Baseline Assessment – Stream Attributes

Reach S-GH40 (Pipeline ROW)
Ephemeral
Spread I
Franklin County, Virginia

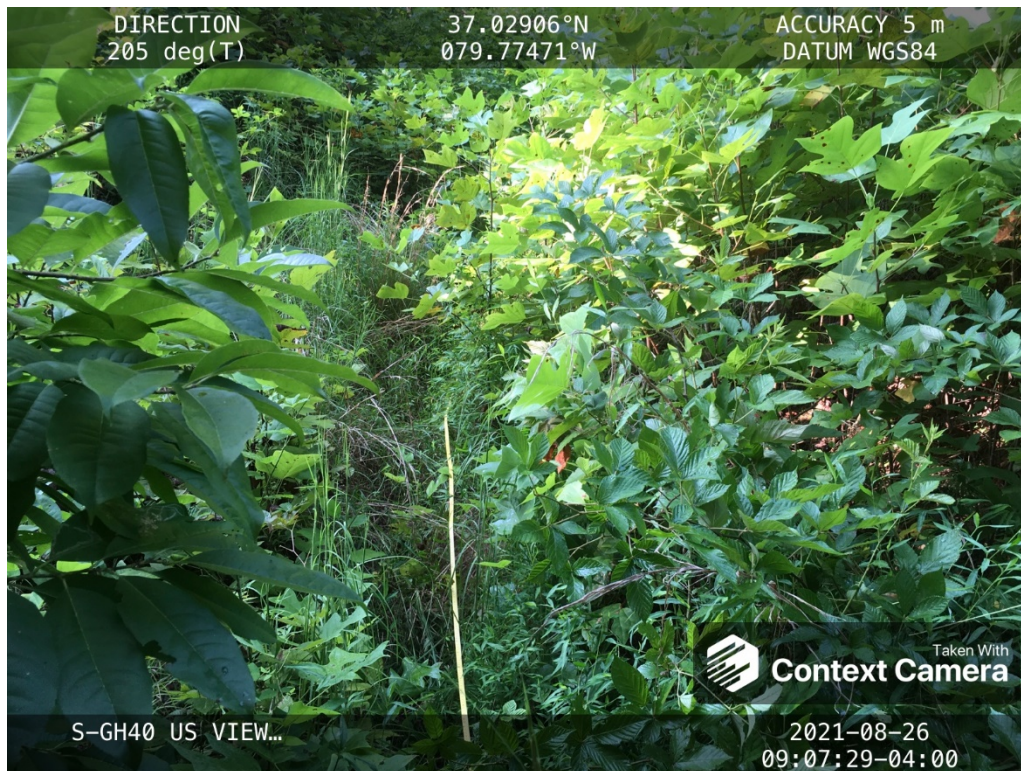| Data	Included
Photos	✓
SWVM Form	✓
FCI Calculator and HGM Form	✓
RBP Physical Characteristics Form	✓
Water Quality Data	N/A – No flow
RBP Habitat Form	✓
RBP Benthic Form	✓
Benthic Identification Sheet	N/A – No flow
Wolman Pebble Count	✓
RiverMorph Data Sheet	✓
USM Form (Virginia Only)	✓
Longitudinal Profile and Cross Sections	✓

Photo Type: US VIEW
Location, Orientation, Photographer Initials: Downstream at ROW/LOC looking SW upstream, VM

Photo Type: DS COND DS
Location, Orientation, Photographer Initials: Downstream at ROW/LOC looking NE downstream, VM

Photo Type: LB CL
Location, Orientation, Photographer Initials: On thalweg at pipe centerline looking SE at left streambank, VM

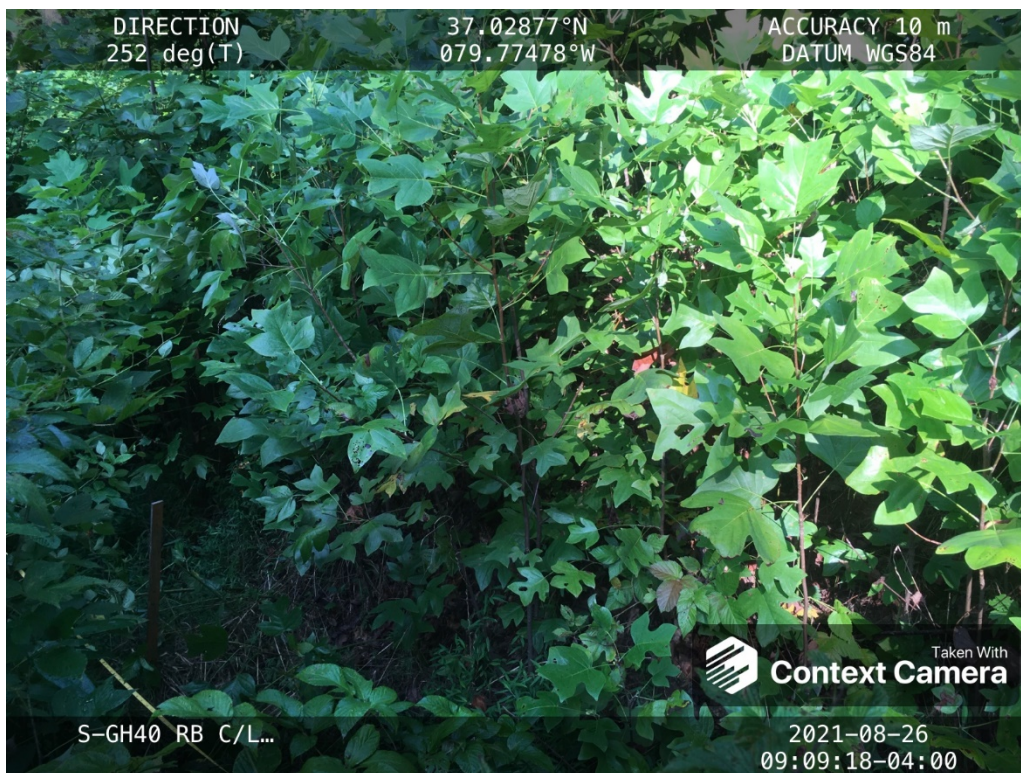Photo Type: RB CL
Location, Orientation, Photographer Initials: On thalweg at pipe centerline looking SW at right streambank, VM
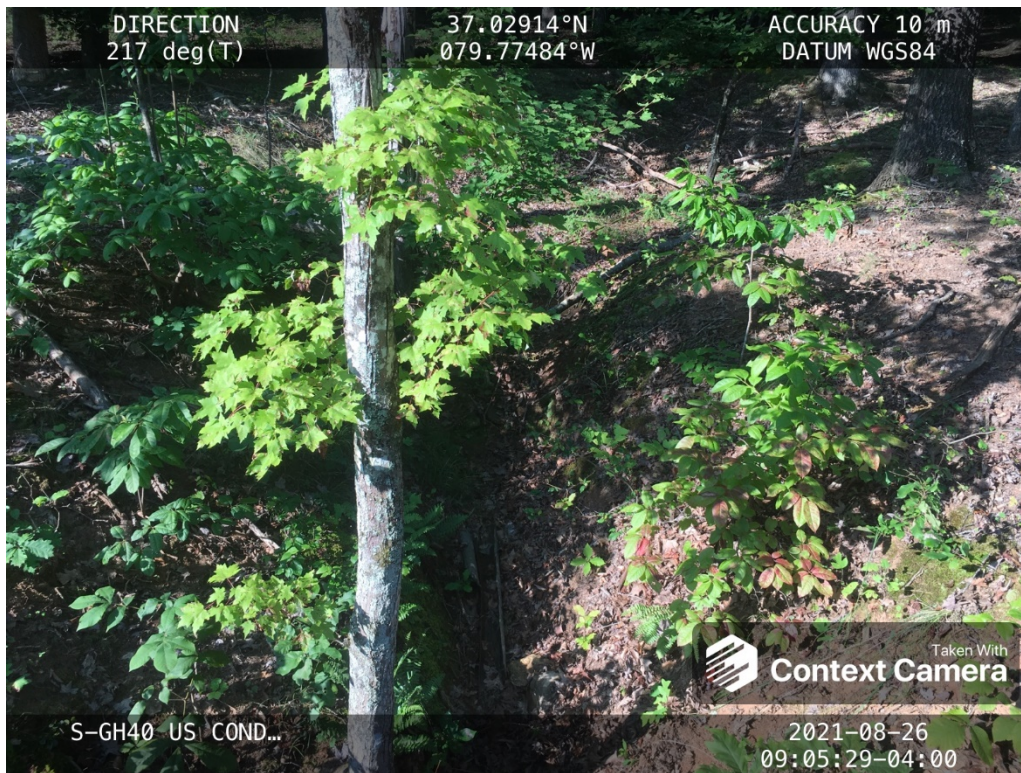
Photo Type: US COND
Location, Orientation, Photographer Initials: Upstream at ROW/LOC looking SW upstream, VM

Photo Type: DS VIEW
Location, Orientation, Photographer Initials: Upstream at ROW/LOC looking NE downstream, VM

West Virginia Stream and Wetland Valuation Metric (SWVM)
Version 2.1, September 2017

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	Mountain Valley Pipeline		IMPACT COORDINATES: (in Decimal Degrees)	Lat.	37.028893	Lon.	-79.774785		WEATHER:	Sunny	DATE:	August 26, 2021

IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)	S-GH40; 5.68 ac	MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)		Comments:

STREAM IMPACT LENGTH:	89	FORM OF MITIGATION:	RESTORATION (Levels I-III)	MIT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		PRECIPITATION PAST 48 HRS:	No	Mitigation Length:

Column No. 1- Impact Existing Condition (Debit)

Stream Classification: Ephemeral

Percent Stream Channel Slope: 5.1

HGM Score (attach data forms):

		Average
Hydrology	0.51	0.33
Biogeochemical Cycling	0.39	
Habitat	0.09	

PART I - Physical, Chemical and Biological Indicators

	Points Scale	Range	Site Score

PHYSICAL INDICATOR (Applies to all streams classifications)

USEPA RBP (High Gradient Data Sheet)

	Points Scale	Range	Site Score
1. Epifaunal Substrate/Available Cover	0-20		0
2. Embeddedness	0-20		4
3. Velocity/ Depth Regime	0-20		0
4. Sediment Deposition	0-20		16
5. Channel Flow Status	0-20	0-1	0
6. Channel Alteration	0-20		10
7. Frequency of Riffles (or bends)	0-20		0
8. Bank Stability (LB & RB)	0-20		18
9. Vegetative Protection (LB & RB)	0-20		14
10. Riparian Vegetative Zone Width (LB & RB)	0-20		18
Total RBP Score	Suboptimal		80
Sub-Total		0.66666667	

CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WVDEP Water Quality Indicators (General)

Specific Conductivity

100-199 - 85 points	0-90		

pH

5.6-5.9 = 45 points	0-80	0-1	

DO

	10-30		

Sub-Total	

BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WV Stream Condition Index (WVSCI)

0	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score

Index	Linear Feet	Unit Score
0.532	89	47.3183333

Column No. 2- Mitigation Existing Condition - Baseline (Credit)

Stream Classification:

Percent Stream Channel Slope

HGM Score (attach data forms):

		Average
Hydrology		0
Biogeochemical Cycling		
Habitat		

PART I - Physical, Chemical and Biological Indicators

	Points Scale	Range	Site Score

PHYSICAL INDICATOR (Applies to all streams classifications)

USEPA RBP (Low Gradient Data Sheet)

	Points Scale	Range	Site Score
1. Epifaunal Substrate/Available Cover	0-20		
2. Pool Substrate Characterization	0-20		
3. Pool Variability	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20	0-1	
6. Channel Alteration	0-20		
7. Channel Sinuosity	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0

CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WVDEP Water Quality Indicators (General)

Specific Conductivity

	0-90		

pH

	5-90	0-1	

DO

	10-30		

Sub-Total	0

BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WV Stream Condition Index (WVSCI)

	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score

Index	Linear Feet	Unit Score
0	0	0

Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)

Stream Classification: 0

Percent Stream Channel Slope: 0

HGM Score (attach data forms):

		Average
Hydrology		0
Biogeochemical Cycling		
Habitat		

PART I - Physical, Chemical and Biological Indicators

	Points Scale	Range	Site Score

PHYSICAL INDICATOR (Applies to all streams classifications)

USEPA RBP (High Gradient Data Sheet)

	Points Scale	Range	Site Score
1. Epifaunal Substrate/Available Cover	0-20		
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20	0-1	
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0

CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WVDEP Water Quality Indicators (General)

Specific Conductivity

	0-90		

pH

	5-90	0-1	

DO

	10-30		

Sub-Total	0

BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WV Stream Condition Index (WVSCI)

	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score

Index	Linear Feet	Unit Score
0	0	0

Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)

Stream Classification: 0

Percent Stream Channel Slope: 0

HGM Score (attach data forms):

		Average
Hydrology		0
Biogeochemical Cycling		
Habitat		

PART I - Physical, Chemical and Biological Indicators

	Points Scale	Range	Site Score

PHYSICAL INDICATOR (Applies to all streams classifications)

USEPA RBP (High Gradient Data Sheet)

	Points Scale	Range	Site Score
1. Epifaunal Substrate/Available Cover	0-20		
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20	0-1	
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0

CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WVDEP Water Quality Indicators (General)

Specific Conductivity

	0-90		

pH

	5-90	0-1	

DO

	10-30		

Sub-Total	0

BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WV Stream Condition Index (WVSCI)

	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score

Index	Linear Feet	Unit Score
0	0	0

Column No. 5- Mitigation Projected at Maturity (Credit)

Stream Classification: 0

Percent Stream Channel Slope: 0

HGM Score (attach data forms):

		Average
Hydrology		0
Biogeochemical Cycling		
Habitat		

PART I - Physical, Chemical and Biological Indicators

	Points Scale	Range	Site Score

PHYSICAL INDICATOR (Applies to all streams classifications)

USEPA RBP (High Gradient Data Sheet)

	Points Scale	Range	Site Score
1. Epifaunal Substrate/Available Cover	0-20		
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20	0-1	
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		0
Sub-Total			0

CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WVDEP Water Quality Indicators (General)

Specific Conductivity

	0-90		

pH

	5-90	0-1	

DO

	10-30		

Sub-Total	0

BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WV Stream Condition Index (WVSCI)

	0-100	0-1	
Sub-Total			0

PART II - Index and Unit Score

Index	Linear Feet	Unit Score
0	0	0

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

Team: AJ, VM		Latitude/UTM Northing: 37.028893
Project Name: Mountain Valley Pipeline		Longitude/UTM Easting: -79.774785
Location: Franklin		Sampling Date: 8-26-21

SAR Number: S-GH40   Reach Length (ft): 60   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.

1.3

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	1	1	1	2	2	1	1	
2	1	2	1	1	2	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}.

0.08 in

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

0.08	0.08	0.08	0.08	0.08	5.50	3.10	0.80	0.08	0.08
3.25	0.08	0.50	1.10	0.08	4.20	0.08	0.08	2.60	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				
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.

58.3

Left Side: 0   Right Side: 35

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)	
☐ 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			

0	Species in Group 1	3	Species in Group 2

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

10	$V_{DETRITUS}$	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	5.83 %

Left Side				Right Side			
0	0	15		0	5	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.	94 %

Left Side				Right Side			
100	100	85		100	95	85	

Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	0.96

Land Use (Choose From Drop List)		Runoff Score	% in Catchment	Running Percent (not >100)
Forest and native range (<50% ground cover)	▼	0.5	9	9
Forest and native range (>75% ground cover)	▼	1	91	100
	▼			
	▼			
	▼			
	▼			
	▼			
	▼			
	▼			

S-GH40			Notes:

Variable	Value	VSI	Land Cover Analysis was completed using the 2019 National Land Cover Database (NLCD), from Landsat satellite imagery and other supplementary datasets. Watershed boundaries are based off of field delineated stream impacts. *Percentages in catchment values have been rounded to the nearest full number
$V_{CCANOPY}$	Not Used, <20%	Not Used	
V_{EMBED}	1.3	0.21	
$V_{SUBSTRATE}$	0.08 in	0.04	
V_{BERO}	0 %	1.00	
V_{LWD}	0.0	0.00	
V_{TDBH}	Not Used	Not Used	
V_{SNAG}	0.0	0.10	
V_{SSD}	58.3	0.90	
V_{SRICH}	0.00	0.00	
$V_{DETRITUS}$	5.8 %	0.07	
V_{HERB}	94 %	1.00	
V_{WLUSE}	0.96	1.00	

FCI Calculator for the High-Gradient Headwater Streams in Appalachia

To ensure accurate calculations, the <u>UPPERMOST STRATUM</u> 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: Franklin
Sampling Date: 8-26-21

Project Site   Before Project

Subclass for this SAR:
Ephemeral Stream

Uppermost stratum present at this SAR: **SAR number:**   S-GH40
Shrub/Herb Strata

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

Function	Functional Capacity Index
Hydrology	0.51
Biogeochemical Cycling	0.28
Habitat	0.09

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.	1.30	0.21
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.08	0.04
V_{BERO}	Total percent of eroded stream channel bank.	0.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	58.33	0.90
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	5.83	0.07
V_{HERB}	Average percent cover of herbaceous vegetation.	94.17	1.00
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.96	1.00

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				Has there been a heavy rain in the last 7 days?
	Now		**Past 24 hours**	Yes No
		storm (heavy rain) rain (steady rain) showers (intermittent)		**Air Temperature_____ ⁰ C**
	____%	%cloud cover clear/sunny	____%	**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 Spring-fed
	    Non-glacial montane Mixture of origins
	    Swamp and bog Other_____
		Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)

WATERSHED FEATURES	**Predominant Surrounding Landuse** Forest Commercial Field/Pasture Industrial Agricultural Other _____ 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** _____
INSTREAM FEATURES	**Estimated Reach Length** _____m **Estimated Stream Width** _____m **Sampling Reach Area** _____m² **Area in km² (m²x1000)** _____km² **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** _____m² **Density of LWD** _____m²/km² **(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 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			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**
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	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	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	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	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	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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) 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 ___ (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

Parameters to be evaluated broader than sampling reach

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: Franklin County   Stream ID: S-GH40

Stream Name: UNT to Foul Ground Creek

HUC Code: 03010101   Basin: Upper Roanoke

Survey Date: 8/26/2021

Surveyors: AJ, VM

Type: Ephemeral

Inches	PARTICLE	Millimeters		Particle Count	Total #	Item %	% Cum
	Silt/Clay	< .062	S/C	▲ ▼	80	80.00	80.00
	Very Fine	.062-.125		▲ ▼		0.00	80.00
	Fine	.125-.25		▲ ▼		0.00	80.00
	Medium	.25-.5	S A N D	▲ ▼	3	3.00	83.00
	Coarse	.50-1.0		▲ ▼	7	7.00	90.00
.04-.08	Very Coarse	1.0-2		▲ ▼		0.00	90.00
.08 -.16	Very Fine	2 -4		▲ ▼		0.00	90.00
.16 - .22	Fine	4 -5.7		▲ ▼		0.00	90.00
.22 - .31	Fine	5.7 - 8		▲ ▼		0.00	90.00
.31 - .44	Medium	8 -11.3		▲ ▼		0.00	90.00
.44 - .63	Medium	11.3 - 16	G R A V E L	▲ ▼		0.00	90.00
.63 - .89	Coarse	16 -22.6		▲ ▼	5	5.00	95.00
.89 - 1.26	Coarse	22.6 - 32		▲ ▼		0.00	95.00
1.26 - 1.77	Vry Coarse	32 - 45		▲ ▼		0.00	95.00
1.77 -2.5	Vry Coarse	45 - 64		▲ ▼		0.00	95.00
2.5 - 3.5	Small	64 - 90		▲ ▼	3	3.00	98.00
3.5 - 5.0	Small	90 - 128		▲ ▼	2	2.00	100.00
5.0 - 7.1	Large	128 - 180	C O B B L E	▲ ▼		0.00	100.00
7.1 - 10.1	Large	180 - 256		▲ ▼		0.00	100.00
10.1 - 14.3	Small	256 - 362		▲ ▼		0.00	100.00
14.3 - 20	Small	362 - 512		▲ ▼		0.00	100.00
20 - 40	Medium	512 - 1024	B O U L D E R	▲ ▼		0.00	100.00
40 - 80	Large	1024 -2048		▲ ▼		0.00	100.00
80 - 160	Vry Large	2048 -4096		▲ ▼		0.00	100.00
	Bedrock		BDRK	▲ ▼		0.00	100.00
				Totals:	100		
	Total Tally:						

```
                    RIVERMORPH PARTICLE SUMMARY

--------------------------------------------------------------------

River Name:       UNT to Foul Ground Creek
Reach Name:       S-GH40
Sample Name:      Representative
Survey Date:      08/26/2021


--------------------------------------------------------------------

Size (mm)               TOT #       ITEM %      CUM %
--------------------------------------------------------------------
0 - 0.062               80          80.00       80.00
0.062 - 0.125           0           0.00        80.00
0.125 - 0.25            0           0.00        80.00
0.25 - 0.50             3           3.00        83.00
0.50 - 1.0              7           7.00        90.00
1.0 - 2.0               0           0.00        90.00
2.0 - 4.0               0           0.00        90.00
4.0 - 5.7               0           0.00        90.00
5.7 - 8.0               0           0.00        90.00
8.0 - 11.3              0           0.00        90.00
11.3 - 16.0             0           0.00        90.00
16.0 - 22.6             5           5.00        95.00
22.6 - 32.0             0           0.00        95.00
32 - 45                 0           0.00        95.00
45 - 64                 0           0.00        95.00
64 - 90                 3           3.00        98.00
90 - 128                2           2.00        100.00
128 - 180               0           0.00        100.00
180 - 256               0           0.00        100.00
256 - 362               0           0.00        100.00
362 - 512               0           0.00        100.00
512 - 1024              0           0.00        100.00
1024 - 2048             0           0.00        100.00
Bedrock                 0           0.00        100.00

D16 (mm)                0.01
D35 (mm)                0.03
D50 (mm)                0.04
D84 (mm)                0.57
D95 (mm)                22.6
D100 (mm)               128
Silt/Clay (%)           80
Sand (%)                10
Gravel (%)              5
Cobble (%)              5
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)	ranklin Coun	R6	03010101	8-26-2021	S-GH40	89	1

Name(s) of Evaluator(s)	Stream Name and Information		SAR Length
AJ, VM	Spread I; UNT to Foul Ground Creek		77

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>	100%						100%	
	Score >	0.85							

CI= (Sum % RA * Scores*0.01)/2

Left Bank	% Riparian Area>	100%						100%	Rt Bank CI >	0.85	CI
	Score >	0.85							Lt Bank CI >	0.85	0.85

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) >>	0.43

RCI= (Riparian CI)/2

COMPENSATION REQUIREMENT (CR) >>	38

CR = RCI X LF X IF

INSERT PHOTOS:

DIRECTION 217 deg(T)   37.02914°N 079.77484°W   ACCURACY 10 m DATUM WGS84

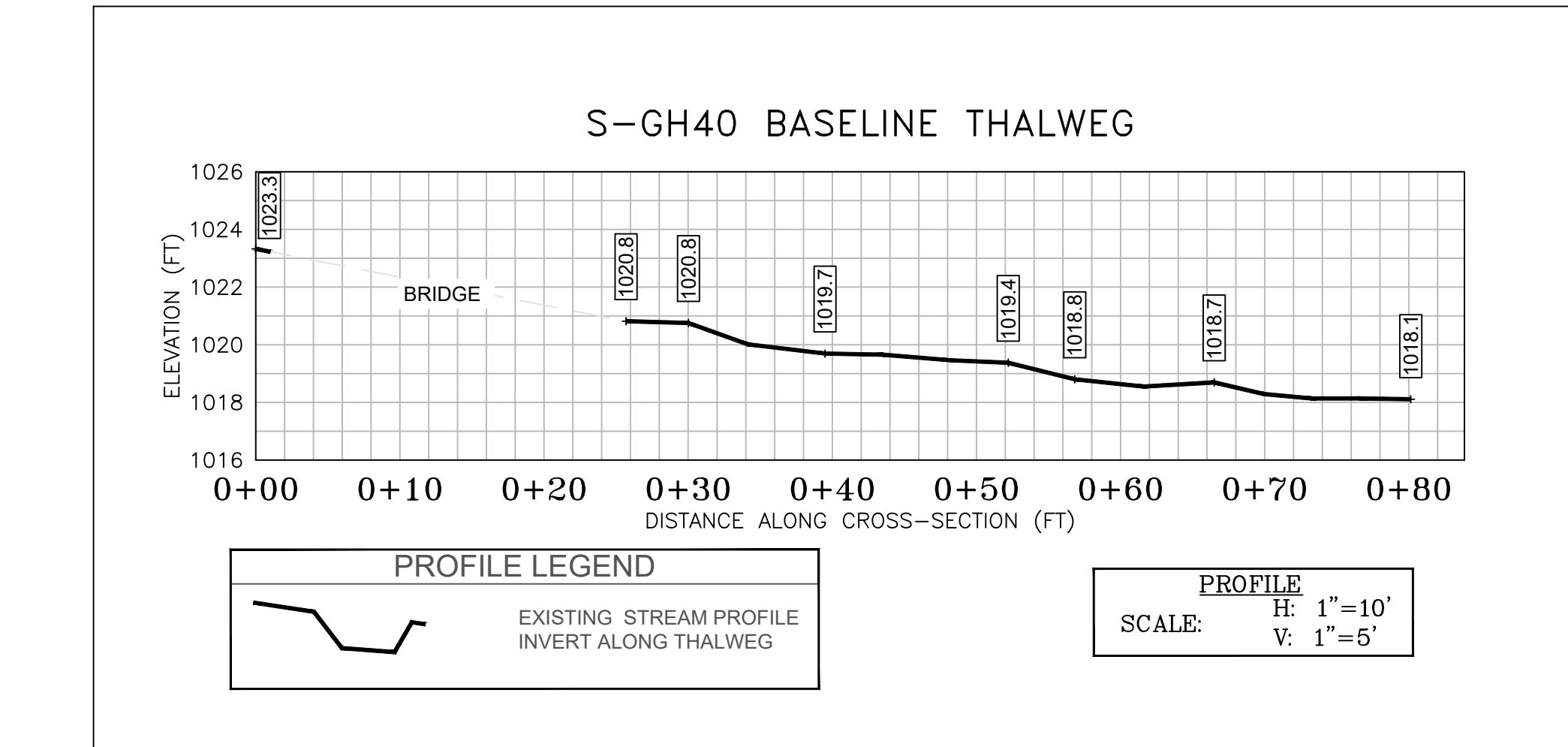S-GH40 US COND…   2021-08-26 09:05:29-04:00

Taken With Context Camera

CAPTION. Assessment is limited to areas within the temporary ROW.

DESCRIBE PROPOSED IMPACT:

PROVIDED UNDER SEPARATE COVER

Profile and Cross-Sections Baseline Survey

Prepared For: MVP

Crossing S-GH40 - UNT to Foul Ground Creek (MP 272.9)

Franklin County, Virginia

CL STAKEOUT POINTS: S-GH40 CROSS SECTION B (PIPE CL)

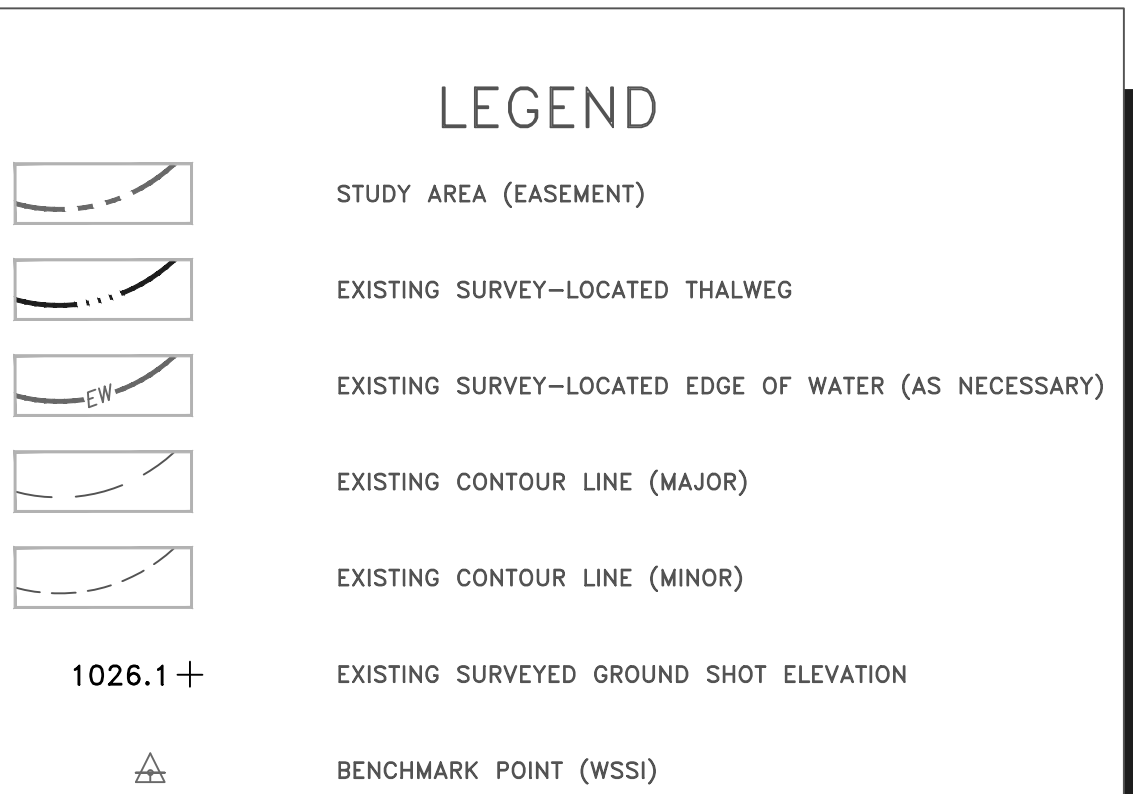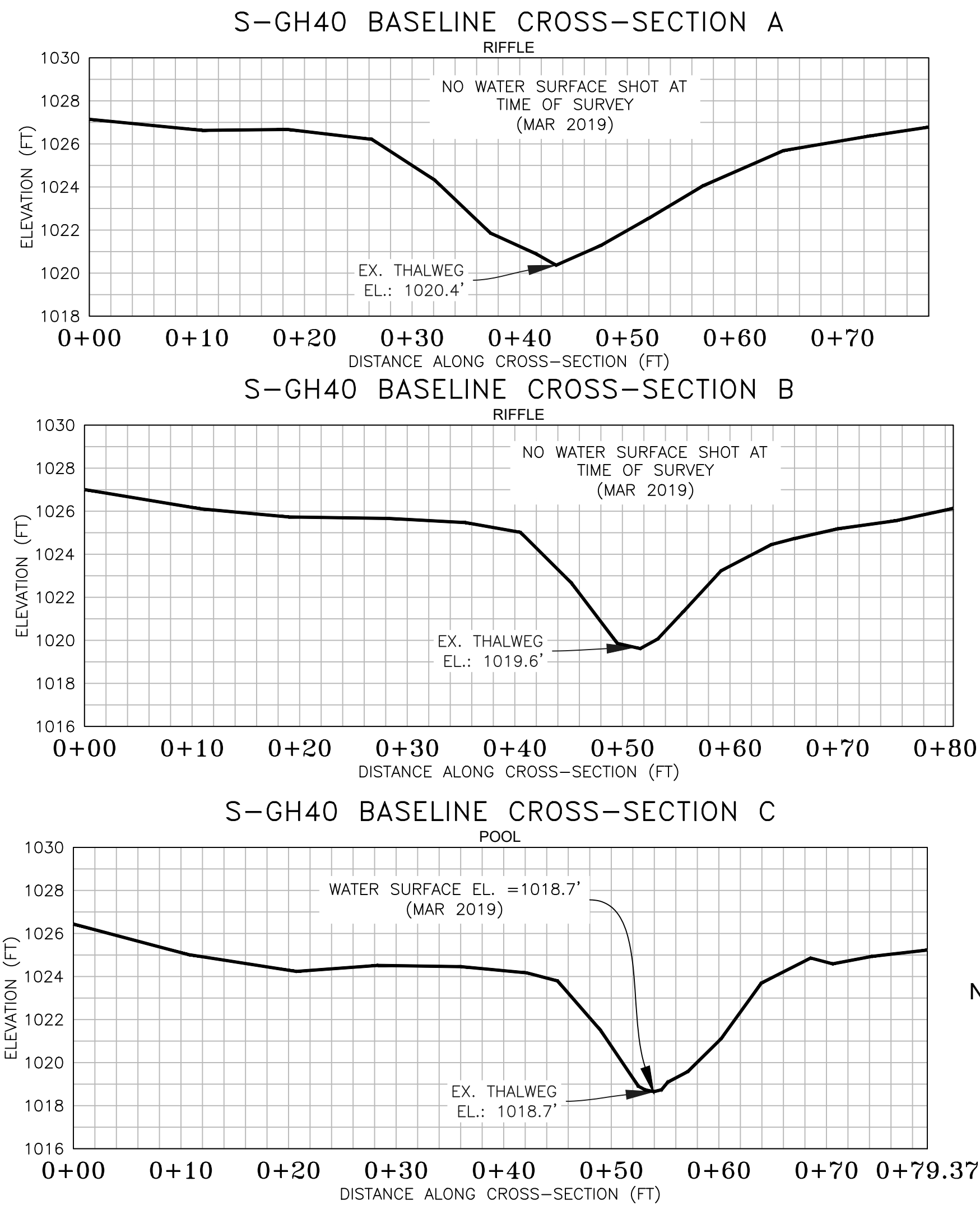| PT. LOC.	PRE-CROSSING			POST-CROSSING	
	NORTHING	EASTING	ELEV	VERT. DIFF.	HORZ. DIFF.
TS-L	13447425.41	1997938.81	1025.47	----	----
BS-L	13447418.31	1997951.00	1019.86	----	----
THW	13447417.45	1997952.95	1019.62	----	----
BS-R	13447416.54	1997954.31	1020.06	----	----
TS-R	13447411.76	1997963.77	1024.45	----	----

TYPICAL 5-POINT CROSS-SECTION
(FACING DOWNSTREAM)

TS-L   TS-R
BS-L   BS-R
THW

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

Plan View

TRAV 52785
ELEV = 1028.96
N 13447437.92
E 1997887.93

N 13447441.7
E 1997907.3

N 13447430.1
E 1997905.5

N 13447452.6
E 1997915.2

UNNAMED TRIBUTARY
TO FOUL GROUND CREEK
(S-GH40)
FLOW

1023.3

1027.1
1027.0
1026.4
1026.6
1025.7
1025.0
1026.2
1025.5
1024.5
1024.2
1021.9
1025.0
1024.2
1020.8
1019.9
1018.9
1021.3
1020.0
1019.1
1018.8
1024.1
1020.7
1025.2
1024.5
1023.7
1026.1
1025.2
1026.8

1021.0
1020.2
1018.8
1018.1

BRIDGE
X-SEC A
X-SEC B
X-SEC C
NORTH

N 13447393.1
E 1997974.1

N 13447419.1
E 1997987.2

N 13447403.3
E 1997992.83

N 13447403.3
E 1997978.4

TRAV 52786
ELEV = 1024.77
N 13447385.12
E 1997992.83

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

S-GH40 BASELINE CROSS-SECTION A
RIFFLE

NO WATER SURFACE SHOT AT
TIME OF SURVEY
(MAR 2019)

EX. THALWEG
EL.: 1020.4'

ELEVATION (FT)
DISTANCE ALONG CROSS-SECTION (FT)

S-GH40 BASELINE CROSS-SECTION B
RIFFLE

NO WATER SURFACE SHOT AT
TIME OF SURVEY
(MAR 2019)

EX. THALWEG
EL.: 1019.6'

ELEVATION (FT)
DISTANCE ALONG CROSS-SECTION (FT)

S-GH40 BASELINE CROSS-SECTION C
POOL

WATER SURFACE EL. =1018.7'
(MAR 2019)

EX. THALWEG
EL.: 1018.7'

ELEVATION (FT)
DISTANCE ALONG CROSS-SECTION (FT)

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

CROSS SECTION LEGEND
———— EXISTING GRADE

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

S-GH40 BASELINE THALWEG

1023.3
BRIDGE
1020.8   1020.8   1019.7   1019.4   1018.8   1018.7   1018.1

ELEVATION (FT)
DISTANCE ALONG CROSS-SECTION (FT)

PROFILE LEGEND
———— EXISTING STREAM PROFILE
INVERT ALONG THALWEG

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

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)
1026.1 +	EXISTING SURVEYED GROUND SHOT ELEVATION
△	BENCHMARK POINT (WSSI)

PRE-CROSSING PHOTOS

PHOTO TAKEN LOOKING DOWNSTREAM FROM
THE BRIDGE TO THE NORTHEAST ON 03/25/2019

PHOTO TAKEN LOOKING UPSTREAM TO
THE SOUTH-SOUTHWEST ON 03/25/2019

PHOTO TAKEN LOOKING TOWARD LEFT BANK
FROM PIPE CENTERLINE ON 03/25/2019

POST-CROSSING PHOTOS

PENDING CROSSING
PHOTO TAKEN LOOKING

PENDING CROSSING
PHOTO TAKEN LOOKING

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 March 25, 2019.

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

6. Cross-section B shot at location of pipe centerline (based on best professional judgement).

REVISIONS

No.	Date	Description	Rev. By	App. By

DATE: September, 2021   SCALE: AS NOTED

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

Design	Draft	Approved
EJC	JSF	NAS

Sheet # 1 of 1

Computer File Name:
L:\Survey\22000\22865\22865.03 Spiral I Work Dwgs
22865_03 S-4 MP 268-276 Sheets_2.dwg