Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3a

February 2017

United States Army Corps of Engineers
Huntington District
ATTN: Kenneth R. Bumgardner
Chief, Real Estate Division
Acquisition and Management Branch
502 Eighth Street
Huntington, West Virginia 25701-2070

Re: Burnsville Lake, Braxton County, Mountain Valley Pipeline, LLC - Easement Request
Docket No. CP16-10-100

Dear Mr. Bumgardner:

Please see the following response by Mountain Valley Pipeline, LLC (MVP or Mountain Valley) in regards to the United States Army Corps of Engineers (USACE) Huntington District's November 1, 2016 comments (Accession number 20161107-0096) on the Federal Energy Regulatory Commission (FERC) Draft Environmental Impact Statement (DEIS) for the Proposed Mountain Valley Pipeline Project (Project).

USACE Comment No. 1: Mountain Valley Pipeline, LLC should post key Burnsville Dam elevation data (top of Flood Control Pool: 825.00 feet; Probable Maximum Flood: 833.70 feet) on all design and as-built drawings and take these elevations into consideration when designing the pipeline installation.

Mountain Valley Response No. 1: Mountain Valley will comply with this request and add the key Burnsville Dam elevation data to its pre-construction alignment sheets and the final as-built alignment sheets. In flood zone areas, Mountain Valley will design for negative buoyancy and, if necessary use aggregate filled sacks to weight the pipeline.

USACE Comment No. 2: The proposed pipeline installation must not result in a net decrease in the flood control storage of the Burnsville Dam.

Mountain Valley Response No. 2: Mountain Valley's construction activities are temporary in nature, and existing contours will be restored as close as possible after construction. Existing flow patterns and surface hydrology along the Project area will be maintained during and after construction. Impacts to the flood control storage of the Burnsville Dam are not anticipated as a result of this Project.

USACE Comment No. 3: MVP should evaluate the proposed pipeline installation alignment for potential aggressive subsurface conditions with regard to designing/implementing corrosion protection measures on the pipeline.

Mountain Valley Response No. 3: Mountain Valley will coat the pipeline in fusion-bonded epoxy to prevent any damage or deterioration to the pipeline from subsurface conditions. Mountain Valley will also install a cathodic protection system to prevent corrosion and conduct periodic inspections of the cathodic corrosion prevention system to ensure proper function of corrosion mitigation. These periodic inspections will be in compliance with DOT/PHMSA regulations at 49 CFR 192.465, which are as follows:

§192.465 External corrosion control: Monitoring.

(a) Each pipeline that is under cathodic protection must be tested at least once each calendar year, but with intervals not exceeding 15 months, to determine whether the cathodic protection meets the requirements of §192.463. However, if tests at those intervals are impractical for separately protected short sections of mains or transmission lines, not in excess of 100 feet (30 meters), or separately protected service lines, these pipelines may be surveyed on a sampling basis. At least 10 percent of these protected structures, distributed over the entire system must be surveyed each calendar year, with a different 10 percent checked each subsequent year, so that the entire system is tested in each 10-year period.

(b) Each cathodic protection rectifier or other impressed current power source must be inspected six times each calendar year, but with intervals not exceeding 2½ months, to insure that it is operating.

(c) Each reverse current switch, each diode, and each interference bond whose failure would jeopardize structure protection must be electrically checked for proper performance six times each calendar year, but with intervals not exceeding 2½months. Each other interference bond must be checked at least once each calendar year, but with intervals not exceeding 15 months.

(d) Each operator shall take prompt remedial action to correct any deficiencies indicated by the monitoring.

(e) After the initial evaluation required by §§192.455(b) and (c) and 192.457(b), each operator must, not less than every 3 years at intervals not exceeding 39 months, reevaluate its unprotected pipelines and cathodically protect them in accordance with this subpart in areas in which active corrosion is found. The operator must determine the areas of active corrosion by electrical survey. However, on distribution lines and where an electrical survey is impractical on transmission lines, areas of active corrosion may be determined by other means that include review and analysis of leak repair and inspection records, corrosion monitoring records, exposed pipe inspection records, and the pipeline environment.

USACE Comment No. 4: MVP should perform geotechnical subsurface explorations along the proposed pipeline installation alignment to better define subsurface conditions and design requirements, particularly regarding the feasibility of completing the proposed conventional bore beneath the Weston Gauley Bridge Turnpike Trail.

Mountain Valley Response No. 4: Mountain Valley will complete subsurface investigations for the Weston and Gauley Bridge Turnpike Trail (WGBTT) bore crossing prior to the start of construction.

Mountain Valley has conducted desktop and field reconnaissance activities to gather geologic information to determine the feasibility for the proposed conventional bore. The WGBTT bore crossing is located on west-dipping bedrock of the Appalachian Plateau geologic province (www.wvgs.wvnet.edu/www/maps/pprovinces.htm). Geologic mapping of the Braxton County, West Virginia area, specifically the Burnsville and Orlando quadrangles, has not been completed (see status of geologic quadrangle completion in West Virginia as of April 2016: http://www.wvgs.wvnet.edu/www/statemap/statemap.htm). The state-wide geologic map for West Virginia is interpreted to indicate that the Pennsylvanian-age Monongahela Formation is the ridge-forming

sandstone at the WGBTT bore site (http://www.wvgs.wvnet.edu/www/maps/geomap.htm).

The following description of the Monongahela Formation summarizes pertinent rock description. See Figure 1 for photographs of the bedrock in the vicinity of the WGBTT bore site.

The Upper Pennsylvanian-aged Monongahela Formation consists of non-marine cyclic sequences of sandstone, siltstone, red and gray shale, limestone, and coal. The Formation extends from the top of the Waynesburg coal to the base of the Pittsburgh coal and includes the Uniontown, Sewickley, and Redstone coals. In West Virginia, the thickness of the Formation generally ranges from 170 feet to 300 feet. Sandstone in the Formation is described as medium-light-gray, very fine- to coarse-grained, conglomeratic with rounded quartz pebbles; thin-bedded to massive. Siltstone and shale in the Formation are described as medium-dark-gray to grayish-red, thin to poorly bedded, slightly fissile, silty, carbonaceous, and slightly calcareous. The shales and siltstones of the Formation, commonly known as red beds, are associated with landslides. Coal beds are also found in the Monongahela Formation and are often underlain by underclay, flint clay, or semi-flint clay. These clays are described as medium-gray, grayish-yellow, grayish-red, poorly bedded and brecciated with concoidal fracture, and containing fossil root prints. (https://mrdata.usgs.gov/geology/state/sgmc-unit.php?unit=WVPAm%3B0).

There are no readily available geotechnical data on the Monongahela Formation. However, it is noted that this geologic rock-type is commonly found capping ridges throughout central-northern West Virginia and southwestern Pennsylvania, and Mountain Valley's personnel have pre-existing experience with pipeline installation in this formation. It is not anticipated that the Monongahela Formation at the WGBTT will present a particularly challenging bore project, particularly given that the approximate bore length is 130 feet, which is relatively minor in nature.

The Momentum Midstream 36-inch-diameter Stonewall Pipeline crosses under the WGBTT via a conventional bore approximately 0.25 mile from the proposed MVP crossing. The Momentum bore was apparently successful as the pipeline is installed and currently operating.

Therefore, the proposed conventional bore under the WGBTT for this Project does not appear to present Mountain Valley with a significant risk for completion based on MVP's understanding of the rock formation, the relatively limited bore length, the completed nearby Momentum-Stonewall bore, and Mountain Valley's experience with this type of geology from other pipeline installations.

USACE Comment No. 5: Drill spoil and excess excavated material, soil and rock, from pipeline installation, maintenance, repairs, and/or abandonment should be disposed of at an approved landfill site located outside the project operations defined flowage easement and fee land.

Mountain Valley Response No. 5: The spoil and excess excavated materials from the pipeline installation will not be distributed on any USACE property and will be spread along the existing private right-of-way on either side of the USACE property.

USACE Comment No. 6: MVP to include Huntington District on the emergency notification/management list.

Mountain Valley Response No. 6: MVP will include the Huntington District on the emergency notification/management list.

USACE Comment No. 7: It is requested that MVP bore under the property in its entirety and not disturb any Government property on the surface.

Mountain Valley Response No. 7: Mountain Valley will comply with this request. Mountain Valley is proposing a bore length of approximately 130 feet under the USACE property, which will avoid the surface of the USACE property in its entirety. The bore profile is shown in Figure 2.

USACE Comment No. 8: Adequate screening should be left on each side of the bore so users of the trail do not see the unsightly right-of-way with no trees.

Mountain Valley Response No. 8: Mountain Valley will comply with this request. The USACE right-of-way fence is approximately 65 feet wide at the proposed crossing location. Mountain Valley is proposing a bore length of approximately 130 feet under the USACE property, which allows Mountain Valley to leave a buffer of approximately 20 feet from the right-of-way fence to the beginning of tree clearing for the bore pits. Please see Figure 2.

USACE Comment No. 9: The surface of the turnpike shall not be crossed at any point with any motorized vehicles except by using County Route 46 near Mt. Hope Church.

Mountain Valley Response No. 9: Mountain Valley will comply with this request.

USACE Comment No. 10: Access shall not be obtained by using any part of the Weston Gauley Bridge Turnpike that is located on Government property.

Mountain Valley Response No. 10: Mountain Valley will comply with this request.

USACE Comment No. 11: The right-of-way fence that delineates the turnpike shall not be disturbed in any way.

Mountain Valley Response No. 11: Mountain Valley will comply with this request.

USACE Comment No. 12: Due to the pipeline crossing Government Flowage Easement the following paragraph needs to be added to the Easement:

> **CONSENT TO EASEMENT STRUCTURES**
> Subject to all the conditions herein, consent of the United States is hereby granted for the installation, operation, maintenance, and removal of a 42-inch diameter natural gas pipeline on Tract No. 723E in which the United States owns a perpetual flowage easement; provided, however, that this consent is granted pursuant to the provisions of and subordinate to the rights granted to the United States in said land.
>
> The area over which consent herein is granted is shown in green on Exhibit (?), attached hereto and made a part hereof. This consent does not wave the necessity for the grantee to obtain appropriate rights from the owners of the fee title to the property.

Mountain Valley Response No. 12: Mountain Valley agrees to utilize this language in the USACE crossing agreement.

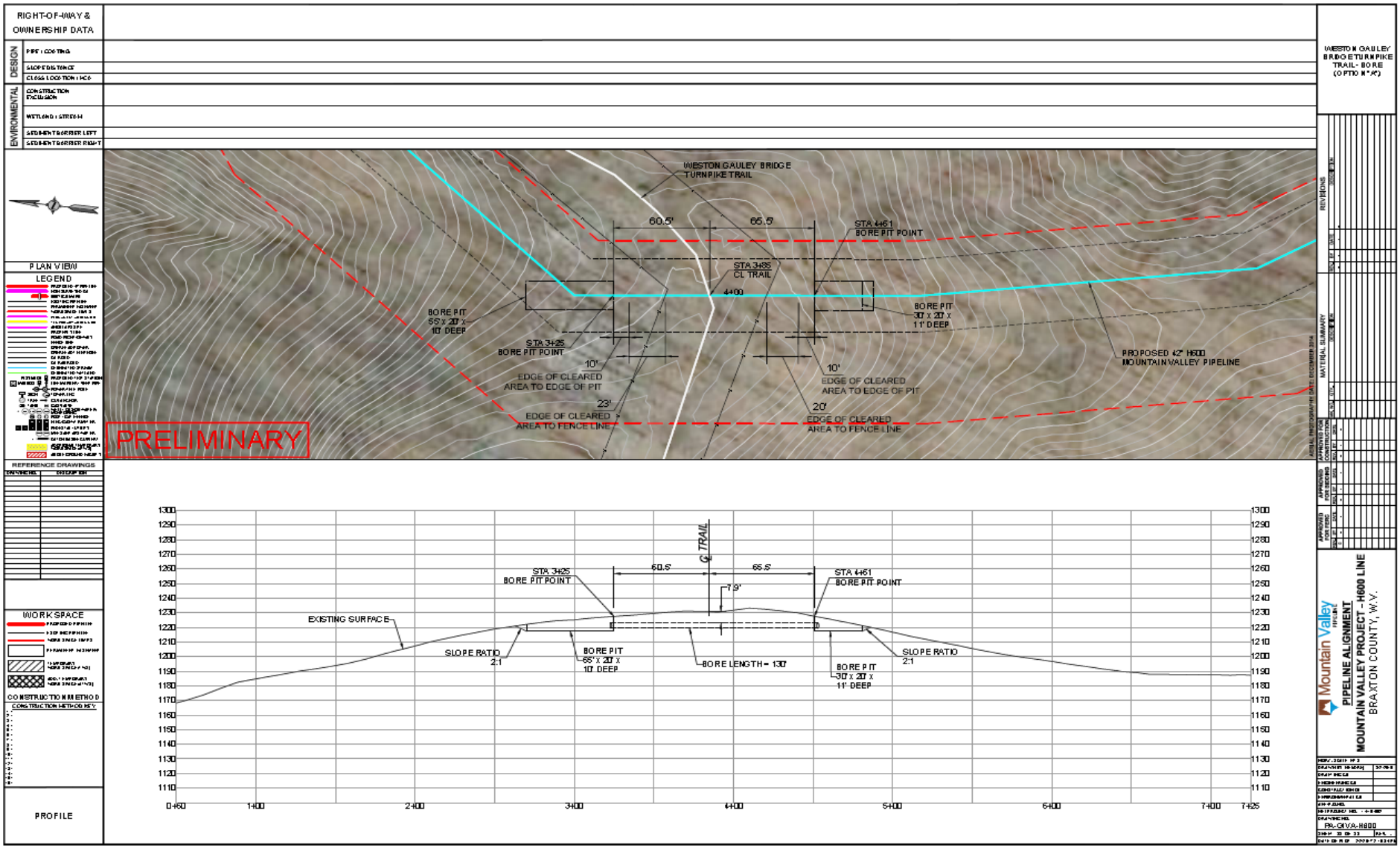
Mountain Valley Pipeline looks forward to continuing to work with USACE during the course of this Project. Please feel free to contact me if you have questions or need any additional information. Thank you for your time and consideration.

Sincerely,

John Centofanti
Corporate Director Environmental Affairs
(412) 395-3305
JCentofanti@eqt.com

Figure 1 –
Site Photographs of Monongahela Bedrock Outcrop near WGBTT Bore Site (MVP Milepost 66.9)

Figure 2


RIGHT-OF-WAY & OWNERSHIP DATA
DESIGN
ENVIRONMENTAL
WESTON GAULEY BRIDGE TURNPIKE TRAIL- BORE (OPTION #X)
PLAN VIEW
LEGEND
REFERENCE DRAWINGS
WORK SPACE
CONSTRUCTION METHOD
PROFILE
WESTON GAULEY BRIDGE TURNPIKE TRAIL
60.5'
65.5'
STA 4+61
BORE PIT POINT
STA 3+85
CL TRAIL
4+00
BORE PIT
55' X 20' X
10' DEEP
STA 3+25
BORE PIT POINT
10'
EDGE OF CLEARED
AREA TO EDGE OF PIT
23'
EDGE OF CLEARED
AREA TO FENCE LINE
BORE PIT
30' X 20' X
11' DEEP
10'
EDGE OF CLEARED
AREA TO EDGE OF PIT
20'
EDGE OF CLEARED
AREA TO FENCE LINE
PROPOSED 42" H600
MOUNTAIN VALLEY PIPELINE
PRELIMINARY
CL TRAIL
60.5'
65.5'
STA 3+25
BORE PIT POINT
STA 4+61
BORE PIT POINT
7.9'
EXISTING SURFACE
SLOPE RATIO
2:1
BORE PIT
55' X 20' X
10' DEEP
BORE LENGTH = 130'
BORE PIT
30' X 20' X
11' DEEP
SLOPE RATIO
2:1
0+60
1+00
2+00
3+00
4+00
5+00
6+00
7+00
7+25
Mountain Valley
PIPELINE ALIGNMENT
MOUNTAIN VALLEY PROJECT - H600 LINE
BRAXTON COUNTY, W.V.
MVP-CIVIL-H600

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3b1

February 16, 2017

U.S. Geological Survey
National Streamflow Information Program
ATTN: J. Michael Norris
361 Commerce Way
Suite #2, Mail Stop 415
Pembroke, NH 03275

Re: Comments on the Federal Energy Regulatory Commission (FERC) Draft Environmental Impact Statement (DEIS) for the Proposed Mountain Valley Project (MVP) by the Mountain Valley Pipeline Company, LLC and proposed Equitrans Expansion Project by the Equitrans LP; FERC No. CP16-10-000, CP16-13-000; Pennsylvania, West Virginia and Virginia

Dear Mr. Norris:

Please see the following response by Mountain Valley Pipeline, LLC (MVP or Mountain Valley) in regards to the United States Geological Survey's (USGS) comments within the United States Department of Interior's December 22, 2016 comments (Accession number 20161223-5049) on the Federal Energy Regulatory Commission (FERC) Draft Environmental Impact Statement (DEIS) for the Proposed Mountain Valley Pipeline Project (Project):

USGS Comment No. 1: The USGS operates streamgages along streams throughout the US to collect water quantity and quality data for a variety of purposes. Continuous operation of USGS streamgages is essential for our stakeholders. These streamgages have permanent infrastructure and are vulnerable to disruption when nearby construction or dredging occurs in the vicinity of these stations. Four active USGS streamgages fall in or near the project area. These are station numbers 02054500, 02056900, 03151400 and 03187000 in Virginia and West Virginia.

The draft EIS should list USGS structures as sites to be safeguarded. The USGS Virginia-West Virginia Water Science Center (WSC) should be contacted and given sufficient advance notice before project activities occur near active USGS streamgages. Efforts should be made to both preserve the streamgages and minimize impacts to the data integrity at those sites.

Mountain Valley Response No. 1: The locations of the four referenced U.S. Geological Survey (USGS) streamgages are shown on Figure 1. As shown in Figure 2 through Figure 5, the four streamgages are located approximately 4,000 to 6,000 feet from the proposed alignment. Based on this physical separation between the alignment crossings and the streamgages, there is negligible risk to the USGS streamgages from pipeline construction. Nonetheless, prior to construction, Mountain Valley will document the condition of each of the streamgage facilities for comparison after pipeline construction is complete. Mountain Valley believes that adhering to the measures outlined in the Project-specific Erosion and Sediment Control Plans (ESCP) and FERC's Plans and Procedures will adequately safeguard these streamgages. However, Mountain Valley will consult with the USGS Virginia-West Virginia Water Science Center to develop additional safeguards for these specific four streamgages, if necessary, and in general to safeguard other USGS appurtenances if encountered along the route during construction. Mountain Valley

will contact the USGS Virginia-West Virginia Water Science Center (https://www.usgs.gov/centers/va-wv-water; West Virginia Science Center 304-347-5130; Virginia Science Center 804-261-2600) two weeks prior to commencing construction at the waterbody crossings on which the four streamgages are installed to provide the Center with advance notice before Project activities occur near active USGS streamgages.

USGS Comment No. 2: Water quality impacts from sediment mobilization due to open cut construction in waterbodies is addressed within the DEIS on pages 4-87 and 4-108. In 2006-2008, the USGS monitored the effects of construction of the Jewell Ridge Lateral natural gas pipeline on turbidity conditions below pipeline crossings of Indian Creek in Tazewell County, Virginia (Moyer and Hyer, 2009). Water-quality conditions were assessed using continuous water-quality monitors deployed upstream and downstream from the pipeline crossings. Adding data collection to the project by employing this successful and relatively simple technique would allow for a rapid response to a major turbidity event. The use of this technique could be especially important at crossings directly upstream of water supply intakes.

The DEIS discusses a review of impaired waters databases and the National Sediment Quality Survey on page 4-94. Transport of particle-associated contaminants, such as bacteria, nutrients, and metals, may accompany elevated sediment concentrations. USGS stream bed sediment samples collected in West Virginia near the proposed Project route show some sites with arsenic concentrations approaching and exceeding EPA Ecological Screening Value of 9.8 mg/kg (EPA, 2006). An analysis of sediment contaminant data from sites near the project should be completed as part of this EIS.

Mountain Valley Response No. 2: Moyer and Hyer (2009) reported the results of a USGS water quality monitoring study on Indian Creek and an unnamed tributary to Indian Creek (Tazewell County, Virginia) during construction of the East Tennessee Natural Gas' Jewell Ridge Lateral pipeline. Water quality monitoring results indicated that turbidity in Indian Creek increased less than 2 Formazin Nephelometric Units between the upstream and downstream monitoring locations during construction. Continuous turbidity monitoring data indicated that pipeline crossing of Indian Creek had little influence on downstream water quality, while upland runoff from the construction right-of-way was the primary source of the turbidity increase. Regarding the unnamed tributary, the three construction phases did not adversely alter long-term water-quality conditions (short-term turbidity increases did occur downstream but the increases were shown to be minimal compared to the turbidity values measured during natural runoff events).

The Moyer and Hyer (2009) study indicates that pipeline construction at stream crossings can be successfully completed without negatively affecting water quality. Mountain Valley does not anticipate any notable impacts to stream water quality from construction and crossings.

The USGS suggests adding continuous water-quality monitoring upstream and downstream of water crossings and notes that these data would allow for a rapid response to a "major turbidity event." However, Mountain Valley does not concur that such action would elevate the level of protection for the water body. Mountain Valley will employ preemptive measures to reduce risks to water bodies from construction and operation of the proposed pipeline. Mountain Valley will implement and maintain the erosion and sediment control best management practices (BMPs) that are illustrated on the Project-specific ESCP.

Mountain Valley has proposed to use a dry open-cut technique in place of the wet open-cut construction technique for Elk River, Gauley River, Meadow River, and Greenbrier River identified on page 4-87 of the DEIS. Using the dry open-cut methodology carries less potential for downstream impacts such as sedimentation and turbidity when compared to the wet open-cut method and would greatly reduce the potential for downstream water quality impacts. Mountain Valley developed a Proposed River Crossing Methods summary sheet for these rivers in West Virginia and provided this information to the West Virginia Department of Environmental Protection. The MVP Proposed River Crossing Methods document (Exhibit

A) and construction detail (Figure 6) are included as attachments to this response.

Mountain Valley considers a "major turbidity event" referenced by the USGS (in light of the Moyer and Hyer (2009)[1] report and Mountain Valley's construction experience) to represent a short-duration high-intensity or long-duration precipitation event producing flooding and bedload mobilization. Such naturally occurring events far outweigh the risks presented by Mountain Valley construction activities. In the event of extreme weather, Mountain Valley would suspend construction until such time as the risk for uncontrolled stormwater run-on to and run-off from the limit of disturbance became negligible and would implement enhanced erosion and sediment control measures to safeguard water bodies.

Stream crossings for the proposed pipeline construction entail a relatively narrow construction footprint given the limited width of the pipeline trench (i.e., approximately 10-foot wide trench). As a result, there is relatively limited amounts of water and sediment to be managed when compared to the impact of major precipitation events and flooding that can directly affect many miles of stream and river bedload mobilization. Mountain Valley will conduct construction at stream crossings expeditiously to reduce the time that the open-cut is exposed to the elements. Mountain Valley will implement the terms of the Project-specific ESCP, which incorporates state construction erosion and sediment control regulations for access roads and work space adjacent to water bodies, and will comply with local erosion and sediment control ordinances. Construction practices to avoid mobilization of sediment will be verified by inspectors present on-site during all phases of construction.

Mountain Valley does not anticipate significant negative impacts to water bodies due to pipeline construction, including stream crossings. Mobilization of sediment in surface water will be minimized, and this will prevent potential mobilization of metal-entrained sediment (e.g., arsenic oxyhydroxides sorbed to river sediment). Moyer and Hyer (2009) indicated that pipeline construction at stream crossings can be accomplished with no notable impact to water quality, and Mountain Valley is fully capable of conducting the proposed construction operations using techniques and construction planning that will minimize risks to water quality. Naturally occurring hydrologic events (e.g., flooding) that have no relationship to pipeline construction present a much higher risk for sediment and related contaminant mobilization in the streams and rivers. The erosion and sediment control measures prescribed by Mountain Valley's construction plans, state approved ESCPs, and verified by on-site inspectors are effective to mitigate potential risks, without the need to conduct research-scale hydrogeochemical studies on surface water bodies and sediments where construction activities would be of very short duration.

USGS Comment No. 3: The DEIS discusses pre-construction water quality evaluations to be conducted on water wells on page 4-80. Post-construction water quality evaluations are discussed on page 4-81 as to be provided only after owner complaint. Post-construction water quality sampling of all preconstruction sampled water wells should be considered. It is known that many serious contaminants in water are colorless, odorless, and tasteless (examples: arsenic, chromium, lead, nitrate, coliform bacteria). Collection and analysis of both pre and post-construction samples is essential to establish impacts and for the protection of human health.

Water quality criteria is needed to define impacts to groundwater and should be included in the DEIS. Without established criteria, it will not be possible to determine elevated levels or to discuss water quality with well owners. Clear criteria for what constitutes an impact to water quality should be established prior to pre-construction sampling and provided to well owners.

We strongly encourage the documentation of the USGS stream gage infrastructure near the project area and

[1] Moyer, D.L., and Hyer, K.E., 2009, Continuous turbidity monitoring in the Indian Creek watershed, Tazewell County, Virginia, 2006–08: U.S. Geological Survey Scientific Investigations Report 2009–5085, p.42.

description of the protection and coordination to occur during project activities. We recommend that more research be conducted on water quality impacts with expanded discussion within the EIS. We recommend that groundwater quality criteria be established and discussed within the EIS.

Mountain Valley Response No. 3: Mountain Valley considers the post-construction sampling and analysis of all private water supplies to be unnecessary for protecting quality and quantity. Based on Mountain Valley's construction experience, there is negligible risk to water supplies from pipeline construction and operation.

Mountain Valley provided FERC a Water Supply Identification and Testing Plan (Testing Plan). The Testing Plan identifies the process by which Mountain Valley will identify private and public water supplies (wells, intakes, springs) along the proposed alignment and establishes a pre-construction testing program.

Two pre-construction testing events will be completed at all identified water supplies (wells, springs, and intakes) where owner permission is granted, over an approximately six-month period in order to collect one sample during a relatively wet period, and one during a relatively dry period. The pre-construction testing results will provide a baseline of water quality conditions, in the event of an impairment claim. Also, as part of the pre-construction sampling process, Mountain Valley will gather information on the configuration of the water supply, including near-vicinity characteristics that could present ambient influences on water quality that are unrelated to pipeline construction. As a result, Mountain Valley will have adequate information from pre-construction testing to evaluate potential claims of water supply impact by an owner, if such occurs, on a case-specific basis.

Because the construction will generally consist of a 10-foot-deep excavation, installed under controlled and documented conditions, risks to water supply quality and quantity will be negligible. Springs will be visually monitored by on-site construction and environmental inspectors during construction and safeguarded through actions specified in the Project-specific ESCP and, where applicable, the Karst Mitigation Plan. Risks from construction are negligible for water supply wells that are properly cased and drilled to a depth encountering a potable aquifer.

The examples of contaminants listed in the USGS comment (e.g., trace elements) are not endemic to materials or construction methods used by Mountain Valley. Also, as reported by Moyer and Hyer (2009), the potential mobilization of sediment, (which may be associated with pre-existing contaminants in a water body, leads to inconsequential impact to water quality. The Testing Plan includes a target analyte list that measures overall water quality and characterizes ambient conditions in the supply. In cooperation with the Virginia Department of Health, Mountain Valley added to the pre-construction sampling program (1) pollutant-specific analytes benzene, toluene, ethylbenzene, and xylenes to determine if a water supply has been impacted by petroleum products and (2) bacteria to identify if surface water or other sources of ambient bacteria are affecting the supply.

Mountain Valley is committed to protecting water supplies, and if an impact is claimed by a water-supply owner, Mountain Valley will complete a thorough investigation of the water supply, setting, and water well characteristics and may undertake additional sample collection at that time. Mountain Valley will address potential claims on a case-specific basis, using experienced hydrogeologists and engineers to thoroughly evaluate the hydrologic system and potential impact.

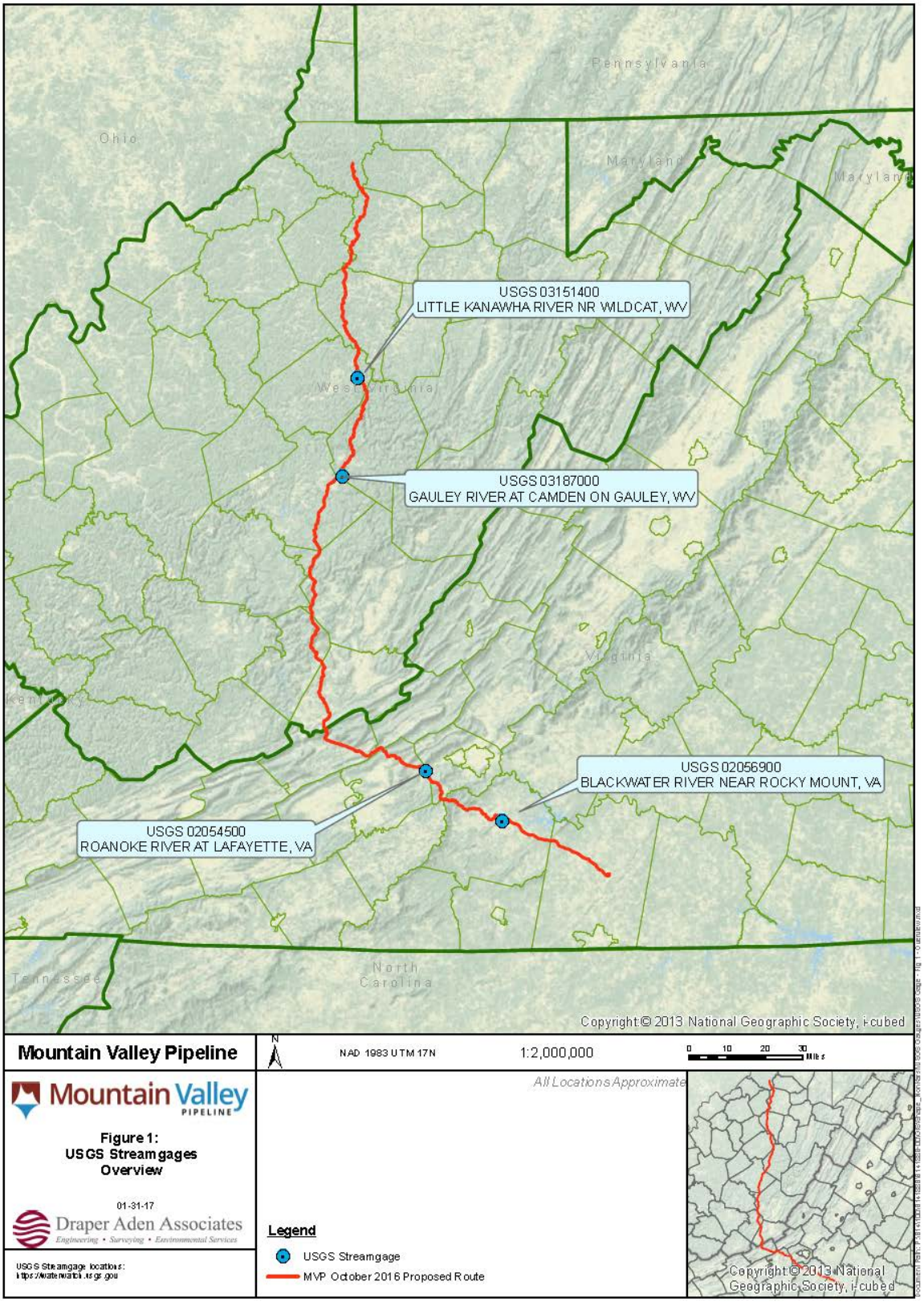
Furthermore, Mountain Valley does not consider it necessary to establish water quality standards for each water supply in order to determine and evaluate potential impacts. As noted above, the Testing Plan establishes a target analyte list that is designed to characterize overall water quality for use as a baseline should a claim of impact arise. Mountain Valley acknowledges and documents state and federal water quality standards for applicable target analytes in the Testing Plan. Should a claim arise, a thorough case-

specific analysis of the water-supply characteristics and the claim of impact would be conducted by Mountain Valley with the goal of (1) identifying the specific incident or event causing or the source(s) of impact, (2) providing recommendations for mitigation, and (3) if Mountain Valley's materials or practices caused the impact, establishing means of restoring water supply quality and/or quantity to pre-construction conditions. The water quality testing results would be reviewed in aggregate along with information gathered on the water-supply characteristics and the surrounding environs during pre-construction testing to assist in identifying whether impact has actually occurred and identifying the likely source(s).

Mountain Valley Pipeline looks forward to continuing to work with USGS on this Project. Please feel free to contact me if you have questions or need any additional information. Thank you for your time and consideration.

Sincerely,

John Centofanti
Corporate Director Environmental Affairs
(412) 395-3305
JCentofanti@eqt.com


Pennsylvania
Ohio
Maryland
West Virginia
Virginia
Kentucky
Tennessee
North Carolina
USGS 03151400
LITTLE KANAWHA RIVER NR WILDCAT, WV
USGS 03187000
GAULEY RIVER AT CAMDEN ON GAULEY, WV
USGS 02056900
BLACKWATER RIVER NEAR ROCKY MOUNT, VA
USGS 02054500
ROANOKE RIVER AT LAFAYETTE, VA
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Mountain Valley Pipeline
N
NAD 1983 UTM 17N
1:2,000,000
0 10 20 30 Miles
All Locations Approximate
Mountain Valley PIPELINE
Figure 1:
USGS Streamgages
Overview
01-31-17
Draper Aden Associates
Engineering • Surveying • Environmental Services
USGS Streamgage locations:
https://waterwatch.usgs.gov
Legend
USGS Streamgage
MVP October 2016 Proposed Route
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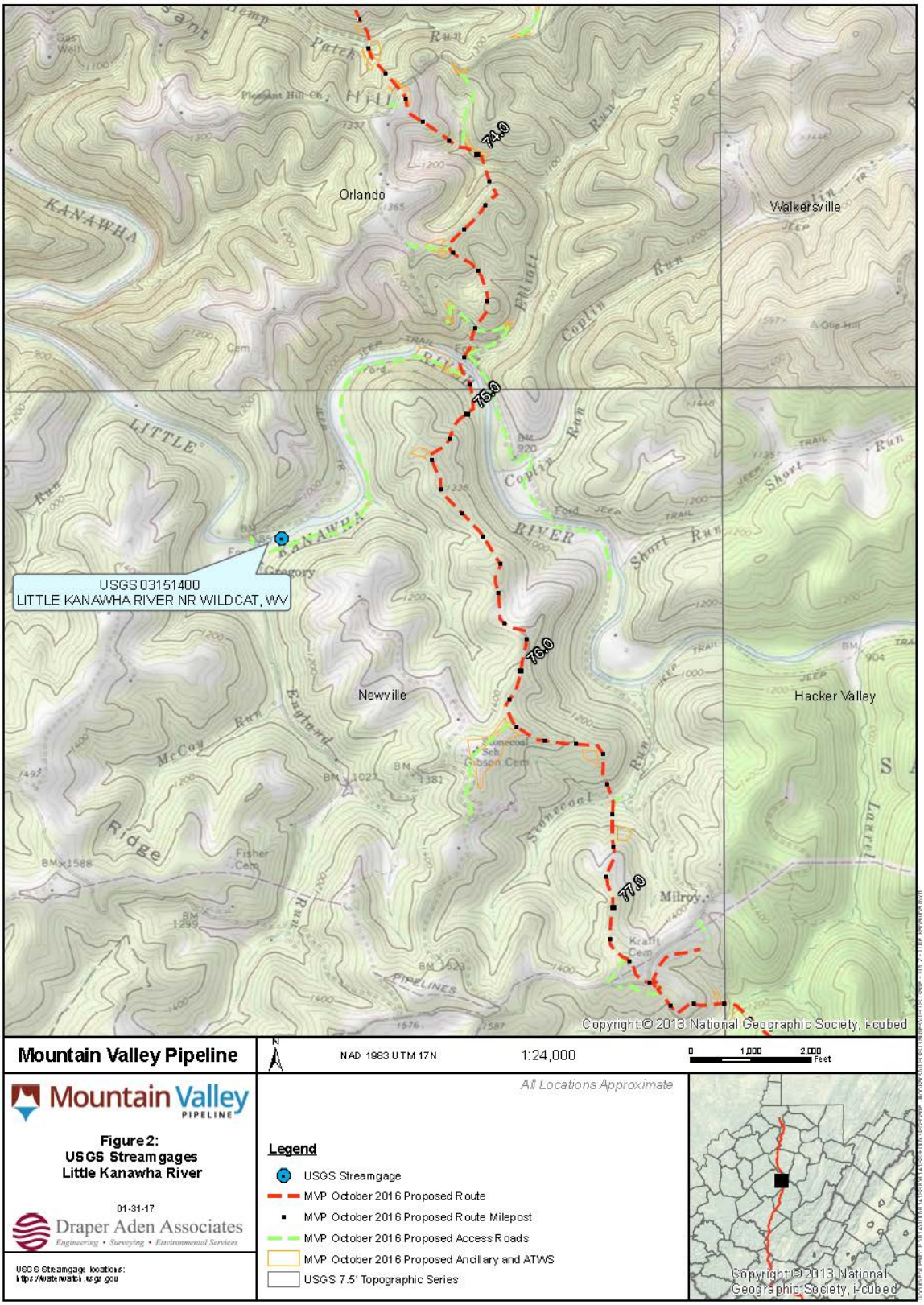
74.0
75.0
76.0
77.0
Orlando
Walkersville
Newville
Hacker Valley
Milroy
USGS 03151400
LITTLE KANAWHA RIVER NR WILDCAT, WV
Copyright © 2013 National Geographic Society, i-cubed
Mountain Valley Pipeline
NAD 1983 UTM 17N
1:24,000
0 1,000 2,000 Feet
All Locations Approximate
Mountain Valley PIPELINE
Figure 2:
USGS Streamgages
Little Kanawha River
01-31-17
Draper Aden Associates
Engineering • Surveying • Environmental Services
USGS Streamgage locations:
https://waterwatch.usgs.gov
Legend
USGS Streamgage
MVP October 2016 Proposed Route
MVP October 2016 Proposed Route Milepost
MVP October 2016 Proposed Access Roads
MVP October 2016 Proposed Ancillary and ATWS
USGS 7.5' Topographic Series
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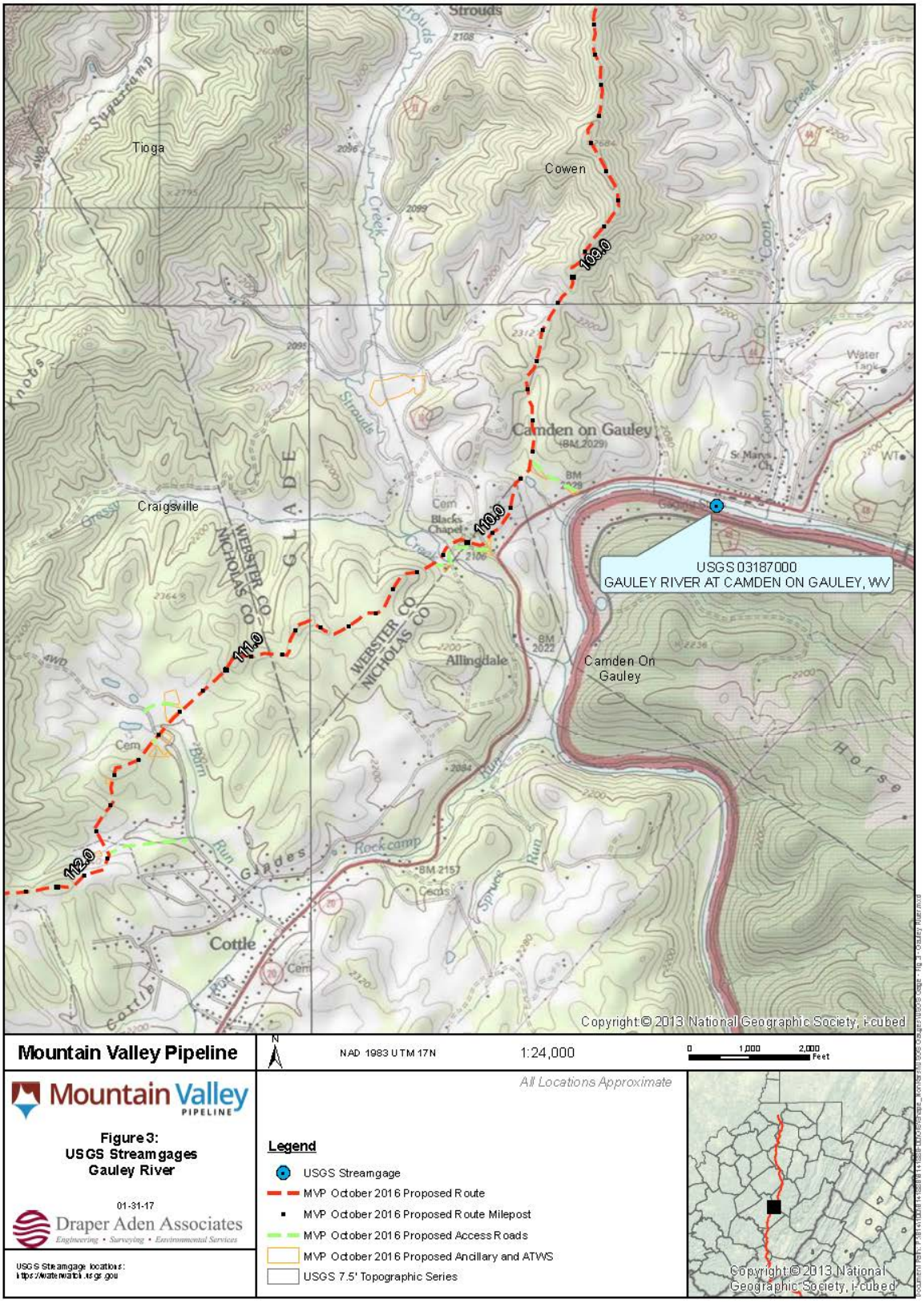
Strouds
Tioga
Cowen
109.0
Camden on Gauley
(BM 2029)
Craigsville
110.0
USGS 03187000
GAULEY RIVER AT CAMDEN ON GAULEY, WV
WEBSTER CO
NICHOLAS CO
GLADE
111.0
Allingdale
Camden On
Gauley
112.0
Cottle
Rockcamp
Copyright © 2013 National Geographic Society, i-cubed
Mountain Valley Pipeline
NAD 1983 UTM 17N
1:24,000
0 1,000 2,000 Feet
All Locations Approximate
Mountain Valley PIPELINE
Figure 3:
USGS Streamgages
Gauley River
01-31-17
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Legend
USGS Streamgage
MVP October 2016 Proposed Route
MVP October 2016 Proposed Route Milepost
MVP October 2016 Proposed Access Roads
MVP October 2016 Proposed Ancillary and ATWS
USGS 7.5' Topographic Series
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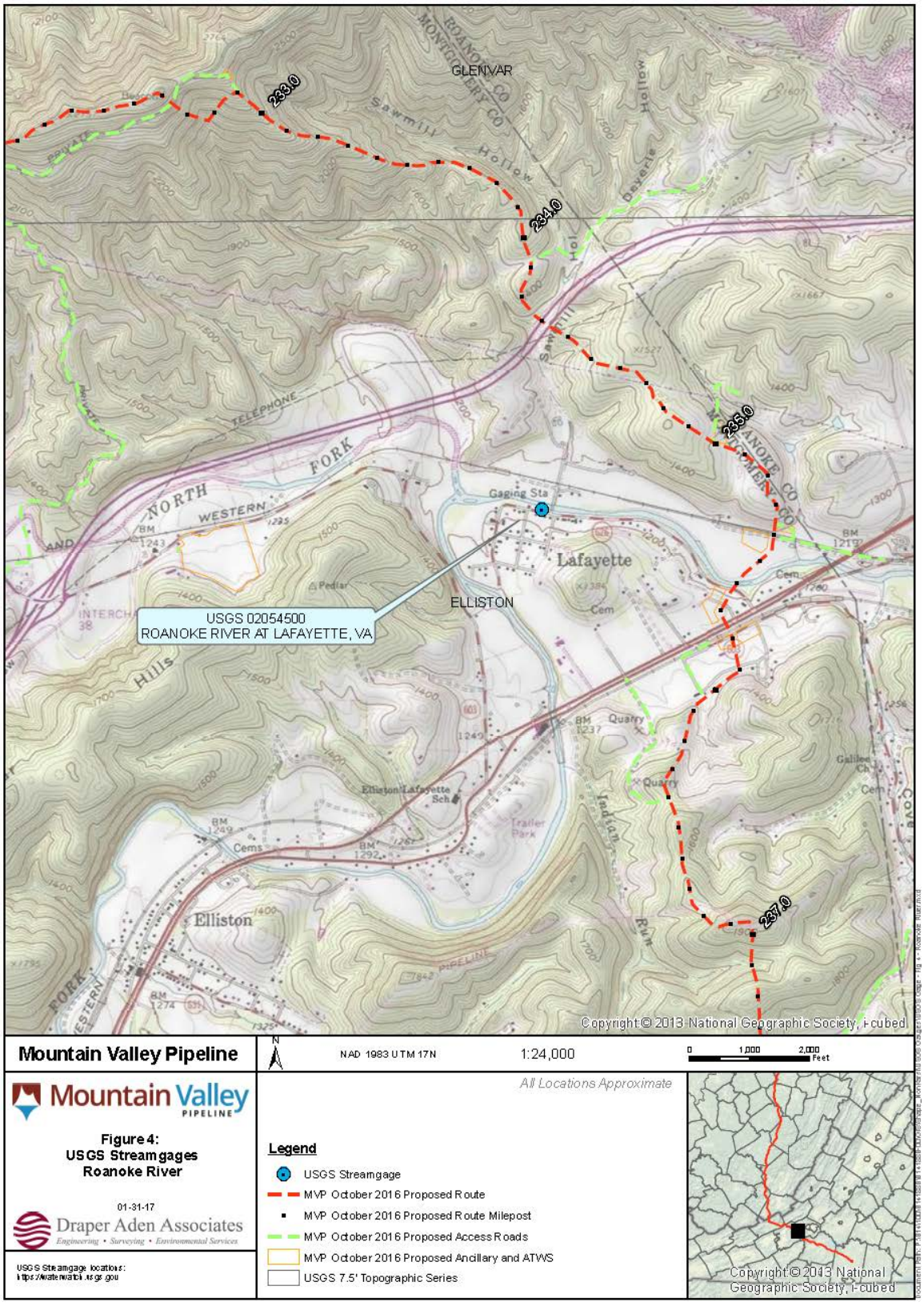
GLENVAR
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USGS 02054500
ROANOKE RIVER AT LAFAYETTE, VA
ELLISTON
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Elliston
Copyright © 2013 National Geographic Society, i-cubed
Mountain Valley Pipeline
NAD 1983 UTM 17N
1:24,000
0 1,000 2,000 Feet
All Locations Approximate
Mountain Valley PIPELINE
Figure 4:
USGS Streamgages
Roanoke River
01-31-17
Draper Aden Associates
Engineering • Surveying • Environmental Services
USGS Streamgage locations:
https://waterwatch.usgs.gov
Legend
USGS Streamgage
MVP October 2016 Proposed Route
MVP October 2016 Proposed Route Milepost
MVP October 2016 Proposed Access Roads
MVP October 2016 Proposed Ancillary and ATWS
USGS 7.5' Topographic Series
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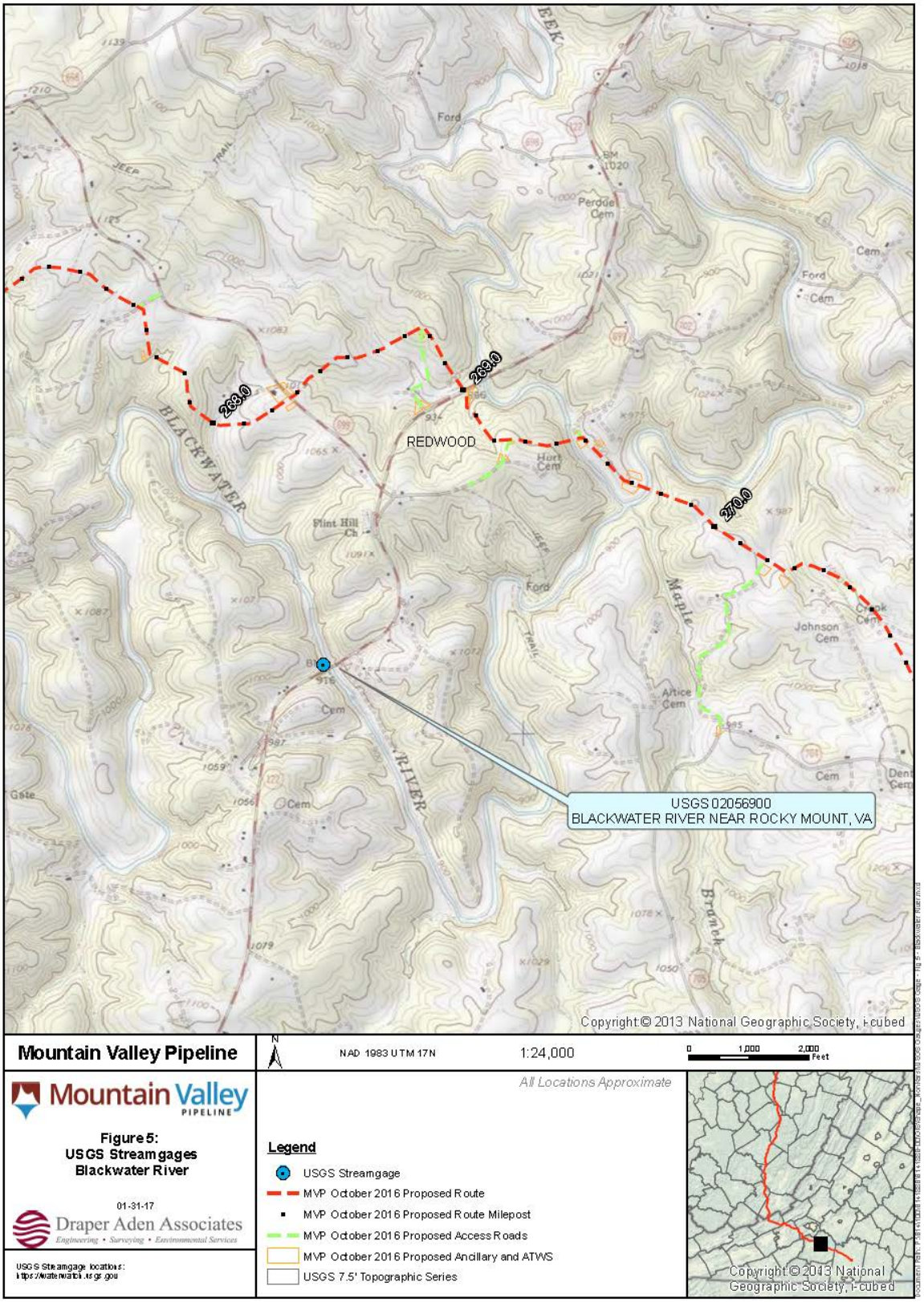
Mountain Valley Pipeline
NAD 1983 UTM 17N
1:24,000
0 1,000 2,000 Feet
All Locations Approximate
Mountain Valley PIPELINE
Figure 5:
USGS Streamgages
Blackwater River
01-31-17
Draper Aden Associates
Engineering • Surveying • Environmental Services
USGS Streamgage locations:
https://waterwatch.usgs.gov
Legend
USGS Streamgage
MVP October 2016 Proposed Route
MVP October 2016 Proposed Route Milepost
MVP October 2016 Proposed Access Roads
MVP October 2016 Proposed Ancillary and ATWS
USGS 7.5' Topographic Series
USGS 02056900
BLACKWATER RIVER NEAR ROCKY MOUNT, VA
REDWOOD
BLACKWATER
RIVER
263.0
269.0
270.0
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EXHIBIT A

January 18, 2017

Mountain Valley Pipeline: Proposed River Crossing Methods

The following information is a summary of Mountain Valley Pipeline's (MVP) proposed crossing methods for the Elk, Gauley, Greenbrier, and Meadow Rivers in West Virginia. The goal of this document is to provide further insight on MVP's crossing methodology, while also providing resource protection to the rivers within this project area.

MVP had originally explored the option of crossing these rivers using a wet, open-cut technique which would allow the water to flow over the active construction site while the trench was being excavated. Under this scenario, downstream best management practices (BMPs), such as turbidity curtains, would be utilized to protect and reduce sediment migration. However, after further analysis, MVP has determined that a dry-ditch technique is a more viable option and will reduce the potential for downstream sedimentation and turbidity by creating a dry working site. Typically, the dry-ditch technique uses a sandbag or jersey barrier cofferedam to create a dry workable area. The dry-ditch technique establishes a controlled, dry working site, while also maintaining sediment free water-flow downstream of the work area by using a pump around technique, fluming, or direct diversion method. However, because of the topography, crossing size, and hydrology of these four rivers, the standard sandbag/jersey barrier cofferdam approach would not provide a safe, reliable work area and could potentially increase downstream impacts.

As an alternative to the cofferdam approach, MVP intends to use a Portadam structure (or equivalent structured system) that creates a dry-ditch work site for these stream crossings. The Portadam is an engineered, segmental or linked system that creates a dry workable area while minimizing instream and downstream impacts. When compared to open-cut/wet ditch or sandbag coffer dam techniques, the dry ditch/Portadam technique offers better environmental protection for the following reasons:

- The structure creates a more reliable, controlled, dry workable area;
- Downstream sedimentation is reduced by constructing inside a dry workable area, which keeps the trench spoils contained and provides better control over trenching depth;
- Potential impacts to aquatic life are reduced by conducting earth disturbance within a controlled structure, maintaining upstream and downstream connectivity, and removing instream construction activities;
- The structure maintains water flow during construction; and
- The Portadam also allows for continued recreational uses during the construction process.

In addition to the E&S BMPs that will be onsite during construction, a site specific spill response plan will be developed and an Aid to Navigation (ATON) will be prepared to provide public information on construction, instream activities, and any potential user restrictions during construction. The installation process will include installing approximately one half of the crossing, completing required stream restoration in that area and then switching to the other side of the project to install the system and complete the project accordingly.

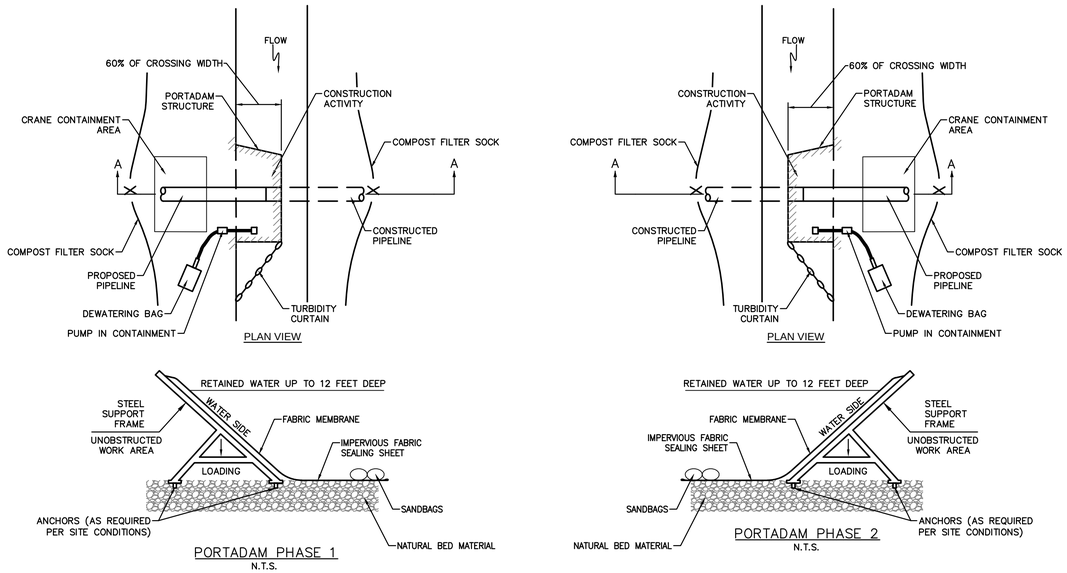
The following provides a summary of the proposed dry-ditch crossing methodology that MVP proposes for the Elk, Greenbrier, Gauley and Meadow Rivers:

- All material, including spill kits, E&S BMPs (such as turbidity curtains, timber mats, compost filter socks, belted silt fences, etc.), pipes, water pumps, secondary containment units, and fittings shall be placed on site before starting the installation;
- All fueling equipment will be parked or located at least 100' from the waterbody; signs will be installed stating that fueling must occur at least 100' from the waterbody;
- All topsoil shall be removed on both sides of the crossing and all work areas as necessary. Topsoil shall be stockpiled inside the approved Limits of Disturbance (LOD) and protected by E&S BMPs identified in the approved Erosion and Sediment Control Plan (ESCP);
- Equipment mats shall be installed as necessary where all equipment will be used;
- E&S controls shall be installed in all work areas of the crossing according to approved ESCP;
- All necessary containment shall be installed for ancillary equipment that is necessary for the river crossing. This includes full containment of cranes and pumps (including backup pumps). The containment is necessary to properly operate and fuel equipment that is positioned next to the river for the duration of the crossing. This practice will be duplicated on both sides of the crossing;
- Silt booms/turbidity curtains shall be installed downstream of the proposed Portadam location. The silt boom/turbidity curtain will be attached to the Portadam corner and the working side shoreline. All pumped out water will be discharged on the inside of this curtain structure through a filtration device (sediment bag) of required micron. Filtering through a sediment bag and then the turbidity curtain will help reduce the potential for downstream sedimentation by creating a dual filtration procedure;
- As necessary, the cofferdam location will be cleared of all large rocks, boulders, or other debris that would interfere with the Portadam footprint. These objects will be moved to the inside of the structure where they can be managed after pump down. The stockpiled material will be placed inside the Portadam in areas conducive to ensure that necessary work is unobstructed;
- The Portadam structure will be installed, starting on the upstream side and then working towards the center of the river;
- The structure shall be extended to a point in the river to create a safe area of overlap when the opposite side is installed;
- The A-frame supports are anchored by a U-bolt fastener. The fastener is installed by hand or pneumatic hammer;
- The center section shall be installed parallel to stream flow;
- The downstream section that connects to the stream bank will then be installed;
- The flow will be maintained in the river section outside of the Portadam during this process;
- A waterproof membrane shall be installed over the Portadam and anchored with sandbags to ensure a watertight seal;
- The working side of the Portadam will be dewatered by a floating dewatering structure. It will be dewatered into the silt boom/turbidity curtain area on the surface through the sediment filter bag to prevent impacts from occurring;

- A perimeter trench on the inside of the Portadam will then be installed to maintain dry conditions. A pump in a containment unit will be used for the entire construction sequence;
- Equipment mats shall be installed over and adjacent to the ditch line for operating equipment;
- The next step is to string pipe (i.e. place pipe segments) in preparation of welding and installation;
- The pipe will then be welded and welding inspections performed to prepare for installation;
- Ditch/rock shall be excavated and material inside the Portadam will be stockpiled in areas to ensure that the work area is unobstructed;
- The pipe shall be installed. The pipe trench, and perimeter trench will then be backfilled inside of the Portadam;
- The Portadam structure is then removed and large rocks and boulders are returned to their approximate original location;
- The above installation sequence will then be conducted on the opposite side of the stream to complete the project (the process will be similar, except the final tie-in will be in a shored, excavated trench at the midpoint of the river); and
- When the project is completed, all mats will be removed, topsoil replaced and the area will be restored to pre-construction condition.

Figure 6

Figure 6



PORTADAM DETAIL
N.T.S.

NOTES:

- ALL MATERIAL, INCLUDING SPILL KITS, E&S BMPS (SUCH AS TURBIDITY CURTAINS, TIMBER MATS, COMPOST FILTER SOCKS, BELTED SILT FENCES, ETC.), PIPES, WATER PUMPS, SECONDARY CONTAINMENT UNITS, AND FITTINGS SHALL BE PLACED ON SITE BEFORE STARTING THE INSTALLATION;
- ALL FUELING EQUIPMENT WILL BE PARKED OR LOCATED AT LEAST 100' FROM THE WATERBODY; SIGNS WILL BE INSTALLED STATING THAT FUELING MUST OCCUR AT LEAST 100' FROM THE WATERBODY;
- ALL TOPSOIL SHALL BE REMOVED ON BOTH SIDES OF THE CROSSING AND ALL WORK AREAS AS NECESSARY. TOPSOIL SHALL BE STOCKPILED INSIDE THE APPROVED LIMITS OF DISTURBANCE (LOD) AND PROTECTED BY E&S BMPS IDENTIFIED IN THE APPROVED EROSION AND SEDIMENT CONTROL PLAN (ESCP);
- EQUIPMENT MATS SHALL BE INSTALLED AS NECESSARY WHERE ALL EQUIPMENT WILL BE USED;
- E&S CONTROLS SHALL BE INSTALLED IN ALL WORK AREAS OF THE CROSSING ACCORDING TO APPROVED ESCP;
- ALL NECESSARY CONTAINMENT SHALL BE INSTALLED FOR ANCILLARY EQUIPMENT THAT IS NECESSARY FOR THE RIVER CROSSING. THIS INCLUDES FULL CONTAINMENT OF CRANES AND PUMPS (INCLUDING BACKUP PUMPS). THE CONTAINMENT IS NECESSARY TO PROPERLY OPERATE AND FUEL EQUIPMENT THAT IS POSITIONED NEXT TO THE RIVER FOR THE DURATION OF THE CROSSING. THIS PRACTICE WILL BE DUPLICATED ON BOTH SIDES OF THE CROSSING;
- SILT BOOMS/TURBIDITY CURTAINS SHALL BE INSTALLED DOWNSTREAM OF THE PROPOSED PORTADAM LOCATION. THE SILT BOOM/TURBIDITY CURTAIN WILL BE ATTACHED TO THE PORTADAM CORNER AND THE WORKING SIDE SHORELINE. ALL PUMPED OUT WATER WILL BE DISCHARGED ON THE INSIDE OF THIS CURTAIN STRUCTURE THROUGH A FILTRATION DEVICE (SEDIMENT BAG) OF REQUIRED MICRON. FILTERING THROUGH A SEDIMENT BAG AND THEN THE TURBIDITY CURTAIN WILL HELP REDUCE THE POTENTIAL FOR DOWNSTREAM SEDIMENTATION BY CREATING A DUAL FILTRATION PROCEDURE;
- AS NECESSARY, THE COFFERDAM LOCATION WILL BE CLEARED OF ALL LARGE ROCKS, BOULDERS, OR OTHER DEBRIS THAT WOULD INTERFERE WITH THE PORTADAM FOOTPRINT. THESE OBJECTS WILL BE MOVED TO THE INSIDE OF THE STRUCTURE WHERE THEY CAN BE MANAGED AFTER PUMP DOWN. THE STOCKPILED MATERIAL WILL BE PLACED INSIDE THE PORTADAM IN AREAS CONDUCIVE TO ENSURE THAT NECESSARY WORK IS UNOBSTRUCTED;
- THE PORTADAM STRUCTURE WILL BE INSTALLED, STARTING ON THE UPSTREAM SIDE AND THEN WORKING TOWARDS THE CENTER OF THE RIVER;
- THE STRUCTURE SHALL BE EXTENDED TO A POINT IN THE RIVER TO CREATE A SAFE AREA OF OVERLAP WHEN THE OPPOSITE SIDE IS INSTALLED;
- THE A-FRAME SUPPORTS ARE ANCHORED BY A U-BOLT FASTENER. THE FASTENER IS INSTALLED BY HAND OR PNEUMATIC HAMMER;
- THE CENTER SECTION SHALL BE INSTALLED PARALLEL TO STREAM FLOW;
- THE DOWNSTREAM SECTION THAT CONNECTS TO THE STREAM BANK WILL THEN BE INSTALLED;
- THE FLOW WILL BE MAINTAINED IN THE RIVER SECTION OUTSIDE OF THE PORTADAM DURING THIS PROCESS;
- A WATERPROOF MEMBRANE SHALL BE INSTALLED OVER THE PORTADAM AND ANCHORED WITH SANDBAGS TO ENSURE A WATERTIGHT SEAL;
- THE WORKING SIDE OF THE PORTADAM WILL BE DEWATERED BY A FLOATING DEWATERING STRUCTURE. IT WILL BE DEWATERED INTO THE SILT BOOM/TURBIDITY CURTAIN AREA ON THE SURFACE THROUGH THE SEDIMENT FILTER BAG TO PREVENT IMPACTS FROM OCCURRING;
- A PERIMETER TRENCH ON THE INSIDE OF THE PORTADAM WILL THEN BE INSTALLED TO MAINTAIN DRY CONDITIONS. A PUMP IN A CONTAINMENT UNIT WILL BE USED FOR THE ENTIRE CONSTRUCTION SEQUENCE;
- EQUIPMENT MATS SHALL BE INSTALLED OVER AND ADJACENT TO THE DITCH LINE FOR OPERATING EQUIPMENT;
- THE NEXT STEP IS TO STRING PIPE (I.E. PLACE PIPE SEGMENTS) IN PREPARATION OF WELDING AND INSTALLATION;
- THE PIPE WILL THEN BE WELDED AND WELDING INSPECTIONS PERFORMED TO PREPARE FOR INSTALLATION;
- DITCH/ROCK SHALL BE EXCAVATED AND MATERIAL INSIDE THE PORTADAM WILL BE STOCKPILED IN AREAS TO ENSURE THAT THE WORK AREA IS UNOBSTRUCTED;
- THE PIPE SHALL BE INSTALLED. THE PIPE TRENCH, AND PERIMETER TRENCH WILL THEN BE BACKFILLED INSIDE OF THE PORTADAM;
- THE PORTADAM STRUCTURE IS THEN REMOVED AND LARGE ROCKS AND BOULDERS ARE RETURNED TO THEIR APPROXIMATE ORIGINAL LOCATION;
- THE ABOVE INSTALLATION SEQUENCE WILL THEN BE CONDUCTED ON THE OPPOSITE SIDE OF THE STREAM TO COMPLETE THE PROJECT (THE PROCESS WILL BE SIMILAR, EXCEPT THE FINAL TIE-IN WILL BE IN A SHORED, EXCAVATED TRENCH AT THE MIDPOINT OF THE RIVER); AND
- WHEN THE PROJECT IS COMPLETED, ALL MATS WILL BE REMOVED, TOPSOIL REPLACED AND THE AREA WILL BE RESTORED TO PRE-CONSTRUCTION CONDITION.

REFERENCES:

WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL, DATED 2006.
WEST VIRGINIA EROSION AND SEDIMENT CONTROL FIELD MANUAL, DRAFT DATED 7-28-2010.
WEST VIRGINIA EROSION AND SEDIMENT CONTROL FIELD MANUAL, DATED MAY 2012

NO.:	DATE:	DWN.:	CHKD.:	APPD.:	DESCRIPTION:

REVISIONS:

Mountain Valley PIPELINE

EROSION AND SEDIMENT CONTROL DETAILS

MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

WETZEL COUNTY THROUGH MONROE COUNTY, WEST VIRGINIA

MOUNTAIN VALLEY PIPELINE, LLC
555 SOUTHPOINTE BOULEVARD, SUITE 200
CANONSBURG, PA 15317

TETRA TECH
complex world | CLEAR SOLUTIONS™
661 ANDERSEN DRIVE
FOSTER PLAZA 7
PITTSBURGH, PA 15220

CONSTRUCTION PLANS

DRAWN BY:	KAL
CHECKED BY:	HT
APPROVED BY:	RE
DATE:	2/19/2016
SCALE:	AS SHOWN
SHT. NO.	0.08A OF 0.21

REVISION

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3e

February 2017

Response:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) regulates all natural gas transmission pipeline construction, operations, maintenance, and safety regulations. Currently, there are no PHMSA regulations governing firefighting or emergency services in proximity to a natural gas transmission pipeline. In response to previous public comments, Mountain Valley determined the average straight-line distance between any point on the pipeline and a fire department is 3.75 miles, with the furthest distance being approximately 8 miles. Determining the actual driving distance to any point on the pipeline is not an effective measure of response time, and the absence of PHMSA regulations or guidelines results in no comparable basis or standard for response times.

PHMSA does, however, have regulations requiring pipeline operators to develop public awareness programs, which includes outreach to local officials and first responders. In addition to the public awareness program, Mountain Valley will engage emergency services and officials to gain familiarity with Mountain Valley assets, emergency shutdown and isolation systems, and monitoring and isolation protocols. Additionally, Mountain Valley will offer Natural Gas Fire Awareness Training, and coordinate and financially support periodic response drills and table-top exercises to local responders.

The Mountain Valley pipeline does not create a unique risk for firefighters or emergency personnel. The responders' primary role in a pipeline emergency is to manage public safety, control the scene, and fight secondary exposures or fires. The only effective approach for fighting natural gas fires is isolation of the source, which will be accomplished remotely or locally by Mountain Valley personnel. Additionally, the men and women serving as firefighters and emergency responders complete training and certifications as defined by their respective states and localities. Since the Mountain Valley pipeline does not transport flammable liquids, there are no specific equipment requirements or firefighting capabilities necessary to extinguish a pipeline fire above what is currently in place.

The focus of Mountain Valley is the protection of the public and the environment and the prevention of pipeline incidents, with safety engineered into all facets of pipeline design and construction. Once the pipeline is in operation, comprehensive operating and maintenance programs will be in place to ensure the integrity of the assets and minimize the potential for third-party damage. As examples:

- Employee training and qualification;
- 24/7 monitoring of pipeline and compressor conditions;
- Right-of-way patrols and surveys;
- Valve and equipment inspection and maintenance;
- Corrosion protection system monitoring;
- Pipeline assessments and measurements with In-Line Inspection tools;

- Public outreach and awareness (including local officials and first responders); and
- Underground damage program participation (Miss Utility).

In the event a leak or failure were to occur, early detection and isolation can minimize the extent and impact of the release. Mountain Valley will use a control system that continuously monitors changes to pipeline data, which will enable personnel to be immediately aware of a potential issue, even if not detected by the public. When a leak or failure is identified, procedures are in place and qualified Gas Control employees will operate remote-controlled valves to isolate the affected pipeline segment or shut down compressor stations to control the release.

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3f

February 2017

Comment	Response
Placement of pressurized natural gas pipelines above sensitive karst terrains characterized by interconnected caves and conduits creates the potential for adverse impacts to the environment and public safety. More specifically, routing of the MVP Project through karst terrain known to host major cave systems and interconnected conduit networks poses high risk of pipeline rupture, destruction of cave-dwelling fauna, asphyxiation and high air pressure death of cavers, and disruption in gas delivery.	The Karst Hazards Assessment confirms that the proposed alignment avoids known cave systems. The route has been selected to the fullest extent possible to minimize impact to karst topography and hydrology. As an added safety measure, Mountain Valley increased the pipeline wall thickness from Class 1 to at least Class 2 in Karst areas.
There is a high risk that pipeline rupture may occur as a result of pipeline subsidence into sinkholes. A portion of past pipeline failures have been attributed to subsidence and earthquakes. Importantly, portions of the proposed pipeline route are seismically active, as demonstrated by hundreds of earthquakes in southwest Virginia, many in the Giles County Seismic Zone.	Mountain Valley does not concur with the author's assessment of risk for pipeline rupture. The proposed alignment has been specifically routed to avoid sinkholes and other karst features. As noted in the Karst Mitigation Plan, minor alignment adjustments and mitigation measures will avoid or stabilize cover collapse sinkholes or soil piping that may be encountered during construction. Mountain Valley asserts that the possibility of subsidence on a scale that would impact the pipeline is negligible. Seismic risks to the pipeline were addressed in Resource Report #6 and accounted for in engineering design of the pipeline. The Giles County Seismic Zone is not recognized by USGS Earthquake Hazards assessment. Pipelines in karst areas and seismically-active areas are common in the U.S.
While natural gas is lighter than air, high pressure and high volume gas releases stemming from pipeline failure have the potential, at least initially, of rapidly dispersing into the subsurface environment. Catastrophic pipeline	As noted above, the pipeline was routed to avoid subsurface voids and caves. Karst Specialists will be deployed on-site during all phases of construction in karst terrain to surveille karst features and advise on minor route adjustments to avoid a feature

ruptures are documented as creating large craters into surrounding geologic materials . The rapid release of natural gas downward into underlying bedrock-walled fractures, caves and conduits would create a high velocity pressure wave.	or implement appropriate mitigation measures. The Mountain Valley Pipeline will utilize welded joints on buried piping. The welds will be 100% inspected by non-destructive means and the pipeline will be 100% pressure tested prior to service. The pipeline will be leak surveyed per 49 CFR 192.706. A Supervisory Control and Data Acquisition (SCADA) system will provide for and enable continuous pipeline monitoring and the control of pressure and flow along the gas pipeline. The mainline valves of the pipeline can be remotely operated by gas control and can be closed to isolate pipeline sections if necessary.
While MVP has proposed various mitigation strategies in its Karst Mitigation Plan, the technical analyses in the DEIS do not support findings that these measures will actually mitigate the impacts to geological resources, groundwater resources, and public safety. The potential impacts associated with construction of the MVP Project through rugged karst terrain may be unmitigable. Based on the information provided, I would recommend rerouting the proposed pipeline along a non-carbonate pathway. Significant portions of the MVP Project route contain long interconnected conduits, miles long caves, and springs, and are located near homes and farms.	The karst mitigation strategies described in the Karst Mitigation Plan are standard best practices that have been successfully employed. The Karst Specialist Team considers that these potential karst features can be avoided, or readily and effectively mitigated. Karst geology comprises vast expanses of southern West Virginia and southwestern Virginia that trends generally perpendicular to the overall pipeline alignment (i.e., avoiding all karst terrain is simply not reasonable). Mountain Valley notes that other pipelines have been successfully and safely installed and operated in karst terrain of the Appalachian Mountains. Mountain Valley has re-routed the proposed alignment to avoid notable karst features including caves through on-site investigations coupled with desktop review. Mountain Valley has prepared assessment plans (Karst Hazards, Water Supply Testing) and construction management plans (Karst Mitigation, Erosion and Sediment Control) that are designed to avoid and

	mitigate potential risk for impact, particularly in karst terrain.
Kastning also addresses individual and cumulative potential adverse impacts to groundwater, caves and cave ecosystems stemming from natural geologic hazards including subsidence, seismic events, slope failure and landslides. Earthquake hazards leading to possible pipeline rupture are unusually high along portions of the proposed Mountain Valley Pipeline route, especially within the Giles County Seismic Zone. He emphasizes the risk of groundwater contamination stemming from project activities. I concur with Dr. Kastning's assessment of the karst setting, its vulnerability and the many geologic hazards he identifies as individually and collectively posing risk to pipeline integrity.	Mountain Valley fully rebutted the Ernst Kastning report and filed its rebuttal with FERC on December 22, 2016.
Khomenko (2010) discusses buried sinkholes as potentially hazardous geological factors because buried sinkholes can be exposed as a result of engineering activities and can be "reanimated" by activation of natural or manmade factors. He also addresses the appearance of new sinkholes near buried sinkholes as a reason supporting geophysical investigations with borehole confirmation, making the important conclusion that the smaller the distance between sinkhole borders – the greater the danger. Khomenko stresses the importance of geophysical and borehole investigations in evaluating sinkhole danger in engineering projects. MVP did not conduct detailed geophysical or confirmatory borehole investigations.	The majority of the karst topography along the pipeline route is not prone to buried sinkholes or cover collapse sinkholes. Much of the carbonate outcrop is in mountain areas with thin soil cover that minimally forms solution or subsidence sinkholes. Mountain Valley has conducted detailed geophysical studies (e.g., electrical resistivity analyses) in areas that are slightly more conducive to cover collapse sinkhole development.
Trenching through sinkholes may be injurious to life adapted to sinkholes. Significantly, the release of highly	Pipeline construction will not entail trenching through any notable sinkholes. As noted in the Karst Mitigation Plan,

pressurized methane or even slowly leaking methane and hydrocarbons into cave environments may irreparably harm or destroy cave fauna, as well as degrade water quality. Aquatic cave species are particularly vulnerable to groundwater contamination, including hydrocarbons that might enter caves from leaking or ruptured pipelines. Virginia has some of the richest cave fauna in the world, which are specifically protected under the Virginia Cave Protection Act. Not only do Virginia caves host rare species, it is likely that many species remain to be identified.	minor route adjustments within the approved right-of-way will be implemented to avoid a sinkhole, or the feature will be properly stabilized through industry-standard procedures and coordinated with the applicable state agency. Groundwater contamination is not anticipated from trenching activities, and therefore cave hydrologic and biological resources will not be impacted.
The external corrosion of buried metallic on-shore ferrous piping has been identified as a serious threat to the mechanical integrity of pipelines around the world. Pitting and corrosion rates are soil specific, thus emphasizing the need to conduct corrosion risk assessments specific to individual MVP Project segment soil profiles as part of the evaluation process. Assessment of soil corrosiveness requires detailed evaluation of soil resistivity chemistry and water chemistry.	Mountain Valley has performed soil resistivity testing along the pipeline route where access was granted. The soil resistivity testing was used to select rectifier size, ground bed locations, and the design of the AC mitigation system where induced current from overhead high voltage power transmission lines are located. Fusion Bonded Epoxy (FBE) coating will be used as the pipeline coating. FBE coating is resistant to hydrocarbons, acids, and alkalis and is a proven and industry accepted pipeline coating. Prior to installation in the ditch, the girth welds will be coated with a field applied epoxy coating. The weld coating along with the entire pipe will be electronically inspected. This process will detect any imperfections such as discontinuity or pinholes in the coating. The imperfections will be repaired prior to back fill to ensure that the pipeline is continuously coated. The project will have cathodic protection and will be closely monitored and maintained in compliance with PHMSA requirements and National Association of Corrosion Engineers

	International guidelines. Specifically, the cathodic protection system will be monitored through routine rectifier readings and annual surveys.
Other common pipeline failure mechanisms include seam corrosion, coupling failures, stress cracks, stress corrosion cracking (SCC), over pressurization, and inadequate cathodic protection. The gas industry's concept that new pipeline installations are inherently safer than older installations is erroneous.	Failure due to coupling failure can be ruled out for this project because they will not be used. Modern pipelines are made of high strength carbon steel with full penetration welds, resulting in a system with substantial, inherent strength and ductility. Mountain Valley commissioned experts to develop a pipe specification for the large diameter pipe that will be used on the pipeline. Some of the general protective measures and controls of a modern pipeline that will be utilized on the Mountain Valley pipeline are listed below. •Pipeline design, construction, commissioning, and operation have been and will be conducted in accordance with PHMSA requirements. •The pipeline design factor, wall thickness, location of mainline valves (MLVs), and other parameters were established in accordance with PHMSA requirements. •Mountain Valley's design specifications adopt the applicable sections of the American Society for Mechanical Engineers, American National Standards Institute B31.8, Gas Transmission and Distribution Piping Systems, which is the most widely used industry code. •The pipeline will be externally coated with a fusion-bonded epoxy and will be cathodically protected against external corrosion. Fusion-bonded epoxy is an effective protection against stress corrosion cracking.

	•The pipeline will be equipped with facilities to accommodate inline inspection tool (smart pigging) operations for the purpose of locating anomalies in the pipeline wall thickness that may indicate corrosion, and out-of-roundness or dents that may indicate the pipe has been subjected to external forces.
In my opinion, there is a significant risk of loss of liquids from the proposed MVP Project in the event of pipeline rupture, which may jeopardize water quality and ecosystems in karst aquifers and caves.	The gas transported in the MVP pipeline will be transmission-quality, processed natural gas.
Trenches dug to contain pipelines disrupt and significantly increase the natural porosity and permeability of soil, sediment, and bedrock alongside pipelines. The high porosity and permeability of backfilled trench material will result in pipeline trenches functioning as zones of low hydraulic head, effectively acting as interceptor trenches that will preferentially shunt shallow groundwater flow into and then along them. Increased pipeline permeability will promote and increase sinkhole drainage efficiency, thereby increasing the likelihood of subsidence, collapse, and pipeline failure. Depending on the physical, topographic, and hydrogeologic setting, trench construction may cause a number of unnatural changes which require detailed evaluation.	Mountain Valley will restore the disturbed land after pipeline construction is completed. As part of the reclamation, the top layer of cover will be disced and loosened in accordance with the approved erosion and sediment control plans to restore the workspace to pre-construction conditions. Thus, precipitation recharge characteristics will also return to pre-construction conditions. As specified in the Karst Mitigation Plan, construction storm water control and erosion and sediment control measures will prevent the directing of surface water flow to sinkholes or other karst features in proximity to the proposed route.
The DEIS identifies a number of studies that either have not been conducted or not been completed. Examples include evaluation and avoidance measures for Canoe Cave and the Mount Tabor Sinkhole Plain, spring survey and karst feature surveys. Absent that information, there is really no scientific basis for finding that impacts to geological	The DEIS identifies a number of studies that either have not been conducted or not been completed. Examples include evaluation and avoidance measures for Canoe Cave and the Mount Tabor Sinkhole Plain, spring survey and karst feature surveys. Absent that information, there is really no scientific basis for finding that impacts to geological

resources will be insignificant. The suggested activities have been completed. Re-routes of the pipeline to avoid major concerns in the Canoe Cave area, the Mt Tabor sinkhole plain, as well as numerous other areas were completed and incorporated into the most recent proposed alignment. Spring and karst features have been field checked and inventoried, where property access was granted, by the Karst Specialist Team. If the project is approved, and prior to land clearing, Mountain Valley Karst Specialist Team will have the opportunity to field-confirm properties that have not allowed access, to date.	resources will be insignificant. The suggested activities have been completed. Re-routes of the pipeline to avoid major concerns in the Canoe Cave area, the Mt Tabor sinkhole plain, as well as numerous other areas were completed and incorporated into the most recent proposed alignment. Spring and karst features have been field checked and inventoried, where property access was granted, by the Karst Specialist Team. If the project is approved, and prior to land clearing, Mountain Valley Karst Specialist Team will have the opportunity to field-confirm properties that have not allowed access, to date.

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3g

February 2017

Response:

The Roanoke County Hydrogeological Assessment neither documents nor demonstrates experience in the analysis of geologic hazards for natural gas pipeline construction in karst terrain, on steep slopes, or in the analysis of seismic hazards, materials and engineering controls. The Roanoke County Hydrogeological Assessment is nearly identical to a report prepared by the same author for the Indian Creek Watershed Association and submitted to the FERC by Giles County. It is vital that infrastructure projects such as the Mountain Valley Pipeline Project (Project) be evaluated for efficacy by scientific and engineering analyses. Unfortunately, the Roanoke County Hydrogeological Assessment includes extreme worst-case scenarios that are not reasonably expected to occur under the controlled nature of the Project construction that is regulated by multiple federal and state laws and regulations, and subject to adherence to local ordinances.

The Mountain Valley Project team, including the Karst Specialist Team, developed numerous detailed analyses and documents on the topics of karst terrain, hydrogeology, foundation and slope analyses, water resources, seismic hazards analysis, and materials design. The resulting documents include the Karst Hazards Assessment, Karst Mitigation Plan, Seismic Hazards Assessment, and the Water Supply Identification and Testing Plan. However, it does not appear that the Roanoke County Hydrogeological Assessment included a thorough review of these reports or the substantial amount of background study completed.

The Roanoke County Hydrogeological Assessment presents several assertions including worst-case scenarios regarding the Project. The Mountain Valley Project Team reviewed these assertions and found them to be inaccurate, as well as flawed in the interpretation of the nature and scale of the Project.

Comment	Response
Construction of the Project will adversely impact headwater aquatic habitats that serve as the base of the food chain for the entire river continuum ecosystem.	Mountain Valley deployed experts in the fields of aquatic and terrestrial biology, wetlands, rivers and streams, erosion and sediment control, slope stability, soils, groundwater hydrogeology, and karst hydrogeology to evaluate the proposed alignment and potential impacts to the environment. This multi-discipline approach to evaluating risks to environmental resources. Based on these various analyses, Mountain Valley adjusted the alignment to avoid risks to the environment to the maximum extent practicable, prepared construction control documents, and will deploy construction inspectors to ensure that prescribed Best Management Practices (BMPs) in these control documents are implemented. The

Comment	Response
	proposed alignment will traverse perpendicular to, not along or within, topographic headwaters noted in the Roanoke County Hydrogeological Assessment, thus minimizing the potential risks. Mountain Valley will implement state approved stormwater plans and erosion and sediment control plans that contain construction BMPs to mitigate stormwater and erosion during and after construction. The Project presents negligible risk for adversely impacting headwater aquatic habitats.
Construction of the Project will adversely impact springs and wetlands by soil removal and cause adverse impacts to springs and wetlands and to the hydrologic function of transporting water from the watershed to wetlands and first order stream channels. Construction of the Project will adversely impact the hydraulic function of transporting water in ephemeral channels in ravines, in the channel, and through the sediments.	The Project is a narrow, shallow, linear construction project that will restore the topsoil and native slopes and establish revegetation as part of reclamation, followed by inspections to ensure revegetation is progressing satisfactorily.
Construction will require deforestation and blasting, both of which will reduce groundwater recharge and cause significant changes to the amount of groundwater available as a drinking water source, as well as to groundwater flow routes. Deforestation for construction will adversely impact the geomorphologic function of conserving water in the ecosystem as well as transporting wood and sediment to create diverse bed forms and dynamic equilibrium. Construction will adversely impact the physicochemical functions of temperature oxygen regulation, and also the processing of organic matter and nutrients.	These assertions are not representative of construction practices and site conditions. The Roanoke County Hydrogeological Assessment makes these assertions without any direct application of Mountain Valley's construction practices, or without any data to support that these issues would result from pipeline construction. Moreover, it is important to note that the Roanoke County Hydrogeological Assessment does not acknowledge the fact that linear infrastructure projects are built and operated safely in the Appalachian region. Mountain Valley designed the Project alignment to minimize the extent of blasting. In Roanoke County, the Project primarily entails excavation of a trench approximately 10 feet deep, mostly in unconsolidated overburden or highly weathered rippable bedrock. If required, blasting would be conducted by a qualified contractor under the strict guidance of a Project-specific blasting plan, with the intent of effecting minimal disturbance on bedrock to the extent necessary only to promote mechanical ripping of the fractured

Comment	Response
	rock. Negligible seismic energy will propagate from the Limit of Disturbance (LOD).
Pipeline construction will degrade karst environments.	The assertion made in the Roanoke County Hydrogeological Assessment that "This karst terrain contains a unique array of cave systems, bedrock voids, and associated drainage basins..." when describing the proposed Roanoke River crossing is inaccurate. The Karst Specialist Team conducted field reconnaissance for the portion of the proposed route that crosses the Roanoke River for karst conditions and found there to be no features of notable sensitivity or heightened risk from pipeline construction. There is no basis for concluding that construction will "degrade fragile cave systems" or that "There is a strong potential for collapse of the gas pipeline…"
Construction will cause increased stormwater discharge and also degrade stream functions at the numerous locations where stream crossings are proposed.	The right-of-way will be re-graded to pre-construction contours and will be revegetated. The Roanoke County Hydrogeological Assessment presents no facts or data to support the assertion that a quantifiable diminution of net infiltration (i.e., increased run-off) will occur in the resulting narrow linear revegetated corridor. The Roanoke County Hydrogeological Assessment asserts with no evidence that the right-of-way will promote run-off to the extent that the increase will cause streambed scouring and release of existing contaminants sequestered in sediment. There is no reasonable expectation that the resulting right-of-way will influence run-off to that extent. Mountain Valley will adhere to the state approved stormwater plans and erosion and sediment control plans. Mountain Valley will deploy the necessary BMPs to manage stormwater and erosion during construction and land reclamation. There is no reasonable expectation that the resulting narrow, revegetated right-of-way graded to pre-construction conditions will effect such influence on the watershed-scale drainage of the area.
Construction will create the potential for landslides.	Mountain Valley will implement all necessary and reasonable BMPs to prevent, manage, and contain stormwater runoff and erosion and sediment migration beyond the limit of

Comment	Response
	disturbance during construction, and will stabilize and revegetate the right-of-way. Mountain Valley will also deploy a geotechnical inspection team in accordance with the Landslide Mitigation Plan during construction to provide real-time inspection of slope stability during construction. The inspection team will monitor slope conditions during construction and will provide avoidance and mitigation measures as necessary to ensure slope stability.
Construction will create the potential for pipeline collapse in areas known to have experienced earthquakes.	There is no basis for the assertion made in the Roanoke County Hydrogeological Assessment that constructing the pipeline in Roanoke County creates the potential for pipeline collapse due to earthquakes. The Roanoke County Hydrogeological Assessment states "Roanoke County is located in the Giles earthquake hazard zones which has experienced significant numbers of earthquakes and which is considered to be at risk for future earthquakes." The USGS no longer recognizes the Giles County Seismic Zone as a seismic impact zone delineation, instead referencing the Pembroke Fault Zone. Mountain Valley assessed seismic hazards along the entire alignment and incorporated these into the Project design and engineering.
Cumulative damage would result from pipeline construction when combined with other past, present, and reasonably foreseeable future actions.	The Roanoke County Hydrogeological Assessment does not present any past, present, or reasonably foreseeable future actions to support this assertion. Without this information, a cumulative impacts analysis could not be conducted. Mountain Valley, however, included a detailed cumulative impacts analysis in Resource Report 1 of its certificate application. In addition, the draft EIS evaluated cumulative impacts and "conclude[d] that the effects of adding the impacts of the [Mountain Valley and Equitrans projects] with the impacts of other projects would not be significant." DEIS at ES-13.

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3h

February 2017

Response:

LiDAR is a valuable resource for desktop evaluation of karst topography. Indeed, Mountain Valley has been using LiDAR data for routing evaluations in karst areas. However, many of the key karst features in assessing karst terrain are not identifiable through aerial remote sensing. Field evaluation by direct observation and geophysical methods provides a more comprehensive understanding of the sub-surface geology. Electrical resistivity (ER) imaging is a technique for geophysical analysis of sub-surface conditions using measurements made at the surface using electrodes.

Mountain Valley conducted two-dimensional surface electrical resistivity (ER) surveys on the physically-accessible portions on all parcels of the October 2016 Proposed Route between mileposts 221.8 and 227.2 (previously referred to as the Mount Tabor Variation, which has been incorporated into the October 2016 Proposed Route). ER imaging in the sub-surface operates by inducing an electric current into the ground between two electrodes and measuring the change in current at other electrodes. Between mileposts 221.8 and 227.2, Mountain Valley utilized a spacing of 3-5 meters between electrodes. Using a long line of electrodes connected to a cable on the surface, hundreds of resistivity measurements can be collected to create a data set for a two-dimensional cross-section of sub-surface ERs.

Mountain Valley's geophysical experts collected the ER data and used computer software and expertise to analyze the data to determine whether a notable karst feature was present below the ground surface. The ER analysis demonstrated an irregular bedrock surface, which is common in karst terrain. The ER analysis also indicated a stable sub-surface within the design depth of the pipeline excavation and through a depth where the pipeline could affect, or be affected by, any karst features. For example, the ER analysis indicated that open, air-filled voids are not present within these areas.

Based on this ER analysis, coupled with desktop analysis and other field reconnaissance, Mountain Valley does not expect any significant risk associated with karst terrain between mileposts 221.8 and 227.2 of the October 2016 Proposed Route. Any karst encountered during construction can be addressed through the processes detailed in the Karst Mitigation Plan, including minor route adjustments. As such, Mountain Valley confirms that the referenced portion of the October 2016 Proposed Route is preferable to the originally proposed alignment in the vicinity of the Mount Tabor sinkhole plain.

Mountain Valley's ER analysis provides a much more comprehensive and field-evaluated analysis of karst features than the aerial LiDAR evaluation in Mr. Johnson's December 16, 2016 letter to FERC.

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3i

February 2017

Attachment DR4 General 3i	
Comment	**Response**
Section 4.3.2 Stream Crossings: The DEIS states that MVP plans to cross the Elk, Gauley and Greenbrier Rivers using the open-cut wet crossing method. This method uses no water diversion and is the most invasive and impactful crossing method available. FERC must require MVP to minimize impacts during river crossings including reducing the construction area to a minimum. Please address the method to be used to go across Second Big Run in Lewis County.	MVP will utilize a dry-ditch open-cut method to cross Elk River, Gauley River, Greenbrier River, and Second Big Run. Instream diversions will be used to divert the water during construction. Once construction is complete, the stream channel will be restored and the stream banks will be properly graded and stabilized.
Section 4.3.3 Wetland Crossings: The DEIS claims there is no net loss of wetlands, but then states that MVP has not supplied information regarding their proposal to permanently fill 44 wetlands along access roads. The permanent filling of 44 wetlands is a significant impact. Information on wetland impacts must be provided to FERC. WV-LE-133 will suffer permanent wetland impact from the pipeline route.	All permanent wetland and stream impacts will be mitigated through approved wetland mitigation banks or state approved In-Lieu Fee program. The appropriate state and federal permits have been filed with the USACE and WVDEP.
Section 4.3.1 Groundwater: Private and domestic drinking water wells within the pipeline route have not yet been identified. FERC cannot determine the impact of blasting on water wells without this information. All water wells within the impact zone must be identified in the DEIS. I was not provided with a copy of the water testers' report. They said MVP would not pay for all of them, even though the creek was assessed in several places due to the high number of springs.	The Water Resources Identification and Testing Plan (Plan) was submitted to FERC. The Plan specifies the methods by which Mountain Valley has identified the locations of private and public water supplies. Private water supplies were initially identified through desktop review and field survey where property access was permitted, within 150 feet (500 feet in karst terrain) of Project components. Mountain Valley is in the process of confirming water supply locations on all parcels within the referenced buffer distances from Project components through direct outreach to all property owners. Pre-construction sampling in these areas is underway.
Section 4.6 Aquatic Resources: The DEIS does not adequately assess impacts of construction on aquatic life. MVP has not submitted the results of their analysis on sedimentation and turbidity from wet crossing methods. This information must be included in the DEIS.	The proposed dry ditch crossing technique significantly reduces the amount of sedimentation and turbidity, therefore a quantitative turbidity and sedimentation analysis is no longer needed.
Section 4.1.1.5 Geologic Hazards: The DEIS identifies 94 karst features, or caves, to be	The property is not located in an area of known karst geology. If a karst issue develops during

crossed by MVP. FERC has requested route variations to avoid some of these features. A study to determine interconnection between karst and water resources has not been completed. FERC must require a final route that avoids all karst features. In addition, going next to an obvious slip, in an obviously hazardous area is not wise. The pipeline should be moved to a major road corridor where it can be accessed in the event of an accident. There is no access to this pipeline other than it's [sic] own easement, in rugged central WV, next to my farm.	construction, Mountain Valley will evaluate and address the area according to the Karst Mitigation Plan.
Section 4.1.2.4 Landslide Potential: The DEIS states that 78% of the pipeline route is highly susceptible to landslides; however, MVP has not supplied a detailed Landslide Mitigation Plan. FERC has requested route adjustments, additional information on landslide prone areas, and additional Best Management Practices (BMPs) to mitigate hazards from potential landslides. This information must be included in the DEIS.	Mountain Valley has addressed slope stability for the project via the Landslide Mitigation Plan (LMP). The LMP presents typical details to be employed during construction to minimize the risk of earth movement and specifies the use of these mitigation measures at predetermined locations along the pipeline. The mitigation measures are generally consistent with those recommended in INGAA's Mitigation of Land Movement in Steep and Rugged Terrain for Pipeline Projects, which presents best management practices for landslide mitigation in the Appalachian region. During construction, geotechnical inspectors will be deployed to identify additional areas, not already specifically addressed in the LMP, where the landslide mitigation typical details should be implemented. The geotechnical inspectors, in conjunction with Mountain Valley engineers, will develop additional mitigation measures to address slope stability as necessary based on subsurface conditions revealed during construction.

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3j

February 2017

Attachment DR4 General 3j	
Comment	**Response**
Expansion of the road to meet the 40 ft. width of the proposed easement and the 25 ft. width of "driveway" (DEIS Appendix El-58) is therefore impossible without running a culvert through the creek and then covering over it with fill dirt for almost one mile, or cutting more steeply into the hillside on the western side, which would require major construction including building of retaining walls. Larger and more frequent mud/rock slides would be nearly impossible to avoid. Trying to build a new road on the east side of the creek would also require major construction because of the steep slopes going to the top of Poor Mountain. Bringing in fill dirt and possibly building retaining walls would be required to reduce frequent large mud slides.	Mountain Valley recognizes expanding the road width to forty feet is not practical and anticipates utilizing the existing roadway. In this case, the forty-foot limit of disturbance is primarily for installation of erosion control devices and allows for vegetation removal where necessary to facilitate unobstructed ingress and egress from the pipeline right of way.
In addition, power poles would have to be moved to locations on slopes, which would be less stable. Telephone lines buried under the lane would have to be relocated. Also, the road crosses the creek in two places through culverts that would need to be replaced and structurally enhanced to support large construction equipment. Furthermore, road expansion through bank modifications on the west side of the existing road would bring the road dangerously close to the Bohon and Aker homes, exposing them to potential destruction from hillside erosion and mudslides. The Aker home is currently within 20 ft. of the existing road due to bank erosion. The Bohon home is approximately 25 ft. from the road, 15 ft. of which is steep slopes before leveling out somewhat in front of the house. Moreover, new driveways to the landowners' homes would have to be constructed.	Mountain valley does not anticipate expanding Yellow Finch Lane through bank modifications. Relocation of power poles is not anticipated on Yellow Finch Lane. In addition, Mountain Valley will assess the need for culvert replacement on the existing roadway and install culvert piping appropriate for construction of the Project.
Finally, Yellow Finch Lane does not permit two-way traffic. Should MVP attempt lane expansion for temporary access purposes, landowners would experience road blockage such that they would not have ingress or egress to their properties. Nor would any emergency service	Mountain Valley will not create blockage(s) to the homes of Yellow Finch Lane residents. The majority of traffic associated with the construction of Mountain Valley Pipeline will occur between the hours of seven and eight A.M., and five to seven P.M. When mobilization

vehicles be able to gain access. There is no extra space to construct pulloffs or pullovers to grant such access along the nearly one mile length of Yellow Finch Lane. Yet, the December 24, 2015 MVP Supplemental Response (Item K) stipulates that "Access will not be restricted to any residence. Mountain Valley will work with all affected landowners to ensure adequate access is maintained to their property as specified in landowner agreements." Existing geographic and geologic conditions for Yellow Finch do not suggest this statement can be enforced for this particular proposed temporary access road.	of large vehicles is required, Mountain Valley will use escort vehicles and two-way radios to announce ingress and egress so that two-way traffic is not encountered on Yellow Finch Lane.

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3k1

February 2017

Response:

Mountain Valley has reviewed comments and concerns expressed on behalf of Four Corners Farm (Franklin County, VA) and has completed further investigation/analysis of the crossing of Four Corners Farm property. In order to address the concerns expressed by Four Corners Farms, Mountain Valley would implement the following during Project construction and operation of the facilities:

- Mountain Valley will not utilize pesticides or herbicides (sprays) on property owned by Four Corners Farm during the operational life of Project facilities. This would include prior to, during and post-construction restoration activities as well as during operation of the pipeline facilities. Temporary and permanent seed mixes, soil amendments, and straw to be used during construction and restoration activities would be coordinated with the landowner and implemented during the Project. The total area disturbed during implementation of the Project on the Four Corners Farm property would be approximately 4.27 acres.
- During implementation of the Project, Mountain Valley would install temporary livestock fencing adjacent to the pipeline ROW in areas designated by the landowner to allow Four Corners Farm to continue to utilize the lower pasture to the maximum extent practicable during Project construction activities. Following restoration of the construction ROW to stabilized vegetated conditions, Four Corners Farm will have unrestricted grazing access to their lower pasture.
- In order to mitigate concerns regarding the Project's crossing of Teel Creek and Little Creek, Mountain Valley conducted a scour analysis of all waterbodies crossed by the Project. Mountain Valley conducted lateral channel erosion analyses for all waterbodies crossed by the Project, including Teels Creek and Little Creek. Natural channel shifting has been accounted for by determining horizontal migration zones (HMZs). These were delineated for both the Teels and Little Creek crossings via high-resolution project LiDAR. Project LiDAR and its first derivative (slope) were used to map the existing banks and identify relic channels, meander scars, and other fluvial features that indicate previous channel locations. The HMZs were drawn to encompass the existing channel corridor and any identified features that indicate past channel locations. The generated Historical Migration Zone Map is in Attachment DR4 General 3k-2.
- Natural channel shifting will be mitigated by utilizing the delineated HMZ with a Factor of Safety (FS) to determine the horizontal setback for each waterbody crossing. For these waterbodies, the added FS will be 20% of the HMZ width at the waterbody crossing. The proposed pipeline will be installed at Teels Creek and Little Creek at depths of at least 4 and 5 feet, respectively. These depths will be maintained while within the HMZ and 20% FS. Based on

the results of this analysis and the proposed location of the pipeline, Mountain Valley does not anticipate channel migration or scour along Teel Creek or Little Creek to result in exposure of the pipeline. However, in the event an exposure would occur, Mountain Valley would not utilize concrete mesh to stabilize the pipeline ROW from erosion.

- Following approval to complete environmental field surveys (waterbody and wetland delineations, cultural resource surveys, etc.) on the Four Corners Farm property, Mountain Valley would update Project construction and restoration documents to show the extent of waterbody and wetland areas, springs, and other sensitive resources. Updated impact information would be submitted to federal and state agencies for review as needed. Crossing of waterbodies and wetlands during construction would be conducted in accordance with the FERC's Plan and Procedures as well as other federal and state permitting requirements. Construction method for the crossing would be via open cut methods with the top 12 inches of wetland soil segregated for use during restoration activities. This will allow the native wetland seedbank to help re-establish the wetland with plant species native to the wetland. Groundwater encountered during excavation and installation activities would be collected and dewatered in an upland area, downslope of the limit of disturbance. Dewatering would be conducted through a pumped water filter bag and VADEQ Dewatering Structure. Following installation of the pipeline, impervious trench breakers would be established in the pipeline trench where it enters and exits the wetland. The impervious trench breaker would be installed in accordance with standard pipeline construction practices. Following installation of the pipeline and restoration of the wetland area, drainage would return to its pre-existing drainage patterns/pathway. Mountain Valley will coat the pipeline with industry standard products that prevent corrosion of the pipe. Additional water in contact with a coated pipeline will not increase corrosion.

Mountain Valley would coordinate restoration activities with the landowner regarding repair and restoration of any livestock watering devices or other property infrastructure that may be damaged during Project construction activities.

Access to the Project areas on the Four Corners Farm property would be conducted via Iron Ridge Road (Route 775) to the southeast and Grassy Hill Road (Route 919) to the west. Mountain Valley would install temporary equipment bridges (timber mats or portable bridge spans) within the Project ROW at the crossings of Teels Creek and Little Creek. Erosion and sediment control devices will be installed in accordance with the Project specific ESC Plans being developed and will be reviewed by VADEQ. Implementation of the ESCP will include continual monitoring and inspection by environmental inspectors for Mountain Valley, FERC third party and VADEQ.

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3k-2

February 2017

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Drawn By: BRS
Date Created: 9/14/2016
Last Revised: 2/2/2017
Approved By: DBR
Document Name: C10 Little Creek Update.mxd
File Path: E:\EQT Wetlands\GIS\Stream Scour\Lateral Scour Figures\C10 Little Creek Update.mxd

N
0 90 180 Feet

Little Creek, Franklin County, Virginia

- Crossing Location
- October 2016 Proposed Route Milepost
- October 2016 Proposed Route Centerline
- Waterbody GPS Centerline
- Historical Migration Zone
- 5 ft Contours

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3l

February 2017

Attachment DR4 General 3l	
Comment	**Response**
(1) The steep terrain in the route's descent into the Greenbrier Valley: "If they do not modify the current route, to get to the river they will have to descend an almost vertical hillside between 70 and 100 feet high (my estimate) to a shallow flat about 20 feet wide." In fact, MVP's subsequent reports of slopes show that the descent involves a stretch .2 mile long (that is 1164 feet) of hillsides estimated at between 53% and 62.78% (depending on contradictory estimates provided by MVP). Even MVP has subsequently acknowledged grounds for concern, stating in their Erosion and Sedimentation Control Plan (released in February 2016, Docket CP16-10, Document # 20160226-5404, Part 1, pp. 1-21) that any slope in excess of 30-35% will require special construction and mitigation techniques. This admission would seem to be proof that the chosen route does not provide for "minimal" environmental impacts—since exceptional efforts must be made to contain the damage.	Mountain Valley has addressed slope stability for the project via the Landslide Mitigation Plan (LMP). The LMP presents typical details to be employed during construction to minimize the risk of earth movement, including areas such as those mentioned in the comment. The mitigation measures are generally consistent with those recommended in INGAA's Mitigation of Land Movement in Steep and Rugged Terrain for Pipeline Projects, which presents best management practices for landslide mitigation in the Appalachian region. During construction, geotechnical inspectors will be deployed to identify additional areas, not already specifically addressed in the LMP, where the landslide mitigation typical details would be implemented. The geotechnical inspectors, in conjunction with Mountain Valley engineers, will develop additional mitigation measures to address slope stability as necessary based on subsurface conditions revealed during construction. Such mitigation measures are common in the industry for sloped construction.
(2) The crossing of WV State Route 3/12: As noted in the original comment, WV 3/12 is the main highway communicating between Hinton and Alderson: "…WV Route 3/12—the only two-lane highway between the town of Alderson and the city of Hinton, which carries commuter traffic, as well as emergency vehicles to and from Hinton's hospital facilities (the closest to this area), and public transportation between the city and outlying rural areas." This highway is directly below the steepest slope in the descent to the valley: any construction debris released will fall into the southwest-bound lane. Whatever techniques are used in crossing this road will have to be instituted in a very narrow space between the hillside and road bed (the 20-foot flat mentioned in the comment). These concerns are yet to be directly addressed by MVP to the satisfaction of concerned citizens.	During construction, geotechnical inspectors will be deployed to identify additional areas, not already specifically addressed in the LMP, where the landslide mitigation typical details would be implemented. The geotechnical inspectors, in conjunction with Mountain Valley engineers, will develop additional mitigation measures to address slope stability as necessary based on subsurface conditions revealed during construction. Once construction is complete, the hillside will be stabilized through conventional practices or, if necessary, stabilized according to the information in the LMP. Mountain Valley will implement its Traffic and Transportation Management Plan filed with the FERC to address traffic issues identified in the comment.

(3) The potential for slope collapse in the approach to the crossing: "The steep descent to WV Route 3/12 would require extreme caution to prevent erosion, sedimentation, and rockslides during construction as well as ongoing monitoring and remediation during operation." The newest submissions from MVP indicate that there are no areas of landslide concern in Summers County. While this may be true in the abstract judgments of various informational resources, any resident of the Hungards Creek area can tell you that rock slides and minor soil spills from the roadside banks are a regular occurrence along both WV 3/12 and the county road ascending the mountain to the Hungards Creek valley. Given the steepness of the slopes and the narrowness of the road bed, any slope failure in this area would make major transportation problems for residents, and should the lower hillside give way entirely, constructing or reconstructing the road would be a major project. MVP has not addressed these dangers in their Erosion and Sedimentation Control Plan, and indeed seems oblivious to the danger. A detailed response is required that takes into consideration an onsite examination of the contexts in which the descent would have to be engineered.	During construction, geotechnical inspectors will be deployed to identify additional areas, not already specifically addressed in the LMP, where the landslide mitigation typical details would be implemented. The geotechnical inspectors, in conjunction with Mountain Valley engineers, will develop additional mitigation measures to address slope stability as necessary based on subsurface conditions revealed during construction. Once construction is complete, the hillside will be stabilized through conventional practices or, if necessary, stabilized according to the information in the LMP. Mountain Valley will implement its Traffic and Transportation Management Plan filed with the FERC to address traffic issues identified in the comment.
(4) The proximity of the crossing site to the Big Bend PSD water intakes: "The crossing is about one mile above the water intake for the Big Bend Public Service District in Talcott which provides water to about 700 customers. It is perilously close to the Zone of Critical Concern for the PSD, in fact. Siltation during construction and any resulting hydrologic changes during operation are potentially a problem" This issue is yet to be addressed seriously by either MVP or FERC. To suggest their rather cavalier attitude toward the problem, the DEIS provides three different estimates of how far the crossing will be from the in-takes: on page 4-91, Table 4.3.2- 3 reports the intakes are 19,800 feet (3.75 miles) below the crossing, while Table 4.3.2-4 on the next page says 1.4 miles, and the intervening text says the intakes are approximately 2 miles from the crossing. Clearly, neither MVP nor the FERC	The two DEIS tables referenced in the comment relate to different types of information. DEIS Table 4.3.2-3 reports the intake is 19,800 feet downstream from the crossing by following the path of the river. DEIS Table 4.3.2-4, on the other hand, reports the point-to-point (i.e., aerial) distance between the intake and the nearest construction right-of-way. Mountain Valley has contacted the Big Bend PSD regarding the Project, and will continue to coordinate with the PSD throughout the development of the Project. Mountain Valley met with the PSD on August 25, 2015, and again on March 17, 2016 to discuss in detail the Mountain Valley Pipeline Project, the PSD's water system, and the PSD's concerns over pipeline construction and the potential for impacts to their surface water intake on the Greenbrier

staff seem to know it's important to get it right. A thorough and authoritative discussion is clearly called for to resolve a major issue of potential impacts on public water supplies.	River. Mountain Valley has provided a commitment directly to the PSD that it will assist with updating their Source Water Assessment Plan (which is overseen by the Environmental Engineering Division of the West Virginia Department of Health and Human Resources), perform pre-construction water quality monitoring, coordinate closely with the PSD prior to and during construction, establish contingency water supply to be used by the PSD in the unlikely event of an impact during construction upstream of the intake, and to take all necessary and appropriate actions to ensure that there are no temporary or long-term impacts to the PSDs water source or interruptions in its service. Mountain Valley has modified its crossing method for the Greenbrier River to open cut, dry-ditch, which would reduce the potential for downstream sedimentation and turbidity. Mountain Valley will also implement the erosion and sediment devices identified in the Erosion and Sediment Control plan, which will minimize and control sediments reaching the Greenbrier River and other aquatic resources. Mountain Valley is committed to ensuring that there are no interruptions to any public water supply (or private water source) as a result of pipeline construction and operation. The Water Supply Identification and Testing Plan details these efforts.
(5) The presence of mussels in the Greenbrier River: "Also, the crossing is an area of the river providing habitat for a number of mussel species. These require a detailed census and, I'm told, a form of mitigation such as being moved upstream from the site to prevent death from siltation." Subsequent submissions from various sources confirm the claims concerning the protection of these organisms, including a comment from the Center for Biological Diversity, Docket PF-15-3, Document # 20160502-5219. Concern for mussels, including threatened and endangered species, has in fact emerged as a central theme among concerns for MVP's impacts on wildlife; the public deserves a detailed report on their presence in the	Mussel surveys were conducted at the Greenbrier River crossing in September of 2015. The survey was conducted by WVDNR and USFWS approved malacologists. Live mussels were observed at the crossing, but state or federally listed species were not identified. Prior to construction at this crossing, mussel relocation efforts will be conducted according to WVDNR and USFWS standard procedures.

watershed and whatever mitigation practices are being considered, together with any information evaluating the effectiveness of such practices in preserving these creatures [sic] endemic to certain North American streams.	
(6) The presence of a major archaeological site near the proposed crossing: "Moreover, the crossing's "flat land" is in an area of the valley believed to have been a site of Native American hunting camps and possibly other settlements as well (see accounts of Indian raids at nearby Lowell—site of the Colonel James Graham House on the National Historic Register since 1976—and other histories of Native American activity in the Greenbrier Valley)." Documentation of these concerns was sufficient that FERC required MVP to submit a plan for avoidance of the site, although I can locate no confirmation that they ever did so (as best I could determine, no such plan had been submitted as of 1/27/2016, as documented in comment to Docket CP16-10, Document #20160127-5020. This comment also documents other inadequacies in MVP's treatment of the Greenbrier crossing, almost 9 months after the original concerns were articulated). MVP owes it to the public to provide a thorough explanation of how the project can support preservation of the historic and cultural resources of the crossing site.	Mountain Valley has routed the pipeline to avoid potentially eligible archaeological sites on the south bank of the Greenbrier River. The report entitled Mountain Valley Pipeline Project, Addendum 1 to Volume IV, Summers and Monroe, Counties West Virginia and Appendix G of the report Geomorphological Evaluation of the South Bank, Greenbrier River Crossing addresses these resources. The comments of the WVDCH regarding the eligibility and avoidance of said resources have been filed with FERC.
(7) The proximity of the site to other properties on the National Register of Historic Places: as noted in the quotation in the previous paragraph, the crossing is in fairly close proximity to a number of properties on the National Historic Register, including the Graham House in Lowell, and the Gwinn plantation properties across the river from Lowell. Subsequent information from landowners in the area suggests that in exploring alternative routes across the Greenbrier River, MVP has, in fact, been surveying properties and purchased easements even closer to these historic places than the original crossing site.	The Mountain Valley routing alternative that passed near the Graham House and Gwinn Planation is no longer under consideration as an alternative.
(8) The proximity of the crossing to the Greenbrier Academy for Girls: "Moreover, the	The Greenbrier Academy for Girls is located outside of the direct and indirect Area of

crossing is within a half mile of another National Historic Register site (since 1985), the Pence Springs Hotel complex, now the home of the Greenbrier Academy for Girls—a well-regarded boarding school, the main buildings of which would be perilously close to the Primary Impact area of the proposed pipeline route." As noted, the Pence Springs Hotel is another National Historic Register property that is in close proximity to the proposed crossing. The Indian Creek Watershed Association Interactive Environmental Map shows the school to be barely outside the PIR for the pipeline but clearly within the evacuation zone as measured from the actual crossing site. Moreover, it is possible that the current re-routing of the line (recently submitted as DEIS supplemental material) in its approach to the final descent into the valley may bring the pipeline closer to the school. Obviously this possibility must be addressed and clarified with systematic and authoritative data, and the results discussed with both the school officials and the general public.	Potential Effect (APE) as agreed upon by the West Virginia Division of Culture and History. Impacts to this resource are not anticipated. The Greenbrier Academy for Girls is also located outside of the Potential Impact Radius (PIR).
(9) The history of recurrent flooding in the Greenbrier Valley: "In the forty years we have owned property here, there have been three flood events in which the Greenbrier [River]… was between 15 and 20 feet above the level of the proposed crossing site. Clearly, any entry and exit structures need to be engineered to withstand the force of a 100-year flood: where flow rates could well exceed 40,000 cubic feet per second." This statement reveals both the essence of my concern for our local "recreational fishing stream" and the naivete I brought to my earliest expressions of that concern: I was underestimating the maximum discharge of the Greenbrier River as only 40,000 cubic feet per second, where I later found USGS records confirming a discharge of 94,000 cfs. Subsequent developments proved that MVP had little knowledge of the stream dynamics of the Greenbrier—and even less concern for accurately depicting the issues of stream scour and the rates of discharge. (I will not re-hash here the details of this episode but readers can find the comments	Mountain Valley has updated and finalized the Vertical Scour and Lateral Channel Erosion Analyses in accordance with comments received from FERC. The analyses are included as Attachment DR4 Water Resources 13e.

and discussion in Docket CP16-10 by searching for mentions of "stream scour" or "scour rates".) Given the fact that my later comments resulted in FERC requiring MVP's research staff to address the issues (the results of which were submitted AFTER the publication of the DEIS), it is hard to believe that the company's apologists would characterize my original comment as focusing on impacts to a recreational fishing stream—rather than on the safety of the pipeline. And even harder to believe they could assert that the problem could be resolved by simply removing a temporary workspace from my property.	
(10) The problematic geological features of the crossing site's location: "I have waded the pools in the immediate area of the proposed crossing. The bottom is composed of immense plates, slabs of sedimentary rock (sandstone, I suspect, given the layers of stone in the surrounding hillside). These plates are separated by deep fissures. Geological study is clearly mandatory prior to approval to assure that these structures can: (1) withstand the stresses of tunnel construction, and (2) in the event of any reconfiguration resulting from construction, withstand the pressures and stresses of floodwaters after construction. Finally, the crossing site is about 5 miles upstream from what is most likely an ancient sinkhole or collapsed cave. Known locally as “the Turnhole,” this is a pool of several acres, roughly circular in shape, where the river drops from a riffle about 3 feet deep into a hole over 30 feet deep. It seems to me likely that this feature indicates an intrusion of the Karst geology so common in nearby Monroe County." As seen in this quotation, my concerns for the crossing are not exactly that it is a favorite recreational stream: rather I would characterize my comment as addressing serious potential impacts of geology on the safe construction and operation of MVP's project. The DEIS does not yet contain a coherent discussion of the interaction of such features as the high flood discharge, the extremely shallow bedrock in the river bed, and geological features suggesting the possible presence of karst—	The Greenbrier River crossing associated with the October 2016 Proposed Route is approximately 407 feet. The crossing length has been updated as the crossing method and alignment have been refined. The Greenbrier River crossing will use the open-cut, dry-ditch method and blasting is not anticipated. Per Mountain Valley’s scour analysis, the pipeline will be placed at a sufficient depth to avoid scour impacts. The Greenbrier River will not be reconfigured as a result of this project. The Greenbrier River crossing is not located in an area of known karst geology. If a karst issue develops during construction, Mountain Valley will evaluate and address the area according to the Karst Mitigation Plan.

thereby requiring some detailed geotechnical evaluations of the site prior to approval. The Greenbrier River is designated by the National Rivers Inventory as a Waterbody with Exceptional Quality or Importance. It is, in other words, one of West Virginia's Federally Recognized Exceptional Waters, listed as significant for Scenery, Recreation, Geology, Fish, and History. The Greenbrier River also happens to have the highest flood-stage discharge of any waterbody crossing proposed for the MVP route. It must be required that these issues of potential environmental impacts be addressed with authoritative evidence of the safety of the installation at the crossing and of the minimal environmental impacts that can be secured by the proposed crossing techniques. And in the course of such a discussion, perhaps we may finally get a stable estimate of the length of the proposed crossing as part of the deal: current statements have set the crossing length as everything from 270 feet (Docket CP16-10, Document #20160422-5012, Part 120, file page 13) to 1841 feet (DEIS Table 4.1.1-9 pg. 4-20), with MVP's most recent statement asserting the crossing will require 403.6 feet (as reported in the October 20, 2016 filing, Attachment D, file page 279). Perhaps we can even get the official word on the extent of blasting needed to attempt the crossing—as well as an explanation and full presentation of all the evidence that has persuaded FERC that further geotechnical research is unnecessary.	

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3m

February 2017

Attachment DR4 General 3m	
Comment	**Response**
Commenter has concerns that potential total GHG emissions from the two pipelines are not consistent with national and international goals for climate mitigation. Commenter is concerned with wide variation in methane emissions and 'very high total potential GHG emissions' and recommends FERC provide complete life-cycle estimates of methane and CO2 emissions for the EIS with detailed documentation of assumptions so that potential GHG and other environmental impacts may be judged.	Mountain Valley has already obtained air permits for all three compressor stations that are part of the Project. Regarding the assessment of GHG emissions, the climate change analysis in the Draft EIS is fully consistent with the Council on Environmental Quality's Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews (Aug. 1, 2016). With regard to broader climate issues, FERC recently reiterated that it does not have the authority to establish national environmental policy in the manner suggested by the commenter: "[W]hile the Commission does not utilize a specific 'climate test,' we do examine the impacts of the projects before us, including impacts on climate change. Under NEPA, we are required to take a 'hard look' at the environmental impacts of the proposed project and we have done so. To the extent that [a commenter] suggests an alignment of project permitting with national climate change goals, *we note that it is for Congress, the Executive Branch, and agencies with jurisdiction over broad environmental issues to establish such goals; our role under the NGA is considerably more limited, and we have no authority to establish national environmental policy.*" *Columbia Gas Transmission, LLC*, 158 FERC 61,046 at P 123 (Jan. 19, 2017) (emphasis added).
FERC should require detailed maintenance and emission monitoring plans for new and associated existing pipelines and compressor stations adequate to prevent leaks and detect all releases of methane to the atmosphere in a timely fashion.	The Greenhouse Gas Reporting Program (codified at 40 CFR Part 98) (Part 98) requires reporting of greenhouse gas and other relevant information from the various segments of the oil and gas industry. The proposed transmission compression facilities and transmission pipeline will be required to comply with the monitoring and

	reporting requirements of Part 98 as administered by US EPA. The compression and pipeline facilities will report as required to US EPA an annual inventory of greenhouse gases including leaks and releases. There would be no benefit to a redundant program administered by FERC.
Concerns regarding the estimated project total GHG emissions of MVP and EEP (48 million metric tons CO2). DEIS Table 4.13.2-1. The total MVP and EEP GHG emissions are more than double the CO2eq emissions from all the 177 sources in Virginia reporting in the EPA's 2014 GHG inventory (49.7 million tons CO2eq).	Mountain Valley could not confirm the data presented by the commenter (177 sources and 49.7 million tons CO2eq). It is unclear which sources made up this total. For both projects, the total GHG emissions estimated in DEIS Table 4.13.2-1 assumes 100% of the natural gas transported by the pipelines were combusted instead of used for other purposes, such as plastic manufacturing. In addition, the commenter assumes that 100% of the natural gas would be consumed in Virginia, which is not the case. Mountain Valley's target markets are the Mid-Atlantic and southeastern markets, where the natural gas would be used by local distribution companies, industrial users, and power generators.

Mountain Valley Pipeline Project

Docket No. CP16-10-000

Attachment DR4 General 3n

February 2017

Response:

On August 26, 2016, the Mountain Valley Karst Specialist Team visited the proposed Mountain Valley alignment near Milepost (MP) 197.5 (latitude and longitude 37.39073, -80.67988, respectively) to investigate the claim of a major karst feature within the proposed right-of-way (ROW). Joseph Chasnoff made this claim in Accession #20160829-5096 and 20161223-5008.

Joseph Chasnoff stated in both Accessions that a large surficial karst feature is located in a large area of rocks and boulders at a ridgetop wet weather spring, noting that *"especially large timber growth indicates root access to underground water, as does the presence of moss on the rocks, and the openings between rocks including multiple cavities where there is an absence of soil. This area is clearly a portal for surface water to flow into a network of eroded carbonate. This area needs further study by qualified geologists and/or hydrologists."* Joseph Chasnoff also stated, *"This major surficial karst feature which is a portal into the mountain for surface water is likewise not a viable location for a pipeline."*

The Mountain Valley Karst Specialist Team identified a bench covered in meter-size sandstone boulders and colluvium at the location identified from latitude and longitude coordinate data provided by Joseph Chasnoff. However, no sinkholes or other karst features, and no locations of focused water infiltration, were observed. The photographs in Figure 1 were taken of the site (match line is a tree in foreground), showing the vicinity of the referenced location, where sandstone boulders and colluvium are found at the ground surface.

From consultation with the U.S. Forest Service, Mountain Valley filed revised alignment sheets on December 22, 2016. The revised alignment sheets include minor adjustments in the vicinity of this site and the route shifted approximately 40 feet to the east, closer to the existing road, hence farther away from this specific location and the loose colluvium cover.

The slopes and sub-ridgelines of Peters Mountain in the Mystery Ridge area are underlain by a relatively thin unconsolidated overburden mantle, and in some areas thicker colluvial deposits or ancient debris flows. As opposed to a karst hydrologic system, or so-called portal for water infiltration, the veneer deposits observed for this evaluation, and commonly observed in the vicinity of Mystery Ridge, are limited areal extent subsurface zones that become ephemerally saturated during and after precipitation periods, and then periodically dry under natural conditions responding to local climate. These veneer deposits do not constitute a surficial aquifer because they do not typically retain water, but rather convey precipitation relatively unimpeded down-slope by gravity flow. Some percentage of this infiltrating precipitation will likely encounter the underlying sedimentary bedrock interface and infiltrate into bedrock via joints, fractures, bedding planes. However, there was no evidence that the geologic conditions in the vicinity of MP 197.5 constitute karst terrain or karst hydrology.

Mountain Valley considers there to be negligible risk that the scope of the Project (i.e., an excavation typically less than 10 feet deep) will have any effect on groundwater resources, recharge zones, or watersheds as a whole at or near Milepost MP 197.5.

Figure 1