Application for WV Natural Streams Preservation Act Permit

Greenbrier River Crossing, Summers County, West Virginia

Prepared for:

Mountain Valley Pipeline, LLC

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Submitted to:

WV Department of Environmental Protection

Division of Water and Waste Management

401 Certification Program

601 57th Street SE

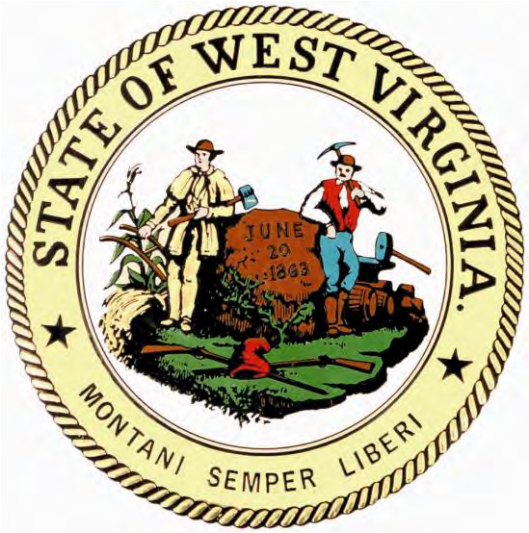
Charleston, WV 25304

January 2017

Application for

WV Natural Streams Preservation Act Permit

State of West Virginia



STATE OF WEST VIRGINIA
APPLICATION FOR
WV NATURAL STREAMS PRESERVATION ACT PERMIT

This application must be completed whenever a proposed activity requires a WV Natural Streams Preservation Act Permit from the West Virginia Department of Environmental Protection (WVDEP). A WV Natural Streams Preservation Act Permit is required whenever an activity proposes to modify any protected stream or any part thereof. Streams or rivers protected under the WV Natural Stream Preservation Act from activities that would impound, divert, or flood the body of water include: Greenbrier River from its confluence with Knapps Creek to its confluence with the New River, Anthony Creek from its headwaters to its confluence with the Greenbrier River, Cranberry River from its headwaters to its confluence with the Gauley River, Birch River from Cora Brown Bridge in Nicholas County to the confluence of the Birch River with the Elk River, and New River from its confluence with the Greenbrier River to its confluence with the Gauley River. To determine whether you need to submit this application, contact the WVDEP Division of Water and Waste Management 401 Certification Program Manager at (304) 926-0499.

The WVDEP WV Natural Streams Preservation Act permit program is authorized by West Virginia Code §22-13-9. West Virginia Code §22-13 outlines the application process and criteria for decision by the Secretary of the WVDEP. In order for the DEP to issue a WV Natural Streams Preservation Act Permit, the project must not materially alter or affect the free-flowing characteristics of a substantial part of a protected stream or streams, be necessary to prevent an undue hardship, and meet the approval of the Secretary of the WVDEP.

Information provided with the application will be used to evaluate the project for a permit and is a matter of public record. If the Secretary determines that the application lacks information necessary to determine whether the applicant has demonstrated the criteria set forth in West Virginia Code §22-13, the West Virginia Department of Environmental Protection will inform the applicant in writing of the additional information that must be submitted. The application will not be accepted until it is considered complete by the Section 401 Program Manager. The Director of the DEP Division of Water and Waste Management will inform you in writing when your application is determined to be complete.

Please submit the following with the $10 application fee to: Division of Water and Waste Management, Section 401 Program, 601 57th Street SE, Charleston, West Virginia 25304

* One (1) completed application form including a map of location, scaled plan drawings and sections, and an electronic copy of the completed application.

Any information missing in this package will be considered incomplete. A full permit review will not be made until all information is provided. The Department of Environmental Protection will notify you of any missing and/or further information necessary for a proper and thorough review for a permit.

For Agency Use Only

Date Received by Agency:	DEP application No.:
Public Notice Number:	Filing Fee of $10 received: Check No.:
Reviewer's Name:	Date Application Deemed Complete:

APPLICANT INFORMATION

Applicant Name:			Agent Name:		
Shawn Posey			Preston Smith		
Company:			Company:		
Mountain Valley Pipeline, LLC			Tetra Tech, Inc.		
Address:			Address:		
555 Southpointe Blvd, Suite 200			661 Andersen Dr., Foster Plaza 7		
City:	State:	Zip Code:	City:	State:	Zip Code:
Canonsburg	PA	15317	Pittsburgh	PA	15220
Telephone Number:			Telephone Number:		
724-395-3931			412-921-8167		
Email Address:			Email Address:		
sposey@eqt.com			Preston.Smith@tetratech.com		

PROJECT DESCRIPTION

State the type of federal permit applicant is applying for:

_____ Individual 404 permit – Public Notice No. _____

__x__ Nationwide 404 permit requiring 401 Certification – Nationwide Permit No. LRH-2015-592

_____ Modified 404 permit requiring 401 Certification – Original Public Notice No. _____

__x__ Section 10 of the Rivers and Harbors Act permit – Corps Public Notice No. TBD

__x__ Federal Energy Regulatory Commission Licenses – FERC Project No. PF 16-10-000

Type of Operation: Installation of a 42" diameter natural gas pipeline

Activity proposed in stream or wetland: _____

Temporary impacts associated with the Greenbrier River crossing during pipeline construction and installation.

Project Purpose:
The proposed crossing of the Greenbrier River is associated with the Mountain Valley Pipeline Project which is designed to transport natural gas to growing markets in the Mid-Atlantic, southeastern United States, and Appalachian region. See Section 1.0 Project Description and Purpose for details.

Briefly describe proposed project:
The proposed project is a pipeline crossing of the Greenbrier River. See Section 1.0 Project Description and Purpose for details.

PROJECT INFORMATION

County: Summers County

Nearest Town: Pence Springs

Coordinates: 37.680131° N, -80.731502° W

Directions to site: include a USGS topographical map section showing location of proposed project.
From Beckley, WV, head southeast on N Kanawha St. toward E. Main St. Turn right onto Howe St. Turn left onto S. Fayette St., go 2 miles. Turn right onto US-19 S/S. Eisenhower Dr., go 6 miles. Turn left onto WV-3 E/ Hinton Rd, follow WV-3 E for 14.5 miles. Turn right onto WV-20 S/WV-3 E., go 1 mile. Turn right onto WV-3 E/ Greenbrier Dr., go 5 miles. Turn left onto WV-12 N/WV-3 E., go 7 miles. A USGS topographical map showing the location of the proposed project is attached (Figure 1).

Watershed Name: Greenbrier

Watershed Size (acres): 1,052,738 acres

Name of stream(s) where work will occur and receiving streams to which they drain:
S-I8 (Greenbrier River) tributary to New River

Length and Width of Section 10 impacts:
407 feet in length, 75 feet in width

Wetlands on project site (acres): 2.10 acres

Wetlands impacted by proposed project (acres): 0 acres - No wetlands will be impacted by the project.

Briefly describe wetland functions:
N/A. The project will not incur any impacts to wetlands. See Section 2.1 Wetlands and Streams Impacts

Describe the type, composition and quantity of fill material:
A total of 40,700 cubic yards of temporary fill material is anticipated to be discharged at the Greenbrier River Crossing. No other wetlands or streams are anticipated to be impacted by this project.
After pipeline installation, previously excavated material will be used to backfill the pipeline trench and restore the grade to pre-excavation conditions. The first 12 inches above the top of the pipe will be clean fill free of rocks from the excavation; where the previously excavated material contains large rocks or other materials that could damage the pipe or coating, clean fill will be used to protect the pipe. See Section 3.0 Type, Composition, and Quantity of fill for details.

NO PRACTICAL ALTERNATIVE DEMONSTRATION (See Instructions)

Alternative stream crossing methods considered for the crossing of the Greenbrier River included open cut wet crossing, conventional bore crossing, and horizontal directional drilling (HDD) bore. See Section 4.0 No Practical Alternative Demonstration for alternate crossing method descriptions and evaluations.

WETLANDS DELINEATION (See Instructions)

The methods and results of a wetland delineation and stream identification field survey conducted for the Project are included in Appendix A and discussed in Section 2.0. The resources in proximity to the Greenbrier River Crossing are included with this application as supplemental information only. All identified wetlands and streams adjacent adjacent to the Greenbrier River were included in the Individual 401 Water Quality Certification application for the Mountain Valley Pipeline submitted to the WV DEP in February 2016 and updated in December 2016.

STREAM RESTORATION PLAN (See Instructions)

It is anticipated that all stream impacts within the pipeline limit-of-disturbance will be temporary, occurring during pipeline construction activities. Restoration will commence following the completion of backfilling and testing. Natural stream channel design practices will be employed during restoration to ensure that the channels proper hydrogeomorphic characteristics are restored. Permanent impacts to the Greenbrier River are not anticipated with this crossing. See Section 5.0 Restoration Plan.

MITIGATION / COMPENSATION AGREEMENT

Include West Virginia Stream and Wetland Valuation Metric (See Instructions)

N/A. No permanent stream impacts are anticipated for the Project.

SIGNATURE – STATEMENT OF AFFIRMATION

Please read carefully before signing

Application is hereby made for a WV Natural Streams Preservation Act Permit to authorize the activities described herein. I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true and accurate. I certify that I have the authority to undertake the activities proposed in the application. I understand and agree to allow representatives of the Department of Environmental Protection to enter upon said property in order to inspect the proposed project. I understand that the granting of other permits by local, state or federal agencies does not release me from the requirements of obtaining the permit requested herein before commencing the project.

Applicants Printed Name: Shawn M. Posey

Applicant's Signature: Shawn M. Posey Date: 1-24-17

PUBLIC NOTICE

Publication Date:

Expiration Date: (7 days after Public Hearing Date)

Public Hearing Date and Time:

Public Hearing Location:

TO WHOM IT MAY CONCERN:

A West Virginia (WV) Natural Streams Preservation Act Permit, as required by WV Code Chapter 22, Article 13, Section 9 has been requested from the West Virginia Department of Environmental Protection (WVDEP) for:

Mountain Valley Pipeline Project - Greenbrier River Crossing

(Name of Project)

Mountain Valley Pipeline, LLC, 555 Southpointe Boulevard, Suite 200 Canonsburg, Pennsylvania 15317

(Name and Address of Applicant)

SCOPE OF PERMIT:

Pursuant to the WV Natural Streams Preservation Act, the State may issue, issue with conditions, or deny a permit. When issuing the permit, the WVDEP will consider the proposed activity's impact on the natural condition and free-flowing characteristics of the protected stream. Procedural code governing the scope of the Department's permit process, including the required public hearing and appeal process may be found in WV Code Chapter 22, Article 13.

DESCRIPTION OF THE ACTIVITY:

The Greenbrier River Pipeline Crossing is proposed to be constructed using an open cut, dry ditch crossing using a cofferdam in two stages. The cofferdam will be installed in half of the river to allow excavation of the trench and installation of the pipe. Once the pipeline is installed the cofferdam will be moved to the other half of the river and the pipeline installation will be completed in that section. The proposed half-width construction method will allow continual downstream flow and recreational access at the project area. The cofferdam will be removed when the pipeline crossing construction is complete.

PURPOSE OF PROJECT:

The proposed crossing of the Greenbrier River is associated with MVP's proposed Mountain Valley Pipeline Project. MVP plans to construct an approximately 303-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 proposed Mountain Valley Pipeline route will begin at an existing Equitrans, L.P. transmission system near the Mobley processing facility in Wetzel County, West Virginia and extend to the Transcontinental Gas Pipe Line Company, LLC's Zone 5 Compressor Station 165 in Transco Village, Pittsylvania County, Virginia.

PROJECT LOCATION:

The project is located on the Greenbrier River in Summers County, north of Pence Springs WV. The approximate coordinates are 37.680131° N, -80.731502° W.

INFORMATION AVAILABLE:

The WV Natural Streams Preservation Act application is available for inspection between the hours of 9:00 a.m. and 4:00 p.m., Monday through Friday, at the following location:

WV Department of Environmental Protection
Division of Water and Waste Management
401 Certification Program
601 57th Street SE
Charleston, West Virginia 25304

Arrangements to receive a copy of the WV Streams Preservation Act application by email may be made by calling (304) 926-0499 Ext 1599.

COMMENTS:

Comments and information relating to the WV Natural Streams Preservation Act for this activity are hereby solicited. Comments may be made at the public hearing or mailed to the following address:

WV Department of Environmental Protection
Division of Water and Waste Management
401 Certification Program
601 57th Street SE
Charleston, West Virginia 25304

All mailed comments and information on the activity's impact will be considered if postmarked prior to the expiration date of this notice. Comments and information postmarked later than the expiration date may not be considered.

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1.0 PROJECT DESCRIPTION AND PURPOSE

Mountain Valley Pipeline, LLC (MVP) is proposing to construct the Mountain Valley Pipeline, a natural gas pipeline 303-miles in length and 42-inches in diameter, in order to provide timely and affordable 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 proposed Mountain Valley Pipeline route will begin at an existing Equitrans, L.P. transmission system near the Mobley processing facility in Wetzel County, West Virginia (WV) and extend to the Transcontinental Gas Pipe Line Company, LLC's (Transco) Zone 5 Compressor Station 165 in Transco Village, Pittsylvania County, Virginia (VA). A Federal Energy Regulatory Commission (FERC) application requesting a certificate of public convenience and authorization was filed on October 23, 2015 for the Mountain Valley Pipeline.

As part of the Mountain Valley Pipeline, MVP is proposing to cross the Greenbrier River in Summers County, WV (Figure 1). The proposed Greenbrier River crossing would result in temporary impacts to the Greenbrier River during pipeline construction. The Greenbrier River is listed as a protected stream under the WV Natural Streams Preservation Act; therefore, MVP is submitting this WV Natural Streams Preservation Act Permit application for the Greenbrier River Crossing Project.

This WV Natural Streams Preservation Act Permit application is only for anticipated temporary impacts associated with the proposed crossing of the Greenbrier River (identified as Stream S-I8 on Figure 2-1). Adjacent wetland and stream features identified in the vicinity of the Greenbrier River are included on attached figures to show their location in relation to the Greenbrier River (Figure 2-1 to 2-3); however, anticipated impacts to adjacent features are not included in this permit application. Anticipated potential impacts to wetland and stream features adjacent to the Greenbrier River were included in the WV Individual 401 Water Quality Certification application for the entire segment of the Mountain Valley Pipeline located in WV that was submitted to the WV Department of Environmental Protection (WV DEP) in February 2016 and updated in December 2016.

The Greenbrier River Crossing Project is proposed to be constructed using an open cut, dry ditch crossing using a cofferdam in two stages (Drawing 1). The cofferdam will be installed in half of the river to allow excavation of the trench and installation of the pipe. Once the pipeline is installed the cofferdam will be moved to the other half of the river and the pipeline installation will be completed in that section. The proposed half-width construction method will allow continual downstream flow of the Greenbrier River during the construction process. This method is not anticipated to interfere with recreational access or impede the movement of aquatic life. The cofferdam will be removed when the pipeline crossing construction is complete. The proposed Project will also include two work spaces and two access roads as shown on the attached Construction Plans (Drawing 1). MVP has prepared a river crossing methodology and this is included with the Construction Plans (Drawing 1). The proposed Greenbrier River Crossing Project will not materially alter or affect the free-flowing characteristics of a substantial part of the Greenbrier River.

2.0 WETLANDS AND STREAMS ON SITE

A Wetland Delineation and Waters of the U.S. field survey was completed for the Greenbrier River Crossing Project. The study area was limited to a 300-foot wide corridor for the proposed pipeline route. A total of three wetlands and four streams were identified during the field surveys within the Greenbrier River Crossing Project study area. The results of the wetland and waterbody field survey are presented in the Aquatic Resource Report (Appendix A).

While a majority of the Greenbrier River Crossing Project area was surveyed for wetlands and waterbodies, field teams have not been granted access to a small portion just north of the Greenbrier River. A desktop wetland and waterbody evaluation of the unsurveyed area was conducted to evaluate the likely presence and approximate location of wetlands and waterbodies in order to estimate potential impacts until a survey can be conducted in the area. To help distinguish between desktop delineated features and field-delineated features, the feature identification names of all desktop delineated wetlands begin with “TTWV”.

One desktop wetland (TTWV-W-MM20) was identified in the unsurveyed area north of the Greenbrier River (Figure 2-1). TTWV-W-MM20 is a desktop evaluated extension of the field-delineated wetland W-MM20; therefore, no data forms, photographs, or Function and Value assessment are provided for TTWV-W-MM20 in the Aquatic Resource Report in Appendix A.

2.1 Wetland and Stream Impacts

It is anticipated that the Project will have 407 linear feet of temporary impacts on the Greenbrier River (Table 1).

No impacts to adjacent wetlands or stream features are anticipated as part of the Greenbrier River Crossing Project. Anticipated potential impacts to wetland and stream features adjacent to the Greenbrier River were included in the WV Individual 401 Water Quality Certification application for the entire segment of the Mountain Valley Pipeline located in WV that was submitted to the WV DEP in February 2016 and updated in December 2016.

3.0 TYPE, COMPOSITION, AND QUANTITY OF FILL

It is anticipated that there will be Greenbrier River will have 407 linear feet of temporary stream impacts, resulting in approximately 40,700 cubic yards of temporary fill (Table 1). No other impacts are anticipated as part of the Greenbrier River Crossing Project.

After pipeline installation, previously excavated material will be used to backfill the pipeline trench and restore the grade to pre-excavation conditions. The first 12 inches above the top of the pipe will be clean fill free of rocks from the excavation; where the previously excavated material contains large rocks or other materials that could damage the pipe or coating, clean fill will be used to protect the pipe.

4.0 NO PRACTICAL ALTERNATIVE DEMONSTRATION

Alternative stream crossing methods considered for the crossing of the Greenbrier River included open-cut wet crossing, conventional bore, and Horizontal Directional Drilling (HDD) bore.

4.1 Open-Cut Waterbody Crossing

An open-cut waterbody crossing is conducted using methods similar to conventional upland open-cut trenching. The pipeline trench is excavated across the waterbody, followed by installation of a prefabricated segment of pipeline, and backfilling of the trench with native material. Stream flow is not isolated from the construction activities, and upland methods are used for crossing of the waterbody when it is temporarily dry or frozen and not flowing. If there is perceptible flow, the open-cut crossing method may be used on minor or intermediate waterbodies with restrictions in timing of instream construction activities, limiting use of equipment within the waterbody or use of an equipment bridge as per the FERC Procedures.

Due to the size and flow of the Greenbrier River the open-cut wet crossing method was not selected.

4.2 Conventional Bore Crossing

A conventional bore crossing entails the excavation of two pits, one on each side of the waterbody or feature to be crossed. The boring machine is then lowered into one pit, a horizontal hole is bored for the length of the crossing, and then the pipeline section is pushed through the bore hole. This crossing method is typically used to cross waterbodies associated with, or immediately adjacent to, railroads or major roadways.

A conventional bore crossing was not proposed for the Greenbrier River because the bore pit depth and width required to safely bore under the river would be too great and create significant safety concerns. The vertical scour and lateral channel erosion analysis completed for this crossing recommended approximately 7-feet of cover for the Greenbrier River crossing. Therefore, the bore pit depth would be approximately 26 to 30 feet below the top of bank elevation in order to account for pipe cover depth, pipe diameter, top of bank height, and the bore machine. The bore pits would be below the water table, which would cause water to flow constantly into the bore pits during construction. In addition, MVP did perform one geotechnical bore in the vicinity of the river. The results demonstrated very porous soil/rock conditions near the surface. It will not be possible to pump the excavations dry enough to permit safe working conditions for the boring machine, operators, welders, and laborers. This would pose a risk of failure to boring that is likely insurmountable as well as a safety risk to construction staff. In addition, to create a safe workspace for the bore in a 26 to 30-foot deep bore pit, the bore pit walls would require a 2:1 or 3:1 slope and would result in a bore pit width of approximately 100 to 156-feet wide.

4.3 Horizontal Directional Drilling (HDD) Bore Crossing

HDD construction involves utilizing a steerable drill to establish a pilot hole for the eventual pipe installation. The pilot hole is expanded in diameter by a succession of reams until the diameter is large enough to accommodate pulling the pipe string under the river. A bentonite drilling fluid circulated under high pressure is used throughout the process to drive the drill and reams as well as transport cuttings back to the surface and then eventually to center and lubricate the pipe during its installation.

For a HDD, it is necessary to prefabricate a section of pipe aboveground that is equal to the length of the HDD. Existing surface features such as roads and railroads, could restrict the length of the prefabricated section to less than that of the HDD length. Therefore, the HDD method requires specific site conditions. Furthermore, using commonly accepted industry practice of a bending radius of 100 times the pipe outer diameter, the allowable bending radius for 42-inch steel pipe is 4,200 feet. This is a typical conservative industry rule of thumb and is not based on any actual stress analysis. Based on the stress analysis for the pipe grade and wall thickness used for the Mountain Valley Pipeline, the minimum bend radius without over-stressing the pipe is 1,510 feet. For assessment purposes, an allowable minimum pipe bend radius of 2,500 feet was used to evaluate HDD crossings, with some exceptions made on a case by case basis. An HDD with an entry angle of 12 degrees, exit angle of 6 degrees and a bend radius of 2,500 feet would require a minimum length of at least 1,287 feet if the terrain was flat. Changes in site elevation from entry to exit could cause the minimum required length to change. A bend radius of 2,500 feet is the max radius for a 42-inch-diameter pipe, but would be necessary to traverse the crossings within the Project alignment

provided. Use of a 2,500-foot radius would increase the risk associated with successfully completing the crossings by HDD, utilizing analysis based on pipeline depths of at least 25 feet below rivers for HDD construction. The pipeline depth for HDD was based on minimizing the potential for inadvertent returns.

Another disadvantage of the HDD method is the possibility of an inadvertent return, when the pressurized drilling mud in the borehole finds a fracture or weak area and the drilling fluids discharge into the waterbody and other areas. Given the porous geology at the Greenbrier River this risk is elevated, particularly at the drill entry end of the project. An HDD crossing alignment for the Greenbrier River would be approximately 3.75 miles upstream of the water intake for the Big Bend Public Service District. In the event of an inadvertent return, this could have a negative impact on Big Bend's filtration system and short term water service to the community.

The Greenbrier River crossing is located in the Valley and Ridge physiographic province. The geology is characterized primarily by shale and sandstone, with occurrences of limestone. The overall formation is the Bluefield Formation with the Kanawha Monongahela soil series at the near surface. Deposits with potential for a high percentage of gravel and cobbles have been reported in soils overlying rock in this area. The geotechnical data indicates a high potential for inadvertent returns and/or release of drilling fluids in the river due to the presence of gravel and cobble.

The gravel and cobble geology may also cause steering problems in both an HDD and conventional bore. In gravel and cobbles, the drilling head tends to not follow the bore path and will not surface at the intended location. Gravel and cobbles also creates an unstable drill hole creating a high potential for hole collapse and subsequent failure of the bore.

Due to environmental risks associated with an inadvertent return and the design limitations inherent with the size of the pipe and the difficult terrain, not allowing adequate pullback space, it was determined that the HDD method is not feasible for the Greenbrier River crossing.

5.0 STREAM RESTORATION

Stream impacts within the pipeline limit of disturbance will be temporary and will only occur during pipeline construction activities. Temporary waterbody crossings will not result in a long-term impact to water quality, physical habitat, or aquatic species within the Greenbrier River Crossing Project area due to the short duration of stream crossing construction activities and the implementation of the Erosion and Sedimentation Control Plan Best Management Practices.

All waterbody banks will be restored to their original grades and foreign objects will be removed from the waterbody. Excavated material not required for backfill will be removed and disposed of at an upland site.

Restoration will commence after completion of backfilling and testing. Cleanup and restoration activities include replacing grade cuts to original contours, seeding, fertilizing, and mulching to restore ground cover, minimize erosion, and stabilize stream banks for their natural reversion toward their previous state. Original streambed and bank contours will be re-established for surface water and groundwater flow, and mulch, jute thatching, or bonded fiber blankets will be installed on the stream banks.

Seeding of disturbed stream approaches will be completed in accordance with FERC's Procedures after final grading, weather and soil conditions permitting. MVP is committed to increasing conservation and biodiversity in the region by using native grasses and wildflower seed mixes. Slope breakers will be installed adjacent to stream banks to minimize the potential for erosion and sediment barriers, such as silt fence and/or compost filter sock will be maintained across the right-of-way until permanent vegetation is established. Temporary equipment bridges will be removed following construction.

Figures

Greenbrier River Crossing

Mountain Valley Pipeline Project

N

1:24,000

0 1,000 2,000 3,000 4,000 Feet

Mountain Valley PIPELINE

USGS Project Location Map
Greenbrier River Crossing

Figure 1
Summers County, West Virginia

January, 2017

Data Sources: ESRI Streaming Data 2014.

Legend

- Alignment Centerline
- Limit of Disturbance
- County Boundary
- Big Bend Public Service Distric Water Intake

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Mountain Valley Pipeline Project

N

1:2,400

0 100 200 300 400 Feet

Mountain Valley PIPELINE

Detail Map
Greenbrier River Crossing

Figure 2-1
Summers County, West Virginia

January, 2017

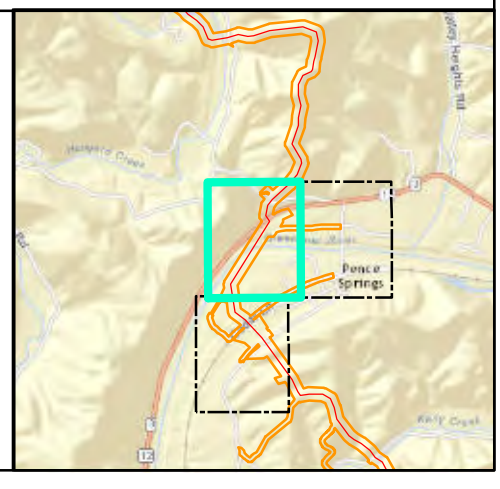
Data Sources: ESRI Streaming Data 2014.
Note: Map insets are at a scale of 1 inch = 50 feet unless otherwise noted.

Legend

- Milepost
- Alignment Centerline
- Access Road Temporary LOD
- Access Road Permanent LOD
- Limit of Disturbance
- Unsurveyed Area

Stream
- Perennial
- Intermittent

Wetland
- PFO
- TTWV Desktop Delineated Feature



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Mountain Valley Pipeline Project

N

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0 100 200 300 400 Feet

Mountain Valley PIPELINE

Detail Map
Greenbrier River Crossing

Figure 2-2
Summers County, West Virginia

January, 2017

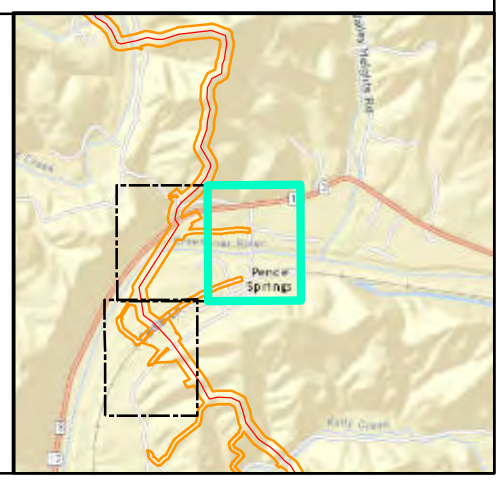
Data Sources: ESRI Streaming Data 2014.
Note: Map insets are at a scale of 1 inch = 50 feet unless otherwise noted.

Legend

- Access Road Temporary LOD
- Access Road Permanent LOD
- Limit of Disturbance
- Sample Location

Wetland

- PFO



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Mountain Valley Pipeline Project

N

1:2,400

0 100 200 300 400 Feet

Mountain Valley PIPELINE

Detail Map
Greenbrier River Crossing

Figure 2-3
Summers County, West Virginia

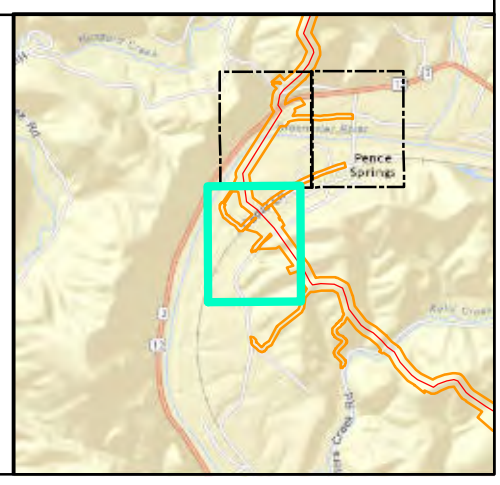
January, 2017

Data Sources: ESRI Streaming Data 2014.
Note: Map insets are at a scale of 1 inch = 50 feet unless otherwise noted.

Legend

- Milepost
- Alignment Centerline
- Access Road Permanent LOD
- Limit of Disturbance
- Culvert
- Drainage Feature

Stream
- Perennial
- Intermittent



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Tables

Table 1.
Stream Impacts Table
Greenbrier Pipeline Crossing Project

Stream ID	NHD Stream Name	County	Latitude[1]	Longitude[1]	Flow Regime	Water Type[2]	Feature Location	Designation[3]	Top of Bank Width (ft)	Temporary Linear Feet Impact (ft)	Permanent Linear Feet Impact (ft)	Temporary Fill (cubic yard)	Permanent Fill (cubic yard)
S-I8	Greenbrier River	Summers	37.680131 N	-80.731502 W	Perennial	TNW	Pipeline ROW	Tier 3, WV Natural Stream, M	270	407	-	40,700	-

Notes:

1 - in decimal degrees

2 - TNW = Traditional Navigable Waters

3 - WV Natural Stream - streams identified in WV Natural Streams Preservation Act listed in Nationwide Permits for the State of West Virginia General Conditions;
- Tier 3 - outstanding national resource waters, streams were identified using an ArcGIS shapefile provided by WVDEP in June, 2016;
- M - freshwater mussels observed in the proposed Project crossing area.

Drawings

Drawing 1 **Construction Plans**

LEGEND

- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED ACCESS ROAD CENTERLINE
- PROPOSED PIPELINE
- SF — PROPOSED SILT FENCE
- SSF — PROPOSED SUPER SILT FENCE
- OCSF — ORANGE CONSTRUCTION SAFETY FENCE
- CFS — PROPOSED COMPOST FILTER SOCK
- PROPOSED TEMPORARY RIGHT OF WAY DIVERSION AND OUTLET
- EXISTING CULVERT
- STREAM
- WETLAND
- PROPOSED CULVERT WITH OUTLET PROTECTION
- TIMBER MAT
- STEEP SLOPE EROSION CONTROL
- STEEP SLOPE
- PROPOSED PERMANENT WATER BAR
- PROPOSED TEMPORARY WATER BAR
- PROPOSED BROAD BASED DIP
- PROPOSED TRENCH PLUG
- PROPOSED ROCK CONSTRUCTION ENTRANCE

ACCESS ROAD LEGEND

1. ROCK CONSTRUCTION ENTRANCE
2. WETLAND CROSSING
3. STREAM CROSSING

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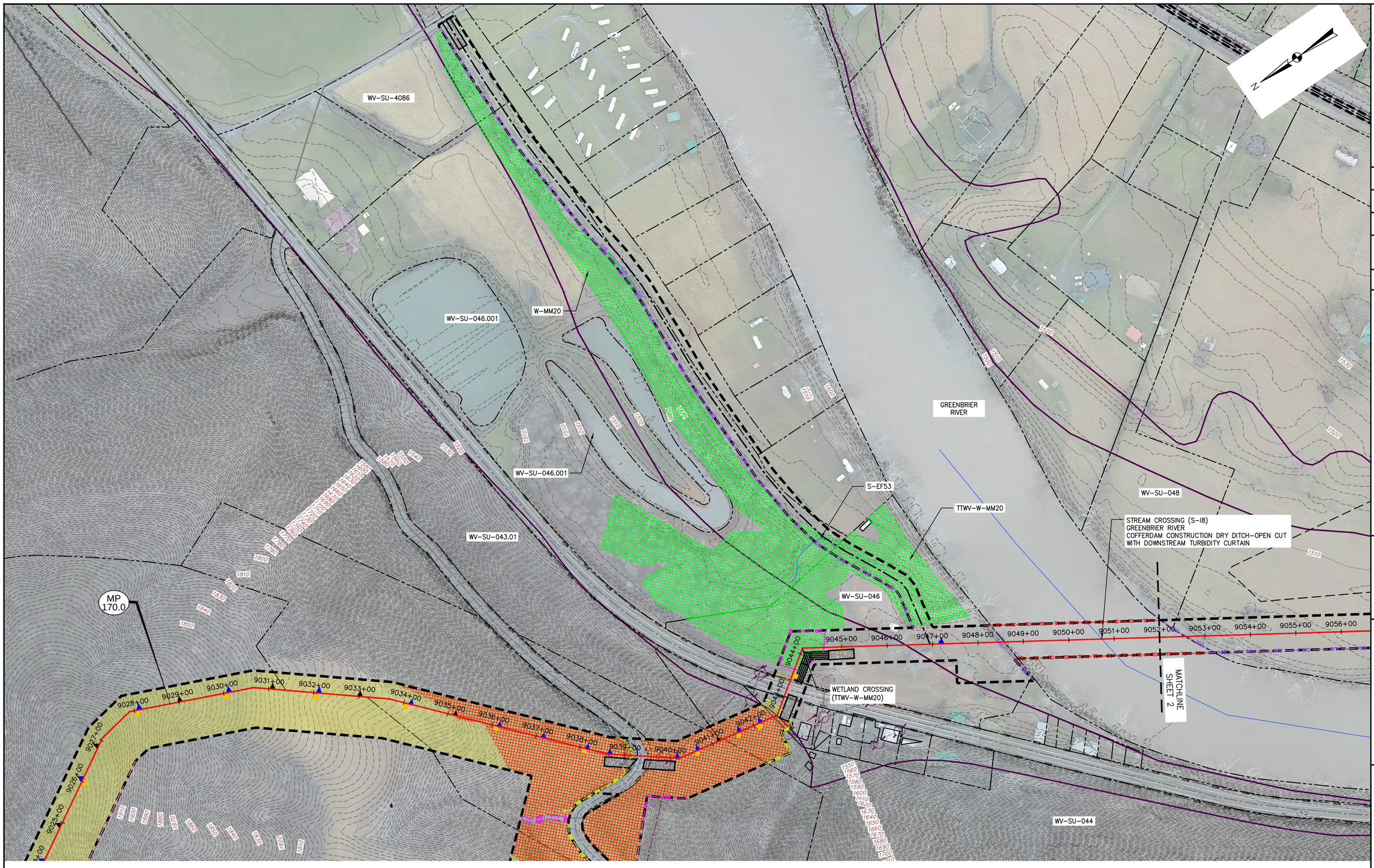
Mountain Valley PIPELINE

MOUNTAIN VALLEY PIPELINE PROJECT

DRAWING 1
CONSTRUCTION PLAN LEGEND

DATE:	01/23/17
PROJECT NO.:	112IC07157
DESIGNED BY:	–
DRAWN BY:	JK
CHECKED BY:	RE
SHEET: 1 OF 4	



GREENBRIER RIVER CROSSING
SUMMERS COUNTY, WEST VIRGINIA

SCALE: 1" = 100'

100 0 100 200

MOUNTAIN VALLEY PIPELINE PROJECT – H600 LINE
SUMMERS COUNTY, WEST VIRGINIA

MOUNTAIN VALLEY PIPELINE, LLC
555 SOUTHPOINTE BOULEVARD, SUITE 200
CANONSBURG, PA 15311

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CONSTRUCTION PLANS

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APPROVED BY:	RE
DATE:	1/5/2016
SCALE:	AS SHOWN
SHT. NO.	2 OF 4

REVISION

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GREENBRIER RIVER CROSSING
SUMMERS COUNTY, WEST VIRGINIA

SCALE: 1" = 100'

100 0 100 200

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Mountain Valley PIPELINE

MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE
SUMMERS COUNTY, WEST VIRGINIA

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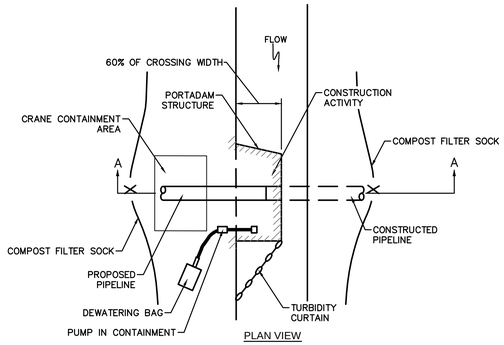
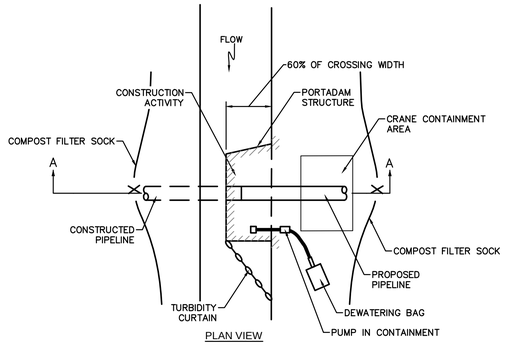
APPROVED BY:	RE
DATE:	1/5/2016
SCALE:	AS SHOWN
SHT. NO.	3 OF 4

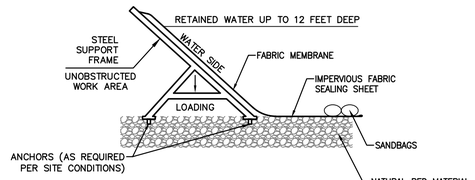
REVISION



PLAN VIEW



PLAN VIEW



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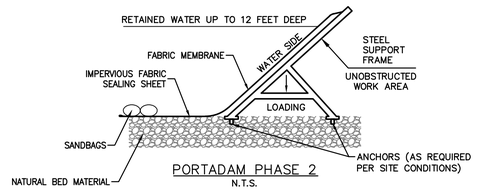

PORTADAM PHASE 2
N.T.S.

PORTADAM DETAIL
N.T.S.

NOTES:

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

REFERENCES:

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

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

REVISIONS:

Mountain Valley PIPELINE

EROSION AND SEDIMENT CONTROL DETAILS

MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

WETZEL COUNTY THROUGH MONROE COUNTY, WEST VIRGINIA

MOUNTAIN VALLEY PIPELINE, LLC
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CONSTRUCTION PLANS

DRAWN BY:	KAL
CHECKED BY:	HT
APPROVED BY:	RE
DATE:	2/19/2016
SCALE:	AS SHOWN
SHT. NO.	4 OF 4

REVISION

APPENDIX A
Aquatic Resource Report

Aquatic Resource Report for the Greenbrier River Pipeline Crossing

Summers County, West Virginia

Prepared for:

Mountain Valley Pipeline, LLC
555 Southpointe Boulevard, Suite 200
Canonsburg, Pennsylvania 15317

Prepared by:

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January 2017

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Appendix

LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYM	MEANING
1987 Manual	US Army Corps of Engineers Wetland Delineation Manual
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
GIS	Geographic Information Systems
GPS	Global Positioning System
HGM	Hydrogeomorphic
MVP	Mountain Valley Pipeline, LLC
NHD	National Hydrography Dataset
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OBL	Obligate
PEM	Palustrine Emergent
PFO	Palustrine Forested
Project	Mountain Valley Pipeline Project
PSS	Palustrine Scrub-Shrub
Regional Supplement	Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region
ROW	Right-of-Way
Tetra Tech	Tetra Tech, Inc.
Transco	Transcontinental Gas Pipeline Company, LLC
UNT	Unnamed Tributary
UPL	Upland
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VA	Virginia
WV	West Virginia
WV DEP	West Virginia Department of Environmental Protection

1.0 PROJECT INTRODUCTION

This Aquatic Resource Report for the proposed Project has been prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of Mountain Valley Pipeline, LLC (MVP). The proposed Greenbrier River Pipeline Crossing (Project) location is shown on United States Geological Survey (USGS) Project Location Map (Figure 1). The content of this report presents the methodology, results, and conclusions of wetland delineation and stream identification activities completed for the proposed Project in Summers County, WV.

2.0 METHODOLOGY

2.1 Wetland Delineation

United States Army Corps of Engineers (USACE) requires the use of the procedures enumerated in the *USACE Wetland Delineation Manual* (*1987 Manual*; Environmental Laboratory, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region* (*USACE Regional Supplement*; Environmental Laboratory, 2012) for making jurisdictional determinations. According to the *1987 Manual*, an area is defined as a wetland if, under normal circumstances, it meets all three of the following criteria:

1. Predominance of hydrophytic vegetation (plants adapted for life in saturated soil conditions);
2. Hydric soils (soils formed under water, or in saturated conditions); and
3. Wetland hydrology (presence of inundated or saturated soils at some time during the growing season).

Wetlands identified in the field were classified in accordance with the U.S. Fish and Wildlife Service's (USFWS) *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979), *A Hydrogeomorphic (HGM) Classification for Wetlands (*Brinson, 1993), and USACE Waters Type (USACE, 2007). Cowardin wetland classifications (Cowardin et al., 1979) are as follows:

Palustrine emergent (PEM) – emergent, herbaceous (non-woody) plants are the tallest life form with at least 30 percent aerial coverage
Palustrine scrub-shrub (PSS) –woody plants less than six meters (20 feet) in height are the tallest life form with at least 30 percent aerial coverage
Palustrine forested (PFO) - woody plants at least six meters (20 feet) in height are the tallest life form with at least 30 percent aerial coverage

Dominant vegetation was identified and classified according to *The National Wetland Plant List: 2016 wetland ratings* (Lichvar, 2016). Plant classifications are as follows:

Obligate (OBL) - essentially always found in wetlands; estimated probability >99%
Facultative Wetland (FACW) - usually found in wetlands; estimated probability 67%-99%
Facultative (FAC) - equally likely to occur in wetlands and non-wetlands; estimated probability 34%-66%
Facultative Upland (FACU) - usually occurs in non-wetlands; estimated probability 1%-33%
Upland (UPL) –rarely occurs in wetlands; estimated probability <1%

2.2 Stream Identification

Streams identified in the field were classified by Flow Regime, USACE Water Type (USACE, 2007), Cowardin Classification (Cowardin et al., 1979), and West Virginia Department of Environmental Protection (WV DEP) Water Quality Standard Antidegradation Policy tier classification.

The WV DEP Water Quality Standard Antidegradation Policy assigns specific tiers to all waters depending up on the level of protection necessary to maintain high quality and/or existing uses. Tier 3 streams were identified using an ArcGIS shapefile provided by WV DEP in June, 2016. The tier classifications are:

Tier 1 – A waterbody that is listed as impaired on the state 303(d) list
Tier 2 – The default assignment for a waterbody not listed as impaired on the state 303(d) list or designated as Tier 3
Tier 3 – Outstanding national resource waters, including waters in Federal Wilderness Areas, specifically designated federal waters, and high quality waters or naturally reproducing trout streams in state parks, national parks, and national forests

2.3 Field Surveys

The field investigations for the proposed Greenbrier River Pipeline Crossing were performed on April 14-15, 2015, December 11, 2015, and September 21, 2016. The study area was limited to a 300-foot wide corridor along the proposed pipeline right-of-way (ROW) and a 100-foot wide corridor on access roads (Figure 1).

Preliminary site reconnaissance of the study area was conducted through a review of available Geographic Information Systems (GIS) resources. Existing information reviewed included the following:

- USGS topographic mapping (Figure 1; USGS, 2009)
- Natural Resources Conservation Service (NRCS) National Cooperative Soil Survey (Figure 2; NRCS, 2014)
- USFWS National Wetland Inventory (NWI) Mapping (Figure 3; USFWS, 2009)

Wetland delineation in the field involved the establishment of the wetland/upland margin with flagging hung at intervals that accurately depicted the outline of the boundary. The individual flags were then located using a Global Positioning System (GPS) receiver with sub-meter accuracy and later added to the Project area mapping. Wetland flagging was limited to the bounds of the investigated study area and wetlands are shown as closed or partially closed systems on the detail maps (Figures 4-1 to 4-3).

All wetlands and streams identified were given unique identification names (i.e. Wetland ID, Stream ID). For streams, the National Hydrography Dataset (NHD) mapped stream names (USGS, 2015) are also provided in the results. For identified streams without a NHD name, the identified stream was given the name, “Unnamed Tributary (UNT)”, of the first named receiving waterbody.

Data concerning soils, hydrology, and vegetation were collected and recorded on USACE Wetland Determination Data Forms at wetlands and at upland point locations associated with each wetland. USACE Wetland Determination Forms are provided in Appendix A. Photographs depicting wetland topography and vegetation are included in Appendix B. Stream data sheets detailing stream characteristics are provided in Appendix C. Appendix D contains photographs of streams identified within the study area. A matrix of Project field personnel, summarizing professional experience, qualifications, and education, is included in Appendix E.

3.0 RESULTS

The field investigation identified three areas within the Greenbrier River Pipeline Crossing that met the wetland criteria outlined in the *1987 Manual* (Environmental Laboratory, 1987) as amended by the *USACE Regional Supplement* (Environmental Laboratory, 2012). Four streams were identified within the Project study area.

The detail maps provided as Figures 4-1 to 4-3 illustrate the wetland and watercourse locations in relation to the study area. Tables 1 and 2 summarize wetland and stream information for all wetlands and streams identified within the Project study area.

3.1 Wetland Identification and Delineation

A review of the NRCS Soil Survey and hydric soil list indicates that there are two soils mapped within the study area classified as hydric or containing hydric components (Table 3). Hydric soils and soils with hydric components are often associated with wetlands. The NRCS soil survey mapping units are shown on Figure 2. Confirmation of the soil mapping units was not performed during this site evaluation.

A review of the USFWS NWI database indicates that there is one NWI mapped wetland in the Project study area (Figure 3).

Based on our review of available GIS mapping data, evidence collected during field surveys, and best professional judgment, three wetlands are present within the study area. Three areas demonstrated the presence of all three wetland parameters required by the *1987 Manual* (Environmental Laboratory, 1987) and the *USACE Regional Supplement* (Environmental Laboratory, 2012):

1. Predominance of hydrophytic vegetation (plants adapted for life in saturated soil conditions);
2. Hydric soils (soils formed under water, or in saturated conditions); and
3. Wetland hydrology (presence of inundated or saturated soils at some time during the growing season).

A summary of each wetland identified and delineated within the Project study area is provided in Table 1. Table 1 shows the location of each wetland, Cowardin classification, HGM classification, Waters Type classification, the identity of any associated (i.e. abutting or adjacent) waterbodies, wetland size within the study area (in acres and square feet), whether the wetland boundary is open or closed (open wetland boundaries indicate that delineated wetlands continue beyond the Project study area), and dominant vegetation identified within the wetland. Wetlands with multiple habitat types (e.g. PEM and PSS) are considered a single wetland system and are counted as one wetland. The wetland size provided in Table 1 represents the size of the wetland delineated within the Project study area. Open boundary wetlands continue beyond the survey area; therefore, the size of open boundary wetlands may be larger than the size provided in Table 1.

USACE wetland determination data forms detailing the existing vegetation, soil characteristics, and hydrology for each wetland and its associated upland point are provided in Appendix A. Photographs of each delineated wetland are provided in Appendix B.

3.2 Stream Identification and Evaluation

Based on our review of available GIS mapping data, evidence collected during field surveys, and best professional judgment, four streams were identified and evaluated within the study area. A summary of each stream identified and evaluated within the Project study area is provided in Table 2. Table 2 shows the stream field identification name (Stream ID), the NHD mapped stream name (NHD Stream Name), stream location, Flow Regime classification, Water Type classification, Cowardin classification, WV DEP tier classification, and top of bank width. One WV DEP Tier 3 streams was identified in the study area.

Stream data sheets detailing the bank and channel measurements, substrate composition, aquatic habitat, and hydrology are provided for each stream in Appendix C. Photographs of each identified stream are provided in Appendix D.

4.0 CONCLUSION

During the field investigations of the Project study area, three locations were identified and delineated as wetlands in accordance with the *1987 Manual* (Environmental Laboratory, 1987) and the *USACE Regional Supplement* (Environmental Laboratory, 2012). In addition, four streams were identified and evaluated within the Project study area. A summary of wetland and stream data is provided in Tables 1 and 2 and locations of all identified wetlands and streams are shown on Figures 4-1 to 4-3.

5.0 REFERENCES

Brinson, M. M. 1993. A Hydrogeomorphic Classification for Wetlands, Technical Report WRP-DE-4. U.S. Army Engineer Waterways Experiment Station. Vicksburg, Mississippi.

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United States Geological Survey. 2015. National Hydrography Dataset. Available at: http://nhd.usgs.gov/index.htm

Figures

Greenbrier River Crossing

Mountain Valley Pipeline Project

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0 1,000 2,000 3,000 4,000 Feet

Mountain Valley PIPELINE

USGS Project Location Map
Greenbrier River Crossing

Figure 1
Summers County, West Virginia

January, 2017

Data Sources: ESRI Streaming Data 2014.

Legend

- Alignment Centerline
- Limit of Disturbance
- County Boundary

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Greenbrier River Crossing

Mountain Valley Pipeline Project

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Mountain Valley PIPELINE

NRCS Soils and Codes Map
Greenbrier River Crossing

Figure 2
Summers County, West Virginia

January, 2017

Data Sources: ESRI Streaming Data 2014, National Wetlands Inventory, National Hydrography Dataset for West Virginia (2014), Geospatial Gateway.

Legend

- Alignment Centerline
- Limit of Disturbance
- WeD NRCS Soils and Codes
- County Boundary

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Greenbrier River Crossing

Mountain Valley Pipeline Project

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Mountain Valley PIPELINE

NWI Wetlands and Codes Map
Greenbrier River Crossing

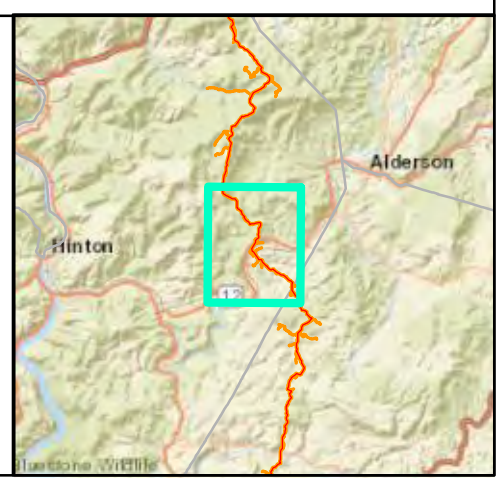
Figure 3
Summers County, West Virginia

January, 2017

Data Sources: ESRI Streaming Data 2014, National Wetlands Inventory, National Hydrography Dataset for West Virginia (2014), Geospatial Gateway.

Legend

- Alignment Centerline
- Study Area
- NWI Wetlands and Codes
- County Boundary



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Page 1

Page 2

Page 3

Greenbrier River Crossing

Mountain Valley Pipeline Project

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Mountain Valley PIPELINE

USGS Project Location Index Map
Greenbrier River Crossing

Figure 4-INDEX
Summers County, West Virginia

January, 2017

Data Sources: ESRI Streaming Data 2014.

Legend

- Alignment Centerline
- Limit of Disturbance
- Index
- County Boundary

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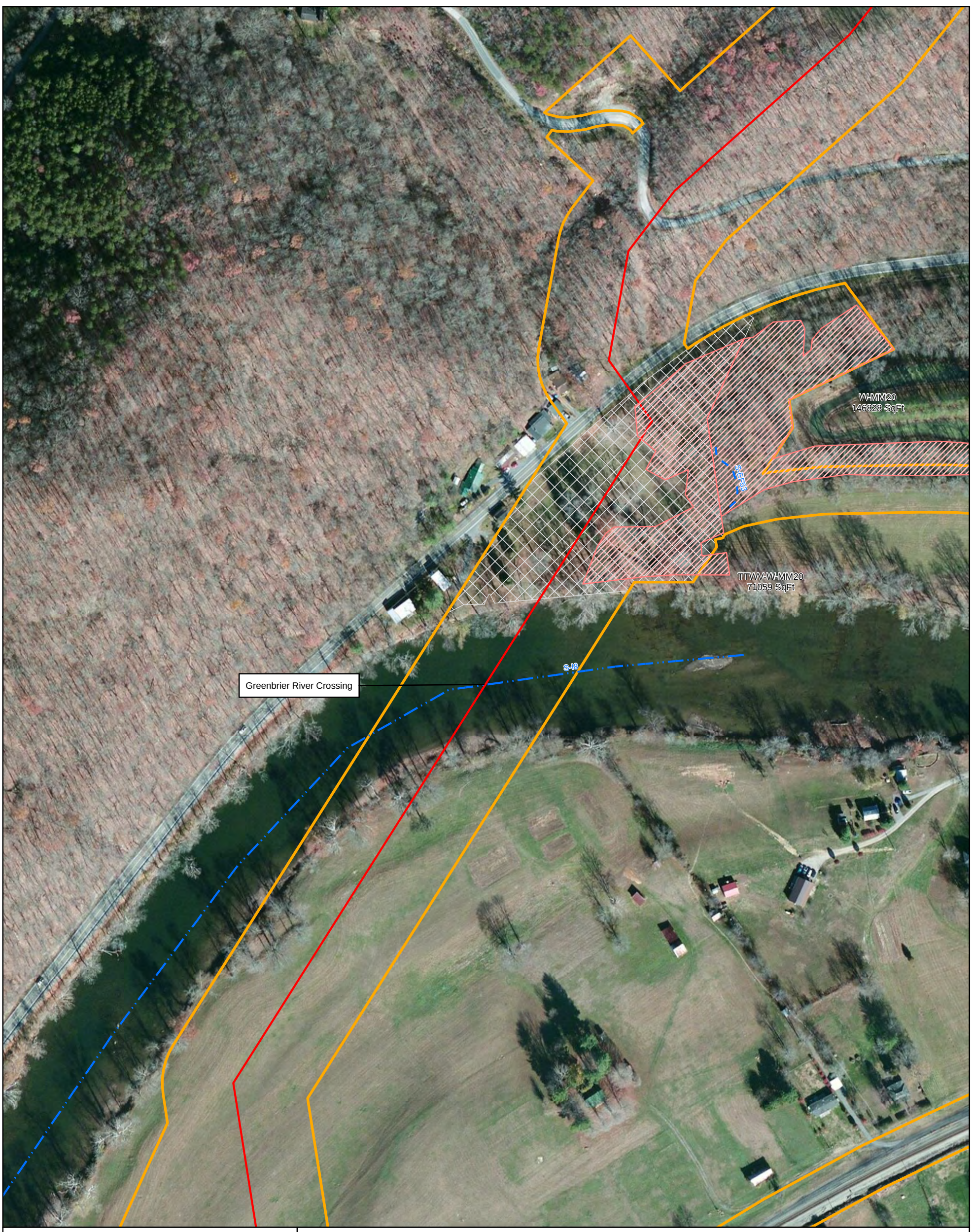

Mountain Valley Pipeline Project

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Mountain Valley PIPELINE

Detail Map
Greenbrier River Crossing

Figure 4-1
Summers County, West Virginia

January, 2017

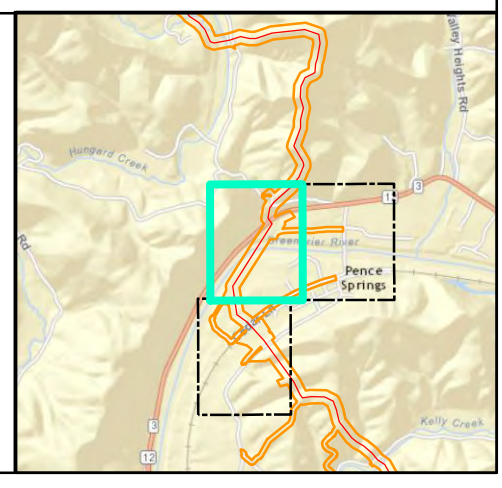
Data Sources: ESRI Streaming Data 2014.
Note: Map insets are at a scale of 1 inch = 60 feet.

Legend

- Alignment Centerline
- Study Area
- Unsurveyed Area

Stream
- Perennial
- Intermittent

Wetland
- PFO
- TTWV Desktop Delineated Feature



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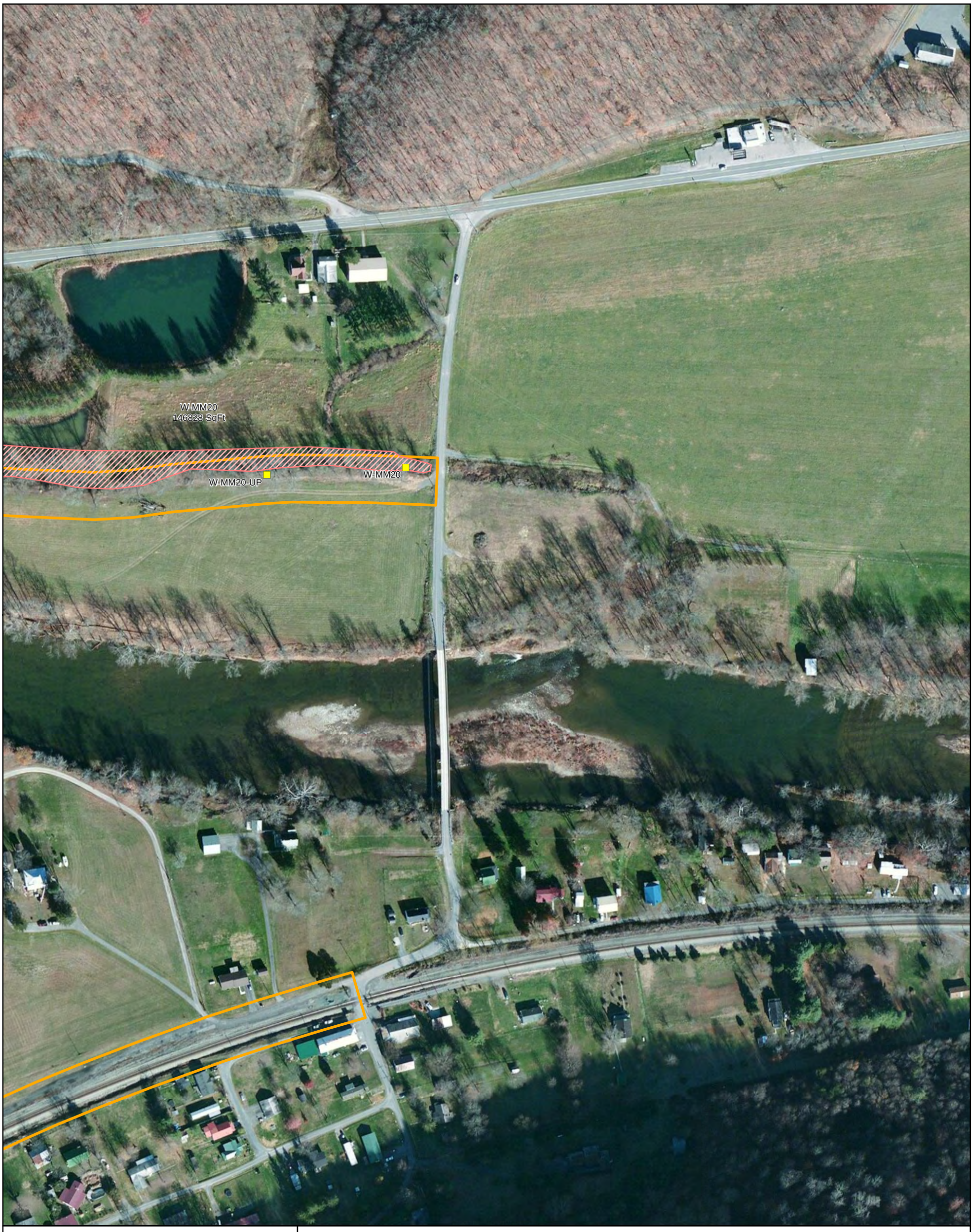


Mountain Valley Pipeline Project

N

1:2,400

0 100 200 300 400 Feet

Mountain Valley PIPELINE

Detail Map
Greenbrier River Crossing

Figure 4-2
Summers County, West Virginia

January, 2017

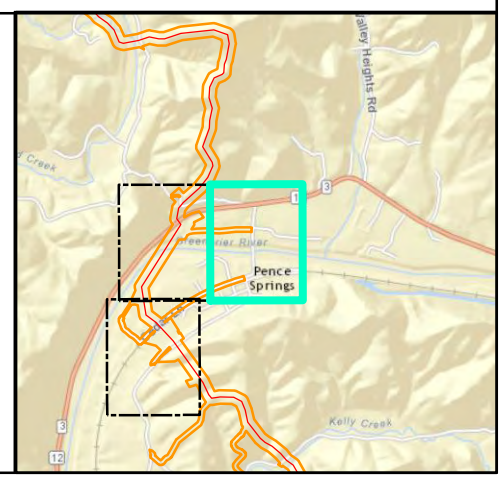
Data Sources: ESRI Streaming Data 2014.
Note: Map insets are at a scale of 1 inch = 60 feet.

Legend

- Study Area
- Sample Location

Wetland

- PFO



Document Path: Z:\EQT_MVP\Mapdocs\Wetlands\MVP_Greenbrier_River_Detail.mxd

S-J9

S-K10

1

2

1

W-K3-UP

W-K3
6134 SqFt

W-K3

S-J9

2

W-K4
8749 SqFt

W-K4

S-J9

W-K4-UP

Mountain Valley Pipeline Project

N

1:2,400

0 100 200 300 400 Feet

Mountain Valley PIPELINE

Detail Map
Greenbrier River Crossing

Figure 4-3
Summers County, West Virginia

January, 2017

Data Sources: ESRI Streaming Data 2014.
Note: Map insets are at a scale of 1 inch = 60 feet.

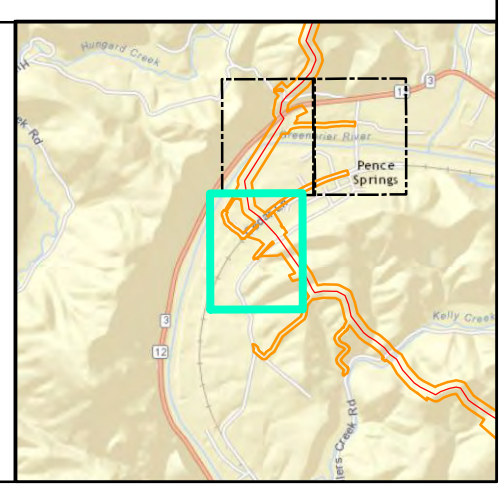
Legend

- Alignment Centerline
- Study Area
- Culvert
- Drainage Feature

Stream
- Perennial
- Intermittent

- Sample Location

Wetland
- PEM



Document Path: Z:\EQT_MVP\Mapdocs\Wetlands\MVP_Greenbrier_River_Detail.mxd

Tables

Table 1.
Identified Wetlands

Wetland ID	Wetland Habitat ID	County	Latitude[1]	Longitude[1]	Cowardin Class[2]	HGM[3]	Water Type[4]	Associated Waterbodies	Size (Acres)[5]	Size (square feet)[5]	Open/Closed Boundary	Dominant Species
W-MM20	W-MM20	Summers	37.681389	-80.725030	PFO	Depressional	RPWWD	S-EF53 (UNT to Greenbrier River)	1.76	76,601	Open	*Acer saccharinum, Acer rubrum, Lindera benzoin, Carex sp.*
W-K3	W-K3	Summers	37.675936	-80.733611	PEM	Riverine	RPWWD	S-I9 (UNT to Greenbrier River)	0.14	6,134	Closed	*Carex lurida, Poa trivialis*
W-K4	W-K4	Summers	37.675799	-80.732369	PEM	Riverine	RPWWD	S-I9 (UNT to Greenbrier River)	0.20	8,749	Closed	*Asclepias incarnata, Impatiens capensis*

Notes:

1 - In decimal degrees. Coordinates show wetland test pit locations

2 - PEM = Palustrine Emergent
- PSS = Palustrine Scrub-Shrub
- PFO = Palustrine Forested

3 - HGM = Hydrogeomorphic

4 - RPWWD = Wetlands directly abutting Relatively Permanent Waters (RPWs) that flow directly or indirectly into Traditional Navigable Waterways (TNWs)
- RPWWN = Wetlands adjacent but not directly abutting RPWs that flow directly or indirectly into TNWs
- NRPWW = Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
- Isolate = Isolated (interstate or intrastate) waters, including isolated wetlands

5 - Size of wetlands with open boundaries may be larger than shown in this table. See Section 3.1 for more information

Table 2.
Identified Streams

Stream ID	NHD Stream Name[1]	County	Latitude[2]	Longitude[2]	Flow Regime	Water Type[3]	Cowardin Class[4]	WV DEP Tier[5]	Top of Bank Width (ft)
S-EF53	UNT to Greenbrier River	Summers	37.681281	-80.729663	Intermittent	RPW	R4SB5	2	8
S-I8	Greenbrier River	Summers	37.677504	-80.734060	Perennial	TNW	R2RB2	3	270
S-I9	UNT to Greenbrier River	Summers	37.675924	-80.733347	Intermittent	RPW	R4SB5	2	7
S-K10	UNT to Greenbrier River	Summers	37.675066	-80.734473	Intermittent	RPW	R4SB5	2	6

Notes:

1 - For identified streams without a NHD (National Hydrography Dataset) name, the identified stream was given the name, “Unidentified Tributary (UNT)”, of the first named receiving waterbody

2 - In decimal degrees

3 - RPW = Relatively Permanent Waters
- NRPW = Non-Relatively Permanent Waters
- TNW = Traditional Navigable Waters

4 - See Cowardin et al., 1979

5 - Tier 1 = A waterbody that is listed as impaired on the state 303(d) list
- Tier 2 = The default assignment for a waterbody not listed as impaired on the state 303(d) list or designated as Tier 3
- Tier 3 = Outstanding national resource waters, including waters in Federal Wilderness Areas, specifically designated federal waters, and high quality waters or naturally reproducing trout streams in state parks, national parks, and national forests

Table 3.
Mapped Soils

Map Unit Symbol	Map Unit Name	Hydric Classification
Cm	Chagrin loam	Hydric
Lo	Lobdell loam	Hydric
ChF	Cateache-Berks channery silt loams, 30 to 70 percent slopes, very stony	-
Ka	Kanawha fine sandy loam	-
MgB	Monongahela silt loam, warm, 3 to 8 percent slopes	-
Ud	Udifluvents and Psamments, frequently flooded	-

APPENDIX A
Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: MVP City/County: Summers Sampling Date: 12/11/2015

Applicant/Owner: MVP State: WV Sampling Point: W-MM20

Investigator(s): A.Stott, A.Grech Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): flloodplain Local relief (concave, convex, none): Concave Slope (%): 0-5%

Subregion (LRR or MLRA): LRRN Lat: 37.681389 Long: -80.725030 Datum: NAD 83

Soil Map Unit Name: Kanawha fine sandy loam (Ka), Lobdell loam (Lo), Udifluvents and Psamments (Ud) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** **Yes** ✔ **No** _____
Hydric Soil Present?	Yes ✔	No _____	
Wetland Hydrology Present?	Yes ✔	No _____	

Remarks:
Cowardin Code: PFO
HGM: Depressional
WT: RPWWD

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ✔ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ✔ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✔	No _____	Depth (inches): _____
Water Table Present?	Yes ✔	No _____	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ✔	No _____	Depth (inches): _____

Wetland Hydrology Present? **Yes** ✔ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-MM20

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	15	✔	FACW
2. Acer rubrum	10	✔	FAC
3. Acer negundo	5		FAC
4.			
5.			
6.			
7.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		
Sapling/Shrub Stratum (Plot size: 15')			
1. Lindera benzoin	30	✔	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		
Herb Stratum (Plot size: 5')			
1. Carex sp.	10	✔	ND
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3* (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✔ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Flooded wetland from 4 culverts crossing road

ND - Not Determined

*Vegetation not identified down to species not included in dominance test.

SOIL

Sampling Point: W-MM20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-20"	7.5yr 4/1	88	5yr 4/6	12	C	M/PL	L	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ **No** ____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: MVP City/County: Summers Sampling Date: 12/11/2015

Applicant/Owner: MVP State: WV Sampling Point: W-MM20 UPL

Investigator(s): A.Stott, A.Grech Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): flloodplain Local relief (concave, convex, none): Convex Slope (%): 0

Subregion (LRR or MLRA): LRRN Lat: 37.681349° Long: -80.726041° Datum: NAD 83

Soil Map Unit Name: Lobdell loam (Lo) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:
Upland

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No ✔	Depth (inches): _____
Water Table Present?	Yes _____	No ✔	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No ✔	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Upland

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-MM20 UPL

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Prunus serotina	10	✔	FACU
2. Ulmus americana	5		FACW
3.			
4.			
5.			
6.			
7.			
	15 = Total Cover		
50% of total cover: 7.5	20% of total cover: 3		
Sapling/Shrub Stratum (Plot size: 15')			
1. Rosa multiflora	20	✔	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		
Herb Stratum (Plot size: 5')			
1. Viola sp.	15	✔	ND
2. Trifolium pratense	15	✔	FACU
3. Poa sp.	10	✔	ND
4. Cirsium sp.	5		ND
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	45 = Total Cover		
50% of total cover: 22.5	20% of total cover: 9		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** ✔

Remarks: (Include photo numbers here or on a separate sheet.)

ND - Not Determined

*Vegetation not identified down to species not included in the dominance test.

SOIL

Sampling Point: W-MM20 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6"	10yr 3/3	100					SiL	
6-20"	10yr 4/4	100					SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** ✔

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: MVP City/County: Summers Sampling Date: 04/15/2015

Applicant/Owner: MVP State: WV Sampling Point: W-K3

Investigator(s): J. Hart, B. Czeck, N. Katsiaficas Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR or MLRA): LRRN Lat: 37.675936 Long: -80.733611 Datum: NAD 83

Soil Map Unit Name: Kanawha fine sandy loam NWI classification: PEM/F01A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** **Yes** ✔ **No** _____
Hydric Soil Present?	Yes ✔	No _____	
Wetland Hydrology Present?	Yes ✔	No _____	

Remarks:
Cowardin Code: PEM
HGM: Riverine
WT: RPWWD
Mapped NWI feature is adjacent to intermittent stream (S-I9) that flows directly to Greenbrier River. Feature shape is different than what is represented on NWI. Wetland plot paired with W-K3 UP.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✔	No _____	Depth (inches): 1
Water Table Present?	Yes ✔	No _____	Depth (inches): 11
Saturation Present? (includes capillary fringe)	Yes ✔	No _____	Depth (inches): 6

Wetland Hydrology Present? **Yes** ✔ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Surface water present in vicinity of plot.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-K3

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		
Herb Stratum (Plot size: 5')			
1. Carex lurida	35	✔	OBL
2. Poa trivialis	20	✔	FACW
3. Verbena hastata	10		FACW
4. Impatiens capensis	10		FACW
5. Barbarea vulgaris	10		FACU
6. Juncus effusus	10		FACW
7.			
8.			
9.			
10.			
11.			
	95 = Total Cover		
50% of total cover: 47.5	20% of total cover: 19		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

✔ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Remaining cover in herb stratum is bare ground.

SOIL Sampling Point: W-K3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/1	100					Loam	
5-17	10YR 4/1	85	10YR 4/6	15	C	PL	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: MVP City/County: Pence Springs/Summer Sampling Date: 04/15/2015

Applicant/Owner: MVP State: WV Sampling Point: W-K3 UP

Investigator(s): J. Hart, B. Czeck, N. Katsiaficas Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Convex Slope (%): 3

Subregion (LRR or MLRA): LRRN Lat: 37.676029 Long: -80.733528 Datum: NAD 83

Soil Map Unit Name: Kanawha fine sandy loam NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:
Upland
Slightly higher terrace above riverine wetland lacks any hydric indicators. Upland plot paired with W-K3.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No ✔	Depth (inches): _____
Water Table Present?	Yes _____	No ✔	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No ✔	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
No hydrology observed

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-K3 UP

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		
Herb Stratum (Plot size: 5')			
1. Andropogon virginicus	25	✔	FACU
2. Poa trivialis	15	✔	FACW
3. Taraxacum officianale	10	✔	FACU
4. Plantago lanceoleta	10	✔	UPL
5. Verbena hastata	10	✔	FACW
6. Trifolium repens	10	✔	FACU
7. Sanguinaria canadensis	5		UPL
8. Viola bicolor	5		FACU
9.			
10.			
11.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

Remaining cover in herb stratum is thatch.

SOIL Sampling Point: W-K3 UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 4/3	100					L	
9-16	7.5YR 5/6	100					CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** ✔

Remarks:

No hydric indicators

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: MVP City/County: Summers Sampling Date: 07/25/2016

Applicant/Owner: MVP State: WV Sampling Point: W-K4

Investigator(s): D Hadersbeck S Therkildson S Pitcher Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%): 0-2

Subregion (LRR or MLRA): LRR N Lat: 37.675799 Long: -80.732369 Datum: NAD 83

Soil Map Unit Name: MgB-Monongahela silt loam, warm, 3 to 8 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil ✔, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No ✔

Are Vegetation _____, Soil ✔, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** **Yes ✔** **No _____**
Hydric Soil Present?	Yes ✔	No _____	
Wetland Hydrology Present?	Yes ✔	No _____	

Remarks: Cowardin Code: PEM HGM: Riverine Water Type: RPWWD

Same upland form as W-K4-UP. Problematic soils present, top ~4" of soil are stained/contaminated from what appears to be creosote from adjacent railroad tracks.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No ✔	Depth (inches): _____
Water Table Present?	Yes _____	No ✔	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No ✔	Depth (inches): _____

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-K4

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		
Herb Stratum (Plot size: 5')			
1. Asclepias incarnata	35	✔	OBL
2. Impatiens capensis	20	✔	FACW
3. Solidago sp.	15		ND
4. Phalaris arundinaceae	10		FACW
5. Vernonia noveboracensis	5		FACW
6. Sium suave	10		OBL
7.			
8.			
9.			
10.			
11.			
	95 = Total Cover		
50% of total cover: 47.5	20% of total cover: 19		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

✔ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: W-K4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10yr 2/1	100					L	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ✔ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Fragmented rock

Depth (inches): 10

Hydric Soil Present? **Yes** ✔ **No** ___

Remarks:

Problematic soils. Soils within ditch and adjacent to railroad smelled strongly of creosote and were visibly contaminated with a black oil sheen present on the soils to a depth of 4 inches where a restrictive layer was hit. Contamination of the soils has clearly altered the color of the soils in the wetland, 10yr 2/1 most accurately represented the black color currently present.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: MVP City/County: Summers Sampling Date: 04/15/2015

Applicant/Owner: MVP State: WV Sampling Point: W-K4 UP

Investigator(s): J. Hart, B. Czeck, N. Katsiaficas Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%): 4

Subregion (LRR or MLRA): LRRN Lat: 37.675764 Long: -80.732421 Datum: NAD 83

Soil Map Unit Name: Monongahela silt loam, warm, 3 to 8 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ✔ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes ✔	No _____	

Remarks:
Upland
Upslope of wetland in area dominated by multiflora rose. Upland plot paired with W-K4
Significant rain previously effecting uplands hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No ✔	Depth (inches): _____
Water Table Present?	Yes ✔	No _____	Depth (inches): 15
Saturation Present? (includes capillary fringe)	Yes ✔	No _____	Depth (inches): 11

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Significant recent precipitation.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-K4 UP

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercas rubra	15	✔	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	15 = Total Cover		
50% of total cover: 7.5	20% of total cover: 3		
Sapling/Shrub Stratum (Plot size: 15')			
1. Rosa multiflora	25	✔	FACU
2. Ligustrum sinense	10	✔	FACU
3. Sambucus nigra	5		FAC
4.			
5.			
6.			
7.			
8.			
9.			
	40 = Total Cover		
50% of total cover: 20	20% of total cover: 8		
Herb Stratum (Plot size: 5')			
1. Allium canadense	15	✔	FACU
2. Phalaris arundinacea	10	✔	FACW
3. Achillea millefolium	10	✔	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	35 = Total Cover		
50% of total cover: 17.5	20% of total cover: 7		
Woody Vine Stratum (Plot size: 15')			
1. Lonicera japonica	35	✔	FAC
2.			
3.			
4.			
5.			
	35 = Total Cover		
50% of total cover: 17.5	20% of total cover: 7		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 29 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

Remaining cover in herb stratum is bare ground.

SOIL

Sampling Point: W-K4 UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	100					Loam	
8-20	7.5YR 6/4	100					Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ **No** ✔

Remarks:

APPENDIX B
Wetland Photographs

Photograph Number: 1 **Feature Name:** W-MM20 **Cowardin Class:** PFO

Direction: N **Date:** 12/11/2015

Photograph Number: 2 **Feature Name:** W-K3 **Cowardin Class:** PEM

Direction: NW **Date:** 04/15/2015

Photograph Number: 3 **Feature Name:** W-K4 **Cowardin Class:** PEM

Direction: N **Date:** 4/15/2015

APPENDIX C
Stream Data Sheets

STREAM ID S-EF53		**STREAM NAME** UNT to Greenbrier River	
CLIENT MVP		**PROJECT NAME** MVP	
LAT 37.681281	**LONG** -80.729663	**DATE** 09/21/2016	**COUNTY** Summers
INVESTIGATORS D Hadersbeck C Wieman J Niergarth			
WATER TYPE TNW ☐ RPW ☑ NRPW ☐		**FLOW REGIME** Perennial ☐ Intermittent ☑ Ephemeral ☐	

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 8.0 ft
Top of Bank Height:
LB 1.0 ft RB 1.0 ft
Water Depth: 0.00 in
Water Width: 0.0 ft
Ordinary High Water Mark (Width): 5.0 ft
Ordinary High Water Mark (Height): 6.0 in
Flow Direction: South

Sinuosity ___ Low ✔ Medium ___ High

Gradient ✔ Flat (0.5/100 ft) ___ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

Stream Erosion
___ None ✔ Moderate ___ Heavy

Artificial, Modified or Channelized
___ Yes ✔ No

Within Roadside Ditch
___ Yes ✔ No

Culvert Present ___ Yes ✔ No
Culvert Material:_____
Culvert Size: _____in

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
✔ Stream bed moist
___ Standing water
___ Flowing water

Velocity
___ Fast ___ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types (Only enter if water present)
Riffle % Run %
Pool %

Turbidity
___ Clear ___ Slightly turbid ___ Turbid
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%) 100

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	
Cobble	64-256 mm (2.5"-10")	
Gravel	2-64 mm (0.1"-2.5")	20
Sand	0.06-2mm (gritty)	20
Silt	0.004-0.06 mm	60
Clay	< 0.004 mm (slick)	

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	20
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
✔ Forest ___ Commercial
___ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ ROW ___ Other:

Floodplain Width
✔ Wide > 30ft ___ Moderate 15-30ft
___ Narrow <15ft

Canopy Cover
___ Open ✔ Partly shaded
___ Shaded

MACROINVERTEBRATES/OTHER WILDLIFE OBSERVED OR OTHER NOTES AND OBSERVATIONS

large channel with moist bed and bank. W-MM20 is adjacent. mapped stream ends at red tract

STREAM ID S-I8	**STREAM NAME** Greenbrier River
LAT 37.677504 **LONG** -80.734060	**DATE** 04/15/2015
CLIENT MVP	**PROJECT NAME** MVP
INVESTIGATORS RS, AH, MB	
FLOW REGIME Perennial ✔ Intermittent ___ Ephemeral ___	**WATER TYPE** TNW ✔ RPW ___ NRPW ___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 270.0 ft
Top of Bank Height:
LB 10.0 ft RB 10.0 ft
Water Depth: 15.00 in
Water Width: 100.0 ft
High Water Mark: 10.0 ft
Flow Direction: West

Stream Erosion
___ None ✔ Moderate ___ Heavy

Artificial, Modified or Channelized
___ Yes ✔ No

Dam Present ___ Yes ✔ No

Sinuosity ✔ Low ___ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ✔ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✔ Flowing water

Velocity
✔ Fast ___ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle % Run 100 %
Pool %

Turbidity
___ Clear ___ Slightly turbid ✔ Turbid
___ Opaque ___ Stained
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		15
Boulder	> 256 mm (10")	25
Cobble	64-256 mm (2.5"-10")	10
Gravel	2-64 mm (0.1"-2.5")	20
Sand	0.06-2mm (gritty)	10
Silt	0.004-0.06 mm	10
Clay	< 0.004 mm (slick)	10

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	20
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
✔ Forest ___ Commercial
___ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___ Partly open ✔ Partly shaded
___ Shaded ___ Open

Indicate the dominant type (Check one)
✔ Trees ___ Shrubs
___ Grasses ___ Herbaceous

Floodplain Width
✔ Wide > 30ft ___ Moderate 15-30ft
___ Narrow <16ft

Wetland Present ___ Yes ✔ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
___ Rooted emergent ___ Rooted submergent ___ Rooted floating ___ Free floating
___ Floating algae ___ Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES	Greenbrier River is currently flooded above bankfull.

STREAM ID S-I9	**STREAM NAME** UNT to Greenbrier River
LAT 37.675924 **LONG** -80.733347	**DATE** 04/15/2015
CLIENT MVP	**PROJECT NAME** MVP
INVESTIGATORS RS, AH, MB	
FLOW REGIME Perennial ___ Intermittent ✔ Ephemeral ___	**WATER TYPE** TNW ___ RPW ✔ NRPW ___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 7.0 ft
Top of Bank Height:
LB 1.5 ft RB 1.5 ft
Water Depth: 10.00 in
Water Width: 2.0 ft
High Water Mark: 3.0 ft
Flow Direction: North

Stream Erosion
✔ None ___ Moderate ___ Heavy

Artificial, Modified or Channelized
___ Yes ✔ No

Dam Present ___ Yes ✔ No

Sinuosity ✔ Low ___ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ___ Moderate (2 ft/100 ft) ✔ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✔ Flowing water

Velocity
___ Fast ✔ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle % Run 100 %
Pool %

Turbidity
___ Clear ✔ Slightly turbid ___ Turbid
___ Opaque ___ Stained
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	
Cobble	64-256 mm (2.5"-10")	
Gravel	2-64 mm (0.1"-2.5")	15
Sand	0.06-2mm (gritty)	15
Silt	0.004-0.06 mm	40
Clay	< 0.004 mm (slick)	30

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	50
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
___ Forest ___ Commercial
✔ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___ Partly open ___ Partly shaded
___ Shaded ✔ Open

Indicate the dominant type (Check one)
___ Trees ___ Shrubs
✔ Grasses ___ Herbaceous

Floodplain Width
___ Wide > 30ft ___ Moderate 15-30ft
✔ Narrow <16ft

Wetland Present ✔ Yes ___ No
Wetland ID W-K3

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
✔ Rooted emergent ___ Rooted submergent ___ Rooted floating ___ Free floating
___ Floating algae ___ Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

Intermittent stream from surface runoff, flows to Greenbrier River.

STREAM ID S-K10	**STREAM NAME** UNT to Greenbrier River
LAT 37.675066 **LONG** -80.734473	**DATE** 04/14/2015
CLIENT MVP	**PROJECT NAME** MVP
INVESTIGATORS J. Hart, B. Czeck, N. Katsiaficas	
FLOW REGIME Perennial ___ Intermittent ✔ Ephemeral ___	**WATER TYPE** TNW ___ RPW ✔ NRPW ___

CHANNEL FEATURES

Estimate Measurements
Top of Bank Width: 6.0 ft
Top of Bank Height:
LB 3.0 ft RB 4.0 ft
Water Depth: 5.00 in
Water Width: 2.5 ft
High Water Mark: 2.5 ft
Flow Direction: NW

Stream Erosion
___ None ✔ Moderate ___ Heavy

Artificial, Modified or Channelized
✔ Yes ___ No

Dam Present ___ Yes ✔ No

Sinuosity ✔ Low ___ Medium ___ High

Gradient
___ Flat (0.5/100 ft) ✔ Moderate (2 ft/100 ft) ___ Severe (10 ft/100 ft)

FLOW CHARACTERISTICS

Water Present
___ No water, stream bed dry
___ Stream bed moist
___ Standing water
✔ Flowing water

Velocity
___ Fast ✔ Moderate
___ Slow

Proportion of Reach Represented by Stream Morphology Types
Riffle 30 % Run 60 %
Pool 10 %

Turbidity
___ Clear ___ Slightly turbid ___ Turbid
___ Opaque ✔ Stained
___ Other_____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	
Cobble	64-256 mm (2.5"-10")	15
Gravel	2-64 mm (0.1"-2.5")	15
Sand	0.06-2mm (gritty)	10
Silt	0.004-0.06 mm	30
Clay	< 0.004 mm (slick)	30

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	20
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

WATERSHED FEATURES

Predominant Surrounding Landuse
___ Forest ___ Commercial
✔ Field/Pasture ___ Industrial
___ Agricultural ___ Residential
___ Other:

Canopy Cover
___ Partly open ✔ Partly shaded
___ Shaded ___ Open

Indicate the dominant type (Check one)
___ Trees ___ Shrubs
✔ Grasses ___ Herbaceous

Floodplain Width
___ Wide > 30ft ___ Moderate 15-30ft
✔ Narrow <16ft

Wetland Present ___ Yes ✔ No
Wetland ID

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
___ Rooted emergent ___ Rooted submergent ___ Rooted floating ___ Free floating
___ Floating algae ___ Attached algae

MACROINVERTEBRATES OR OTHER WILDLIFE OBSERVED/OTHER OBSERVATIONS AND NOTES

Drains from ditch adjacent to access road on the north side of railroad tracks. Sampled during heavy rain and high flows. Water is black in color at time of sampling (coal from trains?). Crosses road and loses structure for short stretch within ATWS.

APPENDIX D
Stream Photographs

Photograph Number: 1 **Feature Name:** S-EF53 **Flow Regime:** Intermittent

Direction: S **Date:** 9/21/2016

Photograph Number: 2 **Feature Name:** S-I8 **Flow Regime:** Perennial

Direction: SSW **Date:** 4/15/2015

Photograph Number: 3 **Feature Name:** S-I9 **Flow Regime:** Intermittent

Direction: SSE **Date:** 4/15/2015

Photograph Number: 4 **Feature Name:** S-K10 **Flow Regime:** Intermittent

Direction: NE **Date:** 04/14/2015

APPENDIX E
Project Field Personnel

Tetra Tech Project Field Personnel

Name	Job Title	Degree	Years of Experience	Summary
Hadersbeck, David	Wildlife Biologist II	B.S. Wildlife Ecology	13+	Extensive experience with avian research, botanical surveys, and wetland delineations ranging across the United States.
Hart, James	Scientist Biologist III	B.S. Environmental Science	10+	Seven years as a biological technician, four years in private consulting, primarily conducting wetland delineations. Trainings include a 40 hour Basic Wetland Delineation Training.
Sparhawk, Ryan	Environmental Scientist	B.S. Environmental Science, M.S. Soil Science	10+	Over ten years of experience as a Soil/Environmental Scientist conducting environmental compliance assessments, groundwater monitoring, soil sampling/mapping, wetland delineations, vegetation identification, avian surveys, biological evaluations, remediation, environmental sampling, and field investigations.
Hatfield, Ashley	Assistant Geologist	B.A. Geology, M.S. Geology	5+	Experience includes groundwater, sediment, and soil sampling in support of environmental projects; community air monitoring, real-time soil screening using an XRF and photoionization detector; data evaluation and report preparation
Katsiaficas, Nathan	Sci. Geologist I	B.A. Geology, M.S. Earth & Environmental Sciences	3	Three years of field experience as a geologist working on sediment-stratigraphy, hillslope and fluvial geomorphology, and soil provenance.
Czeck, Ben	Geologist	B.S. Geology, M.S. Geology	1+	One year in Environmental Site Assessments and one year in wetland delineation and mapping.