

HABITAT ASSESSMENTS
FOR ROANOKE LOGPERCH (*PERCINA REX*)
ALONG THE PROPOSED MOUNTAIN VALLEY PIPELINE IN VIRGINIA.

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Submitted to:

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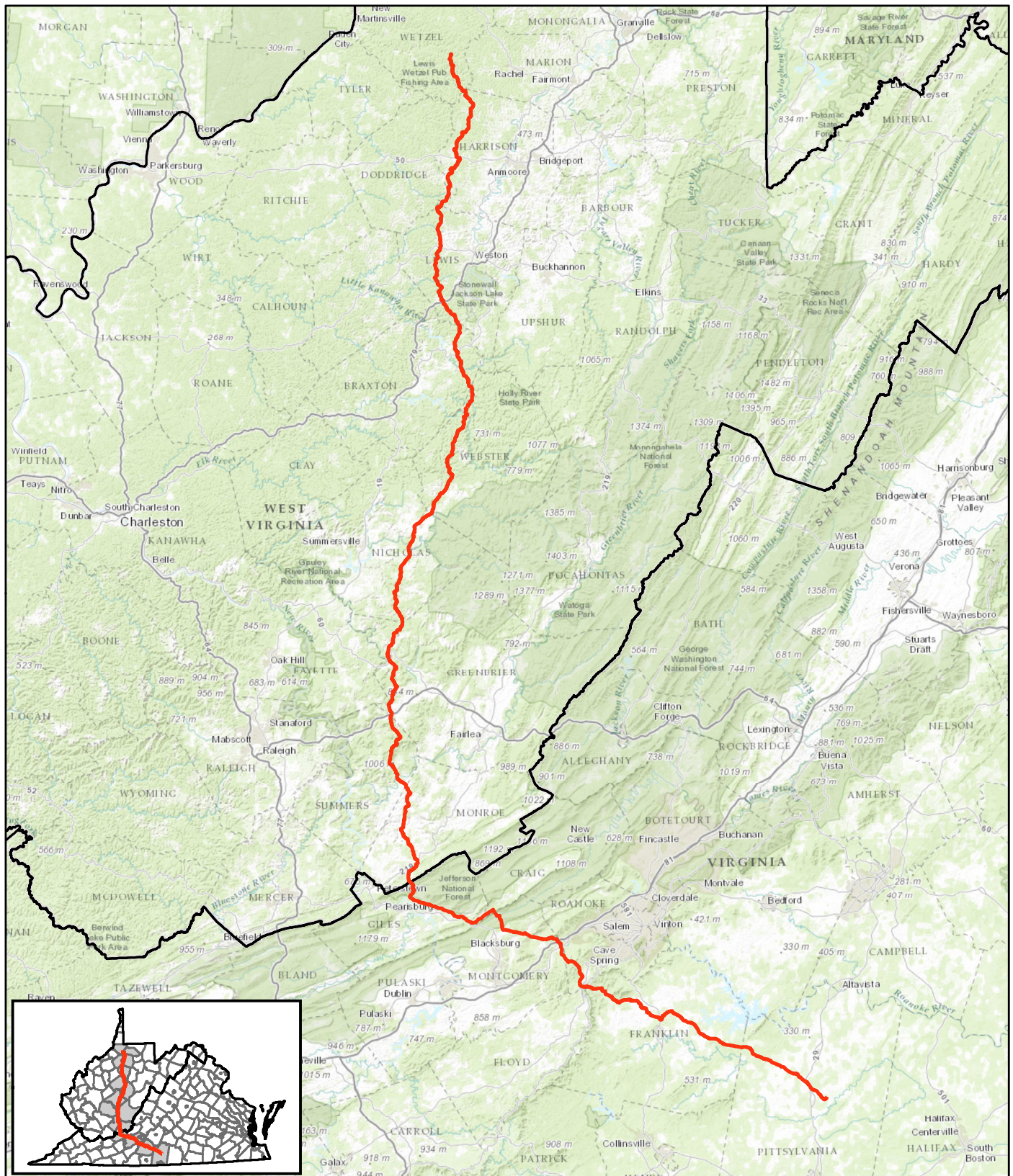
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1.0 Introduction and Project Description

Mountain Valley Pipeline, LLC (MVP), a joint venture of EQT Midstream Partners, LP, a subsidiary of NextEra Energy, Inc., WGL Holdings, Inc., Vega Energy Partners, Ltd., and RGC Midstream, LLC, plans to construct the Mountain Valley Pipeline (Project), an approximate 301-mile, 42-inch diameter natural gas pipeline, to provide timely, cost-effective access to the growing demand for natural gas for use by local distribution companies, industrial users and power generation in the Mid-Atlantic and southeastern markets, as well as potential markets in the Appalachian region. The Project will extend from the existing Equitrans, L.P. transmission system near Mobley in Wetzel County, West Virginia, to Transcontinental Gas Pipe Line Company, LLC's Zone 5 compressor station 165 in Pittsylvania County, Virginia (Figure 1). In West Virginia, approximately 195.5 miles of the pipeline is expected to cross Braxton, Doddridge, Fayette, Greenbrier, Harrison, Lewis, Monroe, Nicholas, Summers, Webster, and Wetzel counties. In Virginia, approximately 105.5 miles of the pipeline is expected to cross Craig, Franklin, Giles, Montgomery, Pittsylvania, and Roanoke counties. In addition, more than 53 miles of supporting access roads are proposed to be used or constructed along the Project in Virginia.

Several alternate routes were originally proposed for the Project in Virginia and West Virginia. The current route as proposed includes a permanent right-of-way (ROW) of 50 feet. This encompasses a total of 1,378.02 acres in West Virginia and 713.64 acres in Virginia. The width of the construction ROW is 125 feet which will temporarily impact an additional 2,861.21 acres in West Virginia and 1,344.66 acres in Virginia.

The Project traverses numerous watersheds that harbor both state listed and federally threatened and endangered aquatic species. Within Virginia, the Project traverses the Roanoke River basin, which is known to harbor the federally endangered Roanoke logperch (*Percina rex*) as well as the Virginia state-threatened orangefin madtom (*Noturus gilberti*). Environmental Solutions & Innovations, Inc. (ESI) was contracted to assist with determination of the impacts to fishes by the Project in Virginia. This document contains results of the desktop analysis and field survey efforts to address Project stream crossings within the known range of federally and state listed fishes in Craig, Giles, Franklin, Montgomery, Pittsylvania, and Roanoke counties, Virginia.



— Proposed Route 4.0.0 Alignment

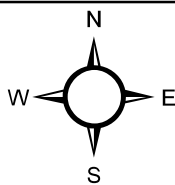


Figure 1. Location of the proposed Mountain Valley Pipeline Project in Virginia and West Virginia.

Project No.
593.14

20 0 20 40
Kilometers



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2.0 Regulatory Setting

2.1 Endangered Species Act

The Federal Endangered Species Act (ESA) [16 U.S.C. 1531 et seq.] was codified into law in 1973. This law provides for the listing, conservation, and recovery of endangered and threatened species of plants and wildlife. Under the ESA, the U.S. Fish and Wildlife Service (USFWS) is mandated to monitor and protect listed species.

Section 9 of the ESA prohibits the take of listed species unless otherwise specifically authorized by regulation. Take is defined by the ESA as, “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect” [16 U.S.C. 1532(19)]. USFWS further defines harm to include significant habitat modification or degradation [50 CFR §17.3] to the point where it actually kills or injures an individual or significantly impairs essential behavioral patterns, including feeding, breeding, and sheltering. Harassment is an intentional or negligent act or omission that creates the likelihood of injury by annoying an individual to such an extent as to significantly disrupt formal behavior patterns, which include but are not limited to breeding, foraging, and sheltering. Harassment does not cover habitat disturbing activities.

Section 7(a)(2) of the ESA states that each federal agency shall insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of designated critical habitat. Federal actions include (1) expenditure of federal funds for roads, buildings, or other construction projects, and (2) approval of a permit or license, and the activities resulting from such permit or license. Compliance is required regardless of whether involvement is apparent, such as issuance of a federal permit, or less direct, such as federal oversight of a state-operated program. Actions of federal agencies that do not result in jeopardy or adverse modification, but that could result in a take, must also be addressed under Section 7. Take by a federal agency can be authorized through the Section 7 consultation process, culminating in an Incidental Take Statement (ITS) by the USFWS. The take must be Incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

In 1982 amendments to the ESA, Congress established a provision in Section 10(a)(1)(B) that authorizes incidental take by nonfederal entities. To obtain an Incidental Take Permit (ITP), an applicant must submit a conservation plan specifying impacts that result in take and measures to minimize and mitigate those impacts.

Regardless of whether incidental take might be covered under Section 7 or Section 10, it is the obligation of the project proponent to avoid and minimize impacts to listed

species. If, through this process, take is avoided, then an ITS or ITP is not required. The initial step in avoidance and minimization is to determine whether suitable habitat and listed species are present.

2.2 Virginia Endangered Species Act

The Virginia Endangered Species Act (29.1-563 - 29.1-570) provides that Virginia Department of Game and Inland Fish (VDGIF) is the state regulatory authority over federally or state listed endangered or threatened fish and wildlife in the Commonwealth, defining fish or wildlife as “. . . any member of the animal kingdom, vertebrate or invertebrate, except for the class Insecta, and includes any part, products, egg, or the dead body or parts thereof.” It prohibits the taking, transportation, processing, sale, or offer for sale within the Commonwealth of any fish or wildlife listed as a federally endangered or threatened species, except as permitted by the Board of Game and Inland Fisheries for zoological, educational, scientific, or captive propagation for preservation purposes. State-listed species are provided the same protection per VDGIF Regulation 4 VAC 15-20-130.

The law further authorizes the Board of the VDGIF to adopt the federal list of endangered and threatened species, to declare by regulation that species not listed by the federal government are endangered or threatened in Virginia, and to prohibit by regulation the taking, transportation, processing, sale, or offer for sale of those species. Implementing regulations pursuant to this authority (4 VAC 15-20-130 through 140) further define “take” and other terms similarly to the federal ESA.

2.3 Initial Project Review

On 13 October 2014, MVP submitted letters introducing the Project to the USFWS Gloucester Field Office (USFWS GFO) and VDGIF. Correspondence with USFWS GFO (3 April 2015) and Virginia Department of Conservation and Recreation (VCNR) (6 April 2015) provided formal comments regarding the Project’s potential to impact federally listed species in the Project Area. The Project traverses streams within the Roanoke River drainage known to harbor federally endangered Roanoke logperch. This correspondence identified three waterbodies (i.e., North Fork Roanoke, Roanoke, and Pigg rivers) with known populations of Roanoke logperch; assumption of presence is required for these streams and therefore presence/absence surveys are not necessary. The agencies also recommended conducting habitat assessments in other perennial streams in the Roanoke River watershed within Montgomery, Roanoke, Franklin, and Pittsylvania counties. VDGIF deferred to USFWS GFO regarding waters potentially supporting threatened and endangered fishes. Agency correspondence is provided in Appendix A.

2.4 Regional Occurrence of Listed Fishes

The Project is within the range of the federally endangered Roanoke logperch and state threatened orangefin madtom. Ecological profiles of each species follow.

2.4.1 Roanoke logperch (*Percina rex*)

The Roanoke logperch was listed as a federally endangered species on 18 August 1989 (54 FR 34464). At the time of listing, the species was known from five populations in widely separated segments of the upper Roanoke, Pigg, Smith, Nottoway, and Meherrin rivers (USFWS 2003). In 2007, Roanoke logperch was found in two new watersheds of the Roanoke River, Goose Creek and Big Otter River, as well as in the mainstem of the Dan River near Eden, North Carolina (Lahey and Angermeier 2007). More recently, logperch were also observed in several tributaries to the Dan River within North Carolina, including the Big Beaver Island Creek, Cascade Creek, Mayo River, and Wolf Island Creek. All of the populations are geographically small and isolated with no genetic exchange among them because they are separated by large impoundments and wide river gaps of seemingly unsuitable habitat (USFWS 2003). In watersheds where the species is known to occur, logperch are patchily distributed among stream segments and among mesohabitats within segments, suggesting a complex preference for habitat at multiple spatial scales (Simonson and Neves 1986, Lahey and Angermeier 2007). Roanoke logperch typically inhabit medium-to-large (3rd to 6th order streams), warm, usually clear streams and small rivers of moderate to low gradient (USFWS 2003). Occupied streams within the Roanoke River system typically exhibit low siltation and light embeddedness, which heavy amounts can potentially inhibit foraging for food (Lahey and Angermeier 2007). Adult logperch in the Roanoke River are typically found in deep (>30 cm or 11.8 in), high velocity riffle and run habitats over coarse substrates (highest preference=cobble) with limited (<25% coverage) to no silt coverage (Ensign et al. 2000), while young and juveniles have been observed in slow runs and pools, where they are frequently observed over clean sand bottoms. Subadults in the Roanoke River are found in habitats intermediate in depth, with lower velocities than occupied by adults. Young of year (YOY) logperch are also found in low-velocity habitat, but are typically not observed in the Roanoke River thalweg. Instead, small individuals are found in shallow backwaters and river edges feeding over small patches of loosely embedded, silt-free gravel substrate. YOY have also been observed in interspecific shoals in the Roanoke River, an uncommon behavior in adult and subadult logperch (Rosenberger and Angermeier 2002). Common associates of the species include central stoneroller, bluehead chub, white shiner, crescent shiner, northern and Roanoke hogsucker, blacktip jumprock, torrent sucker, fantail darter, and Roanoke darter (Burkhead 1983).

2.4.2 Orangefin Madtom (*Noturus gilberti*)

Orangefin madtom is listed as a federal species of concern and Virginia state-threatened species. Two distinct populations occur within Virginia: a native population within the Roanoke River drainage and an introduced population within the James River drainage. VDCR identified both populations along the Project. The introduced population does not warrant a level of protection equal to that of the native population as indicated by the introduced population's exemptions defined in the

VDGIF time of year restrictions (TOYR) table (Appendix B). The table states TOYRs apply ‘Only in native range – not in the James River drainage, where it has been introduced.’ Within its native range (Roanoke River drainage), the orangefin madtom is a species that co-occurs, typically occupies similar mesohabitats, and is commonly associated with the Roanoke logperch (Burkhead 1983). Like Roanoke logperch, orangefin madtom has a narrow, specific range of suitable habitats, especially compared to other lotic species of the Roanoke. The species occupies small to large streams that are clear, unimpounded and have a moderate-gradient. In occupied streams the species can be observed in swift riffle habitats over coarse substrates. The species is less common in runs with similar substrates and is rarely found in shallow areas or over gravel substrates (Burkhead 1983). According to Burkhead, the species likely occupies swifter habitat than any other species within the genus *Noturus*. Orangefin madtom are specially adapted to occupy interstitial spaces amid large, silt-free substrates. Siltation might be one of the largest limiting factors for this species. In the Dan River, the species is only known from a limited area where silt has been trapped by upstream impoundments. (Jenkins and Burkhead 1994). Common associates of the orangefin madtom include the same species listed for the Roanoke logperch, with the addition of the riverweed darter and the Roanoke logperch itself. However, it should be noted that the Roanoke logperch is a common associate of the orangefin madtom but the orangefin madtom is not a common associate of the Roanoke logperch (Burkhead 1983). This suggests that the orangefin madtom possibly has stricter microhabitat requirements than the Roanoke logperch. Given these constraints, sites that are found unsuitable for Roanoke logperch are likely unsuitable for orangefin madtom as well. However, orangefin madtom is also known from a few smaller streams (e.g., Elliott Creek) that appear to be too small to host Roanoke logperch.

2.5 Study Plan Submission

A study plan outlining methods for habitat assessments and potential fish surveys was submitted to the USFWS GFO Office and VDGIF on 4 June 2015 and approved on 5 June 2015 (Appendix A).

3.0 Desktop Review and Analysis

A detailed desktop analysis using geographical information system (GIS – Esri ArcMap 10.3) is completed to identify potential occurrences of Roanoke logperch and orangefin madtom along the Project route (including access roads). Given that the habitat unsuitable to Roanoke logperch is also likely unsuitable for orangefin madtom, desktop and field assessments focused on identifying habitat suitable for

Roanoke logperch and therefore, the two species are singly referred to as Roanoke logperch, hereafter. All waterbodies traversed by the Project in the Roanoke River watershed are identified and preliminarily assessed for their potential to support Roanoke logperch including stream type (i.e., ephemeral, intermittent, or perennial), watershed size (e.g. stream order, upstream drainage area), known and existing available Roanoke logperch distribution data, and proximity to waterbodies with known or potential occurrences of Roanoke logperch. Stream order is calculated using the 1:24,000 high resolution National Hydrography Dataset, and upstream drainage area is calculated using a 30-m resolution digital elevation model from the National Elevation Dataset. These remotely sensed metrics are then used to identify areas possibly supporting Roanoke logperch.

The proposed Project traverses a large portion of the Roanoke River basin within the geographic distribution of the Roanoke logperch. Results of the desktop analysis identified a total of 44 perennial stream crossings with potential to support populations of Roanoke logperch (Table 1) within the counties of Montgomery, Roanoke, Franklin, and Pittsylvania. Of these, four crossings at three streams (Roanoke River, Pigg River, and North Fork Roanoke River [two crossing locations]) are known to support populations of Roanoke logperch. USFWS requested to assume presence of Roanoke logperch' in the three rivers therefore presence/absence surveys are not necessary (Appendix A). The remaining 40 stream crossings warrant habitat assessments to determine habitat suitability or potential presence for Roanoke logperch populations.

The proposed Project is dynamic in nature and has altered alignments. Habitat assessments were performed at numerous crossing locations of formerly proposed alignments that have since been eliminated. This document covers studies completed the currently proposed Project alignment; habitat assessments at eliminated alignments are not reported with the exception of those that may provide value to inaccessible stream crossing areas (i.e., land access restrictions).

Table 1. Streams within the Roanoke River Watershed with potential for Roanoke logperch and orange-fin madtom occurrence along the proposed Mountain Valley Pipeline Project and access roads in Virginia.

| County | Stream Name ¹ | Mile Post | Crossing Type ² | Field Assessment ³ |
|------------|------------------------------|-----------|----------------------------|-------------------------------|
| Montgomery | Mill Creek1 | 223.9 | Pipeline | HA |
| Montgomery | North Fork Roanoke River1 | 225.8 | Pipeline | Assume Presence |
| Montgomery | North Fork Roanoke River AR1 | 225.9 | AR | Assume Presence |
| Montgomery | Flatwood Branch | 228.1 | Pipeline | HA |
| Montgomery | Bradshaw Creek1 | 229.2 | Pipeline | HA |
| Montgomery | Bradshaw Creek AR | 230.0 | AR | HA |

| County | Stream Name ¹ | Mile Post | Crossing Type ² | Field Assessment ³ |
|--------------|---------------------------------------|-----------|----------------------------|-------------------------------|
| Roanoke | Roanoke River | 233.85 | Pipeline | Assume Presence |
| Roanoke | Bottom Creek AR1 | 239.3 | AR | HA |
| Roanoke | Bottom Creek AR2 | 239.6 | AR | HA |
| Roanoke | Bottom Creek | 240.4 | Pipeline | HA |
| Roanoke | Mill Creek2 | 243.0 | Pipeline | HA |
| Franklin | UNT1 North Fork Blackwater River | 246.85 | Pipeline | HA |
| Franklin | North Fork Blackwater River | 247.3 | Pipeline | HA |
| Franklin | UNT2 UNT2 North Fork Blackwater River | 247.3 | Pipeline | HA |
| Franklin | UNT3 UNT2 North Fork Blackwater River | 249.5 | Pipeline | HA |
| Franklin | Teels Creek 0.1 | 255.7 | Pipeline | HA |
| Franklin | Teels Creek0.2 | 256.7 | Pipeline | HA |
| Franklin | Teels Creek0.3 | 256.9 | Pipeline | HA |
| Franklin | Teels Creek0.6 | 257.85 | Pipeline | HA |
| Franklin | Teels Creek2 | 258.5 | Pipeline | HA |
| Franklin | Teels Creek3 | 259.3 | Pipeline | HA |
| Franklin | Teels Creek4 | 259.9 | Pipeline | HA |
| Franklin | Little Creek1.5 | 260.1 | Pipeline | HA |
| Franklin | Little Creek2 | 260.8 | Pipeline | HA |
| Franklin | Blackwater River1 | 262.8 | Pipeline | HA |
| Franklin | Blackwater River2 | 263.3 | Pipeline | HA |
| Franklin | UNT1 Maggodee Creek1 | 266.1 | Pipeline | HA |
| Franklin | Magoddee Creek1 | 266.6 | Pipeline | HA |
| Franklin | Blackwater River3 | 266.9 | Pipeline | HA |
| Franklin | Foul Ground Creek | 269.6 | Pipeline | HA |
| Franklin | Poplar Camp Creek | 271.6 | Pipeline | HA |
| Franklin | UNT1 Smith Mountain Lake | 273.2 | Pipeline | HA |
| Franklin | Owens Creek | 279.35 | Pipeline | HA |
| Franklin | Strawfield Creek | 279.5 | Pipeline | HA |
| Franklin | Parrot Branch | 280.2 | Pipeline | HA |
| Pittsylvania | Jonnikin Creek | 281.6 | Pipeline | HA |
| Pittsylvania | UNT1 Jonnikin Creek | 282.0 | Pipeline | HA |
| Pittsylvania | Pigg River | 286.3 | Pipeline | Assume Presence |
| Pittsylvania | Harpen Creek1 | 287.1 | Pipeline | HA |
| Pittsylvania | Harpen Creek2 | 287.7 | Pipeline | HA |
| Pittsylvania | Harpen Creek3 | 289.2 | Pipeline | HA |
| Pittsylvania | Cherrystone Creek3 | 292.45 | Pipeline | HA |
| Pittsylvania | Polebridge Branch | 293.8 | Pipeline | HA |

| County | Stream Name ¹ | Mile Post | Crossing Type ² | Field Assessment ³ |
|--------------|---------------------------------------|-----------|----------------------------|-------------------------------|
| Pittsylvania | Little Cherrystone Creek ³ | 300.3 | Pipeline | HA |

¹UNT – Unnamed tributary

²AR = Access Road

³HA = Habitat Assessment; Assume Presence = stream is known to support Roanoke logperch/orangeфин madtom populations

4.0 Methods

Each stream crossing identified by the Desktop Analysis with potential to support populations of, or suitable habitat for, Roanoke logperch is evaluated via completion of a habitat assessment. If suitable habitat is present, a presence/absence survey may be necessary, based on coordination with Agencies.

4.1 Habitat Assessments

Habitat assessments are completed at stream crossings to determine whether potentially suitable habitat, as described above, for Roanoke logperch is present. Qualitative habitat assessments are completed throughout a survey reach (i.e., total of approximately 100 meters [328 ft]) extending upstream and downstream of the proposed Project footprint. Habitat assessments include determination of a stream segment's ability to support logperch populations. Habitat features are mapped and the maps are georeferenced and delineated by stream morphology (i.e., pools, riffles, and runs) based on water depth, velocity, and substrate. Additional data such as depths, stream widths, and percent substrate embeddedness are gathered and recorded. During the habitat assessment careful attention is paid to the present fish assemblage as well as other aquatic organisms (e.g., crayfish, snails, mussels), and any observation of Roanoke logperch is noted. Habitat assessments are performed any time of year provided stream conditions (i.e., non-elevated flow conditions) are favorable to assess potential Roanoke logperch habitat.

4.2 Presence/Absence Surveys

Presence/absence fish surveys for Roanoke logperch are not anticipated; however, in the event fish surveys are necessary, continued correspondence with VDGIF and USFWS will occur. Visual fish surveys can occur during periods of adequate water clarity and visibility. If alternative fish survey methods (i.e., seining, electrofishing, or snorkeling) are necessary, Roanoke logperch and orangeфин madtom surveys are performed outside of the spawning seasons (15 March – 30 June).

5.0 Results

5.1 Stream Identification and Desktop Analysis

Forty-four perennial stream crossings with potential to support populations of Roanoke logperch were identified (Table 1). Presence of Roanoke logperch is assumed at four stream crossing locations. Three of these crossings received site visits in association with mussel surveys; however, site visits have not been completed at the Roanoke River crossing. Between April and November 2015, 27 proposed stream crossings along the currently proposed MVP alignment and access roads in Montgomery, Roanoke, Franklin and Pittsylvania counties were assessed for suitable Roanoke logperch habitat (Table 2). The remaining thirteen crossings were not evaluated due to land access restrictions. One stream (Little Cherrystone Creek) was not assessed at its proposed crossing location due to land access restrictions; however, two assessments completed upstream provided valuable, surrogate information regarding habitat features and characteristics representative of the stream. No fish surveys were performed at any proposed stream crossings along the Project. Maps depicting the locations of fish assessments along the Project in Virginia are provided in Appendix C, and representative photographs are presented in Appendix D. Field notes and datasheets can be provided upon request.

Table 2. Stream crossings warranting assessments for Roanoke logperch along the proposed Mountain Valley Pipeline Project within the Roanoke River watershed in Virginia.

| County | Stream Name ¹ | Mile Post | Crossing Type ² | HA Completed ³ | Strahler Stream Order | Drainage Area (mi ²) | Suitable Habitat |
|------------|----------------------------------|-----------|----------------------------|---------------------------|-----------------------|----------------------------------|------------------|
| Montgomery | Mill Creek1 | 223.9 | Pipeline | Yes | 3 | 5.1 | No |
| Montgomery | North Fork Roanoke River1 | 225.8 | Pipeline | AP | 4 | 23.8 | Yes |
| Montgomery | North Fork Roanoke River AR1 | 225.9 | AR | AP | 4 | 23.7 | Yes |
| Montgomery | Flatwood Branch | 228.1 | Pipeline | Yes | 1 | 0.2 | No |
| Montgomery | Bradshaw Creek1 | 229.2 | Pipeline | Yes | 4 | 17.5 | Potential |
| Montgomery | Bradshaw Creek AR | 230.0 | AR | No | 4 | 13.5 | NA |
| Roanoke | Roanoke River | 233.85 | Pipeline | AP | 6 | 256.5 | Yes |
| Roanoke | Bottom Creek AR1 | 239.3 | AR | No | 2 | 1.6 | NA |
| Roanoke | Bottom Creek AR2 | 239.6 | AR | No | 2 | 1.9 | NA |
| Roanoke | Bottom Creek | 240.4 | Pipeline | No | 3 | 2.8 | NA |
| Roanoke | Mill Creek2 | 243.0 | Pipeline | No | 3 | 5.8 | NA |
| Franklin | UNT1 North Fork Blackwater River | 246.85 | Pipeline | Yes | 1 | 0.6 | No |
| Franklin | North Fork Blackwater River | 247.3 | Pipeline | Yes | 3 | 5.9 | No |
| Franklin | UNT2 UNT2 North Fork | 247.3 | Pipeline | Yes | 2 | 2.1 | No |

| County | Stream Name ¹ | Mile Post | Crossing Type ² | HA Completed ³ | Strahler Stream Order | Drainage Area (mi ²) | Suitable Habitat |
|--------------|---------------------------|-----------|----------------------------|---------------------------|-----------------------|----------------------------------|------------------|
| | Blackwater River | | | | | | |
| Franklin | UNT3 UNT2 North Fork | 249.5 | Pipeline | No | 2 | 1.8 | NA |
| | Blackwater River | | | | | | |
| Franklin | Teels Creek 0.1 | 255.7 | Pipeline | Yes | 3 | 2.2 | No |
| Franklin | Teels Creek0.2 | 256.7 | Pipeline | Yes | 3 | 3.1 | No |
| Franklin | Teels Creek0.3 | 256.9 | Pipeline | No | 3 | 3.5 | NA |
| Franklin | Teels Creek0.6 | 257.85 | Pipeline | No | 3 | 4.5 | NA |
| Franklin | Teels Creek2 | 258.5 | Pipeline | Yes | 3 | 5.1 | No |
| Franklin | Teels Creek3 | 259.3 | Pipeline | Yes | 3 | 5.5 | No |
| Franklin | Teels Creek4 | 259.9 | Pipeline | No | 3 | 22.6 | NA |
| Franklin | Little Creek1.5 | 260.1 | Pipeline | No | 4 | 22.6 | NA |
| Franklin | Little Creek2 | 260.8 | Pipeline | No | 4 | 25.1 | NA |
| Franklin | Blackwater River1 | 262.8 | Pipeline | No | 5 | 107.6 | NA |
| Franklin | Blackwater River2 | 263.3 | Pipeline | Yes | 5 | 109.9 | No |
| Franklin | UNT1 Maggodee Creek1 | 266.1 | Pipeline | Yes | 2 | 0.8 | No |
| Franklin | Magoddee Creek1 | 266.6 | Pipeline | Yes | 5 | 45.4 | No |
| Franklin | Blackwater River3 | 266.9 | Pipeline | Yes | 6 | 165.4 | No |
| Franklin | Foul Ground Creek | 269.6 | Pipeline | Yes | 3 | 1.9 | No |
| Franklin | Poplar Camp Creek | 271.6 | Pipeline | Yes | 2 | 1.9 | No |
| Franklin | UNT1 Smith Mountain Lake | 273.2 | Pipeline | Yes | 3 | 2.0 | No |
| Franklin | Owens Creek | 279.35 | Pipeline | Yes | 2 | 0.6 | No |
| Franklin | Strawfield Creek | 279.5 | Pipeline | Yes | 2 | 0.8 | No |
| Franklin | Parrot Branch | 280.2 | Pipeline | Yes | 2 | 0.5 | No |
| Pittsylvania | Jonnikin Creek | 281.6 | Pipeline | Yes | 3 | 1.2 | No |
| Pittsylvania | UNT1 Jonnikin Creek | 282.0 | Pipeline | Yes | 2 | 1.0 | No |
| Pittsylvania | Pigg River | 286.3 | Pipeline | AP | 6 | 340.1 | Yes |
| Pittsylvania | Harpen Creek1 | 287.1 | Pipeline | Yes | 3 | 7.8 | No |
| Pittsylvania | Harpen Creek2 | 287.7 | Pipeline | Yes | 2 | 3.1 | No |
| Pittsylvania | Harpen Creek3 | 289.2 | Pipeline | Yes | 2 | 1.6 | No |
| Pittsylvania | Cherrystone Creek3 | 292.45 | Pipeline | Yes | 3 | 3.6 | No |
| Pittsylvania | Polebridge Branch | 293.8 | Pipeline | Yes | 3 | 4.4 | No |
| Pittsylvania | Little Cherrystone Creek3 | 300.3 | Pipeline | No ⁴ | 3 | 5.0 | No |

¹ UNT = Unnamed tributary

² AR = supporting access road

³ HA = Roanoke logperch Habitat Assessment; AP = Assumed presence of Roanoke logperch. (Progress as of 3 November 2015.)

⁴ Site-specific field visit was not completed however assessments completed upstream serve as a surrogate assessment

5.2 Montgomery County

The proposed Project traverses the northern portion of Montgomery County in an easterly direction. Two watersheds, the James River and Roanoke River, are traversed within the county. The James River system does not support Roanoke logperch therefore assessments were not completed. In the Roanoke River system, the Project traverses four perennial streams at six crossing locations. One

waterbody, North Fork Roanoke River (two crossings), is known to support Roanoke logperch and, at the recommendation of USFWS, presence of the species is assumed. Roanoke logperch assessments were completed at four additional proposed crossings in Montgomery County including Mill Creek, Flatwood Branch, and Bradshaw Creek (two crossings). These streams are within the North Fork Roanoke River drainage prior to entering into the Roanoke River.

5.2.1 Mill Creek 1

Mill Creek 1 is a direct tributary to the North Fork Roanoke River and was assessed on 14 July 2015. It is a third-order stream with an upstream drainage area of 13.1 square kilometers (5.1 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream (i.e., a small tributary where the stream network originates) with average bankfull width of 8 meters (26.2 ft) and wetted width of 3 meters (9.8 ft) at the time of assessment. It is a high gradient stream and substrates are a heterogeneous mix of 85 percent cobble, 10 percent gravel, and 5 percent sand. Stream morphology is characterized as 30 percent riffle and 70 percent run habitats. Average and maximum depths measure 0.5 meter (1.6 ft) and 1.0 meter (3.3 ft), respectively. Riffles are shallow and exhibit little to no embeddedness nor siltation. Natural forest, with approximately 60 percent closed canopy cover, predominates land use in the vicinity of the stream. A narrow riparian buffer is intact along the entirety of the Project crossing. A trout farm is present at the Mill Creek crossing. The stream provides water used by the trout farm and two impoundments occur on the property. The impoundments are approximately 200 meters (656 ft) downstream of the Project crossing and likely impede the upstream movement of fishes. Aquatic fauna such as macroinvertebrates, snails, crayfish, amphibians (i.e., frogs, tadpoles), and fish are present. Based on limited available suitable habitat (i.e., lack of relatively silt free, deep-swift riffles and runs), an observed headwater fish assemblage (i.e., an assemblage that consists of few species mainly composed of chubs, dace, and shiners), and existence of downstream impoundments, the stream crossing is considered unlikely to support Roanoke logperch.

5.2.2 North Fork Roanoke River – Two Crossings

The Project proposes to traverse North Fork Roanoke River at two locations including a pipeline crossing and an access ford crossing approximately 120 meters (394 ft) upstream of the proposed pipeline crossing. MVP proposes to use the existing agricultural ford crossing to transport equipment associated with construction operations. Roanoke logperch presence is assumed at these two crossing locations of North Fork Roanoke River.

5.2.3 Flatwoods Branch

Flatwoods Branch is a tributary to Craig Branch which flows into the North Fork Roanoke River. It is a first-order stream with an upstream drainage area of 0.4 square kilometer (0.2 mi²) at the Project crossing. The stream is characterized as a

small ephemeral stream and was void of water during the assessment in July 2015. The stream does not support fish populations year-round, and therefore does not support Roanoke logperch.

5.2.4 Bradshaw Creek

Bradshaw Creek is a direct tributary to the North Fork Roanoke River. Two crossings are proposed including a pipeline crossing (Bradshaw Creek 1) and an access road crossing (Bradshaw Creek 2). Bradshaw Creek 2 is an existing private crossing that passes through culverts beneath a road and was not visited because of land access restrictions. The proposed MVP crossing of Bradshaw Creek 1 was assessed for Roanoke logperch. In addition, a mussel survey was performed at this location (see below).

Bradshaw Creek 1 is a direct tributary to the North Fork Roanoke River and was assessed on 14 July 2015. It is a fourth-order stream with an upstream drainage area of 45.4 square kilometers (17.5 mi²) at the proposed pipeline crossing. The stream is characterized as a small perennial stream with average bankfull width of 12 meters (39 ft) and wetted width of 6 meters (16 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a heterogeneous mix composed of 15 percent cobble, 25 percent gravel, 10 percent sand, and 50 percent bedrock. Stream morphology is characterized as 35 percent riffle, 35 percent run and 30 percent pool habitats. Average and maximum depths measure 0.5 meter (1.6 ft) and 1.3 meters (4.3 ft), respectively. Riffles are narrow and shallow and exhibit little to no embeddedness nor siltation. Natural forest, with approximately 60 percent closed canopy cover surrounds the stream. The stream is crossed by Bradshaw Road Bridge, approximately 25 meters (82 ft) downstream of the proposed centerline. Riparian vegetation is intact upstream of the Bradshaw Road Bridge and the riparian buffer narrows downstream of the bridge. Aquatic fauna such as macroinvertebrates, crayfish, amphibians (i.e., frogs, tadpoles), and fish are present.

The habitat assessment revealed the presence of suitable freshwater mussel habitat and subsequently on 21 October 2015 a mussel survey was completed approximately 400 meters (1,312 ft) downstream and 100 meters (328 ft) upstream of the proposed crossing. During the mussel survey, researchers remained attentive to documenting the presence of other aquatic species including fish. Roanoke logperch were not observed and overall the stream appeared relatively depauperate of fishes. Given the size of the stream (fourth order) and proximity to the North Fork Roanoke River, a known occupied stream, it is possible that Roanoke logperch might utilize the stream during specific times of the year; however, based on the limited available suitable habitat and minimal observed fish population, the stream is unlikely to support Roanoke logperch year round and therefore received a habitat ranking of moderate.

5.3 Roanoke County

The Project traverses the southwestern corner of Roanoke County in a southeasterly direction. Three different streams, Roanoke River, Bottom Creek, and Mill Creek, are proposed for crossing by the pipeline and access roads at five locations. Bottom Creek includes crossings by the MVP alignment and two access roads. Roanoke logperch assessments were not performed at the three Bottom Creek crossings nor the single crossing of Mill Creek (Mill Creek 2) due to land access restrictions. At the recommendation of USFWS, Roanoke logperch presence is assumed at the Roanoke River crossing.

5.4 Franklin County

The Project traverses the entirety of Franklin County in an easterly direction. The current alignment and access roads propose to traverse 15 different streams at 24 stream crossings in Franklin County. Three streams, Teels Creek, Little Creek, and Blackwater River, are proposed for crossing at 7, 2, and 3 locations, respectively. All but two streams are tributaries of the Blackwater River basin. Parrot Branch and Owens Creek, in the eastern-most portion of the county, flow into the Pigg River. One stream (Pigg River) is known to support Roanoke logperch and at the recommendation of USFWS, the species presence is assumed. Roanoke logperch assessments were completed at nine additional proposed crossings in Franklin County. Streams assessed include three unnamed tributaries (UNT) to North Fork Blackwater River (UNT1 North Fork Blackwater River, UNT2 UNT2 North Fork Blackwater River, and UNT3 UNT2 North Fork Blackwater), UNT1 Maggodee Creek, Maggodee Creek1, Foul Ground Creek, Poplar Camp Creek, UNT1 to Blackwater River, and Strawfield Creek.

5.4.1 UNT1 North Fork Blackwater River

UNT1 North Fork Blackwater River is a tributary to the North Fork Blackwater River and was assessed on 15 July 2015. It is a first-order stream with an upstream drainage area of 1.6 square kilometers (0.6 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with average bankfull width of 4 meters (13.1 ft) and wetted width of 1.5 meters (4.9 ft) at the time of assessment. It is a moderately high gradient stream and substrates are a heterogeneous mix of 40 percent cobble, 40 percent gravel, 10 percent sand, and 10 percent boulder. Stream morphology is characterized as 90 percent riffle and 10 percent pool habitats. Average and maximum depths measure 3 centimeters (1.2 in) and 6 centimeters (2.4 in), respectively. Natural forest, with approximately 90 percent closed canopy cover, predominates land use in the vicinity of the stream. The riparian vegetation is intact along the entire assessment reach. Aquatic fauna such as macroinvertebrates, crayfish, and amphibians (i.e., salamanders) are present. Based on limited available suitable habitat, stream size, and no observed fish populations, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.2 North Fork Blackwater River

North Fork Blackwater River is a tributary to the Blackwater River and was assessed on 15 July 2015. It is a third-order stream with an upstream drainage area of 15.3 square kilometers (5.9 mi²) at the Project crossing. The stream is characterized as a perennial stream with average bankfull width of 5 meters (16.4 ft) and wetted width of 3 meters (9.8 ft) at the time of assessment. It is a moderately high gradient stream and substrates are a heterogeneous mix of 75 percent cobble, 20 percent gravel, and 5 percent sand. Stream morphology is characterized as 25 percent riffle and 75 percent run habitats. Average and maximum depths measure 0.2 meter (0.7 ft) and 0.5 meter (1.6 ft), respectively. Riffles are narrow and shallow and exhibit little embeddedness. A pasture with less than 10 percent closed canopy cover and no riparian buffer surround the stream. Cattle have direct access to the stream. Adney Gap Road Bridge crosses the stream approximately 30 meters (98 ft) downstream of the proposed centerline. Aquatic fauna such as macroinvertebrates, crayfish, and fish are present but are not abundant. Based on limited available suitable habitat, limited fish populations, and locally-degraded conditions, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.3 UNT2 UNT2 North Fork Blackwater River

UNT2 UNT2 North Fork Blackwater River is a secondary tributary to the North Fork Blackwater River and was assessed on 15 July 2015. Due to access issues, the assessed stream reach is approximately 270 meters upstream of the currently proposed alignment. No major land use variations nor tributaries occur within the aforementioned stream distance and it is highly likely that similar stream characteristics (both biotic and abiotic) are present. The stream is a second-order stream with an upstream drainage area of 5.5 square kilometers (2.1 mi²) at the proposed pipeline crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 8 meters (26.2 ft) and wetted width of 3 meters (9.8 ft) at the time of assessment. It is a moderately high gradient stream and substrates are a heterogeneous mix of 35 percent cobble, 30 percent gravel, 30 percent sand, and 5 percent boulder. The morphology of the stream is characterized as 45 percent riffle, 50 percent run, and 5 percent pool habitats. Average and maximum depths measure 6 centimeters (2.4 in) and 100 centimeters (39.4 in), respectively. Riffles are narrow and shallow and exhibit little embeddedness. Natural forest, with approximately 90 percent closed canopy cover, predominates land use in the vicinity of the stream. Aquatic fauna such as macroinvertebrates and fish are present. Based on limited available suitable habitat and a headwater fish assemblage, the stream is considered unlikely to support Roanoke logperch.

5.4.4 UNT3 UNT2 North Fork Blackwater River

UNT3 UNT2 North Fork Blackwater River is a secondary tributary to the North Fork Blackwater River. It is a first-order stream with an upstream drainage area of 5.5

square kilometers (2.1 mi²) at the proposed pipeline crossing. The stream crossing was not assessed due to restricted land access.

5.4.5 Teels Creek – Seven Crossings

Teels Creek is a tributary to Little Creek which empties into the Blackwater River. Four of seven crossings proposed to traverse Teels Creek in Franklin County were assessed. The three remaining streams were not assessed due to land access restrictions.

5.4.5.1 Teels Creek 0.1

Teels Creek 0.1 was assessed on 12 August 2015. It is a third-order stream with an upstream drainage area of 5.6 square kilometers (2.2 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 5 meters (16.4 ft) and wetted width of 1.8 meters (5.9 ft) at the time of assessment. It is a low gradient stream and substrates are a heterogeneous mix of 5 percent cobble, 50 percent gravel, 40 percent sand, and 5 percent silt. Stream morphology is characterized as 40 percent riffle, 50 percent run, and 10 percent pool habitats. Average and maximum depths measure 10 centimeters (3.9 in) and 30 centimeters (11.8 in), respectively. Riffles are shallow and exhibit moderate embeddedness and siltation. Natural forest and row crops, with approximately 70 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. A narrow riparian buffer is intact along the entirety of the Project crossing and the crossing is flanked primarily by row crop fields. Teels Creek passes through culverts beneath Leaning Oak Road, approximately 50 meters (164 ft) downstream of the proposed centerline. Aquatic fauna such as macroinvertebrates, crayfish, amphibians (i.e., frogs), and fish are present. Based on limited available suitable habitat, low gradient, shallow depth, and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.5.2 Teels Creek 0.2

Teels Creek 0.2 was assessed on 15 July 2015. It is a third-order stream with an upstream drainage area of 8.0 square kilometers (3.1 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 4 meters (13.1 ft) and wetted width of 2 meters (6.6 ft) at the time of assessment. It is a low gradient stream and substrates are a heterogeneous mix of 5 percent boulder, 5 percent gravel, 80 percent sand, 5 percent silt, and 5 percent bedrock. Stream morphology is characterized as 5 percent riffle, 80 percent run, and 15 percent pool habitats. Average and maximum depths measure 8 centimeters (3.1 in) and 120 centimeters (47.2 in), respectively. Riffles are shallow and exhibit high embeddedness and siltation. Natural forest and agriculture, with less than 10 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. A narrow riparian buffer is flanked primarily by hay fields along the entirety of the Project crossing. Grassy Hill Road Bridge crosses the stream approximately 30

meters (98 ft) upstream of the proposed centerline. Aquatic fauna such as macroinvertebrates, crayfish, amphibians (i.e., tadpoles), and fish are present. Based on limited available suitable habitat, shallow average depth, and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.5.3 Teels Creek 2

Teels Creek 2 was assessed on 22 April 2015. It is a third-order stream with an upstream drainage area of 13.1 square kilometers (5.1 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 14 meters (46 ft) and wetted width of 4.3 meters (14 ft) at the time of assessment. It is a low gradient stream and substrates are a heterogeneous mix of 5 percent boulder, 10 percent cobble, 20 percent gravel, 60 percent sand, and 5 percent bedrock. Stream morphology is characterized as 20 percent riffle, 75 percent run, and 5 percent pool habitats. Average and maximum depths measure 0.4 meter (1.3 ft) and 1.0 meter (3.3 ft), respectively. Riffles are shallow and exhibit high embeddedness and siltation. Natural forest and agricultural practices, with approximately 40 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. A riparian buffer is present along the majority of the Project crossing and is flanked primarily by hay fields and natural forest. Aquatic fauna such as macroinvertebrates, Asiatic clam, snails, crayfish, and fish are present. Based on limited available suitable habitat and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.5.4 Teels Creek 3

Teels Creek 3 was assessed on 22 April 2015. It is a third-order stream with an upstream drainage area of 14.3 square kilometers (5.5 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 12.5 meters (41 ft) and wetted width of 8 meters (26 ft) at the time of assessment. It is a low gradient stream and substrates are a heterogeneous mix of 5 percent boulder, 10 percent cobble, 25 percent gravel, 50 percent sand, and 10 percent bedrock. Stream morphology is characterized as 35 percent riffle, 60 percent run, and 5 percent pool habitats. Average and maximum depths measure 0.3 meter (1.0 ft) and 1.0 meter (3.3 ft), respectively. Riffles are shallow and exhibit high embeddedness and siltation. Natural forest and agricultural practices, with approximately 40 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. A riparian buffer is intact along the majority of the Project crossing with the exception of a utility line corridor that crosses Teels Creek downstream of the proposed centerline. Aquatic fauna such as macroinvertebrates, Asiatic clam, snails, crayfish, and fish are present. Based on limited available suitable habitat and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.6 Little Creek

Little Creek is a tributary to the Blackwater River and is proposed to be traversed by the alignment at two locations (Little Creek 1.5 and Little Creek 2) and neither stream crossing was visited due to restricted land access. Little Creek is a fourth-order stream at both locations and the crossings are within 3.9 stream kilometers (2.4 mi) of one another. The upstream drainage area at Little Creek 1.5 is 65.0 square kilometers (25.1 mi²) and the upstream drainage area at Little Creek 2 is 58.6 square kilometers (22.6 mi²) at the proposed pipeline crossing.

5.4.7 Blackwater River

Blackwater River is a direct tributary to the Roanoke River. Three crossings (Blackwater River 1, 2, 3) are proposed to be traversed by the MVP centerline. Blackwater River 1 was not visited because of land access restrictions. Two of the proposed crossings (Blackwater River 2 and 3) were assessed for Roanoke logperch. In addition, a mussel survey was performed at Blackwater River 3.

5.4.7.1 Blackwater River 2

Blackwater River 2 was assessed for Roanoke logperch habitat on 11 August 2015. It is a fifth-order stream with an upstream drainage area of 284.6 square kilometers (109.9 mi²) at the proposed Project crossing. The stream is characterized as a small river with an average bankfull width of 45 meters (148 ft) and wetted width of 35 meters (15 ft) at the time of assessment. It is a low gradient stream and substrates are a mixture of 30 percent gravel, 50 percent sand, and 20 percent silt. Stream morphology is characterized as 80 percent glide and 20 percent pool habitats. Average and maximum depths measure 0.3 meter (1.0 ft) and 1.2 meters (3.9 ft), respectively. The stream reach is highly embedded (90%) by sandy substrates which are unstable and prone to shifting. A fine layer of silt covers the stream bottom with the exception of a few isolated areas where flow is diverted around large substrate (e.g., bedrock exposure, woody debris). Silt aggregates in areas of reduced stream flow (e.g., depressions in the substrates, along the stream margins). The overall stream reach is void of functional interstitial spaces. Natural forest, with approximately 10 percent closed canopy cover surrounds the stream. An existing powerline ROW is present approximately 15 meters (49 ft) upstream of the proposed centerline. Riparian vegetation is intact along the entire stream reach. Aquatic fauna such as macroinvertebrates, amphibians (i.e., tadpoles), snails, Asian clam, and fish are present. Based on the size of the stream and the presence of microhabitats potentially suitable to Roanoke logperch, Blackwater River 2 received a suitability ranking of moderate; however, riffles severe as isolated mesohabitats surrounded by run and pool habitats embedded by sand that limit interstitial spaces within the habitat. These conditions could possibly limit the occurrence of the species within the system, especially females which typically occur in deeper runs over gravel and cobble (Burkhead 1983). Despite intensive surveys in the past in the Blackwater

River (including surveys by Lahey and Angermeier 2007 and Petrimoulx 1980), Roanoke logperch (or orangefin madtom) have not been observed. Given these constraints is very unlikely that the Blackwater River supports Roanoke logperch.

5.4.7.2 Blackwater River 3

Blackwater River 3 was assessed for Roanoke logperch habitat on 16 July 2015 during elevated stream flows and again on 22 October 2015 during normal flows. It is a sixth-order stream with an upstream drainage area of 428.3 square kilometers (165.4 mi²) at the proposed Project crossing. The stream is characterized as a small river with an average bankfull width of 25 meters (82 ft) and wetted width of 22 meters (72 ft) at the time of assessment. It is a low gradient stream and substrates are a mixture of 15 percent bedrock, 10 percent cobble, 25 percent gravel, and 50 percent sand. Stream morphology is characterized as 30 percent riffle, 50 percent run, and 20 percent pool habitats. Average and maximum depths measure 0.7 meter (2.3 ft) and 1.4 meters (4.6 ft), respectively. In areas of reduced stream velocities (i.e., run and pool habitats), the stream reach is highly embedded (90%) by sandy substrates which are unstable and prone to shifting. These areas are void of functional interstitial spaces. Despite the abundance of sand substrates, silt comprises a negligible amount of substrate. In areas of elevated stream velocities (i.e., riffles, flow-diverting substrates such as boulders and bedrock exposures), gravel substrates are relatively clean-swept and less embedded (20 percent embeddedness). Land use immediately surrounding the stream includes a hayfield along the left descending bank (LDB) and natural forest along the right descending bank (RDB). Aquatic fauna such as macroinvertebrates, snails, Asian clam, crayfish, and fish are present.

The assessment revealed the presence of suitable freshwater mussel habitat and subsequently on 22 October 2015 a mussel survey was completed approximately 400 meters (1,312 ft) downstream and 100 meters (328 ft) upstream of the proposed crossing. During the mussel survey, researchers remained attentive to documenting the presence of other aquatic species including fish. Roanoke logperch were not observed and overall the stream appeared relatively depauperate of fishes. Based on the size of the stream and the presence of microhabitats potentially suitable to Roanoke logperch, Blackwater River 3 received a suitability ranking of moderate; however, similar to reasons discussed above for Blackwater River 2, it is unlikely that the river supports populations of Roanoke logperch.

5.4.8 UNT1 Maggodee Creek1

UNT1 Maggodee Creek1 is a tributary to Maggodee Creek which empties into the Blackwater River and was assessed on 16 July 2015. It is a second-order stream with an upstream drainage area of 2.2 square kilometers (0.8 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 8 meters (26 ft) and wetted width of 3 meters (9.8 ft) at the

time of assessment. It is a high gradient stream and substrates are a heterogeneous mix of 10 percent boulder, 25 percent cobble, 20 percent gravel, 10 percent sand, 15 percent silt, and 20 percent bedrock. Stream morphology is characterized as 20 percent riffle, 60 percent run, and 20 percent pool habitats. Average and maximum depths measure 6 centimeters (2.4 in) and 25 centimeters (9.8 in), respectively. Riffles are shallow and exhibit little to no embeddedness nor siltation. Pastureland, with approximately 60 percent closed canopy cover, predominates land use in the vicinity of the stream crossing. A narrow riparian buffer is intact along the entirety of the Project crossing. The stream parallels Booker T. Washington Highway and a narrow forested buffer, along the RDB, lies between the stream and Highway. Aquatic fauna such as macroinvertebrates, snails, crayfish, amphibians (i.e., frogs), and fish are present. Based on limited suitable habitat available and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.9 Maggodee Creek1

Maggodee Creek1 is a direct tributary to the Blackwater River and was assessed on 16 July 2015. It is a fifth-order stream with an upstream drainage area of 117.6 square kilometers (45.4 mi²) at the proposed pipeline crossing. The stream is characterized as a moderate-sized stream with an average bankfull width of 24 meters (79 ft) and wetted width of 14 meters (46 ft) at the time of assessment. It is a low gradient stream and substrates are a heterogeneous mix of 20 percent cobble, 20 percent gravel, 55 percent sand, and 5 percent bedrock. Stream morphology is characterized as 20 percent riffle, 60 percent run and 20 percent pool habitats. Average and maximum depths measure 0.5 meter (1.6 ft) and 1.0 meter (3.3 ft), respectively. In areas of reduced stream velocities (i.e., run and pool habitats), the stream reach is highly embedded (75%) by sandy substrates which are unstable and prone to shifting. These areas are void of functional interstitial spaces. Despite the abundance of sand substrates, silt comprises a negligible amount of substrate. In areas of elevated stream velocities (i.e., riffles, flow-diverting substrates such as boulders and bedrock exposures), gravel substrates are relatively clean-swept and less embedded (25% embeddedness). The stream is impounded by a large dam, a legacy of a former mill operation, approximately 80 meters (262 ft) upstream of the Project crossing and is. Land use immediately surrounding the stream comprises a hayfield along the LDB and natural forest along the RDB. Aquatic fauna such as macroinvertebrates, snails, Asian clam, and fish are present.

The assessment revealed the presence of suitable freshwater mussel habitat and subsequently on 22 October 2015 a mussel survey was completed from approximately 420 meters (1,378 ft) downstream to 80 meters (262 ft) upstream of the proposed Project crossing. During the mussel survey, researchers remained attentive to documenting the presence of other aquatic species including fish. Roanoke logperch were not observed and overall the stream appeared relatively

depauperate of fishes. Based on the mesohabitat conditions at the crossing, Maggodee Creek¹ appeared suitable for Roanoke logperch; however, the microhabitat conditions demonstrate high amounts of embeddedness that could potentially limit the foraging behavior of Roanoke logperch. In addition to these constraints, Maggodee Creek¹ is a tributary to the Blackwater River, and as mentioned above, logperch have not been observed in this river, despite intensive survey efforts in the past. Based on all these factors, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.10 Foul Ground Creek

Foul Ground Creek is a tributary to the Blackwater River and was assessed on 16 July 2015. It is a third-order stream with an upstream drainage area of 4.8 square kilometers (1.9 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with average bankfull width of 3 meters (9.8 ft) and wetted width of 2.5 meters (8.2 ft) at the time of assessment. It is a low gradient stream and substrates are a relatively homogeneous mix of 10 percent gravel, 10 percent sand, and 80 percent silt. Stream morphology is characterized as 20 percent riffle and 80 percent run habitats. Average and maximum depths measure 4 centimeters (1.6 in) and 10 centimeters (3.9 in), respectively. Stream substrates are highly embedded and moderately silted (60%). Pastureland, with approximately 40 percent closed canopy cover, predominates land use in the vicinity of the stream crossing. A riparian buffer is loosely intact along the majority of the Project crossing. Despite the crossing's location between two pastures, livestock are prohibited access to the stream. Aquatic fauna such as macroinvertebrates and fish are present. Based on limited available suitable habitat and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.11 Poplar Camp Creek

Poplar Camp Creek is a tributary to Smith Mountain Lake and was assessed on 16 July 2015. It is a second-order stream with an upstream drainage area of 5.0 square kilometers (1.9 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with average bankfull width of 7 meters (23 ft) and wetted width of 5 meters (16 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a relatively heterogeneous mix of 5 percent cobble, 25 percent gravel, 20 percent sand, 10 percent silt, and 40 percent bedrock. Stream morphology is characterized as 20 percent riffle, 75 percent run and 5 percent pool habitats. Average and maximum depths measure 5 centimeters (2.0 in) and 22 centimeters (8.7 in), respectively. Riffles are shallow and exhibit heavy embeddedness and little siltation. Natural forest and pastureland predominate land use in the vicinity of the stream crossing. The riparian buffer is intact in upstream of the proposed crossing; however, an existing powerline corridor is present downstream of the crossing location. Aquatic fauna such as macroinvertebrates, crayfish, and fish are present. Based on limited available suitable habitat and a

headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.12 UNT1 Smith Mountain Lake

UNT1 Smith Mountain Lake is an unnamed tributary to Smith Mountain Lake and was assessed on 16 July 2015. It is a third-order stream with an upstream drainage area of 5.1 square kilometers (2.0 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 2.5 meters (8.2 ft) and wetted width of 1.5 meters (4.9ft) at the time of assessment. It is a low gradient stream and substrates are a relatively homogeneous mix of 15 percent gravel, 45 percent sand, and 40 percent silt. Stream morphology is characterized as 15 percent riffle and 85 percent run habitats. Average and maximum depths measure 4 centimeters (1.6 in) and 10 centimeters (3.9 in), respectively. Riffles are shallow and exhibit heavy embeddedness and siltation. Pastureland, with approximately 20 percent closed canopy cover, predominates land use in the vicinity of the stream crossing. The crossing is within a pasture and livestock have direct access to the stream. A very limited and narrow riparian buffer is intact along the entirety of the crossing and an existing utility line corridor is present downstream. Aquatic fauna such as macroinvertebrates and fish are present. Based on limited available suitable habitat and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.13 Owens Creek

Owens Creek is a tributary to Parrot Branch which empties into the Pigg River and was assessed on 16 July 2015. It is a second-order stream with an upstream drainage area of 1.4 square kilometers (0.6 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 10 meters (33 ft) and wetted width of 2 meters (6.6 ft) at the time of assessment. It is a low gradient stream and substrates are a relatively homogenous mix of 20 percent gravel, 60 percent sand, 15 percent silt, and 5 percent bedrock. Stream morphology is characterized as 40 percent riffle, 20 percent run, and 40 percent pool habitats. Average and maximum depths measure 6 centimeters (2.4 in) and 40 centimeters (15.7 in), respectively. Riffles are shallow and exhibit high embeddedness with siltation in areas of reduced velocity. Natural forest and hayfields, with approximately 60 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. Overall, the riparian buffer is intact along the Project with the exception of an existing utility line ROW, in the upstream reach. Aquatic fauna such as macroinvertebrates, crayfish, amphibians (i.e., frogs), and fish are present. Based on the limited suitable available habitat and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.14 Strawfield Creek

Strawfield Creek is a tributary to Parrot Branch which empties into the Pigg River and was assessed on 16 July 2015. It is a second-order stream with an upstream drainage area of 2.2 square kilometers (0.8 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 8 meters (26 ft) and wetted width of 2.5 meters (8.2 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a relatively mixture of 10 percent cobble, 20 percent gravel, 50 percent sand, 15 percent silt, and 5 percent bedrock. Stream morphology is characterized as 40 percent riffle, 40 percent run, and 20 percent pool habitats. Average and maximum depths measure 10 centimeters (3.9 in) and 60 centimeters (23.6 in), respectively. Riffles are shallow and exhibit high embeddedness with siltation in areas of reduced velocity. Natural forest and hayfields, with approximately 80 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. Overall, the riparian buffer is intact along the Project with the exception of an existing utility line ROW, in the upstream reach. Aquatic fauna such as macroinvertebrates, crayfish, amphibians (i.e., frogs), and fish are present. Based on the limited available suitable habitat and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.4.15 Parrot Branch

Parrot Branch, a tributary to the Pigg River, was assessed on 16 July 2015. It is a second-order stream with an upstream drainage area of 1.3 square kilometers (0.5 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 5 meters (8.2 ft) and wetted width of 1 meter (3.3 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a relatively heterogeneous mix of 15 percent cobble, 70 percent gravel, 5 percent sand, and 10 percent bedrock. Stream morphology is characterized as 40 percent riffle and 60 percent run habitats. Average and maximum depths measure 4 centimeters (1.6 in) and 20 centimeters (7.9 in), respectively. Riffles are shallow and exhibit little to no embeddedness nor siltation. Natural forest, with approximately 90 percent closed canopy cover, predominates land use in the vicinity of the stream crossing. The riparian buffer is intact along the entirety of the Project crossing. The stream parallels an existing utility line ROW between forested tracts of land. Aquatic fauna such as macroinvertebrates, crayfish, and fish are present. Based on limited available habitat and headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.5 Pittsylvania County

The proposed Project traverses the western half of Pittsylvania County in an easterly direction. The current alignment proposes to traverse seven different streams at nine stream crossings in Pittsylvania County. One stream, Harpen Creek, includes three

different crossing locations. The Pigg River is proposed to be traversed by the Project and is known to support Roanoke logperch. At the recommendation of USFWS, Roanoke logperch presence of is assumed at the Pigg River location. Five additional Roanoke logperch assessments were completed at proposed crossings in Pittsylvania County including Jonnikin Creek, UNT1 Jonnikin Creek, Cherrystone Creek, Polebridge Branch, and Little Cherrystone Creek.

5.5.1 Jonnikin Creek

Jonnikin Creek is a secondary tributary to the Pigg River and was assessed on 17 July 2015. It is a third-order stream with an upstream drainage area of 3.2 square kilometers (1.2 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 5 meters (16.4 ft) and wetted width of 2.5 meters (8.2 ft) at the time of assessment. It is a low gradient stream and substrates are a relatively heterogeneous mix of 5 percent cobble, 40 percent gravel, 40 percent sand, and 15 percent silt. Stream morphology is characterized as 20 percent riffle and 80 percent run habitats. Average and maximum depths measure 5 centimeters (2.0 in) and 15 centimeters (5.9in), respectively. Riffles are shallow and exhibit little embeddedness and siltation. Natural forest, with approximately 90 percent closed canopy cover, predominates land use in the vicinity of the stream crossing. The riparian buffer is fully intact along the entirety of the Project crossing. Aquatic fauna such as macroinvertebrates, crayfish, and fish are present. Based on limited available suitable habitat and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.5.2 UNT1 Jonnikin Creek

UNT1 Jonnikin Creek is a secondary tributary to the Pigg River and was assessed on 17 July 2015. It is a second-order stream with an upstream drainage area of 2.5 square kilometers (1.0 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 7 meters (23 ft) and wetted width of 2 meters (6.6 ft) at the time of assessment. It is a low gradient stream and substrates are a relatively heterogeneous mix of 5 percent cobble, 35 percent gravel, and 60 percent sand. Stream morphology is characterized as 25 percent riffle, 60 percent run, and 15 percent pool habitats. Average and maximum depths measure 6 centimeters (2.4 in) and 25 centimeters (9.8 in), respectively. Riffles are shallow and exhibit little to no embeddedness nor siltation. Natural forest, with approximately 90 percent closed canopy cover, predominates land use in the vicinity of the stream crossing. The riparian buffer is fully intact along the entirety of the Project crossing. Aquatic fauna such as macroinvertebrates, crayfish, and fish are present. Based on limited available suitable habitat and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.5.3 Pigg River

Pigg River, at the proposed crossing location, is a sixth-order stream and at the request of USFWS, Roanoke logperch presence is assumed. To address freshwater mussel concerns, two site visits occurred at the Project crossing. The first, a mussel habitat assessment performed on 17 July 2015, revealed the presence of suitable freshwater mussel habitat, warranting a subsequent mussel survey. On the second visit, 23 October 2015, a mussel survey was completed approximately 400 meters (1,312 ft) downstream and 100 meters (328 ft) upstream of the proposed crossing. During the mussel survey, researchers remained attentive to documenting the presence of other aquatic species including fish. Despite the presence of suitable Roanoke logperch habitat, Roanoke logperch were not observed.

5.5.4 Harpen Creek – Three Crossings

Harpen Creek is a direct tributary to the Pigg River. Three crossings are proposed to traverse Harpen Creek in Pittsylvania County.

5.5.4.1 Harpen Creek1

Harpen Creek 1 was assessed on 19 July 2015. It is a third-order stream with an upstream drainage area of 20.1 square kilometers (7.8 mi²) at the Project crossing. The stream is characterized as a perennial stream with an average bankfull width of 25 meters (82 ft) and wetted width of 5 meters (16.4 ft) at the time of assessment. It is a low gradient stream and substrates are a relatively mixture of 10 percent gravel, 50 percent sand and 40 percent silt. Stream morphology is characterized as 30 percent riffle, 30 percent run, 20 percent pool, and 20 percent glide habitats. Average and maximum depths measure 0.3 meter (1.0 ft) and 0.8 meter (2.6 ft), respectively. Riffles are shallow and exhibit heavy embeddedness and siltation. Pastureland and natural forest, with approximately 90 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. A large-scale livestock farm is adjacent the stream. The pasture is predominantly void of vegetation resulting in considerable erosion that contributes run-off to the stream. A narrow riparian buffer is intact along the majority of the assessment reach. Aquatic fauna such as macroinvertebrates, Asiatic clam, and fish are present. Based on limited available suitable habitat, the stream crossing is considered unlikely to support Roanoke logperch.

5.5.4.2 Harpen Creek2

Harpen Creek 2 was assessed on 19 July 2015. It is a second-order stream with an upstream drainage area of 8.0 square kilometers (3.1 mi²) at the Project crossing. The stream is characterized as perennial with an average bankfull width of 12 meters (39.3 ft) and wetted width of 2 meters (6.6 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a relatively heterogeneous mix of 5 percent cobble, 20 percent gravel, 45 percent sand and 30 percent silt. Stream

morphology is characterized as 20 percent riffle, 30 percent run, 30 percent pool, and 20 percent glide habitats. Average and maximum depths measure 0.25 meter (0.8 ft) and 0.75 meter (2.5 ft), respectively. Riffles are shallow and exhibit heavy embeddedness and moderate siltation. Pastureland and natural forest pastureland, with less than 10 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. A large, heavily-eroded livestock pasture is in the downstream portion of Harpen Creek 2 is likely contributes considerable sedimentation to the stream. In addition, remnants of woody debris are prevalent within the stream resulting from recent logging operations on the surrounding landscape. Aquatic fauna such as macroinvertebrates, Asiatic clam, crayfish, amphibians (i.e., frogs), and fish are present. Based on limited available habitat, the stream crossing is considered unlikely to support Roanoke logperch.

5.5.4.3 Harpen Creek3

Harpen Creek 3 was assessed on 19 July 2015. It is a second-order stream with an upstream drainage area of 7.0 square kilometers (4.0 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 16 meters (52 ft) and wetted width of 3.5 meters (11.5 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a relatively heterogeneous mix of 20 percent cobble, 20 percent gravel, 40 percent sand, and 20 percent silt. Stream morphology is characterized as 20 percent riffle, 40 percent run, 30 percent pool, and 10 percent glide habitats. Average and maximum depths measure 0.2 meters (0.7 ft) and 1.5 meters (4.9 ft), respectively. Riffles are shallow and exhibit moderate embeddedness and light siltation. Pastureland and natural forest, with less than 90 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. A riparian buffer is intact along the majority of the assessment reach. Aquatic fauna such as macroinvertebrates, snails, Asiatic clam, crayfish, amphibians (i.e., frogs), and fish are present. Based on limited available suitable habitat, the stream crossing is considered unlikely to support Roanoke logperch.

5.5.5 Cherrystone Creek3

Cherrystone Creek is a direct tributary to the Banister River and was assessed on 3 November 2015. It is a third-order stream with an upstream drainage area of 9.4 square kilometers (3.6 mi²) at the Project crossing. The stream is characterized as perennial with an average bankfull width of 5 meters (16.4 ft) and wetted width of 3 meters (9.8 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a relatively heterogeneous mix of 10 percent boulder, 15 cobble, 40 percent gravel, and 35 percent sand. Stream morphology is characterized as 40 percent riffle, 30 percent run, and 30 percent pool habitats. Average and maximum depths measure 15 centimeters (5.9 cm) and 60 centimeters (23.6 cm), respectively. Riffles are shallow and exhibit moderate embeddedness with minor siltation. Pastureland and natural forest, with approximately 90 percent closed canopy cover,

predominate land use in the vicinity of the stream crossing. The riparian buffer is fully intact along both banks and is flanked by natural forest. An impoundment (i.e., Cherrystone Lake) is approximately 2.7 kilometers (1.7 mi) downstream of the Project crossing and likely impedes upstream movement of fishes. Aquatic fauna such as macroinvertebrates, snails, crayfish, and fish are present. Based on limited available suitable habitat and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.5.6 Polebridge Branch

Polebridge Branch is a tributary to Cherrystone Creek which empties into the Banister River and was assessed on 18 July 2015. It is a third-order stream with an upstream drainage area of 11.3 square kilometers (4.4 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 12 meters (39 ft) and wetted width of 3 meters (9.8 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a mixture of 10 percent boulder, 20 percent gravel, and 70 percent sand. Stream morphology is characterized as 20 percent riffle, 40 percent run, 30 percent pool, and 10 percent glide habitats. Average and maximum depths measure 0.25 meter (0.8 ft) and 1.5 meters (4.9 ft), respectively. Riffles are shallow and exhibit heavy embeddedness with minor siltation. Pastureland and natural forest, with approximately 90 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. The riparian buffer is fully intact along the RDB and is flanked by natural forest. The riparian buffer along the LDB is narrow and flanked by pastureland. An impoundment, Cherrystone Lake, is approximately 3.1 kilometers (1.9 mi) downstream of the Project crossing and likely impedes upstream movement of fishes. Aquatic fauna such as macroinvertebrates, crayfish, amphibians (i.e., frogs), and fish are present. Based on limited suitable available habitat and a headwater fish assemblage, the stream crossing is considered unlikely to support Roanoke logperch.

5.5.7 Little Cherrystone Creek

Little Cherrystone Creek is a tributary to Cherrystone Creek which empties into the Banister River. A single crossing of Little Cherrystone Creek is proposed along the current alignment at Little Cherrystone Creek 3. Little Cherrystone Creek 3 was not visited nor assessed due to land access restrictions; however, two crossings (Little Cherrystone Creek 1 and 2) were assessed previously on 18 July 2015 in association with alternative alignments that were subsequently eliminated from consideration.. The assessments of Little Cherrystone Creek 1 and 2 act as surrogate assessments for Little Cherrystone Creek 3. Little Cherrystone Creek 3 is a third-order stream with an upstream drainage area of 13.0 square kilometers (5.0 mi²) at the Project crossing.

5.5.7.1 Little Cherrystone Creek 1

Little Cherrystone Creek 1 is approximately 1.2 kilometers upstream of Little Cherrystone Creek 3. The stream is characterized as a perennial headwater stream with an average bankfull width of 15 meters (49 ft) and wetted width of 3.5 meters (11.5 ft) at the time of assessment. It is a low gradient stream and substrates are a relatively heterogeneous mix of 10 percent boulder, 10 percent cobble, 5 percent gravel, 70 percent sand, and 5 percent silt. Stream morphology is characterized as 10 percent riffle, 60 percent run, 10 percent pool, and 20 percent glide habitats. Average and maximum depths measure 12 centimeters (4.7 in) and 50 centimeters (19.7 in), respectively. Riffles are shallow and substrates are highly embedded. Aquatic fauna such as macroinvertebrates, crayfish, and fish are present. Based on limited available habitat, the stream crossing is considered unlikely to support Roanoke logperch.

5.5.7.2 Little Cherrystone Creek 2

Little Cherrystone Creek 2 is approximately 3 kilometers upstream of Little Cherrystone Creek 3. The stream is characterized as a perennial headwater stream with average bankfull width of 6 meters (19.7 ft) and wetted width of 1.5 meters (4.9 ft) at the time of assessment. It is a low gradient stream and substrates are a mixture of 10 percent gravel, 80 percent sand, and 10 percent silt. Stream morphology is characterized as 30 percent riffle, 50 percent run, and 20 percent pool habitats. Average and maximum depths measure 18 centimeters (7.1 in) and 50 centimeters (19.7 in), respectively. Riffles are shallow and substrates are highly embedded. The majority of substrates are covered in a fine layer of silt. Aquatic fauna such as macroinvertebrates, crayfish, amphibians (i.e. frogs), and fish are present. Based on limited available habitat, the stream crossing is considered unlikely to support Roanoke logperch.

5.5.7.3 Little Cherrystone Creek 3

Little Cherrystone Creek 3 is a third-order stream with an upstream drainage area of 13.0 square kilometers (5.0 mi²) at the Project crossing. No tributaries enter the stream between the evaluated sites and the currently proposed crossing location therefore no major habitat variations are likely to occur. The stream is highly embedded and dominated by sandy substrates. Based on limited available suitable habitat, the stream crossing is considered unlikely to support Roanoke logperch.

6.0 Discussion

The Project proposes to traverse all streams within the Roanoke River basin via an open-trench construction method (i.e., wet cut, dam and flume, etc.). Of the 44 stream crossings identified during the desktop analysis and traversed by the project, 27 were assessed for the presence of suitable Roanoke logperch habitat (Table 3). Of the 27 stream crossings assessed, 26 did not provide suitable habitat for Roanoke logperch and one stream (Bradshaw Creek) had potential to harbor the species. Thirteen identified crossings were not evaluated due to restricted access and habitat assessments are anticipated to occur upon receipt of landowner permission to access. Once access is granted, an assessment will be completed and an amended report will be submitted to the agencies. No Roanoke logperch nor orange-fin madtom were observed during habitat assessments.

Table 3. Progress summary of Roanoke logperch habitat assessments along the proposed Mountain Valley Pipeline project in Virginia.

| County | # Stream Crossings | | | Total |
|--------------|--------------------|---------------------------|------------------|-----------|
| | Assessed | Not Assessed ^a | Assumed Presence | |
| Montgomery | 3 | 1 | 2 | 6 |
| Roanoke | 0 | 4 | 1 | 5 |
| Franklin | 17 | 7 | 0 | 24 |
| Pittsylvania | 7 | 1 ^b | 1 | 9 |
| Total | 27 | 13 | 4 | 44 |

^a = not assessed due to land access restrictions

^b = site-specific field visit not completed; however, stream assessments completed upstream serve as a surrogate assessment

At the recommendation of USFWS, Roanoke logperch presence is assumed at the remaining four stream crossing locations. North Fork Roanoke River (two crossings), is a fourth-order stream with an upstream drainage area of 61.5 square kilometers (23.8 mi²) at the MVP crossing and 61.8 square kilometers (23.7 mi²) at the access ford crossing. Roanoke River is a sixth-order stream with an upstream drainage area of 664.4 square kilometers (256.5 mi²). Pigg River is also a sixth-order stream with an upstream drainage area of 880.9 square kilometers (340.1 mi²).

Nine second-order streams and twelve third-order streams were assessed. Headwater fish assemblages were observed at most of these streams, bedrock substrates were pervasive at many, and limited habitat was available. Riffles were less than 20 centimeters (7.8 in) deep and the majority of these streams were likely too small to support populations of Roanoke logperch. Two fourth order streams are

proposed for crossing including Bradshaw Creek and Little Creek. On Bradshaw Creek, two crossings are proposed. Bradshaw Creek 1 was assessed; however, the assessment revealed the presence of suitable freshwater mussel habitat and a subsequent mussel survey was completed. Neither efforts for the habitat assessment nor the mussel survey yielded observations of Roanoke logperch. Given the size of the stream (fourth order) and proximity to a known, occupied stream (i.e., North Fork Roanoke River), it is possible that Roanoke logperch might utilize the stream during specific times of the year. The two proposed crossings of Little Creek were not assessed due to land access restrictions.

Two fifth-order streams including Maggodee Creek and Blackwater River were assessed. Both of these streams demonstrated habitats that could potentially host Roanoke logperch, but despite extensive past survey efforts within the Blackwater River drainage, no populations of Roanoke logperch nor orangefin madtom have been encountered within the Blackwater drainage, which includes Maggodee Creek (Burkhead 1983). The lack of logperch observations might be due to the presence of relatively high substrate embeddedness in non-riffle areas. Female Roanoke logperch are known to occur in runs over gravel and cobble substrate, but these habitats were limited in both the Blackwater and Maggodee Creek. Sand comprises the dominant substrate at these crossing locations and during elevated flow conditions is prone to shifts. Limited amounts of clean-swept gravel-sized substrate are present as a result of pervasive, shifting sand.

MVP will implement and strictly adhere to applicable federal and state erosion and sediment control/storm water management laws and regulations in watersheds; especially those that harbor threatened and endangered species. To further minimize adverse impacts to threatened and endangered fish, MVP intends to adhere to the TOYR standards recommended by VDGIF to the maximum extent practicable. Construction within waterbodies potentially harboring Roanoke logperch or orangefin madtom is not permitted between 15 March to 30 June and 15 March to 31 May, respectively, according to VDGIF TOYR standards. Coordination with VDGIF will occur if any deviation or modification from the TOYR standards is anticipated. Construction is scheduled to commence in early 2017 therefore fish removal surveys will occur in accordance with the instream construction schedules that will likely occur in 2018. Fish removal surveys are not limited to only those streams listed in this report but all perennial streams in Virginia capable of supporting fish populations (per VDGIF recommendation).

To date, presence/absence surveys for Roanoke logperch are not anticipated along the Project. Where habitat assessments have been completed and suitable habitat is not present, ESI respectfully requests concurrence that the methods, results, and overall approach described herein are adequate to address potential Project-related disturbances to Roanoke logperch, orangefin madtom, and other fishes in Virginia.

7.0 Literature Cited

- Burkhead, N. M. 1983. Ecological studies of two potentially threatened fishes (the orangefin madtom, *Noturus gilberti* and the Roanoke logperch, *Percina rex*) endemic to the Roanoke River drainage. Report to the Wilmington District of the Army Corps of Engineers, Wilmington, NC.
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- Petrimoulx, H.J. 1980. The biology and distribution of the Roanoke bass, *Ambloplites cavifrons* Cope, in Virginia. M.S. Thesis, Va. Commonwealth University, Richmond, VA. 92 pp
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- Simonson, T. D., and R. J. Neves. 1986. A status survey of the orangefin madtom (*Noturus gilberti*) and Roanoke logperch (*Percina rex*). Virginia Commission of Game and Inland Fisheries, Richmond, VA.
- USFWS. 2003. Roanoke Logperch (*Percina rex*) fact sheet. U.S. Department of Interior, Fish and Wildlife Service, Virginia Field Office. Gloucester, Virginia.

APPENDIX A
AGENCY CORRESPONDENCE LETTERS





United States Department of the Interior

FISH AND WILDLIFE SERVICE



Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

April 3, 2015

Ms. Valerie Clarkston
Environmental Solutions & Innovations, Inc.
4525 Este Avenue
Cincinnati, OH 45232

Re: Mountain Valley Pipeline, Virginia
Segments

Dear Ms. Clarkston:

The U.S. Fish and Wildlife Service (Service) has reviewed the project package for the referenced project. Mountain Valley Pipeline plans to construct a 42-inch diameter natural gas pipeline to allow producers and end-users a direct route to transport new gas supplies. The project will extend from the existing Equitrans transmission system near Mobley in Wetzel County, WV to Transcontinental Gas Pipeline Company's Zone 5 compressor station 165 in Pittsylvania County, VA. In Virginia, the pipeline is expected to cross Craig, Franklin, Giles, Montgomery, Pittsylvania, and Roanoke Counties. The following comments are provided under provisions of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended, Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c, 54 Stat. 250), as amended, and Migratory Bird Treaty Act of 1940 (16 U.S.C. 703-712, 40 Stat. 755).

Our recommendations are based on the route alignment provided on March 6, 2015. Once the action area of the project is finalized, an additional review that includes all attendant facilities, staging areas, etc. will be necessary. Action area refers to all areas directly or indirectly affected by the proposed action and not only the immediate area involved in the action.

Migratory birds are a Federal trust resource and are protected under the Migratory Bird Treaty Act. The project package did not include information on proposed impacts to migratory birds and their habitats. The Service will provide additional comments upon receipt of a plan that identifies and addresses impacts to migratory birds.

We recommend a detailed habitat assessment be conducted for the federally listed and proposed species below within the specified areas of potential habitat. An approved surveyor can conduct these habitat assessments in the action area to identify suitable habitat and survey for the species

if suitable habitat is identified. Surveys are not needed if the approved surveyor determines that no suitable habitat is present.

A table of optimal survey times for plants can be found on our website at:

http://www.fws.gov/northeast/virginiafield/pdf/endspecies/MISC/20120125_VIRGINIA_survey_time_frame_for_plants.pdf.

A list of qualified surveyors can be found on our website at:

<http://www.fws.gov/northeast/virginiafield/endspecies/surveyors.html>. This list does not include all individuals qualified or authorized to survey for these species. If you select someone not on the pre-approved surveyor list, provide the proposed surveyor's qualifications and proposed survey design to this office for review and approval prior to initiating the survey. Send copies of all habitat assessments and/or survey results to this office.

- James spinymussel (*Pleurobema collina*): federally listed endangered. We have reviewed the study plan entitled, "Freshwater mussel (Unionidae) site assessments, surveys, and relocations for the proposed Mountain Valley Pipeline in Virginia." Because this species has been documented in Craig, Johns, Little Oregon, and Dicks Creeks in Virginia, presence/absence surveys are not necessary in these streams. Habitat assessments are necessary for other perennial streams in the Craig Creek watershed in Craig County. We recommend that alternative routes be developed that avoid this watershed due to its importance to the conservation and recovery of this species. Formal consultation pursuant to the Endangered Species Act between the Service and Federal Energy Regulatory Commission is likely if this route or other routes in this watershed are pursued. Any relocation of federally listed mussels must be authorized by the Service prior to relocation. This species also occurs in South Fork Potts Creek in West Virginia and coordination with Service's West Virginia Field Office is necessary (see contact information below).
- Roanoke logperch (*Percina rex*): federally listed endangered. Because this species has been documented in the Pigg, Roanoke, and North Fork Roanoke Rivers, presence/absence surveys are not necessary in these rivers. Habitat assessments are necessary for other perennial streams in the Roanoke River watershed in Montgomery, Roanoke, Franklin, and Pittsylvania Counties.
- Northeastern bulrush (*Scirpus ancistrochaetus*): federally listed endangered. Potential habitat occurs in Craig and Giles Counties between points -80.237, 37.416 and -80.246, 37.42; -80.284, 37.387 and -80.287, 37.392; and -80.688, 37.392 and -80.693, 37.402.
- Smooth coneflower (*Echinacea laevigata*): federally listed endangered. Potential habitat occurs in Roanoke and Montgomery Counties between points -80.364, 37.275 and -80.329, 37.268; 80.242, 37.319 and -80.243, 37.316; -80.21, 37.246 and -80.202, 37.242; and 80.198, 37.229 and 80.197, 37.227.

- Mitchell's satyr butterfly (*Neonympha mitchellii mitchellii*): federally listed endangered. Potential habitat occurs in Franklin and Montgomery Counties.
- Bats
 - Surveys for potential hibernacula including cave openings and cave-like structures (e.g., abandoned or active mines, railroad tunnels) should be conducted following the guidance on page B3 of the Northern Long-Eared Bat Interim Conference and Planning Guidance within the action area of the proposed pipeline route. This guidance is available at:
<http://www.fws.gov/Midwest/endangered/mammals/nlba/pdf/NLEBinterimGuidance6Jan2014.pdf>.
 - In areas where tree removal will occur, surveys should be conducted by an approved surveyor following the most recent version of the Range-wide Indiana Bat Summer Survey Guidelines (available at:
<http://www.fws.gov/northeast/virginiafield/endangered/about.html>) for the following species in the areas specified below within suitable habitat.
 - Indiana bat (*Myotis sodalis*): federally listed endangered. Potential habitat occurs in Giles, Montgomery, Roanoke, and Craig Counties.
 - Northern long-eared bat (*Myotis septentrionalis*) (NLEB): federally proposed endangered (effective May 2, 2015 this species will be federally listed threatened with an interim 4(d) rule). Potential habitat occurs in Franklin, Giles, Montgomery, Pittsylvania, Roanoke, and Craig Counties.
 - The proposed route intersects with Tawneys Cave in Giles County, a known hibernaculum for Indiana and Northern long-eared bats. We recommend a minimum 5 mile buffer from the known hibernaculum opening and any mapped passages.
 - Specific comments on the revised study plan dated March 6, 2015:
 - Page 4 – Per page B5 of the NLEB Interim Conference and Planning Guidance, revise the description as follows, “a field survey, where access can be obtained, of all land within one-half mile of the edge of the project footprint and documentation (i.e., literature search) of all known caves and abandoned mine portals within 3 miles of the outside edge of the project footprint should be conducted.”
 - Page 5 – Per page B6 of the NLEB Interim Conference and Planning Guidance, if you plan to conduct spring portal/cave surveys they must be conducted between April 1 and April 21 and prior to any tree clearing. A minimum of three nights of sampling per week for three weeks (i.e., 9

nights of sampling) is required at each suitable entrance as determined by the Phase 1 Habitat Assessment. Your study plan proposes two evenings of sampling. Fall portal/cave surveys can be conducted rather than spring surveys. Per page B5 of the NLEB Guidance, surveys must be conducted between September 1 and October 31 and prior to any tree clearing. A minimum of two nights of sampling is required at each suitable entrance as determined by the Phase 1 Habitat Assessment.

- Page 5 - Per page B6 of the NLEB Interim Conference and Planning Guidance, harp traps and/or mist nets should be monitored for captured bats on 10-minute intervals. Your study plan states “traps are checked at least once per hour or continuously if the catch rate is greater than 25 bats per hour.” Change your plan to reflect the NLEB Interim Guidance.
- Address and incorporate comments the Service provided on November 26, 2014 on the study plan dated November 3, 2014. Specifically comments: SH10, SH11, SH12, and SH13.

To assist us in analyzing effects to federally listed and proposed species from the proposed action, provide the following information to this office:

- For proposed stream crossings where federally listed species are present, provide us an analysis that outlines all alternatives considered for that crossing, how the determination was made that the selected alternative was the least environmentally damaging, an analysis of effects to the stream anticipated due to the pipeline approaches to each side of the stream, and the proposed schedule/timing of the crossing. If boring or drilling is proposed, provide a best professional opinion on the likelihood that drilling fluids will escape through the bedrock to the stream.

To avoid and minimize impacts to federally listed and proposed species, incorporate the following conservation measures into the proposed project:

- To address impacts to summer bat habitat (see Appendix D of the NLEB Interim Conference and Planning Guidance): leave dead or dying trees standing (if not a safety hazard), maintain or improve forest patches and forested connections (e.g., hedgerows, riparian corridors) between patches, clearly demarcate trees to be protected vs. cut to help ensure contractors do not accidentally remove more trees than anticipated, avoid/minimize tree clearing that fragments large forested areas or tree lined corridors (e.g., route linear features along the edge of a woodlot instead of through the middle).

We recommend that you contact Liz Stout (West Virginia Field Office) at 304-636-6586 or elizabeth_stout@fws.gov to coordinate the portions of the project in West Virginia.

Once the action area of the project is finalized, an additional review that includes all attendant facilities, staging areas, etc. will be necessary. If habitat assessments and/or surveys determine that suitable habitat for listed or proposed species are present, this office will work with you to ensure that the project avoids or minimizes adverse impact to listed species and their habitats.

If you have any questions, please contact Kim Smith at (804) 824-2410 or via email at kimberly_smith@fws.gov.

Sincerely,

FOR Cindy Schulz
Field Supervisor
Virginia Ecological Services

cc: FERC, Washington, D.C. (Attn: Paul Friedman)
Service, Elkins, WV (Attn: Liz Stout)
VDCR-DNH, Richmond, VA (Attn: Rene Hypes)
VDGIF, Richmond, VA (Attn: Amy Ewing)

Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director



Joe Elton
Deputy Director of Operations

Rochelle Altholz
Deputy Director of Administration
and Finance

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

600 East Main Street, 24th Floor
Richmond, Virginia 23219
(804)786-6124

April 6, 2015

Valerie Clarkston
Environmental Solutions & Innovations, Inc.
4525 Este Avenue
Cincinnati, Ohio 45232

Re: PF 15-3 Mountain Valley Pipeline

Dear Ms. Clarkston:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

Below the natural heritage information is provided for the Mountain Valley Pipeline (March 2015 alignment and Feb 2015 Alternatives) by 1:24000 quadrangle for the Mountain Valley Pipeline Preferred Alignment study area (1 mile buffer of centerline) and Alternative Routes study area (1 mile buffer of centerline) including compressor stations, laydown areas and access roads.

Preferred Alignment 3v22 20150302

Bent Mountain Quad, Check Quad, Callaway Quad, Redwood Quad, Moneta SW Quad, Gladehill Quad, Pittsville Quad and Garden City Quad

According to the information currently in our files, natural heritage resources have not been documented within two miles of the project boundary. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources.

Chatham Quad

Biotics does contain historical records on the presence natural heritage resources within two miles of the project boundary. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

*State Parks • Soil and Water Conservation • Outdoor Recreation Planning
Natural Heritage • Dam Safety and Floodplain Management • Land Conservation*

Glenvar Quad and Spring Garden Quad

Biotics documents the presence of natural heritage resources within two miles of the project area. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

Lindside Quad, Pearisburg Quad, Eggleston Quad and Newport Quad

See Preliminary cave/karst information regarding the Mountain Valley Pipeline Route.

For Lindside and Pearisburg Quads, according to the information currently in our file, the Stony Creek Stream Conservation Unit (SCU) is located within the pipeline study area and is crossed by the centerline on the Pearisburg Quad. SCUs identify stream reaches that contain aquatic natural heritage resources, including 2 miles upstream and 1 mile downstream of documented occurrences, and all tributaries within this reach. SCUs are also given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain. The Stony Creek SCU has been given a biodiversity ranking of B4, which represents a site of moderate significance. The natural heritage resource associated with this site is:

Etheostoma osburni

Candy darter

G3/S1/NL/NL

To minimize adverse impacts to the aquatic ecosystem as a result of the proposed activities, DCR recommends the implementation of and strict adherence to applicable state and local erosion and sediment control/storm water management laws and regulations. DCR recommends a spill plan be developed to address issues with leaks or ruptures that may occur at or near stream/river crossings, and that spill plan should be evaluated by resource agencies to determine if it addresses concerns for aquatic species, including those associated with subterranean karst streams and aquifers.

McDonalds Mill Quad

According to the information currently in our files, the Upper Mill Creek Conservation Site is within the pipeline study area. Upper Mill Creek Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resources of concern at this site are:

Echinacea laevigata

Smooth coneflower

G2G3/S2/LE/LT

Significant Community

Appalachian Sugar Maple – Chinquapin Oak Dry Calcareous Forest

G4?/S4?/NL/NL

Significant Community

Limestone/Dolomite Barren (Ridge and Valley Hillslope Type)

G2/S1S2/NL/NL

DCR recommends avoidance of the Upper Mill Creek Conservation Site and associated documented natural heritage resources.

Due to the potential for this site to support populations of Smooth coneflower, DCR recommends an inventory for the resource in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources. Due to the legal status of the Smooth coneflower, DCR also recommends coordination with USFWS to ensure compliance with protected species legislation.

In addition, the Mill Creek Springs Natural Area Preserve has been documented within the center line of the pipeline. To avoid and minimize impacts to the preserve and documented natural heritage resources, DCR recommends avoid crossing the natural area preserve (Blake Preserve Alternative Alignment). However, if the

crossing of the preserve cannot be avoided, DCR recommends the crossing occur within the existing utility right-of-way corridor and recommends further coordination with DCR (Larry Smith, DCR Natural Areas Protection Manager at 804-371-6205) and The Nature Conservancy, the natural area preserve landowner to minimize and avoid impacts.

Ironto Quad

According to the information currently in our files, the Roanoke River – North and South Forks Stream Conservation Unit (SCU) is downstream of the project site. The natural heritage resources of concern associated with this SCU are:

| | | |
|-----------------------------|-------------------|-----------------|
| <i>Noturus gilberti</i> | Orangefin madtom | G2/S2/SOC/LT |
| <i>Percina rex</i> | Roanoke logperch | G1G2/S1S2/LE/LE |
| <i>Allocapnia simmonsii</i> | Spatulate snowfly | G3/S1S2/NL/NL |

In addition, the North Fork Roanoke River has been designated by the VDGIF as a “Threatened and Endangered Species Water” and is downstream of the project site. The species associated with this T & E Water are the Orangefin madtom and the Roanoke logperch.

To minimize adverse impacts to the aquatic ecosystem as a result of the proposed activities, DCR recommends the implementation of and strict adherence to applicable state and local erosion and sediment control/storm water management laws and regulations. Due to the legal status of the Roanoke logperch and Orangefin madtom, DCR also recommends coordination with the USFWS and the VDGIF to ensure compliance with protected species legislation. DCR recommends that a spill plan be developed to address issues with leaks or ruptures that may occur at or near stream/river crossings, and that spill plan should be evaluated by resource agencies to determine if it addresses concerns for aquatic species, including those associated with subterranean karst streams and aquifers.

Elliston Quad

According to the information currently in our files, the Elliston Glades Conservation Site is located within the pipeline study area. Elliston Glades Conservation Site has been given a biodiversity significance ranking of B1, which represents a site of outstanding significance. The natural heritage resources of concern at this site are:

| | | |
|----------------------------|------------------------------------|----------------|
| <i>Clematis addisonii</i> | Addison’s leatherflower | G1?/S1?/SOC/NL |
| <i>Paxistima canbyi</i> | Canby’s mountain-lover | G2/S2/SOC/NL |
| <i>Echinacea laevigata</i> | Smooth coneflower | G2G3/S2/LE/LT |
| Significant Community | Ridge and Valley Dolomite Woodland | G2/S2/NL/NL |

In addition, the Chestnut lip fern (*Cheilanthes castanea*, G5?/S2/NL/NL) has been historically documented in the pipeline study corridor.

Due to the potential for this site to support populations of natural heritage resources, DCR recommends an inventory for the resources in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources. Due to the legal status of the Smooth coneflower, DCR also recommends coordination with USFWS to ensure compliance with protected species legislation.

DCR recommends avoidance of the Elliston Glades Conservation Site and associated documented natural heritage resources.

The Pedlar Hills Natural Area Preserve is adjacent to the pipeline study corridor. DCR recommends coordination with DCR (Larry Smith, DCR Natural Areas Protection Manager at 804-371-6205) to avoid and minimize impacts to the preserve and associated documented natural heritage resources.

In addition, the Roanoke River – North and South Forks SCU is within the centerline of the pipeline and adjacent to the laydown yards. The South Fork Roanoke River and North Fork Roanoke River T & E waters are also adjacent. Due to the legal status of the Roanoke logperch and Orange-fin madtom, DCR also recommends coordination with the USFWS and the VDGIF to ensure compliance with protected species legislation.

Boones Mill Quad

According to the information currently in our files, the Grassy Hill Conservation Site is located within the pipeline study area. Grassy Hill Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resources of concern at this site are:

| | | |
|---|---------------------|---------------|
| <i>Echinacea laevigata</i> | Smooth coneflower | G2G3/S2/LE/LT |
| <i>Phemeranthus piedmontanus</i> | Piedmont fameflower | G1/S1/SOC/NL |
| Significant Community Central Appalachian Basic Ash – Hickory Woodland | | G2/S2/NL/NL |
| Significant Community Central Appalachian Acidic Oak – Hickory Forest | | G4/S4/NL/NL |
| Significant Community Central Appalachian Xeric Chestnut Oak – Virginia Pine Woodland | | G3?S3/NL/NL |

DCR recommends avoidance of the Grassy Hill Conservation Site and associated documented occurrences of natural heritage resources.

Due to the potential for this site to support populations of natural heritage resources, DCR recommends an inventory for the resource in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources. Due to the legal status of the Smooth coneflower, DCR also recommends coordination with USFWS to ensure compliance with protected species legislation.

Sandy Level Quad

According to the information currently in our files, the Sweet-shrub (*Calycanthus floridus*, G5/S2/NL/NL) has historically been documented within the pipeline study corridor. Due to the potential for this site to support populations of this rare resource, DCR recommends an inventory for the resource in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources.

Penhook Quad

According to the information currently in our files, the Jacks Creek Conservation Site is immediately adjacent to the pipeline centerline. Jacks Creek Conservation Site has been given a biodiversity significance ranking of B1, which represents a site of outstanding significance. The natural heritage resources of concern at this site are:

| | | |
|----------------------------------|-------------------------------------|--------------|
| <i>Phemeranthus piedmontanus</i> | Piedmont fameflower | G1/S1/SOC/NL |
| <i>Poa saltuensis</i> | Weak bluegrass | G5/S2/NL/NL |
| <i>Sporobolus heterolepis</i> | Prairie dropseed | G5/S1/NL/NL |
| Significant Community | Southern Piedmont Ultramafic Barren | G1/S1/NL/NL |

Due to the potential for this site to support populations of natural heritage resources, DCR recommends an inventory for the resource in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources.

DCR recommends avoidance of the Jacks Creek Conservation Site and associated documented occurrences of natural heritage resources.

In addition, the Pigg River – Owens Creek Stream Conservation Unit (SCU) is downstream of the project site. The Pigg River – Owens Creek SCU has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resource of concern associated with this SCU is:

Percina rex

Roanoke logperch

G1G2/S1S2/LE/LE

To minimize adverse impacts to the aquatic ecosystem as a result of the proposed activities, DCR recommends the implementation of and strict adherence to applicable state and local erosion and sediment control/storm water management laws and regulations. Due to the legal status of these species, DCR also recommends coordination with the USFWS and the VDGIF to ensure compliance with protected species legislation. DCR recommends a spill plan be developed to address issues with leaks or ruptures that may occur at or near stream/river crossings, and that spill plan should be evaluated by resource agencies to determine if it addresses concerns for aquatic species, including those associated with subterranean karst streams and aquifers.

Alt 87 and Alt 93- Newport Quad

See Preliminary cave/karst information regarding the Mountain Valley Pipeline Route.

Blake Preserve Alternative- McDonalds Mills Quad

The Virginia Karst Program and the Virginia Speleological Survey have reviewed this project for documented sensitive karst features and caves. This project is situated on karst-forming carbonate rock and if karst features such as sinkholes, caves, disappearing streams, and large springs are encountered during the project, please coordinate with Wil Orndorff (540-230-5960), Wil.Orndorff@dcr.virginia.gov to document and minimize adverse impacts. Discharge of runoff to sinkholes or sinking streams, filling of sinkholes, and alteration of cave entrances can lead to surface collapse, flooding, erosion and sedimentation, groundwater contamination, and degradation of subterranean habitat for natural heritage resources. If the project involves filling or “improvement” of sinkholes or cave openings, DCR would like detailed location information and copies of the design specifications. In cases where sinkhole improvement is for stormwater discharge, copies of VDOT Form EQ-120 will suffice.

In addition, according to the information in our files the alignment intersects a Virginia Outdoor Foundation (VOF) easement (MON-VOF-3333). For more information, please access the VOF website at <http://www.vofonline.org/>.

Alt 210- Callaway and Boones Mill Quads

According to the information currently in our files, natural heritage resources have not been documented within two miles of the project boundary. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources.

Alt 144 and Alt 192- Pittsville Quad

According to the information currently in our files, natural heritage resources have not been documented within two miles of the project boundary. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources.

Alt 35- Spring Garden and Chatham Quads

Biotics documents the presence of natural heritage resources within two miles of the project area. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

Alt 110

Waiteville Quad

According to the information currently in our files, the Mudlick Branch Woodland Conservation Site is located within the pipeline study area. Mudlick Branch Woodland Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resource of concern at this site is:

| | |
|-----------------------|--|
| Significant Community | Central Appalachian Shale Barren (Shale Ridge Bald/Prairie Type) |
| | G2/S2/NL/NL |

DCR recommends avoidance of the Mudlick Branch Woodland Conservation Site and associated documented occurrences of natural heritage resources.

According to the information currently in our files, the Craig Creek – Johns Creek Stream Conservation Unit (SCU) is within the pipeline centerline. The Craig Creek – Johns Creek SCU has been given a biodiversity ranking of B1, which represents a site of outstanding significance. Natural heritage resources associated with this site are:

| | | |
|----------------------------|--------------------|------------------|
| <i>Elliptio lanceolata</i> | Yellow lance | G2G3/S2S3/SOC/NL |
| <i>Fusconaia masoni</i> | Atlantic pigtoe | G2/S2/SOC/LT |
| <i>Noturus gilberti</i> | Orangefin madtom | G2/S2/SOC/LT |
| <i>Pleurobema collina</i> | James spiny mussel | G1/S1/LE/LE |

In addition, John Creek and Dicks Creek have been designated by the Virginia Department of Game and Inland Fisheries (VDGIF) as a “Threatened and Endangered Species Water”. The species associated with this T & E Water are the James spiny mussel and Atlantic pigtoe.

To minimize adverse impacts to the aquatic ecosystem as a result of the proposed activities, DCR recommends the implementation of and strict adherence to applicable state and local erosion and sediment control/storm water management laws and regulations. Due to the legal status of the Atlantic pigtoe, Orangefin madtom and James spiny mussel, DCR also recommends coordination with USFWS and the VDGIF to ensure compliance with protected species legislation. DCR recommends a spill plan be developed to address issues with leaks or ruptures that may occur at or near stream/river crossings, and that spill plan should be evaluated by resource agencies to determine if it addresses concerns for aquatic species, including those associated with subterranean karst streams and aquifers.

Craig Springs Quad

In addition to the Craig Creek – Johns Creek Stream Conservation Unit (SCU) within the pipeline centerline, the southwest portion of the Sinking Creek Mountain Conservation Site is also within the centerline. Sinking Creek Mountain Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resources of concern at this site are:

| | |
|-----------------------|--|
| Significant Community | Central Appalachian Montane Oak – Hickory Forest G3G4/S3S3/NL/NL |
| Significant Community | Central Appalachian Xeric Chestnut Oak – Virginia Pine Woodland Forest G3?/S3/NL/NL |

DCR recommends avoidance of the Sinking Creek Mountain Conservation Site and associated documented occurrences of natural heritage resources.

McDonalds Mill Quad

According to the information currently in our files, the Lynn Hollow Conservation Site is within the pipeline centerline. Lynn Hollow Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resource of concern at this site is:

| | | |
|-------------------------------|-----------------|-------------|
| <i>Gaylussacia brachycera</i> | Box huckleberry | G3/S1/NL/NL |
|-------------------------------|-----------------|-------------|

Due to the potential for this site to support populations of natural heritage resources, DCR recommends an inventory for the resource in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources.

Glenvar Quad

According to the information currently in our files, the Fort Lewis Mountain Slopes are within the pipeline centerline. Fort Lewis Mountain Slopes Conservation Site has been given a biodiversity significance ranking of B5, which represents a site of general biodiversity. The natural heritage resource of concern at this site is:

| | | |
|---|------------------|---------------|
| <i>Symphoricarpos albus</i> var. <i>albus</i> | Common snowberry | G5T5/S1/NL/NL |
|---|------------------|---------------|

DCR recommends avoidance of the Fort Lewis Conservation Site and associated documented occurrences of natural heritage resources.

Elliston Quad

The Virginia Karst Program and the Virginia Speleological Survey have reviewed this project for documented sensitive karst features and caves. This project is situated on karst-forming carbonate rock and if karst features such as sinkholes, caves, disappearing streams, and large springs are encountered during the project, please coordinate with Wil Orndorff (540-230-5960), Wil.Orndorff@dcr.virginia.gov to document and minimize adverse impacts. Discharge of runoff to sinkholes or sinking streams, filling of sinkholes, and alteration of cave entrances can lead to surface collapse, flooding, erosion and sedimentation, groundwater contamination, and degradation of subterranean habitat for natural heritage resources. If the project involves filling or “improvement” of sinkholes or cave openings, DCR would like detailed location information and copies of the design specifications. In cases where sinkhole improvement is for stormwater discharge, copies of VDOT Form EQ-120 will suffice.

Alt 135

According to the information currently in our files, the Roanoke River – North and South Forks Stream Conservation Unit (SCU) is downstream of the project site (see Ironto quad for information on this SCU).

In addition, the North Fork and South Fork Roanoke River have been designated by the VDGIF as a “Threatened and Endangered Species Water” and is downstream of the project site. The species associated with this T & E Water are the Orangefin madtom and the Roanoke logperch.

To minimize adverse impacts to the aquatic ecosystem as a result of the proposed activities, DCR recommends the implementation of and strict adherence to applicable state and local erosion and sediment control/storm water management laws and regulations. Due to the legal status of the Roanoke logperch and Orangefin madtom, DCR also recommends coordination with the USFWS and the VDGIF to ensure compliance with protected species legislation.

The Virginia Karst Program and the Virginia Speleological Survey have reviewed this project for documented sensitive karst features and caves. This project is situated on karst-forming carbonate rock and if karst features such as sinkholes, caves, disappearing streams, and large springs are encountered during the project, please coordinate with Wil Orndorff (540-230-5960), Wil.Orndorff@dc.virginia.gov) to document and minimize adverse impacts. Discharge of runoff to sinkholes or sinking streams, filling of sinkholes, and alteration of cave entrances can lead to surface collapse, flooding, erosion and sedimentation, groundwater contamination, and degradation of subterranean habitat for natural heritage resources. If the project involves filling or “improvement” of sinkholes or cave openings, DCR would like detailed location information and copies of the design specifications. In cases where sinkhole improvement is for stormwater discharge, copies of VDOT Form EQ-120 will suffice.

Alt 110J

Craig Springs Quad

The Virginia Karst Program and the Virginia Speleological Survey have reviewed this project for documented sensitive karst features and caves. This project is situated on karst-forming carbonate rock and if karst features such as sinkholes, caves, disappearing streams, and large springs are encountered during the project, please coordinate with Wil Orndorff (540-230-5960), Wil.Orndorff@dcv.virginia.gov to document and minimize adverse impacts. Discharge of runoff to sinkholes or sinking streams, filling of sinkholes, and alteration of cave entrances can lead to surface collapse, flooding, erosion and sedimentation, groundwater contamination, and degradation of subterranean habitat for natural heritage resources. If the project involves filling or “improvement” of sinkholes or cave openings, DCR would like detailed location information and copies of the design specifications. In cases where sinkhole improvement is for stormwater discharge, copies of VDOT Form EQ-120 will suffice.

Looney Quad

According to the information currently in our files, Sinking Creek Mountain, Trout Creek Barren and Pickles Branch Conservation Sites are within the pipeline centerline. The Sarver Barrens Conservation Site is within the pipeline study area. See Alt 110 –Craig Springs Quad for information on Sinking Creek Mountain Conservation Site.

Trout Creek Barren Conservation Site has been given a biodiversity significance ranking of B3, which represents a site of high significance. The natural heritage resource of concern at this site is:

Significant Community Central Appalachian Xeric Shale Woodland (Chestnut Oak.Mixed Herbs Type)
G3?S3/NL/NL

Salter Barrens Conservation Site has been given a biodiversity significance ranking of B3, which represents a site of high significance. The natural heritage resources of concern at this site are:

| | | |
|-------------------------|--|--------------|
| <i>Paxistima canbyi</i> | Canby's mountain-lover | G2/S2/SOC/NL |
| Significant Community | Central Appalachian Shale Barren (Northern Type) | G3/S3/NL/NL |

DCR recommends avoidance of the Trout Creek Barren Conservation Site and the Sarver Conservation Site and associated documented occurrences of natural heritage resources.

Pickles Branch Conservation Site has been given a biodiversity significance ranking of B4, which represents a site of moderate significance. The natural heritage resource of concern at this site is:

| | | |
|--------------------------------|------------|-------------|
| <i>Buckleya distichophylla</i> | Piratebush | G3/S2/NL/NL |
|--------------------------------|------------|-------------|

Due to the potential for this site to support populations of natural heritage resources, DCR recommends an inventory for the resource in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources.

Glenvar Quad

See Preliminary cave/karst information regarding the Mountain Valley Pipeline Route.

Alt 110R

Craig Springs Quad

Sugar Bottom Hollow Conservation Site has been given a biodiversity significance ranking of B3, which represents a site of high significance. The natural heritage resource of concern at this site is:

| | | |
|--------------------------------|------------|-------------|
| <i>Buckleya distichophylla</i> | Piratebush | G3/S2/NL/NL |
|--------------------------------|------------|-------------|

Due to the potential for this site to support populations of natural heritage resources, DCR recommends an inventory for the resource in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources.

Preliminary cave/karst information regarding the Mountain Valley Pipeline Route

The following information was prepared by Wil Orndorff, DCR Karst Protection Coordinator. As of April 2, 2015, two major alternative routes are being proposed for the NextEra/Equitable Mountain Valley Gas Transmission Pipeline. These major routes are herein referred to as the southern (MVP) route (passing through karst areas in Giles, Montgomery and Roanoke counties, Virginia) and the northern (Alt 110) route (passing across karst areas in Craig, Roanoke, and Montgomery counties.) Both corridors under consideration cross karst areas. Their locations relative to karstic bedrock, sinkholes, and cave conservation sites are shown in Figure 1. Alternative MVP (Southern route) crosses a broad swath of karst in Giles County and two additional bands of karst, one in northwestern Montgomery County just northeast of Blacksburg, and the other near Dixie Caverns in both Montgomery and Roanoke counties. Alternative 110 (northern route) crosses belts of karst in Craig, Roanoke, and a small part of Montgomery County. The intensity of karst features in some areas proposed for the pipeline is not necessarily an insurmountable obstacle, but careful planning and design will be essential to minimize the footprint of the pipeline on this fragile and hazardous landscape. It may be necessary to reroute portions of the pipeline to avoid significant negative impacts to sensitive karst features and/or geotechnical obstacles that these features present.

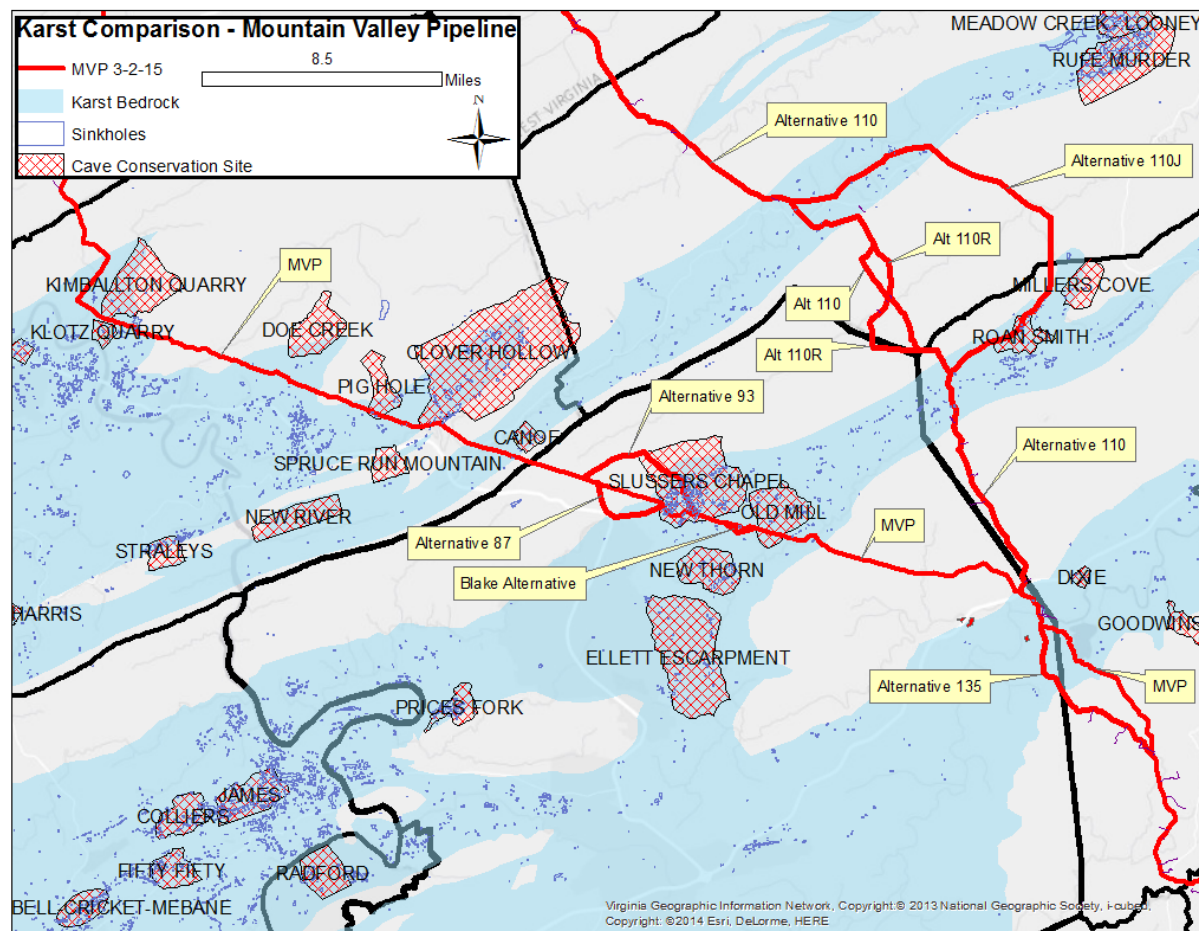


Figure 1. Overview of Proposed MVP alternatives overlain on karst features.

Table 1 presents a comparison of the impact of the proposed pipeline alternative routes in terms of proximity to sinkholes, cave entrances, and to Cave Element Occurrence Conservation sites. The conservation sites represent areas on the landscape where land disturbance could affect a state designated significant cave and/or one or more documented occurrences of cave obligate rare, threatened, or endangered species. Cave entrance locations are provided courtesy of the Virginia Speleological Survey. Sinkholes are as mapped by the Virginia Division of Mineral Resources. Cave conservation sites are those delineated by the Virginia DCR Natural Heritage Program.

Table 1 and Figure 1 clearly illustrate that the northern route(s) have a much lower likelihood of impacting documented cave and karst resources. The northern route 110 is the proposed route least likely to impact cave and karst resources, having only 17 as opposed to 85 sinkholes along the southern (MVP) route within ¼ mile of the centerline, and intersecting no cave element occurrence conservation sites as opposed to 4 for the southern (MVP) route. However, incorporation of Alternative 110J into the northern route would increase the number of sinkholes within ¼ mile to 44 and intersect one cave element occurrence conservation site while coming near a second. The southern (MVP) route, incorporating Alternative 93 (Preston North) would be the worst alternative in respect to karst.

Appendix A contains descriptions of the specific cave element occurrence conservation sites that either intersect or are within a mile of a proposed centerline.

Each cave conservation site has a biodiversity ranking that is a function of the number, rarity, and quality of element occurrences (rare plants, animals, or natural communities, including significant caves) within each site. B ranks range from B1 to B5, with lower ranks representing a higher degree of biodiversity significance. B1 sites are considered of “Outstanding” significance, and are typically associated with high quality occurrences of multiple rare species or natural communities. More information on these rankings can be found at http://www.dcr.virginia.gov/natural_heritage/help.shtml.

The type localities of several cave limited invertebrate animals lie within these conservation sites. These are enumerated in Appendix B.

However, it must be emphasized that our knowledge of the karst is incomplete. The **Virginia Speleological Survey (VSS)** may know of additional caves that are not shared with DCR due to landowner restrictions. In addition, there are likely to be undocumented caves proximal to any corridor that is chosen. These caves should be investigated as they are discovered. Some cave entrances may even be opened during the actual excavation of the pipeline itself, as happened during the construction of the Jewell Ridge Pipeline. In such cases, DCR should be notified immediately and given opportunity to examine and inventory these features.

Table 1. Comparative analysis of Proposed Mountain Valley Pipeline routes on Karst

| Route (alternative) | Sinkholes | | Cave entrances | | Cave Element Occurrence Conservation Sites | | |
|-------------------------------|------------|-----------|----------------|-----------|---|----------|-----------|
| | 1 mile | .25 mi. | 1 mile | .25 mi. | 1 mile | .25 mi. | intersect |
| Southern (MVP) | 395 | 85 | 73 | 18 | 9 | 7 | 4 |
| Southern – Preston South (87) | nc | -1 | nc | nc | nc | nc | nc |
| Southern – Preston North (93) | +3 | +30 | +1 | nc | nc | nc | nc |
| Southern – Blake Alternative | -3 | +1 | nc | nc | nc | nc | nc |
| Northern (Alt 110) | 68 | 17 | 13 | 1 | 0 | 0 | 0 |
| Northern (110R) | nc | nc | nc | nc | 0 | 0 | 0 |
| Northern (110J) | +79 | +27 | -1 | -1 | +2 | +1 | +1 |
| Alt 135 | nc | nc | -2 | 0 | nc | nc | nc |

* - includes any cave with documented element occurrences

The MVP alternative runs directly over top of caves passages in Tawney’s Cave and Smokehole Cave, immediately adjacent to and downhill of Pig Hole Cave, and over underground streams feeding Old Mill Cave and Johnsons Cave. It crosses the watershed of Slussers Chapel and Mill Creek Caves as well, cutting off the southwestern corner of the conservation site. All but Johnsons Cave are state designated significant caves.

General concerns regarding gas line installation and operation in karst

In addition to concerns about impacts to documented resources, there are some important, general considerations regarding the potential impact of pipeline construction and operation on karst resources. It is critical both for resource conservation and for the integrity of the pipeline that karst issues be recognized and dealt with in an appropriate manner. For some features, this will mean avoidance, while for others, appropriate engineering solutions. Of particular relevance are:

- 1) The use of directional drilling for stream crossings in karst areas, where loss of drilling fluid into voids can damage habitat and contaminate ground and surface water. This happened during the Duke Energy Patriot Pipeline crossing of the New River near Fosters Falls in Wythe County. For these reasons, direction drilling in karst is not recommended.
- 2) The potential for subsidence along the pipeline, which could affect the structural integrity of the pipeline and induce leakage. Subsidence prone areas should be avoided if possible, and/or the the structural integrity of the pipeline must be documented as sufficient to bridge any voids that may form.
- 3) The potential for dissolution of methane into groundwater along the pipeline corridor. The extent to which this occurs is unknown, but the project's proponents should evaluate the potential for this to occur, particularly in areas where the pipeline will pass below the water table.
- 4) The impact to undocumented karst features encountered during survey and construction. The project's proponents should document and investigate any features of potential significance discovered during the course of the project, and the results of any such investigation be shared with Virginia DCR.
- 5) The discharge of slug test water to sinkholes or the karst land surface. Discharge of slug test water to the land surface, including but not limited to sinkholes, has in the past (for example, during the Duke Energy Patriot pipeline) induced the formation of sinkholes adjacent to pipeline ROWs, causing safety hazards and introducing sediment as well as any chemicals in the slug test water into the local ground water. Slug test water should not be discharged to sinkholes or to the land surface in karst areas.
- 6) Spills of fuel and other chemicals during project construction and maintenance activities. If such spills drain to sinkholes, caves, or sinking streams, they have the potential to contaminate groundwater and adversely impact subterranean habitat as well as drinking water supplies. Project proponents should include karst specific provisions in the spill prevention plan that provide the same level of protection to karst features as that afforded to surface waters.

Bat Comments for the Preferred Alternative and Alternative Routes

According to Chris Hobson, DCR zoologist, the newly listed Federally Threatened Northern long-eared bat (*Myotis septentrionalis*) could roost during summer along any portion of the pipeline right of way that includes forested habitats, and suitable roost trees. The Federally Endangered Indiana bat (*Myotis sodali*) is also possible during summer, particularly along the western portions of the alignment associated with karst terrain. DCR recommends that timber harvest activities be done during the hibernation season to avoid impacts to these species during summer residency. If this is not possible, then a thorough habitat evaluation and field surveys following USFWS protocol for both species along the entire pipeline ROW should be conducted to evaluate roost potential and summer residency for these two listed species. If active roost sites for either species are encountered during surveys, then those sites should be avoided,

and additional consultation with USFWS, DCR, and DGIF would be warranted to re evaluate alternatives to avoid take of the two listed bat species. The rare *Myotis leibii* could also occur along the right of way, but is more likely to roost in rock outcrops and cliffs. Presence/absence for this species could be addressed during evaluation for the other two species, and if active roosts are found, we recommend avoidance of the roost site.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species.

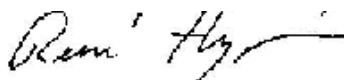
New and updated information is continually added to Biotics. Please re-submit a completed order form and project map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

A fee of \$ 2,220 has been assessed for the service of providing this information. Please find enclosed an invoice for that amount. Please return one copy of the invoice along with your remittance made payable to the Treasurer of Virginia, Department of Conservation and Recreation, Division of Natural Heritage, 600 East Main Street, 24th Floor, Richmond, VA 23219. Payment is due within thirty days of the invoice date. Please note late payment may result in the suspension of project review service for future projects.

The VDGIF maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from <http://vafwis.org/fwis/> or contact Gladys Cason (804-367-0909 or Gladys.Cason@dgif.virginia.gov). According to the information currently in our files, several T & E waters are within 2 miles of the project area in the Waiteville, McDonalds Mill, Glenvar, Sandy Level, Gladehill, Elliston, Ironto and Craig Springs quads. Additionally, there are federally and state listed species within 2 miles of the project area. Therefore, DCR recommends coordination with the USFWS and the VDGIF, Virginia's regulatory authority for the management and protection of these species to ensure compliance with the Virginia Endangered Species Act (VA ST §§ 29.1-563 – 570).

Should you have any questions or concerns, feel free to contact me at 804-371-2708. Thank you for the opportunity to comment on this project.

Sincerely,



S. René Hypes
Project Review Coordinator

CC: Troy Andersen, USFWS
Ernie Aschenbach, VDGIF
Wil Orndorff, DCR-Karst

COMMONWEALTH OF VIRGINIA
Department of Conservation and Recreation

DCR – Natural Heritage
600 East Main Street, 24th Floor
Richmond, VA 23219

Make checks payable to: **TREASURER OF VIRGINIA**
Send payment to the address at the left
Payment is due 30 days after receipt of invoice

Fed I.D. # 54-600449
DUNS # 8097 44444

Accounts Payable

INVOICE

Valerie Clarkston
Environmental Solutions & Innovations, Inc.
4525 Este Avenue
Cincinnati, Ohio 45232

Invoice Number: **H-11309**

Invoice Date: April 6, 2015

Taxpayer I.D.# _____

Please return remittance copy with payment
to ensure proper credit to your invoice.

Contact: Liz Dean
Division of Natural Heritage
(804) 371-2671 FAX# (804) 371-2674 TDD (804) 786-2121

| DESCRIPTION | QUANTITY | UNIT | UNIT PRICE | TOTAL AMOUNT |
|----------------------|----------|------|------------|--------------|
| <i>Impact Review</i> | 24 | EA | 90.00 | 2160.00 |
| Element Occurrences | 6+ | AT | 60.00 | 60.00 |

Site Reference
PF 15-3, Mountain Valley Pipeline

Credit Information:
199 0200 15 50317 02199 73201 304

| | |
|--------|---------|
| Amount | 2220.00 |
| Due: | |

The Department of Conservation and Recreation may charge interest on all past due accounts receivable in accordance with guidelines promulgated by the Department of Accounts and at the underpayment rate prescribed in Section 58.1-15 of the Code of Virginia. Each past due account receivable may also be charged an additional amount which shall approximate the administrative cost incurred in collecting the past due amount. The Department may also assess late payment penalty fees as appropriate.

Appendix A. Cave related conservation sites along the MVP Corridors

This Appendix contains descriptions of conservation sites for cave element occurrences that are intersect or are proximal to (within 1 mile) proposed Mountain Valley Pipeline corridors. Please note that biological inventory work in many of these sites is incomplete, the level of sampling across sites is inconsistent, and the assigned biodiversity ranking may under represent the biodiversity significance of any individual site.

1. Sites intersected by proposed Mountain Valley Pipeline corridor (s) center line (alternative segment indicated in parentheses)

A. Clover Hollow Conservation Site (MVP-Eggleston Quad and Newport Quad):

Clover Hollow is a conservation site of first order significance (B1). No extant records of federally listed species are associated with this conservation site. There is a historical record for the Indiana bat.

This conservation site protects cave and karst associated element occurrences, including 4 state designated significant caves. The conservation site boundary includes the land overlying the caves and the watershed of the cave streams as determined by dye trace studies and topographic analysis. Nineteen additional caves are documented within the conservation site.

A total of 7 cave limited terrestrial species and 3 cave limited aquatic species are known from the site.

Of these six species are globally very rare, cave limited invertebrate. Tawneys cave is the type locality for three of these species, Smokehole cave for one, and Stay High Cave (state Natural Area Preserve) for another. The range for three of these species is limited to the Sinking Creek Valley in Giles and Craig counties, VA.

Two rare bat species, the Eastern small-footed bat and the Indiana bat are known from the conservation site. However, the Indiana bat record is very old and the species has not been observed in the conservation site for decades.

The current center line for Mountain Valley passes directly over known cave passage in two designated significant caves – Tawneys and Smokehole. In addition to the invertebrate element occurrences, Tawneys Cave has hosted a modest hibernacula (~800-1000 total individuals) for little brown (*Myotis lucifugus*), tricolored (*Perimyotis subflavus*), and big brown bats (*Eptesicus fuscus*.)

Tawneys and Smokehole caves are highly significant in terms of recreational use. Tawney's Cave is used by numerous parks and recreation departments, scouting troops, church groups, and other civic organizations, as well as members of the caving community. Smokehole Cave is popular among cavers in the region, and receives some informal visitation as well. The loss of these caves as recreational resources due to safety concerns associated with underlying a gas pipeline would be likely to move the "traffic" to other sites, many of which are less suitable due to safety and environmental reasons.

B. Pig Hole Conservation Site (MVP-Eggleston Quad):

Pig Hole is a conservation site currently ranked at 4th order significance (B4). No extant records of federally listed species are associated with this conservation site. However, no biological inventories for cave-related fauna had been performed in the site prior to 2014. Inventories of the site are currently in progress.

This conservation site protects a state designated significant cave. The conservation site boundary includes the land overlying the cave and the watershed of the cave stream as

determined by dye trace studies and topographic analysis. A second small cave occurs within the site.

B.1 – Cave adapted invertebrates in Pig Hole Cave

Cave limited species occur in the significant cave, but they are poorly documented. A recent collection trip obtained specimens of cave adapted millipedes, *Stygobromus* sp. cave-adapted amphipods, cave adapted spiders, a flea, troglophilic beetles, cave adapted spiders, and monogynaspid mites.

Dr. John Holsinger of Old Dominion University has examined the *Stygobromus* specimens collected in the fall of 2014 and determined that they are new to science. Once this species is formally described, it will be added to the state list of rare species, which will bump the biodiversity ranking of Pig Hole Cave Conservation Site to B2. In the highly likely event that additional globally rare cave adapted invertebrates are found in the cave, the site could be raised to B1 status. For example, the spotted cave beetle (*Pseudanophthalmus punctatus*), known only from the Sinking Creek basin, was recently documented from a cave 0.3 km east of the current boundary of the Pig Hole conservation site. Dye trace studies suggest that water from this cave passes beneath the site and that the beetle is likely present in Pig Hole Cave.

For purposes of environmental planning, we recommend treating the site as a B2 rather than B4 conservation site.

B.2 – Bats in Pig Hole Cave

Although Pig Hole cave has long been known to cavers as a bat cave, there has been no formal inventory of the cave in terms of bat use. At the very least, it is clear the little brown bats, big brown bats, and tricolored bats currently use the cave. Cavers report that as recently as the mid- to late 1990s, there were probably over a thousand *Myotis* (little browns?) hibernating in the Hess' Hollow portion of the cave, and there were several clusters of bats near the lower elevation entrance of the cave. These clustering bats were probably little brown bats, but could have been Indiana bats or possibly Virginia big-eared bats. *Myotis* populations have declined precipitously in response to White Nose Syndrome in the New River Valley, so currently populations are anticipated to be much lower than those reported from the 1990s. Nonetheless, investigation of Pig Hole cave's current significance as a hibernacula was warranted, and performed in early March, 2015. The historic record of the Indiana bat from a cave 3km to the east suggested that use of Pig Hole by Indiana bats may have been probable.

A thorough inventory of the cave for hibernating bats was performed on March 3, 2015, by Virginia Natural Heritage Program staff scientists and volunteers from the VPI (Virginia Tech) Cave Club. A total of nine bats of three species were observed (1 little brown bat, 3 tricolored bats, and 5 big brown bats.) No listed species were observed. It is likely that White Nose Syndrome is responsible for the precipitous decline of the bat population over the last 6 years.

B.3 – Recreational use of Pig Hole Cave

The current center line for Mountain Valley passes within 300' of underlying mapped cave passage in Pig Hole Cave. It also passes down a steep slope below the cave's lower entrance, into which air flows aggressively during the winter months due to the chimney effect of the higher entrance. It is a concern that gas leaking from the pipeline down slope of the cave could become entrained in airflow entering the cave and subsequently concentrated within domes in the cave. The cave receives significant recreational use on a regular basis, and an accumulation of gas would pose a risk to human health and safety.

C. Slussers Chapel Conservation Site (MVP; Alt 87; Alt 93- Eggleston Quad and Newport Quad):

Slussers Chapel is a conservation site of third order significance (B3). No extant records of federal or state listed species are associated with this conservation site. There is potential for the state listed endangered Ellett Valley Millipede (*Pseudotremia cavernarum*) in the site.

This conservation site protects cave and karst associated element occurrences, including 2 state designated significant caves, both under conservation ownership. The conservation site boundary includes the land overlying the caves and the watershed of the cave streams as determined by dye trace studies and topographic analysis. Six additional caves are documented within the conservation site.

The two significant caves are Slussers Chapel and Mill Creek Caves. Entrances to both caves are in conservation ownership, Slussers Chapel by the Cave Conservancy of the Virginias and Mill Creek Cave by the Nature Conservancy.

Three cave limited terrestrial invertebrate species and two cave limited aquatic invertebrate species are known from the site.

Of these, three species are globally very rare, cave limited invertebrates. Slussers Chapel cave is the type locality for one of these species. The range for two of these species is limited to the karst of the upper Roanoke River basin.

A recent biological inventory of Mill Creek Cave (2012) obtained specimens of the millipede genus *Pseudotremia*. They specimens were consistent with the state listed endangered Ellett Valley millipede. However, the specimens were juveniles and not identifiable to the species level. Subsequent collections of adult male *Pseudotremia* will help to determine whether or not the state endangered species is present in the conservation site.

Little brown, tricolored, and big brown bats are known from caves in the site, but not in high numbers.

Three kilometers of the current center line for MVP pass directly over the sinkhole plain in the southwestern corner of this conservation site, passing through or draining to at least six mapped sinkholes that serve as recharge for Slussers Chapel. Alternative 87 presents no significant change. Alternative 93 is much worse for the conservation site, increasing the number of sinkholes within ¼ mile of the centerline by 30.

D. Old Mill Conservation Site (MVP-McDonald's Mill):

Old Mill is a conservation site of third order significance (B3). No extant records of federal or state listed species are associated with this conservation site. There is potential for the state listed endangered Ellett Valley Millipede (*Pseudotremia cavernarum*) in the site.

This conservation site protects cave and karst associated element occurrences, including a state designated significant cave. The conservation site boundary includes the land overlying the cave and the watershed of the cave stream as determined by dye trace studies and topographic analysis. The current boundary should be modified to include the entire watershed of Dry Run, which sinks in its bed supplying the majority of the water in the Old Mill Cave stream. Two additional caves are documented within the conservation site.

Three cave limited terrestrial invertebrate species and two cave limited aquatic invertebrate species are known from the site.

Of these, three species are globally very rare, cave limited invertebrates. In addition, a globally rare troglomorphic beetle is known from the cave. The range for two of these species is limited to the karst of the upper Roanoke River basin.

No information is available regarding bat use of the site.

One and a half kilometers of the current center line for Mountain Valley crosses the conservation site, passing directly over the underground stream that forms the cave stream in Old Mill Cave, approximately ½ mile northeast of the cave entrance.

E. Roan Smith Conservation Site (110J)-(Glenvar Quad):

Roan Smith is a conservation site of third order significance (B3). No extant records of federal or state listed species are associated with this conservation site.

2. Sites within 4 miles of the proposed Mountain Valley Pipeline corridor(s) center line (alternative segment indicated in parentheses)

A. Kimballton Quarry (**MVP- Lindside Quad and Pearisburg Quad**) – B4 Site represents a state designated significant cave discovered ~ 30 years ago when intersected by an active underground limestone mine. The mine remains active to this day, and the cave is off limits. No biological studies of the cave have been performed. Active mine operation remains the overriding threat to this cave.

B. Klotz Quarry (**MVP Pearisburg Quad**) – B4 Site represents a state significant cave with five entrances in the face of a dormant (abandoned?) limestone quarry. No systematic biological studies of the cave have been performed. Some bat use of the cave has been reported.

C. Doe Mountain (**MVP-Eggleston Quad**) – This B2 site has a high biodiversity significance due to presence of terrestrial plant element occurrences in the site. The extensive cave beneath the site has a high potential for cave limited invertebrates in addition to three already documented in the cave.

D. Spruce Run Mountain (**MVP- Eggleston Quad**) – This B2 site has high biodiversity significance due to the presence of an extremely rare cave beetle species.

E. New Thorn (**MVP- McDonald's Mill Quad, Newport Quad, Ironto Quad and Blacksburg Quad**) – The B3 biodiversity significance of this site is based on the presence of globally rare cave adapted fauna. There is also potential in the site for the state listed endangered Ellett Valley millipede.

F. Millers Cove (**110J-Glenvar Quad**) – This B4 conservation site protects a designated significant cave (Millers Cove Cave) located on the US Forest Service land. Similar to Pig Hole Cave, the fauna of this cave is probably underdescribed.

Appendix B. Cave limited species whose type locality conservation sites are intersected by Mountain Valley Pipeline alignments under consideration (4/2/2015)

Clover Hollow Conservation Site:

- Smokehole Cave, *Caecidotea henroti* – 2 of 4 sites are in consite; Va endemic
- Tawney's Cave, *Stygobromus ephemerus* – endemic to Sinking Creek basin in Giles County, all but one known occurrence are in Clover Hollow Conservation site
- Tawney's Cave, *Pseudanophthalmus punctatus* – Giles County endemic; all but one occurrence are in Clover Hollow Conservation site
- Tawney's Cave, *Pseudanophthalmus gracilis* – Endemic to Sinking Creek basin; all but one occurrence are in Clover Hollow Conservation site
- Stay High Cave, *Pygmarrhopalites commorus* – widespread springtail
- Slussers Chapel Conservation Site
- Slussers Chapel Cave – *Stygobromus fergusonii* (2 of 3 records are in consite)

Pig Hole Conservation site

- Pig Hole Cave – undescribed species of amphipod, genus *Stygobromus*

Valerie Clarkston

From: ProjectReview (DGIF) <ProjectReview@dgif.virginia.gov>
Sent: Thursday, April 02, 2015 11:50 AM
To: Pinder, Mike (DGIF); Valerie Clarkston
Cc: ProjectReview (DGIF); Cason, Gladys (DGIF)
Subject: ESSLog 35246; Mountain Valley Pipeline Project extending from Wetzel County, West Virginia to Pittsylvania County, VA

Importance: High

Mike:

Quick follow-up to let you know...

Just got off the phone with Valerie Clarkston of ESI (T&E species consultant for this project) who has been trying to reach you to discuss aquatic surveys for listed fish known from the project area. I will let you provide species-specific guidance about surveys and qualified biologists, as appropriate. Species known from region include:

- Federal Endangered state Endangered (FESE) Roanoke logperch
- State Threatened (ST) orangefin madtom
- Federal Species of Concern (FC) roughhead shiner (DGIF has no protective recommendation for non-listed species)
- Collection concern (CC) candy darter (DGIF has no protective recommendation for non-listed species)

My preliminary guidance is , DGIF generally recommends (the proponent), assume presence of the species (we typically do not recommend surveys for presence/absence) and (1) avoid instream work or (2) minimize impact by implementing best construction practices; for projects requiring instream work where listed fish [species ____] or designated Threatened and Endangered (T&E) species waters known from project area:

- Avoid all instream work;
- Stage all work from the top of bank/existing roadway (no machines instream), if practicable;
- DGIF will consider alternative methodologies for instream work, as appropriate (e.g., directional drilling, recommend frac-out plan, etc.)
- If instream work becomes necessary, ensure all instream work adhere to a Time of Year Restriction (TOYR=no instream work during that time of any given year) protective of [species], as appropriate.
 - See DGIF website for DGIF Time of Year Restriction recommendations (table):
<http://www.dgif.virginia.gov/environmental-programs/environmental-services-section.asp>
- If instream work becomes necessary, performing all instream work in the dry within cofferdams (ins some cases turbidity curtains or other protective measures may be recommended);
- Having a qualified biologist present to remove all fish from cofferdam areas, prior to dewatering (same recommendation if listed mussels are known from the area...)
 - repeat above, as needed of over-topping/flooding of cofferdam area occurs;
- Provided cofferdams are installed and removed outside the TOYR for [species], work within the cofferdam can be performed throughout the year;
- Strict adherence to E&S controls, during all land disturbance;
- We also recommend the proponent contact the USFWS regarding all federally listed species.

DGIF may possibly recommend habitat assessment/survey when a listed species has the potential to be present/known from the project area (e.g., instream work in a headwater tributary near confluence with designated T&E species water,

etc.). In general, this typically consists of photo documentation of stream characteristics and narrative. After DGIF reviews the habitat assessment, a survey may be recommended, as appropriate. DGIF may request a site visit.

Please keep me posted if you 2 coordinate to discuss...

Thanks.

Ernie Aschenbach
Environmental Services Biologist
Virginia Dept. of Game and Inland Fisheries
P.O. Box 11104
4010 West Broad Street
Richmond, VA 23230
Phone: (804) 367-2733
FAX: (804) 367-2427
Email: Ernie.Aschenbach@dgif.virginia.gov



TELEPHONE / PERSONAL CONVERSATION REPORT

| | |
|---------------------------|--|
| PROJECT NAME: | Mountain Valley Pipeline Project |
| MVP TEAM CALLER: | Valerie Clarkston |
| CONVERSATION WITH: | Mike Pinder |
| AGENCY: | Virginia Department of Game & Inland Fisheries |
| EMAIL ADDRESS: | Mike.Pinder@dgif.virginia.gov |
| PHONE NUMBER: | 540-961-8387 |
| SUBJECT: | Fish Impacts |
| DATE AND TIME: | 4/8/2015 at 9:50 AM |

SUMMARY OF CONVERSATION:

Mike was returning Valerie's email regarding potential impacts to fish species along MVP's project route. He indicated he would not likely provide a formal review until the project's final route be determined. However, he did offer the following general comments:

Mike emphasized that for streams with known T/E species:

- Assume presence and do not recommend surveys
- Prefer complete avoidance of the stream
- VDGIF recommendations will be dependent on what type of construction method is proposed
- If avoidance is not possible, then VDGIF typically requests
 - Project must follow Time of Year Restrictions
 - Enforce strong erosion and sediment controls
 - VDGIF request that a qualified biologist be on-site during stream crossings
 - Depending on the stream, VDGIF sometimes prefers trenching over HDD because trenching is a faster method and could possibly have less of an impact than the long, drawn-out process of HDDing.
 - For all federal T/E waters, VDGIF defers to USFWS

Mike mentioned that for streams with suitable habitat for T/E fish but few to no document occurrence are known, VDGIF typically recommends that surveys for species be completed. Mike indicated that smaller streams or tributaries leading to larger streams with known occurrences need to be carefully monitored during construction. He commented that he has seen things fall apart at the seams on other projects that cross small streams but fail to maintain strong erosion and sediment controls. For such small and seemingly benign streams, Mike suggested MVP take the following steps:

- Go beyond the minimum requirements with regards to erosion and sediment controls
- Install extra sediment fencing or, in areas where flash flooding may occur, use chain-link fence to hold straw bales in place
- Always consider the worst case scenario and prepare for it



- Always use Time of Year Restrictions; keep in mind that many streams lead into Roanoke logperch waters and their TOYR is from March to July

Mike requested that MVP give serious thought to how or if they plan to rebuild stream banks following construction of the pipeline. If trees are to be removed and the ROW to be maintained free of trees, he suggested planting shrub-like vegetation along the bank to provide stability. He also requested that MVP not use herbicide or other chemicals when performing maintenance operations in the vicinity of streams.

Valerie asked about the status of the Candy Darter and what, if any, regulations should be followed. Mike replied that the candy darter is not currently listed and is only considered a species of concern in VA. However, this species last stronghold is in VA and it is being petitioned to be listed. Mike is aware that MVP is crossing Big Stony Creek where numerous occurrences of candy darters have been documented. Mike said the farther down the stream you cross is better because the species is more common upstream. Avoidance of the stream is not necessary at this point in time, but Mike did request that MVP follow the TOYR for the species.

Contact Signature: _____

From: [ProjectReview \(DGIF\)](#)
To: [Casey Swecker](#); [Pinder, Mike \(DGIF\)](#)
Cc: [ProjectReview \(DGIF\)](#)
Subject: ESSLog 35246; RE: Fish Study Plan for Mountain Valley Pipeline Project
Date: Friday, June 05, 2015 9:54:24 AM

Please see recommendation from Mike Pinder, DGIF Region 3 Aquatic Biologist.

Thanks.

Ernie Aschenbach
Environmental Services Biologist
Virginia Dept. of Game and Inland Fisheries
Phone: (804) 367-2733
Email: Ernie.Aschenbach@dgif.virginia.gov

We moved! Our new address is:

Physical
7870 Villa Park Dr, Suite 400
Henrico, VA 23228

Mailing
P O Box 90778
Henrico, VA 23228

From: Pinder, Mike (DGIF)
Sent: Thursday, June 04, 2015 1:23 PM
To: Aschenbach, Ernie (DGIF)
Subject: RE: Fish Study Plan for Mountain Valley Pipeline Project

Ernie,

Any stream crossing that exposes the stream bottom will require removing all fish and moving them to suitable habitat within the same stream.

Mike

From: Casey Swecker [<mailto:CSwecker@envsi.com>]
Sent: Thursday, June 04, 2015 11:39 AM
To: Aschenbach, Ernie (DGIF); Pinder, Mike (DGIF); troy_andersen@fws.gov
Cc: John Spaeth; Watson, Brian (DGIF)
Subject: Fish Study Plan for Mountain Valley Pipeline Project

Gentleman,

Please find the attached study plan associated with ESI's survey and habitat study plan for all fishes along the proposed Mountain Valley Pipeline Project in Virginia.

The level of survey effort identified within this plan is based on review of agency correspondence letters as described in Section 2.0 of the attached document. We appreciate any edits, recommendations, and comments to the attached study plan to obtain concurrence that the level of effort fulfills all regulatory obligations associated with rare, threatened, and endangered fish species for the Project in Virginia.

We request concurrence that only fish species identified within the attached document necessitate habitat assessment/survey attention and no other species (i.e., Candy Darter, etc.) require additional consideration.

Hard copy of the attached study plan has been mailed to VDGIF (Mr. Aschenbach's attention). If you would like a hard copy, please let me know and I will get it mailed out to you today.

If you have any questions, please don't hesitate to contact me by email, or on my cell 304.633.5808

Thanks,



Casey Swecker

Senior Project Manager

Environmental Solutions & Innovations, Inc.
4525 Este Avenue | Cincinnati, Ohio 45232 | USA
office: 513.451.1777 **direct:** 513.591.4324
fax: 513.451.3321 **cell:** 304.633.5808
cswecker@envsi.com | www.envsi.com

APPENDIX B
VDGIF TIME OF YEAR RESTRICTIONS



APPENDIX B

VDGIF Time of Year Restrictions (TOYR) Table

This document provides general guidance for the protection of selected wildlife resources, focusing on times of year during which certain species may be most sensitive to human activities such as construction and land clearing. It does not constitute a list of best management practices to protect imperiled or sensitive wildlife species or their habitats; nor is adherence to these restrictions essential for every project. These recommendations, however, should be considered as guidance for project planning and scheduling of construction activities that may impact the identified wildlife species. Environmental documents and permit applications are reviewed individually, and modification or waiver of these time-of-year standards will be considered on a case-by-case basis.

| Fish | TOYR (no instream work to occur) |
|---|--|
| brown and brook trout waters | 01 October – 31 March |
| rainbow trout waters | 15 March – 15 May |
| general warmwater species spawning | 15 April – 15 July |
| general coldwater species spawning | 1 March – 30 June |
| Anadromous Fish Waters and tributaries – see exceptions below | 15 February – 30 June |
| James River and tributaries: | |
| ▪ Jamestown Island (Gray's Creek) - Rt. 17 bridge. | 15 February - 15 June |
| ▪ Tribell Shoals and Goose Hill Channel | 15 February - 1 June |
| ▪ Jamestown Island - Boshers' Dam | 15 February – 30 June |
| ▪ Above Boshers' (including Rivanna River) | 15 March – 30 June |
| ▪ Below Rt. 17 bridge | No TOYR unless project spans width of River to an extent that it significantly impedes passage |
| Rappahannock River and tributaries (below Rt. 360) | 15 February – 15 June |
| York River and tributaries (below Rt. 33) | 15 February – 15 June |
| Elizabeth River | No TOYR unless project spans width of River to an extent that it significantly impedes passage |
| Nansemond River | 15 February – 15 June |
| landlocked white bass, striped bass, sunfish (incl. on Lake Anna) | 15 March – 30 June |
| general fish - Smith Mountain Lake | 15 February - 15 June |
| Roanoke logperch | 15 March – 30 June |
| orangeфин madtom | 15 March – 31 May (only in native range – not in the James River drainage, where it has been introduced) |

| | |
|--|--|
| whitemouth shiner | 15 March – 30 June |
| yellowfin madtom | 01 April – 31 Aug |
| Carolina darter | 15 March – 30 June |
| Tennessee dace | 01 April – 31 July |
| spotfin chub | 01 May – 31 Aug |
| blackside dace | 01 April – 01 August |
| Clinch dace | 01 April – 31 July |
| blackbanded sunfish | 01 May – 30 June |
| variegate darter | 15 March – 31 July |
| duskytail darter | 01 April – 15 July |
| sickle darter (previously longhead darter) | 15 March – 31 July |
| greenfin darter | 01 May – 01 July |
| Roanoke bass | 15 March – 15 July |
| Roanoke hogsucker | 15 March – 15 July |
| bridle shiner | 15 May – 31 July |
| roughhead shiner | 15 March - 30 June |
| golden darter | 01 May - 31 August |
| riverweed darter | 15 April – 31 May |
| speckled killifish | 01 June - 15 July |
| sharphead darter | 15 June - 31 August |
| Bluestone sculpin | 01 Jan – 31 May |
| Atlantic sturgeon | Recommend coordination with NOAA Fisheries for any instream construction located within channel habitat of designated Threatened and Endangered Species Water. This is not to include projects with minimal impacts along the water's edge such as small shoreline stabilization projects, pier repairs, etc |
| | |
| Crayfish: | TOYR (no instream work to occur) |
| Big Sandy crayfish | 1 July – 31 October |
| | |
| Freshwater mollusks* | TOYR (no instream work to occur) |
| Long-term brooders - general | 15 April – 15 June (release of glochidia); 15 August – 30 September (spawning) |
| Short-term brooders - general | 15 May – 31 July |
| dwarf wedgemussel | 15 March - 31 May; 15 August – 15 Oct. |
| purple bean | 15 Feb. - 15 June; 15 August - 30 September |
| spiny riversnail | 1 April – 15 June |
| spider elimia | 1 April - 15 June |
| | |
| Birds | TOYR (certain activities may not occur) |
| bald eagle nest sites | 15 December – 15 July |
| bald eagle, concentration area and roost sites | Summer: 15 May – 31 August; Winter: 15 December – 15 March |

| | |
|--|--|
| black skimmer | 01 April – 31 August |
| common tern | 01 April – 31 August |
| great blue heron | 15 Feb – 31 July for activities within 0.25 mile of rookery or within 0.5 mile of rookery if project involves high density activity; maintain undisturbed naturally vegetated buffer of at least 500 ft around rookery |
| great egret | 01 April – 15 August for activities within 0.25 mile of rookery |
| green heron | 01 April – 15 August for activities within 0.25 mile of rookery |
| least tern | 01 April – 31 August |
| peregrine falcon | 15 February – 15 July for activities within 600 feet of nest. |
| piping plover | 15 Mar – 31 August; TOYR ends when last brood fledges as determined during most recent monitoring activity. |
| Wilson's plover | 01 April – 31 August; TOYR ends when last brood fledges as determined during most recent monitoring activity. |
| other beach nesting birds | 01 April – 31 August; TOYR ends when last brood fledges as determined during most recent monitoring activity. |
| yellow-crowned night heron | 01 April – 15 August for activities within 0.25 mile of rookery |
| loggerhead shrike | 01 April – 31 July |
| upland sandpiper | 01 April – 31 July |
| Bewick's wren | 01 April – 30 June |
| Bachman's sparrow | 01 April – 15 August |
| Henslow's sparrow | 01 April – 31 August |
| black rail | 01 April – 31 August |
| general migratory and resident songbirds | 15 March – 15 August |
| | |
| Mammals | TOYR (certain activities may not occur) |
| gray bat | 30 March – 30 October - particularly for activities on or near bridges/culverts over the Powell and Clinch rivers |
| Indiana bat | no significant tree removal at project site from 15 Apr – 15 Sep; no significant tree removal within 5 miles of hibernacula from 1 Apr – 15 Nov |
| | |
| Amphibians | Protective Recommendations |
| Mabee's salamander | Maintain undisturbed naturally vegetated buffer of at least 300 meters on pond. No impacts upon pond without incurring impacts |

| | |
|--------------------------|---|
| | upon salamander. |
| eastern tiger salamander | Maintain undisturbed naturally vegetated buffer of at least 300 meters on pond. No impacts upon pond without incurring impacts upon salamander. |

| Reptiles | TOYR (certain activities may not occur) |
|-----------------------------------|--|
| wood turtle | <i>For instream work:</i> 01 October – 31 March; <i>For work within 900 feet of stream (zone of concern):</i> 01 April – 30 September. Maintain undisturbed naturally vegetated buffer of at least 300 feet (preferably larger) on stream. |
| sea turtles (beach activities) | Nest searches are conducted from 1 May – 31 August. TOYR ends when last nest hatches as determined during most recent monitoring activity. If nest searches are not conducted, no work on beaches (or affecting beaches) from 1 May – 15 November. |
| sea turtles (dredging activities) | 01 April – 30 November for hydraulic hopper dredging in the Bay, ocean and major tributaries. Efforts to waive the TOYR must be coordinated through NMFS. |

Nesting Dates (non-listed birds):

Raptors (including hawks, owls, falcons): 01 Jan – 31 May

Woodpeckers: 01 April – 31 July

Resident passerines and non-passerines**: 01 Mar – 31 July

Migrant passerines and non-passerines***: 01 May – 31 July

American goldfinch: 15 July – 15 September

****Resident passerines and non-passerines** – examples: mourning dove, Carolina chickadee, white-breasted nuthatch, Carolina wren, American robin, northern mockingbird, common grackle, northern cardinal, song sparrow, etc.

*****Migrant passerines and non-passerines – examples:** cuckoos, nightjars, swifts, hummingbirds, swallows, warblers, vireos, tanagers, etc.

***Freshwater mollusks:**

Long-term brooders:

fragile papershell

elktoe

brook floater

birdwing pearlymussel

spectaclecase

Short-term brooders:

yellow lance

shiny pigtoe

fine-rayed pigtoe

Atlantic pigtoe

cracking pearlymussel

Long-term brooders:

fanshell
dromedary pearlymussel
cumberlandian combshell
oyster mussel
green-blossom
snuffbox
tan riffleshell
pink mucket
yellow lampmussel
Tennessee heelsplitter
green floater
little-wing pearlymussel
purple lilliput
rayed bean
Cumberland bean
slippershell mussel
black sandshell

Short-term brooders:

slabside pearlymussel
James spinymussel
Tennessee clubshell
rough pigtoe
pyramid pigtoe
rough rabbitsfoot
Cumberland monkeyface
pistolgrip
Appalachian monkeyface
sheepnose

APPENDIX C
MAPS

Path: G:\Current\593_EQT_MVP\MXD\Aquatic\2015_VA_Fish_Report\593_VA_Fish_Report_ApndxA_Fig_2_20151112.mxd (ganderson) - 11/12/2015



Habitat Assessment Location

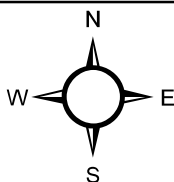
● Site Assessed

● Milepost

— Proposed MVP Alignment

--- Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

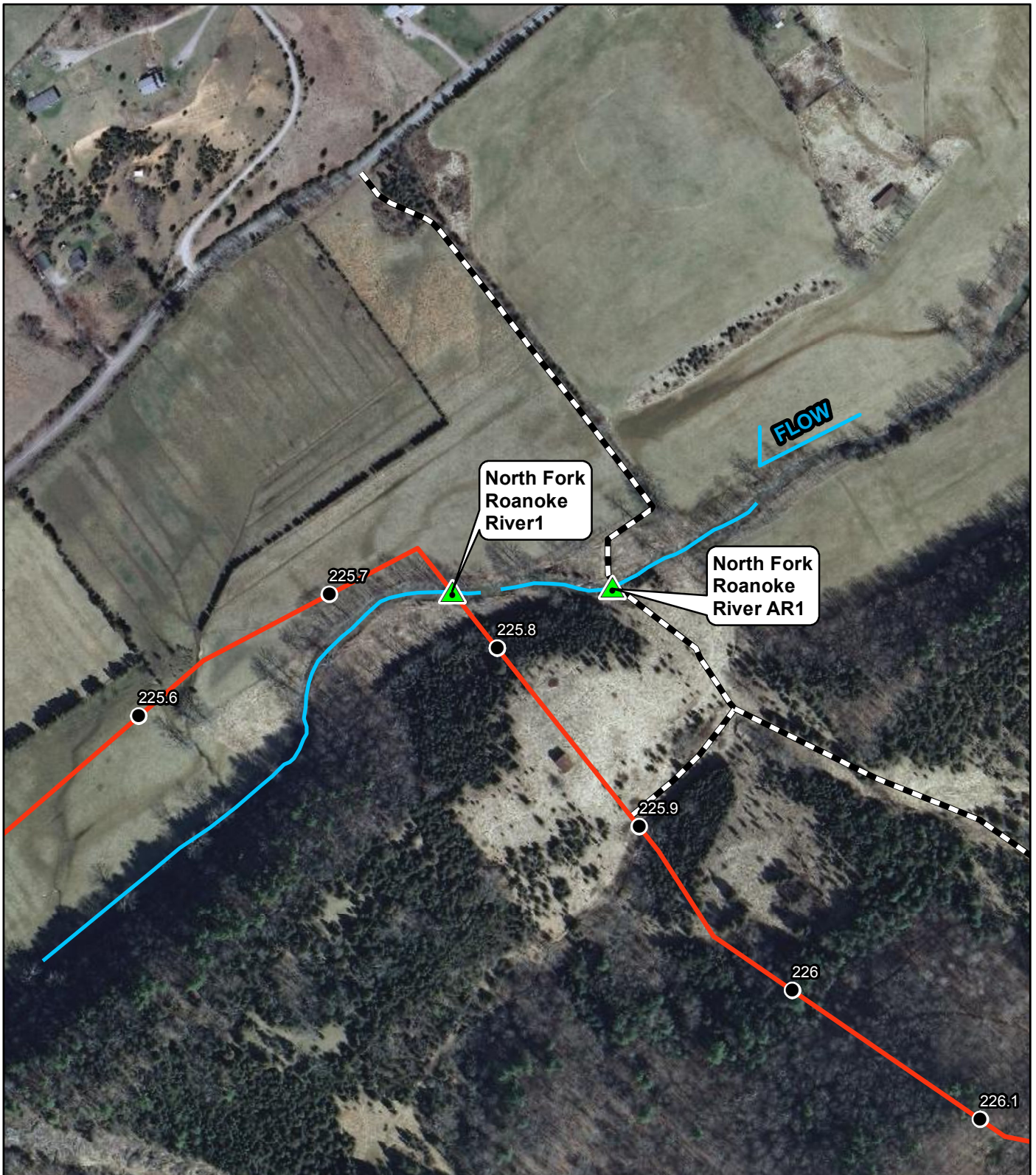
Map 1 of 37

Project No.
593.14

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Habitat Assessment Location

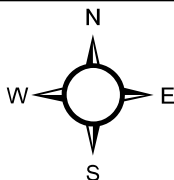
▲ Presence Assumed

● Milepost

— Proposed MVP Alignment

- - - Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 2 of 37

Project No.
593.14

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Habitat Assessment Location

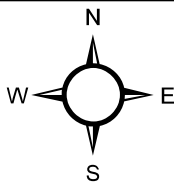
● Site Assessed

● Milepost

— Proposed MVP Alignment

--- Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

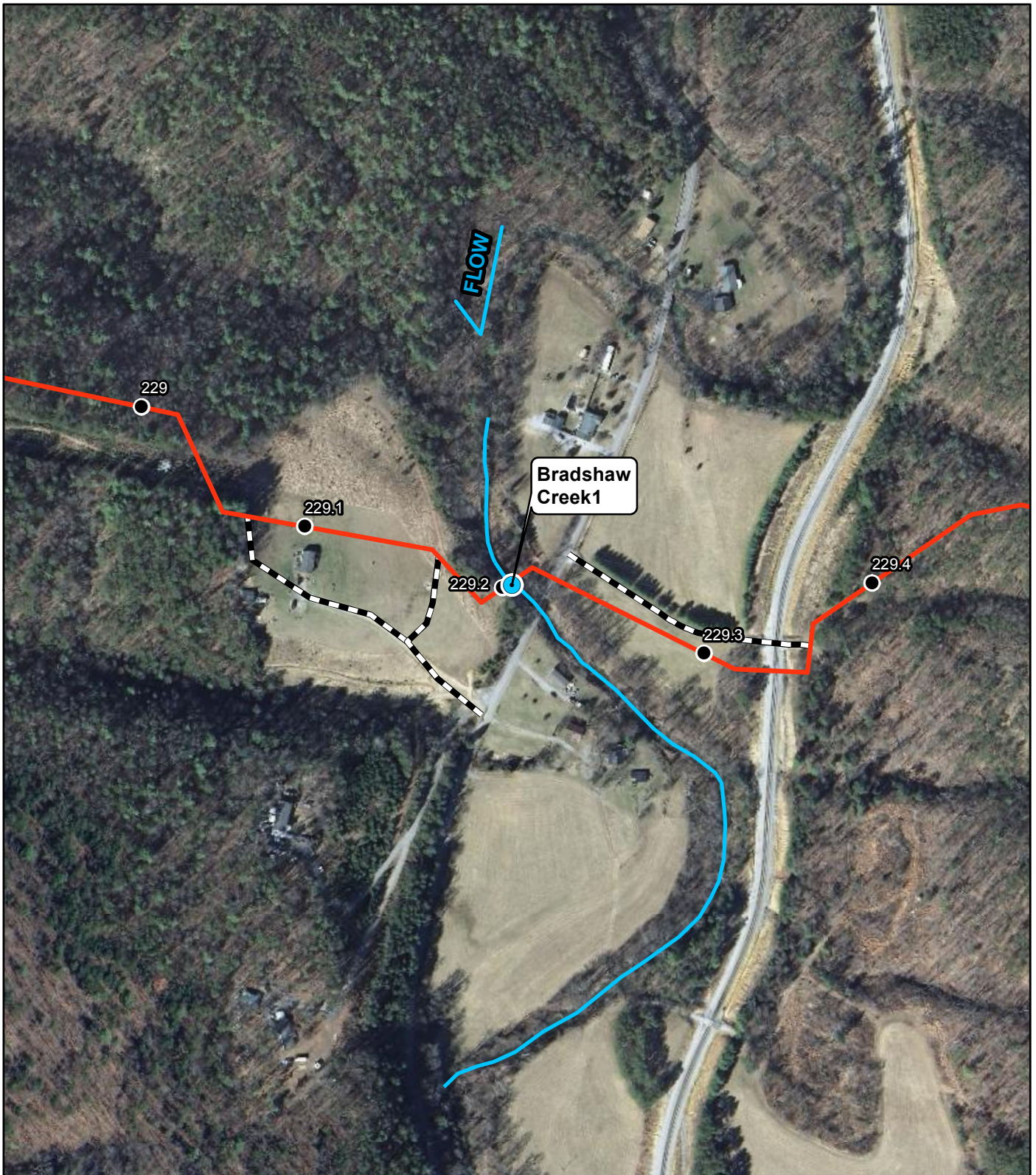
Map 3 of 37

Project No.
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Habitat Assessment Location

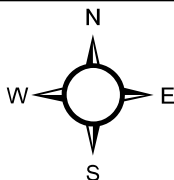
● Site Assessed

● Milepost

— Proposed MVP Alignment

--- Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 4 of 37

Project No.
593.14

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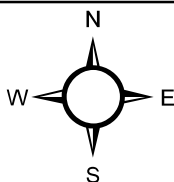
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Habitat Assessment Location Thawleg

■ Site Not Assessed

--- Access Road



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

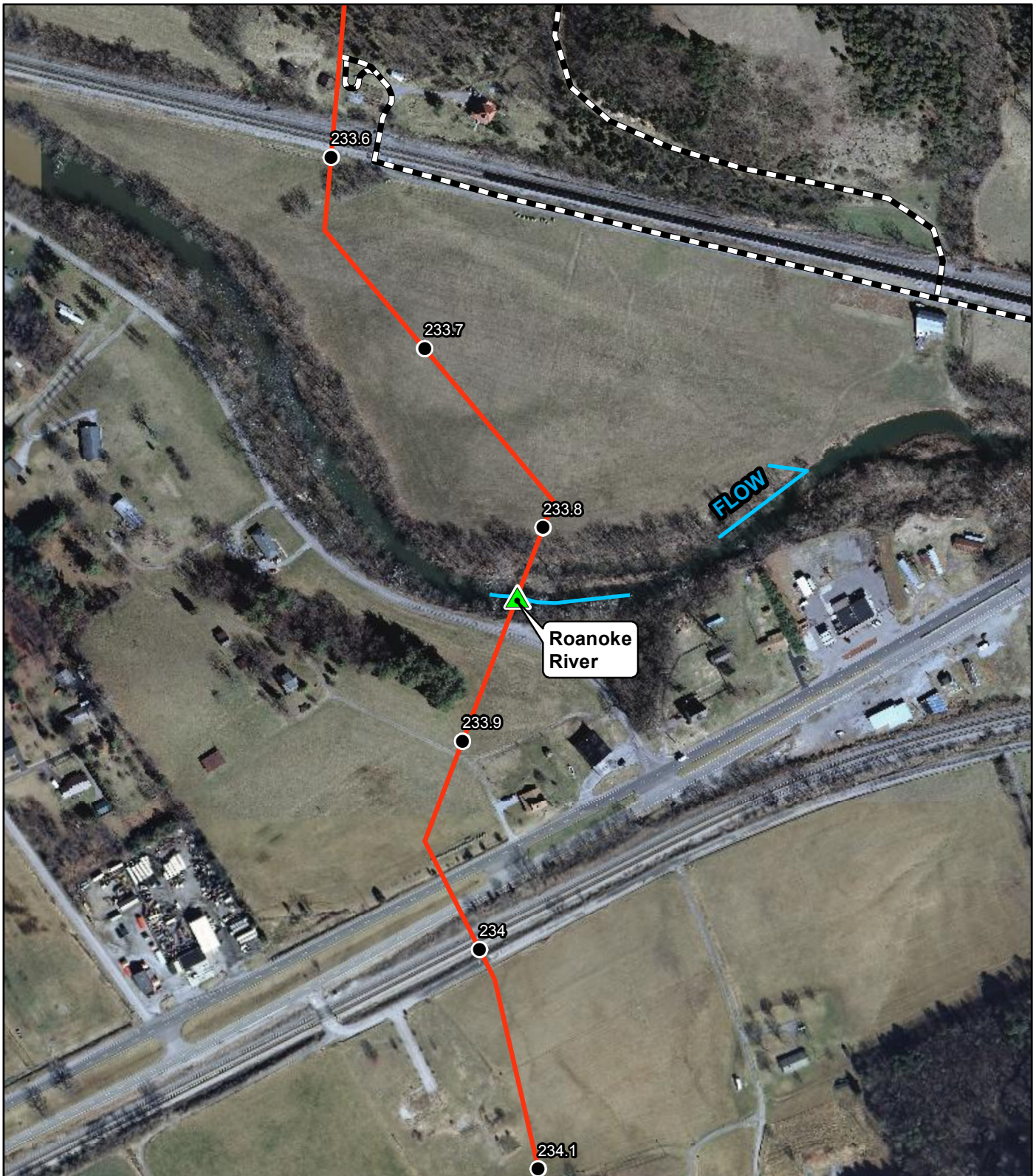
Map 5 of 37

Project No.
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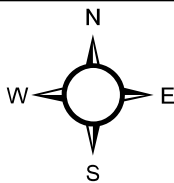
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| Habitat Assessment Location | ● Milepost | — Thawleg |
| ▲ Presence Assumed | — Proposed MVP Alignment | |
| | --- Access Road | |



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 6 of 37

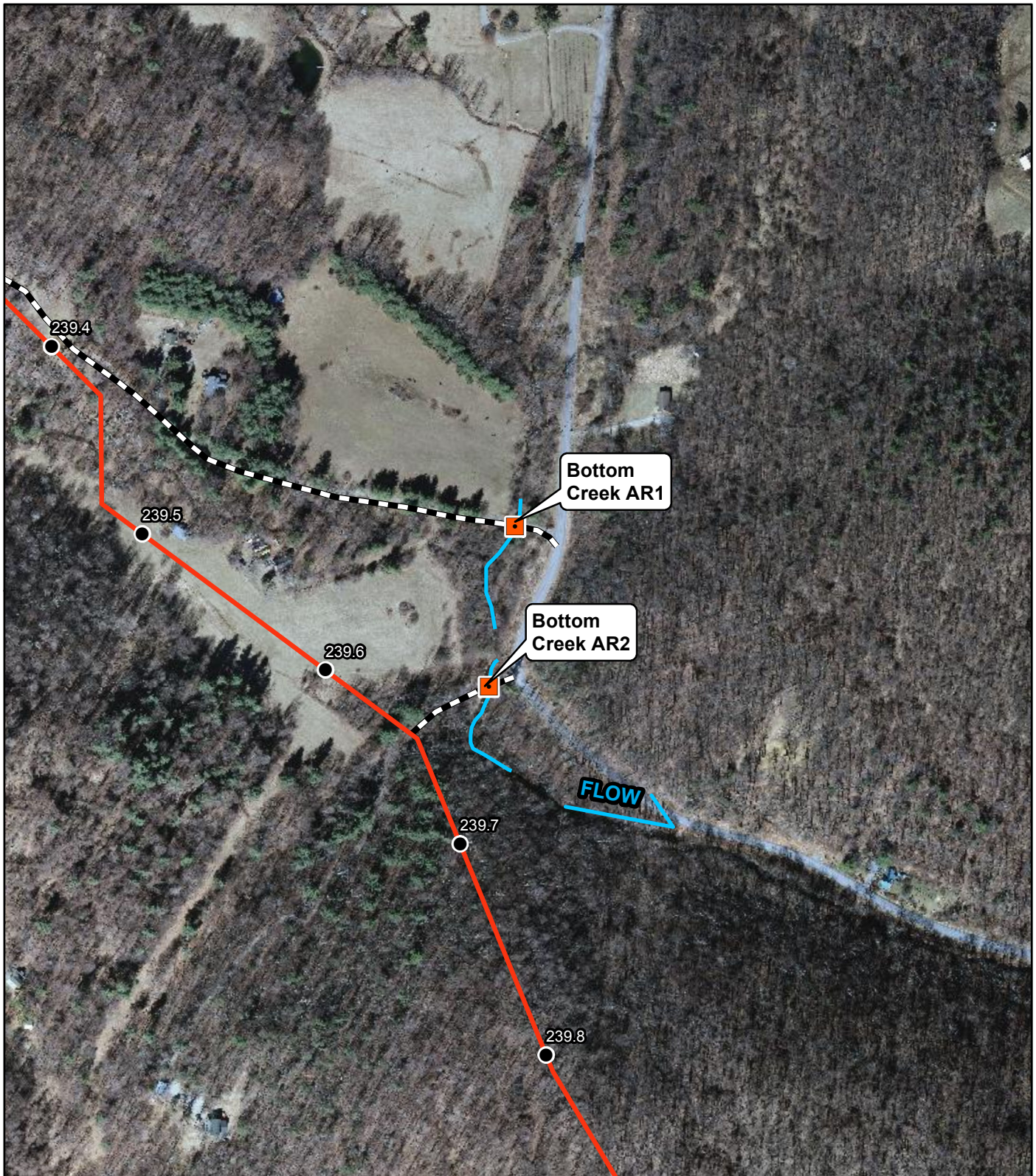
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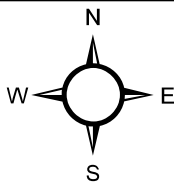
Site Not Assessed

Milepost

Proposed MVP Alignment

Access Road

Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

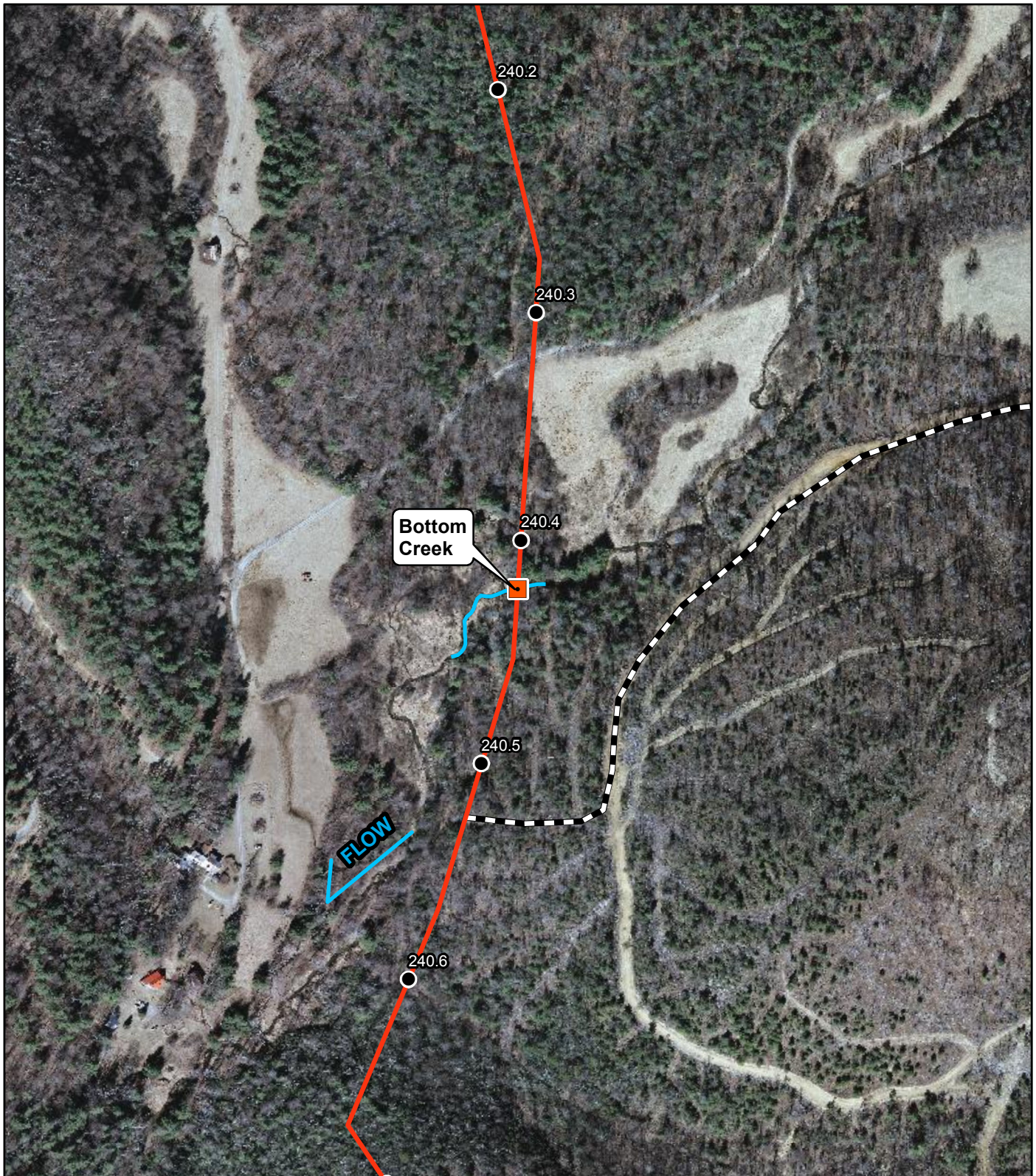
Map 7 of 37

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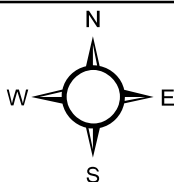
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| ■ Site Not Assessed | — Proposed MVP Alignment | --- Access Road |



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

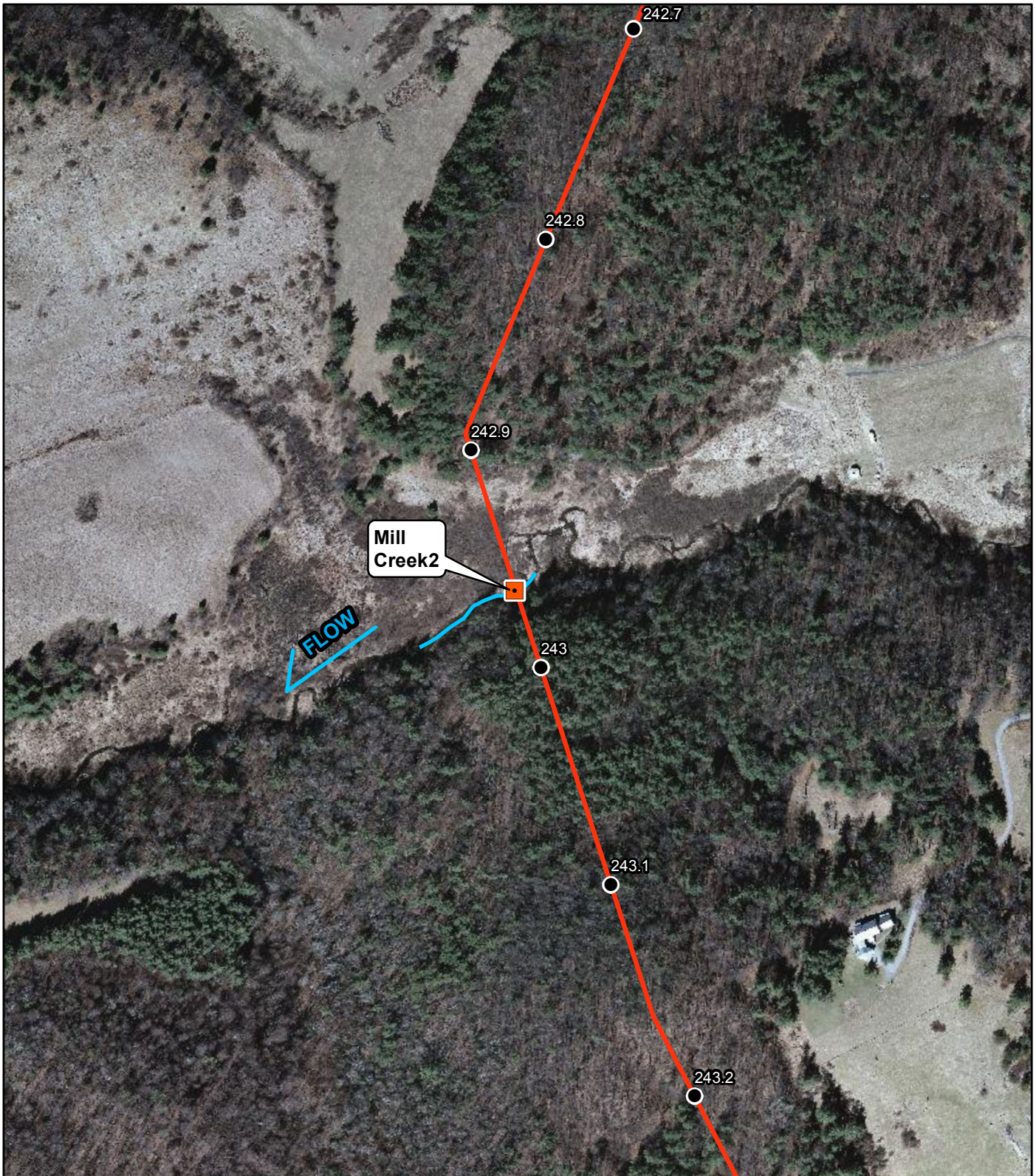
Map 8 of 37

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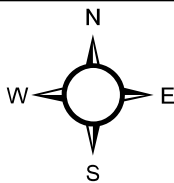
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Habitat Assessment Location ● Milepost — Thawleg
 ■ Site Not Assessed — Proposed MVP Alignment



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. Map 9 of 37

Project No.
593.14

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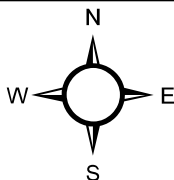


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Habitat Assessment Location ● Milepost — Thawleg
● Site Assessed — Proposed MVP Alignment
— Access Road



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. Map 10 of 37

Project No.
593.14

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Meters



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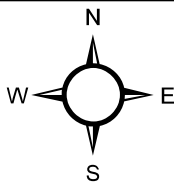
● Site Assessed

● Milepost

— Proposed MVP Alignment

— Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 11 of 37

Project No.
593.14

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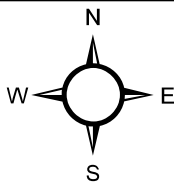
● Site Assessed

● Milepost

— Proposed MVP Alignment

— Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

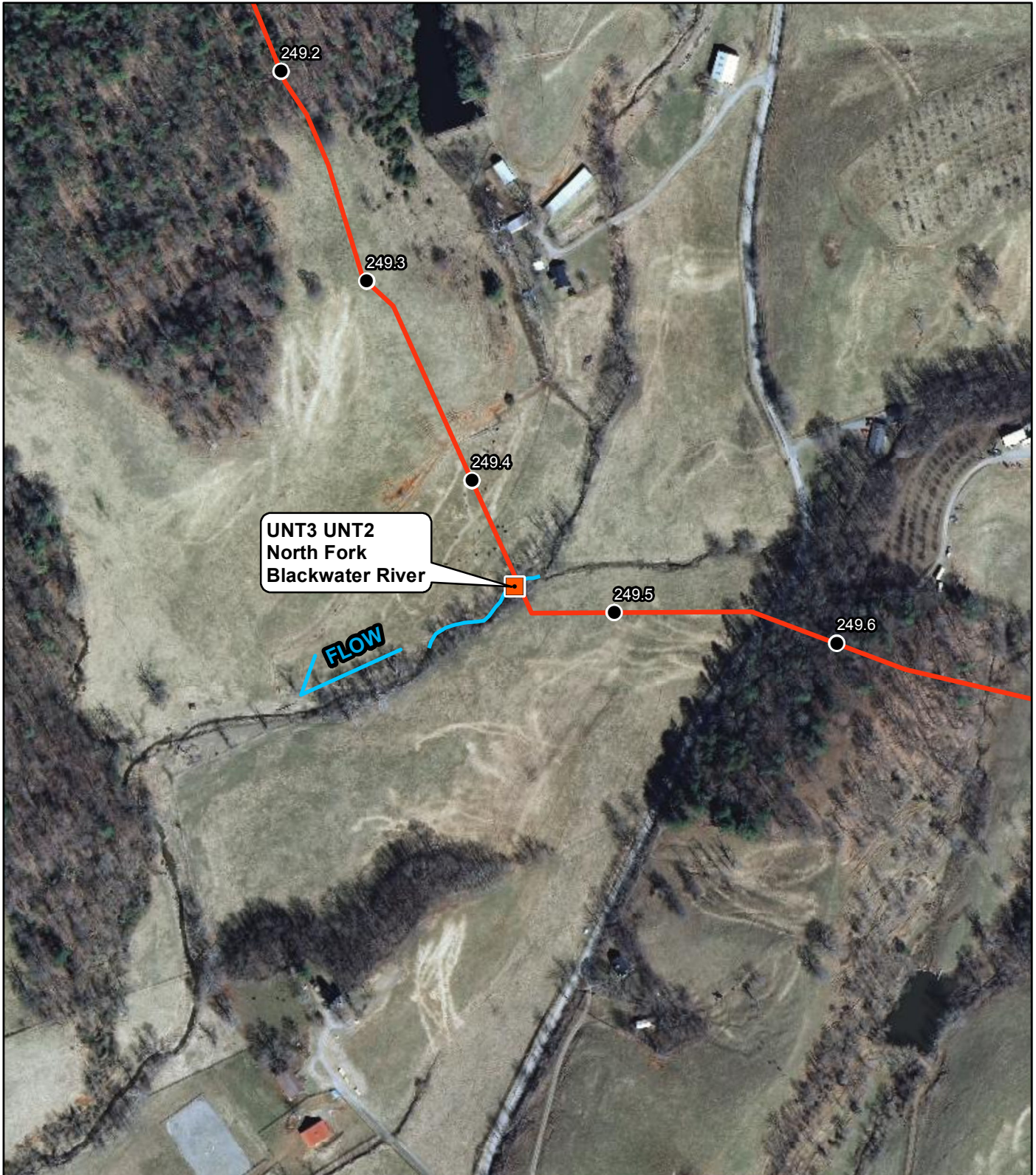
Map 12 of 37

Project No.
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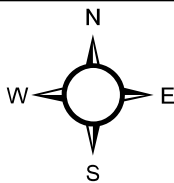
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Habitat Assessment Location ● Milepost — Thawleg
 ■ Site Not Assessed — Proposed MVP Alignment



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. Map 13 of 37

Project No.
593.14

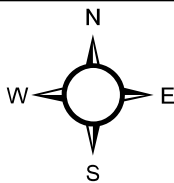
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Habitat Assessment Location ● Milepost Thawleg
 Site Assessed Proposed MVP Alignment



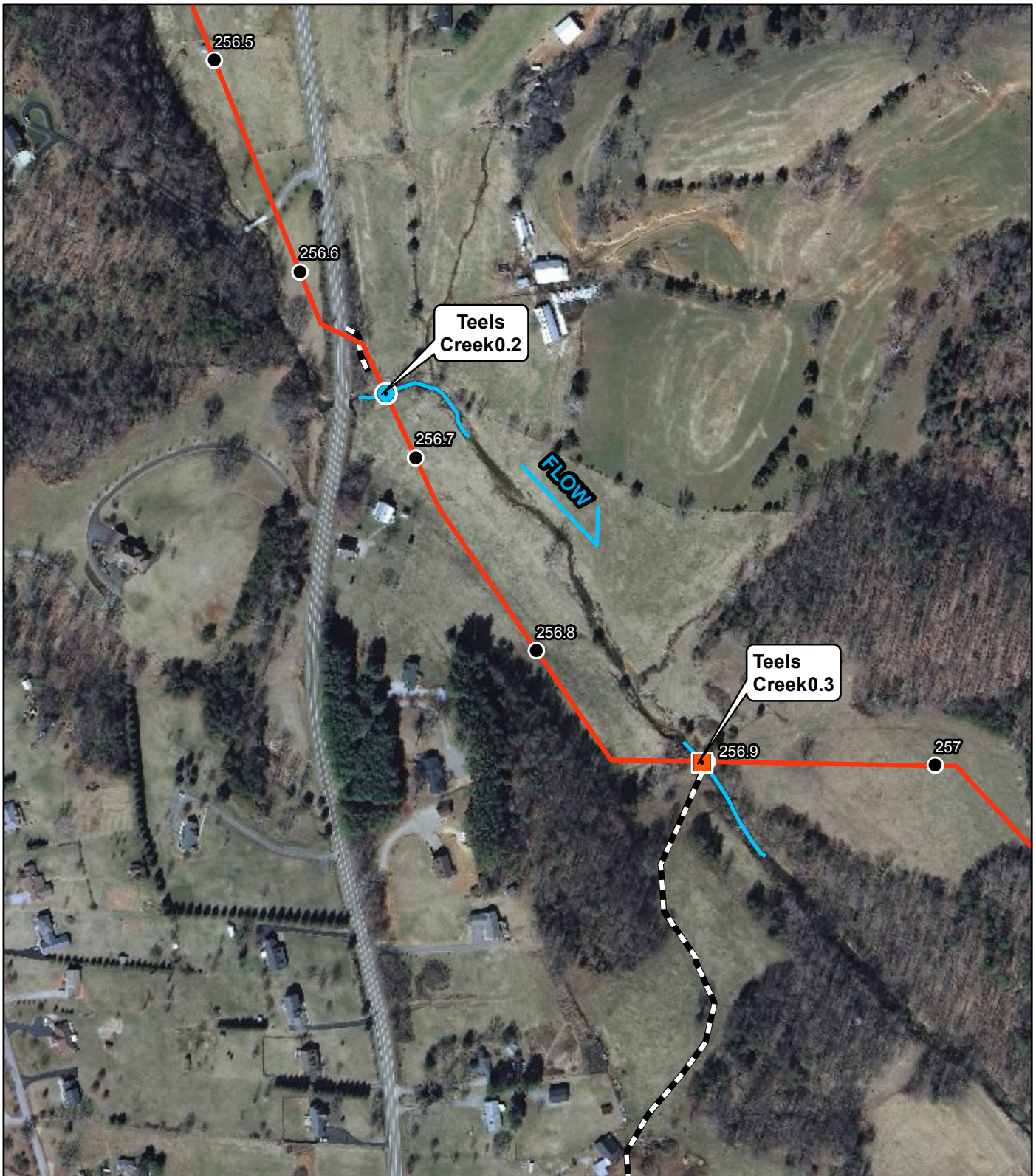
Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. **Map 14 of 37**

Project No.
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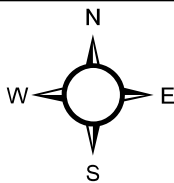
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|-----------------------------|--------------------------|-----------|
| Habitat Assessment Location | ● Milepost | — Thawleg |
| ● Site Assessed | — Proposed MVP Alignment | |
| ■ Site Not Assessed | --- Access Road | |



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

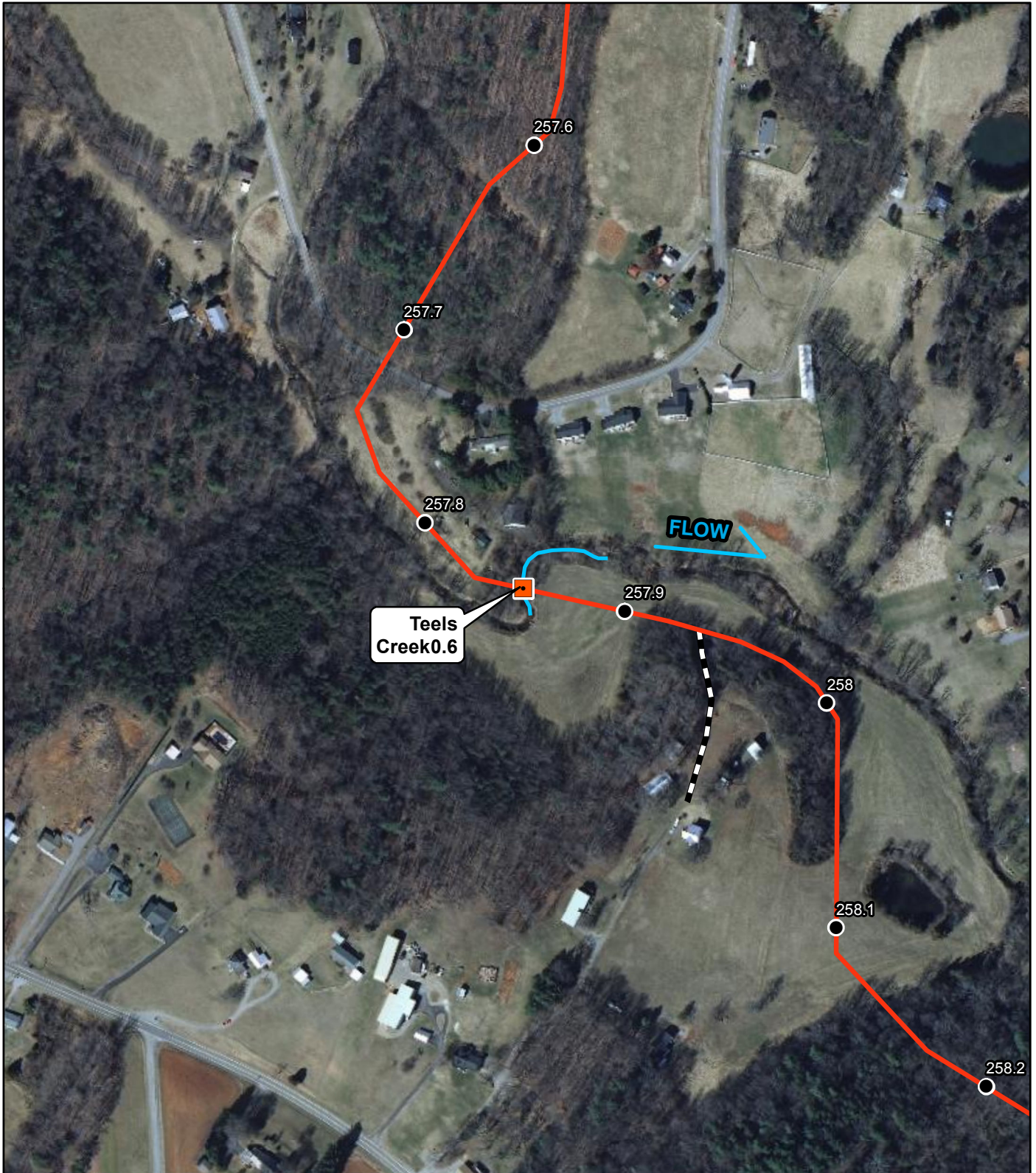
Map 15 of 37

Project No.
593.14

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Habitat Assessment Location

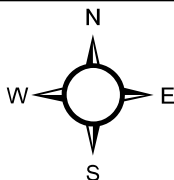
Site Not Assessed

Milepost

Proposed MVP Alignment

Access Road

Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 16 of 37

Project No.
593.14

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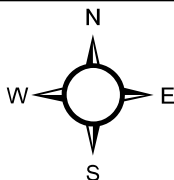
● Site Assessed

● Milepost

— Proposed MVP Alignment

--- Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

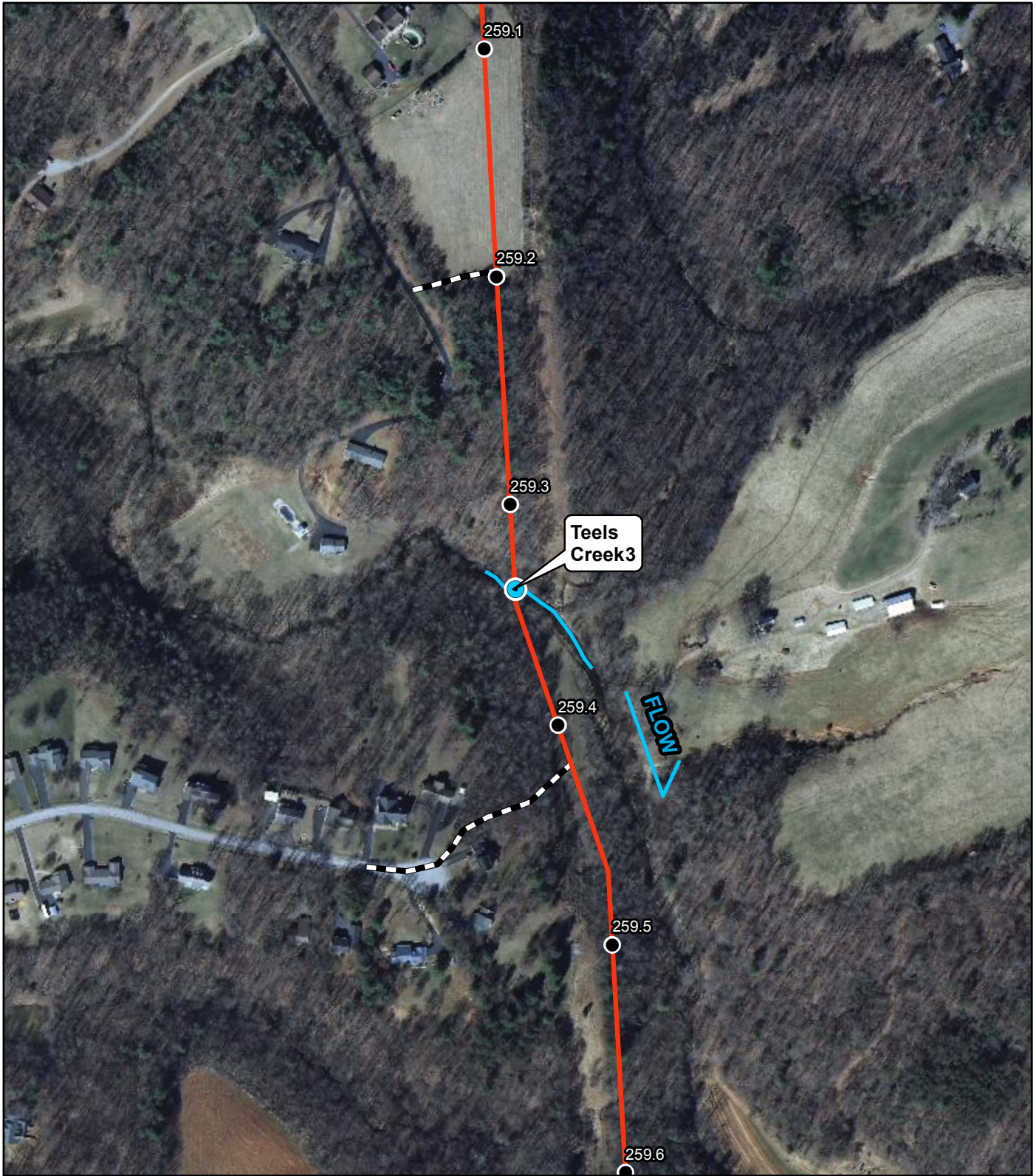
Map 17 of 37

Project No.
593.14

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Meters



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Habitat Assessment Location

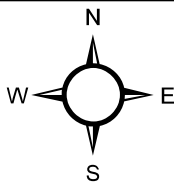
● Site Assessed

● Milepost

— Proposed MVP Alignment

- - - Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 18 of 37

Project No.
593.14

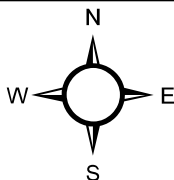
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Habitat Assessment Location ● Milepost — Thawleg
 ■ Site Not Assessed — Proposed MVP Alignment



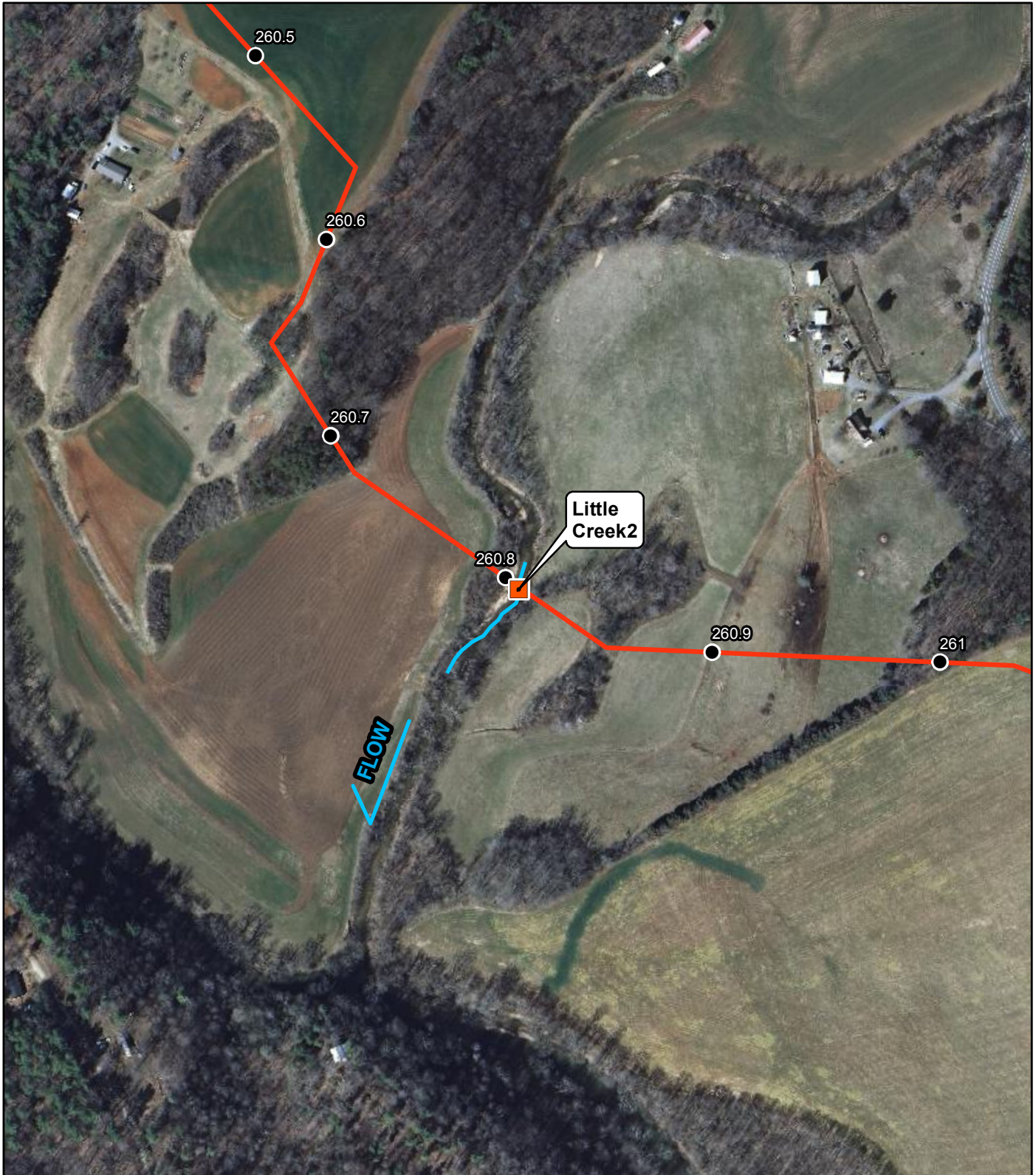
Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. Map 19 of 37

Project No.
593.14

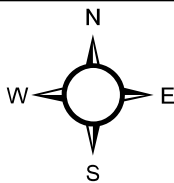
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Habitat Assessment Location ● Milepost Thawleg
 ■ Site Not Assessed — Proposed MVP Alignment



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. **Map 20 of 37**

Project No.
593.14

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Habitat Assessment Location

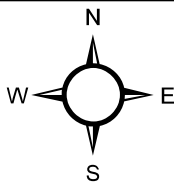
Site Not Assessed

Milepost

Proposed MVP Alignment

Access Road

Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 21 of 37

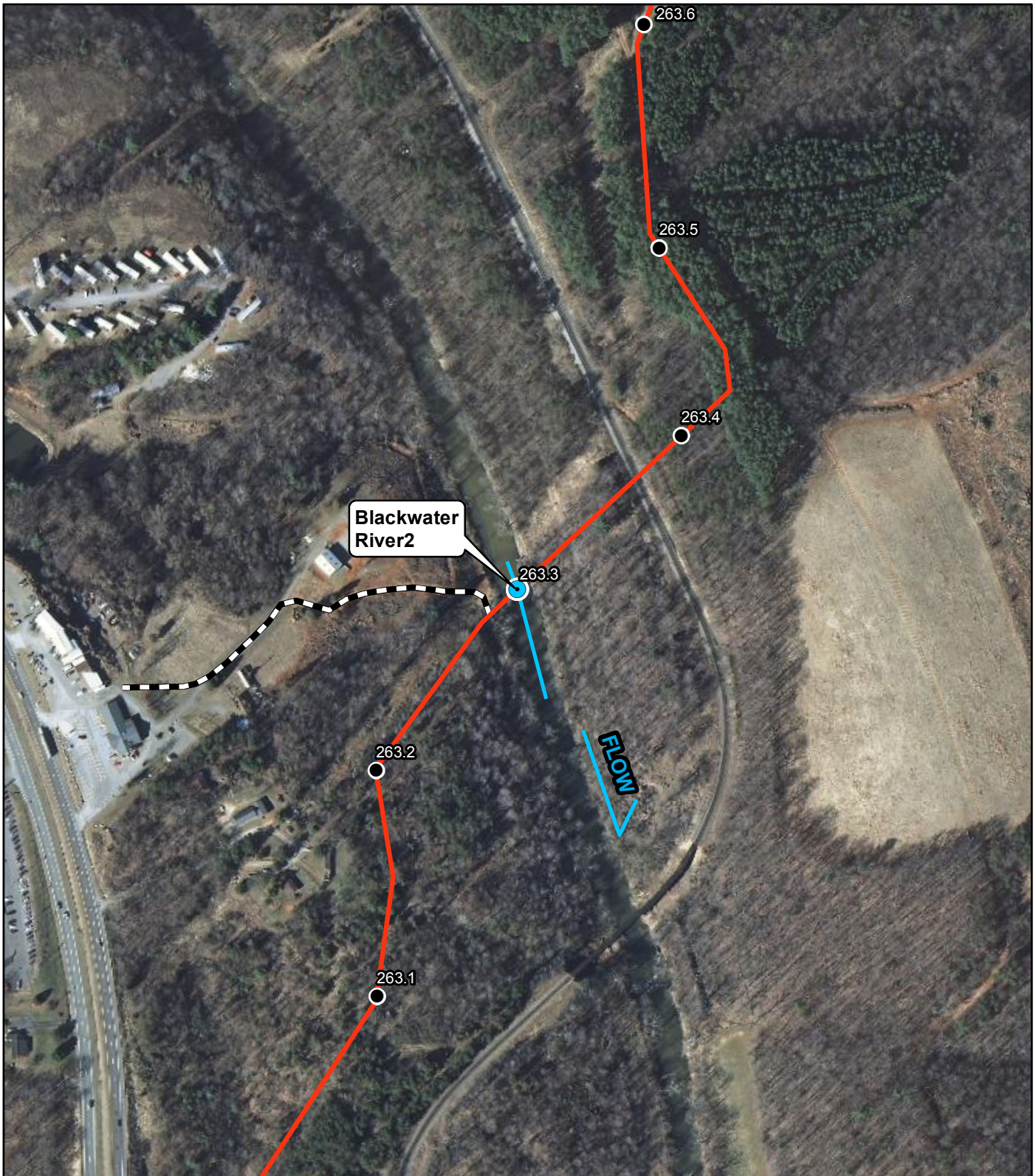
Project No.
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Habitat Assessment Location

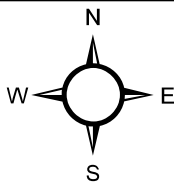
● Site Assessed

● Milepost

— Proposed MVP Alignment

--- Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 22 of 37

Project No.
593.14

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Meters



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Habitat Assessment Location

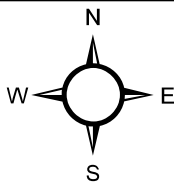
● Site Assessed

● Milepost

— Proposed MVP Alignment

--- Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

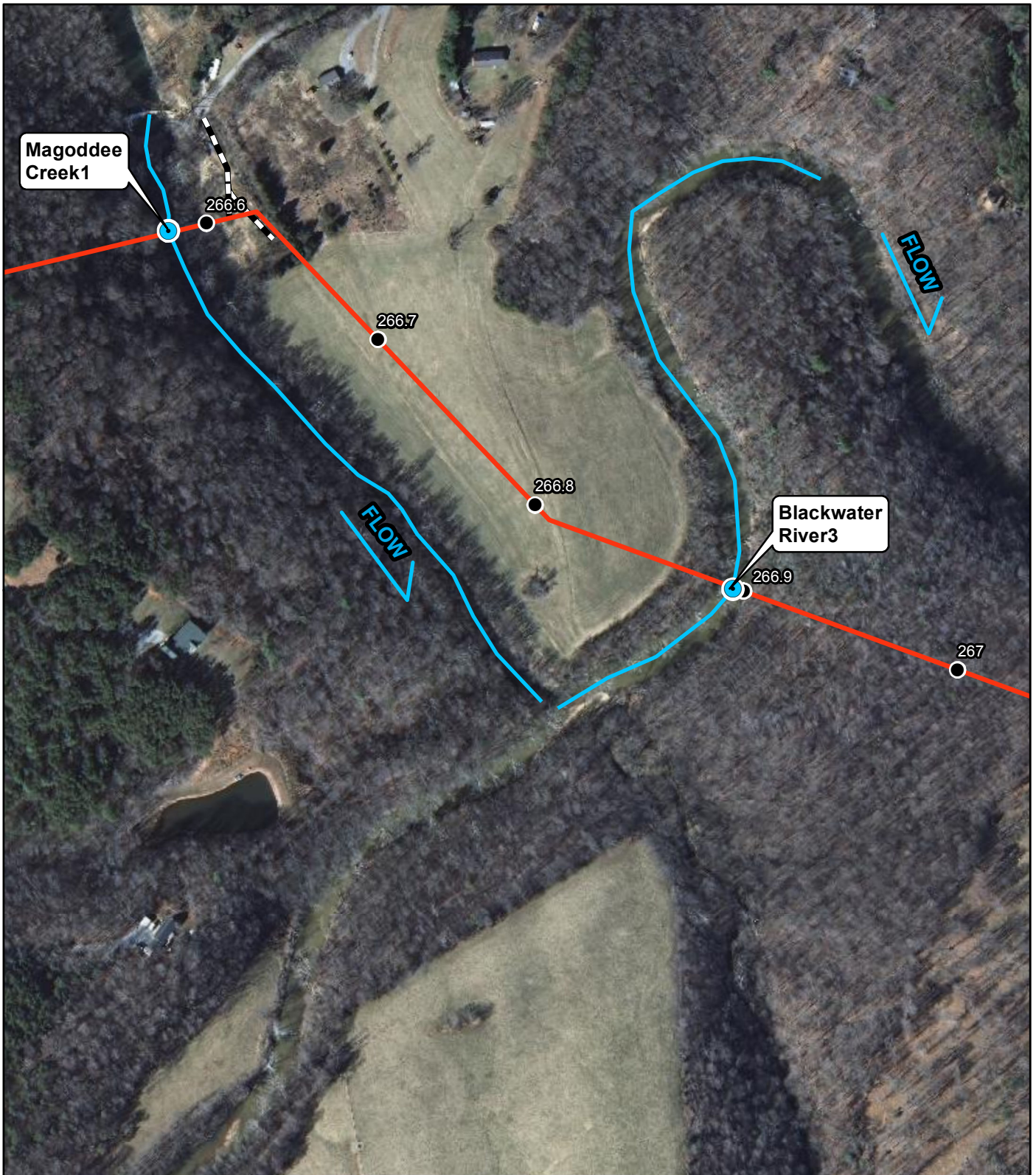
Map 23 of 37

Project No.
593.14

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ENVIRONMENTAL SOLUTIONS
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Habitat Assessment Location

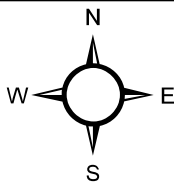
● Site Assessed

● Milepost

— Proposed MVP Alignment

--- Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 24 of 37

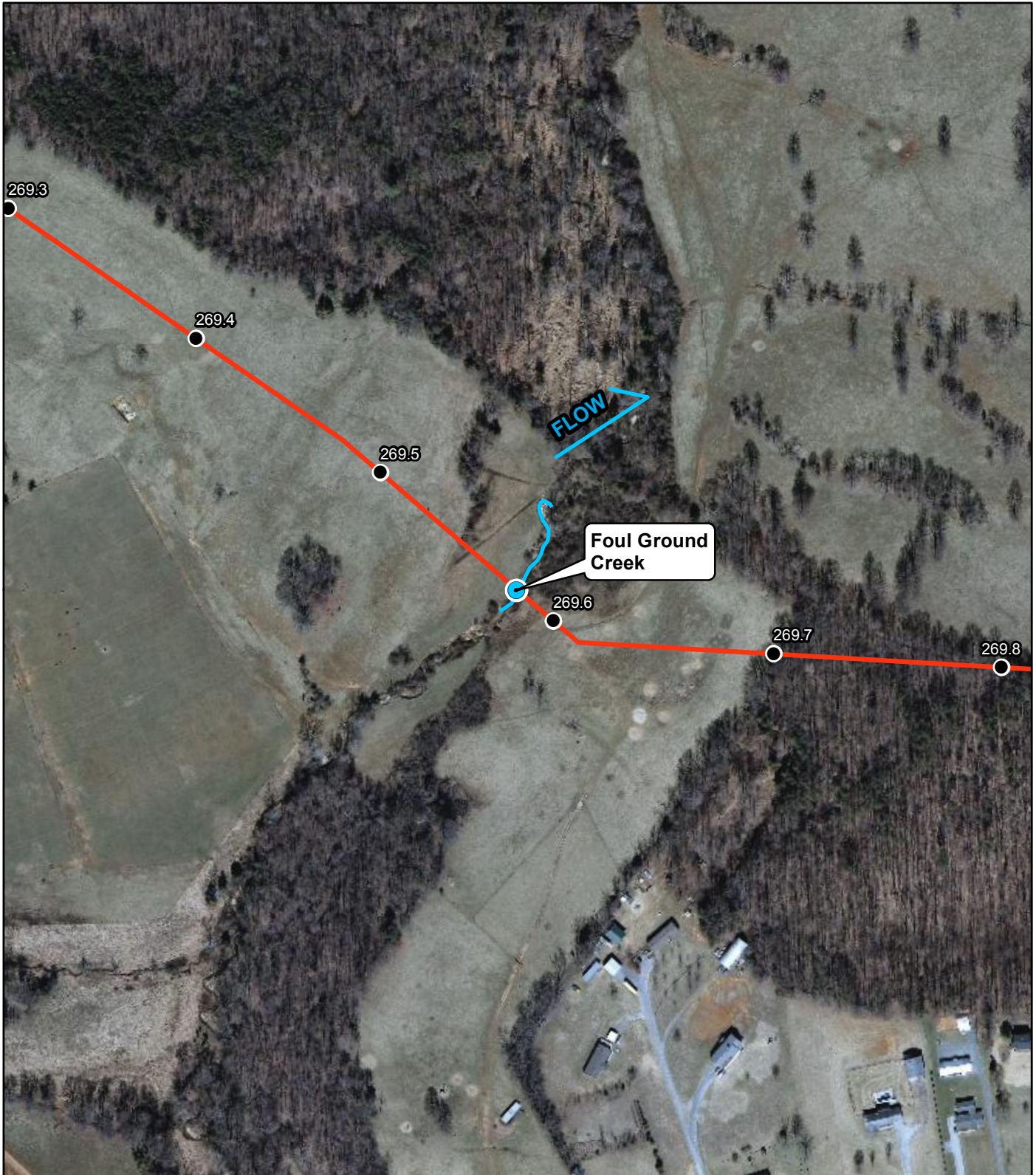
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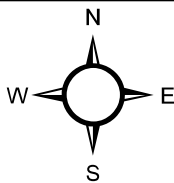
Habitat Assessment Location

● Site Assessed

● Milepost

— Proposed MVP Alignment

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

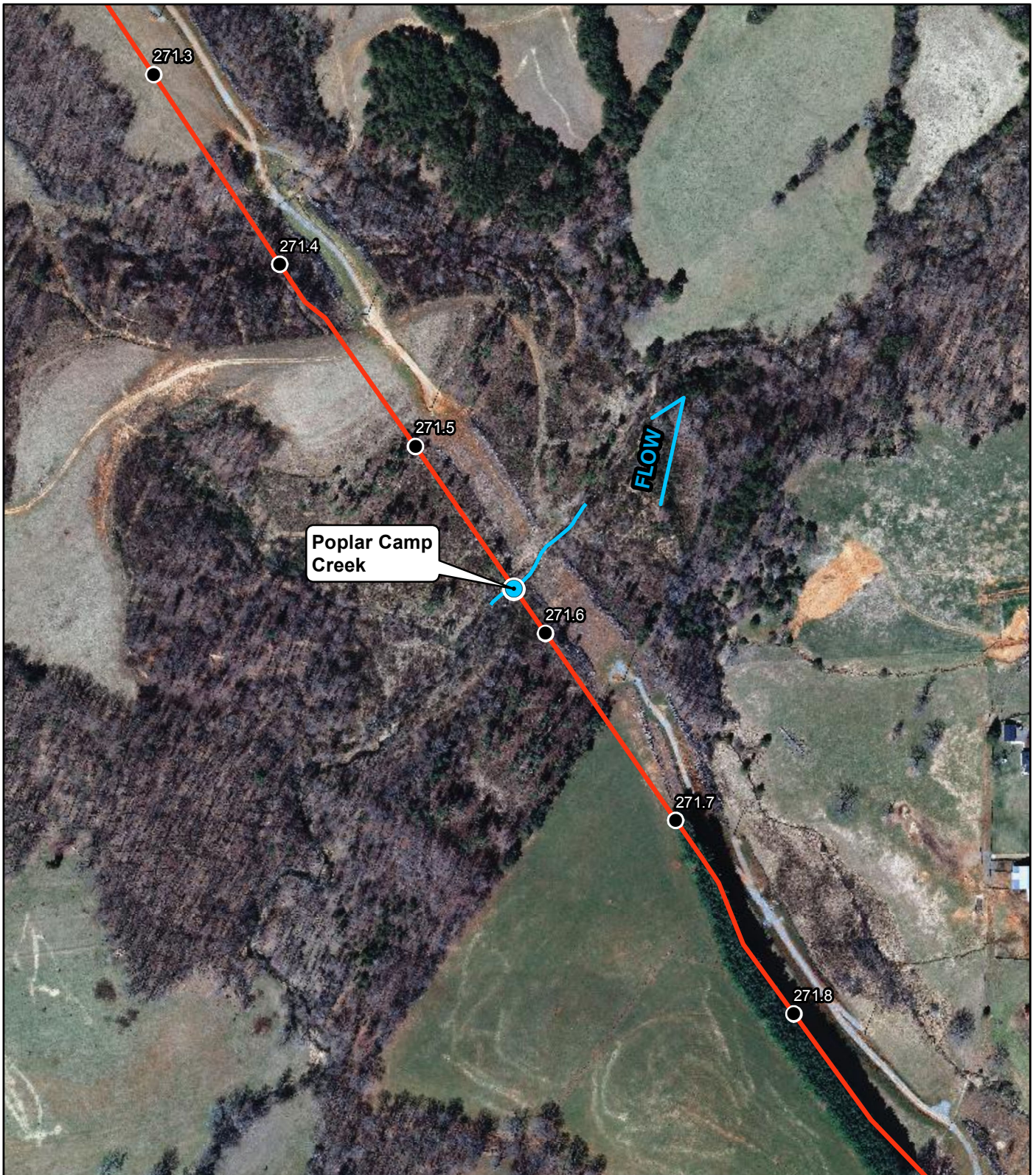
Map 25 of 37

Project No.
593.14

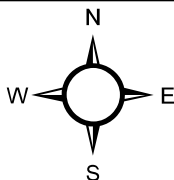
50 0 50 100
Meters



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Habitat Assessment Location ● Milepost — Thawleg
 ● Site Assessed — Proposed MVP Alignment



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. **Map 26 of 37**

Project No.
593.14

50 0 50 100 Meters



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Habitat Assessment Location

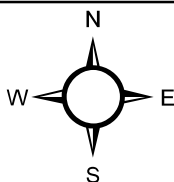
● Site Assessed

● Milepost

— Proposed MVP Alignment

--- Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

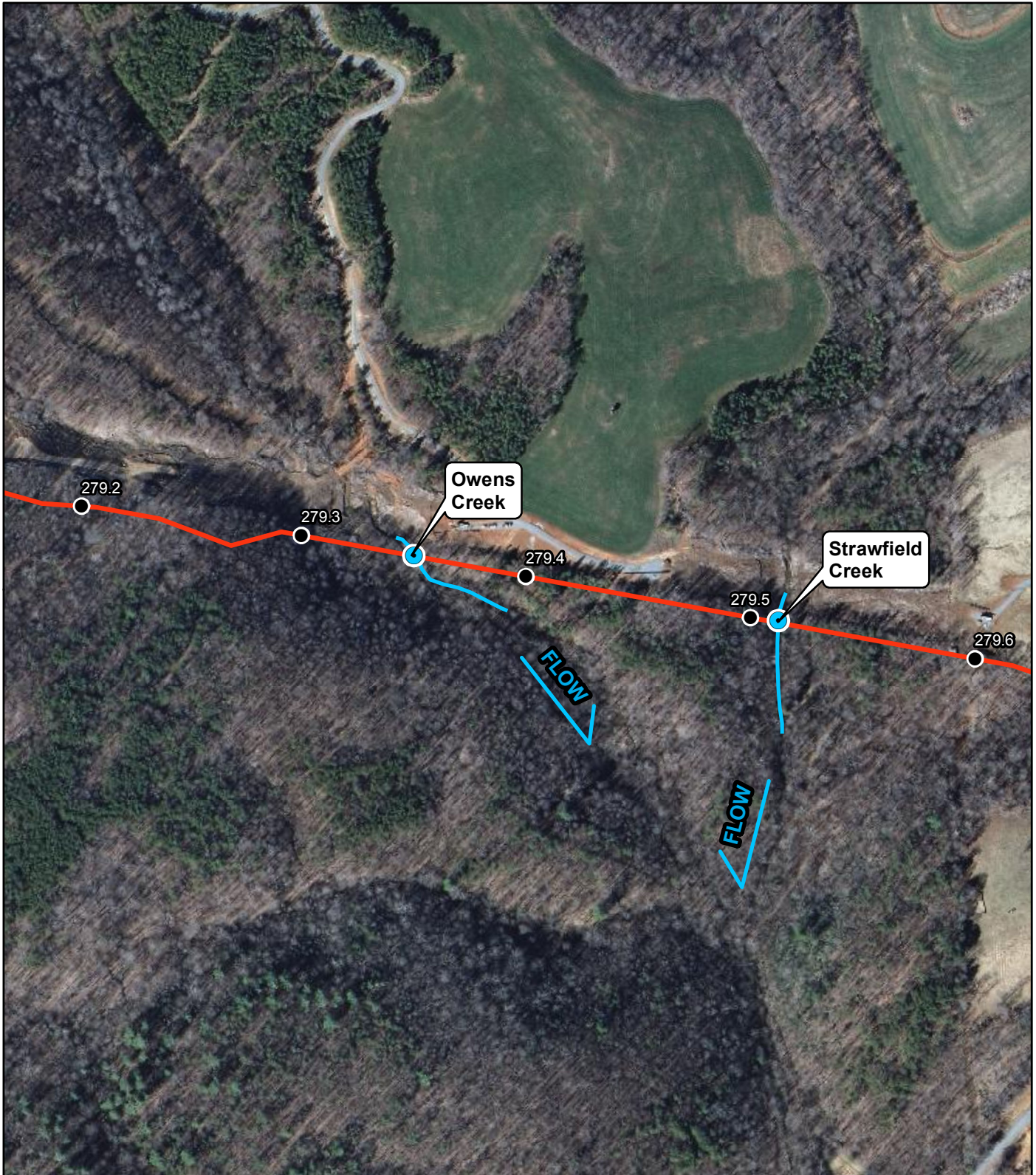
Map 27 of 37

Project No.
593.14

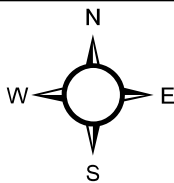
50 0 50 100
Meters



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Habitat Assessment Location ● Milepost Thawleg
 Site Assessed Proposed MVP Alignment



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. **Map 28 of 37**

Project No.
593.14

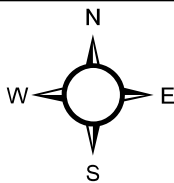
50 0 50 100 Meters



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& INNOVATIONS, INC.



Habitat Assessment Location ● Milepost — Thawleg
 ● Site Assessed — Proposed MVP Alignment



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. **Map 29 of 37**

Project No.
593.14

50 0 50 100 Meters

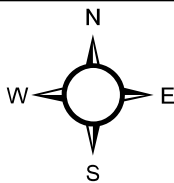


ENVIRONMENTAL SOLUTIONS
& INNOVATIONS, INC.

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Habitat Assessment Location ● Milepost — Thawleg
● Site Assessed — Proposed MVP Alignment



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. **Map 30 of 37**

Project No.
593.14

50 0 50 100
Meters



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Habitat Assessment Location



Presence Assumed

Milepost

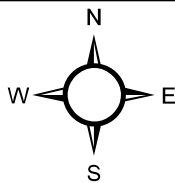


Proposed MVP Alignment

Access Road



Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 31 of 37

Project No.
593.14

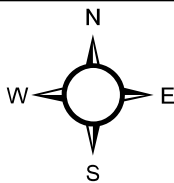
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ENVIRONMENTAL SOLUTIONS
& INNOVATIONS, INC.



Habitat Assessment Location ● Milepost — Thawleg
 ● Site Assessed — Proposed MVP Alignment



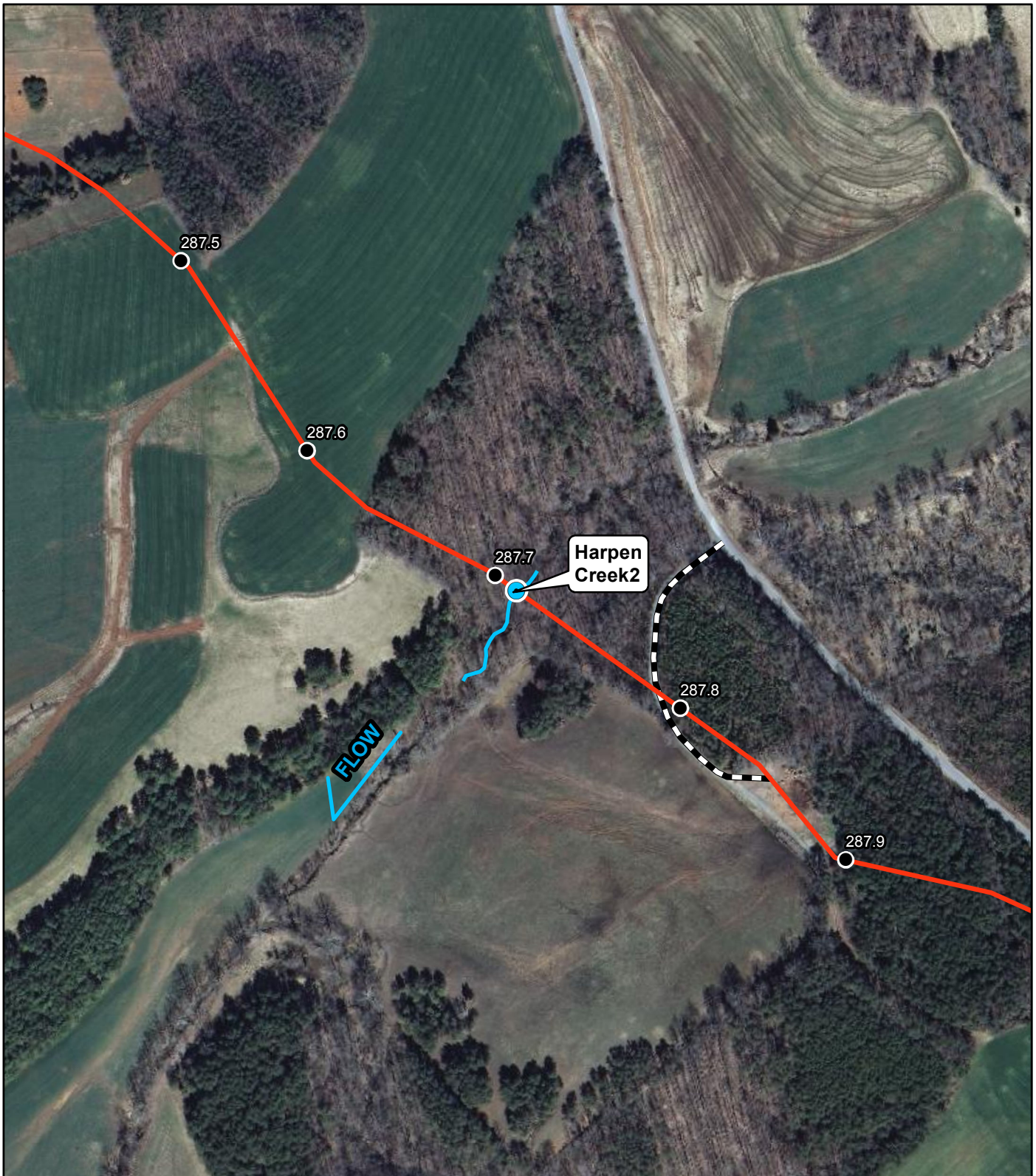
Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia. **Map 32 of 37**

Project No.
593.14

50 0 50 100 Meters



ENVIRONMENTAL SOLUTIONS
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Habitat Assessment Location

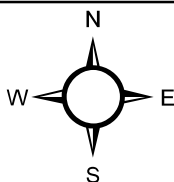
● Site Assessed

● Milepost

— Proposed MVP Alignment

--- Access Road

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 33 of 37

Project No.
593.14

50 0 50 100
Meters



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& INNOVATIONS, INC.

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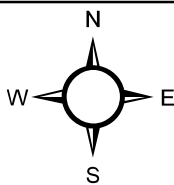
Habitat Assessment Location

● Site Assessed

● Milepost

— Proposed MVP Alignment

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 34 of 37

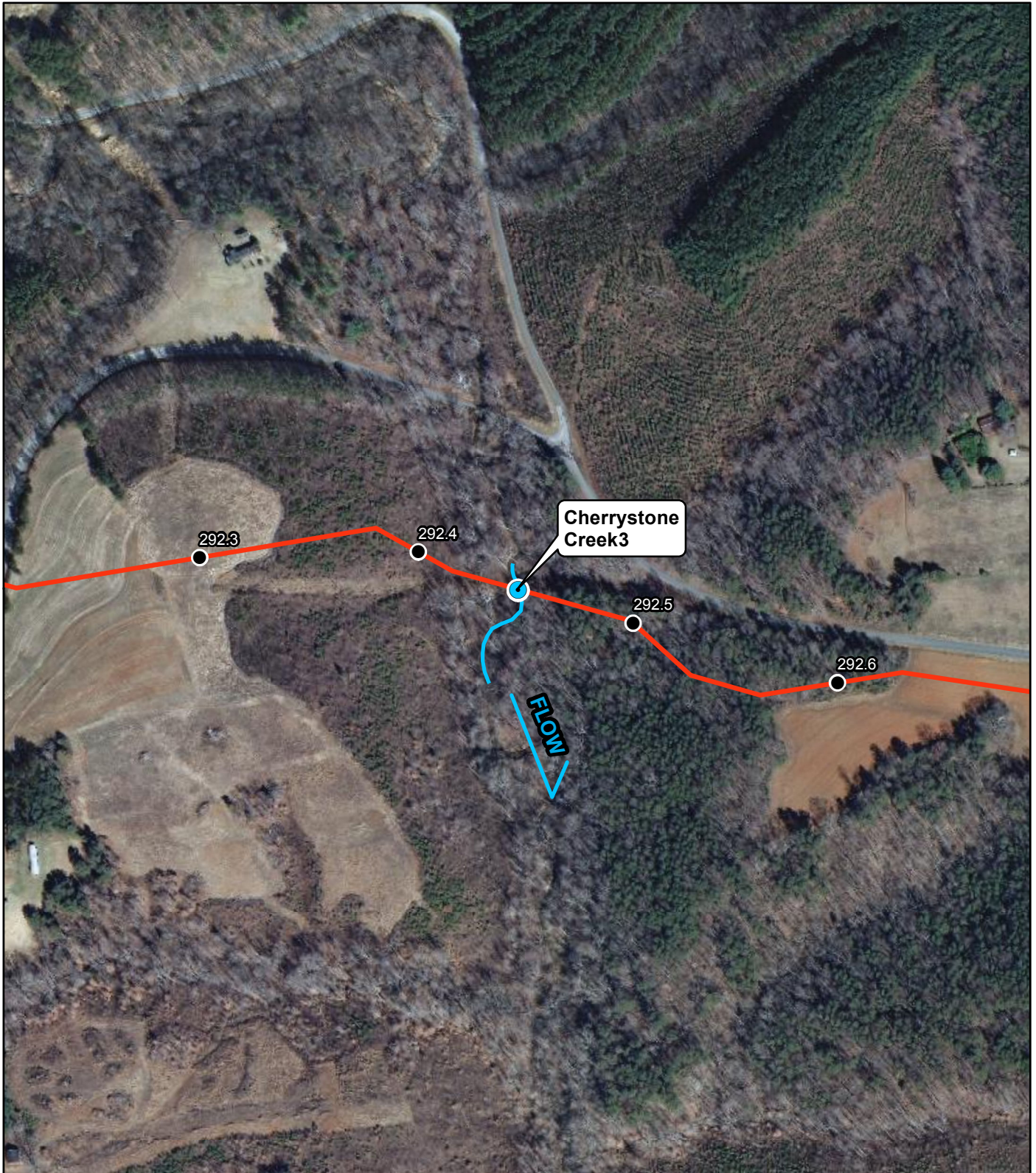
Project No.
593.14

50 0 50 100
Meters



ENVIRONMENTAL SOLUTIONS
& INNOVATIONS, INC.

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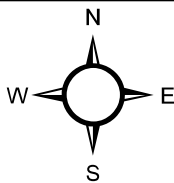
Habitat Assessment Location

● Site Assessed

● Milepost

— Proposed MVP Alignment

— Thawleg



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

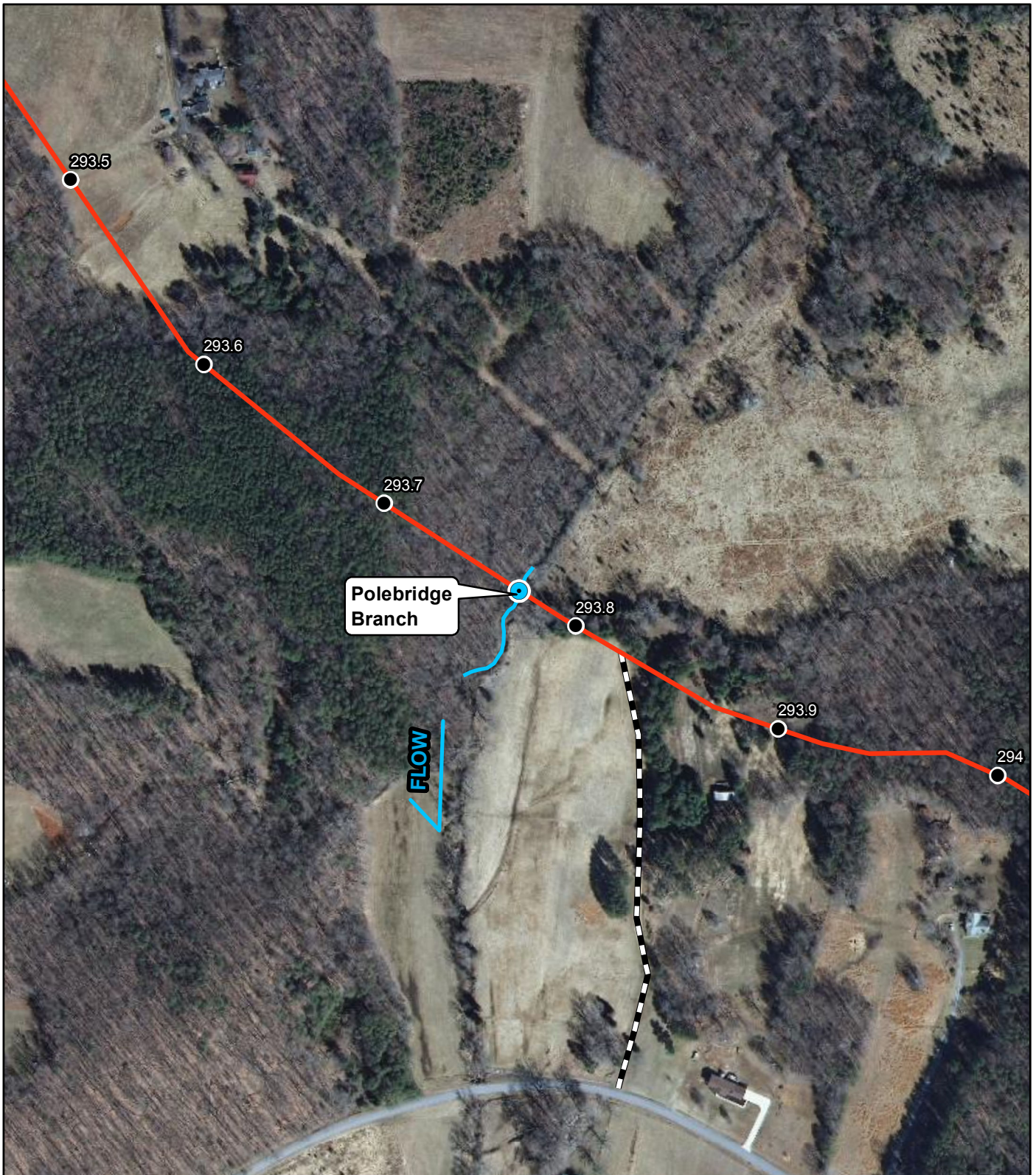
Map 35 of 37

Project No.
593.14

50 0 50 100
Meters



ENVIRONMENTAL SOLUTIONS
& INNOVATIONS, INC.



Habitat Assessment Location

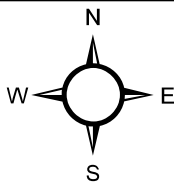
● Site Assessed

● Milepost

— Proposed MVP Alignment

— Thawleg

— Access Road



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 36 of 37

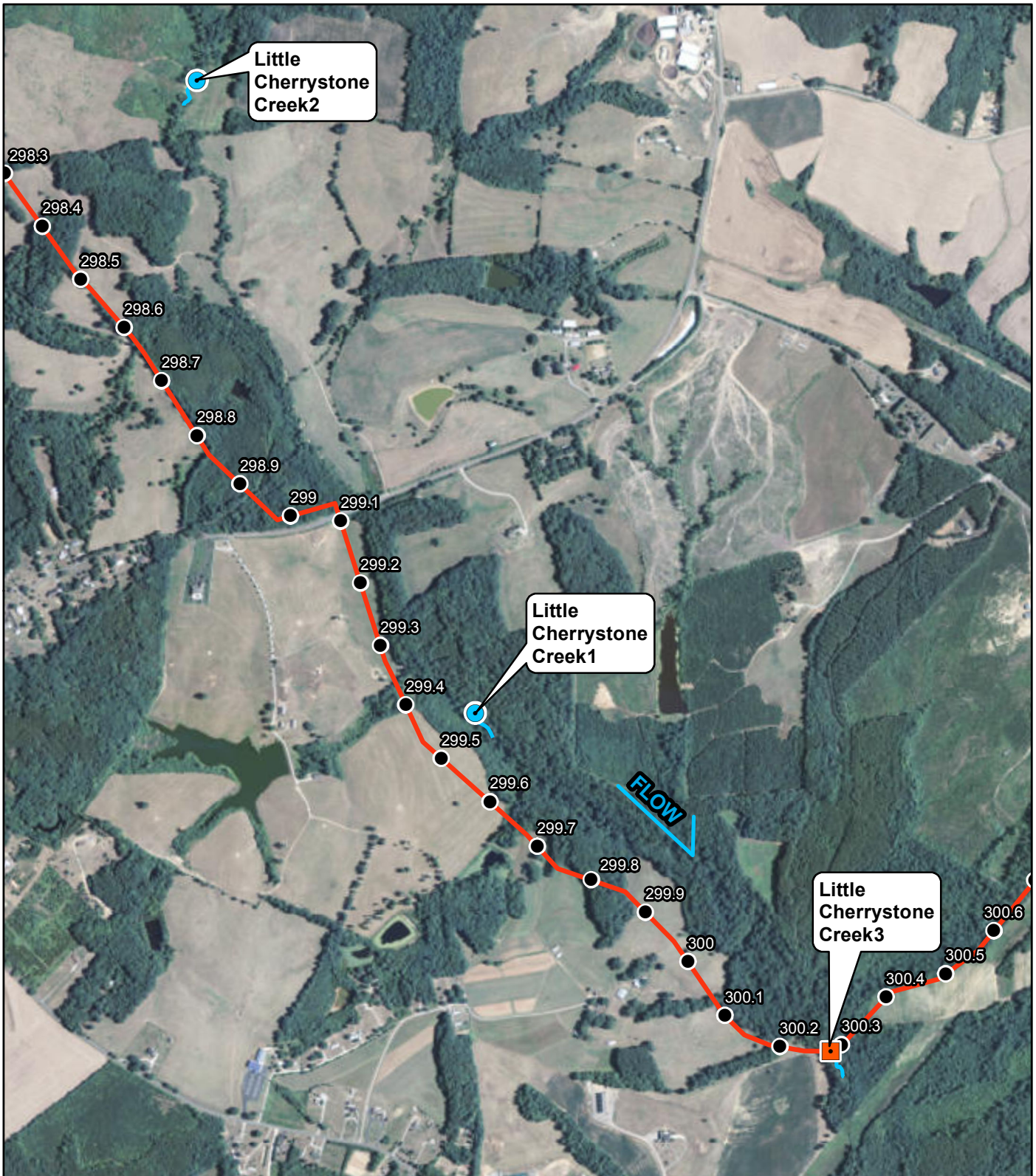
Project No.
593.14

50 0 50 100
Meters

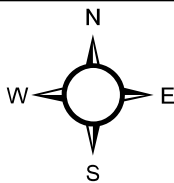


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& INNOVATIONS, INC.

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- | | | |
|-----------------------------|--------------------------|-----------|
| Habitat Assessment Location | ● Milepost | — Thawleg |
| ● Site Assessed | — Proposed MVP Alignment | |
| ■ Site Not Assessed | | |



Endangered Fish Habitat Assessment along the proposed Mountain Valley Pipeline Project in Virginia.

Map 37 of 37

Project No.
593.14

175 0 175 350
Meters



ENVIRONMENTAL SOLUTIONS
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APPENDIX D
REPRESENTATIVE PHOTOGRAPHS





Mill Creek 1 - looking upstream



Mill Creek 1 - looking upstream



North Fork Roanoke River 1 - looking upstream



North Fork Roanoke River 1 - looking downstream



North Fork Roanoke River AR1 - Looking upstream



North Fork Roanoke River AR1 - Looking upstream



Flatwood Branch - dry streambed



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking downstream



UNT1 North Fork Blackwater River - looking upstream



UNT1 North Fork Blackwater River - looking downstream



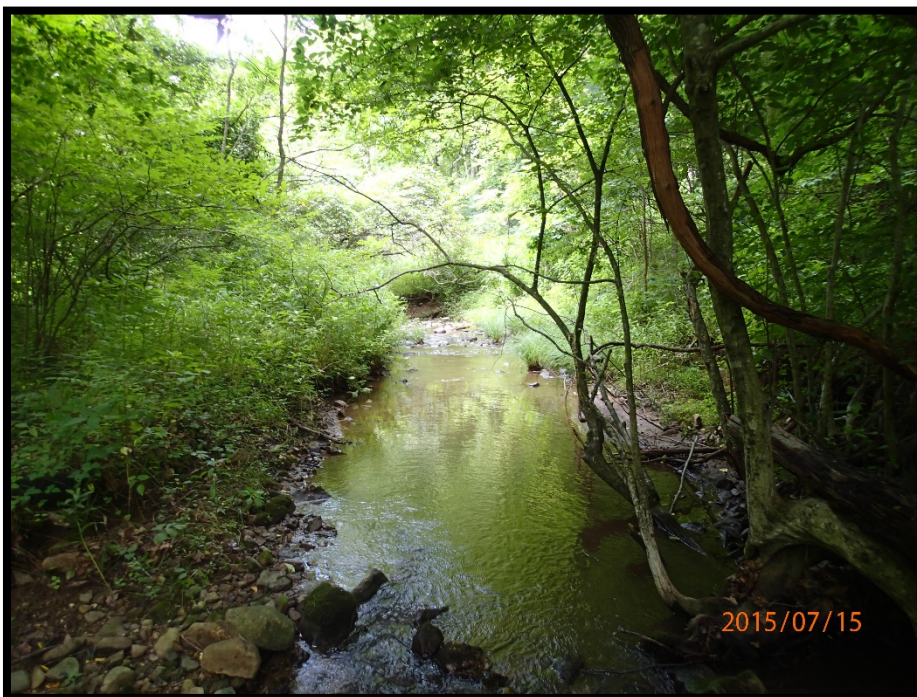
North Fork Blackwater River - looking upstream



North Fork Blackwater River - looking downstream



UNT2 UNT2 North Fork Blackwater River - looking upstream



UNT2 UNT2 North Fork Blackwater River - looking downstream



Teels Creek 0.1 – Looking upstream



Teels Creek 0.1 – Looking downstream



Teels Creek 0.2 - looking upstream



Teels Creek 0.2 - looking downstream



Teels Creek 2 - looking upstream



Teels Creek 2 - looking upstream



Teels Creek 3 - looking upstream



Teels Creek 3 - looking downstream



Blackwater River 2 – looking downstream



Blackwater River 2 – looking upstream



Blackwater River 3 - looking upstream



Blackwater River 3 - looking downstream



Blackwater River 3 - looking upstream



Blackwater River 3 - looking downstream



Blackwater River 3 - looking upstream



Blackwater River 3 - looking downstream



UNT1 Maggodee Creek - looking downstream



UNT1 Maggodee Creek - looking upstream



Maggodee Creek - looking upstream



Maggodee Creek - looking upstream



Maggodee Creek - looking downstream



Maggodee Creek - looking upstream



Maggodee Creek - looking upstream



Maggodee Creek - looking upstream



Maggodee Creek - upstream dam



Foul Ground Creek - looking upstream



Foul Ground Creek - looking downstream



Poplar Camp Creek - looking upstream



Poplar Camp Creek - looking upstream



Pigg River – looking upstream



Pigg River – looking upstream



Pigg River – looking upstream



Pigg River – looking upstream



Harpen Creek 1 - looking upstream



Harpen Creek 2 - looking upstream



Harpen Creek 2 - looking upstream



Harpen Creek 3 - looking upstream



Harpen Creek 3 - looking downstream



Cherrystone Creek 3 - looking upstream



Cherrystone Creek 3 - looking downstream



Polebridge Branch - looking upstream



Polebridge Branch - looking downstream



Little Cherrystone Creek 1 - looking upstream



Little Cherrystone Creek 1 - looking downstream



Little Cherrystone Creek 2 - looking upstream



Little Cherrystone Creek 2 - looking downstream