Baseline Assessment - Stream Attributes

Reach S-PP23 (Timber Mat Crossing)
Ephemeral
Spread H
Montgomery County, Virginia

Data	Included
Photos	✓
SWVM Form	✓
FCI Calculator and HGM Form	✓
RBP Physical Characteristics Form	✓
Water Quality Data	N/A – No water present
RBP Habitat Form	✓
RBP Benthic Form	✓
Benthic Identification Sheet	N/A – No water present
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 SW, AO

Photo Type: US VIEW
Location, Orientation, Photographer Initials: Upstream view of ROW looking NE, AO

Photo Type: LB CL
Location, Orientation, Photographer Initials: Standing on LB looking at RB along pipe centerline looking NW, AO

Photo Type: RB CL
Location, Orientation, Photographer Initials: Standing on RB looking at LB along pipe centerline looking SE, AO

Photo Type: DS COND
Location, Orientation, Photographer Initials: Downstream conditions outside of ROW looking N, AO

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USACE FILE NO./ Project Name: (v2.1, Sept 2015)	Mountain Valley Pipeline	IMPACT COORDINATES: (in Decimal Degrees)	Lat.	37.264858	Lon.	-80.307151	WEATHER:	Sunny	DATE:	August 24, 2021
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)	S-PP23	MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)							Comments:	
STREAM IMPACT LENGTH:	20	FORM OF MITIGATION:	RESTORATION (Levels I-III)	MIT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		PRECIPITATION PAST 48 HRS:	None	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	17.55		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	0.52		Hydrology			Hydrology			Hydrology			Hydrology		
Biogeochemical Cycling	0.55	0.47	Biogeochemical Cycling		0	Biogeochemical Cycling		0	Biogeochemical Cycling		0	Biogeochemical Cycling		0
Habitat	0.34		Habitat			Habitat			Habitat			Habitat		
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	Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)															
USEPA RBP (High Gradient Data Sheet)															
1. Epifaunal Substrate/Available Cover	0-20		0	0-20			0-20			0-20			0-20		
2. Embeddedness	0-20		13	0-20			0-20			0-20			0-20		
3. Velocity/ Depth Regime	0-20		0	0-20			0-20			0-20			0-20		
4. Sediment Deposition	0-20		12	0-20			0-20			0-20			0-20		
5. Channel Flow Status	0-20	0-1	0	0-20	0-1		0-20	0-1		0-20	0-1		0-20	0-1	
6. Channel Alteration	0-20		20	0-20			0-20			0-20			0-20		
7. Frequency of Riffles (or bends)	0-20		0	0-20			0-20			0-20			0-20		
8. Bank Stability (LB & RB)	0-20		4	0-20			0-20			0-20			0-20		
9. Vegetative Protection (LB & RB)	0-20		13	0-20			0-20			0-20			0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		16	0-20			0-20			0-20			0-20		
Total RBP Score	Suboptimal		78	Poor		0	Poor		0	Poor		0	Poor		0
Sub-Total			0.65			0			0			0			0
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)															
WVDEP Water Quality Indicators (General)															
Specific Conductivity															
100-199 - 85 points	0-90			0-90			0-90			0-90			0-90		
pH		0-1			0-1			0-1			0-1			0-1	
5.6-5.9 = 45 points	0-80			5-90			5-90			5-90			5-90		
DO															
	10-30			10-30			10-30			10-30			10-30		
Sub-Total						0			0			0			0
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)															
WV Stream Condition Index (WVSCI)															
0	0-100	0-1		0-100	0-1		0-100	0-1		0-100	0-1		0-100	0-1	
Sub-Total			0			0			0			0			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	Unit Score	Index	Linear Feet	Unit Score	Index	Linear Feet	Unit Score	Index	Linear Feet	Unit Score	Index	Linear Feet	Unit Score
0.598	20	11.95	0	0	0	0	0	0	0	0	0	0	0	0

Ver. 10-20-17

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 $V_{CCANOPY}$ (≥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; Spread H
Sampling Date: 8/24/2021

Project Site | Before Project

Subclass for this SAR:
Ephemeral Stream

Uppermost stratum present at this SAR:
Shrub/Herb Strata

SAR number: S-PP23

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.52
Biogeochemical Cycling	0.55
Habitat	0.34

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canpoy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	3.08	0.85
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.95	0.48
V_{BERO}	Total percent of eroded stream channel bank.	173.77	0.14
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.	31.15	0.48
V_{SRICH}	Riparian vegetation species richness.	3.28	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	24.17	0.29
V_{HERB}	Average percent cover of herbaceous vegetation.	71.67	0.96
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.93	0.98

Version 10-20-17

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

Team:	AO, MM	Latitude/UTM Northing:	37.264858
Project Name:	Mountain Valley Pipeline	Longitude/UTM Easting:	-80.307151
Location:	Montgomery County; Spread H	Sampling Date:	8/24/2021

SAR Number: S-PP23 Reach Length (ft): 61 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.

3.1

Measure at least 30 points

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

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

List the ratings at each point below:

1	1	4	3	1	5	4	1	3	4
3	3	3	4	3	1	4	4	4	4
1	4	5	4						

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}.

0.95 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	1.80	5.70	0.08	99.00	1.90	0.50	1.95	1.00
0.20	7.00	3.20	0.90	0.80	0.08	4.60	0.40	1.30	1.90
0.08	0.50	0.25	1.30						

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%.

174 %

Left Bank: 53 ft Right Bank: 53 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.

31.1

Left Side: 13 Right Side: 6

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.	3.28

Group 1 = 1.0		Group 2 (-1.0)	
☐ *Acer rubrum*	☐ *Magnolia tripetala*	☐ *Ailanthus altissima*	☐ *Lonicera japonica*
☐ *Acer saccharum*	☐ *Nyssa sylvatica*	☐ *Albizia julibrissin*	☐ *Lonicera tatarica*
☐ *Aesculus flava*	☐ *Oxydendrum arboreum*	☐ *Alliaria petiolata*	☐ *Lotus corniculatus*
☐ *Asimina triloba*	☐ *Prunus serotina*	☐ *Alternanthera philoxeroides*	☐ *Lythrum salicaria*
☐ *Betula alleghaniensis*	☑ *Quercus alba*		☐ *Microstegium vimineum*
☐ *Betula lenta*	☐ *Quercus coccinea*	☐ *Aster tataricus*	☐ *Paulownia tomentosa*
☐ *Carya alba*	☐ *Quercus imbricaria*	☐ *Cerastium fontanum*	☐ *Polygonum cuspidatum*
☐ *Carya glabra*	☐ *Quercus prinus*	☐ *Coronilla varia*	☐ *Pueraria montana*
☐ *Carya ovalis*	☐ *Quercus rubra*	☐ *Elaeagnus umbellata*	☐ *Rosa multiflora*
☐ *Carya ovata*	☐ *Quercus velutina*	☐ *Lespedeza bicolor*	☐ *Sorghum halepense*
☐ *Cornus florida*	☐ *Sassafras albidum*	☐ *Lespedeza cuneata*	☐ *Verbena brasiliensis*
☐ *Fagus grandifolia*	☐ *Tilia americana*	☐ *Ligustrum obtusifolium*	
☐ *Fraxinus americana*	☐ *Tsuga canadensis*	☐ *Ligustrum sinense*	
☑ *Liriodendron tulipifera*	☐ *Ulmus americana*		
☐ *Magnolia acuminata*			
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.	24.17 %

Left Side				Right Side			
5	30	40		15	5	50	

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.	72 %

Left Side				Right Side			
95	50	50		90	95	50	

Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	0.93

Land Use (Choose From Drop List)	Runoff Score	% in Catch-ment	Running Percent (not >100)
Forest and native range (<50% ground cover)	0.5	14	14
Forest and native range (>75% ground cover)	1	86	100

S-PP23

Variable	Value	VSI
$V_{CCANOPY}$	Not Used, <20%	Not Used
V_{EMBED}	3.1	0.85
$V_{SUBSTRATE}$	0.95 in	0.48
V_{BERO}	174 %	0.14
V_{LWD}	0.0	0.00
V_{TDBH}	Not Used	Not Used
V_{SNAG}	0.0	0.10
V_{SSD}	31.1	0.48
V_{SRICH}	3.28	1.00
$V_{DETRITUS}$	24.2 %	0.29
V_{HERB}	72 %	0.96
V_{WLUSE}	0.93	0.98

Notes:

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.

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME S-PP23	LOCATION Montgomery County	
STATION # 12035+75 RIVERMILE	STREAM CLASS Ephemeral	
LAT 37.264858 LONG -80.307151	RIVER BASIN Upper Roanoke	
STORET #	AGENCY VADEQ	
INVESTIGATORS AO, MM		
FORM COMPLETED BY AO, MM	DATE 8/24/2021 TIME 10:53am	REASON FOR SURVEY Baseline Assessment

WEATHER CONDITIONS

Now		Past 24 hours
	storm (heavy rain)	
	rain (steady rain)	
	showers (intermittent)	
____%	%cloud cover	☑ 30 %
☑	clear/sunny	

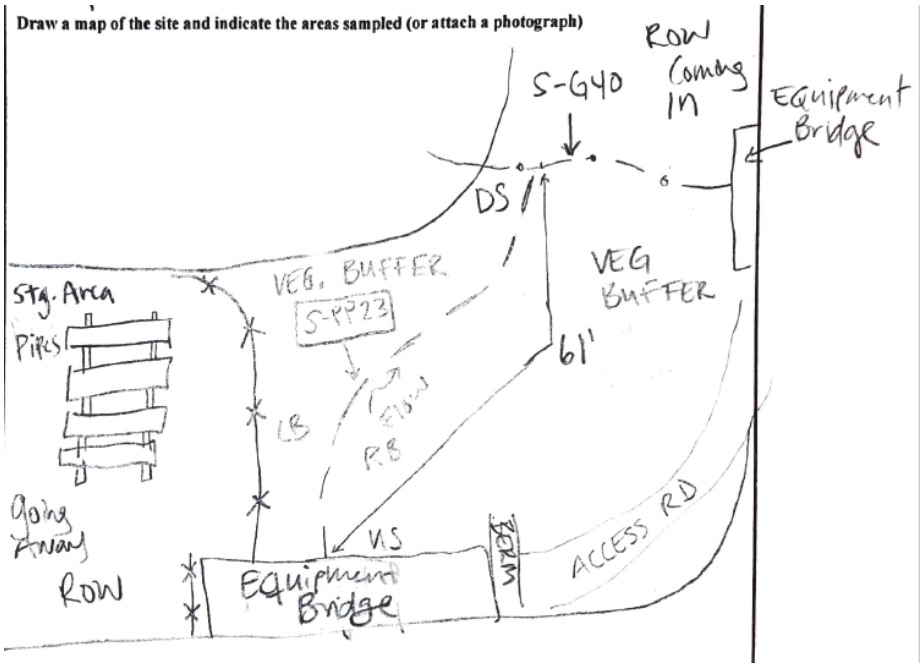
Has there been a heavy rain in the last 7 days? ☐ Yes ☑ No

Air Temperature 28 ^{0} C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



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_____

Catchment Area 0.07 km^2

Notes: No water present.

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☑ Other maintained ROW
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ 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 wild bergamont

INSTREAM FEATURES

Estimated Reach Length 18.6 m

Estimated Stream Width 1.4 m

Sampling Reach Area 26.5 m^2

Area in km^2 (m^2x1000) _____ km^2

Estimated Stream Depth _____ m

Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☑ Partly open ☐ Partly shaded ☐ Shaded

High Water Mark 0.3 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 (DS, US)

Temperature N/A ^{0} C

Specific Conductance N/A

Dissolved Oxygen N/A

pH N/A

Turbidity N/A

WQ Instrument Used N/A

Water Odors
☐ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs Flecks
☐ None ☐ Other _____

Turbidity (if not measured)
☐ Clear ☐ 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		10	Detritus	sticks, wood, coarse plant materials (CPOM)	15
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	20	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	60			
Sand	0.06-2mm (gritty)	2	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	4			
Clay	< 0.004 mm (slick)	4			

Notes: No water present. Water quality measurements not taken.

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

STREAM NAME S-PP23	LOCATION Montgomery County	
STATION # 12035+75 RIVERMILE	STREAM CLASS Ephemeral	
LAT 37.264858 LONG -80.307151	RIVER BASIN Upper Roanoke	
STORET #	AGENCY VADEQ	
INVESTIGATORS AO, MM		
FORM COMPLETED BY AO, MM	DATE 8/24/2021 TIME 10:53am AM PM	REASON FOR SURVEY Baseline Assessment

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

Notes: No flow.

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

Parameters to be evaluated broader than sampling reach

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	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 0	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.	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.
SCORE 2	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 2	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 6	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 8	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 78

Notes: No flow.

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME S-PP23	LOCATION Montgomery County	
STATION # 12035+75 RIVERMILE_____	STREAM CLASS Ephemeral	
LAT 37.264858 LONG -80.307151	RIVER BASIN Upper Roanoke	
STORET #	AGENCY VADEQ	
INVESTIGATORS AO, MM		LOT NUMBER
FORM COMPLETED BY AO, MM	DATE 8/24/2021 TIME 10:53am	REASON FOR SURVEY Baseline Assessment

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	No flow.

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

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

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

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

WOLMAN PEBBLE COUNT FORM

County:	Montgomery County	Stream ID:	S-PP23
Stream Name:	UNT to North Fork Roanoke River		
HUC Code:	03010101	Basin:	Upper Roanoke
Survey Date:	8/24/2021		
Surveyors:	AO, MM		
Type:	Representative		

PEBBLE COUNT							
Inches	PARTICLE	Millimeters		Particle Count	**Total #**	**Item %**	**% Cum**
	Silt/Clay	< .062	S/C		3	3.00	3.00
	Very Fine	.062-.125	SAND		0	0.00	3.00
	Fine	.125-.25			0	0.00	3.00
	Medium	.25-.5			0	0.00	3.00
	Coarse	.50-1.0			0	0.00	3.00
.04-.08	Very Coarse	1.0-2			1	1.00	4.00
.08 -.16	Very Fine	2 -4	GRAVEL		3	3.00	7.00
.16 - .22	Fine	4 -5.7			2	2.00	9.00
.22 - .31	Fine	5.7 - 8			3	3.00	12.00
.31 - .44	Medium	8 -11.3			10	10.00	22.00
.44 - .63	Medium	11.3 - 16			8	8.00	30.00
.63 - .89	Coarse	16 -22.6			9	9.00	39.00
.89 - 1.26	Coarse	22.6 - 32			15	15.00	54.00
1.26 - 1.77	Vry Coarse	32 - 45			10	10.00	64.00
1.77 -2.5	Vry Coarse	45 - 64			9	9.00	73.00
2.5 - 3.5	Small	64 - 90	COBBLE		9	9.00	82.00
3.5 - 5.0	Small	90 - 128			7	7.00	89.00
5.0 - 7.1	Large	128 - 180			3	3.00	92.00
7.1 - 10.1	Large	180 - 256			0	0.00	92.00
10.1 - 14.3	Small	256 - 362	BOULDER		0	0.00	92.00
14.3 - 20	Small	362 - 512			0	0.00	92.00
20 - 40	Medium	512 - 1024			0	0.00	92.00
40 - 80	Large	1024 -2048			0	0.00	92.00
80 - 160	Vry Large	2048 -4096			0	0.00	92.00
	Bedrock		BDRK		8	8.00	100.00
				Totals	100		
	Total Tally:						

RIVERMORPH PARTICLE SUMMARY

River Name: UNT to North Fork Roanoke River
Reach Name: S-PP23
Sample Name: Representative
Survey Date: 08/24/2021

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	3	3.00	3.00
0.062 - 0.125	0	0.00	3.00
0.125 - 0.25	0	0.00	3.00
0.25 - 0.50	0	0.00	3.00
0.50 - 1.0	0	0.00	3.00
1.0 - 2.0	1	1.00	4.00
2.0 - 4.0	3	3.00	7.00
4.0 - 5.7	2	2.00	9.00
5.7 - 8.0	3	3.00	12.00
8.0 - 11.3	10	10.00	22.00
11.3 - 16.0	8	8.00	30.00
16.0 - 22.6	9	9.00	39.00
22.6 - 32.0	15	15.00	54.00
32 - 45	10	10.00	64.00
45 - 64	9	9.00	73.00
64 - 90	9	9.00	82.00
90 - 128	7	7.00	89.00
128 - 180	3	3.00	92.00
180 - 256	0	0.00	92.00
256 - 362	0	0.00	92.00
362 - 512	0	0.00	92.00
512 - 1024	0	0.00	92.00
1024 - 2048	0	0.00	92.00
Bedrock	8	8.00	100.00

D16 (mm)	9.32
D35 (mm)	19.67
D50 (mm)	29.49
D84 (mm)	100.86
D95 (mm)	Bedrock
D100 (mm)	Bedrock
Silt/Clay (%)	3
Sand (%)	1
Gravel (%)	69
Cobble (%)	19
Boulder (%)	0
Bedrock (%)	8

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	8/24/2021	S-PP23	20	1

Name(s) of Evaluator(s)	Stream Name and Information	SAR Length
AO, MM	Unnamed Tributary to North Fork Roanoke River	70

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

Conditional Category								NOTES>>
	Optimal	Suboptimal		Marginal		Poor		
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and an 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.	
		High	Low	High	Low	High	Low	
Condition Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5	

1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors.
2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below.
3. Enter the % Riparian Area and Score for each riparian category in the blocks below.

Ensure the sums of % Riparian Blocks equal 100

Right Bank	% Riparian Area>	85%	10%	5%				100%			
	Score >	0.75	0.6	1.5							
									CI= (Sum % RA * Scores*0.01)/2		
Left Bank	% Riparian Area>	85%	10%	5%				100%	Rt Bank CI >	0.77	CI
	Score >	0.75	1.2	0.6					Lt Bank CI >	0.79	0.78

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) >>	0.39

RCI= (Riparian CI)/2

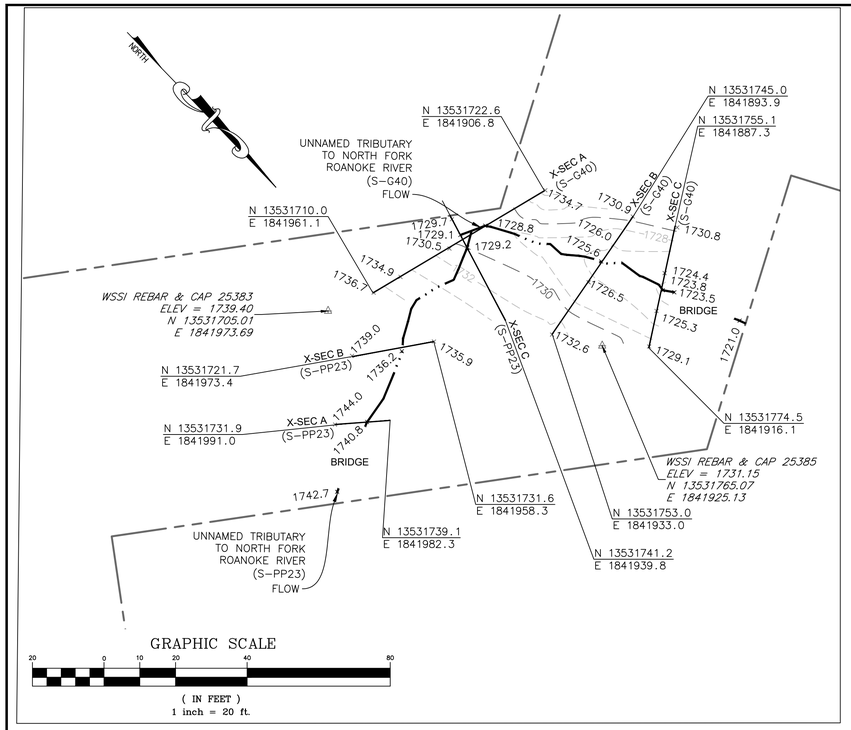
COMPENSATION REQUIREMENT (CR) >>	8

CR = RCI X LF X IF

INSERT PHOTOS:

(WSSI Photo Location L:\22000s\22800\22865.06\Admin\05-ENVR\Field Data\Spread H\Field Forms\S-PP23\Photos\US VIEW.JPG)

Upstream view of ROW looking NE. Assessment is limited to areas within the temporary ROW.



SURVEY NOTES:

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 a Real Time Network (RTN) GPS. Field locations were completed on October 10, 2018 and October 7, 2021.

2. Monumentation, including traverse stations and fly points, shown on this drawing should be used to orient any future boundary, topographic, or location survey.

3. Easement lines shown on plan view were provided by Mountain Valley Pipeline (MVP).

4. 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.

5. Profile and cross-section data shown hereon is based on post-pipeline installation to convey the baseline assessment data requested. Information regarding pre-crossing and restoration conditions will be provided to the agencies as applicable.

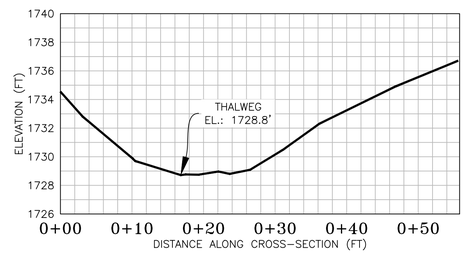
6. All section views shown are left to right facing downstream.

7. S-G40 and S-PP23 cross-section B shot at location of pipe centerline (based on field stakes).

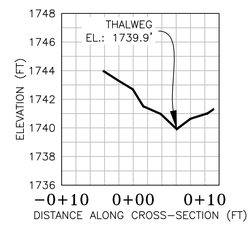
LEGEND

- STUDY AREA (EASEMENT)
- EXISTING SURVEY-LOCATED THALWEG
- EW — EXISTING SURVEY-LOCATED EDGE OF WATER (AS NECESSARY)
- EXISTING CONTOUR LINE (MAJOR)
- EXISTING CONTOUR LINE (MINOR)
- 1736.8 + EXISTING SURVEYED GROUND SHOT ELEVATION
- BENCHMARK POINT (WSSI)

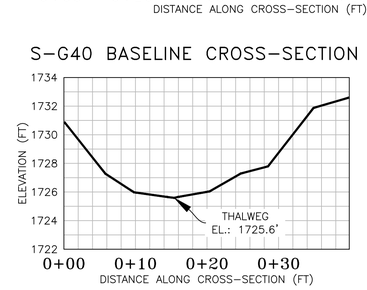
S-G40 BASELINE CROSS-SECTION A



S-PP23 BASELINE XSEC A



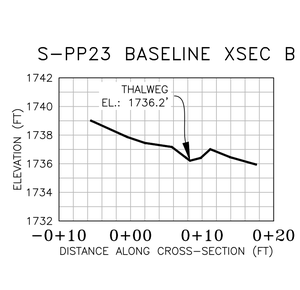
S-G40 BASELINE CROSS-SECTION B



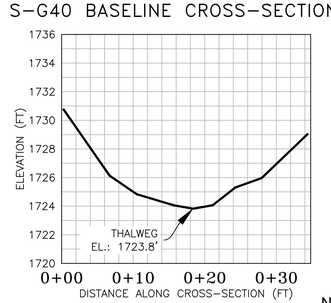
CROSS SECTION
SCALE: H: 1"=10'
V: 1"=5'

CROSS SECTION LEGEND
EXISTING GRADE

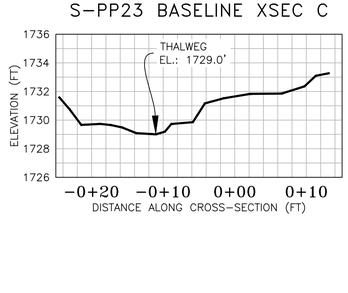
S-PP23 BASELINE XSEC B



S-G40 BASELINE CROSS-SECTION C

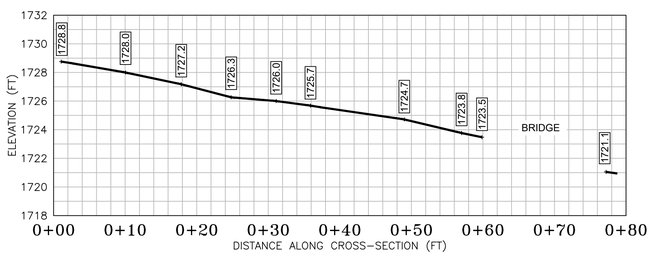


S-PP23 BASELINE XSEC C

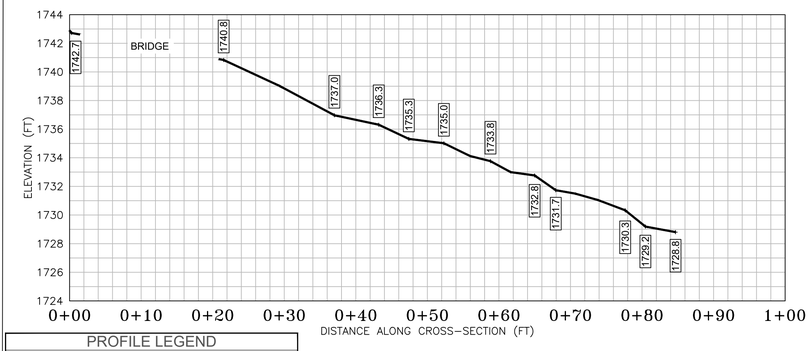


NOTE: ALL SECTION VIEWS SHOWN LEFT TO RIGHT FACING DOWNSTREAM.

S-G40 BASELINE THALWEG PROFILE



S-PP23 BASELINE THALWEG



PROFILE LEGEND
EXISTING STREAM PROFILE
INVERT ALONG THALWEG

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

CROSSING PHOTOS

PHOTO TAKEN LOOKING UPSTREAM ON 10/01/2018

PHOTO TAKEN LOOKING DOWNSTREAM ON 10/01/2018

POST-CROSSING PHOTOS

PENDING CROSSING

PHOTO TAKEN LOOKING UPSTREAM ON

PENDING CROSSING

PHOTO TAKEN LOOKING DOWNSTREAM ON

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Profile and Cross-Sections Baseline Survey

Prepared For: MVP

Crossing S-G40 & S-PP23 - UNT to N. Fork Roanoke River (MP 227.8)

Montgomery County, Virginia

REVISIONS

No.	Date	Description	Rev. By	App. By

SCALE: AS NOTED

DATE: October 2021

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	TLK	PFS

Sheet #
1 of 1

Computer File Name:
L:\Survey\22000s\22065\03\Spread H Work Dwgs\NW12 Crossing Sheets dwgs 22065_03-S-01 MP 227-240 Sheets G40-C.mxs.dwg