

Preliminary Stream Assessment Data

Reach S-MN22 (Pipeline ROW) Ephemeral Spread G Montgomery 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 S, TC



Photo Type: US VIEW
Location, Orientation, Photographer Initials: Upstream view of ROW looking N, TC



Photo Type: LB CL

Location, Orientation, Photographer Initials: Standing on LB looking at RB along pipe centerline looking W, TC



Photo Type: RB CL

Location, Orientation, Photographer Initials: Standing on RB looking at LB along pipe centerline looking E, TC



Photo Type: DS COND

Location, Orientation, Photographer Initials: Downstream conditions outside of ROW looking S, TC

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USACE FILE NO/ Project Name: <small>(V2.1, Sept 2019)</small>		Mountain Valley Pipeline		IMPACT COORDINATES: (in Decimal Degrees)		Lat.	37.297166	Lon.	-80.386612	WEATHER:		Mostly Sunny		DATE:		August 23, 2021			
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: <small>(watershed size (acreage), unaltered or impairments)</small>				S-MN22				MITIGATION STREAM CLASS/SITE ID AND SITE DESCRIPTION: <small>(watershed size (acreage), unaltered or impairments)</small>				Comments:							
STREAM IMPACT LENGTH:		96		FORM OF MITIGATION:		RESTORATION (Levels I-III)		MIT COORDINATES: (in Decimal Degrees)		Lat.		Lon.		PRECIPITATION PAST 48 HRS:		0.01"		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: Ephemeral				Stream Classification:				Stream Classification: 0				Stream Classification: 0				Stream Classification: 0			
Percent Stream Channel Slope: 11.91				Percent Stream Channel Slope:				Percent Stream Channel Slope: 0				Percent Stream Channel Slope: 0				Percent Stream Channel Slope: 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: 0.43				Hydrology: 0				Hydrology: 0				Hydrology: 0				Hydrology: 0			
Biogeochemical Cycling: 0.41				Biogeochemical Cycling: 0				Biogeochemical Cycling: 0				Biogeochemical Cycling: 0				Biogeochemical Cycling: 0			
Habitat: 0.19				Habitat: 0				Habitat: 0				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			
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				1. Epifaunal Substrate/Available Cover: 0.20				1. Epifaunal Substrate/Available Cover: 0.20			
2. Embeddedness: 0.20				2. Pool Substrate Characterization: 0.20				2. Embeddedness: 0.20				2. Embeddedness: 0.20				2. Embeddedness: 0.20			
3. Velocity/ Depth Regime: 0.20				3. Pool Variability: 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				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				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				6. Channel Alteration: 0.20				6. Channel Alteration: 0.20			
7. Frequency of Riffles (or bends): 0.20				7. Channel Sinuosity: 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				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				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				10. Riparian Vegetative Zone Width (LB & RB): 0.20				10. Riparian Vegetative Zone Width (LB & RB): 0.20			
Total RBP Score: Suboptimal				Total RBP Score: Poor				Total RBP Score: Poor				Total RBP Score: Poor				Total RBP Score: Poor			
Sub-Total: 0.64166667				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)			
Specific Conductivity				Specific Conductivity				Specific Conductivity				Specific Conductivity				Specific Conductivity			
100-199 = 85 points: 0.80				pH: 0.80				pH: 0.80				pH: 0.80				pH: 0.80			
5.6-5.9 = 45 points: 0.80				DO: 0.80				DO: 0.80				DO: 0.80				DO: 0.80			
10-30				Sub-Total: 0				Sub-Total: 0				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)				WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)			
0: 0.100				0: 0.100				0: 0.100				0: 0.100				0: 0.100			
Sub-Total: 0				Sub-Total: 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: 0.532				Index: 0				Index: 0				Index: 0				Index: 0			
Linear Feet: 96				Linear Feet: 0				Linear Feet: 0				Linear Feet: 0				Linear Feet: 0			
Unit Score: 51.08				Unit Score: 0				Unit Score: 0				Unit Score: 0				Unit Score: 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: Mountain Valley Pipeline

Location: Montgomery County

Sampling Date: 8/23/21

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Shrub/Herb Strata

SAR number: S-MN22

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.43
Biogeochemical Cycling	0.41
Habitat	0.19

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.	2.53	0.65
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.40	0.20
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.	19.75	0.24
V_{HERB}	Average percent cover of herbaceous vegetation.	60.00	0.80
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.73	0.77

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

Team: **KB & TC** Latitude/UTM Northing: **37.297166**
 Project Name: **Mountain Valley Pipeline** Longitude/UTM Easting: **-80.386612**
 Location: **Montgomery County** Sampling Date: **8/23/21**
 SAR Number: **S-MN22** Reach Length (ft): **86** Stream Type: **Ephemeral 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. 2.5

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	5	3	1	5	3	1	3	2
1	5	1	3	1	1	1	5	5	1
1	5	1	3	4	5	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} . 0.40 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):

0.50	0.40	0.70	1.00	0.08	0.60	1.70	0.08	0.50	0.08
0.08	1.60	0.08	0.80	0.08	0.08	4.10	0.40	0.20	0.08
0.40	3.50	0.08	2.10	0.70	0.40	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. 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
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 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		1 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.	19.75 %																
		<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>30</td> <td>40</td> <td>10</td> <td>20</td> <td>20</td> <td>3</td> <td>20</td> <td>15</td> </tr> </table>	Left Side				Right Side				30	40	10	20	20	3	20	15	
Left Side				Right Side															
30	40	10	20	20	3	20	15												
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.	60 %																
		<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>70</td> <td>60</td> <td>5</td> <td>60</td> <td>80</td> <td>70</td> <td>50</td> <td>85</td> </tr> </table>	Left Side				Right Side				70	60	5	60	80	70	50	85	
Left Side				Right Side															
70	60	5	60	80	70	50	85												

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	0.73																																				
		<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>55</td> <td>55</td> </tr> <tr> <td>Forest and native range (>75% ground cover)</td> <td>1</td> <td>45</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 (<50% ground cover)	0.5	55	55	Forest and native range (>75% ground cover)	1	45	100																									
Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)																																				
Forest and native range (<50% ground cover)	0.5	55	55																																				
Forest and native range (>75% ground cover)	1	45	100																																				

S-MN22			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}	2.5	0.65	
V _{SUBSTRATE}	0.40 in	0.20	
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}	19.8 %	0.24	
V _{HERB}	60 %	0.80	
V _{WLUSE}	0.73	0.77	

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME _____	LOCATION _____	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
LAT _____ LONG _____	RIVER BASIN _____	
STORET # _____	AGENCY _____	
INVESTIGATORS _____		
FORM COMPLETED BY _____	DATE _____ TIME _____	REASON FOR SURVEY _____

WEATHER CONDITIONS	Now storm (heavy rain) _____ rain (steady rain) _____ showers (intermittent) _____ %cloud cover _____ clear/sunny _____	Past 24 hours _____%	Has there been a heavy rain in the last 7 days? Yes _____ No _____ Air Temperature _____ °C Other _____
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SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph) <div style="border: 1px solid black; padding: 10px; text-align: center;"> <small>Add Notes and a Site Sketch in this space:</small> </div>
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STREAM CHARACTERIZATION	Stream Subsystem Perennial _____ Intermittent _____ Tidal _____	Stream Type Coldwater _____ Warmwater _____
	Stream Origin Glacial _____ Non-glacial montane _____ Swamp and bog _____	Spring-fed _____ Mixture of origins _____ Other _____

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse Forest Field/Pasture Agricultural Residential Commercial Industrial Other _____	Local Watershed NPS Pollution No evidence <input type="checkbox"/> Some potential sources Obvious sources Local Watershed Erosion None Moderate Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present Trees Shrubs Grasses Herbaceous Dominant species present _____	
INSTREAM FEATURES	Estimated Reach Length _____ m Estimated Stream Width _____ m Sampling Reach Area _____ m ² Area in km ² (m ² x1000) _____ km ² Estimated Stream Depth _____ m Surface Velocity _____ m/sec (at thalweg)	Canopy Cover Partly open Partly shaded Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types Riffle _____% Run _____% Pool _____% Channelized Yes No Dam Present Yes No
LARGE WOODY DEBRIS	LWD _____ m ² Density of LWD _____ m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present Rooted emergent Rooted submergent Rooted floating Free floating Floating Algae Attached Algae Dominant species present _____ Portion of the reach with aquatic vegetation ____ %	
WATER QUALITY	Temperature _____ °C Specific Conductance _____ Dissolved Oxygen _____ pH _____ Turbidity _____ WQ Instrument Used _____	Water Odors Normal/None Sewage Petroleum Chemical Fishy Other _____ Water Surface Oils Slick Sheen Globes Flecks None Other _____ Turbidity (if not measured) Clear <input type="checkbox"/> Slightly turbid Turbid Opaque Stained Other _____
SEDIMENT/SUBSTRATE	Odors Normal Sewage Petroleum Chemical Anaerobic None Other _____ Oils Absent Slight Moderate Profuse Deposits Sludge Sawdust Paper fiber Sand Relict shells Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? Yes 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			Detritus	sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

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

STREAM NAME		LOCATION	
STATION # _____ RIVERMILE _____		STREAM CLASS	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS			
FORM COMPLETED BY		DATE _____ TIME _____ AM PM	REASON FOR SURVEY

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
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	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
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	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
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	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
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	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
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	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6

Parameters to be evaluated in sampling reach

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

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
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	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.					
SCORE	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 ____ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE ____ (RB)	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 ____ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE ____ (RB)	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 ____ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE ____ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			

Total Score _____

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS	LOT NUMBER	
FORM COMPLETED BY	DATE _____ TIME _____	REASON FOR SURVEY

HABITAT TYPES	Indicate the percentage of each habitat type present Cobble _____% Snags _____% Vegetated Banks _____% Sand _____% Submerged Macrophytes _____% Other (_____) _____%
SAMPLE COLLECTION	Gear used D-frame kick-net Other _____ How were the samples collected? wading from bank from boat Indicate the number of jabs/kicks taken in each habitat type. Cobble _____ Snags _____ Vegetated Banks _____ Sand _____ Submerged Macrophytes _____ Other (_____) _____
GENERAL COMMENTS	

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: Montgomery County
 Stream Name: UNT to Mill Creek
 HUC Code: 03010101
 Survey Date: 8/23/2021
 Surveyors: KB
 Type: Representative

Stream ID: S-MN22
 Basin: Upper Roanoke

PEBBLE COUNT							
Inches	PARTICLE	Millimeters		Particle Count	Total #	Item %	% Cum
	Silt/Clay	<.062	S/C	▲ ▼	66	66.00	66.00
	Very Fine	.062-.125	S A N D	▲ ▼	0	0.00	66.00
	Fine	.125-.25		▲ ▼	0	0.00	66.00
	Medium	.25-.5		▲ ▼	0	0.00	66.00
	Coarse	.50-1.0		▲ ▼	0	0.00	66.00
.04-.08	Very Coarse	1.0-2		▲ ▼	0	0.00	66.00
.08-.16	Very Fine	2-4		G R A V E L	▲ ▼	0	0.00
.16-.22	Fine	4-5.7	▲ ▼		8	8.00	74.00
.22-.31	Fine	5.7-8	▲ ▼		3	3.00	77.00
.31-.44	Medium	8-11.3	▲ ▼		3	3.00	80.00
.44-.63	Medium	11.3-16	▲ ▼		6	6.00	86.00
.63-.89	Coarse	16-22.6	▲ ▼		6	6.00	92.00
.89-1.26	Coarse	22.6-32	▲ ▼		1	1.00	93.00
1.26-1.77	Vry Coarse	32-45	▲ ▼		5	5.00	98.00
1.77-2.5	Vry Coarse	45-64	▲ ▼		0	0.00	98.00
2.5-3.5	Small	64-90	C O B B L E		▲ ▼	2	2.00
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 Mill Creek
 Reach Name: S-MN22
 Sample Name: Representative
 Survey Date: 08/23/2021

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	66	66.00	66.00
0.062 - 0.125	0	0.00	66.00
0.125 - 0.25	0	0.00	66.00
0.25 - 0.50	0	0.00	66.00
0.50 - 1.0	0	0.00	66.00
1.0 - 2.0	0	0.00	66.00
2.0 - 4.0	0	0.00	66.00
4.0 - 5.7	8	8.00	74.00
5.7 - 8.0	3	3.00	77.00
8.0 - 11.3	3	3.00	80.00
11.3 - 16.0	6	6.00	86.00
16.0 - 22.6	6	6.00	92.00
22.6 - 32.0	1	1.00	93.00
32 - 45	5	5.00	98.00
45 - 64	0	0.00	98.00
64 - 90	2	2.00	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)	0.02
D35 (mm)	0.03
D50 (mm)	0.05
D84 (mm)	14.43
D95 (mm)	37.2
D100 (mm)	90
Silt/Clay (%)	66
Sand (%)	0
Gravel (%)	32
Cobble (%)	2
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100.

Ephemeral Stream Assessment Form (Form 1a)

Unified Stream Methodology for use in Virginia

For use in ephemeral streams

Project #	Project Name	Locality	Cowardin Class.	HUC	Date	SAR #	Impact Length	Impact Factor
22865.06	Mountain Valley Pipeline (Mountain Valley Pipeline, LLC)	Montgomery County	R6	03010101	8/23/2021	S-MN22	96	1
Name(s) of Evaluator(s)		Stream Name and Information					SAR Length	
KB & TC		UNT to Mill Creek					104	

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			
Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and a non-maintained understory. Wetlands 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% 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 non-maintained 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.		
Condition 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						CI = (Sum % RA * Scores*0.01)/2	
Right Bank	% Riparian Area >	100%						100%	
	Score >	0.75							
Left Bank	% Riparian Area >	100%						100%	Rt Bank CI > 0.75
	Score >	0.75							Lt Bank CI > 0.75

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) >>	0.38
RCI = (Riparian CI)/2	
COMPENSATION REQUIREMENT (CR) >>	36
CR = RCI X LF X IF	

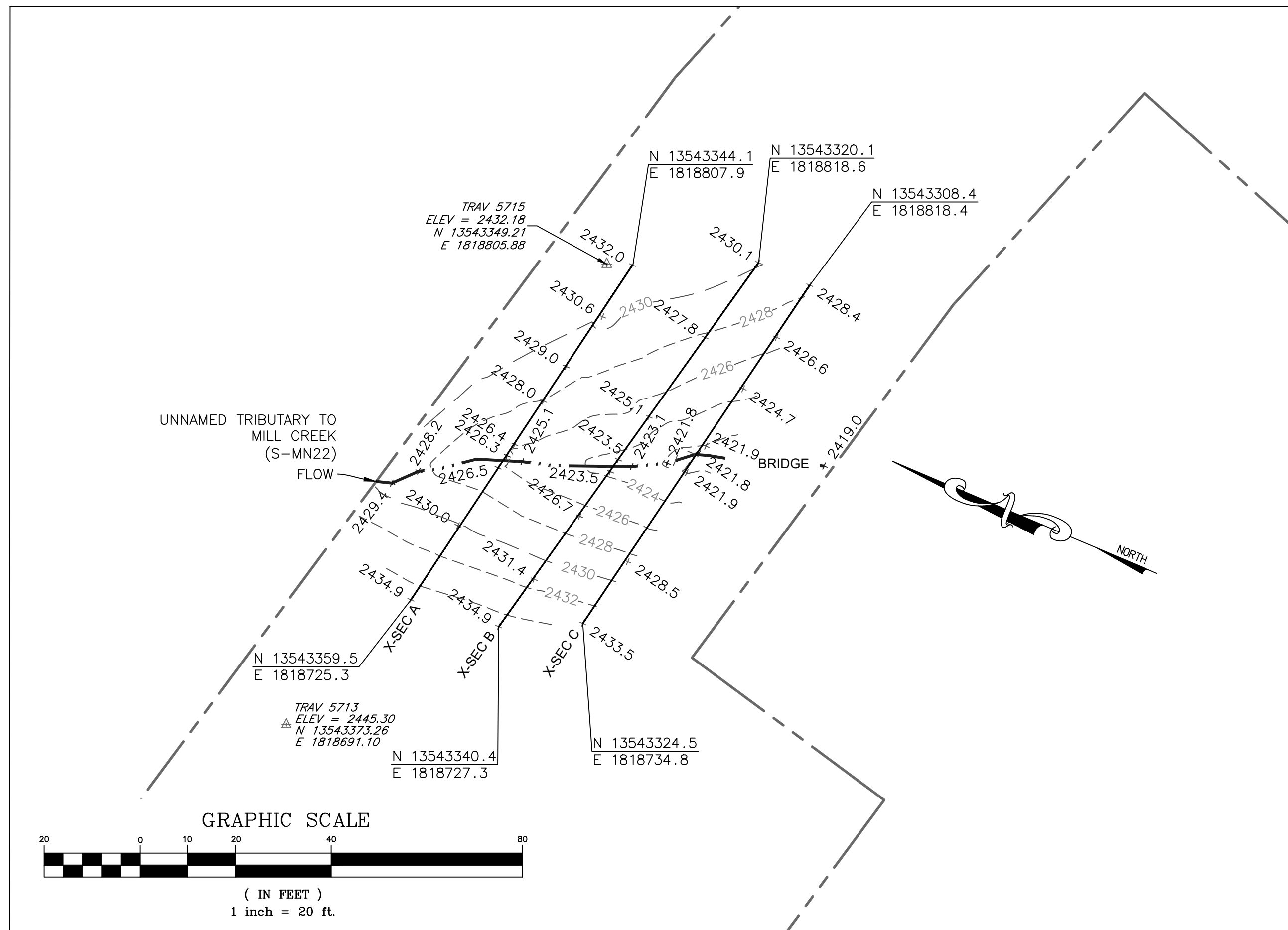
INSERT PHOTOS:

(WSSI Photo Location L:\22000s\22800\22865.06\Admin\05-ENVR\Field Data\Spread G\Field Forms\S-MN22\Photos\IMG_0532.JPG)



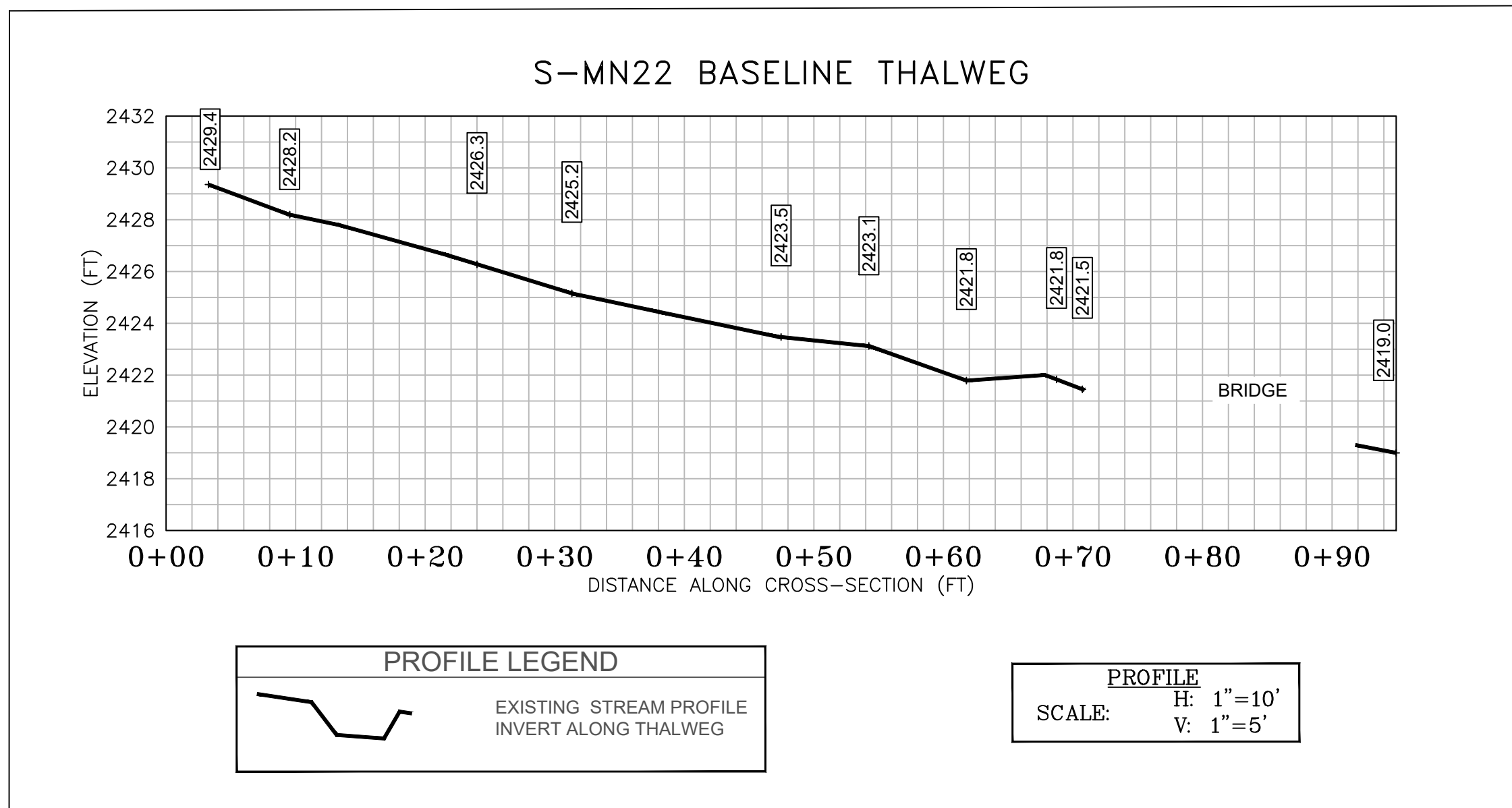
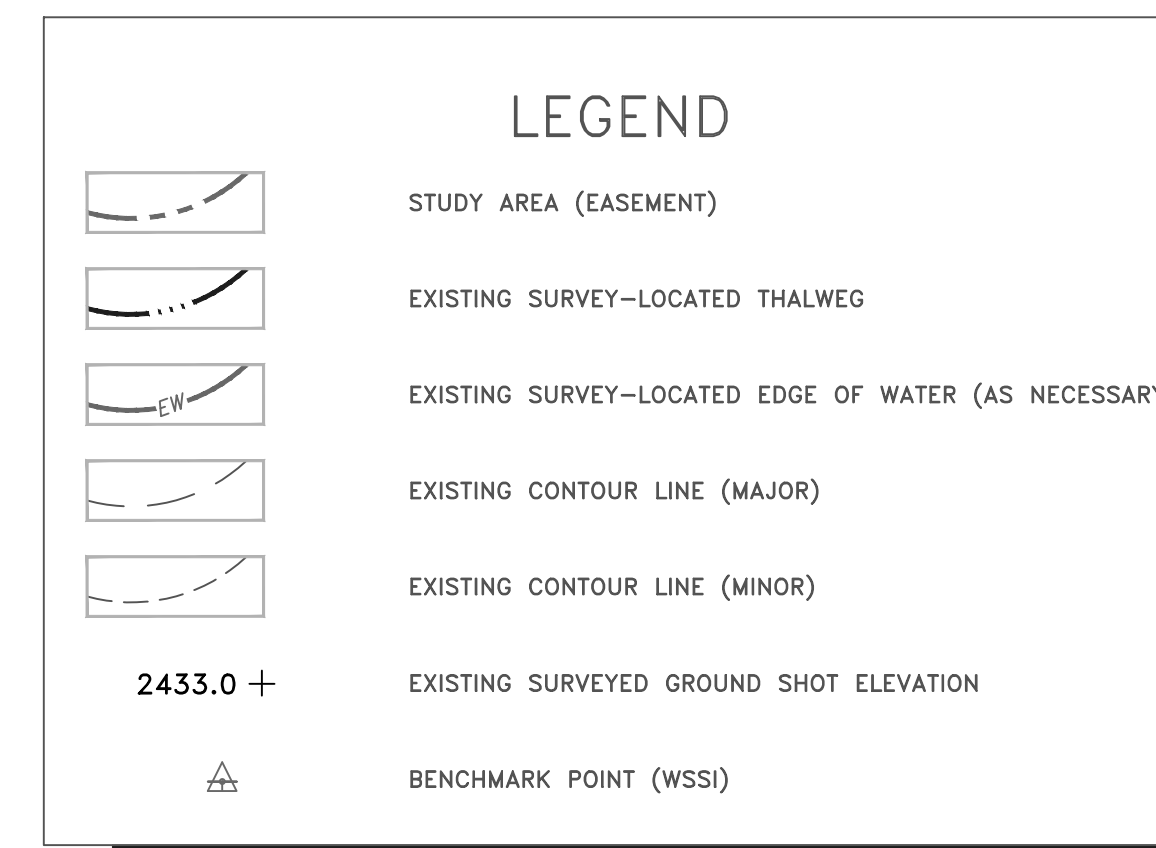
A view downstream facing S. Assessment is limited to areas within the temporary ROW.

DESCRIBE PROPOSED IMPACT:



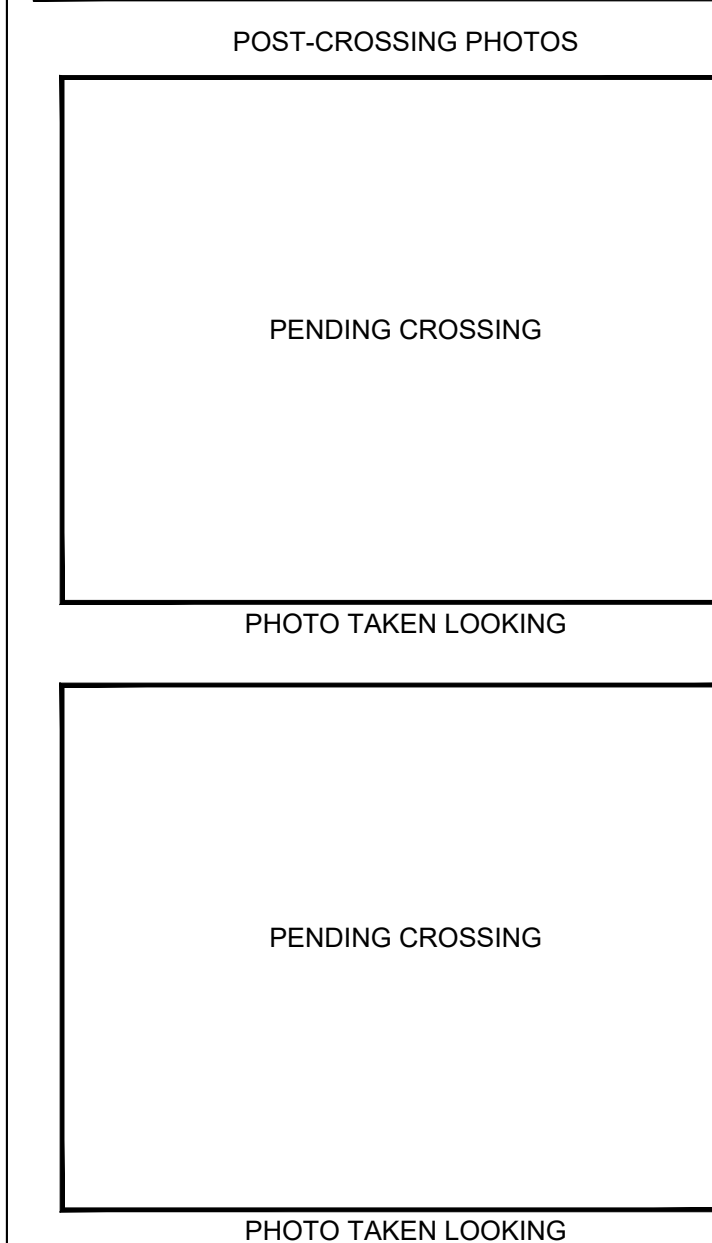
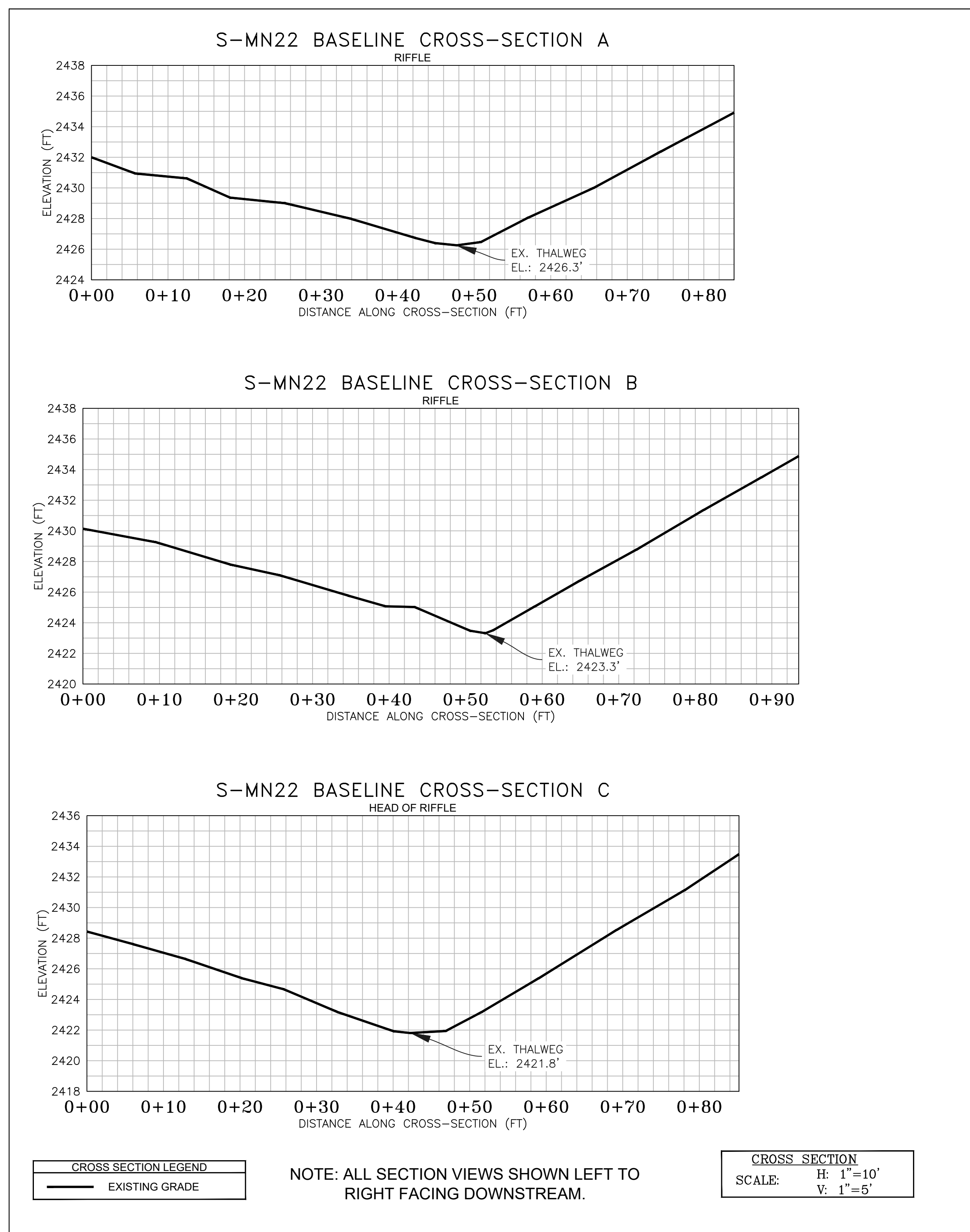
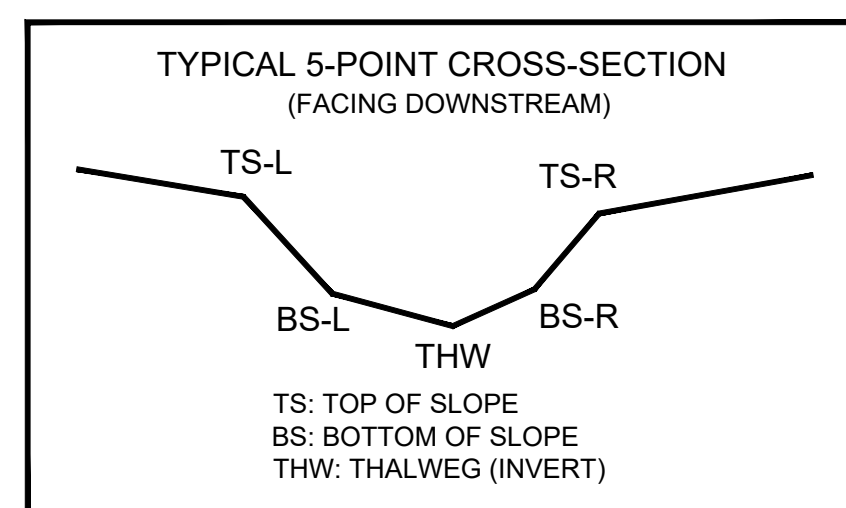
SURVEY NOTES:

- This map has been oriented to NAD 1983 UTM ZONE 17N, and vertically to the North American Vertical Datum of 1988 (NAVD 88), using a Real Time Network (RTN) GPS. Field locations were completed on July 3, 2019.
- Monumentation, including traverse stations and fly points, shown on this drawing should be used to orient any future boundary, topographic, or location survey.
- Easement lines shown on plan view were provided by Mountain Valley Pipeline (MVP).
- WSSI Contour Interval = 2.0'. Contours within the channel were interpolated using stream channel breaklines (i.e. top of slopes, toe of slopes, thalweg) and cross-sectional points. Contours outside the channel were interpolated using cross-sectional spot shots.
- All section views shown are left to right facing downstream.
- Cross-section B shot at location of pipe centerline (based on best professional judgement).



CL STAKEOUT POINTS: S-MN22 CROSS SECTION B (PIPE CL)

PT. LOC.	PRE-CROSSING			POST-CROSSING	
	NORTHING	EASTING	ELEV.	VERT. DIFF.	HORZ. DIFF.
TS-L	13543325.83	1818793.43	2427.09	----	----
BS-L	13543330.99	1818769.21	2423.48	----	----
THW	13543331.39	1818767.24	2423.32	----	----
BS-R	13543331.54	1818766.26	2423.50	----	----
TS-R	13543333.82	1818755.17	2426.74	----	----



REVISIONS

No.	Date	Description	Rev. By	App. By

Horizontal Datum: NAD 1983 UTM ZONE 17N
Vertical Datum: NAVD 88
Boundary and Topo Source: MVP
WSSI 2' C.I. Topo

Design	Draft	Approved
PFS	JSF	NAS

DATE: September, 2021 SCALE: AS NOTED

Sheet #
1 of 1

Computer File Name:
L:\Projects\22066_22066_Crossing\22066_Crossing\22066_Crossing.dwg
22066_03-6-6-MP-208-227-Stream_2.dwg