

Baseline Assessment - Stream Attributes

Reach S-D13 (Pipeline ROW) Intermittent Spread H Franklin County, Virginia

Data	Included
Photos	✓
SWVM Form	✓
FCI Calculator and HGM Form	✓
RBP Physical Characteristics Form	✓
Water Quality Data	N/A - Low flow
RBP Habitat Form	✓
RBP Benthic Form	✓
Benthic Identification Sheet	N/A - Low flow
Wolman Pebble Count	✓
RiverMorph Data Sheet	✓
USM Form (Virginia Only)	✓
Longitudinal Profile and Cross Sections	✓



Photo Type: DS VIEW
Location, Orientation, Photographer Initials: Downstream view of ROW looking SE, JB



Photo Type: US VIEW
Location, Orientation, Photographer Initials: Upstream view of ROW looking NW, JB



Photo Type: LB CL

Location, Orientation, Photographer Initials: Standing on LB looking at RB along pipe centerline looking SW, AW



Photo Type: RB CL

Location, Orientation, Photographer Initials: Standing on RB looking at LB along pipe centerline looking N, JB



Photo Type: DS COND

Location, Orientation, Photographer Initials: Downstream conditions outside of ROW looking SE, JB

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FCI Calculator for the High-Gradient Headwater Streams in Appalachia

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-Gradient Headwater Streams and Low-Gradient Perennial Streams in Appalachia (Environmental Laboratory U.S. Army Corps of Engineers 2017).

Project Name: Mountain Valley Pipeline

Location: Franklin County

Sampling Date: 8/26/21

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Shrub/Herb Strata

SAR number: S-D13

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.51
Biogeochemical Cycling	0.20
Habitat	0.10

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	1.00	0.10
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.08	0.04
V_{BERO}	Total percent of eroded stream channel bank.	56.00	0.77
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	160.00	1.00
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	27.50	0.34
V_{HERB}	Average percent cover of herbaceous vegetation.	85.00	1.00
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.97	1.00

High-Gradient Headwater Streams in Appalachia Field Data Sheet and Calculator

Team: AW, JB	Latitude/UTM Northing: 37.121513
Project Name: Mountain Valley Pipeline	Longitude/UTM Easting: -80.08568
Location: Franklin County	Sampling Date: 8/26/21
SAR Number: S-D13	Reach Length (ft): 25
Stream Type: Intermittent Stream	
Top Strata: Shrub/Herb Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site Before Project	

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) Not Used, <20%

List the percent cover measurements at each point below:

0									
---	--	--	--	--	--	--	--	--	--

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 1.0

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

1	1								
1	1								
1	1								
1	1								
1	1								

Measure at least 30 points

3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 0.08 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

0.08	0.08								
0.08	0.08								
0.08	0.08								
0.08	0.08								
0.08	0.08								

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 56 %

Left Bank: **4 ft** Right Bank: **10 ft**

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5 V_{LWD} Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated. 0.0

Number of downed woody stems: **0**

6 V_{TDBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. Not Used

List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

Left Side					Right Side				
0					0				

7 V_{SNAG} Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated. 0.0

Left Side: **0** Right Side: **0**

8 V_{SSD} Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated. 160.0

Left Side: **0** Right Side: **40**

9	V _{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	0.00
Group 1 = 1.0		Group 2 (-1.0)	
<input type="checkbox"/>	<i>Acer rubrum</i>	<input type="checkbox"/>	<i>Magnolia tripetala</i>
<input type="checkbox"/>	<i>Acer saccharum</i>	<input type="checkbox"/>	<i>Nyssa sylvatica</i>
<input type="checkbox"/>	<i>Aesculus flava</i>	<input type="checkbox"/>	<i>Oxydendrum arboreum</i>
<input type="checkbox"/>	<i>Asimina triloba</i>	<input type="checkbox"/>	<i>Prunus serotina</i>
<input type="checkbox"/>	<i>Betula alleghaniensis</i>	<input type="checkbox"/>	<i>Quercus alba</i>
<input type="checkbox"/>	<i>Betula lenta</i>	<input type="checkbox"/>	<i>Quercus coccinea</i>
<input type="checkbox"/>	<i>Carya alba</i>	<input type="checkbox"/>	<i>Quercus imbricaria</i>
<input type="checkbox"/>	<i>Carya glabra</i>	<input type="checkbox"/>	<i>Quercus prinus</i>
<input type="checkbox"/>	<i>Carya ovalis</i>	<input type="checkbox"/>	<i>Quercus rubra</i>
<input type="checkbox"/>	<i>Carya ovata</i>	<input type="checkbox"/>	<i>Quercus velutina</i>
<input type="checkbox"/>	<i>Cornus florida</i>	<input type="checkbox"/>	<i>Sassafras albidum</i>
<input type="checkbox"/>	<i>Fagus grandifolia</i>	<input type="checkbox"/>	<i>Tilia americana</i>
<input type="checkbox"/>	<i>Fraxinus americana</i>	<input type="checkbox"/>	<i>Tsuga canadensis</i>
<input checked="" type="checkbox"/>	<i>Liriodendron tulipifera</i>	<input type="checkbox"/>	<i>Ulmus americana</i>
<input type="checkbox"/>	<i>Magnolia acuminata</i>		
1 Species in Group 1		3 Species in Group 2	

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	27.50 %																								
		<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>20</td><td></td><td></td><td></td> <td>40</td><td></td><td></td><td></td> </tr> <tr> <td>20</td><td></td><td></td><td></td> <td>30</td><td></td><td></td><td></td> </tr> </table>	Left Side				Right Side				20				40				20				30				
Left Side				Right Side																							
20				40																							
20				30																							
11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	85 %																								
		<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>80</td><td></td><td></td><td></td> <td>90</td><td></td><td></td><td></td> </tr> <tr> <td>100</td><td></td><td></td><td></td> <td>70</td><td></td><td></td><td></td> </tr> </table>	Left Side				Right Side				80				90				100				70				
Left Side				Right Side																							
80				90																							
100				70																							

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	0.97																																				
		<table border="1"> <thead> <tr> <th>Land Use (Choose From Drop List)</th> <th>Runoff Score</th> <th>% in Catchment</th> <th>Running Percent (not >100)</th> </tr> </thead> <tbody> <tr> <td>Forest and native range (>75% ground cover)</td> <td>1</td> <td>97</td> <td>97</td> </tr> <tr> <td>Impervious areas (parking lots, roofs, driveways, etc)</td> <td>0</td> <td>3</td> <td>100</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover)	1	97	97	Impervious areas (parking lots, roofs, driveways, etc)	0	3	100																									
Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)																																				
Forest and native range (>75% ground cover)	1	97	97																																				
Impervious areas (parking lots, roofs, driveways, etc)	0	3	100																																				

S-D13			Notes:
Variable	Value	VSI	Land Cover Analysis was completed using the 2019 National Land Cover Database (NLCD), from Landsat satellite imagery and other supplementary datasets. Watershed boundaries are based off of field delineated stream impacts. *Percentages in catchment values have been rounded to the nearest full number.
V _{CCANOPY}	Not Used, <20%	Not Used	
V _{EMBED}	1.0	0.10	
V _{SUBSTRATE}	0.08 in	0.04	
V _{BERO}	56 %	0.77	
V _{LWD}	0.0	0.00	
V _{TDBH}	Not Used	Not Used	
V _{SNAG}	0.0	0.10	
V _{SSD}	160.0	1.00	
V _{SRICH}	0.00	0.00	
V _{DETRITUS}	27.5 %	0.34	
V _{HERB}	85 %	1.00	
V _{WLUSE}	0.97	1.00	

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME S-D13	LOCATION Franklin County	
STATION # _____ RIVERMILE _____	STREAM CLASS Intermittent	
LAT 37.121513 LONG -80.08568	RIVER BASIN Upper Roanoke	
STORET # _____	AGENCY VADEQ	
INVESTIGATORS AW, JB		
FORM COMPLETED BY AW, JB	DATE 8/26/21 TIME 10:00am	REASON FOR SURVEY Baseline Assessment

WEATHER CONDITIONS	<p>Now</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input checked="" type="checkbox"/> clear/sunny </div> <div style="width: 45%;"> <p>Past 24 hours</p> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input checked="" type="checkbox"/> clear/sunny </div> </div>	<p>Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>Air Temperature <u>27.8</u> °C</p> <p>Other _____</p>
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SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p>The map shows a stream channel labeled 'S-D13' flowing from top to bottom. On the left bank, there is an 'ACCESS BRIDGE' and a 'DIRT ROAD'. The stream is bordered by 'DENSE RIPARIAN VEG'. A note says '-VEG TOO DENSE - NO ACCESS'. Below the stream, there is a 'FENCE/SILT FENCE' and 'Herbaceous veg'. The area below the fence is labeled 'RECENTLY STABILIZED AREA'. Arrows indicate flow direction: 'COMING IN' at the top and 'GOING AWAY' at the bottom. A note on the left says 'Stream goes underground'. The stream is labeled 'S-D12' near the bottom. The map is bounded by 'LOT' lines on the left and right.</p>
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STREAM CHARACTERIZATION	<p>Stream Subsystem</p> <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	<p>Stream Type</p> <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater
	<p>Stream Origin</p> <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<p>Catchment Area <u>0.03</u> km²</p>

Notes: Low flow

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input checked="" type="checkbox"/> Other <u>Utility line</u> <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous Dominant species present <u>Erechtites hieracifolius, Rosa multiflora, Rubus sp.</u>	
INSTREAM FEATURES	Estimated Reach Length <u>7.6</u> m Estimated Stream Width <u>0.2</u> m Sampling Reach Area <u>1.52</u> m ² Area in km² (m²x1000) _____ km ² Estimated Stream Depth <u>0.1</u> m Surface Velocity (at thalweg) <u>0.1</u> m/sec	Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>0.1</u> m Proportion of Reach Represented by Stream Morphology Types Riffle <u>0</u> % Run <u>100</u> % Pool <u>0</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
LARGE WOODY DEBRIS	LWD <u>0</u> m ² Density of LWD <u>N/A</u> m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae Dominant species present <u>N/A</u> Portion of the reach with aquatic vegetation <u>0</u> %	
WATER QUALITY (DS, US)	Temperature <u>N/A</u> °C Specific Conductance <u>N/A</u> Dissolved Oxygen <u>N/A</u> pH <u>N/A</u> Turbidity <u>N/A</u> WQ Instrument Used <u>N/A</u>	Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	0
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	0	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	0			
Sand	0.06-2mm (gritty)	2	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	0			
Clay	< 0.004 mm (slick)	98			

Notes: Water quality measurements were not collected due to low flow.

HABITAT ASSESSMENT FIELD DATA SHEET - HG - USE ON ALL STREAMS (FRONT)

STREAM NAME S-D13		LOCATION Franklin County	
STATION # _____ RIVERMILE _____		STREAM CLASS Intermittent	
LAT 37.121513 LONG -80.08568		RIVER BASIN Upper Roanoke	
STORET # _____		AGENCY VADEQ	
INVESTIGATORS AW, JB			
FORM COMPLETED BY AW, JB		DATE 8/26/21 TIME 10:00am AM PM	REASON FOR SURVEY Baseline Assessment

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 3	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE 3	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	SCORE 2	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

Notes: Low flow

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

	Habitat Parameter	Condition Category																			
		Optimal					Suboptimal					Marginal					Poor				
Parameters to be evaluated broader than sampling reach	6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern. SCORE <u>19</u>	20 19 18 17 16					15 14 13 12 11					10 9 8 7 6					5 4 3 2 1 0				
	7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important. SCORE <u>3</u>	20 19 18 17 16					15 14 13 12 11					10 9 8 7 6					5 4 3 2 1 0				
	8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream. SCORE <u>6</u> SCORE <u>3</u>	Left Bank 10 9					8 7 6					5 4 3					2 1 0				
	9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE <u>5</u> SCORE <u>5</u>	Left Bank 10 9					8 7 6					5 4 3					2 1 0				
	10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone. SCORE <u>9</u> SCORE <u>4</u>	Left Bank 10 9					8 7 6					5 4 3					2 1 0				

Total Score 95

Notes: Low flow

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME S-D13	LOCATION Franklin County	
STATION # _____ RIVERMILE _____	STREAM CLASS Intermittent	
LAT <u>37.121513</u> LONG <u>-80.08568</u>	RIVER BASIN Upper Roanoke	
STORET # _____	AGENCY VADEQ	
INVESTIGATORS AW, JB	LOT NUMBER _____	
FORM COMPLETED BY AW, JB	DATE <u>8/26/21</u> TIME <u>10:00am</u>	REASON FOR SURVEY Baseline Assessment

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____% <input type="checkbox"/> Snags _____% <input type="checkbox"/> Vegetated Banks _____% <input type="checkbox"/> Sand _____% <input type="checkbox"/> Submerged Macrophytes _____% <input type="checkbox"/> Other (_____) _____%
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	Benthic sample not collected due to lack of riffle habitat and low flow.

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

WOLMAN PEBBLE COUNT FORM

County: Franklin County Stream ID: S-D13
 Stream Name: UNT to North Fork Blackwater River
 HUC Code: 03010101 Basin: Upper Roanoke
 Survey Date: 8/26/2021
 Surveyors: AW, JB
 Type: Representative

PEBBLE COUNT								
Inches	PARTICLE	Millimeters		Particle Count	Total #	Item %	% Cum	
	Silt/Clay	< .062	S/C	▲ ▼	84	84.00	84.00	
	Very Fine	.062-.125	S A N D	▲ ▼	0	0.00	84.00	
	Fine	.125-.25		▲ ▼	3	3.00	87.00	
	Medium	.25-.5		▲ ▼	0	0.00	87.00	
	Coarse	.50-1.0		▲ ▼	8	8.00	95.00	
.04-.08	Very Coarse	1.0-2		▲ ▼	4	4.00	99.00	
.08 -.16	Very Fine	2 -4		G R A V E L	▲ ▼	0	0.00	99.00
.16 - .22	Fine	4 -5.7			▲ ▼	0	0.00	99.00
.22 - .31	Fine	5.7 - 8	▲ ▼		1	1.00	100.00	
.31 - .44	Medium	8 -11.3	▲ ▼		0	0.00	100.00	
.44 - .63	Medium	11.3 - 16	▲ ▼		0	0.00	100.00	
.63 - .89	Coarse	16 -22.6	▲ ▼		0	0.00	100.00	
.89 - 1.26	Coarse	22.6 - 32	▲ ▼		0	0.00	100.00	
1.26 - 1.77	Vry Coarse	32 - 45	▲ ▼		0	0.00	100.00	
1.77 -2.5	Vry Coarse	45 - 64	▲ ▼		0	0.00	100.00	
2.5 - 3.5	Small	64 - 90	C O B B L E		▲ ▼	0	0.00	100.00
3.5 - 5.0	Small	90 - 128		▲ ▼	0	0.00	100.00	
5.0 - 7.1	Large	128 - 180		▲ ▼	0	0.00	100.00	
7.1 - 10.1	Large	180 - 256		▲ ▼	0	0.00	100.00	
10.1 - 14.3	Small	256 - 362	B O U L D E R	▲ ▼	0	0.00	100.00	
14.3 - 20	Small	362 - 512		▲ ▼	0	0.00	100.00	
20 - 40	Medium	512 - 1024		▲ ▼	0	0.00	100.00	
40 - 80	Large	1024 -2048		▲ ▼	0	0.00	100.00	
80 - 160	Vry Large	2048 -4096		▲ ▼	0	0.00	100.00	
	Bedrock		BDRK	▲ ▼	0	0.00	100.00	
				Totals	100			
	Total Tally:							

RIVERMORPH PARTICLE SUMMARY

River Name: UNT to North Fork Blackwater River
Reach Name: S-D13
Sample Name: Representative
Survey Date: 08/26/2021

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	84	84.00	84.00
0.062 - 0.125	0	0.00	84.00
0.125 - 0.25	3	3.00	87.00
0.25 - 0.50	0	0.00	87.00
0.50 - 1.0	8	8.00	95.00
1.0 - 2.0	4	4.00	99.00
2.0 - 4.0	0	0.00	99.00
4.0 - 5.7	0	0.00	99.00
5.7 - 8.0	1	1.00	100.00
8.0 - 11.3	0	0.00	100.00
11.3 - 16.0	0	0.00	100.00
16.0 - 22.6	0	0.00	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
Bedrock	0	0.00	100.00

D16 (mm)	0.01
D35 (mm)	0.03
D50 (mm)	0.04
D84 (mm)	0.06
D95 (mm)	1
D100 (mm)	8
Silt/Clay (%)	84
Sand (%)	15
Gravel (%)	1
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100.


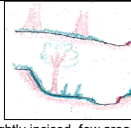
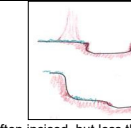
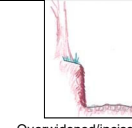
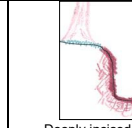
Stream Assessment Form (Form 1)

Unified Stream Methodology for use in Virginia

For use in wadeable channels classified as intermittent or perennial

Project #	Project Name (Applicant)	Locality	Cowardin Class.	HUC	Date	SAR #	Impact Length	Impact Factor	
22865.06	Mountain Valley Pipeline (Mountain Valley Pipeline, LLC)	Franklin County	R4	03010101	8/26/21	S-D13	117	1	
Name(s) of Evaluator(s)		Stream Name and Information					SAR Length		
AW, JB		UNT to North Fork Blackwater River					117		

1. Channel Condition: Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

Conditional Category					
	Optimal	Suboptimal	Marginal	Poor	Severe
Channel Condition					
	Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%). AND/OR Stable point bars / bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid-channel bars and transverse bars few. Transient sediment deposition covers less than 10% of bottom.	Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed floodplains along portions of the reach. Transient sediment covers 10-40% of the stream bottom.	Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may be vertical or undercut. AND/OR 40-60% Sediment may be temporary / transient, contribute to instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	Overwidened/incised. Vertically / laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-80% of banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. AND/OR 60-80% of the stream is covered by sediment. Sediment is temporary / transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on > 40% of the banks and stable sediment deposition is absent.	Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average rooting depth. Majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. Greater than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.
Scores	3	2.4	2	1.6	1
NOTES>>					

CI

2.00

2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

Conditional Category								NOTES>>		
	Optimal	Suboptimal	Marginal	Poor						
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover. Wetlands located within the riparian areas.	High Suboptimal: Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory. Low Suboptimal: Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	High Marginal: Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover. Low Marginal: Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh > 3 inches) present, with <30% tree canopy cover with maintained understory.	High Poor: Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated area, recently seeded and stabilized, or other comparable condition. Low Poor: Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.						
Scores	1.5	High 1.2	Low 1.1	High 0.85	Low 0.75	High 0.6	Low 0.5			
1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors. 2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below. 3. Enter the % Riparian Area and Score for each riparian category in the blocks below.								Ensure the sums of % Riparian Blocks equal 100		
Right Bank	% Riparian Area >	80%	20%					100%		
	Score >	0.5	0.85							
Left Bank	% Riparian Area >	65%	15%	10%	10%			100%		
	Score >	0.75	1.5	0.85	0.5					
								CI = (Sum % RA * Scores*0.01)/2		
								Rt Bank CI >	0.57	CI
								Lt Bank CI >	0.85	0.71

3. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embeddedness; shade; undercut banks; root mats; SAV; riffle/pool complexes, stable features.

Conditional Category						NOTES>>	
	Optimal	Suboptimal	Marginal	Poor			
Instream Habitat/ Available Cover	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.			
Scores	1.5	1.2	0.9	0.5		Stream Gradient High	CI 0.50

Stream Impact Assessment Form Page 2

Project #	Project Name (Applicant)	Locality	Cowardin Class.	HUC	Date	SAR #	Impact Length	Impact Factor
22865.06	Mountain Valley Pipeline (Mountain Valley Pipeline, LLC)	Franklin County	R4	03010101	8/26/21	S-D13	117	1

4. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock

Channel Alteration	Conditional Category						NOTES>>
	Negligible	Minor	Moderate	Severe			
Channelization, dredging, alteration, or hardening absent. Stream has an unaltered pattern or has naturalized.	Less than 20% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	20-40% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	40 - 60% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	60 - 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines AND/OR 80% of banks shored with gabion, riprap, or cement.		
Scores	1.5	1.3	1.1	0.9	0.7	0.5	CI

1.50

REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH

NOTE: The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.

THE REACH CONDITION INDEX (RCI) >>	0.94
RCI= (Sum of all CI's)/5, except if stream is ephemeral RCI = (Riparian CI/2)	
COMPENSATION REQUIREMENT (CR) >>	110
CR = RCI X L _i X IF	

INSERT PHOTOS:

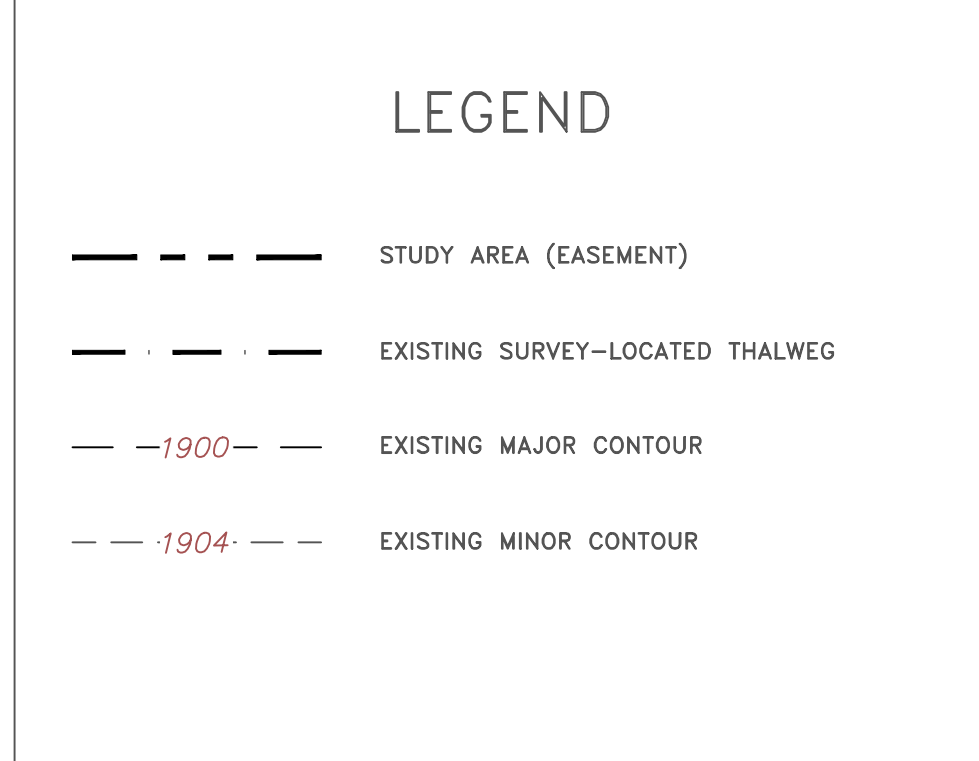
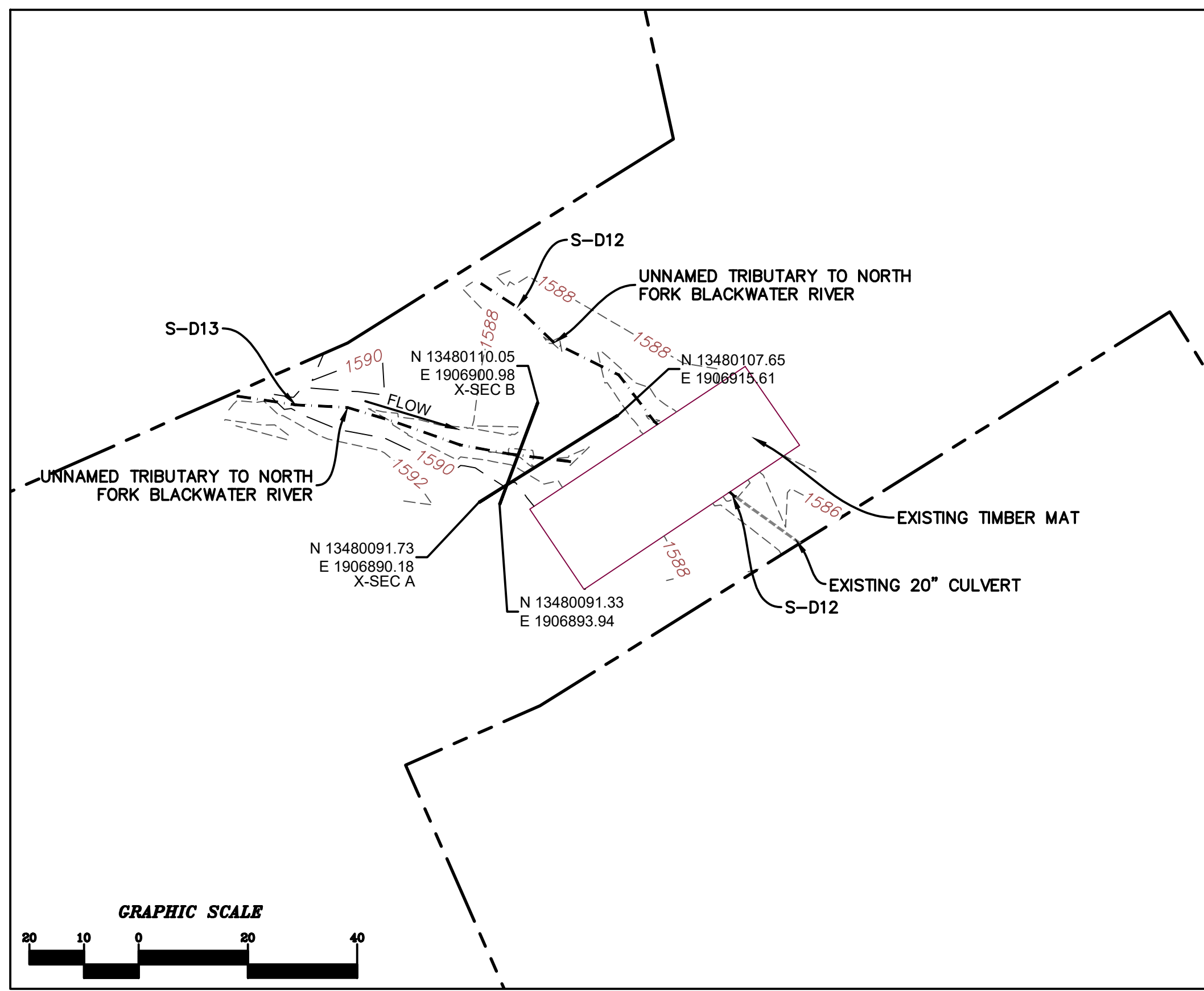
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Reach S-D13 looking downstream within ROW. Assessment is limited to areas within the temporary ROW.

DESCRIBE PROPOSED IMPACT:

PROVIDED UNDER SEPARATE COVER

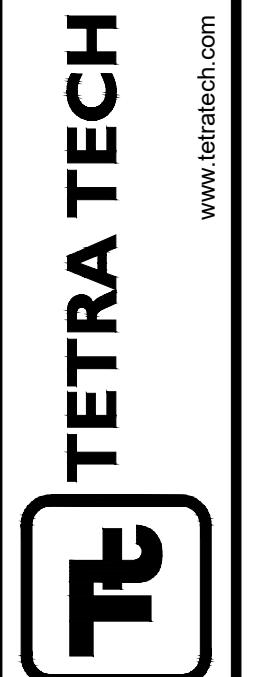


- SURVEY NOTES:
- THIS MAP HAS BEEN ORIENTED TO NAD 1983 UTM ZONE 17N, AND VERTICALLY TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), USING REAL TIME DGPS. FIELD LOCATIONS WERE COMPLETED ON AUGUST 26, 2021.
 - EASEMENT LINES SHOWN ON PLAN VIEW WERE PROVIDED BY MOUNTAIN VALLEY PIPELINE.
 - SURVEY POINTS FOR CROSS SECTIONS AND THALWEG PROFILES COLLECTED IN 2021 HAVE BEEN USED IN COMBINATION WITH SURVEY POINTS COLLECTED PREVIOUSLY IN 2020 IN ORDER TO GENERATE THE PRE-CROSSING SURFACE SHOWN IN PLAN. DUE TO NATURAL EROSIONAL STREAM PROCESSES THAT CAN OCCUR OVER TIME, MINOR ADJUSTMENTS TO THE PROFILE ALIGNMENTS MAY HAVE BEEN REQUIRED IN ORDER TO GENERATE A CLEAN PRE-CROSSING SURFACE.
 - ALL SECTION VIEWS SHOWN LEFT TO RIGHT FACING DOWNSTREAM.
 - CROSS SECTION A GENERATED USING SURFACE (NOT SURVEYED.) ALL OTHER WERE GENERATED FROM SURVEY DATA.

No.	Date	Eng.	Revision

CAD File No. JZ
 Drawn GH
 Checked DW
 Approved NOTED
 Scale: SEPT. 2021
 Date: 112IC07157
 Project No.

TETRA TECH, INC.
 661 ANDERSEN DRIVE FOSTER PLAZA 7
 PITTSBURGH, PA 15220
 TEL: (412) 921-7000 FAX: (412) 921-4040
 E-Mail Address: WWW.TETRA TECH.COM



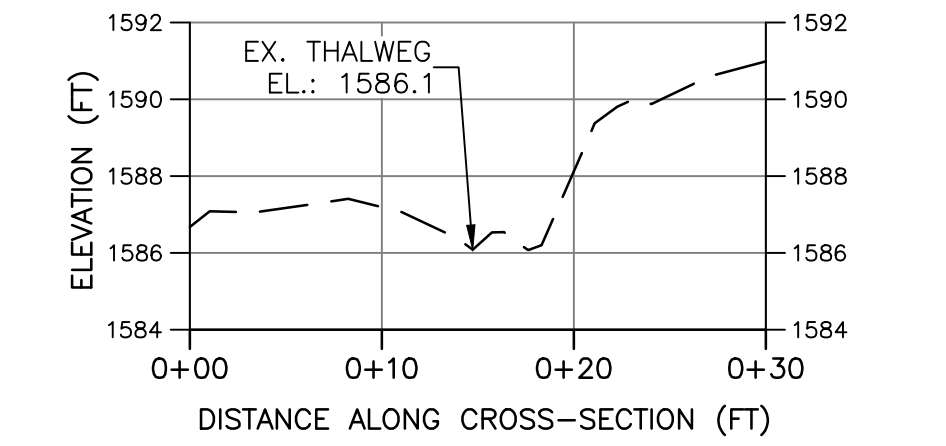
Client: MOUNTAIN VALLEY PIPELINE, LLC
 2200 ENERGY DRIVE, 2ND FLOOR
 CANONSBURG, PA 15317

Title: PROFILE AND CROSS-SECTIONS
 BASELINE SURVEY
 CROSSING S-D13 - UNNAMED TRIB.
 N. FORK BLACKWATER RIVER (MP 213.72)
 FRANKLIN COUNTY, VA



S-D13

S-D13 BASELINE CROSS-SECTION A
 PIPE CL



PRE-CROSSING PHOTOS

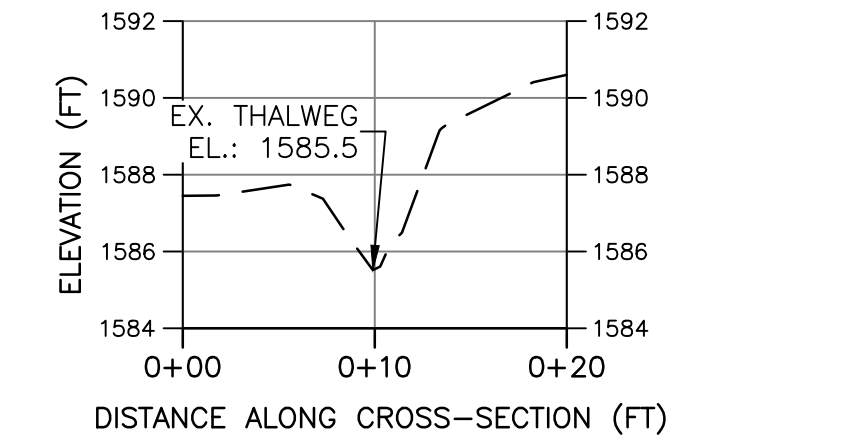


PHOTO TAKEN AUGUST 26, 2021 LOOKING DOWNSTREAM FROM UPSTREAM IMPACT LIMITS

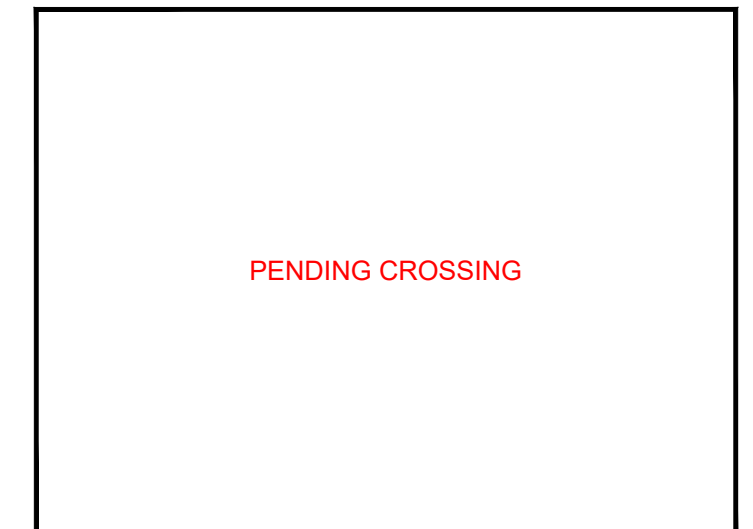


PHOTO TAKEN AUGUST 26, 2021 LOOKING UPSTREAM FROM DOWNSTREAM IMPACT LIMITS

S-D13 BASELINE CROSS-SECTION B
 POOL

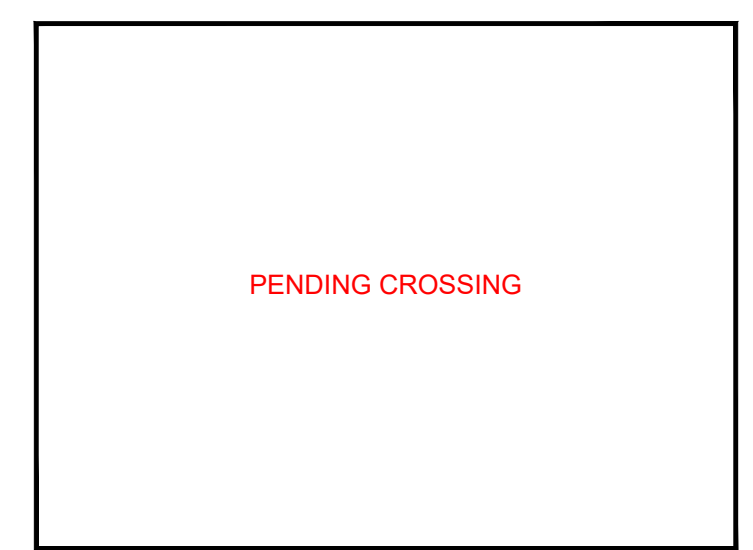


POST-CROSSING PHOTOS



PENDING CROSSING

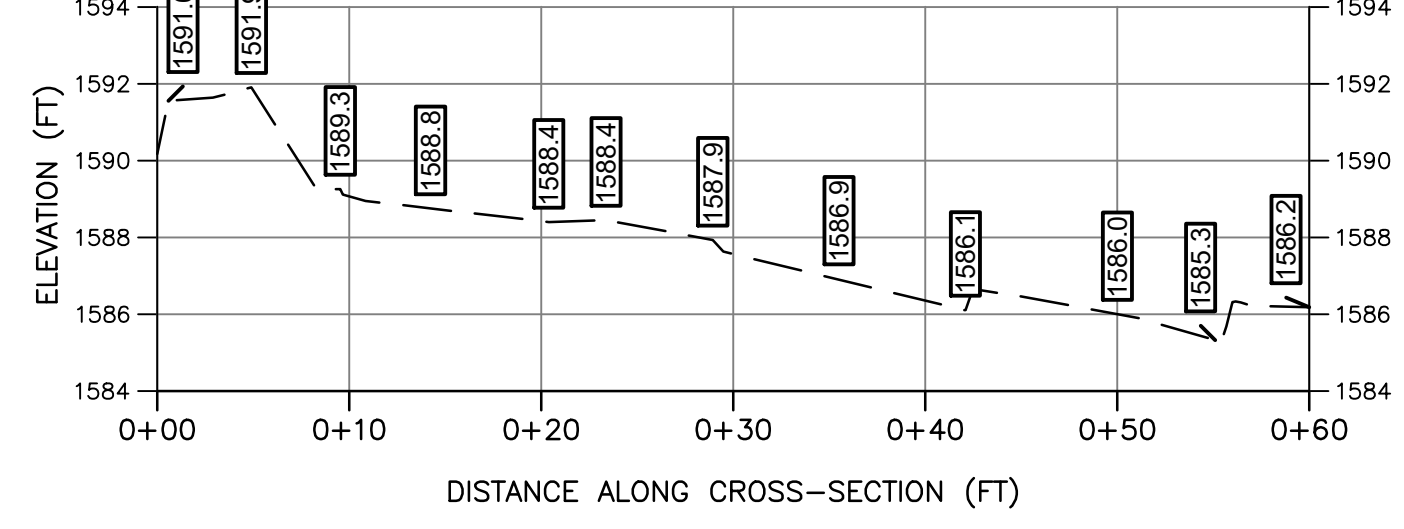
PHOTO TAKEN LOOKING DOWNSTREAM FROM UPSTREAM IMPACT LIMITS



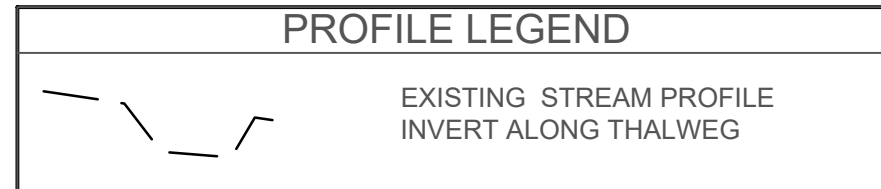
PENDING CROSSING

PHOTO TAKEN LOOKING UPSTREAM FROM DOWNSTREAM IMPACT LIMITS

S-D13 BASELINE THALWEG PROFILE

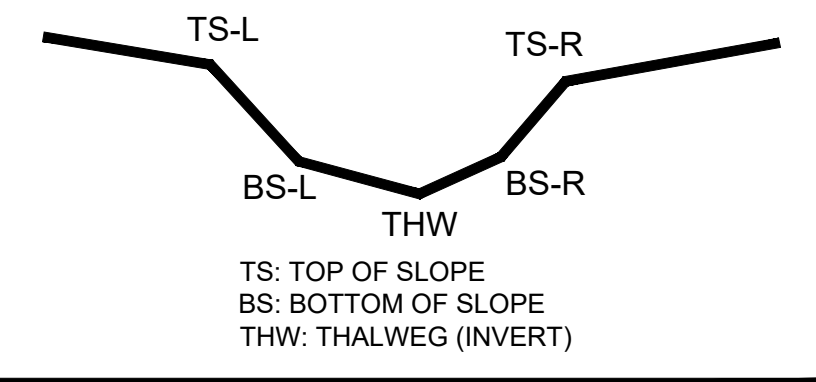


PROFILE LEGEND



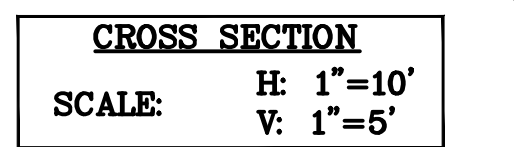
PROFILE SCALE: H: 1"=10'
 V: 1"=5'

TYPICAL 5-POINT CROSS-SECTION (FACING DOWNSTREAM)



TS: TOP OF SLOPE
 BS: BOTTOM OF SLOPE
 THW: THALWEG (INVERT)

CROSS SECTION LEGEND



CROSS SECTION SCALE: H: 1"=10'
 V: 1"=5'

NOTE: ALL SECTIONS VIEWS SHOWN LEFT TO RIGHT FACING DOWNSTREAM.

CL STAKEOUT POINTS: S-D13 CROSS SECTION A (PIPE CL)					
PT. LOC.	PRE-CROSSING			POST-CROSSING	
	NORTHING	EASTING	ELEV.	VERT. DIFF.	HORZ. DIFF.
TS-L	13480100.5140'	1906906.5570'	1586.441'		
BS-L	13480099.7270'	1906906.4920'	1585.810'		
THW	13480099.6902'	1906902.8975'	1586.301'		
BS-R	13480098.4100'	1906899.7800'	1585.935'		
TS-R	13480096.0900'	1906898.2370'	1589.454'		

File: \\C:\Users\jwheeler\OneDrive - Tetra Tech\Documents\Projects\VA\VA-2021-08-15 - S-D13 & S-D13\Drawings\Profile.dwg
 Plot Date: 08/27/2021 1:12:00 PM
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 Plot Scale: 1"=10'
 Plot Size: 24" x 36"