

Baseline Assessment – Stream Attributes

Reach S-L24 (Timber Mat Crossing) Intermittent Spread E Greenbrier County, West Virginia

Data	Included
Photos	✓
SWVM Form	✓
FCI Calculator and HGM Form	✓
RBP Physical Characteristics Form	✓
Water Quality Data	✓
RBP Habitat Form	✓
RBP Benthic Form	✓
Benthic Identification Sheet	N/A – Low flow
Wolman Pebble Count	✓
Reference Reach Software Pebble Count Data	✓
Longitudinal Profile and Cross Sections	✓



37.963068 ° N, -80.733141°

Photo Type: US Reach, US View

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



37.963068 ° N, -80.733141°

Photo Type: US Reach, DS View

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



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



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



Photo Type: DS Reach, US View
Location, Orientation, Photographer Initials: Downstream Reach, Upstream View, AAK/SM



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-L24"

USACE FILE NO./ Project Name: (v2.1, Sept 2015)		Mountain Valley Pipeline		IMPACT COORDINATES: (in Decimal Degrees)		Lat.	37.963068	Lon.	-80.733141	WEATHER:		Sunny		DATE:		9/10/2021							
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)				S-L24 UNT to Sewell Creek				MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)				Comments:											
STREAM IMPACT LENGTH:		22		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				Stream Classification:				0				Stream Classification:				0			
Percent Stream Channel Slope				7.07				Percent Stream Channel Slope				0				Percent Stream Channel Slope				0			
HGM Score (attach data forms):				Average				HGM Score (attach data forms):				Average				HGM Score (attach data forms):				Average			
Hydrology				0.23				Hydrology				0				Hydrology				0			
Biogeochemical Cycling				0.19				Biogeochemical Cycling				0				Biogeochemical Cycling				0			
Habitat				0.15				Habitat				0				Habitat				0			
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				Points Scale				Range				Points Scale				Range			
Site Score				0				Site Score				0				Site Score				0			
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				1. Epifaunal Substrate/Available Cover				0-20				1. Epifaunal Substrate/Available Cover				0-20			
2. Embeddedness				0-20				2. Embeddedness				0-20				2. Embeddedness				0-20			
3. Velocity/ Depth Regime				0-20				3. Velocity/ Depth Regime				0-20				3. Velocity/ Depth Regime				0-20			
4. Sediment Deposition				0-20				4. Sediment Deposition				0-20				4. Sediment Deposition				0-20			
5. Channel Flow Status				0-20				5. Channel Flow Status				0-20				5. Channel Flow Status				0-20			
6. Channel Alteration				0-20				6. Channel Alteration				0-20				6. Channel Alteration				0-20			
7. Frequency of Riffles (or bends)				0-20				7. Frequency of Riffles (or bends)				0-20				7. Frequency of Riffles (or bends)				0-20			
8. Bank Stability (LB & RB)				0-20				8. Bank Stability (LB & RB)				0-20				8. Bank Stability (LB & RB)				0-20			
9. Vegetative Protection (LB & RB)				0-20				9. Vegetative Protection (LB & RB)				0-20				9. Vegetative Protection (LB & RB)				0-20			
10. Riparian Vegetative Zone Width (LB & RB)				0-20				10. Riparian Vegetative Zone Width (LB & RB)				0-20				10. Riparian Vegetative Zone Width (LB & RB)				0-20			
Total RBP Score				Marginal				Total RBP Score				Poor				Total RBP Score				Poor			
Sub-Total				0.53				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)							
Specific Conductivity				0-90				Specific Conductivity				0-90				Specific Conductivity				0-90			
pH				0-1				pH				0-1				pH				0-1			
DO				4.6-5.5 = 10 points				DO				5-90				DO				5-90			
Sub-Total				0.65				Sub-Total				0				Sub-Total				0			
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)							
WV Stream Condition Index (WVSCI)				0				WV Stream Condition Index (WVSCI)				0				WV Stream Condition Index (WVSCI)				0			
Sub-Total				0				Sub-Total				0				Sub-Total				0			
PART II - Index and Unit Score				PART II - Index and Unit Score				PART II - Index and Unit Score				PART II - Index and Unit Score				PART II - Index and Unit Score							
Index				Linear Feet				Index				Linear Feet				Index				Linear Feet			
Unit Score				8.58				Index				Unit Score				Index				Unit Score			
0.390				22				0				0				0				0			

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 Little Sewell Creek
Sampling Date: 9-10-2021

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:
 Shrub/Herb Strata

SAR number: S-L24

Functional Results Summary: Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.23
Biogeochemical Cycling	0.19
Habitat	0.15

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.	0.65	0.33
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.	0.00	0.00
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	9.38	0.11
V_{HERB}	Average percent cover of herbaceous vegetation.	64.38	0.86
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.32	0.34

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

Team: Potesta/Edge (AK/SM)	Latitude/UTM Northing: 37.963068
Project Name: MVP Preliminary Assessment	Longitude/UTM Easting: -80.733141
Location: UNT to Little Sewell Creek	Sampling Date: 9-10-2021
SAR Number: S-L24 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	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

There should be the same number of entries for Embeddedness and Substrate Size

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)

Measure at least 30 points

List the ratings at each point below:

1	1	2	1	3	1	1	1	2	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} . 0.65 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):

2.50	0.90	0.40	0.08	0.08	0.70	0.08	1.20	0.80	0.08
0.08	2.20	4.30	6.20	5.70	0.60	3.80	1.10	0.30	0.08
3.20	2.70	0.60	0.20	0.08	2.20	1.80	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. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	Not Used
---	------------	---	----------

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.	0.0
Left Side: 0 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.	0.00
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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 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 type="checkbox"/>	<i>Liriodendron tulipifera</i>	<input type="checkbox"/>	<i>Ulmus americana</i>				
<input type="checkbox"/>	<i>Magnolia acuminata</i>						

0 Species in Group 1	0 Species in Group 2
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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.	9.38 %																								
		<table border="1"> <thead> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>5</td> <td></td> <td></td> <td>20</td> <td>10</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td>5</td> <td></td> <td></td> <td>10</td> <td>10</td> <td></td> <td></td> </tr> </tbody> </table>	Left Side				Right Side				10	5			20	10			5	5			10	10			
Left Side				Right Side																							
10	5			20	10																						
5	5			10	10																						

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.	64 %																								
		<table border="1"> <thead> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> </thead> <tbody> <tr> <td>50</td> <td>60</td> <td></td> <td></td> <td>75</td> <td>60</td> <td></td> <td></td> </tr> <tr> <td>25</td> <td>60</td> <td></td> <td></td> <td>100</td> <td>85</td> <td></td> <td></td> </tr> </tbody> </table>	Left Side				Right Side				50	60			75	60			25	60			100	85			
Left Side				Right Side																							
50	60			75	60																						
25	60			100	85																						

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	0.32																																				
		<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 (<50% ground cover)</td> <td>0.5</td> <td>11.12</td> <td>11.12</td> </tr> <tr> <td>Open space (pasture, lawns, parks, etc.), grass cover >75%</td> <td>0.3</td> <td>85.18</td> <td>96.3</td> </tr> <tr> <td>Residential districts, 2 acres (12% cover)</td> <td>0.3</td> <td>3.7</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> </tbody> </table>	Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (<50% ground cover)	0.5	11.12	11.12	Open space (pasture, lawns, parks, etc.), grass cover >75%	0.3	85.18	96.3	Residential districts, 2 acres (12% cover)	0.3	3.7	100																					
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S-L24			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 _{SUBSTRATE}	0.65 in	0.33	
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}	0.0	0.00	
V _{SRICH}	0.00	0.00	
V _{DETRITUS}	9.4 %	0.11	
V _{HERB}	64 %	0.86	
V _{WLUSE}	0.32	0.34	

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME S-L24	LOCATION UNT to Little Sewell Creek Spread E	
STATION # _____ RIVERMILE _____	STREAM CLASS Intermittent	
LAT 37.963068 LONG -80.733141	COUNTY Greenbrier	
STORET # _____	AGENCY Potesta/Edge	
INVESTIGATORS AK/SM		
FORM COMPLETED BY AK	DATE 9-10-21 TIME 11:30 AM	REASON FOR SURVEY Preliminary 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 checked="" type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ </div> </div> <p>Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature _____ °C Other 1.32" fell 9-9-21</p>	
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p style="text-align: center;">timber mat stream crossing LOD</p>	
STREAM CHARACTERIZATION	<p>Stream Subsystem <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Origin <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> <p>Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km²</p>	

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 checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous Dominant species present <u>tulip poplar, locust, goldenrod</u>	
INSTREAM FEATURES	Estimated Reach Length <u>45 ft</u> m Estimated Stream Width <u>0.7 ft</u> m Sampling Reach Area _____ m ² Area in km ² (m ² x1000) _____ km ² Estimated Stream Depth <u>0.05 ft</u> m Surface Velocity <u>0.34 ft/sec</u> m/sec Stream Dry <input type="checkbox"/>	Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>0.6 ft</u> m Proportion of Reach Represented by Stream Morphology Types Rifle <u>20</u> % Run <u>80</u> % Pool <u>0</u> % Channelized <input checked="" type="checkbox"/> Yes <input 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 _____ 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>NA</u> Portion of the reach with aquatic vegetation <u>0</u> %	
WATER QUALITY	Temperature <u>16.4</u> °C Specific Conductance <u>0.053</u> ms/cm Dissolved Oxygen <u>8.38</u> mg/L pH <u>5.56</u> SU Turbidity <u>21.7</u> ntu WQ Instrument Used <u>YSI</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 type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____
SEDIMENT/SUBSTRATE	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	Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ 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)	5
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	45	Muck-Mud	black, very fine organic (FPOM)	-
Gravel	2-64 mm (0.1"-2.5")	75			
Sand	0.06-2mm (gritty)	15	Marl	grey, shell fragments	-
Silt	0.004-0.06 mm	15			
Clay	< 0.004 mm (slick)	0			

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

STREAM NAME S-L24		LOCATION UNT to Little Sewell Creek	
STATION # _____ RIVERMILE _____		STREAM CLASS Intermittent	
LAT 37.963068 LONG -80.733141		COUNTY Greenbrier	
STORET # _____		AGENCY Potesta/Edge	
INVESTIGATORS AK/SM			
FORM COMPLETED BY AK		DATE 9-10-21 TIME 11:30 AM AM PM	REASON FOR SURVEY Preliminary Assessment

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover <input type="checkbox"/> N/A SCORE 11	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 12	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 type="checkbox"/> N/A SCORE 8	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 11	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 type="checkbox"/> N/A SCORE 16	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	

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.				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.								
	SCORE 9	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.				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.								
<input type="checkbox"/> N/A																						
SCORE 9	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.				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.									
Note: determine left or right side by facing downstream.																						
SCORE 7	Left Bank	10	9			8	7	6			5	4	3			2	1	0				
SCORE 7	Right 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.				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.									
SCORE 7	Left Bank	10	9			8	7	6			5	4	3			2	1	0				
SCORE 7	Right 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.				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.									
SCORE 1	Left Bank	10	9			8	7	6			5	4	3			2	1	0				
SCORE 1	Right Bank	10	9			8	7	6			5	4	3			2	1	0				

Total Score 106

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME S-L24		LOCATION UNT to Little Sewell Creek	
STATION # _____ RIVERMILE _____		STREAM CLASS Intermittent	
LAT <u>37.963088</u> LONG <u>-80.733141</u>		COUNTY Greenbrier	
STORET # _____		AGENCY Potesta/Edge	
INVESTIGATORS AK/SM		LOT NUMBER	
FORM COMPLETED BY AK		DATE <u>9-10-21</u> TIME <u>11:30 AM</u>	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 due to width of channel and depth of 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-L24

Spread E

DATE: 10 September 2021

COLLECTOR(S): SM

Wolman Pebble Count (Reach Wide)

435	87	52	53	135	62	112	112	123	S
191	191	7	191	.062	.062	.062	11	17	11
300	154	102	72	31	120	34	16	.062	14
144	171	74	87	93	85	105	109	.062	41
65	.062	.062	.062	.062	.062	.062	.062	34	.062
87	.062	91	.062	.062	87	56	.062	91	.062
148	87	123	163	77	123	65	166	72	61
.062	.062	.062	.062	.062	163	163	163	111	163
.062	.062	.062	171	171	120	100	.062	.062	.062
130	91	124	.062	192	.062	135	51	74	66

NOTES:

Riffle Pebble Count

NOTES:

NOTES:

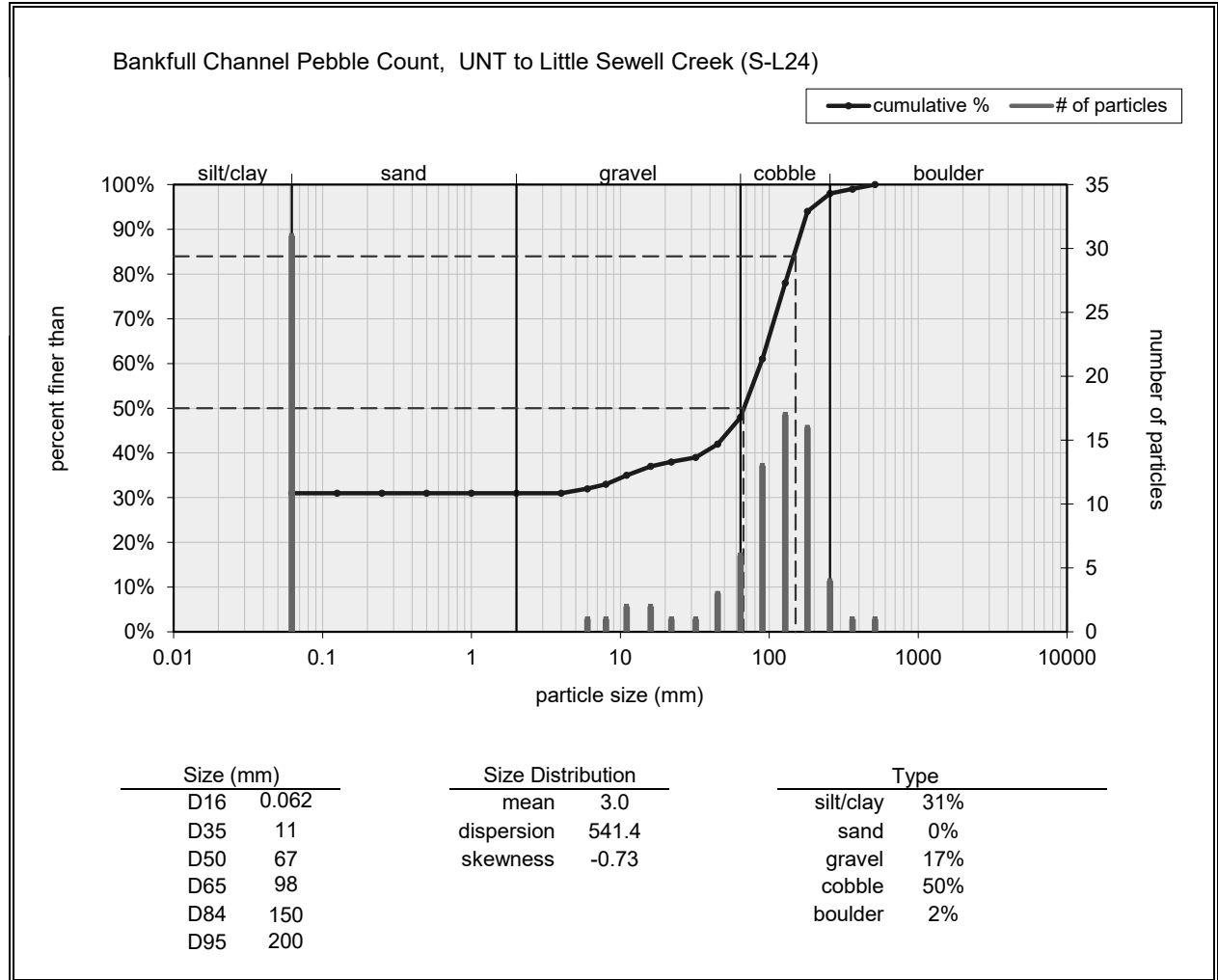
Inches	Millimeters	
	Silt/Clay	425
	Very Fine	62 - 125
	Fine	125 - 250
	Medium	250 - 500
	Coarse	500 - 1000
0.075 - 0.09	Very Coarse	1000 - 2000
0.09 - 0.16	Very Fine	2 - 4
0.16 - 0.22	Fine	4 - 6.7
0.22 - 0.31	Fine	6.7 - 9
0.31 - 0.44	Medium	9 - 17
0.44 - 0.62	Medium	17.3 - 16
0.62 - 0.89	Coarse	16 - 22.5
0.89 - 1.2	Coarse	22.5 - 32
1.2 - 1.8	Very Coarse	32 - 45
1.8 - 2.5	Very Coarse	45 - 64
2.5 - 3.5	Small	64 - 80
3.5 - 5.0	Small	80 - 100
5.0 - 7.1	Large	100 - 160
7.1 - 10	Large	160 - 250
10 - 14.3	Small	250 - 360
14.3 - 20	Small	360 - 512
20 - 40	Medium	512 - 1024
40 - 80	Large-Very Large	1024 - 2048
	Bedrock	

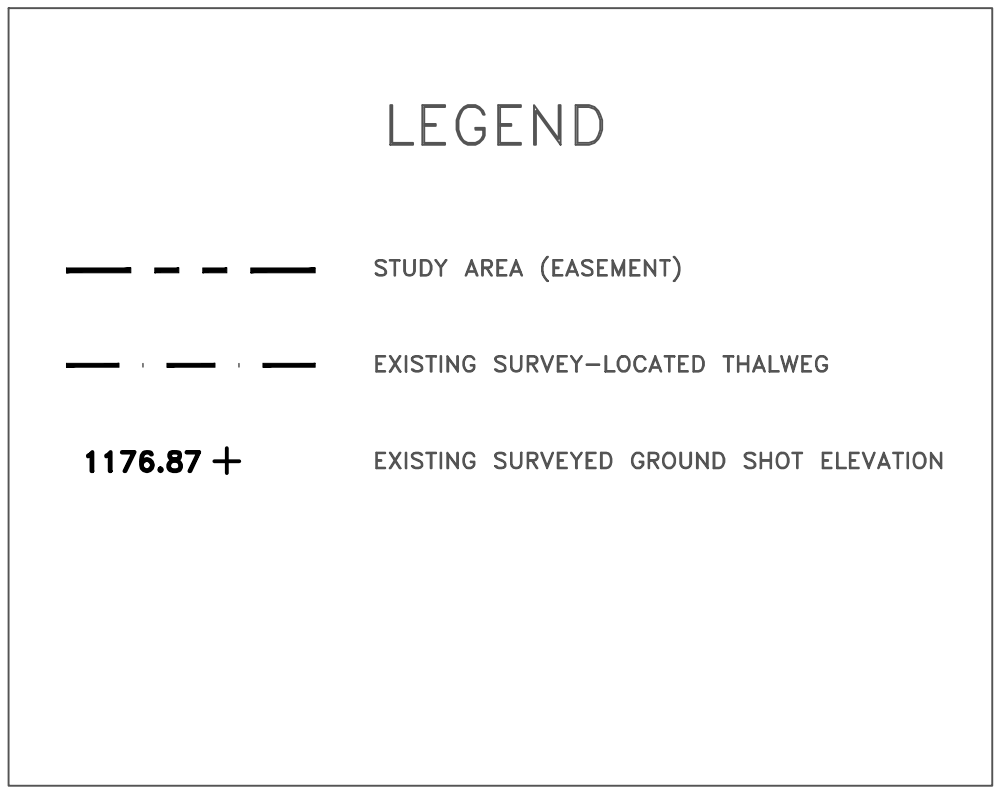
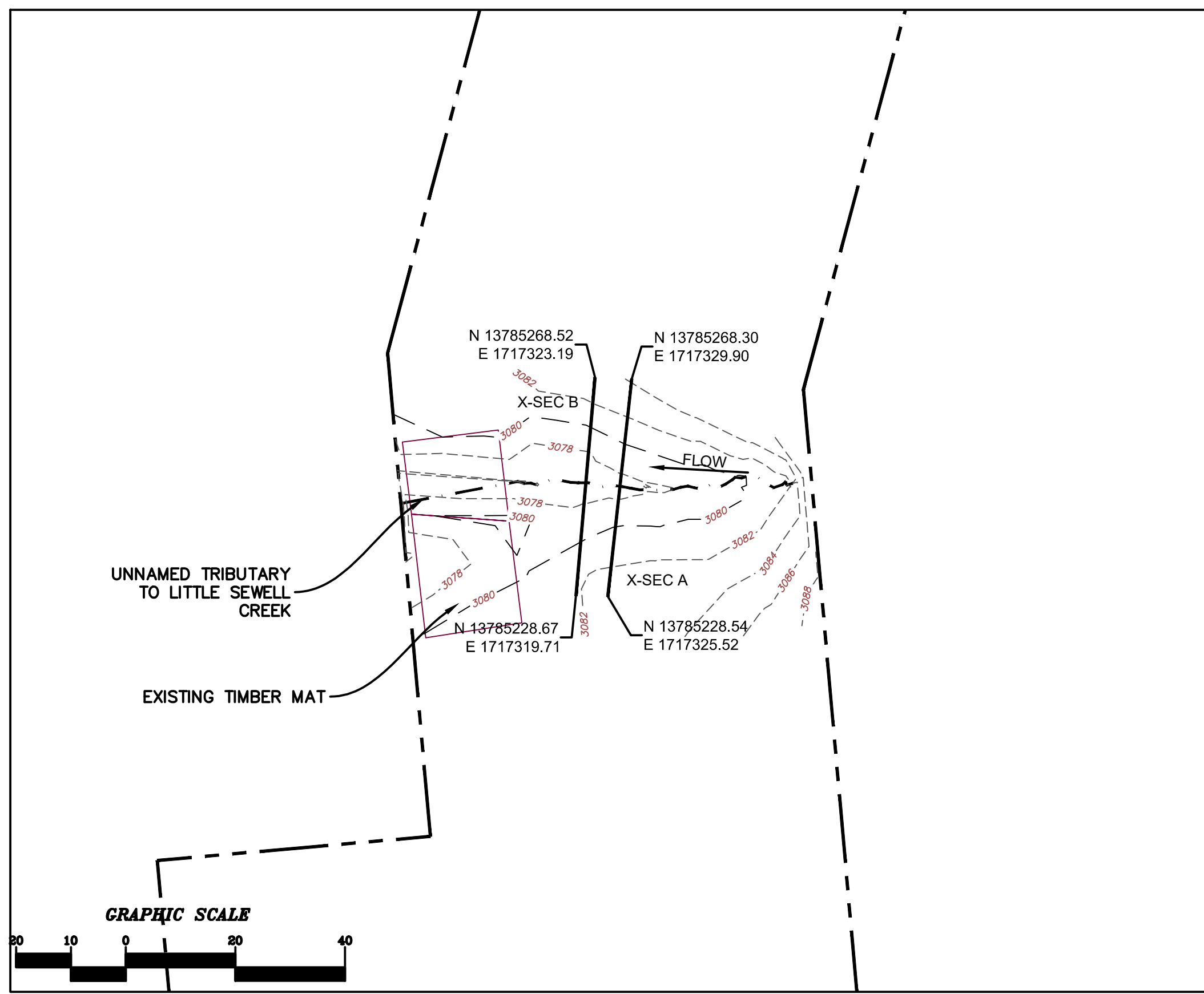
SAND

GRAVEL

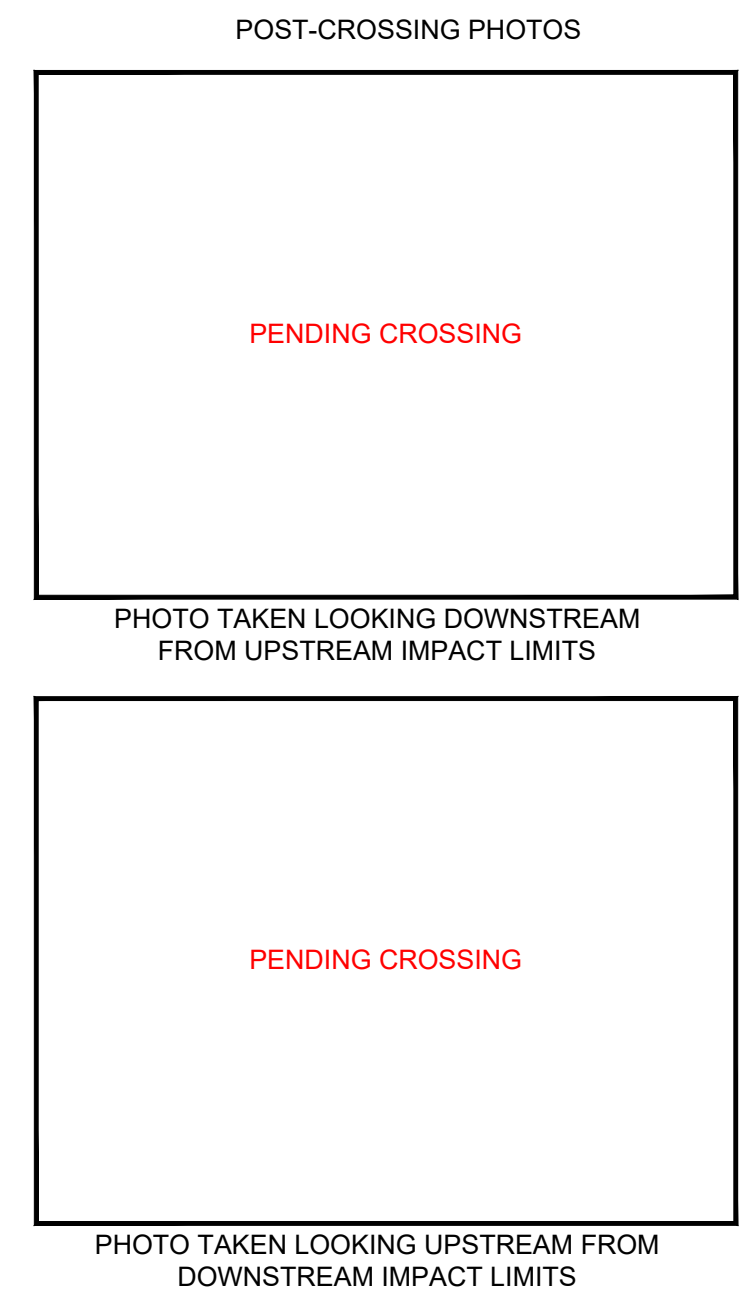
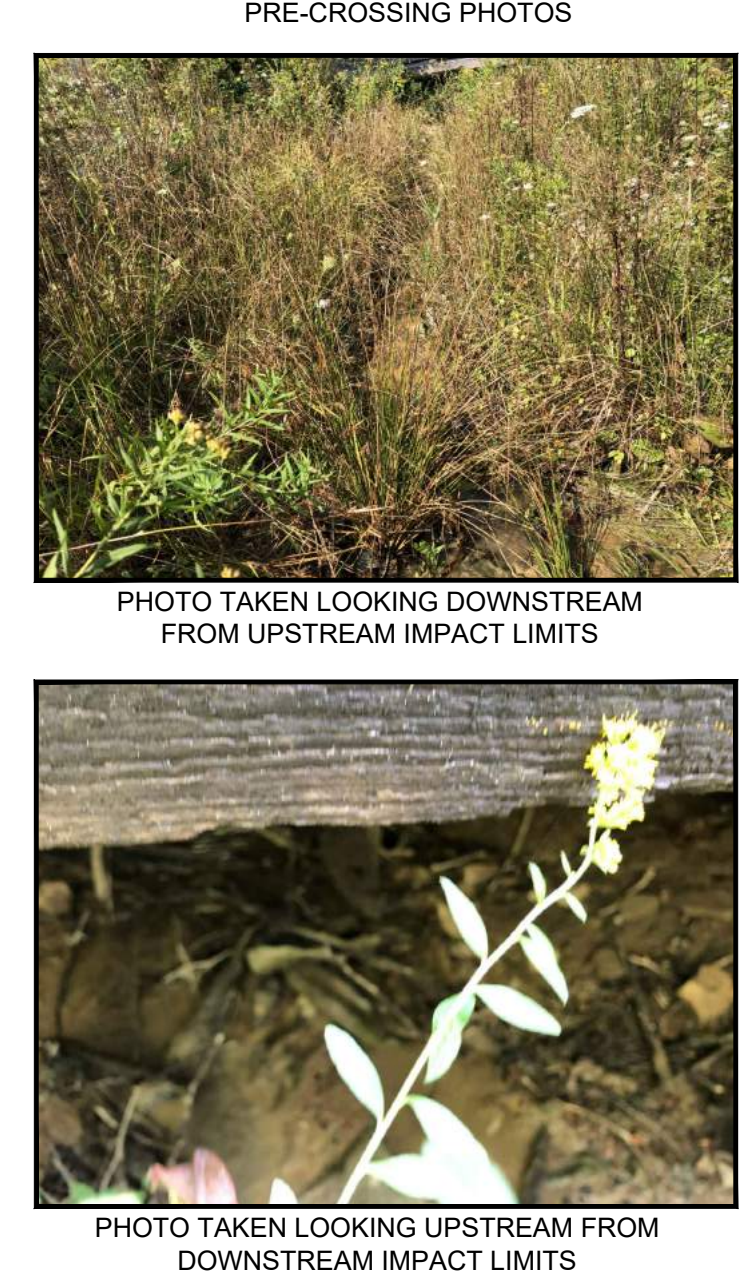
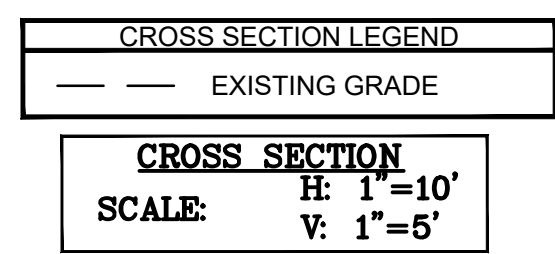
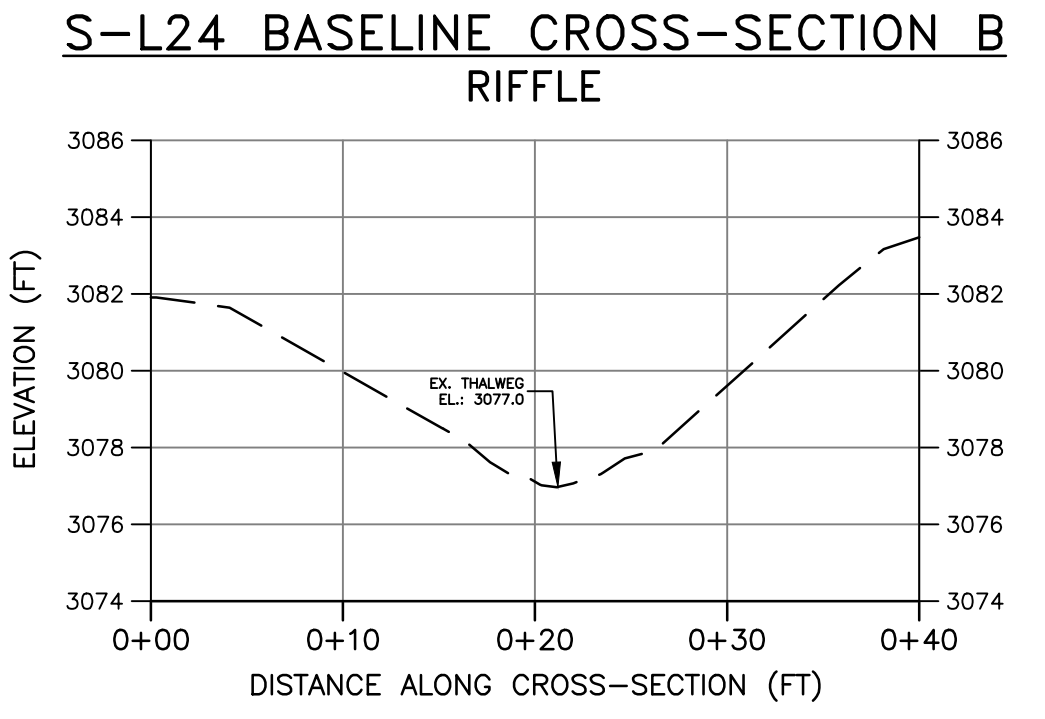
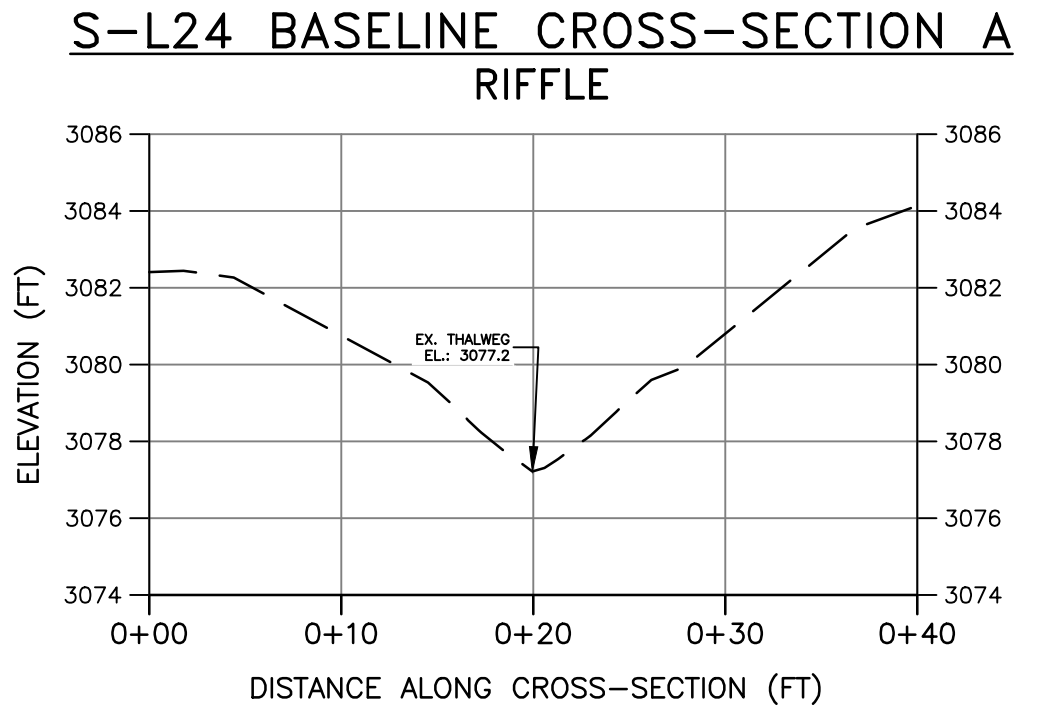
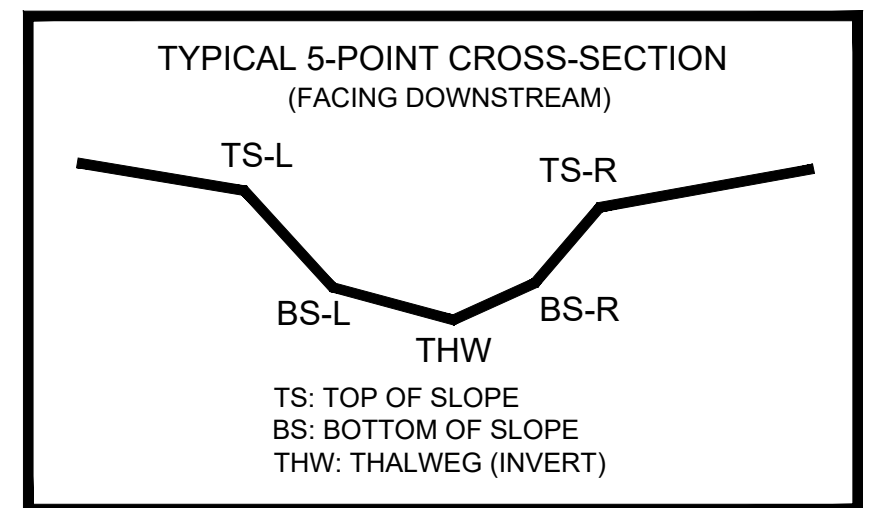
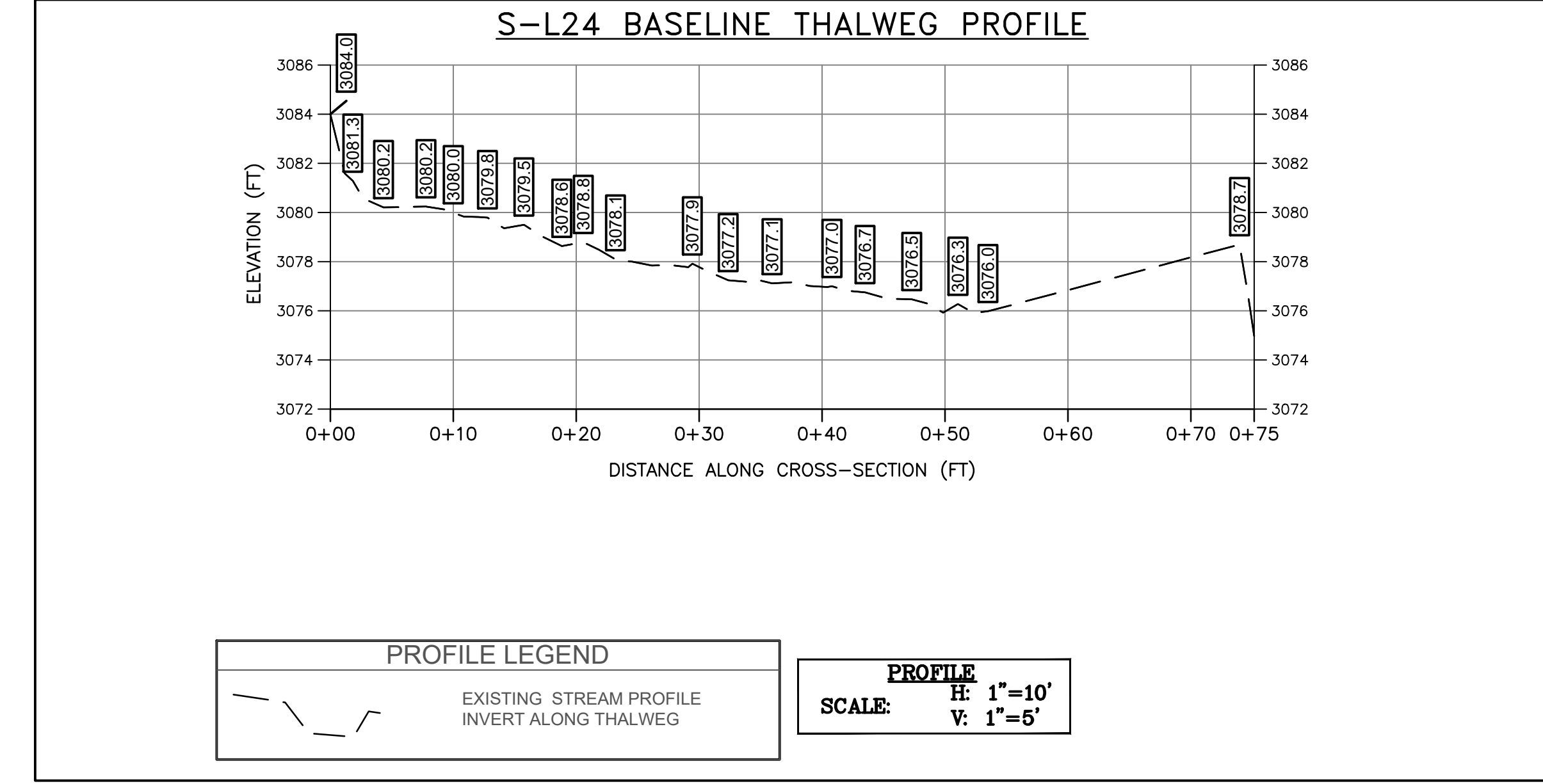
COBBLES

Bankfull Channel		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	31
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	
fine gravel	4 - 6	1
fine gravel	6 - 8	1
medium gravel	8 - 11	2
medium gravel	11 - 16	2
coarse gravel	16 - 22	1
coarse gravel	22 - 32	1
very coarse gravel	32 - 45	3
very coarse gravel	45 - 64	6
small cobble	64 - 90	13
medium cobble	90 - 128	17
large cobble	128 - 180	16
very large cobble	180 - 256	4
small boulder	256 - 362	1
small boulder	362 - 512	1
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: <input type="text"/>		





- 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 SEPTEMBER 21, 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.
 - POST-CROSSING SURVEY INFORMATION SHOWN IN RED. DATA PENDING.
 - POST-CROSSING SURVEY POINTS FOR CROSS SECTIONS AND THALWEG ARE PROJECTED ONTO PRE-CROSSING SECTION AND PROFILE VIEWS FOR COMPARISON.

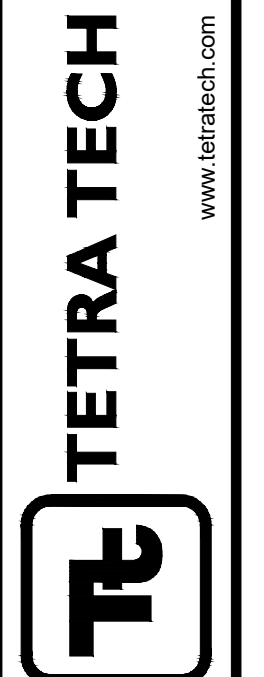


NOTE: ALL SECTIONS VIEWS SHOWN LEFT TO RIGHT FACING DOWNSTREAM.

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 Plotter: HP DesignJet 5000

CAD File No.	JZ
Drawn	GH
Checked	DW
Approved	NOTED
Scale:	Scale:
SEPT. 2021	Date:
1121C07157	Project No.

TETRA TECH, INC.
 861 ANDERSEN DRIVE FOSTER PLAZA 7
 PITTSBURGH, PA 15220
 TEL: (412) 921-7090 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-L24 - UNNAMED TRIB. TO
 LITTLE SEWELL CREEK (MP 146.09)
 GREENBRIER COUNTY, WV

PRELIMINARY

PRE-CROSSING