A HIGH-RISK PROPOSAL

DRILLING THROUGH THE BLUE RIDGE MOUNTAINS

FOR THE ATLANTIC COAST PIPELINE

Piney Mountain, Three Ridges and Reeds Gap (Photo by John Claman)

Comments to the Federal Energy Regulatory Commission
Docket CP15-554

Submitted on behalf of the Dominion Pipeline Monitoring Coalition
Rick Webb, Program Coordinator

February 6, 2017

EXECUTIVE SUMMARY

The Federal Energy Regulatory Commission (FERC) published a Draft Environmental Impact Statement (DEIS) on December 30, 2016 for Dominion's proposed Atlantic Coast Pipeline (ACP).[1] Among other deficiencies, the DEIS does not acknowledge the risk of failure and the unavoidable environmental damage associated with plans for drilling 4,639 feet through the Blue Ridge under the George Washington National Forest, Appalachian National Scenic Trail, and Blue Ridge Parkway. Dominion's plan calls for use of horizontal directional drilling (HDD) and contingency use of direct pipe installation (DPI) if the HDD operation fails. The U.S. Forest Service has stipulated that any permit for ACP construction on National Forest lands will be conditioned on prior successful completion of the Blue Ridge HDD or DPI operations.

The Undisclosed Environmental Footprint

The extensive earth disturbance on steep slopes that will be required for the proposed Blue Ridge HDD and DPI operations was not addressed in the DEIS. The area and amount of excavation required for construction of level entry- and exit-side workspaces are imprecisely specified as "*proposed*" and "*to be determined by contractor*." The DEIS also failed to address the significant linear footprint associated with the additional pullback workspace needed for assembly and staging of the pipe string that is pulled from the exit-side through the drilled borehole. Due to the need for alignment of the pull-section pipe with the borehole and the accepted safe bending radius of a 42-inch steel pipe, it will be necessary to suspend the pipe for approximately 2,000 feet at heights approaching 200 feet above the sloping mountainside. This will require excavation for access, pipe fabrication and testing, and siting of heavy equipment needed for pipe handling and support.

Construction in the proposed HDD and DPI operations area, including for the pipeline corridor, entry- and exit-side workspaces, pipe pullback workspace, and access roads, will directly impact 7 perennial streams and 11 intermittent streams. Construction activity, will continuously affect these streams for a year or more, including during wintertime conditions. In-stream blasting will be required for crossing 7 streams, including the South Fork of Rockfish River, a native brook trout stream subject to time-of-year restrictions.

[1] Atlantic Coast Pipeline, LLC, formed by four companies, Dominion, Duke Energy, Piedmont Natural Gas, and Southern Company Gas, is herein referenced as "Dominion."

Risk Factors Associated with HDD Failure

HDD operations can fail due to difficult or unexpected geologic conditions and lodging of the pipe in the borehole during the pipe-pullback phase of the operation.

Significant topographic and geologic risk factors confront the proposed HDD and contingency DPI operations. Pipeline engineers, including Dominion consultants, recommend fabrication and testing of the pull-section pipe in one continuous string to avoid delays and increased risk of failure associated with connecting multiple strings during pullback. The limited workspace on the pullback side of the proposed HDD operation precludes adherence to this recommendation.

Although detailed geophysical investigation of the drill path is standard practice for assessing the feasibility of prospective HDD and DPI operations, the information included in the DEIS is limited in both scope and reliability. The DEIS includes a Dominion claim that subsurface borings confirm expectations that the HDD drill path will be primarily through non-problematic solid rock. This claim, however, is contradicted by geophysical studies reported in previous Dominion submissions to FERC. Only two subsurface borings were completed near the HDD location. These borings were conducted at distances of 500-650 feet from the HDD endpoints, at lower elevations than the drill path, and they did not encounter solid rock. In addition, ground-based geophysical surveys were conducted in the vicinity of the HDD endpoints, but data were obtained for less than 25% of the drill path, and interpretation was qualified by insufficient subsurface boring data with which to corroborate the geophysics. This limited geophysical data indicated the presence of faulted and fractured rock in the drill path within about 150 to 550 feet of the entry and exit points. The data collected and reported for the proposed HDD and DPI operations did not indicate that the drill paths will primarily encounter solid rock.

A similar HDD operation for another FERC jurisdictional project, the proposed Mountain Valley Pipeline, was considered for Peters Mountain in the Jefferson National Forest on the Virginia-West Virginia border in Giles County, Virginia. The HDD option for Peters Mountain was rejected by the developer and FERC as infeasible due to engineering constraints and topographic conditions. The cited problematic conditions are similar to those associated with the proposed Blue Ridge HDD operation. A comparison of the factors that led to opposite conclusions concerning the feasibility of the proposed MVP Peters Mountain and ACP Blue Ridge HDD operations is needed.

Erosion, Runoff, and Slope Stability Issues

The DEIS does not include site-specific details concerning erosion and sediment control, stormwater management, and slope-failure prevention. Dominion proposes to wait until after

completion of environmental review, until after permitting, or until after initiation of construction to complete surveys and provide specific plans and identify engineering solutions for the range of significant geohazard and water-related problems that confront the ACP project. FERC seemingly accepts this deferral, and recommends completion and submission of critical studies "prior to construction." FERC also dismisses concerns about erosion, sedimentation, and runoff control based on its generalized requirements for minimizing water resource impacts of pipeline construction. FERC has not been responsive to comments seeking scientifically objective evidence that its generic requirements are sufficient to prevent water resource impacts during and after pipeline construction in the central Appalachian region.

State Regulatory Oversight in Question

Past performance and unresolved issues raise significant concerns about Virginia natural resource agency oversight of ACP construction, including the proposed Blue Ridge HDD and DPI operations.

- The state has a duty under Section 401 of the Clean Water Act to rule against the ACP unless there is a reasonable assurance that the project will not violate water quality standards. It is not clear that the state will conduct the review necessary to make this determination or if the public will be provided its rightful opportunity for involvement in the process.
- Despite clear regulatory requirements and a lack of evidence, Dominion contends that the ACP is exempt from stormwater management regulations and permit requirements because the project will not alter the long-term runoff properties of the construction corridor.
- Erosion and sediment control plans were not available in the DEIS, and unless they are made available during the state's Clean Water Act section 401 review, the public will be denied the right to review and make informed comments.
- Dominion intends to seek variances to regulatory restrictions that limit open-trench segments to 500 feet. Dominion has argued that the open-trench limit increases the amount of disturbance and construction time for pipeline construction. In fact, an open trench prevents compliance with the required installation and spacing of erosion and sediment control structures that intercept and divert runoff on steep slopes.
- It is not clear whether state agencies or localities will be responsible for erosion and runoff control plan review and compliance oversight for ACP access roads. In many areas of the ACP, including the Blue Ridge HDD area, an extensive system of access roads will be located on steep slopes, requiring significant excavation. Many of these roads will cross or be in close proximity to streams.

- In order to proceed with wintertime construction, Dominion will seek waivers from time-of-year restrictions on construction activity that may affect brook trout during sensitive early-life stages.

National Forest Stewardship

Although FERC has primary responsibility for conducting the required NEPA review for the proposed ACP project, the Forest Service is responsible for decisions concerning pipeline construction in the Monongahela and George Washington National Forests. The Forest Service must follow an administrative review process established by federal law in making decisions concerning the permits and management plan amendments that the ACP will require. The Forest Service has repeatedly requested information about the ACP that Dominion has persistently failed to provide.

- The Forest Service has asked Dominion to document the effectiveness of control methods for construction in areas that present high risks for slope failure, slippage, erosion, and sedimentation.
- The Forest Service has asked Dominion to demonstrate that the ACP can be built without unacceptable risk of resource damage by developing site-specific stabilization designs for selected high-hazard areas.
- The Forest Service has asked for specific documentation that justifies not considering post-construction stormwater management measures.
- The Forest Service has asked for proof that the open-trench limit causes a significant increase in disturbance and construction time for pipeline construction in steep mountainous terrain.
- The Forest Service has indicated that erosion and sediment control plans will be required for ACP access roads in the National Forest, and has indicated that detailed soil surveys and analysis of fill-slope stability will be needed.

Conclusion: Avoid a Bad Outcome

Given the topographic and geophysical challenges at the site, plus the insufficient investigation of the drill path, it is reasonable to conclude that the risk of failure for the proposed HDD and DPI operations is substantial. Should the HDD and DPI prove impracticable after ACP construction is underway and options for alternative routing are foreclosed, there will be an incentive for allowing an open-cut crossing of the ANST and the Blue Ridge Parkway. The Forest Service stipulation that any authorization for ACP construction on National Forest lands will be conditioned on prior successful completion of the proposed HDD or DPI operations will help avoid a situation in which significant investment and resource commitment is put in direct conflict with established legal protection of highly valued public resources.

The DEIS is inadequate. It does not fully disclose the scope and degree of excavation required for the proposed drilling operations, the results of critical geophysical investigations have not been provided, and the identification of risks and evaluation of mitigation measures have been deferred until later, precluding the meaningful opportunity for public review and comment required by NEPA. A revised DEIS is necessary to meet the information needs of multiple stakeholders, including the general public, the regulatory agencies, Dominion partners and investors, and affected property owners.

Report Author

Rick Webb, has studied the hydrology and biogeochemistry of forested mountain watersheds in the central Appalachian region for more than 30 years. His resume is appended to this report.

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NOTE TO READER: Many of the cited documents are posted in the FERC docket for the Atlantic Coast Pipeline project, which can be accessed via https://elibrary.ferc.gov. Searches can be based on date, docket number, and text. The docket number for the ACP is CP15-554.

ACKNOWLEDGEMENT: This report represents the collective effort of many individuals, including participants in the Dominion Pipeline Monitoring Coalition (pipelineupdate.org). In particular, research and editorial assistance was provided by Lynn and Malcolm Cameron, Peggy Quarles, and David Sligh. Assistance with geospatial analysis was provided by Dan Shaffer.

1.0 A FAILURE TO ACKNOWLEDGE RISK

The Federal Energy Regulatory Commission (FERC) has published a Draft Environmental Impact Statement (DEIS) for the proposed Atlantic Coast Pipeline (ACP).[2] The DEIS does not acknowledge the risk of failure and the unavoidable environmental damage associated with the plans proposed by Atlantic Coast Pipeline, LLC (Dominion) for drilling through the Blue Ridge Mountains.[3]

Because of restrictions on construction of a utility corridor across the Appalachian National Scenic Trail (ANST), Dominion proposes to tunnel through the Blue Ridge using horizontal directional drilling (HDD). Another drilling method, direct pipe installation (DPI), is proposed as a contingency should the HDD operation fail.[4] A map depicting the proposed HDD and DPI drill paths, workspace, pipe pullback areas, and access roads is provided as **Figure 1**.

As described in this report, both the HDD and DPI methods involve substantial risks of failure and environmental damage, given workspace limitations and the topographic and geologic characteristics of the proposed drilling locations.

1.1 A Precautionary Requirement

Because of the uncertainty associated with the Dominion proposals, the U.S. Forest Service (USFS) has stipulated that any authorization for ACP construction on National Forest lands would be conditioned on prior successful completion of the proposed Blue Ridge HDD or DPI operations.[5] This requirement should serve to avoid a situation in which a significant investment and resource commitment associated with premature ACP construction would be put at risk and in direct conflict with established legal protection of a highly valued public resource.

Dominion's proposed construction schedule for the ACP, however, cannot be met given the year or more that would be required to first complete the HDD or DPI operations. FERC has thus recommended that Dominion consult with the USFS and provide a realistic schedule prior to the end of the comment period for the DEIS.

Dominion can be expected to argue that its plans are sufficient to assure the success of the drilling effort, and thus there is no need for the delay required to demonstrate success. However,

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[2] Atlantic Coast Pipeline and Supply Header Project, Draft Environmental Impact Statement, 12/30/16.

[3] Atlantic Coast Pipeline, LLC, formed by four companies, Dominion, Duke Energy, Piedmont Natural Gas, and Southern Company Gas, is herein referenced as "Dominion."

[4] The proposed HDD operation endpoints would be at elevation of 2,000 feet, and the length of the drill path would be 4,639 feet. The proposed DPI operation endpoints would be at elevations of 2,400 and 2,600 feet, and length of the drill path would be 1,396 feet.

[5] This condition was initially stated in correspondence to Leslie Hartz, Vice President, Atlantic Coast Pipeline, LLC, from the U.S. Forest Service, Regional Forester Eastern Region and Regional Forester Southern Region, 1/19/16.

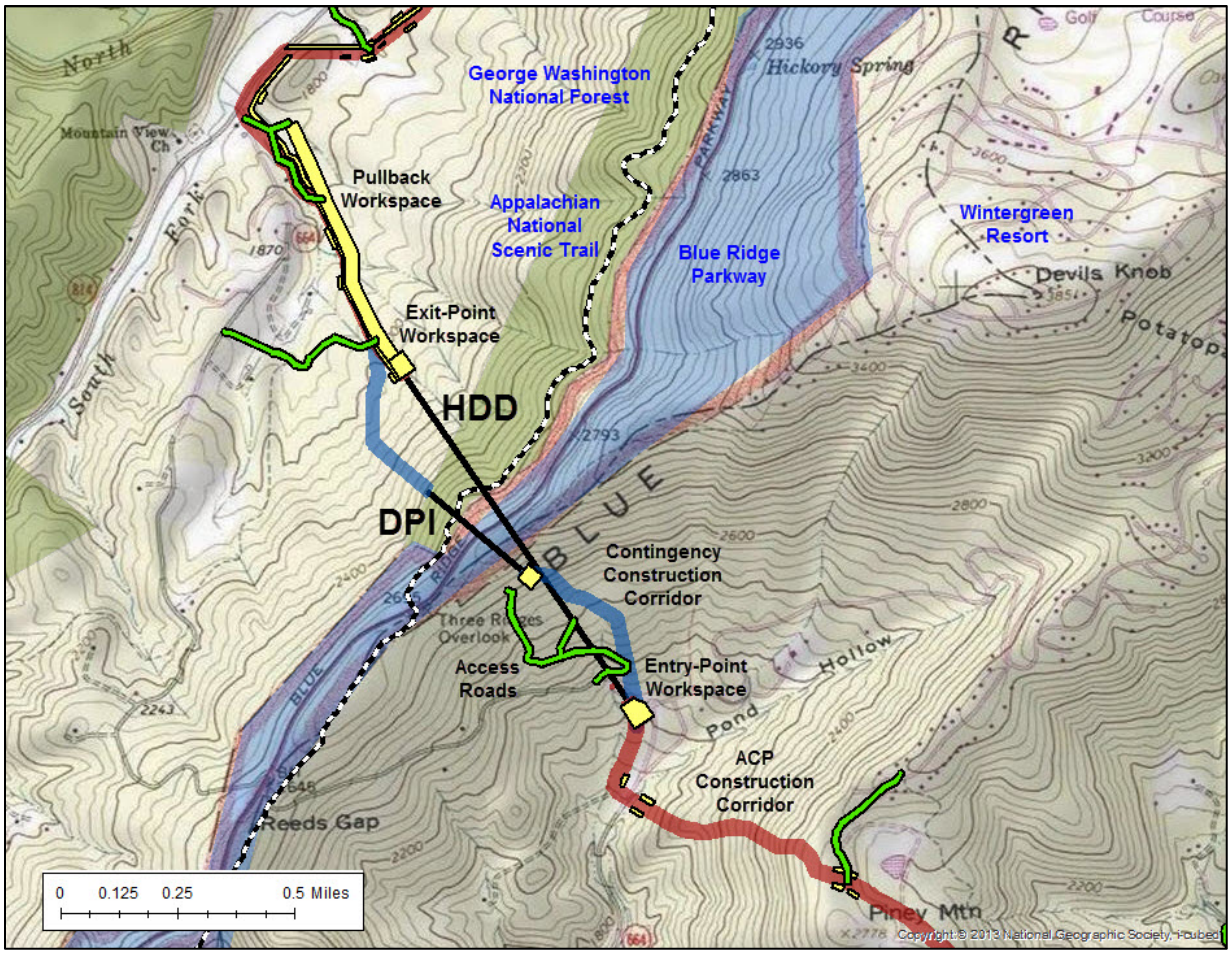

FIGURE 1 – Proposed Horizontal Directional Drilling (HDD) and contingency Direct Pipe Installation (DPI), endpoint workspace, access roads, and construction corridors, based on information included in the DEIS and other information submitted to FERC by Dominion prior to publication of the DEIS. The location of the pullback workspace is based on information submitted to FERC on 1/19/17, after the DEIS was published.

the information that Dominion provided for consideration in the DEIS analysis is incomplete and misleading. It does not support an objective evaluation of the proposed drilling operations with respect to either the potential for successful completion or the acceptability of associated environmental damage.

Implementation of the National Environmental Policy Act (NEPA) requires an opportunity for public and agency review and comment. The DEIS for the ACP, however, repeatedly fails to address or provide the critical information required for meaningful review. The DEIS treatment of Dominion's proposed Blue Ridge drilling operation is a significant example of this deficiency.

This report describes the failure of the DEIS to fully disclose the risk factors and uncertainties associated with the proposal.

2.0 THE PROPOSED DRILLING METHODS

The HDD operation would involve drilling for 4,639 feet at 800 feet below the crest of the Blue Ridge. The contingency DPI operation would involve drilling for 1,396 feet at 200 feet below the crest. Both methods are commonly used for installing pipelines under rivers or other obstacles where the terrain is relatively flat and extremely hard or fractured bedrock is not encountered. The use of either method to drill for long distances through steep mountains is less common. Dominion's proposal for drilling through the Blue Ridge approaches the limits of either technology, especially where geophysical conditions are both problematic and uncertain.

Horizontal Directional Drilling typically involves three operational phases (**Figure 2**).

Phase 1: A pilot hole is drilled from one side of the obstacle (river, mountain, road, etc.) to the other. A bentonite clay drilling fluid removes drill cuttings.

Phase 2: Reamers with larger bits and cutters are used to enlarge the borehole.

Phase 3: A pre-welded and pre-tested pipe string is pulled through the borehole from the exit side. The pullback section of pipe is elevated to align with the borehole.

Direct Pipe Installation is a newer method that involves mounting the drill bit on the front of a pre-welded and pre-tested pipe string and pushing it though or under the obstacle.

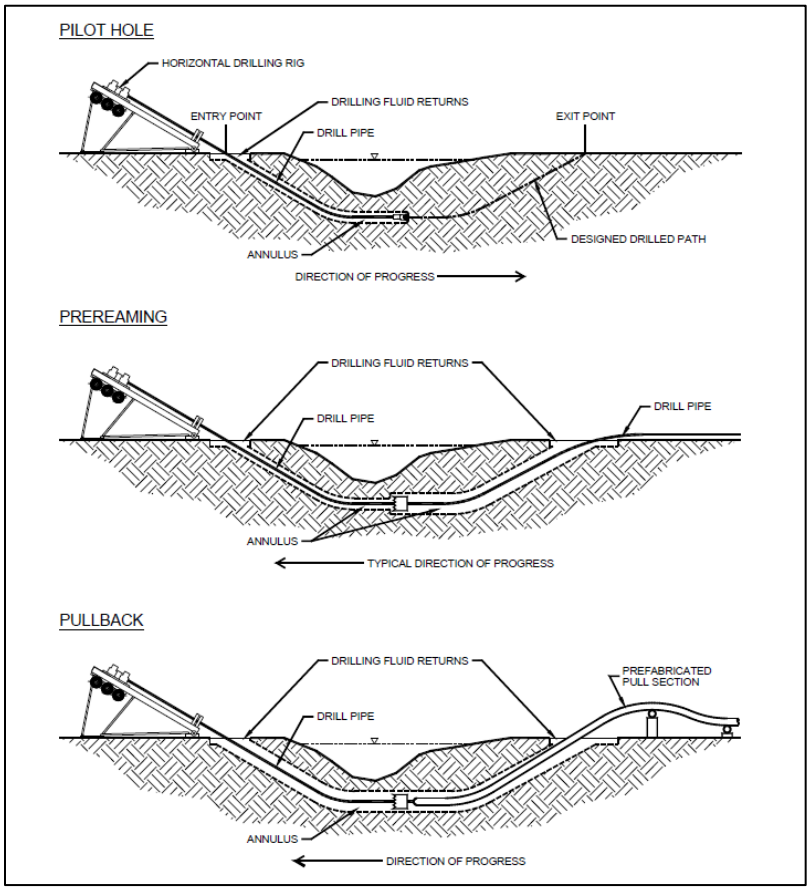

FIGURE 2 – Phases of the HDD process as presented in the HDD Design Report prepared for Dominion Transmission, Inc. by J.D. Hair & Associates, Inc. (7/27/16). The depiction shows the more-common use of HDD for installing pipelines under rivers or other water bodies. Dominion proposes ten HDD crossings for pipe diameters of 36-inches or greater. The Blue Ridge crossing is the only HDD that involves drilling through a mountain, and it is the longest among the ten, exceeding the next longest by 1,674 feet.

3.0 THE UNDISCLOSED ENVIRONMENTAL FOOTPRINT

Our objection to the proposed Blue Ridge crossing is much like that for other areas of the ACP project. Large-scale forest clearing and excavation on steep mountainsides presents substantial risk of erosion and sedimentation, alteration of runoff properties, and landslides. FERC, however, has failed to require detailed plans for construction and mitigation prior to publication of the DEIS, thereby precluding informed public and regulatory agency analysis of risks, alternatives, and mitigation measures.

The proposed HDD and contingency DPI installations will require extensive excavation for creation of level workspaces, access roads, and areas for pipe fabrication, testing, staging, and pullback. The information included in the DEIS, however, does not disclose the full scope or impact of the proposed operations.

3.1 Missing Information on Workspace requirements

The DEIS provides limited or misleading information concerning the excavation that will be required for the proposed primary and contingency drilling operations, and to the extent that information is provided, it is subject to change.

Information submitted to FERC by Dominion does acknowledge, but only in general terms, that there are issues related to the amount of excavation that will be required.

The proposed HDD crossing will be complicated by the challenging topography at the site, which is likely to require some amount of excavation at both ends of the crossing to create level work areas for the HDD equipment.[6]

Despite this admission, no specific information concerning the actual extent of entry- and exit point excavation was provided to FERC for consideration in the DEIS.

For example, the DEIS includes a schematic of the HDD operation.[7] However, the locations, areas, and excavation required for the entry and exit points are imprecisely specified as "*proposed*" or "*to be designed by contractor*." In addition, the DEIS does not address plans submitted to the National Park Service that describe a modified HDD operation in which drilling would be conducted from both sides of the mountain.[8]

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[6] HDD Design Report, Revision 2, Atlantic Coast Pipeline, prepared by J. D. Hair and Associates, Inc., page 16, 12/14/14. Submitted to FERC by Dominion, 1/10/17.

[7] Site-Specific Horizontal Directional Drill Plans. Included in the DEIS, Vol. II, Part 5, Appendix H3, 12/30/16.

[8] Stated in correspondence to Mark H. Woods, Superintendent, Blue Ridge Parkway, from Leslie Hartz, Vice President, Atlantic Coast Pipeline, LLC, 10/21/16. Submitted to FERC by Dominion, 11/17/16.

Information in the DEIS concerning the contingency DPI operation is similarly deficient. The limited information provided on excavation required for entry and exit points is characterized as "*conceptual*" and qualified by the statement that "*Any excavations required for launch and reception of the tunnel boring machine shall be designed by the contractor.*"[9] Although the DEIS indicates that Dominion was to provide a site-specific contingency plan in late 2016, the plan was not included in the DEIS.[10]

Perspective on the footprint associated with HDD operations is provided by **Figure 3**, which shows an entry-side workspace for a recent HDD operation in West Virginia. In contrast with the proposed Blue Ridge operations, this workspace was on relatively level ground where the need for cut and fill excavation was minimal. The pipeline was also smaller, and the length of the drill path was much less. **Figure 4** shows the approximate location of the entry-side workspace for the proposed Blue Ridge HDD.

Photo by DPMC Pipeline Air Force

FIGURE 3 – Entry-side workspace for a comparatively small HDD operation for the Stonewall Gathering Pipeline in West Virginia. The pullback phase has been completed and the drilling rig has been removed. This operation involved a 1,000 foot boring to install a 36-inch pipeline under Interstate 79.

[9] Contingency Plan for the Proposed Crossing of the Appalachian National Scenic Trail and Blue Ridge Parkway, 8/4/16. Included in the DEIS, Vol. II, Part 5, Appendix H2, 12/30/16.

[10] Horizontal Directional Drill Drilling Fluid Monitoring, Operations, and Contingency Plan, prepared by ERM, Inc., 7/18/16. Included in the DEIS, Vol. II, Part 5, Appendix H1, 12/30/16.

Photo by Lynn Cameron

FIGURE 4 – This photo was taken adjacent to the location (to the right) of the entry-side workspace for the proposed Blue Ridge HDD operation. The entrance to Wintergreen Resort is in the background.

3.2 Misinformation on Workspace Requirements

The DEIS failed to address the footprint that will be required for pipe pullback, fabrication, and testing. The schematic provided for the HDD operation simply indicated that the pull-section staging area will be about 3,000 feet long and the workspace will be 150-feet wide.[11] The necessary alignment of the pull-section pipe with the borehole will require suspension of the pipe high above the ground. The industry-accepted safe bending radius (radius of curvature) for a 42-inch steel pipe is 4,200 feet.[12] Given this bending radius and the slope of the location, it will be necessary to suspend the pipe for approximately 2,000 feet at heights approaching 200 feet above the mountainside (see **Figure 5**). If this is even practicable, it will require significant excavation for access, pipe fabrication and testing, and siting of the multiple large cranes or other heavy equipment needed for pipe handling and support. The required suspension of pull-section pipe for the proposed mountainside HDD operation greatly exceeds what is required for typical HDD operations on relatively flat ground. For example, see **Figure 6**.

[11] Site-Specific Horizontal Directional Drill Plans. Included in the DEIS, Vol. II, Part 5, Appendix H3, 12/30/16.
[12] American Society of Civil Engineers, Pipeline Design for Installation by Horizontal Directional Drilling, 2014.

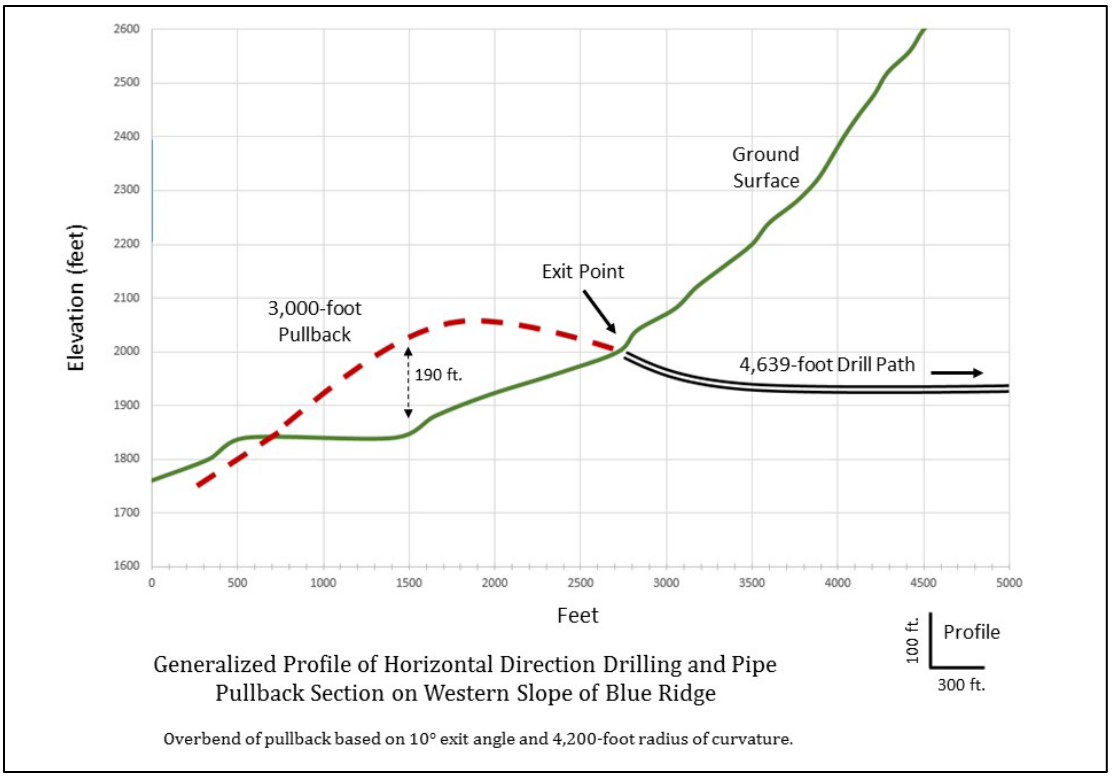

FIGURE 5 – Extreme pullback required for the proposed Blue Ridge HDD.

Photo by Mike Taylor

FIGURE 6 – Final section of pullback pipe for an HDD operation in relatively flat terrain.

The contingency DPI installation, which would occur on even steeper slopes than the proposed HDD operation, also raises questions about the potential footprint of the staging and fabrication area and the need for pipe suspension.[13]

The fact that the suspension of pullback pipe and the magnitude of the related footprint were not addressed in the DEIS may be due to incorrect or misleading information provided to FERC by Dominion. The only depiction of the HDD pullback section included in Dominion submissions to FERC is based on a 1,500 feet bending radius (see **Figure 7**). This differs substantially from

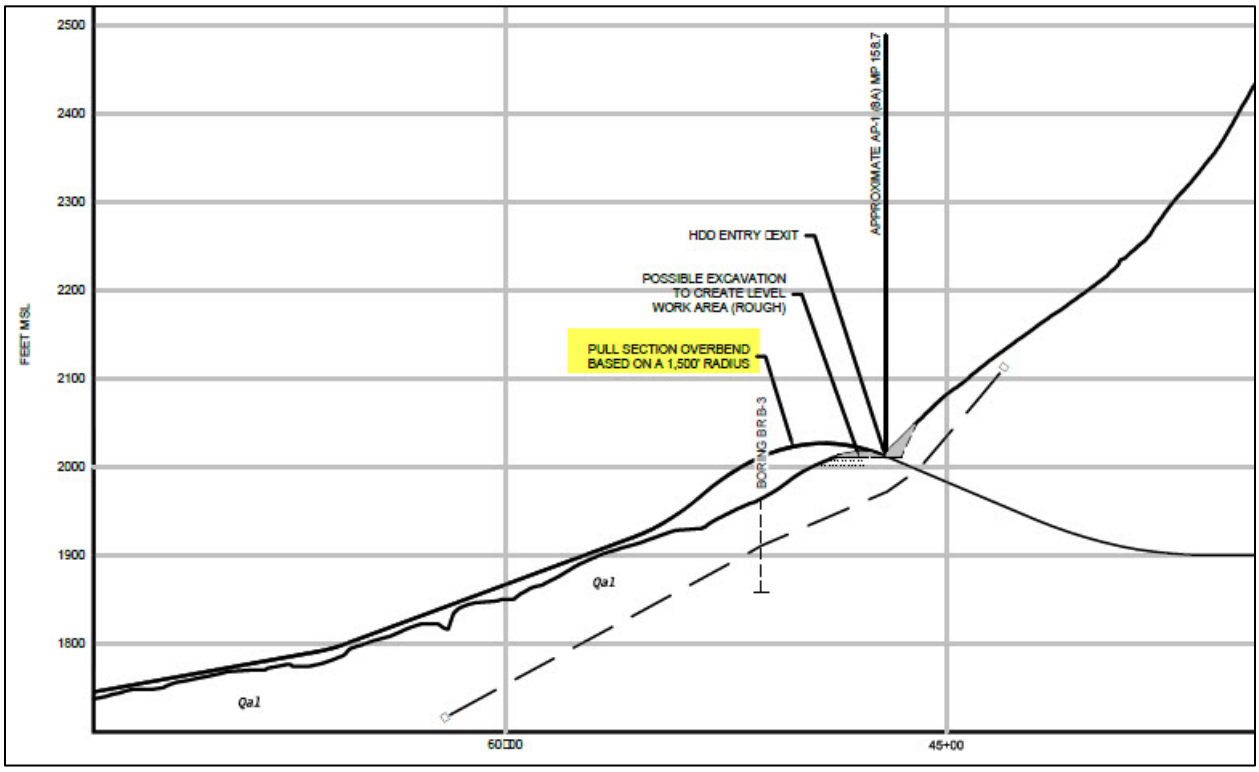

FIGURE 7 – Profile of the proposed Blue Ridge HDD showing the exit-side suspension of pullback pipe based on a 1,500-foot bend radius instead of the correct 4,200-foot bend radius. From Geotechnical Site Investigation Report for Atlantic Coast Pipeline – Proposed Horizontal Directionally Drilled Crossing, Blue Ridge Parkway, Segment AP-1 MP 158 to 159, Virginia, Figure 4, prepared by Geosyntec Consultants, Inc., May 2016.

[13] DPI requires a large entry-side work area to accommodate the pipe thruster, supporting equipment and long lengths of welded pipe. The pipe thruster requires that structural steel, including piles, be installed to support the operation. (See Waterbody Crossing Review, Mountain Valley Pipeline Project, February 2016. FERC Docket CP16-10.)

the correct 4,200-foot bending radius. As indicated in the depiction, a shorter bending radius would require much less lifting of the pipe. The necessary elevation would only be about 50 feet compared to about 200 feet for the longer correct bending radius. The length of pipe suspension would also be much less. Dominion has acknowledged, but only in general terms, that there are topographic complications that affect the pullback operation.

. . . since the product pipe will be laid downhill from the proposed exit point, it is anticipated that several cranes will be needed to handle the pipe and support it as it is lifted during pullback to be aligned with the reamed hole. However, the need for excavations and cranes does not cause any concern with regard to technical feasibility.[14]

It is not clear, however, that the statement concerning technical feasibility and the suggestion that only "*several cranes will be needed"* is based on accurate information concerning the design or bending radius of the pipe. In addition, evaluation of environmental impacts, as required in preparation of a DEIS, concerns more than technical feasibility. However, the unavoidable environmental impacts associated the forest clearing and mountainside excavation required for the pullback component of the HDD operation are not addressed in the DEIS.

3.3 Minimal Information on Stream Crossings

Construction in the proposed HDD and DPI operations area, including for the primary and contingency pipeline corridors, the entry- and exit-point workspaces, the pipe pullback workspace, and access roads, will directly impact a number of streams (see **Figure 8**). The DEIS does not address the impact of construction for an extended period (a year or more) on these streams. The DEIS provides summary information concerning stream crossings (see **Table 1**).

TABLE 1 – Water Crossing Information: Excerpt from DEIS.[15]

	Mile Post 157-158 Western Slope	Mile Post 158-159 Eastern Slope
Total Stream Crossings	14	5
Perennial Streams	3	4
Intermittent Streams	10	1
Blasting Within 1000 Feet	7	4
In-Stream Blasting	5	1
Time-of-Year Restrictions	11	5

[14] HDD Design Report, Revision 2, Atlantic Coast Pipeline, prepared by J. D. Hair and Associates, Inc., page 16, 12/14/14. Submitted to FERC by Dominion, 1/10/17.

[15] Waterbody Crossings along the Atlantic Coast Project. Included in the DEIS, Vol. III, Part 1, Appendix K-1, 12/30/16.

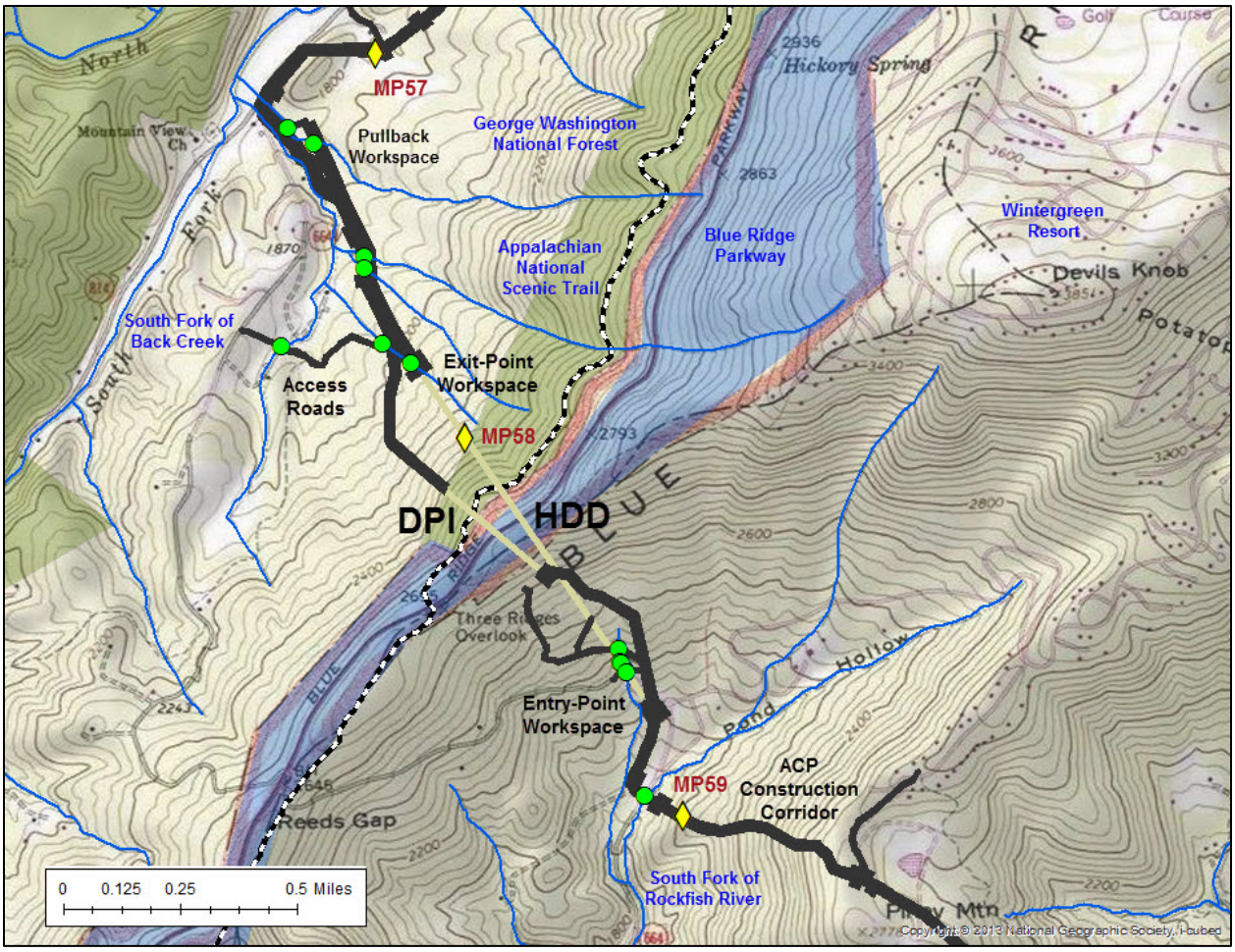

FIGURE 8 – Streams crossed by construction associated with the proposed HDD and contingency DPI operations. The green symbols indicate stream crossings by the pipeline construction corridor, entry- and exit-point workspaces, pipe pullback and other workspace, and access roads. The yellow symbols indicate ACP mileposts. The stream lines shown on the map were obtained from the National Hydrography Dataset (U.S. Geological Survey). Note that more stream crossings are listed for this area in the DEIS (see **Table 1**). The reason for the difference has not been determined.

The indicated time-of-year restrictions for these streams limits work from October 1 to March 31 to protect sensitive life stages of aquatic life (see **Section 5.1**). Adherence to time-of-year restrictions conflicts with Dominion's plans for wintertime construction.

Information submitted by Dominion to the National Park Service does not correlate with the stream crossing information depicted in **Figure 8**, nor does it reflect a pro-active approach to stream protection.[16] Among a series of questions concerning the HDD operation, the National

[16] Correspondence with Mark H. Woods, Superintendent, Blue Ridge Parkway, from Leslie Hartz, Vice President, Atlantic Coast Pipeline, LLC, 10/21/16. Submitted to FERC by Dominion, 11/17/16.

Park Service asked: "*Does the project proposal include altering any stream courses, surface or ground water flows in the area . . . ?*"

Dominion's response:

No. The project will not result in the alteration of any perennial or intermittent streams . . . . Both the HDD entry and exit points are located between 50 and 100 feet away from intermittent streambeds. . . . The temporary construction workspace for both sides of the HDD will be in close proximity to the intermittent streambeds. However, should the streams happen to be flowing during construction, the intermittent streambeds will be protected with erosion control devices installed within or along the boundaries of the workspace in compliance with applicable regulations.

4.0 HOW COULD THE DRILLLING OPERATION FAIL?

It is possible for HDD operations to fail, primarily due to encountering unexpected geologic conditions during drilling or if the pipe were to become lodged in the hole during pullback operations.[17]

4.1 Segmentation of Pullback Pipe Increases Risk of Failure

Topographic and workspace limitations affecting the pullback stage are among the significant problems confronting the proposed Blue Ridge HDD operation. As indicated in the DEIS, Dominion anticipates fabricating the pullback string in at least two sections.[18] Segmentation of the pullback string requires tie-in welding and thus a delay during the pullback. According to published HDD design information, segmentation of the pipe pullback string increases the risk of failure, and it does not conform to recommendations provided by engineering consultants working for Dominion.

The American Society of Civil Engineers has published a series of reports on engineering practice, including a 2014 report on HDD design that includes the following statement:

The exit side (sometimes referred to as the pipe side) is where the pipeline is fabricated. Ideally, there is space in line with the drill alignment of sufficient length to fabricate the pipeline into one string. Delays associated with connecting strings together during pullback increase risk for the HDD installation.[19]

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[17] Description of Proposed Action. Included in the DEIS, Volume I, Section 2, page 2-40, 12/30/16
[18] Site-Specific Horizontal Directional Drill Plans. Included in the DEIS, Vol. II, Part 5, Appendix H3, 12/30/16.
[19] American Society of Civil Engineers, Pipeline Design for Installation by Horizontal Directional Drilling, 2014.

The HDD design report prepared for Dominion by J.D. Hair & Associates, Inc. includes the following statement on pullback workspace requirements:

It is preferable to have workspace aligned with the drilled segment extending back from the exit point the length of the pull section plus approximately 200 feet. This will allow the pull section to be prefabricated in one continuous length prior to installation. If space is not available, the pull section may be fabricated in two or more sections which are welded together during installation. ***It should be noted that delays associated with joining multiple pipe strings during pullback can increase the risk of the pipe becoming stuck in the hole.*** *. . . A typical pull section fabrication site plan is shown in Figure 3* [see **Figure 9**]. *Where possible, we recommend obtaining workspaces of similar dimensions to accommodate HDD pipe side operations on the ACP Project.* [20]

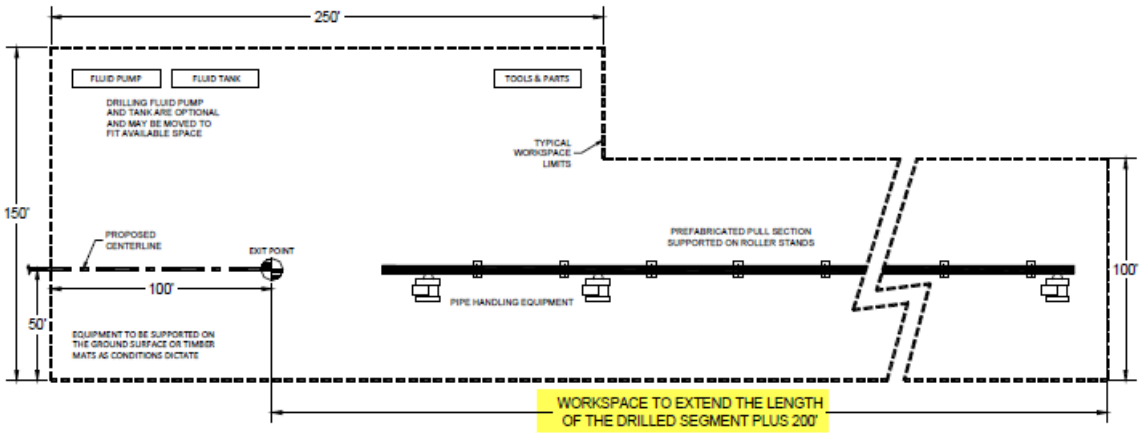

Figure 3. Typical Pull Section Fabrication Site Plan

FIGURE 9 – Recommended exit-side and pullback pipe fabrication workspace.

The length of the drilled segment for Dominion's proposed HDD is 4,639 feet. The recommended pullback segment would thus be 4,839 feet. However, as indicated in the DEIS, the length of the workspace available for staging the pipe pullback is only about 3,000 feet, which makes fabrication, hydrostatic testing, and pullback of the recommended single continuous pipe string impossible.

Figure 10 shows the exit-side and pullback area for the proposed HDD on western slope of the Blue Ridge.

[20] HDD Design Report, Revision 2, Atlantic Coast Pipeline, prepared by J. D. Hair and Associates, Inc., page 6, 12/14/14. Submitted to FERC by Dominion, 1/10/17. (emphasis added)

Photo by Malcolm Cameron

FIGURE 10 – Exit-side for the proposed HDD. The pullback workspace for the HDD operation would extend from the western slope of the main Blue Ridge crest in the background. This photo was taken from Torry Ridge Trail above the Sherando Lake Recreation Area in the George Washington National Forest.

4.2 Lack of Geophysical Characterization Increases Risk of Failure

It is possible for HDD operations to fail, primarily due to encountering unexpected geologic conditions during drilling or if the pipe were to become lodged in the hole during pullback operations.[21]

Detailed investigation of geophysical conditions is thus standard practice for assessing the feasibility of prospective HDD operations. The DEIS includes the following assurance:

Atlantic has completed geotechnical subsurface borings at the HDD crossing location and has confirmed its expectations that the drill path would be primarily through solid rock approximately 800 feet below the BRP and the AT. Drilling through solid rock, while a time-

[21] Description of Proposed Action. Included in the DEIS, Volume I, Section 2, page 2-40, 12/30/16.

consuming process, significantly helps to ensure the success of the drill operation due to the avoidance of rock fragments and cobbles that can disrupt or block the drill pathway.[22]

This statement is not supported by information included in the DEIS nor in documents published in the FERC docket. In fact, Dominion has obtained surprisingly little geotechnical information specific to the proposed HDD or contingency DPI drill paths.

Based on the information submitted to FERC by Dominion, only two subsurface borings were completed for the proposed HDD, and both were at a lower elevation than the proposed HDD drill path. The only direct physical measurement of geotechnical properties or groundwater in the HDD area was provided by these borings. There were no subsurface borings in the area of the contingency DPI. Additional investigation using geophysical survey methods was limited to areas close to the HDD entry and exit points, covering only a small part of the projected drill path.

The locations of the two subsurface borings and other geophysical surveys for the HDD are indicated in **Figure 11**.

Neither the borings nor the geophysical surveys were focused on the full length of the proposed drill path, and none of the information obtained through borings or geophysical surveys confirms *"that the drill path would be primarily through solid rock."* The results of these investigations instead reveal a high degree of uncertainty concerning geotechnical properties of the drill path.

An 85-foot subsurface boring on the HDD entry (eastern) side is about 500 feet downslope and south of the entry point. A 108-foot boring on the HDD exit (western) side is about 650 feet downslope of the exit point. Both borings encountered thick surficial layers of unconsolidated material consisting of boulders, cobbles, gravel, sand, silt, and clay. The entry-side boring did not reach bedrock. The exit-side boring encountered highly fractured rock beginning at about 60 feet, but did not reach solid bedrock.[23]

In addition to the two subsurface borings, surface-based geophysical survey techniques were employed to evaluate geologic conditions associated with the proposed HDD operation. In addition to the near-surface unconsolidated material identified with the subsurface borings, the

[22] Contingency Plan for the Proposed Crossing of the Appalachian National Scenic Trail and Blue Ridge Parkway. Included in the DEIS, Volume II, Part 5, Appendix H2, 12/30/16.

[23] Geotechnical Site Investigation Report for Atlantic Coast Pipeline – Proposed Horizontal Directionally Drilled Crossing, Blue Ridge Parkway, Segment AP-1 MP 158 to 159, Virginia, prepared by Geosyntec Consultants, Inc., May 2016. Submitted to FERC by Dominion, 5/13/16.

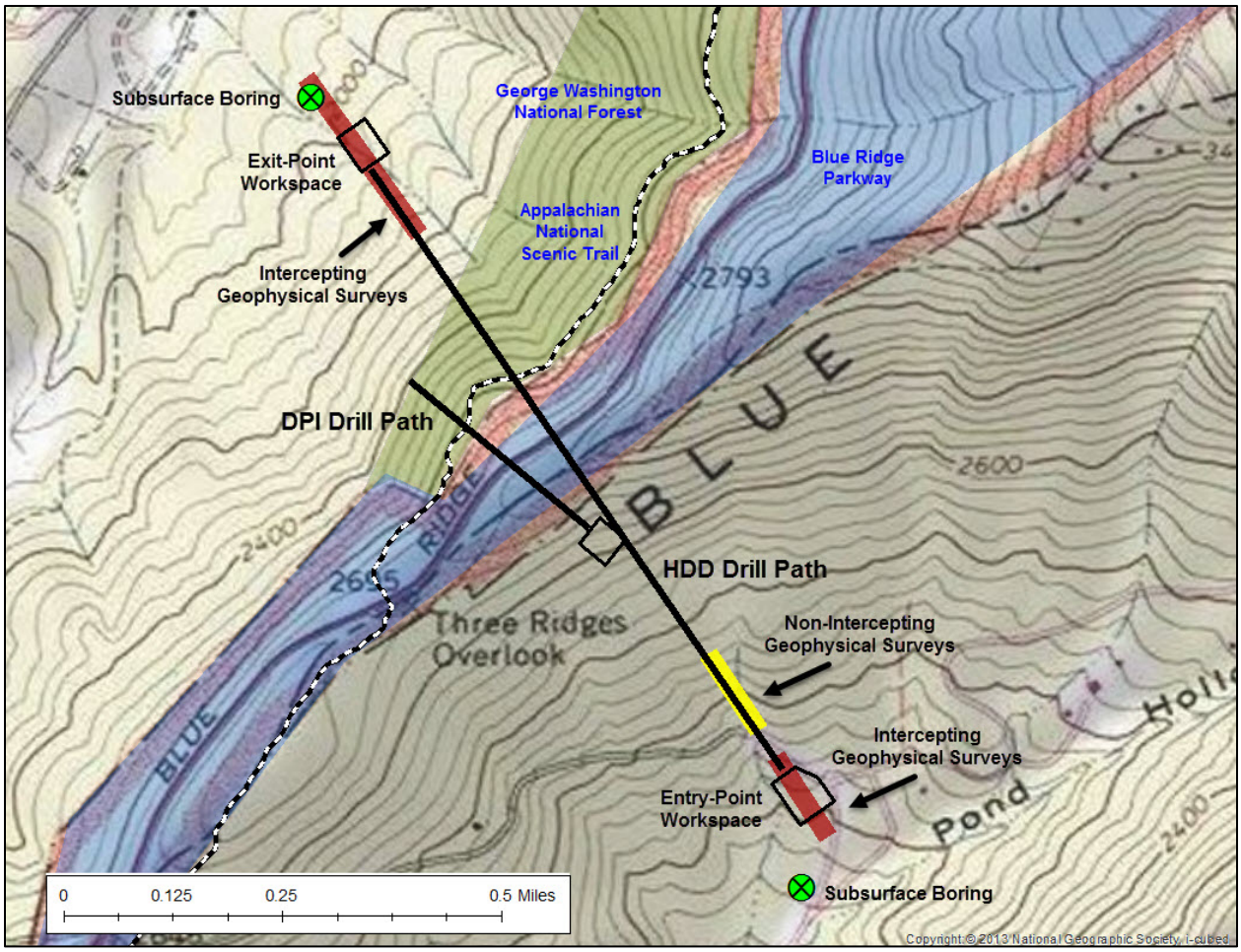

FIGURE 11 – Locations of subsurface borings and geophysical surveys conducted for the proposed Blue Ridge HDD crossing. From Geotechnical Site Investigation Report for Atlantic Coast Pipeline Horizontal Directionally Drilled Crossing, Blue Ridge Parkway, Segment AP-1 MP 158 to 159, Virginia, Geosyntec Consultants, Inc., May 2016.

Designation of geophysical surveys (intercepting or non-intercepting) refers to the depth of seismic refraction and electrical resistivity imaging in relation to the depth of the drill path. From Geophysical Study for a Proposed Blue Ridge HDD Crossing, Augusta and Nelson Counties, Virginia, ATS International, Inc., 4/12/16.

surveys indicated the presence of faulting and fractured rock at greater depth.[24] The survey results indicated that approximately 100 feet of fractured rock associated with a fault would be encountered at approximately 160 feet from the west-side exit point. Another fault of undetermined extent, was estimated to be present in the drill path beginning at approximately 425-550 feet from the ground surface at the east-side entry point.[25]

Figure 12 depicts the findings obtained through electrical resistivity and seismic refraction surveys.

Although the geophysical surveys served to confirm the presence of faulting and fractured rock in the projected HDD drill path, the information provided is limited in both scope and reliability No geotechnical information was obtained for more than 75% of the drill path. For the part of the drill path that was surveyed, the absence of representative subsurface borings precluded specific findings concerning the location of the faults, the geotechnical properties of the fault zones, or the presence and amount of associated groundwater.[26]

In fact, the geophysical services company that conducted and interpreted the surveys raised questions concerning the reliability of even its limited findings, stating:

. . . while three different geophysical methods were utilized in this study with the purpose of providing ample corroboration between the methods, all geophysical methods are interpretive, and the results presented in this report are provided with limited boring data with which to corroborate the geophysics. Additional boring and/or coring data would be necessary to confirm or refute these findings. Actual subsurface conditions may differ from those interpreted within this report.[27]

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[24] Geophysical Study for a Proposed Blue Ridge HDD Crossing Augusta and Nelson Counties, Virginia, prepared by ATS International, Inc., 4/12/16. Included in Geotechnical Site Investigation Report for Atlantic Coast Pipeline – Proposed Horizontal Directionally Drilled Crossing, Blue Ridge Parkway, Segment AP-1 MP 158 to 159, Virginia, prepared by Geosyntec Consultants, Inc., May 2016. Submitted to FERC by Dominion, 5/13/16.

[25] This corresponds to a major thrust fault at the contact between the primary bedrock formations in the area, the granitic Pedlar Formation and the basaltic Catoctin Formation. Faulting in the Pedlar and Catoctin Formations is extensive, with offsets ranging from hundreds to over 1,000 feet. (See Bartholomew, M. J. (1977). Geology of the Greenfield and Sherando Quadrangles, Virginia. Virginia Division of Mineral Resources, Commonwealth of Virginia)

[26] Interception of groundwater during an HDD operation can interfere with the circulation of drilling fluids, result in "*inadvertent return*" of drilling fluid to the surface, and disrupt or contaminate groundwater systems. The DEIS and information in the FERC docket addressed "*hydrofracture*" and loss of drilling fluids during HDD but did not address the potential for groundwater-related problems associated with fault zones in the Blue Ridge. Investigations have shown that faults in the Blue Ridge Province can yield significant quantities of water and may dominate the hydrology of the region. (See, for example, Seaton, W.J., and T.J. Burbey, 2004. Influence of Ancient Thrust Faults on the Hydrogeology of the Blue Ridge Province, *Groundwater* 43, No. 3:301-313.)

[27] Geophysical Study for a Proposed Blue Ridge HDD Crossing Augusta and Nelson Counties, Virginia, prepared by ATS International, Inc., 4/12/16. Included in Geotechnical Site Investigation Report for Atlantic Coast Pipeline – Proposed Horizontal Directionally Drilled Crossing, Blue Ridge Parkway, Segment AP-1 MP 158 to 159, Virginia, prepared by Geosyntec Consultants, Inc., May 2016. Submitted to FERC by Dominion, 5/13/16.

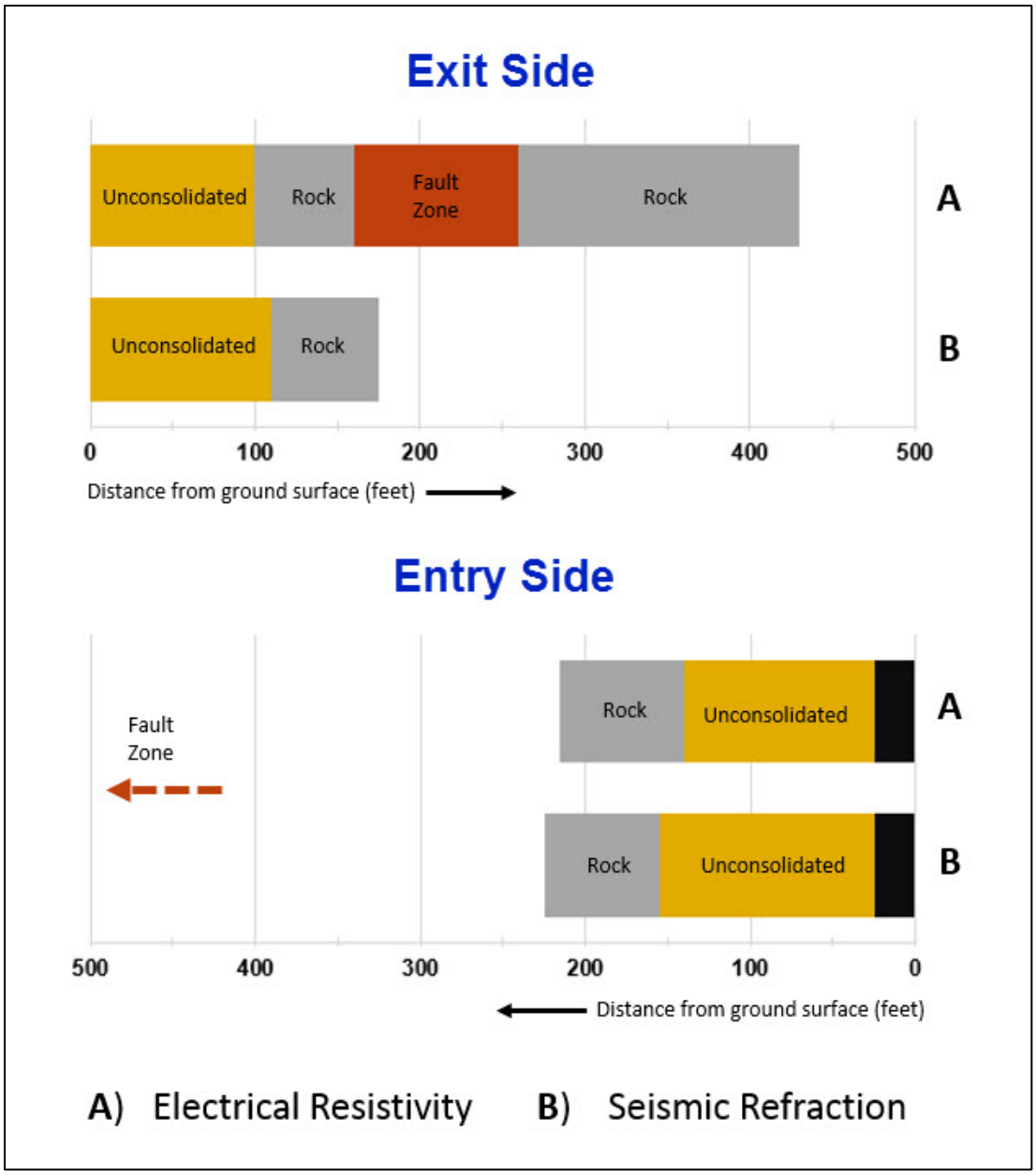

FIGURE 12 – Interpreted results of geophysical surveys conducted at the entry- and exit-sides of the proposed HDD drill path. (Based on Geophysical Study for a Proposed Blue Ridge HDD Crossing Augusta and Nelson Counties, Virginia, prepared by ATS International, Inc., 4/12/16.)

Results are shown for survey sections where imaging intercepted the projected drilling path. The fault zone in the entry-side section was estimated based on non-intercepting surveys, and was estimated to begin at 425-550 feet from the ground surface. The black-colored segments starting at the ground surface on the entry side indicate planned excavation. The total length of the projected drill path is 4,639 feet.

In other words, the company that performed the survey work cannot verify the accuracy of its interpretation.

This is consistent with the industry-recognized need for corroboration of information derived with geophysical techniques. A report prepared for a pipeline-industry research organization includes the following statement concerning the value of geophysical surveys:

Geophysical exploration techniques are sometimes employed, but, results are only moderately reliable and vary significantly depending on the number of exploratory borings available for correlation.[28]

The DEIS gave no consideration to the lack of substantive geologic data for the Blue Ridge HDD and DPI contingency proposals. Although the DEIS acknowledged that any Forest Service approval of ACP construction will be conditioned on successful completion of the Blue Ridge drilling, the DEIS did not address the risk factors at issue. The only risk-related information included in the DEIS was the misleading claim that subsurface borings provided confirmation that the drilling would primarily encounter solid rock.

Neither Dominion nor FERC have acknowledged the risk associated with the presence of fault zones and fractured rock deeper in the drilling path. Dominion's earlier submissions to FERC, however, acknowledged risks associated with the unconsolidated near-surface material.

Upon completion of the boring on the southeast end of the crossing in which bedrock was not encountered, there was a concern that the adverse alluvium may be so extensive that the feasibility of the proposed HDD installation would be questionable. However, the results of the boring on the northwest end of the crossing and the subsequent geophysical survey indicate that the adverse alluvial soils are not as extensive as initially feared. Based on that information, it is believed that bedrock can be reached within 90 to130 feet of both HDD endpoints which will allow for large diameter surface casings to be set from the endpoints to competent rock. The ability to set surface casings through the adverse soils significantly reduces the risk of the proposed HDD installation.[29]

Although the installation of large-diameter casings may allow the HDD operation to bypass the unconsolidated material covering the mountainside, the environmental issues related to the installation of casings are not addressed in the DEIS. These include the possible plan to conduct entry-side drilling from both sides of the mountain, a plan that was probably developed due to

[28] J.D. Hair and Associates, Inc., Pre-Construction Drillabillity Assessment for Horizontal Directional Drilling, prepared for the Pipeline Research Council International, Inc., 2008.

[29] HDD Design Report, Revision 2, Atlantic Coast Pipeline, prepared by J. D. Hair and Associates, Inc., page 6, 12/14/14. Submitted to FERC by Dominion, 1/10/17.

the difficulty of aligning the drill path with a distant exit-point casing.[30] It is also possible that Dominion will opt to remove the unconsolidated material rather than install casings. This would avoid the significant noise factor reportedly associated with this type of casing installation.[31] Although excavation on this scale would dramatically increase the footprint of the HDD operation, it is an option that Dominion reserved in plans submitted to FERC by indicating that excavation, if needed at the entry-point, will be "*determined by the contractor*."[32]

4.3 A Similar HDD Proposal Deemed Likely to Fail

Another proposed pipeline project, the Mountain Valley Pipeline (MVP), may cross the Appalachian National Scenic Trail and Peters Mountain in the Jefferson National Forest at the West Virginia-Virginia border. HDD was rejected as a crossing method due to site-specific engineering constraints.[33]

The 2016 DEIS for the proposed MVP project included the following statement:

Mountain Valley assessed the feasibility of HDD at the proposed ANST crossing area and reported that due to the topography of the area, the drill entry and exit areas exceeded recommended angles, thereby increasing the chance of HDD failure. . . . Substantial issues associated with topography and with a safe bending radius during pullback of the pipeline section (either in whole or in sub-sections) back through the bore hole also would increase the likelihood of HDD failure. Further, given the geology of the area, the use of drilling fluids under high pressure, and the likelihood of a high rock content and potential issues with keeping the borehole open prior to pipeline pullback, Mountain Valley concluded that HDD at this location was too likely to fail. We [FERC] *concur.*[34]

In response to earlier information requests from FERC, it was explained that:

Fabrication and pullback of the pipe in one continuous pullback is the preferred method for installing pipe by HDD. In analyzing the proposed exit side for HDD construction, the steep slopes on either side of the ANST lower the feasibility of an HDD. Due to the length of the proposed HDD and the sloping topography, long sections of pipe would have to be elevated to maintain a safe bend radius during the pullback phase. In addition, pipe pullback will likely have

[30] The plan for drilling from both sides of the mountain was revealed in correspondence to Mark H. Woods, Superintendent, Blue Ridge Parkway, from Leslie Hartz, Vice President, Atlantic Coast Pipeline, LLC, 10/21/16.
[31] Although Dominion has not provided specifics on the installation of endpoint casings, the noise levels associated with the equipment most often used to drive casings may not be acceptable. (See Going Deep with HDD, *World Pipelines*, October 2012 (Accessed at www.golder.com, 1/22/17).
[32] Site-Specific Horizontal Directional Drill Plans. Included in the DEIS, Vol. II, Part 5, Appendix H3, 12/30/16.
[33] Responses to Forest Service Comments on Final FERC Resource Reports, Mountain Valley Pipeline, LLC, 3/9/16, FERC Docket No. CP16-10.
[34] Alternates for Crossing the Appalachian National Scenic Trail. Included in the Mountain Valley Project and Equitrans Expansion Project, Draft Environmental Impact Statement, page 3-46, September 2016.

to be achieved in numerous sections, further complicating pullback operations. Based on these factors an HDD is not a feasible method for crossing the ANST.[35]

It's notable that FERC agreed with the MVP developer's assessment that the Peters Mountain HDD would be likely to fail. Examination of topographic and geologic maps suggests that geophysical conditions associated with the proposed Peters Mountain HDD operation, including the length of the drill path, slope steepness, rock content, and resulting pullback issues are similar to those of the proposed Blue Ridge HDD operation.

Given the significance of the decisions, an objective comparison of the conditions that led to opposite conclusions concerning the feasibility of the proposed MVP Peters Mountain and ACP Blue Ridge HDD operations is needed.

5.0 EROSION, RUNOFF, AND SLOPE STABILITY ISSUES

Despite the extensive steep-slope excavation that will be required for the proposed Blue Ridge HDD, the DEIS does not include site-specific details concerning erosion and sediment control, stormwater management, and slope-failure prevention. This is the case for the broader ACP project, as well as for the Blue Ridge HDD location.

Figure 13 shows slope classes for the pipeline corridor, workspaces, pullback area, and access roads in the Blue Ridge HDD and contingency DPI areas.

Dominion proposes to wait until after completion of environmental review, until after permitting, or until after initiation of construction to provide specific plans and identify engineering solutions for the range of significant geohazard and water-related problems that confront the ACP project. This delay in planning and analysis undermines the regulatory review process, as it will not provide the agencies with the information needed for responsible permitting decisions. It also denies the public an opportunity to review and comment on the actual project.

5.1 Regulatory System Dysfunction

Dominion is developing what it calls a "*Best in Class Program*" to address geohazards in the proposed pipeline corridor. This Best in Class Program will convene a team of subject-matter experts to identify hazards and design mitigation measures.[36] However, Dominion has not

[35] Responses to FERC Post-Application Environmental Information Request #3, Mountain Valley Pipeline, LLC, 7/28/16, FERC Docket No. CP16-10

[36] Draft Construction, Operations, and Maintenance Plans, prepared by ERM, August 2016. Submitted by Dominion to the U.S. Forest Service and FERC, 8/22/16. Included in the DEIS, Vol. II, Part 5, Appendix G, 12/30/16.

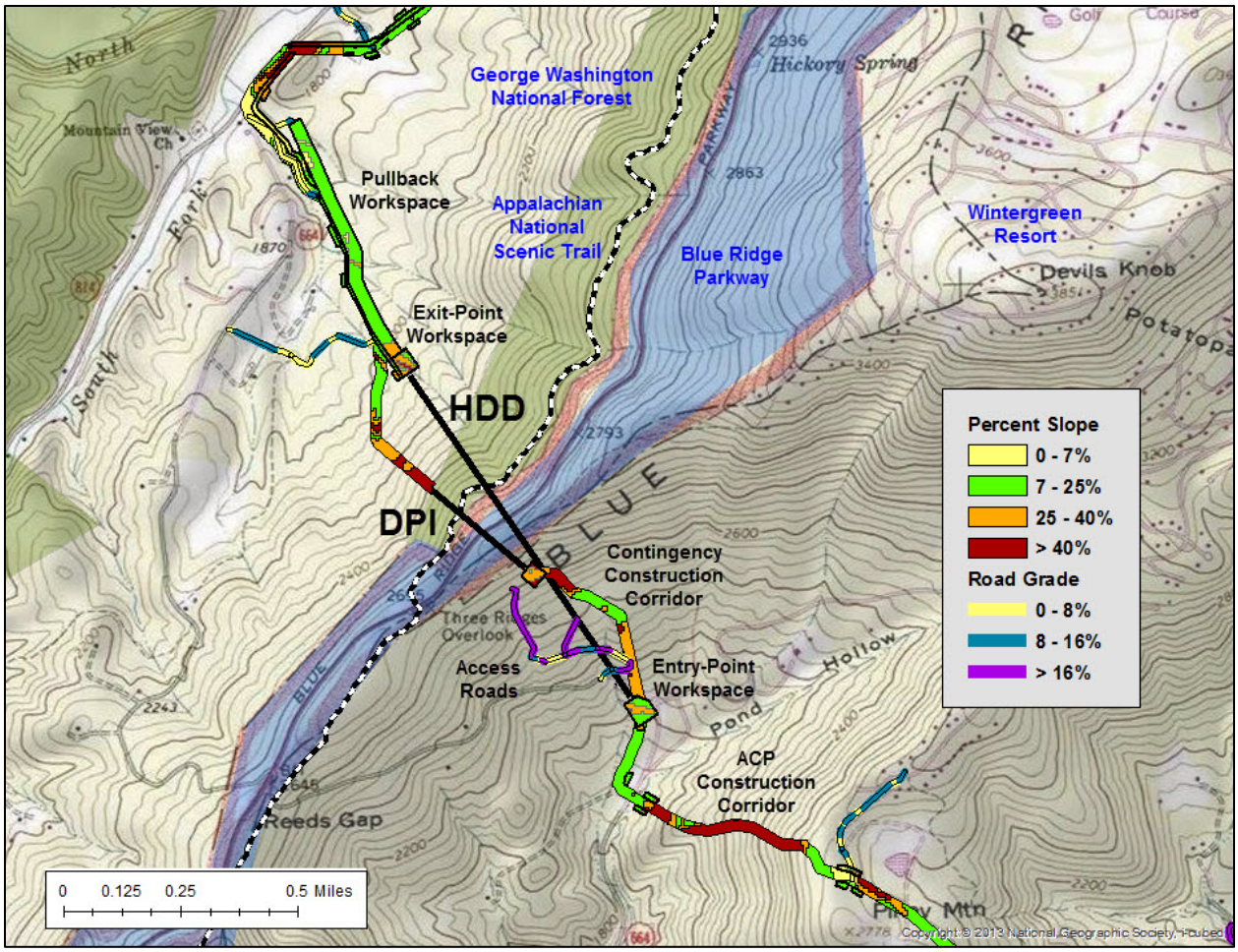

FIGURE 13 – Construction-area slope and access-road grade classification for the Blue Ridge HDD and contingency DPI operations area.

- Slope classification for the corridor and workspace areas is based on the following spacing criteria for right-of-way or runoff diversions (Virginia Erosion and Sediment Control Handbook, 1992).

SLOPE	REQUIRED SPACING
7 – 25%	75 feet
25 – 40%	50 feet
>40%	25 feet

- Slope classification for access-road gradients is based on the following design requirements for oil and gas roads (Surface Operating Standards and Guideline for Oil and Gas Exploration and Development, Bureau of Land Management and U.S. Forest Service, 2007).

  The gradient should fit as closely as possible to natural terrain. . . . The gradient should not exceed 8 percent except for pitch grades (300 feet or less in length) in order to minimize environmental effects. In mountainous or dissected terrain, grades greater than 8 percent up to 16 percent may be permissible with prior approval of the surface management agency.

completed the related field surveys, geotechnical studies, and geohazard analyses.[37] FERC is evidently willing to accept deferral of this critical data gathering, analysis, and planning until after environmental review and permitting. FERC simply recommends completion of the work and submission of results "*prior to construction*."[38] This approach relies on the presumption that practicable control technologies are available for mitigation of the most-extreme geohazards that confront the ACP. It precludes any possible conclusion that the risks are insurmountable or unacceptable.

FERC routinely dismisses concerns about erosion, sedimentation, and runoff control based on the expectation that pipeline construction will comply with its Plans and Procedures.[39] These are one-size-fits-all guidelines that identify mitigation measures for minimizing impacts of pipeline construction, including erosion and impacts to water resources.

FERC has not been responsive to concerns that the central Appalachian region presents a set of geophysical and hydrologic conditions that, in combination with the extreme earth disturbance required for the proposed ACP, present challenges that are not adequately addressed by the generic Plans and Procedures. The DEIS did not address scoping comments that called on FERC to identify scientifically objective and quantitative evidence that the Plans and Procedures requirements are sufficient to prevent water resource impacts during and after construction of the ACP.[40] Given this failure to consider substantive concerns, there is no reason to expect a more-objective analysis of geohazard and water resource issues prior to FERC's final decision on the project.

Virginia natural resource agencies may also prove ineffectual with respect to oversight of the ACP. The Department of Environmental Quality (DEQ) has the primary responsibility for ensuring that pipeline construction projects comply with state erosion and sediment control (ESC) and stormwater management (SWM) requirements. A regulatory system investigation in 2014 revealed basic problems with DEQ oversight of pipeline projects.[41] Deficiencies included:

[37] DEIS, Vol I, Executive Summary, page ES-4, 12/30/16.
[38] DEIS, Vol I, Conclusions and Recommendations, page 5-2, 12/30/16.
[39] Upland Erosion Control, Vegetation, and Maintenance Plan, FERC, 2013; Wetland and Waterbody Construction and Mitigation Procedures, FERC, 2013. (Accessed at www.ferc.gov/industries/gas/enviro, 1/22/17)
[40] Dominion Pipeline Monitoring Coalition, 6/2/16. Submitted in response to the Supplemental Notice of Intent to Prepare an Environmental Impact Statement and Proposed Land and Resource Plan Amendment(s) for the Proposed Atlantic Coast Pipeline, Request for Comments on Environmental Issues Related to New Route and Facility Modifications, and Notice of Public Meetings. Published by FERC, 5/1/16.
[41] The investigation was conducted by the Dominion Pipeline Monitoring Coalition through a series of Freedom of Information Act requests and meetings with agency officials. See http://pipelineupdate.org/case-study-no-1/.

- Failure to require submission of Annual Standards and Specifications by pipeline construction companies.[42]
- Failure to require submission of site-specific ESC plans for pipeline projects.
- Failure to inspect pipeline construction projects except in response to complaints.

In addition, it was revealed that the DEQ routinely grants variances to the minimum ESC standard that limits open-trench segments to no more than 500 linear feet, a critical requirement for large pipelines on steep mountainsides.[43] See **Figure 14**.

There is some recent evidence of improvement in DEQ's program. After a several-year gap in submissions, Annual Standards and Specifications were submitted to DEQ by Dominion in 2016.[44] It has also been reported that Dominion will finalize ESC plans for the entry and exit locations for the Blue Ridge HDD in March of 2017.[45] There are still many unresolved issues, however, concerning state natural resource agency oversight of pipeline construction. Some of the significant issues that apply to the ACP, as well as to the proposed Blue Ridge HDD, are described briefly below.

- **401 Certification.** The Clean Water Act (CWA) assigns two obligations to the state in regulating pipelines that require federal approval. First, the state must certify that federal and state water quality requirements will be met. Second, the state must provide for public involvement in the process. The state has a duty under CWA section 401 to rule against the ACP unless "*there is a reasonable assurance that the activity will be conducted in a manner which will not violate applicable water quality standards*."[46] It is not clear that the state will conduct the review necessary to make this determination or if the public will be provided a meaningful opportunity for involvement in the process.[47]
- **Stormwater Management.** Dominion contends in its Annual Standards and Specifications that the ACP is exempt from stormwater management regulations and permit requirements because the project will not alter the long-term runoff properties of the construction

[42] Although most construction projects are under the jurisdiction of local ESC authorities, pipeline construction companies are instead subject to Annual Standards and Specifications for ESC and SWM, with oversight by the DEQ.
[43] Virginia Erosion and Sediment Control Regulations (9VAC25-840-40), 2013. (Accessed at http://law.lis.virginia.gov/admincode/title9/agency25/chapter840/section40, 1/22/17).
[44] 2016 Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management for Construction and Maintenance of Pipeline Projects in Virginia, Dominion Transmission, Inc., February 2016.
[45] Indicated in correspondence to Mark H. Woods, Superintendent, Blue Ridge Parkway, from Leslie Hartz, Vice President, Atlantic Coast Pipeline, LLC, 10/21/16.
[46] 40 CFR § 121.2(a)(3) (1993)
[47] Virginia Secretary of Natural Resources, Molly Ward, has indicated that the DEQ is evaluating the scope of its authority for this review. Correspondence with Dominion Pipeline Monitoring Coalition, 8/23/16.

Forest Service photo

FIGURE 14 – A comparatively small 2014 pipeline replacement project in the Jefferson National Forest on Peters Mountain in Giles County, Virginia. A variance to the 500-foot open trench limit was requested for this project. Although slopes exceeded 40%, the DEQ approved the variance request, allowing a 2,000-foot open trench. No water interceptor diversions were installed during trenching. Following a rain event that occurred shortly before the above photo was taken, a Forest Service employee described having "*never seen that much sediment move off site before*." A case-study report is posted at www.pipelineupdate.org/case-study-no-1/.

The Dominion Pipeline Monitoring Coalition conducted a study of open-trench variance requests for pipeline construction projects in Virginia. Fifteen variance requests were submitted between January 2011 and July 2014, and all were approved. The authorized open-trench lengths ranged between 800 feet and 15 miles, with an average length of 2.3 miles. Nothing was discovered in DEQ documents to indicate that an analysis was conducted to ensure that these variances would not cause illegal discharges and water quality degradation.

corridor.[48] Regardless of this assertion, SWM plans are required by regulation for all construction projects that disturb five or more acres.[49]

- **Erosion and Sediment Control.** Dominion has indicated that site-specific ESC plans will be submitted to the DEQ prior to construction, and that stakeholders will have an opportunity to review these plans and provide comment to the DEQ.[50] The level of detail and sufficiency of these plans remains to be seen. The plans were not available in the DEIS, and unless they are made available during the state's CWA section 401 review, the public will be denied the right to review and make informed comments.

- **Open-Trench Limits.** Dominion intends to seek variances to the open-trench limit from the DEQ.[51] This will exacerbate runoff control problems on steep slope sections of the pipeline corridor such as areas adjacent to the proposed Blue Ridge HDD. Dominion has argued that the open-trench limit increases the amount and period of disturbance for pipeline construction. However, an open trench prevents compliance with the required installation and spacing of erosion and sediment control structures that intercept and divert runoff on steep slopes.[52]

  The spacing criteria for right-of-way or runoff diversions, for example, are listed above (see **Figure 13**). These diversions, which must be constructed completely across the disturbed part of the right-of-way, are intended to prevent downslope runoff and erosion and offsite transport of sediment.

  Based on the slope and length of the disturbed areas, about 45 runoff diversions would be required on the exit-side of the proposed HDD operation. About 80 runoff diversions would be required on the steep western side of Piney Mountain adjacent to the HDD operation. These runoff diversions cannot be properly designed, installed, and maintained in combination with long open trenches.

- **Access Road Oversight**. It is not clear whether the DEQ or localities will assume responsibility for ESC and SWM plan review and compliance oversight for construction of ACP access roads. In many areas, including the Blue Ridge HDD area, an extensive system of access roads is proposed. Many of the proposed roads are located on steep slopes, many will require significant excavation, and many will cross or be in close proximity to streams. These roads will be used for hauling heavy equipment and pipe.

  The grade of the access road leading up to the entry-point workspace for the contingency DPI operation greatly exceeds recommendations for roads associated with natural gas

[48] 2016 Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management for Construction and Maintenance of Pipeline Projects in Virginia, Dominion Transmission, Inc., February 2016.
[49] Virginia Stormwater Management Program Regulations (9VAC25-870-10), 2014. (Accessed at http://law.lis.virginia.gov/vacode/title62.1/chapter3.1/section62.1-44.15:28/, 1/22/17.
[50] Indicated in correspondence to Mark H. Woods, Superintendent, Blue Ridge Parkway, from Leslie Hartz, Vice President, Atlantic Coast Pipeline, LLC, 10/21/16.
[51] Resource Report 1, General Project Description, Permit Table for Atlantic Coast Pipeline, Table 1.12-1, submitted to FERC by Dominion, September 2015.
[52] The required spacing of right-of-way or runoff diversions is based on slope, with closer spacing required on steeper slopes. See Virginia Erosion and Sediment Control Handbook, 1992.

development (see **Figure 13**). This particular access road includes a 1,300-foot segment with grades that are continuously above 25% and partly above 40%.

- **Trout Habitat Protection.** Virginia, West Virginia, and the Forest Service apply time-of-year restrictions on construction activities that may affect brook trout habitat. These restrictions apply to the cold-season months, October 1 through April 1, and are designed to protect native trout populations from siltation during the sensitive early-life-stage period. Dominion intends to seek waivers in order to proceed with winter-time construction. If these waivers are granted, many native brook trout streams will be harmed, including the South Fork of the Rockfish River, which would be crossed by the ACP using in-stream blasting below the entry-side workspace for the Blue Ridge HDD (**Figure 15)**.

FIGURE 15 – South Fork of Rockfish River, a native brook trout stream on the eastern side of the proposed Blue Ridge HDD operation.

The photo shows the location of the proposed ACP crossing, about 800 feet down the mountain from the HDD entry-side workspace. In-stream blasting is planned for this crossing.[53]

Construction across this stream in winter will require a waiver of time-of-year restrictions by the Virginia Department of Game and Inland Fisheries.

Photo by Lynn Cameron

[53] Waterbody Crossings along the Atlantic Coast Project. Included in the DEIS, Vol. III, Part 1, Appendix K-1, 12/30/16.

5.2 National Forest Stewardship

Before construction of the ACP on National Forest land can proceed, the Forest Service must grant construction orders and special use permits and amend the Land and Resource Management Plans for the Monongahela National Forest (MNF) and the George Washington National Forest (GWNF).

Although FERC has primary responsibility for conducting the required NEPA review for the proposed project, the Forest Service is responsible for decisions concerning pipeline construction on National Forest lands.[54] The Forest Service also has a duty to meet all NEPA requirements independently if FERC fails to do so. The Forest Service has indicated that it must follow the administrative review process established by federal law, and that its timetable will depend on receipt of necessary information, including data, analysis, and design criteria.[55] In contrast, FERC has sought to follow a fixed schedule and consequently has issued a DEIS that does not include information required by the Forest Service. Dominion, for its part, has sought an expedited review process and even a waiver of FERC regulations.[56]

The Forest Service has repeatedly requested information about the ACP that Dominion has persistently failed to provide. As stated in Forest Service correspondence with FERC, much of this missing information is needed for evaluation of risks and mitigation options.

The Forest Service, to the extent necessary, will develop avoidance, minimization, and mitigation strategies on National Forest System lands that would be affected by the proposed Atlantic Coast Pipeline Project. A number of effects have not been analyzed due to outstanding data and analyses. Without having all of the information requested for the project, the Forest Service cannot provide detailed comments on potential avoidance, minimization, and mitigation strategies.[57]

The need for informed evaluation of risks and mitigation options extends to other areas in the route of the proposed ACP project, as well as to the National Forests. By insisting on receipt of critical information and analysis as a prerequisite for decisions on the project, the Forest Service is meeting its own obligations and demonstrating an appropriate standard of review for other permit-granting agencies and the concerned public.

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[54] Notice of Availability of the Atlantic Coast Pipeline Project and Supply Header Project Draft Environmental Impact Statement and the Forest Service Draft of Associated Land and Resource Management Plan Amendments, USDA Forest Service, Federal Register, Vol. 82, No. 4, 1/6/17.

[55] Forest Service submission to FERC, 12/13/16.

[56] Amendment to Application of Atlantic Coast Pipeline for a Certificate of Public Convenience and Necessity and Blanket Certification. Submitted to FERC by Dominion, 3/11/16.

[57] Forest Service submission to FERC, 12/13/16.

Some of the ACP project information that the Forest Service requires is directly relevant to the proposed Blue Ridge HDD.

- **High-Hazard Locations.** The Forest Service has repeatedly raised concerns about the high-hazard conditions that the ACP would encounter in the central Appalachian region.

  . . . difficult situations include steep slopes, presence of headwater streams, geologic formations with high slippage potential, highly erodible soils, and the presence of high-value natural resources downslope of high hazard areas . . . exacerbated by high annual rates of precipitation and the potential for extreme precipitation events.[58]

  As described above (see **Section 5.1**), Dominion proposed a "*Best in Class Program*" that defers critical data gathering, analysis, and planning until after environmental review and permitting. For the purpose of informing a preliminary determination of Forest Plan consistency, the Forest Service asked Dominion to instead demonstrate that the ACP can be built without unacceptable risk of resource damage (1) by documenting the effectiveness of control methods and (2) by developing site-specific stabilization designs for selected areas that present high risks for slope failure, slippage, erosion, and sedimentation.[59] Only limited information has been provided in response to this request.

  One of the high-hazard areas selected for site-specific analysis is in the GWNF on the western slope of the Blue Ridge near ACP mile post 155, about two miles north of the pullback workspace for the proposed HDD (see **Figure 16**). Similar high-hazard conditions are present in the proposed HDD area. Based on geologic and topographic factors associated with slope failures in the region, the geohazard risks may be even more extreme in the HDD operations area.[60] Dominion identified the area as susceptible to debris flow hazards.[61]

- **Stormwater Management.** Dominion contends that preparation and implementation of post-construction stormwater management are not required for the ACP on National Forest lands because areas disturbed by pipeline-related construction will be restored to pre-development runoff condition.

  . . . *forest/open space or managed turf will be returned to a vegetative state and characteristics of stormwater runoff should remain unchanged. Therefore, post-construction stormwater management will not be required . . . .*[62]

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[58] Forest Service submission to FERC, 10/24/16.

[59] U.S. Forest Service Request for Site-Specific Design of Stabilization Measures in Selected High-Hazard Portions of the Proposed Atlantic Coast Pipeline Route. Submitted to FERC by the Forest Service, 10/24/16.

[60] Many of the debris-avalanches and landslides that occurred in the 1969 Hurricane Camille catastrophe were associated with the type of granitic and basaltic rock, saprolite, and soil present in the proposed HDD operations area. See Bartholomew, M. J., 1977. Geology of the Greenfield and Sherando Quadrangles, Virginia. Virginia Division of Mineral Resources, Commonwealth of Virginia

[61] Geohazard Analysis Program Phase 2 Report, Atlantic Coast Pipeline and Supply Header Project, prepared by Geosyntec Consultants, Inc., Table 3-2, August 2016. Submitted to FERC by Dominion, 8/2/16.

[62] Construction, Operations, and Maintenance Plans, Draft, Prepared by ERM, August 2016. Submitted by Dominion to the U.S. Forest Service and FERC, 8/22/16. Included in the DEIS, Vol. II, Part 5, Appendix G, 12/30/16.

Photo by DPMC Pipeline Air Force

FIGURE 16 – One of the high-hazard areas selected for site-specific analysis by the Forest Service is located in the Back Creek watershed near the center of this photo. The HDD pullback area for the proposed ACP would extend from the western slope of the Blue Ridge in the foreground. The ACP would follow Back Creek northward and turn west across the Shenandoah Valley in the distance. Back Creek is identified as a Priority Watershed in the Forest Plan for the GWNF, a designation that places a priority on evaluation of proposed actions that could affect water quality.

This is the same argument made in Dominion's 2016 Annual Standards and Specifications submission to the Virginia DEQ.[63] Dominion further argues in its submission to the Forest Service that regulatory agencies in both Virginia and West Virginia recognize that construction of aboveground and underground linear utilities "*may not result in changes*" to the post-development runoff characteristics of the land surface.

The Forest Service responded to this argument by asking for specific documentation that justifies not considering post-construction stormwater management measures.

[63] 2016 Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management for Construction and Maintenance of Pipeline Projects in Virginia, Dominion Transmission, Inc., February 2016.

*While it is true that the ACP pipeline as proposed **may not** create a significant increase in impervious surface along the majority of its route, there will be significant permanent changes to the vegetative composition of the pipeline corridor, as well as potential changes to soil compaction and other environmental conditions. These changes together will have a measureable impact on the ability of the land within the pipeline corridor to intercept, absorb, and retain both aboveground and belowground flow.*[64]

- **Open-Trench Limits**. Dominion has advised the Forest Service of its intention to seek a variance to Virginia's open-trench limit.

  The Virginia Erosion and Sediment Control Law Minimum Standard 16a requires that no more than 500 feet of trench remain open at one time. However, this requirement would significantly slow construction and increase the amount of time the work area remains disturbed. In accordance with 9 VAC 25-870-50, Atlantic will request that DEQ waive Minimum Standard 16a.[65]

  The Forest Service responded that Dominion has not presented proof that the open-trench limit causes a significant increase in disturbance and construction time in steep mountainous terrain, citing a recent example on National Forest land where the result was unacceptable.

  *This standard is in place to help minimize erosion and sedimentation. Unknown to the USFS, a waiver was granted for the Celanese pipeline replacement, and there was excessive erosion and sedimentation at this location following a heavy rain event. **Such a waiver would not be allowed on NFS lands**. . . . Construction practices shall be planned in such a manner that the minimum standard 16a is met. . . . No variance shall be granted on NFS lands without site specific approval by a USFS AO* [Authorized Officer] *prior to implementation.*[66]

  The cited Celanese pipeline replacement project is described in **Figure 14.**

- **Access Road Oversight.** The Forest Service has clearly indicated that ESC plans will be required for ACP access roads in the National Forest, including new, upgraded, and reconstructed roads. Detailed soil surveys will be required to ensure that access roads are designed to support the anticipated level of use. Additional information, including analysis of cut and fill slopes will be required to assess the potential for road construction to impact slope stability.[67] This level of investigation and planning may not be required for ACP access roads that are not in the National Forest. As indicated in **Section 5.1**, it is not clear whether state or local-level government will be responsible for ESC plan review and compliance oversight for access roads associated with the proposed Blue Ridge HDD and contingency DPI operations. It is also not clear, given the extreme gradients, how these roads can be constructed in compliance with accepted standards.

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[64] Forest Service Comments on the Construction, Operation, Maintenance Plan for the Proposed Atlantic Coast Pipeline Project. Forest Service submission to FERC, 11/10/16. (emphasis added)

[65] Construction, Operations, and Maintenance Plans, Draft, Prepared by ERM, August 2016. Submitted by Dominion to the U.S. Forest Service and FERC, 8/22/16. Included in the DEIS, Appendix G, 12/30/16.

[66] Forest Service Comments on the Construction, Operation, Maintenance Plan for the Proposed Atlantic Coast Pipeline Project. Forest Service submission to FERC, 11/10/16.

[67] Ibid.

6.0 CONCLUSION: AVOID A BAD OUTCOME

The primary purpose of this report was to examine the identifiable risk factors associated with the drilling proposal. Given the topographic and geophysical challenges at the site, plus the insufficient investigation of the drill path, it is reasonable to conclude that the risks are substantial. The Forest Service condition that any authorization for ACP construction on National Forest lands would be conditioned on prior successful completion of the proposed HDD or DPI operations is thus clearly warranted.

As stated previously, the Forest Service condition will help avoid a situation in which a significant investment and resource commitment associated with premature ACP construction would be put at risk and in direct conflict with established legal protection of a highly valued public resource. Should the HDD and DPI prove impracticable after ACP construction is substantially underway and options for alternative routing are foreclosed, there will be a strong incentive for allowing an open-cut crossing of the ANST and the Blue Ridge Parkway. **Figure 17** shows the Blue Ridge Parkway area that aligns with the proposed ACP.

A secondary purpose of this report is to establish the need for a revised DEIS. The information provided in the published DEIS and in the project docket is insufficient to support evaluation of the proposed HDD and contingency DPI operations. The scope and degree of excavation required for the proposed drilling operations are not fully disclosed or considered, and the results of critical geophysical investigations have not been provided. Identification of geohazards and evaluation of mitigation measures have been deferred until later, precluding a meaningful opportunity for informed review of the project. Without this information, FERC cannot make objective decisions concerning the proposed project.

The published DEIS fails to meet the information and analysis needs of other governmental agencies that have permitting and oversight responsibilities related to the project, including:

1) **U.S. Forest Service.** The Forest Service is responsible for decisions concerning pipeline construction on National Forest lands, issuance of special use permits, and Forest Plan amendments. The Forest Service must follow an administrative review process established by federal law, and a timetable that depends on receipt of necessary information, including data, analysis, and design criteria. As described in this report (see **Section 5.2**), the published DEIS does not provide the information needed for assessment of risk to National Forest resources and evaluation of mitigation options. The DEIS does not satisfy the NEPA duties of the Forest Service.
2) **National Park Service.** The National Park Service relies on the NEPA review process for information related to Dominion's request for a right-of-way permit and a construction permit for the proposed HDD and DPI. As described in this report (see **Section 3.3**),

Photo by Lynn Cameron

FIGURE 17 – The Three Ridges Overlook area on the Blue Ridge Parkway. Any open-cut crossing would probably be in this area. The proposed ACP will cross under the Blue Ridge near this location, cross the South Fork of the Rockfish River in the valley below, and ascend steep-sided Piney Mountain in the middle distance.

misleading information has been submitted to the National Park Service concerning effects on perennial or intermittent streams. The DEIS does not address this discrepancy.

3) **U.S. Army Corps of Engineers.** The U.S. Army Corps of Engineers relies, in part, on the NEPA review process to inform its decisions concerning Clean Water Act Section 404 permit requirements for the ACP. The DEIS does not address the cumulative impact of multiple stream crossings and extensive in-stream and near-stream excavation. As described in this report (see **Section 3.3**), the DEIS does not address the impact of an extended period (a year or more) of continuous and intensive construction activity directly affecting multiple streams in the HDD and DPI operation areas.

4) **Virginia Department of Environmental Quality.** The DEQ is relying, in part, on the NEPA review process to inform its decisions concerning Clean Water Act Section 401 certification.[68] The DEIS, however, does not identify and assess the capability of available mitigation measures for prevention of water quality degradation during construction of the ACP. As described in this report (see **Section 5.1**), the DEIS compromises the NEPA process and fails to provide information needed by the DEQ by deferring identification of high-risk areas and engineering solutions until after NEPA review.[69]

The DEIS also fails to meet the information and analysis needs of non-government stakeholders, including:

1) **The Concerned Public.** The concerned public, which has an interest in effective implementation of environmental policy and protection of conservation values, has a right to informed participation in the NEPA review process. The DEIS for the ACP failed to provide critical information about the scope and impact of project that is required for effective participation in the review process (see **Sections 3.1 and 3.2**). The DEIS also failed to address substantive concerns that were raised by the public during the scoping period about the effectiveness of available mitigation options (see **Section 5.1**).

2) **Landowners in the Path of the ACP.** The most aggrieved of the stakeholders are the landowners whose property is in or near the path of the proposed ACP and its associated workspaces, staging areas, and access roads. Most rural property owners have a stewardship commitment to their land. For many, ownership of the land goes back for generations, and for others, land ownership was obtained through a lifetime of work. FERC approval of the ACP will grant Dominion the extraordinary power of eminent domain to cut forests, excavate for the construction corridor and workspaces, and build access roads, with long-term impacts on the land and landowners. The footprint of the Blue Ridge HDD and DPI operations, in particular, will be extreme. A poorly prepared DEIS does not serve the needs nor respect the interests of affected landowners.

3) **Dominion Partners and Investors.** Dominion's ACP partners and investors may be misinformed concerning the risk of failure and delay associated with the proposed Blue Ridge HDD. Annual reports submitted to the U.S. Securities Exchange Commission (SEC) by Dominion Resources, Inc. and its affiliates, for example, must disclose risk factors that

[68] Indicated in correspondence from Virginia Secretary of Natural Resource, Molly Ward, to David Sligh, Dominion Pipeline Monitoring Coalition, 8/23/16.

[69] Although the DEQ is relying, in part, on information provided through FERC's NEPA review process, the DEQ has an independent duty to conduct its own regulatory process, which includes a public comment opportunity, before it may issue a CWA section 401 water quality certification.

may affect company projects and the investors and partners with a stake in those projects. The information provided concerning risks associated with the ACP, however, is limited.

The 2015 report acknowledged: *The large diameter of the* [ACP] *pipeline and difficult terrain of certain portions of the proposed pipeline route aggravate the typical construction risks with which DTI* [Dominion Transportation, Inc.] *is familiar.*[70]

The 2016 report acknowledged: *Several of the Companies' key projects are increasingly large-scale, complex and being constructed in constrained geographic areas . . . or in difficult terrain (for example, the Atlantic Coast Pipeline Project).*[71]

Dominion's partners and investors would be well served by more-complete and accurate information concerning the issues that confront the ACP project, including the risk of failure and the unavoidable environmental damage associated with the proposed Blue Ridge HDD and DPI operations. The published DEIS, however, fails to provide that information.

[70] Annual Report Pursuant to the Section 13 or 15(d) of the Securities Exchange Act of 1934 for Fiscal Year Ended December 31, 2014 (Form 10-K), Dominion Resources, Inc., Virginia Electric and Power Company, Dominion Gas Holdings, LLC, 2015.

[71] Annual Report Pursuant to the Section 13 or 15(d) of the Securities Exchange Act of 1934 for Fiscal Year Ended December 31, 2015 (Form 10-K), Dominion Resources, Inc., Virginia Electric and Power Company, Dominion Gas Holdings, LLC, 2016.

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PROFESSIONAL FOCUS

Scientific investigation, analysis, and assessment contributing to the preservation of ecosystem integrity in the forested mountains of western Virginia and the central Appalachian region.

EDUCATION

M.S. (Environmental Sciences), University of Virginia, 1988

PRESENT POSITIONS

Program Coordinator, Dominion Pipeline Monitoring Coalition

Steering Committee Member, Allegheny-Blue Ridge Alliance

Board Member, West Virginia Highlands Conservancy

Senior Scientist, Department of Environmental Sciences, University of Virginia

SELECTED PROFESSIONAL EXPERIENCE

1988–2014	Projects Coordinator, Shenandoah Watershed Study and Virginia Trout Stream Sensitivity Study
2000–2012	Expert witness for the U.S. Department of Justice concerning effects of power plant emissions in the central Appalachian region (U.S. vs. Westvaco Corporation; U.S. vs. Ohio-Edison Corporation; U.S. vs. Illinois Power Corporation)
2009–2011	Consultant, Development of U.S. Forest Service National Protocols for Air Pollution Sensitive Waters (E & S Environmental Chemistry, Inc.)
2007–2010	Co-Principal Investigator, Water Quality Monitoring Plan Development for the Mid-Atlantic Network of the National Park Service
2005–2007	Member, National Research Council Committee on Environmental Impacts of Wind Energy Projects in the Mid-Atlantic Highlands
2000–2003	Co-Principal Investigator, National Park Service research project: Assessment of Air Quality and Air Pollutant Impacts in the Shenandoah National Park
1993-1999	Member (academic community representative), Technical Oversight Committee, Southern Appalachian Mountain Initiative
1997–1998	Co-Principal Investigator, Trout Unlimited research project: Current and Projected Status of Cold Water Fish Communities in the Southeastern United States in the Context of Continued Acid Deposition
1992-1995	Co-Principal Investigator, Shenandoah National Park: Fish in Sensitive Habitats Project (National Park Service)

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