree species removed during construction with the same native species, if available, and replace non-native shrubs and trees with native functional counterpart species. That is, if a non-native thorny tree were to be removed from foraging habitat during construction, Mountain Valley would replace the tree with a native thorny tree. Following guidance from the VADGIF, Mountain Valley would increase species diversity within a construction area in some instances. That is, if a single native or non-native species comprises the majority of the species composition within a section of suitable nesting or foraging habitat, Mountain Valley could plant a mixture of multiple native species that provide the same habitat function of the species that was removed. Specific details of Mountain Valley's proposed habitat restoration for the loggerhead shrike is provided in Mountain Valley's *Migratory Bird Habitat Conservation Plan*. Based on Mountain Valley's proposed avoidance, minimization, and restoration measures, we do not anticipate significant impacts on loggerhead shrikes.

Communication between Mountain Valley and the VADGIF indicates that the closest observation of a peregrine falcon to the project area is over 1 mile away. The VADGIF noted this particular falcon, observed in the spring of 2015, was not likely to be breeding at the time. The VADGIF conducted peregrine falcon surveys at the same location in 2016 and did not observe any falcons in the vicinity. Nonetheless, the VADGIF has expressed concern regarding potential blasting by Mountain Valley near the New River, where suitable peregrine falcon nesting habitat is present. The VADGIF would not expect the MVP to cause peregrine falcons potentially breeding in this area to abandon their nests but it has requested Mountain Valley to coordinate with the VADGIF regarding any proposed blasting activities near the New River. MVP would notify the VADGIF of any plans for blasting within 2 miles of the New River. Therefore, we do not anticipate significant impacts on peregrine falcons.

Fish

There are two state-listed fish that could be affected by the MVP, the state threatened orangefin madtom and the state endangered Roanoke logperch. Both of these species are discussed above in section 4.7.1.1.

Mussels

There are six state threatened or endangered species of freshwater mussels that could be affected by the MVP: the Atlantic pigtoe, clubshell, green floater, James spinymussel, pistolgrip, and snuffbox. Five of the six state-listed mussels are also federally listed, and thus discussed in section 4.7.1.1. Mountain Valley's proposed freshwater mussel conservation measures (see section 4.6.2.7) would also provide protection for the state-listed pistolgrip in Virginia. We do not anticipate significant impacts on this species.

Reptiles

There are two state endangered reptiles that could be affected by the MVP: the bog turtle and the timber rattlesnake. The bog turtle is also federally listed, and thus is discussed above in section 4.7.1.1. However, because the bog turtle is listed as federally threatened based on similarity of appearance to the federally threatened northern population of the bog turtle, it is not subject to ESA Section 7 consultation and we therefore do not provide an effects determination for the bog turtle in section 4.7.1.1. We provide a state-level impact assessment here. Due to access restrictions, bog turtle habitat assessments are not complete for one parcel of about 22 acres along the MVP in Roanoke County. We are assuming that bog turtle habitat and bog turtles are present within this unsurveyed parcel; therefore, we conclude the MVP may impact bog turtles.

Timber rattlesnakes may be present in the MVP area; however, only coastal populations are considered state endangered. Impacts on any snakes encountered would be similar to the impacts discussed in the general wildlife section (see section 4.5.2.1), and not expected to be significant.

Terrestrial Invertebrates

The Ellett Valley millipede is state-listed as threatened in Virginia. It is also a federal species of concern, and thus is discussed in section 4.7.1.1.

Plants

There are nine state-listed plant species that could be affected by the MVP: Addison's leatherflower, Candy's mountain-lover, chestnut lip fern, pinnate-lobed coneflower, running buffalo clover, shale barren rock cress, small whorled pogonia, sweet-shrub, and Virginia spiraea. Running buffalo clover, shale barren rock cress, small whorled pogonia, and Virginia spiraea are also federally listed, and thus discussed in section 4.7.1.1.

Surveys in 2015 and 2016 documented no occurrences of the remaining state-listed plant species in West Virginia or Virginia (ESI, 2015f; ESI, 2015g; ESI, 2016n; ESI, 2016o). Therefore, we conclude that the MVP would not significantly impact Addison's leatherflower, Candy's mountain-lover, chestnut lip fern, pinnate-lobed coneflower, and sweet-shrub.

4.7.2.2 Equitrans Expansion Project

Mammals

There are two state-listed mammals that could be affected by the EEP, the Indiana bat and northern long-eared bat. Both of these species are also federally listed, and thus are discussed in section 4.7.1.2.

Mussels

The South Fork Tenmile Creek is the only waterbody crossing in the EEP corridor noted by the PAFBC as a potential concern for freshwater mussels. Equitrans conducted a mussel survey at the location of the proposed crossing at South Fork Tenmile Creek in October 2015 (ESI, 2015j). No state-listed mussels were documented at the proposed crossing location. Equitrans would cross under the South Fork Tenmile Creek using an HDD. A successful HDD would avoid impacts on the South Fork Tenmile Creek and its aquatic environment. The PAFBC notified Equitrans in January 2016 that the EEP, as proposed, would not result in adverse impacts on state-listed mussels (PAFBC, 2016). Therefore, we do not anticipate any impacts on state-listed mussels.

Plants

Six plant species listed or otherwise considered sensitive by the state of Pennsylvania were noted as potentially present in the EEP area: blue false-indigo, cranefly orchid, purple rocket, rock skullcap, snow trillium, and white trout-lily. No special status plant species are known to be present within the West Virginia portion of the EEP. Equitrans conducted surveys in Pennsylvania during multiple optimal survey windows for flowering and/or vegetative periods for the respective plant species: cranefly orchid, snow trillium, and white trout-lily in April 2016; blue false-indigo, purple rocket, and white trout-lily again in May 2016; and cranefly orchid again and rock skullcap in July 2016 (ESI, 2016r).

None of the targeted species were observed during the surveys. However, two state special status plant species were identified within the construction workspaces for the EEP: one population of nodding rattlesnake-root (*Prenanthes crepidinea*), previously classified as endangered in Pennsylvania and currently on the PADCNR Watch List; and two populations of goldenseal, classified as vulnerable in Pennsylvania. The incorporation of the New Cline Route Variation by Equitrans (see section 3.5.3) subsequent to the rare plant surveys resulted in the population of nodding rattlesnake-root being avoided by the EEP. The two populations of goldenseal remain within the proposed construction work areas for the EEP. In a letter to Equitrans in October 2016, the PADCNR recommended that Equitrans avoid or transplant the goldenseal populations to suitable habitat adjacent to the project site, but noted that such actions would be voluntary. Equitrans subsequently noted it would not avoid or transplant the goldenseal populations. Within the same letter, the PADCNR stated it had determined that no impacts on rare threatened or endangered plant species would be anticipated as a result of construction and operation of the EEP. We concur.

4.7.2.3 Conclusions for State-Listed and Other Sensitive Species

The MVP and EEP would not significantly impact the state-listed and other sensitive species that are not also listed at the federal level. The Applicants would implement their stated avoidance and minimization measures and continue communication and coordination activities with the WVDNR, VADCR, VADGIF, PADCNR, PAGC, and PAFBC where required prior to construction to ensure impacts from constructing and operating the MVP and EEP would not be significant..

4.7.3 Jefferson National Forest

Mountain Valley consulted with the FS to determine what types of special status species could be affected by the MVP within the Jefferson National Forest. The different FS classifications of special status species and the species that may be present are provided in the following sections.

All programs and activities planned, funded, executed, or permitted by the FS require a (biological evaluation) BE to assess whether the activities would cause adverse effects on federally listed threatened and endangered or sensitive species. Mountain Valley submitted a BE to the FS on March 1, 2017 (see appendix O-1). The BE submitted to the FS by Mountain Valley contains project-wide and Jefferson National Forest-specific measures recommended for avoiding and minimizing adverse effects on FS special status species.

4.7.3.1 Federally Listed Species within the Jefferson National Forest

According to the FS and desktop analyses, the MVP pipeline route within the Jefferson National Forest would cross suitable habitat and/or the geographic ranges of multiple federally listed species which would require evaluation during field surveys and the BE, including:

- gray bat (endangered);
- Indiana bat (endangered);
- northern long-eared bat (threatened);
- rusty patched bumble bee;
- Roanoke logperch (endangered);
- James spinymussel (endangered);
- northeastern bulrush;
- shale barren rock cress;
- small whorled pogonia; and
- smooth coneflower.

Field surveys conducted by Mountain Valley in 2015 and 2016 revealed that all but two of the federally listed species were either not documented during the surveys or suitable habitat was not present within the surveyed corridor. The remaining species with potential to occur in the MVP area within the Jefferson National Forest are the Roanoke logperch and James spinymussel. These aquatic species may be present in the North Fork Roanoke River and Craig Creek, respectively, both of which would be crossed by the pipeline on private land outside of the Jefferson National Forest. However, construction of the MVP within the National Forest, may result in sedimentation running into tributaries of the North Fork Roanoke River and Craig Creek, which may affect aquatic species downstream.

Field surveys of waterbody crossings along the MVP pipeline route indicated that no suitable habitat for the Roanoke logperch is present in the Jefferson National Forest. Roanoke logperch are known to occur downstream of the MVP waterbody crossings within the North Fork Roanoke River; however, the occurrences are outside of the project area and beyond the extents of increased sedimentation modeled for the waterbody crossings within the Jefferson National Forest. Given the relatively small amount of construction activity that is proposed for these waterbodies, the expected effects on Roanoke logperch from construction within the Jefferson National Forest would be minimal and temporary at most.

Field surveys for the James spinymussel documented no indication (live or deadshell) of the presence of mussels at the waterbody crossings of the MVP in the Jefferson National Forest. The MVP waterbody crossings within the Jefferson National Forest occur near the headwaters of Craig Creek where suitable mussel habitat is not present. Suitable habitat is known to occur downstream, and specimens of James spinymussel have been documented about 16 miles downstream of the MVP crossings, outside of the project area and beyond the extents of increased sedimentation modeled for the Craig Creek. Therefore, we conclude that implementation of the measures of Mountain Valley's Procedures and project-specific *Erosion and Sediment Control Plan* would adequately reduce erosion and sedimentation running into streams to minimize any downstream effects on the James spinymussel.

4.7.3.2 Regional Forester's Sensitive Species

Regional Forester's Sensitive Species are plant and animal species found on FS lands for which population viability is a concern based on significant current or predicted downward trends in population numbers, population density, or habitat capability that would reduce the existing distribution of the species and potentially lead to federal listing as threatened or endangered (FS, 2005). The effects on Regional Forester's Sensitive Species are defined differently than for federally listed threatened and endangered species. Options for determinations include the following: "No Impacts," if an action will not have any impacts on a species; "Beneficial Impacts," when positive effects may occur with no adverse effects (e.g., the action would result in the creation of new habitat for a given species); "May Impact – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability," and "May Impact – Is Likely to Cause a Trend Toward Federal Listing or Loss of Viability."

Mountain Valley initially identified 28 Regional Forester's Sensitive Species that could potentially occur in the vicinity of the MVP corridor where it passes through the Jefferson National Forest (see appendix O-1). Based on field surveys in the Jefferson National Forest, 16 FS Sensitive Species were determined to possibly be within the project area, have habitat within the construction right-of-way (but were not observed during surveys), or are located downstream of the project area. As identified in table 4.7.3-1, the determinations for these 16 species range from "Beneficial Impacts" to "May Impact – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability." To minimize or avoid adverse effects on aquatic and wildlife habitat that support FS sensitive, rare, and indicator species, Mountain Valley would adhere to measures established in the FERC Plan and its project-specific Procedures, *Erosion and Sediment Control Plan*, *SPCCP*, and the *Migratory Bird Conservation Plan* (see sections 4.5 and 4.6). The BE did not find a likelihood that the MVP would cause a Trend Toward Federal Listing or Loss of Viability for any of these 16 species. We concur with this conclusion.

4.7.3.3 Forest Service Locally Rare Species

In addition to sensitive species, the FS also selects locally rare species that, despite having secure populations on a range-wide basis, are present in low population numbers within a particular forest. The species are recognized by the FS as requiring appropriate management to maintain the populations within the forest. The FS indicates that suitable habitat exists within the MVP area for a total of 151 locally rare species, including 3 mammals, 11 birds, 3 reptiles, 1 amphibian, 4 aquatic species, 14 terrestrial invertebrates, and 113 plants. Appendix O-2 lists these species and their required habitats.

TABLE 4.7.3-1

Forest Service Sensitive Species Within or Near Portions of Jefferson National Forest Crossed by the Mountain Valley Project

Common Name	Scientific Name	Occurrence Analysis Results	Determination
Mammals			
Eastern small-footed bat	*Myotis leibii*	Species occurs in project area, but outside of activity area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Fish			
Candy darter	*Etheostoma osburni*	Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Kanawha minnow	*Phenacobius teretulus*	Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Orangefin madtom	*Noturus gilbert*	Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Roughhead shiner	*Notropis ariommus*	Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Freshwater Mussels			
Atlantic pigtoe	*Fusconaia masoni*	Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Green floater	*Lasmigona subviridis*	Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Yellow lance	*Elliptio lanceolata*	Aquatic species or habitat known or suspected downstream of project/activity area, but outside identified geographic bounds of water resource cumulative effects analysis area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability

TABLE 4.7.3-1 (continued)

Forest Service Sensitive Species Within or Near Portions of Jefferson National Forest Crossed by the Mountain Valley Project

Common Name	Scientific Name	Occurrence Analysis Results	Determination
Invertebrates			
Allegheny snaketail	*Ophiogomphus incurvatus alleganiensis*	Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Maureen's Shale Stream Beetle	*Hydraena maureenae*	Species occurs in project area, but outside of activity area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Diana fritillary	*Speyeria diana*	Species not seen during field survey, but possibly occurs in activity area based on habitat observed.	Beneficial Impacts; species benefits from woodland clearings
Green-faced clubtail	*Gomphus viridifrons*	Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Regal fritillary	*Speyeria idalia*	Species not seen during field survey, but possibly occurs in activity area based on habitat observed.	Beneficial Impacts; species benefits from woodland clearings
Plants			
American barberry	*Berberis canadensis*	Species occurs in project area, but outside of activity area.	No Impacts
Rock skullcap	*Scutellaria saxatilis*	Field survey located species in activity area	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability
Sweet pinesap	*Monotropis odorata*	Species not seen during field survey, but possibly occurs in activity area based on habitat observed.	May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability

Field surveys have not documented any FS Locally Rare Species in the vicinity of the MVP corridor. Surveys did document a midden attributed to the Allegheny woodrat, located about 0.3 mile west of the MVP pipeline right-of-way. Comments from the FS note that the finding of the midden serves as an indication of presence of the woodrat and therefore its presence should be assumed. Additional surveys for locally rare plant species within the Jefferson National Forest were conducted by Mountain Valley in August 2016. A single population of rock skullcap (a Regional Forester Sensitive Species) was identified during the August 2016 surveys (ESI, 2016o).

4.7.3.4 Management Indicator Species

The Jefferson National Forest LRMP was revised under a prior planning regulation (36 CFR 219, 1982) that required the identification of Management Indicator Species (MIS). MIS were selected in the Jefferson National Forest LRMP because their population changes were believed to indicate the effects of management activities. Consideration of MIS is intended to assist the FS to help compare effects of potential project alternatives and as a focus for wildlife monitoring. MIS were chosen to represent the following groups of species: threatened and endangered species; species with special habitat needs; species commonly hunted, fished, or trapped (demand species); non-game species of special interest; and species selected to indicate effects on other species of selected major biological communities (USDA, 2004). Table 4.7.3-2 lists the 13 MIS designated for the Jefferson National Forest.

TABLE 4.7.3-2

Jefferson National Forest Management Indicator Species

Common Name	Scientific Name	Rationale for Designation
Acadian flycatcher	*Empidonax virescens*	Special Habitat Indicator
Black bear	*Ursus americanus*	Demand Species Indicator
Chestnut-sided warbler	*Setophaga pensylvanica*	Special Habitat Indicator
Eastern towhee	*Pipilo erythrophthalmus*	Biological Community Indicator
Eastern wild turkey	*Meleagris gallopavo*	Demand Species Indicator
Hooded warbler	*Setophaga citrina*	Biological Community Indicator
Ovenbird	*Seiurus aurocapilla*	Special Habitat Indicator
Peaks of otter salamander	*Plethodon hubrichti*	T/E/S Indicator, Special Interest Species Indicator
Pileated woodpecker	*Dryocopus pileatus*	Special Habitat Indicator
Pine warbler	*Setophaga pinus*	Biological Community Indicator
Scarlet tanager	*Piranga olivacea*	Biological Community Indicator
White-tailed deer	*Odocoileus virginianus*	Demand Species Indicator
Wild trout	*Oncorhynchus mykiss, Salmo trutta, Salvelinus fontinalis*	Biological Community Indicator, Demand Species Indicator

Source: USDA, 2004.

Of the 13 MIS established for the Jefferson National Forest, 11 were observed during field surveys in 2015 and 2016. Only the peaks of otter salamander and wild trout were not observed. The MVP pipeline route through the Jefferson National Forest would not cross the known range of the Peaks of Otter salamander. The MVP pipeline route would cross Kimballton Branch, which is known to contain wild trout. The pipeline crossing of Kimballton Branch is on private land less than 0.5 mile downstream from the National Forest boundary. However, an access road (Pocahontas Road) crosses Kimballton Branch and a perennial tributary on National Forest land, and could affect wild trout resources within Jefferson National Forest. The culverts crossing Kimballton Branch are proposed to be replaced as part of this project. Installation of new culverts could increase habitat connectivity within the upper reaches of Kimballton Branch. The pipeline crossing of Stony Creek, another wild trout stream, is approximately 2.5 miles downstream from National Forest land; and the pipeline crossings of the wild trout streams Little Stony Creek and Mill Creek are approximately 0.8 and 0.3 mile downstream from National Forest land, respectively.

Mountain Valley does not propose the wide-scale use of pesticides and/or herbicides; however, the FS has requested that herbicides be incorporated into the management plan for treatment of invasive species on the Jefferson National Forest and maintenance of the right-of-way during operation.[68] Once in the soils, some herbicides can migrate via gravity, leaching, and surface runoff to other soils, groundwater, or surface water. Section 4.4.2.6 includes a description of specific herbicides that could be used in the project area and discusses the potential of herbicide residues accumulating in soils and possibly contaminating waterbodies within and downstream of the Jefferson National Forest. In short, due to the limited acreage and dispersed extent of the areas in which herbicides may be applied, and the short half-lives of the chemicals proposed for use, the effects of any herbicide accumulation or residue migration on habitat or waterbodies containing federally listed species, Regional Forester's Sensitive Species, FS Locally Rare Species, or MIS would be temporary and minor.

4.7.3.5 Conclusions for the Jefferson National Forest

We assessed the potential effects of the MVP on four categories of special status species within the Jefferson National Forest. We conclude that the MVP is not likely to adversely affect federally listed species within the Jefferson National Forest (though see section 4.7.1.1 for effects of the project at large on these species). We further conclude that the MVP would be unlikely to cause a Trend Toward Federal Listing or Loss of Viability for Regional Forester's Sensitive Species. FS Locally Rare Species and MIS do not have regulatory protection associated with them and we therefore do not make any final determination of the effects of the MVP on these species here. Nonetheless, field surveys have not documented any FS Locally Rare Species in the vicinity of the MVP corridor, while field surveys have documented all but two of the MIS within the Jefferson National Forest. Although field surveys did not document wild trout, they are known from streams on and downstream from National Forest land in the vicinity of the MVP corridor. We anticipate that the mitigation measures discussed above in sections 4.4, 4.5, and 4.6, such as those contained in the FERC Plan and Mountain Valley's project-specific Procedures, and its *Exotic and Invasive Species Control Plan*, *Erosion and Sediment Control Plan,* and *Migratory Bird Conservation Plan*, would also provide protection for, and limit impacts on FS Locally Rare Species and MIS.

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[68] See accession no. 20161116-5006.

4.8 LAND USE, SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

4.8.1 Affected Environment

This section discusses the land requirements for construction and operation of the proposed projects, the current use of those lands, crossings of recreational and special interest areas, and visual resources in the project area.

4.8.1.1 Counties Crossed By Pipelines

The MVP and the EEP combined consist of about 311 miles of new natural gas pipelines that would cross 11 counties in West Virginia, 6 counties in Virginia, and 3 counties in Pennsylvania. Mountain Valley would collocate its pipeline with existing rights-of-way for about 30 percent of its route. Equitrans would collocate its pipelines for 20 percent of their routes.

4.8.1.2 Land Use Types

Land use in the areas crossed by the proposed MVP and the EEP are generally classified into the following categories and definitions:

- agricultural: crop land, pasture/hay fields, and vineyards/orchards;
- forested/woodland: upland and wetland conifer forests, and deciduous woodlands;
- industrial/commercial: manufacturing or industrial plants, paved areas, landfills, mines, quarries, utilities, roads, railroads, and commercial or retail facilities;
- open land: utility rights-of-way, open fields, vacant land, grasslands, range lands, scrub-shrub uplands, emergent and scrub-shrub wetlands, golf courses, and recreational (non-forested) land;
- open water: ponds, reservoirs, lakes, rivers, and streams; and
- residential: houses, farmsteads, apartments, mobile home parks, and residential subdivisions.

Table 4.8.1-1 summarizes the acreage of each land use type that would be affected during construction and operation of the projects.

TABLE 4.8.1-1

Land Use Types Affected by Construction and Operation of the Mountain Valley Project and the Equitrans Expansion Project (in acres)

Project/State/ Component	Open Land		Agricultural		Forested/ Woodland		Industrial/ Commercial		Residential		Open Water		Total	
	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper
MOUNTAIN VALLEY PROJECT														
Virginia														
Pipeline Right-of-Way	70.2	29.5	405.9	169.6	1,085.4	451.5	2.0	0.7	8.5	4.2	0.2	0.1	1,572.1	655.7
Additional Temporary Workspace	28.7	0.0	106.0	0.0	58.7	0.0	0.5	0.0	5.1	0.0	0.0	0.0	199.0	0.0
Aboveground Facilities	0.6	0.0	0.0	0.1	40.4	2.6	0.0	0.0	0.0	0.0	0.0	0.0	41.0	2.7
Access Roads	19.2	4.0	61.7	11.1	171.2	46.1	0.9	0.4	5.8	1.6	0.0	0.0	258.8	63.3
Yards	4.0	0.0	27.9	0.0	2.3	0.0	0.5	0.0	3.1	0.0	0.0	0.0	37.8	0.0
Cathodic Protection	1.6	0.9	3.7	1.8	0.4	0.2	0.3	0.1	0.5	0.3	0.0	0.0	6.4	3.4
Virginia Subtotal	*124.3*	*34.5*	*605.2*	*182.7*	*1,358.5*	*500.4*	*4.1*	*1.2*	*23.1*	*6.1*	*0.2*	*0.1*	*2,115.3*	*725.1*
West Virginia														
Pipeline Right-of-Way	140.5	62.1	146.8	63.4	2,592.9	1,060.2	3.4	1.8	4.1	1.7	2.1	1.2	2,889.7	1,190.4
Additional Temporary Workspace	71.2	0.0	85.0	0.0	297.4	0.0	1.7	0.0	3.0	0.0	0.6	0.0	458.8	0.0
Aboveground Facilities	16.5	2.5	3.3	0.0	88.2	19.9	0.0	0.0	0.0	0.0	0.0	0.0	108.0	22.4
Access Roads	99.3	34.9	39.6	10.7	504.6	126.6	0.6	0.2	3.3	1.4	0.3	0.0	647.6	173.7
Yards	35.3	0.0	50.4	0.0	26.7	0.0	9.9	0.0	10.5	0.0	0.0	0.0	132.6	0.0
Cathodic Protection	3.6	2.1	1.8	0.9	5.5	3.0	0.0	0.0	0.3	0.2	0.0	0.0	11.3	6.2
West Virginia Subtotal	*366.3*	*101.6*	*326.9*	*74.9*	*3,515.3*	*1,209.7*	*15.5*	*2.0*	*21.2*	*3.2*	*2.9*	*1.2*	*4,248.1*	*1,392.7*
MOUNTAIN VALLEY PROJECT SUBTOTAL	***490.6***	***136.1***	***932.0***	***257.6***	***4,873.8***	***1,710.2***	***19.7***	***3.2***	***44.3***	***9.4***	***3.1***	***1.3***	***6,363.4***	***2,117.8***

TABLE 4.8.1-1 (continued)

Land Use Types Affected by Construction and Operation of the Mountain Valley Project and the Equitrans Expansion Project (in acres)

Project/State/ Component	Open Land		Agricultural		Forested/ Woodland		Industrial/ Commercial		Residential		Open Water		Total	
	Constr	**Oper**	**Constr**	**Oper**	**Constr**	**Oper**	**Constr**	**Oper**	**Constr**	**Oper**	**Constr**	**Oper**	**Constr**	**Oper**
EQUITRANS EXPANSION PROJECT														
Pennsylvania														
Pipeline Right-of-Way	8.9	4.5	36.2	16.7	40.4	21.5	0.1	0.1	1.5	0.7	0.9	0.9	88.0	44.5
Additional Temporary Workspace	5.6	0.0	30.3	0.0	20.3	0.0	0.0	0.0	0.2	0.0	0.0	0.0	56.5	0.0
Aboveground Facilities	3.1	1.3	17.3	12.4	4.9	3.2	0.0	0.0	0.0	0.0	0.0	0.0	25.3	16.9
Access Roads	1.5	0.1	3.2	1.6	5.1	3.6	0.0	0.0	0.4	0.0	0.0	0.0	10.2	5.3
Yards	1.9	0.0	4.1	0.0	1.5	0.0	0.0	0.0	4.0	0.0	0.0	0.0	11.4	0.0
Cathodic Protection	0.8	0.8	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
Pennsylvania Subtotal	*21.8*	*6.7*	*91.2*	*30.9*	*72.2*	*28.3*	*0.1*	*0.1*	*6.1*	*0.7*	*0.9*	*0.9*	*192.3*	*67.7*
West Virginia														
Pipeline Right-of-Way	0.4	0.3	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.4
Additional Temporary Workspace	1.2	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0
Aboveground Facilities	0.9	0.8	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.0
Access Roads	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Yards	0.2	0.0	0.0	0.0	0.0a/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Cathodic Protection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West Virginia Subtotal	*2.8*	*1.1*	*0.0*	*0.0*	*1.8*	*0.4*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*4.6*	*1.5*
EQUITRANS EXPANSION SUBTOTALS	***24.7***	***7.8***	***91.2***	***30.9***	***74.0***	***28.7***	***0.1***	***0.1***	***6.1***	***0.7***	***0.9***	***0.9***	***196.9***	***69.1***

TABLE 4.8.1-1 (continued)

Land Use Types Affected by Construction and Operation of the Mountain Valley Project and the Equitrans Expansion Project (in acres)

Project/State/ Component	Open Land		Agricultural		Forested/ Woodland		Industrial/ Commercial		Residential		Open Water		Total	
	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper
Combined Project Totals	**515.3**	**143.9**	**1,023.2**	**288.5**	**4,947.8**	**1,738.9**	**19.8**	**3.3**	**50.4**	**10.1**	**4.0**	**2.2**	**6,560.3**	**2,186.9**

a/ Greater than zero but less than 0.05 acre.

The majority of the land use types disturbed by construction would be forest (4,948 acres), followed by agricultural (1,023 acres), and open land (515 acres). Operation of the MVP and EEP combined would affect about 2,187 acres. Likewise, the major land use types affected by project operations would be forest (1,739 acres), agricultural (289 acres), and open land (134 acres).

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Construction of the MVP would impact a total of 6,363 acres. Of this acreage, 80.7 percent would be used for the pipeline facilities, including the construction right-of-way (70.1 percent), ATWS (10.3 percent), and cathodic protection (0.3 percent). The remaining acreage affected during construction would be associated with yards (2.7 percent), access roads (14.2 percent), and aboveground facilities (2.3 percent). The primary land use types affected during construction would be forest (76.6 percent) and agricultural (14.6 percent). Open land, commercial, open water, and residential would make up the remaining 8.7 percent of land use types affected during construction of the MVP. After construction, temporary workspaces, yards, and temporary access roads would be restored to their original condition and land use.

A total of 2,118 acres would be affected during operation of the MVP. This would include 1,846 acres for the permanent pipeline right-of-way easement, 19 acres for the compressor stations, 6 acres for the M&R stations, and 238 acres for permanent access roads. About 87.2 percent of this acreage would be within the 50-foot-wide permanent pipeline operational easement, 1.2 percent would be at aboveground facilities, and 11.2 percent would be new permanent access roads. Land use types affected during operation of the MVP include forest (80.7 percent), agricultural (12.2 percent), open land (6.4 percent), residential (0.4 percent), and open water and industrial land (each about 0.1 percent).

Pipeline

The main component of the MVP would be a 304-mile-long, 42-inch-diameter pipeline. The nominal construction right-of-way for the pipeline would be 125 feet in uplands. The construction right-of-way would be necked down to 75 feet where the pipeline crosses wetlands. The MVP pipeline construction right-of-way, cathodic protection, and ATWS combined would impact a total of about 5,137 acres, of which 4,040 acres is currently forest (78.6 percent), 749 acres is agricultural (14.6 percent), and 316 acres is open land (6.2 percent).

However, 1,336 ATWS would be used at road, railroad, and river crossings, in steep terrain where two-tone construction is necessary, and to store additional topsoil in agricultural areas. The ATWS are all listed in appendix D. In total, the ATWS would encompass 658 acres, of which 54.1 percent is currently forest, 29.0 percent is agricultural, and 15.2 percent is open land. The ATWS would be use temporarily during construction. After pipeline installation all ATWS would be restored, revegetation, and returned to their original condition and land use.

Operation and maintenance of the MVP pipeline right-of-way easement would permanently affect a total of about 1,846 acres, of which 1,512 acres is currently forest (81.9 percent), 233 acres is agricultural (12.6 percent), and 92 acres is open land (5.0 percent). Associated with the operational pipeline easement would be cathodic protection facilities which would total about 10 acres.

Aboveground Facilities

Mountain Valley proposes to build 3 new compressor stations, 4 new M&R stations, 3 taps, 36 MLVs, and 5 pig launcher and receiver facilities. In total, the MVP would use 149 acres to construct the new compressor stations and M&R stations. Table 4.8.1-2 summarizes the land requirements and land uses affected by construction and operation of the aboveground facilities. The MLVs would be located within the construction right-of-way for the pipeline, and would share the same land use types listed for the pipeline above (listed on table 4.8.1-1). The pig launchers and receivers would be located within the compressor stations or M&R stations, and would share the same land use types for those stations as discussed below (listed on table 4.8.1-2).

In total, construction of the three compressor stations for the MVP would affect about 70 acres of forest and 13 acres of open land. Construction of the four M&R stations and interconnects combined would impact about 59 acres of forest, 4 acres of open land, and 4 acres of agricultural land. Operation of the compressor stations, M&R stations, interconnects, and taps combined for the MVP would permanently convert 23 acres of current forest, 3 acres of open land, and less than an acre of agricultural land to industrial land.

Construction of the Bradshaw Compressor Station in Wetzel County, West Virginia would cover about 37 acres, of which 25 acres would be forest and 11 acres would be open land. During operation of the station, 4 acres of forest land and 2 acres of open land would be affected for a total of 6 acres.

Construction of the Harris Compressor Station in Braxton County, West Virginia would cover about 17 acres, of which about 16 acres would be forest and 1 acre would be open land. During operation, 6 acres of forest land would be affected.

Construction of the Stallworth Compressor Station, in Fayette County, West Virginia would cover about 30 acres, almost all of which would be forest and less than an acre of which would be open land. Operation of the compressor station would impact about 7 acres of forest.

Construction of the Mobley Interconnect, in Wetzel County, West Virginia, would cover 3 acres, of which about 1 acre would be forest and 2 acres would be open land. Operation of the facility would impact less than an acre of open land and less than an acre of forest land.

Construction of the Sherwood Interconnect, in Harrison County, West Virginia, would cover 12 acres, 10 acres of which would be forest, less than an acre would be agricultural land, and less than an acre would be open land. During operation, 1 acre would be affected.

TABLE 4.8.1-2

Land Use Types Affected by Construction and Operation of the Mountain Valley Project Aboveground Facilities (in acres)

Project/State/ Component	Open Land		Agricultural		Forested/ Woodland		Industrial/ Commercial		Residential		Open Water		Total	
	Constr.	**Oper.**	**Constr.**	**Oper.**	**Constr.**	**Oper.**	**Constr.**	**Oper.**	**Constr.**	**Oper.**	**Constr.**	**Oper.**	**Constr.**	**Oper.**
Virginia														
M&R Stations and Interconnections														
Transco Interconnect	0.6	0.0	0.0	0.0	40.4	2.5	0.0	0.0	0.0	0.0	0.0	0.0	41.0	2.5
Launcher and Receiver Sites	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Virginia Totals	*0.6*	*0.0*	*0.0*	*0.2*	*40.4*	*2.5*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*41.0*	*2.8*
West Virginia														
Compressor Stations														
Bradshaw Station	11.1	1.8	0.0	0.0	25.4	4.4	0.0	0.0	0.0	0.0	0.0	0.0	36.5	6.3
Harris Station	1.0	0.0	0.0	0.0	15.5	5.6	0.0	0.0	0.0	0.0	0.0	0.0	16.5	5.6
Stallworth Station	0.5	0.0	0.0	0.0	29.5	7.2	0.0	0.0	0.0	0.0	0.0	0.0	29.9	7.2
M&R Stations and Interconnections														
Mobley Interconnect	1.8	0.7	0.0	0.0	1.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	3.2	1.1
Sherwood Interconnect	0.8	0.0	0.9	0.0	10.3	1.1	0.0	0.0	0.0	0.0	0.0	0.0	12.0	1.1
WB Interconnect	0.9	0.0	2.6	0.0	6.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0	9.9	1.2
West Virginia Totals	*16.0*	*2.5*	*3.5*	*0.0*	*88.5*	*19.9*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*108.0*	*22.5*
Mountain Valley Project Aboveground Totals	**16.6**	**2.5**	**3.5**	**0.2**	**128.9**	**22.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**149.0**	**25.3**

Construction of the WB Interconnect in Braxton County, West Virginia, would cover 10 acres, of which about 6 acres would be forest, 3 acres would be agricultural land, and less than an acre would be open land. During operation, 1 acre of forest land would be affected.

Construction of the Transco Interconnect in Pittsylvania County, Virginia, would cover 41 acres, of which about 40 acres would be forest and less than an acre would be open land. During operation, 3 acres of forest would be affected.

The Webster tap in Wetzel County, West Virginia, the Roanoke Gas Lafayette tap in Montgomery County, Virginia, and the Roanoke Gas Franklin tap in Franklin County, Virginia would each occupy about 2 acres. Mountain Valley would design and install the pipeline tap, valve, and piping. The interconnection company would be responsible for the interconnect design, installation, land acquisition, permits, and cost.

Yards

Mountain Valley proposes to use 22 yards during construction of its MVP (see table 4.8.1-3). The yards would cover a total of 170 acres. Of that total, 83 acres (48.6 percent) would be agricultural, 33 acres (19.1 percent) would be forest, 32 acres (18.6 percent) would be open land, and 23 acres (13.7 percent) would be residential or industrial land. After construction of the MVP, all of the yards would be restored and returned to their previous condition and land use.

Access Roads

The route of the proposed MVP pipeline would cross 263 public roadways and 12 railroads (see appendix Q). Mountain Valley proposes to use 393 new or existing roads to access construction workspace (including the construction right-of-way and aboveground facilities) (see appendix E). These roads would total 906 acres of impacts during construction and 237 acres of impacts during operation. The majority of the construction impacts for access roads would be on forest (676 acres), open land (119 acres), and agricultural land (101 acres).

Of the 393 access roads that would be used during construction, 355 (totaling 203.3 miles) would be existing roads. Mountain Valley stated that 353 of the existing roads would need to be improved, affecting 416.6 acres of land outside of the existing road footprint. Mountain Valley would construct 37 new roads for access during pipeline construction, totaling 4.8 miles, and affecting a total of 23.2 acres. An additional road has been identified by Mountain Valley as a temporary access road, but due to its inability to survey the land because of lack of landowner access, Mountain Valley has not been able to determine the road status (i.e., new or existing). Of the 393 access roads that would be used during construction, 232 are temporary and would be restored and returned to their original condition and use after pipeline installation.

During operation of the project, Mountain Valley would use 161 roads for permanent access to the right-of-way and aboveground facilities, including 131 existing roads, 27 new roads, and 1 road that is partially existing and partially will be new. The 161 access roads that would be used during operation would result in a permanent impact on 237 acres of land. Access roads are listed in appendix E.

TABLE 4.8.1-3

Land Use Types Affected by Yards Used During Construction of the Mountain Valley Project (in acres)

State/Yard Type/ Site ID	Type	MP	County	Open Land a/	Agricultural b/	Forested/ Woodland c/	Industrial/ Commercial d/	Residential e/	Open Water f/	Total
Virginia										
MVP-PY-005	Pipe Yard	264.3	Franklin	0.0	12.7	0.6	0.1	1.6	0.0	15.0
MVP-PY-006	Pipe Yard	234.2	Montgomery	4.0	15.2	1.7	0.5	1.5	0.0	22.8
Virginia Totals				*4.0*	*27.9*	*2.3*	*0.5*	*3.1*	*0.0*	*37.8*
West Virginia										
MVP-AP-001	Truck Turn Radius	52.3	Lewis	0.0	0.0	0.6	0.0	0.0	0.0	0.7
MVP-AP-002	Truck Turn Radius	59.6	Lewis	0.2	0.0	0.0	0.0	0.0	0.0	0.2
MVP-LOG-001	Truck Turn Radius	54.2	Lewis	0.1	0.0	0.1	0.0	0.0	0.0	0.2
MVP-LY-001	Laydown Yard	2.0	Wetzel	0.9	2.7	0.9	0.0	0.3	0.0	4.8
MVP-LY-001A	Laydown Yard	75.3	Braxton	0.0	19.4	0.0	0.0	0.0	0.0	19.4
MVP-LY-002	Laydown Yard	59.6	Lewis	1.4	0.2	16.1	0.0	0.0	0.0	17.8
MVP-LY-003	Laydown Yard	25.8	Harrison	4.8	0.0	2.5	0.0	0.0	0.0	7.3
MVP-LY-004	Laydown Yard	93.3	Braxton	1.1	0.0	0.0	4.5	3.2	0.0	8.9
MVP-LY-007	Laydown Yard	118.8	Nicholas	2.3	15.2	0.3	0.0	0.1	0.0	17.8
MVP-LY-013	Laydown Yard	31.5	Doddridge	2.2	0.0	0.1	0.0	3.5	0.0	5.7
MVP-LY-016	Laydown Yard	45.7	Lewis	5.2	0.4	0.0	1.7	2.3	0.0	9.5
MVP-LY-017	Laydown Yard	46.4	Lewis	1.0	3.9	0.0	0.0	0.9	0.0	5.7

TABLE 4.8.1-3 (continued)

Land Use Types Affected by Yards Used During Construction of the Mountain Valley Project (in acres)

State/Yard Type/ Site ID	Type	MP	County	Open Land a/	Agricultural b/	Forested/ Woodland c/	Industrial/ Commercial d/	Residential e/	Open Water f/	Total
MVP-LY-018	Laydown Yard	46.5	Lewis	1.9	1.4	0.0	0.0	0.0	0.0	3.3
MVP-LY-021	Laydown Yard	76.2	Braxton	0.0	0.0	0.0	3.1	0.2	0.0	3.2
MVP-LY-022	Laydown Yard	114.5	Nicholas	0.5	5.0	1.8	0.0	0.2	0.0	7.4
MVP-LY-023	Laydown Yard	109.4	Braxton	0.9	4.7	0.9	0.0	0.0	0.0	6.5
MVP-LY-024	Laydown Yard	0.1	Wetzel	0.0	0.0	0.9	0.0	0.0	0.0	0.9
MVP-LY-025	Laydown Yard	154.7	Greenbrier	1.9	2.2	0.0	0.0	0.0	0.0	4.1
MVP-RD-001	Laydown Yard	2.3	Wetzel	3.1	0.0	6.0	0.0	0.0	0.0	9.2
MVP-SA-001	Truck Turn Radius	58.7	Lewis	0.1	0.0	0.1	0.0	0.0	0.0	0.2
West Virginia Totals				*27.7*	*54.9*	*30.3*	*9.2*	*10.5*	*0.0*	*132.6*
Mountain Valley Project Totals				**31.7**	**82.9**	**32.5**	**9.8**	**13.7**	**0.0**	**170.5**

a/ NLCD Categories: Developed Open Space, Emergent Herbaceous Wetlands
b/ NLCD Categories: Cultivated Crops, Pasture/Hay
c/ NLCD Categories: Deciduous Forest
d/ NLCD Categories: Developed High Intensity, Developed Medium Intensity
e/ NLCD Categories: Developed Low Intensity
f/ NLCD Categories: Open Water

Cathodic Protection

Mountain Valley is planning a total of 31 groundbed locations that would be used to provide cathodic protection to the pipe (see section 2.1.3.1). Of the 31 locations, 27 would be surface groundbeds that would run perpendicular to the pipeline and require a construction area ranging from 25 feet wide and 377 feet long to 25 feet wide and 972 feet long. The remaining four locations would be deep well groundbeds that would require a construction area roughly 25 feet by 25 feet, affecting about 0.1 acre in total. In the draft EIS, we recommended Mountain Valley file the results for environmental surveys for all cathodic protection groundbeds prior to construction. Mountain Valley identified 8 cultural resources sites, 5 waterbodies, and 9 wetlands at 24 proposed cathodic protection beds. However, surveys were not fully completed at three proposed groundbeds due a lack of survey permission. Since not all cathodic protection groundbeds have been surveyed, **we recommend that**:

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary the results of all environmental surveys (water resources, wetlands, cultural resources, and threatened and endangered species) for all cathodic protection groundbeds.**

Altogether, the cathodic protection sites would require 18 acres of land during construction. This includes 6 acres of agricultural land, 6 acres of forest, 5 acres of open land, less than an acre of residential land, and less than an acre of industrial land. During operation, about 10 acres of land would be used, including 3 acres of forest, 3 acres of agricultural land, 3 acres of open land, less than an acre of residential land, and less than an acre of industrial land.

Equitrans Expansion Project

The EEP would impact a total of about 197 acres during construction, of which 45.0 percent would be pipeline right-of-way, 29.9 percent would be ATWS, 13.5 percent would be aboveground facilities, 5.9 percent would be yards, and 5.2 percent would be for access roads. Land affected by EEP construction is mostly agricultural (46.3 percent), followed by forest (37.6 percent), and open land (12.5 percent). Operation of the EEP facilities would affect a total of about 69 acres, of which about 44.7 percent is currently agricultural land, 41.5 percent is forest, and 11.3 percent is open land.

Pipelines

The EEP consists of about 7 miles of varying diameter pipe including 3.0 miles of 30-inch-pipe, 0.1 mile of 24-inch-pipe, 3.7 miles of 20-inch-pipe, less than 0.1 mile of 16-inch-pipe, 0.2 mile of 12-inch-pipe, and 0.2 mile of 6-inch-pipe. Construction right-of-way widths for the EEP vary depending on the diameter of pipe being installed and range from 85 feet to 125 feet. When crossing wetlands, Equitrans proposes to use a 75-foot-wide construction right-of-way, except where a modification has been requested and found acceptable (see table 2.3-2). Operational permanent right-of-way easements would be 50-feet-wide for all pipe sizes. About 0.6 mile of EEP pipelines (8 percent of the routes) would be collocated adjacent to existing rights-of-way.

Construction of the EEP pipelines combined would affect a total of about 89 acres, of which about 41 acres are currently forest (45.9 percent), 36 acres are agricultural lands (40.8 percent), and 9 acres is open lands (10.5 percent). Operation of the EEP pipelines combined would affect a total of about 45 acres. Combined, the EEP pipelines would affect about 22 acres that is currently forest (48.3 percent), 17 acres of agricultural land (37.2 percent), and 5 acres of open land (10.7 percent) during operation (see table 4.8.1-4).

Aboveground Facilities

Aboveground facilities of the EEP would include the new Redhook Compressor Station, abandonment of the existing Pratt Compressor Station, the new Webster Interconnect site, the Mobley Tap facility, and pig launcher and receiver facilities. These facilities would affect a total of about 26 acres during construction and operation. Table 4.8.1-5 summarizes the land requirements and land uses for the aboveground facilities. Construction of the aboveground facilities for the EEP would affect a total of about 17 acres of agricultural land (66.0 percent), 5 acres of forest (18.5 percent), and 4 acres of open land (16.2 percent). The operation of the EEP aboveground facilities would permanently convert the sites to about 18 acres industrial use. This would include 12 acres currently used for agriculture, 3 acres of forest, and 2 acres of open land.

The new Redhook Compressor Station would be located at MP 0.24 of pipelines H-158 and M-80 and at MP 0.0 of pipelines H-305 and H-316 in Greene County, Pennsylvania. During construction, the site would affect about 17 acres, including 11 acres that is currently agricultural land, 4 acres of forest, and 2 acres of open land. Operation of the station would convert 6 acres of agricultural land, 3 acres of forest, and less than an acre of open land to industrial land.

Once operational, the new Redhook Compressor Station would replace the existing Pratt Compressor Station, which would be decommissioned and demolished. The 8-acre industrial site where the Pratt Compressor Station is currently located would continue to be used by Equitrans as a storage yard.

The Mobley Tap facility would be located near Mountain Valley's Mobley Interconnect in Wetzel County, West Virginia. Construction of the Mobley Tap would impact less than an acre of open land during construction and less than an acre of open land during operation.

Construction of the Webster Interconnect site would impact less than an acre of open land and less than an acre of forest in Wetzel County, West Virginia.

TABLE 4.8.1-4

Land Use Types Affected by Construction and Operation of the Equitrans Expansion Project Pipeline Facilities (in acres) a/

State/Component	Open Land		Agricultural		Forested/ Woodland		Industrial/ Commercial		Residential		Open Water		Total	
	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper	Constr	Oper
Pennsylvania														
H-158	0.6	0.2	0.8	0.3	2.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	1.6
M80 Pipeline	0.6	0.2	0.8	0.3	2.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	1.6
H-316 Pipeline	2.6	1.0	18.1	7.9	16.5	8.9	0.0	0.0	0.8	0.2	0.0	0.0	38.0	18.0
H-318 Pipeline	5.1	3.0	15.3	7.6	19.2	10.7	0.1	0.1	0.7	0.6	0.9	0.9	41.2	22.8
H-305 Pipeline	0.0	0.0	1.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.6
West Virginia														
H-319 Pipeline	0.1	0.1	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3
Equitrans Expansion Project Pipeline Totals	**9.1**	**4.5**	**36.2**	**16.7**	**40.6**	**21.8**	**0.1**	**0.1**	**1.5**	**0.7**	**0.9**	**0.9**	**88.5**	**44.9**

a/ Acreages are for pipeline rights-of-way only and do not include ATWS, yards, or access roads.

TABLE 4.8.1-5

Summary of Land Use Types Affected by Construction and Operation of the Equitrans Expansion Project Aboveground Facilities (in acres)

	Open Land		Agricultural		Forested/ Woodland		Industrial/ Commercial		Residential		Open Water		Total	
State/Component	**Constr**	**Oper**	**Constr**	**Oper**	**Constr**	**Oper**	**Constr**	**Oper**	**Constr**	**Oper**	**Constr**	**Oper**	**Constr**	**Oper**
Pennsylvania														
Redhook Compressor Station	2.2	0.3	10.8	6.0	4.2	2.5	0.0	0.0	0.0	0.0	0.0	0.0	17.2	8.8
Pratt Compressor Station Abandonment	1.0	1.0	6.3	6.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	7.5	7.5
Pennsylvania Totals	3.2	1.3	17.1	12.3	4.5	2.8	0.0	0.0	0.0	0.0	0.0	0.0	24.7	16.3
West Virginia														
Mobley Tap	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2
Webster Interconnect	0.6	0.6	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8
West Virginia Totals	1.0	0.8	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.1
EEP Aboveground Totals	**4.2**	**2.2**	**17.1**	**12.3**	**4.8**	**3.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**25.9**	**17.5**

Yards

Equitrans plans on using seven yards, covering a total of about 19 acres (see table 4.8.1-6). This includes about 2 acres of forest, 3 acres of open space, 10 acres of agricultural land, and 4 acres of residential land.

TABLE 4.8.1-6

Land Use at the Yards for the Equitrans Expansion Project

Yard Name/Number	County/State	Size (acres) a/	Land Use (acres) a/
Pratt Compressor Station b/	Greene, PA	7.5	Forest - 0.3 Open Space - 1.0 Agriculture - 6.3
H-158/M-80 ATWS-01	Greene, PA	3.3	Forest - 0.1 Open Space - 0.9 Agriculture - 2.4
H316 ATWS-08	Greene, PA	1.8	Agriculture - 1.7 Forest - 0.1
H318-ATWS-08	Washington, PA	2.5	Residential - 2.4 Open Space - 0.2
H318-ATWS-09	Washington, PA	1.4	Forest - 1.3 Open Space - 0.1
H318-ATWS-010	Washington, PA	2.3	Residential - 1.6 Open Space - 0.7
H319 ATWS 02	Wetzel, WV	0.3	Forest - 0.1 Open Space - 0.2

a/ Size may not add up to total of individual land uses due to rounding.

b/ The Pratt Compressor Station site would be used for pipe storage after demolition of the station. Acreages for the station are listed under Aboveground Facilities in table 4.8.1-1.

Access Roads

The EEP pipeline routes would cross 12 public roads and 5 railroads. Equitrans is proposing to use 29 access roads (28 private and 1 public) totaling 3.7 miles for the construction of its project, of which 17 are existing roads. All but three of the existing roads would need improvements such as widening and stabilization. Four of the existing roads are paved, the rest are gravel or grass covered. Total construction impacts from access roads would be about 11 acres including 5 acres of forested land, 4 acres of agricultural land, 2 acres of open land, and 0.4 acre of residential land. Equitrans would build 10 new temporary roads during project construction totaling 0.7 mile and 1.1 acres. Equitrans would use six of the existing roads for permanent access during operation of the EEP. Permanent access roads would impact 2 acres of agricultural land, 4 acre of forest, less than an acre of open space, and less than an acre of residential land. The permanent access roads would result in a total of about 5 acres converted to an industrial land use. Access roads are all listed in appendix E.

4.8.1.3 Agricultural Land Conservation Programs

The MVP pipeline route would not cross any lands enrolled in the Agricultural Conservation Easement Program (ACEP), which is administered by the NRCS, or the Conservation Reserve Program (CRP), which is administered by the Farm Service Agency (FSA).

No known CRP lands would be crossed by any of the proposed EEP pipelines. Pipeline H-318 would cross four farms in Allegheny County enrolled in the Pennsylvania Agricultural Land Preserve Program, as well as the Forward Township Agricultural Security Area. The Pennsylvania Land Preservation Program is devoted to the preservation of small farms through the acquisition of conservation easements.

4.8.1.4 Orchards, Specialty Crops, and Organic Farms

The MVP pipeline route would cross five organic farms (see table 4.8.1-7 below). Mountain Valley has developed an OFPP that outlines measures to be used when crossing organic farms or farms that intend to transition to organic farming before the start of construction. The MVP pipeline route does not cross any other orchards, or farms growing specialty crops, such as vineyards.

TABLE 4.8.1-7

Farms Growing Specialty Crops Crossed by the Mountain Valley Project

Crop/Orchard	County/ State	Start MP	Acres Affected	
			Construction	Operation
Organic	Monroe, WV	183.6	19.5	7.5
Organic	Monroe, WV	185.7	4.1	1.6
Organic	Monroe, WV	193.9	0.6	0.4
Organic	Monroe, WV	194.0	1.7	0.8
Organic	Franklin, VA	276.0	5.0	1.7

Source: USDA AMS Organic Farm Points, Monroe County Organic District, Landrun Parcels

No orchards, vineyards, organic farms, or farms growing specialty crops were identified along the EEP pipelines.

4.8.1.5 Existing Residences, Businesses, and Planned Developments

Mountain Valley Project

As mentioned in section 4.8.1.1, construction of the MVP pipeline would affect a total of about 44 acres of residential land during construction and about 9 acres of residential land during operation. Appendix H lists residences and other structures within 50 feet of any proposed construction work area by milepost, and indicates the distance from the work areas. Mountain Valley's construction work area would be within 50 feet of 118 residential structures (including homes, mobile homes, and cabins), 8 of which have been purchased by Mountain Valley and would not be occupied during construction (see appendix R). No comments were received on the site-specific plans during the draft EIS comment period.

The proposed MVP pipeline route was adjusted by Mountain Valley in October 2016 to adopt two variations to be farther away from the Mayapple Preschool in Giles County, Virginia and the Sunshine Valley School in Franklin County, Virginia. These route variations were recommended in the draft EIS to reduce impacts on these two schools.

Mountain Valley contacted local planning agencies and has not yet identified any planned residential or commercial developments within 0.25 mile of the MVP.

Equitrans Expansion Project

No residences appear to be within 50 feet of the construction rights-of-way for its EEP pipelines. There are four existing residences within the boundary of the newly proposed Redhook Compressor Station parcel. Equitrans stated that it has negotiated purchase agreements with all four of these property owners.

No businesses or commercial buildings have been identified within 50 feet of the construction right-of-way for the EEP. The EverGreene Technology Park is about 0.25 mile south of the access roads associated with the M-80 and H-158 pipelines, in Greene County, Pennsylvania.

4.8.1.6 Recreational and Special Interest Areas

Mountain Valley Project

A number of recreational and special interest areas are within 0.25 mile of the MVP facilities (see table 4.8.1-8).

Federal Lands

The MVP pipeline route would cross the following recreational and special interest areas on federal lands:

- Weston and Gauley Bridge Turnpike Trail;
- Jefferson National Forest;
- Brush Mountain Inventoried Roadless Area;
- Appalachian National Scenic Trail; and
- Blue Ridge Parkway.

TABLE 4.8.1-8

Recreational and Special Interest Areas within 0.25 Mile of the Mountain Valley Pipeline Route

MP	County	State	Name of Area	Ownership	Existing Land Use	Distance; Direction from Pipeline	Crossing Length (feet)	Construction (acres)	Operation (acres)	Crossing Method
66.8	Braxton	WV	Weston and Gauley Bridge Turnpike Trail	Federal (COE)	Forest	Crossed	125	NA	NA	Bore
68.7	Braxton	WV	Burnsville Lake WMA a/	Federal (COE) State (WVDNR)	Forest; Open	Crossed	177	0.5	0.2	Open-cut
81.6	Braxton	WV	Elk River WMA	State (WVDNR)	Forest; Open	1,243 feet; West	NA	0.0	0.0	NA
105.1	Webster	WV	Big Ditch WMA	State (WVDNR)	Forest; Open; Agriculture; Water	676 feet; South	NA	0.0	0.0	NA
118.9	Nicholas	WV	Gauley River	State	Forest; Open Water	Crossed	300	0.7	0.3	Dry open-cut
154.2	Fayette	WV	National Coal Heritage Area	State & Private	Mixed	Crossed	2,625	32.1	10.9	Open-cut
157.2	Summers	WV					90,411	318.9	109.2	Open-cut
171.3	Summers	WV	Greenbrier River	State	Open Water	Crossed	400	0.9	0.5	Dry open-cut
196.3	Monroe	WV	Jefferson National Forest	Federal (FS)	Forest	Crossed	522	0.7	0.6	Open-cut
196.4	Giles	VA					7,958	28.4	13.8	Open-cut
218.6, 220.7	Montgomery	VA					9,486	26.8	10.9	Open-cut
196.3	Monroe	WV	Appalachian National Scenic Trail (on Jefferson National Forest)	Federal (FS)	Forest	Crossed	600	NA	NA	Bore

TABLE 4.8.1-8 (continued)

Recreational and Special Interest Areas within 0.25 Mile of the Mountain Valley Pipeline Route

MP	County	State	Name of Area	Ownership	Existing Land Use	Distance; Direction from Pipeline	Crossing Length (feet)	Construction (acres)	Operation (acres)	Crossing Method
196.8	Giles	VA	Peters Mountain Wilderness (on Jefferson National Forest)	Federal (FS)	Forest; Open	135 feet; East	NA	0.0	0.0	NA
204.3	Giles	VA	New River Conservancy Easement (Sizemore Property)	NGO (NRC)	Forest; Agriculture	Crossed	2,148	6.5	2.5	Open-cut
209.3	Giles	VA	Newport Recreation Center (1933 High School)	County (Giles)	Residential; Commercial	945 feet away	NA	0.0	0.0	Open-cut
219.8	Montgomery	VA	Brush Mountain Inventoried Roadless Area (on Jefferson National Forest)	Federal (FS)	Forest	Crossed	4,919	13.8	5.6	Open-cut
220.0	Montgomery	VA	Brush Mountain Wilderness (on Jefferson National Forest)	Federal (FS)	Forest; Open	1,035 feet; East	NA	0.0	0.0	NA
220.7	Montgomery	VA	Catawba Valley Special Project Area	State (VOF) b/ Private	Agricultural; Forest	Crossed	40,245	135.3	47.6	Open-cut
222.9	Montgomery	VA	VOF Easement	State (VOF)	Forest; Open Space; Agriculture	117 feet; South	NA	0.0	0.0	NA
234.2	Montgomery	VA	MON-VOF-1871	State (VOF)	Forest; Agriculture	Crossed	314	0.9	0.4	Open-cut
239.3	Roanoke	VA	MON-VOF-2563/ ROA-VOF-2563	State (VOF) Private	Forest; Open	Access Road MVP-RO279.01 c/	420	0.4	0.4	NA

TABLE 4.8.1-8 (continued)

Recreational and Special Interest Areas within 0.25 Mile of the Mountain Valley Pipeline Route

MP	County	State	Name of Area	Ownership	Existing Land Use	Distance; Direction from Pipeline	Crossing Length (feet)	Construction (acres)	Operation (acres)	Crossing Method
239.5	Roanoke	VA	TNC Poor Mountain Easement	NGO (TNC) Private	Forest; Open	Crossed	7,025	21.8	8.1	Open-cut
241.7	Roanoke	VA	ROA-VOF-2931	State (VOF)	Forest; Open Space; Agriculture	865 feet; East	NA	0.0	0.0	NA
243.2	Roanoke	VA	BRLC Easement d/	NGO (BRLC)	Forest; Open Space	41 feet; East	NA	0.0	0.0	NA
246.1	Roanoke Franklin	VA VA	Blue Ridge Parkway	Federal (NPS)	Forest; Open Space; Agriculture	Crossed	2,276	8.5	3.1	Bore

a/ WMA = Wildlife Management Area

b/ VOF = Virginia Outdoors Foundation

c/ In section 3.5.1.12 we are including a recommendation that Mountain Valley not utilize access road MVP-RO-279.01.

d/ BRLC = Blue Ridge Land Conservancy

The MVP pipeline route would be within 0.25 mile of the Peters Mountain Wilderness and the Brush Mountain Wilderness, within 2.5 miles of the Mountain Lake Wilderness, and within 7.5 miles of the Brush Mountain East Wilderness. Each of these designated Wilderness Areas are part of the Jefferson National Forest. Wilderness Areas are special areas of federal land where the impacts of human activities and control are minimized, areas according to section 2c of the Wilderness Act of 1964 "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain," and which are managed to preserve natural conditions and wilderness character. Pipelines and other facilities are prohibited in Wilderness Areas, unless specifically authorized by the President of the United States (P.L. 88-577, Wilderness Act, sections 2c and 4d4).

The MVP pipeline route would be within 5 miles of two National Historic Landmarks designated by the NPS: Weston State Hospital in Lewis County, West Virginia, and the Pittsylvania County Courthouse in Pittsylvania County, Virginia.

Weston and Gauley Bridge Turnpike Trail – The MVP pipeline route would cross the Weston and Gauley Bridge Turnpike Trail at about MP 66.8 in Braxton County, West Virginia. Currently a dirt/grass hiking trail owned in fee by the COE, the turnpike was first a road built by a private company between 1849 and 1858. The original road was about 110 miles long, and provided transportation access to Sutton's grist mills and the sawmills at Bulltown. The turnpike was used during the Civil War by Union troops who took control of the Kanawha Valley. Portions of the turnpike were abandoned after what is now U.S. 19 was paved in the 1920s. A ten-mile-long segment of the turnpike was acquired by the COE in the 1970s when the Burnsville Lake Project was developed. The Weston and Gauley Bridge Turnpike Trail was placed on the NRHP in 1998, and is also mentioned in section 4.10 of this EIS.

Jefferson National Forest – The MVP pipeline route would pass through the Jefferson National Forest for a total of 3.5 miles in three segments between MPs 196.2 and 197.8, MPs 218.5 and 219.4, and MPs 219.8 and 220.8 in Monroe County, West Virginia, and Giles and Montgomery Counties, Virginia. This includes the crossing of the ANST and the Brush Mountain Inventoried Roadless Area. The Jefferson National Forest is managed by the FS. The Forest was created in 1936 out of the Natural Bridge National Forest, dating back to 1916.

In 1995, the Jefferson National Forest was administratively combined with the George Washington National Forest in west central Virginia. Together the two Forests—the GWJeff—are nearly 1.8 million acres, with the Forest Supervisor's Office located in Roanoke, Virginia. The Forests are a part of the Southern Region (Region 8) of the FS, headquartered in Atlanta, Georgia. The Forests are two of 154 national forests and 20 national grasslands in 44 states and Puerto Rico.

The mission of the FS is to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations. The agency carries out this mission through four main activities: international assistance in forest management, domestic community assistance to help protect and manage non-federal forest lands, forestry research, and the protection and management of NFS lands. It is the responsibility of the FS to manage national forests for multiple uses of resources such as water, forage, wildlife, wood, recreation, and Wilderness; and to provide products and benefits to benefit the American people while ensuring the productivity of the land and protecting the quality of the environment. National forests are governed by a variety of federal laws, and management is directed by a multiyear LRMP, and by project and site-specific planning and NEPA analysis.

The Jefferson National Forest covers about 723,300 acres in three states (Kentucky, West Virginia, and Virginia), within seven major river basins. It is located in the Blue Ridge, Central Ridge and Valley, and Cumberland Plateau physiographic provinces in the Appalachian Mountains. Vegetation in the National Forest is dominated by the Appalachian Hardwood Forest. Jefferson National Forest contains over 60 tree species and provides habitats for at least 180 birds species, 60 mammals, 70 amphibians and reptiles, and 100 freshwater fish and mussels (FS, 2016a).

The Jefferson National Forest provides a wide variety of recreation opportunities, including developed camping and day-use recreation sites; more than 1,000 miles of trails for hiking, horse riding, mountain bicycling, and off-highway vehicle (OHV) use; more than 800 miles of public roads, and public land available for a range of dispersed recreation activities including hunting, fishing, wildlife viewing, and more.

We describe the existing environment for land use and visual resources along the MVP pipeline route through the Jefferson National Forest separately below in sections 4.8.1.10 and 4.8.1.11. In section 4.8.2.6 of this EIS, we discuss land use impacts resulting from construction and operation of the MVP on NFS lands, and the needed LRMP amendments to allow the MVP pipeline to cross the Jefferson National Forest.

Appalachian National Scenic Trail – The MVP pipeline route would cross the ANST at about MP 196.3, within the Jefferson National Forest. The ANST is the longest hiking-only footpath in the world – a 2,190-mile trail traversing the Appalachian Mountains in 14 eastern states, extending from Katahdin in Maine south to Springer Mountain in Georgia. The trail was conceived in 1921, and completed in 1937, primarily by citizen volunteers. Volunteers from local trail clubs perform most of the maintenance on the ANST today. It is visited by more than 3 million people annually. It was designated as the first National Scenic Trail by the U.S. Congress in the National Trails System Act of 1968 (P.L. 90-543).

The trail is a unit of the National Park system, and the NPS is the lead federal agency for the entire ANST. The ANST is managed through a unique cooperative management system comprised of the NPS, the ATC, volunteers from 31 ATC-affiliated local trail clubs, and public land-managing agencies, including the FS.

More than 325 miles of the ANST is located within the GWJeff in central and southwest Virginia. The GWJeff manages the ANST, both the footpath itself and the adjacent lands mapped as the foreground visual area using the Scenery Management System, to protect the ANST experience; to preserve and strengthen the role of volunteers and volunteer organizations; to provide opportunities for high quality recreational experiences; and to provide for the conservation and enjoyment of the nationally significant scenic, historic, natural, and cultural qualities of the land through which the ANST passes. The Virginia SHPO has determined that the ANST is eligible for nomination to the NRHP, as discussed in section 4.10.

Brush Mountain Inventoried Roadless Area (IRA) – IRAs are a FS classification of lands that have no roads or a very low road density. The intent of identifying inventoried roadless areas in the 2001 Roadless Area Conservation Rule (RACR, 36 CFR 294) is to provide lasting protection for IRAs within the context of FS multiple use management by establishing prohibitions on road construction, road reconstruction and timber harvesting, with limited exceptions, within IRAs on NFS lands. The proposed MVP pipeline route, between about MPs 219.8 and 220.7, crosses the Brush Mountain IRA for a length of approximately 1 mile within the Jefferson National Forest. The Brush Mountain IRA was originally 5,920 acres in size and is included in the 2001 RACR. In the Omnibus Public Land Management Act of 2009 (P.L.111-11), 4,795 acres of the Brush Mountain IRA was designated as Brush Mountain Wilderness. The western portion of the IRA was not designated as Wilderness primarily due to concerns from an adjacent high density subdivision and concerns about fire suppression.

The pipeline route is located on the eastern side of the remaining IRA, within approximately 1,000 feet of the western boundary of Brush Mountain Wilderness. There is no road construction or ATWS proposed by Mountain Valley within the IRA.

Blue Ridge Parkway – The MVP pipeline route would cross the BRP at about MP 246.1, in Roanoke County, Virginia. The BRP is a 469-mile-long paved rural roadway connecting the Shenandoah National Park in Virginia with the Great Smoky Mountains National Park in Tennessee and North Carolina. The U.S. Congress allocated funds for the construction of the BRP in 1933, and in 1936 authorized the NPS to administer the parkway. The parkway is intended for leisurely recreational driving that offers travelers varied scenic vistas of the landscape of the Appalachian Mountains. The BRP National Historic District was placed on the NRHP in 2008, and is also listed on the Historic American Engineering Record (HAER), as mentioned in section 4.10.

State Lands, Easements, and Designated Conservation Areas

In the state of West Virginia, the MVP pipeline route would cross state managed lands at:

- North Bend Rail Trail;
- Burnsville Lake WMA;
- National Coal Heritage Area (NCHA); and
- Recreational rivers.

The MVP pipeline route would avoid crossing the Elk River WMA, Big Ditch WMA, and Meadow River WMA, all of which are within 0.25 mile of the proposed route.

North Bend Rail Trail – The North Bend Rail Trail is a converted railroad right-of-way, originally constructed by the Baltimore and Ohio Railroad in the 1850s (NBRTF, 2015). The trail extends for 72 miles from I-77 near Parkersburg in Wood County to Wolf Summit in Harrison County, West Virginia. It is managed by the West Virginia State Park and Forest (WVSPF) system. Use of the trail is limited to hiking, biking, and horseback riding (WVSPF, 2016). It is part of the American Discovery Trail, which is a non-motorized recreational trail that crosses over 6,800 miles and 15 states (ADT, 2016). The MVP pipeline route would cross the North Bend Rail Trail near MP 26 in Harrison County, West Virginia.

Burnsville Lake Wildlife Management Area - At about MP 68.7, in Braxton County, West Virginia, the MVP pipeline route would cross about 177 feet within the Burnsville Lake WMA. The Burnsville Lake WMA consists of a total of about 12,579 acres, including hilly uplands and flat creek bottoms, covered with a mixture of young timber, brush, and old fields. The WMA includes the 968 acre Burnsville Lake. The land was acquired by the COE in the 1970s; and is currently managed by the WVDNR-Wildlife Resources Section. The uplands contain hunting opportunities for deer, grouse, rabbit, raccoon, and turkey. There is a marina at the lake, and three boat ramps, and the lake presents fishing opportunities to catch bass, bluegill, catfish, crappie, muskellunge, walleye, and stocked trout. There are 264 tent/trailer campsites at the Burnsville Lake WMA. The WVDNR manages its WMA program to conserve high quality habitats for a variety of wildlife species, and to improve public access to those resources.

National Coal Heritage Area - The U.S. Congress designated the NCHA in 1996, to preserve and interpret lands, structures, and communities associated with historic coal mining in West Virginia. The NCHA is a partnership between the NPS, the state of West Virginia, and local counties. In 2002, the West Virginia Legislature created the National Coal Heritage Area Authority as the state agency responsible for management of the NCHA. The NCHA encompasses 5,300 square miles in 13 counties in West Virginia; most of which is private lands. Land use decisions remain on the local level. The MVP pipeline route would cross through the NCHA between MPs 154.2 to 154.6 in Fayette County, West Virginia; and MPs 157.2 to 174.2 in Summers County, West Virginia. The project elements in the NCHA are listed on table 4.8.1-9.

TABLE 4.8.1-9

Mountain Valley Project Facilities located within the National Coal Heritage Area

Facility	Construction Footprint (acres)	MPs	Pipeline length in NCHA (miles)
Fayette County, West Virginia		154.2 – 154.6	0.5
Pipeline Right-of-Way	2.4		
Laydown Yard	<0.1		
Stallworth CS	29.9		
Summers County, West Virginia		157.2 – 174.2	17.1
Pipeline Right-of-Way	251.8		
ATWS	50.1		
Access Roads	44.4		
Total	**379.3**		**17.6**

Also in West Virginia, the MVP pipeline would cross two rivers used recreationally. The state of West Virginia has rights to the river beds of its navigable rivers; and these rights are vested in the Public Land Corporation within the WVDNR (WVDEP, 2013; George, 1998). Both the Gauley River and the Greenbrier River, discussed below for their recreational values, are navigable rivers that are managed by the state of West Virginia.

Gauley River – The Gauley River offers a number of recreational opportunities and is particularly known for its whitewater rafting and recreational boating. The MVP pipeline route would cross the Gauley River in Nicholas County, West Virginia at about MP 118.9. The majority of the rafting on the river occurs below the Summersville Dam which provides controlled releases of water to enhance recreation. The pipeline crossing of the river would be about 10 miles above the dam. Apparently, the Gauley River at the crossing location is not typically used for recreational activities.

Greenbrier River – The Greenbrier River supports many types of recreational activities, including fishing and boating. Additionally, scenic trails and roadways follow beside the river. The Greenbrier River would be crossed by the MVP pipeline at about MP 171.3, near the community of Pence Spring, in Summers County, West Virginia. Later in this section we discuss the Lower Greenbrier River Byway.

In the Commonwealth of Virginia, the MVP pipeline route would cross state managed lands or easements at:

- Open Space parcels MON-VOF-1871 and MON-VOF-2563/ROA-VOF-2563; and
- VADCR-designated Conservation Units/Sites (mostly on privately-owned lands).

Other parcels owned or managed by the Commonwealth of Virginia, or easements held by the VOF, located within 0.25 mile of the MVP pipeline, that would be avoided include the Mill Creek Springs Natural Area Preserve (Blake Reserve) in Montgomery County, Virginia, a VOF open space easement near MP 222.9, and VOF open space easement ROA-VOF-2931.

Virginia Outdoors Foundation – The VOF was established by the Virginia General Assembly in 1966. In accordance with the Open Space Land Act (VA Code § 10.1-1700 et seq.), the VOF holds easements on behalf of the Commonwealth to preserve natural, scenic, historic, scientific, open space, and recreational areas.[69] The VOF manages more than 750,000 acres of land in Virginia (VOF, 2015). Mountain Valley reviewed protected areas databases and consulted with the VOF to identify open space properties crossed by the proposed MVP.

At about MP 234.2, the MVP pipeline route would cross the VOF easement labeled as MON-VOF-1871, in Montgomery County, Virginia. The easement is an area of contiguous deciduous forest adjacent to I-81 which is managed by the VOF as a forested vegetation community with scenic and recreational properties.

At about MP 239.3, Mountain Valley proposes to utilize an existing road for access (MVP-RO279.01) that is within a forested area of a VOF easement (parcel MON-VOF-2563/ROA-VOF-2563) on privately-owned land in Roanoke County, Virginia. However, in section 3.5.1.12 we are including a recommendation that Mountain Valley not utilize access road MVP-RO-279.01.

[69] See letter to Mountain Valley from VOF dated March 17, 2015 (accession number 20150327-5153).

The proposed pipeline route would be within the Catawba Valley Special Project Area for 7.2 miles, between approximately MPs 220.7 to 228.3, in Montgomery County. VOF Special Project Areas are geographic regions in Virginia that have been identified as having a high concentration of conservation values warranting special consideration (VOF, 2015). The Catawba Valley Special Project Area was designated in October 2009 by the VOF after nomination by the New River Land Trust. The area encompasses a total of 51,800 acres, of which 4,325 acres are currently protected by the VOF.

Virginia Department of Conservation and Recreation Designated Conservation Units/Sites

VADCR manages a biodiversity database that contains locations of natural heritage resources. Certain landscapes, that support habitats for rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, or significant geological features, are designed by the VADCR as Conservation Areas, Units, or Sites, because they are worthy of protection and stewardship action. Terrestrial conservation sites contain one or more rare plant, animal, or natural community. Stream conservation units contain rare aquatic resources. There are more than 1,800 terrestrial and stream conservation site records. Conservation sites are given a biodiversity significance ranking based on the rarity, quality and number of natural heritage resources they contain. Conservation sites are used to identify land management needs and protection priorities. More than half of the identified conservation sites are in private ownership.

The MVP pipeline route would avoid most of the conservation areas identified by the VADCR[70] in the project area, including the Stony Creek Stream Conservation Unit, Upper Mill Creek Conservation Site, Roanoke River – North and South Forks Stream Conservation Unit, Ellison Glades Conservation Site, Grassy Hill Conservation Site, Jacks Creek Conservation Site, Canoe Cave Conservation Pigg River – Owens Creek Conservation Unit, Sinking Creek Mountain Conservation Site, Lynn Hollow Conservation Site, Fort Lewis Mountain Slopes Conservation Site, Trout Creek Barren Conservation Site, Pickles Branch Conservation Site, Sarver Barrens Conservation Site, Clover Hollow Conservation Site, Canoe Cave Conservation Site, and Pig Hole Cave Conservation Site.[71] However, the pipeline route would cross through the three VADCR-designated conservation areas discussed below.

Craig Creek – Johns Creek Stream Conservation Unit – The MVP pipeline would cross Craig Creek at about MP 218.2, in Montgomery County, Virginia within the VADCR's designated Craig Creek – Johns Creek Stream Conservation Unit. The stream crossing is on private land. The conservation unit has been given a biodiversity ranking of B1 by the VADCR, representing a site with outstanding natural resources significance.

Slussers Chapel Conservation Site – The Slussers Chapel Conservation Site would be crossed by the MVP pipeline route between about MPs 220.8 and 224.4, in Montgomery County, Virginia. The VADCR ranks this site B3, having third order significance for natural resources. The site includes Slussers Chapel Cave, which is owned by the Cave Conservancy of Virginia. The Mount Tabor Variation, adopted into the currently proposed route for the MVP pipeline,

70 See letters to the FERC from the VDCR dated June 11, 2015, March 17, 2016, and May 20, 2016.

71 See Mountain Valley's October 2015 application to the FERC, RR3, page 3-22 and table 3.2-2.

would avoid Slussers Chapel Cave. Alternative routes that may lessen impacts on the Slussers Chapel Conservation Sites are discussed in section 3.5.

Old Mill Conservation Site – The Old Mill Conservation Site would be crossed by the MVP pipeline route between about MPs 224.6 and 226.9, in Montgomery County, Virginia. The VADCR ranks the site B3, having third order significance for natural resources. The entrance to Old Mill Cave is owned by TNC. The Mount Tabor Variation, which was adopted into the currently proposed route for the MVP pipeline, would avoid Old Mill Cave.

County and Municipal Lands

The MVP pipeline route would not cross any county or municipal parks or developed recreation areas. The pipeline route would be within 0.25 mile of the Newport Recreation Center (1933 high school building) in Giles County, Virginia. The MVP pipeline route would be 0.6 mile away from Elliston Park in Montgomery County, Virginia.

Conservation Easements on Private Lands Managed by Non-Governmental Organizations

The MVP pipeline route would cross the following special interest areas, owned, controlled, or managed by NGOs, or on privately-owned lands:

- Easement of the New River Conservancy; and
- Easement of TNC.

The MVP pipeline route would avoid an easement held by the Blue Ridge Land Conservancy, within 0.25 mile

New River Conservancy – The New River Conservancy was established in 1974 to protect "… the waters, woodland, and wildlife of the New River watershed" (NRC, 2015). The New River winds for 320 miles through three states (West Virginia, Virginia, and North Carolina). The New River Conservancy holds a conservation easement for a tract of private land owned by Sizemore, Inc., that would be crossed by the MVP pipeline route between about MPs 203.4 and 203.6 in Giles County, Virginia.[72] Alternatives for avoiding this property are discussed in section 3.5.

The Nature Conservancy – TNC is an international non-profit organization, founded in 1951, with a mission to: "…conserve the lands and waters on which all life depends" (TNC, 2016). TNC has protected nearly 15 million acres of land in the United States. TNC stated that the MVP pipeline route would cross a conservation easement that the TNC holds over private land owned by James and Jill Woltz, and a tract of land owned in fee by TNC.[73] The MVP pipeline route would cross the Poor Mountain TNC easements between about MPs 239.5 and 241.0, in Roanoke County, Virginia.

[72] See letter to Mountain Valley from Ziegler & Ziegler dated June 16, 2015.

[73] See motion to intervene filed by TNC on November 25, 2015.

During the comment period for the draft EIS, the Virginia chapter of the Sierra Club submitted a comment asking about the pipeline's potential impacts on the Falls Ridge Preserve which is located in Montgomery County, Virginia and is owned by TNC.[74] At its closest point the preserve is roughly 4 miles from the pipeline at MP 228.6 and due to the distance would not be affected.

Equitrans Expansion Project

The EEP would not cross any federally designated Wild and Scenic Rivers, National Parks, National Trails, National Landmarks, federal or state designated Wilderness Areas, national or state forests, wildlife refuges, nature preserves or game management areas, Indian reservations, or state or county parks or recreational areas. A small portion of the Riverview Golf Course would be crossed by the H-318 pipeline.

4.8.1.7 Scenic Byways

Mountain Valley Project

The MVP pipeline route would cross the following national or state designed scenic byways:

- Staunton-Parkersburg Turnpike in Lewis County, West Virginia;
- Midland Trail in Greenbrier County, West Virginia;
- Lower Greenbrier River Byway in Summers County, West Virginia;
- Lowell Backway in Summers County, West Virginia;
- Farm Heritage Road in Monroe County, West Virginia;
- Big Stony Creek Road in Giles County, Virginia;
- Blue Grass Trail in Giles County, Virginia; and
- Catawba Road in Montgomery County, Virginia.

Staunton-Parkersburg Turnpike

At MP 47.9 in Lewis County, West Virginia, the MVP pipeline route would cross the Staunton-Parkersburg Turnpike, which is designated as a National Scenic Byway and a West Virginia state scenic byway. Historically, the turnpike, originally designed by Claudius Crozet and built between 1838 and 1850, linked the Shenandoah Valley with the Ohio River Valley. It has been replaced in modern times by paved federal and state highways. From Staunton, Virginia, the turnpike follows U.S. 250 west through Augusta and Highland Counties. Crossing into West Virginia, the turnpike continues through the Allegheny Mountains of Pocahontas and Randolph Counties. It then follows U.S. 33 through Upshur and Lewis Counties, and WV 47 through Gilmer, Ritchie, Wirt, and Wood Counties (SPT, 2016). Along the road are Civil War sites associated with the First Campaign, historic towns, small farms, woods, and mountain vistas (DOT, 2016a). Although the turnpike was recorded as an historic site (Field #134) by Mountain Valley's cultural

[74] See accession number 20161222-5311.

resources contractor, it was evaluated as being not eligible for nomination to the NRHP (Espino et al., July 2015a, see section 4.10). The road averaged 2,200 users per day when assessed in 2003.

Coal Heritage Trail/Midland Trail in Greenbrier County, West Virginia

At MP 144.1, in Greenbrier County, West Virginia, the MVP pipeline route would cross the Coal Heritage Trail/Midland Trail, two designated National Scenic Byways. The Midland Trail follows U.S. 60 for 180 miles across the mid-section of West Virginia, from White Sulphur Springs west to Virginia Point Park, past Malden, childhood home of Booker T. Washington, and the State Capitol of Charlestown (DOT, 2016a), through the Gauley Mountains, and Big and Little Sewell Mountains. The trail is bordered by the New River Gorge National Park and the New River Heritage Area. The Coal Heritage Trail, located within the NCHA, winds through more than 187 rugged miles of mountainous southwestern West Virginia, past abandoned coal mines and company towns that reflect the history of the region's coal industry. From Mile Marker 42 at Chimney Corner to Mile Marker 53, the Midland Trail and Coal Heritage Trail are combined into one road. Traffic on the trail in 2012 was estimated at about 6,683 vehicles per day.

Lower Greenbrier River Byway

The Lower Greenbrier River Byway is a West Virginia state designated scenic byway and would be crossed by the MVP pipeline route at MP 171.3 in Summers County, West Virginia. For roughly 32 miles, the byway follows State Route 3 and State Route 63 along the Greenbrier River (West Virginia, 2017).

Lowell Backway

The Lowell Backway is a West Virginia state designated backway, crossed by the MVP pipeline route at MP 171.9, in Summers County, West Virginia. The backway follows County Road 15 for about 9 miles in a large bend in the Greenbrier River (West Virginia, 2017). Along the backway are two mineral springs, farms, and a camp built by the Civilian Conservation Corps.

Farm Heritage Road

The MVP pipeline route would cross the Farm Heritage Road, a West Virginia state designated scenic byway, at MP 182.7 in Monroe County, West Virginia. The 60 mile long Farm Heritage Trail follows WV 3 heading west from Sweet Spring, to US 19 from Union to Greenville, then WV 12 between Ballard and Peterstown. The route affords views of the Indian Creek valley, the Sweet Springs valley, and Peters Mountain. In 2012, traffic counts along Highway 12 averaged 306 vehicles per day.

Big Stony Creek Road/Whistle Stop Byway

The MVP pipeline route would cross the Big Stony Creek Road-Whistle Stop Byway at MP 201.9 in Giles County, Virginia. This road, which is SR 635 between Pembroke to the south and White Rocks to the north, was designated a Virginia Byway by the State Assembly in 2010. It parallels the Norfolk and Western Railway. A portion of SR 635 is within the boundary of the proposed Big Stony Creek Historic District, discussed in section 4.10.

Blue Grass Trail

The Blue Grass Trail is Virginia Route 42 between Newport to the south and New Castle to the north. It is a Virginia Byway, crossed by the proposed route of the MVP pipeline at MP 212.9 in Giles County. A portion of the Blue Grass Trail is within the Greater Newport Rural Historic District, further discussed in section 4.10.

Catawba Road

Catawba Road is Virginia Route 785 from the North Fork Valley in the south to Catawba in the north. It was designated a Virginia Byway by the General Assembly in 1986. The road transects through pastoral landscapes, and is also part of the TransAmerica Bikeway (Virginia, 2016). The proposed route of the MVP pipeline would cross Catawba Road at MP 227.1 in Montgomery County. A portion of the Catawba Road is within the boundaries of the North Fork Rural Historic District, discussed in section 4.10.

Equitrans Expansion Project

The EEP does not cross any national or state designated scenic byways.

4.8.1.8 Coastal Zone Management Act

The MVP and the EEP are not located in any Coastal Zone Management Areas.

4.8.1.9 Hazardous Waste and Contaminated Sites

Mountain Valley Project

Using data from the EPA, the WVDEP, and the VADEQ, Mountain Valley identified 207 sites of potential contamination concern within 0.5 mile of the MVP, 14 of which are within 200 feet. Of the sites within 200 feet, eight are in West Virginia and six are in Virginia. The sites in West Virginia include one site under ongoing monitoring, two regulated discharge sites that are in compliance, three aboveground storage tanks with no release recorded, one small quantity generator with no release indicated, and one completed reclamation site. In Virginia, there is one site with ongoing enforcement and reporting, three closed leaking underground storage tank cases, and two registered tanks with no release indicated. None of the sites are crossed by the proposed project.

Equitrans Expansion Project

Equitrans identified 12 potentially contaminated sites within 0.5 mile of the EEP, two of which are within 200 feet. They include one small quantity generator with no issues of concern recorded and a natural gas facilities site. None of the sites are crossed by the proposed project.

The Pratt Compressor Station abandonment is anticipated to involve the removal of some hazardous materials such as oil contaminated soil, lead paint, asbestos, hydrocarbons in pipe, mercury meters, and a PCB transformer.

4.8.1.10 Visual Resources

Visual resources represent the aesthetic quality of the landscape as perceived subjectively by the viewer. Visual resources refers to the composite of basic terrain features, geologic features, hydrologic features, vegetation patterns, and anthropogenic features that influence the visual appeal of an area for residents or visitors. Federal lands have visual resource rating standards. No such standards exist for state, county, municipal, and private lands.

The most visible features of the MVP and EEP would be the aboveground facilities. A typical compressor station would consist of five structures (compressor unit-turbines building, two electrical control buildings, air compressor building, and an office), pig launchers/receivers, electric utilities, lighting fixtures, graveled yard with piping, surrounded by a chain-link security fence. Interior yard equipment would include gas filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, hears, and auxiliary micro-turbines. The operational compressor stations would cover between 6 to 9 acres each.

The equipment at a typical M&R station and interconnection would consist of custody-transfer flow meter, pressure/flow regulator, over pressure protection, isolation block valves, and associated instrumentation and control devices. The meter runs would be located within a graveled yard surrounded by a fence. There would also be an electric utility hook-up. The operational size of the M&R stations average between 1 and 3 acres.

Most of the MLVs would be located within the permanent right-of-way easement for the pipeline. Usually, the valves are buried, with aboveground extensions. The MLVs would be equipped with valve actuators for remote operation. The MLVs would be located in graveled fenced areas, and typically cover less than 0.1 acre.

Mountain Valley Project

Because they are permanent aboveground facilities, compressor stations and M&R stations would be the most visible features of the MVP. The aboveground facilities include buildings on cleared graveled yards. The Bradshaw Compressor Station would be in a rural area with no identified visual receptors. The Harris Compressor Station would be constructed in a wooded area with one house nearby. However, Mountain Valley states that it intends to purchase that residence. The Stallworth Compressor Station would be constructed on a forested hill in a rural area; with a house about 0.2 mile away.

The four M&R stations would be collocated with other natural gas facilities. The MLVs would be installed either along the pipeline right-of-way or within other aboveground facilities.

Mountain Valley performed a VIA of its pipeline route, encompassing a 3-mile-wide corridor. Visual impacts were assessed by the amount of contrast construction and operation of the facilities would create against the original landscape background from the perspective of a viewer at key observation point (KOP) within the 3-mile-wide corridor. Contrast in the landscape was determined by differences in form, line, color, texture, and juxtaposition between existing conditions and assumed conditions after construction of project facilities. Mountain Valley assessed contrast using aerial imagery and on-site evaluations. After selecting a number of KOPs (see table 4.8.1-10), Mountain Valley evaluated visual impacts using subjective terms such as "none," "low," "medium," or "high."[75] No impacts were found for KOPs where the pipeline right-of-way could not be seen by viewers, either because of distance or existing landscape or vegetation screening. Low to medium impacts were found at KOPs where viewers would only have a brief view of the right-of-way while traveling on a highway. High impacts were found where the pipeline would be visible on a prominent landscape, with sharp contrasts, without landscape or vegetative screening, and the KOP would be located relatively close to viewers. On February 26, 2016, Mountain Valley filed with the FERC computer-generated visual simulations for the KOPs with "high" ratings[76] (see appendix S). Mountain Valley filed with the FERC revisions to its VIA for KOPs within or nearby the Jefferson National Forest on May 1 and 10, 2017. We discuss KOPs that may view the Jefferson National Forest later in this section.

Several comments were received on the VIA. In response, Mountain Valley expanded its analysis to include several additional KOPs near the crossings of the Weston and Gauley Bridge Turnpike Trail (which is administered by the COE), the BRP (which is administered by the NPS), and the Jefferson National Forest (which is administered by the FS).

Visual Resources near the Weston and Gauley Bridge Turnpike Trail

The MVP pipeline route would cross the Weston and Gauley Bridge Turnpike Trail near MP 66.9 in Braxton County, West Virginia on land owned by the COE. The current area adjacent to the trail at the crossing is natural and forested. Mountain Valley submitted its VIA for the Weston and Gauley Bridge Turnpike Trail on March 30, 2017.[77] Four KOPs were chosen from on or near the trail, one of which was determined to have the potential for High impact (see table 4.8.1-10). We discuss the impacts for the KOPs on or near the Weston and Gauley Bridge Turnpike Trail further in section 4.8.2.

Visual Resources near the Blue Ridge Parkway

The MVP pipeline route would cross the BRP near MP 246.4 just on the Roanoke County side of the Roanoke/Franklin County border in Virginia. The current area adjacent to the road at the crossing is an open field. Mountain Valley submitted the Blue Ridge Parkway VIA on February 17, 2017.[78] Of the 23 KOPs selected on or near the BRP for the analysis, none were determined to have the potential for High impact (see table 4.8.1-10). We discuss the impacts for the KOPs on or near the BRP further in section 4.8.2.

75 See section 8.4.3 of Resource Report 8 in the Environmental Report included with Mountain Valley's October 23, 2015 application to the FERC.

76 Attachment 8-30

77 Accession number 20170330-5339 – Attachment DR5 – Land Use 11.

78 Accession number 20170217-5199.

TABLE 4.8.1-10

Key Observation Points Along the Route of the Mountain Valley Pipeline and Assessments of Visual Impacts a/

Key Observation Points Selected by Applicant	County/State	MP	Distance	Applicant's Initial Impact Assessments
Highway 20	Harrison, WV	15.3	Crosses	Low-Moderate – traffic at speed
Ten Mile Creek Road	Harrison, WV	18.7	Crosses	Low-Moderate – traffic at speed
Fletchers Covered Bridge	Harrison, WV	26.1	2.1 miles	None – pipeline not visible
North Bend River Trail	Harrison, WV	25.8	Crosses	High
Smoke Camp WMA	Lewis, WV	39.7	0.6 mile	None – view screened
Staunton-Parkersburg Turnpike	Lewis, WV	47.9	Crosses	Moderate – traffic at speed
I-79	Lewis , WV	60.1	Crosses	Moderate – traffic at speed
Stonewall Jackson Lake WMA	Lewis, WV	64.5	2.2 miles	None – pipeline not visible
Burnsville Lake WMA	Braxton, WV	68.6	Crosses	None – view screened
Weston and Gauley Bridge Turnpike Trail	Braxton, WV	66.9	Crosses	High
KOP-OID-107	Braxton, WV	66.9	<0.1	Low
KOP-OID-105	Braxton, WV	67.0	Crosses	Low
KOP-OID-106	Braxton, WV	67.0	<0.1	None – pipeline not visible
Elk River WMA	Webster, WV	81.6	0.2 mile	None – view screened
Sutton Lake	Webster, WV	84.1	0.1 mile	None – view screened
Williams River State Backway	Webster, WV	103.8	2.1 miles	None – pipeline not visible
Big Ditch WMA	Webster, WV	105.1	0.1 mile	None – view screened
Cranberry WMA	Nicholas, WV	109.7	1.9 miles	None – pipeline not visible
Cranberry Tri-Rivers Rail Trail	Nicholas, WV	117.2	1.9 miles	None – pipeline not visible
Summersville Lake	Nicholas, WV	118.8	1.1 miles	None – pipeline not visible
Coal Heritage and Midland Trail	Greenbrier, WV	144.1	Crosses	Moderate – traffic at speed

TABLE 4.8.1-10 (continued)

Key Observation Points Along the Route of the Mountain Valley Pipeline and Assessments of Visual Impacts a/

Key Observation Points Selected by Applicant	County/State	MP	Distance	Applicant's Initial Impact Assessments
Meadow River WMA	Greenbrier, WV	156.6	1.0 mile	None – view screened
I-64	Greenbrier, WV	156.8	Crosses	High
Bethlehem Farm	Summers, WV	168.7	0.5 mile	None – view screened
Lower Greenbrier River Byway b/	Summers, WV	171.3	Crosses	Low - bored crossing at perpendicular angle
Greenbrier River	Summers, WV	171.4	Crosses	High
Lowell Road Backway b/	Summers, WV	171.9	Crosses	Low – traffic at speed
Farm Heritage Road	Monroe, WV	182.8	Crosses	High
Mountain's Shadow Trail	Monroe, WV	191.4	Crosses	High
Sugar Camp Farm Trailhead	Monroe, WV	194.9	1.0 mile	None – pipeline not visible
Peters Mountain Wilderness	Monroe, WV	196.5	0.4 mile	None
Appalachian National Scenic Trail	Monroe, WV	196.3	Crosses	None – the ANST crossing would be bored and views screened by a buffer of vegetation
Angels Rest Overlook (KOP-OID-111)	Giles, VA	200.0	4.8 miles	Low
Dragon's Tooth (KOP-OID-23)	Roanoke, VA	233.7	7.8 miles	None – pipeline not visible
Rice Field Vista (KOP-OID-85)	Monroe, WV	199.8	3.8 miles	None – pipeline not visible
Wind Rock Overlook (KOP-OID-103)	Giles, VA	208.3	6.6 miles	None – pipeline not visible
Kelly's Knob Main (KOP-OID-115)	Craig, VA	217.9	2.1 miles	Low
Kelly's Knob 2 (KOP-OID-114)	Craig, VA	217.9	2.1 miles	Low
Kelly's Knob 3 (KOP-OID-113)	Craig, VA	217.9	2.1 miles	Low
Sugar Run Mountain	Giles, VA	200.0	11.0 miles	Low
Audie Murphy Monument	Craig, VA	232.9	7.5 miles	None – pipeline not visible

TABLE 4.8.1-10 (continued)

Key Observation Points Along the Route of the Mountain Valley Pipeline and Assessments of Visual Impacts a/

Key Observation Points Selected by Applicant	County/State	MP	Distance	Applicant's Initial Impact Assessments
Sinking Creek Mountain	Montgomery, VA	220.0	2.8 miles	None – pipeline not visible
KOP PR-1	Giles, VA	199.8	3.2 miles	None – road upgrades not visible
KOP PR-2	Giles, VA	199.8	3.2 miles	None – road upgrades not visible
KOP PR-3	Giles, VA	199.8	3.1 miles	None – road upgrades not visible
KOP PR-4	Giles, VA	199.8	3.2 miles	None – road upgrades not visible
KOP PR-5	Giles, VA	199.8	3.2 miles	None – road upgrades not visible
KOP PR-6	Giles, VA	199.8	3.2 miles	None – road upgrades not visible
Whitt Riverbend Park	Giles, VA	201.9	2.0 miles	None – pipeline not visible
Big Stony Creek Road	Giles, VA	201.0	Crosses	Moderate – traffic at speed
Little Stoney Creek	Giles, VA	204.2	Crosses	Moderate – adjacent to existing powerline
Cascade Falls Trailhead	Giles, VA	204.9	1.0 mile	None – pipeline not visible
Cascade Falls	Giles, VA	206.3	2.4 miles	None – pipeline not visible
Mountain Lake Park and Resort	Giles, VA	208.5	2.3 miles	None – pipeline not visible
Pig Hole Cave	Giles, VA	209.1	0.4 mile	Low – adjacent to existing powerline
Smokehole Cave and GIL-VOF-2250 Open Space	Giles, VA	211.2	0.5 mile	None – pipeline not visible
Greater Newport Rural Historic District	Giles, VA	211.8	0.6 mile	Moderate – adjacent to existing powerline
Sinking Creek and Link Farm Covered Bridge	Giles, VA	212.3	Adjacent and 0.4 mile	Moderate – adjacent to existing powerline
Newport Recreation Center (old High School)	Giles, VA	212.9	0.2 mile	None – view screened

TABLE 4.8.1-10 (continued)

Key Observation Points Along the Route of the Mountain Valley Pipeline and Assessments of Visual Impacts a/

Key Observation Points Selected by Applicant	County/State	MP	Distance	Applicant's Initial Impact Assessments
Blue Grass Trail	Giles, VA	212.9	0.1 mile	Moderate – traffic at speed
Clover Hollow State Natural Area Preserve	Giles, VA	211.7	3.5 miles	None – pipeline not visible
KOP PT-21	Montgomery, VA	220.0	0.1 mile	None – pipeline not visible
KOP PT-22	Montgomery, VA	219.9	0.1 mile	None – pipeline not visible
KOP PT-23	Montgomery, VA	219.8	0.1 mile	None – pipeline not visible
KOP PT-25	Montgomery, VA	219.7	0.1 mile	None – pipeline not visible
KOP PT-26	Montgomery, VA	219.4	<0.1 mile	None – pipeline not visible
KOP PT-28	Montgomery, VA	219.4	0.2 mile	None – pipeline not visible
Brush Mountain Wilderness	Montgomery, VA	220.4	0.3 mile	Low- view screened
Shenandoah Bike Trail and Park	Montgomery, VA	221.7	3.2 miles	None – pipeline not visible
Easy Wind Stables	Montgomery, VA	224.6	1.0 mile	Low- adjacent to existing powerline-
MON-VOF-333 Open Space	Montgomery, VA	224.6	1.0 mile	None – no public access
Mill Creek Springs Natural Area Preserve	Montgomery, VA	224.5	0.3 mile	Moderate - adjacent to existing powerline and no public access
Catawba Road	Montgomery, VA	227.1	Crosses	Moderate – adjacent to existing powerline
I-81	Montgomery, VA	234.3	Crosses	Moderate – traffic at speed
Roanoke River	Montgomery, VA	235.6	Crosses	High
Camp Roanoke	Roanoke, VA	238.2	1.4 miles	None – pipeline not visible
Poor Mountain Natural Area Preserve	Roanoke, VA	240.6	3.4 miles	None – pipeline not visible
Bottom Creek Gorge	Roanoke, VA	245.6	2.2 miles	None – pipeline not visible

TABLE 4.8.1-10 (continued)

Key Observation Points Along the Route of the Mountain Valley Pipeline and Assessments of Visual Impacts a/

Key Observation Points Selected by Applicant	County/State	MP	Distance	Applicant's Initial Impact Assessments
Blue Ridge Parkway	Roanoke, VA	246.4	Crosses	Moderate – bore under road in area of pasture
KOP-OID-27 (Vista 246)	Roanoke, VA	250.2	4.2 miles	None – pipeline not visible
KOP-OID-28 (Vista 248)	Roanoke, VA	249.5	4.1 miles	None – pipeline not visible
KOP-OID-33 (Vista 253)	Roanoke, VA	249.5	3.8 miles	None – pipeline not visible
KOP-OID-34 (Vista 254)	Roanoke, VA	243.6	3.8 miles	None – pipeline not visible
KOP-OID-35 (Vista 255)	Roanoke, VA	243.6	3.6 miles	None – pipeline not visible
KOP-OID-36 (Vista 256)	Roanoke, VA	243.6	3.4 miles	None – pipeline not visible
KOP-OID-37 (Vista 257)	Roanoke, VA	243.6	3.1 miles	None – pipeline not visible
KOP-OID-38 (Vista 258)	Roanoke, VA	243.6	3.1 miles	Low
KOP-OID-40 (Vista 260)	Roanoke, VA	243.6	2.7 miles	Low
KOP-OID-41 (Vista 261)	Roanoke, VA	249.2	3.5 miles	None – pipeline not visible
KOP-OID-43 (Vista 262)	Roanoke, VA	249.2	1.8 miles	None – pipeline not visible
KOP-OID-42 (Vista 263)	Roanoke, VA	249.2	1.9 miles	None – pipeline not visible
KOP-OID-44 (Vista 264)	Franklin, VA	247.6	1.5 miles	Low
KOP-OID-46 (Vista 265)	Franklin, VA	247.6	1.5 miles	None – pipeline not visible
KOP-OID-45 (Vista 266)	Franklin, VA	247.6	1.5 miles	None – pipeline not visible
KOP-OID-47 (Vista 267)	Roanoke, VA	247.1	0.9 mile	Low
KOP-OID-48 (Vista 268)	Roanoke, VA	247.1	0.8 mile	Low
KOP-OID-50 (Vista 271)	Roanoke, VA	247.1	0.4 mile	None – pipeline not visible

TABLE 4.8.1-10 (continued)

Key Observation Points Along the Route of the Mountain Valley Pipeline and Assessments of Visual Impacts a/

Key Observation Points Selected by Applicant	County/State	MP	Distance	Applicant's Initial Impact Assessments
KOP-OID-72 (Vista 272)	Floyd, VA	246.5	0.9 mile	None – pipeline not visible
KOP-OID-71 (Vista 273)	Franklin, VA	248.3	2.4 miles	None – pipeline not visible
KOP-OID-70 (Vista 274)	Franklin, VA	248.3	2.4 miles	None – pipeline not visible
KOP-OID-69 (Vista 275)	Franklin, VA	248.3	2.6 miles	Low
Ferrum Mountain Road	Roanoke, VA	246.6	0.1 mile	None – pipeline not visible
Poor Mountain Overlook along Blue Ridge Parkway	Roanoke, VA	244.8	1.5 miles	Low – view screened
Slings Gap Overlook along Blue Ridge Parkway	Franklin, VA	249.4	2.0 miles	None – pipeline not visible
Cahas Overlook along Blue Ridge Parkway	Franklin, VA	248.8	2.3 miles	Low – pipeline not visible
Cahas Mountain	Franklin, VA	253.1	1.4 miles	Low – view screened
Grassy Hill State Natural Area Preserve	Franklin, VA	264.1	1.5 miles	None – pipeline not visible
Highway 220	Franklin, VA	265.2	Crosses	Moderate – traffic at speed
Blackwater River	Franklin, VA	269.7	Crosses	High
Pigg River	Pittsylvania, VA	289.2	Crosses	High

a/ Based on revised table filed by Mountain Valley with FERC on March 30, 2017 (DR5 – Land Use 9).
b/ According to Mountain Valley's February 17, 2017 filing with the FERC (Land Use 15).

Visual Resources within the Jefferson National Forest

The MVP pipeline route on the Jefferson National Forest traverses mountainous terrain which is predominantly forested with mixed hardwoods. At the large physiographic scale, the landscape is characterized by series of long, roughly parallel ridges with stream valleys separating them. There are individual peaks along these linear ridges, and deep drainages create numerous smaller side ridges, typically perpendicular to the main ridge at the top and then often curving as they descend, converging in the stream valleys. These landforms steepen in places and level out in others offering scenery comprised of complex and interesting shapes and forms. Rock outcrops and boulders, water features, and mixed vegetation provide additional textures, patterns and seasonally changing colors. Water also offers sound, movement and reflections.

The majority of the lands within and adjacent to NFS lands along the MVP pipeline route are natural appearing within this landscape. However, there is evidence of human alterations such as gravel and native surface FS roads, native surface trails, and existing utility rights-of-way, primarily overhead transmission lines and also underground gas transmission lines. There is a patchwork of ownership including the FS, Virginia Department of Transportation road rights-of way, and private lands. The boundaries between land ownership are not always evident to the public. Some private lands viewed from FS roads, trails, and general forest area include land uses that are not natural appearing and include roads, utility corridors, residences, pastures, farms, and commercial businesses. These altered settings are primarily located at the lower elevations in the stream valleys and lower toe-slopes. The higher elevations, including mountain ridges and peaks, are predominantly natural appearing on NFS and private lands.

Changes in the scenery of the National Forest can have significant impacts when viewed from travelways (roads, trails, rivers, railroads), observation points, residential areas, and population centers. The FS developed the Scenery Management System (SMS) for inventorying and classifying scenery, and establishing standards called Scenery Integrity Objectives (SIO). The Jefferson National Forest LRMP (Forest Plan) includes SIO that vary by management prescription (Rx) and by the inventoried Scenic Classes within those Rx areas. Meeting SIO is stated in terms of the degree to which the existing landscape character and scenic integrity remain intact, or the degree to which the proposed management activity is expected to create visible deviations in the landscape character.

Within the SMS, there are five categories of SIO that range from Very High to Very Low. Within the management areas crossed by the proposed MVP pipeline route, the SIO include High, Moderate, and Low.

- To achieve the High SIO, landscapes exist where the valued landscape character appears intact, natural and unaltered even though disturbances may be present. These deviations remain unnoticed to the casual observer because they have been designed to repeat attributes of form, line, color, texture, pattern, and scale found in the valued scenery.
- To achieve the Moderate SIO, landscapes exist where the valued landscape character appears slightly altered. Noticeable human-created deviations are minor and remain visually subordinate to the landscape character being viewed because they repeat its form, line, color, texture, pattern, and scale.
- To achieve the Low SIO, landscapes exist where the valued landscape character appears moderately altered. Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect, and pattern of natural openings.

Other factors in addition to the design elements of repeating form, line, color, texture, pattern, and scale can increase or alleviate the severity of potential impacts on scenery. These include but may not be limited to duration of view, angle of view and aspect, distance between the viewer and the altered landscape, and visual absorption capability (ability of a landscape to accept human alteration without loss of the landscape character's scenic condition). The distance factor can be surprising. In many instances, a middleground view (0.5 mile to 4 miles) to the proposed action can have more significant impacts than foreground views, depending on aspect and the duration of view. The duration of view is often a factor of the speed the viewer is traveling (road, trail or stopped at an observation point), the angle of view and the location(s) and level of visual screening between the viewer and the area of proposed action (natural terrain, geology, vegetation or man-made features).

As stated above, the SIO established in the Forest Plan are based on the combination of the management prescription and the inventoried Scenic Class. Table 4.8.1-11 lists the management prescription areas, Scenic Classes, and SIO along the pipeline route, per the Jefferson Forest LRMP. On May 1 and 10, 2017, Mountain Valley filed with the FERC revised VIAs covering views of and within Jefferson National Forest. Impacts for the KOPs on or near FS lands are further discussed in section 4.8.2.

TABLE 4.8.1-11

Scenic Integrity Objectives Along the Route of the Mountain Valley Pipeline Within the Jefferson National Forest

Location	MP Start	MP End	Forest Plan Rx a/	Inventoried Scenic Class	Current SIO b/
Peters Mountain	196.2	196.5	4A	1	High
	196.5	197.8	8A1	2	Moderate
Sinking Creek Mountain	218.5	218.8	6C	3	Moderate
	218.8	218.9	8A1	3	Low
	218.9	219.1	8A1	5	Low
	219.1	219.4	8A1	2	Moderate
Brush Mountain	219.2	219.2	6C	2	High
	219.8	220.8	4J	2	High
	220.5	220.8	4J	5	Moderate
	220.8	221.1	4J	3	Moderate

a/ Rx = Management Prescription
Rx 4A = Appalachian National Scenic Trail Corridor
Rx 8A1 = Mix of Successional Habitats in Forested Landscapes
Rx 6C = Old Growth Forest Communities-Disturbance Associated
Rx 4J = Urban/Suburban Interface
b/ SIO = Scenery Integrity Objective

Equitrans Expansion Project

Redhook Compressor Station

The proposed Redhook Compressor Station would be constructed in a previously developed residential area in Greene County, Pennsylvania. Potential visual receptors include four homes within 0.2-mile northwest and southeast of the site and motorists using Jefferson Road.

Pratt Compressor Station

The existing Pratt Compressor Station is in a developed area. A single residence 0.15 mile north of the site and motorists using Jefferson Road would be potential visual receptors.

Mobley Tap

The Mobley Tap would be installed in a forested valley in Wetzel County, West Virginia. The site is surrounded by existing pipeline facilities and an electric transmission line. Visual receptors include residences north, southwest, southeast, and east of the site, as well as well as motorists using County Road 15/3.

Webster Interconnect

The proposed Webster Interconnect would be installed in an area already cleared and containing residential development in Wetzel County, West Virginia. Other nearby features include existing pipeline infrastructure and rights-of-way (not owned by Equitrans), County Roads 80 and 15/17, and hilly, wooded terrain. Visual receptors would include homes immediately adjacent, south, and northwest of the site as well as motorists using the two county roads.

4.8.1.11 Land Use on Federal Lands

Activities from pipeline construction on federal lands would include timber removal, brush clearing, grading, and trenching. Long-term impacts include the time it would take trees to grow back within the temporary work areas that are revegetated after construction. Permanent impacts would include the conversion of forest to herbaceous vegetation within a 50-foot wide corridor kept clear of trees, and restrictions on use of the operating pipeline easement. There would be temporary impacts from pipeline construction on various dispersed recreation activities (including but not limited to hiking and hunting) in and near the pipeline corridor and access roads.

U.S. Army Corps of Engineers Lands

The only COE land crossed by the MVP pipeline route is at the Weston and Gauley Bridge Turnpike Trail at MP 66.9 in Braxton County, West Virginia. The Weston Gauley Bridge Turnpike Trail would be crossed by conventional bore.

National Park Service Lands

The BRP is administered by the NPS and would be crossed by the project at around MP 246.4 in Roanoke County, Virginia. The BRP would be crossed by conventional bore.

National Forest System Lands

About 3.5 miles of the MVP pipeline route would cross the Jefferson National Forest in three segments between MPs 196.2 and 197.8, MPs 218.5 and 219.4, and MPs 219.8 and 220.8 in Monroe County, West Virginia, and Giles and Montgomery Counties, Virginia. The pipeline on the Forest would be installed using open cut methods, as described in section 2 of this EIS. On the Jefferson National Forest, construction of the MVP would disturb about 51.6 acres for the pipeline and the additional temporary workspaces (see table 4.8.1-12). No new access roads would be needed as Mountain Valley would use existing forest roads that would include 6.3 miles of the Pocahontas Road (FR #972) and about 1.1 miles of Mystery Ridge Road (FR #11080), totaling about 31.1 acres of impact. One of the ATWS areas is along Pocahontas Road. For pipeline operation, about 21.3 acres would be required for the pipeline easement, with access provided by the two forest roads.

TABLE 4.8.1-12

Land Requirements for the Mountain Valley Project in the Jefferson National Forest

Facility	Land Required for Construction (acres)	Land Required for Operation (acres)
Pipeline a/	50.8	21.3
Additional Temporary Workspace (ATWS)	0.8	0.0
Access Roads	31.1	20.4
Totals	82.7	41.7

a/ Acreage based on 125-foot-wide construction right-of-way and 50-foot-wide permanent right-of-way. Does not account for reduced workspace in sensitive areas.

There would not be any major aboveground facilities installed within the Jefferson National Forest. This includes no compressor stations, M&R stations and interconnects, MLVs, yards, or cathodic protection groundbeds. There could be minor appurtenances installed in the Forest that include test stations and line markers, which would be entirely contained within the operational right-of-way as required by the DOT - PHMSA code.

Land and Resource Management Plan for the Jefferson National Forest

The Jefferson National Forest is managed under a LRMP (or Forest Plan) required by the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976 (NFMA) and incorporated into the agency planning regulations (36 CFR 219, [2012 version]). A land management plan provides a framework for integrated resource management and for guiding project and activity decision-making on a national forest, grassland, prairie, or other administrative unit. Consistent with the Multiple-Use Sustained-Yield Act of 1960 (MUSYA), the FS manages NFS lands to sustain the multiple use of its renewable resources in perpetuity while maintaining the long-term health and productivity of the land. Resources are managed through a combination of approaches and concepts for the benefit of human communities and natural resources. Land management plans guide sustainable, integrated resource management of the resources within the plan area in the context of the broader landscape, giving due consideration to the relative values of the various resources in particular areas. Plans guide management of NFS lands so that they are ecologically sustainable and contribute to social and economic sustainability; consist of ecosystems and watersheds with ecological integrity and diverse plant and animal communities; and have the capacity to provide people and communities with ecosystem services and multiple uses that provide a range of social, economic, and ecological benefits for the present and into the future. A Forest Plan does not authorize projects or activities or commit the FS to take action. A plan may constrain the agency from authorizing or carrying out projects and activities, or the manner in which they may occur. All projects and activities occurring on NFS lands must be consistent with the LRMP (§ 219.15).

In 2004, the FS revised its LRMP for the Jefferson National Forest. The Forest Plan is a strategic document providing direction to manage the Forest over the next 10-15 years through land allocations, desired conditions, objectives, suitable uses, and standards. Rxs are described for land allocations of areas within a National Forest having common biological, physical, watershed and social conditions, desired conditions, suitable uses, management objectives, and design criteria (standards). Desired conditions describe the vision for achieving the FS's mission on the National Forest. They portray the ecological, social and economic conditions the Forest is expected to provide in the future when the management direction in the Forest Plan has been successfully implemented. Desired conditions "paint a picture" of an area by describing the appearance and condition of various natural and social resources within the area, in part giving a sense of the type and extent of human influence that a forest visitor could expect. Objectives identify the measures projected to be implemented to move the Forest toward the desired conditions. They are concise, time-specific statements of measurable planned results. Suitable uses are appropriate resource management activities that are allowable to achieve desired conditions and objectives. Standards are specific technical resource management directions and often preclude or impose limitations on management activities or resource uses, generally for environmental protection, public safety, or resolution of an issue. Some desired conditions, objectives, suitable uses and standards are applicable across the entire National Forest and other are applicable to specific Rxs.

The MVP project through the Jefferson National Forest (see figure 3.5.1-7) would impact five separate Rxs:

- Rx 4A-Appalachian National Scenic Trail Corridor;
- Rx 8A1-Mix of Successional Habitats in Forested Landscapes;
- Rx 6C-Old Growth Forest Communities-Disturbance Associated;
- Rx 4J-Urban/Suburban Interface; and
- Rx 11-Riparian Corridors (occur within the other Rxs).

The affected acreage for each prescription area are shown in table 4.8.1-13.

TABLE 4.8.1-13

Acres of Impact by Management Prescription Area

Management Prescription Area	**Access Road**	**Additional Temporary Workspace**	**Construction Right-of-Way**
4.A Appalachian National Scenic Trail	0	0	2.5
4.J Urban-Suburban Interface Area	0	0	14.1
6.C Old Growth Forest	2.3	0.6	4.6
8.A.1 Mix of Successional Habitats	28.8	0.3	29.6
Total	**31.1**	**0.8**	**50.8**

Note: The acres shown in this table are GIS estimates. Numbers are not exact and columns may not sum correctly due to rounding.

Rx 4A-Appalachian National Scenic Trail Corridor lands are managed to protect the experience of users of the ANST and includes the footpath of the trail and the foreground area (up to 0.5 mile) visible from the trail in all directions. Roads, utility transmission corridors, communication facilities, or signs of mineral development activity exist or may be seen within the Rx area, although the goal is to avoid these types of facilities and land uses to the greatest extent possible and blend facilities which cannot be avoided into the landscape so that they remain visually subordinate. Activities within Rx 4A should be consistent with the semi-primitive non-motorized Recreation Opportunity Spectrum class.

Rx 8A1-Mix of Successional Habitats in Forested Landscapes lands provide a mix of habitats for plants and animals associated with mid- to late-successional forest habitats. Management activities are designed to: 1) retain forest cover across the Rx area; 2) increase spatial heterogeneity by increasing both early and late-successional habitat conditions; 3) increase vertical vegetation diversity (canopy, sub-canopy, shrub, herbaceous layers all present and fairly well developed); 4) maintain or enhance hard and soft mast production; and 5) limit motorized access across the Rx area. New utility corridors are allowed in this Rx.

Rx 6C-Old Growth Forest Communities Associated with Disturbance areas are managed to emphasize protection, restoration, and management of old growth forests and their associated wildlife, botanical, recreational, scientific, educational, cultural, and spiritual values. Most of the areas contain forest communities where no forest management activities occur. These areas are unsuitable for new utility corridors.

Rx 4J-Urban/Suburban Interface is north of the city of Blacksburg, Virginia, and this area is designed to be a buffer between urban/suburban developments and forest lands, reducing the risk of wildland fire. The Rx 4J allows active management and new utility corridors.

Rx 11-Riparian Corridors include the riparian habitat along streams, lakes, wetlands, and floodplains. These corridors are managed to retain, restore and/or enhance the inherent ecological processes and functions of the associated aquatic, riparian and upland components within the corridor. These areas are not specifically mapped on the Rx area map but are embedded within other Rxs. Ground disturbing activities are allowed within this Rx if necessary; however, resource effects are minimized by application of standards and mitigation measures.

The proposed route between MPs 219.8 and 220.7 crosses the Brush Mountain IRA for a length of approximately 1 mile. The Brush Mountain IRA was originally 5,920 acres in size and was included in the 2001 RACR (36 CFR 294). In the Omnibus Public Land Management Act of 2009 (P.L. 111-11), 4,795 acres of the Brush Mountain IRA was designated as Brush Mountain Wilderness. The proposed MVP pipeline route would not cross the Brush Mountain Wilderness, but would be within the remaining 1,125 acres of the IRA to the west of the Wilderness.

After the 2001 RACR was established, it was challenged several times in the court system. At the time the Forest Plan was approved in 2004, the RACR was enjoined by litigation and the Brush Mountain IRA was allocated to Rx 4J-Urban/Suburban Interface, which allows construction of utility corridors, timber harvest and road construction. However, the ROD for the Forest Plan stated "the Jefferson National Forest will follow the management direction contained in this Forest Plan and any FS policy on roadless area management specified in the FS directives. However, should the Roadless Rule become effective, it will supersede this Revised Plan for those IRAs identified in the Roadless Rule. According to 36 CFR 294.14 (b), should the Roadless Rule become effective, an amendment to this Revised Forest Plan would not be needed to implement its direction" (ROD, pp. 36-37). The RACR has since been reinstated and is now in effect; therefore the direction contained in the RACR supersedes the Rx 4J direction within the Brush Mountain IRA.

The RACR prohibits timber removal and road construction and reconstruction in IRAs except under specific circumstances (36 CFR 294). The RACR does not prohibit special use permits for the construction of utility corridors. The final EIS for the RACR specifically states that "Under these alternatives, all or part of the more common types of uses [non-recreation special uses] could occur without road construction, but most likely, at a higher cost than if road construction was allowed to occur." The RACR also allows incidental timber harvest in the implementation of a management activity not otherwise prohibited by the rule (36 CFR 294.13(b)(2)). The Preamble to the RACR states that "Paragraph (b)(2) allows timber cutting, sale, or removal in IRAs when incidental to implementation of a management activity not otherwise prohibited by this rule. Examples of these activities include, … other authorized activities such as ski runs and utility corridors..." (Federal Register, January 12, 2001, page 3258).

4.8.2 Environmental Consequences

4.8.2.1 Land Use

Combined, construction of the MVP and the EEP would affect about 4,948 acres of forested land, 1,023 acres of agricultural land, 515 acres of open land, 50 acres of residential land, 20 acres of industrial land, and 4 acres of open water. Operation of the MVP and EEP combined would affect a total of about 1,739 acres of forest, 289 acres of agricultural land, 144 acres of open land, 10 acres of residential land, 2 acres of open water, and 3 acres of industrial land.

Mountain Valley Project

The MVP pipeline route would cross about 249 miles of forested land (82 percent of the route), and construction of the pipeline would affect a total of about 4,040 acres of forest, including the right-of-way, ATWS, and cathodic protection areas. Construction of the proposed Mountain Valley aboveground facilities would disturb about 129 acres of forest. Operation of the pipeline would affect about 1,515acres of forest, and operation of the aboveground facilities would permanently remove about 23 acres of forest.

The pipeline route would cross about 39 miles of agricultural land (13 percent of the route) and construction of the pipeline would affect a total of about 749 acres of agricultural land. Operation of the pipeline would disturb about 236 acres of agricultural land. Construction of the aboveground facilities would affect about 3 acres of agricultural land and operation would affect less than an acre.

The pipeline route would cross about 15 miles of open land (5 percent of the route) and construction of the pipeline would affect a total of about 316 acres of open land. Operation of the pipeline would affect about 95 acres of open land. Construction of the aboveground facilities would affect about 17 acres of open land, while operation of those facilities would remove about 3 acres of open land.

Mountain Valley's proposed temporary yards would affect at total of about 29 acres of forest, 78 acres of agricultural land, 39 acres of open land, 14 acres of residential land, and 10 acres of industrial land. After pipeline installation all temporary yards would be returned to their previous condition and land use.

Construction or improvements of access roads would affect about 676 acres of forest, 119 acres of open land, 101 acres of agricultural land, 9 acres of residential land, and 2 acres of industrial land. After pipeline installation, all temporary existing and new roads would be returned to their previous condition and use. Mountain Valley would build 28 new permanent access roads. Those new permanent access roads would affect about 173 acres of forest, 39 acres of open land, 22 acres of agricultural land, 0.6 acre of industrial land, and 3 acres of residential land. Construction and operation of the new permanent access roads would represent a conversion of previous land uses to industrial use.

In a filing on May 31, 2016, Appalachian Mountain Advocates filed with the FERC a report produced by KeyLog Economics (KeyLog), entitled "Economic Costs of the MVP Pipeline" (Phillips et al., May 2016[79]) that addressed land use in a portion of the project area covering the pipeline route in Greenbrier, Monroe, and Summers Counties, West Virginia, and Craig, Franklin, Giles, Montgomery, and Roanoke Counties in Virginia. Table 4 of the KeyLog report incorrectly stated that during pipeline operation cultivated land would be converted to pasture/forage. This is not necessarily the case. Cultivated land affected by construction could be used again as cultivated land after pipeline installation, as crops can be grown over the entire right-of-way during operation.[80] It would be entirely up to the property owner or manager whether to continue the land use as cropland or convert it to pasture/forage (which is still considered an agricultural use). Therefore, for the purposes of our analysis, we can assume that all 932 acres of agricultural land disturbed by construction along the entire 303-mile-long length of the proposed pipeline route would be returned to agricultural land use after restoration.[81] Likewise, the indication by KeyLog that forested land would be completely converted to scrub-shrub land use over the entire right-of-way during pipeline operation is also misleading. In fact, only the 50-foot-wide permanent easement would be kept clear of trees, resulting in the conversion of forest to grasslands/shrub land use during pipeline operation. The remainder of the temporary construction workspace

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79 Accession number 20160531-5236

80 The statement by Phillips et al. (May 2016) that "….row crops will be greatly curtailed, if not eliminated entirely by the physical limits imposed by the MVP…" is false and without support. In fact, as proven by thousands of FERC certificated natural gas projects, row crops can be grown over the entire pipeline right-of-way after restoration in agricultural lands, documented in project-specific restoration inspections placed into the public dockets. Companies rarely restrict standard farming practices and indeed will often ensure a pipe burial depth that accommodates standard as well as deep-tilling farming practices. As discussed below in the text of this EIS, if crop production along the right-of-way is less than the remainder of the farm, companies typically compensate the landowner.

81 This includes land temporarily affected by the pipeline construction right-of-way, yards, and temporary improvements to access roads. It does not include permanent access roads and aboveground facilities, where a total of about 30 acres would be converted from current agricultural land use to future industrial land use.

(including ATWS) along the pipeline route would be allowed to regenerate back to forest; although it would take many years for trees to mature. Therefore, about 1,515 acres of forest would be converted to grasslands/shrub land use during operation within the permanent pipeline easement and areas of cathodic protection; and about 195 acres of forest would be converted to industrial land use at the permanent access roads and aboveground facilities combined. However, 3,164 acres of forest cleared within temporary work areas during construction would eventually be returned to forested land use after restoration.[82]

Equitrans Expansion Project

Combined, the EEP pipelines would cross about 4 miles of forested land, and construction, including the right-of-way, ATWS, and cathodic protection would affect a total of about 62 acres of forest. Operation of the pipelines would impact a total of about 22 acres of forest. Construction of the EEP proposed aboveground facilities would remove a total of about 5 acres of forest and operation would affect 4 acres.

The EEP pipelines combined would cross about 2 miles of agricultural land. The construction right-of-way, ATWS, and cathodic protection areas would affect a total of about 67 acres of agricultural land, and operation of the pipelines would impact about 17 acres of agricultural lands. Construction of the aboveground facilities would remove about 17 acres of agricultural land and operation would affect 12 acres.

The EEP pipelines would cross a total of about 1 mile of open land. Construction of the pipelines, ATWS, and cathodic protection areas would affect about 17 acres of open land, while operation of the pipeline would affect about 6 acres of open land. Construction of the aboveground facilities would remove a total of about 4 acres of open land and operation would affect 2 acres.

The yards for the EEP would affect a total of about 2 acres of forest, 2 acres of open land, 4 acres of agricultural land, and 4 acres of residential land. After pipeline installation, all the yards would be returned to their previous condition and use.

Total construction impacts from access roads for the EEP would be 5 acres of forested land, 3 acres of agricultural land, 2 acres of open land, and 0.4 acre of residential land. During operation about 5 acres would be affected by access roads. This would result in the conversion of 2 acres of agricultural land, 4 acres of forest, and less than an acre of open land to industrial use.

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82 This would include the temporary workspace along the pipeline right-of-way outside of the 50-foot-wide permanent easement, ATWS, yards, and temporary access roads.

General Project-Related Impacts on Land Use and Proposed Mitigation Measures

Trees within the construction right-of-way across forested land would be cleared. In the temporary workspaces, trees would be allowed to regenerate after pipeline installation and restoration; however, larger trees likely would not grow to maturity for many decades, making this a long-term impact. According to our Plan, mowing over the entire permanent right-of-way could not occur more frequently than every 3 years; although a 10-foot-wide corridor over the pipeline centerline could be maintained more regularly in an herbaceous state. We discuss impacts on forest in more detail in section 4.4 of this EIS. Where aboveground facilities and new permanent access roads would be located in forested areas, the trees would be permanently removed, and the land use at those facilities permanently converted to industrial land.

Impacts on agricultural lands would be short-term, lasting during the period of construction and restoration and a few years later. Farmers would experience loss of crop production in areas directly disturbed by construction-related activities for a season or two. Farmers may have to alter sowing and irrigation patterns around the construction schedule. Grazing animals may have to be moved to different pastures, and confined with new pens or fences. The Applicants would ensure that livestock have access to water sources during construction; or alternative source of water would be provided.

The Applicants would compensate farmers for loss of crop production during the construction and restoration period. Typically, compensation would be at least 100 percent of the value of the crop at current market prices. Following pipeline installation, the right-of-way would be restored to near pre-construction conditions and use, and agricultural practices could resume. Except for orchards, crops and pasture can be planted directly over the entire right-of-way. Usually, individual landowners decide on the type of seeds to be planted over the restored right-of-way in agricultural lands. If crops in the right-of-way are not as productive as portions of the farm outside the right-of-way for the first several growing seasons after restoration, the Applicants may compensate landowners for that difference.

Mitigation measures typically implemented in agricultural lands include topsoil segregation, rock removal, soil decompaction, and repair/replacement of irrigation and drainage structures damaged by construction. Impacts on and mitigation measures for prime farmlands and statewide important farmland soils are discussed in section 4.2.2.

To date, no landowners contacted by the Applicants have indicated the presence of irrigation systems or drain tiles; but that does not mean they do not exist. Prior to construction, the Applicants would conduct surveys to identify and flag irrigation systems and drain tiles. Usually, the pipeline would be installed below drain tiles. Should drainage tiles or irrigation features be damaged during project construction, repair and replacement would be done shortly thereafter (Mountain Valley stated within 3 days of the damage). The location of damaged drain tiles would be noted, and replacement would be with the same size. The Applicants would consult with landowners to ensure their satisfaction with repairs and/or replacements.

Certified organic farms and other specialty crops are mentioned in section 4.8.1.4. No orchards, tree farms, specialty crops, or organic farms were identified along the EEP. Five organic farms were identified for the MVP. About 20 acres would be affected at one tree farm at MP 183.6 in Monroe County, West Virginia. About 4 acres would be disturbed at another tree farm at MP 185.7 in Monroe County, West Virginia. At about MP 193.9 less than an acre would be disturbed and at MPs 194.0 in Monroe, West Virginia and MP 276.0 in Franklin, Virginia, 2 acres and 5 acres would be disturbed respectively. Mountain Valley developed an OFPP that outlines BMPs that would be implemented when crossing organic farms. Mountain Valley has submitted the OFPP to applicable state agencies for review, and would consult with the owners of the organic farms to ensure that the OFPP measures would preserve the organic certifications of the farms.

Mountain Valley stated that it would work with farmers who grow specialty crops during easement negotiations to develop measures that would avoid or minimize impacts. Mitigation in orchards would include compensation for tree removal in the permanent right-of-way easement. Orchard trees could be replanted in the temporary workspace.

The MVP would not cross any lands in the ACEP or CRP.

The EEP would cross four farms along the H-318 pipeline route in Allegheny County, Pennsylvania enrolled in the Pennsylvania Agricultural Land Preserve Program through the Allegheny County Farmland Preservation Program. The farms also have agricultural easements located within the Forward Township Agricultural Security Area. Equitrans indicated that it would implement BMPs adopted from the PADEP's Erosion and Sediment Pollution Control Program Manual (PADEP, 2012a) to reduce impacts on the farms enrolled in the Pennsylvania Agricultural Land Preserve Program. Those BMPs include:

- stabilization of the right-of-way if construction would be delayed more than 4 days;
- installation of devices to remove sediment from runoff;
- segregation and stockpiling of topsoil;
- backfilling the trench with the segregated topsoil to its original horizon;
- placement of 48 inches of cover over the pipe; and
- grading all work areas to original contours, after pipeline installation and backfilling.

Construction-related impacts on open land would include the removal of vegetation and disturbance of soils. Following installation of the pipeline, the right-of-way would be restored to its pre-construction conditions and uses. In open lands, grasses and shrubs would be reestablished over the entire right-of-way.

There is virtually no industrial/commercial land that would be adversely affected by the projects. However, both the MVP and EEP pipeline combined would cross a total of about 1.6 miles of residential lands. Impacts associated with pipeline construction across residential lands could include fugitive dust, traffic, blocking access, and removal of landscaping. Dust could be reduced by spraying water on access roads and the right-of-way. Fugitive dust is discussed in more detail in section 4.11.1.3. The companies have developed *Transportation Management Plans* to reduce impacts on traffic. They would communicate with landowners to coordinate construction, and would retain access to driveways. The *Transportation Management Plans* are discussed in more detail in section 4.9.2.5. In accordance with the FERC Plan, Mountain Valley would restore residential landscaping to the satisfaction of the landowner after pipeline installation.

However, trees could not be replanted within the permanent 50-foot-wide operational easement, and in those situations the Applicants would compensate landowners for their landscaping loss.

4.8.2.2 Residences and Commercial Lands

Mountain Valley Project

Mountain Valley indicated that its proposed pipeline route would cross about 0.4 mile of commercial/industrial lands.

The proposed MVP pipeline route would cross about 1.0 mile of residential land, and operation of the pipeline would impact about 9 acres of residential land. In most cases, this would restrict some residential uses across the permanent right-of-way easement. For example, landowners could not build structures on the permanent easement, and could not construct access roads without the permission of Mountain Valley.

In accordance with the FERC's regulations at 18 CFR 380.12(j)(10), Mountain Valley must provide residence-specific mitigation plans for all residences within 50 feet of the construction workspace (appendix H). Mountain Valley identified 118 residences within 50 feet of its construction work areas, 7 of which have been purchased by Mountain Valley and would not be occupied during construction. The residence-specific mitigation plans are attached in appendix H in this EIS. In the draft EIS, we requested that affected landowners comment on the Residential Construction Plans. We did not receive any comments in response to our request.

Additionally, 35 of these residences were identified to be 10 feet or less from the construction workspace, 7 of which had been purchased by Mountain Valley at the time of the issuance of the draft EIS and would not be occupied during construction (see table 4.8.2-1). Because of route changes that have been made since the issuance of the draft EIS some residences are no longer within 10 feet of workspaces and some residences are now within 10 feet that previously were not. Table 4.8.2-1 has been updated to reflect the changes.

In addition to the 7 structures that have been purchased, landowners have approved the following residential site-specific plans: RSS-H600-110, RSS-H600-033, RSS-H600-034, RSS-H600-009, and RSS-H600-010. We typically require evidence that the owners of residences within 10 feet of construction work areas have had the opportunity to review and approve residential mitigation plans.

TABLE 4.8.2-1

Residences within 10 feet of Mountain Valley Project Construction Work Areas

Building Type	MP	Distance From Edge of Workspace (feet)	Residential Construction Plan ID
House	0.0	0.0	(Property Purchased)
House	0.8	7.5	(Property Purchased)
House	1.3	1.1	RSS-H600-105 (Easement acquired)
House	1.7	0.0	(Property Purchased)
House	2.2	0.0	(Property Purchased)
House	22.5	0.7	RSS-H600-175
Cabin	32.1	0.9	RSS-H600-005 (Easement acquired)
Cabin	33.9	0.0	(Easement acquired, Landowner Compensated for loss of structure)
House	39.7	3.7	RSS-H600-110 (Easement acquired)
House	44.4	6.0	RSS-H600-033 (Easement acquired)
House	44.5	1.2	RSS-H600-034 (Easement acquired)
House	67.2	5.7	RSS-H600-173
House	77.3	0.0	(Property Purchased)
Cabin	84.0	2.3	RSS-H600-044 (Easement acquired)
House	84.2	6.0	RSS-H600-043 (Easement acquired)
Cabin	87.4	0.0	RSS-H600-007, (Easement acquired, Landowner Compensated for loss of structure)
House	112.5	3.8	RSS-H600-184
House	112.6	8.5	RSS-H600-179
Mobile Home	138.9	0.0	RSS-H600-009 (Easement acquired)
Mobile Home	139.0	0.0	RSS-H600-010 (Easement acquired)
House	143.9	7.1	RSS-H600-061
House	143.9	0.0	RSS-H600-204
House	149.5	2.0	RSS-H600-012
House	155.8	3.2	RSS-H600-203
House	155.9	6.5	RSS-H600-065)
House	156.5	0.0	RSS-H600-067
House	166.9	1.0	RSS-H600-127
Hunting Cabin	197.8	6.7	RSS-H600-015 (Easement acquired)
House	198.4	5.0	RSS-H600-016 (Easement acquired)
Cabin	199.5	6.2	RSS-H600-017 (Easement acquired)
Mobile Home	212.9	0.0	RSS-H600-136
House	213.6	2.0	RSS-H600-171
House	230.8	0.0	RSS-H600-083
House	230.9	0.0	RSS-H600-202
Cabin	266.4	2.7	RSS-H600-209

We identified an additional residence at about MP 216.6 in Giles County, Virginia which appears to have been incorrectly omitted by Mountain Valley from appendix H (residential construction plans) and appendix R (structures within 50 feet). The residence on parcel VA-GI-5673 appears to be about 20 feet from access road MVP-CR-258.01. Therefore, in order to provide owners an opportunity to review and approve residential mitigation plans and account for the missing residential mitigation plan, **we recommend that:**

- **Prior to construction, Mountain Valley should file with the Secretary evidence of landowner concurrence with the site-specific residential construction plans for all locations where construction work areas will be within 10 feet of a residence. Mountain Valley should also file with the Secretary a site-specific residential construction plan, including site-specific justification for locating project components within 50 feet of structures located on parcel VA-GI-5673 at about MP 216.6.**

Mountain Valley has offered the following general mitigation measures for construction in residential areas:

- notification of landowners at least 3 days in advance of construction;
- coordination of construction activities with local utilities;
- installation of safety fencing around existing buildings;
- using techniques such as stovepipe and drag section construction where appropriate;
- limiting the time the trench is left open;
- maintaining access to homes and driveways;
- controlling dust by spraying water on the right-of-way and access roads;
- following Mountain Valley's *Traffic Management Plan*;
- avoiding the removal of large trees and mature landscaping where possible; and
- restoring the right-of-way within 10 days after backfilling.

Equitrans Expansion Project

Equitrans intends to purchase the four existing houses within the boundaries for the newly proposed Redhook Compressor Station. Equitrans has negotiated purchase agreements with all of the properties.

No residences were identified by Equitrans within 50 feet of the construction rights-of-way for its EEP pipelines.

Easement Agreements

Jurisdictional natural gas companies must obtain easements from landowners along the route of their pipelines to construct and operate authorized facilities. Easements can be temporary, granting the company the use of the land during construction (e.g., extra workspaces, temporary access roads, yards), or permanent, granting the company the right to operate and maintain the facilities once constructed. In the case of aboveground facilities, companies usually purchase the land in fee.

An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on uses that would not be permitted on the permanent right-of-way. Compensation would be determined through negotiations between the company and the landowner.

The Commission urges companies to reach mutual negotiated easement agreements with all private landowners prior to construction. As a last resort, if the Commission issues a Certificate to Mountain Valley and Equitrans, and if an agreement cannot be negotiated with a landowner, the Applicants may use the power of eminent domain, under Section 7(h) of the NGA, to acquire an easement. Mountain Valley and Equitrans would still be required to compensate the landowners for the right-of-way and damages incurred during construction. However, the level of compensation would be determined by a court of law.

During scoping and after issuance of the draft EIS we received comments that the projects could reduce property values, affect the ability to obtain loans or home mortgages, and increase home insurance rates. We address those topics in section 4.9.2.6. The FERC's environmental complaint resolution procedures would minimize impacts on landowners.

We recognize that during and after construction, issues or complaints may develop that were not addressed during the environmental proceedings at the Commission, and it is important that landowners have an avenue to contact the Applicants' representatives. Should the Commission approve the MVP and the EEP, we are interested in ensuring that landowner issues and complaints received during and after construction are resolved in a timely and efficient manner. Therefore, **we recommend that if the projects are authorized, the Commission Order should contain the following requirement condition:**

- **<u>Prior to construction</u>, Mountain Valley and Equitrans should each file with the Secretary copies of their environmental complaint resolution procedures. The procedures should provide landowners with clear directions for identifying and resolving concerns resulting from construction and restoration of the projects. Mountain Valley and Equitrans should mail copies of their complaint procedures to each landowner whose property would be crossed by the projects.**

  a. In their letters to affected landowners, Mountain Valley and Equitrans should:

  (1) provide a local contact that the landowners should call first with their concerns; the letter should indicate how soon a landowner should expect a response;
  (2) instruct the landowners that if they are not satisfied with the response, they should call the Mountain Valley or Equitrans

Hotline, as appropriate. The letter should indicate how soon to expect a response from the company; and

(3) instruct the landowners that if they are still not satisfied with the response from the company Hotline, they should contact the Commission's Landowner Helpline at 877-337-2237 or at LandownerHelp@ferc.gov.

b. In addition, Mountain Valley and Equitrans should include in their weekly status reports to the FERC a table that contains the following information for each problem/concern:

(1) the identity of the caller and date of the call;
(2) the location by milepost and engineering station number from the alignment sheet(s) of the affected property;
(3) a description of the problem/concern; and
(4) an explanation of how and when the problem was resolved, will be resolved, or why it has not been resolved.

4.8.2.3 Hazardous Waste Sites

Neither the MVP pipeline nor the EEP pipelines would cross any identified existing hazardous waste sites. Areas of potential soil or groundwater contamination in proximity to the pipelines are identified in sections 4.2.2 and 4.3.1. In the unlikely event that contaminated areas are encountered during construction, Mountain Valley has prepared an *Unanticipated Discovery of Contamination Plan*, and Equitrans has stated it would follow all applicable federal and state laws and regulations.

Hazardous materials at the Pratt Compressor Station site would be disposed of in accordance with the requirements of the Commonwealth of Pennsylvania, the Resource Conservation and Recovery Act, the Toxic Substance Control Act for PCBs, and the National Emission Standards for Hazardous Air Pollutants for asbestos. All the materials would be handled from the site by licensed haulers following DOT requirements.

4.8.2.4 Recreation and Special Interest Areas

One of the primary concerns when crossing recreation and special interest areas is the impact of construction on the purpose for which the area was established (e.g., the recreational activities, public access, and resources the area aims to protect). Construction could alter visual aesthetics by removing existing vegetation and disturbing soils; these potential impacts are discussed in section 4.8.2.5. Construction could also generate dust and noise, which could be a nuisance to recreational users. Construction could also interfere with or diminish the quality of the recreational experience by affecting wildlife movements or disturbing hikers while using trails. Lastly, construction may block access to the area.

Construction periods could coincide with a variety of hunting seasons. The companies would educate their workers about hunting seasons, require workers to wear highly visible vests and hard hats, and would conduct daily safety meetings to inform workers of relevant conditions. The companies would communicate with landowners about hunting restrictions on private property. The companies would inform their employees to avoid specific areas during hunting seasons.

Other than long-term alterations of the visual landscape in forested areas, in general, impacts on recreational and special interest areas would be temporary and limited to the period of active construction, which typically would only last a few days to several weeks in any one area. Specific impacts and mitigation measures are described below for certain recreation and special interest areas.

Mountain Valley Project

The MVP may disrupt dispersed recreational activities on public and federal lands, including, but not limited to, hunting, camping, fishing, hiking, horse riding, mountain bicycling, ORV use, berry picking, wildlife watching, and in the winter cross-country skiing. This disruption would only be temporary, during construction. Once installed underground, with the right-of-way restored and revegetated, the pipeline would not be an impediment to dispersed recreational activities during its operation.

As discussed above in section 4.8.1.6, the proposed MVP pipeline route would cross through five federally owned recreational or special use areas including a National Forest, six state managed areas, and two easements controlled by NGOs. In addition, the pipeline route would cross six scenic byways. Below we discuss measures Mountain Valley would implement to avoid, reduce, or mitigate project-related impacts on those areas. The crossing of the Jefferson National Forest is discussed separately in section 4.8.2.6.

Federally Managed Land

Weston and Gauley Bridge Turnpike Trail – The proposed MVP pipeline route would cross the Weston and Gauley Bridge Turnpike Trail in a forested area at about MP 66.9, in Braxton County, West Virginia. At this location, the turnpike is owned by the COE. On April 21, 2016, Mountain Valley filed with the FERC a plan for crossing the Weston and Gauley Bridge Turnpike Trail. Mountain Valley stated that it would bore under the turnpike and leave a vegetation buffer of 30 feet on each side of the turnpike to avoid impacts on the trail and its users. Including the two 30-foot buffers, the crossing would total 125 feet. The plan calls for a single pass by the construction crew on timber mats at the crossing; with only one tree removed. Mountain Valley filed with the FERC a VIA for the crossing of the Weston and Gauley Bridge Turnpike Trail on March 30, 2017.[83] The VIA was also provided to the COE.

Appalachian National Scenic Trail – Mountain Valley proposes to have its pipeline cross the ANST at MPs 196.3, within the Jefferson National Forest. At this location, the trail is located in a managed clearing on a ridgetop, with steep forested slopes on either side.

On May 4, 2016, the ATC filed a letter with the FERC in which it objected to Mountain Valley's plan for crossing the ANST. The points made by the ATC include:

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[83] Accession number 20170330-5339.

- it is preferred that the crossing location be moved to where impacts on the ANST have already occurred, such as adjacent to existing utility rights-of-way or roads;
- it is preferred that the ANST crossing location be moved further away from the Peters Mountain Wilderness;
- it is preferred that the ANST crossing location be moved further away from Angels Rest, to reduce visual impacts for trail users; and
- it is preferred that an HDD, and not a bore, be used to cross under the ANST.

On May 16, 2016, the FS filed a letter with the FERC objecting to Mountain Valley's ANST crossing plan. The FS questioned the distance between the bore pits at the crossing. The FS believed the bore holes and portions of the right-of-way would be visible to trail users during construction and operations. The pipeline crossing may also be visible to hikers at Angels Rest. In addition, Mountain Valley's proposed ANST crossing would not be consistent with current Jefferson National Forest LRMP Standard FW-252, which specifies that a utility in the Forest must meet an SIO as high as practicable. The FS sought alternative construction techniques or other mitigation measures to reduce visual impacts.

A revised crossing plan for the ANST was filed by Mountain Valley on June 24, 2016. Mountain Valley intends to use a 600-foot-long bore to cross under the ANST, leaving a roughly 300-foot forested buffer on each side of the trail. This route adjustment is discussed in greater detail in section 3.5.

On July 22, 2016, representatives of the FERC, FS, ATC, and RATC conducted a site visit to the alternative ANST crossing.[84] Based on that visit, the FS wrote a letter to the FERC, dated August 5, 2016,[85] stating that the FS was satisfied that the bore pit location on the south side of the ANST could meet requirements of the High SIO. It is uncertain if the bore pit location on the north side of the ANST could meet FS scenic objectives; and visual simulation modeling of a "leaf-off" scenario would be necessary.

The ATC also wrote a letter to the FERC, filed August 8, 2016,[86] providing its comments on the July 22, 2016 field visit to the alternative ANST crossing. In the opinion of the ATC, the proposed MVP pipeline would be visible to users from multiple locations along the ANST. Visual simulations should be conducted to evaluate impacts. In the Alternatives section (3.5.1) of the draft EIS, we recommended that Mountain Valley continue coordination with the FS and other ANST stakeholders, and file the results of visual simulations at the revised trail crossing and at other potential points where the pipeline would potentially be visible from the ANST.

Mountain Valley filed updated correspondence and revised visual simulations on February 17, 2017[87] and February 23, 2017.[88] These filings indicated they were continuing to coordinate

84 Staff notes from that meeting were placed into the FERC public files for Docket No. CP16-10-000 on August 5, 2016 (accession number 20160805-0006).

85 Accession number 20160805-5165.

86 Accession number 20160808-5122.

87 Accession number 20170217-5199.

88 Accession number 20170222-5199.

with the FS and ATC on the evaluation of the updated visual simulations. On March 20, 2017, we filed a request for additional information from Mountain Valley, which included a request for additional visual simulations.[89] The FS also filed a comment on the VIA on April 3, 2017 which also requested additional visual simulations and they requested a meeting with Mountain Valley.[90] Mountain Valley met with the FS on April 11 and April 20, 2017, to present photographs taken in March 2017 during leaf-off conditions, and to develop a plan for preparing the final visual simulations and VIA. Mountain Valley filed an updated VIA on May 1, 2017.[91] On May 3, 2017 the FS then filed specific guidance and requested that Mountain Valley file a supplement to the VIA.[92] On May 11, 2017 Mountain Valley filed a revised VIA.[93] Visual simulations are provided in appendix S.

Other than visual impacts, people using the trail could potentially be affected during the short periods of construction when there could be noise and dust created from construction activities. These would be temporary impacts during construction. Both noise and dust impacts would be reduced for trail users during construction, because the bore pits would be located about 300 feet away from and below the ANST, buffered by forest.

Brush Mountain Inventoried Roadless Area - The MVP pipeline route would cross about 1 mile of the Brush Mountain IRA. The route would cross the IRA near the Brush Mountain Wilderness boundary within the Jefferson National Forest, cutting off the remaining 1,125 acres of the IRA from the Wilderness.

During pipeline construction, heavy equipment would be used to clear vegetation, dig a trench, bring in the sections of pipe, lay the pipe, cover the pipe, construct drainage and sediment control structures, grade the area, and reseed the area of the construction corridor that will not be within the operational Right-of-Way Grant area. Trees would be cut to clear the pipeline right-of-way. The right-of-way for the pipeline would become a construction zone during the installation of the pipe. No roads are proposed to be constructed in the Brush Mountain IRA for this project. About 14 acres in the IRA would be affected by the 125-foot-wide construction right-of-way. The FS indicated that within the 50-foot-wide permanent easement, only a 10-foot-wide strip over the pipeline centerline, 1 acre, should be maintained in herbaceous cover. Although Mountain Valley has not committed to these maintenance features for the permanent right-of-way, the FS has indicated that it will require such features as part of its separate FS permitting process. The linear permanent operational pipeline easement would remain an open area. About 8 acres of construction workspace within the IRA would be revegetated. However, it would take many years for trees to mature.

The effects of the proposed pipeline on the Brush Mountain IRA consider the impacts on the roadless area's values and characteristics as defined in 36 CFR 294.

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89 Accession number 20170320-3003.

90 Accession number 20170403-5058.

91 Accession number 20170501-5410.

92 Accession number 20170503-5005.

93 Accession number 20170511-5018.

- **High quality or undisturbed soil, water and air** - Soil, water and air outside of the pipeline corridor would still be undisturbed in the roadless area. Soil, water and air within the pipeline corridor would be disturbed during construction of the pipeline.
- **Sources of public drinking water** - There are no known sources of public drinking water that are directly affected by the roadless area. The roadless area contains the headwaters of several tributaries that feed into Craig Creek, a popular fishery. Craig Creek is a cool water stream with a poor to fair macroinvertebrate monitoring score. There are no known water shortage needs or any existing special use water permits. Water quality is expected to remain at its current level whether or not the area is designated as wilderness. The proposed pipeline would not impact sources of public drinking water associated with the roadless area.
- **Diversity of plant and animal communities** - The Brush Mountain IRA provides habitat for a diversity of wildlife species. There are no wildlife habitat improvement projects within the area. Natural processes are operating within the area and the area is minimally affected by outside forces. The proposed pipeline would affect species that require a forest overstory but may favor those species requiring a grass/forb habitat. The roadless area is forested by eastern deciduous and coniferous species. Approximately 2 percent of the area has a site index of 70 or greater, indicating moderate to high productivity for tree growth. These areas occur in colluvial drainages or toe-slopes or along alluvial floodplains of small to medium sized streams, such as Craig Creek, where yellow poplar, northern red oak, white oak, basswood, cucumbertree, white ash, eastern hemlock, white pine, and red maple dominate the overstory. The remaining 98 percent of the area has a site index of 60 or less, indicating a moderate to low productivity for tree growth. White oak, northern red oak, and hickory generally occur on north and west aspects. Chestnut oak, scarlet oak, and yellow pine occur on ridgetops and exposed south and east mid-slope aspects with yellow pine occurring on the driest sites. The area also contains several of Virginia's few remaining pure stands of table mountain pine. This species requires fire to reproduce and is becoming increasingly uncommon within its natural range due to fire exclusion. The proposed pipeline right-of-way would remain as grasses until the end of the project resulting in a break in the undisturbed canopy of existing deciduous and coniferous species.
- **Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land** - There are no known species of these types of classifications occurring in the roadless area.
- **Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation** - Much of the Brush Mountain IRA appears to be natural but there are signs of disturbance. The area contains no solitude core area. A solitude core area refers to the semi-primitive Recreation Opportunity Spectrum (ROS) setting. Visitor use along the crest of Brush Mountain can be described as moderate to high, primarily during hunting season. The further one gets away from roads and the periphery of the area, the greater the feeling of being in an unconfined, natural area since the area appears to be relatively free from disturbance. However, some areas may be affected by noises and sights associated with traffic on US 460 at the western end of the area, other improved roads along the area's periphery, noises from the electric transmission lines, or activities from adjoining private land, which may reduce the

feeling of solitude and isolation. Additionally, noises from a nearby FS shooting range can be heard within the area on calm days and a portion of the area is within a flight path involving US military jets on low altitude flight training missions. Much of the terrain in this roadless area is steep and rugged, offering the visitor good opportunities for self-reliance and challenge in orienteering and backcountry primitive camping.
The proposed pipeline could become a new means of foot access to the area similar to existing powerlines on the boundaries of this area. However, the pipeline corridor could also become a means for illegal OHV use. To address concerns for illegal motorized use of the pipeline corridor, the POD[94] developed between the FS and MVP contains an Off-Highway Vehicle Management Plan (POD Appendix Z). This plan identifies methods to limit OHV use within the right-of-way in order to avert user conflicts in adjacent areas, as well as to avoid problems with revegetation efforts and prevent potential erosion within the right-of-way. To minimize OHV access within the right-of-way, MVP will install barriers at appropriate locations in coordination with the FS. The proposed OHV barriers will be designed and constructed in a manner that attempts to prevent unauthorized motor vehicle/OHV use of and along the right-of-way. A plan for monitoring involving FS law enforcement personnel is included in the communication plan. Monitoring of forest resources will be conducted by the FS and funded through cost recovery.

- **Reference landscapes** - there are no identified features in the area.
- **Natural appearing landscapes with high scenic quality** - The scenic integrity objective is High for this area. The pipeline corridor may not meet this SIO without significant mitigations to reduce impacts on scenery.
- **Traditional cultural properties and sacred sites** - no cultural resources have been identified and there are no known traditional properties or sacred sites.
- **Other locally identified unique characteristics** - there are no locally identified unique characteristics.

The construction of the MVP pipeline would impact the IRA's roadless characteristics by disturbing soils, and the cleared right-of-way would bisect a natural landscape with high scenic quality. The IRA does not contain sources of public drinking water, a unique diversity of plants and animals, known critical habitat for federally listed species, core solitude areas, reference landscape features, traditional cultural properties or sacred sites, or other locally identified unique characteristics.

Blue Ridge Parkway – Mountain Valley proposes to have its pipeline cross the BRP at MP 246.4 in Roanoke County, Virginia. At a meeting with the NPS on September 14, 2015, Mountain Valley presented its plan for crossing the BRP. Mountain Valley filed with the FERC its BRP Crossing Plan on April 21, 2016. The plan indicated that Mountain Valley would use a 40-foot-long bore to cross under the parkway.

Mountain Valley clarified that it had adopted "Alternative 3,"developed in coordination with the NPS including field visits with NPS staff, into the proposed route in its filing dated March 30, 2017. As described in section 3.5, the newly proposed route would cross the BRP in the same

94 The draft Plan of Development (POD) was submitted by Mountain Valley on March 3, 2017. Accession number 20170303-5014.

open field about 600 feet south of the original crossing and would avoid cultural resources, reduce impacts on visual resources, and reduce the crossing length of NPS lands.

Mountain Valley continued to coordinate with the NPS regarding the proposed crossing of the BRP after issuance of the draft EIS. As part of this coordination, Mountain Valley prepared a VIA report for the BRP, filed with the FERC on February 17, 2017.

State Owned or Managed Land and Designated Conservation Areas

Burnsville Lake Wildlife Management Area – At about MP 68.7 the MVP pipeline route would cross about 177 feet within the Burnsville Lake WMA. In forested areas of the WMA trees within the construction right-of-way across forested land would be cleared. In the temporary workspaces, trees would be allowed to regenerate after pipeline installation and restoration; however, larger trees likely would not grow to maturity for many decades, making this a long-term impact. According to our Plan, mowing over the entire permanent right-of-way could not occur more frequently than every 3 years; although a 10-foot-wide corridor over the pipeline centerline could be maintained more regularly in an herbaceous state. We discuss impacts on forest in more detail in section 4.4 of this EIS. Construction-related impacts on open land would include the removal of vegetation and disturbance of soils. Following installation of the pipeline, the right-of-way would be restored to its pre-construction conditions and uses. In open lands, grasses and shrubs would be reestablished over the entire right-of-way.

Mountain Valley would educate their workers about hunting seasons, require workers to wear highly visible vests and hard hats, and would conduct daily safety meetings to inform workers of relevant conditions. They would communicate with landowners about hunting restrictions on private property and would inform their employees to avoid specific areas during hunting seasons.

Other than long-term alterations of the visual landscape in forested areas, in general, impacts would be temporary and limited to the period of active construction, which typically would only last a few days to several weeks. The topography in the area would make the visual impacts from the cleared trees visible only in areas near the pipeline. Mountain Valley has not documented that it provided its Burnsville Lake WMA Crossing Plan to appropriate state agencies for review. Therefore, **we recommend that:**

- **Prior to construction, Mountain Valley should file with the Secretary documentation that the Burnsville Lake WMA Crossing Plan was provided to the WVDNR for review and comment.**

North Bend Rail Trail – The MVP pipeline route would cross the North Bend Rail Trail under the existing U.S. Highway 50 bridge at MP 25.8 in Harrison County, West Virginia. The North Bend Rail Trail is owned and managed by the WVSPF. Associated with the highway crossing would be a laydown yard and a temporary staging area adjacent to the trail on the west side of the bridge, where there is a current yard. On the east side of Highway 50 there is an existing shed and two mobile homes within the temporary workspace for the pipeline and an existing house or agricultural outbuilding located about 60 feet south of the construction right-of-way boundaries. Mountain Valley intends to open-cut the North Bend Rail Trail, with the crossing accomplished within about 48 hours. The construction right-of-way width would be reduced to 75 feet in the area of the crossing to minimize impacts. Mountain Valley has not documented that it provided its North Bend Rail Trail and Highway 50 Crossing Plan to appropriate state agencies for review. Therefore, **we recommend that:**

- **Prior to construction, Mountain Valley should file with the Secretary documentation that the U.S. Highway 50 and North Bend Rail Trail Crossing Plan was provided to the WVDOT and WVDNR for review and comment.**

National Coal Heritage Area - The MVP pipeline route would cross through the NCHA for a total of 17.1 miles between MPs 154.2 to 154.6 in Fayette County, West Virginia and MPs 157.2 to 174.2 in Summers County, West Virginia. The MVP would affect a total of about 392 acres in two counties within the NCHA; while in total the NCHA encompasses about 5,300 square miles (3,392,000 acres) in 13 counties in southern West Virginia. The NCHA is a partnership between the NPS, the state of West Virginia, and local counties, with the National Coal Heritage Area Authority designated as the state agency responsible for management of the NCHA. The mission of the NCHA is to preserve, protect, and interpret lands, structures, and communities associated with the history of coal mining in West Virginia. The proposed pipeline route would cross the New River and Greenbrier Coal Fields, and 12 active or abandoned coal mines were identified within 0.25 mile of the pipeline in Summers County, West Virginia (see table 4.1.1-5). However, during the cultural resources survey, which covered 14.1 miles out of the 17.1 miles (91 percent) within the NCHA, no historic resources related to the coal mining industry, including mines or camps, were identified within the APE. The MVP pipeline would be buried underground, and after installation, the right-of-way would be restored and revegetated. Our conclusion is that the MVP would not significantly alter the character or landscape of the region, or affect how structures and communities related to historic coal mining are interpreted within the NCHA.

Gauley River –The MVP pipeline route would cross the Gauley River in Nicholas County, West Virginia at about MP 118.9. People participating in recreational activities on the river or along the river banks may be affected during construction. Mountain Valley would use a cofferdam technique for a dry open-cut crossing of the Gauley River and will limit construction to half of the waterbody at a time. This method will allow Mountain Valley to maintain water access through the pipeline crossing area for recreational users.

Greenbrier River – The MVP pipeline route would cross the Greenbrier River at MP 171.3, in Summers County, West Virginia. People participating in recreational activities on the river or along the river banks may be affected during construction. Mountain Valley would use a cofferdam technique for a dry open-cut crossing of the Greenbrier River and will limit construction to half of the waterbody at a time. This method will allow Mountain Valley to maintain water access through the pipeline crossing area for recreational users.

Virginia Outdoors Foundation – At about MP 234.2, the MVP pipeline route would cross the easement labeled as MON-VOF-1871, in Montgomery County, Virginia. At about MP 239.3, Mountain Valley proposes to utilize an existing road for access (MVP-RO-279.01) that is within a VOF easement (parcel MON-VOF-2563/ROA-VOF-2563) on privately-owned land in Roanoke County, Virginia.

In a letter to the FERC dated January 10, 2017, the VOF indicated that it found the use of an access road to be inconsistent with the terms of the deed for the easement, and requested that Mountain Valley apply for a Conversion of Open Space pursuant to Virginia Code Section 10.1-1704.[95] An additional letter was filed by the VOF on March 28, 2017, stating that the VOF had yet to receive this application.[96] However, in section 3.5.1.12 we are including a recommendation that Mountain Valley not utilize access road MVP-RO-279.01.

Between MPs 220.7 and 228.3 in Montgomery County, Virginia the pipeline route would be within the VOF designated Catawba Valley Special Project Area. Most of the land crossed in this area is privately-owned forest or agricultural parcels. During construction about 137.1 acres within this area would be temporarily affected, with 45.9 acres within the permanent operational easement for the pipeline. There would be no aboveground facilities in this area. The pipeline would be collocated with existing rights-of-way for 2.3 miles out of the 7.2 miles (32 percent of the route) through the Catawba Valley Special Project Area. To minimize or mitigate impacts in this area, Mountain Valley would follow the FERC Plan and the measures discussed above in section 4.8.2.1.

Virginia Department of Conservation and Recreation Designated Conservation Units/Sites

Craig Creek – Johns Creek Stream Conservation Unit – The MVP pipeline route would cross Craig Creek at about MP 218.2, in Montgomery County, Virginia within the VADCR's designated Craig Creek – Johns Creek Stream Conservation Unit. The stream crossing is on private land. The pipeline route through part of the conservation unit would be adjacent to a powerline easement. In response to FS concerns, Mountain Valley has reduced the number of Craig Creek crossings from three to one. In addition, Mountain Valley has committed to limit construction (including waterbody crossings) in the Craig Creek area to times of dry weather or low water flow. Mountain Valley will also continue to work with the FS and VADEQ during the development and implementation of high quality and multiple tiered erosion control measures at the proposed Craig Creek crossing to minimize potential erosion and subsequent water quality impacts.

Slussers Chapel Conservation Site – The Slussers Chapel Cave Conservation Site would be crossed by the MVP pipeline route between about MPs 220.8 and 224.4, in Montgomery County, Virginia. In section 3.5 of this final EIS, we recommend that Mountain Valley adopt Variation 250, to avoid or reduce impacts on karst features within the Mount Tabor Sinkhole Plain.

Old Mill Conservation Site – The Old Mill Conservation Site would be crossed by the MVP pipeline route between about MPs 224.6 and 226.9, in Montgomery County, Virginia. The Mount Tabor Variation, which was adopted into the currently proposed route for the MVP pipeline, would avoid Old Mill Cave, and reduce impacts on karst features within the Mount Tabor Sinkhole Plain. Mountain Valley would further mitigate for karst by implementing the measures outlined in its *Karst Mitigation Plan*.

95 See accession number 20170110-5207.

96 See accession number 20170328-5127.

Other Recreational and Special Use Areas on Private Lands with NGO Easements

New River Conservancy – The New River Conservancy holds a conservation easement for a tract owned by Sizemore, Inc., that would be crossed by the proposed MVP pipeline route between about MPs 204.3 and 204.6 in Giles County, Virginia. The crossing plan filed with the FERC by Mountain Valley on April 21, 2016 showed that the pipeline would cross about 2,400 feet of the New River Conservancy easement adjacent to an existing powerline. Mountain Valley has had ongoing communications with the New River Conservancy. In a letter to the FERC dated May 31, 2016, the New River Conservancy indicated that it had stated to Mountain Valley that the conservation easement for the Sizemore property prohibits a utility crossing, in accordance with Internal Revenue Code § 170h. It is possible that a FERC issued Certificate could override this prohibition.

However, we considered if the pipeline route could be realigned to avoid the New River Conservancy easement. In response to the FERC's March 31, 2016 EIR, Mountain Valley indicated that it selected the route across the New River Conservancy parcel in order to avoid the densely populated area in the vicinity of the existing village of Pembroke. In a filing on July 18, 2016, Mountain Valley identified "Variation 82," (also known as the "New River Conservancy Variation"), which would avoid the New River Conservancy easement by moving the pipeline route to the south. In section 3.5 of this EIS, we analyzed Variation 82, and concluded that the variation would not be environmentally superior to the proposed route. In a letter to the FERC dated August 19, 2016,[97] an attorney representing Sizemore Inc., the owners of the tract, indicated that they object to Variation 82 and prefer the original proposed route for the pipeline.

Land use in the area of the crossing is forest land, an open field, and the powerline easement. Land within the construction right-of-way across forested land would be cleared. In the temporary workspaces, trees would be allowed to regenerate after pipeline installation and restoration; however, larger trees likely would not grow to maturity for many decades, making this a long-term impact. According to our Plan, mowing over the entire permanent right-of-way could not occur more frequently than every 3 years; although a 10-foot-wide corridor over the pipeline centerline could be maintained more regularly in an herbaceous state. We discuss impacts on forest in more detail in section 4.4 of this EIS. Construction-related impacts on open land would include the removal of vegetation and disturbance of soils. Following installation of the pipeline, the right-of-way would be restored to its pre-construction conditions and uses. In open lands, grasses and shrubs would be reestablished over the entire right-of-way.

The Nature Conservancy – The MVP pipeline route would cross easements held by TNC between about MPs 239.3 and 241.0 in the vicinity of Poor Mountain, on both sides of Honeysuckle Road, in Roanoke County, Virginia. TNC filed additional comments about impacts on its Poor Mountain easement on December 19, 2016.[98] TNC believes that a pipeline through its property would violate the terms of its easement.

We considered alternatives that would avoid the TNC Poor Mountain easements in section 3.5 of this final EIS. After looking at alternative routes on both the west and east side of Poor

[97] Accession number 20160819-5278

[98] See accession number 20161219-5368.

Mountain, we concluded that those alternatives would not provide a significant environmental advantage compared to the proposed route.

Mountain Valley filed with the FERC on April 21, 2016 plans for crossing TNC parcels. Mountain Valley stated that it originally proposed to locate the pipeline adjacent to an existing powerline, but after communications with TNC the route was shifted south to lessen impacts on environmental resources. Because Mountain Valley has not yet documented that its crossing plan has been provided to the TNC, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary documentation that the TNC Property Crossing Plan was provided to the TNC for review and comment.**

<u>Scenic Byways</u>

Staunton-Parkersburg Turnpike – The proposed MVP pipeline route would cross the Staunton-Parkersburg Turnpike where it is U.S. Highway 33 between Camden and Linn, West Virginia. At this location the road is asphalt, and would be crossed with a bore.

Coal Heritage Trail/Midland Trail in Greenbrier County, West Virginia – The MVP pipeline route would descend Laurel Creek Mountain, cross the Meadow River, then cross the Coal Heritage Trail/Midland Trail where it is U.S. Highway 60 at a perpendicular angle before ascending Little Sewell Mountain. There would be a temporary construction laydown area adjacent to the pipeline at the trail crossing. Highway 60 is an asphalt road that would be bored.

Lower Greenbrier River Byway – The proposed MVP pipeline route would cross the Lower Greenbrier River Byway where it is State Route 3. The roadway is asphalt and would be crossed by boring underneath. The crossing would be done perpendicular to the road.

Lowell Backway – The Lowell Backway would be crossed by the proposed MVP pipeline route where it is County Road 15. The crossing would be done using an open-cut method perpendicular to the roadway.

Farm Heritage Road – The MVP pipeline route would cross the Farm Heritage Road where it is State Highway 122. The road is asphalt and would be bored. The crossing would be a perpendicular angle.

Big Stony Creek Road/Whistle Stop Byway – The MVP pipeline route would cross the Big Stony Creek Road where it is State Route 635. The road is asphalt and would be bored. The crossing would be at a perpendicular angle parallel to two existing powerlines.

Blue Grass Trail – The MVP pipeline route would cross the Blue Grass Trail where it is State Route 42. This road is asphalt and would be bored. The pipeline route would be parallel to an existing powerline, and would cross the road at a perpendicular angle.

Catawba Road – The MVP pipeline would cross Catawba Road where it is State Route 785. The road is asphalt and would be bored. At this location, the pipeline would be adjacent to an existing powerline and east of the byway the route would follow the topography around a prominent ridge.

Equitrans Expansion Project

The EEP would not cross any federally designated Wild and Scenic Rivers, National Parks, National Trails, National Landmarks, federal or state designated Wilderness Areas, national or state forests, wildlife refuges, nature preserves or game management areas, Indian reservations, or state or county parks or recreational areas. With the adoption of the Cline Variation, a small portion of the Riverview Golf Course would be crossed by the H-318 pipeline. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Equitrans should file with the Secretary, for the review and written approval of the Director of OEP, a crossing plan for the Riverview Golf Course that includes mitigation measures and documentation that the plan was reviewed by the landowners.**

4.8.2.5 Visual Resources

Visual impacts would be greatest at operating aboveground facilities. Views of aboveground facilities would be permanent. In some cases, however, views of aboveground facilities would be screened by vegetation or topography, or there may be a lack of receptors if few roads or houses are nearby. In addition, the pipeline corridor itself may be a significant visual feature, especially in mountainous terrain with multiple viewpoints.

Visual impacts may be considered permanent for the 50-foot-wide operating easement for the pipeline through forested areas, where trees would be removed. However, visual impacts even in forested areas may be reduced by topographic or vegetation screening, or where there are no receptors because of a lack of houses or roads in rural areas. Visual impacts would be highest where the pipeline route parallels or crosses roads and the pipeline right-of-way may be seen by passing motorists; where the pipeline may be located on a prominent landform; and from residences where vegetation used for visual screening or for ornamental value is removed. The duration of visual impacts would depend on the type of vegetation that is cleared or altered, and the amount of time the viewer can see the right-of-way. In many cases, Mountain Valley classified visual impacts as low to moderate at road crossing because of the speed of traffic, where views would last virtually seconds while a vehicle passes by.

In open lands, visual impacts related to construction would be temporary or short-term, as after pipeline installation the right-of-way would be restored and revegetated with grasses and shrubs. In agricultural lands, visual impacts would also be temporary or short-term, during the construction and restoration periods. After restoration, crops may be grown over the entire right-of-way in agricultural lands. After pipeline installation, pasture lands would be restored to their previous condition and use, and the right-of-way revegetated with grasses.

Mountain Valley Project

Mountain Valley proposes to generally use a 125-foot-wide construction right-of-way for its pipeline; except when crossing wetlands, where it would be narrowed to 75 feet. Some construction areas would be wider because ATWS would be needed at waterbody, road, and utility crossings. Other visual effects could result from the removal of large individual trees that have intrinsic aesthetic value; the removal or alteration of vegetation that may currently provide a visual barrier; or landform changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture.

The area crossed by the pipeline is predominately forested land. While trees cleared within temporary construction work areas would be allowed to regenerate; this would still be a long-term impact, as it would take many years for trees to mature. The 50-foot-wide permanent operating pipeline easement would be kept clear of trees. However, the forested setting around the pipeline corridor would also act as screening, helping to minimize the view for receptors.

In order for the aboveground facilities associated with the MVP to have visual impacts, there should be a receptor, such as a house or public road, nearby. The Bradshaw Compressor Station would be located in a rural area with no houses identified nearby. The proposed Harris Compressor Station would be located in a forested area. There is a residence adjacent to the station location that Mountain Valley stated it intends to purchase. The Stallworth Compressor Station is also located in a rural area. There is a house about 0.2 mile away. Since there is forest between the residence and the house, visual impacts would be screened. We conclude that construction and operation of the Mountain Valley compressor stations would not have significant adverse visual impacts; since views of the facilities would be limited.

Mountain Valley would also construct four interconnects and M&R stations. The interconnects and M&R station facilities generally are located at the site of existing pipeline infrastructure and therefore would not have significant adverse visual impacts. The Sherwood Interconnect would be surrounded by forested land, resulting in a natural visual buffer. The Mobley Interconnect is adjacent to a roadway and an existing utility corridor, and construction would require tree clearing. During construction, motorists along the road would be able to view construction activities; however this would be a temporary impact. Impacts from operation of the facility would be permanent. Given the short duration of time motorists would view the facility and given that there are no other visual receptors in the area, the impact would not be significant. The Transco Interconnect would be located across from an existing industrial site and 475 feet from a public roadway. Given the location of the facility at an existing industrial area, impacts from construction and operation would not be significant. The WB interconnect would be adjacent to the Harris Compressor Station and would have similar visual impacts (see discussion above).

The MVP would also have 36 MLVs constructed within the pipeline right-of-way or within aboveground facilities. At the MLV sites, only a small portion of the equipment would extend above the ground. However, these areas would be fenced and gated. Therefore, the MLVs may have visual impacts where located near roads and houses, without landscape or vegetation screening. MLVs located in close proximity to roadways may be visible to motorists. However, given their small size, it is unlikely that impacts on motorists' view would be significant. Based on our desktop review of alignment sheets and aerial photographs, the closest residence with a potential direct line of sight to an MLV would be about 430 feet. If an MLV is within the viewshed of a landowner, landowners could negotiate additional screening measures as part of landowner easement negotiations.

The yards would be located on lands classified as agricultural, open, industrial/commercial, and forested. The only impacts at yards would be temporary when trailers, vehicles, pipe, and other construction-related materials are stored at these sites during construction. After construction, the yards would be returned to their original condition and land use. For yards that contain forest land, the clearing of trees would result in long-term visual impacts.

Mountain Valley evaluated visual impacts from various KOP along its proposed pipeline route (see table 4.8.1-10). The following KOPs were rated by Mountain Valley as having high visual impacts:

- North Bend River Trail;
- Weston Gauley Bridge Turnpike Trail;
- I-64;
- Greenbrier River;
- Farm Heritage Road;
- Mountain Shadow Trail;
- Roanoke River;
- Blackwater River; and
- Pigg River.

We asked Mountain Valley to produce computer generated visual simulations for all KOPs with a high visual impact rating, which were filed with the FERC on February 26, 2016 (see appendix S). Each depiction represents the expected view during operation of the project. The level of visual impact varies depending on the surrounding vegetation and the amount of clearing that would be needed. Based on the visual simulations, viewers from Red Spring Mountain/I-64 crossing in Greenbrier County, West Virginia, and from the Greenbrier River in Summers County, West Virginia would see the biggest changes due to the level of tree clearing needed and the proximity of the project to the KOPs. The changes at the Red Spring Mountain/I-64 crossing would involve a new, meandering corridor extending across forested hill tops readily visible to motorists traveling on the highway. The new corridor would intersect I-64 at an angle. The immediate vicinity at the proposed crossing is largely undeveloped, although an existing cell phone tower is located and visible at the top of the higher terrain near where the new corridor would descend from the ridgetop down to I-64. Since the viewers would be travelling at speed, we assess that the visual impacts would be moderate. At the Greenbrier River, some tree clearing associated with the pipeline crossing and more substantial tree clearing associated with an adjacent ATWS would be visible to motorists travelling along State Highway 3. After construction, motorists' views to the southwest from State Highway 3 toward the Greenbrier River would be substantially more open, but viewers would be travelling at speed and we conclude that visual impacts would be moderate. Views from the Greenbrier River, such as for fishermen or boaters, would also be affected, but would largely be limited to the width of the right-of-way and would be moderate. Visual impacts on federally managed lands including the Weston and Gauley Bridge Turnpike Trail, the BRP, and the Jefferson National Forest are discussed in section 4.8.2.6.

Equitrans Expansion Project

Equitrans proposes to use construction right-of-way widths ranging from 85 feet to 125 feet depending on the diameter of pipe being installed. Some locations would require ATWS outside the construction right-of-way. Construction of the EEP pipelines combined would cross almost 4 miles of forest, affecting about 74 acres. During construction all trees would be removed from the construction right-of-way and ATWS. After pipeline installation, trees would be allowed to regenerate in the temporary workspaces. This would be a long-term impact, because of the time it takes trees to mature. However, trees would not be allowed to regenerate within the 50-foot-wide operational permanent pipeline right-of-way easement. This permanent easement would be covered by herbaceous and shrub vegetation, and could be a visible corridor depending on landscape, other land use, and points of observation.

The aboveground facilities would be the most visible features of the EEP. The operational footprint of the aboveground facilities combined for the EEP would cover a total of about 17.9 acres. Given the presence of substantial pipeline infrastructure already in the area, we conclude that the newly proposed Redhook Compressor Station would generally blend into the current setting and would not result in adverse visual impacts on nearby receptors. If the EEP is approved by the Commission, and after the Redhook Compressor Station is functioning, the Pratt Compressor Station would be decommissioned and demolished with the debris removed. Given the existing setting in a developed area, we conclude that demolition of the Pratt Compressor Station would not result in adverse visual impacts on nearby visual receptors. Given the presence of substantial pipeline infrastructure already in the area, we conclude that the proposed Mobley Tap and Webster Interconnect would generally blend into the current landscape setting and would not result in adverse visual impacts on nearby receptors.

4.8.2.6 Land Use on Federal Lands

U.S. Army Corps of Engineers Lands

The Weston and Gauley Bridge Turnpike Trail is managed by the COE. The trail is 20 feet wide and unpaved at the location of the crossing. Mountain Valley is proposing to use a 130-foot conventional bore for the crossing which would leave the surface of the trail intact and would leave a 20-foot buffer of vegetation between the edge of the trail and the bore pits throughout construction. The length of the bore would leave the entire length of COE land undisturbed on the surface, which would allow people to use the trail throughout construction although there may be impacts from noise or dust. There would be tree clearing on either side of the trail where the bore pits would be constructed; however, the buffer of vegetation between the trail and the pits would help to mitigate visual impacts from the trail. In leaf-off simulations some tree clearing would still be visible from the trail even with the buffer. Impacts during construction could include noise and dust. However, impacts on trail users would be temporary during construction, and would be reduced by the distance of the bore pits away from the trail, and the forest buffer.

National Park Service

The BRP is administered by the NPS. Mountain Valley is proposing to bore under the road, keeping the surface of the road intact throughout construction. The area near the crossing is mostly an open grassy field, and only minor tree clearing would be required. In addition, Mountain Valley would feather the right-of-way in some visible areas in order to reduce contrast and they would narrow the construction right-of-way to 75 feet for a distance of 75 feet to reduce visual impacts from tree clearing.

Land Use Impacts on the Jefferson National Forest

The following analysis is specific to the portions of the MVP that impact NFS lands. The Jefferson National Forest utilizes prescribed fire and timber harvest as important management tools to achieve the desired conditions of the Forest Plan. Prescribed fires in the Jefferson National Forest would not affect pipeline integrity. When a prescribed fire is being planned by the FS, communication with Mountain Valley should occur so the plastic surface line markers can be removed during the event and replaced when completed. In the event a fire, planned or unplanned, was to occur on the surface in the vicinity of the pipeline, the presence of the pipeline would not increase fire hazards or impact wildland firefighting or prescribed burning operations. Fires on the surface are not a direct threat to underground natural gas pipelines because of the insulating effects of soil cover over the pipeline.

As described in section 4.8.1.11, the route of the MVP pipeline through the Jefferson National Forest would cross five separate Rxs:

- Rx 4A-Appalachian National Scenic Trail Corridor;
- Rx 8A1-Mix of Successional Habitats in Forested Landscapes;
- Rx 6C-Old Growth Forest Communities Associated with Disturbance;
- Rx 4J-Urban/Suburban Interface; and
- Rx 11-Riparian Corridors (not mapped but considered embedded within other Rxs)

There is an ATWS area proposed on the NFS lands along Pocahontas Road in Rx 8A1 and another on the south side of Sinking Creek Mountain adjoining the construction corridor in Rx 6C. In addition, the proposed route between MPs 219.8 and 220.7 crosses the Brush Mountain IRA for a length of approximately 1 mile.

Construction of the MVP would result in an impact on 2.5 acres within Rx 4A (although the pipeline would be installed by the conventional bore method underground), 14.1 acres within Rx 4J, 58.7 acres within Rx 8A1, and 7.5 acres within Rx 6C for a total impact of 82.7 acres. Lands between the construction corridor and the operational corridor will be revegetated. The operational corridor for the pipeline would result in long-term impacts of about 12 acres in Rx 8A1, 2 acres in Rx 6C and 6 acres in Rx 4J. Of these Rxs, only Rx 8A1 is suitable for timber production. Operation of the MVP would not impact potential future timber operations, and would not isolate currently manageable timber tracts. However, Mountain Valley would require that future operation of heavy equipment within the right-of-way be coordinated with Mountain Valley to ensure the integrity of the pipeline is maintained.

Amendment to the LRMP for the Jefferson National Forest

The environmental consequences of the construction and operation of the MVP pipeline on the various resources are addressed throughout Chapter 4 of this final EIS. This section described why an LRMP amendment is needed, what that amendment is, and how the amendment will meet the NFMA requirements.

The NFMA requires that proposed projects, including third-party proposals subject to permits or rights-of-way grants, be consistent with the LRMP (or Forest Plan) of the administrative unit where the project would occur. When a project is not consistent with the Forest Plan where the project would occur, the FS has the following options: (1) modify the proposed project to make it consistent with the Forest Plan; (2) reject the proposal; (3) amend the Forest Plan so that the project would be consistent with the plan as amended; or (4) amend the Forest Plan contemporaneously with the approval of the project so the project would be consistent with the plan as amended. The fourth option may be limited to apply only to the project (36 CFR 219.15(c)).

The linear nature of the pipeline corridor and the topography of the Jefferson National Forest make it difficult to avoid every circumstance that would be inconsistent with the management direction and standards in the Forest Plan. Mountain Valley has cooperated with the FS to make its proposal consistent with the Forest Plan where feasible and include additional mitigation measures. Even with several route adjustments and modified project design features, the FS has determined that if the Right-of-Way Grant would be approved for the proposed route crossing the Jefferson National Forest, the Forest Plan would require amendment. With amendment, the MVP pipeline would then be consistent with the Forest Plan.

Forest Plan amendments are guided by direction in the NFMA and the planning rule regulations (36 CFR 219.5 and 219.13). The planning rule was amended on December 15, 2016 to clarify direction for Forest Plan amendments. In particular, the Responsible Official is required to determine if a proposed Forest Plan amendment is directly related to the substantive requirements of § 219.8 through 219.11. 36 CFR 219.13(b)(5) (81 FR at 90738). These substantive requirements address sustainability, diversity of plant and animal communities, multiple use, and timber requirements based on the NFMA. A proposed amendment is "directly related" to a substantive requirement if it has one or more of the following relationships to a substantive requirement: the purpose for the amendment; there would be a beneficial effect of the amendment; there would be a substantial adverse effect of the amendment; or there would be a lessening of plan protections by the amendment. If a proposed amendment is determined to be "directly related" to a substantive rule requirement, the Responsible Official must apply that requirement within the scope and scale of the proposed amendment and, if necessary, make adjustments to the proposed amendment to meet the requirement (36 CFR 219.13 (b)(5) and (6)). In other words, if a proposed amendment was determined to have substantial adverse effects on a substantive rule requirement, then additional Forest Plan components may need to be added to the amendment.

The Forest Plan amendment proposed by the FS is needed because the MVP project cannot meet several Forest Plan standards that are intended to protect soil, water, riparian, visual, old growth and recreational resources. Standards are mandatory constraints on project and activity decision-making, established to help achieve or maintain desired conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iii)). The wording of some standards contains flexibility to allow for site-specific adaptation to meet the intent of the standard. However, the standards identified as needing to be amended do not have such flexibility.

LRMP Amendment that was Proposed at the time of the Draft EIS

In the draft EIS, the FS proposed an amendment to the LRMP, which would have consisted of four parts. This amendment was based on the knowledge and anticipated effects of the proposed project at that time. After new information and further reviews following the draft EIS, changes to the proposed amendment have been made. Those changes are described in the next section.

Final EIS Amendment, Part 1:

After further consideration and review of public comments received on the draft EIS, the FS no longer proposes a land allocation change to the Rx 5C-Designated Utility Corridors. This proposed amendment is being replaced with a project-specific amendment that would exempt the MVP pipeline right-of-way, if approved, from forestwide standard FW-248 that would require a Rx reallocation.

The FS has determined that a specific amendment to FW-247 is not needed. The option of collocating the pipeline within existing utility corridors was considered by Mountain Valley (see section 3.0 Alternatives), but determined to not be feasible on NFS lands.

The FS has also decided it is preferable to not allocate the MVP right-of-way corridor to a Rx that encourages future collocation opportunities. While other linear utilities could be proposed to collocate with this corridor in the future, such an option is not likely to be feasible. In addition, it has been determined that the scope of this EIS should not be expanded to include the possibilities of future utility facilities being collocated within a 500 foot corridor associated with the MVP pipeline as in the amendment proposed in the draft EIS. Therefore, a new 500-foot prescription area designated for utility corridors would not be amended into the Jefferson's LRMP, and the operational right-of-way needed for the MVP would remain within the existing management prescriptions. There is, however, still the need to address the FW-248 standard, shown below, that would require the reallocation of the lands within the MVP pipeline operational Right-of-Way Grant to the Rx 5C-Designated Utility Corridor.

- Standard FW-248: "… decisions for new authorizations outside of existing corridors and designated communication sites will include an amendment to the Forest Plan designating them as Prescription (Rx) Area 5B or 5C."

The new proposal to amend Standard FW-248 is:

- Standard FW-248: Following evaluation of the above criteria, decisions for new authorizations outside of existing corridors and designated communication sites will include an amendment to the Forest Plan designating them as Prescription Area 5B or 5C. **However, this requirement will not apply to the operational right-of-way associated with the MVP pipeline.**

With this amendment, the lands would remain in the existing management prescriptions of Rx 4A-Appalachian National Scenic Trail Corridor, Rx 4J-Urban/Suburban Interface, Rx 6C-Old Growth Associated with Disturbance, Rx 8A1-Mix of Successional Habitats in Forested Landscapes, and Rx 11- Riparian Corridors.

The 36 CFR 219 planning rule requirement that is relevant to this part of the proposed amendment is:

- § 219.10(a)(3) – "[The responsible official shall consider] Appropriate placement and sustainable management of infrastructure, such as recreational facilities and transportation and utility corridors"

The requirement to consider the appropriate placement and management of utility corridors is addressed throughout this EIS. Various alternatives for the location of the pipeline through the Jefferson National Forest have been considered through the planning process for the pipeline, and the applicable mitigation and monitoring measures to minimize the effects of the pipeline on the other resources have been identified in the POD.

Final EIS Amendment, Part 2:

Since the draft EIS release, the FS has more closely examined the standards related to soil, water and riparian areas and has determined that Standard 11-017 allows for tree removal for approved facility construction. So if the MVP is approved, tree removal activities associated with the MVP would be consistent with this standard. Two additional standards have been identified that would require an exemption, FW-8 and Management Prescription standard 11-003. It is now proposed to amend the standards in the Jefferson National Forest that are listed below to allow the construction and operation of the MVP pipeline to exceed these restrictions on soil conditions and riparian corridor conditions, and to require that the mitigation measures set out in the POD that are applicable to the protection of soil and riparian conditions would be implemented.

- Standard FW-5: On all soils dedicated to growing vegetation, the organic layers, topsoil and root mat will be left in place over at least 85 percent of the activity area and revegetation is accomplished within 5 years.
- Standard FW-8: To limit soil compaction, no heavy equipment is used on plastic soils when the water table is within 12 inches of the surface, or when soil moisture exceeds the plastic limit. Soil moisture exceeds the plastic limit when soil can be rolled to pencil size without breaking or crumbling.
- Standard FW-9: Heavy equipment is operated so that soil indentations, ruts, or furrows are aligned on the contour and the slope of such indentations is 5 percent or less.
- Standard FW-13: Management activities expose no more than 10 percent mineral soil in the channeled ephemeral zone.
- Standard FW-14: In channeled ephemeral zones, up to 50 percent of the basal area may be removed down to a minimum basal area of 50 square feet per acre. Removal of additional basal area is allowed on a case-by-case basis when needed to benefit riparian-dependent resources.
- Standard 11-003: Management activities expose no more than 10 percent mineral soil within the project area riparian corridor.

The new proposal to amend these standards is:

- Standard FW-5: On all soils dedicated to growing vegetation, the organic layers, topsoil and root mat will be left in place over at least 85 percent of the activity area and revegetation is accomplished within 5 years, **with the exception of the operational right-of-way and the construction zone for the MVP pipeline, where the applicable mitigation measures identified in the POD and MVP design requirements will be implemented.**

- Standard FW-8: To limit soil compaction, no heavy equipment is used on plastic soils when the water table is within 12 inches of the surface, or when soil moisture exceeds the plastic limit, **with the exception of the operational right-of-way and the construction zone for the MVP pipeline, where the applicable mitigation measures identified in the POD and MVP design requirements will be implemented.** Soil moisture exceeds the plastic limit when soil can be rolled to pencil size without breaking or crumbling.
- Standard FW-9: Heavy equipment is operated so that soil indentations, ruts, or furrows are aligned on the contour and the slope of such indentations is 5 percent or less, **with the exception of the operational right-of-way and the construction zone for the MVP pipeline, where the applicable mitigation measures identified in the POD and MVP design requirements will be implemented.**
- Standard FW-13: Management activities expose no more than 10 percent mineral soil in the channeled ephemeral zone, with the exception of the operational right-of-way and the construction zone for the MVP pipeline, where the applicable mitigation measures identified in the POD and MVP design requirements will be implemented.
- Standard FW-14: In channeled ephemeral zones, up to 50 percent of the basal area may be removed down to a minimum basal area of 50 square feet per acre. Removal of additional basal area is allowed on a case-by-case basis when needed to benefit riparian-dependent resources, **with the exception of the operational right-of-way and the construction zone for the MVP pipeline, where the applicable mitigation measures identified in the POD and MVP design requirements will be implemented.**
- Standard 11-003: Management activities expose no more than 10 percent mineral soil within the project area riparian corridor, **with the exception of the operational right-of-way and the construction zone for the MVP pipeline, where the applicable mitigation measures identified in the POD and MVP design requirements will be implemented.**

The following is a summary of the major applicable mitigation measures from Mountain Valley's POD:

- To protect soil productivity, topsoil segregation will be required for pipeline construction along the entire length of the right-of-way on NFS lands (POD, Section 6.1.1.11 Typical Topsoil Segregation). On slopes greater than 50 percent, where topsoil is minimal, disturbed areas must be covered with jute netting or other biodegradable erosion control material compatible with establishing vegetation on these steeper slops during reclamation. This segregated topsoil must be replaced over the subsoils after the trench is backfilled and prior to restoration and revegetation effort. Soils that have been compacted by construction equipment traffic must be decompacted via disking. No additional soil materials must be brought onto the Forest from outside the NFS lands (POD, Section 8.1 Restoration (Soil Replacement and Stabilization)).

- The applicable mitigation measures designed to minimize the potential for soil movement and to ensure adequate restoration and revegetation are identified in the Erosion and Sediment Control Plan (POD, Appendix C), Landslide Mitigation Plan (POD, Appendix F), the Site-Specific Design of Stabilization Measures in High Hazard Portions of the Route (POD, Appendix G), the Restoration Plan (POD, Appendix H), and the Winter Construction Plan (POD, Appendix L). Mountain Valley would also follow the FERC's Plan.
- The applicable mitigation measures in the POD to protect wetlands and minimize compaction include: limiting the construction right-of-way width to 75 feet through wetlands (unless approved by the FERC); placing equipment on mats; using low-pressure ground equipment; limiting equipment operation and construction traffic along the right-of-way; locating ATWS more than 50 feet away from wetland boundaries (unless approved by the FS); cutting vegetation at ground level; limiting stump removal to the trench; segregating the top 12 inches of soil, or to the depth of the topsoil horizon; using "push-pull" techniques in saturated wetlands; limiting the amount of time that the trench is open by not trenching until the pipe is assembled and ready for installation; not using imported rock and soils for backfill; and not using fertilizer, lime, or mulch during restoration in wetlands. Mountain Valley would also follow its project-specific Procedures.
- The applicable mitigation measures and monitoring requirements in the POD relating to water crossings are included in the Site-Specific Water Crossing Monitoring and Mitigation Plans (POD, Appendix K). The construction corridor will be reduced to 75 feet through wetlands.
- It is also noted that Mountain Valley adopted a minor route variation (FS 71) that modified the crossing of Craig Creek, reducing the number of crossings and later incorporated another variation to minimize impacts on a 100-foot riparian area where the pipeline parallels Craig Creek. In addition, Mountain Valley has committed to limit construction (including waterbody crossings) in the Craig Creek area to times of dry weather or low water flow. Mountain Valley would also continue to work with the FS and VADEQ during the development and implementation of high quality and multiple tiered erosion control measures at the proposed Craig Creek crossing to minimize potential erosion and subsequent water quality impacts.

The 36 CFR 219 planning rule requirements that are relevant to this part of the proposed amendment are:

- § 219.8(a)(2)(ii) – [The plan must include plan components to maintain or restore …] "Soils and soil productivity, including guidance to reduce soil erosion and sedimentation"
- § 219.8(a)(2)(iv) – [The plan must include plan components to maintain or restore …] "Water resources in the plan area, including lakes, streams, and wetlands; … and other sources of drinking water (including guidance to prevent or mitigate detrimental changes in quantity, quality, and availability)"
- § 219.8(a)(3)(i) – The plan must include plan components "to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity"

Sections 4.2.2.5 and 4.4.2.4 of the final EIS provide descriptions of the effects of the pipeline on the soil and riparian resources. With the mitigation measures in place, it is likely that there would not be any substantial adverse effects on the soil and riparian resources. Therefore, the § 219.8(a)(2)(ii)-(iv) and § 219.8(a)(3)(i) planning rule requirements would not be "directly related" to this amendment and they would not apply.

Final EIS Amendment, Part 3:

Upon further examination, the FS has decided to change this proposed amendment from what was described in the draft EIS as Proposed Amendment, Part 3. Standard FW-77 does not actually prohibit the harvest of old growth in certain old growth forest types, but rather it directs the Forest to inventory the stands in the project area to determine if any stands have "existing old growth conditions" and to then "consider" the contribution of any identified stands to the distribution and abundance of the old growth community types.

In addressing the requirement of FW-77, inventories were conducted by Mountain Valley and the FS that found 13.2 acres of the dry-mesic oak forest and 1.7 acres of the Dry and Dry-Mesic Oak-Pine Forest old growth community types. Dry-Mesic Oak Forest is the most represented old growth community type (44 percent) of identified existing old growth on the Forest whereas Dry and Dry-Mesic Oak-Pine Forest represents 18 percent of identified existing old growth. Existing dry-mesic oak forest old growth represents approximately 8 percent of the estimated total acres of this community type across the Forest. Existing dry and dry-mesic oak-pine old growth represents approximately 6 percent of the estimated total acres of this community type across the Forest.

The Jefferson National Forest Plan, however, does need to be amended to allow the construction of the MVP pipeline in Rx 6C-Old Growth Forest Communities Associated with Disturbance. Originally, the lands within the pipeline right-of-way in Rx 6C were going to be reallocated to Rx 5C, but now with the change to Plan Amendment, Part 1, the lands in Rx 6C would not be reallocated to Rx 5C and consequently the plan requirements associated with Rx 6C apply. The following standards in Rx 6C would need to be amended to allow for a new utility right-of-way within this prescription area.

- Standard 6C-007: Allow vegetation management activities to: maintain and restore dry-mesic oak forest, dry and xeric oak forest, dry and dry-mesic oak-pine old growth forest communities; restore, enhance, or mimic historic fire regimes; reduce fuel buildups; maintain rare communities and species dependent on disturbance; provide for public health and safety; improve threatened, endangered, sensitive, and locally rare species habitat; control non-native invasive vegetation.
- Standard 6C-026: These areas are unsuitable for designation of new utility corridors, utility rights-of-way, or communication sites. Existing uses are allowed to continue.

The new proposal to amend these standards is:

- Standard 6C-007: Allow vegetation management activities to: maintain and restore dry-mesic oak forest, dry and xeric oak forest, dry and dry-mesic oak-pine old growth forest communities; restore, enhance, or mimic historic fire regimes; reduce fuel buildups; maintain rare communities and species dependent on disturbance; provide for public health and safety; improve threatened, endangered, sensitive, and locally rare species habitat; control non-native invasive vegetation, **and clear the trees within the construction zone associated with the MVP pipeline.**

- Standard 6C-026: These areas are unsuitable for designation of new utility corridors, utility rights-of-way, or communication sites, **with the exception of the MVP pipeline right-of-way.** Existing uses are allowed to continue.

The 36 CFR 219 planning rule requirements that are relevant to this part of the proposed amendment are:

- § 219.8(a)(1) – "The plan must include plan components, including standards and guidelines, to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity."
- § 219.11(c) – The plan may include plan components "to allow for timber harvest for purposes other than timber production throughout the plan area, or portions of the plan area, as a tool to assist in achieving or maintaining one or more applicable desired conditions or objectives of the plan in order to protect other multiple-use values …"

With respect to meeting the § 219.8(a)(1) planning rule requirement, since only 2 acres of Rx 6C would be affected by the pipeline, it is likely that there would not be any "substantial adverse effects" to the ecosystems within Rx 6C and therefore, this planning rule provision would not apply. (See section 4.4.2.4 of the final EIS for a further discussion of the effects of the pipeline on the ecosystems and vegetation within the pipeline's right-of way and construction zone.)

With respect to meeting the § 219.11(c) requirement, this planning rule requirement allows for timber to be harvested to meet other plan desired conditions or objectives, or to meet other multiple-use values. The amendment to Rx 6C-007 would still meet this planning rule requirement.

Final EIS Amendment, Part 4:

Since the draft EIS release, the FS has worked with Mountain Valley on the location of the bore entry and exit points to go under the ANST such that there is now an approximate 300-foot buffer from the ANST footpath. Photographic simulations contained in the VIA (see appendix S) prepared for multiple KOPs at this crossing indicate that this retained vegetative buffer will be sufficient to block the views from the ANST footpath. Therefore, there is no longer a need to change Standard 4A-020 to lower the SIO within the Rx 4A area. Management Prescription standard 4A-028 (shown below) would still need to be amended to allow the MVP pipeline to cross beneath the ANST in Giles County, Virginia on Peters Mountain.

- Standard 4A-028: Locate new public utilities and rights-of-way in areas of this management prescription area where major impacts already exist. Limit linear utilities and rights-of-way to a single crossing of the prescription area, per project.

The new proposal to amend this standard is:

- Standard 4A-028: Locate new public utilities and rights-of-way in areas of this management prescription area where major impacts already exist, with the exception of the MVP pipeline right-of-way. Limit linear utilities and rights-of-way to a single crossing of the prescription area, per project.

The 36 CFR 219 planning rule requirements that are relevant to this part of the proposed amendment are:

- § 219.10(b)(1)(vi) – "[The plan must include plan components to provide for] Appropriate management of other designated areas or recommended designated areas in the plan area".

With respect to the need to amend Rx Standard 4A-028, the location of the pipeline crossing the ANST at Peters Mountain occurs where no other major impacts already exist. In addressing the § 219.10(b)(1)(vi) requirement, as a part of the mitigation for crossing the ANST, the project design specifies that the pipeline will use a conventional auger bore machine underneath the ANST. Should the conventional bore under the ANST fail, Mountain Valley would utilize the methods described in the Contingency Plan for the Proposed Crossing of the Appalachian National Scenic Trail (POD, Appendix E) that does not include an open trench crossing of the ANST. The contingency methods include reattempting the bore, using a microtunnel boring machine, or using the direct pipe method (trenchless).

Final EIS Amendment, Part 5:

Forestwide standard FW-184 (shown below) would need to be amended since the operational right-of-way of the pipeline cannot immediately meet all of the existing Scenic Integrity Objectives.

- Standard FW-184: The Forest SIO Maps govern all new projects (including special uses). Assigned SIO are consistent with ROS management direction. Existing conditions may not currently meet the assigned SIO.

The new proposal to amend this standard would be:

- Standard FW-184: The Forest (SIO Maps govern all new projects including special uses), **with the exception of the MVP pipeline right-of-way. MVP will meet the existing SIO within 5 years after completion of the construction phase of the project, to allow for vegetation growth.** Assigned SIO are consistent with ROS management direction. Existing conditions may not currently meet the assigned SIO.

The 36 CFR 219 planning rule requirement that is relevant to this part of the proposed amendment is:

- § 219.10(b)(1)(i) – [The plan must include plan components to provide for …] "Sustainable recreation; … and scenic character."

With respect to meeting the § 219.10(b)(1)(i) requirement, the revised VIA was submitted on May 11, 2017.[99] The FS would like to incorporate mitigation measures, such as reducing the permanent operational right-of-way that is converted to herbaceous cover from 50 feet wide to 10 feet wide for its length on the Jefferson National Forest, and planting the remainder of the permanent right-of-way with FS approved shrubs and shallow rooted trees and maintained along a slightly undulating line in order to break up the straight edge and offer a variety of plant heights to reduce a hard shadow line. Although Mountain Valley has not committed to these maintenance practices for the permanent right-of-way, the FS may require those practices as part of its separate permitting process. This would significantly reduce the visibility of the pipeline right-of-way, especially when viewed in the far middleground and background distance zones, and it would reduce or eliminate its visibility when viewed on an angle. Reducing the herbaceous right-of-way width and allowing more of a vegetative transition within the operational corridor (i.e., grasses over the pipeline then shrubs between the grasses and treeline) would help mitigate the effects of the change to the scenic character of the area. (See also the mitigation measures for addressing the effects of the pipeline on the visual resources that are described in the following section and in the POD.) With the implementation of these mitigation measures, this planning rule requirement (to provide for scenic character) would be addressed.

Mitigation Measures for Complying with the Jefferson LRMP as Amended

Mountain Valley would follow FERC's Plan; its project-specific Procedures; and COE permit conditions. Mountain Valley has worked with the FS on a POD to identify additional requirements beyond these standard mitigation protocols that must be followed during construction and operation of the pipeline on NFS lands to reduce the environmental consequences. At the time of issuance of this final EIS, the POD is still an iterative document that is evolving and would be finalized prior to the decision of the FS to amend the Forest Plan. The final POD requirements would be incorporated into the BLM Right-of-Way Grant on federal lands, if the grant is approved.

Additionally, oversight responsibilities for Mountain Valley, the FERC, FS, and BLM are described in the POD, Environmental Compliance Management Plan, Appendix M, that would apply to the construction, operation, and maintenance of the project on NFS lands. The FS Authorized Officer would be responsible for administering and enforcing Right-of-Way Grant provisions and would have stop work authority. The FS Authorized Officer's designated representatives would be responsible to ensure stipulations and mitigation measures included in the POD are adhered to during project construction, operation, and maintenance. BLM would also have an Authorized Officer who would work with the FS to ensure the work is being conducted in accordance with the Right-of-Way Grant and agreed upon conditions. BLM would also have stop work authority. Field variance requests would be coordinated with the Authorized Officers.

Visual Impacts on the Jefferson National Forest

Scenic Integrity Objectives

The USDA Forest Service Scenery Management System (Agriculture Handbook Number 701, Landscape Aesthetics, A Handbook for Scenery Management), often referred to as the SMS

[99] Accession number 20170511-5018.

Handbook, provides direction for inventorying and classifying scenery. The primary purpose is its use in establishing SIO in the Forest Plan. SIO are based on the combination of the Rx and the inventoried Scenic Class. Table 4.8.1-11 in this final EIS lists the Rxs, Scenic Classes and SIO along the pipeline route, per the Jefferson National Forest LRMP. Meeting SIO is stated in terms of the degree to which the existing landscape integrity remains intact or the degree to which the proposed management activity is expected to create visible deviations by introducing contrasts in form, line, color, texture, pattern or scale that do not currently exist in the landscape character.

For all Jefferson National Forest project locations (except where Mountain Valley would bore under the ANST and roads), trees would be cleared along the pipeline right-of-way for a 125-foot width during construction. This conversion from forested landscape to a cleared work zone would create contrasts in the scenery by changing the texture and color, and introducing lines, and changing forms. The edges of the corridor would form parallel lines not typically found in natural appearing landscapes. The construction right-of-way would not repeat or mimic the natural attributes currently found in the landscape character of the National Forest.

Where visible in foreground and middleground distance zones (up to 4 miles) and where the project would be on moderate to steep slopes, the project during the construction period and after would either dominate or begin to dominate the characteristic landscape depending on the angle and aspect of view, the relative size of the project within the overall viewshed from the viewer's location, and the duration of view (in a moving car, hiking, stopping at an overlook). Where visible in the background distance zone, the project could begin to dominate the characteristic landscape, particularly in fall, winter and spring seasons when air quality is typically clear, and also when the corridor becomes covered in frost or snow. The clearing of trees from the right-of-way would have a long-term impact on the visual resources because of the time it takes for trees to mature and reinstate the textures and colors of trees and reduce the visibility of the lines along each edge of the construction corridor.

After construction is completed, topography would be restored to its previous contours to the extent feasible. The construction right-of-way and ATWS would be restored and revegetated.

Without mitigation, the pipeline right-of-way would not repeat or mimic the natural attributes currently found in the landscape character of the National Forest. The edges of the maintained permanent easement, although narrower than the construction corridor, would continue to form nearly parallel lines that are straight for long stretches which are not natural appearing (geometric shapes are avoided as a standard mitigation). These parallel corridor edges would primarily consist of trees while the permanent pipeline easement would be herbaceous ground cover. These vertical edges would introduce shadow lines which further accentuate and draw the viewers' attention to the corridor. The color and texture of the herbaceous groundcover, typically lighter green during growing season and yellowing or brown in dormant season, would contrast with the deeper green color and texture of the adjacent mixed hardwood forest in the growing season; and in winter, snow would be obvious within the corridor before it covers the adjacent trees. The texture of herbaceous cover would appear smooth while the adjacent intact forest canopy texture would be moderate to course, depending upon the species composition and distance from the viewer. Where the pipeline would cross the tops of the forested ridges on Sinking Creek Mountain and Brush Mountain, it would create a square notch in the otherwise intact ridgeline. Major forms, particularly mountains, draw viewers' attention normally, and a notch in the otherwise intact ridgeline is a noticeable deviation to the landscape character. All of these contrasts and changes in line, color, texture and form can attract the casual observer's attention if the line of sight between the observer and the altered landscape is not blocked or screened by intervening topography, vegetation, buildings or other features.

Mitigation Measures to Reduce Visual Resource Effects

Minimizing visual effects is critical for reducing long-term impacts of the permanent right-of-way. Therefore, per conversations between FERC and the FS, the permanent right-of-way width could be maintained consistent with Mountain Valley's Procedures, for the length of the entire right-of-way on the NFS lands. More specifically, the FS would require the company to reduce its mowing to a 10-foot-wide strip centered over the pipeline, and also reduce its trimming or selective cutting of trees to a 30-foot-wide strip centered over pipeline. Although Mountain Valley has not committed to these maintenance practices for the permanent right-of-way within the Jefferson National Forest, the FS may require such maintenance as part of its separate permitting process.

Outside the 10-foot-wide strip, the remainder of the construction and permanent right-of-way would be revegetated through the use of acceptable seed mixes, pollinator plants, shrubs and trees in accordance with the FERC Plan, Mountain Valley's Procedures, and as described in the POD. Particularly along the edge of this herbaceous linear opening, a variety of sizes and species of vegetation would be planted in a manner that breaks up the straight, parallel edges of the corridor and reduces the hard shadow line that can draw the viewer's attention.

The FS recognizes the potential hazards of woody vegetation close to the pipeline that could affect the integrity of the pipe. The POD would include monitoring requirements consistent with the PHMSA to maintain the integrity of the pipe and henceforth safety.

Visual Impact Assessment

The FS requested that Mountain Valley prepare a landscape scale analysis of areas potentially visible within 5 miles from the centerline of the proposed route on the National Forest (indicating the pipeline could potentially be visible from these areas). This radius includes the foreground, middleground, and a portion of the background distance zones defined in the SMS. The analysis used bare earth viewshed maps to identify all potentially visible areas and develop KOPs. A KOP can represent a point from which the MVP would be visible but can also represent lengths of travelways such as roads and the ANST and the extent of visibility along that travelway. Additional KOPs were added as recommended by the FS, public comments, and the ATC. Mountain Valley selected 47 KOPs on or adjacent to NFS lands that include specific viewing locations associated with the ANST, on Craig Creek Road, and on Pocahontas Road. Mountain Valley then used these KOPs to conduct on-site assessments of potential views to the pipeline corridor, inventory existing landscape character and uses, identify lack or presence of intervening topography and vegetative screening, and prepare visual simulations from photographs. The VIA also considered other factors such as distance viewed, duration of view, angle of view, and aspect of the project in relation to the KOP to determine whether the project would achieve the Forest Plan SIO at project locations on NFS lands.

It is important to note that the VIA filed by Mountain Valley did not incorporate the measures identified in the aforementioned section "Mitigation Measures to Reduce Visual Resource Effects." Visual impacts would be lessened by implementation of these mitigation measures.

Project Consistency with Scenic Integrity Objectives

The MVP would cross two areas on NFS lands assigned a High SIO, four areas with a Moderate SIO, and one area with a Low SIO. The following describes the prescription areas, scenic classes, and SIO's that would be crossed by the MVP pipeline on the Jefferson National Forest and the impacts on the visual resource.

Rx 4A Scenic Class 1 and Rx 4J Scenic Class 2 – High SIO

In High SIO areas the landscape character should appear unaltered to the casual observer. The MVP pipeline route would cross 0.29 mile of this area of Jefferson National Forest on the ridge of Peters Mountain at the ANST, Rx 4A. Mountain Valley intends to bore under the ANST. This would retain about 300 feet of forest on each side of the trail to provide a visual buffer between the trail and the bore pits. Photographic simulations contained in the VIA (see appendix S) prepared for multiple KOPs at this crossing indicate that this retained vegetative buffer would be sufficient to block the views between the MVP and the ANST footpath, dispersed campsite, and the nearby Peters Mountain Wilderness. The MVP would not be visible and therefore the High SIO would be met. Operation of the pipeline would not prevent recreational opportunities for users of the ANST, since the pipeline would be buried underground.

The Rx 4A area extends below the bore openings on each side of Peters Mountain. The VIA includes analysis from other ANST locations with background views to Peters Mountain, and from locations in the valleys with middleground and background views to the top of Peters Mountain.

- The analysis indicates that ANST points south of the project area along Pearis and Sugar Run Mountains, including Angels Rest, as well as ANST points northbound from the project area, including Wind Rock, would have views of the MVP on NFS lands on Peters Mountain. The pipeline right-of-way would be noticeable from these KOPs and therefore would not meet the High SIO. The mitigating measures described above would result in a significantly reduced width of the permanent easement that is converted to herbaceous groundcover. Because views to Peters Mountain from these ANST locations are on an angle, in the background distance zone, and the corridor does not cross the top of the mountain, the High SIO would be achieved within 5 years.
- In Monroe County, West Virginia, Little Mountain blocks most of the views of the MVP between U.S. 219 and Peters Mountain. However, travelers on short sections of U.S. 219 and approximately 60 to 70 residential and other structures in this vicinity could see the pipeline corridor through gaps in Little Mountain created by Painters Run, Rich Creek, and Crooked Creek. These views are in the middleground distance zone where many details are clear including individual crowns of trees. The pipeline right-of-way would be noticeable from these KOPs and therefore would not meet the High SIO. Only approximately 0.08 mile at the top portion of Peters Mountain is in FS

ownership on the West Virginia side. The remainder of the pipeline route on the north side of Peters Mountain is non-NFS lands. The long-term operating corridor on NFS lands would meet the High SIO within 5 years of vegetative growth following construction.
- In Giles County, Virginia, a photographic simulation from the Giles County High School shows that the corridor would be highly visible from at least a portion of that campus. The view extends up Mystery Ridge but does not extend to the Rx 4A area at the top of Peters Mountain where the High SIO is assigned. Mystery Ridge is expected to block most or all views from the populated areas in the valley south of Peters Mountain so that views to the Rx 4A area are not possible. Locations within Pearisburg west of Main Street (business U.S. 460) may have views toward Peters Mountain. If there are higher elevation points within the valley that obtain views to the top of Peters Mountain, the impacts would be similar to those described above for the valley north of Peters Mountain in Monroe County.

The other NFS land with a High SIO that would be crossed by MVP is about 0.25 mile of Rx 4J at the base of Brush Mountain with a Scenic Class of 2. This is located in the valley near Craig Creek along SR 621. The land use types along SR 621 on private lands are mottled with forested, residential, and pastoral/agricultural lands. Grass fields are located in close proximity to the project area on NFS land in the valley bottom. During and following construction, the project will be noticeable to travelers along SR 621 and would not meet the High SIO. In the 5 years following construction, Mountain Valley would work with the FS to design the revegetation of the corridor to mimic the appearance of the fields and pastures so that the long-term operating right-of-way would be consistent with the landscape character and would meet the High SIO.

Rx 8A1 Scenic Class 2, Rx 6C Scenic Class 3, Rx 4J Scenic Classes 3 and 5 – Moderate SIO

The landscape character in Moderate SIO areas may appear to be slightly altered, but should borrow from elements of form, line, color, texture and scale found in the characteristic landscape.

The MVP pipeline route would cross 1.25 miles of Rx 8A1 with a Scenic Class of 2 on Peters Mountain. Per the bare earth visibility analysis, this south face of Peters Mountain is potentially visible from locations in Pearisburg west of Main Street (business U.S. 460) and an area around Giles County High School. From these locations, the Rx 8A1 area through which the project would cross is in the middleground distance zone on moderate to steep slopes. At this distance, details in the landscape are clear enough to see individual treeforms; and on steep slopes, changes in the landscape would be more evident than in most other situations. Locations in the valley have an inferior viewing angle to the project, which typically reduces the impacts. The VIA contains a photographic simulation of the construction right-of-way on Peters Mountain viewed from Giles County High School. The construction right-of-way is noticeable and dominates the natural appearing landscape. The construction right-of-way would not meet the Moderate SIO as viewed from this location.

The MVP would wind down the south face of Peters Mountain so there are only short sections where viewers would have an opportunity to look straight up the right-of-way which would typically have greater impact than viewing the corridor at an angle. Therefore, the revegetated construction right-of-way would result in trees along the edge of the herbaceous corridor screening or partially screening the view of the permanently maintained herbaceous right-of-way, reducing the impacts on scenery. Five years following construction, the permanent right-of-way would be largely revegetated. The permanent right-of-way would still be visible and noticeable to the casual observer, but the significantly reduced appearance of the right-of-way should remain subordinate to the characteristic landscape and would therefore meet the Moderate SIO.

Per the VIA, the project on Peters Mountain in the Rx 8A1 area would also be visible and noticeable from Angels Rest on the ANST in the background distance zone. There are other utility corridors on Peters Mountain and a significant amount of development in the valley; however, there is no other development on this end of Peters Mountain visible from Angels Rest. In the photo simulation in the VIA, the construction right-of-way appears to roughly parallel the top of the landform. At a distance of approximately 6 miles, and the relatively small scale of the project within an extensive panorama viewed from Angels Rest, it is not likely that the construction right-of-way would begin to dominate the landscape character. After revegetation of most of the right-of-way in accordance with mitigations required in the POD, the appearance of the pipeline corridor would be greatly reduced. The SIO of Moderate would be achieved.

Rx 6C, Scenic Class 3, for a distance of about 0.39 mile at the top of Sinking Creek Mountain has a Moderate SIO. The FS ownership through which the MVP pipeline would cross is located entirely on the upper elevation of the south facing slope. The only public travelway in this vicinity is SR 621 which winds through the valley below this site. There are no system trails or FS developed recreation sites. There are multiple residences along the road and a private camp lies north of the proposed project area. Potential visibility was assessed from this road and one location on SR 621 in front of the entrance to Camp Tuk-a-Way could potentially view the project. An indicative photographic simulation suggests that there may be views toward this area during leaf-off. The aspect of the MVP to the viewer is on a right angle, so the trees along the near edge of the right-of-way corridor would help screen these leaf-off views. The project area would not be expected to be visible during leaf-on. There may be low visual impact to travelers on SR 621 who obtain a short duration view of the project in the winter months and to camp visitors during the winter season. If the area is noticeable to the casual observer, it would not begin to dominate the existing landscape character and would meet the Moderate SIO. Other potential viewing locations were not found. If there are areas of visibility, they would be of short duration as people travel SR 621. There would be greater potential for visibility during and after construction until the vegetation is restored in the permanent right-of-way, but no long-term visual impacts are expected.

The ridgetop location on Sinking Creek Mountain where the FS ownership begins may be visible from travelways, including SR 42, and ANST locations to the west. In particular, vistas at Kelly's Knob on the ANST may include views of the ridgetop in the middleground distance zone. If so, the "notch" the proposed pipeline corridor would create as it crests the mountain would be clearly visible. Because the more elevated view from Kelly's Knob would look down toward this notch, it would not be backlit by sky but would be backed by the next ridge, Brush Mountain. This would reduce the visual impact of the notch, but it would still be noticeable to the casual observer. The notch itself, being backed by a similar color and texture on the next ridge, would not begin to dominate the landscape character. For the long-term, with the revegetation mitigation measures implemented, the appearance of the notch would diminish further. The impact to scenery on the National Forest would meet the Moderate SIO. This location may also be visible in the far background from ANST locations on Pearis and Sugar Run Mountains. The notch at the top of the mountain, from this distance would not dominate the National Forest landscape character and would meet the Moderate SIO.

Another area that would be crossed by the MVP is 0.24 mile within Rx 8A1 with Scenic Class 2 on Sinking Creek Mountain in the Jefferson National Forest, which has a Moderate SIO. This area is located at the bottom of the slope near SR 621. Although no points were identified where this area would be visible from the road or from other travelways including roads and trails, it may be possible that the removal of canopy during construction and the restoration period could be visible. If visible and noticeable to the casual observer, it would not begin to dominate the characteristic landscape which includes openings throughout the valley adjacent to the roadway. The project would meet the Moderate SIO if noticeable from SR 621.

The majority of the proposed MVP on Brush Mountain would cross the Rx 4J area with Scenic Classes of 3 and 5 which are assigned a Moderate SIO. These areas lie from an elevation just above Craig Creek to the top of the ridge. There are no system trails or FS recreation sites in the Craig Creek Valley, but SR 621 is a well-traveled road, along which multiple residences and a private camp occur. The VIA contains photographic simulations for multiple viewpoints along SR 621 in this Craig Creek Valley. There are several locations where travelers on this road may have short duration views toward the project area on Brush Mountain, primarily during leaf-off seasons. During the construction phase and for about 5 years during a restoration period for revegetation, the potential visibility would be greater. Where visible, the pipeline right-of-way extending up the mountainside would begin to dominate the landscape character and would not meet a Moderate SIO. After revegetation, the right-of-way may continue to be visible and noticeable to the casual observer, but would remain subordinate to the desired landscape character.

Photographic simulations contained in the VIA indicate that the top of Brush Mountain would be visible from the ANST at Kelly’s Knob. A viewer at Kelly’s Knob, from a distance of 3.75-4.0 miles and looking down at the corridor on Brush Mountain, would see details in the landscape, including individual tree canopies. The permanent pipeline easement crossing the top of Brush Mountain would be visible and noticeable, but once revegetated, the permanent right-of-way would not be expected to dominate the landscape character viewed from 4 miles at Kelly’s Knob.

Photographic simulations did not accurately include views from the managed vistas along the ANST on Sinking Creek Mountain that would have provided the visibility of the MVP on Brush Mountain. Views from the ANST on Sinking Creek Mountain would be even closer, but at an angle. The pipeline right-of-way would not meet a Moderate SIO due to the introduction of contrasts in color, texture, form and line. These contrasts would be more pronounced in the snow. The revegetation of the corridor would lessen the degree of these contrasts. The view from Sinking Creek Mountain would be on an angle so that trees and shrubs along the edge of the herbaceous portion of the right-of-way would substantially screen the view. The MVP would be noticeable to the casual observer, but would not dominate the landscape character viewed from the ANST on Sinking Creek Mountain. This would meet the Moderate SIO.

The top of Brush Mountain may also be visible from points on the ANST on Pearis and Sugar Run Mountains at distances of 18-23 miles. At this distance, the pipeline corridor crossing the ridgetop would likely not be noticeable except perhaps when covered in snow. This would be a very small feature in an expansive view from those locations and therefore would not begin to dominate the landscape character. The MVP would meet the Moderate SIO if visible from those ANST locations.

Rx 8A1 Scenic Class 5– Low SIO

In Low SIO areas, landscape character may appear to be moderately altered and may begin to dominate the characteristic landscape, but should borrow some elements of form, line, color, texture and/or scale found in the landscape character. The MVP would cross 0.25 mile of Rx 8A1 with Scenic Class 5 that has a Low SIO. This area is located on the south face of Sinking Creek Mountain at mid-slope. The only public travelway in the vicinity is SR 621; there are no system trails or FS developed recreation areas. Along SR 621, there are multiple residences and a private camp. The VIA contains photographic simulations for multiple viewpoints along SR 621 in this Craig Creek Valley. On SR 621 at the entrance to Camp Tuk-a-Way, the indicative photographic simulation suggests that there may be a view of the MVP during leaf-off. The aspect of the project to the viewer is on a right angle, so the trees along the near edge of the right-of-way would help screen these leaf-off views of the corridor. The project area is not expected to be visible during leaf-on. There may be low visual impact to travelers on SR 621 who may obtain a short duration view of the project in the winter months and to visitors to the camp during the winter season. If the area is noticeable to the casual observer, it would not begin to dominate the existing landscape character and would meet the Low SIO. Other potential viewing locations to this portion of Sinking Creek Mountain were not found. If there are areas of visibility, they would be of short duration as people travel SR 621. There would be more potential for visibility of the MVP during and after construction until the vegetation is restored in the permanent right-of-way, but no long-term visual impacts are expected.

Table 4.8.2-2 lists these KOPs and presents our assessment of the impacts.

TABLE 4.8.2-2

Key Observation Points Along the Route of the Mountain Valley Pipeline in the Jefferson National Forest and Assessments of Visual Impacts

Key Observation Points	County/State	MP	Distance	Impact Assessments based on Visual Simulations
Peters Mountain Wilderness	Monroe, WV	196.5	0.4 mile	None – pipeline right-of-way is not visible from the viewpoint in the simulation.
Appalachian National Scenic Trail at the crossing on Peters Mountain	Monroe, WV	196.3	Crosses	None – the ANST crossing would be bored and views screened by vegetation and topography because of the roughly 300-foot buffer between the trail and the bore pits which will screen views. If needed, shrubs and trees approved by the FS will be planted to assure High SIO is met.
Appalachian National Scenic Trail at Angels Rest	Giles County, VA	Intermittent from 196.3 to 220.8	6.0 miles	Low – The project would be viewed on an angle in the background and would be noticeable during and following construction. Revegetation of the permanent right-of-way will significantly reduce visual impacts so that the corridor would not be noticeable to the casual observer.
Appalachian National Scenic Trail on Pearis Mountain (other than Angels Rest)	Giles County, VA	218.5 and 220.8	21 miles	Low – The terrain of Pearis Mountain would block most or all of the view toward Peters Mountain (no locations found), but there are potential views toward Sinking Creek and Brush Mountains in the distance.
Appalachian National Scenic Trail on Sugar Run Mountain 2	Giles County, VA	Intermittent from 197.3 to 220.8	13-24 miles	Low – The range of potential project visibility would be from the south slope of Peters Mountain to the ridges of Sinking Creek Mountain and Brush Mountain.
Appalachian National Scenic Trail at Wind Rock	Giles County, VA	196.3 to 196.7	6.5 miles	Low - The project would be viewed on an angle in the background and would be noticeable during and following construction. Revegetation of the permanent right-of-way would significantly reduce visual impacts so that the corridor would not be noticeable to the casual observer.

TABLE 4.8.2-2 (continued)

Key Observation Points Along the Route of the Mountain Valley Pipeline in the Jefferson National Forest and Assessments of Visual Impacts

Key Observation Points	County/State	MP	Distance	Impact Assessments based on Visual Simulations
Appalachian National Scenic Trail at Kelly's Knob	Montgomery County, VA		2.0-2.5 miles	Moderate during and following construction, Low for the permanent right-of-way. The tops of Sinking Creek and Brush Mountains would be visible in the middleground. Impacts would be greatest during the construction period and would lessen over the span of 5 years as the corridor is revegetated.
Appalachian National Scenic Trail on Sinking Creek Mountain	Montgomery County, VA	220.1-220.8	3.0-3.4 miles	Low – There would be potential views toward the project on Brush Mountain, especially during the construction phase and during the vegetation restoration phase, and the impacts would be greater during leaf-off. Revegetation of the corridor is expected to decrease the impacts and meet SIO.
Craig Creek Road	Montgomery County, VA	219.4	Crosses	None – the road crossing would be bored and views of the right-of-way through the forest would be screened by a vegetation buffer along the road.
Craig Creek Road	Montgomery County, VA	218.5-220.8	0.2-2.5 miles	Low – There would be potential views toward the project on Sinking Creek and Brush Mountains, especially during the construction phase and during the vegetation restoration phase, and the impacts would be greater during leaf-off. Revegetation of the corridor is expected to decrease the impacts and meet SIO.
Pocahontas Road	Giles County, VA	198.4	0 mile	High during construction – The ANST is concurrent with the project at the bottom of Pocahontas Road. Widening of the road and installation of two active ATWS sites at the corner of Pocahontas Road and SR 641 will have a significant impact on the immediate foreground viewed by ANST users during construction. Restoration of this area after construction is expected to eliminate these impacts for the long-term operation of the MVP.

TABLE 4.8.2-2 (continued)

Key Observation Points Along the Route of the Mountain Valley Pipeline in the Jefferson National Forest and Assessments of Visual Impacts

Key Observation Points	County/State	MP	Distance	Impact Assessments based on Visual Simulations
US 219	Monroe County, WV	196.25-196.3	2.25-3.25 miles	Low – The project at the top of Peters Mountain would be visible in the middleground from several locations along US 219, especially during construction. These impacts are anticipated to be mitigated by revegetation of the permanent right-of-way following construction.
Brush Mountain Wilderness	Montgomery County, VA	220.4	0.3 mile	Low- view screened by thick forest between the proposed pipeline route and the Wilderness.

The initial route and length of conventional bore for the ANST crossing was deemed unacceptable by the FS and ATC, and issues were raised about crossing of a headwaters location on the south side of Peters Mountain and the multiple crossings of Craig Creek. In June 2016, Mountain Valley filed an alternative crossing of the ANST. Both the FS and ATC requested additional visual simulation modeling of the new crossing location. Therefore, in the Alternatives section (3.5.1) of the draft EIS we recommended that Mountain Valley continue coordination with the FS and other ANST stakeholders, and file the results of visual simulations for the new ANST crossing. Additionally, several comments were received during the comment period on the draft EIS regarding the visual analysis for FS land and specifically for the crossing of the ANST.

In meetings on October 19 and December 13, 2017, and in a letter filed on December 12, 2017, the FS provided additional requirements for the Visual Impact Assessment.

In response to our recommendation, FS comments, and other comments received Mountain Valley filed the Jefferson National Forest Visual Impact Assessment on February 17, 2017.[100] The Visual Impact Assessment included several new KOPs and additional visual simulations, including leaf-off simulations, which reduces the screening ability of vegetation. In the filing, MVP indicated it was continuing to coordinate with the FS and ATC on the evaluation of the updated visual simulations. On March 20, 2017, we filed a request for additional information from the Applicant, which included a request for additional visual simulations.[101] The FS also filed a comment regarding the February 2017 Visual Impact Assessment on April 3, 2017 in which they requested, among other items, new and additional photographs taken in better atmospheric and lighting conditions, additional information about the method MVP used to select photographs for simulations and the accuracy of the photographic simulation methods, as well as a request to discuss measures to reduce impacts on scenery, and they requested a meeting with Mountain

[100] Accession number 20170217-5199.

[101] Accession number 20170320-3003.

Valley to discuss their concerns with the visual analysis.[102] MVP met with the FS on April 11, and April 20, 2017, to present photographs taken in March 2017 during leaf-off, and to develop a plan for preparing the final VIA. MVP filed an updated VIA on May 1, 2017.[103] On May 3, 2017 the FS then filed specific guidance and requested that MVP file a supplement to the VIA. The FS and Mountain Valley conducted a page-turn meeting on May 9, 2017, to make final edits to the VIA, and Mountain Valley filed the Final VIA and the VIA Supplement on May 11, 2017.[104]

The latest VIA submitted by MVP includes measures to mitigate visual impacts including feathering the right-of-way to reduce contrast and make vegetative openings appear more natural, crossing roads or trails at a right angle where feasible to ensure the shortest duration of view, crossing the ANST using a conventional bore method, and siting the alignment to conform to natural lines in the landscape. The ANST bore crossing would allow for a 300-foot vegetative buffer on each side of the trail, which would reduce visual impacts from the clearing of trees. The VIA includes 47 visual simulations from 47 KOPs (see table 4.8.2-3). Of the 47 KOPs there are 36 KOPs for the ANST, 6 for Craig Creek Road, and 5 for Pocahontas Road. A visual impact rating of "none" was assigned to 37 simulations, a rating of "low" was assigned to 9 simulations, and a rating of "moderate" was assigned to 1 simulation. The visual simulations can be found in appendix S. Overall the visual impacts range from low to moderate.

TABLE 4.8.2-3

Visual Simulations Along the Route of the Mountain Valley Pipeline in the Jefferson National Forest and Assessments of Visual Impacts

KOP	Resource Name	Viewers	Scenic Class Rating	Distance (miles)	Project Visibility	Visual Impact
KOP-OID-92	Peters Mt. ANST Crossing 1	Recreational	1	<0.1	None	None
KOP-110	Peters Mt. ANST Crossing 1	Recreational	1	<0.1	None	None
KOP-OID-88	Peters Mt. ANST Crossing 2	Recreational	1	0.2	None	None
KOP-OID-93	Peters Mt. ANST Crossing 3	Recreational	1	<0.1	None	None
KOP-OID-95	Peters Mt. ANST Crossing 4	Recreational	1	<0.1	None	None
KOP-OID-97	Peters Mt. ANST Crossing 5	Recreational	1	<0.1	None	None
KOP-OID-99	Peters Mt. ANST Crossing 6	Recreational	1	<0.1	None	None
KOP-OID-111	Angels Rest	Recreational	2	6.0	Low	Low
KOP-634	Wilburton Valley Overlook	Recreational	2	6.0	Low	Low
KOP-632	Pearis Mountain	Recreational	1	7.4	None	None
KOP-210	Sugar Run Mountain 1	Recreational	2	12.2	None	None

[102] Accession number 20170403-5058.

[103] Accession number 20170501-5410.

[104] Accession number 20170511-5108.

TABLE 4.8.2-3 (continued)

Visual Simulations Along the Route of the Mountain Valley Pipeline in the Jefferson National Forest and Assessments of Visual Impacts

KOP	Resource Name	Viewers	Scenic Class Rating	Distance (miles)	Project Visibility	Visual Impact
KOP-211	Sugar Run Mountain 2	Recreational	2	11.0	None	None
KOP-416	Giles High School	Recreational	NA	2.5	Moderate	Moderate
KOP-408	Kelly Knob 1	Recreational	1	2.0	Low	Low
KOP-409	Kelly Knob 2	Recreational	1	2.0	Low	Low
KOP-411	Kelly Knob 3	Recreational	1	2.0	Low	Low
KOP-413	Sugar Camp Trailhead	Recreational	1	1.6	Low	Low
KOP PT-02	Peters Mountain Wilderness	Recreational	1	0.4	None	None
KOP-OID-103	Wind Rock	Recreational	2	6.5	None	None
KOP-213	Sawtooth Ridge	Recreational	NA	11.0	None	None
KOP-OID-85	Rice Field	Recreational	1	4.1	Low	None
KOP-403	Audie Murphy Monument	Recreational	1	8.0	None	None
KOP-404	Brush Mountain	Recreational	1	7.5	None	None
KOP-617	Dragon’s Tooth	Recreational	1	12.7	Low	Low
KOP-618	Dragon’s Tooth	Recreational	1	8.0	None	None
KOP-203	ATC Vista	Recreational	1	3.5	Low	Low
KOP-300	Sinking Creek Valley	Recreational	1	3.0	None	None
KOP-316	McAfee Knob 1	Recreational	1	14.0	None	None
KOP-317	McAfee Knob 2	Recreational	1	14.0	None	None
KOP-225	Sinking Creek Mountain 1	Recreational	1	15.0	None	None
KOP-224	Sinking Creek Mountain 2	Recreational	1	9.5	None	None
KOP-220	Sinking Creek Mountain 3	Recreational	1	9.5	None	None
KOP-511	ATC Vista	Recreational	1	2.5	None	None
KOP-523	McAfee Knob 3	Recreational	1	14.0	None	None
KOP-200	Peters Mt. Crossing 7	Recreational	1	<0.1	None	None
KOP-201	Peters Mt. Campsite	Recreational	1	0.2	None	None
KOP PT-21	Craig Creek Road	Residential	NA	0.1	None	None
KOP PT-22	Craig Creek Road	Residential	NA	0.1	None	None
KOP PT-23	Craig Creek Road	Residential	NA	0.5	None	None
KOP PT-25	Craig Creek Road	Residential	NA	0.1	Low	Low
KOP PT-26	Craig Creek Road	Residential	NA	<0.1	None	None
KOP PT-28	Craig Creek Road	Residential	NA	0.2	None	None
KOP-205	Pocahontas Road	Recreational	5	0.0	Low	None
KOP-206	Pocahontas Road	Recreational	5	0.0	Low	None

TABLE 4.8.2-3 (continued)

Visual Simulations Along the Route of the Mountain Valley Pipeline in the Jefferson National Forest and Assessments of Visual Impacts

KOP	Resource Name	Viewers	Scenic Class Rating	Distance (miles)	Project Visibility	Visual Impact
KOP-207	ANST	Recreational	5	<0.1	None	None
KOP-208	ANST	Recreational	5	<0.1	None	None
KOP-243	ANST	Recreational	NA	0.0	Low	None

4.8.3 Conclusions for Land Use, Special Interest Areas, and Visual Resources

The MVP pipeline route would mostly cross forest, followed by agricultural land, and open land. Forested land uses would be affected either long-term in temporary construction workspaces or permanently in the maintained, permanent right-of-way. Land that would be affected by EEP construction is mostly agricultural, followed by forest, and open land. Impacts on agricultural and open land uses generally would be limited to the season of construction, and both Mountain Valley and Equitrans have committed to processes to minimize effects on farms in general as well as specialty farms. Potential impacts on residences would either be avoided by the Applicants' purchases of the structures or minimized by utilization of site-specific residential construction plans.

Specially managed areas such as the BRP, ANST, and Weston and Gauley Bridge Turnpike Trail would be crossed by conventional bore, thereby precluding surface disruption and minimizing impacts. About 3.5 miles of the MVP pipeline route would cross the Jefferson National Forest, including the ANST and the Brush Mountain IRA. The route of the MVP pipeline through the Jefferson National Forest would cross five separate management prescriptions outlined in the LRMP. Impacts on National Forest resources would be minimized by Mountain Valley following the measures outlined the various resource-specific plans, in its POD, and Right-of-Way Grant that must be approved by BLM.

Visual resources would be affected through installation of aboveground facilities or by creation and maintenance of a new grassy corridor in a formerly forested area. Mitigation measures for revegetation and restoration identified above would be required to meet the SIO on NFS lands within 5 years of project construction. Given the measures proposed by the Applicants, our recommendations, and other requirements of agency-specific permitting (such as the FS), we conclude that overall impacts on land use, special interest areas, and visual resources would be adequately minimized

4.9 SOCIOECONOMICS

Construction and operation of both the MVP and the EEP may affect socioeconomic elements in the communities in proximity to the proposed facilities. These include alteration of populations, employment opportunities, increased demand for housing and public services, impacts on tourism and local businesses, transportation impacts, environmental justice, and revenues associated with sales and payroll taxes. The socioeconomic study area consists of the 20 counties in 3 states crossed by the projects.

4.9.1 Affected Environment

4.9.1.1 Population and Employment

The total population of the three affected states combined in 2015 was about 23 million people.

Mountain Valley Project

The 304-mile-long MVP pipeline would cross 11 counties in West Virginia and 6 counties in Virginia.

West Virginia

According to the U.S. Census Bureau, in 2016 West Virginia had a population of about 1.8 million people, with a population density of 77.1 people per square mile. The total population of the 11 counties where project facilities would be located is about 263,034 people. Population totals in the counties within the study area range from 8,413 people in Doddridge County to 68,400 people in Harrison County. Population densities range from 16.1 people per square mile in Webster County to 165.8 people per square mile in Harrison County. West Virginia experienced a population growth of 2.5 percent between 2000 and 2010 and a 1.2 percent decline between 2010 and 2016. Between 2010 and 2016, of the West Virginia counties where the Mountain Valley facilities would be located, Doddridge County had the most population growth at 2.6 percent, and the largest decrease was in Summers County with a population decline of 7.6 percent. Table 4.9.1-1 provides information on population levels and trends for all counties within the study area for the MVP.

TABLE 4.9.1-1

Existing Population Levels and Trends in the Project Areas for the Mountain Valley Project and the Equitrans Expansion Project

Project/Location	2016 Population Estimate a/	Population Density (persons/sq. mi.) 2010 b/	Change in Population (2000-2010) Percent b/	Change in Population (2010-2016) percent a/
Mountain Valley Project				
West Virginia	**1,831,102**	**77.1**	**2.5**	**-1.2**
Wetzel c/	15,640	45.3	-6.3	-5.7
Harrison	68,400	165.8	0.7	-1.0
Doddridge	8,413	26.1	10.8	2.6
Lewis	16,309	42.7	-3.2	-0.4
Braxton	14,471	28.4	-1.2	-0.3
Webster	8,646	16.1	-5.8	-5.5
Nicholas	25,311	40.1	-1.2	-3.5
Greenbrier	35,279	35	3	-0.6
Fayette	44,323	68.9	-3.2	-3.7
Summers	12,872	37.6	7.1	-7.6
Monroe	13,370	28.5	-7.4	-1.0
Virginia	**8,411,808**	**209.2**	**13.4**	**5.1**
Giles	16,857	47.6	3.8	-2.5
Craig	5,158	15.8	1.9	-0.3
Montgomery	98,602	248.6	12.9	4.4
Roanoke	94,031	373.3	7.7	1.7
Franklin	56,069	81.6	18.8	-0.1
Pittsylvania	61,687	64.4	2.9	-2.8
Equitrans Expansion Project				
Pennsylvania	**12,784,227**	**285.2**	**3.5**	**0.6**
Allegheny	1,225,365	1,683.6	-4.5	0.2
Washington	207,981	242.9	2.5	0.1
Greene	37,197	66.3	-5.1	-3.8

a/ U.S. Census Bureau 2016
b/ U.S. Census Bureau 2010
c/ Both the EEP and the MVP would be located in Wetzel County.

Virginia

According to the U.S. Census Bureau, in 2016 Virginia had a population of about 8.4 million people, with a population density of 209.2 people per square mile. The total population of the six counties that contain project facilities in Virginia is 332,404 people. Populations range from 5,158 people and a population density of 15.8 people per square mile in Craig County to 98,602 people in Montgomery County and a population density of 373 people per square mile in

Roanoke County. The Commonwealth of Virginia experienced population growth of 13.4 percent between 2000 and 2010 and 5.1 percent growth between 2010 and 2016. Franklin and Montgomery Counties experienced a relatively high rate of population growth between 2000 and 2010 with increases of 18.8 and 12.9 percent, respectively. Between 2010 and 2016, of the counties where MVP facilities would be located, the largest population increase was in Montgomery County with 4.4 percent, while Giles County declined 2.5 percent. Table 4.9.1-1 provides information on population levels and trends for all Virginia counties within the study area for the MVP.

Equitrans Expansion Project

The EEP facilities would be located in three counties in Pennsylvania (Greene, Allegheny, and Washington) and one county in West Virginia (Wetzel).

Pennsylvania

According to the U.S. Census Bureau, in 2015 Pennsylvania had a population of about 12.8 million people, with a population density of 285.2 people per square mile. Population totals in the counties within the study area range from 37,197 people in Greene County with a population density of 66.3 people per square mile to 1.2 million people with a population density of 1,683.6 people per square mile in Allegheny County. Pennsylvania experienced population growth of 3.5 percent between 2000 and 2010 and 0.6 percent growth between 2010 and 2016. Washington County experienced a population growth between 2000 and 2010 with an increase of 2.5 percent. Between 2010 and 2016, of the counties where EEP facilities would be located, the largest population increase was in Allegheny County with 0.2 percent, while Greene County declined 3.8 percent. Table 4.9.1-1 provides information on population levels and trends for all Pennsylvania counties and communities within the study area for the EEP.

West Virginia

According to the U.S. Census Bureau, in 2016 the population in Wetzel County, West Virginia was 15,640 people, with a population density of 45.3 people per square mile. Between 2010 and 2016, Wetzel County's population decreased by 5.7 percent.

4.9.1.2 Housing

Mountain Valley Project

West Virginia

Based on U.S. Census Bureau data, there were 1,913 units available for rent in the affected counties in West Virginia on average between 2011 and 2015. Rental vacancy rates in the study area range from 0.7 percent in Webster County to 9.1 percent in Doddridge County. In 2015, there were 5,202 hotel and motel rooms and an additional 2,704 recreational vehicle (RV) and campground spaces available in the project area in West Virginia. There are no hotels or motels in Doddridge or Monroe Counties, and only one hotel/motel in Webster County. Likewise, there is only one campground or RV park each in Harrison, Monroe, and Webster Counties. Little data are available concerning occupancy rates for the hotels/motels of the study area. In Lewis County, peak tourist season occurs between March and November, with daily occupancy rates averaging 56 percent for four hotels, and a peak occupancy rate of 71 percent between July and September. In Fayette County, peak tourist season is between May and August, when all accommodations are reported to be fully booked.[105] Table 4.9.1-2 presents information on housing accommodations for all counties where the MVP facilities would be located.

TABLE 4.9.1-2

Existing Housing Accommodations in the Project Areas for the Mountain Valley Project and the Equitrans Expansion Project

Project/ Location	Rental Vacancy Rate (percent) a/	Units Available for Rent b/	Units for Seasonal Recreation b/	Hotel/ Motel Facilities c/	Hotel/ Motel Rooms c/	RV and Campground Locations d/	RV and Campground Spaces d/
West Virginia	**7.6**	**17,074**	**44,581**	**800 f/**	**NA**	**194**	**NA**
Wetzel e/	8.6	131	422	4	188	0	0
Harrison	6.4	499	403	16	1,475	1	0
Doddridge	9.1	39	604	0	0	0	0
Lewis	6.1	126	439	5	441	4	160
Braxton	6.2	96	721	5	360	5	543
Webster	0.7	7	716	1	23	1	88
Nicholas	8.9	220	1,115	9	667	6	552
Greenbrier	8.5	380	1,591	13	1,326	13	303
Fayette	6.9	316	612	8	531	20	457
Summers	1	13	950	3	191	3	553
Monroe	7	86	742	0	0	1	48
West Virginia Subtotal	*6.3*	*1,913*	*8,315*	*64*	*5,202*	*54*	*2,704*
Virginia	**6.1**	**68,583**	**90,548**	**3,275 f/**	**NA**	**258**	**NA**
Giles	4.8	90	418	4	181	0	0
Craig	7	32	381	0	0	0	0
Montgomery	3.4	587	705	27	2,145	1	16
Roanoke	5.8	607	288	35	2,997	1	92
Franklin	8	474	3,555	2	124	3	190
Pittsylvania	3	196	752	17	1,101	3	23
Virginia Subtotal	*5.3*	*1,986*	*6,099*	*85*	*6,548*	*8*	*321*

[105] Data obtained from the Lewis County Chamber of Commerce and Fayette County Convention and Visitor Bureau. Local Chambers of Commerce and Visitor Bureaus for other affected West Virginia counties did not have data on hotel occupancy rates.

TABLE 4.9.1-2 (continued)

Existing Housing Accommodations in the Project Areas for the Mountain Valley Project and the Equitrans Expansion Project

Project/ Location	Rental Vacancy Rate (percent) a/	Units Available for Rent b/	Units for Seasonal Recreation b/	Hotel/ Motel Facilities c/	Hotel/ Motel Rooms c/	RV and Campground Locations d/	RV and Campground Spaces d/
Pennsylvania	**5.9**	**97,321**	**172,142**	**3,975 f**	**NA**	**536**	**NA**
Allegheny	4.5	8,880	1,877	159	18,273	0	0
Washington	5	1,069	847	32	2,651	1	38
Greene	5.5	227	466	7	380	1	37
Pennsylvania Subtotal	*5*	*10,176*	*3,190*	*198*	*21,304*	*2*	*75*

a/ US Census Bureau, 2016b
b/ US Census Bureau, 2016c
c/ STR, 2015
d/ RV Parking, 2015
e/ Both the EEP and the MVP would be located in Wetzel County.
f/ HotelMotels, 2016

Virginia

Based on U.S. Census Bureau data, between 2011 and 2015 there were an average of about 1,986 rental units and over 6,000 seasonal units available in the project area in Virginia. Rental vacancy rates range from 3.4 percent in Montgomery County to 8.0 percent in Franklin County. In 2015, there were 6,548 hotel/motel rooms in the affected counties and an additional 321 campground and RV park spaces. Roanoke County has the highest number of hotel/motel rooms with almost 3,000 rooms, while Craig County has no hotels, motels, campgrounds, or RV parks. Little information is available about occupancy rates for the hotels/motels of the study area. In Montgomery County, peak tourist season is between June and August, when approximately 1,700 rooms are sold.[106] Table 4.9.1-2 provides information on housing accommodations within the MVP study area.

Equitrans Expansion Project

Pennsylvania

According to the U.S. Census Bureau, between 2011 and 2015 there were a combined total of 10,176 units available for rent (8,880 units in Allegheny County, 1,069 units in Washington County, and 227 units in Greene County) in the three affected counties in Pennsylvania. Vacancy rates were 5.5 percent in Greene County, 4.5 percent in Allegheny County, and 5.0 percent in Washington County (U.S Census Bureau, 2016b). There are 21,304 hotel/motel rooms and an

[106] The Montgomery County Chamber of Commerce was the source of these data. No other Chambers of Commerce or Economic Development Offices in the affected counties in Virginia provided or had data on hotel occupancy rates.

additional 75 campground and RV park spaces in the affected counties in Pennsylvania. Allegheny County has the highest number of hotel/motel rooms in the project area with over 18,000. Data on occupancy rates for the hotels/motels of the study area are limited. The average annual hotel occupancy rate in Washington County is about 75 percent.[107] Table 4.9.1-2 provides information on housing accommodations for all Pennsylvania counties within the study area for the EEP.

West Virginia

According to the U.S. Census Bureau, between 2011 and 2015 there were a total of 131 units available for rent in Wetzel County, West Virginia. The rental vacancy rate in Wetzel County is 8.6 percent. In 2015, there were 188 hotel and motel rooms in Wetzel County. The occupancy rates for the hotels/motels of the county is unknown.

4.9.1.3 Public Services

A wide range of public services and facilities are available in the counties affected by the MVP and the EEP, including law enforcement agencies, fire departments, medical facilities, and schools, as described by project and state below. Table 4.9.1-3 summarizes the medical, police, and fire protection facilities in the counties within the study area.

Mountain Valley Project

West Virginia

In West Virginia, the number of police departments in each affected county ranges from one department in Monroe County to nine departments in Fayette and Harrison Counties. The number of fire departments in the counties within the study area in West Virginia range from 3 in Doddridge County to 15 in Harrison and Greenbrier Counties. There are a total of 119 schools within the affected counties in West Virginia, with a combined total enrollment of 40,735 students. There are eight medical facilities in the project area with a total of 674 beds (American Hospital Directory, 2015). There are no hospitals within Doddridge, Fayette, or Monroe Counties; however, there are hospitals within commuting distance in neighboring counties.

All of the counties within the study area in West Virginia have been designated by the U.S. Department of Health and Human Services as containing Health Professional Shortage Areas (HPSA) or Medically Underserved Areas/Populations (MUA/P), or have been designated at the county level as a whole (HRSA.gov, 2015). HPSA or MUA/P designation indicates a shortage of health care professionals and facilities (primary care, dental, and mental health) at either the county level as a whole or for particular census tracts within the county that contain low-income populations who are underserved by primary medical care.

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[107] The source for this information was the Washington County Chamber of Commerce. Data on hotel occupancy rates could not be obtained for other affected counties in Pennsylvania.

TABLE 4.9.1-3

Public Services in the Counties Affected by the Mountain Valley Project and the Equitrans Expansion Project

Project/State/ County	Number of Fire Departments a/	Number of Hospitals / Hospital Beds b/	Number of Police & Sheriff Departments c/	Number of Public Schools d/
West Virginia	**412 f/**	**35 / 6,163**	**239**	**57**
Wetzel e/	10	1 / 48	5	9
Harrison	15	1 / 264	9	26
Doddridge	3	0 / 0	2	4
Lewis	6	1 / 70	2	6
Braxton	5	1 / 25	4	8
Webster	5	1 / 25	3	6
Nicholas	7	1 / 101	3	17
Greenbrier	15	1 / 116	6	13
Fayette	13	0 / 0	9	20
Summers	7	1 / 25	3	5
Monroe	4	0 / 0	1	5
Virginia	**548 f/**	**95 / 19,074**	**345**	**161**
Giles	10	1 / 25	6	6
Craig	2	0 / 0	1	2
Montgomery	5	2 / 234	5	21
Roanoke	4	4 / 1,373	3	27
Franklin	8	1 / 37	2	16
Pittsylvania	11	1 / 250	4	20
Pennsylvania	**1,796 f/**	**179 / 36,443**	**1,207**	**612**
Allegheny	196	37 / 8,939	70	303
Washington	45	5 / 461	14	56
Greene	13	1 / 58	5	14

a/ Fire Departments, 2016
b/ American Hospital Directory, 2015
c/ Capitol Impact, 2015
d/ National Education Association Research, 2014
e/ Both the EEP and the MVP would be located in Wetzel County
f/ USFA, 2016

Virginia

In Virginia, the number of police departments in the affected counties ranges from one in Craig County to six in Giles County. The number of fire departments ranges from 2 in Craig County to 11 in Pittsylvania County. There are nine medical facilities available in the project area with a total of 1,919 beds (American Hospital Directory, 2015). There are no hospitals in Craig County, but the LewisGale Hospital-Montgomery is within 10 miles from the work area in Craig County. In the affected counties in Virginia, there are 92 schools, with a total enrollment of 34,773 students combined.

Of the counties affected by the project in Virginia, all have been designated by the U.S. Department of Health and Human Services as containing HPSAs, and five have been designated as containing MUA/P (HRSA.gov, 2015).

Equitrans Expansion Project

Pennsylvania

There are 70 police departments in Allegheny County and 5 in Greene County. There are 196 fire departments and fire stations in Allegheny County and 13 in Greene County. There are 43 medical facilities available in the project area with a total of 9,458 beds (American Hospital Directory, 2015). There are 373 schools in the counties in Pennsylvania crossed by the proposed EEP, with a total enrollment of 183,707 students combined.

All of the counties within the study area in Pennsylvania have been designated as containing HPSA and MUA/P, or have been designated at the county level as a whole (HRSA.gov, 2015).

West Virginia

In Wetzel County, West Virginia, there are 5 police departments and 10 fire departments. There is one hospital with 48 beds. There are a total of nine schools in Wetzel County, with 2,757 students enrolled (see table 4.9.1-3).

4.9.1.4 Tourism

Tourist and recreational attractions in the project area are list in table 4.9.1-4.

TABLE 4.9.1-4

Major Tourist Attractions and Recreation Areas in the Vicinity of the Mountain Valley Project and the Equitrans Expansion Project

Attraction	County a/	Approximate Distance from the Projects
West Virginia		
Lantz Farm and Nature Preserve	Wetzel County	5.0 miles
Lewis Wetzel WMA	Wetzel County	6.0 miles
Hoyt Forest	Wetzel County	5.0 miles
North Bend Rail Trail	Harrison County	Crossed by the pipeline
Smoke Camp WMA	Lewis County	0.6 mile
Stonewall Jackson Lake WMA	Lewis County	2.1 miles
Stonewall Resort (at Stonewall Jackson Lake State Park)	Lewis County	4.3 miles
Jackson's Mill	Lewis County	6.2 miles
Staunton-Parkersburg Turnpike (Scenic Byway)	Lewis County	Crossed by the pipeline
Burnsville Lake and Burnsville Lake WMA	Braxton County	Crossed by the pipeline
Weston and Gauley Bridge Turnpike Trail	Braxton County	Crossed by the pipeline
Elk River WMA	Braxton County	0.2 mile
Bee Run Recreation Area	Braxton County	10.7 miles
Bulltown Recreation Area	Braxton County	1.5 miles
Big Ditch WMA	Webster County	676 feet
Bakers Island Recreation Area	Webster County	7.6 miles
Salt Sulphur Well and Veterans Memorial	Webster County	7.3 miles
Holly River State Park	Webster County	5.0 miles
Cranberry WMA	Webster, Nicholas, and Greenbrier Counties	1.9 miles
Summersville Lake	Nicholas County	1.1 miles
Cranberry Tri-Rivers Rail Trail	Nicholas County	2.0 miles
Gauley River	Nicholas County	Crossed by the pipeline
Gauley River National Recreation Area	Nicholas County	16.0 miles
Carbufax Ferry Battlefield State Park	Nicholas County	12.0 miles
Meadow River WMA	Greenbrier County	0.9 mile
Blue Bend Recreation Area	Greenbrier County	25.4 miles
Greenbrier River Trail	Greenbrier County	24.6 miles
Greenbrier State Forest	Greenbrier County	21.0 miles
Lewisburg and Ronceverte Trail	Greenbrier County	15.5 miles
Midland Trail - National Coal Heritage Trail (Scenic Byway)	Greenbrier County	Crossed by the pipeline
Babcock State Park	Fayette County	9.9 miles
Hawks Nest State Park	Fayette County	26.0 miles
New River Gorge National River	Summers County	5.3 miles
Pipestem Resort State Park	Summers County	14.0 miles

TABLE 4.9.1-4 (continued)

Major Tourist Attractions and Recreation Areas in the Vicinity of the Mountain Valley Project and the Equitrans Expansion Project

Attraction	County a/	Approximate Distance from the Projects
Bluestone State Park	Summers County	12.0 miles
Bluestone National Scenic River	Summers County	12.0 miles
Bluestone WMA	Summers County	4.7 miles
National Coal Heritage Area	Fayette and Summers Counties	Crossed by the pipeline
George Washington National Forest	Greenbrier County	21.0 miles
Little Beaver State Park	Raleigh County	18.1 miles
Potts Valley Rail Trail	Monroe County	13.3 miles
Moncove Lake State Park	Monroe County	18.6 miles
Slaty Mountain Preserve	Monroe County	23.2 miles
Jefferson National Forest	Monroe County	Crossed by the pipeline
Appalachian National Scenic Trail	Monroe County	Crossed by the pipeline
Virginia		
Niday Place State Forest	Craig County	4.1 miles
Appalachian National Scenic Trail	Giles County	Crossed by the pipeline
Jefferson National Forest	Giles County	Crossed by the pipeline
Peters Mountain Wilderness	Giles County	135 feet
Cascade Falls and Recreation Area	Giles County	2.6 miles
Cascades National Recreation Trail	Giles County	1.1 miles
Mountain Lake Park and Resort	Giles County	2.4 miles
Mountain Lake Wilderness	Giles County	2.5 miles
Whitt-Riverbend Park	Giles County	1.9 miles
Greater Newport Rural Historic District	Giles County	Crossed by the pipeline
Newport Historic District	Giles County	0.1 mile away
Dismal Falls	Giles County	18.5 miles
Claytor Lake State Park	Pulaski County	20.0 miles
New River Gorge National Recreation Trail	Fayette and Summers Counties	15.0 miles
Roanoke River	Montgomery County	Crossed by the pipeline
Elliston Park	Montgomery County	0.6 mile
Shenandoah Bike Trail and Park	Montgomery County	2.4 miles
Bottom Creek Gorge	Montgomery County	2.2 miles
North Fork Valley Rural Historic District	Montgomery County	Crossed by the pipeline
Brush Mountain Wilderness	Montgomery County	1,035 feet
Cahas Mountain Rural Historic District	Roanoke County	1.5 miles
Cahas Overlook	Roanoke County	4.7 miles
Camp Roanoke	Roanoke County	1.4 miles
Poor Mountain Overlook	Roanoke County	0.5 mile
Blue Ridge Parkway	Roanoke and Franklin Counties	Crossed by the pipeline
Slings Gap Overlook	Franklin County	2.6 miles

TABLE 4.9.1-4 (continued)

Major Tourist Attractions and Recreation Areas in the Vicinity of the Mountain Valley Project and the Equitrans Expansion Project

Attraction	County a/	Approximate Distance from the Projects
Pigg River (State Scenic River)	Franklin County	Crossed by the pipeline
Smith Mountain Lake	Franklin County	1.9 miles
Philpot Lake	Franklin County	23.6 miles
Waid Recreation Area	Franklin County	5.7 miles
White Oak Mountain WMA	Pittsylvania County	1.7 miles
Pennsylvania		
Beachwood Farms Nature Preserve	Allegheny County	20.0 miles
Riverview Golf Course	Allegheny County	Crosses
Monongahela River	Allegheny and Washington Counties	Crossed by H-318
Mountour Trail	Washington County	6.1 miles
Panhandle Trail	Washington County	13.5 miles
Canonburg Lake	Washington County	9.0 miles

a/ Several attractions are located in multiple counties and/or states. Only the counties within the project area are listed on this table.

Mountain Valley Project

Tourism opportunities include federal, state, and local special interest areas discussed in section 4.8, as well as businesses that are dependent upon attracting year-round or seasonal tourists. Tourist attractions and general recreational areas are situated throughout the project area. Travel-related spending supports local economies, and many people are employed by activities related to tourism.

West Virginia

In 2012, travel-related spending totaled more than $5.1 billion in West Virginia. That year the tourism industry in the state employed about 46,400 people (Dean Runyan Associates, 2013). In the affected counties of the state, travel-related spending totaled $624.1 million dollars, and created over 6,680 jobs (approximately 6 percent of the total workforce in those counties combined; see table 4.9.1-5). Tourism is the largest economic industry in Greenbrier County, employing almost 11 percent of the workforce.

While tourism occurs year-round in West Virginia, the peak tourism season is May through October (Smatertravel.com, 2015). As such, construction of the MVP would overlap with the peak tourism season and could impact public access to tourist attractions and accommodations, and potentially result in economic impacts on local businesses.

TABLE 4.9.1-5

Travel-Related Economic Contributions to the West Virginia Counties Crossed by the Mountain Valley Project a/

County	Travel Spending ($ million)	Travel-Related Earnings ($ million)	Travel-Related Employment	Percent of Total Employment
West Virginia	**5,103.00**	**1,075.00**	**46,421**	**5.0**
Wetzel	27.5	4.7	267	4.1
Harrison	142.4	37.2	1,531	3.4
Doddridge	6.7	1.2	50	1.6
Lewis	47.3	12.1	539	5.5
Braxton	40.2	7.8	328	6
Webster	10.4	1.1	73	2.4
Nicholas	66.5	10.2	587	5.4
Greenbrier	243.7	83.2	2,064	10.8
Fayette	8.4	15.5	792	4.8
Summers	20.6	4.6	295	7.6
Monroe	10.4	2.3	158	3.7
Project area total	**624.1**	**179.9**	**6,684**	**6.0**

a/ Source: Dean Runyan Associates, 2013

Virginia

In 2014, domestic travelers to Virginia spent a total of about $22.4 billion, on transportation, lodging, food, amusement, and recreation. That year, domestic travel in Virginia supported a total of about 216,900 full-time and part-time jobs (U.S. Travel Association, 2015). Travel-related employment represented about 5.3 percent of the total workforce in Virginia in 2013 (U.S. Bureau of Labor Statistics, 2014). In the counties where MVP facilities would be located in Virginia, travel-related expenditures in 2014 totaled about $503.4 million and supported a total of about 5,130 jobs (see table 4.9.1-6). Tourism is the largest economic industry in Franklin County, employing almost 5 percent of the total labor force.

While tourism occurs year-round in Virginia, the peak tourism season is May through October (Smatertravel.com, 2015). As such, construction of the MVP would overlap with the peak tourism season and could impact public access to tourist attractions and accommodations, and potentially result in economic impacts on local businesses.

TABLE 4.9.1-6

Travel-related Economic Contributions to the Virginia Counties Crossed by the Mountain Valley Project a/

Geographic Area Counties	Travel-Related Spending ($ million)	Travel-Related Earnings ($ million)	Travel-Related Employment (number of people)	Percent of Total Employment b/
Virginia	**22,400**	**5,803**	**216,900**	**5.3**
Giles	25.9	4.5	240	3.0
Craig	4.1	0.8	50	1.9
Montgomery	136.3	25.4	1,330	2.9
Roanoke	164.7	30.6	1,640	3.2
Franklin	102.4	22.2	1,240	4.5
Pittsylvania	70.0	12.8	630	2.1
Project area total	**503.4**	**96.3**	**5,130**	**2.9**

a/ Source: U.S. Travel Association, 2015

b/ Percent of total employment was estimated by comparing the travel-related employment estimate presented here with the number of people employed in each county in 2013 (U.S. Bureau of Labor Statistics, 2014).

Equitrans Expansion Project

Pennsylvania

Pennsylvania hosted an estimated 190.4 million domestic travelers in 2014. That year, total traveler spending in the Commonwealth was about $39.7 billion, supporting about 482,524 jobs (see table 4.9-1-7). In Allegheny County, the tourist industry employed about 40,000 people (6 percent of the total workforce) and generated $5.6 billion in visitor spending. In Washington County, the tourist industry employed almost 6,000 people (6 percent of the workforce) and generated $760 million in visitor spending. In Greene County, the tourism industry employed almost 500 people (2.7 percent of the workforce) and generated about $95 million in visitor spending (Tourism Economics, 2015).

While tourism occurs year-round in Pennsylvania, the peak tourism season is June through early November (Smatertravel.com, 2015). As such, construction of the EEP would overlap with the peak tourism season and could impact public access to tourist attractions and accommodations, and potentially result in economic impacts on local businesses.

TABLE 4.9.1-7 **Travel-related Economic Contributions to the Pennsylvania Counties that Contain Equitrans Expansion Project Facilities a/**				
Geographic Area Counties	**Travel-Related Spending ($ millions)**	**Travel-Related Earnings ($ millions)**	**Travel-Related Employment (number of people)**	**Percent of Total Employment b/**
Pennsylvania	39,700	19,500	482,524	7.5
Allegheny	5,600	1,400	40,254	6.2
Washington	760.3	171.7	5,953	5.6
Greene	94.7	11.3	488	2.7
Project area total	**6,500**	**1,600**	**46,695**	**6.0**

a/ Source: Tourism Economics, 2015
b/ Percent of total employment was estimated by comparing the travel-related employment estimate presented here with the number of people employed in each county in 2013 (U.S. Bureau of Labor Statistics, 2014).

West Virginia

In Wetzel County, West Virginia, about $27.5 million was spent on travel-related activities in 2012, generating about 260 jobs (about 4 percent of the total workforce in the county) (see table 4.9.1-4).

Tourism occurs year-round in West Virginia with the peak tourism season occurring from May through October (Smatertravel.com, 2015). No tourist attractions would be crossed or within 0.25 mile of the EEP in West Virginia.

4.9.1.5 Transportation and Traffic

Mountain Valley Project

A complete list of road and railroad crossings associated with the MVP, including proposed crossing methods, is provided in appendix Q. The MVP pipeline route would cross 263 roadways and 12 railroads. Mountain Valley proposes to use 393 roads to access the construction right-of-way (see appendix E), including 355 existing roads and 37 new access roads. Additionally, there is one temporary access road that Mountain Valley has identified, but has been unable to survey or determine its current status (see section 4.8.1.2). Of the 353 existing access roads, almost all would need improvements such as widening, grading, and stabilization. During operation of the MVP, Mountain Valley would continue to use 131 of the existing access roads for permanent access to its facilities. Of the 37 new access roads, 27 would be permanent access roads, and 1 road that is partially existing and partially new. A total of 232 access roads would be temporary and would be returned to pre-construction conditions once construction is completed.

Appendix T lists current traffic counts for existing roads that would be used by Mountain Valley to access the project area during construction activities. The appendix includes traffic counts for public access roads as well as roadways and highways that workers would likely use to reach those access roads. The peak traffic times on these roads are usually between 4:00pm and 5:00pm. The heaviest current peak average daily traffic can be found on the following federal and state highways that would also be used for project access:

- I-70 – 4,794 vehicles;
- I-79 – 5,076 vehicles;
- I-64 – 1,184 vehicles;
- I-81 – 5,280 vehicles;
- U.S. 50 – 4,456 vehicles;
- U.S. 33 – 1,311 vehicles;
- U.S. 19 – 1,616 vehicles;
- U.S. 29 – 1,430 vehicles;
- U.S. 220 – 2,640 vehicles;
- U.S. 11/460 – 3,235 vehicles; and
- WV-2 – 1,514 vehicles.

Traffic counts for average daily traffic on other state highways that would be used for access for the MVP are much lower, with peak daily averages ranging between 858 vehicles (WV-107) and 1 vehicle (various roads).

West Virginia

The MVP pipeline route would cross 5 railroads and 751 roadways in West Virginia, including 157 public roads and 594 private roads. During construction, Mountain Valley would use 297 existing public roads for access to the project area in West Virginia (see appendix Q). The heaviest existing traffic in West Virginia can be found on I-70, I-79, U.S. 50, U.S. 33, and U.S. 19. Peak average daily traffic on other state roads in West Virginia can range from 1,514 vehicles on WV-2 to 1 vehicle on 34 other state roads.

Virginia

The MVP pipeline route would cross 6 railroads and 323 roadways, including 105 public roads and 217 private roads in Virginia. During construction, Mountain Valley would use 149 existing public roads for access to the right-of-way in Virginia (see appendix Q). The most used public highway assigned for project access in Virginia would be on I-81, with a traffic count of 5,280 vehicles per day. On other state roads, peak average daily traffic would vary from 550 vehicles on VA-40 to 1 vehicle on VA-775.

Equitrans Expansion Project

Equitrans is proposing to use 28 access roads during construction for access to the right-of-way during construction of the EEP, including 17 existing roads and 11 new roads (see appendix E). Of the 17 existing access roads, 14 would need improvements such as widening and stabilization. During operation of the EEP, Equitrans would continue to use six of the existing access roads for permanent access to its facilities. Equitrans would not need any new permanent access roads. The remaining 22 access roads would be temporary and would be restored to pre-construction conditions.

Appendix T lists current traffic counts for existing roads that would be used by Equitrans to access the project area during construction activities. The appendix includes traffic counts for public access roads as well as roadways and highways that workers would likely use to reach those access roads. Peak daily traffic was not available for most roads; however, the peak traffic times on most roads are usually between 4:00 pm and 5:00 pm. The heaviest current annual average daily traffic (AADT) can be found on the following federal and state highways that would also be used for project access:

- North Fork Road – 1,000 vehicles per day;
- I-79 – 12,292 vehicles per day;
- E. Roy Furman Highway – 8,366 vehicles per day;
- Jefferson Road – 7,200 vehicles per day;
- PA 43 Turnpike – 8,806 vehicles per day;
- PA 837 – 3,927 vehicles per day; and
- Finleyville-Elrama Road – 1,300 vehicles per day.

Traffic counts for AADT on other state and county highways that would be used for access for the EEP are much lower, with averages ranging between 850 vehicles (Bunola River Road) and 10 vehicles (Mobley Run).

Pennsylvania

The EEP would cross 32 roads and railroads in Pennsylvania (see appendix Q). Equitrans would use 21 existing public roads in Pennsylvania for access to the right-of-way during construction. Current traffic on those roads ranges from 12,292 vehicles per day on I-79 to 150 vehicles per day on Church Hollow Road.

West Virginia

The EEP would cross two roads in Wetzel County, West Virginia. Equitrans would use two existing roads for access to the right-of-way during construction. Current traffic on those roads are 1,000 vehicles per day on North Fork Road and 10 vehicles per day on Mobley Run.

4.9.1.6 Property Values, Mortgages, and Insurance

Mountain Valley Project

We received comments during scoping and the draft EIS comment period regarding the potential effect of the MVP on property values, mortgages, and home insurance.[108] Specific issues mentioned include devaluation of property if encumbered by a pipeline easement; being the responsible party for property taxes within a pipeline easement; paying increased landowner insurance premiums for project-related effects; the inability to obtain home insurance or charges

[108] See for examples letters filed by Patricia Tracy on April 6, 2015 (accession number 2015406-007); by Margaret Roston on May 5, 2015 (accession number 2015505-5053); by Patricia Laurell on June 3, 2015 (accession number 2015604-0046); by Lois and Roy Quesenberry on July 13, 2015 (accession number 20150713-5194); by Charles Chong on August 3, 2015 (accession number 20150803-0052), and by Patricia Tracy on September 21, 2016 (accession number 20160921-5132).

of higher premiums if the property is encumbered by a pipeline easement; and negative economic effects resulting from changes in land use (e.g., loss of timber production within the permanent right-of-way).

A report by KeyLog claimed that within an eight-county study area (in Greenbrier, Monroe, and Summers Counties, West Virginia, and Craig, Franklin, Giles, Montgomery, and Roanoke Counties Virginia) there are 716 parcels within the MVP pipeline right-of-way with a current total value of $125.9 million (Phillips et al., May 2016). Unfortunately, KeyLog did not cite the source of that data.

Patricia Tracy stated that she is a retired real estate agent who sold properties in Montgomery County, Virginia between 2003 and 2013.[109] In her opinion, the MVP would cause properties in the Preston Forest, Brush Mountain Estates, and Coal Bank Ridge neighborhoods to suffer depreciation in real estate values. Unfortunately, Ms. Tracy did not present any evidence or real estate sales data to support her opinion.

Patricia Laurrell, a certified residential real estate appraiser residing in Blacksburg, Virginia, stated that in her 25 years of experience as a realtor, properties around powerlines and pipelines tended to drop in value.[110] Again, the opinion of Ms. Laurrell was not supported with any documented evidence or real estate sales data.

An opinion survey taken of real estate agents in Wisconsin found that 68 percent of the respondents questioned believed that the presence of a pipeline on a parcel would decrease its value between 5 and 10 percent. About 70 percent of the realtors queried in that survey believed it would take longer to sell a property with a pipeline on it, than a parcel without a pipeline. Another public opinion poll in Wisconsin found that 58.9 percent of prospective property buyers would not purchase land with a pipeline on it; while 18.7 percent would only buy land encumbered by a pipeline at a reduced price (Kielisch, 2015). A third public opinion survey of property owners in a subdivision near Las Vegas, Nevada crossed by the Kern River Pipeline (Wilde et al., 2013) found that 43 percent of the respondents were willing to purchase land close to a natural gas pipeline (15 percent at no discount and 28 percent at substantial discount). In these polls, the data were strictly personal opinions, and any perceived reduction of property values from the presence of a natural gas pipeline was not based on any actual real estate sales data.

Lois and Roy Quesenberry listed several studies they believe support their opinion that the project would lower property values.[111] The Quesenberrys referenced a series of articles authored by Joel Dyer that appeared in *Boulder Weekly* on December 12 and 19, 2013, which discussed the impact of fracking on real estate values. Dyer, in turn, summarized a study written by Throupe et al. (2013) in the *Journal of Real Estate Literatur*e. The Throupe et al. study presented the results of telephone interviews that asked respondents if they would bid on property near oil or gas wells where fracking techniques were being used. Based on this telephone survey, Throupe et al.

109 See letter to the FERC dated March 29, 2015 (accession number 20150406-0070).

110 See letter to the FERC dated June 3, 2005 (accession number 20150604-0046).

111 See letter to the FERC dated July 13, 2015 (accession number 20150713-5194).

estimated that there would be a discount of an average of 34 percent for a property near a fracked well.

There are many problems with using this study to inform our analysis of MVP. First, it was a survey and not a study, as research parameters were not defined and there was no control group or other statistically vetted protocols necessary for a proper study (which typically include a defined percent margin of error). More importantly, the survey addressed fracking, which is a method of natural gas production. The MVP is for natural gas transmission. There are vastly different impacts associated with unconventional natural gas production and the impacts associated with the operation of a natural gas pipeline.

Another study cited by the Quesenberrys was conducted by Conversations for Responsible Economic Development (CRED, 2013). CRED is a non-profit research NGO advocating for energy development in British Columbia, Canada. The CRED paper summarized eight different oil spill events in North America where other studies indicated that property values were affected. CRED conducted no original research. Also, impacts from oil spills are very different from a natural gas leak. An oil spill would tend to pool on the ground or collect in liquid form at or below the ground surface, potentially introducing contaminants into soils and groundwater. On the other hand, natural gas, which is lighter than air, would dissipate into the atmosphere if leaked from a pipeline and does not pose a contamination threat.

The FERC staff conducted its own independent research and found multiple studies that examined the effects of pipeline easements on property values based on actual real estate sales. One set of studies examined the affect a pipeline accident had on nearby property values. A 2001 study analyzed the impact that a June 1999 Bellingham, Washington gasoline pipeline explosion had on sales of real estate on or near the pipeline after the accident. That study found that neither the market value of properties nor the length of time necessary for a sale were negatively affected by the presence of a pipeline. One property near the site of the explosion sold for a higher price afterwards (Whatcom County, 2001). Another study of the same incident found that prior to the Bellingham explosion there was no significant effect on house prices due to proximity to the pipeline. Immediately after the accident, houses adjacent to the pipeline sold for about $13,000 less than houses further away. However, over time the discount was reduced to pre-incident levels (Hansen et al., 2006). A study of a 1993 natural gas pipeline rupture in Fairfax County, Virginia found a 5.5 percent reduction in price for the sales of homes adjacent to the pipeline (Simons, 1999).

A 1994 paper compared data from nine towns in Connecticut traversed by natural gas pipelines operated by Algonquin and Tennessee Gas Pipeline companies since the 1960s, with a Southwestern pipeline through a planned community near a major city. The Connecticut study assessed 1,171 home sales between 1986 and 1991. The Southwestern study looked at 2,212 home sales between 1988 and 1991. The results of the studies for both Connecticut and the Southwestern pipeline were essentially the same. No systematic pattern of measureable or significant negative impacts on home sale prices were observed for residences close to a natural gas pipeline (Kinnard et al., 1994).

In 2001, the Interstate Natural Gas Association of America (INGAA) sponsored a national study to determine if the presence of a pipeline affected property values or sales prices. The study employed paired sales, descriptive statistics, and linear regression analysis to assess impacts on four separate, geographically diverse case study areas. The study found that having a pipeline on the property did not significantly alter sales prices. The size of the pipeline (diameter) had no significant impact on home prices. The study concluded that the presence of a pipeline did not impede the development of surrounding properties (Allen, Williford & Seale, Inc., 2001).

Portland State University evaluated the impact of the South Mist Pipeline Extension (SMPE) in Clackamas and Washington Counties, Oregon on residential sales between 2004 and 2008 using a hedonic price modeling approach. Based on sales price data for 10,642 single-family residential properties located within 1 mile of the pipeline, the study found that proximity to the pipeline had no statistically or economically significant impact on residential property values (Fruits, 2008).

A 2008 market study conducted by PGP Valuation on behalf of Palomar Gas Transmission, LLC also assessed the impacts of the SMPE on property values. Using a sales comparison methodology, the study evaluated sales data for a total of 18 properties encumbered by SMPE right-of-way easements and compared these with sales of other comparable unencumbered properties. Based on this analysis, PGP Valuation concluded that natural gas pipelines had no measurable long-term impact on property values. The study also concluded that variations in short-term values were either not substantial or non-existent, and that residential properties were not affected by the pipeline easement any more or less than other property types (PGP, 2008).

A 2011 study analyzed sales data from approximately 1,000 residential properties in Arizona to test whether proximity to a natural gas pipeline had an effect on real estate sales prices. The study compared sales prices for properties encumbered by or adjacent to a natural gas transmission pipeline with comparable properties not along a pipeline right-of-way. The study was unable to identify a systematic relationship between proximity to a pipeline and sales price or property values (Diskin et al., 2011).

Wilde et al. (2013) published a study of the effects the Kern River Pipeline had on property values within the subdivision of Summerlin near Las Vegas, Nevada, based on home sales and data reviewed at the Clark County Assessor's office. Looking at sales between 1991 and 1996 of representative three bedroom single-family houses, with fireplace and garage, the study found that properties closest to the pipeline sold on average for higher prices that properties further away. Even after the 2010 non-jurisdictional Pacific Gas and Electric Company San Bruno, California incident, this pattern did not change for houses sold in 2011-2012.

In 2016, INGAA released another study, conducted by Interga Reality Resources (IRR), of selected FERC-jurisdictional natural gas transmission pipelines throughout the county and their impact on property values (IRR, 2016). Case studies were analyzed from Ohio, Virginia, New Jersey, Pennsylvania, and Mississippi. The investigation focused on single-family homes and townhomes, and looked at sale prices over a number of years. In all the case studies, sale prices were adjusted for square footage, a linear regression was run, and then a paired sales analysis was evaluated comparing prices of houses next to a pipeline with houses further away.

Victory Lakes is a 580-acre master-planned community in Bristow, Virginia developed after 2000, which is bisected by three existing Transco natural gas transmission pipelines, between 30 and 36 inches in diameter, originally installed in the 1950s and 1960s. Since the pipelines predate the subdivision, the developer was confident that houses could be sold in proximity to the existing easements. IRR examined Prince William County Property Assessment Records for sales of 68 townhouses in Victory Lakes between 2008 and 2015. The average sale price, after adjustments for gross living space, was 1.4 percent lower for properties located adjacent to the pipeline easement, compared with houses further away. A regression analysis found that the sale prices were not related to whether or not the homes were located on or off the pipeline.

Other neighborhoods studied by IRR likewise did not exhibit large-scale price differences due to the presence of a pipeline. At Kyles Station Meadows in Liberty Township, Ohio, the average adjusted sale price for houses adjacent to the pipeline easement was 0.08 percent higher than houses further away. At Wellington Knolls in Clinton Township, New Jersey, prices of houses adjacent to the pipeline easement were an average of 0.6 percent lower. At Saddle Ridge, in Luzerne County, Pennsylvania, the adjusted sale prices of houses encumbered by a pipeline easement were on average 1 percent higher than houses not encumbered. In Brandon, Mississippi the adjusted sale price of a house adjacent to a pipeline easement was 1.8 percent lower than a house further away. In conclusion, IRR found that nationally there were no statistically significant differences between prices paid for houses along a pipeline easement with houses further away within the same subdivision. Also, regression analyses found that house prices were not related to being either on or off a pipeline right-of-way.

The Quesenberrys claim that landowners must get permission from their mortgage holder in order to grant a pipeline easement on their property. They further claim that future buyers of property encumbered by a pipeline easement may be unable to obtain financing for a loan. They cite an article from the *New York Times*[112] to support their arguments. However, the *New York Times* article is about banks granting loans for property leased for natural gas drilling. This has no relationship to property that would be encumbered by a natural gas transmission pipeline easement.

The FERC has also previously researched the concern raised that installation of a pipeline and the corresponding easement would hinder the ability of a prospective buyer to obtain a mortgage or have impacts on mortgage rates (FERC, 2014). Several national banks were contacted, including Wells Fargo, Citizens Bank, Bank of America, and Chase Bank. The results of this research indicated that lenders consider many factors when assessing whether or not to offer a mortgage for a property. The most important factor is the lender's evaluation of the prospective borrower's ability to repay the loan. Property value appraisals are also taken into consideration. Banks and other lending institutions review loan applications on an individual basis. There is no industry standard for considering pipeline easements when reviewing loan applications. Banks regularly make loans for properties that contain natural gas pipeline easements.

IRR (2016) interviewed Wells Fargo Bank and other lenders concerning the ability of buyers to obtain mortgages if the property was encumbered by a natural gas pipeline easement. Wells Fargo is the largest home lender in the country. The bank's representative indicated that any improvements to a property must meet a 10-foot-setback requirement from a right-of-way to qualify for a Veterans Administration or Federal Housing Administration loan. IRR found many examples of buyers of property with pipeline easements who were able to obtain Veterans

112 Uribina, I. 19 October 2011, "Rush to Drill for Natural Gas Creates Conflict with Mortgages," *New York Times.*

Administration and Federal Housing Administration loans. Lenders interviewed indicated that the presence of a pipeline easement would not hinder the ability of a buyer to obtain a loan, provided that the buyer could obtain title insurance, and all improvements were outside of the setback distance.

Margaret Roston of Blacksburg, Virginia stated in a comment letter to the FERC that she spoke with two different local insurance companies about obtaining homeowners insurance for property that may contain a natural gas pipeline easement.[113] She reports that she was told that insurance coverage would be determined on a case-by-case basis. According to Roston, it is likely that rates could increase if the insurance company discovered there was a pipeline on the property. In another comment letter to the FERC, Charles Chong of Bristol, West Virginia also contends that the presence of a pipeline would affect the ability of a buyer to obtain property insurance. However, in a letter appended to Mr. Chong's comments, the Dyer Insurance Agency of Clarksburg, West Virginia stated that: "We cannot predict if a future purchaser of this property would have difficulties obtaining insurance or not." Tim Farrell, owner of an insurance brokerage firm in Greenfield, Massachusetts, told a newspaper reporter that none of the insurance companies he represents currently take natural gas transmission pipelines into consideration when processing applications for homeowner's insurance (Relihan, 2015).

For another project, the FERC staff conducted independent research on the matter of obtaining insurance for properties encumbered by a natural gas pipeline (FERC, 2014). The research involved calling a number of insurance agencies. The FERC asked whether the presence of a utility crossing would change the terms of an existing or new residential insurance policy, which types of utilities may cause a change, how a policy might change, and what factors would influence a change in the policy terms, including the potential for a policy to be dropped completely. Results of this investigation suggested that the potential for a residential insurance policy to be affected could exist, but the extent of any action and corresponding corrective action would depend upon several factors, including the terms of the individual landowner's policy and the terms of the pipeline operator's policy. Insurance company contacts were neither able to provide the potential factors that could cause a change in a policy (e.g., type of utility, proximity of the residence to the utility), nor provide quantitative information on the potential change in a policy premium (in dollars or percent).

IRR (2016) contacted the corporate offices of State Farm, Allstate, and Farmers, the three largest home insurers in the nation. Representatives of all three companies indicated that proximity to a pipeline was not taken into consideration when underwriting a homeowner's policy. In addition, premiums would not increase because a pipeline was installed on a property. There is no evidence that insurance companies view properties with pipeline easements any different than properties without easements.

Equitrans Expansion Project

The FERC received no comments specific to the EEP questioning whether the presence of a pipeline easement would reduce property values, increase the cost of homeowners insurance, or

[113] See letter filed May 5, 2015 (accession number 20150505-5053).

influence the ability of a buyer to obtain a mortgage. These issues are addressed above in our discussion of the MVP.

4.9.1.7 Economy and Tax Revenue

Mountain Valley Project

In the counties where MVP facilities would be located the workforce totals 552,522 people.

West Virginia

The major industries in West Virginia include social, producer, and consumer services, retail trade, and government employment. Based on U.S. Bureau of Labor Statistics data, the civilian workforce in West Virginia in 2015 was 0.8 million people. The unemployment rate in West Virginia was 6.7 percent. Per capita income in West Virginia in 2014 averaged $36,132.

In the counties affected by the MVP in West Virginia, the civilian workforce ranges from 3,545 people in Webster County to 31,687 people in Harrison County. Unemployment rates range from 5.6 percent in Monroe County to 10.0 percent in Wetzel County. Per capita income in the affected counties range from a low of $20,757 in Doddridge County to a high of $36,695 in Lewis County (see table 4.9.1-8).

The state sales taxes rate in West Virginia is currently 6 percent (West Virginia State Tax Department, 2015). Local sales taxes are collected by some municipalities and are an additional 1 percent. Taxes in the counties containing MVP components in West Virginia generate a total about $100.6 million annually (see table 4.9.1-9).

TABLE 4.9.1-8

Existing Economic Conditions in the Counties Affected by the Mountain Valley Project and the Equitrans Expansion Project

Project/Location	Per capita income (dollars) a/	Civilian Workforce b/	Unemployment Rate (percent) b/	Top Three Industries a/, c/
MOUNTAIN VALLEY PIPELINE PROJECT				
West Virginia	**36,132**	**785,049**	**6.7**	**Social Services, Consumer Services, State and Local Government**
Wetzel d/	32,672	7,193	10.0	Retail Trade, State and Local Government, Consumer Services
Harrison	34,434	31,687	6.4	Social Services, Consumer Services, Retail Trade
Doddridge	20,757	3,638	5.7	Mining, State and Local Government, Farming
Lewis	36,695	7,006	8.2	Mining, State and Local Government, Consumer Services
Braxton	28,315	5,449	9.0	State and Local Government, Consumer Services, Social Services
Webster	26,692	3,545	7.7	State and Local Government, Social Services, Manufacturing
Nicholas	32,557	9,879	9.1	State and Local Government, Retail Trade, Consumer Services
Greenbrier	34,966	15,350	6.5	Consumer Services, Social Services, State and Local Government
Fayette	35,189	16,354	8.5	State and Local Government, Consumer Services, Farming
Summers	26,714	4,555	7.0	State and Local Government, Consumer Services, Social Services
Monroe	30,453	5,752	5.6	Farming, State and Local Government, Manufacturing
Virginia	**50,345**	**4,240,470**	**4.4**	**Producer Services, Consumer Services, Social Services**
Giles	34,874	8,069	5.1	Manufacturing, State and Local Government, Retail Trade
Craig	33,756	2,431	5.5	State and Local Government, Farming, Consumer Services
Montgomery	31,569	50,008	4.3	State and Local Government, Consumer Services, Retail Trade
Roanoke	45,577	49,551	3.9	Producer Services, Consumer Services, Retail Trade
Franklin	34,586	26,923	4.6	Consumer Services, Manufacturing, Retail Trade
Pittsylvania	32,716	30,102	5.3	Social Services, Consumer Services, State and Local Government

TABLE 4.9.1-8 (continued)

Existing Economic Conditions in the Counties Affected by the Mountain Valley Project and the Equitrans Expansion Project

Project/Location	Per capita income (dollars) a/	Civilian Workforce b/	Unemployment Rate (percent) b/	Top Three Industries a/, c/
EQUITRANS EXPANSION PROJECT				
Pennsylvania	**47,679**	**6,423,903**	**5.1**	**Social Services, Retail Trade, Producer Services**
Allegheny	53,976	647,602	4.8	Social Services, Producer Services, Consumer Services
Washington	48,258	106,529	5.4	Social Services, Producer Services, Retail Trade
Greene	43,047	18,281	5.8	State and Local Government, Consumer Services, Retail Trade

a/ BEA, 2015
b/ BLS, 2015
c/ Consumer services consists of other services; arts, entertainment, and recreation; and accommodation and food services. Producer services consists of information; professional and technical services; management of companies and enterprises; and administrative and waste services. Social Services consists of educational services; and health care and social assistance.
d/ Both the EEP and MVP are located in Wetzel County, West Virginia.

Virginia

The major industries in Virginia include producer, consumer, and social service, retail trade, and government employments (see table 4.9.1-8). Based on U.S. Bureau of Labor Statistics data, the civilian workforce in Virginia in 2015 totaled about 4.2 million people. The unemployment rate in Virginia in 2015 was 4.4 percent. Per capita income in Virginia was $50,345 in 2014 (BEA, 2015).

In the counties affected by the MVP in Virginia, the civilian workforce ranges from 2,431 people in Craig County to 50,008 people in Montgomery County. Unemployment rates range from 3.9 percent in Roanoke County to 5.5 percent in Craig County. Per capita income in the study area ranged from $31,569 in Montgomery County to $45,577 in Roanoke County (see table 4.9.1-8).

The state sales taxes rate in Virginia is currently 4.3 percent. Local sales taxes are collected at a rate of 1 percent, for a total 5.3 percent combined sales tax. Taxes in the affected counties in Virginia generate total $439 million annually (see table 4.9.1-9).

TABLE 4.9.1-9

Tax Revenues for the Counties Affected by the Mountain Valley Project and Equitrans Expansion Project

State/County	General Fund Total Revenues ($1,000s)
West Virginia a/	
Wetzel	13,460
Harrison	26,631
Doddridge	5,589
Lewis	10,898
Braxton	4,387
Webster	2,531
Nicholas	8,390
Greenbrier	11,305
Fayette	11,333
Summers	3,290
Monroe	2,809
West Virginia Subtotal	*100,625*
Virginia b/	
Giles	51,810
Craig	6,675
Montgomery	43,767
Roanoke	198,174
Franklin	79,788
Pittsylvania	58,971
Virginia Subtotal	*439,176*
Pennsylvania	
Allegheny c/	694,383
Washington d/	79,429
Greene e/	17,808
Pennsylvania Subtotal	*791,620*

a/ FTI Consulting, 2015a
b/ FTI Consulting, 2015b
c/ County of Allegheny, 2013
d/ Washington County, 2013
e/ County of Greene, 2013

Equitrans Expansion Project

Pennsylvania

Based on U.S. Bureau of Labor Statistics data, the civilian workforce in Pennsylvania in 2015 was 6.4 million people. Per capita income in Pennsylvania in 2014 was $47,679. The unemployment rate in Pennsylvania was 5.1 percent.

In the counties affected by the EEP in Pennsylvania, the civilian workforce ranges from 18,281 people in Greene County to 647,602 people in Allegheny County. Unemployment rates are 5.8 percent in Greene County, 5.4 percent in Washington County, and 4.8 percent in Allegheny County. Per capita income was $53,976 in Allegheny County, $43,047 in Greene County, and $48,258 in Washington County (see table 4.9.1-8).

The state sales taxes rate in Pennsylvania is currently 6 percent (Pennsylvania Department of Revenue, 2015). Local sales taxes are collected by Allegheny County and are an additional 1 percent. In the affected counties of Pennsylvania, yearly tax revenues were estimated to total about $792 million (see table 4.9.1-9).

West Virginia

In Wetzel County, West Virginia, the civilian workforce is 7,193 people, with an unemployment rate of 10.0 percent. Per capita income of the county is $32,672 (see table 4.9.1-8).

The state sales taxes rate in West Virginia is currently 6 percent (West Virginia State Tax Department, 2015). Local sales taxes are collected by some municipalities and are an additional 1 percent. In Wetzel County, tax revenues are estimated to be about $13.5 million annually (see table 4.9.1-9).

4.9.1.8 Environmental Justice

EO 12898 requires federal agencies to consider the adverse health or environmental effects of their programs, policies, and activities on minority and low-income populations. Consistent with EO 12898, the CEQ (1997) called on federal agencies to actively scrutinize the following issues with respect to environmental justice during the NEPA compliance process:

- the racial and economic composition of affected communities;
- health-related issues that may amplify project effects on minority or low-income individuals; and
- public participation strategies, including community or tribal participation in the process.

Minority and Low-income Populations

Minority populations include African-Americans, Hispanics, Asian-Americans, Pacific Islanders and Native Hawaiians, and American Indians and Alaskan Natives. The CEQ (1997) suggests that an environmental justice community exists where the minority population of an area is greater than 50 percent of the total population or is meaningfully greater than the population percentage for a surrounding reference area such as the state or county. In the counties that contain MVP facilities in West Virginia, minorities represent between 0.7 to 7.0 percent of the population, compared to the statewide average of 6.4 percent. In the affected counties of Virginia, minorities comprise between 3.9 and 25.2 percent of the population, compared to the Virginia-wide average of 31.0 percent. In the Pennsylvania counties that contain EEP facilities, minorities comprise between 6.0 and 19.2 percent of the population, compared to the Pennsylvania-wide average of 18.4 percent (see table 4.9.1-10).

Larger and more populated geographic areas may have the effect of "masking" or "diluting" the presence of concentrations of minority and/or low-income populations (CEQ, 1997; EPA, 1998). Therefore, we also reviewed data at the census tract (averaging 4,000 residents) and census block (a subdivision of the census tract that includes at least 600 people and 240 housing units) levels to identify minority and low-income communities that may be adversely affected by the projects. The MVP pipeline route would cross 38 census tracts: 21 in West Virginia and 17 in Virginia. The pipeline route would cross 60 census blocks: 38 in West Virginia and 22 in Virginia. None of the census tracts or blocks that would be crossed have minority populations exceeding 50 percent.

The U.S. Census Bureau defines "low-income populations" as those living below the established poverty level. In the United States, the "poverty line" is set annually by the Department of Health and Human Services. In 2016, the poverty level was an income of $11,880 for an individual and $28,440 for a family of five.

Eight of the 17 counties in the MVP area have poverty rates that are higher than the respective statewide levels. The highest poverty rate is in Webster County, West Virginia, where 26.1 percent of the population live below the poverty line. This rate is 45 percent greater than the statewide average for West Virginia, which is at 18.0 percent. The largest discrepancy between state and county poverty rates, a difference of 116 percent, occurs in Montgomery County, where 24.8 percent of the population live below the poverty line compared to the Virginia average of 11.5 percent (see table 4.9.1-9).

For the EEP, two of the four counties crossed have poverty rates that are higher than the respective state. Wetzel County, West Virginia has a poverty rate of 19.8 percent compared to the state rate of 18.0 percent, while Greene County, Pennsylvania has a poverty rate of 13.9 percent, compared to the state rate of 13.5 percent.

To further assess the potential impacts on low-income communities in the project area, we reviewed poverty rate data for census blocks within counties affected by the project. Table 4.9.1-11 lists the census blocks in the affected counties for the MVP where more than 20 percent of the population lives below the poverty line. According to 15 CFR 689(3)(A)(i), the U.S. Department of Housing and Urban Development defines a "low-income geographic area" as an area with a poverty rate of 20 percent or greater. More than 20 percent of the population lives below the poverty line in 16 of the 38 census blocks in West Virginia, and 5 out of 22 census blocks in Virginia. This indicates that low-income communities are present along the proposed MVP pipeline route.

TABLE 4.9.1-10

Ethnic and Poverty Statistics in the Counties Affected by the Mountain Valley Project and the Equitrans Expansion Project

	White (percent) a/	African American (percent) a/	Native American/ Alaska Native (percent) a/	Asian (percent) a/	Native Hawaiian & Other Pacific Islander (percent) a/	Hispanic Origin (any race) (percent) a/	Total Minority Populations (percent) a/	Median Household Income (dollars) a/	Persons in Poverty (percent) b/
MOUNTAIN VALLEY PROJECT									
West Virginia	**93.6**	**3.3**	**0.2**	**0.7**	**0**	**1.4**	**6.4**	**41,751**	**18**
Wetzel	98.4	0.1	0	0.5	0	0.6	1.6	39,096	19.8
Harrison	95.7	1.8	0.2	0.5	0.2	1.5	4.3	43,987	16.3
Doddridge	96.7	1.1	0.1	0.1	0	0.4	3.3	39,974	15.7
Lewis	97.8	0.5	0	0.3	0.1	1.1	2.2	37,849	20.6
Braxton	97.9	0.5	0.1	0	0	0.6	2.1	32,750	21
Webster	98	0.1	0.3	0.4	0.1	0.3	2	29,086	26.1
Nicholas	99.3	0	0	0.2	0	0	0.7	39,171	18.1
Greenbrier	94.1	2.3	0	0.4	0	1.3	5.9	39,746	18.7
Fayette	93.4	5.2	0.3	0.1	0	1	6.6	36,293	19.9
Summers	93	5.1	0.3	0.1	0	1.8	7	36,651	17.6
Monroe	97.7	0.7	0.3	0	0	1	2.3	36,918	16.8
Virginia	**69**	**19.2**	**0.3**	**6**	**0.1**	**8.6**	**31**	**65,015**	**11.5**
Giles	96.1	1.6	0.6	0.7	0.1	1.2	3.9	46,390	11.3
Craig	96	0.2	0	0.4	0	0	4	44,330	11.8
Montgomery	86.7	4.3	0.2	6.1	0	3	13.3	46,663	24.8
Roanoke	89	5.8	0.1	2.9	0	2.6	11	60,519	8.3
Franklin	89.1	8.5	0.1	0.3	0	2.7	10.5	46,870	14.9
Pittsylvania	74.8	21.4	0.1	0.3	0	2.4	25.2	41,824	16.1
EQUITRANS EXPANSION PROJECT									
Pennsylvania	**81.6**	**11**	**0.2**	**3.1**	**0**	**6.4**	**18.4**	**53,599**	**13.5**
Allegheny	80.8	13	0.1	3.3	0	1.8	19.2	53,040	13
Washington	94	2.9	0.1	0.9	0	1.4	6	56,450	10.4
Greene	92.2	5.1	0.2	0.2	0	2.3	7.8	46,661	13.9

a U.S. Census Bureau, 2016d
b U.S. Census Bureau, 2016e

TABLE 4.9.1-11

Census Blocks where more than 20 Percent of the Population Lives Below the Poverty Line Along the Proposed Route of the Mountain Valley Project

State/County/Census Block	Number of Households	Percent of Households Below the Poverty Line
WEST VIRGINIA		
Webster County	3,928	22.6
Block Group 2, Census Tract 9701	425	22.6
Block Group 4, 9701	589	33.8
Block Group 1, Census Tract 9703	857	20.0
Harrison County	27,599	17.2
Block Group 1, Census Tract 317	430	29.8
Block Group 2, Census Tract 317	371	22.6
Lewis County	6,451	19.5
Block Group 1, Census Tract 9672	428	24.8
Block Group 2, Census Tract 9672	240	26.3
Block Group 3, Census Tract 9676	582	23.5
Braxton County	5,700	20.4
Block Group 1, Census Tract 9679	142	28.4
Nicholas County	10,657	18.2
Block Group 2, Census Tract 9504	315	35.2
Block Group 3, Census Tract 9504	761	30.0
Greenbrier County	15,409	20.0
Block Group 1, Census Tract 9503	314	22.3
Block Group 3, Census Tract 9503	580	29.3
Fayette County	17,250	20.2
Block Group 3, Census Tract 211	363	22.0
Summers County	6,350	22.3
Block Group 1, Census Tract 5	479	25.5
Monroe County	5,648	14.6
Block Group 1, Census Tract 9502	502	25.7
VIRGINIA		
Montgomery County	34,789	22.4
Block Group 1, Census Tract 214	390	32.1
Franklin County	23,358	12.9
Block Group 2, Census Tract 204	988	20.0
Block Group 1, Census Tract 209	586	24.2
Pittsylvania County	26,092	14.9
Block Group 4, Census Tract 103	369	29.3
Block Group 1, Census Tract 105	420	20.5

Source: U.S. Census Bureau, 2014

Other Vulnerable Communities

In a letter dated June 16, 2015, responding to our NOI, the EPA recommended the EIS address EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks." Table 4.9.1-12 lists other vulnerable populations in the project area including children, the elderly, disabled, non-English speakers, and other disadvantaged people that may be disproportionally affected by the projects. Appendix U contains vulnerable populations by census block.

TABLE 4.9.1-12

Other Vulnerable Populations in the Counties Affected by the Mountain Valley Project and the Equitrans Expansion Project

State/ County	Children Under 18-Years-Old (percent)	Elderly More Than 65-Years-Old (percent)	Non-English Speaking Households (percent)	Disabled Persons Under 65-Years-Old (percent)
Mountain Valley Project				
West Virginia	**20.6**	**18.2**	**2.4**	**14.4**
Wetzel a/	20.2	21.8	1.1	10.7
Harrison	21.7	18.2	2.5	13.9
Doddridge	17.4	17.9	1.7	10.2
Lewis	21.0	19.6	1.0	14.8
Braxton	19.9	21.0	1.0	15.4
Webster	20.5	22.1	0.6	15.4
Nicholas	20.7	20.1	0.5	16.0
Greenbrier	19.7	21.9	1.3	13.1
Fayette	21.0	19.2	2.0	20.4
Summers	17.4	21.7	2.7	22.5
Monroe	20.6	22.8	0.7	16.4
Virginia	**22.3**	**14.2**	**15.2**	**7.6**
Giles	20.4	20.5	5.3	14.5
Craig	19.0	21.4	1.9	12.4
Montgomery	16.0	11.3	10.9	6.6
Roanoke	20.7	20.1	6.4	7.1
Franklin	19.3	21.5	3.4	11.1
Pittsylvania	19.9	20.6	3.3	12.8
Equitrans Expansion Project				
Pennsylvania	**21.0**	**17.0**	**10.5**	**9.3**
Allegheny	19.0	17.7	7.1	8.8
Washington	19.8	19.3	3.4	9.8
Greene	19.2	17.5	3.6	13.8

Source: U.S. Census Bureau, 2016a
a/ Wetzel County is affected by both the MVP and the EEP

Harrison, Lewis, Nicholas, and Fayette Counties, West Virginia have more children as a percentage of population than the state average. None of the affected counties in Virginia had more children as a percentage of the population than the Virginia average. A review of the census block data indicated that the number of children in the affected blocks is similar to the county levels. Of the 65 census blocks crossed by the projects, 24 have a higher percentage of children than their respective county (see appendix U).

Nine of the eleven affected counties in West Virginia and five of the six counties in Virginia have more elderly than the state average. Only Montgomery County, Virginia has fewer elderly than the Commonwealth average. The census block data revealed that people over 65 years old were over-represented in all the affected blocks in comparison to the county averages.

Only Harrison and Summers Counties, West Virginia have more non-English speaking households than the state average. All the affected counties in Virginia are below the state average for non-English speaking households. Looking at the census block data, non-English speaking households ranged from 0 to 0.9 percent in the affected census blocks in West Virginia, and 0 to 2.9 percent in the census blocks in Virginia (see appendix U).

Adverse impacts on water quality and air quality resulting from construction and operation of the projects were identified as concerns that should be addressed in our review. Water quality is addressed in section 4.3 of this EIS, and air quality is addressed in section 4.11.1. For the MVP, three new compressor stations, which could affect air quality, would be constructed in Wetzel, Braxton, and Fayette Counties, West Virginia. For the EEP, the new Redhook Compressor Station would be constructed in Greene County, Pennsylvania. As described in section 4.11.1, all of the affected counties are in attainment or are unclassified for criteria air pollutants.

In West Virginia, 6.4 percent of the population is considered minority, and 18.0 percent of the population lives below the poverty line. Minorities make up about 1.6 percent of the population of Wetzel County, and about 19.8 percent of the people in Wetzel County live below the poverty line. Neither of these measures indicate an environmental justice community. In Braxton County, minorities account for about 2.1 percent of the population, and 21 percent of the population lives below the poverty line. Minorities total 6.6 percent of the population of Fayette County, where 19.9 percent live below the poverty line. With greater than 20 percent of their populations living below the poverty line, Braxton County and Fayette County are considered environmental justice communities. For the Commonwealth of Pennsylvania as a whole, 18.4 percent of the population are minorities, and 13.5 percent live below the poverty line. Minorities comprise about 7.8 percent of the population of Greene County, and 13.9 percent of the county's population live below the poverty line. Neither of these measures indicate an environmental justice community.

Public Participation

The EPA's Environmental Justice Policies focus on enhancing opportunities for residents to participate in decision-making. The EPA (2011a) states that environmental justice involves meaningful public involvement so that: "(1) potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; (2) the public's contributions can influence the regulatory agency's decision; (3) the concerns of all participants involved will be considered in the decision-making process; and (4) the decision-makers seek out and facilitate the involvement of those potentially affected."

As discussed in sections 1.1 and 1.4 of this EIS, there have been many opportunities for public involvement during the Commission's environmental review process. The FERC has issued multiple notices regarding the projects that were posted on the Commission public dockets, published in the Federal Register, and sent to our environmental mailing list that included local libraries and newspapers. These notices included a Project Update issued March 25, 2015; NOIs issued April 17 and August 11, 2015; Notice of Applications issued November 5, 2015; another Project Update issued April 11, 2016; and the Notice of Availability for the draft EIS issued September 16, 2016. After Mountain Valley filed minor route modifications in October 2016, the FERC issued letters to 45 newly affected landowners on January 17, 2017, with an extended comment period to February 21, 2017. The FERC also held multiple public scoping meetings in the project areas, and public sessions to take comments on the draft EIS.

All documents that form the administrative record for these proceedings are available to the public electronically through the internet on the FERC's web page (at www.ferc.gov), using the eLibrary link (under "Documents & Filings"). Anyone, at any time, may comment to the FERC about the projects, either in writing via a letter to the Secretary of the Commission, or electronically using the eComment and eFiling links on the FERC's web page (again under "Documents & Filings").

The Applicants used the FERC's pre-filing process, which allowed for input from stakeholders in advance of the filing of formal applications. During the pre-filing period, Mountain Valley held 16 open houses, and Equitrans held 2 open houses, with the participation of the FERC staff. The Applicants each established a project-specific website to convey information to the public. In addition, during pre-filing the FERC staff held six public scoping meetings at various locations spaced relatively evenly apart along the MVP route to take environmental comments.

We recognize that not everyone has internet access or is comfortable or adept at filing electronic comments. For this reason, each notice and Project Update brochure was physically mailed to all parties on the environmental mailing list. Further, FERC staff has consistently emphasized in meetings with the public that all comments, whether spoken or delivered in person at meetings, mailed in, or submitted electronically, receive equal weight by FERC staff for consideration in the EIS. In addition, the Applicants sent copies of their FERC applications in hard copy format to the local libraries in the project area.

The draft EIS was issued with a 90-day comment period and was posted on the FERC website for the docket, enabling electronic reading or downloads. Further, every party on the environmental mailing list received copies of the draft EIS; and those who preferred a hard copy over the default CD version had the opportunity to request one. We also sent copies of the draft EIS to local libraries. During the draft EIS comment period, the FERC staff held seven public sessions in the project area to receive verbal comments on the draft EIS. Additionally, 1,237 individual comment letters (not counting repeats, form letters, and petitions) were received by FERC during the 90-day comment period.

4.9.1.9 Jefferson National Forest

In general, the socioeconomic data given below was derived from the final EIS that accompanied the 2004 revision of the LRMP for the Jefferson National Forest. In 2000, the counties that contain portions of the Jefferson National Forest had a population density of 92 persons per square mile. About 14 percent of the population of the region were minorities in 2000. The unemployment rate in 1999 for the Jefferson National Forest counties was 14.7 percent. In 1996, the main sectors of the economy employing people in the Jefferson National Forest counties were non-tourist services (22.5 percent), non-tourist wholesale and retail trades (21.4 percent), and government (21.1 percent). The average per capita income of people who resided in the Jefferson National Forest counties in 2000 was $17,034. The median value for a housing unit in 2000 was $81,416. The FS estimated that activities on the Jefferson National Forest supports more than 3,400 jobs and generates about $86 million in labor income.

Tourism represented only 2.5 percent of the local economy for the counties that contain the Jefferson National Forest. In 2000, over 3.5 million people visited the Jefferson National Forest to participate mostly in recreational activities.

There are specific activities within the Jefferson National Forest that generate income, including timber sales, mineral leases, and fees. In 2001, 11 million board feet of timber was sold on the Jefferson National Forest. In the 1990s, six natural gas wells were drilled within the Jefferson National Forest. As of June 2002, there were 14 oil and gas leases covering 14,979 acres on the Clinch Ranger District.

The Payments in Lieu of Taxes (PILT) Act of 1976 provides payments to counties that contain federally-owned lands. In 2000, the Jefferson National Forest contributed a total of $551,077 in PILT to affected counties. In addition, the FS pays 25 percent of its revenues to counties within National Forest boundaries. In 2000, the Jefferson National Forest paid $208,658 to local affected counties as its part of the 25 Percent Funds.

4.9.2 Environmental Consequences

4.9.2.1 Population and Employment

Mountain Valley Project

Mountain Valley estimated that it would take up to 29 months (about 2.5 years) to construct its entire project, including right-of-way reclamation. Construction of the project would be completed using 11 construction spreads ranging in length from 22.2 miles to 39.2 miles. In addition, there would be seven separate spreads for construction of the aboveground facilities. Mountain Valley estimates that the peak construction workforce would be 7,865 people for the pipeline and 460 people for construction of the aboveground facilities (see table 4.9.2-1).

TABLE 4.9.2-1

Estimated Workforce and Construction Schedule for the Mountain Valley Project and the Equitrans Expansion Project

Construction Spread	County/State	Duration (months)	Peak Construction Workforce	Peak Local Workers	Peak Non-local Workers
MOUNTAIN VALLEY PROJECT					
Pipeline					
Spread 1 MPs 0-25.9	Wetzel, WV Harrison, WV	17	715	179	536
Spread 2 MPs 25.9-48.0	Harrison, WV Doddridge, WV Lewis, WV	17	715	179	536
Spread 3 MPs 48.0-77.6	Lewis, WV Braxton, WV	17	715	179	536
Spread 4 MPs 77.6-104.4	Braxton, WV Webster, WV	17	715	179	536
Spread 5 MPs 104.4-128.2	Webster, WV Nicholas, WV	17	715	179	536
Spread 6 MPs 128.2-154.5	Nicholas, WV Greenbrier, WV	17	715	179	536
Spread 7 MPs 154.5-182.7	Greenbrier, WV Fayette, WV Summers WV, Monroe, WV	17	715	179	536
Spread 8 MPs 182.7-205.9	Monroe, WV Giles, VA	19	715	179	536
Spread 9 MPs 205.9-235.8	Giles, VA Craig, VA Montgomery, VA	19	715	179	536
Spread 10 MPs 235.8-264.2	Montgomery, VA Roanoke, VA Franklin, VA	19	715	179	536
Spread 11 MPs 264.2-303.5	Franklin, VA Pittsylvania, VA	19	715	179	536
Pipeline Subtotal			*7,865*	*1,969*	*5,896*
Aboveground Facilities					
Bradshaw Compressor Station	Wetzel, WV	15	100	25	75
Mobley Interconnect Receipt	Wetzel, WV	9	40	10	30
WB Interconnect Delivery	Braxton, WV	9	40	10	30
Sherwood Interconnect Receipt	Harrison, WV	7	40	10	30
Harris Compressor Station	Braxton, WV	15	100	25	75
Stallworth Compressor Station	Fayette, WV	15	100	25	75

TABLE 4.9.2-1 (continued) **Estimated Workforce and Construction Schedule for the Mountain Valley Project and the Equitrans Expansion Project**					
Construction Spread	**County/State**	**Duration (months)**	**Peak Construction Workforce**	**Peak Local Workers**	**Peak Non-local Workers**
Transco Interconnect Delivery	Pittsylvania, VA	9	40	10	30
Aboveground Facilities Subtotal			*460*	*115*	*345*
Mountain Valley Project Total			***8,325***	***2,084***	***6,241***
EQUITRANS EXPANSION PROJECT					
Pipelines					
H-318 Pipeline	Allegheny, PA Washington, PA	12	100	25	75
H-316 Pipeline	Greene, PA	12	150	38	112
Pipeline Subtotal			*250*	*63*	*187*
Aboveground Facilities					
Webster Interconnect, and Mobley Tap + H-319 pipeline	Wetzel, WV	10	30	30	0
Redhook Compressor Station + M-80, H-158, and H-305 pipelines	Greene, PA	14	90	23	67
Pratt Compressor Station Demolition	Greene, PA	8	30	8	22
Aboveground Facilities Subtotal			*150*	*61*	*89*
Equitrans Expansion Project Total			***400***	***124***	***276***

Mountain Valley estimates that about 25 percent of the workforce during construction would be local hires and that peak local workers would average about 715 people per pipeline spread. Peak non-local construction workers would average between 536 and 671 people per spread (including aboveground facilities). Average employment of non-local workers during non-peak periods would be between 289 and 394 people per spread (including aboveground facilities). The peak construction workforce for non-local labor at the compressor stations would about 75 people each; with an additional 25 local workers per station.

Mountain Valley estimated that the average construction worker would be employed about 10 months along the pipeline, and about 8 months at the aboveground facilities. Due to the transitory nature and short duration of project construction, most non-local workers are not expected to bring their families with them to project area.

Mountain Valley stated that it would hire 25 new permanent employees for operation and maintenance of the project facilities. These employees would be stationed in various communities or locations along the pipeline or at Mountain Valley's corporate headquarters. The specific locations where permanent employees would reside cannot be determined at this time. For the purposes of this analysis, we have assumed that the distribution of permanent workers would likely be spread out in each state and/or they would take residence in one of the more populated communities in the project area. Therefore, the effects of these permanent employees would likely be negligible in regard to population levels within the counties crossed by the MVP.

West Virginia

In total, we estimate that there would be about 4,335 non-local workers in all the West Virginia spreads combined, including the pipeline and aboveground facilities, during the peak construction period. This represents a total population increase for all the West Virginia counties where there would be project facilities combined of about 1.6 percent. Population increases from direct project employment of non-local construction workers could range from 12.0 percent in Webster County to 1.2 percent in Fayette County, assuming a worst case scenario of the entire workforce for each spread residing in a single county at one time. This compares to population increases of between +2.0 percent to -3.3 percent in all the affected counties between 2010 and 2015.

The MVP construction workers would be spread out along 8 separate pipeline spreads and 7 aboveground facilities across 11 counties in West Virginia. We conclude that non-local construction workers on the MVP could easily be absorbed within the populations of the affected counties in West Virginia, and that the project would not have significant adverse effects on the state's population.

In West Virginia, unemployment rates in the affected counties are generally on par with or slightly higher than the state rate. In the affected counties in West Virginia unemployment rates range from 10.0 percent in Wetzel County to 5.6 percent in Monroe County. During peak construction, up to 1,448 local workers would be employed on the project in West Virginia. This represents about 1.3 percent of the total workforce in the affected counties of West Virginia. Given the low percentage of local populations that would work on the MVP, and the short duration of construction (just over 2 years), any increase in local employment rates from construction of the project in West Virginia would be temporary and minor, and the project is unlikely to affect local unemployment rates.

Virginia

We estimate that during the peak construction period, the MVP would employ a total of about 1,906 non-local workers in all the Virginia affected counties combined. This would represent a total population increase in those combined counties of about 0.6 percent. Based on the peak non-local workforce along spreads in Virginia, population increases could range from 10.3 percent in Craig County to 0.6 percent in Roanoke County. This compares to past population trends in the counties crossed by the MVP pipeline, where between 2000 and 2010 populations rose between 2.9 percent and 18.8 percent, depending on the county.

The MVP workers would be spread out over four pipeline spreads in six counties in Virginia. We conclude that non-local construction workers on the MVP could easily be absorbed within the populations of the affected counties in Virginia, and that the project would not have significant adverse effects on the Commonwealth's population.

Unemployment rates in the affected counties in Virginia range from a high of 5.5 percent in Craig County to a low of 3.9 percent in Roanoke County. The MVP would employ 637 workers in Virginia from the local area. This represents about 0.4 percent of the total workforce in the affected counties in Virginia combined. Given the low percentage of local populations that would work on the MVP, and the relatively short duration of construction and restoration (just under 2.5 years), any increase in local employment rates from construction of the project in Virginia would be temporary and minor, and the project is unlikely to affect local unemployment rates.

Equitrans Expansion Project

Equitrans estimated that construction and restoration for its pipelines would take about 1 year, with an additional 4 months needed to put the new Redhook Compressor Station into service, and 8 more months to complete the demolition of the existing Pratt Compressor Station (2 years total of construction, demolition, and restoration periods for the entire EEP). The total peak workforce for the EEP, including pipelines and aboveground facilities, would be about 400 people. Equitrans expects to hire about 25 percent of its total peak workforce locally in Pennsylvania and 100 percent locally in West Virginia. Overall, about 124 people would be hired locally, and the remaining employees (about 276 of its total peak workforce) would have to relocate from outside the project area (see table 4.9.2-1). Equitrans estimates that the average pipeline construction worker for the project would be on the job for a term of about 6 months. Because of the relatively short duration of project construction, most non-local workers are not expected to bring their families with them to the project area.

No additional employees would be added to operate the EEP facilities. The Redhook Compressor Station would be unmanned. It would be remotely monitored from Equitrans' Waynesburg, Pennsylvania office. The pipelines, Mobley Tap, and Webster Interconnect would be operated, monitored, and maintained by Equitrans staff stationed at its Manning and Logansport offices in West Virginia.

Pennsylvania

We estimate that the EEP, including pipeline and aboveground facilities construction, would employ a total of about 276 non-local workers in Pennsylvania during the peak period. These employees would be spread out over four pipelines and two compressor station sites in three counties. In 2016, the three counties in Pennsylvania that contain the proposed project facilities had a total population of 1,470,543 people. That means that the EEP non-local peak construction workforce would represent an increase of about 0.02 percent in regional population. We conclude that non-local construction workers on the EEP could easily be absorbed within the populations of the affected counties in Pennsylvania, and that the project would not have significant adverse effects on the Commonwealth's population.

Unemployment rates in the affected counties in Pennsylvania range from 6.4 percent in Greene County to 7.6 percent in Alleghany County. The EEP would employ a peak total of about 94 local workers during construction of all the facilities in Pennsylvania. This represents 0.01 percent of the total workforce of the three affected counties combined. Given the low percentage of local populations that would work on the EEP, and the short duration of construction (2.5 years), any increase in local employment rates from construction of the project in Pennsylvania would be temporary and minor, and the project is unlikely to affect local unemployment rates.

West Virginia

Equitrans stated it would employ 30 local people to construct the Webster Interconnect, Mobley Tap, and H-319 pipeline in Wetzel County, West Virginia. Because no non-local labor would be used, this activity would have no effect on the population of the county or the state.

Wetzel County has a total workforce of 7,193 people and an unemployment rate of 10.0 percent. The EEP construction workers would represent about 0.4 percent of the total county workforce. We conclude that the project would not have a significant effect on local employment rates.

4.9.2.2 Housing

Mountain Valley Project

Mountain Valley would not build any temporary "man-camps" or project housing complexes during construction of the MVP. Instead, non-local construction workers would need to find housing in vacant rental units, including houses, apartments, mobile home parks, hotels/motels, and campgrounds and RV parks. Construction and restoration activities for the MVP would occur over a 2.5-year period; but the typical pipeline construction worker would only be retained on the job for about 8 months. Local employees would not need housing, as they would commute from their existing homes.

In West Virginia, the influx of 4,335 non-local construction workers would represent a demand on 44 percent of the available accommodations in the project area. The housing stock in the affected counties of West Virginia would include 1,913 rental units, 5,202 hotel/motel rooms, and 2,704 RV spaces (see table 4.9.1-2).

In Virginia, the influx of 1,906 non-local workers during construction would represent a demand on 22 percent of the available temporary housing. The housing stock in the affected counties of Virginia would include 1,986 rental units, 6,548 hotel/motel rooms, and 321 RV spaces.

In those counties where housing is limited, workers would likely find accommodations at larger communities in adjacent counties that are within commuting distance to the work site. For those working on project elements in Doddridge County, West Virginia (Spread 2), where there are no hotels, accommodations could probably be found in neighboring Harrison County, which contains 16 hotels (STR, 2015). Those working on project elements in Monroe County, West Virginia (Spreads 7 and 8), where there are no hotels, may find housing in nearby communities such as Princeton, where there are at least 18 hotels (STR, 2015). For those working on project elements in Craig County, Virginia (Spread 9), where there are no hotels, accommodations could be found in the nearby cities of Blacksburg (with at least 15 hotels) or Roanoke (with at least 35 hotels) (STR, 2015). While project-related demand for housing would benefit (increase revenue) the proprietors/owners of the rental units, motels/motels, and campgrounds and RV parks, it would conversely increase competition for units (and cost) and decrease housing availability for tourists, recreationalists, and local renters/residents.

The demand for housing would be lessened by the fact that the MVP construction workforce would be spread out over 11 pipeline spreads and 7 aboveground facilities over 17 counties in 2 states. The average pipeline construction spread would employ about 536 non-local workers. For other natural gas pipeline projects, it was estimated that up to 30 percent of non-local construction workers would bring their own housing to the job site, in the form of RVs and pop-up trailers (FERC, 2015). Further, Mountain Valley estimated that up to 30 non-local workers per spread would probably share accommodations. Impacts on housing would be temporary, lasting not more than the 2.5-year total construction period for the MVP. The average pipeline construction worker on this project would typically only be retained on the job for about 8 months. Given the relatively short duration of construction, the number of housing units available, the fact that some non-local workers would live in RVs, and that a few non-local workers would likely share accommodations, we conclude that the MVP would not have significant adverse impacts on housing.

Equitrans Expansion Project

Equitrans would not build any temporary "man-camps" or project housing complexes during construction of the EEP. Instead, non-local construction workers would need to find housing in vacant rental units, including houses, apartments, and mobile home parks, hotels/motels, and campgrounds and RV parks. Construction and restoration activities for the EEP would occur over a 2-year period; but the typical pipeline construction worker would only be retained on the job for about 6 months. Local employees would not need housing, as they would commute from their existing homes.

A total of about 276 non-local workers would be employed during construction of EEP facilities in Pennsylvania during the peak period. There are about 31,555 housing units available in the three counties in Pennsylvania where EEP facilities would be located, including rental units, hotel/motel rooms, and camping spots (see table 4.9.1-2). No non-local construction workers would be hired in West Virginia.

Impacts on housing would be temporary, lasting less than the 2-year total construction, demolition, and restoration period for the EEP. The average pipeline construction worker for the EEP would be retained on the job for about 6 months. Given the relatively short duration of construction, the number of housing units available, the fact that some non-local workers would live in RVs, and that a few non-local workers would share accommodations, we conclude that the project would not have significant adverse impacts on housing.

4.9.2.3 Public Services

Mountain Valley Project

Constructing the project would increase demands on local services and facilities. Local police may need to assist in maintaining traffic flow during construction at road crossings or may need to respond to emergencies associated with pipeline construction. Fire departments may be needed in response to project-related emergencies. Increased need for medical services would be mainly due to any illness or injury of workforce personnel.

Mountain Valley would establish relationships with local fire departments and emergency first responders, including determining each of the departments present staffing and available equipment (see section 4.12-1 and appendix X for additional information). Mountain Valley would educate local fire departments and first responders about the hazards of natural gas, and familiarize them with the safety assets of its facilities, including emergency shutdown and isolation systems. Mountain Valley would coordinate and financially support periodic response drills and table-top exercises. Mountain Valley is committed to supporting fire department budgets, equipment, and training needs through donations.

Since few non-local workers would relocate their families to the project area, there should be little impact on schools. Mountain Valley estimated that there may be up to 35 children per spread relocated into the area. Given the low number of children expected to relocate, local schools should easily be able to absorb any additional children moving to the project area because of the MVP.

The communities in the project area have adequate infrastructure to meet the potential needs of non-local workers who relocate temporarily. Community services would be supported by additional tax revenues generated by the project. We conclude that the MVP would not have significant adverse impacts on public services.

Equitrans Expansion Project

Constructing the EEP could result in some increased demand on local services and facilities. Local police may need to assist in maintaining traffic flow during construction at road crossings or may need to respond to situations associated with pipeline construction. Fire departments may be needed in response to project-related emergencies. Increased need for medical services would be mainly due to any illness or injury of workforce personnel.

Equitrans would work directly with local law enforcement, fire departments, and medical services to coordinate effective responses to emergency situations. Equitrans expects to host annual training conferences for local emergency response organizations. Equitrans would accommodate requests for additional training from local police and fire departments, and other first responders. In addition, Equitrans would make annual contributions to local fire departments to assist with their operations.

Few children are expected to relocate to the project area due to their non-local parents working on the EEP. Therefore, the project should not adversely impact school enrollment.

The communities in the project area have adequate infrastructure to meet the potential needs of non-local workers who relocate temporarily. Community services would be supported by additional tax revenues generated by the project. We conclude that the EEP would not have significant adverse impacts on public services.

4.9.2.4 Tourism

Mountain Valley Project

A report by KeyLog claims that the MVP would harm the travel and tourism industry. According to KeyLog, if the MVP were to cause a 10 percent drop in recreation and tourism spending from the 2014 baseline, that could mean $96.8 million less in travel expenditures each year in the eight-county study area. Those missing revenues would otherwise support roughly $24.3 million in payroll, $2.6 million in local tax revenue, $4.8 million in state tax revenue, and 1,073 jobs (Phillips et al., May 2016). However, KeyLog did not present any facts or data to support its claim of a 10 percent decline in tourism spending as a result of the construction and operation of the MVP. KeyLog filed additional comments on the draft EIS which are addressed in appendix AA. In fact, the MVP may result in an increase in regional tourism, if non-local construction workers visit area attractions during their off-hours.

During the peak tourist season, in the counties that contain tourist attractions and recreational areas, there could be competition for vacant rental units, hotel/motel rooms, and camping spots between temporary non-local laborers working on the MVP and tourists and recreationalists visiting the project area. However, as explained above in section 4.9.2.2, we conclude that there would be enough housing stock to serve both tourists and MVP workers. Combing all of the counties affected by the MVP, there are a total of 4,100 rental units, 11,750 hotel/motel rooms, and 3,025 RV spaces available. The non-local workers on the MVP would be spread out over 11 construction spreads and 7 aboveground facilities sites in 17 counties in 2 states. The average construction spread would employ about 500 non-local workers. The average pipeline construction worker for the MVP would only be on the job for about 8 months, so housing impacts would be short-term. Some non-local workers would bring their own housing in the form of RVs and pop-up trailers, and some employees would share accommodations.

In the instances where the pipeline crosses a tourist attraction, users may be affected by construction noise and dust, and access to the recreation area may be temporarily impeded. The pipeline route would cross the following tourist attractions and recreational use areas:

- North Bend Rail Trail;
- Staunton-Parkersburg Turnpike;
- Weston and Gauley Bridge Turnpike Trail;
- NCHA and Coal Heritage Trail;
- Jefferson National Forest;
- ANST; and
- BRP.

We discuss potential project impacts on these recreational use areas in section 4.8.2 of this EIS. In many cases, Mountain Valley would use a bore to cross under the trail or road to reduce or mitigate impacts. In several cases, Mountain Valley developed site-specific crossing plans to minimize or mitigate impacts. The construction spread would only need a few days or a few weeks to install the pipeline across most of the recreational use areas. Dust would be suppressed by spraying water on the right-of-way and access roads. Access would be maintained in accordance with Mountain Valley's *Traffic and Transportation Management Plan*.

A case can be made that the economic benefits of the MVP in terms of employment and dollar expenditures during construction, spurring additional indirect and induced jobs and services in the region, outweigh the minor impacts on the local tourist industry. The additional expenditures related to the construction of the MVP, combined with tourist dollars, would likely benefit the local economy.

Operation of the MVP would not result in significant impacts on tourist attractions, as the pipeline would be installed underground. Further, the pipeline would be collocated with existing rights-of-way for 29 percent of the route.

Equitrans Expansion Project

As discussed above in section 4.9.2.1, Equitrans would hire about 276 non-local workers for the construction of the EEP. The typical pipeline construction worker for the EEP would be employed for about 6 months. As explained in section 4.9.2.2, there are about 31,795 housing units available in the three counties in Pennsylvania where EEP facilities would be located, including rental units, hotel/motel rooms, and camping spots. Therefore, we conclude that there would be enough vacant housing stock to accommodate both temporary EEP non-local construction workers and tourists and recreationalist visiting the project area. We also conclude that the EEP would have no significant adverse impacts on tourist attractions in the region. The EEP would not cross any recreational areas. Equitrans would use an HDD to cross under the Monongahela River and the South Fork Tenmile Creek.

4.9.2.5 Transportation and Traffic

Mountain Valley Project

Most paved roads and all railroads crossed by the MVP would be bored. Therefore, there would no impacts on users. Some gravel or grass/dirt two-track roads crossed would be open-cut (see appendix Q). Use of the open-cut method generally requires a temporary road closure and establishment of detours. If no detour is feasible, Mountain Valley would create temporary travel lanes or install steel plate bridges over the open-cut area to ensure continued traffic flow during construction. At least one lane of the road being crossed would be kept open to traffic except for brief periods when it would be essential to close the road to install the pipeline. Mountain Valley would coordinate with local police departments in areas of high traffic volume to avoid traffic flow interruptions and ensure the safety of pedestrians and vehicles and passing emergency vehicles. Mountain Valley would also employ traffic control measures, such as flagmen and signs, as necessary to ensure safety of local traffic. Most open-cut road crossings could be accomplished in a day or 2, to install the pipe and backfill the trench, although final road resurfacing could require several weeks to allow for soil settlement and compaction. After pipeline installation, all roads crossed would be returned to their pre-construction condition and use.

During construction of the pipeline, Mountain Valley would use 355 existing roads (13 state roads and 342 private roads) for access to the right-of-way, of which 353 would need improvements such as grading, widening, or stabilization. Mountain Valley is still assessing the remaining two roads to determine if they may need improvements. Following pipeline installation, Mountain Valley would restore improved roads to their pre-construction condition, unless otherwise directed by the landowner, county, or state agency. Mountain Valley would coordinate with state and local departments of transportation to obtain the required permits to operate trucks on public roads. Mountain Valley filed its initial *Traffic and Transportation Management Plan* in October 2015 and a revised plan in March 2017.

Typical construction equipment per spread would include 3 to 7 bobcats, 2 to 4 cherry-pickers, 2 to 4 chipper/shredders, 2 to 4 compactors, 1 to 2 concrete mixer trucks, 32 to 81 bulldozers, 17 to 44 dump trucks, 25 to 63 excavators, 2 to 4 graders, 1 or 2 cranes, 46 to 109 pick-up trucks, 12 to 26 pipe tractor trailers, 17 to 44 side-booms, 3 to 9 sweepers, 5 water trucks, 4 fuel trucks, 22 to 55 welding rigs, and 5 to 13 x-ray machine trucks. Construction workers would commute from yards to the right-of-way. Once on the right-of-way, construction equipment would typically proceed in a linear fashion, minimizing additional traffic on local roads.

Mountain Valley expects a maximum of about 45 vehicle trips from each yard between 7:30 am and 8:30 am, with return trips from the right-of-way between 4:30 pm and 6:00 pm. This may be outside of the typical peak commuter traffic period. Construction impacts on transportation infrastructure would include disruption to traffic flow due to the movement of construction equipment, materials, and crew members; construction of pipeline facilities across existing roads; and damage to local roads from the movement of heavy construction equipment and materials. Construction activities would be scheduled to take advantage of daylight hours and, as such, construction crews would typically avoid peak commuting periods by traveling to the worksite early in the morning and from the worksite later in the evening. Certain construction-related activities such as hydrostatic testing, tie-ins, purge and packing the pipelines facilities, amongst others, could occur at unspecified times and outside the normal work day. Mountain Valley would attempt to schedule these activities in such a way (e.g., outside of peak traffic hours) that impacts on local commuter traffic would be minimized.

Public roads used by construction vehicles to get to and from workspaces could experience increase sediment tracking/build-up and surface damage. Mountain Valley would mitigate the trackout of sediment from the access roads or workspaces onto paved roads using rock construction entrances. If sediment or other loose material is tracked onto paved roads, Mountain Valley contractors would sweep or vacuum to remove from the road.

During construction, Mountain Valley would inspect roads periodically and, if damages occur as a direct result of project-related activities, would repair them as appropriate and in accordance with the applicable permit. Paved roads are the most durable and generally stand up well to periodic surges in traffic and heavy use. Unpaved roads, on the other hand, are much less durable. Depending on the quality of the road surface, impacts could occur to gravel or dirt roads. Mountain Valley would use pre-construction video to document the condition of roadways prior to the project. Following construction, roads would be restored to their original conditions unless otherwise directed by the landowner, county, or state agency. As a result of measures described above, we conclude that construction activities would result in temporary to short-term impacts on transportation infrastructure.

Equitrans Expansion Project

Most paved roads would be crossed using the conventional bore method. Most gravel or dirt roads would be crossed by open-cut. Traffic would not be disrupted on paved roads that are bored. Open-cutting of roads would usually be accomplished in 1 or 2 days, to install the pipe and backfill the trench. Detours would be established during the crossing period. Equitrans would use traffic control measures, such as flaggers, warning signs, and barriers to maintain traffic flow on roads crossed. Steel plates would be placed over the open trench at the end of each day to maintain access. On April 20, 2016, Equitrans filed with the FERC an updated copy of its *Traffic and Transportation Management Plan*.

Construction traffic would include heavy equipment and light trucks. Traffic would be from the yards to the right-of-way. Several construction-related trips to and from the job site would be made each day, typically in the early morning (before 7:00 am) or evening hours (after 6:00 pm) in an effort to avoid local commuter traffic. Once on the right-of-way, most construction equipment would proceed in a linear fashion, minimizing additional traffic on local roads.

Equitrans would coordinate with state and local departments of transportation to obtain the required permits to operate trucks on public roads. Equitrans would limit construction traffic during times when school buses may be using access road. Equitrans would limit construction traffic to posted speeds on all access roads. Equitrans would limit its equipment to weight restrictions for access roads. To reduce dust resulting from construction traffic, Equitrans would spray water on access roads.

Public roads used by construction vehicles to get to and from workspaces could experience increase sediment tracking/build-up and surface damage. Equitrans would mitigate the trackout of sediment onto paved roads using rock construction entrances between paved roads and access roads. If sediment or other loose material is tracked onto paved roads, Equitrans contractors would sweep or vacuum to remove from the road.

Paved roads are the most durable and generally stand up well to periodic surges in traffic and heavy use; unpaved roads, on the other hand, are much less durable. Depending on the quality of the road surface, impacts could occur to roads used during construction of the EEP. Following construction, Equitrans would restore roads their original conditions unless otherwise directed by the landowner, county, or state agency.

Equitrans proposes to make improvements at 14 existing access roads prior to their use; so that they could handle project construction equipment. After pipeline installation, Equitrans would implement measures to reduce noxious weeds along disturbed roadways. After pipeline installation, all roads crossed would be restored to their pre-construction condition.

Impacts on other road users would be temporary and minor, because the total construction period for the EEP extends over just 2 years, and individual road crossings would be accomplished typically in 48 hours. Construction spreads and personnel would be geographically dispersed, and workers would commute to the job sites early in the morning and late in the evening to avoid current peak traffic hours. Based on the measures described above, we conclude that construction of the EEP would not have significant adverse impacts on transportation infrastructure and road users.

4.9.2.6 Property Values, Mortgages, and Insurance

Land values are determined by appraisals, which take into account objective characteristics of the property such as size, location, and improvements. The square footage of living space of a home can have the greatest effect on its sale price. The value of a tract of land, with or without a dwelling, would be related to many variables, including the size of the tract, improvements, land use, views, location, and nearby amenities, and the values of adjacent properties. Phillips et al. (May 2016) contend, and we would generally agree, that factors such as scenic vistas, proximity to recreational areas and open space, and clean air and water, convey positive values to real property.

The presence of a pipeline, and the restrictions associated with an easement, may influence a potential buyer's decision whether or not to purchase that property. If a buyer is looking for a specific use, which the presence of the pipeline renders infeasible, then the buyer may decide against purchasing that property in favor of another tract without a pipeline and more suitable to their objectives. This would be similar to other buyer-specific preferences, such as nearby shopping centers, relative seclusion, or access to a high quality school district.

A report by KeyLog claimed that the MVP would cause between $42.2 million and $53.3 million in diminished property values within its eight-county study area (Phillips et al., May 2016). Unfortunately, KeyLog did not present any facts or data to support that claim.

The KeyLog report cited two other studies that also claimed that the presence of oil and gas facilities reduced property values. An analysis of 532 sales of rural residential properties in 30 townships around the city of Calgary, Canada found that oil or gas production wells had negative impacts on property values (Boxall et al., 2005). However, production wells are not equivalent to natural gas pipelines. Another report examined four studies of vacant land in Ohio that concluded that the presence of a natural gas transmission pipeline reduced property values by an average of 12 percent. Studies of subdivisions and agricultural land in Wisconsin with pipeline easements found properties reduced in value a mean of 15 percent (Kielisch, 2015).

There is a preponderance of evidence from multiple independent studies cited above (including Kinnard et al., 1994; Allen, Williford & Seale, 2001; Fruits, 2008, Diskin et al., 2011; and Wilde, et al., 2013) that refute the claims of KeyLog that the presence of a natural gas pipeline would significantly reduce property values. IRR (2016) indicated that there is little difference in adjusted sale prices for houses adjacent to a pipeline easement and those further away in the same subdivision.

Also, there is little evidence that buyers of land with pipeline easements were unable to obtain mortgages. IRR indicated that banks regularly issue loans for properties that contain pipeline easements. Likewise, there is little evidence that owners of land with pipeline easements were unable to obtain home insurance. IRR indicated that insurance companies do not consider the presence of a pipeline when underwriting homeowner policies.

Mountain Valley and Equitrans have agreed to document, track, investigate, and report to the FERC quarterly for a period of 2 years following of granting of in-service status, complaints from any affected landowners whose insurance policy was cancelled or materially increased in price as a direct result of the projects. The companies would consider any potential mitigation on a case-by-case basis, and address resolutions in quarterly reports to the FERC.

The Commission prefers that applicants obtain easements from landowners through mutually negotiated agreements. Those agreements should compensate landowners for the easement and establish a compensation mechanism for damages caused by construction and operation of the project facilities. The easement agreements can also include indemnification language, which means that the company, not the landowner, would be responsible for any damages or injuries resulting from pipeline construction and operation. If the Applicants cannot reach agreements with landowners, and the Commission authorizes the projects and issues Certificates, the Applicants may use the power of eminent domain, granted by the U.S. Congress under Section 7(h) of the NGA, to obtain easements. However, in those cases, a local court, not the FERC, not the Applicants, and not the landowner, would decide on the value of the easements and compensation for damages.

We conclude, based on the discussion in section 4.9.1.6 of this EIS, that neither the MVP nor the EEP would have significant adverse impacts on property values; nor affect the ability of landowners to obtain mortgages; and would not affect the ability of homeowners to obtain fair market base priced insurance.

4.9.2.7 Economy and Tax Revenue

Mountain Valley Project

On October 16, 2015, the Sierra Club – Virginia Chapter filed comments from Spence Phillips, Ph.D., of KeyLog, challenging the findings of Mountain Valley's economic consultant. We will respond to some of Dr. Phillips contentions. He questioned the use of the IMPLAN model, without providing any evidence why this model would be inappropriate. This input-output model is a well-accepted standard approach used in economic studies throughout the county.[114] Dr. Phillips claimed that non-residents working on the project would depress the local economy, without any data to support that unlikely claim. In fact, non-resident construction workers would be spending money at hotels, restaurants, and stores, generating tax revenues, benefiting the local economy, not depressing it. In the opinion of Dr. Phillips, expected tax revenues were overstated in the reports produced by FTI Consulting for Mountain Valley, while public service costs associated with the project were ignored. However, he did not present any specific public service costs or any alternative estimate of tax revenues. As stated above (in section 4.9.2.3), we conclude that the project would not have significant adverse impacts on public services. Besides making

[114] IMPLAN was developed for the FS. It has been used for a wide variety of economic analyses across the county, including to measure travel-related revenues, trade flows, watershed improvements, and impacts from infrastructure construction. For example, the University of Vermont used an IMPLAN model to study the impact of tourism on the economy of the state. The FERC has often relied on economic studies based on use of the IMPLAN model in our environmental reports for various natural gas proposals; see for example: ECONorthwest, 2012, "An Economic Impact Analysis of the Construction of an LNG Terminal and Natural Gas Pipeline in Oregon," as cited in our final EIS for the Jordan Cove Project in Docket No. CP13-483-000.

monetary contributions to first responders, including fire and police departments, Mountain Valley would repair all roads used for access that may have been damaged. State and local tax revenues generated by the MVP, which appear to have been properly estimated by FTI Consulting using an acceptable IMPLAN model, should far exceed the cost of local public services.

A second report by KeyLog was filed on May 31, 2016. That report claims that based on median property tax rates, lower property values caused by the MVP would result in reductions in property tax revenue of between $243,500 and $308,400 per year within its eight-county study area (Phillips, et al., May 2016). As indicated above, the evidence to support the lowering of property values linked to the MVP is suspect.

Mountain Valley estimated that the total capital cost for the MVP would be about $3.5 billion. About $1.22 billion would be spent on labor, equipment, materials, and services in West Virginia and Virginia during project construction.

Overall, the MVP would benefit the state and local economies by creating a short-term stimulus to the affected areas through payroll expenditures, local purchases of consumables project-specific materials, room rentals, and sales tax. Table 4.9.2-2 lists estimated state and local tax revenues related to construction of the MVP.

TABLE 4.9.2-2

Estimated State and Local Tax Revenues Generated During Construction of the Mountain Valley Project

Type of Tax	West Virginia ($ million)	Virginia ($ million)
Sales Tax	13.4	6.5
Use Tax	N/A	8.7
Income Tax	12.4	7
Property Tax	7.4	8.6
Severance	3.4	N/A
Other	10.7	3.3
Total	**47.3**	**34.1**

Source: FTI Consulting, 2015a; 2015b
N/A = Not Applicable

Operation of the MVP would result in long-term ad valorem property tax benefits for the counties crossed by the MVP in West Virginia and Virginia. These property taxes would be paid for the life of the project. Table 4.9.2-3 provides the total ad valorem taxes estimated for each state and county in the MVP area in West Virginia and Virginia.

West Virginia

Mountain Valley estimated that the total MVP construction payroll would be $337.3 million in West Virginia. Payroll taxes would be collected from the workers employed on the project. Based on the size of the workforce, Mountain Valley estimated that $12.4 million in income tax revenues would be generated by construction payroll in the state.

An economic consultant working for Mountain Valley estimated that during the peak of construction, the MVP would create more than 4,500 jobs in West Virginia, including direct and indirect jobs. Construction the project would also generate an aggregate total of $47 million in state and local taxes in West Virginia, including income tax, sales tax, property tax, other personal tax, severance tax, and other tax.

During operation of the MVP, a total of about 54 direct and indirect jobs would be supported in West Virginia, with average annual salaries of about $65,000. Mountain Valley would pay a total of up to $17 million in property of ad valorem taxes in West Virginia annually (FTI Consulting, 2015a).

TABLE 4.9.2-3

Estimated Annual Ad Valorem Tax Revenues by County During Operation of the Mountain Valley Project

County/State	General Fund Total Revenues (dollars) a/	Annual Ad Valorem Taxes (dollars) a/	Percent of General Fund Total Revenues
West Virginia			
Wetzel	13,460	1,740	13
Harrison	26,631	2,120	8
Doddridge	5,589	470	8
Lewis	10,898	1,980	18
Braxton	4,387	1,500	34
Webster	2,531	1,610	64
Nicholas	8,390	2,240	27
Greenbrier	11,305	1,730	15
Fayette	11,333	840	7
Summers	3,290	890	27
Monroe	2,809	1,840	66
West Virginia Subtotal	*100,625*	*16,960*	*17*
Virginia			
Giles	51,810	1,140	2
Craig	6,675	103	2
Montgomery	43,767	1,780	4
Roanoke	198,174	957	0
Franklin	79,788	2,159	3
Pittsylvania	58,971	1,215	2
Virginia Subtotal	*439,176*	*7,354*	*2*

Note: less than 1 mile of the pipeline crosses Fayette County.
a/ Numbers are presented in 1,000s.
Source: FTI Consulting, 2015a; 2015b

Virginia

Mountain Valley estimates that the total MVP construction payroll would be $168.3 million in Virginia. Payroll taxes would be collected from the workers employed on the project. Based on the size of the workforce, Mountain Valley estimates that about $7 million in income tax revenues would be generated by construction payroll in the state.

Mountain Valley's economic consultant estimated that peak construction of the project would support a total of about 4,400 jobs in Virginia, including direct and indirect jobs. A total of about $34 million in taxes would be generated during project construction in Virginia.

During operation of the MVP, about 34 jobs in Virginia, with an average annual salary of $67,000 each, would be supported in Virginia. Mountain Valley would pay a total up to $7.4 million annually in property and ad valorem taxes in Virginia (FTI Consulting, 2015b).

Equitrans Expansion Project

Equitrans estimated that the total capital cost for the EEP would be about $171.5 million, including the costs of acquiring the right-of-way, civil surveys, environmental studies, engineering, materials, installation, inspection, and administrative overhead (Tetra Tech, 2016). A total of about $57 million would be spent on labor, equipment, materials, and services (see table 4.9.2-4).

TABLE 4.9.2-4

Direct Construction Payroll and Consumable Expenditures by State for the Equitrans Expansion Project

Expenditure	Pennsylvania	West Virginia
Direct Payroll for Construction	$26,089,000	$846,500
Consumable Expenditures during Construction	$30,144,000	$731,500
Construction Total	**$56,233,000**	**$1,578,000**
Direct Payroll for Operation	$781,500	$41,000
Consumable Expenditures during Operation	$519,500	$27,300
Operation Total	**$1,301,000**	**$68,300**

Overall, the EEP would benefit state and local economies by creating a short-term stimulus to the affected areas through payroll expenditures, local purchases of consumables, and sales tax (see table 4.9.2-5).

TABLE 4.9.2-5 **Estimated State and Local Tax Revenues Generated During Construction of the Equitrans Expansion Project**					
County/State	**Sales Tax**		**Use Tax**		**State Income Tax**
	State	**Local**	**State**	**Local**	
Allegheny	$390,543	$65,090	$236,328	$39,388	$58,536
Greene	$1,259,560	$0	$3,018,888	$0	$198,018
Washington	$158,537	$0	$95,935	$0	$23,762
Total Pennsylvania	**$1,808,640**	**$65,090**	**$3,351,152**	**$39,388**	**$280,316**
Wetzel	$43,890	$0	$272,604	$0	$55,019
Total West Virginia	**$43,890**	**$0**	**$272,604**	**$0**	**$55,019**

Operation of the EEP would result in long-term ad valorem property tax income for the counties crossed by the project. These property taxes would be paid for the life of the project. Equitrans estimated that property taxes on its operational facilities for the EEP would be about $192,000 annually for all the affected counties combined (see table 4.9.2-6).

TABLE 4.9.2-6 **Estimate of Property Tax Revenues During Operation of the Equitrans Expansion Project a/**			
County/State	**General Fund Total Revenues ($1,000s) a/**	**Annual Property Taxes ($1,000) b/**	**Percent of General Fund Total Revenues (percent)**
Pennsylvania			
Allegheny	694,383	0	0.0
Washington	79,429	0	0.0
Greene	17,808	85	0.5
Subtotal Pennsylvania	*791,620*	*85*	*<0.1*
West Virginia			
Wetzel	13,499	107	0.8
Subtotal West Virginia	*13,499*	*107*	*0.8*
Project Total	**805,119**	**192**	**<0.1**

a/ Tetra Tech, 2016
b/ Compressor stations are generally treated as personal property in Pennsylvania; therefore, no value is assigned to the real estate for property taxation purposes.

Pennsylvania

Equitrans estimated that it would spend a total of about $53 million on labor, equipment, materials, and services during construction of EEP facilities in Pennsylvania. Direct payroll during construction in Pennsylvania would be a total of about $26 million (see table 4.9.2-4). Payroll taxes would be collected from the workers employed on the project. Based on the size of the workforce, Equitrans estimated that $280,000 in income tax revenues would be generated by construction payroll in Pennsylvania. At the peak of construction, the EEP would result in a total of 583 jobs in Pennsylvania, including direct, indirect, and induced jobs, generating a total of about $43 million in income (Tetra Tech, 2016) (see table 4.9.2-7).

TABLE 4.9.2-7

Construction Phase Contributions to the Economy of the Affected Counties in Pennsylvania from the Equitrans Expansion Project

Impact Type/Measure a/	Jobs b/	Income ($ million) c/	Output ($ million) c/
Direct Contributions	275	24.8	54.4
Indirect Contributions	125	8.1	21.1
Induced Contributions	182	9.8	28.2
Totals	**582**	**42.7**	**103.7**

a/ Estimates are for the entire construction period.
b/ Jobs are full-time equivalent for a period of 1 year (1 FTE = 2,080 hours). Direct jobs include those workers from Pennsylvania directly employed on-site during construction and workers directly employed by the project and related direct spending elsewhere in the state economy. Additional on-site positions that would be filled by out-of-state workers are not included in these estimates.
c/ Income and output are expressed in Year 2016 dollars.
Source: Tetra Tech, 2016

Consumable expenditures include materials and equipment purchased, and per diem spending for food and lodging by non-local workers. Equitrans estimated that it would spend a total of about $30 million on consumables during project construction in Pennsylvania (see table 4.9.2-4). Spending on consumables would also generate tax revenue for Pennsylvania through state and local sales and use taxes. Equitrans estimates that consumables spending would generate about $1.8 million in sales taxes and $3.4 million in use taxes (see table 4.9.2-5).

Equitrans would dedicate about eight existing employees in Pennsylvania to maintain and manage the EEP facilities in the Commonwealth during operation, with an estimated total annual payroll of $781,500. About $1.5 million would be spent on operation and maintenance cost during the first year of operation of the EEP facilities (Tetra Tech, 2016). Consumable expenditures during operation of EEP facilities in Pennsylvania would be about $519,500. The total estimated ad valorem property tax associated with operation the EEP would be about $85,000 in Pennsylvania per year (see table 4.9.2-4).

West Virginia

Equitrans estimates that it would spend a total of about $9 million on labor, equipment, materials, and services during construction of EEP facilities in West Virginia. About $846,500 would be spent on direct payroll for labor during construction in the state. Payroll taxes would be collected from the workers employed on the project. Based on the size of the workforce, Equitrans estimated that $55,000 in income tax revenues would be generated by construction payroll in the state (see table 4.9.2-5). A total of about 36 jobs would result from EEP construction in West Virginia, including direct, indirect, and induced jobs, generating a total income of $2.1 million (see table 4.9.2-8).

TABLE 4.9.2-8 **Contributions to the Economy of Wetzel County, West Virginia During the Construction Phase of the Equitrans Expansion Project**			
Impact Type/Measure a/	**Jobs b/**	**Income ($ million) c/**	**Output ($ million) c/**
Direct Contributions	21	1.4	3.8
Indirect Contributions	7	0.3	1.0
Induced Contributions	8	0.4	1.2
Totals	**36**	**2.1**	**6.0**

a/ Estimates are for the entire construction period.
b/ Jobs are full-time equivalent for a period of 1 year (1 FTE = 2,080 hours). Direct jobs include those directly employed on-site during construction and workers directly employed by the project and related direct spending elsewhere in the state economy.
c/ Income and output are expressed in millions of dollars in Year 2016 dollars.
Source: Tetra Tech, 2016

Consumable expenditures include materials and equipment purchased, and per diem spending by non-local workers on food and lodging. Equitrans estimated that it would spend a total of $731,500 on consumables during project construction in the state (see table 4.9.2-4). Spending on consumables would also generate tax revenue for West Virginia through state and local sales and use taxes. Equitrans estimates that consumables spending would generate about $43,000 in state sales tax and $272,000 in state use tax (see table 4.9.2-5).

Equitrans would dedicate five existing employees in West Virginia to operate and maintain the EEP facilities, with a total operational direct payroll for labor estimated at $41,000. About $0.08 million would be spent in West Virginia on project-specific operation and maintenance costs during the first year of operation of the EEP facilities in that state. Consumable expenditures during operation of the West Virginia facilities would be $27,300. The total estimated ad valorem property taxes associated with the EEP would be about $107,000 in West Virginia per year (see table 4.9.2-6).

4.9.2.8 Environmental Justice

As mentioned above in section 4.9.1.8, guidance from the CEQ (1997) states that "minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." None of the counties or census blocks crossed by the MVP or the EEP have minority populations exceeding 50 percent nor have minority populations meaningfully greater than the minority population percentage in the respective states.

Low-income communities exist along the route of the MVP. These communities could be affected by construction and operation of the project. Mountain Valley would mitigate for impacts on low-income communities through short-term employment, spending, and generation of tax revenues that would stimulate the local economy, as discussed above in section 4.9.2.7.

As discussed in section 4.9.1.8 above, there are communities that contain vulnerable populations located along the route of the proposed MVP. However, as discussed throughout this EIS, construction and operation of the MVP would not significantly affect the environment. Specifically, water resources and air quality, which may contribute to environmental health risks, are discussed in sections 4.3 and 4.11.1 respectively. Safety risks are discussed in section 4.12. In those sections, we have determined that water resources and air quality would not be significantly affected and that safety risks would be minimal. Therefore, these populations would in turn not be significantly affected.

The MVP is designed to transport natural gas from the production fields of northern West Virginia to the Transco interconnect in central Virginia. Along the way, Mountain Valley selected its pipeline route to take advantage of ridgetop alignments, cross as little federal lands as possible, avoid major waterbodies and wetlands where possible, and avoid major population centers. The pipeline route mostly crosses rural regions with relatively low population densities. By avoiding metropolitan areas, the MVP should reduce impacts on communities with high percentages of minorities, low-income populations, and other vulnerable populations.

The MVP and EEP were designed to be collocated with existing utility rights-of-way to the greatest extent practical. The Commission encourages the collocation of natural gas pipelines with existing rights-of-way to avoid and minimize impacts on the environment. Unlike discrete facilities whose impacts are generally concentrated in one location, a pipeline establishes or expands a narrow corridor over long distances that necessarily traverses a mosaic of ethnic and economic characteristics. Compressor stations associated with a pipeline are anchored by the pipeline corridor and hydraulically bound to a specific segment of the pipeline, with some flexibility within the segment (depending on project-specific conditions).

Based on our review, we determined that low-income populations exist in the MVP and EEP areas; however, impacts from the projects would not disproportionately fall on environmental justice populations. Further, impacts on these populations would not appreciably exceed impacts on the general population.

There is no evidence that the projects would cause significant adverse health or environmental harm to any community with a disproportionate number of monitories, low-income, or other vulnerable populations. The projects would not adversely affect water quality. The compressor stations would operate within federal and state laws and regulations.

4.9.2.9 Jefferson National Forest

Within the Jefferson National Forest, the MVP pipeline route would cross the ANST, which is a popular recreational attraction. Potential socioeconomic impacts of the MVP on the Jefferson National Forest would be primarily related to timber harvesting and recreational activities.

The MVP pipeline route would cross five Rxs in the Jefferson National Forest. Portions of two of the Rxs, 1,900 acres in Rx 4J and 85,600 acres in Rx 8A1, are listed in the LRMP as suitable for timber production. Construction of the MVP would impact 14.1 acres within Rx 4J and 52.4 acres within Rx 8A1, both of which would be less than 0.1 percent of the total area of timber suitable for production in each of the Rxs. During operation of the MVP, a total of 31.1 acres within these two Rxs would be within the permanent right-of-way. Mountain Valley has completed tree surveys of the pipeline route through the National Forest. Mountain Valley is coordinating with the FS to estimate the value of timber that would be removed due to the MVP. Additionally, operation of the MVP would not restrict future timber operations on land outside of the permanent right-of-way.

The only recreational activities that generate revenue for the Jefferson National Forest are fee-based activities such as day-use passes, camping, and cabin rentals. As discussed in section 4.8, the MVP pipeline route would cross the ANST; however, the trail would be crossed using a bore resulting in no direct impacts on use of the trail. No other recreational areas would be directly affected by the MVP. While there may be temporary air and noise impacts due to construction of the pipeline, we do not anticipate these impacts to result in a significant impact on tourism to the forest, and therefore, would not significantly impact any revenue received from these fee-based activities.

4.10 CULTURAL RESOURCES

The NHPA is the linchpin in the federal government's historic preservation program.[115] Section 101 of the NHPA requires the identification of religious and cultural properties in the APE that may be important to Indian tribes that historically occupied or used the project area. As discussed below, it is the obligation of the FERC to consult on a government-to-government basis with Indian tribes that may have an interest in the projects.

Section 106 of the NHPA, as amended, requires that the FERC take into account the effects of its undertakings (including authorizations under Section 7 of the NGA) on historic properties, and afford the ACHP an opportunity to comment. The steps in the process to comply with Section 106, outlined in the ACHP's implementing regulations at 36 CFR 800, include consultations, identification of historic properties, assessment of effects, and resolution of adverse effects.

Mountain Valley and Equitrans, as non-federal Applicants, are assisting the FERC staff in meeting its obligations under Section 106 by providing data, analyses, and recommendations in accordance with Part 800.2(a)(3) and the FERC's regulations at 18 CFR 380.12(f). The FERC remains responsible for all findings and determinations under the NHPA. As the lead federal agency for these projects,[116] the FERC will address compliance with Section 106 on behalf of all the federal cooperating agencies in this EIS. In a letter to the FERC, dated October 20, 2016, the Norfolk District of the COE indicated that it authorizes FERC to conduct Section 106 coordination on its behalf.[117] The FERC will also be the lead federal agency conducting government-to-government consultations with Indian tribes to comply with Section 101 of the 3NHPA, on behalf of the other federal cooperating agencies.

Direct effects are the physical disturbances of an action (e.g., construction, operation, or restoration) on a historic property that occur at the same time and place as the action within the footprint of the physical disturbance. Indirect effects may change the character of the historic property's use or physical features within its setting that contribute to its historic significance and integrity (see also section 4.10.10.1).

4.10.1 General Communications with the Public and Others

We consulted with the West Virginia and Virginia SHPOs, interested Indian tribes, government agencies, and the public regarding potential impacts on historic properties resulting from construction and operation of the MVP and the EEP, as discussed below. In accordance with Parts 800.2(a)(4) and 800.3(c)(3), the FERC is the lead federal agency responsible for consultations with the appropriate SHPOs and interested Indian tribes, and other consulting parties.

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[115] Other federal preservation laws and regulations may also apply to the projects and must be considered by applicable agencies; for example, the Archaeological Resources Protection Act of 1979 applies to federal and tribal lands and must be considered by the FS and BLM prior to an issuance of a Right-of-Way Grant for the proposed projects.

[116] Pursuant to 36 CFR 800.2(a)(2), the EPAct, and the May 2002 *Interagency Agreement on Early Coordination of Required Environmental and Historic Preservation Reviews*.

[117] Filed October 27, 2016 (accession number 20161027-0011).

The Applicants assisted the FERC staff by also communicating with SHPOs, interested Indian tribes, and other government agencies to gather information about cultural resources in the APE.

4.10.1.1 Mountain Valley Project

The FERC sent copies of the MVP NOI issued April 17, 2015, to a wide range of stakeholders, including federal agencies, (such as the ACHP, EPA, COE, NPS, USDOI Bureau of Indian Affairs [BIA]); state agencies and SHPOs; local governments and historical organizations; landowners; and Indian tribes and Native American communities that may have an interest in the project area. The NOI contained a paragraph about Section 106 of the NHPA, and stated that the FERC would use the NOI to initiate consultations with the SHPOs, and to solicit their views, and those of other government agencies, interested Indian tribes, and the public on the project's potential effects on historic properties.

By the end of the scoping period, on June 16, 2015, the FERC had received 392 comments on cultural resources issues filed in the docket. Most of the comments raised general concerns about project impacts on recreational, scenic and geographic sites, and known Historic Districts, including the Jefferson National Forest, ANST, BRP, Peters Mountain, and Cahas Mountain. However, some comments were more specific and raised concerns about impacts on certain individual historic or archaeological sites. Table 4.10.1-1 lists some of the specific cultural resources concerns raised during scoping.

TABLE 4.10.1-1

Specific Cultural Resource Concerns Raised During Scoping for the Mountain Valley Project a/

Letter Date	Entity or Individual	Location	Concerns
11/27/14	Douglas Martin	Newport, VA	Impacts on the Greater Newport Rural Historical District and three historic covered bridges in the Newport area, Giles County, VA.
1/22/15	Richard Ettelson	Waiteville, WV	Cultural attachment in Monroe County, WV and Giles and Craig Counties, VA.
2/1/15	Carl Zipper	Blacksburg, VA	Impacts on the Greater Newport Rural Historic District in Giles County, VA; North Fork Valley Rural Historic District in Montgomery County, VA; Cahas Mountain Rural Historic District in Franklin County, VA; and Bowman Farm in Franklin County, VA.
2/2/15	Stephen Whitehurst	Newport, VA	Impacts on the Greater Newport Rural Historic District and Newport Historic District, Giles County, VA.
2/3/15	John Bernard	Raleigh, NC	Impacts on the Cahas Mountain Rural Historic District in Franklin County, VA.
2/3/15	Beth Garst	Boones Mill, VA	Impacts on the Cahas Mountain Rural Historic District, Franklin County, VA.
2/16/15	Kristin Peckman	Roanoke, VA	Pre-contact archaeological sites along Teels Creek, Franklin County, VA.
3/15/15	Tunis McElwain	Bokeelia, FL	McElwain Cemetery, Webster County, WV.

TABLE 4.10.1-1 (continued)

Specific Cultural Resource Concerns Raised During Scoping for the Mountain Valley Project a/

Letter Date	Entity or Individual	Location	Concerns
3/17/15	Marvin Bryant	Chatham, VA	100-year-old farm containing a slave cemetery, Pittsylvania County, VA.
3/24/15	John Pitt	Red Oak Community	Josiah Whitney Cemetery.
3/29/15	Richard Ettelson	Waiteville, WV	Alternative 110 may cross historic Potts Valley Railroad, Monroe County, WV.
4/9/15	Carl Zipper	Blacksburg, VA	Swann Compressor Station would be located within the North Fork Valley Rural Historic District, Montgomery County, VA.
4/23/15	Roberta Johnson	Bent Mountain, VA	Pre-contact archaeological sites along Roanoke River, Montgomery County, VA.
5/13/15	Elise Keaton	Lewisburg, WA	Pre-contact archaeological sites along Greenbrier River near Pence Springs, Summer County, WV.
5/18/15	David Hancock	Wytheville, VA	Swann Compressor Station would be located within the North Fork Valley Rural Historic District, Montgomery County, VA.
5/18/15	Janet Hancock	Wytheville, VA	Swann Compressor Station would be located within the North Fork Valley Rural Historic District, Montgomery County, VA.
6/3/15	Kay Offutt	Catawba, VA	Indian mound on Craig Creek along Alternative 110J.
6/8/15	Nellie Keffer	Craig County, VA	Historic Ross Cemetery and Cumberland Gap Trail.
6/10/15	Carl Absher	Blacksburg, VA	Historic Griffith John Cabin, Wilderness Road, Civil War Cemetery, and Johnsville Old German Baptist Meetinghouse.
6/15/15	Patti Allman	Catawba, VA	Audie Murphy Memorial is an historic landmark on Brush Mountain, Montgomery County, VA.
6/15/15	Tina Badger	Elliston, VA	Cemetery close to Alternative 110. Historic Bennett's Mill and McDonald Mill in Catawba Valley.
6/15/15	Linda Sink	Blacksburg, VA	Pumping Station in Catawba Valley would be within the North Fork Valley Rural Historic District, Montgomery County, VA.
6/15/15	Barbara Rasmussen	Monroe County, WV	Gap Valley WV is eligible for the NRHP.
6/16/15	Nan Gray	Newport, VA	Along Alternative 110 in Craig County VA there are 185 cemeteries, 54 historic ruins, 283 old homes, 4 old roads, and 479 archaeological sites.
6/16/15	Kevin Bartholomew	Westerville, OH	Pipeline route in Monroe County, WV may go through historic family cemetery.
6/16/15	Jean Clark	Olathe, CO	Johnson family cemetery dating to 1793 in Monroe County, WV.
6/16/15	Greater Newport Rural Historic District Committee	Newport, VA	Impacts on the Greater Newport Rural Historic District, Giles County, VA; North Fork Valley Rural Historic District, Montgomery County, VA; and Cahas Mountain Rural Historic District, Franklin County, VA.

a/ The official scoping period began on April 17, 2015 and concluded on June 16, 2015.

Mountain Valley no longer is proposing to place a new compressor station in the Catawba Valley in Montgomery County, Virginia, or within the North Fork Valley Rural Historic District. As explained in section 3 of this EIS, we did not recommend that the pipeline route be changed to Alternative 110 or its variations. The proposed pipeline route does not cross through the Gap Valley in West Virginia, and goes through less than 2 miles in Craig County, Virginia.

The project would have no effect on the Cahas Mountain Rural Historic District because that Historic District is located about 1.5 miles away from the currently proposed pipeline route. The proposed pipeline route is adjacent to, but would not cross the Newport Historic District in Giles County, Virginia. However, the proposed pipeline route would cross through the NRHP-listed North Fork Valley Rural Historic District in Montgomery County, Virginia, and the Greater Newport Rural Historic District in Giles County, Virginia. Later in this section, we discuss potential project effects on those Historic Districts. Cultural attachment in the Peter Mountain area is also discussed later in this section. Additionally, later in this section, the results of archaeological surveys at the crossing of the Greenbrier River near Pence Springs, Summers County, West Virginia, at the crossing of Teels Creek in Franklin County, Virginia, and at the Roanoke River in Montgomery County, Virginia are discussed.

In response to our draft EIS, issued on September 16, 2016, we received about 429 comments on cultural resources issues by the end of the comment period on December 22, 2016. We address individual comments in appendix AA of this final EIS.

In a letter dated December 22, 2016, the National Trust for Historic Preservation commented on the draft EIS. We respond to those comments in appendix AA of this final EIS. Members of the public and local historical organizations reported on a number of historic or archaeological sites in the project area, listed on table 4.10.1-2. Some of the sites on the table below were previously identified during scoping, and are listed on table 4.10.1-1 above. Some sites in table 4.10.1-2 were identified in comments on the draft EIS. We have estimated the distance from the pipeline route filed on October 14, 2016 to each individual site, based on data filed by Mountain Valley on January 19, 2016 and February 17, 2017; and made an assessment of project effects. Table 4.10.1-2 excludes Historic Districts in the project area, which are discussed later in this section.

The pipeline route would cross previously recorded archaeological sites adjacent to Hungards Creek and the Greenbrier River near Pence Springs in Summers County, West Virginia, that are discussed later in this section. The Wilderness Road would be crossed at I-81. The project would have no adverse effects on this modern highway.

TABLE 4.10.1-2

Cultural Resources Identified by the Public in the Vicinity of the Mountain Valley Project a/ and the FERC Staff's Evaluation of Potential Project Effects

Site/Name/Number	County/State	NRHP Evaluation	Distance to Pipeline b/	Potential Project Effects (reason)
Josiah Whitney Cemetery	Webster, WV	Unknown	Unknown c/	Unknown
McElwain Cemeteries	Webster, WV	Unknown	0.7 mile	No effect (outside direct APE)
McElwain Historic Houses	Webster, WV	Unknown	Unknown d/	No effect (outside APE)
1852 Beaver Gist Mill (NR#01000776)	Nicholas, WV	NRHP-listed	0.2 mile	No adverse effect (inside indirect APE – but outside construction right-of-way)
Civil War camp at Ford Hollow	Greenbrier, WV	Not evaluated	1.2 miles	No effect (outside indirect APE)
Bartholomew Cemetery	Summers, WV	Unknown	Unknown c/	Unknown
Hungards Creek archaeological sites (46SU239, SU719, & SU724)	Summers, WV	46SU239 - Unevaluated 46SU719 – Not eligible 46SU724 – Not eligible	Crosses	No effect on site 46SU239 (avoided) No effect on sites 46SU719 and 46SU724 (not eligible)
Greenbrier River at Pence Springs archaeological sites (46SU147, SU163, SU722, SU725, SU738, SU739, & SU740)	Summers, WV	46SU147 – Unevaluated 46SU163 - Not re-located 46SU738 – Not eligible 46SU739 – Not eligible	Crosses	No effect on sites 46SU147, 46SU722, 46SU725, & 46SU740 (avoided) No effect on sites 46SU738 & 46SU739 (not eligible)
Berkley House at Kinney Knob	Summers, WV	Unknown	5,000 feet	No effect (outside APE)
Samuel Gwinn Planation	Summers, WV	Unknown	6,691 feet	No effect (outside APE)
Historic Road on Oak Hill Farm	Monroe, WV	Unknown	Unknown	Unknown e/
Johnson Crossroads Cemetery	Monroe, WV	Unknown	3.1 miles	No effect (outside indirect APE)
Cook's Old Mill	Monroe, WV	NRHP-listed	0.5 mile	No adverse effect (inside indirect APE – but outside construction right-of-way)
Cook's Fort	Monroe, WV	Not evaluated	1.3 miles	No effect (outside indirect APE)

TABLE 4.10.1-2 (continued)

Cultural Resources Identified by the Public in the Vicinity of the Mountain Valley Project a/ and the FERC Staff's Evaluation of Potential Project Effects

Site/Name/Number	County/State	NRHP Evaluation	Distance to Pipeline b/	Potential Project Effects (reason)
Wood's Fort	Monroe, WV	Not evaluated	2.5 miles	No effect (outside indirect APE)
Red Sulphur Springs Resort	Monroe, WV	Not evaluated	2.3 miles	No effect (outside indirect APE)
McClung's Mill	Monroe, WV	Not evaluated	8.2 miles	No effect (outside indirect APE)
Reed's Grist Mill	Monroe, WV	NRHP-listed	12.8 miles	No effect (outside indirect APE)
Hanging Rock Observatory on Peters Mountain	Monroe, WV	Not evaluated	12.0 miles	No effect (outside indirect APE)
Elmwood	Monroe, WV	NRHP-listed	8.4 miles	No effect (outside indirect APE)
Old Sweet Spring Resort	Monroe, WV	NRHP-listed	22.8 miles	No effect (outside indirect APE)
Sinks Grove	Monroe, WV	Not evaluated	8.3 miles	No effect (outside indirect APE)
Old Rehoboth Church	Monroe, WV	Not evaluated	10.3 miles	No effect (outside indirect APE)
New Zion Church	Monroe, WV	Not evaluated	10.0 miles	No effect (outside indirect APE)
Waiteville Christian Church	Monroe, WV	Not evaluated	10.0 miles	No effect (outside indirect APE)
Potts Valley Railroad	Monroe, WV	Not evaluated	8.7 miles	No effect (outside indirect APE)
Indian Creek Bridge	Monroe, WV	NRHP-listed	7.0 miles	No effect (outside indirect APE)
Laurel Creek Bridge	Monroe, WV	NRHP-listed	4.4 miles	No effect (outside indirect APE)
Maury Johnson Property – Isolated finds 46ME293, 294, 295	Monroe, WV	IFs 46ME293, 294, & 295 - Not eligible	Crosses	No effect (IFs not eligible)
Cumberland Gap Trail	Craig, VA	Unknown	0.5 mile	No adverse effect (inside indirect APE – but outside construction right-of-way)
Audie Murphy Memorial	Montgomery, VA	Unknown	7.5 miles	No effect (outside indirect APE)
Griffith John Cabin	Montgomery, VA	Unknown	Unknown c/	Unknown
Wilderness Road	Montgomery, VA	Unknown	Crosses	No adverse effect (now modern I-81)
Civil War Cemetery	Montgomery, VA	Unknown	Unknown c/	Unknown

TABLE 4.10.1-2 (continued)

Cultural Resources Identified by the Public in the Vicinity of the Mountain Valley Project a/ and the FERC Staff's Evaluation of Potential Project Effects

Site/Name/Number	County/State	NRHP Evaluation	Distance to Pipeline b/	Potential Project Effects (reason)
Johnsville Old German Baptist Meetinghouse	Montgomery, VA	Unknown	4.2 miles	No effect (outside indirect APE)
Kinzie houses	Giles, VA	Unknown	0.5 mile 0.2 mile	No adverse effect (inside indirect APE – but outside construction right-of-way)
Archaeological sites on Kinzie farm	Giles, VA	Unknown	Unknown c/	Unknown
1912 Red Covered Bridge – Link Farm (35-412-245)	Giles, VA	Contributing element to NRHP-listed Greater Newport Rural Historic District	337 feet	No adverse effects (inside indirect APE – but outside construction right-of-way)
Willow Springs 1870 McWorter House (35-412-61)	Giles, VA	Contributing element to NRHP-listed Greater Newport Rural Historic District	1,820 feet	No adverse effects (inside indirect APE – but outside construction right-of-way)
1865 Dameron House (80-487)	Roanoke, VA	Contributing element to NRHP-Eligible Bent Mountain Rural Historic District	1,940 feet	No adverse effects (inside indirect APE – but outside construction right-of-way)
Archaeological sites along Teels Creek g/	Franklin , VA	Unknown	Unknown c/	Unknown
Archaeological sites on Angle property (44FR398, 399, 400, & 404)	Franklin, VA	Not eligible f/	Crosses	No effect (not eligible)
Bowman Farm	Franklin, VA	Unknown	0.7 mile	No effect (outside indirect APE)
Slave Cemetery	Pittsylvania, VA	Unknown	Unknown c/	Unknown
Archaeological Sites Near Crossing of Pigg River – 44PY420 & 437	Pittsylvania, VA	44PY420 & 437 both Not Eligible	44PY420 – 169 feet; 44PY437 – 85 feet	No effect (not eligible)

a/ Excludes Historic Districts that are listed in appendix V.

b/ Distance based on proposed route filed October 14, 2016, revised table filed by Mountain Valley on October 21, 2016, and February 17, 2017 filing.

c/ We have insufficient data to locate the site in relation to the MVP pipeline.

d/ In a filing on February 17, 2017, Mountain Valley stated that the McElwain properties were surveyed for cultural resources between about MPs 97.7 and 98.1 in Webster County, West Virginia, and no historic buildings were identified in the APE.

e/ In a filing on February 17, 2017, Mountain Valley stated that they had not yet surveyed the Oak Hill Farm, located between about MPs 188.3 and 189.2 in Monroe County, West Virginia.

f/ In a filing on February 17, 2017, Attachment DR4 Cultural Resources 19, Mountain Valley stated that the archaeological sites on the property owned by Mr. Angle were described in the survey report by Reeve et al.(December 2016).

g/ Sites identified near Teels Creek are listed on table 4.10.8-1 below in this section.

Consulting Party Status

Twenty-three entities or individuals wrote letters to the FERC requesting to be consulting parties to the Section 106 compliance process (see table 4.10.1-3 below). This does not include the SHPOs of Pennsylvania, West Virginia, and Virginia, who are consulting parties in accordance with Part 800.2(c)(1). Likewise, the federal landowning agencies (COE, FS, and BLM) are automatically considered to be consulting parties without having to make written requests. The ACHP is also a consulting party, because it requested to participate in the Section 106 process, in accordance with Part 800.2(b)(1). We accepted the requests of local governments, including the Roanoke County Board of Supervisors, Giles County Board of Supervisors, and Montgomery County Board of Supervisors, granting them consulting party status per Part 800.2(c)(3) and 800.3(f)(1). In a letter dated December 22, 2016, the NPS requested to be a consulting party for the MVP. Because of its demonstrated interest in the undertaking, and legal responsibilities as the manager of the ANST and BRP, which would both be crossed by the proposed MVP pipeline route, we grant the NPS request. In a letter dated February 7, 2017, the ATC requested to be a consulting party to the Section 106 process. Because the ATC participates in a unique partnership with the NPS to manage the ANST, we grant its request.

TABLE 4.10.1-3

Consulting Party Requests and Data Conveyance

Entity/Individuals	Request Date	FERC Response Dates	Dates Mountain Valley Conveyed Reports a/
Greater Newport Rural Historic District Committee	November 15, 2014	February 18, 2016	March 8 and 28, May 25, July 22, and November 2, 2016,and January 5, and February 2017
Barbara Rasmussen	May 23, 2016	February 18, 2016	N/A
Preservation Virginia	June 10, 2015	February 18, 2016	March 8 and 28, May 25, July 22, and November 2, 2016, and January 5, and February 2017
Summers County Historic Landmark Commission	June 11, 2015	February 18, 2016	March 8 and April 12, 2016, and January 4, and February 2017
Preserve Montgomery County	June 15, 2015	February 18, 2016	March 28, May 25, July 22, and November 2, 2016, and February 2017
Roanoke Valley Preservation Foundation	June 16, 2015	February 18, 2016	March 28 and November 2, 2016, and January 5 and February 2017
Committee for Appalachian and Piedmont Preservation	June 16, 2015	February 18, 2016	March 8 and 28 May 25, July 22, and November 2, 2016, and January 5 and February, 2017
Roanoke County Board of Supervisors	June 30, 2015	February 18, 2016	March 28 and November 2, 2016, and January 5 and February, 2017

TABLE 4.10.1-3 (continued)

Consulting Party Requests and Data Conveyance

Entity/Individuals	Request Date	FERC Response Dates	Dates Mountain Valley Conveyed Reports a/
Pittsylvania County Historical Society	August 27, 2015	February 10, 2016	March 8 and 28, July 22, and November 2, 2016
Association for the Study of Archaeological Properties	August 27, 2015	February 18, 2016	March 8 and 28, July 22, and November 2, 2016
Giles County Board of Supervisors	February 18, 2016	March 2, 2016	March 8 and 28, May 25, July 2, and November 2, 2016 and January 5, and February 2017
Michael Williams, Miller Williams, Frances Williams Collins and Tony Williams	March 10, 2016	April 8, 2016, May 17, 2017, and this final EIS	N/A
Jerry and Jerolyn Deplazes	March 10, 2016	April 8, 2016, May 17, 2017, and this final EIS	N/A
Joel and Ann Rader	March 23, 2016	April 8, 2016	N/A
Clarence and Karolyn Givens	March 23, 2016	April 8, 2016, May 17, 2017, and this final EIS	N/A
Newport Mount Olivet Methodist Church	March 23, 2016	April 8, 2016	N/A
Nathan Deplazes and Shannon Lucas	March 23, 2016	April 8, 2016, May 17, 2017, and this final EIS	N/A
Montgomery County Board of Supervisors	March 30, 2016	April 14, 2016	May 4, 2016
Newport Community Action Committee	April 18, 2016	May 19, 2016	N/A
John Snyder	November 2, 2016	This final EIS	N/A
Advisory Council on Historic Preservation	December 14, 2016	This final EIS	N/A
National Park Service	December 22, 2016	This final EIS	August 30 and November 14, 2016
Appalachian Trail Conservancy	February 7, 2017	This final EIS	N/A

N/A = Not Applicable (because either reports were not specifically requested or confidentiality agreements not signed)

a/ See July 18, 2016 filing by Mountain Valley, in response to FERC's June 28, 2016 EIR#3 Cultural Resources Question 11, Attachment DR-3; and its February 9, 2017 filing, Table 6-1, Attachment DR4 Cultural Resources 6, in response to FERC's January 26, 2017 Post-DEIS EIR.

In response to a letter from the ACHP dated December 21, 2016, we reconsidered the consulting party status of four affected landowners who have historic properties within the Greater Newport Rural Historic District near where the MVP pipeline crosses. We therefore are granting consulting party status to Francis Collins, Jerry and Jerolyn Deplazes, Clarence and Karolyn Givens, and Shannon Lucus, in accordance with Part 800.2(c)(5).

In keeping with past FERC practice, we denied the other requests to become consulting parties, because those entities or individuals did not demonstrate a direct legal or economic relationship to the undertaking. However, the Commission would consider any views from the public regarding potential effects on historic properties, per Part 800.2(d), in review of the information in the public record for these proceedings and as disclosed in the draft EIS on the status of the FERC's compliance with Section 106. We believe that our existing procedures allow for comments on cultural resources information without consulting party status.

Pursuant to Section 304 of the NHPA and the Commission's regulations at 18 CFR 380.12(f)(4), information about the location, character, and ownership of archaeological sites was filed in the FERC dockets by the Applicants as "privileged." Mountain Valley asked entities that sought access to archaeological reports filed as privileged to sign confidentiality agreements before receiving copies of reports. Mountain Valley documented that it sent copies of archaeological investigation reports to all entities that requested them and signed the confidentiality agreement, including the Summers County Historic Landmark Commission, Preservation Virginia, Greater Newport Rural Historic District Committee, Roanoke Valley Preservation Foundation, Preserve Montgomery County, Committee for Appalachian and Piedmont Preservation, Association for the Study of Archaeological Properties, Pittsylvania County Historical Society, Giles County, Roanoke County, and Montgomery County (see table 4.10.1-3).

4.10.1.2 Equitrans Expansion Project

The FERC's NOI for the EEP, issued August 11, 2015, was mailed to a wide range of stakeholders, including federal, state, and local government agencies; Indian tribes; regional environmental groups and non-governmental organizations; affected landowners; and local libraries and newspapers. During the scoping period for the EEP, which ended September 14, 2015, the FERC received one comment on cultural resources issues, from the PASHPO, discussed below. We received no comments about cultural resources related to the EEP in response to the issuance of our draft EIS.

4.10.2 Communications with Local Governments and Historical Organizations

4.10.2.1 Mountain Valley Project

In an April 17, 2015 letter to Tetra Tech (one of Mountain Valley's contractors), the West Virginia Division of Culture and History (WVDCH), representing the West Virginia SHPO, requested that Certified Local Governments (CLG) and regional historical organizations should be contacted and informed about the project. In a letter to the FERC, dated June 2, 2015, the Virginia Department of Historic Resources (VADHR), representing the Virginia SHPO, indicated that the FERC should coordinate with local governments, Indian tribes, other consulting parties, and the public in accordance with Part 800. Table 4.10.2-1 (below) lists all the local governments and archaeological and historical organizations on our environmental mail list that were sent copies of our April 17, 2015 NOI for the MVP, and sent copies of our September 16, 2016 draft EIS. Consulting parties are discussed in the sub-section (4.10.1) above; government-to-government consultations with Indian tribes are discussed below in sub-section 4.10.5; and outreach with the general public is addressed in section 1.4 of this EIS.

TABLE 4.10.2-1

Local Governments and Historical Organizations
Sent FERC's Notice of Intent and Draft Environmental Impact Statement
for the Mountain Valley Project

Government/Organization	Response/Comments Dates
Counties/State	
Wetzel, WV	No comments filed to date
Harrison, WV	No comments filed to date
Doddridge, WV	No comments filed to date
Lewis, WV	No comments filed to date
Braxton, WV	No comments filed to date
Webster, WV	No comments filed to date
Nicholas, WV	No comments filed to date
Greenbrier, WV	No comments filed to date
Fayette, WV	No comments filed to date
Summers, WV	No comments filed to date
Monroe, WV	Comments filed 1/12/15, 2/23/15, 5/19/15, 8/17/16
Giles, VA	Comments filed 2/3/15, 5/8/15, 10/4/15, 10/22/15, 10/27/15, 11/23/15, 2/18/16, 3/16/16, 4/6/16, 5/9/16, 5/16/16, 8/17/16, 9/9/16 11/7/16, 11/14/16, 12/9/16, 12/22/16
Craig, VA	Comments filed 4/23/15, 4/28/15, 4/29/15, 7/23/15, 9/3/15, 10/9/15, 10/15/15, 11/5/15, 11/23/15, 12/8/15, 6/30/16, 11/8/16, 11/14/16, 12/14/16, 12/19/16, 12/21/16, 12/27/16
Montgomery, VA	Comments filed 6/30/16, 11/22/16, 12/22/16
Roanoke, VA	Comments filed 4/9/15 6/12/15, 6/16/15, 6/30/15, 11/24/15, 12/22/16
Franklin, VA	Comments filed 6/17/15, 10/21/15, 10/19/16, 12/21/16
Pittsylvania, VA	No comments filed to date
Cities/State	
Bridgeport, WV	No comments filed to date
Clarksburg, WV	No comments filed to date
Hinton, WV	No comments filed to date
New Martinsville, WV	No comments filed to date
Richwood, WV	No comments filed to date
Weston, WV	No comments filed to date
Towns/State	
Addison, WV	No comments filed to date
Camden-on-Gauley, WV	No comments filed to date
Cowen, WV	No comments filed to date
Flatwoods, WV	No comments filed to date
Meadow Bridge, WV	No comments filed to date
Peterstown, WV	Comments filed 12/22/14
Quinwood, WV	No comments filed to date

TABLE 4.10.2-1 (continued)

Local Governments and Historical Organizations Sent FERC's Notice of Intent and Draft Environmental Impact Statement for the Mountain Valley Project

Government/Organization	Response/Comments Dates
Rainelle, WV	No comments filed to date
Rupert, WV	No comments filed to date
Summersville, WV	No comments filed to date
Sutton, WV	No comments filed to date
Union, WV	No comments filed to date
West Union, WV	No comments filed to date
Blacksburg, VA	12/16/16
Boones Mill, VA	Comments filed 12/11/14
Local Historical or Archaeological Organizations/State	
Monroe County Historical Society, WV	Comments filed 6/24/15
Cahas Mountain Rural Historic District, VA	Comments filed 11/23/15
Giles County Historical Society, VA	No comments filed to date
Greater Newport Rural Historic District Committee, VA	Comments filed 6/16/15, 6/17/15, 11/17/15, 3/4/16, 5/16/16, 8/30/16, 10/24/16, 2/21/17
Pittsylvania County Historical Society, VA	Comments filed 9/1/15, 11/27/15
Preservation Virginia, VA	Comments filed 6/10/15, 12/2/15, 12/22/16

During the pre-filing period, we received comments from the Summers County Historic Landmark Commission, Monroe County Historical Society, and the Greater Newport Rural Historic District Committee. In a letter dated May 22, 2015, the Summers County Historic Landmark Commission stated that the previously recorded and NRHP-listed Pence Spring Hotel Historic District is located about 3,000 feet away from the proposed MVP pipeline. In a letter dated June 11, 2015, the Monroe County Historical Society listed historic and archaeological sites in the county (see table 4.10.2-1 above).

In a letter dated November 14, 2014, the Greater Newport Rural Historic District Committee stated that the proposed pipeline route would cross the NRHP-listed Greater Newport Rural Historic District. The Committee claimed that Mountain Valley had not identified the organization as a stakeholder and had not yet communicated with the Committee about potential project effects on the district. The Committee requested to be a consulting party in the Section 106 compliance process, and suggested that alternatives be considered to avoid the Historic District. In response to our MVP NOI, the Committee filed additional comments on June 16, 2015, stating that it may not be possible for Mountain Valley to mitigate impacts on historic properties within the Historic District, and listed contributing resources that may be affected by the MVP.

Post-application, Monroe County, the Greater Newport Rural Historic District Committee, Cahas Mountain Rural Historic District, Craig County, Giles County, Montgomery County, Roanoke County, Pittsylvania County Historical Society, and the Association for the Study of Archaeological Properties filed motions to intervene in this proceeding. In its motion to intervene, dated November 17, 2015, the Greater Newport Rural Historic District Committee stated that the proposed pipeline route and the AEP-Newport Variation would have adverse effects on the Greater Newport Rural Historic District. On March 4, 2016, the Greater Newport Rural Historic District Committee filed additional comments, and objected to Mountain Valley's definition of the APE. The Committee claims that data about effects on the Historic District are incomplete. However, those comments were made prior to Mountain Valley's March 9, 2016 filing of its historic architectural survey report covering Giles County, Virginia, where the Greater Newport Rural Historic District is located (see discussion below).

Mountain Valley sent a letter on March 23, 2016 to the Greater Newport Rural Historic District Committee offering to meet with the Committee to address its concerns. On May 16, 2016, the Greater Newport Rural Historic District Committee filed comments on Mountain Valley's historic architectural survey report covering Giles County (Turco et al., March 2016). The Committee contended that the report contained errors and omissions regarding historic structures in the indirect and direct APE within the Greater Newport Rural Historic District. The VADHR and Mountain Valley's historical contractor (New South Associates) had previously agreed to survey methodologies whereby previously recorded resources would not be re-inventoried within existing Historic Districts. At our request, Mountain Valley prepared an addendum report that included new mapping and updated tables identifying the resources in the APE along the pipeline route through the Greater Newport Rural Historic District (Turco, June 2016). That report was accepted by the Virginia SHPO on August 4, 2016.

In a letter to the FERC dated August 30, 2016, an attorney representing the Greater Newport Rural Historic District Committee filed a copy of a report authored by Thomas F. King.[118] This report was filed after staff had written the draft EIS, so it was not addressed in that document. Dr. King mentioned several Historic Districts (Coles-Terry Rural Historic District, Big Stony Creek Rural Historic District, Newport Historic District, Greater Newport Rural Historic District, North Fork Valley Rural Historic District, and Cahas Mountain Rural Historic District) in the vicinity of the MVP pipeline, that were discussed in the draft EIS and below. As stated above, the MVP pipeline would be about 1.5 miles away from the Cahas Mountain Rural Historic District, and so that Historic District would not be affected by the project. As indicated below, the MVP pipeline would be outside the boundaries for the Newport Historic District.

Dr. King also mentioned the concept of "cultural attachment," and the study of this concept as it relates to the Peters Mountain area conducted for Mountain Valley by Applied Cultural Ecology (ACE, Bengston, et al., 2016). The concept of cultural attachment and the findings of ACE were discussed in the draft EIS and below. Dr. King appears to agree with the FERC staff and ACE that the Peters Mountain area could be considered to be a rural historic cultural landscape. Further, in Dr. King's opinion, the Greater Newport Rural Historic District and the Big Stony Creek Rural Historic District also constitute historic rural landscapes, and may represent traditional cultural places.[119] As previously discussed, those Historic Districts are already either listed on the

[118] King, T.F. August 2016. "Traditional Cultural Places in Appalachian Virginia and the Mountain Valley Pipeline" (accession number 20160830-5133).

[119] As defined in McCelland, L., et al. 1999. "Guidelines for Evaluating and Documenting Rural Historic Landscapes, *National Register Bulletin* 30; and Parker, P. and T. King. 1998. "Traditional Cultural Properties: Guidelines for Evaluation," *National Register Bulletin* 38.

NRHP or found eligible for listing. Dr. King indicated that the MVP could have adverse effects on the Greater Newport Rural Historic District, other Historic Districts, or traditional cultural places. We addressed effects on Historic Districts in the draft EIS and below. On February 17, 2017, Mountain Valley filed a response to Dr. King's statements. In that filing, Mountain Valley provided additional information about the Coles-Terry Rural Historic District, and indicated that it used its Criteria of Effects Assessment developed with the VADHR to assess effects on Historic Districts. Mountain Valley pointed out that Dr. King asserted that "effects are judged with reference to specific places within the districts, not with reference to the districts themselves."

The Greater Newport Rural Historic District Committee filed additional comments on October 24, 2016.[120] Many of those comments were addressed in the addendum to the historic archaeological survey report for Giles County (Turco, June 2016) filed by Mountain Valley with the FERC on June 24, 2016, and discussed below. We also respond to comments on our draft EIS in appendix AA of this final EIS. On March 6, 2017, the Greater Newport Rural Historic District Committee filed additional comments about Hybrid Alternative 1A. We analyze that alternative route in section 3 of this final EIS.

In a filing on February 21, 2017, the Greater Newport Rural Historic District Committee offered additional comments about potential impacts associated with Mountain Valley's October 2016 pipeline route modifications on resources within the Greater Newport Rural Historic District and the Newport Historic District. This final EIS takes into consideration the October 2016 pipeline modifications adopted by Mountain Valley into its proposed route. Impacts on Historic Districts are discussed below.

On May 9, 2016, the Board of Supervisors for Giles County, Virginia requested clarification about the distance between the pipeline and specific resources within the Greater Newport Rural Historic District.[121] J. Daniel Pezzoni's report, appended to that filing, indicated that in his opinion the Newport Mount Olivet United Methodist Church (35-412-28), C.A. Hardwick House (35-151-15), Newport High School (35-412-65), Sinking Creek Furnace (35-412-36), Red Covered Bridge (35-412-245), Reynolds Farm Covered Bridge (35-412-22), Dowdy-Reynolds Farm (35-412-37), and Leffel Farm (35-412-11) are properties that have the potential to be individually listed in the NRHP. Given that the Newport Historic District and the Greater Newport Rural Historic District, which contain the resources mentioned by Mr. Pezzoni, are already listed in the NRHP, his observations appear to be moot. In a May 20, 2016 response to the Giles County letter, we stated that all of the structures listed by Pezzoni, except the Fidel Smith Store (35-412-237), are outside of the direct APE.[122] We discuss potential project-related effects on the Newport Historic District and the Greater Newport Rural Historic District below in Section 4.10.10 (Environmental Consequences).

Preservation Virginia also filed post-application comments. In a filing on December 2, 2015, Preservation Virginia claimed that Mountain Valley's architectural survey report overlooked

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[120] See accession number 20161024-5368.

[121] The filing was made by a law firm on behalf of Giles County and contained the following report: Pezzoni, J.D. April 2016. "Potentially Individual National Register-eligible Resources in the Greater Newport Rural Historic District," Landmark Preservation Associates (accession number 2016509-5155).

[122] See accession number 20160520-3032.

important historic sites and cemeteries that may be within the pipeline right-of-way. However, no specific sites or locations missed were mentioned in that letter. Without specific site locations, the FERC staff cannot address those comments.

After the issuance of our draft EIS on September 16, 2016, we received comments on cultural resources issues from multiple local organizations. Preserve Roanoke, in a letter dated December 21, 2016, provided comments about the Blue Ridge Historic District, Coles-Terry Rural Historic District, and the Bent Mountain Rural Historic District. A December 19, 2016 letter from Preserve Bent Mountain commenting on the draft EIS presented the opinion that the Bent Mountain community should be considered for its cultural attachment to land. Preservation Virginia, in a letter dated December 21, 2016, commented on historic architectural and archaeological sites in Pittsylvania County, Virginia. The Greater Newport Rural Historic District Committee filed comments on the draft EIS on December 21, 2016. We respond to comments on the draft EIS in appendix AA of this final EIS, and discuss cultural resources issues below.

In a filing on January 19, 2016, Mountain Valley indicated that it would contact local governments, CLGs, and local historical organizations in West Virginia, as requested by the WVDCH. In a filing on February 17, 2017, Mountain Valley provided a list of local government agencies and historical organizations in West Virginia that it contacted (see table 4.10.2-2 below). In virtually every case, the contacts consisted of Mountain Valley sending the entities copies of its project newsletters, dated between March 30, 2015 and December 19, 2016. The Summers County Historic Landmark Commission was the only CLG that Mountain Valley communicated with; with three conversations with Commission President Stephen Trail documented between March 8 and December 23, 2016. The Summers County Historic Landmark Commission and the Monroe County Historical Society (mentioned above) were the only local historical organizations in West Virginia to file comments with the FERC. The Monroe County Board of Supervisors and the town of Peterstown also filed with the FERC comments about the MVP (see table 4.10.2-1 above).

TABLE 4.10.2-2

Local Governments, Agencies, and Historical Organizations in West Virginia Contacted by Mountain Valley Between March 30, 2015 and December 23, 2016

Local Governments, Agencies, Organizations	Comments Placed into the FERC Docket
Doddridge County Economic Development Authority	No comments filed during this time period
Lewis County Economic Development Authority	No comments filed during this time period
Braxton County Commission	No comments filed during this time period
Braxton County Economic Development Authority	No comments filed during this time period
Camden-on-Gauley City Council	No comments filed during this time period
Charleston Regional Chamber of Commerce	No comments filed during this time period
City of Bridgeport	No comments filed during this time period
City of Clarksburg	No comments filed during this time period
City of Hilton	No comments filed during this time period
City of Richwood	No comments filed during this time period
City of Weston	No comments filed during this time period
Doddridge County Commission	No comments filed during this time period
Fayette County Commission	No comments filed during this time period
Greater Bluefield Chamber of Commerce	No comments filed during this time period
Greenbrier County Commission	No comments filed during this time period
Greenbrier Valley Economic Development Authority	No comments filed during this time period
Harrison County Commission	No comments filed during this time period
Harrison County Chamber of Commerce	No comments filed during this time period
Harrison County Development Authority	No comments filed during this time period
Lewis County Commission	No comments filed during this time period
Lewis County Chamber of Commerce	No comments filed during this time period
Monroe County Commission	Comments filed 11/25/15, 5/20/15, 5/21/15, 8/22/16
Nicholas County Commission	No comments filed during this time period
Richwood Area Chamber of Commerce	No comments filed during this time period
Summers County Commission	Comments filed 6/16/15, 3/14/16, 4/19/16
Summersville Chamber of Commerce	No comments filed during this time period
Town of Addition	No comments filed during this time period
Town of Cowen	No comments filed during this time period
Town of Flatwoods	No comments filed during this time period
Town of Meadow Bridge	No comments filed during this time period
Town of Peterstown	No comments filed during this time period
Town of Quinwood	No comments filed during this time period
Town of Rainelle	No comments filed during this time period
Town of Rupert	No comments filed during this time period
Town of Summersville	No comments filed during this time period
Summers County Historic Landmark Commission	Comments filed 5/22/15, 6/11/15, 6/8/15, 6/16/15
Town of Sutton	No comments filed during this time period

TABLE 4.10.2-2 (continued) **Local Governments, Agencies, and Historical Organizations in West Virginia Contacted by Mountain Valley Between March 30, 2015 and December 23, 2016**	
Local Governments, Agencies, Organizations	**Comments Placed into the FERC Docket**
Town of Union	Comments filed 6/9/15
Town of West Union	No comments filed during this time period
Webster County Commission	No comments filed during this time period
Webster County Economic Development Authority	No comments filed during this time period
Wetzel County Commission	No comments filed during this time period
Wetzel County Chamber of Commerce	No comments filed during this time period

4.10.2.2 Equitrans Expansion Project

No local governments or archaeological and historical organizations responded to the FERC's August 11, 2015 NOI for the EEP. No local governments or archaeological or historical organizations filed comments with the FERC in response to the issuance of the draft EIS on September 16, 2016.

According to a filing on January 22, 2016, Equitrans examined a mix of local, regional, and state-wide sources while researching the cultural resources of the project area. The reference services of the New Martinsville public library, in Wetzel County, West Virginia; and the Bowlby Library, in Waynesburg, Greene County, Pennsylvania were used in person by Equitrans' contractor. Information about land ownership was gathered at the Greene County tax assessor and registrar of deeds, in Waynesburg, Pennsylvania, while the property record websites for Allegheny and Washington Counties were accessed online. Similarly, online resources available through West Virginia and Pennsylvania archaeological societies were studied. Visual sources were consulted via the University of Pittsburgh's Digital Research Library ("Photographs from the Pittsburgh and Lake Erie Railroad Company Collection"). Historical maps were obtained from online sources including the Pennsylvania Historical and Museum Commission, David Rumsey Historical Map Collection, Historic Map Works, Library of Congress, and USGS TopoView and Map Store.

No written comments were received by Equitrans from local governments or archaeological and historic organizations on potential project effects on cultural resources.

4.10.3 Communications with State Historic Preservation Offices

4.10.3.1 Mountain Valley Project

In response to our April 17, 2015 MVP NOI, the FERC received a letter from the VADHR, representing the Virginia SHPO, dated June 2, 2015. The VADHR acknowledged the initiation of consultations under Section 106 of the NHPA, and requested that the FERC insure the identification of historic properties within the APE for this project. The VADHR indicated that it had communicated with Mountain Valley regarding the scope-of-work for architectural and archaeological studies and that systematic archaeological and architectural surveys should cover all areas of proposed ground disturbance and tree clearing. In a letter to the FERC, dated December 21, 2016, the VADHR commented on the draft EIS. We respond to the VADHR's comments on the draft EIS in appendix AA of this final EIS.

Mountain Valley's Communications with the West Virginia Division of Culture and History

Independent of the FERC staff's consultations, Mountain Valley has been communicating with the SHPOs of West Virginia and Virginia. On November 6, 2014, Mountain Valley's consultant (Tetra Tech) submitted its *Archaeology and Historic Architecture West Virginia Work Plan* to the WVDCH. The WVDCH provided comments on the plan in a letter dated November 21, 2014. On March 18, 2015, Tetra Tech submitted an amendment to its work plan, which the WVDCH reviewed and commented on in a letter to Tetra Tech dated April 17, 2015. The WVDCH concurred with the archaeological field methods proposed but had comments on methods for recording and evaluating historic architectural sites. Tetra Tech submitted additional information to the WVDCH on April 27, 2015. The WVDCH provided comments on the revised work plan in a letter dated May 8, 2015.

On August 12, 2015, Mountain Valley submitted to the WVDCH a copy of its survey report covering portions of Wetzel, Harrison, Doddridge, and Lewis Counties, West Virginia (Espino et al., July 2015a). The WVDCH commented on that report in a letter dated October 6, 2015. Mountain Valley submitted its cultural resources survey report covering Braxton and Webster Counties, West Virginia (Espino et al., October 2015b) on October 12, 2015, that the WVDCH reviewed on November 16, 2015. On December 24, 2015, Mountain Valley submitted to the WVDCH a copy of its survey report covering portions of Nicholas, Greenbrier, and Fayette Counties, West Virginia (Espino et al., December 2015c), that the WVDCH reviewed on January 27, 2016. On February 24, 2016, Mountain Valley submitted to the WVDCH a copy of its survey report covering portions of Summers and Monroe Counties, West Virginia (Clement et al., February 2016). The WVDCH reviewed this report on April 4, 2016.

On May 2, 2016, the WVDCH approved Mountain Valley's amended testing plan for site 46ME281 in Monroe County, West Virginia. On June 10, 2016, Mountain Valley submitted its archaeological testing results report for Doddridge, Harrison, and Lewis Counties, West Virginia (Clement et al., July 2016), that the WVDCH reviewed on July 14, 2016. On July 8, 2016, Mountain Valley submitted its report of Phase II archaeological testing of sites in Webster County, and the WVDCH reviewed that report in a letter dated August 15, 2016. On August 22, 2016, the WVDCH reviewed Mountain Valleys plans to avoid certain sites in West Virginia.

On November 8, 2016, Mountain Valley submitted to the WVDCH an Addendum I survey report for Wetzel, Harrison, Doddridge, and Lewis Counties, West Virginia (Espino et al., November 2016), that the WVDCH reviewed on December 7, 2016. On December 13, 2016, Search, cultural resources consultant for Mountain Valley, submitted to the WVDCH an addendum report documenting additional survey efforts in Summers and Monroe Counties, West Virginia (Freedman et al., December 2016), that the SHPO commented on in a letter dated January 17, 2017. Mountain Valley also submitted to the WVDCH an addendum survey report covering portions of Braxton and Webster Counties on November 11, 2016, and submitted an addendum survey report for Nicholas, Greenbrier and Fayette Counties on December 4, 2016. The WVDCH reviewed the addendum survey report for Braxton and Webster Counties in a letter dated December 8, 2016, and reviewed the addendum survey report for Fayette, Greenbrier, and Nicholas Counties in a letter dated February 8, 2017.

In February 2017, Mountain Valley submitted to the WVDCH copies of a second addendum testing report for Summers and Monroe Counties (Clement et al., February 2017a); results of testing in Braxton County (Clement et al., February 2017b); and the results of testing of sites in Nicholas and Greenbrier Counties (Basrsc et al., 2017). The WVDCH commented on the Braxton County testing report in a letter to Mountain Valley dated March 22, 2017. On March 30, 2017, Mountain Valley filed with the FERC a copy of the WVDCH review, dated March 13, 2017, of the Phase II archaeological testing report for Summers and Monroe Counties. On April 17, 2017, Mountain Valley filed with the FERC a copy of the WVDCH review of the Phase II archaeological testing report for Nicholas and Greenbrier County, dated March 31, 2017.

Mountain Valley's Communications with the Virginia Department of Historic Resources

Mountain Valley informed the VADHR about the project in a letter dated October 13, 2014. In a meeting with Mountain Valley on October 15, 2014, the VADHR requested a formal scope-of-work. On November 12, 2014, Mountain Valley's consultant (Tetra Tech) provided the VADHR with its *Cultural Resources Work Plan*. On February 9, 2015, Tetra Tech provided the VADHR with copies of: 1) its *Archaeological Sensitivity Model*; and 2) background information about historic architectural sites within 2 miles of the pipeline. On February 19, 2015, Tetra Tech provided the VADHR with a copy of its *Plan for Unanticipated Historic Properties and Human Remains* (Discovery Plan). In a letter to Tetra Tech, dated March 2, 2015, the VADHR accepted the Applicant's *Archaeological Sensitivity Model*, but had comments about its Discovery Plan.

On August 11, 2015, Mountain Valley submitted copies of its historic architectural survey report for Pittsylvania County, Virginia (Turco et al., July 2015) to the VADHR. Mountain Valley submitted copies of its Phase IA archaeological survey report for Pittsylvania, Franklin, Roanoke, Montgomery, Craig, and Giles Counties, Virginia (Reeve et al., July 2015) and its Phase IB archaeological survey report for Pittsylvania County, Virginia (Reeve et al., September 2015) on August 12, 2015. The VADHR commented on those reports in letters dated October 22 and 27, 2015. Mountain Valley provided its archaeological survey report for Franklin County, Virginia (Reeve et al., September 2015c) to the VADHR on September 11, 2015, and its historic architectural survey report for Franklin County (Turco et al., September 2015) on October 8, 2015. The VADHR reviewed those reports on December 30, 2015, and January 6, 2016, respectively. On December 1, 2015, Mountain Valley submitted its archaeological survey report for Giles County, Virginia (Reeve et al., November 2015d). The VADHR commented on that report on December 31, 2015.

On April 21, 2016, the VADHR commented on the Phase IB archaeological survey report for Roanoke, Montgomery, and Craig Counties, Virginia (Reeve et al., March 2016) submitted by Mountain Valley on March 10, 2016. Mountain Valley submitted its historic architectural survey reports for Giles, Craig, Montgomery, and Roanoke Counties, Virginia (Turco et al., March 2016a;

Turco et al., March 2016b; Turco et al., March 2016c) to the VADHR on March 15, 2016. The VADHR commented on those reports in letters dated May 25, 2016.

On June 9, 2016, Mountain Valley submitted an addendum architectural report for Pittsylvania and Franklin Counties to the VADHR (Turco, June 2016). On June 24, 2016, Mountain Valley sent the VADHR a copy of an addendum to its historic architectural survey of Craig and Giles Counties. On August 4, 2016, the VAHDR commented on the addendum architectural survey reports.

On September 22, 2016, Mountain Valley submitted its methodologies for assessing effects at historic architectural sites, which the VADHR commented on in an email dated October 19, 2016. The VADHR wrote a review of Mountain Valley's "Results of Criteria Assessment Tasks 2 and 3" (Neylon, 2017) in a letter dated March 22, 2017.

On December 4, 2015, the VADHR commented on the testing plans for archaeological sites in Pittsylvania, Franklin, Roanoke, Montgomery, and Giles Counties, Virginia (Tetra Tech, November 2015) that Mountain Valley submitted on November 20, 2015. On December 12, 2016, Mountain Valley submitted to the VADHR a report documenting additional survey in Pittsylvania County and testing of site 44PY442 (Reeve et al, December 2016); that was reviewed in a letter dated February 7, 2017.

On August 31, 2016, Mountain Valley submitted a Phase II testing report for sites in Pittsylvania County (Reeve et al., August 2016) to the VADHR, On December 20, 2016, Mountain Valley submitted to the VADHR copies of reports of additional survey and testing of sites in Craig County and additional survey in Franklin County (Reeve et al, December 2016a; and Reeve et al., December 2016b). The Virginia SHPO has not yet reviewed the testing reports for Pittsylvania County, and additional surveys and testing reports for Craig County and Franklin County.

In February 2017, Mountain Valley submitted to the VADHR an addendum survey report for Roanoke and Montgomery Counties (Reeve et al., January 2017); additional surveys and result of testing of sites in Giles County (Reeve et al., February 2017a); and testing results for Franklin County (Reeve et al., February 2017b). Mountain Valley has not yet documented SHPO review of those reports. Nor has the VADHR commented on Mountain Valley's Criteria of Effects Report (Dye and Marshall, May 2017) submitted in May 2017.

4.10.3.2 Equitrans Expansion Project

In response to our August 11, 2015 NOI for the EEP, the FERC received a letter from the Pennsylvania Historical and Museum Commission Bureau for Historic Preservation (PABHP) representing the Pennsylvania SHPO, dated August 25, 2015. The PABHP requested that an archaeological survey be conducted of the APE, and additional information should be provided about historic structures that may be affected by the project.

Independent of the FERC staff's consultations, Mountain Valley has been communicating with the SHPOs of Pennsylvania and West Virginia.

Equitrans' Communications with the Pennsylvania Bureau of Historic Preservation

Equitrans wrote a letter to the PABHP and the WVDCH on April 27, 2015 providing information about the EEP. On July 8, 2015, Equitrans, through its consultant (Tetra Tech) submitted a Pennsylvania Historical and Museum Commission "Project Review Form – Request to Initiate SHPO Consultation on State and Federal Undertakings" to the PABHP. In a letter to Tetra Tech dated July 27, 2015, the PABHP approved the proposed work plan and requested that a Phase I archaeological survey be conducted.

On January 28, 2016, a copy of an architectural survey report for the EEP (Sexton, January 2016) was submitted to the PABHP.[123] The PABHP requested additional information before reviewing the report. Tetra Tech provided additional information about aboveground resources to the PABHP on September 26 and October 13 and 25, 2016. On February 17, 2016, Tetra Tech submitted to the PABHP a copy of an archaeological survey report for the EEP (Borstel et al., February 2016), together with an updated Project Review Form. The PABHP responded on March 22, 2016. On September 23, 2016, Tetra Tech informed the PABHP that Equitrans intends to avoid site 36WH1706.

Equitrans' Communications with the West Virginia Division of Cultural and History

Equitrans wrote a letter to the WVDCH on April 27, 2015 providing information about the EEP. On July 8, 2015, Tetra Tech submitted a "West Virginia SHPO Information Sheet for Section 106 Review Projects" to the WVDCH with a request to initiate consultations. In a letter to Equitrans dated June 2, 2015, the WVDCH indicated that it would participate in the Section 106 compliance process and review future reports for the project. The WVDCH commented on the EEP cultural resources survey report for West Virginia facilities (Borstel et al., January 2016) in a letter dated February 16, 2016. .

4.10.4 Communications with Other Federal Agencies

In response to our MVP NOI, the NPS submitted scoping comments to the FERC on June 16, 2015. The NPS raised concerns about potential project impacts on the ANST, BRP, and NCHA. Those resources are discussed in section 4.8 of this EIS, and below.

In a letter to the FERC dated December 22, 2016, the NPS commented on the draft EIS. We respond to the NPS comments on the draft EIS in appendix AA of this final EIS.

Mountain Valley submitted a copy of a report of a cultural resources survey within the Jefferson National Forest (Reeve et al., May 2016) to the FS on May 16, 2016. The FS archaeologist provided his review of the report in an email May 24, 2016. On October 19, 2016, Search submitted an Archaeological Resources Protection Act (ARPA) permit application to the FS for Phase II testing at three sites within the Jefferson National Forest. Additionally, on

[123] The Pennsylvania Bureau for Historic Preservation (PABHP) changed its name to the Pennsylvania State Historic Preservation Office (PASHPO). Both of these designations are used throughout this section.

November 16, 2016, the FS approved an ARPA permit amendment to survey two modified route segments through the Jefferson National Forest including at Mystery Ridge in Giles County, Virginia, and from Craig Creek to Brush Mountain in Montgomery County, Virginia. In December 2016, Mountain Valley submitted to the FS archaeologist the final survey report documenting the additional survey completed for the Craig Creek and Brush Mountain route and Mystery Ridge route within the Jefferson National Forest (Reeve et al., December 2016). On March 9, 2017, the FS sent a copy of a letter to the VADHR conveying its comments on the Reeve et al. May 2016 survey report. Mountain Valley continues to conduct cultural resources investigations within the Jefferson National Forest, including site testing.

In a letter to the FERC dated December 14, 2016, the ACHP stated that it would be participating in the Section 106 consultation process. As discussed later in this section, if the FERC, in consultations with the SHPOs, determines that historic projects would be adversely by the projects, we would notify the ACHP of our official assessment of adverse effects, in accordance with Part 800.6(a)(1), and seek resolution with the participation of the ACHP, in accordance with Part 800.6(b)(2). Likewise, if the FERC makes a finding of no adverse effects, we would notify all the consulting parties, in accordance with Part 800.5(c). The ACHP provided additional comments on the MVP in a letter dated December 21, 2016. The FERC responded in a letter dated February 16, 2017.[124]

4.10.5 Communications with Indian Tribes

Indian tribes are defined in Part 800.16(m), as "an Indian tribe, band, nation, or other organized group or community, including a Native village, Regional Corporation, or Village Corporation, as those terms are defined in Section 3 of the Alaska Native Claims Settlement Act (43 U.S.C. 1602), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their special status as Indians." A unique relationship exists between the U.S. government and Indian tribes as delineated by treaties, statutes, executive orders, judicial decisions, and agreements, which differentiates tribes, as domestic dependent nations, from other entities that deal with, or are affected by, the federal government. This relationship has given rise to a special federal trust responsibility, involving the legal responsibilities and obligations of the U.S. government toward Indian tribes; and the application of fiduciary standards of due care with respect to Indian lands, tribal trust resources, and the exercise of tribal rights.

The FERC acknowledges that it has trust responsibilities to Indian tribes. The Commission issued a "Policy Statement on Consultations with Indian Tribes in Commission Proceedings" in Order 635 on July 23, 2003. That policy statement included the following key objectives:

- The Commission will endeavor to work with Indian tribes on a government-to-government basis, and will seek to address the effects of proposed projects on tribal rights and resources though consultations; and

[124] See accession number 20170216-3029.

- The Commission will ensure that tribal resources and interests are considered whenever the Commission's actions or decisions have the potential to adversely affect Indian tribes or Indian trust resources.

Using basic ethnographic sources, such as the Handbook of North American Indians (Trigger, 1978), and data provided by the Applicants, the FERC identified Indian tribes that historically used or occupied the project areas. The FERC's environmental mailing lists included Indian tribes that may have an interest in the projects. Our mailing lists also included regional Native American organizations and state-recognized tribes.

The FERC sent copies of our April 17, 2015 NOI for the MVP and the August 11, 2015 NOI for EEP to Native Americans and tribes listed on table 4.10.5-1 below. As part of the FERC's government-to-government consultation program with Indian tribes, on July 21, 2015, we sent individual letters to tribal leaders informing them about the MVP and requesting comments or information about resources important to tribes that may be affected by the project (see table 4.10.5-1). Only the Stockbridge-Munsee Band of the Mohican Nation responded on May 4, 2015 to our letter, indicating that the MVP is not located within their area of tribal interest.

All of the Indian tribes listed on table 4.10.5-1 were sent copies of the draft EIS. In November 2016, our third-party environmental contractor (Cardno), on behalf of the FERC staff, sent emails to the Indian tribes and Native American organizations listed on table 4.10.5-1, reminding them that the FERC had issued a draft EIS for the MVP, that was available for comment. In response to the Cardno email, Chief Walt Red Hawk Brown of the Cheroenhoka (Nottoway) Indian Tribe of Virginia requested project maps and indicated he had never received our packet. On November 29, 2016, Cardno sent Chief Brown a CD copy of the draft EIS (which includes maps). In an email to Cardno dated December 2, 2016, Wenonah Haire, Tribal Historic Preservation Officer (THPO) for the Catawba Indian Nation of South Carolina, indicated that she had not received a copy of the draft EIS; so Cardno sent her a CD and hard copy. The Seneca Nation THPO sent an email to Cardno, on December 19, 2016, that indicated it had no problems with projects in rights-of-way of previous disturbance, but would like to be notified if cultural resources are discovered during excavations in undisturbed areas. In an email to Cardno, on December 21, 2016, the THPO for the Stockbridge-Munsee Community indicated the tribe did not have comments on the draft EIS as they have previously determined that the project is not in their cultural area of interest.

TABLE 4.10.5-1

Indian Tribes and Native American Organizations Contacted by the FERC for the Mountain Valley Project and the Equitrans Expansion Project

Tribes Sent FERC's April 17, 2015 NOI for the MVP	Tribes Sent July 21, 2015 Letter from FERC about the MVP	Tribes Sent FERC's August 11, 2015 NOI for the EEP	Responses
Absentee-Shawnee Tribe of Oklahoma, c/o Edwina Butler Wolfe, Governor, and Joseph Blanchard, THPO a/	Absentee-Shawnee Tribe of Oklahoma, c/o Edwina Butler Wolfe, Governor, and Joseph Blanchard, THPO	Absentee-Shawnee Tribe of Oklahoma, c/o Edwina Butler Wolfe, Governor, and Joseph Blanchard, THPO	No response filed to date.
Catawba Indian Nation of South Carolina, c/o Bill Harris, Chief, Darin Steen, Environmental Director, & Evie Stewart, Administrator	Catawba Indian Nation of South Carolina, c/o William Harris, Chief, & Wenonah Haire, THPO	N/A	12/2/16 – THPO requested copy of draft EIS.
Cayuga Nation of New York, c/o Clint Halftown, Representative	Cayuga Nation of New York, c/o Clint Halftown, Representative	Cayuga Nation of New York, c/o Clint Halftown, Representative	No response filed to date.
Cheroenhaka (Nottaway) Indian Tribe of Virginia, c/o W.D. Brown, Chief	N/A	N/A	No response filed to date.
Cherokee Nation of Oklahoma, c/o Bill John Baker, Principal Chief	Cherokee Nation of Oklahoma, c/o Bill John Baker, Principal Chief	N/A	No response filed to date.
Chicahominy Tribe of Virginia, c/o Stephen Adkins, Chief	N/A	N/A	No response filed to date.
Delaware Nation of Oklahoma, c/o Cleanan Watkins, President & Darrin Hill, Cultural Resources	Delaware Nation of Oklahoma, c/o Clifford Peacock, President, & Jason Ross, Cultural Resources	Delaware Nation of Oklahoma, c/o Clifford Peacock, President, & Tamara Francis, THPO	No response filed to date.
Delaware Tribe of Oklahoma, c/o Paula Pechonick, Chief	Delaware Tribe of Oklahoma, c/o Chester Brooks, Chief, & Susan Bachor, THPO	Delaware Tribe of Oklahoma, c/o Chester Brooks, Chief, & Brice Oberrmeyer, THPO	No response filed to date.
Eastern Band of Cherokee Nation in North Carolina, c/o Michael Hicks, Chief, & Russell Townsend, THPO	Eastern Band of Cherokee Nation in North Carolina, c/o Michael Hicks, Chief, & Russell Townsend, THPO	N/A	No response filed to date.
Eastern Chickahominy Tribe of Virginia, c/o Gene Adkins, Chief	N/A	N/A	No response filed to date.
Eastern Shawnee Tribe of Oklahoma, c/o Glenna Wallace, Chief, & Robin Dushane, THPO	Eastern Shawnee Tribe of Oklahoma, c/o Glenna Wallace, Chief, & Robin Dushane, THPO	Eastern Shawnee Tribe of Oklahoma, c/o Glenna Wallace, Chief, & Robin Dushane, THPO	No response filed to date.

TABLE 4.10.5-1 (continued)

Indian Tribes and Native American Organizations Contacted by the FERC for the Mountain Valley Project and the Equitrans Expansion Project

Tribes Sent FERC's April 17, 2015 NOI for the MVP	Tribes Sent July 21, 2015 Letter from FERC about the MVP	Tribes Sent FERC's August 11, 2015 NOI for the EEP	Responses
Mattaponi Indian Nation of Virginia, c/o Carl Custalow, Chief	N/A	N/A	No response filed to date.
N/A	N/A	Miami Tribe of Oklahoma, c/o Douglas Lankford, Chief, & George Strack, THPO	No response filed to date.
Nottoway Indian Tribe of Virginia, c/o Lynette Alliston, Chief	N/A	N/A	11/28/16 – Chief requested map of pipeline route.
Oneida Nation of New York, c/o Ray Halbritter, Representative	Oneida Nation of New York, c/o Ray Halbritter, Representative, & Jesse Bergevin, Historian	Oneida Nation of New York, c/o Ray Halbritter, Representative, & Jesse Bergevin, Historian	No response filed to date.
Oneida Nation of Wisconsin, c/o Ed Delgado, Chair, & Corina Williams, THPO	Oneida Nation of Wisconsin, c/o Christina Danforth, Chair, & Corina Williams, THPO	Oneida Nation of Wisconsin, c/o Corina Williams, THPO	No response filed to date.
Onondaga Nation of New York, c/o Tony Gonyea, Faithkeeper	Onondaga Nation of New York, c/o Irving Powless, Chief, & Tony Gonyea, Faithkeeper	Onondaga Nation of New York, c/o Irving Powless, Chief, & Tony Gonyea, Faithkeeper	No response filed to date.
Ottawa Tribe of Oklahoma, c/o Ethel Cook, Chief, & Rhonda Hayworth, THPO	N/A	Ottawa Tribe of Oklahoma, c/o Ethel Cook, Chief, & Rhonda Hayworth, THPO	No response filed to date.
Pamunkey Nation of Virginia	Pamunkey Nation of Virginia, c/o Kevin Brown, Chief	N/A	No response filed to date.
Pattawomeck Indian Tribe of Virginia, c/o John Lightner, Chief	N/A	N/A	No response filed to date.
Rappahannock Tribe of Virginia	N/A	N/A	No response filed to date.
Seneca Nation of New York, c/o Barry Snyder, President, & Melissa Bach, THPO	Seneca Nation of New York, c/o Maurice John, President, & Melissa Bach, THPO	Seneca Nation of New York, c/o Maurice John, President, & Melissa Bach, THPO	12/19/16 – THPO requested notification of cultural resources identified during excavations in undisturbed areas.
Seneca-Cayuga Nation of Oklahoma, c/o LeRoy Howard, Chief, & Paul Barton, THPO	Seneca-Cayuga Nation of Oklahoma, c/o William Fisher, Chief, & Paul Barton, THPO	Seneca-Cayuga Nation of Oklahoma, c/o William Fisher, Chief, & Paul Barton, THPO	No response filed to date.

TABLE 4.10.5-1 (continued)

Indian Tribes and Native American Organizations Contacted by the FERC for the Mountain Valley Project and the Equitrans Expansion Project

Tribes Sent FERC's April 17, 2015 NOI for the MVP	Tribes Sent July 21, 2015 Letter from FERC about the MVP	Tribes Sent FERC's August 11, 2015 NOI for the EEP	Responses
Shawnee Tribe of Oklahoma, c/o Ron Sparkman, Chief, & Kim Jumper, THPO	Shawnee Tribe of Oklahoma, c/o Ron Sparkman, Chief, & Kim Jumper, THPO	Shawnee Tribe of Oklahoma, c/o Ron Sparkman, Chief, & Kim Jumper, THPO	No response filed to date.
St. Regis Mohawk Tribe of New York, c/o Beverly Cook, Ron LaFrance & Paul Thompson, Chiefs, & Arnold Printup, THPO	St. Regis Mohawk Tribe of New York, c/o Paul Thompson, Chief, & Arnold Printup, THPO	St. Regis Mohawk Tribe of New York, c/o Paul Thompson, Chief, & Arnold Printup, THPO	No response filed to date.
Stockbridge-Munsee Band of Mohican Nation in Wisconsin, c/o Wallace Miller, President, & Sherry White, THPO	Stockbridge-Munsee Band of Mohican Nation in Wisconsin, c/o Wallace Miller, President, & Bonney Hartley, THPO	Stockbridge-Munsee Band of Mohican Nation in Wisconsin, c/o Wallace Miller, President, & Bonney Hartley, THPO	The Tribe responded that the MVP is not within tribal area of interest. 12/21/16 – in email to Cardno, THPO indicated that the MVP is outside tribal area of interest
Tonawanda Band of Seneca Indians in New York, c/o Rodger Hill & Darwin Hill, Chiefs	Tonawanda Band of Seneca Indians in New York, c/o Rodger Hill, Chief, & Christine Abrams, Cultural	Tonawanda Band of Seneca Indians in New York, c/o Rodger Hill, Chief	No response filed to date.
Tuscarora Tribe of New York, c/o Leo Henry, Chief, & Neil Patterson, Environmental	Tuscarora Tribe of New York, c/o Leo Henry, Chief,	Tuscarora Tribe of New York, c/o Leo Henry, Chief,	No response filed to date.
United Keetoowah Band of Cherokee Indians in Oklahoma, c/o Lisa Stupp, THPO	United Keetoowah Band of Cherokee Indians in Oklahoma, c/o George Wickliffe, Chief	N/A	No response filed to date.
N/A	N/A	United South and Eastern Tribes, c/o Kiticki Carroll, Executive Director	No response filed to date.
Upper Mattaponi Tribe of Virginia	N/A	N/A	No response filed to date.
Wyandotte Nation of Oklahoma, c/o Billy Friend, Chief	N/A	N/A	No response filed to date.

a/ THPO = Tribal Historic Preservation Officer
N/A = Not Applicable

On November 23, 2016, the BLM, which is cooperating agency in the production of this EIS, sent letters to the Absentee-Shawnee Tribe of Oklahoma, Catawaba Indian Nation of South Carolina, Cherokee Nation of Oklahoma, Delaware Nation of Oklahoma, and the Delaware Tribe of Oklahoma, informing them that the BLM is considering issuing a Right-of-Way Grant to allow the MVP pipeline to cross federal lands, and that the FERC issued a draft EIS on September 16, 2016 that was available for comment until December 22, 2016. On December 16, 2016, the THPO for the Ponca Tribe of Nebraska sent an email to the BLM inquiring if a "Traditional Cultural Properties" study was ever done for the MVP.

On March 9, 2017, the FS sent a letter to the Eastern Band of Cherokee Indians conveying their comments on an archaeological survey report of a portion of the Jefferson National Forest produced by Mountain Valley. No comments from the Eastern Band of Cherokee Indians about the MVP have yet been filed with the FERC.

4.10.5.1 Mountain Valley Project

Mountain Valley conducted its own Native American contact program, separate from the FERC staff's consultations, as part of the company's data gathering and inventory efforts. On December 2, 2014, Mountain Valley sent letters to 37 tribes, listed on table 4.10.5-2 below, informing them about the project and requesting comments. Mountain Valley received responses at that time from the Delaware Nation of Oklahoma, Peoria Tribe of Oklahoma, Stockbridge-Munsee Band of the Mohican Nation, and the United Keetoowah Band of Cherokee Indians in Oklahoma. These tribes indicated that the MVP should not adversely impact sites of cultural or religious importance.

Mountain Valley refreshed its Native American contact program with letters to tribes dated December 9, 2016. This was followed-up with telephone calls, on January 17, 2017, to all the Indian tribes listed on table 4.10.5-2. In response to these communications, the Catawaba Indian Tribe of South Carolina indicated an interest in the MVP. The Delaware Tribe indicated that the MVP was located outside of its area of interest. The Eastern Band of Cherokee Indians requested the opportunity to review archaeological reports for Fayette, Summers, and Monroe Counties, West Virginia, and Giles and Montgomery Counties, Virginia. The Cherokee Tribe of Oklahoma expressed no interest in the MVP. The Pamunkey Tribe of Virginia also indicated that the MVP was outside of its area of historical significance. The Seneca Nation of New York requested additional information about the project.

TABLE 4.10.5-2

Indian Tribes and Native American Organizations Contacted by Mountain Valley and Equitrans

Tribes Sent December 2, 2014 and December 9, 2016 Letters from Mountain Valley about the MVP, and contacted again January 17, 2017	Tribes Sent April 27, 2015 Letter from Equitrans about the EEP	Responses
Absentee-Shawnee Tribe of Oklahoma, c/o Edwina Butler Wolfe, Governor, & Joseph Blanchard, THPO a/	Absentee-Shawnee Tribe of Oklahoma, c/o Edwina Butler Wolfe, Governor; & Joseph Blanchard, THPO	No comments filed to date.
N/A	Appalachian American Indians of West Virginia, c/o Wayne Gray, Chief; & Owl Appleton	No comments filed to date.
Catawba Indian Nation of South Carolina, c/o Bill Harris, Chief, Darin Steen, Environmental Director; Evie Stewart, Administrator; & Wenonah Haire, THPO	N/A	1/17/17 - Tribe is interested in the MVP.
Cayuga Nation of New York, c/o Clint Halftown, Representative	Cayuga Nation of New York, c/o Clint Halftown, Chief	No comments filed to date.
Cherokee Nation of Oklahoma, c/o Bill John Baker, Principal Chief; & Sheila Bird, THPO	N/A	1/17/17 – no interest in MVP
Citizen Potawatomi Nation of Oklahoma, c/o John Barrett, Chair	N/A	No comments filed to date.
Delaware Nation of Oklahoma, c/o Clifford Peacock, President; Darren Hill, Cultural Resources; & Jason Ross, Cultural Resources Manager	Delaware Nation of Oklahoma, c/o Clifford Peacock, President; Ivy Smith, Environmental; & Jason Ross, Cultural Resources	2/11/15 – in a letter to Mountain Valley, the Tribe stated that the MVP does not endanger cultural or religious sites of interest to the Delaware Nation.
Delaware Tribe of Oklahoma, c/o Paula Pechonick, Chief; and Brice Obermeyer, THPO	Delaware Tribe of Oklahoma, c/o Chester Brooks, Chief, & Brice Obermeyer, THPO	6/2/15 – Tribe will review the EEP. 1/17/17 - Tribe is not interested in MVP
Eastern Band of Cherokee Nation in North Carolina, c/o Michael Hicks, Chief; and Robert Townsend, THPO	N/A	2/7/17 – Tribe wants to review archaeological survey reports
Eastern Shawnee Tribe of Oklahoma, c/o Glenna Wallace, Chief; and Robin DuShane, THP	Eastern Shawnee Tribe of Oklahoma, c/o Glenna Wallace, Chief, & Robin Dushane, THPO	No comments filed to date.
Forest County Potawatomi Community, c/o Harold Frank, Chair	N/A	No comments filed to date.
Hannahville Indian Community, c/o Kenneth Meshiguad, Chair	N/A	No comments filed to date.
Keweenaw Bay Indian Community, c/o Donald Shalifoe, President; warren Swartz, President; & Gary Loonsfoot, THPO	N/A	No comments filed to date.

TABLE 4.10.5-2 (continued)

Indian Tribes and Native American Organizations Contacted by Mountain Valley and Equitrans

Tribes Sent December 2, 2014 and December 9, 2016 Letters from Mountain Valley about the MVP, and contacted again January 17, 2017	Tribes Sent April 27, 2015 Letter from Equitrans about the EEP	Responses
Little River Band of Ottawa Indians in Michigan, c/o Larry Romanelli, Chief	N/A	No comments filed to date.
Little Traverse Bay Bands of Ottawa Indians, c/o Fred Kiogima; & Wesley Andrews, THPO	N/A	No comments filed to date.
Match-e-be-nash-she-wish Band of Potawatomi, c/o David Sprague, Chair; and Scott Sprague, Chair	N/A	No comments filed to date.
Miami Tribe of Oklahoma, c/o Douglas Lanksford, Chief	N/A	No comments filed to date.
Minnesota Chippewa Tribe, c/o Gary Frazer, Executive Director; & Kevin Dupuis, President	N/A	No comments filed to date.
N/A	Native American Indian Federation, c/o David Cremeans, Chief	No comments filed to date.
Nottawaseppi Huron Band of Potawatomi, c/o Jeff Chivis, THPO	N/A	No comments filed to date.
Oneida Nation of New York, c/o Ray Halbritter, Representative,	Oneida Nation of New York, c/o Ray Halbritter, Representative; & Jesse Bergevin, Historian	No comments filed to date.
Oneida Nation of Wisconsin, c/o Ed Delgado, Chair; & Cristina Danforth, Chair	Oneida Nation of Wisconsin, c/o Christina Danforth, Chair; & Corina Williams, THPO	No comments filed to date.
Onondaga Nation of New York, c/o Tony Gonyea, Faithkeeper	Onondaga Nation of New York, c/o Tony Gonyea, Faithkeeper	No comments filed to date.
Ottawa Tribe of Oklahoma, c/o Ethel Cook, Chief	N/A	No comments filed to date.
Pamunkey Tribe of Virginia, c/o Robert Gray, Chief	N/A	1/20/17 - email from Tribe stating MVP would not affect areas of historical significance
Peoria Tribe of Oklahoma, c/o Cynthia Stacy, Special Projects Manager	N/A	12/9/14 – in a letter to Mountain Valley, the Tribe indicated it is unaware of religious sites linked to the MVP and does not object to the project. 6/9/15 – in a letter to Mountain Valley, the Tribe again stated it is unaware of religious sites in the project area.
Pokagon Band of Potawatomi Indians, c/o John Warren, Chair	N/A	No comments filed to date.
Ponca Tribe of Oklahoma, c/o Halona Clawson, TPHO		

TABLE 4.10.5-2 (continued)

Indian Tribes and Native American Organizations Contacted by Mountain Valley and Equitrans

Tribes Sent December 2, 2014 and December 9, 2016 Letters from Mountain Valley about the MVP, and contacted again January 17, 2017	Tribes Sent April 27, 2015 Letter from Equitrans about the EEP	Responses
Prairie Band of Potawatomi Nation, c/o Joyce Guerrero, Vice-Chair; Zah Pahahmie, Vice-Chair; & Vivian Olson, Attorney	N/A	No comments filed to date.
Seneca Nation of New York, c/o Barry Snyder, President; Todd Gates, President; Melissa Bach, THPO; & Scott Abrams, THPO	Seneca Nation of New York, c/o Beverly Cook, President, & Melissa Bach, THPO	12/19/16 – in email to Cardno, THPO expressed concerns about excavations in undisturbed areas for EEP. 1/7/17 - Tribe requested another copy of Mountain Valley's contact letter.
Seneca-Cayuga Nation of Oklahoma, c/o LeRoy Howard, Chief; William Fisher, Chief; Paul Barton, THPO; & Micco Emarhia, THPO	Seneca-Cayuga Nation of Oklahoma, c/o William Fisher, Chief, & Paul Barton, THPO	No comments filed to date.
Shawnee Tribe of Oklahoma, c/o Ron Sparkman, Chief; & Eric Wensmans, THPO	Shawnee Tribe of Oklahoma, c/o Ron Sparkman, Chief	No comments filed to date.
St. Regis Mohawk Tribe of New York, c/o Beverly Cook, Ron LaFrance & Paul Thompson, Chiefs	St. Regis Mohawk Tribe of New York, c/o Tribal Council, Ken Jocks, Director, & Arnold Printup, THPO	No comments filed to date.
Stockbridge-Munsee Band of Mohican Nation in Wisconsin, c/o Wallace Miller, President; & Shannon Holsey, President	Stockbridge-Munsee Band of Mohican Nation in Wisconsin, c/o Tribal Council, Greg Butler, & Sherry White, THPO	12/9/14 – in a letter to Mountain Valley, the Tribe stated that the MVP is not within its area of interest. 4/27/15 – in a letter to Mountain Valley, the Tribe again stated that the project is not within the Mohican area of interest and no more information is necessary. 5/15/2015 – The EEP is not within tribal area of interest.
Tonawanda Band of Seneca Indians in New York, c/o Rodger Hill & Darwin Hill, Chiefs	Tonawanda Band of Seneca Indians in New York, c/o Darwin Hill, Chief	No comments filed to date.
Turtle Mountain Band of Chippewa Indians, c/o Richard McCloud, Chair	N/A	No comments filed to date.
Tuscarora Tribe of New York, c/o Leo Henry, Chief; Neil Patterson, Environmental; & Rene Rickard, Environmental Director	Tuscarora Nation of New York, c/o Chiefs Council, Neil Patterson, Director, & Bryan Printup, THPO	11/18/15 - letter to Mountain Valley expressed concerns about impacts on wildlife and the discovery of human remains.
United Keetoowah Band of Cherokee Indians in Oklahoma, c/o Lisa Stupp, THPO	N/A	12/17/15 – in email to Mountain Valley, the Tribe stated that it does not object to the MVP.

TABLE 4.10.5-2 (continued) **Indian Tribes and Native American Organizations Contacted by Mountain Valley and Equitrans**		
Tribes Sent December 2, 2014 and December 9, 2016 Letters from Mountain Valley about the MVP, and contacted again January 17, 2017	**Tribes Sent April 27, 2015 Letter from Equitrans about the EEP**	**Responses**
Wyandotte Nation of Oklahoma, c/o Billy Friend, Chief	N/A	No comments filed to date
N/A	West Virginia Native American Coalition, c/o Linda Karus	No comments filed to date.

a/ THPO = Tribal Historic Preservation Officer
N/A = Not Applicable

4.10.5.2 Equitrans Expansion Project

Equitrans conducted its own Native American contact program, separate from the FERC staff's consultations. On April 27, 2015, Equitrans sent letters to 18 Native American groups and Indian tribes, listed on table 4.10.5-2. The Stockbridge-Munsee Band of the Mohican Nation indicated that the EEP is not within its area of interest. The Delaware Tribe indicated that it is still conducting research about the project.

4.10.6 Affected Environment

A list of the cultural resource reports filed as part of the MVP and the EEP can be found in appendix V.

4.10.6.1 Definition of the Area of Potential Effect

After consultations with the SHPOs, in accordance with Part 800.4(a)(1), we agree with Mountain Valley's and Equitrans' (and their consultants) definition of the APE for the MVP and EEP, as described below.

Mountain Valley Project

In West Virginia, Tetra Tech defined the direct APE to be a 300-foot-wide corridor along the pipeline route, a 100-foot-wide corridor along access roads, and the limits of ground disturbance at aboveground facilities, yards, and other extra workspaces. The indirect APE was defined as 0.25-mile on each side of the pipeline centerline, and a 0.5-mile radius around proposed compressor stations. Mountain Valley indicated that it provided the WVDCH with its definition of the APE in West Virginia via an email dated March 20, 2015. In an April 17, 2015 letter to Tetra Tech, the WVDCH had comments on the definition of the APE and requested revisions.

Tetra Tech defined the direct APE in Virginia as 150 feet on each side of the pipeline centerline and a 100-foot-wide corridor along proposed access roads. In a letter to the VADHP dated March 20, 2015, Tetra Tech defined the indirect APE in Virginia as 150 feet from the pipeline centerline at elevations below 1,889 feet, 0.5 mile at elevations between 1,889 and 2,551 feet, and 1.0 mile at elevations above 2,551 feet. Mountain Valley's consultant, New South Associates, defined the direct APE for historic architectural resources in Virginia as a 450-foot-wide corridor along the route of the proposed pipeline. In a letter dated May 20, 2015, the VADHP accepted Tetra Tech's definition of the indirect APE.

Equitrans Expansion Project

In its first draft of Resource Report 4, Equitrans defined the APE for direct effects to include all areas of ground disturbance; this differs for the various pipeline segments, corresponding to the width of the construction right-of-way. Based on Equitrans application to the FERC filed October 27, 2015, the direct APE for the H-316 pipeline would be 125 feet wide, the H-318 and the H-305 pipelines would each be 100 feet wide, the M-80 and the H-158 pipelines would each be 125 feet wide, and the H-319 pipeline would be 85 feet wide. The APE for indirect effects was defined by Equitrans as 0.25 mile from the pipeline centerline and 0.5 mile from aboveground facilities.

In a letter to Tetra Tech dated July 27, 2015, the PABHP accepted Equitrans' work plan for the EEP in Pennsylvania. In a letter to Tetra Tech dated August 10, 2015, the WVDCH concurred with Equitrans' definition of the direct APE for archaeological sites and indirect APE for architectural sites in West Virginia.

4.10.7 Previous Surveys and Previously Recorded Cultural Resources

Native Americans occupied North America for many thousands of years before European exploration and settlement. According to the *Handbook of North American Indians*, at about the time of contact, the tidewater and piedmont regions of what is now the Commonwealth of Virginia were occupied by various native Algonquin and Iroquoian linguist groups, while what is now the western portion of the Commonwealth of Pennsylvania was occupied by the Delaware and Susquehannock tribes. European settlement of Virginia was initiated with the establishment of Jamestown by the English in 1607, and the English colony in Pennsylvania began with the founding of Philadelphia in 1682. The State of West Virginia was created in 1863, separating from Virginia during the Civil War. In the discussion below, we refer to Native American archaeological sites as "pre-contact," while Euro-American colonial and more recent archaeological remains and architectural structures are called "historic."

4.10.7.1 Mountain Valley Project

Historic Districts

There are 18 Historic Districts in the vicinity of the MVP, listed appendix V. The pipeline would cross eight of those Historic Districts (Sam's Run Historic District, Big Stony Creek Historic District, Greater Newport Rural Historic District, North Fork Valley Rural Historic District, Bent Mountain Rural Historic District, Blue Ridge Parkway Historic District, Coles-Terry Rural Historic District, and the Lynchburg and Danville Railroad Historic District). Three of the

Historic Districts crossed by the MVP pipeline route (Sam's Run, Big Stony, and Bent Mountain) were created by Mountain Valley's consultants.

In a filing on February 17, 2017, Mountain Valley explained its multi-step approach to assessing project-related effects on individual resources within Historic Districts in Virginia, devised in communications with the VADHR. Mountain Valley believes that its approach analyzes impacts on both the built environment and rural historic cultural landscapes within Historic Districts, as it takes into account project-related changes to the environment that may affect the setting and character of the Historic Districts. Task 1 used digital elevation modeling with National Land Cover Database data and aerial imagery to determine if the MVP would have adverse visual impacts on individual historic architectural sites within the indirect APE. Sites were excluded from further study due to distance from the pipeline and vegetative cover. Task 2 – Step 1 consisted of a viewshed analysis using USGS digital elevation model raster datasets. Sites from which the pipeline corridor would not be visible were eliminated from further study. Task 2- Step 2 was a viewpoint analysis using Google Earth. Each viewpoint was rated as either "inferior," "co-dominant," or "dominant." Sites with dominant viewpoints were next evaluated under Task 3, which was the consideration of historical significance and aspects of integrity. The MVP was assessed to have either a low potential or high potential to adversely affect an historic property. If the MVP would have a high potential to adversely affect an historic property, that site would undergo Task 4 evaluations, which consist of photographic simulations and historic land use and land cover analyses. In a letter dated March 22, 2017, the VADHR accepted Mountain Valley's "Results of Criteria Assessment Tasks 2 and 3" (Neylon, 2017). The VADHR has not yet commented on the results of Task 4 evaluations (Dye and Marshall, May 2017) submitted by Mountain Valley in May 2017.

Sam's Run Historic District

In 2015, Mountain Valley's cultural resources contractor (Tetra Tech) defined the proposed Sam's Run Historic District at the town of Folsum in Wetzel County, West Virginia, running west along Sam's Run Road from near the crossing of the MVP pipeline around MP 7.9 to Fishing Creek at WV Route 20. The historic resources of the proposed Historic District are related to oil and gas development sponsored by the South Penn Oil Company beginning around 1900. The District was recommended as eligible for the NRHP under 36 CFR 60.4 criterion A, for association with important local historic events and activities. The proposed Historic District includes residential, industrial, and transportation related resources. Tetra Tech identified eight historic sites (Folsom Viaduct/WV Shortline Railroad [site 127], South Penn Oil Electrical Plant [site 182], and six residences [sites 183, 184, 185, 186, 187, 188]) that contribute to the significance of the Historic District, and six non-contributing resources, including two historic houses [sites 189 and 190] where modifications have altered their integrity. In its October 6, 2015 review of the Wetzel County survey report (Espino et al., July 2015), the WVDCH concurred with Tetra Tech's recommendations. We agree.

In a filing with the FERC on February 17, 2017, Mountain Valley provided its assessment of effects for the Sam's Run Historic District (Dye, 2017). The eastern boundary of the Historic District is about 280 feet from the closest MVP workspace. Tetra Tech recommended that the MVP would have no effect on the Sam's Run Historic District (Dye, February 2017). Mountain Valley filed an avoidance plan for the Sam's Run Historic District on February 17, 2017

(Attachment DR4 Cultural Resources 13). However, Mountain Valley has not yet documented the WVDCH reviews of its Effects Report or its Avoidance Plan. The FERC staff cannot make a final formal determination of project effects until we see the opinions of the West Virginia SHPO.

Big Stony Creek Historic District

During Mountain Valley's 2015 historic architectural survey of Giles County, Virginia, New South Associates defined the proposed Big Stony Creek Historic District (VADHR site number 35-5127). The Historic District boundaries were drawn to extend for about 1.5 miles along the Big Stony Creek valley, parallel to the Norfolk and Western Railroad and VA Route 684 (Norcross Road) northeast from the community of Norcross through the community of Kimballton. The railroad, which stimulated the development of this river valley, was originally constructed in 1892; and most of the contributing elements of the Historic District also date to the 1890s. New South Associates indicated that the Historic District contains a concentration of buildings and industrial features that are united by geography, date of construction, materials, and function. The proposed Historic District includes eight contributing and one non-contributing resource (APG Lime Corp. Plant #1 [35-5124]). The VADHR, in its May 25, 2016 letter reviewing the historic architectural survey report for Giles County (Turco et al., March 2016), agreed with the report's NRHP eligibility evaluations. We concur.

The MVP pipeline route would cross through the Big Stony Creek Historic District between about MPs 200.2 and 200.5. In appendix V, we list the resources in the Historic District within the indirect APE, their distance to the pipeline, and the effects evaluations by Mountain Valley.

Tom King (August, 2016) believes that the Big Stony Creek Historic District constitutes a rural historic landscape that represents a traditional cultural place. New South Associates recommended additional research for the Historic District, and the VADHR concurred.

In a January 26, 2017 EIR, we asked Mountain Valley to provide the results of the additional research, and to assess potential impacts on the rural historic cultural landscape associated with the Big Stony Creek Historic District. In its February 17, 2017 response, Mountain Valley stated that it would apply its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR.

The Masters House (35-5117) and McDonald Place (35-5118) are outside of the indirect APE, and were not evaluated for project effects. Besides the railroad, none of the other contributing sites within the Historic District are in the direct APE; and were eliminated from further effects evaluations because of their distance away from the pipeline. Mountain Valley's effects assessment Task 2 viewpoint analysis found the railroad to be co-dominate and eliminated it from further study. The VADHR accepted Mountain Valley Task 2 assessments. Mountain Valley intends to cross under the Norfolk and Western Railroad using a bore, and indicated that this should result in no adverse effects on the resource. We agree.

Mountain Valley made a finding of "high potential" under Task 3 for the Big Stony Creek Historic District as a whole, and recommended Task 4 studies be conducted. In a letter to Mountain Valley dated March 22, 2017, the VADHR concurred that further studies under Task 4 be done for the Big Stony Creek Historic District. In its Criteria of Effects Report, conveying the results of the Task 4 analysis, Mountain Valley made a finding of "no adverse effects" for the Big Stony Creek Historic District (Dye and Marshall, May 2017). That report was submitted to the VADHR in May 2017; but no comments have been filed yet. We cannot make our final determination of project-related effects on the Big Stony Creek Historic District until we see the opinion of the VADHR.

Greater Newport Rural Historic District

The Greater Newport Rural Historic District (35-412), listed on the NRHP in 2000, covers about 21,371 acres in Giles County, Virginia. It extends from the New River on the west, to the Craig County boundary at John's Creek Mountain on the east, Mountain Lake and Salt Pond Mountain on the north, and Gap Mountain along the Montgomery County border on the south; encompassing about 33 square miles. The Historic District contains 737 contributing buildings and 540 non-contributing (Kapp, 14 September 1999). Tom King (August, 2016) believes that the Greater Newport Rural Historic District constitutes a cultural landscape that represents a traditional cultural place.

In filings on May 9, October 24, and December 21, 2016, Giles County and the Greater Newport Rural Historic District Committee presented lists of resources associated with the Historic District, claiming that data about those sites were missing from Mountain Valley filings. Table 1 of Turco (June 2016), filed by Mountain Valley with the FERC on June 24, 2016, listed contributing and non-contributing resources within the indirect and indirect APE in the Greater Newport Rural Historic District. Appendix V lists resources within the Greater Newport Rural Historic District mentioned by Giles County, Greater Newport Rural Historic District Committee, and Turco (June 2016; March 2017) in relation to MVP work areas, and Mountain Valley's assessments of effects.

The proposed MVP pipeline route would cross through the boundaries of the Greater Newport Rural Historic District between about MPs 210.8 and 216.9. Fourteen resources in the Historic District were identified and are described Appendix V within the direct APE for the MVP.

The New South Associates historic architecture survey report for Giles County (Turco et al., March 2016a) recommended no further work at the sites within the Greater Newport Rural Historic District. In a filing on January 15, 2016, Mountain Valley indicated that it would discuss impacts on the Adlai Jones Farm pole barn (35-412-10) with the VADHR, and it would use special construction techniques to avoid and minimize impacts on the Red Covered Bridge (35-412-245).

The VADHR accepted Mountain Valley's addendum historic architectural survey report for Giles County (Turco, June 2016) on August 4, 2016. However, in that review letter, the SHPO indicated it needed additional data prior to making an assessment of project effects on the Greater Newport Rural Historic District and its constituent resources. In a January 26, 2017 EIR, we asked Mountain Valley to provide the results of the additional research at the Greater Newport Rural Historic District, including an assessment of effects on the built environment and the rural historic cultural landscape of the Historic District.

In its February 17, 2017 response to our EIR, Mountain Valley stated that it would apply its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR. In a letter dated March 22, 2017, the VADHR accepted Mountain Valley's "Results of Criteria Assessment Tasks 2 and 3" (Neylon, 2017). Mountain Valley made a finding of "high potential" under Task 3 for the Greater Newport Rural Historic District as a whole, and recommended Task 4 studies be conducted. The VADHR concurred that Task 4 studies need to be done. In May 2017, Mountain Valley submitted the results of its Task 4 analysis to the VADHR, which indicated that the MVP would have "no adverse effects" on the Greater Newport Rural Historic District. However, the VADHR has not yet commented on that report (Dye and Marshall, May 2017). We cannot make our final determination of project-related effects on the Greater Newport Rural Historic District until we see the opinion of the VADHR on those studies.

Newport Historic District

The Newport Historic District (35-151) was listed on the NRHP in 1994. It covers about 35 acres including the small rural village of Newport, located in the narrow Greenbrier Branch valley at the base of Gap Mountain in Giles County, Virginia. The Historic District contains 50 contributing buildings and 13 non-contributing resources (Giles and Kern, 18 August 1993). The entire Newport Historic District is subsumed within the Greater Newport Rural Historic District, and some resources were double recorded in both Historic Districts, with different site numbers.

The MVP pipeline centerline would be about 160 feet away from the boundary of the Historic District near MP 212.9. The pipeline route does not cross within the Historic District. The boundary of the Historic District would be within 73 feet of MVP workspaces. The entire Newport Historic District lies within the indirect APE. None of the resources within the Historic District fall within the direct APE for the MVP. It is our opinion that the MVP would have no direct impacts on the Newport Historic District. Appendix V lists resources within the indirect APE for MVP inside the Newport Historic District, mentioned by Giles County, Greater Newport Rural Historic District Committee, and Turco (June 2016) in relation to MVP pipeline, and Mountain Valley's assessments of effects.

In a January 26, 2017 data request, we asked Mountain Valley to provide an assessment of effects on the built environment and the rural historic cultural landscape of the Newport Historic District. In its February 17, 2017 response to our EIR, Mountain Valley stated that it would apply its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR. The VADHR accepted Mountain Valley's "Results of Criteria Assessment Tasks 2 and 3" (Neylon, 2017) in a March 22, 2017 letter. Mountain Valley made a finding of "high potential" under Task 3 for the Newport Historic District as a whole, and recommended Task 4 studies be conducted. The SHPO concurred. In May 2017, Mountain Valley submitted the results of its Task 4 analysis to the VADHR, indicating that the MVP would have "no adverse effects" on the Newport Historic District. The VADHR has not yet provided comments on that report (Dye and Marshall, May 2017). We withhold our final determinations of indirect effects on the Newport Historic District until after we see the VADHR review of the Mountain Valley Task 4 analysis.

North Fork Valley Rural Historic District

The North Fork Valley Rural Historic District (60-574), in Montgomery County, Virginia, was listed on the NRHP in 1990. It encompasses the North Fork Roanoke River valley south of Brush Mountain and north of Paris Mountain, from the community of Lusters Gate east past McDonalds Mill to the Roanoke County line. The Historic District contains 144 contributing resources and 137 non-contributing resources (Worsham, June 1988). Appendix V lists resources within the North Fork Valley Rural Historic District in relation to the MVP indirect APE, and Mountain Valley's assessments of effects.

The currently proposed MVP pipeline route would cross through the North Fork Valley Rural Historic District between about MPs 226.3 and 228.3. Appendix V lists 14 resources in the North Fork Rural Historic District that are also within the indirect APE for the MVP. Only one of those resources is within the direct APE. A barn (60-574-125) is within 36 feet of the centerline. Mountain Valley's Task 3 analysis rated this resource as having "high potential" and recommended further Task 4 studies. The John Brown Farm (60-574-330) is adjacent to a proposed access road, 298 feet away from an MVP workspace.

We agree with the Virginia SHPO's statement, in its review of Mountain Valley's historic architectural survey report covering Montgomery County, that the 1940 log store (60-326) is individually eligible for the NRHP. Mountain Valley's contractor recommended that a project effects determination be made in the future for the resources identified in the APE within the North Fork Valley Rural Historic District boundaries (Turco et al., March 2016c). In a January 26, 2017 data request, we asked Mountain Valley to provide an assessment of effects on the built environment and the rural historic cultural landscape of the North Fork Valley Rural Historic District.

In its February 17, 2017 response to our EIR, Mountain Valley stated that it would apply its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR. In a March 22, 2017 letter to Mountain Valley, the VADHR accepted the "Results of Criteria Assessment Tasks 2 and 3" (Neylon, 2017). Mountain Valley made a finding of "high potential" under Task 3 for the North Fork Valley Rural Historic District as a whole, and recommended Task 4 studies be conducted. The SHPO concurred. In May 2017, Mountain Valley submitted its Task 4 analysis to the VADHR, which indicated that the MVP would have "no adverse effects" on the North Fork Rural Historic District. The VADHR has not yet commented on this report (Dye and Marshall, May 2017). We withhold our final finding of project effects for the North Fork Rural Historic District until after the Virginia SHPO provides its review of those Task 4 studies.

Coles-Terry Rural Historic District

On September 15, 2016, the VADHR found the Coles-Terry Rural Historic District to be eligible for listing on the NRHP. The Coles-Terry Rural Historic District (80-5689) is located in Roanoke County, Virginia. This Historic District encompasses about 2,500 acres, extending from the Montgomery County line and Poor Mountain on the west to Wellett Lane and Bent Mountain on the east, with Honeysuckle Road on the north and Bottom Creek on the south. The Historic District includes four historic houses and a fire observation tower. It is considered eligible for the NRHP under criterion A for its role in local history, and under criterion C for the architecture of the houses. Its period of significance began in 1835 when John Dabney Coles acquired 15,000 acres of land in this area and concluded at about 1970 when the local apple orchard boom declined (Rodgers, 2016). A portion of the Coles-Terry Rural Historic District overlaps with the proposed Bent Mountain Rural Historic District (80-5677), described below.[125]

In appendix V, we list the resources of the Coles-Terry Rural Historic District within the indirect APE, their distance to the pipeline, and the effects evaluations by Mountain Valley. The proposed MVP pipeline route would cross the Coles-Terry Rural Historic District between about MPs 240.4 and 243.0. The closest contributing element to the Historic District (Terry Moncure House) would be about 508 feet away from the pipeline centerline. However, the Baker House would be adjacent to a proposed access road.

Our January 26, 2017 EIR asked Mountain Valley to provide an assessment of project effects for the Coles-Terry Rural Historic District, including impacts on the built environment and the rural historic cultural landscape. In its February 17, 2017 response, Mountain Valley stated that it would apply its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR. The Janet Wynot House (80-490) was eliminated from further study by Mountain Valley during Task 1 because of its distance from the pipeline. The Terry Moncure House was eliminated from further study during Task 2 – Step 1 because the viewshed model showed no visibility. The Coles-Terry House and Baker House were eliminated from further study during Task 2 – Step 2 as Mountain Valley found their viewpoints to be either inferior or co-dominant, and indicated that its project would have no adverse effects on those resources.

In a March 22, 2017 letter to Mountain Valley, the VADHR accepted the "Results of Criteria Assessment Tasks 2 and 3" (Neylon, 2017). Mountain Valley made a finding of "high potential" under Task 3 for the Coles-Terry Historic District as a whole and recommended that Task 4 studies be conducted. The SHPO concurred. In May 2017, Mountain Valley provided the results of its Task 4 analysis to the VADHR, which indicated that the MVP would have "no adverse effects" on the Coles-Terry Rural Historic District. The VADHR has not yet commented on that report (Dye and Marshall, May 2017). We cannot make our final determination of project-related effects on the Coles-Terry Rural Historic District until we see the VADHR review of the Task 4 study results.

Bent Mountain Rural Historic District

The Bent Mountain Rural Historic District (80-5677) was proposed by New South Associates after their 2015 historic architectural survey of the MVP pipeline route in Roanoke County (Turco, March 2017). The proposed Historic District encompasses the community of Bent Mountain and the Mill Creek valley, centered on U.S. Route 221 (Bent Mountain Turnpike). The

[125] Mountain Valley's consultant's report of its historic architectural survey for Roanoke County (Turco et al. March 2016), that identified the Bent Mountain Rural Historic District, was produced in March 2016, before the VADHR PIF Resource Information Sheet for the Coles-Terry Rural Historic District was written (Rodgers, 2016).

boundaries of the Historic District extend east from the Montgomery County line, and north of the Floyd County line and Blue Ridge Parkway, to Bottom Creek and geographic Poor Mountain and Bent Mountain. As mentioned above, a portion of the Coles-Terry Rural Historic District is overlapped by the larger Bent Mountain Rural Historic District.

New South Associates believes that the buildings in the Bent Mountain Rural Historic District are unified by their geographic locations, dates of construction, materials, and function. Within the Bent Mountain Rural Historic District, New South Associates identified 41 structures, including 26 houses, 6 farms and barns, 1 school, 2 churches, 1 cemetery, 4 stores and commercial buildings, and 1 bridge. Twenty-one of those sites were previously recorded. In its May 21, 2016 review of Mountain Valley's historic architectural survey report covering Roanoke County, the VADHR supported New South Associates recommendation for the creation of the Bent Mountain Rural Historic District, with 41 contributing resources. In addition, the VADHR agreed that 10 resources within the proposed Historic District should be considered individually eligible for the NRHP.

In an addendum survey report, Tetra Tech added five newly recorded historic sites to the Bent Mountain Rural Historic District (Reeve et al., January 2017); four were noted to be in the direct APE (80-5677-5, 6, 7, and 8). New South Associates (Turco, March 2017) indicated that two of these sites (80-5677-6 and 8) should be considered contributing elements to the Bent Mountain Rural Historic District. Avoidance was recommended for sites 80-5677-6 (cabin) and 8 (Henry Gregory House and Cemetery).

The MVP pipeline route would cross through the Bent Mountain Rural Historic District between about MPs 242.0 and 246.5. Appendix V lists the resources of the Bent Mountain Rural Historic District that fall within indirect APE for the MVP, their evaluation, distance to the pipeline centerline, and Mountain Valley's assessment of potential project effects.

New South Associates recommended additional research on the proposed Bent Mountain Rural Historic District, and the VADHR concurred. Preserve Bent Mountain claims that there should be a study of "cultural attachment" for the Bent Mountain and Poor Mountain communities.[126] Preserve Roanoke is concerned that our assessment of effects would not take into consideration the historic rural cultural landscape of the Bent Mountain Rural Historic District.[127] In our January 26, 2017 EIR, we asked Mountain Valley to provide the results of additional research about the Bent Mountain Rural Historic District, evaluate potential project effects on the built environment and rural historic cultural landscape associated with the Historic District, and address the comments of Preserve Bent Mountain and Preserve Roanoke.

In its February 17, 2017 response to our EIR, Mountain Valley declined to address whether or not the concept of cultural attachment to land could be applied to the Bent Mountain Rural Historic District, explaining that the concept is not part of the Section 106 compliance process under 36 CFR 800. Mountain Valley quoted from the ACE report (Bengston and Austin, 2016) on cultural attachment that stated that the concept is "lacking in the tangible substantive elements

[126] See the letter dated December 19, 2016 from Preserve Bent Mountain to the FERC (accession number 20161220-5042.

[127] See the letter dated December 21, 2016 from Preserve Roanoke to the FERC.

that lend itself to evaluation under Section 106 of the National Historic Preservation Act or under the National Environmental Policy Act." It may be more useful to discuss the Bent Mountain Rural Historic District as a rural historic landscape, as suggested by Preserve Roanoke, or as a traditional cultural place, as suggested by Tom King. The NPS has issued National Register bulletins about how rural historic landscapes and traditional cultural places can be evaluated within the Section 106 context (McClelland et al., 1999; and Parker and King, 1998). However, since FERC and the SHPO agree that the Bent Mountain Rural Historic District qualifies for the NRHP, it may be moot that it also may be a rural historic landscape or a traditional cultural place. Dr. King (2016) further suggested that: "effects are judged with reference to specific places within the districts, not with reference to the districts themselves."

Mountain Valley contends that it is not necessary to conduct Phase II research for the Bent Mountain Rural Historic District, because it used its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR. In a March 22, 2017 letter to Mountain Valley, the VADHR accepted the "Results of Criteria Assessment Tasks 2 and 3" (Neylon, 2017). Mountain Valley made a finding of "high potential" under Task 3 for the Bent Mountain Rural Historic District, as a whole, and recommended that Task 4 studies be conducted. The SHPO concurred. In May 2017, Mountain Valley provided the VADHR with its Task 4 analysis, which found the MVP would have "no adverse effects" on the Bent Mountain Rural Historic District. The VADHR has not yet commented on that report (Dye and Marshall, May 2017). We cannot make our final determination of project-related effects on the Bent Mountain Rural Historic District until we see the VADHR review of the Task 4 study results.

Blue Ridge Parkway Historic District

The BRP extends about 469 miles between Shenandoah National Park in Virginia and the Smoky Mountain National Park in North Carolina. Construction of the parkway began in 1935, and the Roanoke section was completed by 1965. The portion of the parkway through Adney Gap, which includes the MVP pipeline crossing, was opened to automobile traffic in 1938. Congress authorized the NPS to administer and manage the BRP in 1936.[128]

The Blue Ridge Parkway Historic District (80-5161) was listed in the NRHP in 2008. The BRP was also recorded in the Historic American Engineering Record (NC-42). A portion of the Blue Ridge Parkway Historic District also overlaps with the Bent Mountain Rural Historic District described above.

The MVP pipeline route would cross through the Blue Ridge Parkway Historic District between about MPs 246.1 and 246.6 in Roanoke and Franklin Counties, Virginia. Mountain Valley has conducted several archaeological and historic architectural surveys that intersect with the Blue Ridge Parkway Historic District (Reeve et al., September 2015, March 2016, November 2016, February 2017; Tetra Tech, January 2017; and Turco et al, September 2015, March 2016). The results of those surveys are listed in Appendix V.

Besides the road itself, no associated historic architectural sites were identified in the direct APE at the pipeline crossing within the Blue Ridge Parkway Historic District boundaries.

[128] 49 Stat. 401, Public Law 74-848.

Mountain Valley's architectural consultant re-located the previously recorded 1900 Wimmer Farm (31-5045), 1958 bridge over Callaway Road (80-5161-188) and a circa 1920s barn (80-5161-341) in Roanoke County, and the previously recorded Shaver Cemetery (33-5287) and Retail Store (80-5161-342) in Franklin County; each in the indirect APE within the boundaries for the Blue Ridge Parkway Historic District. The Shilling Cemetery (80-5161-343) and earthen dam (80-5161-344) were reported in Tetra Tech's archaeological survey of the Blue Ridge Parkway MVP pipeline crossing (Reeve et al., December 2016).

The bridge over Callaway Road was previously determined to be a contributing resource to the Historic District. The Wimmer Farm, consisting of outbuildings after a fire destroyed the house, was determined by the VADHR and NPS in 2011 to be a non-contributing element of the Blue Ridge Parkway Historic District. The 1920s barn requires additional research. The Shaver Cemetery is unevaluated. The Retail Store was determined by the NPS to be a non-contributing element to the Historic District (Turco et al., September 2015b; Turco et al., March 2016b). The ca. 1910 Wimmer/Shilling Cemetery was recommended to be a contributing element to the Blue Ridge Parkway Historic District. The breached twentieth century earthen dam was also recommended to be contributing (Turco, March 2017).

Tetra Tech recorded seven pre-contact archaeological sites within the Blue Ridge Parkway Historic District (Reeve et al., December 2016). Five sites were evaluated as not eligible for the NRHP. Two sites (44RN383 and FR402) were evaluated as potentially eligible. The NPS accepted the findings of the survey reports covering pipeline crossings of the BRP and alternative routes in a letters dated December 15, 2016 and February 17, 2017. However, Mountain Valley has not yet documented review of the survey reports by the VADHR.

Mountain Valley had its contractor (Tetra Tech) conduct Phase II archaeological testing at pre-contact sites 44RN383 and FR402. As a result of the testing, site 44RN383 was evaluated as not eligible. However, site 44FR402 was deemed eligible, and avoidance was recommended (Reeve et al., February 2017). Site 44FR402 is located about 631 feet away from the currently proposed MVP pipeline centerline. The NPS accepted the testing report in a letter to Tetra Tech dated March 28, 2017. On February 17, 2017, Mountain Valley filed with FERC a plan to avoid site 44FR402 (Jacoby and Marshall, February 2017). Mountain Valley has not yet documented reviews of the testing report or avoidance plan by the VADHR.

Preserve Roanoke is concerned that the MVP would result in visual impacts on the rural historic cultural landscape within the Blue Ridge Parkway Historic District. Our January 26, 2017 EIR asked Mountain Valley to provide an assessment of project effects for the Blue Ridge Parkway Historic District, including both the built environment and the rural historic cultural landscape encompassing the Historic District at the MVP pipeline crossing.

The BRP is under the jurisdiction of the NPS; which requested a VIA for the pipeline crossing. Mountain Valley filed with the FERC its VIA for the BRP in February 2017 (see section 4.8). Based on the VIA, Mountain Valley concluded that there would be no significant adverse impacts on the visual resources associated with the Blue Ridge Parkway Historic District at the crossing of the MVP pipeline. However, Mountain Valley has not yet filed NPS concurrence with this finding. We cannot make our final official determination of project effects on the Blue Ridge

Parkway Historic District until we see the opinions of the NPS and the VADHR regarding the VIA for the BRP and Mountain Valley's findings of effects.

Lynchburg and Danville Railroad Historic District

The VADHR surveyed the proposed Lynchburg and Danville Railroad Historic District (118-5286) in Pittsylvania County, Virginia in 2007. However, apparently the proposed Historic District was never listed in the NRHP. The railroad is currently operated by the Norfolk & Southern. The proposed MVP pipeline route would cross the railroad at about MP 298.4. New South Associates re-located, rerecorded, and evaluated the pipeline crossing of the Lynchburg and Danville Railroad Historic District. At the crossing location, the site consists of an active double railroad track. Mountain Valley would cross under the railroad using a bore, thus avoiding impacts. There are no other aboveground features at the crossing. New South Associates evaluated the crossing as not being a contributing element to the Historic District (Turco et al., July 2015a). We and the SHPO agree with that evaluation. Therefore, the MVP should have no effect on the Lynchburg and Danville Railroad Historic District.

Previously Recorded Sites in West Virginia

Mountain Valley examined the site files of the WVDCH in January and September 2015. Seventeen archaeological surveys had previously been conducted within 0.5 mile of the proposed MVP facilities in West Virginia; of which seven surveys overlap with a portion of the APE.

In the affected counties of West Virginia, a total of 123 previously recorded archaeological sites and 381 previously recorded aboveground resources were identified within 1.0 mile of the MVP component. Nineteen of the previously recorded archaeological sites and 46 of the previously recorded architectural sites are within 0.5 mile of the pipeline.

Mountain Valley's application (see Appendices 4B-1 and 4C-1 to Resource Report 4) indicated that there were five previously recorded archaeological sites and two previously recorded architectural sites within the direct APE in West Virginia. However, a cultural resources survey report (Espino et al., July 2015a, Appendix A) identified eight previously recorded archaeological sites and three previously recorded architectural sites in the direct APE.

A data response filed by Mountain Valley on January 15, 2016, indicated that there were 11 archaeological sites previously recorded in the direct APE (150 feet from the pipeline) in West Virginia: 1 in Wetzel County, 1 in Nicholas County, 5 in Summers County, and 4 in Monroe County. A February 9, 2017 data response indicated that during cultural resources surveys in West Virginia, Mountain Valley's contractors did not re-locate six previously recorded archaeological sites (46NI20, SU180, ME23, ME194, ME202, and ME207); but five previously recorded archaeological sites were found. Known historic archaeological sites 46WZ278/79 in Wetzel County were previously evaluated as not eligible for the NRHP. Known archaeological sites 46SU78, SU147, SU153, and SU181 in Summers County were all previously unevaluated. Sites 46SU78, SU153 and SU181 were re-located and re-evaluated by Mountain Valley's consultants as not eligible for the NRHP; while site 46SU147 can be avoided.

Mountain Valley's December 24, 2015 data response indicated that in the indirect APE in West Virginia (0.25 mile from the pipeline) 15 previously recorded historic architectural sites were re-located in Harrison County; 1 in Lewis County; 2 in Braxton County; and none in Wetzel and Webster Counties. A filing with FERC by Mountain Valley on April 21, 2016, provided different numbers, indicating that 23 previously recorded historic architectural sites were re-located in the indirect APE in Nicholas County; 3 in Fayette County; 3 in Greenbrier County; and none in Summers and Monroe Counties. Mountain Valley's January 15, 2016 data response listed four previously recorded historic architectural sites in the direct APE in West Virginia: one in Harrison County, two in Lewis County, and one in Nicholas County.

Of the 15 previously recorded historic structures re-located by Tetra Tech in the indirect APE in Harrison County, all but one was evaluated as not eligible for the NRHP (Espino et al., July 2015a). The only previously recorded structure in the direct APE in Harrison County is the circa 1900 Fielder-Profit House (177/HS-495-6), which is about 160 feet from the pipeline; re-evaluated as not eligible for the NRHP. In the indirect APE in Harrison County, Tetra Tech re-located the previously recorded circa 1915 Haught House/New Dale Farm (site number 157/HS-610), about 933 feet away from an ATWS, Site 157/HS-610 was evaluated as eligible. Mountain Valley has indicated that the MVP would have no adverse effects on the Haught House/New Dale Farm (Dye, February 2017). We agree.

In Lewis County, two previously recorded historic architectural sites were re-located by Tetra Tech in the indirect APE. The Curtis Residence (125/LE-21-2) was evaluated as not eligible for the NRHP. St. Bernard's Church and Cemetery (NR#85001583) is listed on the NRHP. The church is located about 814 feet away from an ATWS, and would be avoided by project construction. Mountain Valley indicated that the MVP would have no effect on St. Bernard's Church (Dye, February 2017). We agree.

The proposed pipeline route would cross the previously recorded and NRHP-listed Weston and Gauley Bridge Turnpike Trail (NR#98001430), in Braxton County, which is owned by the COE. Mountain Valley intends to bore under the turnpike. Mountain Valley filed a crossing plan on April 21, 2016, but the COE has not yet commented. Mountain Valley indicated that the MVP would have no adverse effects on the Weston and Gauley Bridge Turnpike Trail (Dye, February 2017), a finding that the WVDCH concurred with in a letter dated April 7, 2016. We agree.

In Nicholas County, the previously recorded Haldeman House (NI-25-64), dating to about 1949, was re-located by Tetra Tech about 100 feet from the pipeline and re-evaluated as not eligible (Espino et al., December 2015c). The previously recorded 1852 Beaver Mill (NR#01000776) in Nicholas County, which is listed on the NRHP (Espino et al., December 2015c), is located about 312 feet from an ATWS, and would be avoided by the project. Mountain Valley indicated that the MVP would have no effect on the Beaver Mill (Dye, February 2017). We agree.

Three previously recorded historic sites (the Carter, Shoemaker, and Painter Residences) are within 0.5 mile of the proposed Stallworth Compressor Station in Fayette County. The three historic architectural sites were re-located and re-evaluated by Tetra Tech as eligible for the NRHP (Espino et al., December 2015c). The WVDCH indicated that the Carter, Shoemaker, and Painter Residences qualify for the NRHP under 36 CFR 60.4(c). Mountain Valley indicated that the MVP would have no effect on the Carter, Shoemaker, and Painter Residences (Dye, February 2017); and we agree.

Previously Recorded Sites in Virginia

The site files of the VADHR were examined by Tetra Tech in October 2014 and September 2015. Seventeen archaeological surveys had previously been conducted within 0.5 mile of the proposed MVP facilities in Virginia; of which seven surveys overlap with a portion of the APE.

According to Overviews conducted for Mountain Valley, in the affected counties of Virginia, a total of 138 archaeological sites and 329 architectural sites were previously recorded within 1.0 mile of the MVP components. Of the previously recorded archaeological sites, 103 were within 0.5 mile of the pipeline, together with 210 of the previously recorded architectural sites (Reeve et al., July 2015a; September 2015b; and December 24, 2015 data response).

According to a January 15, 2016 data response from Mountain Valley, there is 1 previously recorded archaeological site in Giles County, 28 in Franklin County, and 13 in Pittsylvania County, within the direct APE. Another V-CRIS file search, by Tetra Tech, indicated that four archaeological sites (44MY53, 54, 216, 282) had been previously recorded in the direct APE in Montgomery County, but none in Craig and Roanoke Counties (Reeve et al., March 2016). During archaeological surveys in Montgomery County, previously recorded site 44MY53 was not re-located (Reeve et al., January 2017).

According to a February 9, 2017 data response, in the direct APE in Virginia, Mountain Valley's contractors re-located one previously recorded archaeological site in Montgomery County (44MY54), and one site in Franklin County (44FR191). Pre-contact site 44MY54 was evaluated as being eligible for the NRHP. However, it was recommended that Mountain Valley adopt a route modification to avoid this site (Reeve et al., January 2017). On February 17, 2017, Mountain Valley filed a plan to avoid site 44MY54 (Jacoby and Marshall, February 2017).

Pre-contact site 44FR191 was originally recorded in 1987 by the Archaeological Society of Virginia, and revisited by William and Mary College in 1997, and Tetra Tech in 2015 for the MVP. It was originally unevaluated, and then tested by Tetra Tech in 2016. As a result of the testing, it was recommended that site 44FR191 is not eligible. However, Mountain Valley has not yet documented the review of the testing report (Reeve et al., February 2017) by the VADHR.

Mountain Valley indicated that its historic architectural consultant (New South Associates) re-located six previously recorded historic architectural sites (35-34, 35-45, 35-170, 35-412-244, 35-0412-245, and 35-418) within the indirect APE in Giles County, outside of the boundaries of known Historic Districts. New South Associates recommended that the previously recorded Pogonowski mill and residence (35-45), Little Stony schoolhouse (35-170), and D.K. Duncan house (35-418) should be considered not eligible for the NRHP, requiring no further work. The Berean Baptist Church (35-34) was evaluated as potentially eligible for the NRHP, and additional research was recommended (Turco et al., March 2017). In a letter dated May 25, 2016, the VADHR concurred with the recommendations in the historic architectural survey report covering Giles County; we agree.

Our January 26, 2017 EIR asked Mountain Valley to provide the results of research for the Berean Baptist Church. Instead, in its February 17, 2017 response, Mountain Valley indicated that it agreed the site was potentially eligible, and would assess effects using its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia" developed in communications with the VADHR. According to Task 1, the church was eliminated from further analyses due to distance and vegetation. The church is located about 745 feet away from the pipeline and would be avoided. We find that the MVP would have no effect on the Berean Baptist Church.

According to a February 9, 2017 data response from Mountain Valley, two other previously recorded historic sites (farmstead 35-18 and the ANST 21-5012) were re-located within the direct APE in Giles County, outside of Historic Districts. The ANST is discussed below (under the Jefferson National Forest). The historic Doe Creek Farm (35-18) was evaluated as eligible for the NRHP.

The Doe Creek Farm is located about 479 feet away from the pipeline centerline. Task 2 – Step 2, of Mountain Valley's "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," indicated that the viewpoint was co-dominate, and that the MVP would have no adverse effects on the Doe Creek Farm, requiring no further analyses. In a letter dated March 22, 2017, the VADHR concurred with Mountain Valley's Task 2 assessment. We agree.

Three previously recorded historic architectural sites (06-333, 60-415, and 60-5072) were re-located in the indirect APE by New South Associates in Montgomery County, outside of the boundaries of known Historic Districts. The house at 60-5070, and the John Slusser House (60-333) were evaluated as not eligible. The Slusser Farm house is about 3,040 feet away from the pipeline. The Martin House (60-415) was previously determined eligible (Turco et al., March 2016c). It is about 5,296 feet away from the pipeline. At the behest of the FS, Mountain Valley is conducting visual simulations for the Slusser Farm and Martin House. We cannot make our formal determinations of effect until we see the FS review of Mountain Valley's additional analyses.

According to the New South Associates architectural survey report for Roanoke County, 22 previously recorded historic sites were identified in the indirect APE outside of known Historic Districts. New South Associates re-located 10 of the previously recorded historic sites. The VADHR had previously determined that three of the historic sites are not eligible. New South Associates evaluated five historic sites as not eligible. One site (the ca. 1840s Elijah Henry House, 80-5297) was recommended for additional research (Turco et al., March 2017). The Elijah Henry House is located about 139 feet away from the MVP pipeline; in the direct APE. New South Associates believes that the Elijah Henry House should be added as a contributing resource to the Coles-Terry Rural Historic District (Turco, March 2017).

Our January 26, 2017 EIR asked Mountain Valley to provide the results of research at the Elijah Henry House. Mountain Valley indicated that it agreed site 80-5297 is potentially eligible for the NRHP, but instead of doing research it used its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR. Task 3 of Mountain Valley's assessment found that the Elijah Henry House has low potential for visual impacts and was eliminated from further analysis. The VADHR accepted Mountain Valley's Task 3 assessment. We agree that the MVP would have no adverse effects on this resource.

Outside of known Historic Districts, one previously recorded historic farmstead (Flora Farm, 33-389) was re-located in the indirect APE in Franklin County. In a letter to Mountain Valley dated August 4, 2016, the VADHR stated that it had previously found the Flora Farmstead to be eligible for the NRHP. Mountain Valley applied its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia" to site 33-389. Task 2 – Step 2 of the assessment indicated that the viewpoint from the farmstead was inferior, and no further analyses are necessary. The VADHR concurred with the Task 2 assessment. We agree that the MVP would have no adverse effects on the Flora Farm.

One previously recorded historic site, the Motley House (71-5311), was re-located outside of Historic Districts during New South Associates architectural surveys in Pittsylvania County for Mountain Valley. The Motley House is 895 feet from the centerline. New South Associates evaluated the site as not eligible for the NRHP; and we and the SHPO agree.

Previously Recorded Sites in the Jefferson National Forest

Mountain Valley's cultural resources consultant identified one previously recorded historic site that would be within the direct APE in the Jefferson National Forest: the ANST (site number 21-5102), in Giles County, Virginia. The ANST was previously found eligible for the NRHP (Reeve, et al., May 2016). Mountain Valley proposes to avoid adverse effects on the trail by boring under it. We find that the MVP would have no adverse effects on the ANST.

4.10.7.2 Equitrans Expansion Project

Previously Recorded Sites in Pennsylvania

On behalf of Equitrans, Tetra Tech performed a review of site files at the PASHPO between February and November 2015. Since the 1980s, no systematic cultural resources surveys have been conducted that would have covered the EEP facilities in Pennsylvania; however, there were 13 previous surveys in the vicinity.

In Pennsylvania, eight previously recorded archaeological sites were noted within 0.25 mile of the proposed EEP components. None of the previously recorded archaeological sites are within the direct APE.

Five previously recorded historic architectural sites were identified within the indirect APE. The NRHP-listed Dusmal House is 0.2 mile from proposed pipeline H-318 and should not be affected by construction or operation of the EEP. Likewise, the previously recorded Elrama Amory Complex/Site Pi-43 Control and Launcher Area, evaluated as not eligible for the NRHP, is located outside the construction right-of-way for the H-318 pipeline and should not be affected. The previously recorded, but unevaluated, Monongahela Railroad is also outside the proposed construction right-of-way for the H-316 pipeline and should not be affected by the project.

Two previously recorded historic properties (the Monongahela River Navigation System and the Pittsburgh and Lake Erie Railroad) would be crossed by the H-318 pipeline. Equitrans intends to avoid adverse effects on these two historic properties by using an HDD.

Archival research using historic maps identified one school house and six named farmsteads dating to 1876 in the project vicinity. One historic farmstead (J.P. Beatty) was adjacent to the APE, but it is no longer extant. Another historic farmstead dating to the 1890s (Samuel Hindman) is still extant, but is outside the APE for the H-318 pipeline. All the other historic sites identified by map research are not currently extant and are outside the APE.

Previously Recorded Sites in West Virginia

Portions of two previous cultural resources surveys overlap with proposed EEP facilities in Wetzel County, West Virginia. These were the 2010 URS survey of the Equitrans Sunrise Pipeline Project and the 2015 Tetra Tech survey for the MVP.

Historic archaeological sites 46WZ78/79, located in the direct APE, were originally recorded for the Equitrans Sunrise Pipeline Project in 2010; which the MVP survey combined into one multi-component site. Historic archaeological site 46WZ125 was recorded by the MVP survey in the vicinity of the Webster Interconnect. Sites 46WZ78/79 and 125 were evaluated as not eligible for the NRHP, requiring no further work.

Six historic standing structures were identified by the MVP survey within the indirect APE for the EEP. One of those buildings is the Mobley School, evaluated as eligible for the NRHP, located about 0.2-mile from the Webster Interconnect. The Kilcoyne Cemetery is located about 0.3-mile away from the Webster Interconnect; but it has been determined not eligible for the NRHP by the WVDCH.

4.10.8 Sites Newly Identified from Surveys

Both Mountain Valley and Equitrans hired cultural resources contractors who inventoried their proposed facilities and recorded and evaluated archaeological and historic architectural sites within the APE. Previously recorded sites are discussed above. Below we discuss newly recorded sites identified as of February 2017.

4.10.8.1 Mountain Valley Project

Mountain Valley provided survey results for all counties crossed by the pipeline route in West Virginia and Virginia. In total, about 292 miles of proposed pipeline route (96 percent) has been inventoried, as of February 2017. This resulted in the identification of 282 newly recorded archaeological sites and 116 newly recorded historic architectural sites in the direct APE. Each county's inventory is discussed below, together with the identification of newly recorded archaeological and historic architectural sites in the APE.

Newly Identified Sites in West Virginia

In West Virginia, Mountain Valley's archaeological survey covered about 187 miles out of about 196 miles of proposed pipeline route (about 95 percent). The direct APE in West Virginia was defined as within 150 feet of the pipeline (300-foot-wide-corridor). The indirect APE for historic architectural sites in West Virginia was defined as 0.25 mile on each side of the pipeline centerline (0.5-mile-wide corridor), and a 0.5 mile radius around proposed compressor stations.

During the surveys, a total of 160 new archaeological sites and 27 newly recorded historic architectural sites (excluding Historic Districts) were identified within the direct APE in the affected counties in the state.

Wetzel County

The entire pipeline route (9.7 miles) in Wetzel County, West Virginia was inventoried for cultural resources by Mountain Valley's contractor (Tetra Tech). The Bradshaw Compressor Station (35.3 acres), 16 access roads, 48 ATWS, 2 yards, and 3 cathodic protection beds were also examined. Information concerning surveys of the Mobley Interconnect and Webster Tap have not yet been provided to the FERC. Mountain Valley indicated that 1,107 shovel probes were excavated in Wetzel County, of which 239 were positive.[129]

Excluding cemeteries and Historic Districts, 12 newly recorded archaeological sites were identified in the direct APE in Wetzel County; all historic archaeological resources (Espino et al., July 2015a; Espino et al., November 2016). Six isolated finds were recorded; five historic period artifacts, and one pre-contact. All of the isolated finds and 11 of the newly recorded historic archaeological site were recommended as being not eligible for the NRHP. Historic industrial archaeological site 46WZ149 was not assessed for NRHP-eligibility, but was recommended for avoidance; with an avoidance plan included in the Addendum 1 survey report (Espino et al., November 2016).

Two newly recorded historic architectural sites were identified in the direct APE in Wetzel County. This included the North Fork Fishing Creek Bridge (Site 194), and the Titus Residence (Site 193); both evaluated as not eligible for the NRHP. Eight sites (127, 182, 183, 184, 185, 186, 187, and 188) were included in the proposed Sam's Run Historic District, discussed above. Outside of the Historic District, and excluding cemeteries, Tetra Tech identified six other historic architectural sites in the indirect APE in Wetzel County; all but one (Mobley School) evaluated as not eligible.

The 1920s Mobley School (WZ-154/195), evaluated as eligible, is about 559 feet from an ATWS. Mountain Valley indicated that the MVP would have no effect on the Mobley School (Dye, February 2017); and we agree.

Four historic sites in Wetzel County are cemeteries. Tetra Tech (Espino et al., July 2015a) recommended that three cemeteries (Hostuttler, Fisher, and Kilcoyne) should be included as elements of their proposed NRHP-eligible Historic District of Rural Cemeteries. Mountain Valley filed avoidance plans for the Fisher Cemetery (197-46WZ136), located 78 feet from the pipeline, and the Coastal Timberlands Company Property Cemetery (46WZ153), located 97 feet from the pipeline.

The WVDCH reviewed the 2015 survey report (Espino et al., July 2015a) on October 6, 2015, and the 2016 addendum report (Espino et al., November 2016) on December 7, 2016 and

[129] See February 17, 2017 filing by Mountain Valley, Attachment DR4-Cultural Resources-3 for data about cultural resources and surveys for all the counties crossed by the MVP.

accepted Tetra Tech's recommendations for sites in Wetzel County; except for the cemeteries, which were found to be not eligible. We concur with the findings of the West Virginia SHPO.

Harrison County

As of February 2017, Tetra Tech had inventoried about 22.1 miles out of the 23.7 miles of pipeline route (93.4 percent) in Harrison County, West Virginia. Surveys also covered 25 access roads, 108 ATWS, 2 yards, and 4 cathodic protection beds. Information about a survey covering the Sherwood Interconnect has not yet been provided to the FERC. Mountain Valley indicated that 4,140 shovel probes were excavated in the county during the surveys, of which 142 were positive.

Excluding cemeteries, 20 newly recorded archaeological sites were identified in the direct APE in Harrison County, including 7 pre-contact, 11 historic, and 2 multi-component sites. In addition, 19 new isolated finds were recorded (16 from the historic era and 3 pre-contact artifacts). All of the isolated finds and 12 archaeological sites were originally evaluated as not eligible for the NRHP (Espino et al., July 2015a; Espino et al., November 2016). Mountain Valley filed a plan to avoid unevaluated historic archaeological site 46HS99 (Espino and Marine, July 2016), that the SHPO found acceptable on August 18, 2016. In addition, Mountain Valley indicated that unevaluated pre-contact archaeological site 46HS140 would be avoided; with an avoidance plan included in the Addendum 1 survey report (Espino et al., November 2016).

Phase II archaeological testing was conducted at six archaeological sites (46HS100, 101, 104, 109, 111, and 125) in Harrison County, and the testing report concluded that, with the exception of site 46HS101, the resources were not eligible for the NRHP (Espino et al., June 2016). In a letter to Mountain Valley, dated July 14, 2016, the WVDCH concurred with the findings of the archaeological testing report. That letter stated: "Because data from 46HS101 has contributed to our understanding of settlement and subsistence patterns of the Middle Archaic Period, we concur that it is eligible for inclusion in the National Register of Historic Places. However, because nearly 70 percent of the occupational zone related to the Middle Archaic component was explored, we also concur that the research potential has been thoroughly explored and that no further work is necessary. The proposed project would have no adverse effect on 46HS101." We agree with the SHPO.

Twenty-six historic architectural sites were newly recorded in the indirect APE. In total, the new historic sites represent 12 residences, 5 farmsteads, 3 bridges, 3 churches, 2 cemeteries, and 1 railroad. All of the historic architectural sites recoded in the indirect APE, except churches and cemeteries, were recommended not eligible. Two historic architectural sites that were not churches or cemeteries were identified in the direct APE: the Baltimore and Ohio Railroad (Site 169) and the Goulette Farmstead (Site 167); both evaluated as not eligible.

Tetra Tech recommended that three churches in the indirect APE and one cemetery in the direct APE should be considered eligible for the NRHP (Espino et al., July 2015a). The cemetery (WV-HA-27-Cem) is located 44 feet away from the proposed pipeline. Mountain Valley indicated that it would avoid the cemetery; with an avoidance plan included in the Addendum 1 survey report (Espino et al., November 2016).

The WVDCH reviewed the 2015 survey report (Espino et al., July 2015a) on October 6, 2015, and the 2016 addendum report (Espino et al., November 2016) on December 7, 2016 and concurred with Tetra Tech's recommendations for the archaeological sites in Harrison County. However, the SHPO found the historic cemeteries and three churches recorded in Harrison County do not qualify for the NRHP. We agree.

Doddridge County

Tetra Tech inventoried about 4.6 miles out of the 4.8 miles of pipeline route in Doddridge County, West Virginia (96 percent). Surveys also covered 7 access roads, 21 ATWS, 1 yard, and 2 cathodic protection beds. Mountain Valley indicated that 333 shovel probes were excavated during surveys in the county, of which 32 were positive.

Tetra Tech identified six new archaeological sites in the direct APE in Doddridge County, including two pre-contact and four historic sites. Two historic isolated finds were also identified. All of the isolated finds and five of the newly recorded archaeological resources in Doddridge County were evaluated as not eligible for the NRHP (Espino et al., July 2015a; Espino et al., November 2016). One pre-contact archaeological (46DO94) was not originally evaluated; and the WVDCH agreed, in its October 6, 2015 review of the survey report, that the site should be tested

Tetra Tech tested site 46DO94 and concluded it was not eligible for the NRHP (Espino et al., June 2016). The SHPO concurred in a letter dated July 14, 2016. We agree.

One historic site, the Watson Property Cemetery (46DO112), was identified in the indirect APE. While evaluated as not eligible, it was recommended that the cemetery be avoided. No historic architectural sits were found within the direct APE in Doddridge County.

Lewis County

In Lewis County, West Virginia, Tetra Tech inventoried about 27.3 miles out of the proposed 27.5 miles of pipeline route (99.3 percent). In addition, Tetra Tech examined 39 access roads, 138 ATWS, 5 yards, and 6 cathodic protection beds. Tetra Tech excavated 3,177 shovel probes during surveys in the county, of which 97 were positive.

Tetra Tech recorded 12 new archaeological sites in the direct APE in Lewis County, and 7 isolated finds. Six of the archaeological sites are pre-contact, five are historic, and one is multi-component. Five of the isolated finds are pre-contact artifacts, and two are historic. All of the isolated finds and seven archaeological sites were evaluated as not eligible. Pre-contact archaeological site 46LE77 was originally unevaluated, with testing recommended (Espino et al., July 2015a; Tetra Tech November 2016). The WVDCH reviewed the survey report in a letter dated October 6, 2015. Mountain Valley filed avoidance plans for unevaluated archaeological sites 46LE80, 81, 82, and 92 (Espino and Marine, July 2016; Espino et al., November 2016) that the SHPO also found acceptable.

A work plan for testing site 48LE77 was developed, that the SHPO accepted on October 6, 2015. Tetra Tech tested site 46LE77 and found cultural deposits indicating it should be considered eligible for the NRHP (Espino et al., June 2016). In a letter to Mountain Valley, dated

July 14, 2016, reviewing the testing report, the WVDCH stated that 48LE77 was a multi-component rock shelter that yielded important data about the Middle and Late Archaic Periods, rendering it eligible for the NRHP. However, because Tetra Tech's testing exhausted the site's future research potential, no further work was recommended. We agree with the SHPO's finding of no adverse project effects for site 48LE77.

In the indirect APE, 19 newly recorded historic architectural sites (4 dwellings, 8 farmsteads, 4 churches, 1 stand-alone cemetery, 1 road, and 1 bridge) were identified. Tetra Tech recommended that one historic farmstead (Keith, Field Number 123), and three churches (Law Chapel, Baptist Church of Churchville, Evangelical United Brethren Methodist) and their associated cemeteries. Identified in the indirect APE in Lewis County are eligible for the NRHP (Espino et al., July 2015a). The Underwood Farmstead (LE-150) was also evaluated as eligible. The farmhouse is about 968 feet away from an ATWS. Mountain Valley indicated that the MVP would have no effect on the Underwood Farmstead (Dye, February 2017); and we agree.

Three historic architectural sites (LE151/140; 152/139, and 164) were identified in the direct APE. These historic sites were evaluated as not eligible for the NRHP.

The WVDCH reviewed the 2015 survey report (Espino et al., July 2015a) on October 6, 2015, and the 2016 addendum report (Espino et al., November 2016) on December 7, 2016 and agreed with Tetra Tech's recommendations for archaeological sites in Lewis County. However, the WVDCH found the historic Keith farmstead and the three newly recorded historic rural churches in Lewis County to be not eligible. We concur with the findings of the West Virginia SHPO.

Braxton County

In Braxton County, West Virginia the entire pipeline route (14.7 miles) was inspected for cultural resources. Surveys also covered the Harris Compressor Station (87.8 acres), WB Interconnect (1.2 acres), 27 access roads, 93 ATWS, 3 yards, and 2 cathodic protection beds. Mountain Valley indicated that 2,058 shovel probes were excavated during surveys in this county, with 44 being positive.

Excluding cemeteries, 11 newly recorded archaeological sites and 8 isolated finds were identified in the direct APE in Braxton County. Seven of the newly recorded archaeological sites are historic, three are pre-contact, and one is multi-component. Six of the isolated finds are pre-contact artifacts and two are historic. Mountain Valley indicated that all of the isolated finds and eight archaeological sites are not eligible. Two archaeological sites (46BX111 and 114) were recommended for testing or avoidance (Espino et al., October 2015b). The WVDCH reviewed the 2015 archaeological survey report covering Braxton County, and the archaeological testing plans, in a letter to Mountain Valley dated November 16, 2015.

Mountain Valley filed plans to avoid multi-component archaeological sites 46BX111 and 131 (Espino and Marine, July 2016; Freedman et al., November 2016). The WVDCH accepted the avoidance plan for 46BX111 in a letter to Mountain Valley dated March 22, 2017, and found no adverse effects on this site, provided that the temporary construction work areas are fenced. We agree.

On February 17, 2017, Mountain Valley filed with the FERC a copy of the results of archaeological testing at pre-contact site 46BX114 (Attachment DR4 Cultural Resources 11b). The report indicated that site 46BX114 is eligible for the NRHP, but recommended that it be avoided (Clement et al., February 2017). In a letter to Mountain Valley dated March 22, 2017, the WVDCH indicated the MVP would have no adverse effects on site 46BX114, provided that the pipeline is routed between two loci which lack evidence of human occupation, work areas are fenced, and archaeological monitoring is conducted during construction. We agree.

Fourteen newly recorded historic architectural sites were identified in the indirect APE in Braxton County; including 4 dwellings, 3 farmsteads, 2 commercial/agricultural complexes, 2 churches, and 3 cemeteries. The Milroy Road Agricultural/Commercial Complex (Site 55) was identified within 0.5-mile of the proposed Harris Compressor Station, and evaluated as not eligible for the NRHP. Three cemeteries (46BX126, 127, and 129) and a farmstead (Losch, 46BX351) were identified within the direct APE.

Tetra Tech recommended that three historic cemeteries (Gibson, Krafft, and Slaughter), two churches (Pleasant Hill and Fall Run), and two other historic sites (Gregory Road Mill Complex and Craven Farmstead) should be nominated to the NRHP (Espino et al., October 2015b). Another cemetery (Roby, 46BX129) was identified in the addendum report (Freedman et al., November 2016); evaluated as not eligible. Mountain Valley filed avoidance plans for the Slaughter (46BX127), Krafft (46BX126), and Roby (46BX129) Cemeteries (Espino and Marine, July 2016), that the SHPO found acceptable.

The WVDCH reviewed the original 2015 survey report (Espino et al., October 2015b) on November 16, 2015, and 216 addendum report (Freedman et al. November 2016) on December 8, 2016, and agreed with the recommendations for the newly identified archaeological sites in Braxton County. However, the WVDCH found the historic cemeteries and church not eligible; while the Losch Farmstead and the Gregory Mill Complex were deemed eligible. We agree with the findings of the West Virginia SHPO.

The Gregory Mill Complex (BX-328) is located about 421 feet from the permanent right-of-way. Mountain Valley indicated that the MVP would have no effect on the Gregory Mill Complex (Dye, February 2017), and we agree.

The Losch Farmstead (BX-351), located about 27 feet from an access road, was re-evaluated as eligible for the NRHP.[130] Mountain Valley indicated that the MVP would have no effect on the Losch Farmstead (Dye, February 2017); and we agree.

Webster County

In Webster County, West Virginia, Tetra Tech inventoried the entire pipeline route (30.4 miles). In addition, 24 access roads, 125 ATWS, 1 yard, and 4 cathodic protection beds were inspected. In the county, Tetra Tech excavated 2,597 shovel probes during surveys, of which 90 were positive.

[130] See February 16, 2017 letter from Megan Neylon of Mountain Valley to Susan Pierce of the WVDCH, filed with the FERC on February 17, 2017.

Excluding cemeteries, 21 newly recorded archaeological sites were identified in the direct APE along the pipeline route in Webster County; 8 pre-contact, 12 historic, and 1 multi-component sites. Of the 15 isolated finds recorded, 11 are pre-contact artifacts, 3 historic, and 1 multi-component. All of the isolated finds, and 14 archaeological sites were evaluated as not eligible for the NRHP. Seven archaeological sites (46WB405, 407, 412, 414, 416, 433, and 440) were originally unevaluated, with testing or avoidance recommended (Espino et al., October 2015b; Freedman et al. November 2016). The WVDCH reviewed the 2015 first archaeological survey report covering Webster County (Espino et al., October 2015b), and the archaeological testing plans, in a letter to Mountain Valley dated November 16, 2015. The 2016 addendum survey report (Freedman et al. November 2016) was reviewed by the WVDCH on December 8, 2016. Site 46WB440 is located at a yard, and would be avoided if Mountain Valley does not use the yard. Mountain Valley filed plans to avoid archaeological sites 46WB405 and 412 (Espino and Marine, July 2016), that the SHPO found acceptable.

Search conducted Phase II archaeological testing at four sites: 46WB407, 414, 416, and 433. After testing, all four sites were evaluated by Search as not eligible (Clement at al., July 2016). In a letter to Mountain Valley, dated August 15, 2016, reviewing the testing report, the WVDCH stated that it concurred that sites 46WB407, 414, 416, and 433 are not eligible for the NRHP, and require no further work. We agree with the SHPO.

Eleven newly recorded historic architectural sites were identified in the indirect APE in Webster County. This included four residences, three farmsteads, a church, two cemeteries, and a railroad. The church (Glade Summit, Site 60), railroad (branch of the B&O, Site 258), and two cemeteries (46WB404 and 434) are within the direct APE. Tetra Tech recommended that one cemetery (Cox) and the church (Glade Summit) should be nominated to the NRHP. All other historic sites were evaluated as not eligible. Mountain Valley filed plans to avoid the Cox/McCray (45WB404) and Hickman (46WB434) Cemeteries (Espino and Marine, July 2016), that the SHPO found acceptable. The WVDCH indicated that the historic cemeteries and church do not qualify for the NRHP. We agree.

Nicholas County

In Nicholas County, West Virginia, Tetra Tech inventoried 24.1 miles out of 24.8 miles of pipeline route (about 97 percent). In addition, 36 access roads, 162 ATWS, 2 yards, and 4 cathodic protection beds were inspected. A total of 4,735 shovel probes were excavated during surveys in the county, of which 262 were positive.

Excluding cemeteries, 27 new archaeological sites were identified within the direct APE in Nicholas County; including 10 pre-contact sites, 9 historic, and 8 multi-component. Eleven isolated finds were recorded, including 3 pre-contact artifacts, 6 historic period, and 2 multi-component. All the isolated finds and 14 archaeological sites were evaluated to be not eligible. The WVDCH reviewed the 2015 survey report covering Nicholas County and testing plans (Espino et al., December 2015) in a letter dated January 27, 2016, and the addendum report (Espino et al. January 2017) in letter dated February 8, 2017. Mountain Valley filed avoidance plans for

10 sites (46NI811, 813, 817, 818, 819, 821, 822, 824, 848, and 851) (Espino and Marine, July 2016; Espino et al., January 2017).

Phase II archaeological testing was conducted in June-August 2016 at pre-contact sites 46NI827, 846 and 847. Based on the results of that testing, the portion of site 46NI827 within the APE was evaluated as not eligible for the NRHP, while sites 46NI846 and 46NI847 were evaluated as eligible (Barse et al. February 2017). In a letter to Mountain Valley dated March 31, 2017, reviewing the testing report, the WVDCH concurred that sites 46NI846 and 847 are eligible for the NRHP; while site 46NI827 is not eligible, and should be avoided, with the construction right-of-way fenced. The WVDCH indicated that Mountain Valley would shift the centerline northwest to avoid site 46NI846. The WVDCH indicated if Mountain Valley would shift the centerline south, site 46NI847 could be avoided. We agree with the West Virginia SHPO that the MVP would have no adverse effects on sites 46NI846 and 847 if the sites are avoided, and the limits of the construction right-of-way are fenced.

Tetra Tech identified 73 historic architectural sites within the indirect APE in Nicholas County. These historic sites include 56 dwellings, 2 farms, 6 churches, 6 cemeteries, 2 commercial buildings, and 1 bridge. Three cemeteries (46NI840, 841, and 843), the Seabolt Residence (Site 143/105), and the Meadow Farmstead (Site 155/224) were identified in the direct APE. Tetra Tech recommended that three churches (Hilltop Methodist, Mt. Nebo Methodist, and Black's Chapel Memorial), one residence (Walker), and three cemeteries (McClung, Alderson Church, and Blacks Chapel) should be considered NRHP-eligible; while all the other historic architectural sites were evaluated as not eligible. However, the WVDCH disagreed, and found the churches, cemetery, and Walker Residence to not qualify for the NRHP. Mountain Valley filed plans to avoid the Hammonds (46NI840), H.O. Smith (46NI841), McClung (46NI842), and O'Dell (46NI843) Cemeteries (Espino and Marine, July 2016), that the WVDCH accepted on August 18, 2016. We concur with the findings of the West Virginia SHPO.

Greenbrier County

In Greenbrier County, West Virginia, Tetra Tech inspected about 21.0 miles out of 21.3 miles of pipeline route (about 99 percent). In addition, 29 access roads, 94 ATWS, and 5 cathodic protection beds were examined. Mountain Valley indicated that 4,495 shovel probes were excavated during surveys in Greenbrier County, of which 165 were positive.

In the direct APE in Greenbrier County, 19 new archaeological sites were identified, excluding cemeteries (Espino et al., December 2015c; Espino et al. January 2017). The archaeological sites include 13 pre-contact sites, 3 historic, and 3 multi-component resources. Ten isolated finds were recorded, including seven pre-contact artifacts and three historic items. Tetra Tech assessed all the isolated finds and nine archaeological sites as not eligible for the NRHP. Testing was recommended at nine archaeological sites (46GB492, 493, 498, 499, 500, 503, 504, 505, and 533). The WVDCH reviewed the 2015 survey report covering Greenbrier County and testing plans (Espino et al., December 2015) in a letter dated January 27, 2016, and the addendum report (Espino et al. January 2017) in a letter dated February 8, 2017. Mountain Valley filed plans to avoid sites 46GB492, 535, and 536 (Espino and Marine, July 2016; Espino et al., January 2017).

Mountain Valley's consultant conducted Phase II archaeological testing at sites 46GB493, 498, 499, 500, 503, 504, 505, and 533. As a result of the testing, archaeological sites 46GB493, 499, 500, 503, and the portion of site 533 in the APE were evaluated as not eligible for the NRHP. Archaeological sites 46GB498, 504, and 505 were evaluated as eligible. It was recommended that site 46GB498 could be avoided by a route modification, while it was stated that the testing of sites 46GB504 and 505 recovered their significant data (Barse et al., February 2017). In a letter to Mountain Valley, dated March 31, 2017, reviewing the testing report, the WVDCH stated that it concurred that archaeological sites 46GB493, 499, 500, and the portion of 533 within the right-of-way are not eligible for the NRHP; and site 46GB533 would be avoided, with the limits of the construction right-of-way fenced. The WVDCH found archaeological sites 46GB498, 504, and 505 are eligible. However, the WVDCH expects that Mountain Valley would avoid sites 46GB504 and 505, and would use a conventional bore to go under the eastern portion of site 46GB498, with timber mats laid across the surface of the right-of-way for equipment, and monitoring of construction by a qualified professional archaeologist. We agree.

Tetra Tech identified 23 historic architectural sites in the indirect APE; all evaluated as not eligible. The historic sites include 18 residences, 1 farm, 1 church, 2 cemeteries, and 1 Civil War battleground. One historic site, the Callison Residence, also evaluated as not eligible, was identified within the 0.5-mile indirect APE for the Stallworth Compressor Station. Three historic sites (Sheppard Farmstead [GB-1883], Walkup Residence [GB-1818/13], and Smith Cemetery [46GB515]) are located in the direct APE; all recommended not eligible. The WVDCH concurred with the contractor's recommendations for the historic sites identified in Greenbrier County. We agree with the findings of the West Virginia SHPO. Mountain Valley filed a plan to avoid the Smith Cemetery (46GB515) (Espino and Marine, July 2016), that the WVDCH accepted. The Brown Cemetery (46GB546) is located about 390 feet away from the centerline, and should not be affected by project construction

Fayette County

In Fayette County, West Virginia, Tetra Tech inventoried the entire pipeline route (0.5 mile), and one access road. Also, about 82.4 acres was surveyed at the proposed location of the Stallworth Compressor Station. Mountain Valley indicated that a total of 255 shovel probes were excavated during surveys in the county, of which 1 was positive.

Two newly recorded archaeological sites were identified by Tetra Tech in the direct APE in Fayette County; one pre-contact, and one multi-component sites. Four isolated finds were recorded; three pre-contact artifacts and one historic. All the isolated finds were evaluated as not eligible. The two archaeological sites (46FA551 and 46FA552) were not evaluated, but avoidance was recommended; with avoidance plans included in the Addendum 1 survey report (Espino et al., January 2017). The WVDCH reviewed the 2015 survey report covering Fayette County in a letter dated January 27, 2016, and the addendum report in a letter dated February 8, 2017.

One newly recorded historic residence (Ingram, Site 32), evaluated as not eligible, was identified by Tetra Tech in the indirect APE in Fayette County. No historic architectural sites were identified in the direct APE (Espino et al., December 2015c). The WVDCH concurred with Tetra Tech's recommendations for the sites identified in Fayette County. We agree with the findings of the West Virginia SHPO.

Summers County

The surveys in Summers and Monroe Counties, West Virginia were conducted by Search in 2015 and 2016 (Clement et al., February 2016; Freedman et al., December 2016) on behalf of Mountain Valley. In Summers County, 15.1 miles were inventoried out of 17.1 miles of proposed pipeline route (about 88 percent). In addition, 9 access roads, 51 ATWS, and 1 cathodic protection bed were inspected. Mountain Valley indicated that 4,362 shovel probes were excavated during surveys in the county, of which 90 yielded cultural materials.

Excluding cemeteries, Search identified 16 newly recorded archaeological sites in the direct APE in Summers County, including 14 pre-contact, 1 historic site, and 1 multi-component. The seven isolated finds recorded included four pre-contact artifacts and three historic items. All the isolated finds, and 10 archaeological sites were evaluated as not eligible. Originally, Phase II archaeological testing was recommended for four new sites (46SU717, 722, 724, and 725), and three previously recorded sites (46SU78, 147, and 239). The WVDCH reviewed the first survey report covering Summer County (Clement et al. February 2016) in a letter dated April 4, 2016, and the addendum report (Freedman et al. December 2016) in a letter dated February 8, 2017. Mountain Valley filed plans to avoid previously recorded unevaluated site 46SU181, and newly recorded unevaluated sites 46SU730 and 740 (Espino and Marine, July 2016).

Search conducted archaeological testing at sites 46SU78, 717, and 724. As a result of the testing, all three sites were evaluated as not eligible for the NRHP (Clements et al., February 2017). In a letter to Mountain Valley dated March 13, 2017, the WVDCH concurred that archaeological sites 46SU78, 717, and 724 are not eligible. We agree.

Seventeen newly recorded historic architectural sites were identified in the indirect APE in Summers County, including 10 dwellings, 2 farms, 3 cemeteries, 1 school, and 1 railroad. Nine of the historic sites are within the direct APE. With one exception (Wiseman Residence, Site 4), all the historic sites were evaluated as not eligible (Clement et al., February 2016). The SHPO accepted Mountain Valley's plans to avoid the Richmond Property (46SU733), Steward Property (46SU732), and Simmons (46SU734) Cemeteries (Espino and Marine, July 2016).

The Wiseman Residence, evaluated as eligible for the NRHP, is located 155 feet from the pipeline, outside of the construction right-of-way, and would be avoided. An avoidance plan for the Wiseman Residence was filed by Mountain Valley with the FERC on February 17, 2017 (Attachment DR4 Cultural Resources 13); although Mountain Valley has not yet filed the WVDCH review of the avoidance plan. Mountain Valley concluded that the MVP should have no adverse effects on the Wiseman Residence (Dye, February 2017), and we agree

Monroe County

In Monroe County, West Virginia, 17.2 miles out of 22.1 miles of pipeline route (about 78 percent) were inspected for cultural resources by Search. In addition, 14 access roads, 70 ATWS, and 6 cathodic protection beds were surveyed. Mountain Valley indicated that 3,317 shovel probes were excavated during surveys in Monroe County, with 162 yielding cultural materials.

In Monroe County, 14 new archaeological sites were identified in the direct APE; including 9 pre-contact sites, 2 historic, and 3 multi-component. Of the 21 isolated finds recorded, 16 are pre-contact artifacts and 5 are historic items. All the isolated finds and six archaeological sites were evaluated as not eligible for the NRHP. Avoidance was recommended for two sites (46ME280 and 282). Search indicated that six archaeological sites (46ME273, 281 283, 284, 285, and 307) in Monroe County were unevaluated and recommended that they should be tested, if they could not be avoided. The WVDCH reviewed the first survey report covering Monroe County (Clement et al. February 2016) in a letter dated April 4, 2016, and the addendum report (Freedman et al. December 2016) in a letter dated February 8, 2017. Mountain Valley submitted avoidance plans for sites 46ME273, 280, and 282 (Espino and Marine, July 2016), that the WVDCH found acceptable.

The WVDCH agreed with Search's recommendations for archaeological sites in Monroe County, and approved the testing plans. Search conducted Phase II archaeological testing at sites 46ME281, 283, 284, 285, and 307. As a result of the testing, all five sites were evaluated as not eligible for the NRHP, requiring no further work (Clement et al., February 2017). In a letter to Mountain Valley dated March 13, 2017, the WVDCH concurred that archaeological sites 46ME281, 283, 284, 285, and 307 are not eligible. We agree.

The architectural survey of Monroe County identified 33 historic sites in the indirect APE. This includes 23 dwellings, 2 farmsteads, 2 churches, 3 commercial buildings, and 3 cemeteries. Only two cemeteries (46ME305 and 310) and site ME-385 were found in the direct APE. All of the historic architectural sites in Monroe County, except one, were recommended to be not eligible for the NRHP, with one exception. The Tilley Farmstead (Historic Site 233) was evaluated as eligible for the NRHP (Clement et al., February 2016).

The WVDCH concurred with Search's recommendations, and found the Tilley Farmstead is eligible under 36 CFR 60.4(c). An avoidance plan for the Tilley Farmstead was filed by Mountain Valley with the FERC on February 17, 2017 (Attachment DR4 Cultural Resources 13). That plan indicated that the boundary for the historic site is located about 835 feet away from the nearest proposed pipeline construction workspace. It is Mountain Valley's opinion (Dye, February 2017), that the MVP would have no effect on the Tilley Farmstead. We agree. Mountain Valley has not yet filed the WVDCH review of the avoidance plan or assessment report.

Newly Identified Sites in Virginia

In Virginia, Mountain Valley's archaeological surveys covered about 105.3 miles out of a total of about 107.1 miles of proposed pipeline route (about 98 percent). The direct APE for archaeological sites in Virginia was defined as 150 feet from the pipeline, while for historic architectural sites it was 225 feet. The indirect APE for historic architectural sites could extend up to 1 mile, depending on elevation. On behalf of Mountain Valley, in Virginia, the archaeological surveys were conducted by Tetra Tech, while the architectural surveys were done by New South Associates. During the surveys, a total of 122 new archaeological sites and 116 new historic architectural sites were identified within the direct APE in the affected counties.

Giles County

In Giles County, Virginia, Mountain Valley's archaeological contractor (Tetra Tech) inventoried the entire 20.4 miles of pipeline route (100 percent). In addition, 33 access roads, 62 ATWS, and 4 cathodic protection bed locations were inspected. Mountain Valley indicated that 2,250 shovel probes were excavated during surveys in the county, of which 197 were positive.

During archaeological surveys in Giles County, 25 new archaeological sites were identified in the direct APE; including 21 pre-contact, 3 historic, and 1 multi-component sites. Seven of these sites (44GS238, 240, 242, 243, 244, 247, and 251) are located in the Jefferson National Forest and are discussed below. In addition, 44 new isolated finds (12 pre-contact artifacts and 32 historic items) were identified in Giles County. Tetra Tech recommended that all of the isolated finds and eight archaeological sites outside the Jefferson National Forest are not eligible. Phase II testing was recommended at six unevaluated archaeological sites outside the National Forest (44GS226, 227, 229, 230, 321, 236, and 237). It was suggested that the MVP could avoid impacts at four sites (44GS231, 232, 235, and 236) (Reeve et al., November 2015; Reeve et al., January 2017). The VADHR reviewed the 2015 archaeological survey report for Giles County in a letter dated December 31, 2015.

Tetra Tech conducted archaeological testing at sites 44GS227, 229, 230, 231, and 236. Only site 44GS230 was recommended as being eligible for the NRHP. The report recommended that Mountain Valley should avoid sites 44GS226 and 230 (Reeve et al., January 2017). On February 17, 2017, Mountain Valley filed avoidance plans for six archaeological sites (44GS226, 230, 232, 235, 237, and 241) (Jacoby and Marshall, February 2017). The VADHR has not yet commented on the testing report or avoidance plans.

Between May and November 2015, Mountain Valley's architectural consultant (New South Associates) conducted field work in Giles County. Outside the boundaries of Historic Districts which we discussed above, New South Associates identified 26 newly recorded historic architectural sites in the indirect APE in Giles County, including 16 houses, 3 foundations, 4 farms and barns, 1 church, and 2 cemeteries. In a February 17, 2017 filing with the FERC, Mountain Valley listed 15 newly recorded historic architectural sites within the direct APE (outside of Historic Districts) in Giles County. All of the historic sites within the direct APE were evaluated as not eligible for the NRHP.

New South Associates recommended that one of the newly identified historic resources was potentially eligible for the NRHP, but required additional research: Warthen House (35-5106). The VADHR concurred in its May 25, 2016 letter reviewing Mountain Valley's historic architectural survey report covering Giles County (Turco et al., March 2017).

In our January 26, 2017 EIR, we asked Mountain Valley to provide the results of research for the Warthen House. In its February 17, 2017 reply, Mountain Valley stated that it agreed the site was potentially eligible for the NRHP, but instead of conducting research, it would use its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR. The results of Task 1, was the assessment that the Warthen House should be eliminated from further analysis due to distance and vegetation. The Warthen

House is located 3,182 feet away from the pipeline. We find that the MVP would have no effects on that historic site.

Craig County

The entire length of the pipeline route in Craig County, Virginia (1.7 miles) has been inventoried for cultural resources. In addition, one access road was surveyed. No ATWS, staging areas, yards, or aboveground facilities were inspected in Craig County. A total of 365 shovel tests were excavated during surveys in the county, of which 33 were positive.

Three newly recorded archaeological sites were identified during surveys in Craig County; two pre-contact and one multi-component sites. Phase II archaeological testing was recommended for all three sites. In addition, three isolated finds (all pre-contact lithic artifacts) were identified in Craig County; all evaluated as not eligible. The VADHR reviewed the original archaeological survey report covering Craig County (Reeve et al. March 2016) in a letter dated April 21, 2016.

Archaeological testing conducted by Tetra Tech in September – October 2016 resulted in all three archaeological sites in Craig County (44CG253, 254, and 255) being evaluated as not eligible for the NRHP. Mountain Valley has not yet documented VADHR's review of the addendum report (Reeve et al, December 2016).

New South Associates conducted an architectural survey in Craig County for Mountain Valley, and identified six new historic sites in the indirect APE; including five houses and a barn. One historic site (barn, 22-5035) was noted to be in the direct APE. All of those historic structures were recommended as being not eligible. The VADHR accepted New South Associates' historic architectural survey report covering Craig County (Turco et al., March 2016a) in a letter dated May 25, 2016. We agree with the Virginia SHPO that these historic architectural sites are not eligible for the NRHP, and require no further work.

In a letter to the FERC dated December 19, 2016, Donald Wayne Jones requested that we assess impacts on historic resources on his family farm. These resources include: 1880s ditch, William Arkennedy Jones barn, Uncle Bub Jones house, Denny Jones corn crib, Denny Jones Farmstead house foundation, John Jones rock wall, Dude Smith dwelling, and Fisher Cemetery. Some of these sites were located, recorded, and evaluated by Mountain Valley's cultural resources contractors during surveys in Craig County.

An addendum archaeological survey in Craig County identified in the indirect APE four new historic sites: a cemetery, two farmsteads, and a barn. The Fisher Cemetery was recorded by Tetra Tech as site 22-5039. The John Jones rock walls, Denny Jones Farm, and Bob Jones house, originally identified by Donald Wayne Jones, were recorded by Tetra Tech as one combined site (22-5040) within the direct APE. All the newly identified historic sites were evaluated as not eligible for the NRHP (Reeve et al, December 2016). A plan to avoid those sites were filed with the FERC by Mountain Valley on February 17, 2017 (Attachment DR4 Cultural Resources 31d). Mountain Valley has not yet documented VADHR's review of the addendum report and avoidance plans.

Montgomery County

The entire proposed pipeline route length in Montgomery County, Virginia (19.6 miles) was covered by cultural resources inventories. The surveys also inspected 24 access roads, 46 ATWS, 1 yard, and 4 cathodic protection bed locations. A total of 1,906 shovel tests were excavated during surveys in the county, of which 80 were positive.

Nine newly recorded archaeological sites were identified in Tetra Tech's addendum survey report. This includes five pre-contact sites, two historic sites, and two multi-component. All of the newly recorded archaeological sites in the APE in Montgomery County were recommended not eligible (Reeve et al., January 2017). Mountain Valley has not yet documented the VADHR review of the archaeological survey addendum report covering Montgomery County. On February 17, 2017, Mountain Valley filed a plan to avoid site 44MY572 (Jacoby and Marshall, February 2017).

The original survey for architectural sites in Montgomery County occurred between May and November 2015. New South Associates supposedly covered 11,921 acres in the indirect APE; but only examined properties from public rights-of-way. Twenty-four newly identified historic sites were recorded by New South Associates, outside of the known Historic District boundaries. This included 17 houses, 1 shed, 1 barn, 2 stores, and 3 railroad crossings. All of the newly identified historic architectural sites were evaluated as not eligible for the NRHP (Turco et al., March 2016c).

In its May 25, 2016 review of New South Associates' historic architectural survey report for Montgomery County, the VADHR indicated that 23 resources (60-333, 60-5072, 60-5150 through 5163 [inclusive] 60-5167, 60-5173 through 5177 [inclusive] and 60-5180) are not eligible for the NRHP and require no further work. The Norfolk & Southern Railroad (60-5170, 5171, and 5172) is potentially eligible for the NRHP, and New South Associates recommended additional research. We agree with the findings of the Virginia SHPO for these historic architectural sites.

Our January 26, 2017 EIR asked Mountain Valley to conduct research about the Norfolk & Southern Railroad. In its February 17, 2017 response, Mountain Valley indicated that it agreed that the Norfolk & Southern Railroad is potentially eligible for the NRHP, but instead of research, it used its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR. The first railroad crossing (60-5170) is 387 feet from the pipeline; the second railroad crossing (60-5171) is 2,079 feet away; and the railroad bridge (60-5172) is 6,787 feet distant. Mountain Valley stated that the MVP would have no effect on sites 60-5171 and 5172 because they are outside the APE; and we agree. Task 2 – Step 2 of Mountain Valley's assessment of site 60-5170 found the viewshed inferior, eliminating it from further analyses. The SHPO accepted Mountain Valley's Task 2 assessment in a letter dated March 22, 2017. We agree that the MVP would have no adverse effects on the Norfolk & Southern Railroad at the first crossing (site 60-5170) in Montgomery County.

Tetra Tech's addendum archaeological survey report documented five newly recorded historic sites in Montgomery County, outside of Historic Districts, not mentioned by New South Associates. Tetra Tech indicated that Mountain Valley would avoid three of those sites (60-332, 5193, and 5194). The other two sites (60-5195 and 5197) were evaluated as not eligible for the NRHP (Reeve et al., January 2017).

In a filing on February 17, 2017, Mountain Valley indicated that 12 of the newly recorded historic architectural sites are located within the direct APE (Attachment DR4 Cultural Resources – Table 3f). Nine of those sites were recorded by New South Associates, and two were recorded by Tetra Tech. All of the historic architectural sites in the direct APE in Montgomery County, except site 60-5170, were evaluated as not eligible.

Roanoke County

In Roanoke County, Virginia, about 6.5 miles out of a total of about 8.4 miles of pipeline route (about 78 percent) was inventoried for cultural resources. The survey also covered 4 access roads, 19 ATWS, and 2 cathodic protection bed locations. A total of 1,189 shovel tests were excavated during surveys in Roanoke County, of which 60 were positive.

Outside of the Blue Ridge Parkway Historic District, discussed above, Tetra Tech identified six newly recorded archaeological sites within the direct APE in Roanoke County; four pre-contact sites, one historic, and one multi-component. All of these sites were evaluated as not eligible. Mountain Valley has not yet documented the VADHR review of the addendum survey report (Reeve et al, January 2017).

New South Associates conducted a Phase I reconnaissance architectural survey for Mountain Valley in Roanoke County in May, June, and November 2015. Outside of known Historic Districts, New South Associates identified nine newly recorded historic architectural sites in the indirect APE; including seven houses and two commercial structures. Except for one site (site 80-5675), the other resources were all evaluated as not eligible for the NRHP, requiring no further work. The WDBJ Television/WSLQ-FM Radio Transmitting Facility was deemed potentially eligible, and additional research was recommended (Turco et al., March 2016b). The VADHR reviewed the 2015 historic architectural survey report covering Roanoke County in a letter dated May 25, 2016.

Our January 26, 2017 EIR asked Mountain Valley to provide the results of research about the WDBJ Television/WSLQ-FM Radio Transmitting Facility (site 80-5675). In its February 17, 2017 response, Mountain Valley stated that it agreed site 80-5675 is NRHP-eligible, and instead of researching the site it used its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR. In Task 2 – Step 1, Mountain Valley's viewshed model analysis indicated no visibility for site 80-5675. The SHPO accepted Mountain Valley's Task 2 assessment in a letter dated March 22, 2017. The broadcasting facility is located about 1,238 feet away from the pipeline. We concur that the MVP should have no effect on site 80-5675.

In an addendum survey report, Tetra Tech identified nine newly recorded historic sites in Roanoke County; four structures, two barns, one cemetery, and one road. Five of the sites (80-5677-4, 5, 6, 7, and 8) were recommended to be part of the proposed Bent Mountain Rural Historic District, discussed above. Three of the other historic sites (80-5297, 5695, and 5696) were evaluated as not eligible for the NRHP, requiring no further work. Tetra Tech recommended that

Mountain Valley avoid the cemetery at site 80-5690 (Reeve et al., January 2017). Mountain Valley has not yet documented the VADHR review of the addendum archaeological survey report for Roanoke County.

In a filing on February 17, 2017, Mountain Valley indicated that three of the historic architectural sites outside of Historic Districts in Roanoke County were located in the direct APE (Attachment DR4 Cultural Resources – Table 3f). All three of those sites were evaluated as not eligible.

Franklin County

Mountain Valley indicated that almost all of the pipeline route in Franklin County (about 37.4 miles) was inventoried for cultural resources. In addition, surveys covered 47 access roads, 163 ATWS, 1 yard, and 7 cathodic protection bed locations. The archaeologists excavated a total of 7,148 shovel tests while conducting surveys in Franklin County, of which 701 yielded cultural materials.

By February 2017, Mountain Valley identified 52 newly recorded archaeological sites in the direct APE outside of Historic Districts in Franklin County; 45 pre-contact sites, 6 historic sites, and 1 multi-component. In addition, 141 isolated finds were recorded during the surveys; 57 pre-contact artifacts and 84 historic items. Tetra Tech evaluated all the isolated finds and 29 of the newly found archaeological sites as not eligible. Avoidance was recommended for four archaeological sites (44FR355, 392, 394, and 407). Nineteen sites were originally unevaluated when discovered during surveys and Phase II archaeological testing was recommended (for sites 44FR357, 360, 363, 365, 366, 368, 369, 370, 371, 372, 373, 376, 391, 396, 397, 401, 404, 406, and 410). The VADHR commented on Mountain Valley's first archaeological survey report for Franklin County (Reeve et al., September 2015b) in a letter dated December 30, 2015, but has not yet reviewed the addendum survey report (Reeve et al., December 2016).

In November 2015, Tetra Tech produced testing plans for archaeological sites 44FR360, 363, 365, 366, 370, 373, and 376, which were filed in July 2016 (Tetra Tech, July 2016) VADHR approved the testing plans on December 4, 2015. In February 2017, Mountain Valley filed the results of archaeological testing at 17 newly recorded sites (44FR360, 363, 365, 366, 372, 373, 376, 391, 392, 393, 394, 396, 397, 401, 404, 406, and 410) in Franklin County (Reeve et al., February 2017). As a result of the testing, Tetra Tech recommended that 15 of the sites are not eligible for the NRHP, and require no additional work. Two sites (44FR372 and 392) were found to be eligible. Mountain Valley intends to avoid both sites (Tetra Tech, February 2017). On February 17, 2017, Mountain Valley filed with the FERC plans to avoid nine sites (44FR355, 357, 368, 369, 371, 372, 392, 402, and 407) (Jacoby and Marshall, February 2017). Mountain Valley has not yet documented that the VADHR reviewed the testing plans, testing report, or avoidance plans.

In May and June 2015, New South Associates conducted an architectural survey along the proposed pipeline route in Franklin County, Virginia; except between MPs 251.2 and 258.8. New South Associates stated that the survey covered 1,849 acres in the indirect APE; although documentation of historic sites was limited to what was visible from public rights-of-way. During their 2015 survey, New South Associates recorded 31 new historic sites in the indirect APE, outside of Historic Districts. This included 21 houses, 5 agricultural outbuildings, 4 cemeteries, and 1 church (Turco et al., September 2015b). Historic houses at site numbers 33-5304, 5325, and 5329 were recommended as potentially eligible, requiring additional research. All the other newly identified historic architectural sites were evaluated as not eligible for the NRHP. In a letter to Mountain Valley, dated January 6, 2016, the VADHR concurred with the recommendations in the 2015 New South Associates architectural survey report covering Roanoke County. We agree.

Between October and December of 2015, New South Associates conducted additional fieldwork to identify historic architectural sites in Franklin and Pittsylvania Counties, to account for pipeline route changes between pre-filing and the October 2015 FERC application. Eighteen new historic sites were identified in the indirect APE Franklin County, including 12 houses, 3 farmsteads, 1 outbuilding, and 2 cemeteries. Sites 33-5398, and 5400 were recommended as potentially eligible, requiring Phase II research. The remainder were evaluated as not eligible for the NRHP (Turco and Jones, June 2016). In its August 4, 2016 letter to Mountain Valley reviewing the New South Associates 2016 historic architectural addendum survey report, the VADHR concurred that sites 33-5398 (Flora Farmstead) and 5400 are potentially eligible for the NRHP; and we agree.

Sixteen of the historic sites identified by New South Associates were also recorded as archaeological sites by Tetra Tech (Reeve et al., September 2015b; Reeve et al., December 2016). Eleven historic sites (33-5312, 5329, 5337 [44FR354], 5338, 5339 [44FR37], 5340[44FR358], 5341, 5342, 5343, 5344 [44FR369], and 5345 [44FR369]) recorded by New South Associates were also identified in Tetra Tech's 2015 archaeological survey report covering Franklin County. Tetra Tech's 2016 archaeological survey report for Franklin County identified five historic sites (33-5307, 5376, 5377, 5378, and 5383) also recorded by New South Associates. In addition, Tetra Tech's December 2016 archaeological addendum survey report for Franklin County identified seven other new historic sites in the indirect APE not mentioned by New South Associates. Those sites included two cemeteries, two structures, two houses, and a well house. All of those resources were evaluated as not eligible. Mountain Valley has not yet documented the VADHR review of the archaeological addendum survey report (Reeve et al., December 2016).

In a filing on February 17, 2017, Mountain Valley indicated that 35 of the historic architectural sites outside of Historic Districts in Franklin County were located in the direct APE (Attachment DR4 Cultural Resources – Table 3f). Thirty of the sites were evaluated as not eligible. Five historic sites (33-5304, 5325, 5329, 5398, and 5400) were recommended to be potentially eligible, requiring additional investigations.

Our January 26, 2017 EIR asked Mountain Valley to provide the results of research at historic architectural sites 33-5304, 5325, 5329, 5398, and 5400. Mountain Valley's response, filed February 17, 2017, was that instead of conducting research at these sites, it agreed that the sites are potentially NRHP-eligible, and used its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia," developed in communications with the VADHR. Mountain Valley stated that the house at site 33-5400 is not in the APE. We agree that the MVP would have no effect on site 33-5400. Task 2 – Step 2 found the viewpoint from the Clear View Dairy Farm (site 33-5304) was co-dominant and the site was eliminated from further study. The Clear View Dairy Farm is located about 218 feet away from the pipeline. The house at site 33-5329 is about 1,075 feet away from the pipeline. The house at site 33-5398 is about 198 feet away from the pipeline. The viewpoints from the house at site 33-5329 and the house at site 33-5398 were rated inferior, and the sites were eliminated from further study. The Task 3 assessment of the house at site 33-5325 indicated it would incur views of the project, but those views would have a low potential to diminish the integrity of the resource. The house as site 33-5325 is about 3,330 feet away from the pipeline. In a letter dated March 22, 2017, the VADHR accepted Mountain Valley's Task 2 and 3 assessments. We agree that the MVP would have no adverse effects on sites 33-5304, 5325, 5329, and 5398.

The MVP pipeline route would cross Teels Creek multiple times between MPs 258.3 and 262.0 in Franklin County, Virginia. Commenters noted archaeological sites along Teels Creek. Sites identified adjacent to Teels Creek by Mountain Valley's contractors (Reeve et al. September 2015; February 2017) are listed in table 4.10.8-1.

Pittsylvania County

The entire pipeline route (19.5 miles) in Pittsylvania County, Virginia has been inventoried for cultural resources. Surveys also covered 19 access road, 95 ATWS, and 4 cathodic protection bed locations in Pittsylvania County. A total of 4,973 shovel tests were excavated during the surveys in the county, of which 187 were positive.

Tetra Tech identified 27 newly recorded archaeological sites during its surveys in Pittsylvania County; including 16 pre-contact sites and 11 historic sites. Additionally, 164 isolated finds were described, including 82 historic artifacts, and 83 historic items. Originally, Tetra Tech evaluated all the isolated finds and 18 sites as being not eligible for the NRHP. One site (44PY421) was recommended for avoidance. Eight sites (44PY417, 418, 419, 422, 424, 425, 439, and 442) were recommended for Phase II testing (Reeve et al., July 2015; August 2016; November 2016). In letter dated February 7, 2017, the VADHR reviewed Mountain Valley's addendum archaeological survey report for Pittsylvania County, and concurred that sites 44PY417, 418, 419, 421, 422, 424, 425, and 439 were potentially eligible and should be avoided or tested; we agree. On February 17, 2017, Mountain Valley filed with the FERC plans to avoid two archaeological sites (44PY427 and 439) in Pittsylvania County (Jacoby and Marshall, February 2017).

Tetra Tech conducted testing at five pre-contact sites (44PY418, 419, 422, 424, and 425) and three historic archaeological sites (44PY417, 421, and 442). As a result of the testing, all of these sites were all found to be not eligible for the NRHP (Reeve et al., August 2016; November 2016). The VADHR has not yet reviewed Mountain Valley's archaeological testing report.

TABLE 4.10.8-1

Archaeological Sites Identified Near Teels Creek

Site No./ Name	Cultural Type	Recorder/ Company (date)	Company NRHP Evaluation	SHPO Opinion (date)	Future Work
44FR186	Pre-contact	SEARCH (12/07/2015)	Tetra Tech Unevaluated Avoided	Not Eligible Avoided	None Pending VADHR Concurrence
44FR215	Pre-contact	SEARCH (12/07/2015)	Tetra Tech Not Eligible	VADHR Review Pending	None Pending VADHR Concurrence
44FR216	Pre-contact	SEARCH (12/07/2015)	Tetra Tech Not Eligible	VADHR Review Pending	None Pending VADHR Concurrence
44FR188	Pre-contact	SEARCH (12/07/2015)	Pending (Testing in Progress)	Pending	Pending
44FR189	Pre-contact	SEARCH (12/07/2015)	Not Eligible	Pending	None Pending VADHR Concurrence
44FR191	Pre-contact	Tetra Tech (6/01/2016)	Tetra Tech Not Eligible	VADHR Review Pending	None Pending VADHR Concurrence
44FR190	Pre-contact	SEARCH (12/07/2015)	Pending (Testing in Progress)	VADHR Review Pending	Pending
44FR405	Pre-contact lithic scatter	Tetra Tech (8/23/2016)	Tetra Tech Unevaluated Avoided	VADHR Review Pending	None Pending VADHR Review
44FR406	Pre-contact lithic scatter	Tetra Tech (8/23/2016)	Tetra Tech Not Eligible	VADHR Review Pending	Pending Evaluation and VADHR Review
44FR396	Pre-contact lithic scatter	Tetra Tech (5/31/2016)	Tetra Tech Not Eligible	VADHR Review Pending	None Pending VADHR Concurrence
44FR373	Multi-component	Tetra Tech (7/24/2015)	Tetra Tech Not Eligible	VADHR Review Pending	None Pending VADHR Concurrence
44FR371	Pre-contact camp	Tetra Tech (6/30/2015)	Tetra Tech Unevaluated Avoided	VADHR Review Pending	None Pending VADHR Concurrence

In May 2015, New South Associates conducted an architectural survey in Pittsylvania County, during which it examined about 983 acres in the indirect APE. Historic sites were documented from public rights-of-way. During the survey, 22 newly recorded historic sites were identified in the indirect APE. The historic sites included six houses/buildings/ruins, four farms, five barns/sheds, six cemeteries, and one church. None were recommended for the NRHP (Turco et al., July 2015a). In an October 22, 2015 letter to Mountain Valley, the VADHR agreed with the recommendations in New South Associates' 2015 architectural survey report for Pittsylvania County. We concur with the findings of the Virginia SHPO.

New South Associates produced an historic architectural addendum report in June 2016, documenting additional surveys conducted between October and December 2015 in Pittsylvania County. Fifteen new historic sites were identified, including six houses, three farms, three barns, one church, one cemetery, and one industrial site. One site, the Oak Grove Christian Church and Cemetery (71-5483) was recommended as potentially eligible for the NRHP and additional investigations were recommended (Turco and Jones, June 2016). In a letter dated August 4, 2016, the VADHR concurred with the recommendations in 2016 New South Associates addendum architectural survey report; and we agree.

Tetra Tech's 2015 archaeological survey report for Pittsylvania County (Reeve et al., July 2015) re-located nine historic sites (71-5488, 5490, 5491, 5500, 5501, 5502, 5503, 5504, and 5505) previously recorded by New South Associates (Turco et al., July 2015a). Tetra Tech recommended that three of those historic sites (Mease Cemetery at Tosh Farm [71-5488], log house at site 71-5505, and Shanaberger/Craddock Cemetery [71-5491]) should be avoided. In addition, Tetra Tech identified four newly recorded historic sites (VA-PI-S-100, 101, 102, 103); including two structures, a barn, and a grave. Three of those new sites (VA-PI-S-101, 102, and 103) were recommended for avoidance. The other new site (VA-PI-S-100), the barn, in the direct APE, was evaluated as not eligible. The VADHR concurred with the recommendations in the 2015 archaeological survey report for Pittsylvania County in letters dated October 27, 2015 and February 18, 2016; and we agree.

Tetra Tech's 2016 addendum archaeological survey report (Reeve et al., August 2016) re-identified 13 historic sites (71-5481, 5484, 5488, 5490, 5494, 5500, 5501, 5502, 5503, 5504, 5505, 5508, 5515) originally recorded by New South Associates in 2015 in Pittsylvania County (Turco et al., July 2015a). Tetra Tech recommended that the Calloway Level Primitive Baptist Church and Cemetery (71-5484) and the Payne-Jefferson Bennett Cemetery (71-5494) should be avoided. The VADHR accepted Mountain Valley's addendum archaeological survey report for Pittsylvania County in a letter dated February 7, 2017; and we agree.

In a filing on February 17, 2017, Mountain Valley indicated that 23 of the historic architectural sites in Pittsylvania County are located in the direct APE (Attachment DR4 Cultural Resources – Table 3f). With one exception (Oak Grove Church [71-5483]), all of these historic sites were evaluated as not eligible. Mountain Valley indicated that the Oak Grove Church is located about 637 feet away from the pipeline centerline, and contends that it is no longer in the APE, and would not be affected. We agree that the MVP should have no effect on this church.

Newly Identified Sites in the Jefferson National Forest

On February 11, 2016, the FS issued an ARPA permit to Tetra Tech to perform a Phase I survey of the portion of the MVP pipeline route that would cross the Jefferson National Forest. Under that permit, Tetra Tech inspected about 0.2 mile of pipeline route in Monroe County, West Virginia, 1.4 miles in Giles County, Virginia, and 1.9 miles in Montgomery County, Virginia. In addition, one proposed access road (Pocahontas Road, MVP-VA-MO-232), extending about 5.7 miles, was examined. Tetra Tech excavated 541 shovel tests in the Forest, of which 81 produced cultural remains. The Spring 2016 study inventoried about 195 acres in the Jefferson National Forest for the MVP.

During its Spring 2016 survey within the Jefferson National Forest, Tetra Tech identified and recorded 10 new archaeological sites in the direct APE, and 1 historic site. Seven of the archaeological sites were evaluated by Tetra Tech as not being eligible for the NRHP. Three of the archaeological sites (44GS238, 241, and 242) were unevaluated, and should be avoided or tested. The one newly recorded historic site (35-5129) is also unevaluated and requires additional study (Reeve et al., May 2016). As previously discussed, the known NRHP-eligible ANST (21-5012) was re-located.

Mountain Valley submitted a copy of the Jefferson National Forest Spring 2016 survey report to the FS on May 16, 2016, and provided a copy to the VADHR on May 18, 2016. The FS archaeologist indicated in a May 24, 2016 email to Mountain Valley that more work needs to be done at sites 44GS238, GS240, GS241, GS242, GS243, GS244, and MY579 and MY580.

On August 2, 2016, the FS issued an ARPA permit amendment, and Mountain Valley subsequently conducted archaeological investigations along the FS78 variation, that was later adopted into the proposed route. That investigation included the excavation of 182 shovel probes within 8.7 acres (of which 16 probes were positive), and additional pedestrian inventory of 24.3 acres within the Jefferson National Forest. The field work resulted in the identification of a new pre-contact site (44GS247), expanded two previously identified archaeological sites (44GS240 and 241), and found four new isolated finds (all pre-contact artifacts). Tetra Tech evaluated sites 44GS240 and 247 as not eligible for the NRHP, requiring no further work, while site 44GS241 should be avoided or tested. The VADHR has not yet reviewed the September 2016 report (Reeve et al., September 2016). On October 19, 2016, Search submitted its ARPA permit application and plans for Phase II archaeological testing at sites 44GS238 and 241 to the FS.

Additional survey work was authorized in October 2016 by the FS via a permit amendment. Tetra Tech examined about 6,935 linear feet between Craig Creek and Brush Mountain, inventorying about 48 acres, and 91 shovel probes were excavated. One pre-contact isolated find was discovered (Reeve et al., December 2016). The report of those investigations have not yet been reviewed by the VADHR.

On November 16, 2016, the FS approved an ARPA permit amendment to conduct a survey along Mystery Ridge in Giles County, Virginia. The survey of a potential pipeline route modification along Mystery Ridge covered a 300-foot-wide corridor for a linear distance of about 1.4 miles, of which about 10 acres had not been previously inventoried. During the survey, 17 shovel probes were excavated across 1.14 acres. One new pre-contact archaeological site

(44GS251) was recorded, and was evaluated as potentially eligible. Tetra Tech recommended that site 44GS251 should be avoided or tested (Reeve et al., December 2016). The report of those investigations have not yet been reviewed by the VADHR.

In a filing on April 21, 2017, the FS provided the FERC with a copy of a letter it sent to the VADHR, dated March 9, 2017, reviewing the Reeve et al. 2016 Phase I cultural resources survey report for a portion of the Jefferson National Forest. In the opinion of the FS, additional investigations need to be conducted at archaeological sites 44GS238, GS240, GS241, GS242, GS243, GS244, GS247, GS251, and 44MY577, and historic site 35-5129. The FS believes that archaeological sites 44MY579 and MY580 would be avoided.

Currently, the MVP has the potential to adversely affect historic properties on the Jefferson National Forest. MVP has completed a Phase I inventory of the proposed route and is finalizing work on the Phase II evaluations of the cultural resources identified during the Phase I to determine which may qualify as historic properties. For those historic properties that cannot be avoided by MVP, an adverse effect assessment will be made in accordance with 36 CFR 800.5, and a Section 106 MOA would be executed to mitigate adverse effects per 36 CFR 800.6 prior to the signing of the Final ROD.

4.10.8.2 Equitrans Expansion Project

The EEP is located in three counties in Pennsylvania (Greene, Allegheny, and Washington) and one county in West Virginia (Wetzel). Equitrans plans to construct approximately 7.87 miles of pipeline (at multiple separate locations), a new compressor station, an interconnect with the proposed MVP, and ancillary facilities.

Pennsylvania

The EEP pipeline route segments in Pennsylvania totals about 7.83 miles. The direct APE for archaeological resources, consisting of the construction footprint of the project, will occupy approximately 314.6 acres including permanent facilities and temporary workspaces. The indirect APE for historic resources is 3,002 acres, which includes the direct APE. An archaeological survey covering the direct APE in Pennsylvania was conducted by Tetra Tech from August to October 2015. The survey recorded five historic archaeological sites, one pre-contact site, and one pre-contact isolated find. Four historic archaeological sites, one pre-contact site, and one pre-contact isolated finds were identified along pipeline H-318. All of these resources were evaluated as not eligible for the NRHP. One historic archaeological site was recorded at the proposed Redhook Compressor Station. This site was evaluated as not being eligible for the NRHP. No cultural resources were found along pipeline H-316, pipelines M-80/H-158, and pipeline H-305 (Borstel et al., 2016a).

An architectural reconnaissance of the indirect APE in Pennsylvania identified 115 structures greater than 50 years old. None of the newly recorded historic structures were evaluated as eligible for the NRHP (Sexton, 2016).

In a letter to Equitrans dated March 22, 2016, the PABHP concurred with Tetra Tech's findings that no historic properties would be affected by EEP components in Pennsylvania. We agree.

West Virginia

The entire APE for the EEP in West Virginia was surveyed for cultural resources in 2015. The combined direct effects APE for the EEP in West Virginia covers 3.84 acres, including 3.45 acres for the combined area of construction work zones and permanent facilities. Within these 3.84 acres is 0.04 miles of pipeline. The combined indirect effects APE in West Virginia covers 926 acres which includes the area of the direct APE.

Cultural resources field work for EEP components in Wetzel County, West Virginia was conducted by Tetra Tech in September 2015. No new sites were identified (Borstel et al., 2016b).

In a letter to Equitrans dated February 16, 2016, the WVDCH concurred with Tetra Tech that no historic properties would be affected by EEP components in West Virginia. We agree.

4.10.9 Cultural Attachment

The term cultural attachment refers to how a group of people relate to their surrounding environment over time, which may include traditions, attitudes, practices, and stories. People who reside in the area of Peters Mountain in West Virginia and Virginia have indicated that they have a cultural attachment to the area. This cultural attachment is characterized below and the project effects on this phenomenon are assessed.

4.10.9.1 Mountain Valley Project

For the MVP, we received multiple comments referencing "cultural attachment."[131] Some of the commenters cited a draft EIS for the APCo 765kv transmission line produced in June 1996 by the FS, the NPS, and the COE (EPA, 2006). Appendix M of that draft EIS was a study on cultural attachment prepared by James Kent Associates (JKA). The study stated: "The phrase cultural attachment was not defined as a working concept in the sociological or anthropological literature reviewed. Therefore, a working definition had to be created as part of the study process." Their definition was: "Cultural attachment is the cumulative effect over time of a collection of traditions, attitudes, practices, and stories that tie a person to the land, to physical place, and to kinship patterns" (Kent et al., June 1996).

Cultural attachment appears to be a phrase developed by JKA for its study in the powerline draft EIS. That study focused on the Peters Mountain area of West Virginia and Virginia. This area would also be crossed by the MVP pipeline (see figure 4.10.10-1).

[131] See for examples the January 30, 2015 filing by Richard Ettelson (accession number 20150130-0028), the July 16, 2015 filing by Save Monroe Inc. and the Border Conservancy of Monroe County, West Virginia (accession number 20150616-5243), and the October 23, 2015 filing by Preserve Craig (accession number 20151023-5124).

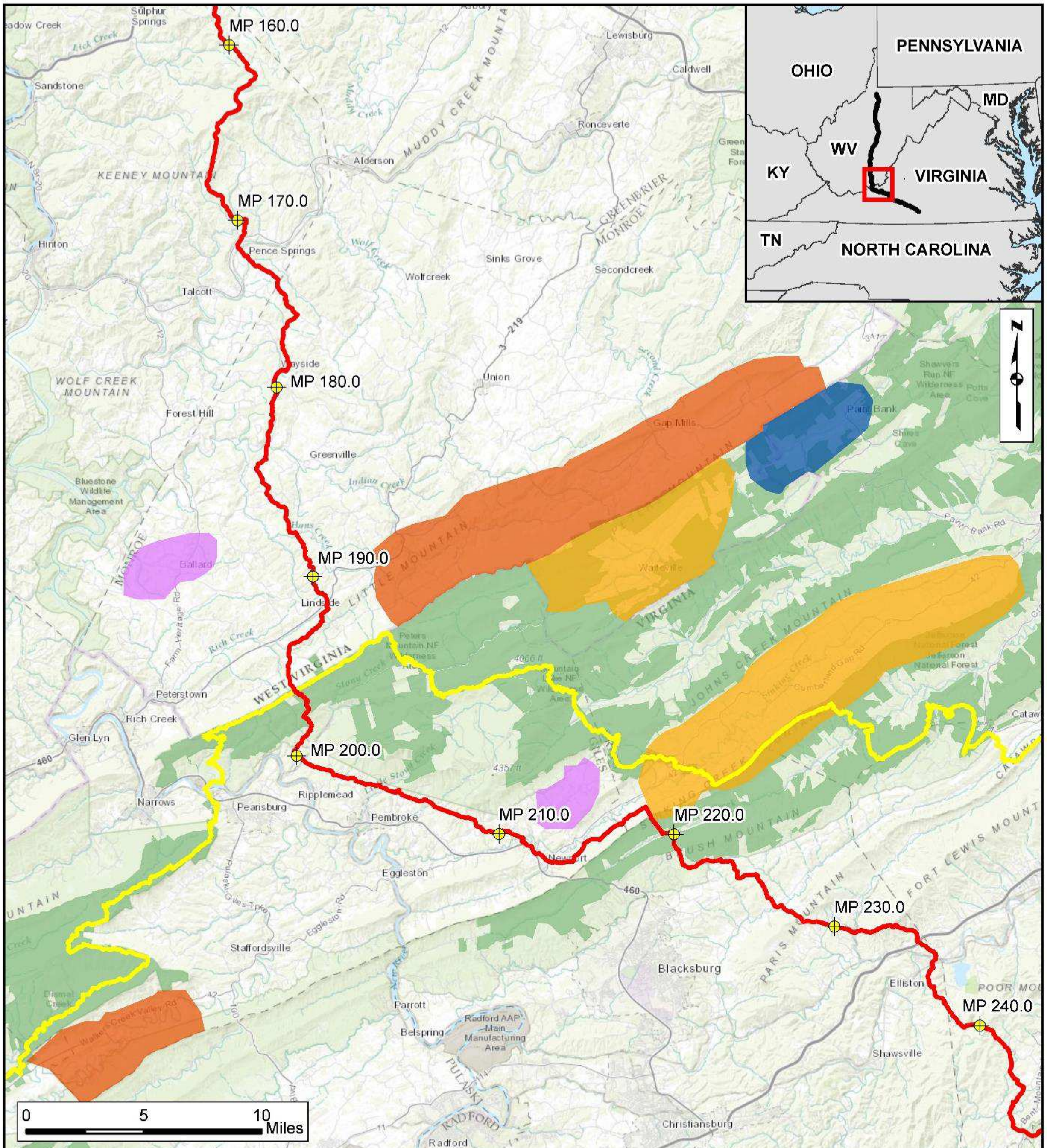

Figure 4.10.10-1

Mountain Valley Project

Identified Areas of Cultural Attachment from Kent et al 1996

The NPS has criticized the JKA powerline study because: "The contractor researchers had no graduate training in anthropology and operated with inadequate background knowledge of the research area" (Howell, 2003). However, the topic of cultural attachment along the proposed powerline route was further researched by Dr. Melinda Bollar Wagner and her student team from Radford University using more academically established ethnographic methods (Wagner, 1999).

Until the JKA powerline study, cultural attachment was a term used mainly as a descriptor rather than a concept in anthropological literature or theory. Cultural attachment theory has been used in the field of child psychology (Hong et al., 2013; Keller, 2013). The phrase has also been used in social history, to characterize kinship and neighborhood ties in rural communities in nineteenth century New England (Clark, 1979).

Cultural attachment is not specific to the project area, and could apply anywhere in the world. For example, cultural attachment was considered in a 1999 ethnographic study of the Thirty Meter Telescope Project on the island of Hawaii (University of Hawaii, 2010). The Hawaii study (Maly, 1999) defined cultural attachment as embodying:

> "…*the tangible and intangible values of a culture. It is how a people identify with and personify the environment (both natural and manmade) around them. Cultural attachment is demonstrated in the intimate relationship (developed over generations of experiences) that people of a particular cultural share with their landscape – for example, the geographic features, natural phenomena and resources, and traditional sites, etc., that make up their surroundings. This attachment to environment bears direct relationships to the beliefs, practices, cultural evolution, and identify of a people*…." [132]

The term cultural attachment has been adopted by the NPS and the FS. The NPS indicated that it could use cultural attachment as a criterion to distinguish "traditionally associated people" from other park neighbors and stakeholders (Howell, 2003). In its ROD for the APCo powerline project, the FS used cultural attachment as a reason to reject certain route alternatives.

Further, the FS requested that this EIS include an analysis of cultural attachment as it relates to the MVP crossing of the Jefferson National Forest. Therefore, Mountain Valley hired a professional cultural anthropological consulting firm ACE to study the topic of cultural attachment for this project.

On January 27, 2016, Mountain Valley filed its Cultural Attachment Report (Bengston and Austin, 2016). Originally, the study area was intended to cover the MVP pipeline route crossing the Jefferson National Forest. However, this area has been mostly devoid of permanent residents since the National Forest was first created in 1916. Therefore, the anthropological study concentrated on the adjacent landscape of Peters Mountain, which is crossed by the proposed MVP pipeline route between about MPs 194 and 200, in Monroe County, West Virginia and Giles County, Virginia.

[132] Mauna Kea Science Reserve and Hale Pohaku Complex Development Plan Update: *Oral History and Consultation Study, and Archival Literature Review* (http://www.envirowatch.org/MKculteral.htm, accessed May 26, 2016).

Peters Mountain is a north-south trending 52-mile-long, narrow ridge in the Appalachian range, with a peak elevation of 4,073 feet, which, in part, forms the border between West Virginia and Virginia. The pipeline route approaches Peters Mountain from the northwest in Monroe County, West Virginia, along Ellison Ridge, crossing Hans Creek and Dry Creek, then over Little Mountain and crossing Pointer Run. On the west side of Peters Mountain near the pipeline route are the towns of Greenville and Lindside, and various small communities (Assurance and Coulter Chapel) along the Hans Creek and Dry Creek valleys. On the east side of the mountain, in Giles County, Virginia, the pipeline route would cross Stony Creek north of the New River and then proceed to cross Little Stony Creek south of Butt Mountain, in the vicinity of the towns of Goldbond, Kimballton, and Pembroke. According to ACE, the Peters Mountain area has not been affected by large-scale resource extraction industries, such as coal mining, unlike most of the Appalachian region.

During the colonial period, the Peters Mountain region was settled by Euro-Americans mostly of Scotch-Irish and German descent. ACE identified three basic types of current residents in the area. First, there are people who claim to be descendants of early Euro-American settlers, whose families have owned their land for generations. Second, there are people who came to the area in the 1970s and established roots and relationships over the last 50 years. Lastly, there are people who moved to the area after 2000. Newcomers state that they were soon included in community gatherings, activities, and events.

U.S. Census data can be used to characterize the population of the counties that contain Peters Mountain in the project area. As summarized in section 4.9 of this EIS, about 30,200 people reside in Monroe County, West Virginia and Giles County, Virginia combined; with population densities ranging from 29 to 49 people per square mile. The vast majority (97 percent) of the populations of both counties are white. Almost all (99 to 96 percent) of the people who identify with a religious affiliation in Monroe and Giles Counties are Protestants; with about half being evangelical. Between 14 to 17 percent of the adult population in the counties have a college education. The average household size for both counties is about 2.3 people. The median household income of Monroe County is about $38,000, with 19 percent below the poverty line. In Giles County, median household income is about $46,000, with about 14 percent living in poverty. The unemployment rate in Monroe County in January 2016 was 5.9 percent; and 5.3 percent in Giles County. In Monroe County 81 percent of the housing is owner-occupied; while in Giles County it is 77 percent. Almost half the land (48 percent) in Monroe County is in farms, with 9 percent growing crops and 91 percent raising livestock; with an average farm size of 182 acres. In Giles County, less than a third of the land (29 percent) is in farms, of which 20 percent grow crops and 80 percent raise livestock; with an average farm size of 173 acres.

According to ACE, the local economy around Peters Mountain consists mainly of small-scale, family-owned farms; with most in the dairy business. Many residents also have subsistence gardens. The Peters Mountain farmsteads are dependent on springs or well water; some of which is derived from underground sources in karst terrain. Groundwater resources are often shared among neighbors. Hunting grounds and plant gathering areas are also often considered communal.

During their interviews with local residents, the ACE study team noted some repeated values associated with cultural attachment to the land. Those shared values include, but are not limited to:

- sense of homeplace;
- land ownership;
- kinship and neighborhood relations;
- sharing of resources;
- self-sufficiency;
- slow-paced lifestyle; and
- water quality.

ACE indicated that the people who reside in the Peters Mountain area have a cultural attachment to the land that is unique to this portion of Appalachia. In the opinion of ACE, Peters Mountain represents a "cultural landscape." This landscape contains springs, crop fields, orchards, pastures, woodlots, fencing, roads, stores, churches, cemeteries, and farmsteads (including houses, barns, and other agricultural outbuildings). The ACE study found that, in the Peters Mountain region, cultural attachment includes intangible aspects, such as emotional and spiritual feelings about the land; as well as tangible or material aspects, such as the landscape where people reside.

An assessment of cultural attachment is not required by any federal laws or regulations relating to historic preservation and cultural resources management. Analyzing cultural attachment or a community's sense of place is one of the many ways to identify potential impacts to the tangible and intangible values of culture associated with the physical environment. Furthermore, the NPS has indicated that historic rural landscapes may qualify for nomination to the NRHP (McClelland et al., 1999). Likewise, traditional cultural places can also be nominated to the NRHP (Parker and King, 1998). In the opinion of ACE, Peters Mountain could be considered a rural historic cultural landscape (Bengston and Austin, 2016). We agree.

On May 24, 2016, Richard Ettelson filed comments on the ACE report.[133] Mr. Ettelson cited the JKA powerline study, repeating that where highly intrusive impacts on cultural attachment would occur, alternatives should be considered that would avoid such impacts. We address alternatives in section 3 of this EIS. No alternatives around Peters Mountain are recommended. According to a map drawn by JKA illustrating areas of cultural attachment in the Peters Mountain vicinity,[134] the route of the MVP pipeline would avoid areas of high cultural attachment intensity and cross a region with moderate or low cultural attachment intensity (see figure 4.10.10-1).

A letter to the FERC and FS dated May 4, 2016, from the Border Conservancy, Save Monroe, Preserve Craig, and Preserve Giles presented their comments on the ACE report.[135] The groups requested that the FERC and FS have a cultural anthropologist conduct an effects analysis. Richard Ettelson also requested that the EIS should include an effects analysis for cultural attachment to land around Peters Mountain. Below is our effects analysis for cultural attachment,

[133] See accession number 20160524-0028.

[134] Included in Appendix B to the April 2002 Supplemental draft EIS for the APCo Transmission Line [EPA 2006] Appendix I Cultural Attachment Technical Report. The attached map was derived from Mountain Valley's application to the FERC.

[135] See accession number 20160505-5090.

written by our team of specialists, including professional cultural anthropologists,[136] based on the ACE report within the context of Mountain Valley's proposed action.

The main component of the MVP would be an underground welded steel pipeline. After pipeline installation, the right-of-way would be restored to its original contours, condition, and land use, and revegetated. Only the 50-foot-wide permanent easement would be kept clear of trees in forested areas. None of the MVP aboveground facilities would be located in the Peters Mountain region. Visual impacts are discussed more fully in section 4.8 of this EIS. For half the route over Peters Mountain (3 out of 6 miles), the pipeline would be placed adjacent to existing powerline rights-of-way. Therefore, the viewshed of Peters Mountain is not pristine, including existing utilities and other infrastructure. The VIA, which concluded that the MVP would not have significant adverse visual impacts on the Jefferson National Forest, includes KOPs of Peters Mountain. Therefore, we conclude that the visual character of the Peters Mountain rural historic landscape would not be significantly altered by the MVP.

The JKA powerline study made the statement that "cultural attachment does not lend itself to mitigation." In fact, there are many ways to avoid, reduce, or mitigate project impacts related to the concept of cultural attachment to land. Even JKA suggested that in areas with low intrusive impacts on cultural attachment, special attention could be given to disruption of agricultural production. Project-specific construction techniques and mitigation plans proposed by Mountain Valley (see section 2.4 of this EIS) would minimize impacts on the landscape; including measures to prevent erosion, protect farmland soils (see section 4.2), and reduce impacts on water resources (see section 4.3).

Mountain Valley would compensate landowners for any damages to their property; such as the removal of timber, or loss of agricultural production. Irrigation or drainage systems, or wells and springs that supply domestic water affected by construction would be repaired or replaced. After the pipeline is installed and the right-of-way restored, farmers could grow crops (but not orchards) on top of the easement. As discussed in section 4.8 of this EIS, Mountain Valley would implement the measures outlined in its OFPP to reduce impacts on any organic farms crossed by the pipeline route.

Mountain Valley would implement measures to protect groundwater resources (see section 4.3 of this EIS), and would keep air quality within limits established by its air permits (see section 4.11). There are no compressor stations proposed for Monroe County, West Virginia or Giles County, Virginia. Impacts on flora and fauna would be minimized or mitigated as discussed in sections 4.4 and 4.5 of this EIS. Historic sites, including farmsteads and family cemeteries, would be treated as discussed in this section.

Concerns expressed by residents include that during project construction there would be an influx of out-of-town workers who may disturb their lifestyle. In the Peters Mountain region, Mountain Valley would have one construction spread (Spread 8), that would employ about 500 non-local workers. Construction along Spread 8 would encompass about 15 months.[137] Within Monroe County, West Virginia and Giles County, Virginia, available housing stock consists of

[136] See the list of preparers in appendix Z of this EIS.

[137] Based on an average rate of construction of 19 days per mile for 23 miles.

236 rental units, 852 seasonal units, 1 campground, and 181 hotel/motel rooms. Non-local workers would compete with other visitors for local accommodations during the overlap of the peak construction period with the tourist season. Towns within 10 miles of the pipeline route in the Peters Mountain region that may be temporarily affected by the influx of non-local project laborers could include Greenville, Lindside, Peterstown, and Union in Monroe County, and Glen Lyn, Narrows, Pearisburg, Ripplemead, Pembroke, Goldbond, Kimballton, and Rich Creek in Giles County. Non-local workers may have to commute to the job from larger cities (such as Blacksburg or Roanoke) with more available accommodations. Construction traffic on local roads would be in accordance with Mountain Valley's *Traffic and Transportation Management Plan.* We conclude that impacts related to MVP construction workers would be temporary, and the project would not have long-term significant adverse effects on the residents of the Peter Mountain area.

In the case of the MVP, no residents of the communities around Peters Mountain would be separated from their land. Mountain Valley does not intend to purchase any homes in Monroe County, West Virginia or Giles County, Virginia. No houses would be taken, and no people would be evicted from their property. Access to properties would be maintained. No buildings outside of the permanent easement would be removed. Mountain Valley only seeks an easement for its 50-foot-wide operational pipeline right-of-way, so that affected property owners would continue to own fee title to their land, and own their improvements outside of the permanent right-of-way. Outside of the operational easement, landowners would be free to manage their property as they see fit. In other words, the MVP would not affect land ownership, tenure, or sense of homeplace, which are important values associated with cultural attachment to land noted in the ACE interviews with residents of the Peters Mountain community.

The MVP should not result in changes to the culture, belief systems, or traditional practices associated with the Peters Mountain region. During pipeline operations, the project would not alter the quality of life in the region, or the slow-paced lifestyle valued by people interviewed by ACE. Livelihoods and avocational pursuits would not be disrupted over the long-term. No businesses would be shut down. In fact, the MVP may provide economic benefits to the region, in the form of temporary jobs and wages, spending on commodities, rents, and local tax revenues (see section 4.9). After pipeline installation and restoration, citizens could continue to farm, gather plants, collect firewood, trade, share water and food, and hunt as they always have.[138]

Preserve Bent Mountain[139] indicated that cultural attachment should be applied to the Bent Mountain region of Roanoke County, as well. We address their concern previously in this section, in our discussion of the Bent Mountain Rural Historic District. In addition, a number of landowners in Franklin County[140] believe that they are culturally attached to their lands. ACE indicated that residents of any community could state that they have cultural attachment to the land. While mentioning family histories, Preserve Bent Mountain and the Franklin County landowners did not present evidence of belief systems or cultural practices that are unique to this

138 See Mountain Valley's January 26, 2016 comments on the ACE Cultural Attachment Report filed on January 27, 2016 as Attachment RR4-30 as part of the Applicant's response to the FERC staff's December 24, 2015 environmental information request.

139 See letter dated December 19, 2016 (accession number 20161220-5373), and February 21, 2017 letter from James and Kathy Chandler (accession number 20170221-5194).

140 See for example the February 20, 2017 letter from Bonnie Law (accession number 20170221-5195).

area and would tie people to a specific landscape, as used by some scholars (Kent et al., June 1996; Maly, 1999) to define cultural attachment. As discussed above for Peters Mountain, construction and operation of the MVP should not have long-term significant adverse effects on cultural attachment to the land, because it would not change land ownership, lifeways, economic activities, cultural practices or beliefs, and effects on most environmental resources (such as impacts on air quality, water quality, and farmland soils) would be reduced or mitigated through measures implemented by Mountain Valley.

4.10.9.2 Equitrans Expansion Project

The topic of cultural attachment was not raised as an issue of concern for the EEP.

4.10.10 Environmental Consequences

4.10.10.1 Historic Properties and Assessment of Project Effects

Below we summarize survey coverage, the identification of historic properties in the direct APE, and provide our assessment of project effects on specific properties.

Section 106 of the NHPA (as codified in Part 800.5) requires federal agencies to apply the "criteria of adverse effect" to determine whether a project would affect historic properties. Effects are found when an undertaking alters, directly or indirectly, the characteristics of a historic property that qualify it for inclusion in the NRHP, in a manner that diminishes the historical integrity of the property. Reasonably foreseeable effects caused by the undertaking may occur later in time, be distant, or be cumulative. Federal agencies are required to consult with consulting parties when there are potential adverse effects. The consultation should attempt to resolve adverse effects and develop mitigation measures as necessary.

Project effects include direct and indirect effects, which can affect the ability of a historic property to convey its significance and may affect its integrity, visibility, accessibility, and research potential. Direct effects are the physical disturbances of an action (e.g., construction, operation, or restoration) on a historic property that occur at the same time and place as the action within the footprint of the physical disturbance. The types of direct effects on a historic property, which are usually adverse, may include the following:

- physical destruction of or damage to a historic property;
- alteration of a historic property;
- removal of a historic property from its historic location;
- change of the character of the historic property's use or of physical features as they relate to historical setting; and/or
- neglect of a historic property that causes its deterioration (except where such neglect and deterioration are recognized qualities of a sacred place).

Indirect effects may change the character of the historic property's use or physical features within its setting that contribute to its historic significance and integrity. Indirect effects may include:

- permanent change in viewshed of a historic property;
- limited or altered access to a historic property, whereby the property may be neglected and fall into ruin, or conversely, access to a historic property may be facilitated, causing vandalism to increase;
- introduction of visual, atmospheric, or audible elements that diminish integrity of the historic property; and/or
- temporary construction-related impacts on a historic property including dust, noise, vibration, and visual intrusions caused by heavy equipment.

For those historic properties that would be adversely affected, where avoidance is not feasible, a Treatment Plan would be prepared by Mountain Valley. Cultural resources that are considered "unevaluated" have not been sufficiently assessed at this time to finalize an eligibility determination for the NRHP. These sites would either be further assessed through NRHP evaluation procedures or would be treated as a historic property and avoidance or mitigation plans developed. Where we make a finding of "no effect" or "no adverse effects" on specific historic properties, no further work may be required.

Mountain Valley Project

General Project-Wide Summary

As of February 2017, about 96 percent of the MVP pipeline route has been inventoried. This includes surveys of about 187 miles in West Virginia and 105 miles in Virginia.

The MVP pipeline route would cross seven Historic Districts (Big Stony Creek Historic District, Greater Newport Rural Historic District, North Fork Valley Rural Historic District, Bent Mountain Rural Historic District, Blue Ridge Parkway Historic District, Coles-Terry Rural Historic District, and the Lynchburg and Danville Railroad Historic District). We agree with Mountain Valley that the project would have no effect on the Sam's Run Historic District in Wetzel County, West Virginia, that would be avoided. The pipeline would be outside of the Newport Historic District boundaries, but the project may still have indirect effects. We and the Virginia SHPO agree that the Lynchburg and Danville Railroad Historic District, in Pittsylvania County, is not eligible for the NRHP; therefore the MVP would have no effect on that Historic District. Mountain Valley's Criteria of Effects Report, filed with the FERC on May 10, 2017, indicated that the MVP would have no adverse effects on the Big Stony Creek Historic District, Newport Historic District, Greater Newport Rural Historic District, North Fork Valley Rural Historic District, Bent Mountain Rural Historic District, and Coles-Terry Rural Historic District. However, we cannot make our official determinations of project effects for these Historic Districts until after we have seen the comments of the VADHR on the report (Dye and Marshall, May 2017). Likewise, we cannot make a determination of project effects on the Blue Ridge Parkway Historic District until after we see the opinions of the NPS on Mountain Valley's VIA for the BRP.

Outside of known Historic Districts (discussed above), in the direct APE, Mountain Valley's cultural resources consultants re-located one previously recorded NRHP-eligible archaeological site (44MY54). It would be avoided by the MVP; together with another unevaluated previously recorded archaeological site (46SU147). One NRHP-listed historic site (Weston and Gauley Bridge Turnpike Trail) was re-located in the direct APE. Mountain Valley intends to bore under this trail, which we and the SHPO found would have no adverse effects. Six previously recorded historic architectural sites in the direct APE that are eligible for the NRHP were also re-located (Haught House and Haldeman House in West Virginia, and ANST, Doe Creek Farm, Elijah Henry House, and Motley House in Virginia). We agree with Mountain Valley that the MVP would have no effect on the Haldeman House and Motely House, and no adverse effects on the Haught House, ANST, Doe Creek Farm, and Elijah Henry House.

A total of 282 newly recorded archaeological sites and 116 historic architectural sites have been identified in the direct APE, outside of Historic Districts. Based on Mountain Valley's cultural resources investigations reports, we have determined that 220 of the newly recorded archaeological sites and 107 of the historic architectural sites in the direct APE are not eligible for the NRHP, are not historic properties, and require no additional work. A total of 46 archaeological sites are unevaluated, and avoidance was recommended. Eleven newly recorded archaeological sites and nine historic architectural sites have been evaluated as eligible for nomination to the NRHP.

In West Virginia, 160 archaeological sites and 27 historic architectural sites were identified in the direct APE. Of these, 123 newly recorded archaeological sites and 25 historic architectural sites were evaluated as not eligible. Twenty-nine archaeological sites in West Virginia would be avoided. Eight archaeological sites and two historic architectural sites were recommended as eligible for the NRHP.

Mountain Valley's cultural resource consultants identified 122 newly recorded archaeological sites and 89 historic architectural sites in the direct APE in Virginia. Of these, 97 of the archaeological sites, and 82 of the historic architectural sites were evaluated as not eligible. Seventeen of the archaeological sites should be avoided. Three archaeological sites and seven historic architectural sites in Virginia are recommended to be eligible for the NRHP.

Appendix V lists cultural resources within the direct APE that are currently unevaluated, may be eligible for nomination, or are listed on the NRHP. The table provides recommendations for future work, and assessments of effects.

Eight newly recorded archaeological sites in West Virginia (HS101, LE77, BX114, NI 846, NI847, GB498, GB504, and GB505) were evaluated as eligible for nomination to the NRHP. Mountain Valley intends to avoid four of those sites (BX114, NI846, NI847, and GB498). In the case of four other eligible sites (HS101, LE77, GB504, and GB505), Mountain Valley indicated that significant data was already recovered, and recommended a finding of no adverse effects.

Two newly recorded historic architectural sites in the direct APE in West Virginia were evaluated as eligible for the NRHP. In the case of the Losrch Farmstead (BX-351), in Braxton County, Mountain Valley indicated that the MVP would have no effect. In the case of the Wiseman House (Site 4) in Summers County, Mountain Valley indicated that the MVP would have no adverse effects.

In Virginia, three newly recorded archaeological sites (44GS226, 44FR372, and FR392) were evaluated as eligible for the NRHP. Mountain Valley intends to avoid all three of these sites. We conclude that the MVP would have no effect on sites that are avoided.

Five newly recorded NRHP-eligible historic architectural sites were identified in the direct APE in Virginia. Mountain Valley applied its "Methods for Historic Architecture Criteria of Effects Assessment for Virginia" to those sites, and found that the MVP should have no adverse effects on the Clear View Dairy Farm (33-5304), and the houses at sites 33-5325, 5329, and 5398 in Franklin County, and the Norfolk & Southern Railroad (60-5170) in Roanoke County.

In sum, as of February 2017, no historic properties have been identified in the direct APE that would be adversely affected by the MVP. However, we have not made final determinations of effects at several Historic Districts, which are pending SHPO review of Mountain Valley's Effects Report. In addition, Mountain Valley is still conducting investigations on the Jefferson National Forest. If the Commission authorizes the project, Mountain Valley would need to conduct surveys where access was previously denied.

U.S. Army Corps of Engineers Jurisdictional Waterbodies and Wetlands

Representatives of the COE have informed FERC staff that the COE Districts do not intend to issue their CWA Section 404 permits until after the FERC can document that it has completed the NHPA Section 106 compliance process outlined in 36 CFR 800. On March 30, 2017, Mountain Valley filed summary data on the status of cultural resources investigations covering COE-jurisdictional waterbodies and wetland crossings.

With two exceptions, no historic properties were identified at COE-jurisdictional stream and wetland crossings in West Virginia during surveys conducted prior to March 2017. At about MP 66.9, in Braxton County, the proposed pipeline route would cross the previously recorded and NRHP-listed Weston and Gauley Bridge Turnpike Trail (NR#98001430), on land owned in fee by the COE. We and the SHPO agree that if Mountain Valley bores under the turnpike, the MVP would have no adverse effects on the trail. At about MP 69.9, at the crossing of stream S1J31, the NRHP-Eligible Loach Farmstead (Site BX351) was identified in the direct APE. This site would be avoided, and we agree with Mountain Valley that the MVP would have no adverse effects on the Loach Farmstead. In West Virginia, Mountain Valley identified 36 stream crossings and 19 wetlands where cultural resources surveys have not yet been completed by March 2017.

In Virginia, 19 stream crossings and 11 wetlands remain to be surveyed for cultural resources as of March 2017. Only one historic property, multi-component site 44FR370, was identified in the direct APE near four stream and three wetland crossings. Mountain Valley still needs to document whether that site would be tested or avoided.

Equitrans Expansion Project

General Project-Wide Summary

In Pennsylvania, five previously recorded historic architectural sites were identified within the indirect APE; but all are outside of the construction right-of-way and should not be affected. Two previously recorded historic properties were identified in the direct APE for the H-318 pipeline: the Monongahela River Navigation System and the Pittsburgh & Lake Erie Railroad. Equitrans would avoid impacts on these two historic properties by using an HDD to cross under the Monongahela River. During surveys for the EEP, Equitrans' consultant identified 6 new archaeological sites within the direct APE and 115 historic architectural sites within the indirect APE; all of which were evaluated as not eligible for the NRHP, requiring no further work. In a letter to Equitrans dated March 22, 2016, the Pennsylvania SHPO concurred with those recommendations, and we agree. We have included a recommendation in section 4.3 for Equitrans to provide cultural resource surveys for the New Cline Variation (part of the H-318 pipeline) prior to construction.

In West Virginia, three previously recorded archaeological sites were identified in the direct APE for EEP facilities; and six previously recorded standing structures were identified in the indirect APE. One of those buildings is the Mobley School, evaluated as eligible for the NRHP, and is about 0.2 mile from the Webster Interconnect. The Kilcoyne Cemetery is about 0.3 mile away from the Webster Interconnect; but it has been determined not eligible for the NRHP. The three previously recorded archaeological sites were also found not eligible. No new archaeological sites or historic standing structures were identified during surveys for the EEP in Wetzel County, and no additional studies were recommended by Equitrans' cultural resources consultant. In a letter to Equitrans dated March 22, 2016, the WVDCH concurred with those recommendations; and we agree.

U.S. Army Corps of Engineers Jurisdictional Waterbodies and Wetlands

Representatives of the COE have informed FERC staff that the COE Districts do not intend to issue their CWA Section 404 permits until after the FERC can document that it has completed the NHPA Section 106 compliance process outlined in 36 CFR 800. All the wetlands and waterbodies crossed by the proposed EEP pipelines would come under the jurisdiction of the COE Pittsburgh District.

Equitrans has conducted surveys of all COE-jurisdictional Waters of the United States that would be crossed by its proposed pipelines. Two historic properties would be crossed by the H-318 pipeline: the Monongahela River Navigation System and the Pittsburgh & Lake Erie Railroad. Equitrans intends to avoid adverse effects on these historic properties by using a HDD under the Monongahela River. We and the Pennsylvania SHPO agree that this should result in no adverse effects on those historic properties.

4.10.10.2 Unanticipated Discoveries Plans

It is possible that during construction, there could be unanticipated discoveries of previously unknown and unidentified cultural resources, unmarked cemeteries or human remains. To account for that possibility, and provide for measures that could be implemented to reduce impacts and mitigate effects for those situations, the Applicants developed project-specific Discovery Plans, which were reviewed by the SHPOs. As discussed below, we concur with the SHPOs that the Discovery Plans are acceptable.

Mountain Valley Project

Mountain Valley filed its original *Plan for Unanticipated Historic Properties and Human Remains* (Discovery Plan) as attachment 4-B to draft RR 4 filed with the FERC on April 24, 2015.

The WVDCH provided comments on the Discovery Plan on April 17, 2015. On March 2, 2015, the VADHR provided comments about Mountain Valley's Discovery Plan. Mountain Valley updated the Discovery Plan to incorporate the WVDCH and the VADHR comments. The VADHR accepted Tetra Tech's revised Discovery Plan on May 20, 2015. The WVDCH approved the plan on May 8, 2015. We agree with the West Virginia and Virginia SHPOs that the Mountain Valley Discovery Plans are acceptable.

Equitrans Expansion Project

As part of its application to the FERC filed on October 27, 2015, Equitrans included a *Plan for Unanticipated Historic Properties and Human Remains, Pennsylvania and West Virginia* (Discovery Plan) as Appendix 4-B attached to RR 4. We believe that the PASHPO found the Discovery Plan acceptable when it approved Equitrans' work plan in a letter dated July 27, 2015. In a letter dated August 10, 2015, the WVDCH found the Discovery Plan acceptable. We concur.

4.10.10.3 Compliance with the National Historic Preservation Act

Mountain Valley Project

No Native American traditional cultural properties, sacred sites, aboriginal burials, or objects of cultural patrimony were identified in the APE for the MVP by the NPS, BIA, FS, SHPOs, Tetra Tech, Search, New South Associates, interested Indian tribes, and other consulting parties. We conclude that the MVP would have no effect on sites of traditional, cultural, or religious importance to Indian tribes, and therefore, we have completed compliance with Section 101(d)(6) of the NHPA.

The entire process of compliance with Section 106 of the NHPA has not yet been completed for the MVP. According to a February 17, 2017 filing, Mountain Valley has not yet surveyed about 9.2 miles of pipeline route in West Virginia, and 1.9 miles in Virginia, plus four yards and an access road in West Virginia, totaling about 47.4 acres.

Only after inventories have been completed for all proposed facilities could all historic properties in the direct APE be identified. The FERC would then make an assessment of project effects for all identified historic properties in the direct APE, in consultation with the appropriate SHPOs, federal land managing agencies, interested Indian tribes, and other consulting parties. If historic properties would be adversely affected, the FERC staff would notify the ACHP, and would develop, in consultations with the ACHP, appropriate SHPOs, federal land managing agencies, interested Indian tribes, and other consulting parties, a MOA to resolve adverse effect on historic properties that cannot be avoided. Therefore, **we recommend that**:

- **Mountain Valley should <u>not begin construction</u> of facilities and/or use of staging, storage, or temporary work areas and new or to-be-improved access roads <u>until</u>:**
  - **Mountain Valley files with the Secretary:**

    i) remaining cultural resources survey reports;

ii) site evaluation reports, avoidance plans, or treatment plans, as required; and

iii) comments on the reports and plans from the appropriate SHPOs, federal land managing agencies, interested Indian tribes, and other consulting parties.

- **the ACHP has been afforded an opportunity to comment if historic properties would be adversely affected; and**
- **the FERC staff reviews and the Director of OEP approves all cultural resources reports and plans, and notifies Mountain Valley in writing that either treatment measures (including archaeological data recovery) may be implemented or construction may proceed.**

All materials filed with the Commission containing location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "CONTAINS PRIVILEGED INFORMATION - DO NOT RELEASE."

Equitrans Expansion Project

No Native American traditional cultural properties, sacred sites, aboriginal burials, or objects of cultural patrimony were identified in the APE that have been surveyed for the EEP by the NPS, BIA, SHPOs, Tetra Tech, interested Indian tribes, or other consulting parties. We conclude that the EEP would have no effect on sites of traditional, cultural, or religious importance to Indian tribes within the portions of the APE that have been surveyed. Therefore, we have satisfied Section 101(d)(6) of the NHPA.

We and the Pennsylvania and West Virginia SHPOs agree that no historic properties have been identified that would be adversely affected by the EEP within the portions of the APE that have been surveyed. All of the newly recorded archaeological sites were evaluated as not eligible for the NRHP, requiring no further work. Because of the HDD under the Monongahela River for the H-318 pipeline, in consultation with the Pennsylvania SHPO, we have determined that the EEP would have no adverse effects upon the previously recorded NRHP-listed Monongahela River Navigation System and the Pittsburgh & Lake Erie Railroad. We have included a recommendation in section 4.3 for Equitrans to provide cultural resource surveys for the New Cline Variation (part of the H-318 pipeline) prior to construction.

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

This section of the EIS describes existing air quality; identifies the construction and operating air emissions; describes methods that would be used to achieve compliance with regulatory requirements; and outlines projected air quality impacts for the MVP and the EEP.

The MVP would include construction and operation of about 304 miles of natural gas transmission pipeline, three new natural gas-fired compressor stations (Bradshaw, Harris, and Stallworth Compressor Stations), and other associated aboveground ancillary facilities (pig launchers/receivers, interconnects, and valves and meter stations) within 17 counties in West Virginia and Virginia.

The EEP would include construction and operation of a total of about 7 miles of natural gas transmission pipeline; a new natural gas-fired compressor station (Redhook Compressor Station) in Greene County, Pennsylvania, decommissioning of the existing Pratt Compressor Station, and other associated aboveground ancillary facilities (pig launchers/receivers, taps, and interconnects). Air quality would be affected by construction and operation of the MVP and the EEP. Section 2.1 describes in detail the primary facilities associated with the MVP and the EEP.

Temporary air emissions would be generated during project construction which would occur over a period of about 2.5 years and across three states; however, most air emissions associated with the MVP and the EEP would result from the long-term operation of the new compressor stations. Construction and operational air emissions and mitigation measures are discussed in section 4.11.1.3.

4.11.1.1 Affected Environment

Regional Climate

West Virginia and Pennsylvania have a humid continental climate while Virginia has a humid coastal climate. Based on information gathered from the National Centers for Environmental Information during the period 1985 through 2014, average monthly precipitation is about 3.8 inches in West Virginia, 3.7 inches in Virginia, and 3.7 inches in Pennsylvania. The highest average precipitation occurs during the month of July at 4.9, 4.5, and 4.3 inches in West Virginia, Virginia, and Pennsylvania, respectively. Average lowest precipitation occurs during the month of February at 3.0, 2.7, and 2.4 inches in West Virginia, Virginia, and Pennsylvania, respectively. Low temperatures (January average) are 22°F in West Virginia, 25.7°F in Virginia, and 18.5°F in Pennsylvania. High temperatures (July average) are 83.1°F in West Virginia, 86.2°F in Virginia, and 82.1°F in Pennsylvania. Average annual temperatures are at 52.3°F, 55.7°F, and 49.2°F in West Virginia, Virginia, and Pennsylvania, respectively (NCEI, 2015a).

Table 4.11.1-1 shows a summary of selected climate parameters measured from representative monitoring stations closest to the proposed compressor stations locations for the MVP and the EEP.

TABLE 4.11.1-1 **Representative Climate Data at the Compressor Stations Locations a/**								
		Distance and Direction from Compressor/ Project Area	**Ambient Temperature (°F)**		**Precipitation (inches)**		**Snowfall (inches)**	
Compressor Station/ County	**Monitoring Station**		**Average Minimum (January)**	**Average Maximum (July)**	**Monthly Average**	**Annual Average**	**Snow Months**	**Annual Average**
Mountain Valley Project								
Bradshaw/ Wetzel, WV	Morgantown Lock & Dam	33 miles NE	21	83	3.6	43.2	Nov-Apr b/	17 b/
Harris/ Braxton, WV	Elkins WSO Airport 2	36 miles NE	19	81	3.8	46.0	Nov-Apr b/	84 b/
Stallworth/ Fayette, WV	Raleigh Co Airport	20 miles SW	23	80	3.5	41.4	Oct-Apr b/	61 b/
Equitrans Expansion Project								
Redhook/ Greene, PA	Waynesburg 1 E, PA	16.9 miles SE	19	83	3.4	40.5 c/	Nov-Apr c/	29 c/
Allegheny County, PA	Pittsburgh Airport, PA	7.5 miles N	22	82	3.3	39.3	Nov-Apr d/	41.9 d/
Wetzel County, PA	Mannington 8 WNW, WV	4.3 miles E	18	83	4.0	48.4	Nov-Apr e/	36.5 e/
Washington County, PA	Donora 1 SW, PA	8.0 miles SE	22	84	3.1	37.6 c/	Nov-Mar c/	19 c/

Sources: NCEI, 2015b; SERCC, 2015; USCD, 2016; CR, 2016

a/ Historical climate data were obtained from NCEI (2015b) based on 1981-2010 normals climate data, except as noted below.

b/ Snowfall data for the Bradshaw, Harris, and Stallworth Compressor Station sites were obtained from SERCC (2015) based on 1921-2012, 1928-2012, and 1963-2012 climate data records, respectively, from the NCEI (2015).

c/ Snowfall and precipitation data for the Waynesburg and Donora monitoring stations were obtained from USCD (2016) based on 1981-2010 normals climate data records from the NCEI (2015).

d/ Snowfall data for the Pittsburgh Airport monitoring station were obtained from CR (2016) based on 1981-2010 normals climate data records from the NCEI (2015b).

e/ Snowfall data for the Mannington monitoring station were obtained from SERCC (2015) based on 1946-2012 climate data records from the NCEI (2015b).

Ambient Air Quality Standards

Ambient air quality is protected by federal and state regulations. Under the CAA, as amended in 1977 and 1990, the EPA has established National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), sulfur dioxide (SO_2), and ozone (O_3). Ozone forms by a reaction nitrogen oxides (NO_x) and volatile organic compounds (VOC); and as a result, ozone formation cannot be directly controlled. Limiting NO_x and VOC emissions would result in a lower potential for ozone formation. Therefore, the EPA has established limits for VOC emissions under certain air quality regulations. The NAAQS include primary standards, which are designed to protect human health including the health of sensitive individuals such as children and those with chronic respiratory problems. The NAAQS also include secondary standards designed to protect public welfare, including economic interests, visibility, vegetation, animal species, and other concerns not related to human health. Also, hazardous air pollutants[141] (HAP) would be emitted during construction and operation. HAPs are those known to cause cancer and other serious health impacts.

Individual state and local air quality control agencies may set air quality standards that are at least as stringent as the NAAQS. The WVDEP has adopted the NAAQS as defined in 40 CFR 50 in Title 45, Series 8, Section 3.1. Similarly, the PADEP has adopted all of the NAAQS in Title 25, Chapter 131.2 of the Pennsylvania Code and has also established additional ambient air quality standards for beryllium, fluorides, and hydrogen sulfide. The Commonwealth of Virginia ambient air quality standards are established under Title 9, Section 5, Chapter 30 of the Virginia Administrative Code (9 VAC 5-30), which are the same as the NAAQS. The NAAQS are listed on the EPA's website at http://www3.epa.gov/ttn/naaqs/criteria.html, current as of December 21, 2015 (EPA, 2015d).

Air Quality Control Regions and Attainment Status

Air Quality Control Regions (AQCRs) were established in accordance with Section 107 of the CAA as a means to implement the CAA and to comply with the NAAQS through State Implementation Plans (SIP). The AQCRs are intra- and interstate regions such as large metropolitan areas where the improvement of the air quality in one portion of the AQCR requires emission reductions throughout the AQCR. Each AQCR, or portion thereof, is designated as attainment, unclassifiable, maintenance, or nonattainment. Areas where an ambient air pollutant concentration is determined to be below the applicable ambient air quality standard are designated attainment. Areas where the ambient air concentration is greater than the applicable ambient air quality standard are designated nonattainment. Areas where no data are available are designated unclassifiable. Unclassifiable areas are treated as attainment areas for the purpose of permitting a stationary source of pollution. Areas that have been designated nonattainment but have since demonstrated compliance with the ambient air quality standard(s) are designated maintenance for that pollutant. For permitting of stationary sources, maintenance areas are treated similarly to attainment areas. However, the state's approved maintenance plan may contain specific provisions for the permitting of stationary sources to ensure that air quality in the area would continue to comply with the NAAQS.

Mountain Valley Project

The NAAQS designation for each county that would be crossed by the MVP in West Virginia and Virginia can be found in 40 CFR 81.349 and 81.347, respectively. All areas covered by the MVP are designated as attainment or unclassifiable for all criteria pollutants.

Equitrans Expansion Project

The NAAQS designation for each county that would be crossed by the EEP in West Virginia and Pennsylvania can be found in 40 CFR 81.349 and 81.339, respectively. All areas covered by the EEP in West Virginia and Pennsylvania are designated as attainment or

[141] Original list of HAPs from the 1990 Clean Air Act Amendments https://www3.epa.gov/airtoxics/orig189.html

unclassifiable for all criteria pollutants, except in some areas of Pennsylvania, as follows: Allegheny and Washington Counties are within the Pittsburgh-Beaver Valley area classified as maintenance for the 1979 1-hour O_3 standard (0.12 parts per million [ppm]), which was revoked effective June 15, 2005. Allegheny and Washington Counties are also classified as moderate nonattainment for the 1997 O_3 standard (0.08 ppm), which was revoked effective April 6, 2015; and are marginal nonattainment for the 2008 O_3 standard (0.075 ppm). Moderate nonattainment area for the 1997 O_3 standard has a design value of 0.092 up to but not including 0.107 ppm; marginal nonattainment area for the 2008 O_3 standard has a design value of 0.076 up to but not including 0.086 ppm. In addition, Allegheny and Washington Counties are classified as maintenance for the 1997 and 2006 $PM_{2.5}$ standards; and Allegheny County is classified as nonattainment for the 2012 $PM_{2.5}$ standard. Furthermore, Greene County is designated as maintenance for the 1997 O_3 standard, which was removed effective April 6, 2015 (EPA, 2017) (also see section 4.11.1.2 for a discussion of the General Conformity analysis).

The entire state of Pennsylvania is within the Ozone Transport Region (OTR)[142] and as such would be treated as moderate nonattainment for ozone for New Source Review permitting purposes. In accordance with 40 CFR 51, states in this region are required to submit a SIP and install a certain level of controls for the pollutants that form ozone, even if they meet the ozone standards.

Air Quality Monitoring and Existing Air Quality

The EPA, state, and local agencies have established a network of ambient air quality monitoring stations to measure and track the background concentrations of criteria pollutants across the United States. Data from these stations are used to establish air quality trends and to determine initial and ongoing attainment/nonattainment designations for AQCRs.

Mountain Valley Project

Data were obtained from representative air quality monitoring stations to characterize the background air quality in proximity to the MVP (see tables 9.1-3, 9.1-4, and 9.1-5 in Resource Report 9 of Mountain Valley's application).[143] The nearest or most representative data were used to characterize existing air quality in the MVP area. As shown, these representative ambient air quality data for all criteria pollutants for each compressor station location are well below the NAAQS.

Equitrans Expansion Project

Data were obtained from representative air quality monitoring stations to characterize the background air quality in proximity to the EEP (see table 9.1-3 in Resource Report 9 of Equitrans'

[142] The Ozone Transport Region (OTR) was created by CAA §184. The states in the OTR are: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, and the Washington, D.C. Metropolitan Statistical Area, including the northern Virginia suburbs.

[143] Resource Report 9 can be found in Mountain Valley's Application filed October 23, 2015 (accession number 20151023-5035).

application).[144] The nearest or most representative data were used to characterize existing air quality in the EEP area. As shown, these representative ambient air quality data for all criteria pollutants for the Redhook Compressor Station location are well below the NAAQS.

Climate Change and Greenhouse Gas

Greenhouse gases (GHG) occur in the atmosphere both naturally and as a result of human activities, such as the burning of fossil fuels. GHGs are gases that absorb infrared radiation in the atmosphere, and have been determined to endanger public health and welfare by causing human induced global climate change. The most common GHGs emitted during fossil fuel combustion and natural gas transportation are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). During construction and operation of the projects, these GHGs would be emitted from non-electrical construction and operational equipment, as well as from fugitive methane leaks from the pipeline and aboveground facilities. GHG emissions are typically used as a proxy to evaluate any project impacts on climate change. Also as a result, these GHGs are subject to New Source Review regulations under the CAA.

As with any fossil fuel-fired project or activity, the MVP and EEP would contribute GHG emissions. The principal GHGs that would be produced by the MVP and EEP are CH_4, CO_2, and N_2O (see table 4.11.1-7 notes d, e, and f, and table 4.11.1-8 noted). No fluorinated gases would be emitted by the MVP or EEP. Emissions of GHGs are typically estimated as carbon dioxide equivalents ($CO_{2\text{-eq}}$), where the potential of each gas to increase heating in the atmosphere is expressed as a multiple of the heating potential of CO_2 over a specific timeframe, or its global warming potential (GWP). The GWP is a ratio relative to CO_2 that is based on the properties of the GHG's ability to absorb solar radiation as well as the residence time within the atmosphere. Thus, the 100-year GWP of CO_2 is 1, CH_4 is 25 and N_2O is 298. The $CO_{2\text{-eq}}$ of a GHG is equal to the product of the mass of the particular gas multiplied by its corresponding GWP. Total GHG emissions are equal to the sum of the individual $CO_{2\text{-eq}}$ values. In compliance with the EPA's definition of air pollution to include GHGs, we have provided estimates of GHG emissions for construction and operation of both projects, as discussed throughout this section. Impacts from GHG emissions and climate change are discussed in more detail in section 4.13.6.14.

Jefferson National Forest

No compressor stations or other aboveground facilities would be located within the Jefferson National Forest. Therefore, impacts on air quality within the Forest would be limited to emissions resulting from pipeline construction.

Impacts on the James River Face Wilderness, the closest Federal Class I Area to the Jefferson National Forest, are not expected (see table 4.11.1-3).

[144] Resource Report 9 can be found in Equitrans' application filed October 27, 2015 (accession number 20151027-5125).

4.11.1.2 Air Quality Regulatory Requirements

The CAA, as amended in 1977 and 1990, is the basic federal statute governing air pollution. The provisions of the CAA that are potentially relevant to the MVP and the EEP include the following:

- New Source Review (NSR);
    - PSD;
    - Nonattainment New Source Review (NNSR);
- Title V Operating Permits;
- NSPS;
- National Emission Standards for Hazardous Air Pollutants for Source Categories (NESHAP);
- Chemical Accident Prevention Provisions;
- General Conformity;
- GHG Reporting Rule; and
- State Regulations.

Stationary source permitting regulations are potentially applicable to all of the new compressor stations: the MVP's Bradshaw, Stallworth, and Harris Compressor Stations; and the EEP's Redhook Compressor Station. The regulatory applicability of these sources are summarized below. The other meter stations, MLVs, and pig launchers/receivers, generate much lower emissions in the form of natural gas from equipment leaks or periodic releases (such as blowdowns). Therefore, none of the other meter stations or minor aboveground facilities associated with the MVP and the EEP would be subject to stationary source permitting regulations.

New Source Review/Prevention of Significant Deterioration/Nonattainment New Source Review

Proposed new or modified air pollutant emissions sources must undergo a NSR permitting process prior to construction or operation. Through the NSR permitting process, federal, state, and local regulatory agencies review and approve project construction plans, regulate pollutant increases or changes, emissions controls, and other details. The agencies then issue construction permits that include specific requirements for emissions control equipment and operating limits. The three basic categories of NSR permitting are PSD, NNSR, and minor source NSR. Federal pre-construction review for affected sources in attainment or unclassifiable areas is called PSD. Federal pre-construction review for affected sources in nonattainment areas is called NNSR and contains stricter thresholds and requirements. A minor NSR permit is required as a pre-construction authorization for minor sources whose emissions are below the major source thresholds. The review process aids in preventing new sources from causing existing air quality to deteriorate beyond acceptable levels.

The new Bradshaw, Harris, and Stallworth Compressor Stations for the MVP would be in areas designated attainment or unclassifiable and, therefore, would potentially be subject to PSD regulations. The PSD potential emissions threshold for each of the criteria pollutants (VOC, NO_x, CO, SO_2, PM, PM_{10}, $PM_{2.5}$, and Pb) is 250 tons per year (tpy) for a new major stationary source not included in the list of 28 source categories. Natural gas compressor stations are not among the 28 listed source categories. Because Greene County, where the EEP's new Redhook Compressor Station would be located, is in an OTR, the compressor station would be subject to NNSR and therefore the more stringent major source thresholds for NO_x (100 tpy) and VOC (50 tpy), which are precursors to the pollutant ozone, would apply.

Equitrans conducted a source aggregation analysis for the Redhook Compressor Station to determine whether the compressor station should be aggregated with other relevant contiguous or adjacent facilities, thus considering them as a single stationary source.[145] The analysis concluded that the Redhook Compressor Station and adjoining facilities cannot be aggregated into a single stationary source because they do not have the same industrial grouping, are not under a common control, and none of the other facilities would have a dedicated interdependent relationship with the proposed Redhook Compressor Station.

Mountain Valley conducted similar source aggregation analyses for the new Bradshaw, Harris, and Stallworth Compressor Stations.[146] The analyses concluded that the Bradshaw and Stallworth Compressor Stations do not meet the criteria for source aggregation with respective contiguous or adjacent facilities due to their lack of interdependency and common control, as well as different industrial grouping. The Harris Compressor Station included one off-site WB Pipeline heater at an interconnect located within 0.25 mile as an aggregated source; therefore, emissions from that heater were taken into consideration in calculating potential emissions from Harris Compressor Station and in determining source classification.

Potential emissions from each of the MVP's (Bradshaw, Harris, and Stallworth) and the EEP's (Redhook) new compressor stations do not exceed the major source threshold for each of the criteria pollutants (see summary of total potential emissions in table 4.11.1-2).

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145 A source aggregation analysis for the Redhook Compressor Station was included by Equitrans with its air permit application submitted to the PADEP. The analysis was based on the PADEP's *Guidance for Performing Single Stationary Source Determinations for Oil and Gas Industries* (Docket 270-0810-006), using the three factors that must all be met: (1) the facilities all belong to the same industrial grouping; (2) the activities are located on one or more contiguous or adjacent properties; and (3) the activities are under common control (PADEP, 2012b).

146 In December 2015, Mountain Valley submitted source aggregation analyses for the Bradshaw, Harris, and Stallworth Compressor Stations in response to the WVDEP's November 2015 additional information request as part of MVP's air quality minor NSR permit application.

TABLE 4.11.1-2							
Potential-to-Emit for the Mountain Valley Project and the Equitrans Expansion Project Compressor Stations							
	Pollutant Emissions (tpy) a/						
Emission Unit (Quantity)	**NO_x**	**CO**	**SO_2**	**PM_{10}/ $PM_{2.5}$**	**VOC**	**Total HAPs**	**GHG (as CO_{2-eq})**
Mountain Valley Project Compressor Stations							
Bradshaw	178.6	197.8	11.0	47.5	31.9	10.8	391,794
Harris	86.7	97.1	5.0	21.4	14.0	4.8	180,861
Stallworth	79.8	91.3	4.7	20.3	13.5	4.5	169,886
Equitrans Expansion Project Compressor Station							
Redhook	92.7	76.7	3.2	18. 6	30.6	15.0	167,091
a/ See table 4.11.1-7 and table 4.11.1-8 for detailed information on emissions from each type of emission source for each compressor station.							

Mountain Valley Project and Equitrans Expansion Project

As shown in table 4.11.1-2, the potential-to-emit (PTE) values of the criteria pollutants calculated from all air pollution-emitting equipment that would be used for each of the new compressor stations for the MVP and the EEP are less than the major source thresholds for any of the criteria pollutants. Therefore, the new compressor stations would be considered minor sources. Mountain Valley filed its minor NSR permit applications with the WVDEP on October 21, 2015, for the Harris, Bradshaw, and Stallworth Compressor Stations; and final Permits to Construct were issued on March 4, March 14, and April 11, 2016, respectively (WVDEP, 2016a). Equitrans filed its application with the PADEP on October 21, 2015 for a Plan Approval permit for the construction and operation of the Redhook Compressor Station.

During the PSD review process, the potential impact of a project on protected Class I areas must also be considered. Areas of the country are categorized as Class I, Class II, or Class III; where Class I areas are designated as pristine natural areas or areas of natural significance, including wilderness areas and national parks, and are afforded special protection under the CAA. If a facility is subject to PSD requirements and near a Class I area, the facility is required to notify the appropriate federal officials[147] and assess the impacts of the facility on the Class I area to ensure pristine air quality is maintained. Since none of the MVP and EEP facilities would be subject to PSD review, this requirement is not triggered for the project. Nevertheless, the nearest Class I areas to the proposed MVP and the EEP compressor stations, as provided by Mountain Valley and Equitrans, are listed on table 4.11.1-3.

[147] Email correspondences from federal land managers dated October 5, 2015 (from the NPS, Denver, Colorado) and October 7, 2015 (from the FS, Washington, DC) confirmed that the Redhook Compressor Station is not anticipated to cause or contribute an adverse impact on any air quality related values of any Class 1 Area due to its distance and potential emissions. Mountain Valley did not submit notification to federal land managers regarding impacts assessment on Class I areas, as it was not required since none of the MVP compressor stations' potential emissions would trigger PSD review.

TABLE 4.11.1-3 **Nearest Federal Class I Areas to the Proposed Compressor Stations**	
Compressor Stations/Class I Areas	**Distance (Miles) and Direction**
Mountain Valley Project	
Bradshaw Compressor Station	
Otter Creek Wilderness, WV	61 miles Southeast
Dolly Sods Wilderness, WV	73 miles Southeast
Shenandoah Nat'l Park and Shenandoah Wilderness, VA	131 miles Southeast
James River Face Wilderness, VA	147 miles Southeast
Harris Compressor Station	
Otter Creek Wilderness, WV	52 miles Northeast
Dolly Sods Wilderness, WV	64 miles Northeast
Shenandoah Nat'l Park and Shenandoah Wilderness, VA	103 miles Southeast
James River Face Wilderness, VA	97 miles Southeast
Stallworth Compressor Station	
Otter Creek Wilderness, WV	99 miles Northeast
Dolly Sods Wilderness, WV	108 miles Northeast
Shenandoah Nat'l Park and Shenandoah Wilderness, VA	117 miles Northeast
James River Face Wilderness, VA	75 miles Southeast
Equitrans Expansion Project	
Redhook Compressor Station	
Otter Creek Wilderness, WV	68 miles Southeast
Dolly Sods Wilderness, WV	76 miles Southeast
Shenandoah Nat'l Park and Shenandoah Wilderness, VA	137 miles Southeast

Title V Operating Permits

The Title V permit program, as described in 40 CFR 70, requires sources of air emissions to obtain federal operating permits if their criteria pollutant emissions reach or exceed the Title V major source threshold. Title V permits list all applicable air regulations and include a compliance demonstration for each applicable requirement. The major source thresholds in attainment areas are 100 tpy of CO, NO_x, SO_2, VOC, PM_{10}, or $PM_{2.5}$; 10 tpy of any individual HAP; or 25 tpy HAPs in aggregate.

The EPA issued the Title V GHG Tailoring Rule, which established Title V permitting requirements and thresholds for GHG however, the U.S. Supreme Court ruled that a facility may not be required to obtain a Title V permit based solely on GHG emissions; however, if a facility is a major stationary source based on the PTE of other regulated pollutants, a Title V permit may include permit requirements for GHG, such as BACT limits or compliance assurance monitoring.

Mountain Valley Project and Equitrans Expansion Project

As shown in table 4.11.1-2, the PTE at the new Bradshaw Compressor Station would exceed the Title V major source threshold for NO_x and CO. Therefore, this facility would be required to obtain a Title V Operating Permit. According to the Permit to Construct R13-3278 issued by the WVDEP on March 14, 2016 for the Bradshaw Compressor Station, Mountain Valley is required to file a Title V permit application with the WVDEP within 12 months of startup of operations.

The Harris Compressor Station, the Stallworth Compressor Station, and the Redhook Compressor Station PTEs would not exceed the major source thresholds for a Title V permit; therefore, these facilities are not subject to Title V permitting. According to Permits to Construct R13-3277 (for Stallworth) and R13-3279 (for Harris) issued by the WVDEP on April 11, 2016 and March 4, 2016 respectively, Mountain Valley is required to file an application for a Certificate to Operate with the WVDEP no later than 30 days prior to the initial startup. As stated above, Equitrans is expecting the PADEP to issue a Plan Approval permit to construct and operate the Redhook Compressor Station.

New Source Performance Standards

Mountain Valley Project and Equitrans Expansion Project

The NSPS, codified in 40 CFR 60, govern emission rates and provide other requirements for new or significantly modified sources. NSPS requirements include emission limits, monitoring, reporting, and record keeping. The following NSPS requirements were identified as potentially applicable to the MVP and the EEP.

NSPS Subpart Dc, *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units*, applies to all steam generating units with a heat capacity of 29 MW (100 million British thermal units per hour [MMBtu/hr]) or less and greater than 2.9 MW (10 MMBtu/hr). Mountain Valley and Equitrans would not operate steam-generating units at the proposed compressor stations that would meet the applicability criteria for NSPS Subpart Dc; therefore, the MVP and the EEP are not subject to Subpart Dc.

NSPS Subpart Kb, *Standards of Performance for Volatile Organic Liquid Storage Vessels (including Petroleum Liquid Storage Vessels)*, applies to each storage vessel with a capacity greater than or equal to 75 m^3 that is used to store volatile organic liquids for which construction, reconstruction, or modification was commenced after July 23, 1984. This subpart does not apply to storage vessels with a capacity greater than or equal to 151 m^3 storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals, or with a capacity greater than or equal to 75 m^3 but less than 151 m^3 storing a liquid with a maximum true vapor pressure less than 15.0 kilopascals. This subpart sets standards for VOC emissions reduction. This subpart does not apply to the storage tanks at the proposed compressor station because they would not meet the applicability criteria.

NSPS Subpart IIII, *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines* (CI ICE) applies to owners and operators of stationary CI ICE that commenced construction after July 11, 2005, where the stationary CI ICE are manufactured after April 1, 2006, and are not fire pump engines. This subpart sets emission standards for oxides of nitrogen and non-methane hydrocarbons, hydrocarbons, oxides of nitrogen, carbon monoxide, and PM. Mountain Valley and Equitrans would not be operating CI ICE units at the proposed compressor stations that would meet the applicability criteria for NSPS Subpart IIII; therefore, the MVP and the EEP are not subject to Subpart IIII.

NSPS Subpart JJJJ, *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*, applies to manufacturers and owner/operators of spark ignition internal combustion engines manufactured after the applicability date stated in the rule for the particular type and size engine. Mountain Valley would not install nor operate spark ignition internal combustion engines at the proposed compressor stations; therefore, it is not subject to this subpart. Equitrans would include new natural gas-fired spark ignition internal combustion generators at the Redhook Compressor Station. These engines would be subject to NSPS Subpart JJJJ. Compliance with the applicable emission standards and operational, monitoring, recordkeeping, and reporting requirements of NSPS Subpart JJJJ would be fulfilled by installing certified engines or by performing performance testing on an uncertified engine, and using a non-resettable hour meter to track engine run time and the reason for use. Mountain Valley would not be operating CI ICE units at the MVP compressor stations; hence, it is not subject to NSPS Subpart JJJJ.

NSPS Subpart KKKK, *Standards of Performance for Stationary Combustion Turbines*, applies to manufacturers and owner/operators of gas turbines with heat input rating exceeding 10 MMBtu/hr that was constructed, reconstructed, or modified after February 18, 2005, for the particular type and size gas turbine. Subpart KKKK regulates emissions of NO_x and SO_2. Turbines meeting these criteria would be installed at all of the new compressor stations for the MVP and the EEP. Mountain Valley and Equitrans would be required to comply with applicable emission limits and monitoring, reporting, and testing requirements of this subpart for the Solar turbines. Compliance with the NO_x emission limit set in this subpart would be demonstrated by compliance testing according to the schedule and requirements of this subpart.

Additionally, NO_x emissions from the proposed turbines would be minimized using lean pre-mix combustion technology (SoLoNO$_x$ system). The SO_2 emission limit would be achieved through the combustion of only pipeline quality natural gas with a maximum total sulfur concentration of 20 grains per dry standard cubic feet. Mountain Valley and Equitrans would operate and maintain the turbines, air pollution control equipment, and monitoring equipment in a manner consistent with good air pollution control practices for minimizing emissions at all times including during startup, shutdown, and malfunction.

NSPS Subpart OOOO, *Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution,* establishes emission standards and compliance schedules for the control of VOCs and SO_2 emissions from affected facilities that commenced construction, modification, or reconstruction after August 23, 2011. Affected facilities include gas wells, centrifugal and reciprocating compressors, pneumatic controllers, condensate and crude oil storage tanks, and natural gas processing plants. This subpart may apply to the storage tanks at all of the proposed compressor stations if they meet the applicability criteria. Subpart OOOO applies to a single storage vessel located in the oil and natural gas production segment, natural gas processing segment or natural gas transmission and storage segment, and has the potential for VOC emissions equal to or greater than 6 tons per year.

National Emission Standards for Hazardous Air Pollutants

Mountain Valley Project and Equitrans Expansion Project

The NESHAPs, codified in 40 CFR Parts 61 and 63, regulate the emissions of HAPs from existing and new sources. Part 61 was promulgated prior to the 1990 CAA Amendments and regulated eight types of hazardous substances: asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. The MVP and the EEP are not expected to operate any processes that are regulated by Part 61.

The 1990 CAA Amendments established a list of 189 HAPs, resulting in the promulgation of Part 63. Part 63, also known as the Maximum Achievable Control Technology (MACT) standards, regulates HAP emissions from major sources of HAP emissions and specific source categories that emit HAPs. Some NESHAPs may apply to non-major sources (area sources) of HAPs. The major source thresholds for the purpose of NESHAP applicability are 10 tpy of any single HAP or 25 tpy of all HAPs in aggregate. All of the new compressor stations would be considered area sources for HAPs after completion of the projects.

The following discussion addresses MACT regulations that may be applicable to the projects. In addition to the source type-specific regulations below, any source which is subject to a subpart of 40 CFR 63 is also subject to the general provision of NESHAP Subpart A, unless otherwise noted in the applicable subpart.

Subpart ZZZZ, *NESHAP for Reciprocating Internal Combustion Engines (RICE),* requires new engines at an area source of HAPs that are subject to NSPS Subpart JJJJ or NSPS Subpart IIII to meet the requirements of the applicable NSPS. The proposed natural gas-fired spark ignition internal combustion emergency generators to be installed as part of the Redhook Compressor Station would be subject to Subpart ZZZZ, which requires compliance with NSPS Subpart JJJJ. The method of compliance with NSPS Subpart JJJJ is discussed above. Mountain Valley would not be operating CI ICE units at the proposed MVP compressor stations; hence, it is not subject to NESHAP Subpart ZZZZ.

Chemical Accident Prevention Provisions

Mountain Valley Project and Equitrans Expansion Project

The chemical accident prevention provisions, codified in 40 CFR 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and minimize potential impacts if a release does occur. The regulations contain a list of substances and threshold quantities for determining applicability to stationary sources, including CH_4, propane, and ethylene in amounts greater than 10,000 pounds. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than that specified in the regulation, the facility must prepare and submit a risk management plan (RMP).

An RMP is not required to be submitted to the EPA until the chemicals are stored on-site at the facility.

If a facility does not have a listed substance on-site, or the quantity of a listed substance is below the applicability threshold, the facility is not required to prepare an RMP. In the latter case, the facility still must comply with the requirements of the general duty provisions in Section 112(r)(1) of the 1990 CAA Amendments if there is any regulated substance or other extremely hazardous substance on-site. The general duty provision is as follows:

"The owners and operators of stationary sources producing, processing, handling and storing such substances have a general duty to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility, taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur."

Chemicals regulated by this rule, including CH_4 and ethane, would be produced, processed, handled, or stored at all of the new compressor stations. However, natural gas transmission facilities are not subject to the RMP regulations if they are subject to DOT requirements or to a state natural gas program certified by the DOT. As such, the MVP and the EEP facilities are not subject to the RMP regulations.

General Conformity

The General Conformity Rule is codified in 40 CFR Part 51, Subpart W and Part 93, Subpart B, Determining Conformity of General Federal Actions to State or Federal Implementation Plans. It was designed to require federal agencies to ensure that federally funded or federally approved projects conform to the applicable SIP. Section 176(c) of the CAA prohibits federal actions in nonattainment or PSD maintenance areas that do not conform to the SIP for the attainment and maintenance of the NAAQS. According to the conformity regulations, emissions from sources that are major for any criteria pollutant with respect to the NNSR or PSD permitting/licensing are exempt and are deemed to have conformed. General Conformity Regulations apply to project-wide emissions of pollutants for which the project areas are designated as nonattainment (or, for ozone, its precursors NO_x and VOC) that are not subject to NSR and that are greater than the significance thresholds established in the General Conformity Regulations or 10 percent of the total emissions budget for the entire nonattainment area. Federal agencies are able to make a positive conformity determination for a proposed project if any of several criteria in the General Conformity Rule are met. These criteria include:

- emissions from the project that are specifically identified and accounted for in the SIP attainment or maintenance demonstration; or
- emissions from the action that are fully offset within the same area through a revision to the SIP, or a similarly enforceable measure that creates emissions reductions so there is no net increase in emissions of that pollutant.

Mountain Valley Project

As noted earlier, the MVP would occur in areas classified as being in attainment or unclassifiable. Therefore, the MVP activities are not subject to General Conformity Regulations.

Equitrans Expansion Project

Part of the EEP would be conducted in Greene, Allegheny, and Washington Counties in Pennsylvania, which are currently classified as nonattainment and/or maintenance for one or more pollutants. Therefore, the General Conformity applicability must be analyzed for project emissions occurring in those counties during construction, demolition, and operation. Emissions from operations of the Redhook Compressor Station and the H-318, H-305, H-316, H-158, and M-80 pipelines would be subject to the Pennsylvania air permitting programs and air quality rules and regulations. As such, the emissions during operations would be administered in accordance with the approved Pennsylvania SIP that addresses the General Conformity Rule; hence, these EEP operational emissions are exempt.

Emissions during construction of the Redhook Compressor Station, the H-318, H-305, H-316, H-158, and M-80 pipelines, and associated aboveground facilities, as well as decommissioning of the existing Pratt Compressor Station would need to be analyzed for the General Conformity applicability. Table 4.11.1-4 shows an overall summary of construction emissions for the nonattainment criteria pollutants (see a detailed discussion of construction emissions in section 4.11.1.3) by area classification to demonstrate the applicability of a General Conformity determination for the project activities within Greene, Allegheny, and Washington Counties. As shown in the table, emissions would not exceed the General Conformity applicability thresholds during EEP construction activities in these counties.

TABLE 4.11.1-4

Summary of Construction Emissions by Area Classification for the Equitrans Expansion Project General Conformity Analysis

		Annual Pollutant Emissions (tpy)						
		O_3 8-hour Standard				$PM_{2.5}$ Standards		
Area Affected	**Year**	**2008 NO_x**	**2008 VOC**	**1997 NO_x**	**1997 VOC**	**2012**	**2006**	**1997**
Greene County								
Redhook Compressor Station, H-305, H-158, and M-80 Pipelines Construction	1	1.7	0.3	1.7	0.3	0.3	0.3	0.3
	2	10.6	1.7	10.6	1.7	1.7	1.7	1.7
Pratt Decommission	3	6.3	1.1	6.3	1.1	1.1	1.1	1.1
H-316 Pipeline Construction	1	1.3	0.2	1.3	0.2	0.3	0.3	0.3
	2	7.0	0.8	7.0	0.8	1.4	1.4	1.4
Attainment Status		*A/U*	*A/U*	*Maint.*	*Maint.*	*A/U*	*NA a/*	*NA a/*
Applicability Threshold (tpy)		*N/A*	*N/A*	*100*	*50*	*N/A*	*N/A*	*N/A*
Max. Total Emissions (tpy)		*17.6*	*2.5*	*17.6*	*2.5*	*3.1*	*3.1*	*3.1*
Exceeds Applicability Threshold (Yes/No)		*No*	*No*	*No*	*No*	*No*	*No*	*No*
Allegheny County								
H-318 Pipeline Construction	1	1.0	0.1	51.0	0.1	0.2	0.2	0.2
	2	5.1	0.6	5.1	0.6	1.0	1.0	1.0
Attainment Status		*Marginal NA*	*Marginal NA*	*Moderate NA*	*Moderate NA*	*NA*	*Maint.*	*Maint.*
Applicability Threshold (tpy)		*100*	*50*	*100*	*50*	*100*	*100*	*100*
Max. Total Emissions (tpy)		*5.1*	*0.6*	*5.1*	*0.6*	*1.0*	*1.0*	*1.0*
Exceeds Applicability Threshold (Yes/No)		*No*	*No*	*No*	*No*	*No*	*No*	*No*
Washington County								
H-318 Pipeline Construction	1	0.4	<0.1	0.4	<0.1	<0.1	<0.1	<0.1
	2	2.0	0.2	2.0	0.2	0.4	0.4	0.4
Attainment Status		*Marginal NA*	*Marginal NA*	*Moderate NA*	*Moderate NA*	*Attain.*	*Maint.*	*Maint.*
Applicability Threshold (tpy)		*100*	*50*	*100*	*50*	*N/A*	*100*	*100*

TABLE 4.11.1-4 (continued) **Summary of Construction Emissions by Area Classification for the Equitrans Expansion Project General Conformity Analysis**								
		Annual Pollutant Emissions (tpy)						
		O_3 8-hour Standard				**$PM_{2.5}$ Standards**		
Area Affected	**Year**	**2008 NO_x**	**2008 VOC**	**1997 NO_x**	**1997 VOC**	**2012**	**2006**	**1997**
Max. Total Emissions (tpy)		*2.0*	*0.2*	*2.0*	*0.2*	*0.4*	*0.4*	*0.4*
Exceeds Applicability Threshold Yes/No)		*No*	*No*	*No*	*No*	*No*	*No*	*No*

Abbreviations:
A/U = Attainment/Unclassified
Maint. = Maintenance
NA = Nonattainment
Attain. = Attainment
N/A = Not Applicable
tpy = tons per year

Notes:
a/ Parts of the county are in Nonattainment; project would not be in the Nonattainment area.

Greenhouse Gas Reporting Rule

Mountain Valley Project and Equitrans Expansion Project

The Mandatory Reporting of Greenhouse Gases Rule (GHGRP) requires reporting of operational GHG emissions from suppliers of fossil fuels and facilities that emit greater than or equal to 25,000 metric tpy of GHG (reported as $CO_{2\text{-eq}}$). Onshore natural gas transmission compression facilities are considered part of the source category regulated by Subpart W. Therefore, the rule applies to the MVP and the EEP's new compressor stations.

If the actual operational emissions from the compressor stations are greater than 25,000 metric tpy, Mountain Valley and Equitrans would be required to comply with all applicable reporting requirements.

State Regulations

Mountain Valley and Equitrans would be required to obtain an air quality permit from the applicable air permitting authority for the new compressor stations. The process of obtaining the air permit would involve the review and implementation of state regulations, inclusive of requirements for PSD, as applicable. As discussed below, the meter stations, MLVs, and other minor aboveground project components are not likely to require air quality permits. However, the final permitting applicability would be determined by the jurisdictional agency.

The state regulations summarized below are those that would establish emission limits or other restrictions that may be applicable in addition to those required under federal regulations.

State regulations that are not applicable to the MVP and the EEP are not discussed in the following summary.

Mountain Valley Project and Equitrans Expansion Project – West Virginia

The Bradshaw, Harris, and Stallworth Compressor Stations for the MVP and the H-319 pipeline segment of the EEP that would be constructed and installed in West Virginia would be subject to West Virginia state air quality standards, codified in West Virginia Code of State Regulations, Title 45 (45 CSR), as listed below:

- 45 CSR 2 – To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers;
- 45 CSR 4 – To Prevent and Control the Discharge of Air Pollutants into the Air Which Causes or Contributes to an Objectionable Odor;
- 45 CSR 6 – Control of Air Pollution from the Combustion of Refuse;
- 45 CSR 10 – To Prevent and Control Air Pollution from the Emission of Sulfur Oxides;
- 45 CSR 13 – Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, Permission to Commence Construction, and Procedures for Evaluation;
- 45 CSR 16 – Standards of Performance for New Stationary Sources;
- 45 CSR 17 – To Prevent and Control Particulate Matter Air Pollution from Materials Handling, Preparation, Storage and Other Sources of Fugitive Particulate Matter;
- 45 CSR 21 – To Prevent and Control Air Pollution from the Emission of Volatile Organic;
- 45 CSR 22 – Air Quality Management Fee Program;
- 45 CSR 30 – Requirements for Operating Permits; and
- 45 CSR 34 – Emissions Standards for Hazardous Air Pollutants.

Mountain Valley Project – Virginia

The project activities undertaken within the state of Virginia would involve only the temporary construction and installation of pipelines. The applicable state air quality regulations, codified in Virginia Administrative Code, Title 9 – Environment (9 VAC), as listed below:

- 9 VAC 5-50-90 – Standard for Fugitive Dust/Emissions; and
- 9 VAC 5-130 – Open Burning.

Equitrans Expansion Project – Pennsylvania

The Bureau of Air Quality under the PADEP develops the air quality regulations for the state. The Redhook Compressor Station for the EEP would be subject to Pennsylvania state air quality standards, codified in the Pennsylvania Code, Title 25 – Environmental Protection (25 Pa Code), as listed below:

- 25 Pa Code §123.1 and 123.2 – Prohibition of Certain Fugitive Emissions and Fugitive Particulate Matter;
- 25 Pa Code §123.11 and 123.13 – Particulate Emissions: Combustion Units;
- 25 Pa Code §123.21 – Sulfur Compound Emissions: General;
- 25 Pa Code §123.31 – Odor Emissions;
- 25 Pa Code §123.41 and §123.43 – Visible Emissions: Limitations;
- 25 Pa Code §127.11 – Plan approval requirements to authorize construction or modification of air contamination sources;
- 25 Pa Code §129.57 – Storage tanks less than or equal to 40,000 gallons capacity containing VOCs;
- 25 Pa Code §129.91 – Control of major sources of NO_x and VOCs;
- 25 Pa Code §131 – Ambient Air Quality Standards;
- 25 Pa Code §135 – Reporting of Sources;
- 25 Pa Code §137 – Air Pollution Episodes; and
- 25 Pa Code §139 – Sampling And Testing Methods And Procedures.

Mountain Valley and Equitrans have committed to comply with all applicable state requirements.

4.11.1.3 Environmental Consequences

Air quality would be affected by construction and operation of the MVP and the EEP. Emissions would be generated during project construction, which would occur intermittently over a period of 29 months for the MVP and 15 months for the EEP, across three states. Following construction, air quality would transition to operational emissions after commissioning and initial startup of the MVP and the EEP facilities.

Construction Emissions

Fugitive dust would result from land clearing, grading, excavation, concrete work, and vehicle traffic on paved and unpaved roads. The quantity of fugitive dust generated by construction-related activities depends on several factors, including the size of area disturbed; nature and intensity of construction activity; surface properties (such as the silt and moisture content of the soil); wind speed; and the speed, weight, and volume of vehicular traffic. Tables 4.11.1-5 and 4.11.1-6 include the estimated emissions associated with fugitive dust generation.

The Applicants have proposed to conduct open burning of debris generated during construction. This would impact local air quality and has the potential to impact regional air quality as it could result in high levels of particulate matter. West Virginia and Virginia each regulate open burning through local permitting processes, and Mountain Valley would be required to comply with applicable regulations. We have estimated the emissions due to open burning.

Mountain Valley Project

Construction of the proposed pipeline and aboveground facilities for the MVP would result in intermittent and short-term increases in emissions of air pollutants. This would include combustion emissions from the use of fossil fuel-fired construction equipment, emissions from open burning, and fugitive dust from construction vehicle movement and soil disruption activities such as trenching and backfilling. There would be some temporary emissions attributable to construction workers commuting to and from work sites; trucks transporting construction materials; and on-road and off-road construction vehicle traffic. Construction emissions from each project component are estimated for the MVP, as summarized in table 4.11.1-5.

TABLE 4.11.1-5

Estimated Construction Emissions for the Mountain Valley Project

Emission Source a/	Annual Pollutant Emissions (tpy)						
	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$	VOC	GHG b/
Year 1 Construction Emissions							
Pipeline (MP 0.0 – MP 135)							
Construction Equipment	14.2	168.8	2.0	2.5	2.5	15.9	7,499.6
Commuting Vehicles				4.0	0.4		
Fugitive Dust							
Open Burning	12.6	432.3		67.9	44.2	36.5	10,080.5
Year 1 Total Emissions (tpy)	**26.8**	**601.1**	**2.0**	**74.3**	**47.1**	**52.4**	**17,580.1**
Year 2 Construction Emissions							
Pipeline (MP 0.0 – MP 303.5)							
Construction Equipment	1,619.0	3,190.2	160.5	256.3	256.3	353.6	597,304.7
Commuting Vehicles	384.9	251.8	1.7	3,566.4	362.5	42.8	229,037.1
Fugitive Dust				374.4	157.6		
Open Burning	11.0	377.5		59.3	38.6	31.8	8,802.2
Bradshaw Compressor Station							
Construction Equipment	80.5	99.5	6.5	12.2	12.2	15.5	25,432.0
Commuting Vehicles	0.5	3.1	<0.1	0.6	0.1	0.2	395.6
Fugitive Dust				1.2	0.5		
Harris Compressor Station							
Construction Equipment	70.9	87.8	5.7	10.8	10.8	13.7	22,362.2
Commuting Vehicles	0.5	3.1	<0.1	0.6	0.1	0.2	395.6
Fugitive Dust				1.1	0.5		
Stallworth Compressor Station							
Construction Equipment	71.0	87.7	5.7	10.8	10.8	13.7	22,362.2
Commuting Vehicles	0.5	3.1	<0.1	0.6	0.1	0.2	395.6
Fugitive Dust				1.1	0.5		
Mobley Interconnect							
Construction Equipment	17.8	21.2	1.3	2.4	2.4	3.4	5,033.4
Commuting Vehicles	0.5	3.1	<0.1	0.6	0.1	0.2	395.6
Fugitive Dust				1.1	0.5		
Sherwood Interconnect							
Construction Equipment	17.8	21.2	1.3	2.4	2.4	3.4	5,033.4
Commuting Vehicles	0.3	1.8	<0.1	0.3	<0.1	0.1	230.8
Fugitive Dust				0.1	0.1		

TABLE 4.11.1-5 (continued)

Estimated Construction Emissions for the Mountain Valley Project

Emission Source a/	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$	VOC	GHG b/
	Annual Pollutant Emissions (tpy)						
WB Interconnect							
Construction Equipment	17.8	21.2	1.3	2.4	2.4	3.4	5,036.2
Commuting Vehicles	0.3	1.8	<0.1	0.3	<0.1	0.1	230.8
Fugitive Dust				0.2	0.1		
Roanoke Taps							
Construction Equipment	35.6	42.4	2.6	4.7	4.7	6.7	10,072.4
Commuting Vehicles	0.6	3.3	<0.1	0.5	<0.1	0.2	461.5
Fugitive Dust				0.3	0.1		
Transco Interconnect							
Construction Equipment	17.8	21.2	1.3	2.4	2.4	3.4	5,036.2
Commuting Vehicles	0.3	1.7	<0.1	0.3	<0.1	0.1	230.8
Fugitive Dust				0.3	0.1		
Year 2 Total Emissions (tpy)	**2,347.6**	**4,242.3**	**188.0**	**4,313.7**	**865.9**	**492.4**	**938,248.1**
Year 3 Construction Emissions							
Pipeline (MP 135 – MP 303.5)							
Construction Equipment	14.1	220.7	2.6	3.0	3.0	18.8	9,990.1
Commuting Vehicles	1.4	26.2	<0.1	58.6	5.9	1.1	1,592.8
Fugitive Dust							
Year 3 Total Emissions (tpy) c/	**15.5**	**246.9**	**2.6**	**61.6**	**8.9**	**19.9**	**11,582.9**

a/ Emission sources for each project component are sorted by type of construction activity, as follows: Construction equipment include tailpipe emissions from heavy equipment; Commuting Vehicles include fugitives from on-road and off-road vehicle travel; Fugitive Dust includes fugitive dust from earthmoving fugitives and wind erosion; and Open Burning includes fugitives from burning of brush and slash from clearing (estimated burning of 5% and 2% of total disturbed acreage in West Virginia and Virginia respectively, and a forest density of 150 metric tons per hectare).

b/ GHG includes only CO_2 emissions.

c/ According to Mountain Valley, right-of-way restoration may occur in the first quarter of Year 3.

Note: Mountain Valley estimates that limited pre-construction emissions would occur in Year 1 due to use of pickup trucks and ATVs.

Equitrans Expansion Project

Construction of the proposed pipeline and aboveground facilities and demolition of the existing Pratt Compressor Station for the EEP would result in intermittent and short-term increases in emissions of air pollutants. This would include combustion emissions from the use of fossil fuel-fired construction equipment, and fugitive dust from construction vehicle movement and soil disruption activities such as trenching and backfilling. Equitrans would not conduct open burning of slash and debris during construction. There would be some temporary emissions attributable to construction workers commuting to and from work sites; trucks transporting construction materials; and on-road and off-road construction vehicle traffic. Construction emissions from each project component are estimated for the EEP, as summarized in table 4.11.1-6.

TABLE 4.11.1-6

Estimated Construction Emissions for the Equitrans Expansion Project

Emission Source a/	Annual Pollutant Emissions (tpy)						
	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$	VOC	GHG b/
Year 1 Construction Emissions							
H-318 Pipeline (Allegheny and Washington Counties, Pennsylvania) c/							
Construction Equipment	1.3	0.9	0.1	0.1	0.1	0.1	313.3
Commuting Vehicles	0.1	0.3	<0.1	0.4	<0.1	<0.1	34.7
Fugitive Dust				0.3	0.1		
H-316 Pipeline (Greene County, Pennsylvania) c/							
Construction Equipment	1.3	0.9	0.1	0.1	0.1	0.1	310.2
Commuting Vehicles	0.1	0.3	<0.1	0.4	<0.1	<0.1	34.7
Fugitive Dust				0.3	0.1		
Mobley Tap (Wetzel County, West Virginia)							
Construction Equipment							
Commuting Vehicles							
Fugitive Dust				0.3	0.1		
Redhook Compressor Station, H-305, H-158, and M-80 Pipelines (Greene County, Pennsylvania) c/							
Construction Equipment	1.7	2.9	0.1	0.2	0.2	0.3	451.5
Commuting Vehicles	<0.1	0.2	<0.1	0.1	<0.1	<0.1	18.9
Fugitive Dust				0.1	0.1		
Webster Interconnect and H-319 Pipeline (Wetzel County, West Virginia) c/							
Construction Equipment	0.7	1.3	<0.1	0.1	0.1	0.8	267.2
Commuting Vehicles	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	2.6
Fugitive Dust				0.2	0.1		
Year 1 Total Emissions (tpy)	**5.1**	**6.8**	**0.2**	**2.7**	**1.1**	**1.3**	**1,443.1**
Year 2 Construction Emissions							
H-318 Pipeline (Allegheny and Washington Counties, Pennsylvania) c/							
Construction Equipment	6.5	4.5	0.3	0.6	0.6	0.7	1,591.3
Commuting Vehicles	0.5	1.6	<0.1	2.1	0.2	0.1	366.4
Fugitive Dust				2.0	0.6		
H-316 Pipeline (Greene County, Pennsylvania) c/							
Construction Equipment	6.4	4.4	0.3	0.6	0.6	0.7	1,575.8
Commuting Vehicles	0.5	1.5	<0.1	2.1	0.2	0.1	366.4
Fugitive Dust				1.9	0.6		
Mobley Tap (Wetzel County, West Virginia)							
Construction Equipment	10.9	12.1	0.8	1.5	1.5	1.7	4,450.3
Commuting Vehicles	<0.1	0.2	<0.1	3.9	0.4	<0.1	16.4
Fugitive Dust				2.0	0.6		
Redhook Compressor Station, H-305, H-158, and M-80 Pipelines (Greene County, Pennsylvania) c/							
Construction Equipment	10.3	17.8	0.5	1.1	1.1	1.6	2,844.6
Commuting Vehicles	0.2	2.1	<0.1	1.3	0.1	0.1	196.5
Fugitive Dust				1.0	0.4		

TABLE 4.11.1-6 (continued)							
Estimated Construction Emissions for the Equitrans Expansion Project							
	Annual Pollutant Emissions (tpy)						
Emission Source a/	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**GHG b/**
Webster Interconnect and H-319 Pipeline (Wetzel County, West Virginia) c/							
Construction Equipment	3.7	6.7	0.2	0.5	0.5	0.7	1,335.8
Commuting Vehicles	<0.1	0.1	<0.1	0.7	0.1	<0.1	13.0
Fugitive Dust				0.9	0.5		
Year 2 Total Emissions (tpy)	**39.3**	**51.2**	**2.1**	**22.1**	**7.9**	**5.7**	**12,756.6**
Year 3 Construction Emissions							
Pratt Station Decommissioning (Greene County, Pennsylvania)							
Construction Equipment	6.2	12.8	0.4	0.7	0.7	1.1	2,229.3
Commuting Vehicles	0.1	1.0	<0.1	0.6	0.1	<0.1	90.1
Fugitive Dust				0.6	0.3		
Year 3 Total Emissions (tpy)	**6.3**	**13.7**	**0.4**	**1.9**	**1.1**	**1.1**	**2,319.4**

a/ Emission sources for each project component are sorted by type of construction activity, as follows: Construction equipment include tailpipe emissions from heavy equipment; Commuting Vehicles include fugitives from on-road and off-road vehicle travel; Fugitive Dust includes fugitive dust from earthmoving fugitives and wind erosion.

b/ GHG includes only CO_2 emissions.

c/ Pipeline emissions are total emissions from all segments covered, including all construction activities pertaining to pipeline installation and associated access roads and facilities, as indicated in the pipeline milepost numbers and/or the pipeline name. H-318 include pipeline construction in two counties in PA [Allegheny (MPs 0.00 to 2.6) and Washington (MPs 2.6 to 3.8)]; H-316 (MPs 0.0 to 3.0), H-305 (MPs 0.0 to 0.1), H-158 (MPs 0.0 to 0.2), and M-80 (MPs 0.0 to 0.2) include pipeline construction in Greene County, PA; and H-319 include pipeline construction in Wetzel County, WV.

Mountain Valley Project and Equitrans Expansion Project Construction Mitigation Measures

The Applicants would implement measures to control fugitive dust emissions. Mountain Valley and Equitrans each prepared separate dust control plans and described how they would control fugitive dust in other application materials. We have reviewed the dust control plans and procedures and found them to be sufficient. Emission reduction measures such as water suppression, covering truckloads during transit, limiting on-site vehicle speed, and measures to reduce track-out on public roads may be used. The Applicants are committed to use reasonable efforts to reduce emissions by avoiding unnecessary construction activities, following the construction sequencing and disturbing limited areas at a time, mulching the piles generated during construction, following manufacturer-recommended operations and good combustion practices, limiting the idling of engines when the construction equipment is not in use, requiring contractors to follow all applicable federal, state, and local emission standards and air quality regulations, and monitoring the contractor's compliance with this measure using its environmental inspectors or other construction inspection staff.

Construction of the MVP and the EEP would occur over 2.5 years and across three states. Construction of a typical pipeline spread would generally last for about 10 months for each for both the MVP and the EEP; however, air quality impacts would be transient as pipeline installation progresses from one location to the next. Construction at aboveground facilities (compressor stations and interconnects) and the use of construction support areas would occur for about 8 months but at specific locations. MVP and EEP would implement mitigation measures for fugitive dust; however, residents near active construction areas may experience intermittent elevated levels of fugitive dust.

Therefore, most construction-related emissions would be temporary and localized; and would dissipate with time and distance from areas of active construction.

Operations Emissions

The MVP and the EEP would include the installation and operation of the following new stationary point sources of air pollutants.

Mountain Valley Project

Bradshaw Compressor Station at MP 2.7, which would consist of:

- four 23,536-hp Solar Titan 130 turbines equipped with $SoLoNO_x$;
- fourteen 200-kW Capstone C200 microturbines;
- two 2.31-MMBtu/hr fuel gas heaters;
- one 0.12-MMBtu/hr natural gas-fired office building heater;
- one waste oil tank;
- one produced fluids tank and associated loadout; and
- associated piping and components.

Harris Compressor Station at MP 77.4, which would consist of:

- two 20,455-hp Solar Titan 130 equipped with $SoLoNO_x$;
- nine 200-kW Capstone C200 microturbines;
- one 9-MMBtu/hr fuel gas WB Pipeline heater (off-station, at interconnect);
- two 2.31-MMBtu/hr fuel gas heaters;
- one 0.12-MMBtu/hr natural gas-fired office building heater;
- one produced fluids tank and associated loadout;
- one waste oil tank; and
- associated piping and components.

Stallworth Compressor Station at MP 154.5, which would consist of:

- two 19,483-hp Solar Titan 130 equipped with $SoLoNO_x$;
- ten 200-kW Capstone C200 microturbines;
- two 2.31-MMBtu/hr fuel gas heaters;
- one 0.12-MMBtu/hr natural gas-fired office building heater;
- one produced fluids tank and associated loadout;
- one waste oil tank; and
- associated piping and components.

Operation of the project facilities at the Bradshaw, Harris, and Stallworth Compressor Stations would result in air emissions increases over existing emissions levels. Table 4.11.1-7 shows a summary of potential emissions from each type of air pollutant emitting equipment for each compressor station during operation stage. Mountain Valley has submitted emission calculations to the WVDEP through the air permit application process.

TABLE 4.11.1-7

Potential-to-Emit for the Mountain Valley Project by Emission Source Type

	Pollutant Emissions (tpy)							
Emission Source	**NO_x**	**CO**	**SO_2**	**PM10**	**$PM_{2.5}$**	**VOC**	**HAPs**	**GHG**
Bradshaw Compressor Station								
4 NG-fired turbines, 23,536 hp each	171.8	182.7	10.5	46.3	46.3	20.1	9.9	366,520
14 NG-fired Microturbines, 200 kW each	4.9	13.4	0.4	1.0	1.0	1.3	0.1	16,324
2 fuel gas heaters, 2.31 MMBtu/hr each	0.4	1.6	<0.1	0.1	0.1	0.1	<0.1	2,368
1 NG-fired office building heater, 0.12 MMBtu/hr	1.9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	62
2 Storage Tanks	--	--	--	--	--	0.2	<0.1	2
Fugitive Leaks a/	--	--	--	0.1	<0.1	10.3	0.8	6,516
Liquid loading operations	--	--	--	--	--	0.1	--	--
TOTAL (Bradshaw) b/	**178.6**	**197.8**	**11.0**	**47.5**	**47.4**	**31.9**	**10.8 c**	**391,794 d/, g/**
Harris Compressor Station								
2 NG-fired turbines, 20,455 hp each	78.0	83.7	4.6	20.3	20.3	9.1	4.3	161,110
9 NG-fired Microturbines, 200 kW each	3.2	8.6	0.3	0.6	0.6	0.8	0.1	10,494
2 fuel gas heaters, 2.31 MMBtu/hr each	1.9	1.6	<0.1	0.1	0.1	0.1	<0.1	2,368
1 NG-fired office building heater, 0.12 MMBtu/hr	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	62
1 NG-fired WB Pipeline heater (off-station, at interconnect), 9 MMBtu/hr	3.6	3.1	<0.1	0.3	0.3	0.2	0.1	4,617
2 Storage Tanks	--	--	--	--	--	0.2	<0.1	2
Fugitive Leaks a/	--	--	--	0.12	<0.1	3.5	0.3	2,207
Liquid loading operations	--	--	--	--	--	0.1	--	--
TOTAL (Harris) b/	**86.7**	**97.1**	**4.9**	**21.4**	**21.4**	**14.0**	**4.8 c/**	**180,861 e/, g/**

TABLE 4.11.1-7 (continued)

Potential-to-Emit for the Mountain Valley Project by Emission Source Type

Emission Source	Pollutant Emissions (tpy)							
	NO_x	CO	SO_2	PM10	$PM_{2.5}$	VOC	HAPs	GHG
Stallworth Compressor Station								
2 NG-fired turbines, 19,483 hp each	74.4	80.0	4.4	19.4	19.4	8.7	4.1	153,564
10 NG-fired Microturbines, 200 kW each	3.5	9.6	0.3	0.7	0.7	0.9	0.1	11,660
2 fuel gas heaters, 2.31 MMBtu/hr each	1.9	1.6	<0.1	0.1	0.1	0.1	<0.1	2,368
1 NG-fired office building heater, 0.12 MMBtu/hr	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	62
2 Storage Tanks	--	--	--	--	--	0.2	<0.1	2
Fugitive Leaks a/	--	--	--	0.1	<0.1	3.5	0.3	2,207
Liquid loading operations	--	--	--	--	--	0.1	--	--
TOTAL (Stallworth) b/	**79.9**	**91.3**	**4.7**	**20.3**	**20.2**	**13.5**	**4.53 c/**	**169,886 f/, g/**

Abbreviations:
tpy = tons per year
-- = no emissions data
N/A = Not Applicable
GHG = greenhouse gas, as CO_2 equivalent ($CO_{2\text{-eq}}$, including CO_2, CH_4, and N_2O), rounded to whole numbers)

a/ Fugitive leaks include emissions from dry seal, connectors, flanges, open-ended lines, pump seals, valves, and blowdown events. Assumed eight normal and one emergency shutdown blowdown events per year. Methane (CH_4) emissions from fugitive leaks (rounded values, tpy) are: Bradshaw = 261; Harris = 88; and Stallworth = 88.

b/ There may be a slight deviation between the total and the sum of emission unit types shown in this table due to rounding of numbers.

c/ The highest single HAP for each compressor station is formaldehyde (HCHO, in tpy): Bradshaw = 9.0; Harris = 4.0; and Stallworth = 3.8. Detailed calculations of HAP emissions are found in Appendix 9-B to Resource Report 9. Resource Report 9 can be found in Mountain Valley's application filed October 23, 2015 (accession number 20151023-5035).

d/ GHG values for the Bradshaw Compressor Station are presented in terms of $CO_{2\text{-eq}}$. GHG components (rounded values, tpy) are: CO_2 = 382,612; CH_4 = 359; and N_2O = 0.7.

e/ GHG values for the Harris Compressor Station are presented in terms of $CO_{2\text{-eq}}$. GHG components (rounded values, tpy) are: CO_2 = 177,417; CH_4 = 134; and N_2O = 0.3.

f/ GHG values for the Stallworth Compressor Station are presented in terms of $CO_{2\text{-eq}}$. GHG components (rounded values, tpy) are: CO_2 = 166,471; CH_4 = 132; and N_2O = 0.3.

g/ $CO_{2\text{-eq}}$ is calculated using the corresponding GWP values for CO_2, CH_4, and N_2O, as follows:
$CO_{2\text{-eq}} = 1{*}CO_2 + 25{*}CH_4 + 298{*}N_2O$.

Equitrans Expansion Project

The new Redhook Compressor Station, which would consist of:

- two 5,350-hp Caterpillar (CAT) G3616 natural gas compressor engines equipped with oxidation catalysts;
- two 11,311-hp Solar Taurus-70 natural gas-fired turbines;
- one 50-MMscf/day tri-ethylene glycol (TEG) dehydration unit;
- one 0.77- MMBtu/hr reboiler;
- one 7.00-MMBtu/hr enclosed flare;
- ten 200-kW natural gas-fired Capstone C-200 microturbines for power generation;
- two 0.77-MMBtu/hr natural gas-fired fuel/start gas heaters (rated at heat input each);
- one 8,820 gallon produced fluid tank;
- seven miscellaneous storage tanks; and
- associated piping and components.

Operation of the project facilities at Equitrans' Redhook Compressor Station would result in air emissions increases over existing emissions levels. Table 4.11.1-8 shows a summary of potential emissions from each type of air pollutant emitting equipment for the compressor station during operations. Equitrans has submitted emission calculations to the PADEP through the air permit application process.

With regard to odors, the state of West Virginia has imposed through 45 CSR 4 the prevention and control of objectionable odor from emissions of air pollutants. Emissions from the turbine driven compressors, fuel gas heaters, and microturbine generators are not expected to produce objectionable odors. Natural gas that would be delivered through the MVP would not be odorized and would be lighter than air; therefore, any infrequent venting of gas would be brief and immediately dissipate and disperse without detection of odors.

TABLE 4.11.1-8

Compressor Station Potential Emissions for the Equitrans Expansion Project

Emission Source	Pollutant Emissions (tpy)							
	NO_x	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**HAPs**	**GHG**
Proposed Redhook Compressor Station								
2 NG-fired engines, 5,350 hp each	41.3	17.1	0.4	3.5	3.5	18.6	11.9	52,820
2 NG-fired turbines, 11,311 hp each	44.0	46.8	2.7	14.2	14.2	5.2	2.5	93,558
10 NG-fired Microturbines, 200 kW each	3.5	9.6	0.3	0.7	0.7	0.9	0.1	11,660
1 TEG Dehy Regenerator; 50 MMscf/day	N/A	N/A	N/A	N/A	N/A	0.4	0.3	1.1
1 Dehy Flash Tank	N/A	N/A	N/A	N/A	N/A	0.1	<0.1	22
1 Dehy Reboiler; 0.77- MMBtu/hr	0.3	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	395
1 Dehy Flare; 7.00-MMBtu/hr	2.9	2.4	<0.1	0.2	0.2	--	--	3,591
2 fuel gas heaters, 2.31 MMBtu/hr each	0.6	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	790
7 Storage Tanks	--	--	--	--	--	0.2	<0.1	2
Fugitive Leaks a/	--	--	--	0.1	<0.1	5.1	0.2	4,250
Liquid loading operations	--	--	--	--	--	0.1	--	
TOTAL (Redhook) b/	**92.7**	**76.7**	**3.2**	**18.6**	**18.6**	**30.6**	**15.0 c/**	**167,091 d/, e/**

Abbreviations:

tpy = tons per year

-- = no emissions data

N/A = Not Applicable

GHG = greenhouse gas, as CO_2 equivalent ($CO_{2\text{-eq}}$, including CO_2, CH_4, and N_2O), rounded to whole numbers)

a/ Fugitive leaks include emissions from dry seal, connectors, flanges, open-ended lines, pump seals, valves, rod packing, engine crankcase and exhaust, and blowdown events. Assumed eight normal and one emergency shutdown blowdown events per year. Methane (CH_4) emissions from fugitive leaks are 168 tpy.

b/ There may be a slight deviation between the total and the sum of emission unit types shown in this table due to rounding of numbers.

c/ The highest single HAP for the Redhook Compressor Station is formaldehyde (HCHO) at 7.5 tpy. Detailed calculations of HAP emissions are found in Appendix 9-C to Resource Report 9. Resource Report 9 can be found in Equitrans' application filed October 27, 2015 (accession number 20151027-5125).

d/ GHG values are presented in terms of $CO_{2\text{-eq}}$. GHG components (rounded values, tpy) are: CO_2 = 152,729; CH_4 = 571.1; and N_2O = 0.3.

e/ $CO_{2\text{-eq}}$ is calculated using the corresponding GWP values for CO_2, CH_4, and N_2O, as follows:
$CO_{2\text{-eq}} = 1{*}CO_2 + 25{*}CH_4 + 298{*}N_2O$.

Operation Mitigation Measures

The Applicants would minimize potential impacts on air quality caused by operation of the new compressor stations by adhering to applicable federal and state regulations to minimize emissions. Air pollutant emissions would be minimized by operating the most efficient turbines, such as selecting units with higher hp output and less fuel consumption rates, and installing SoLoNO$_x$ system for larger turbines. The microturbines would have less air pollutant emissions compared to other power generation alternatives such as RICE.

Mountain Valley Project

Emissions from sources at the MVP's compressor stations sites would be limited by federal and state regulations. Mountain Valley was issued its minor NSR permit by the WVDEP for the Harris, Bradshaw, and Stallworth Compressor Stations on March 4, March 14, and April 11, 2016, respectively. Mountain Valley is also required to file a Title V permit application with the WVDEP for the Bradshaw Compressor Station within 12 months of startup of operations. It is expected that compliance with the applicable federal and state air quality standards and regulations would be addressed accordingly in the air quality permits. As a result, we conclude that air quality impacts during operation of the compressor stations would be minor.

The Solar turbines at all three compressor stations would be subject to NSPS KKKK, which limits NO_x and SO_2. SO_2 emissions would be limited through the exclusive combustion of pipeline quality natural gas. Compliance with the NO_x emission standard required in NSPS KKKK would be achieved using lean pre-mix combustion technology (SoLoNO$_x$ system) and demonstrated through periodic emissions testing. SoLoNO$_x$ technology reduction capability is manufacturer-guaranteed at 15 ppm NO_x emissions, which are well below the 25 ppm limit of NSPS Subpart KKKK.

Adhering to good operating and maintenance practices would help minimize fugitive GHG and VOC leaks. In addition, Mountain Valley has identified the following as feasible mitigation measures, based on review of EPA's voluntary Natural Gas Star program for potential emission reduction measures:

- replace gas starters with air or nitrogen;
- reduce natural gas venting with fewer compressor engine startups and improved engine ignition;
- test and repair pressure safety valves;
- eliminate unnecessary equipment and/or systems;
- install automated air/fuel ratio controls;
- install electric motor starters;
- reduce emissions when taking compressors off-line; and
- wet seal degassing recovery system for centrifugal compressors.

An air quality screening analysis was performed for each of the MVP's new compressor stations (Bradshaw, Harris, and Stallworth) using the AERMOD dispersion model in screening mode. Mountain Valley modeled the PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO, and Pb emissions from each of the compressor stations and compared the result for each pollutant and averaging period to the

NAAQS. A summary of this screening analysis is provided in table 4.11.1-9. The screening analysis shows concentrations for each compressor station are below the applicable NAAQS. As shown in the table, the predicted annual and one-hour NO_2 are all below the respective NO_x NAAQS. The NO_2 results are predicted to be in the range of 22 to 28 percent of the annual NO_x standard and 85 to 97 percent of the one-hour NO_x standard.

TABLE 4.11.1-9

Summary of Air Quality Analysis for the Mountain Valley Project Compressor Stations

Pollutant	Timeframe	Modeled Concentration (µg/m³) a/	Background Concentration (µg/m³)	Total Concentration (µg/m³) b/	NAAQS (µg/m³)
Bradshaw Compressor Station					
PM_{10}	24-hour	11.0	47.0	58.0	150
$PM_{2.5}$	Annual	0.8	9.7	10.5	12
	24-hour	3.8	18.8	22.6	35
SO_2	Annual	0.2	5.2	5.4	80
	24-hour	2.9	16.8	19.7	365
	3-hour	8.3	41.9	50.2	1,300
	1-hour	6.8	39.3	46.1	196
CO	8-hour	101.3	1,718.4	1,819.7	10,000
	1-hour	171.9	2,864.0	3,035.9	40,000
NO_2	Annual	8.9	16.1	24.1	100
	1-hour	114.6	68.4	183.0	188
Pb	Rolling 3 month average	<0.01	0.04	0.04	0.15
Harris Compressor Station					
PM_{10}	24-hour	38.5	30	38.5	150
$PM_{2.5}$	Annual	1.2	9.1	10.3	12
	24-hour	4.6	19	23.6	35
SO_2	Annual	0.2	5.2	5.4	80
	24-hour	2.7	16.8	19.5	365
	3-hour	3.9	41.9	45.8	1,300
	1-hour	3.8	39.3	43.1	196
CO	8-hour	65.3	458.2	523.6	10,000
	1-hour	100.8	953.1	1,053.9	40,000
NO_2	Annual	11.0	17.0	28.0	100
	1-hour	90.8	73.4	164.2	188
Pb	Rolling 3 month average	<0.01	0.01	0.01	0.15

TABLE 4.11.1-9 (continued)

Summary of Air Quality Analysis for the Mountain Valley Project Compressor Stations

Pollutant	Timeframe	Modeled Concentration (µg/m³) a/	Background Concentration (µg/m³)	Total Concentration (µg/m³) b/	NAAQS (µg/m³)
Stallworth Compressor Station					
PM_{10}	24-hour	7.9	30.0	37.8	150
$PM_{2.5}$	Annual	1.0	8.9	9.7	12
	24-hour	4.8	17.3	22.1	35
SO_2	Annual	0.2	10.8	11.0	80
	24-hour	2.0	46.8	48.9	365
	3-hour	3.6	120.5	124.1	1,300
	1-hour	3.7	110.9	114.6	196
CO	8-hour	68.4	1,947.5	2,015.9	10,000
	1-hour	93.3	2,749.5	2,842.8	40,000
NO_2	Annual	9.9	12.6	22.5	100
	1-hour	91.0	69.2	160.3	188
Pb	Rolling 3 month average	<0.01	0.01	0.01	0.15

Source: EPA, 2015d

Abbreviations:

µg = microgram(s)
mg = milligram(s)
m³ = cubic meter(s)
ppm = part(s) per million
ppb = part(s) per billion
NA = not applicable

a/ Modeled concentration is based on worst-case load.
b/ Total concentration is the sum of the modeled and background concentration. This value is compared with the NAAQS.

Equitrans Expansion Project

Equitrans filed its Plan Approval permit application for the construction and operation of the Redhook Compressor Station with the PADEP on October 21, 2015. It is expected that compliance with the applicable federal and state air quality standards and regulations would be addressed accordingly in the air quality permit. As a result, we conclude that air quality impacts during operation of the compressor station would be minor.

The PADEP air quality permitting regulations require implementation of best available technology (BAT) for new air emission sources. As part of the project, Equitrans would be installing BAT for the equipment at Redhook Compressor Station as follows:

BAT for NG-fired engines. For controlling emissions of CO and VOC from the compressor engines, the use of an oxidation catalyst are proposed as BAT. For PM (encompassing both PM_{10} and $PM_{2.5}$) and SO_2, good combustion practices and low-sulfur fuels (achieved by burning pipeline quality natural gas), as well as operating the engines in accordance with the manufacturer's recommended practice, would serve as BAT.

BAT for NG-fired Solar Turbines. For CO, NO_x, and VOC emissions from the turbines, the lean pre-mix technology (SoLoNO_x system) is proposed as BAT. In addition, Equitrans requested limits for maximum operating capacity of the units to not exceed the PADEP BAT maximum concentration levels for CO, NO_x, and VOC. Compliance with these limits would be demonstrated through performance testing.

BAT for TEG Dehydration Unit. For VOC and HAP emissions, which are the pollutant of concern from TEG dehydration units, installation of an enclosed flare with a minimum control efficiency of 98 percent to control emissions of these pollutants is proposed as BAT. This flare emissions control efficiency would meet the PADEP-established BAT levels for dehydration units at 95 percent VOC control.

The Solar turbines at the Redhook Compressor Station would be subject to NSPS KKKK, which limits NO_x and SO_2. SO_2 emissions would be limited through the exclusive combustion of pipeline quality natural gas. Compliance with the NO_x emission standard required in NSPS KKKK would be achieved using lean pre-mix combustion technology (SoLoNO_x system) and demonstrated through periodic emissions testing. The two NG-fired engines at Redhook Compressor Station would be subject to NSPS JJJJ and would be designed and manufactured to meet the requirements of this regulation.

An air quality screening analysis was performed for the Redhook Compressor Station using the AERMOD dispersion model in screening mode. Equitrans modeled the PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO, and Pb emissions from the project and compared the result for each pollutant and averaging period to the NAAQS. A summary of this screening analysis is provided in table 4.11.1-10. The screening analysis shows concentrations for the compressor station are below the applicable NAAQS.

Jefferson National Forest

No compressor stations or other aboveground facilities would be located within the Jefferson National Forest. Air quality impacts within the Forest would be limited to emissions related to pipeline construction. Emissions from construction equipment within the Jefferson National Forest would be the same those discussed in the *Construction Emissions* section above.

TABLE 4.11.1-10

Summary of Air Quality Analysis for the Equitrans Expansion Project Compressor Station

Pollutant	Timeframe	Modeled Concentration ($\mu g/m^3$) a/	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$) b/	NAAQS ($\mu g/m^3$)	Below NAAQS? (Y/N)
Redhook Compressor Station						
PM_{10}	24-hour	9.2	34.0	43.2	150	Y
$PM_{2.5}$	Annual	1.7	8.8	10.5	12	Y
	24-hour	6.9	18.0	24.9	35	Y
SO_2	Annual	0.5	8.5	9.0	80	Y
	24-hour	3.3	23.6	26.9	365	Y
	3-hour	5.1	69.7	74.8	1,300	Y
	1-hour	5.9	67.2	73.1	196	Y
CO	8-hour	144.1	1,718.4	1,862.5	10,000	Y
	1-hour	192.8	2,864.0	3,056.8	40,000	Y
NO_2	Annual	10.7	16.1	26.8	100	Y
	1-hour	106.2	68.4	174.6	188	Y
Pb	Rolling 3 month average	<0.01	0.04	0.04	0.15	Y

Source: EPA, 2015d

Abbreviations:

PM_{10} = particulate matter less than 10 microns
$PM_{2.5}$ = particulate matter less than 2.5 microns
CO = carbon monoxide
NO_2 = nitrogen dioxide
SO_2 = sulfur dioxide
O_3 = ozone
Pb = lead
µg = microgram(s)
mg = milligram(s)
m^3 = cubic meter(s)
ppm = part(s) per million
ppb = part(s) per billion
NA = not applicable

a/ Modeled concentration is based on worst-case load.
b/ Total concentration is the sum of the modeled and background concentration. This value is compared with the NAAQS.

Conclusions Regarding Air Quality Impacts and Mitigation

Because pipeline construction moves through an area relatively quickly, air emissions are typically intermittent and short-term. Once construction activities in an area are completed, fugitive dust and construction equipment emissions would subside and the impact on air quality would diminish. Further, construction emissions for both projects would be minimized by mitigation measures described above. Therefore, we conclude that the projects' construction-related impacts are not expected to result in a significant impact on local or regional air quality, although residents near the pipeline right-of-way and stationary facilities may experience intermittent elevated levels of fugitive dust and smoke-dust from any nearby open burning.

Emissions generated during operation of the MVP and the EEP would be minimal, limited to emissions from maintenance vehicles and equipment and fugitive emissions (considered negligible for the pipeline). Except for Mountain Valley's Bradshaw Compressor Station (which is subject to Title V permitting), emissions from the new compressor stations would be minor sources of air pollution. Using low NO_x turbine combustors, low emission levels would be achieved with normal engine maintenance and operation using pipeline quality natural gas. Implementation of BAT for Equitrans' Redhook Compressor Station as required by the PADEP air quality permitting regulations would minimize emissions of criteria air pollutant. In addition, modeled air quality screening analysis performed for each of the new compressor stations (the MVP's Bradshaw, Harris, and Stallworth and the EEP's Redhook) show that emissions due to the compressor stations' operations would not exceed the NAAQS. Therefore, any emissions resulting from operation of the compressor facilities would not be expected to have significant impacts on local or regional air quality.

In summary, potential impacts on air quality associated with construction and operation of the MVP and the EEP would be minimized by strict adherence to all applicable federal and state regulations which are designed to be protective of air quality. All emission sources proposed for the MVP and the EEP would comply with the appropriate SIP.

4.11.1.4 Radon Exposure

The downstream use of natural gas in the market areas, including the effects of burning natural gas and exposure to radon in homes, is beyond the scope of this EIS. Although the impacts of transporting natural gas to downstream users is outside the scope of the EIS and beyond our jurisdiction, we have provided general background and a review of the literature on radon. Radon is one of many naturally occurring radioactive substances found in natural gas. Natural gas extracted from the Appalachian Basin that is expected to supply the MVP, and the EEP would be located mostly in the EPA's Zone 1 or Zone 2 rated areas with a small portion consisting of Zone 3 rated areas. Zone 1 has the highest potential for radon to exist with a predicted average indoor radon screening level greater than 4 picoCuries per liter (pCi/L)[148]; Zone 2 has moderate potential with a 2 to 4 pCi/L predicted average indoor radon screening level; and Zone 3 has the least potential less than a 2 pCi/L predicted average indoor radon screening level (EPA, 2015e).

Studies by the Responsible Natural Gas Resource Development Group in August 2012 presents information concerning radon levels when natural gas is extracted, and the deterioration/reduction of radon in the gas during transmission, processing, and at combustion. Information compiled shows that, when radon concentrations are detected, levels at upstream gas wells are relatively higher than downstream points, due to radon's deterioration half-life of less than 4 days. Additionally, the longer the transportation distance and subsequent time prior to combustion, the lower the levels of radon in the natural gas. Breakdown of the radon begins in the ground and continues during extractions and transport. Radon removal also occurs in a gas processing plant during the removal of liquefied petroleum gases (LPG), (such as ethane and propane), which rapidly reduces radon levels. Radon gas that reaches the processing plant also undergoes further processing to reduce radon before it is burned. The time needed to gather,

[148] PicoCuries per liter (pCi/L) is a unit used to measure radon level. A "Curie" is a unit of radioactivity equivalent to 1 gram of radium and the prefix "pico" means a trillionth.

process, store, and deliver natural gas to residences allows a portion of the entrained radon to decay, which decreases the amount of radon in the gas before it is used in a residence. The required venting of appliance exhausts from water heaters, furnaces, and other appliances also limits potential exposure pathways to radon emissions.

As mentioned previously, radon concentrations are reduced when a natural gas stream undergoes upstream processing to remove LPG. This is because radon and the two major components of LPG, propane and ethane, have similar boiling points. According to a study of health effects from radon (Johnson et al., 1973), processing can remove an estimated 30 to 75 percent of the radon from natural gas. Research by Gogolak (1980) suggests that the cumulative decay of radon from wellhead to burner tip is on the order of 60 percent. Gogolak concluded that indoor radon concentrations resulting from the use of natural gas in the home are unlikely to pose a radiological hazard to domestic users. Johnson et al. reached a similar conclusion. While the number of deaths due to increased indoor radon concentrations could potentially be higher now than in 1973 due to the growth in the U.S. population over the last 40 or more years, and changes to dose and risk calculation methods, there is no reason to determine that the conclusions by Johnson et al. and Gogolak regarding the risks of radon in natural gas would be any different. In fact, radon exposure associated with the combustion of natural gas may be lower now due to the improved ventilation and increased energy efficiency of modern boilers, furnaces, and hot water heaters, as well as new building codes requiring venting of gas-fired stoves and ovens. Other more recent studies also support the conclusions of Johnson et al. and Gogolak. A study performed by Van Netten et al. (1998) found that the radon exposure risk to domestic users in U.S. and British Columbia households was virtually nonexistent. Another more recent study completed in the United Kingdom reached a similar conclusion and found that individual exposure to radon associated with domestic gas use is small, and radon is not likely to be of concern to suppliers or customers due to the small quantity that is released into buildings from burning natural gas (Dixon, 2001).

In the United States, the EPA has set the indoor action level for radon at 4 pCi/L. If concentrations of radon are high enough to exceed these activity levels, the EPA recommends remedial actions, such as improved ventilation, be implemented to reduce levels below this threshold. The average home in the United States has a radon activity level of 1.3 pCi/L, while outdoor levels average about 0.4 pCi/L. The radiation given off by the decay of radon is not strong enough to penetrate the skin. However, when radon is inhaled, its radiation can cause deleterious effects on the sensitive tissues in the lungs. At the range of 4 pCi/L, the EPA estimates that prolonged exposures would result in about 21,000 deaths per year nationwide, due to lung cancer.

The burning of natural gas in homes can release radon into the air depending on the manner in which it used. In certain closed burning systems such as water heaters, boilers, and furnaces, radon is not released into the air as these appliances generally have ventilation systems that exhaust the radon and combusted materials outside the home. Range top cooking, however, can directly vent radon into living spaces and has been identified as the main contributor of radon into homes via natural gas.

The Dixon and Almaskut papers discussed the human exposure to radon from stove-top cooking (RSI, 2012). They found that by accounting for the dilution within the space of a residence and air exchange rates that radon levels are reduced to below the EPA action level.

It is known that the radon content of natural gas pipelines is highly variable and contingent upon the mixing of many gas sources. Johnson notes that radon activity in producing wells is between 0.2 to 1,450 pCi/L (the highest ranges were found in the central United States). In July of 2012, Spectra Energy conducted an analysis of the radon content of its pipeline in several locations in Pennsylvania and New Jersey, and found that it had a radon activity of 16.9 to 44.1 pCi/L (Anspaugh, 2012). Subsequently, the USGS completed similar testing on gas producing wells in Pennsylvania and found radon activity between 1 to 79 pCi/L with a median of 37 pCi/L (Rowan and Kraemer, 2012).

Using the activity level of 37 pCi/L at the wellhead, and a dilution factor[149,] of 7,111, Johnson determined that natural gas consumption in a residence would account for an incremental 0.005 pCi/L, above background levels and well below the EPA action level. Resnikoff (2012) challenged this dilution factor and presented instead a value of 4,053 that was presented as being representative of New York City apartments. Using this factor instead results in an incremental activity contribution of 0.009 pCi/l, still well below the EPA action level. We also note that residences with existing natural gas service for heating, cooking, and other uses may not experience an incremental increase of 0.005 pCi/L, and it could very well be less, as gas provided to the residence (regardless of the formation in which it was produced) is likely to carry some low residual levels of radon. These findings are consistent with literature on the subject, and that the radon present in natural gas does not introduce new adverse health risks.

While the FERC has no regulatory authority to set, monitor, or respond to indoor radon levels, many federal, state, and local entities establish and enforce radon exposure standards for indoor air. We expect that the combustion of gas delivered by local delivery companies would comply with all applicable air emission standards. In the unlikely event that these standards are exceeded, we would expect that the necessary modifications would be implemented to ensure public safety.

4.11.2 Noise

Sound is mechanical energy transmitted by pressure waves in media such as air or water (FTA, 2006). When sound becomes excessive, annoying, or unwanted, it is referred to as noise. Noise may be continuous (constant noise with a steady dB level), steady (constant noise with a fluctuating dB level), impulsive (having a high peak of short duration), stationary (occurring from a fixed source), intermittent (at intervals of high and low sound levels), or transient (occurring at different rates).

Noise levels are quantified using dB, which are units of sound pressure. Decibels are calculated by quantifying sound in terms of base-ten logarithmic units of ratios of the sound pressure being measured to a reference pressure squared (called "bel") multiplied by ten to get "deci-bel," dB. Typically, the reference pressure is standardized at 20 micro Pascal (µPa), or the standard threshold of human hearing (FTA, 2006). The A-weighted sound level, expressed as dBA, can be used to quantify sound and its effect on people (EPA, 1978). The A-weighted sound level is based on the dB unit but puts more emphasis on frequencies in the range that humans hear

149 The dilution factor used to determine the effective activity was based upon an air exchange rate of 1.0 change per hour, and a home volume of 226.6 m^3.

best and less emphasis on frequencies that humans do not hear well, thus mimicking the human ear.

Ambient sound levels, or background sound levels, result from sound emanating from natural and artificial sources. The magnitude and frequency of background noise may vary considerably over the course of a day and throughout the year, caused in part by weather conditions, seasonal vegetation cover, wildlife, and human activity. Two measures used by federal agencies to relate the time-varying quality of environmental sound levels to known effects on people are the 24-hour equivalent sound level ($L_{eq(24)}$) and the day-night sound level (L_{dn}). The $L_{eq(24)}$ is the level of steady sound with the same total energy as the time-varying sound, averaged over a 24-hour period. The L_{dn} is the $L_{eq(24)}$ with 10 decibels on the A-weighted decibel scale (dBA) added to the nighttime sound levels between the hours of 10:00 pm and 7:00 am to account for people's greater sensitivity to sound during nighttime hours.

The potential for noise impacts can be assessed by considering the sound level increase over existing levels at receptors, referred to as "noise sensitive areas" or "NSAs," such as residences, schools, or hospitals. In general, an increase of 3 dBA is barely detectable by the human ear, and an increase of 5 dBA is considered clearly noticeable. Increases of 10 dBA are perceived as a doubling of noise or twice as loud.

4.11.2.1 Affected Environment

Mountain Valley Project

Mountain Valley conducted a baseline noise survey at the NSAs for the proposed Bradshaw, Harris, and Stallworth Compressor Stations in April and May 2015. Noise survey results at each NSA are summarized in table 4.11.2-1. Figures 4.11.2-1 through 4.11.2-3 show the proximity and direction of the NSAs to the respective compressor stations. The existing land uses at the vicinities of the Bradshaw Compressor Station consist of undeveloped areas and residential land areas in a predominantly wooded hilly location. The proposed Harris and Stallworth Compressor Station sites are located in rural and sparsely populated areas within mainly undeveloped deciduous forests with some residential land uses. As shown in table 4.11.2-1, the existing noise levels in the MVP areas for the compressor stations range from 35.8 to 55.3 dBA L_{dn}, which is typical of ambient noise levels in open space (wetland, forest, open land, abandoned land) and wooded residential areas.

On February 2 through 5, 2016, Mountain Valley conducted a baseline ambient noise survey at the nearby NSAs for the four associated meter stations: Mobley Interconnect, Sherwood Interconnect, WB Interconnect, and Transco Interconnect. Table 4.11.2-2 shows a summary of the measured ambient noise levels at the nearest NSAs to these stations. As shown in table 4.11.2-2, the existing noise levels in the MVP areas for the meter stations range from 47.4 to 57.9 dBA L_{dn}, which is typical of ambient noise levels in agricultural cropland, wooded residential, and old urban residential areas.

TABLE 4.11.2-1

Existing Noise Levels at NSAs Near the Compressor Stations for the Mountain Valley Project

Compressor Station/NSA	NSA Land Use Type	NSA Distance (feet) and Direction from Compressor Station	Existing Ambient Noise Levels (dBA)		Estimated L_{dn} Noise Level (dBA)
			Daytime, L_d	Nighttime, L_n	
Bradshaw Compressor Station (near Smithfield in Wetzel County, West Virginia)					
NSA 1	Residential	1,335 NW	43.6	30.2	42.6
NSA 2	Residential	2,135 WNW	43.6	30.2	42.6
NSA 3	Residential	3,105 WSW	43.6	30.2	42.6
NSA 4	Residential	3,030 SE	44.0	34.2	44.1
NSA 5 a/	Residential	2,380 NE	46.4	34.6	45.8
Harris Compressor Station (near Flatwoods in Braxton County, West Virginia)					
NSA 1	Residential	1,445 N	47.9	38.0	47.9
NSA 2	Residential	1,825 SW	48.7	38.2	48.5
NSA 3 a/	Residential	1,965 SSE	48.7	38.2	48.5
NSA 4	Residential	3,340 WSW	53.1	47.4	55.3
Stallworth Compressor Station (Station near Meadow Bridge in Fayette County, West Virginia)					
NSA 1	Residential	2,835 WNW	54.2	45.9	54.9
NSA 2	Residential	1,985 West	37.8	31.6	39.6
NSA 3	Residential	2,085 SW	42.2	37.3	44.9
NSA 4	Residential	1,465 SSW	34.7	27.8	35.8
NSA 5 a/	Residential	1,340 SE	51.9	46.3	54.1
NSA 6	Residential	2,755 ESE	51.9	46.3	54.1

Source: SLR, 2015

Abbreviations:

E = East N = North W = West S = South

L_d = equivalent sound level (L_{eq}) averaged over daytime hours (7:00 am – 10:00 pm)

L_n = equivalent sound level (L_{eq}) averaged over nighttime hours (10:00 pm - 7:00 am)

$L_{dn} = 10*Log(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$, or to simplify: $L_{dn} = L_{eq} + 6.4$ dBA

a/ The worst-case NSA was used to estimate construction and operation noise impacts.

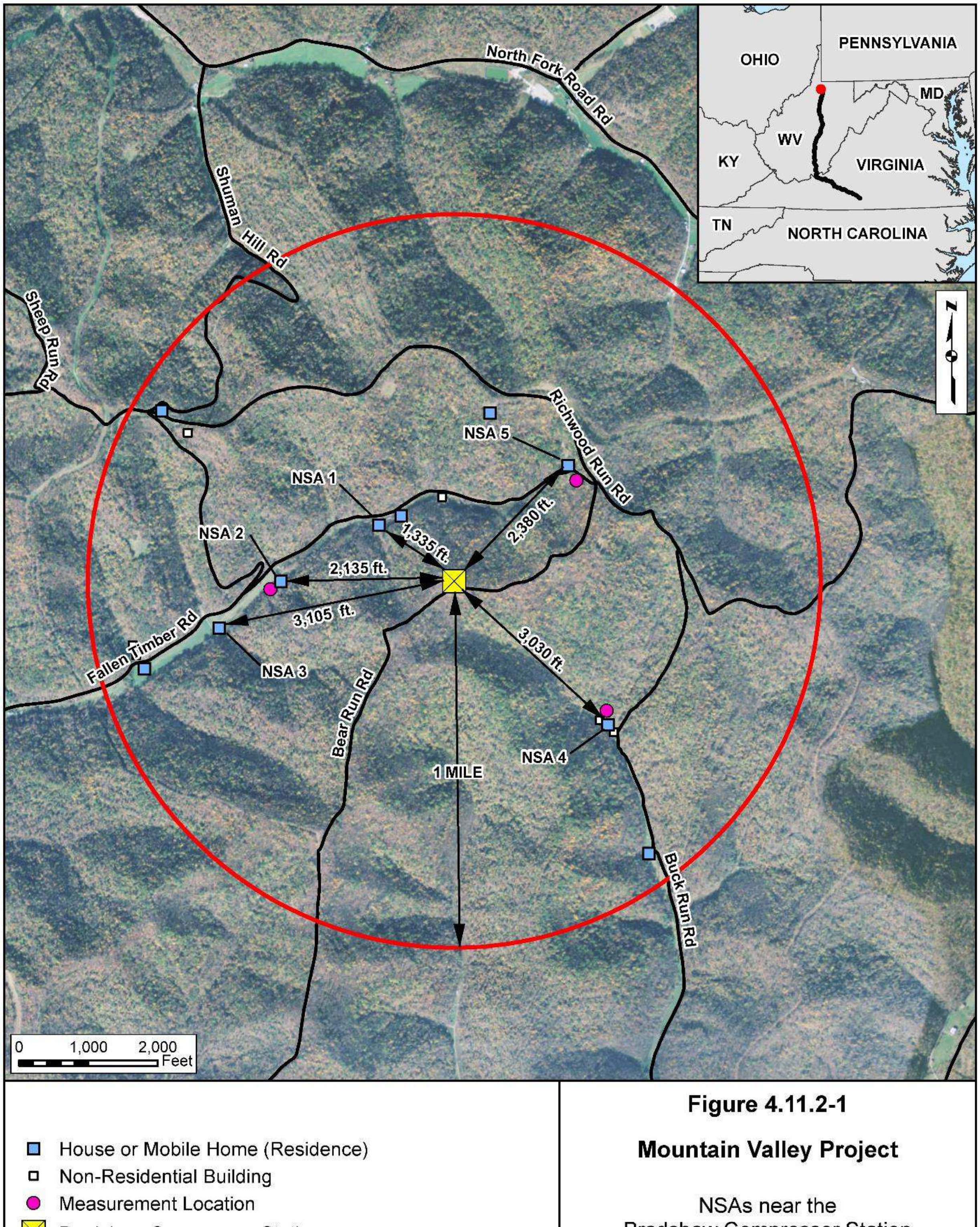
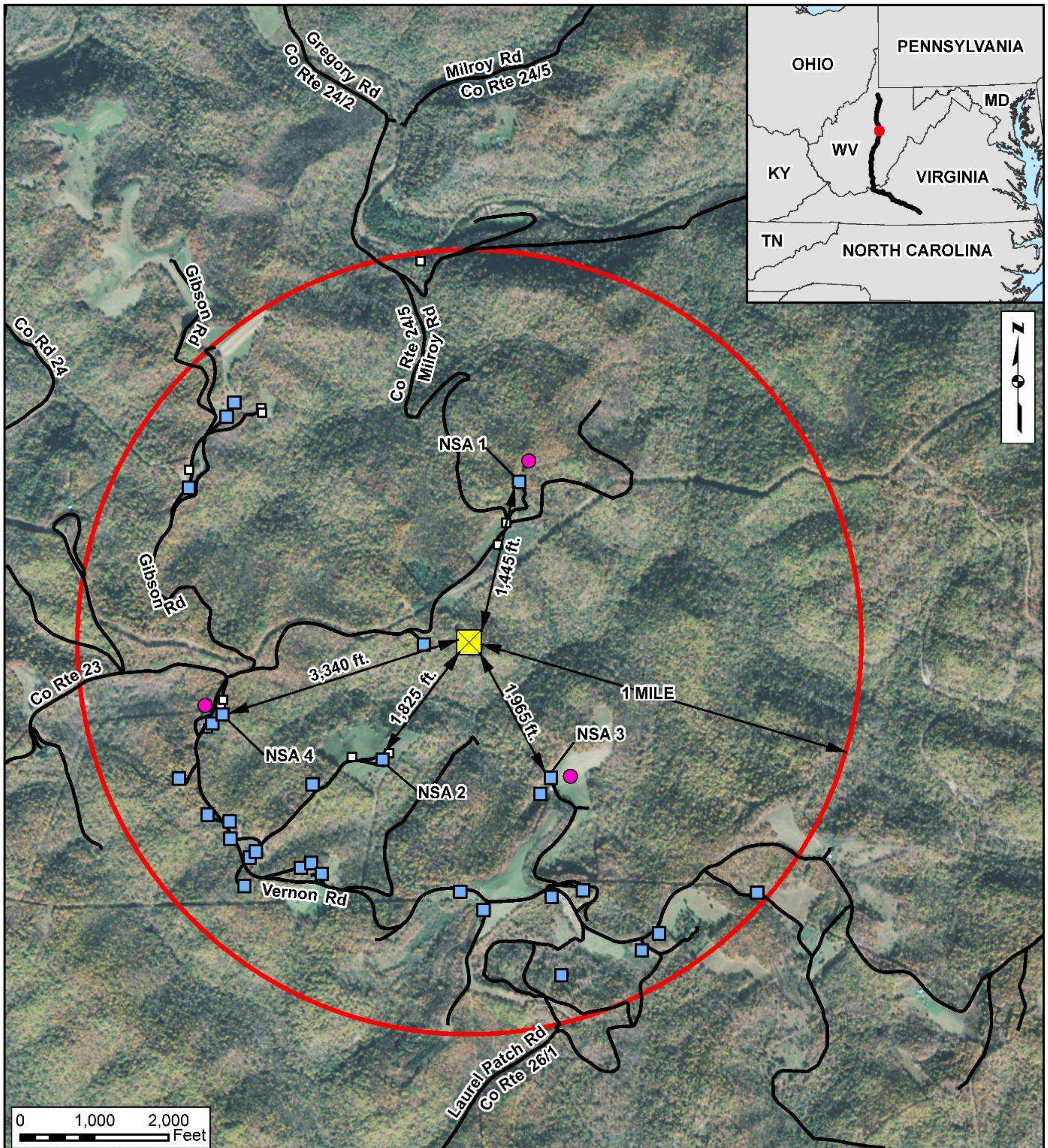


Figure 4.11.2-1

Mountain Valley Project

NSAs near the Bradshaw Compressor Station

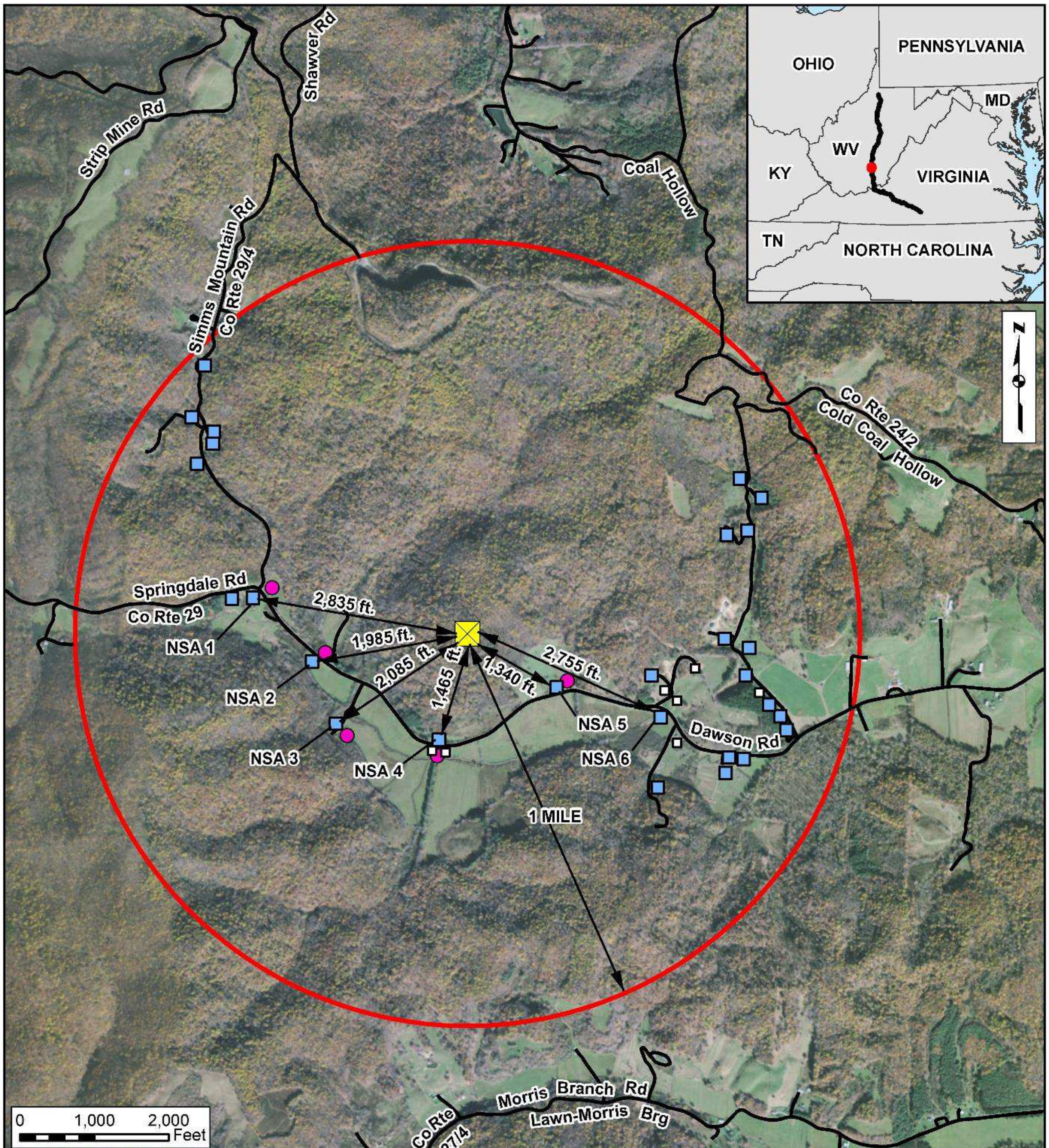


House or Mobile Home (Residence)
Non-Residential Building
Measurement Location
Harris Compressor Station

Figure 4.11.2-2

Mountain Valley Project

NSAs near the
Harris Compressor Station



House or Mobile Home (Residence)
Non-Residential Building
Measurement Location
Stallworth Compressor Station

Figure 4.11.2-3

Mountain Valley Project

NSAs near the Stallworth Compressor Station

TABLE 4.11.2-2

Existing Noise Levels at NSAs Near the Meter Stations for the Mountain Valley Project

Meter Station/NSA	NSA Land Use Type	NSA Distance (feet) and Direction from Meter Station	Existing Ambient Noise Levels (dBA) Daytime, L_d	Nighttime, L_n	Estimated L_{dn} Noise Level (dBA)	Audible Noise Sources
Mobley Interconnect (Wetzel County, West Virginia)						
NSA-MI-1	Residential (unoccupied cabin)	560 ENE	49.4	49.1	55.6	Small stream
NSA-MI-2	Residential	990 SW	53.9	50.9	57.9	Small stream
Sherwood Interconnect (Harrison County, West Virginia)						
NSA-SW-1	Residential	950 SW	55.4	48.1	56.6	Local traffic
WB Interconnect (Braxton County, West Virginia)						
NSA-WB-1	Residential	720 N	47.9	38.0	47.9	Birds
Transco Interconnect (Pittsylvania County, Virginia)						
NSA TI-1	Residential	1040 NW	47.6	36.9	47.4	Facility Noise

Source: SLR, 2016
Abbreviations:
E = East N = North W = West S = South
L_d = equivalent sound level (L_{eq}) averaged over daytime hours (7:00 am – 10:00 pm)
L_n = equivalent sound level (L_{eq}) averaged over nighttime hours (10:00 pm - 7:00 am)
L_{dn} = day-night equivalent sound level calculated using the following equation:
$L_{dn} = 10*Log(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$

Equitrans Expansion Project

Equitrans conducted a baseline noise survey in July 2015 using Larson Davis Model 831 Sound Level Meter (SLM), following the ANSI S12.9-1993 Part 3, at the NSAs near the proposed Redhook Compressor Station as well as near the areas where both HDDs would be conducted. Ambient noise measurements were also taken at the Mobley Tap and the Webster Interconnect on a later date. Equitrans would be installing the H-316 and H-318 pipelines using the HDD method to cross the South Fork Tenmile Creek and Monongahela River, respectively.

Noise survey results at each NSA near the Redhook Compressor Station, the Mobley Tap, the Webster Interconnect, and the HDDs are summarized in tables 4.11.2-3 and 4.11.2-4. Figures 4.11.2-4 through 4.11.2-8 show the proximity and direction of the NSAs to the Redhook Compressor Station and the HDDs' entry and exit points. The existing ambient noise at the project vicinities consists mainly of road traffic.

TABLE 4.11.2-3

Existing Noise Levels at NSAs Near the Redhook Compressor Station, Mobley Tap, and Webster Interconnect

Compressor Station/ NSA	NSA Land Use Type	NSA Distance (feet) and Direction from Compressor Station	Estimated L_{dn} Noise Level (dBA) b/
Redhook Compressor Station (Franklin Township, Greene County, Pennsylvania)			
NSA 1	Residential	3,300 SW	50.5
NSA 2	Residential	2,300 SW	56.1
NSA 3	Animal Hospital	1,900 NW	47.3
NSA 4 a/	Residential	850 E	66.6
Mobley Tap (Grant District, Wetzel County, West Virginia)			
NSA-MT-1 a/	Residential	275 E	45.0
NSA-MT-2	Residential	732 SW	45.0
NSA-MT-3	Residential	1,100 NE	45.0
Webster Interconnect (in Wetzel County, West Virginia)			
NSA-WI-1 a/	Residential	1,225 S	45.0

Source: TC, 2015
Abbreviations:
E = East N = North W = West S = South
L_d = equivalent sound level (L_{eq}) averaged over daytime hours (7:00 am – 10:00 pm)
L_n = equivalent sound level (L_{eq}) averaged over nighttime hours (10:00 pm - 7:00 am)
a/ The nearest NSA was used to estimate the worst-case construction and operation noise impact.
b/ L_{dn} = day-night equivalent sound level calculated using the following equation:

$$L_{dn} = 10*\text{Log}(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$$

TABLE 4.11.2-4

Existing Noise Levels at NSAs Near the Pipeline HDDs for the Equitrans Expansion Project

HDD/ NSA-Direction	NSA Land Use Type	NSA Distance (feet) and Direction from Compressor Station	Existing Ambient Noise Levels, L_{eq} (dBA)		Estimated L_{dn} Noise Level (dBA) a/
			Daytime, L_d	Nighttime, L_n	
H-316 HDD Entry					
NSA-W	Residential	1,100 W	No data	41.2	47.6
NSA-N	Residential	800 N	No data	37.5	43.9
NSA-E	Residential	1,100 E	No data	35.9	42.3
Entry Point	HDD Entry Point	0	46.2	34.9	45.8
H-316 HDD Exit					
NSA-N	Residential	800 N	No data	34.3	40.7
NSA-SW	Residential	1,400 SW	No data	44.4	50.8
H-318 HDD Entry					
NSA-W	Residential	200 W	No data	44.6	51.0
Entry Point	HDD Entry Point	0	No data	45.6	52.0
H-318 HDD Exit					
NSA-N1	Residential	900 N	No data	37.5	43.9
NSA-N2	Residential	500 N	No data	42.4	48.8
NSA-S	Residential	200 SW	No data	45.4	51.8

Source: TC, 2015

Abbreviations:

dBA = A-weighted decibel N/A = Not Applicable

E = East N = North W = West S = South

L_d = equivalent sound level (L_{eq}) averaged over daytime hours (7:00 am – 10:00 pm)

L_n = equivalent sound level (L_{eq}) averaged over nighttime hours (10:00 pm - 7:00 am)

L_{dn} = day-night equivalent sound level

a/ L_{dn} is calculated using the following equation:

$L_{dn} = 10*Log(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$

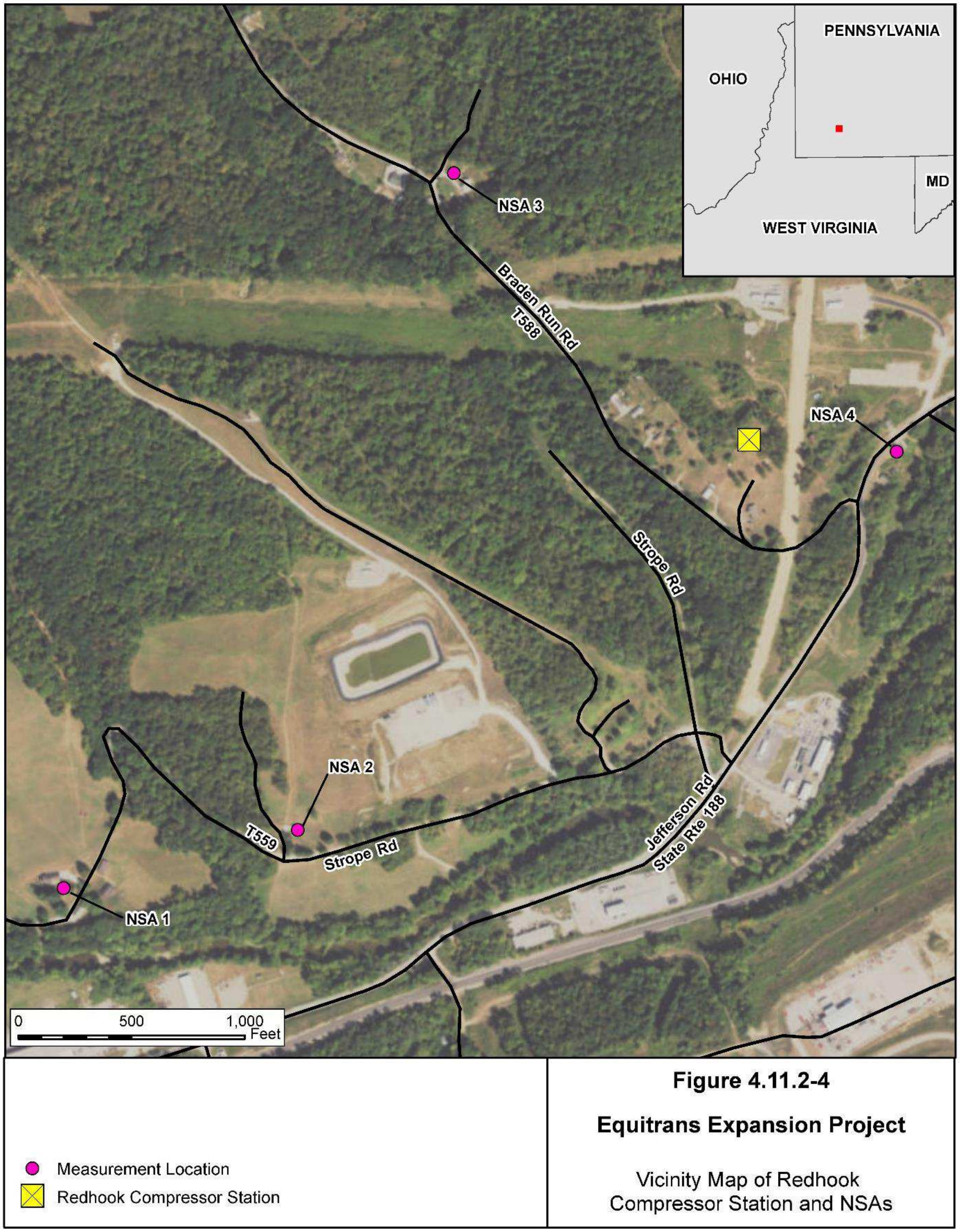
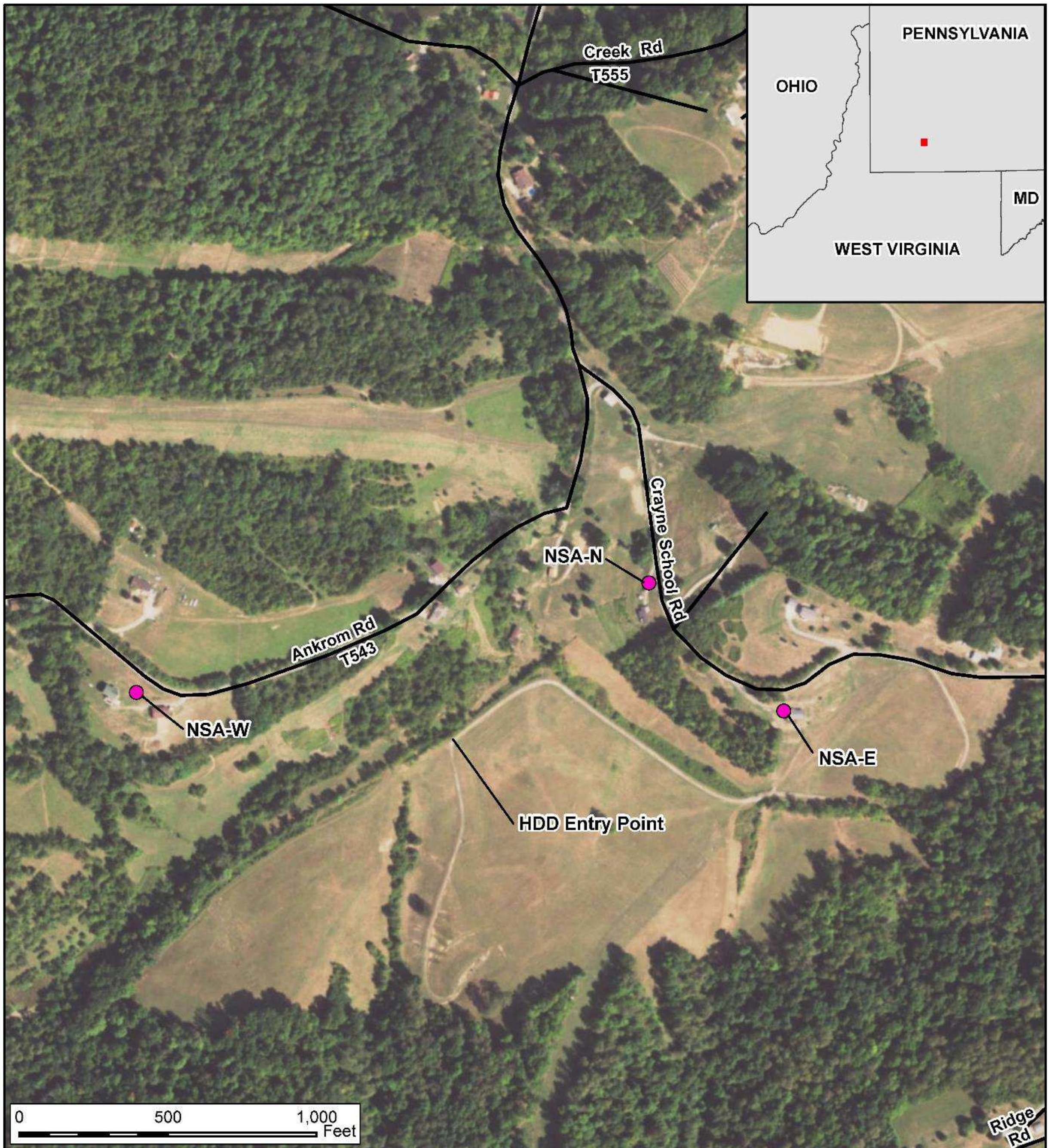


Figure 4.11.2-4

Equitrans Expansion Project

Vicinity Map of Redhook Compressor Station and NSAs

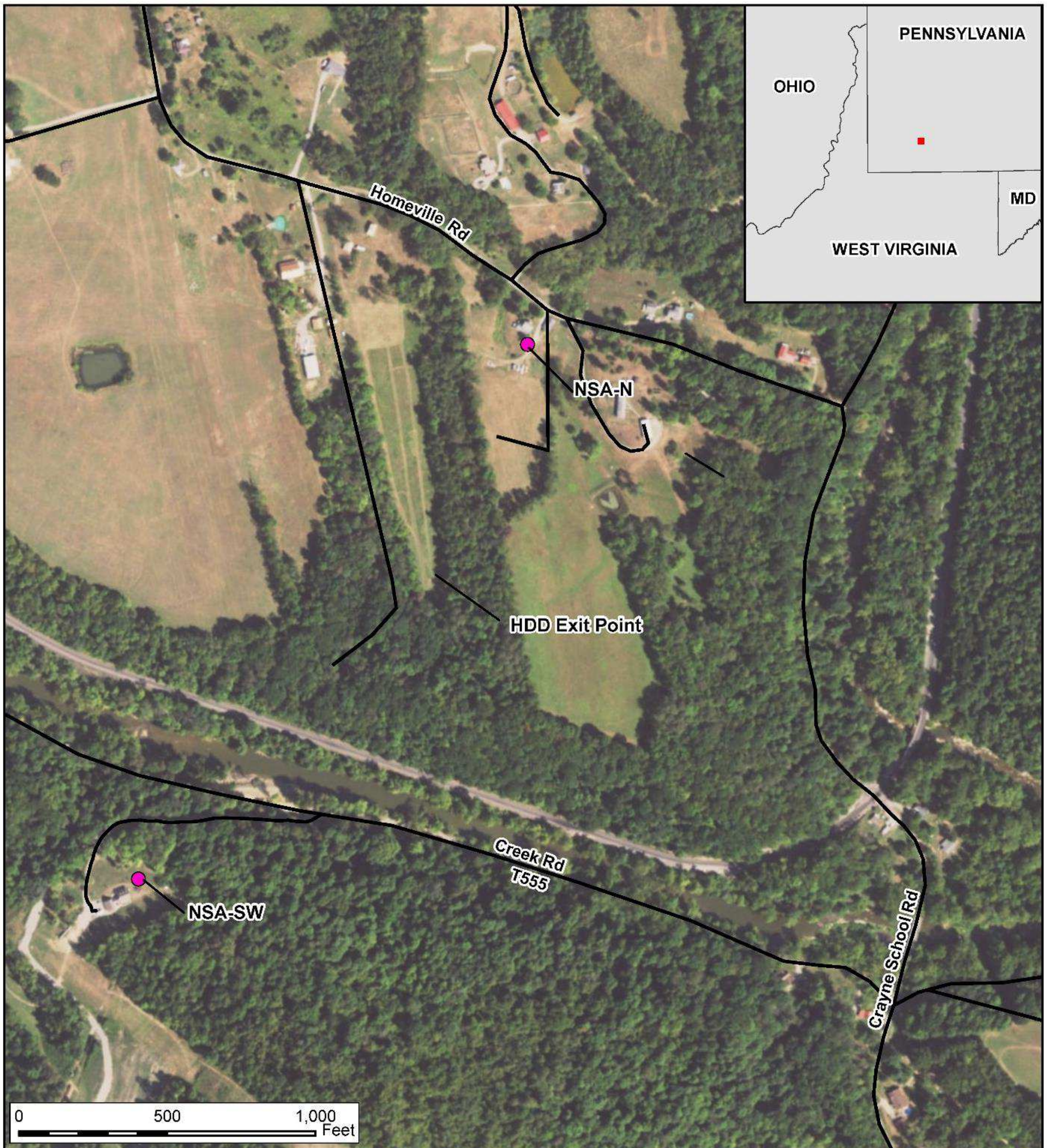


Measurement Location

Figure 4.11.2-5

Equitrans Expansion Project

Vicinity Map of H-316
HDD Entry Point and NSAs



Measurement Location

Figure 4.11.2-6

Equitrans Expansion Project

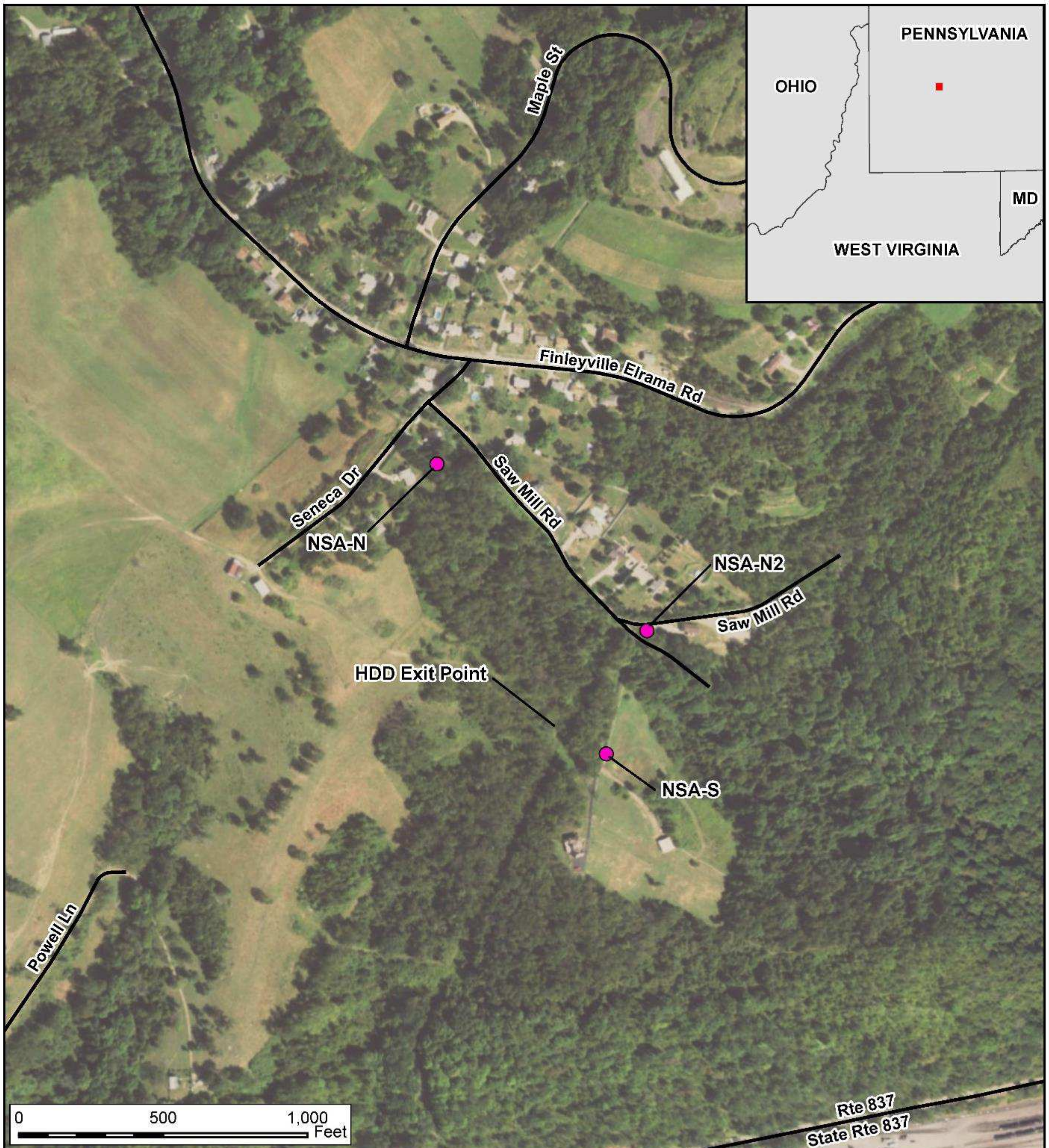
Vicinity Map of H-316
HDD Exit Point and NSAs

Measurement Location

Figure 4.11.2-7

Equitrans Expansion Project

Vicinity Map of H-318
HDD Entry Point and NSAs



Measurement Location

Figure 4.11.2-8

Equitrans Expansion Project

Vicinity Map of H-318
HDD Exit Point and NSAs

Although Equitrans stated that it does not anticipate conducting drilling during nighttime, Equitrans did not commit to daytime only HDD. Noise surveys at the entry and exit points of the two HDDs were conducted only during nighttime to establish more conservative baseline ambient noise levels of the area. The results of the noise surveys are presented in table 4.11.2-4.

As shown in tables 4.11.2-3 and 4.11.2-4, the existing noise levels at the EEP areas range from 40.7 to 66.6 dBA L_{dn}, which is typical of ambient noise levels in rural residential and urban row housing on major avenue areas. Note that the L_{dn} noise levels at NSA 2 and NSA 4 already exceed the FERC noise standard of 55 dBA (see section 4.11.2.2).

Jefferson National Forest

No compressor stations or other aboveground facilities would be located within the Jefferson National Forest. Noise impacts would be limited to construction equipment used for installation of the underground pipeline. Installation of the pipeline via conventional bore beneath the ANST would result in noise that may be audible to hikers but these impacts would vary based on the presence of hikers at the time of construction. In addition, the undisturbed forest on either side of the trail and location of the bore pits 70 to 90 feet below the trail would minimize noise impacts. Noise impacts during operations of the MVP would not be expected within the Jefferson National Forest.

4.11.2.2 Noise Regulatory Requirements

In 1974, the EPA published its *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. This document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has indicated that an L_{dn} of 55 dBA protects the public from indoor and outdoor activity interference. We have adopted this criterion and use it to evaluate the potential noise impacts from construction and operation of the projects. The FERC regulations at 18 CFR 380.12(k)(4)(v)(A) require that noise attributed to any new compressor station or any modification, upgrade, or update to an existing compressor station will not exceed an L_{dn} of 55 dBA at any pre-existing NSA such as schools, hospitals, and residences. In addition, FERC regulations at 18 CFR 380.12(k)(4)(v)(B) require that operation of compressor stations may not result in any perceptible increase in vibration at any NSA. Due to the 10 dBA nighttime penalty added prior to calculation of the L_{dn}, for a facility to meet the L_{dn} 55 dBA limit, the facility must be designed such that a constant noise level on a 24-hour basis does not exceed 48.6 dBA L_{eq} at any NSA.

Mountain Valley Project

The MVP facilities would be located in West Virginia and Virginia. There are no state noise regulations applicable to the construction or operation of the facilities. However, there are county and township noise regulations that would be applicable to the project, as summarized in table 4.11.2-5 below.

TABLE 4.11.2-5

Maximum Permissible County Noise Levels for the Mountain Valley Project

County/State	Noise Limitations (in dBA L_{eq}) At Counties with Noise Regulations		
	Daytime	Nighttime	Notes
Fayette Co., WV	65 (7:00 am – 6:00 pm)	55 (6:00 pm – 7:00 am)	Noise level measured in residential districts. Construction activity between 7:00 am and 7:00 pm is exempt.
Franklin Co., VA	67 (7:00 am – 11:30 pm)	62 (11:31 pm – 6:59 am)	These limits apply to noise produced by using or operating a loudspeaker or other sound amplification device.
Montgomery Co., VA	57 (7:00 am – 10:00 pm)	52 (10:00 pm – 7:00 am)	Residential and agricultural receiving land use.
Pittsylvania Co., VA	55 (7:00 am – 10:00 pm)	50 (10:00 pm – 7:00 am)	Noise Sensitive Zones (school, institution of learning, cemetery during memorial service, funeral homes, nursing homes, courtroom, place of public worship, or medical or veterinary facility).
	57 (7:00 am – 10:00 pm)	52 (10:00 pm – 7:00 am)	Residential District (Residential Estates, District; R-1; RC-1; RMF; RPD; MHP and Conservation Districts).

Sources: FCUDC, 2009; MCC, 2015a; 2015b; PCC, 1993

Equitrans Expansion Project

The EEP facilities would be located in West Virginia and Pennsylvania. There are no state noise regulations applicable to the construction or operation of the project facilities. However, there are county and township noise regulations that would be applicable to the project, as summarized in table 4.11.2-6 below.

TABLE 4.11.2-6

Maximum Permissible County Noise Levels for the Equitrans Expansion Project

County/State	Noise Limitations (in dBA L_{eq}) At Counties with Noise Regulations		
	Daytime	Nighttime	Notes
Jefferson Township, Greene Co., PA	90 (7:00 am – 7:00 pm) measured 25 feet from any property line of noise source property	60 (7:00 pm – 7:00 am) one-hour average (L_{eq}(1)) measured at property line in any district	Not to exceed limit measured at an elevation 4 feet or above ground level.
Franklin Township, Greene Co., PA	60 dB at 20 – 300 Hz; 40 dB at 300 – 2,400 Hz; 30 dB at 2,400 Hz and above Apply any and only one of the following corrections: Daytime operations only: +5 dB Operated less than:20% of any 1 hour period: +5 dB Operated less than:20% of any 1 hour period: +10 dB Impulsive or periodic Noise: -5 dB Property is within 500 feet or any residential zone: + 10 dB		The Redhook Compressor Station would be located in Franklin Township. Hertz (Hz) is a unit used to measure sound frequency in cycles per second. Noise level measured at the noise source property line. These limits do not apply to transportation facilities or temporary construction work.
Union Township, Washington Co., PA	60 dBA in residential district 65 dBA in Commercial Districts 75 dBA in Airport and Industrial Districts		Noise level measured beyond the property line of noise source. Construction or maintenance activities between 7:00 am – 9:00 pm are exempt from the noise standard.

Source: UTZO, 2000; JMMZO, 2013; FTZO, 2000

As shown in tables 4.11.2-5 and 4.11.2-6, the local noise ordinances are less stringent than the FERC noise criterion of 55 dBA L_{dn}. Therefore, for the purpose of this EIS, the FERC noise criterion of 55 dBA L_{dn} is used to evaluate the potential noise impacts from construction and operation of the projects. The potential for noise impacts can be assessed by comparing the projects' noise levels with the 55 dBA noise level criterion and by considering the sound level increase over existing levels at NSAs.

4.11.2.3 Environmental Consequences

Construction Impacts and Mitigation

Construction noise levels are temporary and are rarely steady; they fluctuate depending on the number and type of vehicles and equipment in use at any given time. At times, no large equipment would be operating, and noise would be at or near existing ambient levels. In addition, construction-related sound levels experienced by a noise sensitive receptor in the vicinity of construction activity would be a function of distance, other noise sources, wildlife, and the presence and extent of vegetation and intervening topography between the noise source and the sensitive receptor.

Sound level increases during pipeline construction would be intermittent and would generally occur during daylight hours, with the possible exception of some HDD activities. Construction of aboveground facilities and other activities including HDD operations represent more localized noise sources and are discussed in conjunction with each component of the projects below. Construction activities for aboveground facilities would be primarily limited to daytime hours.

Pipeline and Mainline Valves Construction

Pipeline construction would result in noise along the entire length of the projects. The majority of the pipelines would be constructed using conventional open-cut (or trench-and-cover) methods which involves digging a trench, lowering the pipelines, and backfilling typically lasting for a few days at any given location. Construction of a typical pipeline spread would generally last for about 10 months for both the MVP and EEP; however, noise impacts would be transient as pipe installation progresses from one location to the next.

Prevalent noise sources would come from internal combustion engines used by construction equipment. Construction equipment noise levels would typically be around 85 dBA at 50 feet when the equipment is operating at full load, which could be heard by people in nearby buildings. There are about 128 occupied residences within a 50-foot radius of the proposed MVP pipeline route and 78 sensitive receptors within a 0.25-mile (1,320 feet) radius of the EEP pipeline route. At the worst-case scenario (i.e., assuming no noise shield or barrier between the noise source and sensitive receptor), the nearest distance at which a sound level of 85 dBA attenuates to the 55 dBA criterion would be at a distance of about 1,600 feet. As stated, several sensitive receptors along the pipeline route would be affected by the noise generated during construction. However, most pipeline construction noise would be localized, short-term, and temporary (lasting for a few days to several weeks at any given location), and no NSA would be expected to be exposed to significant noise levels for an extended period of time.

Pipeline construction-related noise would be further mitigated by limiting the great majority of construction to daytime hours when ambient noise levels are often higher and most individuals are less sensitive to noise. Some discrete activities (e.g., hydrostatic testing, tie-ins, purge and packing the pipeline) may require 24 hours of activity for limited periods of time, although these 24-hour activities would require only a few overnight construction personnel and would not result in significant noise generation.

MLVs would be constructed along with pipeline installation, which would take place during daytime. Because MLVs would be constructed simultaneously with the pipeline as construction moves in phases along the right-of-way, noise impacts from MLV construction would be similar and not distinct to those of pipeline construction noise impacts.

Equitrans would be using the HDD method to install portions of the H-316 and H-318 pipelines. Although Mountain Valley did not propose the HDD method to install any pipeline segment, in section 4.3 we are recommending Mountain Valley cross the Pigg River via the HDD method. Noise impacts related to HDD operations from the EEP and recommendations for Mountain Valley to assess noise impacts from MVP are discussed below.

Blasting

For the MVP, it has not yet been determined whether blasting would be necessary. Should blasting be necessary, it would be conducted according to an approved project blasting plan. Blasting activities would be conducted only during daytime and only after nearby residents would have been notified. Blasting is not anticipated during construction of the EEP.

Sound levels produced during blasting would be instantaneous, and would vary based on a number of factors, such as the type and amount of explosives used, distance of the NSA to the blast site, below-ground depth of explosives, and noise mitigation applied. However, typical construction blasting operation noise levels have been documented at about 94 dBA at a distance of 50 feet (FHWA, 2006). A worst-case scenario (i.e.; assuming no noise shield or barrier between the noise source and sensitive receptor), the nearest distance at which a sound level of 94 dBA attenuates to the 55 dBA criterion would be at a distance of about 4,500 feet. Because noise from blasting would occur infrequently and instantaneously for very short durations, noise impacts on the NSAs from blasting would not be significant.

With regard to ground-borne vibration impacts, blasting on construction projects is estimated to be 100 vibration velocity decibel (VdB) at 50 feet away from the source. A vibration level of 100 VdB produces a noise level between 60 dBA (low frequency)[150] and 75 dBA (mid-frequency)[151]; this is the approximate threshold for minor cosmetic damage in fragile buildings. A vibration level of 65 VdB produces a noise level between 25 dBA (low frequency) and 40 dBA (mid-frequency); this is the approximate threshold of perception for many humans. Low-frequency sound is usually inaudible; mid-frequency sound is excessive for quiet sleeping areas (FTA, 2006). The nearest distance at which the vibration level from blasting attenuates to 65 VdB would be about 750 feet. NSAs within 750 feet from the blasting location would feel vibration effects of blasting, however, it would be short-term, instantaneous, and not recurring.

Mountain Valley Project Compressor Stations

Mountain Valley used the FHWA's Roadway Construction Noise Model (RCNM) version 1.0 noise model program to calculate noise levels produced and impacts on the worst-case NSA for each of the compressor stations. All NSA's considered for this EIS are residential. The worst-case NSA was evaluated based not only on its proximity to the noise source but mainly due to the least amount of terrain between the noise source and NSA within the vicinity, as well as the existing ambient sound levels at the NSAs.

The noisiest construction stage was determined to occur during the early earthmoving phase. Therefore, noise impacts were calculated using noise levels generated by equipment typically operated during earthmoving phase which would include two bulldozers, two dump trucks, one generator, one front end loader, two excavators, one light plant, and a drill rig during construction. Dynamic compaction or pile driving equipment operations would not be anticipated.

[150] Approximate noise level when vibration spectrum peak is near 30 Hz. The A-weighted noise level would be approximately 40 dB less than the vibration velocity level if the spectrum peak is around 30 Hz.

[151] Approximate noise level when vibration spectrum peak is near 60 Hz. The A-weighted noise level would be approximately 25 dB less than the vibration velocity level if the spectrum peak is around 60 Hz.

The default maximum noise levels (L_{max}) of this equipment (ranging from 72.8 dBA to 81.7 dBA at 50 feet distance) and their corresponding acoustic usage factors provided by the FHWA RCNM noise model were used, as well as the corresponding appropriate shield factor that would apply for each worst-case NSA.

Table 4.11.2-7 shows the predicted noise impacts on the worst-case NSAs due to construction of each of the new compressor stations. Construction activities would take place for about 8 months for each compressor station during daytime (7:00 am to 7:00 pm) unless emergency or unforeseen circumstances would necessitate nighttime working hours; hence, noise levels are compared to measured daylight existing ambient noise at NSAs. As shown in the table, noise levels due to construction of the Bradshaw, Harris, and Stallworth Compressor Stations would not exceed the 55 dBA criterion. The increases over the existing ambient noise levels at the Bradshaw Compressor Station NSA 5 and the Harris Compressor Station NSA 3 would be 5.2 dBA and 6.2 dBA, respectively. These increases would be noticeable but the increase at the Stallworth Compressor Stations NSA 5 would be barely perceptible at a 0.4 dBA increase. These noise increases would be temporary and generally occurring during daytime; therefore, overall the potential noise impacts due to construction of the Mountain Valley Compressor Stations would be low.

TABLE 4.11.2-7

Predicted Sound Levels due to Compressor Station Construction for Mountain Valley Project

Comp. Station	**Worst-Case NSA a/**	**Distance (feet) and Direction from Compressor to NSA**	**Measured Existing Daytime Ambient at NSA (L_d dBA)**	**Estimated Shielding (dBA)**	**Construction Noise dBA L_d**	**Combined, Construction + Ambient (L_d dBA) b/**	**Increase Above Existing Ambient (dBA)**
Bradshaw	NSA 5	2,380 NE	46.4	2	50.1	51.6	5.2
Harris	NSA 3	1,965 SSE	48.7	0	53.7	54.9	6.2
Stallworth	NSA 5	1,340 SE	51.9	15	42.0	52.3	0.4

Source: SLR, 2015

Abbreviations:

E = East N = North W = West S = South

L_d = measured sound level averaged over daytime hours (7:00 am – 10:00 pm); construction activities would occur during daylight hours (7:00 am – 7:00 pm)

a/ The worst-case NSA for each compressor was used to estimate the station's construction noise impact.

b/ The combined noise levels resulting from construction activities and existing ambient were calculated using the following equation:

$SPL_{Total} = 10Log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and SPL_n represent the first, second, and n^{th} SPL, respectively

Other Mountain Valley Project Aboveground Facilities

Similar to construction activities for compressor stations, the earthmoving phase generates the highest noise during construction of other aboveground facilities. Table 4.11.2-8 shows the predicted worst-case noise levels at nearest NSAs during construction of the Mobley, Sherwood, WB, and Transco Interconnects. As shown in the table, the noise levels contributed by construction at the NSAs would be below the FERC noise criterion of 55 dBA. The temporary noise increases over the existing ambient noise levels at the NSAs would be negligible to barely perceptible; therefore, construction noise impact would be low.

TABLE 4.11.2-8

Predicted Sound Levels due to Meter Stations Construction for the Mountain Valley Project

Meter Station/ NSA a/	Distance (feet) and Direction from Meter Station	Existing Ambient Noise Levels (L_{dn} dBA)	Construction Noise (L_{dn} dBA)	Combined, Construction + Ambient (L_{dn} dBA) b/	Increase Above Existing Ambient (dBA)
Mobley Interconnect (Wetzel County, West Virginia)					
NSA-MI-1	560 ENE	55.6	42.8	55.8	0.2
NSA-MI-2	990 SW	57.9	16.5	57.9	0.0
Sherwood Interconnect (Harrison County, West Virginia)					
NSA-SW-1	950 SW	56.6	32.1	56.6	0.0
WB Interconnect (Braxton County, West Virginia)					
NSA-WB-1	720 N	47.9	33.1	48.0	0.1
Transco Interconnect (Pittsylvania County, Virginia)					
NSA TI-1	1040 NW	47.4	38.1	47.9	0.5

Source: SLR, 2016

Abbreviations:

E = East N = North W = West S = South

L_d = equivalent sound level (L_{eq}) averaged over daytime hours (7:00 am – 10:00 pm)

L_n = equivalent sound level (L_{eq}) averaged over nighttime hours (10:00 pm - 7:00 am)

L_{dn} = day-night equivalent sound level calculated using the following equation:

$$L_{dn} = 10*Log(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$$

a/ The worst-case NSA for each meter station was used to estimate the station's construction noise impact.

b/ The combined noise levels resulting from construction activities and existing ambient were calculated using the following equation:

$$SPL_{Total} = 10Log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and SPL_n represent the first, second, and n^{th} SPL, respectively

Jefferson National Forest

No compressor stations or other aboveground facilities would be located within the Jefferson National Forest. Noise impacts would be limited to construction equipment during installation of the underground pipeline. Impacts would be the same as discussed above for the MVP. Most pipeline construction noise would be localized, short-term, and temporary (lasting for a few days to several weeks at any given location), and no NSA would be expected to be exposed to significant noise levels for an extended period of time.

Horizontal Directional Drills

Equitrans would install the H-316 and H-318 (each 0.7 mile in length) pipelines using the HDD method to cross the South Fork Tenmile Creek and Monongahela River, respectively. HDD operations at the entry and exit locations would result in high noise levels at the source location. Table 4.11.2-9 shows a typical list of equipment that would be used for pipe installation by HDD and their corresponding noise levels at 50 feet.

TABLE 4.11.2-9

Horizontal Directional Drill Equipment and Sound Pressure Levels (SPL)

Construction Equipment	Number Operating at One Time	Noise Level at 50 feet (dBA) a/
Entry Point		
Drill rig & engine-driven hydraulic power unit	1	85
Engine-driven mud pump and engine-driven generator set	1	82
Generator	1	81
Air compressor	1	80
Crane, wheeled	1	83
Pump	1	77
Excavator	2	88
Estimated Combined Noise Level of All Equipment (dBA) b/		**92**
Exit Point		
Engine-driven mud pump and engine-driven generator set	1	82
Generator	1	81
Pump	1	77
Excavator/sideboom	2	88
Estimated Combined Noise Level of All Equipment (dBA) b/		**90**

Source: FHWA, 2006; TC, 2015

a/ The noise levels listed represent the A-weighted maximum sound level (L_{max}) (per equivalent equipment specifications provided in FHWA, 2006 measured at a distance of 50 feet from the equipment).

b/ Combined noise levels emitted by multiple equipment units is calculated using the equation:

$SPL_{Total} = 10Log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \dots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and SPL_n represent the first, second, and n^{th} SPL, respectively

Although Equitrans does not anticipate drilling during nighttime, for the purposes of this EIS, the noise impact analyses consider two HDD operation scenarios: (1) a 12-hour-per-day daytime work schedule (7:00 am – 7:00 pm); and (2) a worst-case 24-hour-per-day work schedule. The predicted noise levels were calculated based on the following conservative assumptions: all equipment operating continuously and simultaneously for the period assessed and no shield factor due to foliage or obstructions; and no usage factors were applied. The calculations used the NSAs' measured ambient noise levels shown in table 4.11.2-4. In addition, two noise mitigation options were provided for assessment:

- Option 1: Equip all combustion engines with a residential-grade exhaust muffler; this would reduce the resulting noise at the NSAs by about 10 dBA; and
- Option 2: Install a 16-foot-high temporary acoustical sound wall (Sound Transmission Class (STC)-25 acoustical barrier blanket, or equivalent); this would reduce the resulting noise at the NSAs by about 25 dBA.

Table 4.11.2-10 summarizes the total sound levels produced by the HDD equipment operations at the entry and exit locations for the H-316 pipeline and the resulting noise levels at the nearest NSAs for each HDD operation scenario and for each mitigation option. As shown in the table, without mitigation, noise levels attributable to HDD activities would exceed the 55 dBA limit. However, with Option 1 mitigation, noise levels would be below the limit for NSAs for daytime only operations. With Option 2 mitigation, noise levels would be below the limit for all NSAs for both 12-hour daytime and 24-hour per day operations.

On a 24-hour per day operation, the following impacts are anticipated: without mitigation, the change in noise levels at the NSAs would create a high impact (i.e., clearly noticeable), at increases over existing ambient noise ranging from 10.4 dBA to 27.0 dBA. With Option 1 mitigation applied, noise increases at NSAs indicate a low impact (i.e., slightly detectable) on Exit NSA-SW (3.3 dBA) and medium impact (i.e., moderately detectable) on all other NSAs (10.8 to 17.1 dBA). With Option 2 mitigation applied, noise increase impacts would be negligible on Exit NSA-SW (0.4 dBA), low impact on Entry NSA-W (3.2 dBA), and medium on all other NSAs (6.3 to 7.8 dBA).

On a 12-hour daytime work schedule, the following impacts are anticipated: without mitigation, the change in noise levels at the NSAs would cause low to high impact, at noise increases over ambient ranging from 3.3 dBA to 17.7 dBA. With Option 1 mitigation applied, noise increase impacts would be negligible on Exit NSA-SW (0.5 dBA), low impact on Entry NSA-W (3.5 dBA), and medium on all other NSAs (6.8 to 8.3 dBA). Option 2 mitigation would not be necessary as the 55 dBA criteria would already be met with the application of Option 1 mitigation.

TABLE 4.11.2-10

Estimated Noise Impact from HDD Activities for the South Fork Tenmile Creek Crossing

Mitigation	NSA	Distance (feet)	Existing Ambient at NSA (L_{dn}, dBA)	Estimated Max. Noise From HDD (L_{dn}, dBA) Daytime Only	Estimated Max. Noise From HDD (L_{dn}, dBA) 24-Hour	Combined Noise, Ambient + HDD (L_{dn}, dBA) a/ Daytime Only	Combined Noise, Ambient + HDD (L_{dn}, dBA) a/ 24-Hour	Increase Above Existing Ambient (dBA) Daytime Only	Increase Above Existing Ambient (dBA) 24-Hour
Entry									
Unmitigated	NSA-W	1,100	47.6	58.6	68.0	58.9	68.0	11	20.4
Option 1				48.6	58.0	51.1	58.4	3.5	10.8
Option 2				NR	48.0	NR	50.8	NR	3.2
Unmitigated	NSA-N	800	43.9	61.5	70.9	61.6	70.9	17.7	27.0
Option 1				51.5	60.9	52.2	61.0	8.3	17.1
Option 2				NR	50.9	NR	51.7	NR	7.8
Unmitigated	NSA-E	1,100	42.3	58.6	68.0	58.7	68.0	16.4	25.7
Option 1				48.6	58.0	49.5	58.1	7.2	15.8
Option 2				NR	48.0	NR	49.0	NR	6.7
Exit									
Unmitigated	NSA-N	800	40.7	56.5	65.9	56.6	65.9	15.9	25.2
Option 1				46.5	55.9	47.5	56.0	6.8	15.3
Option 2				NR	45.9	NR	47.0	NR	6.3
Unmitigated	NSA-SW	1,400	50.8	51.4	60.8	54.1	61.2	3.3	10.4
Option 1				41.4	50.8	51.3	53.8	0.5	3.0
Option 2				NR	40.8	NR	51.2	NR	0.4

Source: TC, 2015
Abbreviations:
dBA = A-weighted decibel
E = East N = North W = West S = South
NR = Not Required
L_{eq} = equivalent sound level averaged over daytime hours (7:00 am – 7:00 pm) or nighttime hours (7:00 pm - 7:00 am)
L_{dn} = day-night equivalent sound level calculated using the following equation:

$L_{dn} = 10*Log(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$

a/ The combined noise levels resulting from HDD operations and existing ambient were calculated using the following equation:

$SPL_{Total} = 10Log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \dots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and … SPL_n represent the first, second, and n^{th} SPL, respectively

Table 4.11.2-11 summarizes the total sound levels produced by HDD equipment operations at the entry and exit locations for the H-318 pipeline and the resulting noise levels at the nearest NSAs for each HDD operation scenario and for each mitigation option. The table shows that without mitigation, the noise levels attributable to HDD activities at all NSAs sites would exceed the 55 dBA limit. With Option 1 mitigation, noise levels at NSA-W (Entry) and NSA-SW (Exit) would still be above the limit for both 12-hour daytime and 24-hour per day operations. With

Option 2 mitigation, noise levels at all NSAs for 12-hour daytime operations would be below the limit. However, for 24-hour–per-day operations, Option 1 and Option 2 mitigation would need to be implemented at Entry NSA-W and Exit NSA-S to meet our 55 dBA noise level criterion.

TABLE 4.11.2-11

Estimated Noise Impact from HDD Activities at the H-318 Pipeline Monongahela River Crossing

Mitigation	NSA	Distance (feet)	Existing Ambient at NSA (L_{dn} dBA)	Estimated Max. Noise From HDD (L_{dn}, dBA) Daytime Only	24-Hour	Combined Noise, Ambient + HDD (L_{dn} dBA) a/ Daytime Only	24-Hour	Increase above Existing Ambient (dBA) Daytime Only	24-Hour
Entry									
Unmitigated	NSA-W	200	51.0	73.2	82.6	73.2	82.6	22.2	31.6
Option 1				63.2	72.6	63.5	72.6	12.5	21.6
Option 2				53.2	62.6	55.2	62.9	4.2	11.9
Option 1 & 2				NR	52.6	NR	54.9	NR	3.9
Exit									
Unmitigated	NSA-N1	900	43.9	55.4	64.8	55.7	64.8	11.8	20.9
Option 1				45.4	54.8	47.7	55.1	3.8	11.2
Option 2				35.4	44.8	44.5	47.4	0.6	3.5
Option 1 & 2				NR	34.8	NR	44.4	NR	0.5
Unmitigated	NSA-N2	500	48.8	60.6	70	60.9	70.0	12.1	21.2
Option 1				50.0	60	52.5	60.3	3.7	11.5
Option 2				40.6	50	49.4	52.5	0.6	3.7
Option 1 & 2				NR	40	NR	49.3	NR	0.5
Unmitigated	NSA-S	200	51.8	68.9	78.3	69.0	78.3	17.18	26.5
Option 1				58.9	68.3	59.7	68.4	7.9	16.6
Option 2				48.9	58.3	53.6	59.2	1.8	7.4
Option 1 & 2				NR	48.3	NR	53.4	NR	1.6

Source: TC, 2015

Abbreviations:

dBA = A-weighted decibel

E = East N = North W = West S = South

NR = Not Required

L_{eq} = equivalent sound level averaged over daytime hours (7:00 am – 10:00 pm) or nighttime hours (10:00 pm - 7:00 am)

L_{dn} = day-night equivalent sound level calculated using the following equation:

$L_{dn} = 10*\text{Log}(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$, or to simplify: $L_{dn} = L_{eq} + 6.4$ dBA

a/ The combined noise levels resulting from HDD operations and existing ambient were calculated using the following equation:

$SPL_{Total} = 10\text{Log}_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and … SPL_n represent the first, second, and n^{th} SPL, respectively

On a 24-hour per day operation, the following impacts are anticipated: without mitigation, the change in noise levels would create high impact on all NSAs, at increases ranging from 20.9 dBA to 31.6 dBA. With Option 1 mitigation applied, noise increases at NSAs also indicate high impact on all NSAs, at increases ranging from 11.2 dBA to 21.6 dBA. With Option 2 mitigation applied, noise increase impacts would be low on Exit NSA-N1 (3.5 dBA) and Exit NSA-N2 (3.7 dBA), medium on Exit NSA-S (7.4 dBA), and high on Entry NSA-W (11.9 dBA). Implementation of Options 1 and 2 would result to low impact on Entry NSA-W and negligible impact on all other NSAs (0.5 to 1.6 dBA).

On a 12-hour daytime work schedule, the following impacts are anticipated: without mitigation, the change in noise levels at the NSAs would create high impact on all NSAs, at increases ranging from 11.8 dBA to 22.2 dBA. With Option 1 mitigation applied, noise increase impacts would be low on Exit NSA-N1 (3.8 dBA) and Exit NSA-N2 (3.7 dBA), medium on Exit NSA-S (7.9 dBA), and high on Entry NSA-W (12.5 dBA). With Option 2 mitigation applied, there would be low impact on Entry NSA-W (4.2 dBA) and negligible impact on all the other NSAs (0.6 to 1.8 dBA).

However, because the HDD noise levels would exceed 10 dB at most locations and it is unknown whether 24-hour operation would be required at this time, **we recommend that:**

- **Prior to construction of the South Fork Tenmile Creek and Monongahela River HDD crossings, Equitrans should file with the Secretary, for the review and written approval by the Director of OEP, an HDD noise mitigation plan to reduce the projected noise level increase attributable to the proposed drilling operations at the NSAs. During drilling operations, Equitrans should implement the approved plan, monitor noise levels, include noise levels in weekly reports to the FERC, and make all reasonable efforts to restrict the noise attributable to the drilling operations to no more than a 10 dBA increase over ambient noise levels at the NSAs.**

In section 4.3, we are recommending Mountain Valley use the HDD method to cross the Pigg River. Depending on the construction equipment used, HDD operations at the entry and exit locations could result in high noise levels at the source location (estimated for the EEP in table 4.11.2-9 to be 90 to 92 dBA at 50 feet). Furthermore, because the distances from the entry and exit locations to the NSAs and the NSAs' associated baseline ambient noise levels have not been assessed, the resulting noise impacts cannot be determined. Consequently, **we recommend that:**

- **Prior to construction of the Pig River HDD crossing, Mountain Valley should file with the Secretary an HDD noise analysis identifying the existing and projected noise levels at each NSA within 0.5 mile of the HDD entry and exit site. If noise attributable to the HDD is projected to exceed a day-night L_{dn} of 55 dBA at any NSA, Mountain Valley should file with the noise analysis a mitigation plan to reduce the projected noise levels for the review and written approval by the Director of OEP. During drilling operations, Mountain Valley should implement the approved plan, monitor noise levels, and make all reasonable efforts to restrict the noise attributable to the drilling operations to no more than an L_{dn} of 55 dBA at the NSAs.**

Equitrans Expansion Project Compressor Station

The CadnaA noise model was used to estimate noise impacts at the NSAs for the Equitrans' Redhook Compressor Station. Except for NSA 3 (animal hospital), all NSAs considered for this EIS are residential. CadnaA is a sophisticated software program that enables noise modeling of complex industrial sources using sound propagation factors as adopted by ISO 9613.[152] The modeling process included the following steps: (1) characterizing the noise sources, (2) creating three-dimensional maps of the site and vicinity to enable the model to evaluate effects of distance and topography on noise attenuation, and (3) assigning the equipment sound levels to appropriate on-site proposed facility locations. The atmospheric absorption used for the CadnaA model was estimated for conditions of 10 °C, 70 percent relative humidity, and wind speed of 3 meters per second (m/s) (i.e., conditions that favor propagation). Topographic cross sections were constructed to calculate sound levels in the proposed facility vicinity using CadnaA.

We expect that the noisiest construction stage for the EEP would occur during the early earthmoving phase. Equitrans included the following equipment list, assumed to operate simultaneously, during the earthmoving phase: two air compressors, two backhoes, three bobcats, one vibratory compactor, three dozers, one front end loader, two excavators, four generators, two rollers, and two trackhoes. Except for the bobcat, the default L_{max} of these equipment (ranging from 78 dBA to 82 dBA at 50 feet distance) provided by the FHWA RCNM noise model were used in the CadnaA model data input. The measured sound pressure level from a previous project was used for the bobcat (64 dBA at 50 feet).

Table 4.11.2-12 shows the predicted noise levels at each NSA. Construction activities for the compressor station would take place for about 15 months during daytime (7:00 am to 7:00 pm). As shown in the table, the noise levels contributed by construction would be below the FERC noise criterion of 55 dBA, except at NSA 4 (59.6 dBA). The combined construction noise and existing noise levels at NSA 2 (56.6 dBA) and NSA 4 (67.4 dBA) would be higher than 55 dBA due to the existing ambient noise at NSA 2 (56.1 dBA) and NSA 4 (66.6 dBA); however, the noise increase over the existing ambient would be minimal (less than 1 dBA). Temporary noise level increases of less than 1 dBA at NSA 1, NSA 2, and NSA 4 due to construction of the Redhook Compressor Station would be considered negligible. The temporary increase of 6.4 dBA noise level at NSA 3 would be noticeable; however, the overall intensity would still be below the 10 dBA L_{dn} increase over ambient criterion. Therefore, temporary noise impacts due to construction of the Redhook Compressor Station would be considered low.

[152] ISO has established internationally recognized standard methods for calculating noise attenuation through the atmosphere.

TABLE 4.11.2-12					
Predicted Sound Levels due to Redhook Compressor Station Construction					
NSA	**Distance and Direction from Compressor to NSA (feet)**	**Measured Existing Ambient at NSA (L_{dn} dBA)**	**Construction Noise (L_{dn} dBA)**	**Combined, Construction + Ambient (L_{dn} dBA) a/**	**Increase Above Existing Ambient (dBA)**
NSA 1	3,300 SW	50.5	44.1	51.4	0.9
NSA 2	2,300 SW	56.1	47.4	56.6	0.5
NSA 3	1,900 NW	47.3	52.6	53.7	6.4
NSA 4	850 E	66.6	59.6	67.4	0.8

Source: TC, 2015

Abbreviations:

dBA = A-weighted decibel

E = East N = North W = West S = South

L_{dn} = day-night equivalent sound level calculated using the following equation:

$L_{dn} = 10*Log(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$

Notes:

a/ The combined noise levels resulting from construction activities and existing ambient were calculated using the following equation:

$SPL_{Total} = 10Log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and … SPL_n represent the first, second, and n^{th} SPL, respectively

Other Equitrans Expansion Project Aboveground Facilities

Table 4.11.2-13 shows the predicted worst-case noise levels at NSAs during construction of Mobley Tap and Webster Interconnect. As shown in the table, the noise levels contributed by construction would exceed the FERC noise criterion of 55 dBA. Temporary noise level increases over the existing ambient at NSA-WI-1 and NSA-MT-3 would be moderate, while noise level increases at NSA-MT-1 and NSA-MT-2 would be high. However, these noise increases would be temporary and generally occurring during daytime. Construction activities for the Mobley Tap and the Webster Interconnection would take about 10 months.

TABLE 4.11.2-13

Predicted Sound Levels due to Construction of the Mobley Tap and Webster Interconnect

NSA	Distance and Direction from Facility to NSA (feet)	Measured Existing Ambient at NSA (L_{dn} dBA)	Construction Noise (L_{dn} dBA) a/	Combined, Construction + Ambient (L_{dn} dBA) b/	Increase Above Existing Ambient (dBA)
Mobley Tap (located in Grant District, Wetzel County, West Virginia)					
NSA-MT-1	275 E	45.0	68.6	68.6	23.6
NSA-MT-2	732 SW	45.0	59.8	59.9	14.9
NSA-MT-3	1,100 NE	45.0	56.1	56.4	11.4
Webster Interconnect (located in Wetzel County, West Virginia)					
NSA-WI-1	1,225 S	45.0	55.0	55.4	10.4

Source: TC, 2015

Abbreviations:

dBA = A-weighted decibel

E = East N = North W = West S = South

L_{dn} = day-night equivalent sound level calculated using the following equation:

$L_{dn} = 10*Log(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$

Notes:

a/ Extrapolated noise level based on a maximum sound power level[153] L_{dn} of 118.2 dBA from earthmoving phase for 12 daylight hours.

b/ The combined noise levels resulting from construction activities and existing ambient were calculated using the following equation:

$SPL_{Total} = 10Log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and … SPL_n represent the first, second, and n^{th} SPL, respectively

Pratt Compressor Station Decommissioning

The existing Pratt Compressor Station would be demolished once construction of the Redhook Compressor Station has been completed. Demolition activities would occur only during daytime for a period of about 8 months, and equipment would be similar to that used during construction of the Redhook Compressor Station. Construction noise levels could be above the FERC noise criterion of 55 dBA L_{dn}. However, it is expected that temporary noise level increases over existing ambient would be low, since existing ambient would account for operation of the Pratt Compressor Station. Furthermore, the noise increase would be temporary and occurring during daytime only.

Construction Mitigation Measures

As discussed above, the majority of construction activities for the MVP and the EEP would be conducted during daytime to minimize noise impacts on NSAs. If blasting would be necessary,

153 Sound power is a property of the source and remains independent of the factors influencing sound pressure (Caltrans, 2009). The maximum sound power level of an object is the amount of sound power it is capable of radiating; it is based on the specific object and does not take into account its surroundings.

it would be conducted according to an approved project blasting plan and only after nearby residents are notified.

Mountain Valley has developed a landowner resolution process protocol to address issues raised by landowners and community members during the project construction and post-construction phases, by using a 24-hour toll free phone line or email submission. We have included a recommendation in section 4.8.2 that Mountain Valley include additional measures to this protocol. This protocol would be used to handle and address noise complaints. A Mountain Valley representative would be available to receive calls and help address noise issues. If noise issues could not be resolved by the hotline representative, the complaint would be directed to the appropriate right-of-way agent and the call would be returned within 3 days. Mountain Valley would document all noise complaints and actions taken to resolve the issues.

Equitrans does not at this time anticipate the need to conduct blasting activities during HDD installation at South Fork Tenmile Creek and Monongahela River. However, should blasting become necessary, Equitrans has committed to use one or both mitigation option(s), where appropriate as analyzed above, so as not to exceed the 55 dBA limit. These mitigation measures include equipping each combustion engine with a residential-grade exhaust muffler and installing a 16-foot high temporary acoustical sound wall. Each option was evaluated for effectivity on reducing noise impacts on each NSA for the entry and exit points of the HDD lines based on a 24-hour per day and a daytime only operations. Should Equitrans receive noise complaints during construction, Equitrans would assess the need for temporary relocation of affected landowners while noise impacts from construction are high.

Operational Impacts and Mitigation

Pipeline and Mainline Valves Operations

Normal operations noise from the pipeline and MLVs would be expected to be negligible as they would be buried underground. The only potential sound level increases associated with operation of the MVP and the EEP pipelines and MLVs would be indirect noise from vehicle and equipment use during maintenance and inspection activities. However, these activities would be transient, temporary, and not significantly more audible than normal vehicle traffic at the nearest NSAs along the pipeline right-of-way.

Mountain Valley Project Compressor Stations

Noise from each of the MVP compressor stations (Bradshaw, Harris, and Stallworth) would be generated from continuous operation of the equipment listed in section 4.11.1.3 (see "Operations Emissions" subsection). The increase in noise would be sustained for the life of the project. The CadnaA noise model was used to estimate noise impacts at the NSAs for each compressor station.

The data used for modeling included available data from equipment manufacturers and noise level measurements from other similar compressor stations. The models assumed an exhaust height of 50 feet per the planned turbine installations and vendor proposal. Certain noise mitigation measures, such as compressor building walls, roof, doors, and ventilation; turbine exhaust, intake silencers, and breakouts; blowdown silencers; underground suction and discharge piping; and acoustically lagged aboveground main gas piping, were included as part of the noise modeling. All three greenfield compressor stations (meaning built in an area where pipelines and associated aboveground facilities do not currently exist) would be located in areas with foliage ranging from grass and crops to areas of dense woods. For a conservative assumption, no foliage shield factor was applied. Existing ambient noise at NSAs were measured (results shown in table 4.11.2-1) and used in the noise model development.

The noise model considered three operational scenarios: (1) during a typical compressor station operations, (2) during a short-term maintenance blowdown, and (3) during a short-term emergency shutdown (ESD). A typical operating scenario involves noise levels generated by all equipment necessary during a normal compressor station operations. A maintenance blowdown scenario occurs when a unit is shut down for an extended period. It entails releasing of high pressure gas in the system in a controlled fashion (through a blowdown silencer) causing a temporary increase of noise level lasting approximately 5 minutes. An ESD blowdown occurs when an ESD system senses irregularity in a compressor station's operation and automatically shuts down the whole station causing elevated noise due to the release of gas from all of the station's piping through a series of silencers. Each blowdown silencers would be designed to limit the maximum sound level due to a unit blowdown event to less than 75 dBA at 50 feet during a maintenance blowdown and 85 dBA at 50 feet during an ESD blowdown.

Table 4.11.2-14 summarizes modeled noise impacts on worst-case NSAs due to operation of the Bradshaw, Harris, and Stallworth Compressor Stations for each operating scenario. As shown in the table, noise levels at each worst-case NSA due to typical compressor station operation would be below our noise limit of 55 dBA for all compressor stations. Noise increases over the existing ambient noise levels would be barely noticeable and ranging from 0.1 dBA to 3 dBA.

During a maintenance blowdown event, worst-case predicted noise levels (i.e., during nighttime) at the worst-case NSAs would be below the 55 dBA limit. Noise increases above the existing nighttime ambient noise level would be clearly noticeable at 8.7 dBA and 5.4 dBA for the Bradshaw and Harris Compressor Stations, respectively. Maintenance blowdowns and the associated elevated noise levels would be short-term (lasting for about 5 minutes) and would only cause minor impacts at worst-case NSAs.

During an ESD blowdown event at the Bradshaw and Stallworth Compressor Stations, worst-case predicted noise levels (i.e., during nighttime) at the respective NSAs would be below the 55 dBA limit. During an ESD blowdown event at the Harris Compressor Station worst-case predicted noise level at the respective NSA (NSA 3) would slightly exceed the limit. Noise increases above the existing nighttime ambient at the NSAs for the Bradshaw and Harris Compressor Stations would be clearly noticeable at 20.1 dBA and 17.2 dBA increases, respectively. Noise increase at the NSA for the Stallworth Compressor Station would be slightly detectable. These noise level increases would be short-term, rare (occurring only during emergency situations or during a pre-scheduled testing period) and unavoidable; therefore, noise impacts for this scenario would range from low to medium.

TABLE 4.11.2-14

Predicted Sound Levels due to Compressor Station Operations for Mountain Valley Project

Comp. Station	Worst-case NSA a/	Distance and Direction from Compressor to NSA (feet)	Measured Existing Ambient at NSA (L_{dn} dBA)	Operations Noise dBA L_{eq}	Operations Noise dBA L_{dn}	Combined, Operations + Ambient (L_{dn} dBA) b/	Increase Above Existing Ambient (dBA)
Typical Operations Scenario							
Bradshaw	NSA 5	2,380 NE	45.8	37.7	44.1	48.0	2.2
Harris	NSA 3	1,965 SSE	48.5	42.1	48.5	51.5	3.0
Stallworth	NSA 5	1,340 SE	54.1	33.0	39.4	54.2	0.1
Maintenance Blowdown Operation Scenario							
Bradshaw	NSA 5	2,380 NE	34.6 c/	42.7	NA	43.3	8.7
Harris	NSA 3	1,965 SSE	38.2 c/	42.1	NA	43.6	5.4
Stallworth	NSA 5	1,340 SE	46.3 c/	37.0	NA	46.8	0.5
ESD Blowdown Operation Scenario							
Bradshaw	NSA 5	2,380 NE	34.6 c/	54.7	NA	54.7	20.1
Harris	NSA 3	1,965 SSE	38.2 c/	55.3	NA	55.4	17.2
Stallworth	NSA 5	1,340 SE	46.3 c/	49.4	NA	51.1	4.8

Source: SLR, 2015

Abbreviations:

E = East N = North W = West S = South

NA = Not Applicable

L_{eq} = equivalent sound level averaged over daytime hours (7:00 am – 10:00 pm) or nighttime hours (10:00 pm - 7:00 am)

L_{dn} = day-night equivalent sound level calculated using the following equation:

$L_{dn} = 10*\text{Log}(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$, or to simplify: $L_{dn} = L_{eq} + 6.4$ dBA

a/ The worst-case NSA for each compressor station was used to estimate the station's operation noise impact.

b/ The combined noise levels resulting from compressor station operations and existing ambient were calculated using the following equation:

$SPL_{Total} = 10\text{Log}_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and … SPL_n represent the first, second, and n^{th} SPL, respectively

c/ For blowdown noise impact analyses, average nighttime L_{eq} noise levels were used to compare with noise produced during a blowdown event to show potential loudest impact on each NSA.

Regarding the potential for facility operations to result in vibration at nearby NSAs, Mountain Valley conducted an analysis of the impacts of low and medium frequency [154] noise at each of the compressor stations to assess the potential to perceive operational vibration at nearby NSAs (see table 4.11.12-15). The ANSI S12.2-2008 Criteria for Evaluating Room Noise concludes that sounds at frequencies of 31.5 Hz and 63 Hz at or above 65 dB and 70 dB, respectively, could result in perceptible vibration in structures with lightweight walls and ceilings. As shown in the table, the estimated noise at 31.5 Hz and 63 Hz for all NSAs would not exceed the 65 dB and 70 dB criteria.

[154] Frequency is the number of times sound fluctuation occurs measured in cycles per second called Hertz (Hz). Human hearing covers the frequency range of 20 Hz to 20,000 Hz (FTA, 2006).

TABLE 4.11.2-15

Low-Frequency Noise (Vibration) Attributable to Mountain Valley Project Compressor Station Operations

Compressor Station	Worst-Case NSA a/	Measured Existing Ambient at NSA (dB)		Operations Noise (dB)		Combined, Operations + Ambient (dB) b/, c/		Increase Above Existing Ambient (dB)	
		31.5 Hz	63 Hz	31.5 Hz	63 Hz	31.5 Hz	63 Hz	31.5 Hz	63 Hz
Bradshaw	NSA 5	46.8	42.4	61.1	59.8	61.3	59.9	14.5	17.5
Harris	NSA 3	44.6	44.6	59.6	61.8	59.7	61.9	15.1	17.3
Stallworth	NSA 5	57.5	56.5	52.5	53.1	58.7	58.1	1.2	1.6

Source: SLR, 2016

Abbreviations:

dB = Unweighted decibel; i.e., based on standard reference sound pressure of 20 micro Pascal (µPa)

Notes:

a/ The worst-case NSA for each compressor was used to estimate the station's operation noise impact.

b/ All levels shown are unweighted 24-hour averages.

c/ The combined noise levels resulting from operations and existing ambient were calculated using the following equation:

$SPL_{Total} = 10Log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and … SPL_n represent the first, second, and n^{th} SPL, respectively

All noise levels in the table are presented in terms of unweighted dBs so they can be compared with the ANSI standards. The A-weighted noise level is approximately 39.4 dB less than the unweighted dB level for a spectrum peak of 31.5 Hz (low frequency) and approximately 26.2 dB less than the dB level for a spectrum peak at63 Hz (mid-frequency) (ETB, 2016). The highest resulting noise levels at 31.5 Hz and 63 Hz would occur at NSA 5 (Bradshaw) with noise levels at 61.3 dB and 59.9 dB. For A-weighted equivalents, these levels would be about 21.9 dBA and 33.7 dBA, which are very quiet sound levels.

To ensure that the actual noise levels resulting from operation of the compressor stations comply with our noise guidelines and do not result in significant noise impacts, **we recommend that:**

- **Mountain Valley should file noise surveys with the Secretary no later than 60 days after placing the equipment at the Bradshaw, Harris (including the WB Interconnect), and Stallworth Compressor Stations into service. If full load condition noise surveys are not possible, Mountain Valley should provide interim surveys at the maximum possible horsepower load within 60 days of placing the equipment into service and provide the full load survey within 6 months. If the noise attributable to the operation of all of the equipment at each station under interim or full horsepower load exceeds an L_{dn} of 55 dBA at the nearest NSA, Mountain Valley should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. Mountain Valley should confirm compliance with the above requirement by filing a second noise survey with the Secretary for each station no later than 60 days after it installs the additional noise controls.**

Other Mountain Valley Project Aboveground Facilities

Noise from the associated meter stations would be generated mainly by flow control valves, two of which would be installed each at the Mobley, Sherwood, and WB Interconnects; and four installed at the Transco Interconnect. The increase in sound would be for the life of the project. Table 4.11.2-16 shows the predicted operational worst-case noise levels at the nearest NSAs. As shown in the table, the noise levels contributed by operations of the interconnects would not exceed the FERC noise criterion of 55 dBA. Noise level increases over the existing ambient at NSAs would be negligible to barely perceptible.

TABLE 4.11.2-16

Predicted Sound Levels due to Meter Stations Operations for Mountain Valley Project

Meter Station/ NSA a/	Distance (feet) and Direction from Meter Station	Existing Ambient Noise Levels (L_{dn} dBA)	Operations Noise (L_{dn} dBA)	Combined, Operations + Ambient (L_{dn} dBA) b/	Increase Above Existing Ambient (dBA)
Mobley Interconnect (Wetzel County, West Virginia)					
NSA-MI-1	560 ENE	55.6	42.8	55.8	0.2
NSA-MI-2	990 SW	57.9	16.5	57.9	0.0
Sherwood Interconnect (Harrison County, West Virginia)					
NSA-SW-1	950 SW	56.6	32.1	56.6	0.0
WB Interconnect (Braxton County, West Virginia)					
NSA-WB-1	720 N	47.9	33.1	48.0	0.1
Transco Interconnect (Pittsylvania County, Virginia)					
NSA TI-1	1,040 NW	47.4	40.5	48.2	0.8

Source: SLR, 2016

Abbreviations:

E = East N = North W = West S = South

L_d = equivalent sound level (L_{eq}) averaged over daytime hours (7:00 am – 10:00 pm)

L_n = equivalent sound level (L_{eq}) averaged over nighttime hours (10:00 pm - 7:00 am)

L_{dn} = day-night equivalent sound level calculated using the following equation:

$L_{dn} = 10*Log(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$

a/ The worst-case NSA for each meter station was used to estimate the station's operation noise impact.

b/ The combined noise levels resulting from compressor station operations and existing ambient were calculated using the following equation:

$SPL_{Total} = 10Log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and … SPL_n represent the first, second, and n^{th} SPL, respectively

Jefferson National Forest

No compressor stations or other aboveground facilities would be located within the Jefferson National Forest. Therefore, noise impacts during operation of the MVP would be limited to the buried underground pipeline. The pipeline is not expected to generate noise within the Jefferson National Forest.

Combined Noise Impacts – Harris Compressor Station and WB Interconnect

As stated in section 4.11.1.2 (under the subtitle New Source Review/Prevention of Significant Deterioration/Nonattainment New Source Review) regarding source aggregation, the WB Interconnect would be located adjacent to and are deemed one stationary source with the proposed Harris Compressor Station compressor. Similarly for noise impact analysis, the combined projected noise generated by the compressor station and the interconnect were calculated to compare with the 55 dBA noise limit, as well as to assess impacts of the resulting noise increases at the nearest NSAs. Table 4.11.2-17 shows the predicted combined worst-case noise levels due to operations of the Harris Compressor Station and WB Interconnect at the nearest NSAs. As shown in the tables, the combined noise levels would not exceed the FERC noise criterion of 55 dBA. Noise level increases over the existing ambient at NSAs would be negligible to barely perceptible.

TABLE 4.11.2-17

Predicted Sound Levels due to Combined Noise from Harris Compressor Station and WB Interconnect

Station / NSA a/	Distance (feet) and Direction from Meter Station	NSA Existing Ambient Noise Levels (L_{dn} dBA)	Operations Noise (L_{dn} dBA)	Combined, Operations + Ambient (L_{dn} dBA) b/	Increase Above Existing Ambient (dBA)
Harris/NSA-1	720 N	47.9	39.9	48.7	0.8
WBI/NSA-1	1,445 N		33.1		
Harris/NSA-3	2,500 SSE	48.5	48.5	51.6	3.1
WBI/NSA-2	1,965 SSE		33.2		
Harris/NSA-4	3,340 WSW	55.3	43.0	55.5	0.2
WBI/NSA-3	4,100 WSW		19.1		

Source: SLR, 2015; 2016

Abbreviations:

E = East N = North W = West S = South

L_d = equivalent sound level (L_{eq}) averaged over daytime hours (7:00 am – 10:00 pm)

L_n = equivalent sound level (L_{eq}) averaged over nighttime hours (10:00 pm - 7:00 am)

L_{dn} = day-night equivalent sound level calculated using the following equation:

$$L_{dn} = 10*Log(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$$

a/ The worst-case NSA for each meter station was used to estimate the station's operation noise impact.

b/ The combined noise levels resulting from compressor station operations and existing ambient were calculated using the following equation:

$$SPL_{Total} = 10Log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and … SPL_n represent the first, second, and n^{th} SPL, respectively

In order to ensure that the actual noise levels produced at the Harris Compressor Station and the WB Interconnect would not cause significant impacts on nearby NSAs, we have included a recommendation above for Mountain Valley to file a noise survey.

Equitrans Expansion Project Compressor Station

Noise from the Redhook Compressor Station would be generated from continuous operations of the equipment identified in section 4.11.1.3 (see "Operations Emissions" subsection). The increases in noise would occur for the life of the project. The CadnaA noise model was used to estimate noise impacts at the NSAs near the Redhook Compressor Station.

Noise data inputs include acoustical data provided by equipment manufacturers and from sound power levels obtained from manufacturer's technical datasheets. Noise point sources include stacks, compressor building sidewall intakes, turbine building sidewall exhausts, and blowdown vents during normal unit shutdown; area sources include walls (vertical), roof, and roof top ventilator; and line sources include noise radiating from pipelines. Noise losses due to certain noise mitigation measures (such as compressor and turbine buildings walls and roof insulation, silencers for turbines, microturbines, and engines air intake and exhaust systems, silencers for pneumatic starting systems, and blowdown vents, aboveground piping insulation, and outdoor valve removable acoustical lagging cover) were accounted for in the noise models. Land uses adjacent to the compressor site are: (1) properties used for a communication tower and another compressor station to the north, (2) about 600 feet of forest cover to the south west, and (3) the Jefferson Road and some grassland to the southeast (see figure 4.11.2-4). The nearest NSA is a residential area (NSA 4) 800 feet to the east.

Table 4.11.2-18 shows a summary of predicted noise impacts on the NSAs as calculated through the noise model due to operations of the Redhook Compressor Station. As shown in the table, the noise levels contributed by construction would be below the FERC noise criterion of 55 dBA. The combined construction noise and existing noise levels at NSA 4 (66.7 dBA) would be above 55 dBA, due to the existing ambient noise at NSA 4 (66.6 dBA); however, noise increase over the existing ambient would be minimal at 0.1 dBA. Noise level increases of less than 3 dBA at all NSAs due to construction of the Redhook Compressor Station would be considered barely detectable. Therefore, noise impacts due to operation of the Redhook Compressor Station would be considered low.

The Redhook Compressor Station would be located in Franklin Township, which has a specific ordinance on allowable maximum noise levels, as shown in table 4.11.2-6. These noise limits are as measured at the noise source's property line and vary with sound frequency. The land uses of the properties adjacent to the Redhook Compressor Station are as follows: communications tower and a compressor station to the north; more than 600 feet of forest cover from the property line to the southwest; and Jefferson Road and some open grass fields to the southeast. As described, the land uses of the adjacent properties are not considered "noise sensitive," such as residential houses, schools, church, or hospitals.

TABLE 4.11.2-18

Predicted Sound Levels due to Redhook Compressor Station Operations for Equitrans Expansion Project

NSA	Distance (feet) and Direction from Compressor to NSA	Measured Existing Ambient at NSA (L_{dn} dBA)	Operations Noise (L_{dn} dBA)	Combined, Operations + Ambient (L_{dn} dBA) a/	Increase Above Existing Ambient (dBA)
NSA 1	3,300 SW	50.5	37.3	50.7	0.2
NSA 2	2,300 SW	56.1	40.4	56.2	0.1
NSA 3	1,900 NW	47.3	46.2	49.8	2.5
NSA 4	850 E	66.6	51.2	66.7	0.1

Source: TC, 2015

Abbreviations:

E = East N = North W = West S = South

L_{dn} = day-night equivalent sound level

a/ The combined noise levels resulting from operations and existing ambient were calculated using the following equation:

$SPL_{Total} = 10Log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and … SPL_n represent the first, second, and n^{th} SPL, respectively

For the sake of comparing the project's predicted noise levels with Franklin Township's noise limits, table 4.11.2-19 shows a summary of predicted noise impacts on adjacent properties due to operation of the Redhook Compressor Station, calculated through CadnaA noise model. As shown in the table, noise limits would be exceeded at each property line for some frequency ranges. However, because the Franklin Township noise ordinance does not relate to FERC's noise criterion of 55 dBA L_{dn} as project-related noise limit that would impact NSAs, the ordinance limits were not used in the noise impacts assessments.

TABLE 4.11.2-19 **Predicted Sound Levels due to Operations of the Redhook Compressor Station Compared to Franklin Township Noise Limits**									
Octave Bands (Hz)	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Franklin Township Noise Limits at Property Line									
dB	60	60	60	60	40	40	40	30	30
dBA	20.6	34.0	44.0	51.0	37.0	40.0	41.0	31.0	29.0
Sound Levels at Property Lines (dBA)									
North a/	ND	ND	41.4	42.0	*43.9*	*47.3*	*45.9*	*44.9*	28.3
Southwest a/	ND	ND	*49.5*	50.3	*52.1*	*55.4*	*58.2*	*63.5*	*59.2*
Southeast a/	ND	ND	37.7	37.8	*39.8*	*43.6*	*42.4*	*40.8*	19.7

Source: TC, 2015
Abbreviations:
dB = Unweighted decibel; i.e., based on standard reference sound pressure of 20 micro Pascal (µPa)
dBA = A-weighted decibel
ND = No data
a/ Sound levels in *italics* indicate exceeding the limits.

In order to ensure that the actual noise levels produced at the Redhook Compressor Station would not cause significant impacts on nearby NSAs, **we recommend that:**

- **Equitrans should file a noise survey with the Secretary no later than 60 days after placing the Redhook Compressor Station into service. If a full load condition noise survey is not possible, Equitrans should provide an interim survey at the maximum possible horsepower load within 60 days of placing the Redhook Compressor Station into service and provide the full load survey within 6 months. If the noise attributable to operation of the equipment at the Redhook Compressor Station exceeds an L_{dn} of 55 dBA at the nearest NSA, Equitrans should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. Equitrans should confirm compliance with the above requirement by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.**

Other Equitrans Expansion Project Aboveground Facilities

Noise from the Mobley Tap and the Webster Interconnect would be generated mainly by the flow control valves. The increases would occur for the life of the project. Table 4.11.2-20 shows the predicted worst-case noise levels at NSAs during operation of the Mobley Tap and the Webster Interconnect. As shown in the table, the noise levels contributed by operations of these facilities would not exceed the FERC noise criterion of 55 dBA. Noise level increases over the existing ambient noise at NSA-MT-1 would be moderately noticeable while noise level increases at NSA-MT-2 and NSA-MT-3 would be negligible.

TABLE 4.11.2-20 **Predicted Sound Levels due to Operations of the Mobley Tap and Webster Interconnect**					
NSA	**Distance (feet) and Direction from Facility to NSA**	**Measured Existing Ambient at NSA (L_{dn} dBA)**	**Operations Noise (L_{dn} dBA) a/**	**Combined, Operations + Ambient (L_{dn} dBA) b/**	**Increase Above Existing Ambient (dBA)**
Mobley Tap (located in Grant District, Wetzel County, West Virginia)					
NSA-MT-1	275 E	45.0	52.0	52.8	7.8
NSA-MT-2	732 SW	45.0	43.4	47.3	2.3
NSA-MT-3	1,100 NE	45.0	39.3	46.2	1.2
Webster Interconnect (located in Wetzel County, West Virginia)					
NSA-WI-1	1,225 S	45.0	39.0	46.0	1.0

Source: TC, 2015

Abbreviations:

E = East N = North W = West S = South

L_{dn} = day-night equivalent sound level calculated using the following equation:

$L_{dn} = 10*\text{Log}(15/24*10^{(Leq(day)/10)}+9/24*10^{(Leq(night)+10)/10)})$; or to simplify: $L_{dn} = L_{eq} + 6.4$ dBA

Notes:

a/ Extrapolated noise level based on maximum sound power level of 101 L_{dn} dBA from 2 flow control valves with L_{eq} of 92 dBA each.

b/ The combined noise levels resulting from operation activities and existing ambient were calculated using the following equation:

$SPL_{Total} = 10\text{Log}_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$

Where: SPL_{Total} = total sound pressure level produced

SPL_1, SPL_2, and … SPL_n represent the first, second, and n^{th} SPL, respectively

Operations Mitigation Measures

Noise impacts would result from operation of MVP and EEP compressor stations and other associated aboveground facilities. Noise from planned or unplanned blowdown events could exceed the noise criteria but would be infrequent and of relative short duration.

As stated above, the Applicants would implement mitigation measures to reduce noise impacts, such as installing the compressor units in an acoustically designed building, installing exhaust stack silencers and combustion air intake silencers as necessary to comply with our noise criterion. In addition, Mountain Valley would be conducting a post-construction noise surveys at NSAs for each of the three compressor stations while operating on full load to ensure that the noise impacts on the station are acceptable. In the event that noise levels exceed our noise criterion of 55 dBA, or should there be any noise complaint received due to operations of any of the compressor stations, we have recommended additional noise surveys to establish appropriate noise mitigation measures. As mentioned earlier, noise complaints would be addressed through a landowner resolution process protocol established by Mountain Valley by using a 24-hour toll free phone line or email submission.

Operation of the Mobley Tap and the Webster Interconnect would not cause noise levels in excess of the FERC noise criterion.

Conclusions Regarding Noise Impacts and Mitigation

Noise generated during the construction phase would cause noise levels above the FERC noise criterion at certain NSAs. Construction noise would be heard by members of the public and residents near to the construction areas. However, construction noise is typically short term and localized, with implementation of the measures proposed by the Applicants, and our recommendations, construction noise impacts would be minimized to the extent practicable. Similarly, operational noise impacts would be limited to areas near the aboveground facilities. Considering the Applicants' proposed mitigation measures and our recommendations, all aboveground facilities would comply with our noise criteria of 55 dBA L_{dn} and should cause no increase in perceptible noise vibration. Therefore, we conclude that the noise associated with construction and operation of the projects would not result in a significant impact on the local noise environment and residents.

4.12 RELIABILITY AND SAFETY

The transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for an accidental release of natural gas. In the unlikely event of a leak, natural gas, which is lighter than air, should dissipate into the atmosphere. However, a spark or ignition at the point of the release could result in a fire or explosion following a major pipeline rupture. Those risks are ameliorated by pipeline design and safety regulations mandated by the DOT, and measures that would be implemented by the Applicants as part of their Emergency Response Plans. Below we discuss historic incidents, in order to quantify risks.

Methane (CH_4), the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death. In addition, the compressor stations' pneumatic control systems are designed to use compressed air rather than natural gas which minimizes any venting or leaking at stations. Further, the use of turbine compressors instead of reciprocating compressors and micro-turbines for on-site power instead of reciprocating compressor generators will also act to prevent or minimize leakage.

Natural gas is buoyant at atmospheric temperatures and disperses rapidly in air. An unconfined mixture of CH_4 and air is not explosive; however, it may ignite if there is an ignition source. Methane has an auto-ignition temperature of 1,000°F and is flammable at concentrations between 5.0 percent and 15.0 percent in air. A flammable concentration of natural gas within an enclosed space in the presence of an ignition source can explode.

4.12.1 Safety Standards

The DOT is mandated to provide pipeline safety under 49 U.S.C. 601. The DOT's PHMSA administers the national regulatory pipeline safety program for the nation's interstate and intrastate pipelines and requires that pipeline operators design, construct, test, operate, and maintain their pipeline facilities in compliance with the federal pipeline safety regulations. Many of the regulations are written as performance standards, which set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety.

PHMSA works closely with state pipeline safety programs. The DOT provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing, at a minimum, the federal standards. A state may also act as the DOT's agent to inspect interstate facilities within its boundaries; however, the DOT is responsible for enforcement actions.

The DOT pipeline standards are published in 49 CFR 190-199. Part 192 specifically addresses the minimum federal safety standards for transportation of natural gas by pipeline.

Under a *Memorandum of Understanding on Natural Gas Transportation Facilities* dated January 15, 1993, between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the FERC's regulations require that an applicant certify that it would design, install, inspect, test, construct, operate, replace, and maintain the facility for which a Certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with Section 3(e) of the Natural Gas Pipeline Safety Act. The FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert the DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the Commission's jurisdiction.

The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee, which determines if proposed safety regulations are reasonable, feasible, and practicable.

The pipeline and aboveground facilities associated with the projects must be designed, constructed, operated, and maintained in accordance with the DOT's *Minimum Federal Safety Standards* in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT regulations specify material requirements and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

The federal pipeline safety regulations also define area classifications, based on population density in the vicinity of pipeline facilities, and specify more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline.

The four area classifications are defined below:

- Class 1 – Location with 10 or fewer buildings intended for human occupancy;
- Class 2 – Location with more than 10 but less than 46 buildings intended for human occupancy;
- Class 3 – Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period; and
- Class 4 – Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. For example, pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock.

Class locations also specify the maximum distance to a sectionalizing block valve (i.e., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4 locations). Pipe wall thickness and pipeline design pressures; hydrostatic test pressures; MAOP; inspection and testing of welds; and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. Class locations for the projects have been determined based on the relationship of the pipeline centerline to other nearby structures and manmade features. Table 4.12.1-1 summarizes the class locations for the MVP and the EEP.

TABLE 4.12.1-1

Lengths of Area Classifications Crossed by the Mountain Valley Project and the Equitrans Expansion Project

State/County	Class 1 (miles)	Class 2 (miles)	Class 3 (miles)
MOUNTAIN VALLEY PROJECT			
West Virginia			
Braxton	14.8	0.0	0.0
Doddridge	3.4	1.3	0.0
Fayette	0.5	0.0	0.0
Greenbrier	20.3	1.3	0.0
Harrison	22.5	1.1	0.0
Lewis	27.5	0.0	0.0
Monroe	21.2	0.8	0.0
Nicholas	21.2	3.6	0.0
Summers	14.6	2.2	0.0
Webster	28.6	1.8	0.0
Wetzel	9.5	0.0	0.0
West Virginia Total	*183.9*	*12.4*	*0.0*
Virginia			
Craig	1.7	0.0	0.0
Franklin	29.0	8.5	0.0
Giles	17.2	3.0	0.3
Montgomery	13.7	5.7	0.0
Pittsylvania	17.8	1.7	0.0
Roanoke	7.4	1.2	0.0
Virginia Total	*86.7*	*20.2*	*0.3*
Mountain Valley Project Total	**270.6**	**32.6**	**0.3**
EQUITRANS EXPANSION PROJECT			
Pennsylvania	5.7	1.7	0.0
West Virginia	0.0	0.0	0.0
Equitrans Expansion Project Total	**5.7**	**1.7**	**0.0**

The majority of the pipeline routes would be in Class 1 areas.

The Applicants have procedures in place to monitor for changes in population density. If a subsequent increase in population density adjacent to the right-of-way results in a change in class location for the pipeline, the Applicants would revise the MAOP to conform to the new class. This would be achieved by reducing the MAOP or replacing the segment with pipe of sufficient grade and wall thickness, if required to comply with DOT requirements for the new class location. Equitrans has stated that they would also increase pipeline patrol frequency and pressure testing, or would decrease the percent specified minimum yield strength (pipeline stress) of a pipe segment in areas where population densities change.

The DOT Pipeline Safety Regulations require operators to develop and follow a written Integrity Management Program (IMP) that contain all the elements described in 49 CFR 192.911 and address the risks on each transmission pipeline segment. Specifically, the rule establishes an IMP that applies to all High Consequence Areas (HCA).

We received comments from county officials who were concerned about construction and operational impacts from the projects, and the potential of an incident affecting vulnerable populations such as children. The Applicants routed their pipelines through mostly rural and not densely populated areas. We discuss the locations of vulnerable populations (including children and the elderly) along the pipeline routes in section 4.9 above. The Applicants, and FERC staff, considered route modifications that would minimize risks to local residents and vulnerable populations, and variations are discussed in the Alternatives section (3.5).

The DOT has published rules that define HCAs where a gas pipeline accident could do considerable harm to people and their property and requires an IMP to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate for the DOT to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method, an HCA includes:

- current Class 3 and 4 locations;
- any area in Class 1 or 2 where the potential impact radius is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle. The potential impact radius (PIR) is determined by the following formula:

  $$r = 0.69 \text{ x } \sqrt{(p \text{ x } d^2)}$$

  where:
  r = the radius of a circular area surrounding the point of failure (feet)

  p = the MAOP in the pipeline segment (psig)

  d = the normal diameter of the pipeline (inches); or

- any area in Class 1 or 2 where the potential impact circle includes an identified site.

An "identified site" is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.

The PIR for the 42-inch-diameter MVP with a MAOP of 1,480 psig is 1,115 feet. The PIR for the EEP segments are presented in table 4.12.1-2.

TABLE 4.12.1-2 **Potential Impact Radius for the Equitrans Expansion Project**				
Pipeline Segment	**MP Range**	**Pipeline Diameter**	**MAOP (psig)**	**PIR (feet)**
H-318	0.0 – 3.77	20	1,200	478
H-316	0.0 – 3.0	30	1,200	717
H-158	0.0 – 0.2	12	1,000	262
M-80	0.0 – 0.2	6	1,000	131
H-305	0.0 – 0.1	24	1,200	574
H-319	- <0.1	16	1,200	382

In the second method, an HCA includes any area within a potential impact circle that contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

Once a pipeline operator has determined the HCAs along its pipeline, it must apply the elements of its IMP to those sections of the pipeline within HCAs. The DOT regulations specify the requirements for the integrity management plan in Subpart O of Part 192, Gas Transmission Pipeline Integrity Management. Table 4.12.1-3 lists the HCAs for the MVP, which have been determined based on the relationship of the pipeline centerline to nearby structures.

No HCAs were identified for the EEP.

We received comments from Giles County officials requesting that the Newport Recreation Center, Newport-Mount Olivet Methodist Church, and Doe Creek Farm be considered for Class 3 classification.[155] These structures are also discussed as historic properties in section 4.10.[156] The Newport Recreation Center and Mount Olivet Methodist Church are both within HCA 12 (Class 1/Class 2). The Newport Recreation Center would be located 945 feet away from the MVP pipeline, while the Mount Olivet Methodist Church would be 430 feet away. Neither of these buildings meet the requirements of the rule for Class 3 consideration as they are not within the 100 yards (300 feet) of the pipeline. The Doe Creek Farm is located about 479 feet away from the pipeline centerline. The Doe Creek Farm, in HCA 10, is within a Class 3 classification. The same integrity monitoring requirements will be applied to all areas identified as HCAs, regardless of their class location designation.

[155] See filing on December 22, 2016 in accession number 20161222-5458.

[156] The Newport Recreation Center (1933 high school building) was previously recorded as site 35-412-65 while the Mount Olivet Methodist Church was previously recorded as site 35-59, and both are contributing resources to the NRHP-listed Greater Newport Rural Historic District. The Doe Creek Farm was previously recorded as site 35-182 and determined to be eligible for the NRHP.

TABLE 4.12.1-3

Location of High Consequence Areas for the Mountain Valley Project

State/County	HCA Name	Start MP	End MP	Length (miles)	Class Location
West Virginia					
Harrison	HCA - 1	25.42	25.94	0.5	Class 1
Webster, Nicholas	HCA - 2	109.38	110.19	0.8	Class 2
Nicholas	HCA - 3	111.14	111.83	0.7	Class 2
Nicholas	HCA - 4	112.93	113.64	0.7	Class 2 (112.93 – 113.29)
					Class 1 (113.29 – 113.64)
Nicholas	HCA - 5	114.34	114.95	0.6	Class 1 (114.34 – 114.54)
					Class 2 (114.54 – 114.89)
					Class 1 (114.89 – 114.95)
Nicholas	HCA - 6	122.24	122.73	0.5	Class 2
Greenbrier	HCA - 7	143.93	144.56	0.6	Class 2 (143.93 – 144.28)
					Class 1 (144.28 – 144.56)
Monroe	HCA - 8	191.81	192.37	0.6	Class 2
Virginia					
Giles	HCA - 9	203.87	204.41	0.5	Class 2
Giles	HCA - 10	206.69	207.57	0.9	Class 1 (206.69 – 207.00)
					Class 3 (207.00 – 207.27)
					Class 1 (207.27 – 207.57)
Giles	HCA - 11	211.01	211.54	0.5	Class 2
Giles	HCA - 12	212.57	213.26	0.8	Class 1 (212.57 – 212.73)
					Class 2 (212.73 – 213.01)
					Class 1 (213.01 – 213.26)
Montgomery	HCA - 13	235.10	236.03	0.9	Class 2 (235.10 – 235.99)
					Class 1 (235.99 – 236.03)
Franklin	HCA - 14	259.82	260.96	1.1	Class 2
Franklin	HCA - 15	261.68	262.14	0.5	Class 2

TABLE 4.12.1-3 (continued)

Location of High Consequence Areas for the Mountain Valley Project

State/County	HCA Name	Start MP	End MP	Length (miles)	Class Location
Franklin	HCA - 16	265.04	266.76	1.7	Class 1 (265.04 – 265.25)
					Class 2 (265.25 – 265.67)
					Class 1 (265.67 – 265.79)
					Class 2 (265.79 – 266.44)
					Class 1 (266.44 – 266.76)
Franklin	HCA - 17	270.58	271.34	0.8	Class 1 (270.58 – 270.72)
					Class 2 (270.72 – 271.34)
Pittsylvania	HCA - 18	298.56	299.81	1.3	Class 2 (298.56 – 298.91)
					Class 1 (298.91 – 299.56)
					Class 2 (299.56 – 299.81)
Pittsylvania	HCA - 19	299.94	300.37	0.4	Class 1 (299.94 – 300.04)
					Class 2 (300.04 – 300.21)
					Class 1 (300.21 – 300.37)

The pipeline and aboveground facilities for both the MVP and EEP would be designed, constructed, operated, and maintained in accordance with the DOT's *Minimum Federal Safety Standards* in 49 CFR 192. The general construction methods that the Applicants would implement to ensure the safety of the project are described in section 2.0, including welding, inspection, and integrity testing procedures.

The DOT prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Each pipeline operator is required to establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency system shutdown and safe restoration of service;

- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

In addition to adhering to the requirements described above, the integrity of completed welds would be visually inspected and tested using non-destructive methods such as x-ray radiography or ultrasound. Any unacceptable welds would be repaired and re-welded.

We received comments regarding potential safety impacts associated with the installation of the projects through areas of karst terrain and the steep and rugged topography which much of the project is proposed to cross. Section 4.1 includes a discussion of such terrain to be represent geological hazards for the MVP pipeline. There is the potential for installation of the pipeline over karst features to result in subsidence. Measures have been identified to reduce or mitigate stability issues. For example, Mountain Valley would implement the measures outlined in its *Karst Mitigation Plan* and its *Karst-Specific Erosion and Sediment Control Plan*. In addition, because of the increased bridging capabilities of the pipe, Mountain Valley proposes to use at least Class 2 pipe in all areas containing karst features. In section 3.5, we have recommended that Mountain Valley adopt Variation 250 into its proposed pipeline route, to avoid or minimize impacts from karst features concentrated in the Mount Tabor Sinkhole Plain.

To reduce or mitigate impacts from steep slopes, which may present the potential for landslides to affect the MVP pipeline, Mountain Valley developed a *Landslide Mitigation Plan.* The measures outlined in this plan include:

- excavation and regrading of soils in steep slopes areas;
- installation of the pipeline within bedrock;
- dewatering of the slope and working area using drains, berms, riprap, side hill low-point drains, trench drains, water bars, water stops (trench breakers), and hard armor;
- staffing geotechnical personnel during construction operations to prescribe any additional mitigation for hazards that may arise during construction; and
- monitoring slopes in areas of prior land sliding or where slope stability is considered to be uncertain.

There is also the potential for seismic activity to result in liquefaction in certain areas crossed by the MVP pipeline route. There are 7.8 miles of Class 1 pipe in areas with a PGA of 0.12 (MPs 178 to 186). The remaining pipe in proximity to the fault zone would be Class 2 or greater and thus have a thicker pipe wall than Class 1 pipe. Mountain Valley has identified one slope between MPs 162.3 and 162.9 that would exceed 1,580 feet in length with an average slope of 35 percent. Mountain Valley would increase the wall thickness to Class 2 pipe for this portion of the route. Table 4.1.1-9 identifies the class of pipe and depth of cover for each of the potential liquefaction areas along the MVP pipeline route. Mountain Valley has also agreed to use Class 2 pipe in all karst areas.

The potential for landslide hazards (slip potential) was assessed by Equitrans during initial route planning, using desktop reviews. Equitrans' design engineers reviewed previous landslide history using USGS Landslide Hazard maps and internal data. They also identified areas along the route where slopes are 18 percent or greater and where construction would be conducted on side slopes. If a segment of the proposed pipeline is located in an area that meets the criteria above (previous landslide history, slopes of 18 percent or more, and/or side slopes), these segments are flagged for further field investigation to evaluate whether the potential for a slide to develop can be mitigated or if the area should be avoided through a reroute. Typically, strain gauges would be used during remediation to identify the potential for continued failure.

Equitrans has also stated that it would exceed pipeline safety regulations. All pipes in Class I areas are designed to Class II standards and tested to Class III standards per 49 CFR 192.

The DOT requires pipeline operators to place pipeline markers at frequent intervals along the pipeline rights-of-way, such as where a pipeline intersects a street, highway, railway, or waterway, and at other prominent points along the route. Pipeline right-of-way markers can help prevent encroachment and excavation-related damage to pipelines. Because the pipeline right-of-way is much wider than the pipeline itself, and a pipeline can be anywhere within the right-of-way, state laws require excavators to call their state One Call center well in advance of digging to locate underground utilities and ensure it is safe for the contractor to dig in that location.

In accordance with DOT regulations, the proposed facilities would be regularly inspected for leakage and potential pipeline hazards such as construction activity, encroachments, and evidence of recent unmonitored excavations as part of scheduled operations and maintenance, including:

- physically walking and inspecting the pipeline corridor periodically;
- conducting fly-over inspections of the right-of-way as required;
- inspecting and maintaining MLVs and M&R stations; and
- conducting leak surveys at least once every calendar year or as required by regulations.

We received comments regarding the frequency of overflight inspections and the minimization of noise during overflight inspections. Aerial inspections would take place at least twice per year using Federal Aviation Administration licensed aerial services with pipeline survey experience. Surveys would be conducted during daylight hours at low altitude and reduced speed. All fixed wing and helicopter aircraft used would meet noise certification standards based on their type.

Cathodic protection would be installed along the entire length of the new pipelines to prevent corrosion. Applicant personnel would check the voltage and amperage at regular intervals as well as the pipe-to-soil potentials and rectifiers. In addition, annual surveys are completed, as described above.

Pipeline markers identifying the owner of the pipe and a 24-hour telephone number would be placed for "line of sight" visibility along the entire pipeline length, except in active agricultural crop locations and in waterbodies in accordance with the DOT's requirements.

We received comments regarding the ability to detect leaks in the pipeline system when an odorant has not been introduced into the natural gas. The Applicants would install data acquisition systems that allow monitoring of pipeline flows and pressures at various points along the system.

The system would permit remote closing of MLVs in the event of an incident along the pipeline systems and would utilize a combination of radio and/or satellite communications to transmit data from the pipeline to the Applicants' pipeline control centers in Pittsburgh, Pennsylvania. In addition, a secondary back-up pipeline control center would be available in Finleyville, Pennsylvania. The data acquisition systems would be monitored by gas control technicians who are on duty 24 hours a day, 365 days a year. If unexpected pressure changes are noted that indicate the possibility of a leak, the gas controller on duty can either shut down the pipeline MLVs upstream and downstream of the apparent leak and/or dispatch field technicians to investigate the pressure change. According to information provided by Mountain Valley, the remotely controlled MLVs could be controlled both locally and remotely and would close within 2 minutes following issuance of a remote signal to close.

In addition, we received comments regarding power outages and the interruption of telecommunication services with respect to the remote signaling for MLV closures. The redundancies that have been built in to station designs ensure that a power outage or cellular service interruption would not affect MVP's ability to close an MLV as all sites have primary and back-up sources of power and telecommunications. MLVs, interconnections, compressor stations, would use a mix of commercial power and microturbines as a primary power source with microturbines, natural gas generators, solar power, and commercial power as back-up power sources. MLVs, interconnections, compressor stations, would use a mix of local service providers, VSAT, cellular as a primary telecommunications source with VSAT and local service providers as back-up telecommunications sources.

We received comments regarding the potential for forest fires to occur from a pipeline accident during construction and operation of the pipeline and about the difficulty for emergency response to get to remote areas crossed by the pipeline. In the most remote portion of the MVP, the maximum distance between a fire department and the pipeline is about 8 miles. Mountain Valley would implement the measures outlined in its *Fire Prevention and Suppression Plan* to protect the public and property from potential fires during construction and operation of the pipelines.

Equitrans would not burn any cleared vegetation as part of the EEP.

In the event of a forest fire in the vicinity of the pipelines, the pipelines would not be affected as they would be insulated by the 24 inches to 36 inches of soil above it. In addition, the Applicants have developed emergency plans that include establishing and maintaining adequate means of communication with appropriate fire, police, and other public officials, including the FS, and developing prompt and effective response to each type of emergency, including that of a fire near or directly involving the pipeline. The Applicants would actively participate in emergency response coordination with local fire personnel and would cooperate by providing the location of the pipeline easement, depth of cover, and measures that should be taken if the pipeline were to be crossed by heavy machinery. The Applicants' Emergency Response Plans developed in coordination with local emergency response officials would ensure that the response to a pipeline emergency would be acceptable.

Mountain Valley indicated that it plans to install Class 2 pipe buried at least 36 inches below the ground surface within the Jefferson National Forest. However, the POD will be revised to include communication protocol regarding the use of heavy firefighting equipment and heavy vehicles such as large bulldozers and fireplows. It is necessary to ensure the integrity of the pipeline is maintained, and it also is necessary for the FS to be able to respond to and control forest fires based on the recommendations of the FS Fire Management Officer.

The DOT regulations specified in Part 192 require that the Applicants establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The Applicants would utilize the emergency procedures contained in each project emergency response plan, which require communication with emergency responders on an annual basis. Local contact phone numbers, external contact information, equipment or resources available for mobilization, and any specific procedures to be followed for the Applicants would be incorporated into the Emergency Response Plans prior to commencement of pipeline operations. The fire departments of the states of West Virginia, Virginia, and Pennsylvania have specific requirements for staffing, training, and equipment that allow them to fight pipeline related fires. In addition, there are 9 fire stations within 1 mile of the MVP and EEP and 46 fire stations within 5 miles of the MVP and EEP. Appendix X provides the available information regarding the number of staff at these fire stations, as well as the available equipment.

The Applicants would also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials.

The Applicants would establish and maintain liaison with appropriate fire, police, and public officials in a variety of ways. The Applicants' annual communications would include the following information:

- the potential hazards associated with project facilities located in their service area and prevention measures undertaken;
- the types of emergencies that may occur on or near the Applicants' facilities;
- the purpose of pipeline markers and the information contained on them;
- pipeline location information and the availability of the National Pipeline Mapping System;
- recognition of and response to pipeline emergencies; and
- procedures to contact each Applicant for more information.

The Applicants' communications with local emergency responders may involve individual meetings, group meetings, or direct mailings to build and maintain a relationship with the appropriate emergency personnel and ensure their knowledge and familiarity with ESD and isolation systems and protocol. In addition, the Applicants would perform and financially support periodic emergency exercises and mock emergency drills with local government, law enforcement, and emergency response agencies, subject to agency availability and willingness to participate. Additional training materials, including the PHMSA – Emergency Response Guidebook, National Association of State Fire Marshals – Pipeline Emergencies textbook, would also be made available to emergency personnel. Mountain Valley would also continue to support fire department budgets, equipment, and training needs through donations from the EQT Foundation.

4.12.2 Pipeline Accident Data

The DOT requires all operators of natural gas transmission pipelines to notify the National Response Center at the earliest practicable moment following the discovery of an incident and to submit a report within 30 days to PHMSA. On January 19, 2017, PHMSA issued a final rule entitled, "Operator Qualification, Cost Recovery, Accident and Incident Notification, and Other Pipeline Safety Changes." The rulemaking lays out a specific time frame requirement for telephonic or electronic notifications of accidents and incidents. The rule also amends drug and alcohol testing requirements, and incorporates consensus standards by reference for inline inspection and Stress Corrosion Cracking Direct Assessment. The rule addresses mandates included in the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011. Incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization; or
- involve property damage, including cost of gas lost, of more than $50,000, in 1984 dollars (approximately $115,499.04 in 2016 [Bureau of Labor and Statistics, 2016]).

During the 20-year period from 1997 through 2016, a total of 1,367 significant incidents were reported on the more than 301,000 total miles of natural gas transmission pipelines nationwide (PHMSA, 2017).

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12.2-1 provides a distribution of the causal factors as well as the number of each incident by cause from 1997 to 2016.

TABLE 4.12.2-1

Natural Gas Transmission Dominant Incident Causes, 1997 – 2016

Incident	Number of Incidents	Percentage
Corrosion	324	23.7
Excavation a/	223	16.3
Pipeline material, weld, or equipment failure	378	27.7
Natural force damage	150	11.0
Outside force b/	87	6.4
Incorrect operation	42	3.1
All other causes c/	163	11.9
Total	**1,367**	**100**

a/ Includes third-party damage
b/ Fire, explosion, vehicle damage, previous damage, and unintentional damage
c/ Miscellaneous causes or other unknown causes
Source: PHMSA, 2017

The dominant causes of pipeline incidents from 1997 to 2016 were corrosion and pipeline material, weld, or equipment failure, constituting 51.0 percent of all significant incidents. The pipelines included in the data set on table 4.12.2-1 vary widely in terms of age, diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

The frequency of significant incidents is strongly dependent on pipeline age. Older pipelines have a higher frequency of corrosion incidents because corrosion is a time-dependent process. Jones et al. (1986) compared reported incidents with the presence or absence of cathodic protection and protective coatings. The results of that study, summarized on table 4.12.2-2, indicated that corrosion control was effective in reducing the incidence of failures caused by external corrosion. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the corrosion rate compared to unprotected or partially protected pipe. The data also indicate that cathodically protected pipe without a protective coating actually has a higher corrosion rate than unprotected pipe. This anomaly reflects the retrofitting of cathodic protection to actively corroding spots on pipes.

TABLE 4.12.2-2

Incidents Caused by External Corrosion and Level of Protection (1970 – June 1984)

Corrosion Control	Incidents per 100 Miles per Year
None – bare pipe	0.42
Cathodic protection only	0.97
Coated only	0.40
Coated and cathodic protection	0.11

Source: Jones et al., 1986

Older pipelines also have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller-diameter pipelines, which are more easily crushed or broken by mechanical equipment or earth movements.

Outside force, excavation, and natural forces were the cause in 33.7 percent of significant pipeline incidents from 1997 to 2016. These result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geological hazards; and weather effects such as winds, storms, and thermal strains; and willful damage. Table 4.12.2-3 provides a breakdown of outside force incidents by cause.

Since 1982, operators have been required to participate in “One Call” public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The One Call program is a service used by public utilities and some private sector companies (e.g., oil pipelines and cable television) to provide pre-construction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

TABLE 4.12.2-3

Outside Forces Incidents by Cause (1997 – 2016) a/

Cause	Number of Incidents	Percent of All Incidents
Third-party excavation damage	181	13.2
Operator excavation damage	27	2.0
Unspecified excavation damage/previous damage	15	1.1
Heavy rains/floods	78	5.7
Earth movement	32	2.3
Lightning/temperature/high winds	28	2.0
Natural force (unspecified and other)	12	0.9
Vehicle (not engaged with excavation)	50	3.7
Fire/explosion	9	0.7
Previous mechanical damage	6	0.4
Fishing or maritime activity/maritime equipment or vessel adrift	9	0.7
Intentional damage	1	0.1
Electrical arcing from other equipment/facility	1	0.1
Unspecified/other outside force	11	0.8
Total	**460**	**33.7**

a/ Excavation, Outside Force, and Natural Force from table 4.12 2-1.
Source: PHMSA, 2017

We received comments regarding the safety history of Equitrans and NextEra Energy (an owner in the MVP). The Commission reviews each project based on its own merits and has siting authority for interstate natural gas infrastructure. PHMSA would be notified of and investigate all pipeline accidents and take any necessary action. Pipeline operator compliance and incident history is publicly available on the PHMSA website at www.phmsa.dot.gov/pipeline.

4.12.3 Impacts on Public Safety

The service incident data summarized on table 4.12.2-1 include pipeline failures of all magnitudes with widely varying consequences. Table 4.12.3-1 presents the average annual fatalities that occurred on natural gas transmission lines between 2010 and 2016. The data have been separated into employees and nonemployees to better identify a fatality rate experienced by the general public. Fatalities among the public averaged two per year over the 20-year period from 1996 to 2016. There were two industry injuries in West Virginia, one in 1998 and one in 2009, and no fatalities in either state.

The majority of fatalities from natural gas pipelines are associated with local distribution pipelines. These pipelines are not regulated by the FERC; they distribute natural gas to homes and businesses after transportation through interstate transmission pipelines. In general, these distribution lines are smaller-diameter pipes and/or plastic pipes that are more susceptible to damage. In addition, local distribution systems do not have large rights-of-way and pipeline markers common to the FERC-regulated interstate natural gas transmission pipelines.

TABLE 4.12.3-1

Injuries and Fatalities – Natural Gas Transmission Pipelines

Year	Injuries		Fatalities	
	Employees	Public	Employees	Public
2010 a/	3	58	0	10
2011	1	0	0	0
2012	1	6	0	0
2013	0	2	0	0
2014	1	0	1	0
2015	1	13	4	2
2016	2	1	2	1

a/ All of the public injuries and fatalities in 2010 were due to the Pacific Gas and Electric pipeline rupture and fire in San Bruno, California on September 9, 2010.

Source: PHMSA, 2016a

The nationwide totals of accidental fatalities from various anthropogenic and natural hazards are listed on table 4.12.3-2 in order to provide a relative measure of the industry-wide safety of natural gas transmission pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. As indicated on table 4.12.3-2, the number of fatalities associated with natural gas facilities is much lower than the fatalities from natural hazards such as lightning, tornados, floods, earthquakes, etc.

TABLE 4.12.3-2

Nationwide Accidental Deaths a/

Type of Accident	Annual Number of Deaths
All accidents	130,557
Motor vehicle	35,369
Poisoning	38,851
Falls	30,208
Drowning	3,391
Fire, smoke inhalation, burns	2,760
Floods b/	38
Lightning b/	26
Tornado b/	47
Natural gas distribution lines c/	13
Natural gas transmission lines c/	2

a/ All data, unless otherwise noted, reflect 2013 statistics from CDC, 2016.
b/ Reflects 2014 data from NWS, 2016.
c/ 20-year average (1996-2015) from PHMSA, 2016b; c.

The available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 1997 to 2016, there were an average of 65 significant incidents and 2 fatalities per year. The number of significant incidents distributed over the more than 300,000 miles of natural gas transmission pipelines indicates the risk is low for an incident at any given location. The rate of total fatalities for the nationwide natural gas transmission lines in service is approximately 0.01 per year per 1,000 miles of pipeline. Thus, operation of the projects would represent only a slight increase in risk to the nearby public.

We received comments regarding how the Applicants would determine compensation for affected parties should an incident occur. Compensation to parties affected by an incident would be for the amount of loss and would be governed by common law or statute. The Applicants stated they would have insurance for both personal injury and property damage.

4.12.4 Terrorism and Security Issues

Safety and security concerns have changed the way pipeline operators as well as regulators must consider terrorism, both in approving new projects and in operating existing facilities. The Office of Homeland Security is tasked with the mission of coordinating the efforts of all executive departments and agencies to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the United States. Among its responsibilities, the U.S. Department of Homeland Security oversees the Homeland Infrastructure Threat and Risk Analysis Center, which analyzes and implements the National Critical Infrastructure Prioritization Program that identifies and lists Tier 1 and Tier 2 assets. The Tier 1 and Tier 2 lists are key components of infrastructure protection programs and are used to prioritize infrastructure protection, response, and recovery activities. The Commission, in cooperation with other federal agencies, industry trade groups, and interstate natural gas companies, is working to improve pipeline security practices, strengthen communications within the industry, and extend public outreach in an ongoing effort to secure pipeline infrastructure.

The Commission, like other federal agencies, is faced with a dilemma in how much information can be offered to the public while still providing a significant level of protection to the facility. Consequently, the Commission has taken measures to limit the distribution of information to the public regarding facility design to minimize the risk of sabotage. Facility design and location information has been removed from the FERC's website to ensure that sensitive information filed as Critical Energy Infrastructure Information is not readily available to the public (Docket No. RM06-23-000, issued October 30, 2007 and effective as of December 14, 2007).

The likelihood of future acts of terrorism or sabotage occurring along the MVP or the EEP pipelines or at any of the myriad natural gas pipeline or energy facilities throughout the United States is unpredictable given the disparate motives and abilities of terrorist groups. Further, the Commission, in cooperation with other federal agencies, industry trade groups, and interstate natural gas companies, is working to improve pipeline security practices, strengthen communications within the industry, and extend public outreach in an ongoing effort to secure pipeline infrastructure.

In accordance with the DOT surveillance requirements, the Applicants would incorporate air and ground inspection of its proposed facilities into its inspection and maintenance program. Security measures at the new aboveground facilities would include secure fencing.

Despite the ongoing potential for terrorist acts along any of the nation's natural gas infrastructure, the continuing need for the construction of these facilities is not eliminated. Given the continued need for natural gas conveyance and the unpredictable nature of terrorist attacks, the efforts of the Commission, the DOT, and the Office of Homeland Security to continually improve pipeline safety would minimize the risk of terrorist sabotage of the projects to the maximum extent practical, while still meeting the nation's natural gas needs. Moreover, the unpredictable possibility of such acts does not support a finding that these particular projects should not be constructed.

4.13 CUMULATIVE IMPACTS

The CEQ regulations for implementing NEPA, at 40 CFR 1508.7, define cumulative impacts as: "impacts on the environment which result from incremental impact of the [proposed] action when added to other past, present, and reasonably foreseeable future actions…." The current environment of the project area reflects a mixture of natural processes and human influences across a range of conditions. Current conditions have been affected by innumerable activities over thousands of years, as explained below. The CEQ issued an interpretive memorandum on June 24, 2005, regarding analysis of past actions, which stated: "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions."

The project region in which the projects would be located has been affected by human activities for over 15,000 years, beginning with the original settlement of North America by Native Americans. The indigenous communities were affected by European settlement beginning in the 17th Century. Settlement of the region brought modifications to the landscape including the imprints of farming and timbering activities. As population settlements grew, resources such as wetlands and forests were modified or converted. Between 1956 and 1979, about 97,000 acres of wetlands in Pennsylvania, West Virginia, and Virginia were lost (Tiner, 1987). In Virginia, since 2001, 484,965 acres of forested land has been lost to changes – 64 percent to urban development and 30 percent to agriculture. (VDOF, 2016). Today, most of the forest in the project area is tertiary or secondary. Since 1990, urban land use in Pennsylvania has increased almost 16 percent; the number is about 11 percent in West Virginia. Approximately 23 million people reside in Virginia, West Virginia, and Pennsylvania.

Although the region has been substantially affected by human activity, natural resources remain. There are still large portions of the project area that are currently rural and not densely occupied. NWI data indicate that there are approximately 20,000 acres of wetlands in the counties that would be crossed by the MVP and the EEP (FWS, 2016). National Land Cover Data from the EPA indicates that there is still about 5,000,000 acres of upland forest in these same counties (EPA, 2016).

In order to understand the contribution of past actions to the cumulative effects of the proposed action, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. In this analysis, we generally consider the impacts of past projects within the resource-specific geographic scopes as part of the affected environment (environmental baseline) which was described under the specific resources discussed throughout section 4.0. However, this analysis does include the present effects of past actions that are relevant and useful.

In accordance with the CEQ regulations for implementing NEPA, we identified other actions located in the vicinity of the MVP and the EEP facilities and evaluated the potential for a cumulative impact on the environment. This analysis evaluates other actions that impact resources also affected by the projects, within the resource-specific geographic scopes described below. Actions located outside the geographic scopes are generally not evaluated because their potential to contribute to a cumulative impact diminishes with increasing distance from the projects.

As described throughout this EIS, the MVP and EEP would temporarily and permanently impact the environment. As detailed in the above resource-specific analysis under environmental consequences in section 4.0, we found that most impacts would be temporary and short-term during construction and restoration of the projects. Long-term impacts were found where the operational easement would be cleared of forest and maintained in a grassy condition, and where compressor stations would emit air pollutants during operation. Permanent impacts would occur at aboveground facilities and permanent new access roads. However, we conclude that with the mitigation measures proposed by the Applicants, or imposed as staff recommended conditions attached to a Commission Order, or by other agency permits, most impacts would not be significant. An exception is the projected impacts on forest land which, due to the number of forested acres cleared, would be a significant impact. Impacts resulting from the projects would mostly be limited to separate narrow corridors, including the construction right-of-way, ATWS, staging areas, yards, and new access roads, that extends for about 311 miles across three states. In terms of other projects that were recently constructed, or may be constructed in the near future, we also considered permanent impacts on specific environmental resources (i.e., removal of forest).

Our review of the estimated MVP and EEP impacts concludes that nearly all construction impacts would be contained within the right-of-way and extra workspaces. Erosion control measures included in FERC's Plan (for the MVP) and Equitrans' Plan (for the EEP), for example, would keep disturbed soils within work areas. Consequently, most of the construction impacts would be temporary and localized and are not expected to contribute to regional cumulative impacts.

Similarly, we conclude that the projects would not significantly contribute to cumulative impacts on geological resources. In addition, we conclude that the limited nature of socioeconomic activities associated with the projects would not greatly alter the natural environment and would result in minimal cumulative effects.

Exceptions exist where the impacts may migrate outside of designated work areas. Of these, we consider construction and operational air emissions to the airshed, noise impacts, and stream turbidity to possibly contribute to cumulative impacts. However, the Applicants would limit any potential stream turbidity through the use of HDDs and dry-cut stream crossings. Another construction resource impact that possibly would be cumulative based on the time required to achieve restoration is forest clearing.

For the purposes of this analysis, we are including the following resources: groundwater, surface water, and wetlands; vegetation; wildlife; fisheries and aquatic resources; land use, recreation, special interest areas, and visual resources; cultural resources; and air quality and noise. For each environmental resource, the potential direct and indirect impacts associated with the projects are discussed in relation to the cumulative effects that may occur when they are added to other past, present, or reasonably foreseeable projects within the geographic scope of analysis, as described further below.

Based on the impacts of the MVP and the EEP, the cumulative impact analysis for the projects included the following resource-specific geographic scopes:

- projects/actions within the HUC10 sub-watersheds (i.e., fifth-field watersheds) crossed by the projects were evaluated for cumulative impacts on water resources and wetlands, vegetation, land use, and wildlife;
- other projects' impacts on air quality were evaluated within AQCRs where the MVP and the EEP would construct compressor stations and have potential long-term impacts on air quality in air basins (Parkersburg-Marietta Interstate, Central West Virginia Intrastate, Southern West Virginia Intrastate, and the Southwest Pennsylvania Intrastate AQCRs [EPA, 1972]); additionally we evaluated projects from any other AQCR within 31.1 miles (50 km) of Mountain Valley's or Equitrans' proposed compressor stations to ensure that all relevant nearfield projects were considered (the Steubenville-Weirton-Wheeling AQCR is within 31.1 miles of both Mountain Valley's proposed Bradshaw Compressor Station and Equitrans' proposed Redhook Compressor Station). These five air basins combined cover approximately 14,066,458 acres. Otherwise, we considered a 0.25-mile buffer for air impacts associated with construction;
- visibility of aboveground facilities as viewed from neighboring communities and 0.25 mile for pipelines except where expanded as needed to consider KOPs;
- other projects' noise impacts on NSAs located within 0.25 mile of construction activities and within 1 mile of a noise emitting permanent aboveground facility, and
- impacts on cultural resources were evaluated on a county-wide level.

In addition, and at the request of the FS, we considered certain potential cumulative impacts on resources within the George Washington National Forest, since its management is administratively combined with the Jefferson National Forest (which would be crossed by the MVP). The relatively large geographic scopes of analysis utilized herein such as HUC10 watersheds and AQCRs were based on scaling to the relatively large size of the two projects, which extend for a combined 311 miles of new pipeline across three states (Pennsylvania, West Virginia, and Virginia). The use of a county basis for cultural resources was dictated by the availability of data, which was catalogued and named on a county level.

The MVP pipeline route would cross 31 HUC10 watersheds, and the EEP would cross 3 HUC10 watersheds. Table 4.13.1-1 lists all the watersheds crossed, their size in acres, the acres affected by other projects considered in this analysis within each watershed, and the acres affected by the MVP and the EEP within each watershed. The 33 HUC10 watersheds (one is shared between the projects) represent a combined total 4,557,727 acres (about 7,121 square miles). The MVP and the EEP would account for about 6,486.7 acres of impacts (0.1 percent) of these watersheds, while other projects located within the same watersheds account for 83,721.6 acres (1.8 percent) of impact.

TABLE 4.13.1-1

Affected HUC10 Watersheds Affected by the Mountain Valley Project and the Equitrans Expansion Project and Other Projects

Activity	Acres	Percent of Watershed
MOUNTAIN VALLEY PROJECT		
West Virginia		
Watershed: Fishing Creek	**139,636**	
Other Identified Projects a/	3,746.8	2.7
MVP pipeline and Associated Facilities	245.7	0.2
Watershed: Tenmile Creek	**79,898**	
Other Identified Projects a/	5,797.8	7.3
MVP pipeline and Associated Facilities	464.4	0.6
Watershed: Headwaters Middle Island Creek	**125,797**	
Other Identified Projects a/	12,135.5	9.7
MVP pipeline and Associated Facilities	79.7	0.1
Watershed: Middle West Fork River	**134,806**	
Other Identified Projects a/	11,643.7	8.6
MVP pipeline and Associated Facilities	183.7	0.1
Watershed: Leading Creek	**93,239**	
Other Identified Projects a/	7,289.0	7.8
MVP pipeline and Associated Facilities	73.8	0.1
Watershed: Upper West Fork River	**111,324**	
Other Identified Projects a/	6,423.3	5.8
MVP pipeline and Associated Facilities	22.43	0.02
Watershed: Sand Fork	**51,305**	
Other Identified Projects a/	5,460.9	10.6
MVP pipeline and Associated Facilities	197.0	0.4
Watershed: Upper Little Kanawha River	**199,843**	
Other Identified Projects a/	9,171.6	4.6
MVP pipeline and Associated Facilities	418.1	0.2
Watershed: Holly River	**94,833**	
Other Identified Projects a/	69.8	0.1
MVP pipeline and Associated Facilities	168.5	0.2
Watershed: Middle Elk River	**179,131**	
Other Identified Projects a/	977.5	0.5
MVP pipeline and Associated Facilities	169.1	0.1
Watershed: Laurel Creek	**42,604**	
Other Identified Projects a/	338.4	0.8
MVP pipeline and Associated Facilities	235.0	0.6

TABLE 4.13.1-1 (continued)

Affected HUC10 Watersheds Affected by the Mountain Valley Project and the Equitrans Expansion Project and Other Projects

Activity	Acres	Percent of Watershed
Watershed: Birch River	**90,848**	
Other Identified Projects a/	948.3	1.0
MVP pipeline and Associated Facilities	79.8	0.1
Watershed: Headwaters Gauley River	**86,241**	
Other Identified Projects a/	24.1	0.02
MVP pipeline and Associated Facilities	116.5	0.1
Watershed: Outlet Gauley River	**216,847**	
Other Identified Projects a/	3,304.5	1.5
MVP pipeline and Associated Facilities	238.8	0.1
Watershed: Hominy Creek	**66,041**	
Other Identified Projects a/	71.7	0.1
MVP pipeline and Associated Facilities	314.9	0.5
Watershed: Meadow River	**233,528**	
Other Identified Projects a/	1,676.8	0.7
MVP pipeline and Associated Facilities	526.4	0.2
Watershed: Glade Creek-New River	**172,268**	
Other Identified Projects a/	8.8	0.01
MVP pipeline and Associated Facilities	107.4	0.1
Watershed: Wolf Creek-Greenbrier River	**203,209**	
Other Identified Projects a/	No other projects identified	NA b/
MVP pipeline and Associated Facilities	331.6	0.2
Watershed: Indian Creek	**123,530**	
Other Identified Projects a/	No other projects identified	NA b/
MVP pipeline and Associated Facilities	193.3	0.2
Watershed: East River-New River	**107,883**	
Other Identified Projects a/	No other projects identified	NA b/
MVP pipeline and Associated Facilities	82.0	0.1
Virginia		
Watershed: Sinking Creek-New River	**126,574**	
Other Identified Projects a/	No other projects identified	NA b/
MVP pipeline and Associated Facilities	432.0	0.3
Watershed: Upper Craig Creek	**71,468**	
Other Identified Projects a/	No other projects identified	NA b/
MVP pipeline and Associated Facilities	35.0	0.05
Watershed: East River-New River	**107,883**	
Other Identified Projects a/	No other projects identified	NA b/
MVP pipeline and Associated Facilities	22.3	0.02

TABLE 4.13.1-1 (continued)

Affected HUC10 Watersheds Affected by the Mountain Valley Project and the Equitrans Expansion Project and Other Projects

Activity	Acres	Percent of Watershed
Watershed: North Fork Roanoke River	**73,974**	
Other Identified Projects a/	6.1	0.01
MVP pipeline and Associated Facilities	277.2	0.4
Watershed: Mason Creek-Roanoke River	**59,357**	
Other Identified Projects a/	No other projects identified	NA b/
MVP pipeline and Associated Facilities	116.8	0.2
Watershed: South Fork Roanoke River	**88,626**	
Other Identified Projects a/	6.3	0.01
MVP pipeline and Associated Facilities	129.1	0.1
Watershed: Upper Blackwater River	**104,641**	
Other Identified Projects a/	No other projects identified	NA b/
MVP pipeline and Associated Facilities	432.9	0.4
Watershed: Lower Blackwater River	**73,204**	
Other Identified Projects a/	7,043.0 c/	9.6 c/
MVP pipeline and Associated Facilities	139.5	0.2
Watershed: Upper Pigg River	**132,025**	
Other Identified Projects a/	No other projects identified	NA b/
MVP pipeline and Associated Facilities	117.2	0.1
Watershed: Lower Pigg River	**52,866**	
Other Identified Projects a/	158 c/	0.3 c/
MVP pipeline and Associated Facilities	178.5	0.3
Watershed: Stinking River-Banister River	**148,877**	
Other Identified Projects a/	79.9	0.1
MVP pipeline and Associated Facilities	49.3	0.03
Watershed: Cherrystone Creek-Banister River	**88,668**	
Other Identified Projects a/	No other projects identified	NA b/
MVP pipeline and Associated Facilities	182.8	0.2
EQUITRANS EXPANSION PROJECT		
Watershed: South Fork Tenmile Creek	**115,200**	
Other Identified Projects a/	3.5	0.003
Equitrans Expansion Project and Associated Facilities	2.4	0.002
Watershed: Lower Monongahela	**869,442**	
Other Identified Projects a/	3,589.5	0.4
Equitrans Expansion Project and Associated Facilities	71.3	0.008
Watershed: Fishing Creek	**139,636**	
Other Identified Projects a/	3,366.8	2.4
Equitrans Expansion Project and Associated Facilities	52.4	0.04

TABLE 4.13.1-1 (continued)		
Affected HUC10 Watersheds Affected by the Mountain Valley Project and the Equitrans Expansion Project and Other Projects		
Activity	**Acres**	**Percent of Watershed**

a/ Includes estimated values.
b/ Not applicable - No other projects identified in the watershed.
c/ Acres are surface water associated with Smith Mountain and Leesville Lakes. No ground disturbance will result from this project, therefore not counted as an impact to the watershed.

The EEP pipelines would cross three counties in Pennsylvania and one county in West Virginia. The MVP pipeline route would cross 11 counties in West Virginia (one overlapping the EEP) and 6 counties in Virginia. Combined, these 20 counties cover approximately 6,972,384 acres.

In addition to the geographic relationship between the MVP and the EEP and other projects in the area, we also considered temporal relationships. In addition to considering past actions that currently contribute effects on resources, we focused our review on projects that were recently constructed (within the last 3 years, the approximate time that would be needed to construct the MVP and the EEP followed by vegetation restoration) and placed into service in the geographic scope. Reasonably foreseeable projects that may be authorized in the near future and could be constructed at about the same time period as the MVP and EEP were also included for consideration. Construction and restoration for the EEP is expected to take about 2 years to complete. Construction and restoration of the MVP is expected to take about 2.5 years. If the Commission were to authorize the projects, and if construction were to begin in 2017, work (including a majority of right-of-way reclamation) would not be completed until about 2020. Two years of restoration monitoring would follow (up to about 2022). Therefore, this cumulative impact analysis considers current and other reasonably foreseeable projects that may be constructed within the geographic scope of analysis up through about 2022.

4.13.1 Other Projects within the Geographic Scope of Analysis

Appendix W identifies other projects or actions within the geographic scope of analysis for the MVP and the EEP. We identified these projects through scoping and independent research, as well as information provided by the Applicants. Independent research included the use of desktop analysis of available aerial photography, files at the FERC, information available on public websites, as well as internet searches for projects within the geographic limits identified in the bulleted section above. The approximate locations of the projects (those that were able to be identified through research) in relation to the MVP are shown in figure 4.13-1 (nine maps); the approximate locations in relation to the EEP are shown in figure 4.13-2 (three maps).

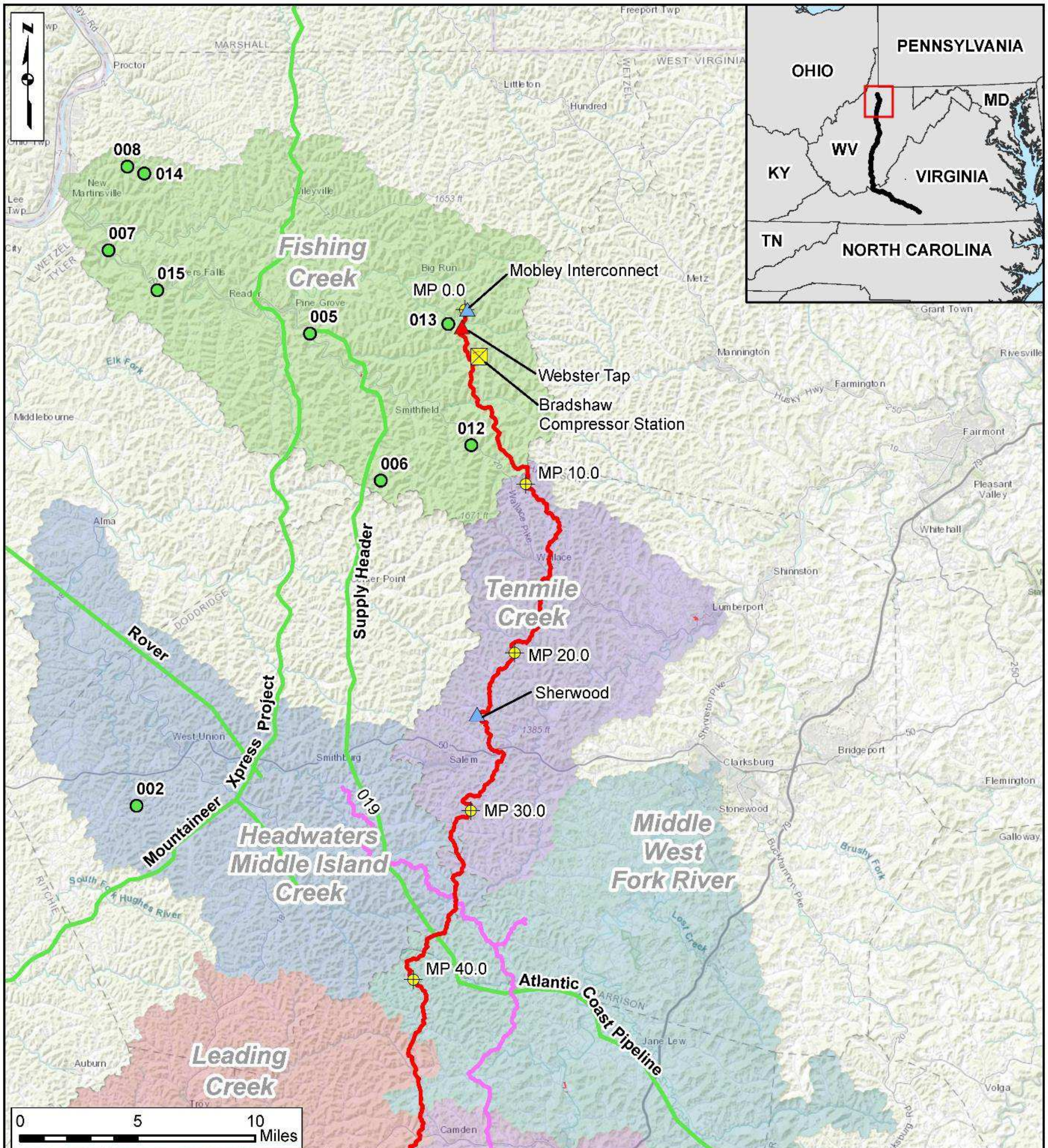
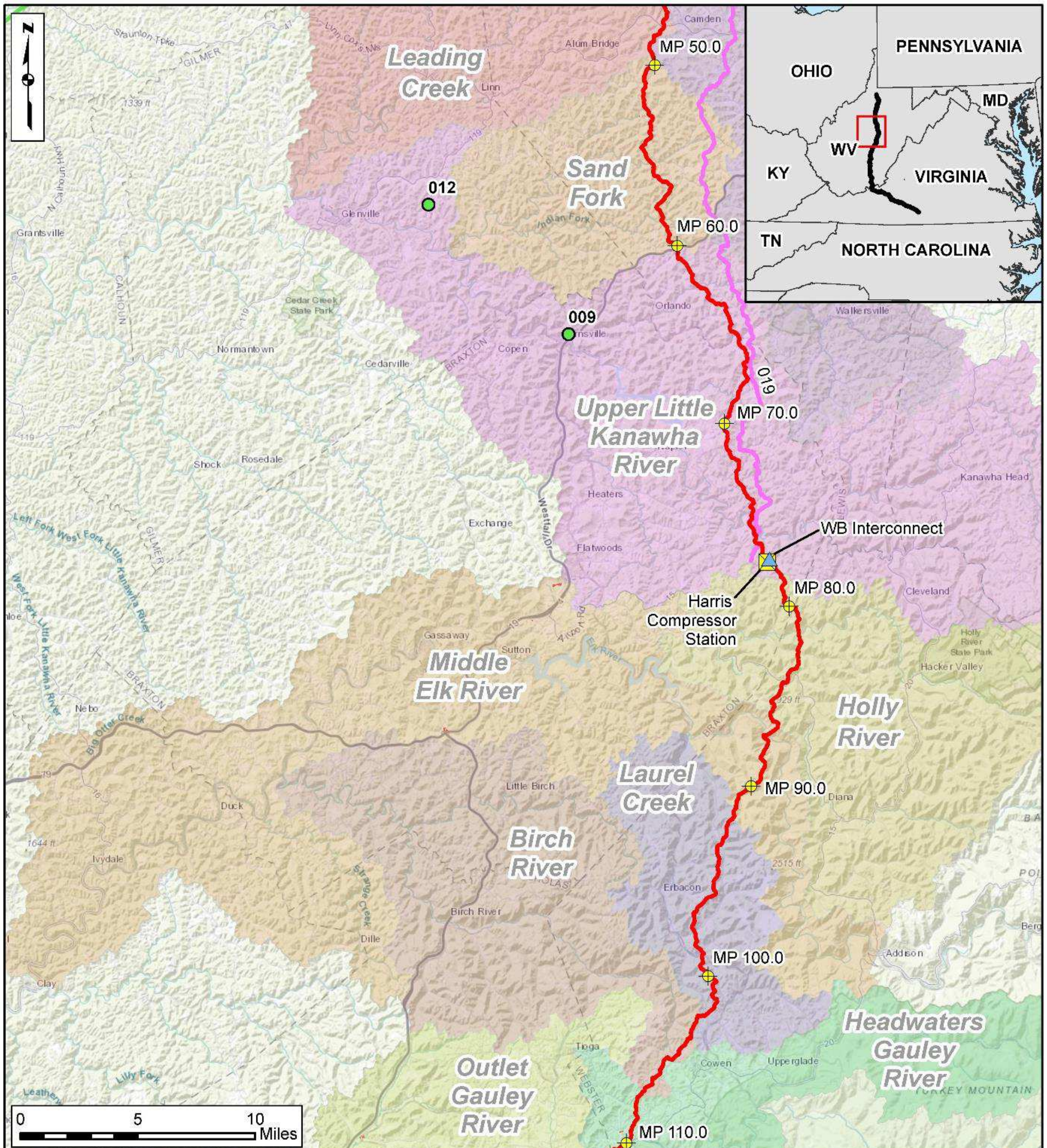


Figure 4.13-1

Mountain Valley Project

Projects Contributing to Cumulative Impacts - Sheet 1 of 9

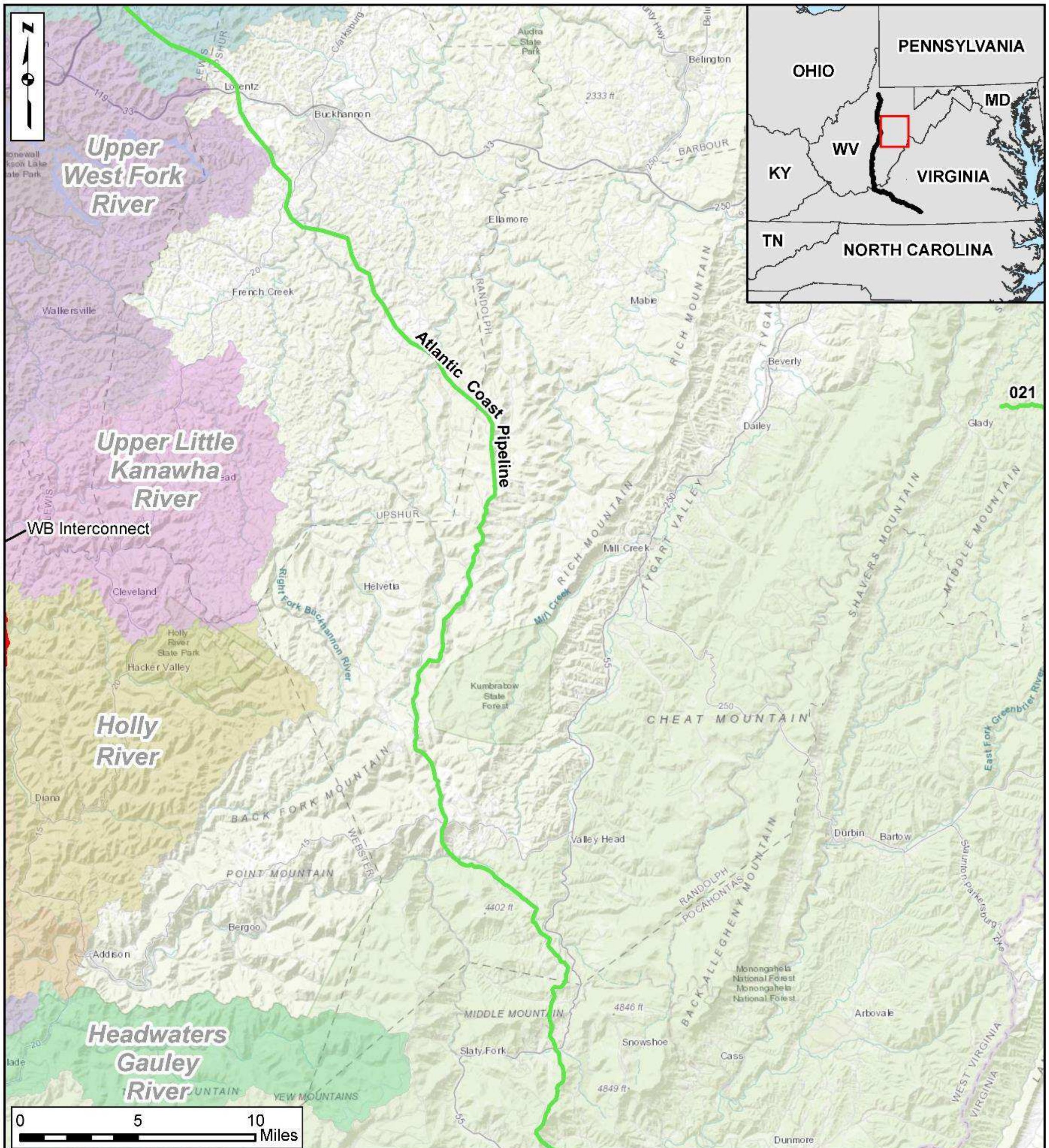


Proposed Pipeline Route
Gas Tap
Proposed Compressor Station Locations
FERC-Jurisdictional
Gathering Systems
Transportational/Roadway
Gathering Systems
Non-Jurisdictional Project-related Facilities
Transportation/Roadway Projects
Mining Operations
Other Projects
Meter Station/Interconnect
Milepost

Figure 4.13-1

Mountain Valley Project

Projects Contributing to Cumulative Impacts - Sheet 2 of 9



Proposed Pipeline Route
Gas Tap
Proposed Compressor Station Locations
FERC-Jurisdictional
Gathering Systems
Transportational/Roadway
Gathering Systems
Non-Jurisdictional Project-related Facilities
Transportation/Roadway Projects
Mining Operations
Other Projects
Meter Station/Interconnect
Milepost

Figure 4.13-1

Mountain Valley Project

Projects Contributing to Cumulative Impacts - Sheet 3 of 9

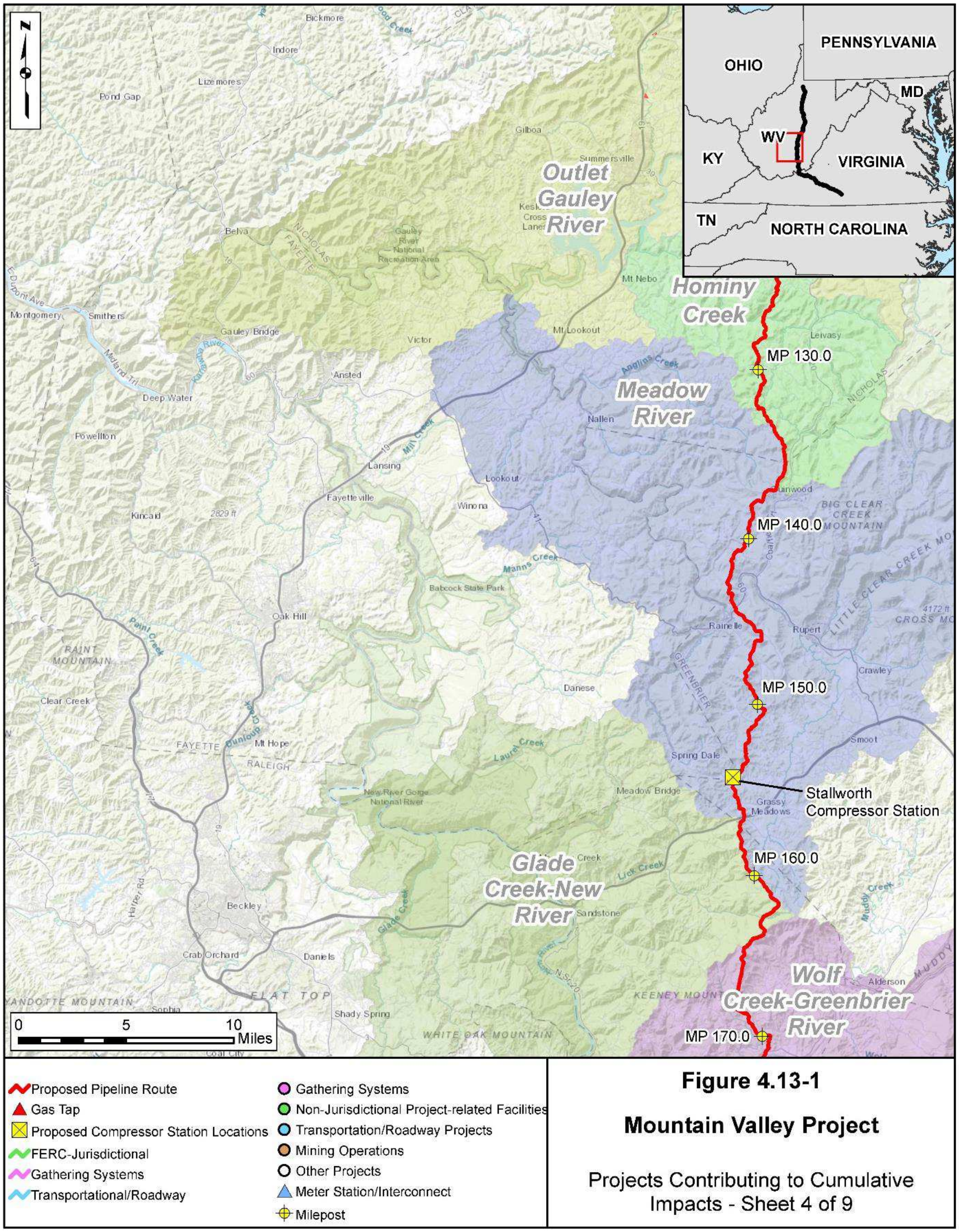


Figure 4.13-1

Mountain Valley Project

Projects Contributing to Cumulative Impacts - Sheet 4 of 9

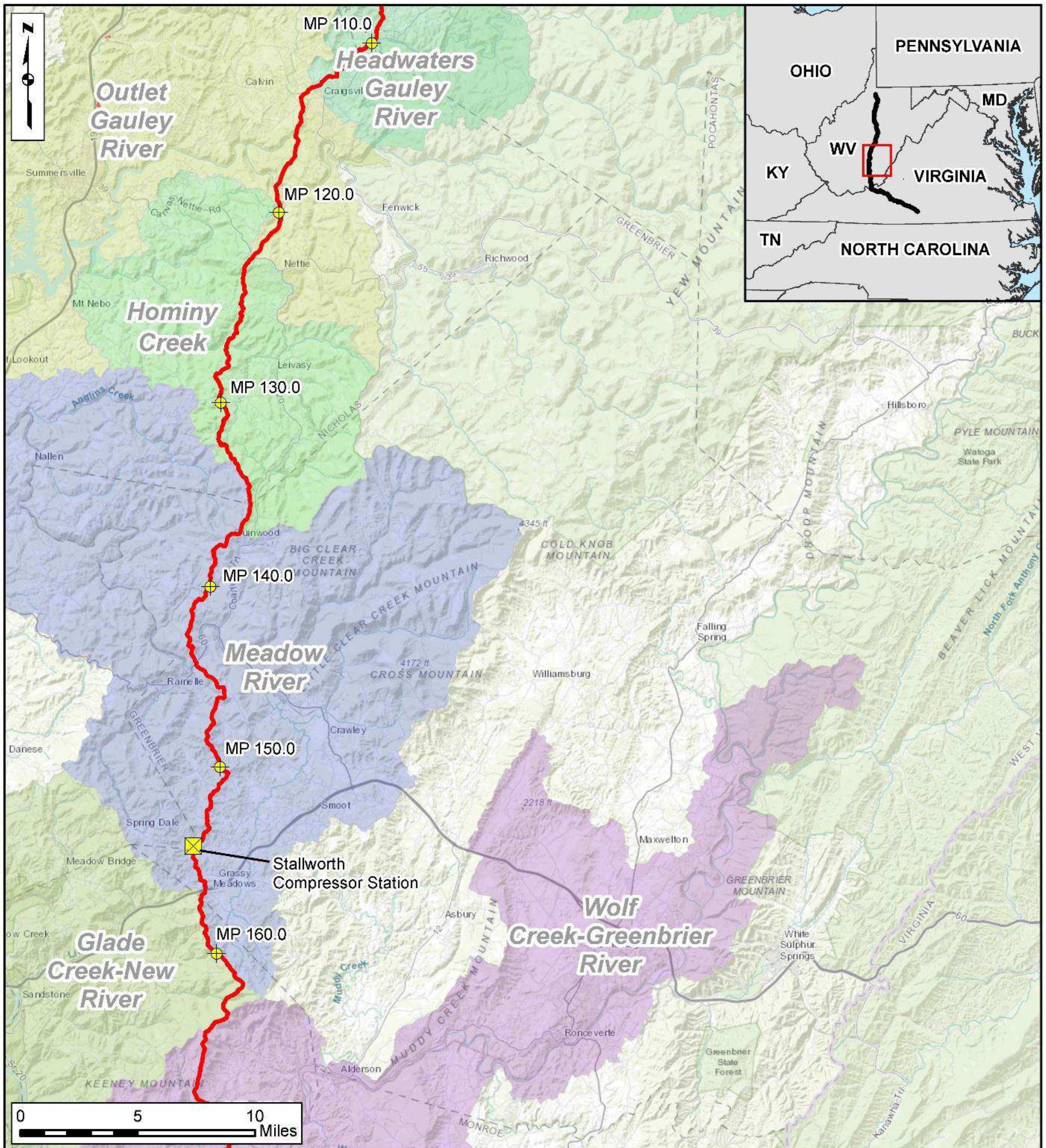


Figure 4.13-1

Mountain Valley Project

Projects Contributing to Cumulative Impacts - Sheet 5 of 9

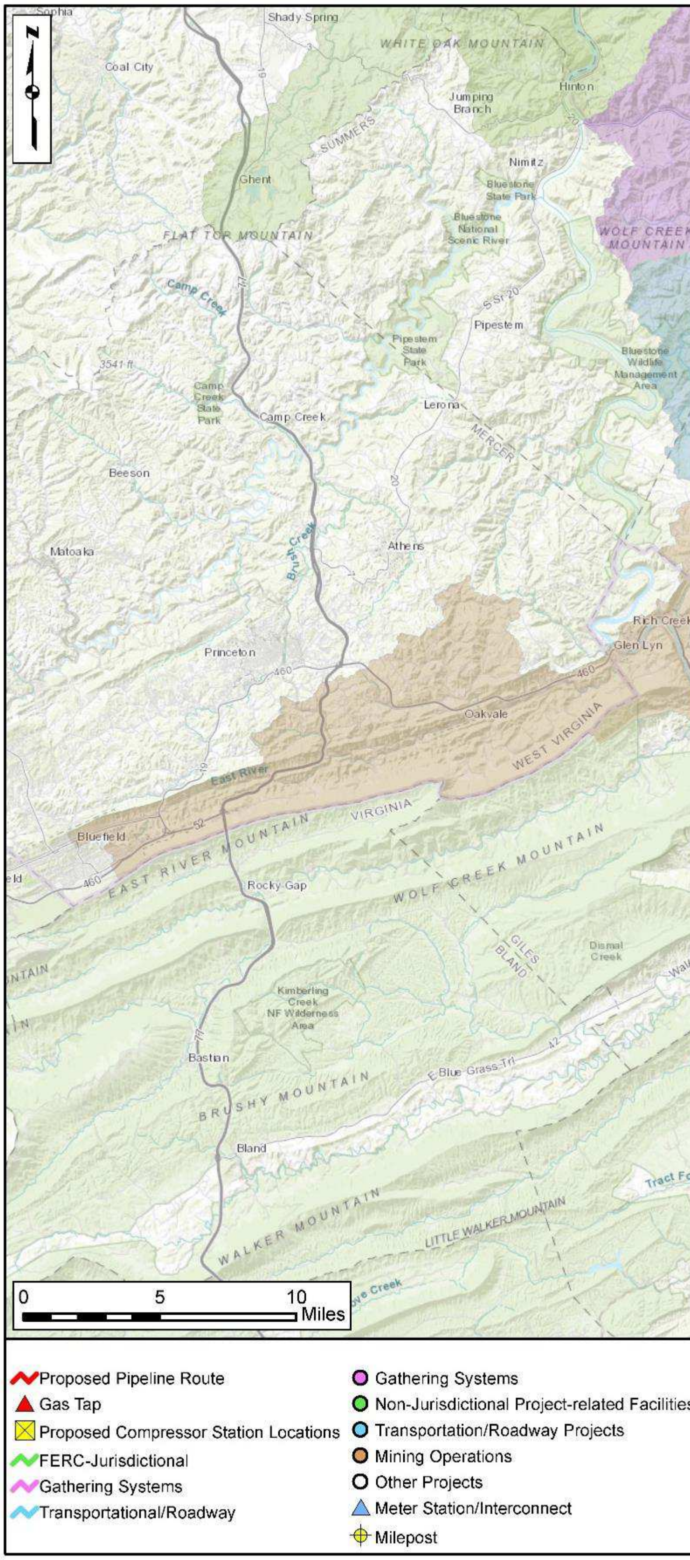


Figure 4.13-1

Mountain Valley Project

Projects Contributing to Cumulative Impacts - Sheet 6 of 9

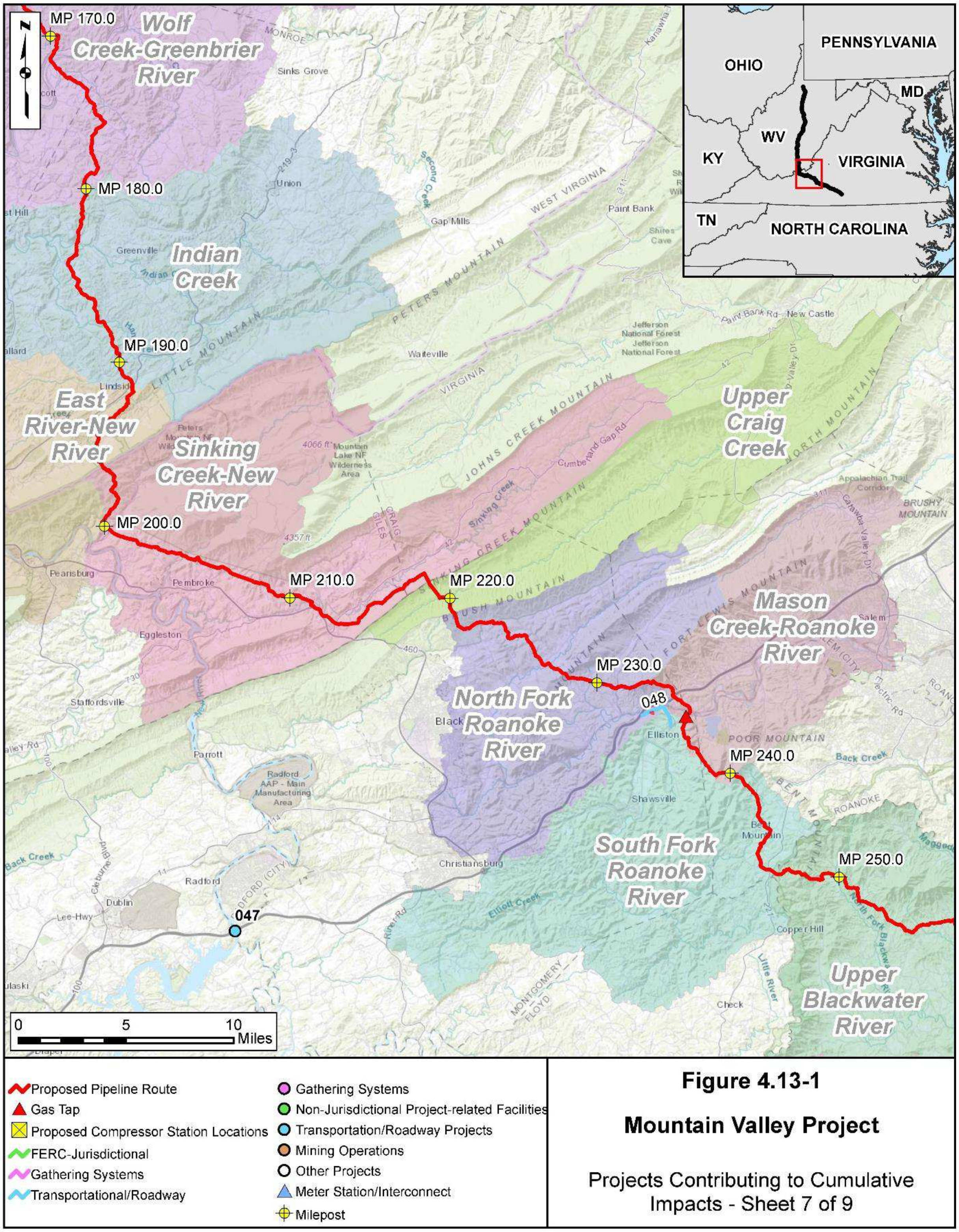


Figure 4.13-1

Mountain Valley Project

Projects Contributing to Cumulative Impacts - Sheet 7 of 9

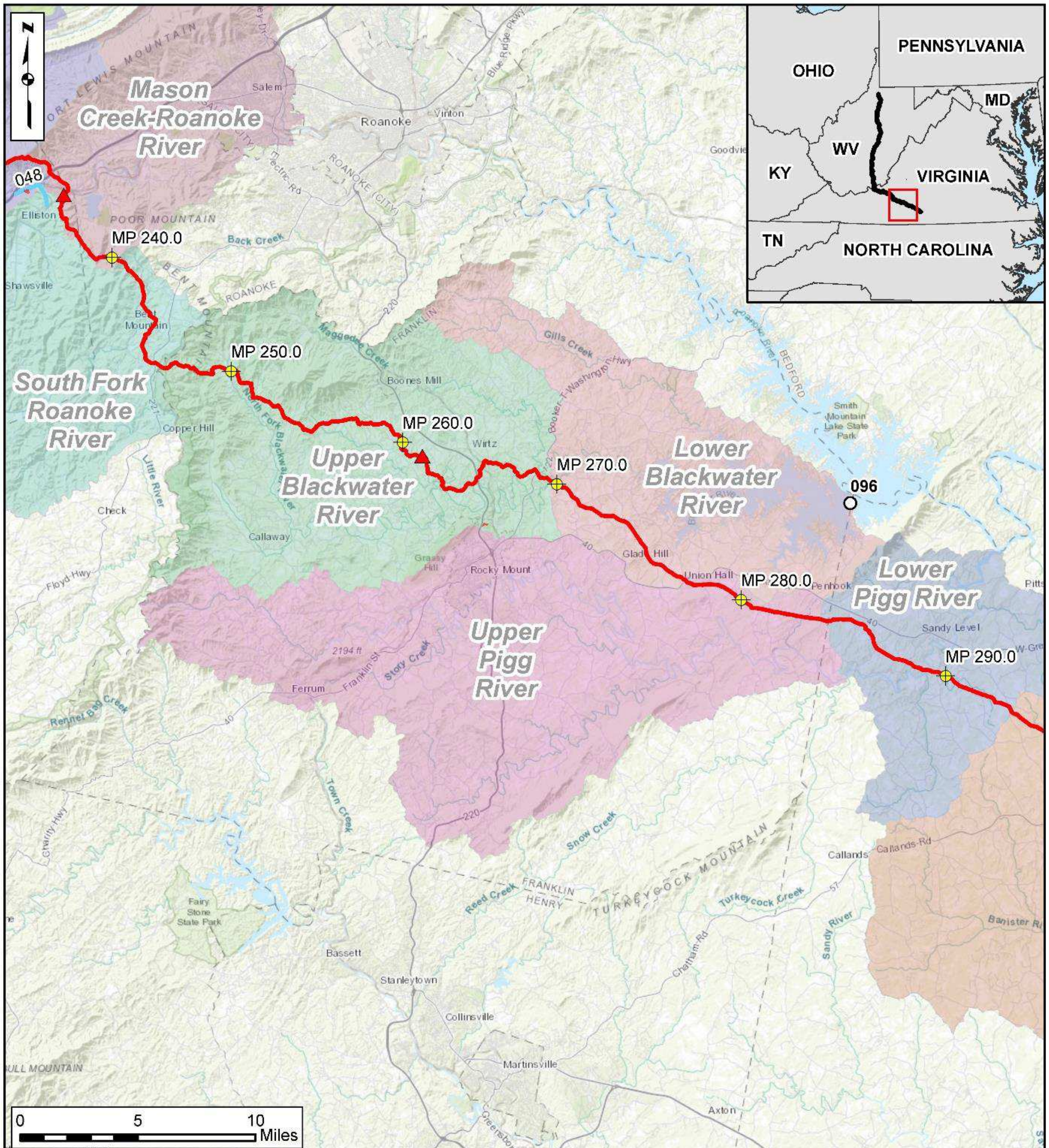


Figure 4.13-1

Mountain Valley Project

Projects Contributing to Cumulative Impacts - Sheet 8 of 9

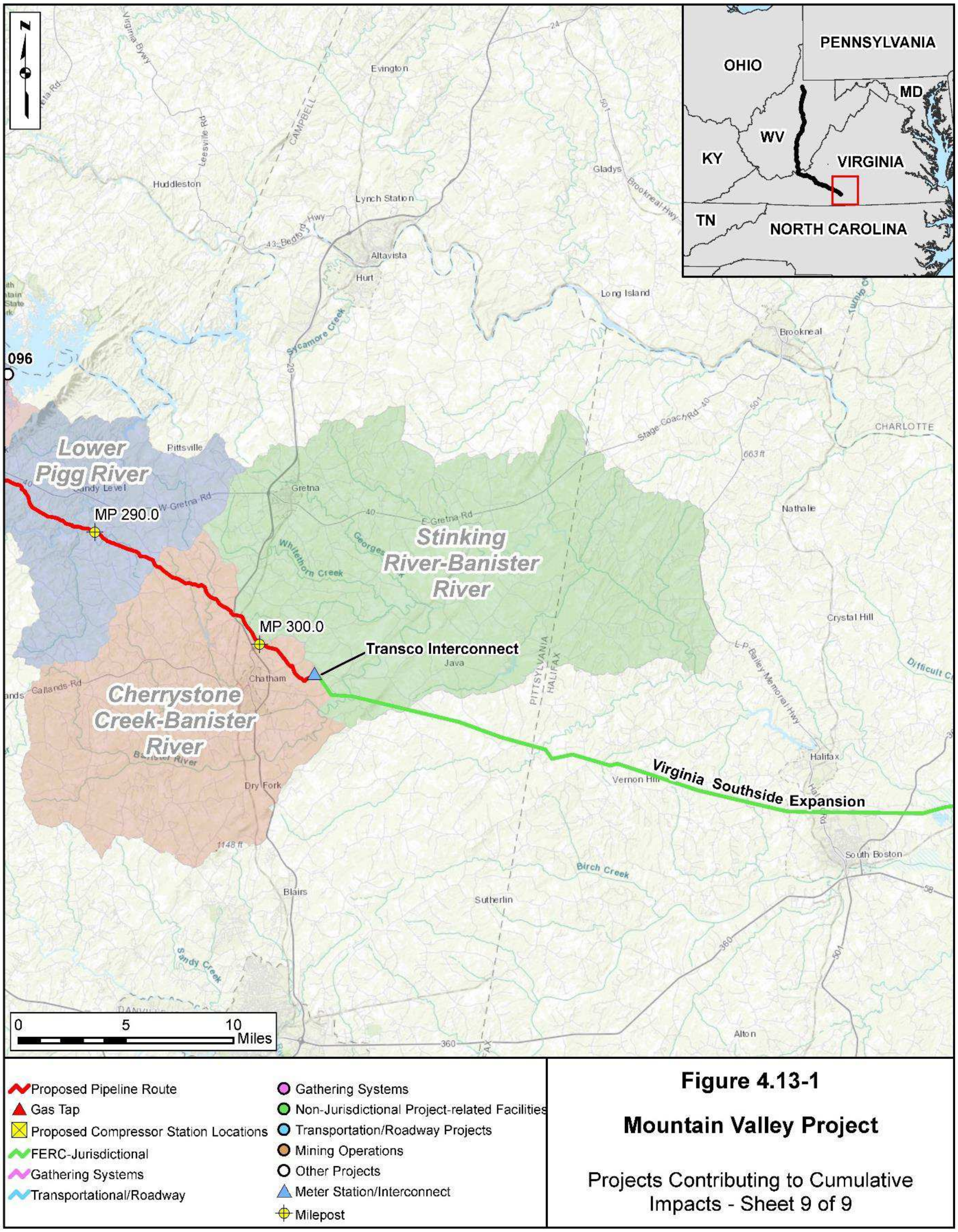


Figure 4.13-1

Mountain Valley Project

Projects Contributing to Cumulative Impacts - Sheet 9 of 9

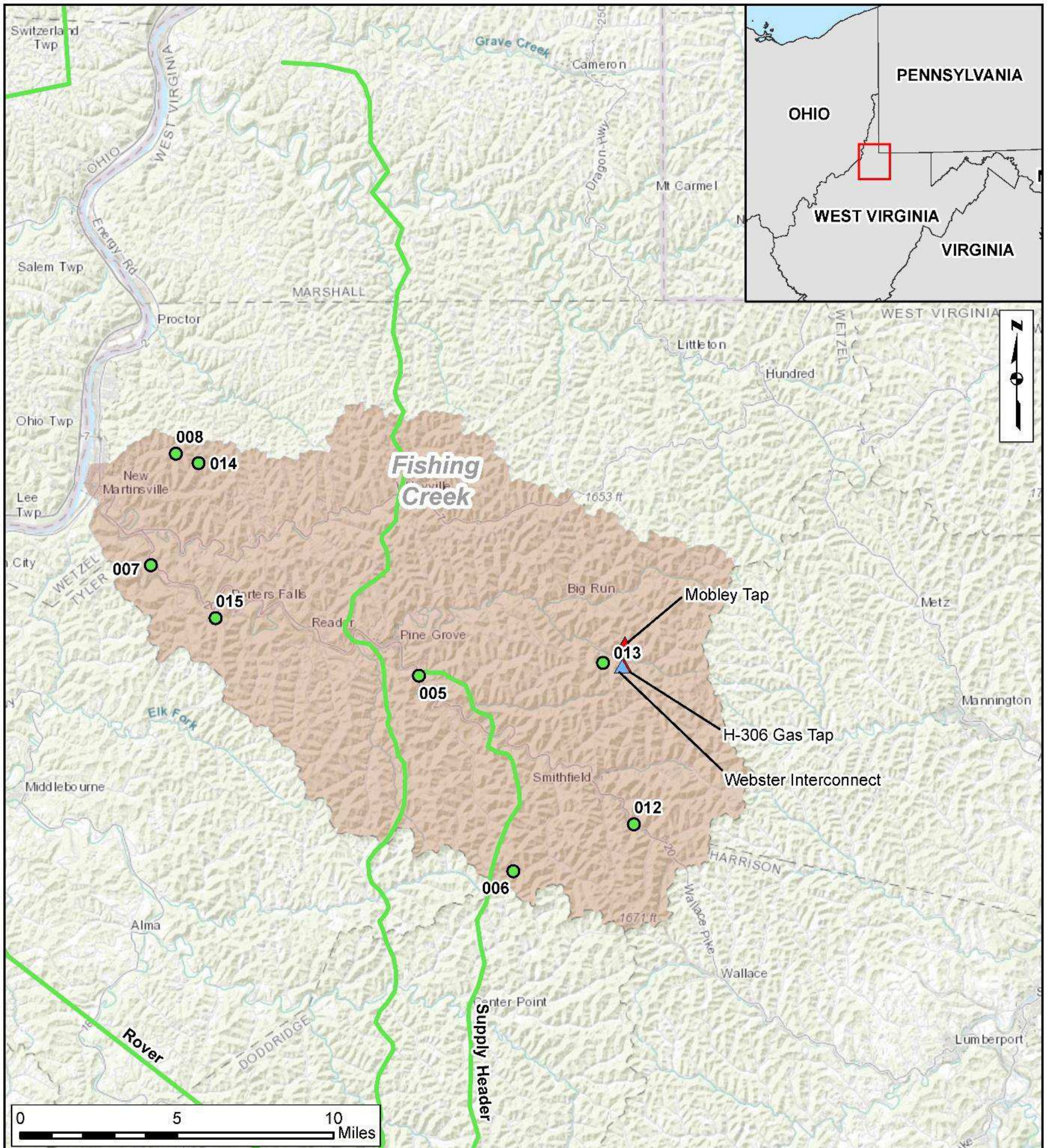


Figure 4.13-2

Equitrans Expansion Project

Projects Contributing to Cumulative Impacts - Sheet 1 of 3

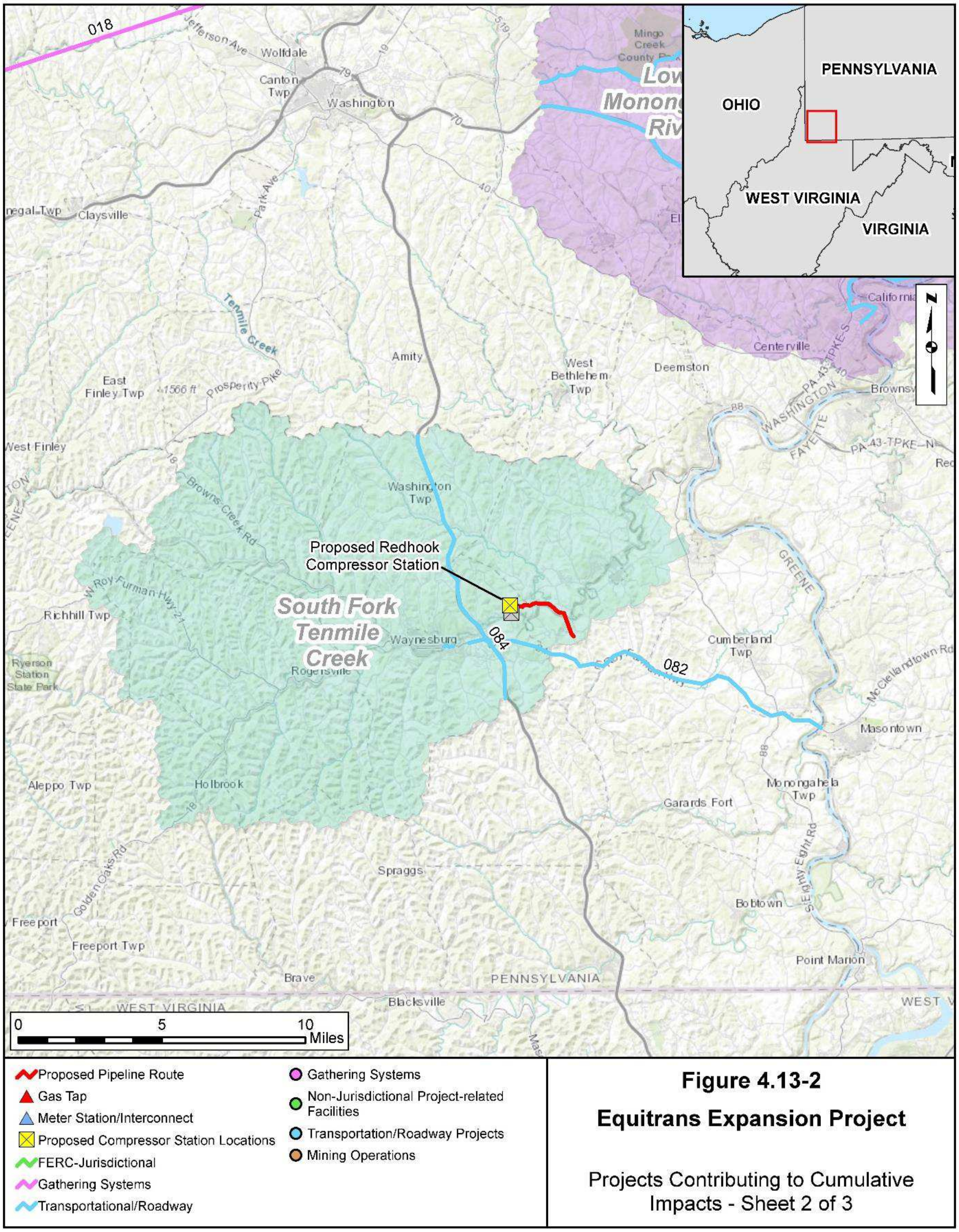


Figure 4.13-2

Equitrans Expansion Project

Projects Contributing to Cumulative Impacts - Sheet 2 of 3

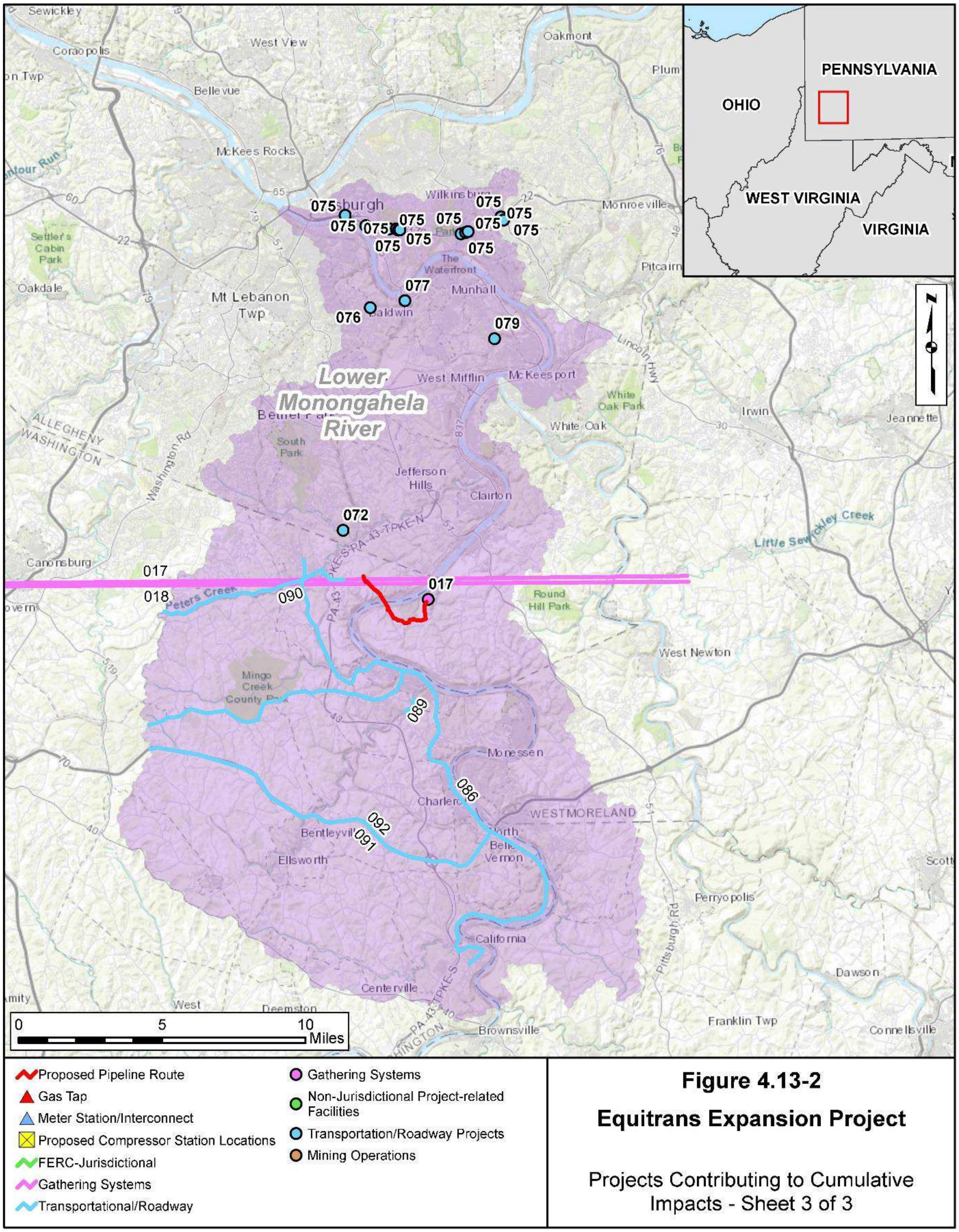


Figure 4.13-2

Equitrans Expansion Project

Projects Contributing to Cumulative Impacts - Sheet 3 of 3

We have identified seven types of projects that would potentially cause a cumulative impact when considered with the proposed projects. These are:

- oil and gas exploration and production;
- other non-jurisdictional pipelines and gathering systems;
- FERC-jurisdictional natural gas interstate transportation projects;
- mining operations;
- transportation or road projects;
- commercial/residential/industrial and other development projects; and
- other energy projects, including power plants or electric transmission lines.

These projects are described below. A discussion of resource-specific cumulative impacts follows.

4.13.1.1 Oil and Gas Exploration and Production

Oil and gas exploration and production includes drilling wells, building access roads, installing gathering lines, and constructing compressor stations and processing plants. Oil and gas exploration, production, and gathering are not under the jurisdiction of FERC; but those activities are regulated by individual states.

Information on oil and natural gas wells located in proximity to the MVP was obtained from the WVGES (2015b), WVDEP (2015), and the VADMME (2015c). Information regarding oil and gas wells near the EEP was obtained from the WVDEP Oil and Gas wells dataset (WVDEP, 2015d) and the PADEP Oil and Gas Locations (PADEP, 2015a).

Oil has been produced in Pennsylvania since the first well was completed in 1859 near Titusville. According to the EIA (2015a), in 2015 Pennsylvania produced 7,369,000 barrels of oil. West Virginia produced 8,282,000 barrels of oil that year. In 2014, West Virginia produced 1.0 trillion cubic feet of natural gas. The Commonwealth of Pennsylvania produced 3.7 trillion cubic feet of natural gas in 2014.

Wells

In 2013 the PADEP issued 2,965 well drilling permits for the construction of unconventional wells in Pennsylvania (25 in Allegheny County, 414 in Washington County, and 259 in Greene County) and 1,652 well drilling permits for the construction of conventional wells (5 in Allegheny County, 2 in Washington County, and 10 in Greene County) (PADEP, 2013). Pennsylvania had 57,068 producing gas wells at the end of 2013. As of 2014, 18,609 unconventional drilling permit applications had been filed with the PADEP. Of those applications, 8,827 unconventional wells have been drilled (PA Gas Outlook Report, 2014). According to the WVGES a total of 673 wells have been completed in the West Virginia counties that would be crossed by the MVP and the EEP since 2010 (WVGES, 2015c).

There are 327 wells within 0.25-mile of the MVP pipeline route; and 69 wells in the vicinity of the EEP pipelines. An estimated total of 62,108 acres are affected by oil and gas exploration and production within the watersheds affected by MVP and EEP.

Gathering Systems

Multiple non-jurisdictional intrastate oil and gas well interconnect and gathering facilities are either proposed, under construction, or have been recently constructed in the vicinity of the proposed projects. One source estimated that by 2014 there were 20,000 miles of gathering pipelines in Pennsylvania (Wereschagin, 2014). In 2010, 43 unconventional natural gas well operators identified 2,536 miles of gathering pipelines to the Pennsylvania Public Utility Commission. In 2012, about 230 miles of gathering pipelines were installed in Washington and Greene Counties, Pennsylvania combined (Washington and Jefferson College, 2014). Non-jurisdictional gathering systems also include access roads, storage tanks, compressor stations, and processing plants.

At least three companies own multiple gathering system projects within the geographic scope for the MVP and EEP (see appendix W). The Applegate Gathering System (EQT Gathering LLC) is currently in the preliminary planning stages, proposing the expansion of a yet undetermined amount of natural gas gathering lines and compressor stations. Sunoco's Mariner East Pipelines (Mariner East 1 and Mariner East 2) are also located in Allegheny County. Mariner East 1 is a Sunoco Logistics underground pipeline project that will transport 70,000 barrels daily of liquid propane and ethane from western Pennsylvania to Marcus Hook, Pennsylvania and Claymont, Delaware. Mariner East 1 utilizes mostly existing 8-inch-diameter steel pipeline, except for a portion of the line in western Pennsylvania that was increased to 12-inch-diameter steel pipe. Mariner East 2 (also known as the Pennsylvania Pipeline Project), is a planned new underground pipeline system of approximately 350 miles that will span Pennsylvania, West Virginia, and Ohio. Primarily, this project will follow the Mariner East 1 route to Marcus Hook, Pennsylvania. Mariner East 2 will utilize both the Utica and Marcellus Shale regions. Mariner East 2 has completed an open season, and contingent on regulatory and permit approvals, has a projected startup date for early 2017 (Landscapes2, 2016).

Completed in 2015, Momentum Midstream's Stonewall Gas Gathering Pipeline started pumping gas in November 2015 and can transport up to 1.4 Bcf/d (up to 2.0 Bcf/d with additional compression). This 50-mile-long pipeline connects to Momentum Midstream's existing Appalachian Gathering System. Approximately 412 miles of gathering systems have been identified as potentially contributing to cumulative impacts within the geographic scope of analysis for the MVP and EEP.

Non-jurisdictional gathering systems including pipelines and compressor stations account for an estimated 3,329 acres of impacts within the affected watersheds. We were able to estimate the amount of land that would be disturbed, but we do not know how many acres of that land are forest, wetland, or pasture. Similarly, data for resources affected by the existing wells are also unknown. As a result, it is only possible to speak in general terms about the cumulative effects on specific resources.

4.13.1.2 FERC-jurisdictional Natural Gas Interstate Transportation Projects

There are seven FERC-regulated natural gas projects within proximity to the MVP and the EEP. Several of these have filed applications with FERC and are in the environmental review process, while others were recently authorized and constructed and are already operational. These projects include the Columbia WB XPress (CP16-38), Supply Header (CP15-555), Atlantic Coast Pipeline (CP15-554), Rover Pipeline (CP15-93), Mountaineer Xpress Project (CP16-357), Columbia Smithfield III (CP13-477), and Virginia Southside Expansion projects (CP13-30). Each FERC-jurisdictional interstate transportation project within the geographic scope of analysis for the MVP and the EEP is listed in appendix W. Additional details regarding each project can be obtained through our website at www.ferc.gov by utilizing our eLibrary system and the docket number given for each project.

Columbia WB XPress Project

Columbia filed its application with the FERC for its planned WB XPress Project (CP16-38) on December 30, 2015. In addition, a special use application was submitted to the FS by Columbia on August 19, 2016 to allow construction and operation of the WB XPress Project on national forest system lands managed by the Monongahela National Forest.

The WB XPress Project would involve the construction of about 29 total miles of pipeline at segments of various diameters, modifications at seven existing compressor stations, construction of two new compressor stations, and uprating various existing segments of the WB systems in West Virginia and Virginia. This project would provide about 1.3 MMcf/d of additional capacity.

On March 24, 2017, FERC issued the Notice of Availability of the Environmental Assessment (EA) for the WB XPress Project. The comment period for the WB XPress Project ended on April 24, 2017. Pending approval from the FERC and other permitting agencies, Columbia anticipates the project being placed in-service in 2018.

About 5 miles of the proposed WB XPress Project would be located within the geographic scope of the MVP and the EEP. In addition to the new pipeline, the existing Frametown Compressor Station in Braxton County, West Virginia would be modified. This compressor station is about 16 miles away from the MVP pipeline. Combined, construction at the WB XPress Project facilities would affect about 76 acres within the Upper Little Kanawah River watershed.

Supply Header Project

On September 18, 2015, Dominion filed an application with the FERC for its planned Supply Header Project (CP15-555). The Supply Header Project is designed to transport about 1.5 MMDth/d. The ACP would be one of the main customers of this project. The ACP and Supply Header projects are being analyzed by the FERC together in one EIS. On December 30, 2016, the FERC issued the draft EIS for the ACP and Supply Header Project. The comment period for the draft EIS ended April 6, 2017. The final EIS is anticipated to be available on July 21, 2017. If the Supply Header Project is authorized by the FERC, Dominion anticipates that it would go into service in late 2018; however, this anticipated date may or may not be feasible, given the current schedule of that project.

The Supply Header Project would include a 37.5-mile-long 30-inch-diameter pipeline loop that crosses portions of Harrison, Doddridge, Tyler, and Wetzel Counties, West Virginia; modification of the existing Mockingbird Hill Compressor Station in Wetzel County, West Virginia; and modification of the existing Crayne Compressor Station in Greene County, Pennsylvania. We estimate that the Supply Header Project would affect a total of about 294 acres within the geographic scope overlapping with MVP and the EEP.

Atlantic Coast Pipeline

Dominion and its partners filed an application for the planned ACP Project (CP15-554) with FERC in September 2015. A special use application was submitted to the FS on November 12, 2015 to allow construction and operation of the ACP on national forest system lands managed by the Monongahela and George Washington National Forests. This application was amended on June 17, 2016 and on April 17, 2017. On December 30, 2016, FERC issued the draft EIS for the ACP and Supply Header Project. The final EIS is anticipated to be available on July 21, 2017. The schedule for the ACP Project would be similar to that of the Supply Header Project.

The entire project would include about 603 miles of new 42-inch-diamter pipeline between West Virginia and North Carolina; 3 new compressor stations; 9 new M&R stations; 29 MLVs; and 8 sets of pig launcher and/or receiver sites. Although the ACP Project is a large project, only a small portion would be within the geographic scope of analysis for the MVP. Specifically, about 21 miles of pipeline would be located within the Middle West Fork watershed, and 1 mile would cross the Upper West Fork watershed. In addition, the ACP Project's proposed Marts Compressor Station in Lewis County lies within the geographic scope of cumulative analysis with the MVP. We estimate that construction of ACP facilities in those watersheds would affect a total of about 325 acres.

Rover Pipeline Project

On February 21, 2015, Rover Pipeline LLC (Rover) filed an application with the FERC in Docket No. CP15-93. The FERC issued a final EIS for the Rover Pipeline Project in July 2016. The Commission issued an Order authorizing the project on February 2, 2017. Construction began on March 2, 2017.

The project includes about 511 miles of multi-diameter pipelines extending in segments from West Virginia to Michigan, to transport about 3.3 Bcf/d of natural gas, and 10 new compressor stations. Within the geographic scope for the MVP and EEP there would be 15 miles of 36-inch-diameter pipeline in the Headwaters Middle Island Creek HUC10 watershed, and Rover's Sherwood Compressor Station would be located in Doddridge County. In total about 219 acres would be disturbed within the same geographic scope.

Mountaineer Xpress Project

Columbia's Mountaineer Xpress Project (MXP) (CP16-357) was filed with FERC on April 29, 2016. The proposed project would consist of about 170 miles of pipeline of various diameter, three new compressor stations, modifications to three existing compressor stations, and two regulating stations in West Virginia. Within the geographic scope for the MVP and EEP there would be 60.6 miles of 24- and 36-inch diameter pipeline in the Headwaters Middle Island Creek and Fishing Creek HUC10 watersheds. In total about 735 acres would be disturbed within the same geographic scope. The primary purpose of the MXP is to add pipeline infrastructure to support the increased transportation demand for natural gas in the Utica and Marcellus basins by increasing the capacity of Columbia Gas' system by up to 2,700,000 dekatherms per day. The FERC issued a Notice of Availability of the draft EIS for the MXP (and associated Gulf Xpress) on February 27, 2017. It is anticipated to be operational by October 2018.

Columbia Smithfield III Expansion Project

Columbia's Smithfield III Expansion Project (CP13-477) involved the construction of a new compressor station (Redd Farm) in Washington County, Pennsylvania and an upgrade to the existing Glenville Compressor Station in Gilmer County, West Virginia. The Smithfield Compressor station was also upgraded. The project went into service in October 2014. The project affected approximately 17 acres within the geographic scope of MVP.

Virginia Southside Expansion

Transco's Virginia Southside Expansion (CP13-30) is a 100-mile-long pipeline expansion that extends the Transco pipeline system from Transco Station 165 (where the MVP would connect) to Brunswick County, Virginia. The project affected about 71 acres within watersheds shared with MVP and EEP. This project went into service in September 2015.

4.13.1.3 Other Energy Projects

The Smith Mountain Lake/Leesville Project is a 636-megawatt, two reservoir hydroelectric generation project located in Bedford, Campbell, Franklin, and Pittsylvania Counties, Virginia. Appalachian Power, a subsidiary of AEP, operates the Smith Mountain Project under a new 30-year-term license from the FERC (Project 2210) which became effective in 2010. The project consists of two dams on the Roanoke River completed in 1963, and two reservoirs covering a total of about 25,000 surface acres that were filled by 1966 (AEP, 2015). Portions of the Smith Mountain Project overlap with the Lower Blackwater River and Lower Pigg River watersheds, which are crossed by the MVP pipeline route.

4.13.1.4 Transportation and Road Improvement Projects

The PADOT, WVDOT, and VADOT are overseeing multiple ongoing and proposed infrastructure projects in the geographic scope for the proposed projects (see appendix W). The scopes of all of the projects are limited to work on existing infrastructure. The exact locations and sizes for many transportation projects are not available, because they involve work at multiple locations. According to available information, the size of many of the transportation projects identified is less than 30 acres. All of the transportation projects were considered minor, as they were generally localized road improvements rather than larger road projects encompassing many miles. An estimated total of 29.5 acres of resources would be affected by transportation and road improvement projects within the geographic scope of MVP and EEP.

4.13.1.5 Mining Operations

Information on proposed mining operations near the EEP in Pennsylvania was obtained from the PADEP Bureau of Mining (PADEP BMR, 2015), PADEP abandoned mining data

(PADEP, 2015b; 2015c), and the PADEP Bureau of District Mining Operations (PADEP DMO, 2015) underground permit boundaries.

Information regarding mineral resources in West Virginia and Virginia were obtained though the West Virginia GIS Technical Center (2015b), the VADMME (2015b), and the USGS (2015b). No non-fuel mining operations were identified within the geographic scope of the EEP in West Virginia (WVDEP, 2016a; 2016b).

There are several active surface mining operations located within the geographic scope as listed on appendix W Mining operations in Pennsylvania and West Virginia consist mainly of coal mines, while the mines in Virginia consist of clay, sand and gravel, limestone, iron, and nickel. Operating these facilities requires surface clearing, excavation, and mineral extraction. These activities are presently ongoing and could occur into the foreseeable future. These activities are also regulated by state and local authorities.

There is a long history of coal mining operations in the project areas since the 1800s. At present, over 3,600 acres are occupied by coal mining operations in West Virginia and Pennsylvania. Coal extraction within the project areas requires land to be disturbed, through surface strip mining (including mountaintop mining) and underground operations (including long wall mining) which can result in impacts on water, and can result in soil erosion, dust, and noise pollution. Depending on the mine operator (and the underlying resources present), we expect future clearing and excavation to occur incrementally.

Several coal mining projects, including refuse disposal and refuse processing sites (such as the Harmar Site, Retention Pile, Phoenix, and Hawkins in Allegheny and Washington Counties, Pennsylvania) were found within counties in Pennsylvania and West Virginia that would be crossed by the MVP and the EEP. The EEP pipelines would cross 13 closed or abandoned coal mines. None are active.

The MVP pipeline route would be in the vicinity of 67 mining operations, of which 4 are active. Underground mines that would be crossed by the MVP could be longwall mines where subsidence may be a factor as part of the mining process or room and pillar mines where supports are left in space. An estimated 4,610 acres would be affected by ongoing mining operations within the geographic scope of MVP and EEP.

4.13.1.6 Residential and Commercial Developments

There are two residential and other development projects which have been identified within the geographic scope of the EEP as permitting in process or under construction. These projects are identified on appendix W.

These two known development projects may impact 44 and 911 acres, respectively. The projects would be located relatively nearby the EEP and within the Lower Monongahela Watershed.

Based on our own research and information provided by Mountain Valley, there are no major recently completed, ongoing, or planned future residential or commercial developments within the vicinity of the MVP. Due to the speculative nature of the housing and development markets and funding mechanisms for other single home construction or other, unknown yet unidentified development projects, it is difficult to determine the amount of land that would ultimately be affected by these projects, and therefore contributing to a cumulative impact.

4.13.1.7 Non-Jurisdictional Facilities Associated with MVP

The non-jurisdictional facilities associated with the MVP would include installation of aboveground and underground powerlines and telecommunications from existing nearby power poles to the interconnects, taps, compressor stations, and MLVs. All of the MLVs associated with the MVP would require the local electric distributor to extend aboveground power and telecommunications from an existing power pole to the MLV site. These extensions would range from 30 feet to 2,212 feet in length. Telecommunications would be radio and/or cellular with VSAT service as a backup. Impacts from these non-jurisdictional facilities are included in appendix W. Impacts associated with these non-jurisdictional facilities are expected to be minimal due to the limited footprint of these projects and potential mitigation measures required by permitting agencies.

4.13.1.8 Non-Jurisdictional Facilities associated with EEP

According to Equitrans, there are no non-jurisdictional facilities associated with the EEP.

4.13.2 Cumulative Impacts on Specific Environmental Resources

The potential impacts that we consider as part of our cumulative review pertain to groundwater, surface water, and wetlands; vegetation; wildlife; fisheries and aquatic resources; land use, recreation, special interest areas, and visual resources; cultural resources; and air quality and noise. For each environmental resource, the potential direct and indirect impacts associated with the projects are discussed in relation to the cumulative effects that may occur between the proposed MVP and/or EEP and the projects listed in appendix W.

We determined that further assessment of the cumulative impact on geological resources was not required for the following reasons:

- the site-specific nature of geological resources; and
- the generally localized potential effects to these resources in relation to the MVP and the EEP as well as from other projects (such as the limited areas where the projects would intersect or overlap).

With the exception of farmland soils, we did not consider the cumulative impacts that the EEP and MVP and other projects located in the same watersheds would have on other soil types, because: 1) of the site-specific nature of the soils crossed; and 2) use of the FERC Plan would keep soils within the construction right-of-way. However, we do discuss impacts on farmland soils as a proxy for agricultural land use.

In addition, although overlapping projects within certain counties may result in either positive (e.g., tax base, employment) or negative (e.g., traffic, reduced tourism) socioeconomic effects, we conclude that the limited nature of this overlap, both temporally and spatially, would result in minimal cumulative effects and that socioeconomics does not require further assessment.

In many cases, resource-specific impact data were lacking for projects by HUC10 watershed, including for FERC-regulated projects. We used project-specific data where appropriate in some circumstances to estimate quantitative resource impacts by watershed using scaling and assumptions. For example, if we knew from project-specific data that upland forest comprised 25 percent of a project's land use, we assumed uniform distribution of forest across the project length and multiplied the known project footprint of a watershed times 25 percent to get an estimate of upland forest impact for that project in that watershed.

4.13.2.1 Water Resources

Construction and operation of the projects would likely result in only short-term impacts on water resources (see section 4.3). These impacts, such as increased turbidity, would return to baseline levels over a period of days or weeks following construction.

Water Consumption

The EEP and MVP would mainly use municipal water sources for hydrostatic testing of their pipeline; except Mountain Valley would also use two surface water sources. Mountain Valley estimates about 11,777,551 gallons of test water would come from surface water sources.

Water availability, use and the regulations that are put in place to protect these resources varies from state to state. According to the WVDEP, there are an estimated 42 billion gallons of water available per day in its rivers and streams. Large quantity users (excluding hydroelectric) withdraw approximately 978 billion gallons per year of which only 59 billion gallons are consumed per year (WVDEP, 2015e).

In West Virginia, the Hydrostatic Testing General Permit, WV0113069, provides coverage for any establishment with discharges composed entirely of waters from hydrostatic testing of new pipeline and agreeing to be regulated under the terms of the General Permit. For the purpose of this General Permit, the term establishment means certain pipeline replacement and/or construction projects. The General Permit for Hydrostatic Testing became effective February 19, 2012 The General Permit was modified on October 31, 2014 to incorporate two new Other Requirements, B.13 and B.14. The current General Permit has been extended through June 2017.

In West Virginia, Groundwater Protection Plans are required for all facilities having the potential to impact groundwater. They are "preventive maintenance" documents that cover all processes and materials at a facility that "may reasonably be expected" to have an effect on groundwater quality. The facility must make an inventory of all potentially contaminating processes and materials, and have structures and practices in place to prevent groundwater contamination from these processes and materials. Groundwater protection practices include, at a minimum, quarterly inspections and maintenance by facility personnel and usually include spill cleanup procedures. In addition, any wastewater generated during exploratory and/or developmental drilling, well treatment operations, plugging operations and reworking of wells is regulated under General Permit GP-WV-1-88. This process is overseen by the WVDEP Office of Oil and Gas.

According to the VADEQ, total 2014 water withdrawals were approximately 17 million gallons per day (MGD) (1.4 percent) greater than those reported for 2013, increasing from 1,202 MGD in 2013 to 1,219 MGD in 2014. This includes agricultural, commercial, irrigation, manufacturing, mining, public water supply, and other uses. The year-to-year changes in withdrawals represented by the two largest categories (Public Water Supply and Manufacturing) have been less than 3 percent of the previous year's total. As a result of these changes, the reported 2014 total withdrawals are within approximately 2 percent of the average for the 5-year period (VADEQ, 2015).

In Virginia, General Permit VAG83 governs the discharge of wastewaters from sites contaminated by petroleum products, chlorinated hydrocarbon solvents, the hydrostatic testing of petroleum and natural gas storage tanks and pipelines, and the hydrostatic testing of water storage tanks and pipelines. These wastewaters may be discharged from the following activities: excavation dewatering, conducting aquifer tests to characterize site conditions, pumping contaminated groundwater to remove free product from the ground, discharges resulting from another petroleum product or chlorinated hydrocarbon solvent cleanup activity approved by the board, hydrostatic tests of natural gas and petroleum storage tanks or pipelines, hydrostatic tests of underground and aboveground storage tanks, and hydrostatic tests of water storage tanks and pipelines.

The VADEQ requires permits related to surface water and groundwater withdrawals and discharges including the Virginia Water Protection General Permit Number WP2 for facilities and activities of utilities regulated by the Commonwealth Corporation Commission. The permit program governs permanent and temporary impacts related to the construction and maintenance of utility lines.

In Pennsylvania, the PADEP NPDES General Permit PAG-10 provides NPDES permit coverage to entities who wish to conduct hydrostatic testing and discharge the water used for this testing to waters of the Commonwealth that are not considered high quality or exceptional value. To address a need for pollution prevention and emergency response, the PADEP has added a pollution prevention and contingency plan requirement applicable to the type of pipeline and tank testing activities.

The other FERC-regulated projects would also utilize water from local water sources, including surface water and municipal water sources. The data presented below is for informational purposes, as it is not always clear if the water withdrawals and/or discharges discussed below would occur within the same HUC10 watersheds that would be affected by the MVP or EEP. The Virginia Southside Expansion project used an estimated 538,000 gallons of water from Reedy Creek for hydrostatic testing. The ACP and Supply Header Project would use an estimated 83.7 million gallons of water combined for hydrostatic testing, as well as 38.2 million and 3.4 million gallons of water for dust control, respectively. MXP would utilize an estimated 43 million gallons, 2.5 million of which would be withdrawn from Grasslink Run. The Columbia Smithfield III project would require 18,800 gallons of water for hydrostatic testing for the Redd Farm Compressor and 40,000 gallons for the Glenville Compressor Station. The Columbia WB

Xpress would use an estimated 5.5 million gallons, and Rover would use 266 million gallons for hydrostatic testing.

Groundwater

The occurrence of water wells, springs, and swallets in the vicinity of the MVP and the EEP are described in section 4.3.1.

We were unable to quantitatively determine the number of these features on a HUC10 watershed basis. However, it is apparent that the MVP and the EEP route would cross near numerous wells, springs, and swallets, some of which would be located within 0.1 mile of the projects. Given the relatively shallow (typically less than about 8 feet) nature of pipeline trenching and the often deep depths at which water wells are drilled to reach aquifers, in general it is unlikely that pipeline activities would negatively affect groundwater supplies from wells, although springs may be more subject to disruption. Potential impacts on groundwater in karst areas may be more likely given the extensive interaction between surface and near surface flow and deeper aquifers. Most other types of other projects listed on appendix W would have a similar, limited ability to significantly affect groundwater resources with the exception of oil and gas well exploration and production.

Sources estimate that about 4.4 million gallons of water is typically used for a single hydraulically fractured well in Pennsylvania (Washington and Jefferson College, 2014). If a total of 3,638 unconventional wells were permitted or completed in 2013 within the geographic scope in Pennsylvania and West Virginia, they could have used about 16 billion gallons of water. Approximately 1.9 million gallons of water per day is used for Marcellus Shale development in Pennsylvania, or about 0.02 percent of the 9.5 billion gallons of water withdrawn in Pennsylvania (from surface or groundwater sources) per day for all general uses and consumption (GMSAC, 2011). This water may be obtained from either groundwater or surface water sources, trucked to the wells, or transported in fresh water pipelines.

Operators in Pennsylvania report that approximately 15 percent of the water used to drill an unconventional well is returned to the surface. Water coming out of an unconventional well is usually termed wastewater. In the first 6 months of 2013, all the unconventional wells in Pennsylvania produced a total of about 15 million barrels of wastewater, recovered from boreholes. About 74 percent of well wastewater is reused on site and about 16 percent was transported to treatment plants.

In Pennsylvania, the PADEP regulates water used by well operators. Oil and gas wells must also be sited at least 500 feet from a drinking water well and at least 100 feet from a spring; further, drillers and operators must appropriately manage well return water. The PADEP's recently promulgated Chapter 95 regulations to address the approved treatment facilities and reduce impacts from unconventional well wastewater discharges (GMSAC, 2011). Well drillers are implementing other measures, such as recycling, to reduce the volume of flowback water for treatment and disposal.

In West Virginia, approximately 5 million gallons of fluid are injected per fractured well. Reused flowback fluid accounts for approximately 8 percent of water used in hydraulic fracturing.

On average 8 percent of injected fluid is recaptured. The remaining 92 percent remains underground, completely removed from the hydrologic cycle (Hansen et al., 2013).

We do not have data about impacts on karst features and related groundwater resources for all of the other projects within the HUC10 watersheds crossed by the MVP and the EEP. However, a review of information available regarding karst features crossed by other FERC-jurisdictional projects shows whether or not there are karst impacts associated with any of those other projects. The Columbia Smithfield Expansion III and the Virginia Southside projects do not cross karst terrain. And while the ACP Project and Supply Header do cross karst terrain, it is unclear whether any of it occurs within the HUC10 watersheds shared by the MVP or the EEP. The Rover Pipeline would cross 89.4 miles of potential karst terrain, most of which is in northwest Ohio, outside of the geographic scope of analyses for the MVP or the EEP. Surveys for karst terrain for the Columbia WB XPress Project identified four areas within the project survey corridor (a 300-foot study area). No caves were identified. No karst would be crossed or found in the proximity of the MXP. Other projects that may also cross karst terrain include transportation or other energy projects.

In consideration of available information for other projects, and the protective measures proposed by MVP, we have not identified any cumulative impacts on karst terrain and related groundwater resources that would result from construction and operation of the projects. Given the nature of shallow pipeline trenching relative to deeper aquifers, Mountain Valley's *Karst Mitigation Plan*, as well as the protective permitting requirements of other agencies for other projects such as oil and gas well development, we conclude that the combined cumulative effects upon groundwater would be less than significant.

Surface Water

The proposed MVP pipeline route would cross 389 perennially flowing waterbodies, and the EEP would cross 15 perennial waterbodies. All waterbodies would be crossed with either HDDs or dry-trenching techniques. The pipelines would be installed below scour depth.

Construction of the projects would result in temporary or short-term impacts on surface water resources (see section 4.3.3), as well as some minor long-term impacts such as loss of forested cover in the watershed and partial loss of riparian vegetation. These impacts, such as increased turbidity levels, are expected to return to baseline levels over a period of days or weeks following construction given the Applicants commitments to restore the waterbodies according to their specifications, which are based on the FERC Procedures.

The other FERC-regulated projects would cross multiple waterbodies (ACP Project - 31 waterbodies; Rover Pipeline - 7 waterbodies; Supply Header Project - 13 waterbodies; Columbia Smithfield Expansion - 17 waterbodies; MXP – 90 waterbodies; and the Virginia Southside Expansion Project - 2 waterbodies) within the HUC10 watersheds comprising the geographic scope based on our review of mapping. No waterbody crossings were identified for the Columbia WB XPress Project in the HUC10 watershed geographic scope of the MVP and the EEP. The use of the other protective measures in our Procedures, such as fueling buffer restrictions, maintenance of flow rates, time requirements to complete in-stream waterbody crossings (typically 48 hours or less), and stream and riparian area restoration, would limit the potential for impacts on waterbodies associated with the FERC-regulated projects.

The footprint of land disturbance, which serves as a proxy for overall land disturbance for purposes of this analysis with implications for sedimentation and turbidity due to runoff, for the MVP, the EEP, and other identified projects combined by watershed is listed on table 4.13.1-1. The MVP and the EEP account for 6,486.7 acres of (0.1 percent) of these watersheds, while other projects located within the same watersheds account for 83,721.6 acres (1.8 percent) of the watersheds affected by the MVP and the EEP. Table 4.13.1-1 also indicates a percentage of each watershed that may be disturbed by all of the various projects. The maximum level of combined watershed disturbance is approximately 11 percent (Sand Fork watershed), but most estimated watershed disturbance levels are below 5 percent.

The projects listed on appendix W are within watersheds crossed by the proposed MVP and EEP, and some of these other projects could result in impacts on surface waters. Thus, there is the potential that cumulative impacts could result if the proposed projects were constructed at the same time as other projects listed on appendix W. However, the MVP and the EEP would contribute little to the long-term cumulative impacts on waterbodies because the majority of the potential impacts are short-term. Also, other energy projects, transportation projects, residential projects, non-jurisdictional pipeline projects, etc. would likely be required to install and maintain BMPs similar to those proposed by the MVP and the EEP as required by federal, state, and local permitting requirements so as to minimize impacts on waterbodies. Any projects crossing Waters of the United States would have to obtain permits from the COE. Consequently, the cumulative effect on surface waterbody resources would be minor.

4.13.2.2 Wetlands

Construction of the MVP and the EEP would affect approximately 32 acres of wetlands during construction and about 9 acres during operation. During operations of the projects, emergent and scrub-shrub wetlands would be returned to their pre-construction condition, use, and function. However, about 4 acres of forested wetlands would be affected over the long-term. About 0.26 acre of forested wetland would be converted to emergent and scrub-shrub conditions and 0.88 acre of forested wetlands would be permanently affected by permanent access roads, which would represent a permanent impact on wetland function. Mountain Valley submitted its draft wetland compensatory mitigation plan to the COE in February 2016. For unavoidable wetland impacts in West Virginia and Virginia for the MVP, wetland and stream credits would be purchased from approved mitigation banks in the respective states. According to Equitrans, compensatory mitigation for the EEP would not be required by the COE.

An estimated total of 53 acres of wetlands would be affected by other FERC-regulated projects within the geographic scope of the MVP and the EEP pipelines. This includes an estimated 42.2 acres of wetland impacts that would result from construction of the ACP, 2.4 acres of impacts as a result of the Supply Header Project, and 3.7 acres of impacts from the Rover Pipeline Project. The Columbia WB XPress Project would impact 2.0 acres of wetlands, the MXP would impact 0.13 acre, and the Virginia Southside Expansion Project would impact about 2.6 acre wetlands within the shared watersheds. No wetlands were identified in proximity to any project components associated with the Columbia Smithfield III Project.

We were unable to find quantitative data for the extent of impacts on wetlands from non-FERC-regulated projects, but we assume that some level of impacts would occur. The available information is presented on a watershed basis in appendix W.

Given the relatively small total of wetland acres affected by the combination of the MVP, the EEP, and other projects listed in appendix W, and the fact that only 13 acres of forested wetlands would be converted to herbaceous or scrub wetlands (total of all projects identified in the watershed), we conclude that cumulative impacts on wetlands within the HUC10 watersheds when considered with the projects identified in this analysis would not be significant.

4.13.2.3 Vegetation

In the case of the MVP and the EEP (except for aboveground facilities), vegetation would be cleared from the right-of-way during construction and then restored during operations of the projects. Constructing the MVP and the EEP would impact 4,830 acres of vegetated lands. For the aboveground facilities, vegetation would be cleared and the operational area converted to industrial use, permanently affecting a total of about 24 acres for MVP. At the EEP aboveground facilities, about 3.8 acres of vegetation would be permanently removed for industrial use during operation.

With the exception of forest clearing, impacts on vegetation from construction of the MVP and the EEP would be short-term. Therefore, we consider impacts on forest as the only vegetation impact for which the projects would contribute cumulatively.

The ACP would affect about 143 acres of forest within the shared HUC10 watersheds during pipeline construction. The Supply Header Project would affect about 259 acres of forest within the Fishing Creek, Middle West Fork River, and Tenmile Creek HUC10 watersheds during pipeline construction. The Rover Pipeline Project would clear a total of about 70 acres of forest within the affected HUC10 watersheds of the MVP and the EEP. Other projects that would contribute to forested impacts within the affected HUC10 watersheds of the MVP and the EEP include the Columbia WB XPress Project (estimated 7 acres), the MXP (38 acres) and the Virginia Southside Expansion Project (estimated 24 acres).

The MVP would result in the clearing of about 1,245 acres of interior forest. The EEP would not affect interior forest habitat. While it is not clear how much additional interior forest habitat would be affected by the other FERC-jurisdictional and non-jurisdictional projects within the common HUC10 watersheds, we assume that at least some impacts on this vegetation type would occur. We have estimated forest impacts by HUC10 watershed for other FERC-regulated projects based on project-specific data and scaling (see appendix W). Constructing the MVP and the EEP, as well as the other linear (and possibly non-linear projects) would create a new, cleared corridor in areas of interior forest where the rights-of-way would not be collocated with existing linear corridors. Clearing or fragmentation of interior forests creates more edge habitat and smaller forested tracts, which can impact characteristics of vegetation communities including their suitability for wildlife such as some migratory bird species. The removal of interior forest would also result in the conversion of forest area to a different vegetation type and provide avenues for the introduction of non-native invasive species.

For all the other projects contributing cumulative impacts on vegetation, we are not able to discern specific impact on forested vegetation or any other vegetation category. In the absence of available resource impact data for these projects, we present these impacts as generic impacts on vegetation. Footprint data for other projects located within the same watersheds, which may be used as a proxy for vegetation impacts, account for 83,721 acres, or 1.8 percent of the watersheds affected by the MVP and the EEP. We expect that non-jurisdictional projects would be held to similar standards as the FERC-jurisdictional projects for restoration and revegetation by other federal and state permitting agencies.

Oil and gas development, transportation projects, residential development projects, and non-jurisdictional projects-related facilities would also likely be required to implement mitigation measures designed to minimize the potential for long-term erosion and resource loss, increase the stability of site conditions, and revegetate disturbed soils, thereby minimizing the degree and duration of the impacts of these projects. Thus, cumulative impacts on vegetation resulting from nearby projects considered along with the MVP and EEP are expected to be minor, considering the limited area affected within the geographic scope, the large amount of undisturbed vegetation, including forests, remaining in each watershed (see table 4.13.1-1) and because the other projects are expected to take the required precautions and mitigation measures in accordance with federal and state regulations and permitting. For these reasons, we conclude that the cumulative effect to vegetation would be minor.

4.13.2.4 Wildlife, Fisheries, and Federally Listed Threatened or Endangered Species

Wildlife

Construction and restoration activities associated with the MVP and the EEP may result in limited mortality of individuals for less mobile wildlife species unable to move out of the way of equipment. More mobile species are expected to relocate to similar adjacent habitat during construction and restoration. After the projects are restored and construction areas revegetated, except for aboveground facilities, we expect species to return to the right-of-way.

The construction of aboveground facilities would result in the permanent loss of habitat. However, this is not a large impact, as the EEP and MVP combined would only have 28 acres total of vegetated habitat occupied operationally for aboveground facilities. Construction of oil and gas wells would also result in some permanent loss of wildlife habitat due to aboveground structures and well pads.

As discussed for the clearing of forest, this would result in habitat fragmentation and produce edge effects. The MVP would result in the clearing of about 1,245 acres of interior forest. In section 4.4.2.3, we determined that the MVP would result in significant impacts on large acreages of upland forest. However, we conclude that impacts on most non-special status wildlife species would not result in long-term or significant population-level effects, given the stability of local populations and the abundance of available habitat outside the proposed right-of-way.

Forest fragmentation may reduce nesting and foraging opportunities for interior bird species. The Applicants' *Migratory Bird Conservation Plan* addresses impacts on forest interior bird species resulting from the creation of edge and includes avoidance, minimization, mitigation, and restoration measures for the impacts on upland forest habitat. Likewise, the herbaceous/shrub vegetated permanent operational pipeline easement may present browse environments that attracts meadow adapted species, such as deer.

We consider that vegetation, as discussed above in section 4.13.2.3, is a generalized proxy for wildlife habitat. The overall footprint of the MVP and the EEP in combination with the other identified projects within the defined geographic scope would result in the disturbance of thousands of acres of wildlife habitat including forested habitat that would either recover over the long-term in temporary workspaces or that would be converted to herbaceous or scrub-shrub habitat in the permanent right-of-way. However, there are over 4.8 million acres of land area, much of which provides habitat for wildlife, within the HUC10 watersheds comprising our geographic scope, and only about 1.8 percent of that area would be disturbed. While herbaceous vegetation and adjacent edge areas do provide habitat for numerous wildlife species more suited to human-caused modifications, this different suite of species would utilize the habitats converted from forested areas that formerly may have been inhabited by certain forest-dwelling migratory bird species, for example.

Clearing of the construction rights-of-way for the proposed projects and other nearby projects would result in loss and fragmentation of wildlife habitat. The effect of workspace clearing on forest-dwelling wildlife species would be greater than on open habitat wildlife species since forested lands could take decades to return to pre-construction condition in areas used for temporary workspace, and would be permanently prevented from re-establishing on the permanent right-of-way. This may result in the cumulative loss of individuals of small mammal species, amphibians, reptiles, nesting birds, and non-mobile species. Once the areas temporarily affected are restored and revegetated, some wildlife displaced during construction of any of the projects would return.

Given the large amount of wildlife habitat that would remain undisturbed within the geographic scope, the measures that Mountain Valley and Equitrans would use to minimize impacts such as rapid revegetation and specialized plans for migratory birds, we conclude that the MVP and EEP, combined with the other identified projects, would not have a significant cumulative impact on wildlife.

Fisheries and Aquatic Resources

As noted above in the discussion for surface water, the MVP, the EEP, other FERC-regulated projects, and other projects would affect numerous waterbodies within the geographic scope that provide habitat for fish, mussels, and other aquatic organisms. The MVP would require 389 crossings of perennial waterbodies, while the EEP would cross 15 perennial waterbodies. Mountain Valley would reduce impacts on waterbodies that contain fisheries by following the measures outlined in its Procedures; crossing during state-determined waterbody work windows for coldwater fisheries, trout streams, and mussel-bearing streams; using dry-crossing techniques, thereby minimizing sedimentation and turbidity; and removing and relocating fish and mussels in the areas dewatered by the crossing procedure.

The other FERC-regulated projects would cross multiple waterbodies (ACP Project - 31 waterbodies; Rover Pipeline - 7 waterbodies; Supply Header Project - 13 waterbodies; Columbia Smithfield Expansion - 17 waterbodies; MXP – 90 waterbodies; and the Virginia Southside Expansion Project - 2 waterbodies) within the HUC10 watersheds comprising the geographic scope based on our review of mapping. No waterbody crossings were identified for the Columbia WB XPress Project in the HUC10 watershed geographic scope of the MVP and the EEP. We assume that these waterbodies contain fisheries and aquatic resources for the purpose of this analysis, since fisheries-specific data was generally not available for the other projects on a HUC10 basis.

Rover would cross two trout streams along the Burgettstown Lateral using an open-cut crossing method. MXP pipelines would result in 108 crossings of B1 fisheries and 36 crossings of High Quality Waters. MXP would not impact any B2 coldwater fisheries or Outstanding National Resource Waters. The Columbia WB XPress crosses 30 perennial streams, 38 intermittent streams, 24 ephemeral streams, and 3 open water ponds. One protected fish species, the diamond darter (*Crystallaria cincotta*), and no commercial fisheries are known or believed to occur within waterbodies crossed by or located near the Columbia WB XPress Project The Columbia Smithfield III project had no impacts on fisheries. The Virginia Southside Expansion II project occurs upstream of the Reedy Creek-Webbs Mill Stream Conservation Unit for freshwater mussels.

Cumulative impacts on fisheries and aquatic resources could occur if other projects occur within the same segment of a waterbody and have similar construction timeframes as the proposed MVP and the EEP or that could result in permanent or long-term impact on the same or similar habitat types. Construction of the projects identified on appendix W and the MVP and the EEP could result in cumulative impacts on waterbodies and fisheries from sedimentation and turbidity, habitat alteration, streambank erosion, fuel and chemical spills, water depletions, entrainment or entrapment due to water withdrawals or construction crossing operations, and blasting if constructed on the same waterbody in a similar timeframe. We expect that most of the projects in the geographic scope would be designed so as to minimize impacts on waterbodies, and thus on fisheries and aquatic resources, as much as possible. Any waterbodies that could not be avoided would be mitigated through implementation of BMPs and restoration practices in accordance with the respective federal, state, and local permitting agencies. Further, we expect that the WVDNR, PAFBC, and VADEQ would require any other applicable projects constructed in the geographic scope to adhere to state-mandated or recommended timing windows for construction within waterbodies containing sensitive fish species. However, until permits and authorizations are finalized, the extent of avoidance, minimization, and mitigation is speculative and we have not used this information to determine significance.

Impacts on waterbodies (and therefore fisheries and aquatic resources) would be temporary and mostly limited to construction activities associated with the projects. As such, none of these impacts are expected to be cumulatively significant because of their temporary nature. The ensuing operations of the proposed MVP and EEP pipelines would not result in any cumulative impacts unless maintenance activities occur in or near streams at the same time/location as other (non-related) project work.

Federally Listed Threatened and Endangered Species

The MVP may adversely affect the Indiana bat, northern long-eared bat, Roanoke logperch, running buffalo clover, shale barren rock cress, small whorled pogonia, and Virginia spiraea as discussed in section 4.7, which are federally listed species protected under the ESA. The EEP would not adversely affect any federally listed species. The FERC staff is developing a BA in order to enter formal consultation with the FWS. The FWS will produce a BO on whether any federally listed species or critical habitats would be placed in jeopardy because of the project.

The ACP would also potentially affect the clubshell mussel, snuffbox mussel, the Indiana bat, and northern long-eared bat within the Middle West Fork River and Upper West Fork River HUC10 watersheds, while the Supply Header Project will also potentially affect those species and the Virginia Spirea in the Fishing Creek, Tenmile Creek, and the Middle West Fork River watersheds. The Columbia WB XPress Project would have long-term effects on the Indiana bat and the northern long-eared bat in the Upper Little Kanawha River watershed. The Rover Pipeline Project is expected to affect the clubshell mussel, fanshell mussel, pink mucket mussel, sheepnose mussel, and snuffbox mussel, as well as the Indian bat and the northern long-eared bat in the Headwaters Middle Island Creek watershed. The Columbia Smithfield III Expansion Project and the Virginia Southside Expansion are not expected to have adverse effects on wildlife in the Upper Little Kanawha River and Stinking River-Banister River HUC10 watersheds, respectively.

Cumulative effects on federally listed wildlife and aquatic species would be most likely to occur where projects would result in permanent or long-term loss of habitat types important to wildlife. These include oil and gas development, transportation projects, residential development projects, and non-jurisdictional project-related facilities listed on appendix W. Construction activities such as right-of-way and other workspace clearing and grading would result in loss of vegetation cover and soil disturbance, alteration of wildlife habitat, displacement of wildlife species from the construction zone and adjacent areas, mortality of less mobile species, and other potential indirect effects as a result of noise created by construction and human activity in the area. Overall impacts would be greatest where projects are constructed in the same timeframe and area as the proposed projects or that have long-term or permanent impacts on the same or similar habitat types.

The species discussed in section 4.7 of this EIS could potentially be affected by construction and operation of other projects occurring within the same area as the proposed MVP and EEP. Mountain Valley, Equitrans, and all other companies would consult, where required, with the FWS regarding federally listed species. Section 7 of the ESA specifically requires "major federal actions" to have separate ESA consultations, so the impacts on all federally listed and proposed species within the geographic scope of the identified projects will be assessed. Further, because protection of threatened, endangered, and other special status species is part of the various state permitting processes or resource reviews, cumulative impacts on such species would be specifically considered and reduced or eliminated through conservation and mitigation measures identified during those relevant processes and consultations. Consequently, we conclude that projects in the geographic scope in combination with the MVP and EEP projects would have minor cumulative effects to special status species.

4.13.2.5 Land Use, Recreation, Special Interest Areas, and Visual Resources

Projects with permanent aboveground components, such as buildings, residential projects, and roads, and aboveground electrical transmission lines would generally have greater impacts on land use than the operational impacts of a pipeline (including non-jurisdictional gathering lines for oil and gas development) which would be buried and thus allow for most uses of the land following construction. In addition, the clearing of forest would have long-term impacts, with land use conversion to herbaceous and shrub vegetation within the permanent operational easement of pipelines. Otherwise, pipeline projects typically only have short-term impacts on land use.

The projects listed on appendix W combined would disturb approximately 86,000 acres of land (out of a total of approximately 4.8 million acres in the combined geographic scope) affecting a variety of land uses. Again, we use total disturbance by other projects as a proxy for impacts on land uses.

Construction of the MVP would disturb about 2,902 acres of prime farmland soils. Construction of the EEP would affect about 90 acres of prime farmland soils. To reduce impacts on soils, and curtail erosion, the Applicants would follow the measures outlined in the FERC Plan (for the MVP) and Equitrans' Plan (for the EEP) which include installation of erosion control devices, topsoil segregation, soil decompaction, and revegetation.

A review of available data for the FERC-jurisdictional projects listed on appendix W shows that an estimated 356 acres of prime farmland would be affected within the same geographic scope of the MVP and the EEP. Projects contributing to these cumulative impacts include the Supply Header (estimated 15 acres of prime farmland), the ACP Project (estimated 97 acres of prime farmland), the MXP (106 acres of prime farmland) and the Rover Pipeline Project (estimated 138 acres of prime farmland). While quantitative data for the amount of total prime farmland soils within the HUC10 watersheds was not available, we consider these impact acreages to be relatively small overall and unlikely to contribute to cumulative impacts.

The MVP and the EEP could result in cumulative impacts on recreation and special interest areas if other projects affect the same areas or feature at the same time. The MVP would cross or be located near several recreation and special interest areas, including government owned or managed lands.

Neither the Supply Header, Rover, Columbia Smithfield III, Columbia WB XPress, or Virginia Southside projects would cross the BRP, or the ANST, any Wilderness or IRAs. The ACP would cross both the BRP and ANST, thereby potentially contributing to cumulative impacts. The ACP proposes to cross under the BRP and ANST with an HDD as not to affect users of the road and trail. Mountain Valley proposes to use a conventional bore to cross under the BRP and ANST. The ACP crossing of the BRP and ANST would be about 100 miles away from the MVP crossing of these federally-managed recreational features, and well outside of our geographic scope. Mountain Valley produced a VIA that indicated that the MVP would not have significant visual impacts on the BRP. The FS noted that the MVP and ACP could have cumulative visual impacts to through-hikers travelling on the ANST within the George Washington National Forest and Jefferson National Forest. Though these users would not see both of the MVP and ACP crossings from any one particular viewpoint, multiple viewings of both pipelines within a short duration of time could occur. However, Mountain Valley produced a VIA that indicates that the MVP would not have significant visual impacts on users of the ANST. Additional details are provided in section 4.8 of this EIS.

Visual resources represent the aesthetic quality of the landscape as perceived subjectively by the viewer. Visual impacts were assessed by the amount of contrast construction and operation of facilities would create against the original background. Landscapes are rarely pristine, and visual quality may be modified by existing infrastructure, including other pipelines, powerlines, highways, railroads, houses, commercial buildings, farmsteads, and fencing. Further, the quality of the view would be influenced by the time span of the view, and surrounding topography and vegetation.

Aboveground facilities, including compressor stations, would have the most impact on a visual setting. Within this context, wells and residential developments listed on appendix W would have the greatest cumulative impact on visual resources.

Whereas visual impacts may be locally noticed, generally they would not be inconsistent with the existing visual character of the area. In many cases, views of the facilities and pipeline right-of-way against the landscape background are from highways, with viewers moving at speed, reducing the time of the view. Those views may also be shielded by topography, perspective (angled crossings would typically be less visible than perpendicular crossings), and vegetation. Revegetation as required by federal and state agencies would reduce visual impacts for most projects.

The MVP and the EEP would add incrementally to this impact, but the overall contribution would be relatively minor given that the majority of projects would be buried pipeline. Existing vegetation around both projects' aboveground facilities would shield surrounding areas from visual impacts. Additionally, disturbed areas would be revegetated as appropriate.

The impact of oil and gas development activities on land use, recreation, special interest areas, and visual resources would vary widely depending on the location of specific facilities and access roads. The primary visual impact of oil and gas production would occur from the conversion of forested land to scrub-shrub or herbaceous vegetation types. Permanent visual impacts would occur in developed areas where permanent structures (e.g., houses, buildings, guardrails) would remain.

Given that the proposed projects' contribution to cumulative impacts on land use, recreation, special interest areas, and visual resources would mostly be limited to the construction phase (except as noted above) and would be short-term, we conclude that cumulative impacts on these resources, when considered with the other projects included in our analysis, would not be significant.

4.13.2.6 Cultural Resources

Mountain Valley has surveyed 96 percent of its pipeline route for cultural resources. This resulted in the identification of 282 newly recorded archaeological sites and 116 newly recorded historic architectural sites in the direct APE. As of February 2017, we have not identified an historic properties along the MVP or EEP that would be adversely affected.

According to the ACP application filed with FERC, the entire ACP route in Harrison and Lewis counties, West Virginia were surveyed for cultural resources. No sites are considered to be eligible for the NRHP. For the Supply Header Project, one unevaluated archaeological site that requires testing was identified in Doddridge County, West Virginia; one historic site was evaluated as NRHP-eligible in Doddridge County; and one historic site was evaluated as NRHP-eligible in Wetzel and Harrison Counties, West Virginia.

The EA for the Virginia Southside Expansion Project indicated there are four historic properties located in Brunswick, Halifax, and Mecklenberg counties, Virginia that would require avoidance or additional work. None of these sites are located in counties that are within the geographic scope of the MVP or the EEP.

According to the Rover Final EIS, archaeological resources surveys have not been completed. All sites identified in the geographic scope are recommended as not eligible for the NRHP. Three historic archaeological sites were identified by Rover in Washington County, Pennsylvania which is within the geographic scope for the EEP, have been identified within the survey corridor of the pipeline route in Pennsylvania.

Cumulative impacts on cultural resources would only occur if other projects were to share the same APE as the proposed projects. The currently proposed projects listed on appendix W that are defined as federal actions would have to comply with Section 106 of the NHPA. The federal agencies that would manage those projects would have to follow the regulatory requirements of 36 CFR 800. Under those regulations, the lead federal agency, in consultation with the SHPO, would have to identify historic properties in the APE, assess potential impacts, and resolve adverse effects through an agreement document that outlines a treatment plan.

The Antiquities Act of 1906, NHPA, Archaeological and Historic Preservation Act of 1974, and the Archaeological Resources Protection Act of 1979 protect cultural resources on federal and tribal lands. The NAGPRA would provide for the treatment of Native American graves and items of cultural patrimony found on federal and tribal lands. Non-federal actions would need to comply with any mitigation measures required by the SHPOs of the affected states.

Because it is not known how other foreseeable actions would affect cultural resources, we cannot make any definitive quantitative statements about the nature of cumulative impacts on historic properties. However, we can conclude that given the state and federal laws and regulations that protect cultural resources, mentioned above, it is not likely that there would be significant cumulative impacts on historic properties, resulting from the MVP and EEP in addition to other projects that may occur within the defined geographic scope.

4.13.2.7 Air Quality and Noise

Air Quality

The MVP would be located in counties in West Virginia and Virginia that are in attainment or unclassifiable for all criteria pollutants. Areas covered by the EEP in West Virginia and Pennsylvania are designated as in attainment or unclassifiable for all criteria pollutants except for Greene, Allegheny and Washington Counties which are classified as maintenance, nonattainment, moderate nonattainment, or marginal nonattainment for various standards, as discussed in section 4.11.1 of this EIS. Mountain Valley and Equitrans would minimize potential impacts on air quality caused by construction and then operation of the new compressor stations by adhering to applicable federal and state regulations to minimize emissions as described in section 4.11. The MVP and EEP would be located in the multiple AQCRs listed on appendix W. Mountain Valley and Equitrans would collectively construct four new compressor stations in four different AQCRs (Parkersburg-Marietta Interstate, Central West Virginia Intrastate, Southern West Virginia Intrastate, and the Southwest Pennsylvania Intrastate AQCRs).

We attempted to identify any other AQCR that may be located within 31.1 miles (50 km) of any compressor station proposed by Mountain Valley or Equitrans to ensure that other nearfield facilities relevant to air quality were adequately considered. This resulted in the identification of one additional AQCR, the Steubenville-Weirton-Wheeling AQCR. Other FERC-regulated projects and other non-jurisdictional projects would be located in AQCRs as listed on appendix W.

Long-term air emissions would contribute to cumulative impacts for FERC-jurisdictional and non-jurisdictional projects located within the geographic scope of analysis (see appendix W). Other projects/actions within the geographic scope would involve the use of heavy equipment that would produce dust, increase traffic, and resultant air emissions. Additionally, when completed, the residential, commercial, and industrial developments in the geographic scope would increase air emissions through increased traffic and operation of industrial equipment. The combination of these effects would cumulatively add to the air impacts in the area.

Emissions from construction equipment would be primarily restricted to daylight hours and would be minimized through applicable equipment emission standards and by mitigation measures such as using properly maintained vehicles and commercial gasoline and diesel fuel products with specifications to control pollutants. Because the construction emissions would be short-term, intermittent, and highly localized (essentially limited to within 0.5 mile of the activity), cumulative impacts would depend on the type and location of construction activities occurring at the same time. The majority of these effects would be mitigated by the large geographical area over which the various projects are located and the fact that the MVP and the EEP collectively would be constructed in phases over about 2.5 years. Emissions during construction of compressor stations, which are stationary (in contrast to pipeline construction which proceeds as a moving assembly line), would be temporary and would be minimized by mitigation measures described above. Ongoing drilling activities of natural gas reserves and other projects in the area such as non-jurisdictional project-related facilities (see appendix W), also would involve the use of heavy equipment that would generate emissions of air contaminants and fugitive dust during construction.

With the exception of GHG emissions, air impacts would be localized and confined primarily to the AQCRs in which the projects occur. The proposed MVP's and EEP's estimated emissions would be well below the attainment standards set for the AQCRs. The combined effect of multiple construction projects occurring in the same AQCR and timeframe as the MVP and the EEP could temporarily add to the ongoing air quality effects of existing activities. However, the contribution of the MVP and the EEP during construction to the cumulative effect of all foreseeable projects would be temporary. The other projects listed in appendix W have varying construction schedules and would take place over a relatively large geographic area. Additionally, it is likely that mitigation measures similar to those employed for the MVP and the EEP would be required for these other projects to protect ambient air quality, based on state permitting requirements. For these reasons, we conclude that construction of the MVP and EEP in combination with other projects would not result in significant cumulative impacts on air quality.

We evaluated the location for the FERC-regulated projects that would involve construction of new or modified natural gas-fired compressor stations by AQCR (see table 4.13.2-1). Operation of the compressor stations would result in a long-term, stationary source of air emissions. Operation of the projects' facilities would generate primarily NO_x, CO, and PM emissions, with lesser amounts of SO_2, VOC, GHG, and HAP emissions. However, none of the major source thresholds would be exceeded, and the facilities would operate in compliance with all permitting requirements, including the CAA. For these reasons, as well as the locations of the facilities and typical meteorological conditions that would likely cause rapid dispersion of emissions, the cumulative impacts from operation of the FERC-regulated projects are not expected to result in a significant impact on local or regional air quality.

TABLE 4.13.2-1

Proposed New and Modified FERC-regulated, Gas-fired Compressor Stations in the Geographic Scope of Analysis

Project	Compressor Station	New/ Upgrade	County	State	Horsepower	Air Quality Control Region
MVP	Harris	New	Braxton	WV	41,000	Central West Virginia Intrastate
Rover	Sherwood	New	Doddridge	WV	14,205	Central West Virginia Intrastate
Columbia Smithfield	Glenville	Upgrade	Gilmer	WV	15,600	Central West Virginia Intrastate
Columbia WB XPress	Cleveland	New	Upshur	WV	31,800	Central West Virginia Intrastate
Virginia Southside	CS166	Upgrade	Pittsylvania	VA	21,830	Central Virginia Intrastate
ACP	CS 1	New	Lewis	WV	55,015	Central West Virginia Intrastate
ACP	CS 2	New	Buckingham	VA	40,715	Central West Virginia Intrastate
Mountaineer Xpress Project	Sherwood	New	Doddridge	WV	47,000	Central West Virginia Intrastate

TABLE 4.13.2-1 (continued)

Proposed New and Modified FERC-regulated, Gas-fired Compressor Stations in the Geographic Scope of Analysis

Project	Compressor Station	New/ Upgrade	County	State	Horsepower	Air Quality Control Region
Mountaineer Xpress Project	White Oak	New	Calhoun	WV	44,800	Central West Virginia Intrastate
MVP	Bradshaw	New	Wetzel	WV	86,900	Parkersburg-Marietta Interstate
Supply Header	Mocking hill	Upgrade	Wetzel	WV	41,000	Parkersburg-Marietta Interstate
Mountaineer Xpress Project	Mount Olive	New	Jackson	WV	61,500	Parkersburg-Marietta Interstate
MVP	Stallworth	New	Fayette	WV	41,000	Southern West Virginia Intrastate
EEP	Redhook	New	Greene	PA	31,300	Southwest Pennsylvania Intrastate
Rover	Burgettstown	New	Washington	PA	5,175	Southwest Pennsylvania Intrastate
Columbia Smithfield	Redd Farm	New	Washington	PA	9,400	Southwest Pennsylvania Intrastate
Supply Header	JB Tonkin	Upgrade	Westmorland	PA	21,830	Southwest Pennsylvania Intrastate
Supply Header	Crayne	Upgrade	Greene	PA	23,300	Southwest Pennsylvania Intrastate
Rover	Clarington	New	Monroe	OH	11,245	Steubenville-Weirton-Wheeling Interstate
Rover	Majorsville	New	Marshall	WV	7,100	Steubenville-Weirton-Wheeling Interstate
Supply Header	Burch Ridge	Upgrade	Marshall	WV	6,130	Steubenville-Weirton-Wheeling Interstate
Nexus Gas Transmission Project	Hanoverton	New	Columbiana	OH	52,000	Steubenville-Weirton-Wheeling Interstate
Mountaineer Xpress Project	Lone Oak	Upgrade	Marshall	WV	15,900	Steubenville-Weirton-Wheeling Interstate

Operation of the MVP and EEP, oil and gas drilling activities, and other nearby projects would also contribute cumulatively to existing air emissions. Operation of residential development projects are not expected to contribute to air emissions in the geographic scope. Each of the projects would need to comply with federal, state, and local air regulations, which may require controls to limit the emission of certain criteria pollutants or HAPs. For these reasons, we conclude that operation of the MVP and the EEP in combination with other projects would not result in significant cumulative impacts on air quality.

Noise

The proposed MVP and EEP could contribute to cumulative noise impacts if noise is generated at the same time as other projects within the geographic scope. However, the impact of noise is highly localized and attenuates quickly as the distance from the noise source increases; therefore, cumulative impacts are unlikely except if one or more of the projects listed on appendix W are constructed at the same time and in the same location. Based on the schedule and proximity of the MVP, Supply Header, Atlantic Coast Pipeline, and the Columbia Smithfield III Expansion, such as in Doddridge County, West Virginia (see figure 4.13-1), and the other projects to the pipeline route, there could be some cumulative noise impacts. However, since the majority of noise impacts associated with the projects would be limited to the period of construction and most construction activities would occur during daytime hours and be intermittent rather than continuous, the proposed contribution from the projects to cumulative noise impacts would primarily be for only short periods of time when the construction activities are occurring at a given location. We did not identify any other construction projects within 0.25 mile of the EEP's proposed HDD.

Operation of the MVP and the EEP compressor stations would not exceed our noise thresholds, nor would any of the other FERC-regulated projects. We did not identify any other stationary sources of long-term noise impacts within the geographic scope for the MVP and EEP compressor stations that would affect their associated NSAs. Noise from blowdown events, which are typically infrequent, of short duration, and occur during daytime hours, may be perceptible at the NSAs, but not at an excessive level such as to interrupt normal human conversation. The maximum estimated noise at a NSA from the blowdown events would be 68.8 dBA, comparable to a washing machine at approximately 65 to 70 dBA (EPA, 1974). Based on the analyses conducted and mitigation measures proposed, we conclude that the MVP and EEP along with other projects in the geographic scope would not result in significant cumulative noise impacts on residents or the surrounding communities.

Climate Change

The cumulative impact analysis described below does not focus on a specific cumulative impact area because climate change is a global phenomenon. Climate change is the change in climate over time, whether due to natural variability or as a result of human activity, and cannot be represented by single annual events or individual anomalies. For example, a single large flood event or particularly hot summer are not indications of climate change, while a series of floods or warm years statistically change the average precipitation or temperature over years of decades may indicate climate change.

The Intergovernmental Panel on Climate Change (IPCC) is the leading international, multi-governmental scientific body for the assessment of climate change. The United States is a member of the IPCC and participates in the IPCC working groups to develop reports. The leading U.S. scientific body on climate change is the U.S. Global Change Research Program (USGCRP).

Thirteen federal departments and agencies participate in the USGCRP, which began as a presidential initiative in 1989 and was mandated by Congress in the Global Change Research Act of 1990. The IPCC and the USGCRP have recognized the following:

- Globally, GHGs have been accumulating in the atmosphere since the beginning of the industrial era (circa 1750);
- Combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture and clearing of forests, is primarily responsible for the accumulation of GHG;
- Anthropogenic GHG emissions are the primary contributing factor to climate change; and
- Impacts extend beyond atmospheric climate change alone and include changes to water resources, transportation, agriculture, ecosystems, and human health.

Both the IPCC and USGCRP have concluded that, over the last half century, climate change is being driven primarily by human activities that release heat-trapping GHGs (USGCRP, 2014). In 2014, the USGCRP published the most recent National Climate Assessment for the United States, which assesses the science of climate change and its impacts across the country. The report presents information on potential impacts from climate change by resource type and by geographical region. Although climate change is a global concern, for this cumulative analysis, we will focus on the cumulative impacts of climate change in the Northeast (includes Pennsylvania and West Virginia) and Southeast (includes Virginia) regions. The USGCRP's report notes the following observations of environmental impacts that may be attributed to climate change in the Northeast and Southeast regions of the United States.

Northeast Region:

- "Heat waves, coastal flooding, and river flooding will pose a growing challenge to the region's environmental, social, and economic systems. This will increase the vulnerability of the region's residents, especially its most disadvantaged populations";
- "Infrastructure will be increasingly compromised by climate-related hazards, including sea level rise, coastal flooding, and intense precipitation events"; and
- "Agriculture, fisheries, and ecosystems will be increasingly compromised over the next century by climate change impacts. Farmers can explore new crop options, but these adaptations are not cost- or risk-free. Moreover, adaptive capacity, which varies throughout the region, could be overwhelmed by a changing climate."

Southeast Region:

- "Sea level rise poses widespread and continuing threats to both natural and built environments and to the regional economy";
- "Increasing temperatures and the associated increase in frequency, intensity, and duration of extreme heat events will affect public health, natural and built environments, energy, agriculture, and forestry"; and
- "Decreased water availability, exacerbated by population growth and land-use change, will continue to increase competition for water and affect the region's economy and unique ecosystems."

On August 3, 2015, the EPA released the final Carbon Pollution Emissions Guidelines for Existing Stationary Sources: Electric Utility Generating Units, also known as the Clean Power Plan (CPP). The CPP sets CO_2 emission standards for power plants and establishes customized goals for states to reduce CO_2. Carbon dioxide accounts for approximately 84 percent of all U.S. GHG emissions. Under the federal Clean Air Act, each state is required to develop a state-specific compliance plan to meet individual state targets set by EPA or be subject to the Federal Plan (PADEP, 2016b). According to the CPP[157], all state goals fall in a range between 771 pounds per megawatt-hour (states that have only natural gas plants) to 1,305 pounds per megawatt-hour (states that only have coal/oil plants). A state's goal is based on how many of each of the two types of plants are in the state. West Virginia's 2030 goal is 1,305 pounds per megawatt-hour, Pennsylvania's 2030 goal is 1,095 pounds per megawatt-hour and Virginia's 2030 goal is 934 pounds per megawatt-hour..

The PADEP submitted a "Climate Change Action Plan Update" in 2014 detailing initiatives and plans that the State has undertaken to address GHG emissions (Prnewswire, 2014). The document discussed expansion of renewable energy sources, higher emission standards, and the PADEP's commitment to developing effective programs such as methane leak and repair, retrofits to natural gas from gasoline powered vehicles, incentives, and preservation of forests. West Virginia is in the process of developing a plan to address the CPP (Charleston Gazette-Mail, 2015). Virginia established the "Governor's Commission on Climate Change" (GCCC) in 2007 (The Center for Climate Strategies, undated). This GCCC developed a plan to reduce GHG emissions that included an inventory of contributors of GHG, evaluation of impacts, identify approaches used by other federal or non-federal governmental agencies, identify needed preparations and actions to address climate change.

The magnitude of expected changes will exceed those experienced in the last century. Existing adaptation and planning efforts may be inadequate to respond to these projected impacts. The National Oceanic and Atmospheric Administration (NOAA) has developed a U.S. Climate Resilience Toolkit to aid in the nation's response to climate change (Climate.gov, Undated). NOAA's steps to resilience for climate change include exploring threats, assessing vulnerability and risks, investigating options, prioritizing actions, and taking action. Example case studies include addressing shoreline erosion, drought, water supply, and risks to infrastructure such as bridges.

The FERC staff has presented the direct and indirect GHG emissions associated with construction and operation of the projects and the potential impacts of GHG emissions in relation to climate change. The GHG emissions associated with construction and operation of the MVP and the EEP are discussed in section 4.11.1. Furthermore, the clearance of 4,772 acres of forest for the MVP right-of-way is estimated to result in a one-time release of about 626,468 metric tons of CO_2, plus an additional loss of about 3,009 metric tpy of CO_2 sequestration capacity; and the clearance of 74 acres of forest for the EEP right-of-way is estimated to result in a one-time release of about 9,716 metric tons of CO_2, plus an additional loss of about 47 metric tpy of CO_2 sequestration capacity.

[157] On March 28, 2017, President Trump signed an Executive Order that directs the EPA to "as appropriate" initiate rulemaking to suspend, revise, or rescind the CPP and related actions. Although the CPP is currently subject to challenge in the D.C. Circuit Court of Appeals and has been stayed by the Supreme Court, the Executive Order directs the Department of Justice to inform the D.C. Circuit of EPA's plans and ask the court to put those challenges on hold while EPA takes action to rescind or revise the rule.

To account for end-use combustion, total annual emissions of GHG were estimated for both the MVP and the EEP based on the total capacity for each project (2 Bcf/d for the MVP and 0.4 Bcf/d for the EEP) (see table 4.13.2-2). Note that burning natural gas emits less CO_2 compared to other fuel sources (e.g., fuel oil or coal). Because coal is widely used as an alternative to natural gas in the region in which the projects would be located, it is anticipated that the projects would result in the displacement of some coal use, thereby potentially offsetting some regional GHG emissions. However, the emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to climate change that produces the impacts previously described. Because we cannot determine the projects' incremental physical impacts on the environment caused by climate change, we cannot determine whether the projects' contribution to cumulative impacts on climate change would be significant.

TABLE 4.13.2-2

Total Projected GHG Emissions from End-Use Combustion

Project	Total GHG Emissions ($CO_{2\text{-eq}}$ MTY)
Mountain Valley Project	40,000,000
Equitrans Expansion Project	8,000,000
Source EPA, 2016b	

4.13.2.8 Jefferson National Forest

The MVP would cross a 3.5-mile portion of the Jefferson National Forest in Monroe County, West Virginia, as well as Giles and Montgomery Counties, Virginia. Construction of the pipeline would impact a total of about 82.7 acres in Jefferson National Forest, including the pipeline right-of-way and access roads. Operation of the pipeline would affect a total of about 38 acres in the Jefferson National Forest, including the permanent right-of-way easement and permanent access roads.

With respect to FS Sensitive Species, Locally Rare species and MIS, we conclude that the MVP would be unlikely to cause a trend toward federal listing or loss of viability for these species. Field surveys conducted within the Jefferson National Forest determined that 16 FS Sensitive Species would possibly be within the project area, have habitat within the construction right-of-way, or area located downstream of the project area. None were observed during surveys. In addition, FS indicates that suitable habitat exists within the MVP area for a total of 151 locally rare species, including 3 mammals, 11 birds, 3 reptiles, 1 amphibian, 4 aquatic species, 14 terrestrial invertebrates, and 113 plants. Field surveys have not documented any FS Locally Rare Species in the vicinity of the MVP corridor. There are 13 MIS established for the Jefferson National Forest. Of these, 11 were observed during field surveys. For the ACP, there is potential habitat or populations for a total of 53 FS Sensitive Species and 66 Locally Rare Species within the George Washington National Forest. Field surveys indicate 14 MIS in the ACP Project area within the George Washington National Forest. Although these species do not have regulatory protection associated with them it is anticipated that the mitigation measures discussed in sections 4.4, 4.5, and 4.6, would also provide protection for, and limit impacts on MIS. Further, cumulative impacts on such species would be specifically considered and reduced or eliminated through conservation and mitigation measures such as those contained in the FERC Plan and Mountain Valley's project-specific Procedures, and its *Exotic and Invasive Species Control Plan, Erosion and Sediment Control Plan*, and *Migratory Bird Conservation Plan*. Consequently, we conclude that projects in the geographic scope in combination with the MVP and EEP projects would have minor cumulative effects to FS Sensitive Species, Locally Rare species, and MIS.

To address proposed impacts on the Jefferson National Forest, the LRMP would be amended, as required such as in relation to the ANST, to make provisions for the MVP. The MVP POD would identify mitigation measures that are deemed necessary by the FS to accomplish goals and objectives of the LRMP.

None of the FERC-jurisdictional projects evaluated for the cumulative impacts analysis would be located within the Jefferson National Forest; however, the ACP is proposed to cross the George Washington National Forest in Virginia. Because the Jefferson National Forest and George Washington National Forest are administratively combined under FS management and review, the impacts on sensitive resources from the proposed pipelines on both Forests have been evaluated together. Table 4.13.2-3 provides a comparison of affected resources of both projects on FS land. It is anticipated that any adverse impacts on sensitive resources within the Jefferson National Forest or George Washington National Forest resulting from any other types of projects considered in our analysis would be regulated through project design, BMPs, and FS permitting. Therefore, we conclude that the cumulative impacts associated with the MVP and the EEP, when combined with other known or reasonably foreseeable projects in the geographic scope, would not be significant for the Jefferson National Forest.

TABLE 4.13.2-3

Cumulative Effects of the Mountain Valley Project and Atlantic Coast Pipeline Project on the Jefferson National Forest and George Washington National Forest,

Resource	Mountain Valley Project	Atlantic Coast Pipeline Project	Total
National Forest Affected	Jefferson National Forest	George Washington National Forest	
No. of Miles Crossed	3.5	15.9	19.4
Acres Affected a/	82.7	301.4	384.1
No. of Waterbodies Crossed b/	16	45	61
Wetlands (Construction Impact - acres)	0.0	0.1	0.1
Forest Affected (acres)	79.1	274.4	353.5
Likely to adversely affect Federally Listed Species (no.)	1	5	5
Crossing of the ANST (no.)	1	1	2

a/ Acres affected during construction
b/ All waterbodies will be crossed by dry open-cut methods

4.13.3 Conclusion

Construction of the MVP and EEP, in addition to other projects within the same watersheds crossed by the pipeline, would have cumulative impacts on a range of environmental resources, as discussed above. We provided information about project-related impacts and mitigation measures for specific environmental resources where available, and were able to make some general assumptions about other federal projects identified in appendix W. For the federal projects, there are laws and regulations in place that protect waterbodies and wetlands, threatened and endangered species, and historic properties, and limit impacts from air and noise pollution. Federal land-managing agencies, such as the FS, have requirements in their LRMPs to protect resources on their lands. We only have limited information about potential or foreseeable private projects in the region. For some resources, there are also state laws and regulations that apply to private projects as listed on appendix W. Given the project BMPs and design features, mitigation measures that would be implemented, federal and state laws and regulations protecting resources, and permitting requirements, we conclude that when added to other past, present, and reasonably foreseeable future actions, the MVP and the EEP would not have significant adverse cumulative impacts on environmental resources within the geographic scope affected by the projects.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS OF THE ENVIRONMENTAL ANALYSIS

The conclusions and recommendations presented in this section are those of the FERC environmental staff. Our conclusions and recommendations were developed with input from the FS, the EPA, the COE, the BLM, the FWS, the PHMSA, the WVDNR, and the WVDEP as cooperating agencies. The federal cooperating agencies may adopt the EIS per 40 CFR 1506.3 if, after an independent review of the document, they conclude that their permitting requirements and/or regulatory responsibilities have been satisfied. However, these agencies would present their own conclusions and recommendations in their respective and applicable records of decision. Otherwise, they may elect to conduct their own supplemental environmental analysis, if necessary.

We determined that construction and operation of the MVP and the EEP would result in limited adverse environmental impacts, with the exception of impacts on forested land. This determination is based on a review of the information provided by the Applicants and further developed from data requests; field investigations; scoping; literature research; alternatives analyses; and contacts with federal, state, and local agencies as well as individual members of the public. As part of our review, we developed specific mitigation measures that we determined would appropriately and reasonably reduce the environmental impacts resulting from construction and operation of the projects. We are therefore recommending that our mitigation measures be attached as conditions to any authorization issued by the Commission. A summary of the anticipated impacts, our conclusions, and our recommended mitigation measures is provided below, by resource area.

5.1.1 Geological Resources

The MVP pipeline would be within 0.25-mile of 227 active oil and gas wells. The EEP pipelines would be located within 0.25-mile of 39 active oil and gas wells. The Applicants would install safety fence or flagging around wells in proximity to the working area. Equitrans would also institute its *Hot Work Safety Program* to assess and prevent hazards when construction is in close proximity to the oil or gas wells.

The MVP pipeline would be within 0.25-mile of 67 mining operations consisting mainly of coal, sand, gravel, and limestone mines, and would cross 10 underground mines, 17 surface mines, and 2 unknown mine types. EEP facilities would be within 0.25-mile of 18 previous mining operations. The EEP pipelines would cross 12 closed or abandoned coal mines. There is the potential for subsidence when crossing underground mines. Mountain Valley would follow the procedures outlined in its *Mining Area Construction Plan* and Equitrans would employ the procedures outlined in its *Mine Subsidence Plan* to prevent hazards from mine crossings.

In the area of the GCSZ, between about MPs 161 to 239 along the MVP pipeline route, peak ground accelerations are greater than 12 percent g, and the potential for a magnitude 5.8 earthquake exists. The EEP would not be in an area where significant earthquakes are likely to occur. To reduce the potential for seismic activity to affect its pipeline, Mountain Valley has committed to using Class 2 pipe at locations where the length of soil displacement over the pipeline exceed 1,580 feet for parallel slopes. We are recommending that Mountain Valley adopt several additional industry BMPs and commit to extending the post-construction monitoring program utilizing sequentially acquired LiDAR imagery to detect slope movement in areas of the Jefferson National Forest, to all landslide prone areas project wide.

The MVP pipeline would cross steep topography (32 percent greater than 15 percent grade). Almost half of the EEP pipelines would cross steep topography. About 67 percent of the MVP pipeline would cross areas susceptible to landslides. Mountain Valley would reduce the potential for impacts from landslide by following the measures outlined in its *Landslide Mitigation Plan* and Equitrans would employ the measures outlines in the its *Landslide Mitigation Plan*.

Karst terrain, including sinkholes and caves, exist along the MVP pipeline route between MPs 172 and 239. There is no karst along the EEP. Mountain Valley would implement the measures outlined in its *Karst Mitigation Plan* to reduce the potential for subsidence when crossing karst terrain. In addition, we have recommended the adoption of Variation 250 to avoid the Mount Tabor Sinkhole Plain and for MVP to adopt a post-construction monitoring program utilizing sequentially acquired LiDAR to determine potential subsidence along the MVP during operation. With the implementation of the Applicants' BMPs, as well as our additional recommendations regarding karst topography and mines, we conclude that impacts on geological resources would be adequately minimized.

5.1.2 Soils

The MVP and EEP would traverse a variety of soil types and conditions. Construction activities, such as clearing, grading, trenching, and backfilling, could adversely affect soil resources by causing erosion, compaction, and introduction of excess rock or fill material to the surface, which could hinder restoration. Permanent impacts on soils would mainly occur at the aboveground facilities where the sites would be graveled and converted to industrial use.

The MVP pipeline route would traverse about 216 miles of shallow bedrock. The EEP pipelines would cross about one mile of shallow bedrock. The Applicants would first attempt to rip bedrock when digging pipeline trenches. If unrippable bedrock is encountered, the Applicants would use rock-trenching machines, rock saws, hydraulic rams, or jack hammers. As a last resort, blasting in bedrock would be conducted, in accordance with the Mountain Valley's *General Blasting Plan*. If blasting should become necessary for construction the EEP, Equitrans would file a blasting plan with the FERC for approval prior to any blasting commencing.

Construction of the MVP would disturb about 5,053 acres of soils that are classified as having the potential for severe water erosion. Construction of the EEP would affect about 193 acres of soils rated as being prone to erosion by water. However, Mountain Valley would implement the measures contained in the FERC Plan and its project-specific *Erosion and Sediment Control Plan;* while Equitrans would implement the measures in its project-specific Plan and the PADEP *Erosion and Sediment Pollution Control Program Manual* to control erosion and enhance successful restoration.

Construction of the MVP would disturb about 2,829 acres of prime farmland or farmland of statewide importance. Construction of the EEP would affect a total of 136 acres of prime farmland and farmland of statewide importance combined. The Applicants would reduce impacts on agricultural lands by repairing or replacing irrigation systems and/or drain tiles, segregating topsoil, removing rocks, and decompacting soils. Based on our analysis of the Applicants proposed measures, we conclude that potential impacts on soils would be effectively minimized.

5.1.3 Water Resources

5.1.3.1 Groundwater

Groundwater resources in the area of the projects come from the Appalachian Plateau Regional, Valley and Ridge Regional, and Blue Ridge and Piedmont Crystalline-Rock aquifer systems. None of the projects would cross any EPA-designated SSAs, and no state-designated aquifers have been identified in the project area.

The MVP would cross 12 mine pools, while the EEP would cross one. Mountain Valley would follow its *Unanticipated Mine Pool Mitigation Plan*, which outlines procedures that would be used in the event that an unanticipated mine pool is encountered that could pose a hazard or be affected during construction. If mine pool water is discovered during construction of the EEP, Equitrans would pump the mine pool water through water filter bags onto grassy areas or up-gradient of compost filter socks.

Mountain Valley has identified 32 springs/swallets near its pipeline. The MVP would be within 0.1 mile of two wells for public supplies: one in Greenbrier County, West Virginia (the Greenbrier County Public Supply District #2), and the other in Pittsylvania County, Virginia (the Robin Court Subdivision). The project would also be within 0.3 mile of Rich Creek Spring, located west of MP 194.5, which is used as a water supply by the Red Sulphur Public Supply District. No public water supply wells have been identified within 1 mile of the EEP.

The Applicants would conduct pre-construction water quality and water yield surveys on water resources. If there are landowner complaints about impacts on wells or drinking water supplies, post-construction water quality/yield samples may be collected. However, we have included recommendation that the Applicants agree to conduct post-construction water quality/yield sampling for drinking water sources within 150 feet of construction (500 feet in karst). In the event of construction-related impacts, the Applicants would provide an alternative water source. Because field surveys have not been completed, in part due to lack of access, we have recommended that prior to construction the Applicants should file the location of all water wells, springs, and other drinking water sources within 150 feet (500 feet in karst terrain[1]) of the pipeline and aboveground facilities.

[1] Longer distances may be necessary if dye traces, cave maps, or other information provided in the enhanced karst management plan required by WVDEP's Special Condition 16 of the Conditional 401 WQC depict distant underground connectivity.

A literature review identified 4 existing reported contamination sites within 200 feet of the MVP. One site with the potential for contaminated groundwater was identified within 200 feet of the EEP. To avoid or minimize potential impacts, Mountain Valley would implement the measures outlined in its *Unanticipated Discovery of Contamination Plan*.

Construction activities are not likely to significantly impact groundwater resources because the majority of construction would involve shallow excavations. Mountain Valley would prevent or adequately minimize accidental spills and leaks of hazardous materials into groundwater resources during construction and operation by adhering to its *SPCCP*. Equitrans would follow its *SPCCP* and *Preparedness, Prevention*, and *Contingency and Emergency Action Plans*. Given the Applicants' proposed measures, we conclude that potential impacts on groundwater resources would be minimized.

5.1.3.2 Surface Waters

The MVP would result in 389 perennial waterbody crossings. The EEP would cross 18 perennial waterbody crossings. Mountain Valley would cross all waterbodies using dry open-cut crossing methods (either flumes, dam-and-pump, cofferdam techniques, or HDD). Use of dry open-cut crossing method would minimize turbidity and sedimentation. In addition, due to engineering feasibility and favorable geotechnical cores, we are recommending that Mountain Valley adopt an alternative route alignment and HDD crossing methodology for the Pigg River at milepost (MP) 289.2. Equitrans would use dry open-cut crossing methods for all but nine waterbodies. The Monongahela River, South Fork Tenmile Creek, and seven crossings of unnamed tributaries of South Fork Tenmile Creek would be crossed with HDDs. To address an HDD failure or frac-out, Equitrans developed a *HDD Contingency Plan*.

Mountain Valley identified four source water protection areas within 0.3 mile of the MVP. We are recommending that, prior to construction, Mountain Valley should file contingency plans outlining measures that would be taken to minimize potential impacts on public surface water supplies. The EEP would not cross any source water protection areas.

On March 23, 2017, Mountain Valley obtained its CWA Section 401 Water Quality Certification from the WVDEP. To reduce impacts on waterbodies, the Applicants would adhere to the measures outlined in their project-specific Procedures. We conclude that these measures would adequately minimize impacts on surface water resources.

5.1.4 Wetlands

Construction of the MVP and the EEP would impact a total of 32.1 acres of wetlands, including 4.6 acres of forested wetlands, 24.9 acres of herbaceous wetlands, and 2.5 acres of scrub-shrub wetlands. Permanent impacts on wetlands would include the conversion of forested wetlands to scrub-shrub or emergent wetlands within the pipeline permanent easement, as well as the installation of culverts and permanent fill in wetlands for access roads. According to Mountain Valley, the permanent fill would be necessary to provide workers safe access to the pipeline and associated facilities during construction, operation, and maintenance. The permanent wetland impacts due to access roads would be included in the COE applications pending approvals.

The Applicants would minimize impacts on wetlands by reducing the construction right-of-way width to 75 feet through wetlands, and following the measures outlined in their project-specific Procedures. The Applicants also submitted applications to the COE to obtain permits to cross Waters of the United States and wetlands under Section 404 of the CWA. To compensate for conversions of wetland types, the Applicants propose to purchase credits from approved wetland mitigation banks in the respective states.

Mountain Valley requested alternative measures from FERC's Procedures in several areas where it concluded that site-specific conditions do not allow for a 50-foot setback of extra workspace from wetlands or where a 75-foot-wide right-of-way is insufficient to accommodate wetland construction. Based on our review, we have determined that Mountain Valley has provided adequate site-specific justification.

While adverse and long-term impacts on wetlands would occur, with the implementation of BMPs and mitigation proposed by the Applicants, as well as our recommendations, we conclude that impacts on wetlands would be effectively minimized.

5.1.5 Vegetation

The MVP pipeline would cross about 235 miles of forest, 2.7 miles of shrublands, and 7.5 miles of grasslands. The EEP pipelines would cross about 4 miles of forest and less than 0.1 mile of grasslands. Impacts on shrublands and grasslands would be short-term, as the Applicants would revegetate the right-of-way after pipeline installation, and shrubs and grasses would be reestablished in a few years. While forest would be allowed to regenerate in temporary workspaces, this would be a long-term impact because it would take many years for trees to mature. The 50-foot-wide operational easement for the pipelines would be kept clear of trees, which would represent a permanent impact. The construction and operation of aboveground facilities would also have permanent impacts on vegetation, as those sites would be converted to industrial use and maintained as gravel yards without vegetation. Construction of the aboveground facilities for the MVP and EEP combined would impact about 100 acres of upland forest.

Construction of the MVP and the EEP would affect about 4,527 acres of upland forest. The MVP would impact about 2,428 acres of Large Core (greater than 500 acres) contiguous interior forest areas in West Virginia. In Virginia, the MVP would impact about 548 acres of contiguous interior forest during construction classified as High to Outstanding quality. The result of establishing a new corridor through interior forest would be the conversion of about 17,194 acres of interior forest in West Virginia and 4,579 acres of interior forest in Virginia into edge habitat based on the extension of forest edge an estimated 300 feet on either side of the MVP right-of-way. To minimize forest fragmentation and edge effects, Mountain Valley has collocated about 30 percent of the pipeline route with existing linear corridors.

Mountain Valley developed an *Exotic and Invasive Species Control Plan*, and would implement invasive species control measures during the restoration phase of construction to control invasive plant species. Equitrans has not developed a formal control plan regarding invasive plants, but would implement invasive species control strategies during and following construction to control invasive plant species.

Given that Mountain Valley would follow our Plan, its project-specific *Erosion and Sediment Control Plan*, and the reseeding recommendation of the Wildlife Habitat Council; while Equitrans would follow its project-specific Plan and the PADEP *Erosion and Sediment Pollution Control Program Manual*, we conclude that the projects would not have significant adverse impacts on grasslands and shrublands. However, in considering the total acres of forest affected, the quality and use of forest for wildlife habitat, and the time required for full restoration in temporary workspaces, we conclude that the projects would have significant impacts on forest.

5.1.6 Wildlife and Aquatic Resources

The MVP and the EEP could have both direct and indirect effects on wildlife species and their habitats. Direct effects of construction on wildlife include the displacement of mobile wildlife from the right-of-way into adjacent areas, and the potential mortality for some individuals of non-mobile species unable to escape equipment.

Indirect effects on wildlife include forest fragmentation and edge effects caused by removal of existing vegetation within the construction work area. Forest fragmentation would lessen the amount of available habitat for nesting and foraging. Indirect effects of construction could include lower reproductive success by disrupting courting or breeding of some species. The creation of a grassy and shrub corridor within the operational right-of-way may increase predation along the forest edge. .

A variety of migratory bird species, including BCCs, are associated with the habitats that would be affected by the MVP and the EEP. The clearing of vegetation during the nesting season could have direct impacts on individual migratory birds. Implementing Mountain Valley's and Equitrans' *Migratory Bird Conservation Plans*, including adhering to the proposed vegetation and tree clearing window to mostly avoid the migratory bird nesting season or conducting nest surveys and utilizing nest protection buffers prior to construction, would minimize impacts.

Given the measures proposed by the Applicants, we conclude that the projects would not have a significant adverse effect on wildlife populations overall. However, some forested species may experience a higher level of impact due to the long-term loss of forested habitat. Mountain Valley filed an updated version of its *Migratory Bird Conservation Plan* on May 11, 2017 to address concerns of the EPA, FWS, VADEQ, WVDNR, and other consulting agencies regarding the impacts on large acreages of upland forest. The plan includes updated avoidance, minimization, and restoration measures for impacts resulting from the MVP, including additional tree and shrub plantings to restore right-of-way sections within riparian areas, forested wetlands, and loggerhead shrike nesting habitat. The updated plan includes a revised tree felling and vegetation clearing schedule and therefore also includes expanded protocols for nesting migratory bird surveys prior to tree felling and vegetation clearing. However, we understand that the May 11, 2017 version of the *Migratory Bird Conservation Plan* is not the final plan, as Mountain Valley continues to coordinate with the consulting agencies to finalize the plan. Therefore, we are recommending Mountain Valley file a final Migratory Bird Conservation Plan prepared in coordination with the FWS, WVDNR, and VADGIF to ensure that impacts on migratory birds, resulting from the significant impacts on upland forest are adequately avoided, minimized, mitigated, and/or restored.

The MVP proposed pipeline right-of-way would entail 136 crossings (including fill, temporary fill, and culverts) of waterbodies classified as fisheries of special concern. None of the waterbodies that would be crossed by the EEP are classified as fisheries of special concern. Mountain Valley has indicated they would cross all fisheries of special concern within state-designated construction windows. Mountain Valley has proposed to use a dry open-cut crossing method at all waterbody crossings and we are recommending Mountain Valley use an HDD to cross the Pigg River. Equitrans has proposed to use an HDD at two waterbody crossings and a dry open-cut method for the remaining crossings.

In-stream pipeline construction across waterbodies could have both direct and indirect effects on aquatic species and their habitats, including increased sedimentation and turbidity, alteration or removal of aquatic habitat cover, stream bank erosion, impingement or entrainment of fish and other biota associated with the use of water pumps, downstream scouring, and the potential for fuel and chemical spills.

Construction-related clearing of trees and other riparian vegetation at waterbody crossings would be minimized and restoration would be implemented in compliance with federal and state permits. The Applicants would also implement guidelines from their Procedures to minimize or prevent sediment or other hazards to aquatic biota, including fuels or other equipment liquids, from entering waterbodies adjacent to aboveground facilities and access roads. No in-stream blasting is expected to be required for the EEP. Mountain Valley is still assessing where blasting may be necessary; however, Mountain Valley would only conduct blasting at waterbody crossings once the trench corridor has been isolated from the waterbody and all aquatic biota has been relocated from the work area. Therefore, we do not expect any blasting-related fishery impacts.

Based on our review of potential effects of the MVP and the EEP as described above, we conclude that the projects would result in some temporary impacts on aquatic resources, but that these impacts may be adequately mitigated through adherence to the measures described in the Mountain Valley's and Equitrans' Procedures and agency recommendations regarding the timing of in-water construction activities.

5.1.7 Special Status Species

Based on our review of existing records and Mountain Valley's and Equitrans' informal consultations with the FWS, we identified 23 federally listed threatened or endangered species (or federal candidate species or federal species of concern) that would be potentially present in the vicinity of the projects. We have concluded that construction and operation of the projects would have *no effect* on 2 of the species, would be *not likely to adversely affect* 8 species, have *no adverse impacts anticipated* for 2 species, would be *not likely to contribute to a trend toward federal listing* for 3 species, and would be *likely to adversely affect* 7 species (Indiana bat, northern long-eared bat, Roanoke logperch, running buffalo clover, shale barren rock cress, small whorled pogonia, and Virginia spiraea). Our *likely to adversely affect* determination for the latter four of these species is based on our assumption that these species are present in portions of the

MVP corridor that Mountain Valley was not granted land access to survey. We would reach the same conclusion for the twenty-third federally listed species, the bog turtle, based on our assumption that the species is present on a parcel that Mountain Valley was not granted land access to survey; however, because the bog turtle is listed threatened due to similarity of appearance to its federally threatened northern population, it is not subject to Section 7 consultation. We concluded that construction and operation of the EEP would be *not likely to adversely affect* the two endangered bats assumed to be present in the vicinity of the EEP. The conclusion was based in part upon Equitrans implementing effects avoidance and minimization measures outlined in the FWS-approved EEP *Myotid Bat Conservation Plan*.

We are currently preparing a BA, which will be submitted separately to the FWS and will include our detailed assessment regarding the effects of the projects on federally listed species. Section 4.7 of the EIS summarizes our BA, and presents our findings of effects for each federally listed species that may be affected by the projects. We are recommending that construction cannot begin until after the FERC completes the process of complying with the ESA.

The projects could also affect 20 species that are state-listed as threatened, endangered, or were noted by the applicable state agencies as being of special concern. Based on our review, we have concluded that the MVP and the EEP would not significantly impact all 20 of these species.

Mountain Valley submitted a BE to the FS regarding whether FS Sensitive Species would be affected where the MVP right-of-way is proposed to overlap with Jefferson National Forest land. The BE classifies the effects of the MVP on FS Sensitive Species as ranging from Beneficial Impacts to May Effect – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability.

Field surveys have documented the presence of 11 of 13 Jefferson National Forest MIS in the vicinity of the MVP. Field surveys to-date have not documented any FS Locally Rare Species in the vicinity of the MVP.

5.1.8 Land Use, Special Interest Areas, and Visual Resources

The MVP pipeline route would mostly cross forest (76.6 percent), followed by agricultural land (14.6 percent), and open land (8.7 percent). Land affected by EEP construction is mostly agricultural (46.3 percent), followed by forest (37.6 percent), and open land (12.5 percent).

Mountain Valley has so far identified five organic farms that would be affected. Mountain Valley developed an OFPP to minimize impacts on organic farms. No orchards, tree farms, specialty crops, or organic farms were identified along the EEP. Equitrans identified four farms along the H-318 pipeline route that are enrolled in the Pennsylvania Agricultural Land Preserve Program as well as the Forward Township Agricultural Security Area. Equitrans would coordinate with the landowner and has committed to using BMPs in order to reduce impacts on the farm.

Mountain Valley has identified 118 residences within 50 feet of its proposed construction work area, 35 of which would be within 10 feet. Mountain Valley has purchased 7 of the residences and has developed site-specific construction plans for all other residences within 50 feet of construction work areas. We are recommending that prior to construction Mountain Valley should file evidence of landowner concurrence for site-specific residential construction plans where construction would be within 10 feet.

Equitrans has identified four residences within the boundary of the proposed Redhook Compressor Station. Equitrans stated that it has negotiated agreements with all four property owners.

Federally owned or managed recreational and special use areas that would be crossed by the MVP pipeline route include the Weston and Gauley Bridge Turnpike Trail, the BRP, and the Jefferson National Forest. Mountain Valley is proposing to bore under the Weston and Gauley Bridge Turnpike Trail and the BRP.

About 3.5 miles of the MVP pipeline route would cross the Jefferson National Forest. Within the Jefferson National Forest, the pipeline would cross the ANST and the Brush Mountain Inventoried Roadless Area. Mountain Valley intends to cross under the ANST using a bore.

On the Jefferson National Forest, construction of the MVP would directly impact a total of about 83 acres. The route of the MVP pipeline through the Jefferson National Forest would cross five separate management prescriptions outlined in the LRMP: ANST Corridor (Rx4A); Mix of Successional Habitats in Forested Landscapes (Rx8A1); Old Growth Forest Communities-Disturbance Associated (Rx6C); Urban/Suburban Interface (Rx4J); and Riparian Corridors (Rx11). Construction of the MVP would result in a long-term impact on about 14.1 acres within Rx4J and 58.7 acres within Rx8A1. Operation of the MVP would result in a permanent loss of timber of about 31.1 acres, including 5.7 acres of Rx4J and 25.4 acres of Rx8A1. Construction would also result in the loss of 13.2 acres of the Dry-Mesic Oak Forest and 1.7 acres of the Dry and Dry-Mesic Oak-Pine Forest old growth community types. The FS analyzed amending its LRMP to allow for the MVP within the Jefferson National Forest, which includes five project-specific amendment parts that apply to the MVP project only. Impacts on National Forest resources would be minimized by Mountain Valley following the measures outlined the various resource-specific plans, in its POD, and Right-of-Way Grant that must be approved by BLM.

Visual resources represent the aesthetic quality of the landscape as perceived subjectively by the viewer. Permanent visual impacts would occur where compressor stations and M&R stations would be built; because these include aboveground buildings. In addition, the pipeline corridor itself can be a significant visual feature, especially in mountainous terrain with multiple viewpoints. Construction of new aboveground facilities would result in conversion of 43 acres of forest, agricultural, and open land into industrial land. Most of the aboveground facilities would be erected in rural areas, with few visual receptors such as houses or travelers on roads. In some cases, the facilities would be screened by topography or vegetation, reducing visual impacts.

Mountain Valley identified KOPs where visual impacts may be high because the pipeline corridor may stand out from the surrounding landscape and would be visible to viewers. Commenters were concerned about views of the cleared pipeline corridor for hikers along the ANST. At the MVP pipeline crossing of the ANST, Mountain Valley would include a 300-foot-wide forested buffer on each side of the trail to the bore pits to reduce visual impacts at the crossings. We requested that Mountain Valley conduct additional visual impact assessments from other KOPs along the ANST and the within the Jefferson National Forest (see appendix S). In response Mountain Valley expanded its analysis to include several additional KOPs and it submitted separate VIAs for the crossings of the Weston and Gauley Bridge Turnpike Trail (which is administered by the COE), the BRP (which is administered by the NPS), and the Jefferson National Forest (which is administered by the FS). The Jefferson National Forest VIA includes 47 KOPs from on NFS land, on Craig Creek Road, on Pocahontas Road, on U.S. 219, and the town of Pearisburg, Virginia. Mitigation measures for revegetation and restoration identified in section 4.8.2.6 would be required to meet the Scenic Integrity Objectives on NFS lands within 5 years of project construction. We conclude that overall impacts on land use and visual resources would be adequately minimized. ’

5.1.9 Socioeconomics

The influx of non-local construction workers could affect local housing availability, as they compete with visitors for limited accommodations in rural areas with few hotels. Peak non-local employees working on the MVP would average between 536 and 671 people per spread. The total peak workforce for the EEP, including pipelines and aboveground facilities, would be about 400 people. The Applicants would not build any temporary “man-camps” or project housing complexes. Instead, non-local construction workers would need to find housing in vacant rental units, including houses, apartments, mobile home parks, hotels/motels, and campgrounds and RV parks. We estimate that in the affected counties combined there are a total of 14,075 rental units, 33,054 hotel rooms, and 3,100 camping and RV spaces. In those counties where housing is limited, workers would likely find accommodations at adjacent larger communities that are within commuting distance. Some construction workers would bring their own lodgings in the form of RVs; others would share units. For the MVP, construction workers would be spread out along 11 separate pipeline spreads and 7 aboveground facilities across 17 counties. The projects would have only temporary impacts on population and local housing during construction. While it would take about 2.5 years to build the MVP, the average worker would only be on the job for about 10 months for the pipeline and 8 months for aboveground facilities.

There is no evidence that the projects would cause significant adverse health or environmental harm to any community with a disproportionate number of monitories, low income, or other vulnerable populations. Our analysis of environmental justice found that in the counties that contain MVP facilities in West Virginia, minorities represent between 0.7 to 7.0 percent of the population, compared to the statewide average of 6.4 percent. In the affected counties of Virginia, minorities comprise between 4 and 25.2 percent of the population, compared to the Virginia-wide average of 31 percent. In the Pennsylvania counties that contain EEP facilities, minorities comprise between 6.0 and 19.2 percent of the population, compared to the Pennsylvania-wide average of 18.4 percent. Eight of the 17 counties in the MVP area have poverty rates that are higher than the respective statewide levels. For the EEP, two of the four counties crossed have poverty rates that are higher than the respective state averages. The projects would mitigate for impacts on low-income communities through short-term employment, spending on commodities, and generation of tax revenues that would stimulate the local economy.

Mountain Valley proposes to use 393 roads to access the construction right-of-way, including 355 existing roads, 36 new access roads, and 1 access road that is both existing and new. Equitrans proposes to use 29 access roads during construction for access to the right-of-way during construction of the EEP, including 17 existing roads and 12 new roads. Construction equipment would typically stay on the right-of-way. The Applicants would minimize impacts on local road users by following the measures outlined in their project-specific *Traffic and Transportation Management Plans*. After construction, the Applicants would repair all roads to their original condition.

We received comments regarding the potential effect of the MVP on property values, mortgages, and insurance policies. The value of a tract of land, with or without a dwelling, would be related to many variables, including the size of the tract, improvements, land use, views, location, and nearby amenities, and the values of adjacent properties. The presence of a pipeline, and the restrictions associated with an easement, may influence a potential buyer's decision whether or not to purchase that property. Multiple studies indicate that the presence of a natural gas pipeline would not significantly reduce property values. One recent study conducted for the INGAA found that there was little difference in adjusted sale prices for houses adjacent to a pipeline easement and those further away in the same subdivision. We contacted some of the largest banks in the nation and discovered that banks regularly make loans for properties that contain natural gas pipeline easements. We are unaware of an example when an insurance company considered the presence of a pipeline when underwriting homeowner policies.

During construction, the projects would have short-term positive economic impacts on the affected counties due to hiring and wages, and expenditures for commodities, including money spent at restaurants and hotels by workers. The long-term socioeconomic effect of the projects is likely to be beneficial due to the increase in tax revenues. Based on the analysis presented, we conclude that the projects would not have a significant adverse effect on the socioeconomic conditions of the project area.

5.1.10 Cultural Resources

We consulted with Indian tribes that may have an interest in the projects. No religious or cultural sites of importance to tribes were identified.

We also consulted with SHPOs, federal land managing agencies, local governments, and other consulting parties. The SHPOs reviewed cultural resources reports and provided us with their opinions on NRHP eligibility and potential project effects.

Equitrans identified two previously recorded historic properties in the direct APE for the H-318 pipeline: the Monongahela River Navigation System and the Pittsburgh & Lake Erie Railroad. Equitrans intends to avoid impacts on these two historic properties by using an HDD to cross under the Monongahela River. Seven new archaeological sites were identified by Equitrans during surveys of its proposed pipeline routes; all evaluated as not eligible for the NRHP, requiring no further work.

The MVP pipeline route would cross through seven recorded Historic Districts (Big Stony Creek Historic District, Greater Newport Rural Historic District, North Fork Valley Rural Historic District, Bent Mountain Rural Historic District, Blue Ridge Parkway Historic District, Coles-Terry Rural Historic District, and the Lynchburg and Danville Railroad Historic District). Project effects on those Historic Districts have not yet been officially determined at this time.

Mountain Valley identified 11 previously recorded archaeological sites and three previously recorded architectural sites in the direct APE in West Virginia. The pipeline route would cross the NRHP-listed Weston and Gauley Bridge Turnpike Trail in Braxton County, but use of a bore under the trail would mitigate adverse effects. In Virginia, there are 42 previously recorded archaeological sites within the direct APE, as well as the NRHP-eligible ANST. Mountain Valley would mitigate adverse effects on the NRHP-eligible ANST by boring under the trail.

Within the direct APE, Mountain Valley identified 282 new archaeological sites and 116 new historic architectural sites. Mountain Valley evaluated 220 archaeological sites and 107 historic architectural sites as being not eligible for the NRHP, requiring no further work. A total of 46 archaeological sites within the direct APE for the MVP are unevaluated, and avoidance was recommended. Eleven newly recorded archaeological sites and nine historic architectural sites have been evaluated as eligible for nomination to the NRHP.

We have not yet completed the process of complying with Section 106, and included a recommendation that construction cannot begin until all surveys are completed, we have received reviews from the SHPOs, we identify historic properties that may be affected, and we develop an agreement to resolve adverse effects with the consulting parties. FERC is continuing to consult with federal land managing agencies, SHPOs, interested Indian tribes, and other consulting parties to complete determinations of project effects, which may require the development of a Memorandum of Agreement pursuant to 36 CFR 800.4(b)(2).

5.1.11 Air Quality and Noise

5.1.11.1 Air Quality

Air quality impacts associated with construction of the projects would include emissions from construction equipment and fugitive dust. Such impacts would generally be temporary and localized and are not expected to cause or contribute to a violation of applicable air quality standards. Once construction activities in an area are completed, fugitive dust and construction equipment emissions would subside and the impact on air quality due to construction would go away completely. Further, MVP would occur in areas classified as attainment or unclassifiable while EEP’s construction emissions would not exceed the General Conformity thresholds in areas of degraded air quality. Therefore, we conclude that the projects’ construction-related impacts would not result in a significant impact on local or regional air quality.

Air quality would be affected by construction and operation of the MVP and the EEP. Temporary air emissions would be generated during project construction, which would occur over a period of over 2.5 years, and across three states; however, most air emissions associated with the MVP and the EEP would result from the long-term operation of the new compressor stations.

All areas covered by the MVP are designated as attainment or unclassifiable for all criteria pollutants; therefore, the general conformity rule would not apply. All areas covered by the EEP in West Virginia and Pennsylvania are designated as attainment or unclassifiable for all criteria pollutants, except in some areas of Pennsylvania. Part of the EEP would be conducted in Greene, Allegheny, and Washington Counties in Pennsylvania, which are currently classified as nonattainment and/or maintenance for one or more pollutants. Therefore, a general conformity rule applicability was analyzed for project emissions occurring in those counties during construction, demolition, and operation. Results of the analysis show that the project emissions during construction and demolition would not exceed the General Conformity thresholds for the pollutants of concern, the general conformity rule applicability is not triggered. In addition, emissions during operations would be administered in accordance with the approved Pennsylvania's SIP that addresses the general conformity rule; hence, would be considered exempt from the rule.

Fugitive dust would result from land clearing, open burning, grading, excavation, concrete work, and vehicle traffic on paved and unpaved roads. Construction of the MVP and the EEP would occur over 2.5 years and across three states. However, most construction-related emissions would be temporary and localized, and would dissipate with time and distance from areas of active construction. Mountain Valley and Equitrans would implement measures to control fugitive dust emissions. Mountain Valley and Equitrans prepared separate dust control plans and described how it would control fugitive dust in other application materials. We have reviewed the dust control plans and procedures and found them to be sufficient.

Emissions generated during operation of the pipeline portion of MVP and EEP would be minimal, limited to emissions from maintenance vehicles and equipment and fugitive emissions (considered negligible for the pipeline). Mountain Valley submitted applications for construction and operation of the Bradshaw, Harris, and Stallworth Compressor Stations to the WVDEP and were issued Permits to Construct. Mountain Valley is required to file a Title V permit application with the WVDEP within 12 months of startup of operations of the Bradshaw Compressor Station. EEP submitted application for construction and operation of the Redhook Compressor Station to the PADEP. The Harris, Stallworth, and Redhook Compressor Stations would not exceed the major source emissions thresholds to be subject to Title V operating permit. All compressor stations would be minor sources with respect to Prevention of Significant Deterioration and New Source Review.

Mountain Valley and Equitrans would minimize potential impacts on air quality caused by operation of the new compressor stations by adhering to applicable federal and state regulations to minimize emissions. Minimization of the criteria air pollutant emissions, HAPs, and GHGs would be achieved by operating the most efficient turbines, installing $SoLoNO_x$ system for larger turbines, installing BAT, and adhering to good operating and maintenance practices on turbines and combustion engines, and using natural gas as fuel. The screening analyses conducted for Mountain Valley's and Equitrans' compressor stations show criteria air pollutant concentrations are below the applicable NAAQS. We conclude that any emissions resulting from operation of the compressor stations would not result in significant impacts on local or regional air quality.

5.1.11.2 Noise

Construction equipment for the projects would be operated on an as-needed basis. NSAs near the construction areas may experience an increase in perceptible noise, but the effect would be temporary and local. Noise mitigation measures that would be employed during construction include the use of sound-muffling devices on engines and the installation of barriers between construction activity and NSAs, as well as, limiting the great majority of construction to daytime hours. Additional noise mitigation measures could be implemented to further reduce construction noise disturbances at NSAs. Proposed mitigation would reduce noise levels from HDD activity to below 55 dBA L_{dn}. Based on modeled noise levels, mitigation measures proposed, and the temporary nature of construction, we conclude that the projects would not result in significant noise impacts on residents and the surrounding communities during construction.

The new compressor stations and associated meter stations would generate noise on a continuous basis (i.e., 24 hours a day) once operating. Mountain Valley and Equitrans completed analyses to identify the estimated noise impacts at the nearest NSAs from the facilities and found that noise levels from each compressor station and meter station during normal operations would be below the FERC criterion of 55 dBA L_{dn} and noise level increases would be undetectable to barely detectable at NSAs for all compressor stations and meter stations, except at Mobley Tap's NSA-MT-1 which would be moderately noticeable. Mountain Valley would conduct a post-construction noise surveys at NSAs for each of the three compressor stations while operating on full load to ensure that the noise impacts are acceptable. To ensure that the actual noise levels produced at the compressor stations would not cause significant impacts on nearby NSAs, we are recommending that Mountain Valley and Equitrans file noise surveys.

Noise from planned or unplanned blowdown events could exceed the noise criteria but would be infrequent and of relative short duration. Noise impacts would result from operation of MVP and the EEP's pipeline facilities, compressor stations, and meter stations. Based on the analyses conducted, mitigation measures proposed, and our recommendations, we conclude that operation of MVP and EEP would not result in significant noise impacts on residents and the surrounding communities.

5.1.12 Reliability and Safety

The projects and associated aboveground facilities would be designed, constructed, operated, and maintained to meet the DOT Minimum Federal Safety Standards in 49 CFR 192 and other applicable federal and state regulations. These regulations include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion. We received comments expressing concern about how the pipeline would be maintained over time and the long-term safety of operations. The DOT rules require regular inspection and maintenance, including repairs as necessary, to ensure the pipeline has adequate strength to transport the natural gas safely.

We received several comments about the potential effects of a pipeline rupture and natural gas ignition (the area of potential effect is sometimes referred to as the potential impact radius). While a pipeline rupture does not necessarily ignite, the DOT does publish rules that define high consequence areas where a gas pipeline accident could do considerable harm to people and their property and requires an integrity management program to minimize the potential for an accident. Mountain Valley and Equitrans would implement its own management plan for its pipeline facilities, which would be clearly marked at line-of-sight intervals and at other key points to indicate the presence of the pipeline. The pipeline system would be inspected to observe right-of-way conditions and identify soil erosion that may expose the pipe, dead vegetation that may indicate a leak in the pipeline, conditions of the vegetation cover and erosion control measures, unauthorized encroachment on the right-of-way such as buildings and other structures, and other conditions that could present a safety hazard or require preventive maintenance or repairs. Mountain Valley and Equitrans would employ the use of data acquisition systems that would allow for continuous monitoring and control of the projects.

Mountain Valley and Equitrans would prepare an emergency response plan that would provide procedures to be followed in the event of an emergency that would meet the requirements of 49 CFR 192.615. The plan would include the procedures for communicating with emergency services departments, prompt responses for each type of emergency, logistics, emergency shut down and pressure reduction, emergency service department notification, and service restoration. Installation of the pipeline within the Jefferson National Forest would not prevent FS personnel from fighting fires. However, Mountain Valley would require landowners to coordinate with Mountain Valley regarding the operation of heavy equipment within the right-of-way to ensure the integrity of the pipeline is maintained.

We conclude that the Applicants' implementation of the above measures would help to protect public safety and the integrity of the proposed facilities.

5.1.13 Cumulative Impacts

We analyzed cumulative impacts of the MVP and EEP, in addition to other projects that may occur within the same area of geographic scope and timeframe. The other projects we examined include oil and gas well, gathering lines, and related facilities; mining and other energy projects; other FERC-jurisdictional natural gas transportation projects; residential or commercial developments; and road improvement projects.

We considered other projects within the geographic scope for cumulative impacts on water resources, wetlands, vegetation, wildlife, and land use using the HUC10 watersheds crossed by the MVP and EEP. For permanent or long-term air quality cumulative impacts associated with compressor stations, the area of geographic scope was air quality control regions either directly affected or those located within about 31 miles. The geographic scope for air quality impacts for construction (as well as noise and generalized visual resources) was 0.25 mile. For cultural resources cumulative impacts, the county was the area of geographic scope.

The MVP would cross 31 HUC10 watersheds and the EEP would cross 3 HUC10 watersheds. The 33 HUC10 watersheds (the projects share one HUC10 watershed) combined total 4,557,727 acres. The MVP and the EEP account for about 6,487 acres of impacts (0.1 percent) of these watersheds, while other projects located within the same watersheds account for 82,607 acres (1.8 percent) of impact. Combined, the 20 counties crossed by the MVP and EEP cover about 6,972,384 acres. For all resources analyzed, and in consideration of the Applicants' proposed measures and our recommendations for additional measures intended to result in the further avoidance, minimization, and/or mitigation of effects, we conclude that the effects of adding the impacts of the MVP and EEP with the impacts of other projects would not be significant.

5.1.14 Alternatives

As an alternative to the proposed action, we evaluated the no-action alternative, system alternatives, route alternatives, and aboveground facility site alternatives. While the no-action alternative would eliminate the environmental impacts identified in the EIS, the stated objectives of the Applicants' proposals would not be met. Further, the natural gas shippers would seek alternative transportation infrastructure that would impact similar resources as the projects.

Our analysis of system alternatives included an evaluation of whether existing or proposed natural gas pipeline systems could meet the projects' objectives while offering a significant environmental advantage. We could not identify any existing interstate natural gas transmission systems that fully extend from the Applicants' proposed starting points (in southwestern Pennsylvania and northern West Virginia) to the termini of their pipelines (in the case of MVP this would be at Transco Station 165 in southeast Virginia). Because existing systems have their capacities already subscribed, there would not be enough space available on those systems for the additional volumes proposed by Equitrans (0.4Bcf/d) and Mountain Valley (2Bcf/d). Therefore, we conclude that no existing interstate natural gas transmission system could reasonably replace the proposed projects.

We also evaluated merging the ACP and the MVP into one project (one pipeline alternative; using a variety of engineering options) along the ACP route. We determined that the one-pipe alternative would not be technically feasible or practical.

We evaluated four major route alternatives for the MVP: Northern Pipeline Alternative – ACP Collocation, Alternative 1, and two hybrid routes combining major elements of the proposed route and Alternative 1. None of the major route alternatives offered significant environmental advantages over the proposed MVP. None of Equitrans' proposed pipelines was long enough to have a major route alternative.

In October 2016, Mountain Valley filed a number of minor route modifications to address issues raised in our September 2016 draft EIS, issues raised by landowners, or engineering issues. Included in those modifications adopted into the proposed route in October 2016 were two realignments recommended in our draft EIS (avoidance of the Mayapple Preschool and the Sunshine Valley School). Equitrans adopted the New Cline Variation into the route of its proposed H-318 pipeline following our recommendation in the draft EIS for additional study of this alternative.

This final EIS analyzes 25 route variations for the MVP. We recommend that Mountain Valley adopt Variation 250 into its proposed route. We found the other variations do not offer significant environmental advantages over the proposed route segments.

We also examined six route variations for the EEP. None of those variations were environmentally superior to the segments of the proposed routes.

In this final EIS we present resolutions proposed by Mountain Valley for realignment issues raised by 15 landowners in the draft EIS. In addition, we listed routing concerns raised by 20 landowners after we issued the draft EIS, and Mountain Valley's responses. We found that in seven cases landowner concerns were not fully addressed by Mountain Valley in response to our post-draft-EIS EIRs, and we recommend that Mountain Valley file parcel-specific plans, developed in coordination with the affected landowners, prior to construction.

5.2 FERC STAFF'S RECOMMENDED MITIGATION MEASURES

If the Commission authorizes the MVP and the EEP, we recommend that the following measures be included as specific environmental conditions in the Commission's Order. These measures would further mitigate the environmental impact associated with construction and operation of the proposed projects. We have included several recommendations that require the Applicants to file additional information **prior to construction**. Other recommendations require actions **during operations**. Some recommendations are standard conditions typically attached to Commission Orders. There are recommendations that apply to both Applicants and other recommendations are specific to either Mountain Valley or Equitrans.

Recommendations 1 through 12 are standard conditions that apply to both Mountain Valley and Equitrans.

1. Mountain Valley and Equitrans shall each follow the construction procedures and mitigation measures described in their application and supplements, including responses to staff data requests and as identified in the EIS, unless modified by the Order. The Applicants must:

   a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;

   b. justify each modification relative to site-specific conditions;

   c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and

   d. receive approval in writing from the Director of OEP **before using that modification**.

2. The Director of OEP has delegated authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the projects. This authority shall allow:

   a. the modification of conditions of the Order; and

b. the design and implementation of any additional measures deemed necessary (including stop-work authority) to ensure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from construction and operation of the projects.

3. **Prior to any construction**, Mountain Valley and Equitrans shall each file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, EIs, and contractor personnel will be informed of the EIs' authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs **before** becoming involved with construction and restoration activities.

4. The authorized facility locations shall be as shown in the EIS, as supplemented by filed alignment sheets, and shall include all of the staff's recommended facility locations identified in recommendations 15, 16, and 22 of the EIS. **As soon as they are available, and before the start of construction**, Mountain Valley and Equitrans shall each file any revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

   The exercise of eminent domain authority granted under NGA Section 7(h) in any condemnation proceedings related to the MVP or EEP must be consistent with the facilities and locations approved in the Commission Order. The right of eminent domain granted under NGA Section 7(h) does not authorize either Mountain Valley or Equitrans to increase the size of the natural gas pipelines approved in the Commission Order to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.

5. Mountain Valley and Equitrans shall each file detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, and staging areas, yards, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction in or near that area**.

   This requirement does not apply to extra workspace allowed by the FERC Plan and/or minor field realignments per landowner needs and requirements, which do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

a. implementation of cultural resources mitigation measures;

b. implementation of endangered, threatened, or special concern species mitigation measures;

c. recommendations by state regulatory authorities; and

d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

6. **Within 60 days of their acceptance of a Certificate and before construction begins**, Mountain Valley and Equitrans shall each file their respective Implementation Plans for review and written approval by the Director of OEP. Mountain Valley and Equitrans must each file revisions to their plans as schedules change. The plans shall identify:

   a. how Mountain Valley and Equitrans will each implement the construction procedures and mitigation measures described in their applications and supplements (including responses to staff data requests), identified in the EIS, and required by the Order;

   b. how the Mountain Valley and Equitrans will each incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;

   c. the number of EIs assigned to each project and spread, and how Mountain Valley and Equitrans will each ensure that sufficient personnel are available to implement the environmental mitigation;

   d. company personnel, including EIs and contractors, who will receive copies of the appropriate materials;

   e. the location and dates of the environmental compliance training and instructions Mountain Valley and Equitrans will each give to all personnel involved with construction and restoration (initial and refresher training as the projects progress and personnel change) with the opportunity for OEP staff to participate in the training sessions;

   f. the company personnel (if known) and specific portion of the company's organization having responsibility for compliance;

   g. the procedures (including use of contract penalties) that Mountain Valley and Equitrans will each follow if noncompliance occurs; and

   h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

      i. the completion of all required surveys and reports;
      ii. the environmental compliance training of onsite personnel;
      iii. the start of construction; and
      iv. the start and completion of restoration.

7. Mountain Valley and Equitrans shall each employ a team of EIs per construction spread. The EIs shall be:

a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;

b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 above) and any other authorizing document;

c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;

d. a full-time position, separate from all other activity inspectors;

e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and

f. responsible for maintaining status reports.

8. **Beginning with the filing of its Implementation Plan**, Mountain Valley and Equitrans shall each file updated status reports with the Secretary on a **weekly basis until all construction and restoration activities are complete**. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

a. an update on Mountain Valley and Equitrans efforts to obtain the necessary federal authorizations;

b. the construction status of the their respective project facilities, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;

c. a listing of all problems encountered and each instance of noncompliance observed by the EIs during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);

d. a description of corrective actions implemented in response to all instances of noncompliance, and their cost;

e. the effectiveness of all corrective actions implemented;

f. a description of any landowner/resident complaints that may relate to compliance with the requirements of the Order, and the measures taken to satisfy their concerns; and

g. copies of any correspondence received by Mountain Valley and Equitrans from other federal, state, or local permitting agencies concerning instances of noncompliance, and the responses of Mountain Valley and Equitrans to each letter.

9. **Prior to construction**, Mountain Valley and Equitrans shall each file with the Secretary copies of their environmental complaint resolution procedures. The procedures shall provide landowners with clear directions for identifying and resolving concerns resulting from construction and restoration of the projects. Mountain Valley and Equitrans shall

mail copies of their complaint procedures to each landowner whose property would be crossed by the projects.

a. In their letters to affected landowners, Mountain Valley and Equitrans shall:

   i. provide a local contact that the landowners shall call first with their concerns; the letter shall indicate how soon a landowner shall expect a response;
   ii. instruct the landowners that if they are not satisfied with the response, they shall call the Mountain Valley or Equitrans Hotline, as appropriate. The letter shall indicate how soon to expect a response from the company; and
   iii. instruct the landowners that if they are still not satisfied with the response from the company Hotline, they shall contact the Commission's Landowner Helpline at 877-337-2237 or at LandownerHelp@ferc.gov.

b. In addition, Mountain Valley and Equitrans shall include in their weekly status reports to the FERC a table that contains the following information for each problem/concern:

   i. the identity of the caller and date of the call;
   ii. the location by milepost and engineering station number from the alignment sheet(s) of the affected property;
   iii. a description of the problem/concern; and
   iv. an explanation of how and when the problem was resolved, will be resolved, or why it has not been resolved. (*section 4.8.2.2*)

10. **Prior to receiving written authorization from the Director of OEP to commence construction of any project facilities**, Mountain Valley and Equitrans shall each file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

11. Mountain Valley and Equitrans must each receive separate written authorization from the Director of OEP **before placing their respective projects into service**. Such authorization will only be granted following a determination that rehabilitation and restoration of areas affected by the projects are proceeding satisfactorily.

12. **Within 30 days of placing the authorized facilities in service**, Mountain Valley and Equitrans shall each file an affirmative statement with the Secretary, certified by a senior company official:

a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or

b. identifying which of the Certificate conditions Mountain Valley and Equitrans has complied or will comply with. This statement shall also identify any areas affected by their respective projects where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

Recommendations 13 and 14 are project-specific conditions that apply to both Mountain Valley and Equitrans, and shall be addressed before construction is allowed to commence.

13. **Prior to construction**, Mountain Valley and Equitrans shall each file with the Secretary the location of all water wells, springs, and other drinking water sources within 150 feet (500 feet in karst terrain) of construction work areas and aboveground facilities. *(section 4.3.1.2)*

14. **Prior to construction**, Mountain Valley and Equitrans shall file with the Secretary, for review and written approval by the Director of OEP, revised erosion control plans that contain only native species. *(section 4.4.2.7)*

Recommendations 15 through 34 are project-specific conditions that apply only to Mountain Valley and shall be addressed before construction is allowed to commence.

15. **Prior to construction**, Mountain Valley shall adopt Variation 250 into its proposed route. As part of its Implementation Plan, Mountain Valley shall file with the Secretary the results of all environmental surveys, an updated 7.5-minute USGS topographic quadrangle map, and a large-scale alignment sheet that illustrates this route change. *(section 3.5.1.11)*

16. **Prior to construction,** Mountain Valley shall file with the Secretary, for review and approval by the Director of OEP, a segment-specific construction and operation access plan for the area between MP 237.6 and 240.3, that does not include access road MVP-RO-279.01. *(section 3.5.1.12)*

17. **Prior to construction**, Mountain Valley shall file landowner-specific crossing plans developed in coordination with the affected landowners which contain impact avoidance, minimization, or mitigation measures, as appropriate, for review and written approval of the Director of OEP. The landowner-specific crossing plans shall be prepared in relation to the draft EIS comments in the following accession numbers: 20161024-5011 (water well), 20161212-5046 (steep ravines), 20161212-5234 (forest impacts, road frontage), 20161213-5021 (cattle and hay operations), 20161223-0033 (gravel road, reconfigure ATWS), 20161228-0073 (water well, waterline for the campground), and 20170324-5140 (home under construction, septic system). *(section 3.5.3.1)*

18. **Prior to construction**, Mountain Valley shall file with the Secretary, for review and written approval by the Director of OEP, a revised *Landslide Mitigation Plan* that includes the following BMPs and measures:

    a. describe methods that will ensure backfill, compaction, and restoration activities occur only during suitable soil moisture content conditions for steep (greater than 15 percent) slopes perpendicular to the slope contour, not just for steep (greater than 15 percent) side slopes;

    b. as identified for steep side slopes, place backfill material in compacted lifts no greater than 12 inches thick and compact using an excavator bucket, sheep's foot, roller, or similar for all steep slopes;

c. geotechnical personnel that will be employed and onsite to prescribe additional mitigation measures for steep slopes shall have regional experience for constructing in and mitigating steep slopes and associated hazards; and

d. monitoring of all landslide hazard areas identified within this EIS in addition to any hazard areas identified during construction using the methods prescribed for the Jefferson National Forest. (*section 4.1.2.4*)

19. **Prior to construction**, Mountain Valley shall file with the Secretary, for review and written approval by the Director of OEP, a revised *Karst Mitigation Plan* that includes monitoring of all potential karst areas for subsidence and collapse using the same LiDAR monitoring methods and procedures currently proposed to monitor for earth movements at landslide hazard areas within the Jefferson National Forest. LiDAR data shall be provided in a form that is conducive to comparison of repeat surveys, such as a Digital Elevation Model or Digital Terrain Model. *(section 4.1.2.5)*

20. **Prior to construction**, Mountain Valley shall file with the Secretary, for review and written approval of the Director of OEP, a revised *Water Resources Identification and Testing Plan* which includes:

    a. water quality testing for oil and grease, volatile organic compounds, and hydrocarbons; and

    b. post-construction monitoring, with the landowner's permission, of all water wells, springs, and other drinking water supply sources within 150 feet of construction workspaces or 500 feet of construction workspaces in karst terrain. *(section 4.3.1.2)*

21. **Prior to construction**, Mountain Valley shall file with the Secretary, for review and written approval of the Director of OEP, source, location, and quantities of water which would be used for dust control. (*section 4.3.2.1*)

22. **Prior to construction**, Mountain Valley shall adopt into its proposed pipeline route the alternative alignment for the crossing of the Pigg River and adopt an HDD as the crossing method. As part of its Implementation Plan, Mountain Valley shall file with the Secretary a revised alignment sheet, a summary comparison of impacts between the HDD alignment and the original alignment, and an HDD Contingency Plan, for the review and approval of the Director of OEP. *(section 4.3.2.2)*

23. **Prior to construction**, Mountain Valley shall file with the Secretary, for review and written approval of the Director of OEP, water supply contingency plans, prepared in coordination with the Public Service/Supply Districts, outlining measures to minimize and mitigate potential impacts on public surface water supplies with intakes within 3 miles downstream of the workspace, and ZCC within 0.5 mile of the workspace. The measures shall include, but not be limited to, providing advance notification to water supply owners prior to the commencement of pipeline construction. *(section 4.3.2.2)*

24. **Prior to construction**, Mountain Valley shall file with the Secretary, for review and approval by the Director of OEP, either a plan to maintain a 15 foot buffer from the

tributary to Foul Ground Creek or proposed mitigation measures to minimize impacts on the waterbody. *(section 4.3.2.2)*

25. **Prior to construction,** Mountain Valley shall file with the Secretary, for review and written approval by the Director of OEP, site plans and maps that illustrate how permanent impacts on wetlands W-EE6 and W-EE7 will be avoided at the Stallworth Compressor Station. *(section 4.3.3.2)*

26. **Prior to construction**, Mountain Valley shall file with the Secretary its final *Migratory Bird Conservation Plan*. The plan shall include impact avoidance, minimization, restoration, and/or mitigation measures for the impacts on migratory birds and it shall be prepared in coordination with the FWS, WVDNR, and VADGIF. (*section 4.5.2.6*)

27. Mountain Valley shall not begin construction of the proposed facilities **until**:

    a. all outstanding and required biological surveys for federally listed species are completed and filed with the Secretary;

    b. the FERC staff completes any necessary ESA Section 7 informal and formal consultation with the FWS; and

    c. Mountain Valley has received written notification from the Director of OEP that construction and/or use of mitigation (including implementation of conservation measures) may begin. (*section 4.7.1.3*)

28. **Prior to construction**, Mountain Valley shall file with the Secretary the results of all remaining environmental surveys (water resources, wetlands, cultural resources, and threatened and endangered species) for all cathodic protection groundbeds. *(section 4.8.1.2)*

29. **Prior to construction**, Mountain Valley shall file with the Secretary evidence of landowner concurrence with the site-specific residential construction plans for all locations where construction work areas will be within 10 feet of a residence. Mountain Valley shall also file with the Secretary a site-specific residential construction plan, including site-specific justification for locating project components within 50 feet of structures located on parcel VA-GI-5673 at about MP 216.6. *(section 4.8.2.2)*

30. **Prior to construction**, Mountain Valley shall file with the Secretary documentation that the Burnsville Lake WMA Crossing Plan was provided to the WVDNR for review and comment. *(section 4.8.2.4)*

31. **Prior to construction**, Mountain Valley shall file with the Secretary documentation that the U.S. Highway 50 and North Bend Rail Trail Crossing Plan was provided to the WVDOT and WVDNR for review and comment. *(section 4.8.2.4)*

32. **Prior to construction**, Mountain Valley shall file with the Secretary documentation that the TNC Property Crossing Plan was provided to the TNC for review and comment. *(section 4.8.2.4)*

33. Mountain Valley **shall not begin construction** of facilities and/or use of staging, storage, or temporary work areas and new or to-be-improved access roads **until**:

a. Mountain Valley files with the Secretary:

i. remaining cultural resources survey reports;
ii. site evaluation reports, avoidance plans, or treatment plans, as required; and
iii. comments on the reports and plans from the appropriate SHPOs, federal land managing agencies, interested Indian tribes, and other consulting parties.

b. the ACHP has been afforded an opportunity to comment if historic properties would be adversely affected; and

c. the FERC staff reviews and the Director of OEP approves all cultural resources reports and plans, and notifies Mountain Valley in writing that either treatment measures (including archaeological data recovery) may be implemented or construction may proceed.

All materials filed with the Commission containing **location, character, and ownership** information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "**CONTAINS PRIVILEGED INFORMATION - DO NOT RELEASE**." (*section 4.10.10.3*)

34. **Prior to construction of the Pig River HDD crossing**, Mountain Valley shall file with the Secretary an HDD noise analysis identifying the existing and projected noise levels at each NSA within 0.5 mile of the HDD entry and exit site. If noise attributable to the HDD is projected to exceed a day-night L_{dn} of 55 dBA at any NSA, Mountain Valley shall file with the noise analysis a mitigation plan to reduce the projected noise levels for the review and written approval by the Director of OEP. During drilling operations, Mountain Valley shall implement the approved plan, monitor noise levels, and make all reasonable efforts to restrict the noise attributable to the drilling operations to no more than an L_{dn} of 55 dBA at the NSAs. *(section 4.11.2.3)*

Recommendations 35 through 39 are project-specific conditions that applies only to Equitrans and shall be addressed <u>before construction is allowed to commence.</u>

35. **Prior to construction**, Equitrans shall offer to conduct, with the landowner's permission, post-construction monitoring of all water wells, springs, and other drinking water supply sources within 150 feet of construction workspaces or 500 feet of construction workspaces in karst terrain. (*section 4.3.1.2)*

36. **Prior to construction**, Equitrans shall file with the Secretary, for review and written approval by the Director of OEP, a plan to identify septic systems and avoidance, minimization, and mitigation measures. (*section 4.3.1.2*)

37. **Prior to construction**, Equitrans shall file with the Secretary the results of all environmental surveys (water resources, wetlands, cultural resources, and threatened and endangered species) for the New Cline Variation. (*section 4.3.2.1*)

38. **Prior to construction,** Equitrans shall file with the Secretary, for the review and written approval of the Director of OEP, a crossing plan for the Riverview Golf Course that includes mitigation measures and documentation that the plan was reviewed by the landowners. (*section 4.8.2.4*)

39. **Prior to construction of the South Fork Tenmile Creek and Monongahela River HDD crossings**, Equitrans shall file with the Secretary, for the review and written approval by the Director of OEP, an HDD noise mitigation plan to reduce the projected noise level increase attributable to the proposed drilling operations at the NSAs. **During drilling operations**, Equitrans shall implement the approved plan, monitor noise levels, include noise levels in weekly reports to the FERC, and make all reasonable efforts to restrict the noise attributable to the drilling operations to no more than a 10 dBA increase over ambient noise levels at the NSAs. *(section 4.11.2.3)*

Recommendation 40 is a project-specific condition that applies only to Mountain Valley and shall be addressed during <u>operation of facilities</u>.

40. Mountain Valley shall file noise surveys with the Secretary **no later than 60 days** after placing the equipment at the Bradshaw, Harris (including the WB Interconnect), and Stallworth Compressor Stations into service. If full load condition noise surveys are not possible, Mountain Valley shall provide interim surveys at the maximum possible horsepower load **within 60 days** of placing the equipment into service and provide the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at each station under interim or full horsepower load exceeds an L_{dn} of 55 dBA at the nearest NSA, Mountain Valley shall file a report on what changes are needed and shall install the additional noise controls to meet the level within **1 year** of the in-service date. Mountain Valley shall confirm compliance with the above requirement by filing a second noise survey with the Secretary for each station **no later than 60 days** after it installs the additional noise controls. *(section 4.11.2.3)*

Recommendation 41 is a project-specific condition that applies only to Equitrans and shall be addressed during <u>operation of facilities.</u>

41. Equitrans shall file a noise survey with the Secretary **no later than 60 days** after placing the Redhook Compressor Station into service. If a full load condition noise survey is not possible, Equitrans shall provide an interim survey at the maximum possible horsepower load **within 60 days** of placing the Redhook Compressor Station into service and provide the full load survey **within 6 months**. If the noise attributable to operation of the equipment at the Redhook Compressor Station exceeds an L_{dn} of 55 dBA at the nearest NSA, Equitrans shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. Equitrans shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(section 4.11.2.3)*