

Baseline Assessment – Stream Attributes

Reach S-I26 (Pipeline ROW) Intermittent Spread E Greenbrier County, West Virginia

Data	Included
Photos	✓
SWVM Form	✓
FCI Calculator and HGM Form	✓
RBP Physical Characteristics Form	✓
Water Quality Data	N/A – No flow
RBP Habitat Form*	✓
RBP Benthic Form	✓
Benthic Identification Sheet	N/A – No flow
Wolman Pebble Count	✓
Reference Reach Software Pebble Count Data	✓
Longitudinal Profile and Cross Sections	✓

*Modified RBP – No water



Photo Type: US Reach, US View

Location, Orientation, Photographer Initials: Upstream Reach, Upstream View, AAK/SM



Photo Type: US Reach, DS View

Location, Orientation, Photographer Initials: Upstream Reach, Downstream View, AAK/SM

38.019129° N, -80.75522° W



Photo Type: Mid-Reach, US View

Location, Orientation, Photographer Initials: Mid-Reach, Upstream View, AAK/SM

38.019129° N, -80.75522° W



Photo Type: Mid-Reach, DS View

Location, Orientation, Photographer Initials: Mid-Reach, Downstream View, AAK/SM

38.019129° N, -80.75522° W



Photo Type: DS Reach, US View

Location, Orientation, Photographer Initials: Downstream Reach, Upstream View, AAK/SM

38.019129° N, -80.75522° W



Photo Type: DS Reach, DS View

Location, Orientation, Photographer Initials: Downstream Reach, Downstream View, AAK/SM

"Q:\Charleston\2021 Projects\21-0244- MVP- STREAM AND WETLAND CONDITIONS ASSESSMENT AND SURVEY PLAN\002 - Pre-Crossing Monitoring\Spread E\S-I26"

USCE FILE NO./ Project Name: (v2.1, Sept 2015)				Mountain Valley Pipeline				IMPACT COORDINATES: (in Decimal Degrees)				Lat.	38.019129				Lon.	-80.75522				WEATHER:				Clear/Sunny 65 °F				DATE:				9/7/2021																									
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)												S-I26 UNT to Meadow Creek												MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)												Comments:																							
STREAM IMPACT LENGTH:				78				FORM OF MITIGATION:				RESTORATION (Levels I-III)				MIT COORDINATES: (in Decimal Degrees)				Lat.					Lon.					PRECIPITATION PAST 48 HRS:								Mitigation Length:																					
Column No. 1- Impact Existing Condition (Debit)												Column No. 2- Mitigation Existing Condition - Baseline (Credit)												Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)												Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)												Column No. 5- Mitigation Projected at Maturity (Credit)											
Stream Classification:				Intermittent																	0					0								0																									
Percent Stream Channel Slope				9.6																	0					0								0																									
HGM Score (attach data forms):												HGM Score (attach data forms):												HGM Score (attach data forms):												HGM Score (attach data forms):												HGM Score (attach data forms):											
Average												Average												Average												Average												Average											
Hydrology				0.49				0.28666667													0					0					0					0																							
Biogeochemical Cycling				0.28																	0					0					0					0																							
Habitat				0.09																																																							
PART I - Physical, Chemical and Biological Indicators												PART I - Physical, Chemical and Biological Indicators												PART I - Physical, Chemical and Biological Indicators												PART I - Physical, Chemical and Biological Indicators												PART I - Physical, Chemical and Biological Indicators											
				Points Scale		Range		Site Score						Points Scale		Range		Site Score						Points Scale		Range		Site Score						Points Scale		Range		Site Score																					
PHYSICAL INDICATOR (Applies to all streams classifications)												PHYSICAL INDICATOR (Applies to all streams classifications)												PHYSICAL INDICATOR (Applies to all streams classifications)												PHYSICAL INDICATOR (Applies to all streams classifications)												PHYSICAL INDICATOR (Applies to all streams classifications)											
USEPA RBP (High Gradient Data Sheet)												USEPA RBP (Low Gradient Data Sheet)												USEPA RBP (High Gradient Data Sheet)												USEPA RBP (High Gradient Data Sheet)												USEPA RBP (High Gradient Data Sheet)											
1. Epifaunal Substrate/Available Cover				0-20				9				1. Epifaunal Substrate/Available Cover				0-20				0				1. Epifaunal Substrate/Available Cover				0-20				0				1. Epifaunal Substrate/Available Cover				0-20				0															
2. Embeddedness				0-20				16				2. Embeddedness				0-20				0				2. Embeddedness				0-20				0				2. Embeddedness				0-20				0															
3. Velocity/ Depth Regime				0-20				16				3. Velocity/ Depth Regime				0-20				0				3. Velocity/ Depth Regime				0-20				0				3. Velocity/ Depth Regime				0-20				0															
4. Sediment Deposition				0-20				18				4. Sediment Deposition				0-20				0				4. Sediment Deposition				0-20				0				4. Sediment Deposition				0-20				0															
5. Channel Flow Status				0-20				18				5. Channel Flow Status				0-20				0				5. Channel Flow Status				0-20				0				5. Channel Flow Status				0-20				0															
6. Channel Alteration				0-20				2				6. Channel Alteration				0-20				0				6. Channel Alteration				0-20				0				6. Channel Alteration				0-20				0															
7. Frequency of Riffles (or bends)				0-20				18				7. Frequency of Riffles (or bends)				0-20				0				7. Frequency of Riffles (or bends)				0-20				0				7. Frequency of Riffles (or bends)				0-20				0															
8. Bank Stability (LB & RB)				0-20				18				8. Bank Stability (LB & RB)				0-20				0				8. Bank Stability (LB & RB)				0-20				0				8. Bank Stability (LB & RB)				0-20				0															
9. Vegetative Protection (LB & RB)				0-20				2				9. Vegetative Protection (LB & RB)				0-20				0				9. Vegetative Protection (LB & RB)				0-20				0				9. Vegetative Protection (LB & RB)				0-20				0															
10. Riparian Vegetative Zone Width (LB & RB)				0-20				79				10. Riparian Vegetative Zone Width (LB & RB)				0-20				0				10. Riparian Vegetative Zone Width (LB & RB)				0-20				0				10. Riparian Vegetative Zone Width (LB & RB)				0-20				0															
Total RBP Score				Marginal				0.395				Total RBP Score				Poor				0				Total RBP Score				Poor				0				Total RBP Score				Poor				0															
Sub-Total								0				Sub-Total								0				Sub-Total								0				Sub-Total								0															
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)												CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)												CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)												CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)												CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)											
WVDEP Water Quality Indicators (General)												WVDEP Water Quality Indicators (General)												WVDEP Water Quality Indicators (General)												WVDEP Water Quality Indicators (General)												WVDEP Water Quality Indicators (General)											

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: MVP Preliminary Assessment

Location: UNT to Meadow Creek

Sampling Date: 9-7-2021

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Shrub/Herb Strata

SAR number: S-I26

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.49
Biogeochemical Cycling	0.28
Habitat	0.09

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.	1.40	0.24
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.08	0.04
V_{BERO}	Total percent of eroded stream channel bank.	0.00	1.00
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.	6.00	0.09
V_{SRICH}	Riparian vegetation species richness.	4.00	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	19.38	0.24
V_{HERB}	Average percent cover of herbaceous vegetation.	100.00	1.00
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.91	0.96

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

Team: Potesta/Edge (AK/SM)	Latitude/UTM Northing: 38.019129
Project Name: MVP Preliminary Assessment	Longitude/UTM Easting: -80.75522
Location: UNT to Meadow Creek	Sampling Date: 9-7-2021
SAR Number: S-I26	Reach Length (ft): 50
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	0	0	0	0					
0	0	0	0	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. 1.4

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:

5	1	1	1	1	1				
5	1	1	1	1	1				
5	1	1	1	1	1				
1	1	1	1	1	1				
1	1	1	1	1	1				

- 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	84.00	0.08	0.08	0.08	0.08				
0.08	111.00	0.08	0.08	0.08	0.08				
0.08	411.00	0.08	0.08	0.08	0.08				
0.08	241.00	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%. 0 %

Left Bank: 0 ft

Right Bank: 0 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				

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.	6.0
---	-----------	---	-----

Left Side: 3 Right Side: 0

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.	4.00
---	-------------	---	------

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>Ailanthus altissima</i>	<input type="checkbox"/> <i>Lonicera japonica</i>
<input type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>
<input type="checkbox"/> <i>Aesculus flava</i>	<input type="checkbox"/> <i>Oxydendrum arboreum</i>	<input type="checkbox"/> <i>Alliaria petiolata</i>	<input type="checkbox"/> <i>Lotus corniculatus</i>
<input type="checkbox"/> <i>Asimina triloba</i>	<input type="checkbox"/> <i>Prunus serotina</i>	<input type="checkbox"/> <i>Alternanthera philoxeroides</i>	<input type="checkbox"/> <i>Lythrum salicaria</i>
<input type="checkbox"/> <i>Betula alleghaniensis</i>	<input type="checkbox"/> <i>Quercus alba</i>	<input type="checkbox"/> <i>Aster tataricus</i>	<input type="checkbox"/> <i>Microstegium vimineum</i>
<input type="checkbox"/> <i>Betula lenta</i>	<input type="checkbox"/> <i>Quercus coccinea</i>	<input type="checkbox"/> <i>Cerastium fontanum</i>	<input type="checkbox"/> <i>Paulownia tomentosa</i>
<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>
<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input type="checkbox"/> <i>Pueraria montana</i>
<input type="checkbox"/> <i>Carya ovalis</i>	<input checked="" type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Rosa multiflora</i>
<input type="checkbox"/> <i>Carya ovata</i>	<input type="checkbox"/> <i>Quercus velutina</i>	<input type="checkbox"/> <i>Lespedeza cuneata</i>	<input type="checkbox"/> <i>Sorghum halepense</i>
<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>
<input type="checkbox"/> <i>Fagus grandifolia</i>	<input type="checkbox"/> <i>Tilia americana</i>	<input type="checkbox"/> <i>Ligustrum sinense</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>			

2 Species in Group 1

0 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.	19.38 %																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>20</td> <td>15</td> <td></td> <td></td> <td>15</td> <td>20</td> <td></td> <td></td> </tr> <tr> <td>20</td> <td>20</td> <td></td> <td></td> <td>25</td> <td>20</td> <td></td> <td></td> </tr> </table>				Left Side				Right Side				20	15			15	20			20	20			25	20		
Left Side				Right Side																							
20	15			15	20																						
20	20			25	20																						
11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> 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.	100 %																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>100</td> <td>100</td> <td></td> <td></td> <td>100</td> <td>100</td> <td></td> <td></td> </tr> <tr> <td>100</td> <td>100</td> <td></td> <td></td> <td>100</td> <td>100</td> <td></td> <td></td> </tr> </table>				Left Side				Right Side				100	100			100	100			100	100			100	100		
Left Side				Right Side																							
100	100			100	100																						
100	100			100	100																						

Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	0.91																																								
<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>89.48</td> <td>89.48</td> </tr> <tr> <td>Open space (pasture, lawns, parks, etc.), grass cover <50%</td> <td>0.1</td> <td>10.52</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> <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	89.48	89.48	Open space (pasture, lawns, parks, etc.), grass cover <50%	0.1	10.52	100																												
Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)																																								
Forest and native range (>75% ground cover)	1	89.48	89.48																																								
Open space (pasture, lawns, parks, etc.), grass cover <50%	0.1	10.52	100																																								

S-I26			Notes:
Variable	Value	VSI	Land Cover Analysis was completed using the 2019 National Land Cover Database (NLCD), from Landat satellite imagery and other supplementary datasets. Watershed boundaries are based off field delineated stream impacts.
V_{CCANOPY}	Not Used, <20%	Not Used	
V_{EMBED}	1.4	0.24	
$V_{\text{SUBSTRATE}}$	0.08 in	0.04	
V_{BERO}	0 %	1.00	
V_{LWD}	0.0	0.00	
V_{TDBH}	Not Used	Not Used	
V_{SNAG}	0.0	0.10	
V_{SSD}	6.0	0.09	
V_{SRICH}	4.00	1.00	
V_{DETRITUS}	19.4 %	0.24	
V_{HERB}	100 %	1.00	
V_{WLUSE}	0.91	0.96	

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAMES-I26		LOCATION UNT to Meadow Creek
STATION # _____ RIVERMILE _____	STREAM CLASS Intermittent <input checked="" type="checkbox"/>	
LAT 38.019129 LONG -80.75522	COUNTY Greenbrier <input checked="" type="checkbox"/>	
STORET # _____	AGENCY Potesta/Edge	
INVESTIGATORS AK/SM		
FORM COMPLETED BY Ak	DATE 9-7-2021 TIME 1015	REASON FOR SURVEY Preliminary Assessment

WEATHER CONDITIONS	<div style="display: flex; justify-content: space-between;"> <div> <p>Now</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </div> <div> <p>storm (heavy rain) rain (steady rain) showers (intermittent) %cloud cover clear/sunny</p> </div> </div> </div> <div> <p>Past 24 hours</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </div> <div> <p>storm (heavy rain) rain (steady rain) showers (intermittent) %cloud cover clear/sunny</p> </div> </div> </div> <div> <p>Has there been a heavy rain in the last 7 days?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Air Temperature 65 F °C</p> <p>Other _____</p> </div> </div>	
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p>	
STREAM CHARACTERIZATION	<div style="display: flex; justify-content: space-between;"> <div> <p>Stream Subsystem</p> <p><input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Origin</p> <p><input type="checkbox"/> Glacial <input 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> </div> <div> <p>Stream Type</p> <p><input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km²</p> </div> </div>	

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 type="checkbox"/> Other _____ <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 type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous Dominant species present <u>golden rod, jewel weed</u>	
INSTREAM FEATURES	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Estimated Reach Length <u>35 ft</u> m Estimated Stream Width <u>0.9 ft</u> m Sampling Reach Area <u>31.5 ft²</u> m² Area in km² (m²x1000) _____ km² Estimated Stream Depth <u><0.05 ft</u> m Surface Velocity <u>0</u> m/sec (at thalweg) Stream Dry <input type="checkbox"/> </div> <div style="width: 45%;"> Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>1.1 ft</u> m Proportion of Reach Represented by Stream Morphology Types Riffle _____ % Run _____ % Pool _____ % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </div> </div>	
LARGE WOODY DEBRIS	LWD <u>0</u> m ² Density of LWD <u>0</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>No aquatic vegetation present</u> Portion of the reach with aquatic vegetation <u>0</u> %	
WATER QUALITY Low Flow; unable to access	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Temperature _____ °C Specific Conductance _____ Dissolved Oxygen _____ pH _____ Turbidity _____ WQ Instrument Used _____ </div> <div style="width: 45%;"> Water Odors <input 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 <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ </div> </div>	
SEDIMENT/SUBSTRATE	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Odors <input type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse </div> <div style="width: 45%;"> Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input checked="" type="checkbox"/> Other <u>silt/clay</u> Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </div> </div>	

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")	5			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	10			
Clay	< 0.004 mm (slick)	80			

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

STREAM NAMES-I26		LOCATION	
STATION # _____ RIVERMILE _____		STREAM CLASS Intermittent <input type="checkbox"/>	
LAT 38.019129 LONG -80.75522		COUNTY Greenbrier <input type="checkbox"/>	
STORET # _____		AGENCY Potesta/Edge	
INVESTIGATORS AK/SM			
FORM COMPLETED BY Ak		DATE 9-7-2021 TIME 1015 AM PM	REASON FOR SURVEY Preliminary Assessment

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover <input checked="" type="checkbox"/> N/A SCORE 0 <input type="checkbox"/>	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.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	2. Embeddedness SCORE 9 <input type="checkbox"/>	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.
	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 <input checked="" type="checkbox"/> N/A SCORE 0 <input type="checkbox"/>	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).
20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	4. Sediment Deposition SCORE 16 <input type="checkbox"/>	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.
	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 <input checked="" type="checkbox"/> N/A SCORE 0 <input type="checkbox"/>	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.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

Low flow present, Unable to assess WQ variables - modified RBP.

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

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration SCORE <u>16</u>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	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) <input checked="" type="checkbox"/> N/A SCORE <u>0</u>	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.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
	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) Note: determine left or right side by facing downstream. SCORE <u>9</u> SCORE <u>9</u>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>9</u> SCORE <u>9</u>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>1</u> SCORE <u>1</u>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 79

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAMES-I26		LOCATION	
STATION # _____ RIVERMILE _____		STREAM CLASS Intermittent <input checked="" type="checkbox"/>	
LAT <small>38.919129</small> _____ LONG <small>-80.75522</small> _____		COUNTY Greenbrier <input checked="" type="checkbox"/>	
STORET # _____		AGENCY Potesta/Edge	
INVESTIGATORS AK/SM		LOT NUMBER	
FORM COMPLETED BY Ak		DATE <small>9-7-2021</small> TIME <small>1015</small>	REASON FOR SURVEY Preliminary 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	No benthics collected, very 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						

SITE ID: S-I26 Spread E
DATE: 7 September 2021
COLLECTOR(S): SM

Wolman Pebble Count (Reach Wide)

.062	062	062	062	062	062	062	062	062	062
241	241	241	067	5	4	241	062	062	062
166	.062	062	166	89	89	062	062	062	062
:062	.062	062	201	201	062	.062	062	201	201
111	111	.062	.062	.062	125	125	.062	.062	.062
062	.062	062	062	.062	.062	.062	.062	.062	.062
.062	062	.062	.062	.062	.062	.062	.062	.062	.062
062	.062	.062	111	111	111	111	111	111	.062
L	.062	.062	.062	.062	.062	.062	.062	.062	.062
.062	062	.062	062	062	062	.062	.062	.062	.062

NOTES:

Rifle Pebble Count

[illegible]

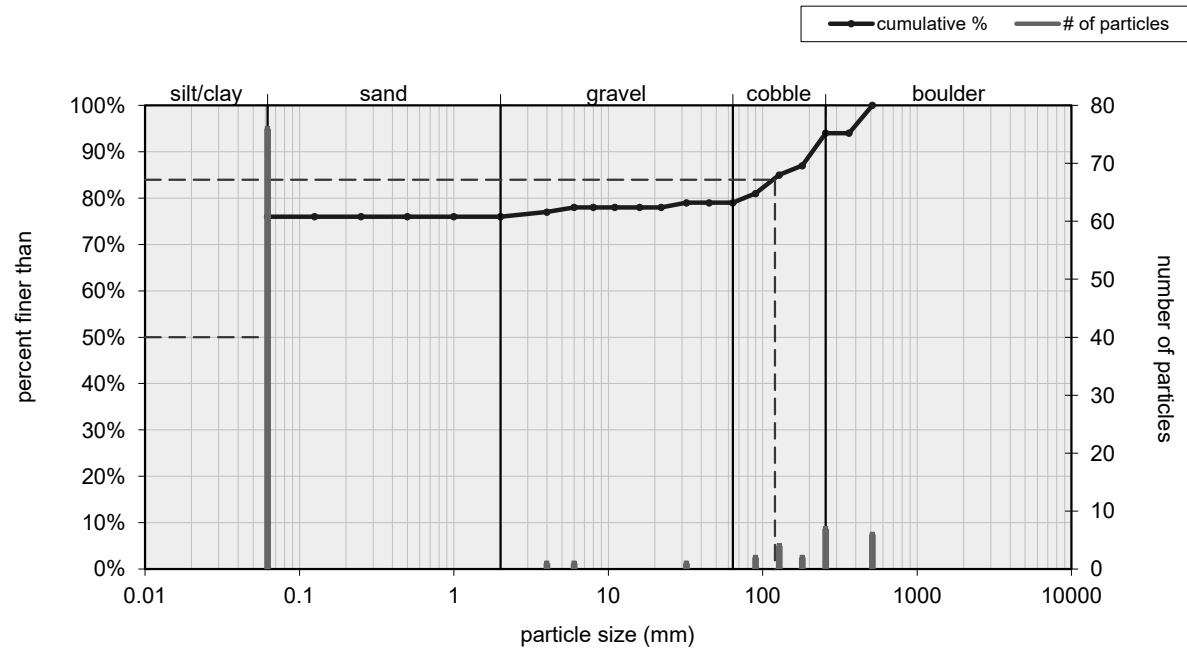
NOTES:

NOTES:

Inches	MILLIMETERS	Millimeters	
	St. Clay	1-100	SAND
	Very Fine	100-125	
	Fine	125-25	
	Medium	25-50	
	Coarse	50-100	GRAVEL
10-15	Very Coarse	100-200	
15-20	Very Fine	2-4	
15-22	Fine	4-5.7	
22-31	Fine	5.7-8	
31-44	Medium	8-11.3	
44-60	Medium	11.3-16	
60-80	Coarse	16-22.5	
80-110	Coarse	22.5-30	
110-125	Very Coarse	30-36	
125-25	Very Coarse	36-54	SAND GRAVEL GRAVEL
25-35	Small	54-66	
35-50	Small	50-108	
50-71	Large	108-180	
71-100	Large	180-256	
100-140	Small	256-360	
140-200	Small	360-512	GRAVEL
200-400	Medium	512-1024	
400-800	Large-Very large	1024-2048	
	Bedrock		

Bankfull Channel		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	76
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	
medium sand	0.25 - 0.5	
coarse sand	0.5 - 1	
very coarse sand	1 - 2	
very fine gravel	2 - 4	1
fine gravel	4 - 6	1
fine gravel	6 - 8	
medium gravel	8 - 11	
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	1
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	2
medium cobble	90 - 128	4
large cobble	128 - 180	2
very large cobble	180 - 256	7
small boulder	256 - 362	
small boulder	362 - 512	6
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		100
bedrock -----		
clay hardpan -----		
detritus/wood -----		
artificial -----		
total count:		100
Note:		

Bankfull Channel Pebble Count, UNT TO MEADOW CREEK (S-I26)

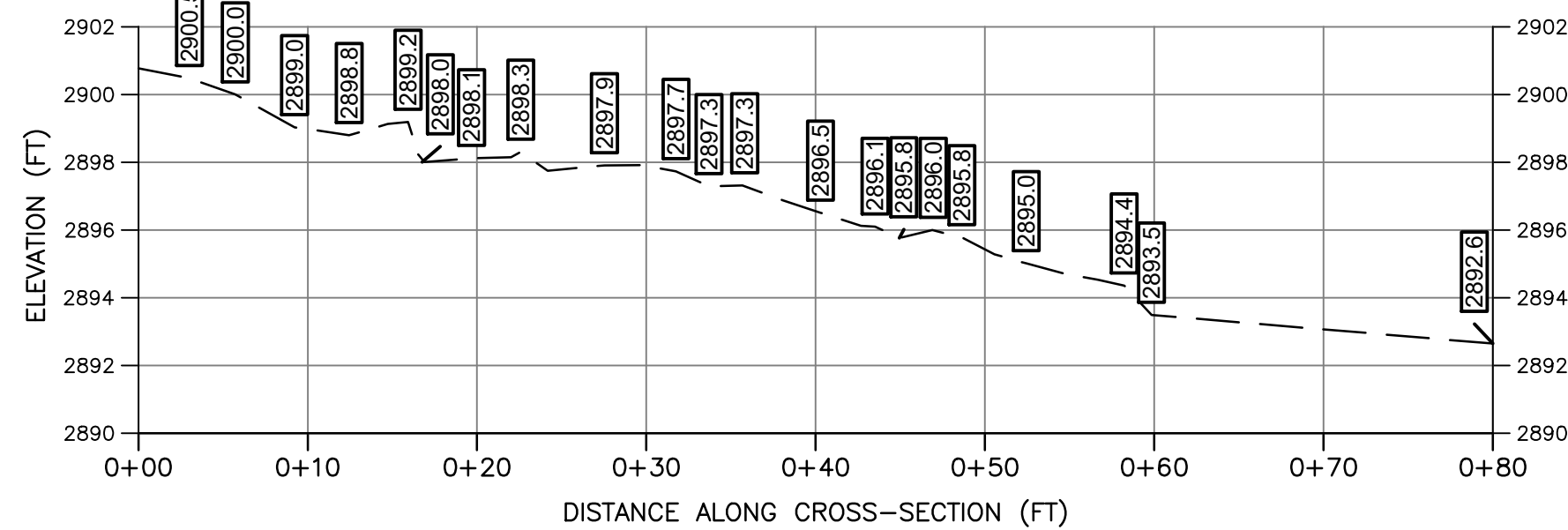
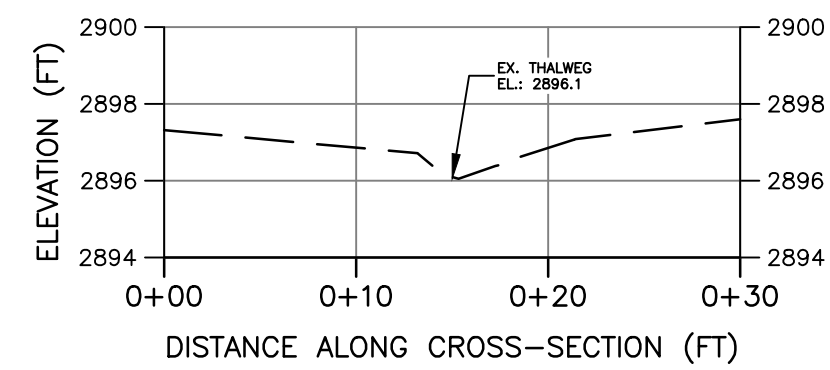


Size (mm)		Size Distribution		Type	
D16	0.062	mean	2.7	silt/clay	76%
D35	0.062	dispersion	968.2	sand	0%
D50	0.062	skewness	0.91	gravel	3%
D65	0.062			cobble	15%
D84	120			boulder	6%
D95	380				



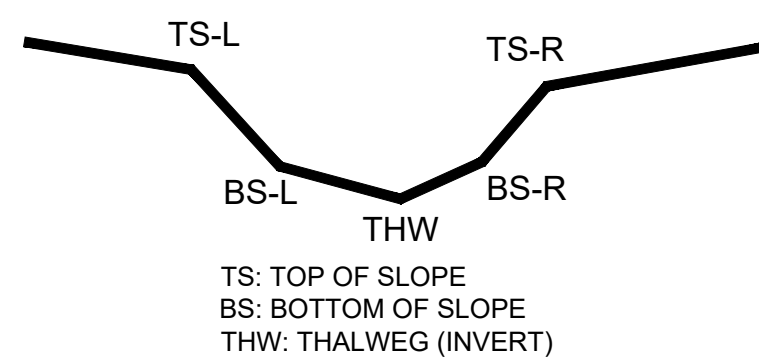
— — — — —	STUDY AREA (EASEMENT)
— . — . —	EXISTING SURVEY-LOCATED THALWEG
1176.87 +	EXISTING SURVEYED GROUND SHOT ELEVATION

1. 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 SEPTEMBER 20, 2021.
2. EASEMENT LINES SHOWN ON PLAN VIEW WERE PROVIDED BY MOUNTAIN VALLEY PIPELINE.
3. 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.
4. ALL SECTION VIEWS SHOWN LEFT TO RIGHT FACING DOWNSTREAM.
5. POST-CROSSING SURVEY INFORMATION SHOWN IN RED. DATA PENDING.
6. POST-CROSSING SURVEY POINTS FOR CROSS SECTIONS AND THALWEG ARE PROJECTED ONTO PRE-CROSSING SECTION AND PROFILE VIEWS FOR COMPARISON.



EXISTING STREAM PROFILE
INVERT ALONG THALWEG

TYPICAL 5-POINT CROSS-SECTION
(FACING DOWNSTREAM)



AS-BUILT TABLE: S-126 CROSS SECTION A					
PRE-CROSSING				AS-BUILT	
PT. LOC.	NORTHING	EASTING	ELEV	VERT. DIFF.	HORZ. DIFF.
TS-L	13805631.8100	1710906.1840	2896.723'		
BS-L	13805632.8000	1710907.1530	2896.156'		
THW	13805633.5300	1710907.6800	2896.037'		
BS-R	13805634.8600	1710909.1840	2896.400'		
TS-R	13805635.5800	1710910.0650	2896.625'		

— — EXISTING GRADE

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

PHOTO TAKEN LOOKING DOWNSTREAM
FROM UPSTREAM IMPACT LIMITS

PENDING CROSSING


PENDING CROSSING

PHOTO TAKEN LOOKING DOWNSTREAM
FROM UPSTREAM IMPACT LIMITS

PHOTO TAKEN LOOKING UPSTREAM FROM
DOWNSTREAM IMPACT LIMITS

PRE-CROSSING

TETRA TECH, INC.
661 ANDERSEN DRIVE FOSTER PLAZA 7
PITTSBURGH, PA 15220
TEL: (412) 921-7090 FAX: (412) 921-4040
E-Mail Address: WWW.TETRATECH.COM



TETRA TECH
www.tetratech.com

MOUNTAIN VALLEY PIPELINE, LLC
100 ENERGY DRIVE, 2ND FLOOR
CANONSBURG, PA 15317

PROFILE AND CROSS-SECTIONS
BASELINE SURVEY
RIDGE S-126 - UNNAMED TRIB.
MEADOW CREEK (MP 141.08)
GREENBRIER COUNTY, WV

1
Drawing No.

PRELIMINARY