

## Baseline Assessment – Stream Attributes

**Reach S-G4 (Timber Mat Crossing)**

**Perennial**

**Spread I**

**Pittsylvania County, Virginia**

<b>Data</b>	<b>Included</b>
Photos	✓
SWVM Form	✓
FCI Calculator and HGM Form	N/A – Perennial stream (not shadeable, slope less than 4%)
RBP Physical Characteristics Form	✓
Water Quality Data	✓
RBP Habitat Form	✓
RBP Benthic Form	✓
Benthic Identification Sheet	✓
Wolman Pebble Count	✓
RiverMorph Data Sheet	✓
USM Form (Virginia Only)	✓
Longitudinal Profile and Cross Sections	✓



Photo Type: LB US VIEW  
Left bank upstream at LOD looking NE, BH

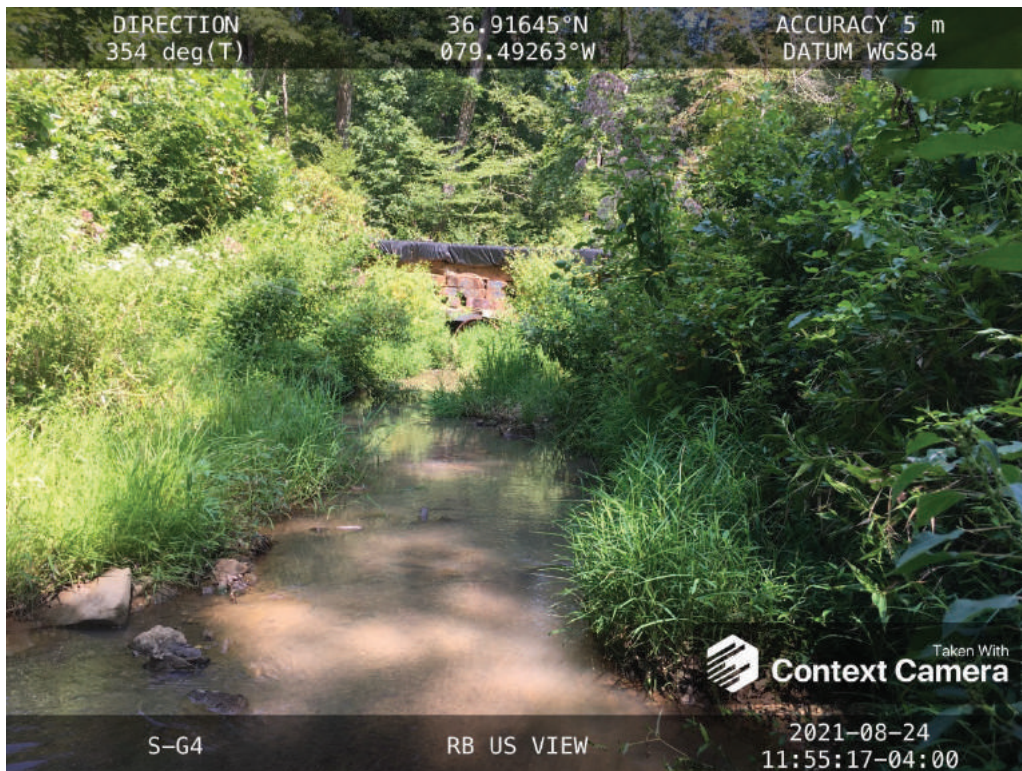


Photo Type: RB US VIEW  
Upstream at LOD looking NW downstream, BH



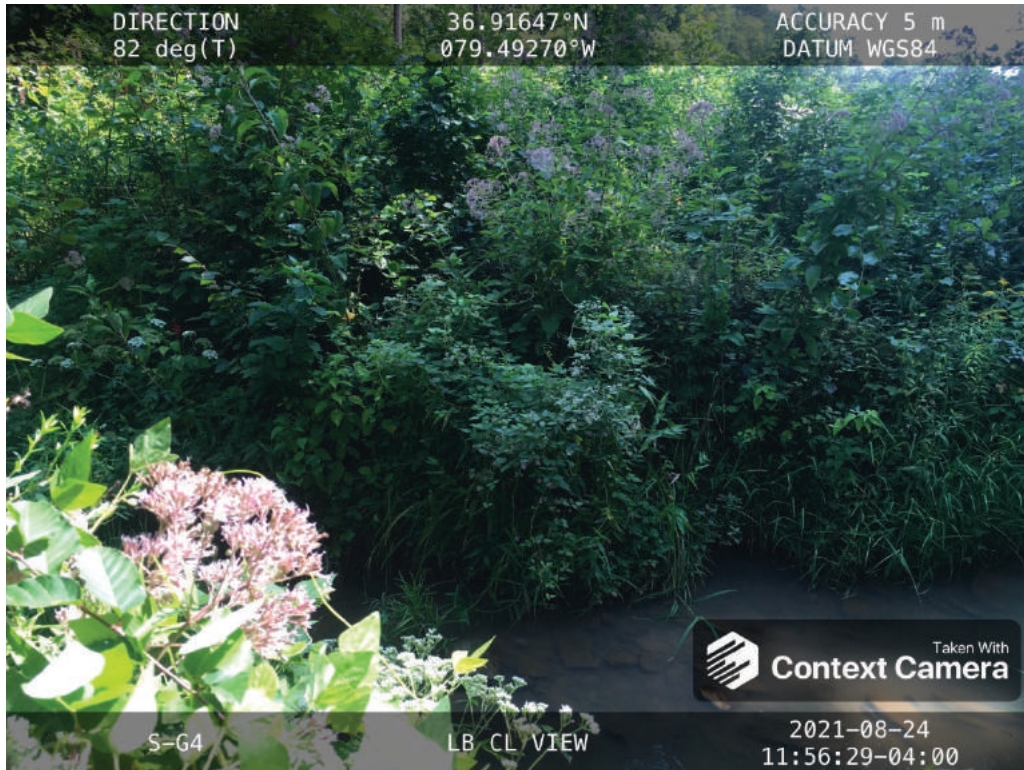


Photo Type: LB CL VIEW  
On thalweg at pipe centerline looking E at left streambank, BH



Photo Type: LB DS VIEW  
Left bank downstream at LOD looking SE, BH



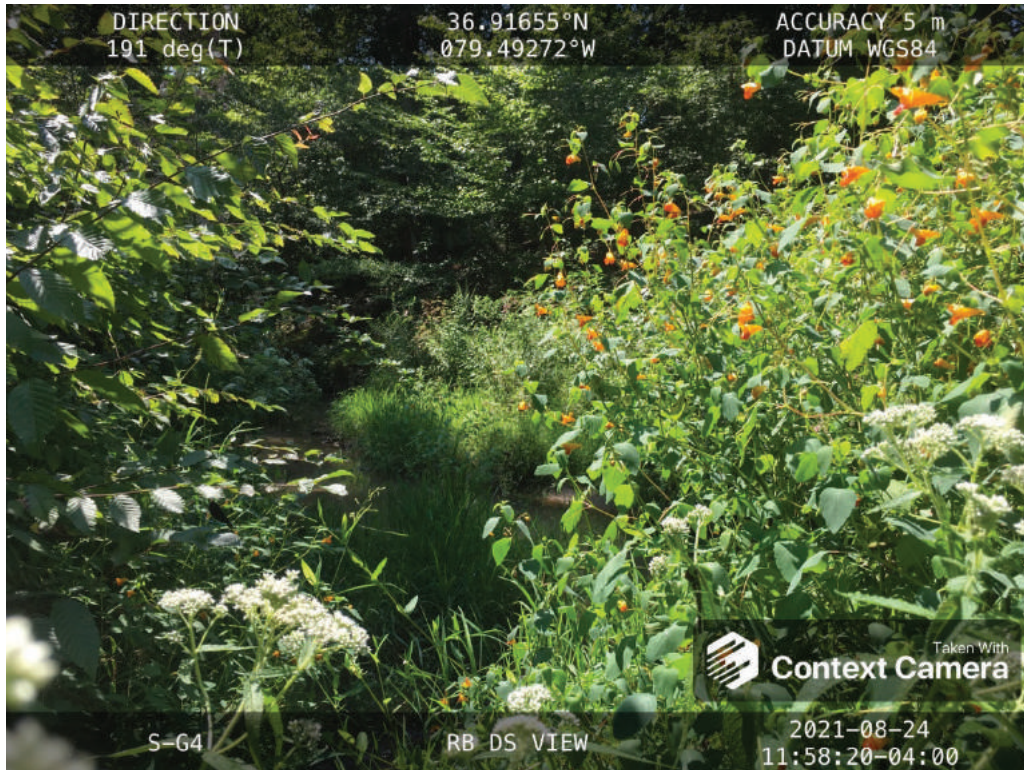


Photo Type: RB DS VIEW  
Right bank downstream at LOD looking NW, BH



Photo Type: RB CL VIEW  
On thalweg at pipe centerline looking SW at right streambank, BH





Photo Type: DS COND  
Downstream at LOD looking N downstream, BH

USACE FILE NO./ Project Name: (v2.1, Sept 2016)			Mountain Valley Pipeline			IMPACT COORDINATES: (in Decimal Degrees)			Lat.	36.916463	Lon.	-79.492669	WEATHER:			Sunny			DATE:			August 24, 2021																									
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)						S-G4; 1001 ac						MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)						Comments:																													
STREAM IMPACT LENGTH:			30			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)						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:						Perennial						Stream Classification:						0						Stream Classification:						0																	
Percent Stream Channel Slope						1.02						Percent Stream Channel Slope						0						Percent Stream Channel Slope						0																	
HGM Score (attach data forms):						Average						HGM Score (attach data forms):						Average						HGM Score (attach data forms):						Average																	
Hydrology												Hydrology												Hydrology												Hydrology											
Biogeochemical Cycling						0						Biogeochemical Cycling						0						Biogeochemical Cycling						0						Biogeochemical Cycling						0					
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											
Points Scale						Range						Points Scale						Range						Points Scale						Range						Points Scale						Range					
Site Score												Site Score												Site Score												Site Score											
PHYSICAL INDICATOR (Applies to all streams classifications)												PHYSICAL INDICATOR (Applies to all streams classifications)												PHYSICAL INDICATOR (Applies to all streams classifications)												PHYSICAL INDICATOR (Applies to all streams classifications)											
USEPA RBP (High 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					
2. Embeddedness						0-20						2. Embeddedness						0-20						2. Embeddedness						0-20						2. Embeddedness						0-20					
3. Velocity Depth Regime						0-20						3. Velocity Depth Regime						0-20						3. Velocity Depth Regime						0-20						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					
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					
7. Frequency of Riffles (or bends)						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					
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					
Total RBP Score						Suboptimal						Total RBP Score						Poor						Total RBP Score						Poor						Total RBP Score						Poor					
Sub-Total						0.79						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)											
WVDEP Water Quality Indicators (General)												WVDEP Water Quality Indicators (General)												WVDEP Water Quality Indicators (General)												WVDEP Water Quality Indicators (General)											
Specific Conductivity						0-90						Specific Conductivity						0-90						Specific Conductivity						0-90						Specific Conductivity						0-90					
pH						0-1						pH						0-1						pH						0-1						pH						0-1					
DO						0-8.0 = 80 points						DO						0-8.0 = 80 points						DO						0-8.0 = 80 points						DO						0-8.0 = 80 points					
Sub-Total						1						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)											
WV Stream Condition Index (WVSCI)												WV Stream Condition Index (WVSCI)												WV Stream Condition Index (WVSCI)												WV Stream Condition Index (WVSCI)											
Very Good						0-100						Very Good						0-100						Very Good						0-100						Very Good						0-100					
Sub-Total						0.811						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											
Index						Linear Feet						Index						Linear Feet						Index						Linear Feet						Index						Linear Feet					
Unit Score												Unit Score												Unit Score												Unit Score											
0.867						30						0						0						0						0						0						0					

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME S-G4		LOCATION Pittsylvania County
STATION # _____ RIVERMILE _____		STREAM CLASS Perennial
LAT 36.916463 LONG -79.492669		RIVER BASIN Upper Roanoke
STORET # _____		AGENCY VADEQ
INVESTIGATORS CB BH		
FORM COMPLETED BY <b>BH</b>	DATE 8/24/2021 TIME 1200	REASON FOR SURVEY Baseline Assessment

<b>WEATHER CONDITIONS</b>	<div style="display: flex; justify-content: space-between;"> <div> <p><b>Now</b></p> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </div> <div> <p>storm (heavy rain) rain (steady rain) showers (intermittent) %cloud cover _____ clear/sunny</p> </div> </div> </div> <div> <p><b>Past 24 hours</b></p> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </div> <div> <p>_____ %</p> </div> </div> </div> <div> <p><b>Has there been a heavy rain in the last 7 days?</b></p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><b>Air Temperature</b> 29.4 °C</p> <p><b>Other</b> _____</p> </div> </div>
<b>SITE LOCATION/MAP</b>	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p>
<b>STREAM CHARACTERIZATION</b>	<div style="display: flex; justify-content: space-between;"> <div> <p><b>Stream Subsystem</b></p> <p><input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p><b>Stream Origin</b></p> <p><input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed  <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins  <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> </div> <div> <p><b>Stream Type</b></p> <p><input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater</p> <p><b>Catchment Area</b> _____ km<sup>2</sup></p> </div> </div>

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input checked="" type="checkbox"/> Other <u>row</u> <input type="checkbox"/> Residential	<b>Local Watershed NPS Pollution</b> <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources <b>Local Watershed Erosion</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy
<b>RIPARIAN VEGETATION (18 meter buffer)</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous <b>Dominant species present</b> <u>Tulip poplar, brambles</u>	
<b>INSTREAM FEATURES</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <b>Estimated Reach Length</b> <u>22.86</u> m  <b>Estimated Stream Width</b> <u>3.7</u> m  <b>Sampling Reach Area</b> <u>83.61</u> m<sup>2</sup>  <b>Area in km<sup>2</sup> (m<sup>2</sup>x1000)</b> _____ km<sup>2</sup>  <b>Estimated Stream Depth</b> <u>0.3</u> m  <b>Surface Velocity (at thalweg)</b> <u>0.3</u> m/sec                         </div> <div style="width: 45%;"> <b>Canopy Cover</b>  <input checked="" type="checkbox"/> Partly open    <input type="checkbox"/> Partly shaded    <input type="checkbox"/> Shaded  <b>High Water Mark</b> <u>0.5</u> m  <b>Proportion of Reach Represented by Stream Morphology Types</b>                              Riffle <u>30</u> %      Run <u>40</u> %                              Pool <u>30</u> %                         </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> <b>Channelized</b>    <input type="checkbox"/> Yes    <input checked="" type="checkbox"/> No  <b>Dam Present</b>    <input type="checkbox"/> Yes    <input checked="" type="checkbox"/> No                         </div> </div>	
<b>LARGE WOODY DEBRIS</b>	<b>LWD</b> <u>15</u> m <sup>2</sup> <b>Density of LWD</b> _____ m <sup>2</sup> /km <sup>2</sup> (LWD/ reach area)	
<b>AQUATIC VEGETATION</b>	<b>Indicate the dominant type and record the dominant species present</b> <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae <b>Dominant species present</b> _____ <b>Portion of the reach with aquatic vegetation</b> _____ %	
<b>WATER QUALITY</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <b>Temperature</b> <u>21.5d/20.5u</u> °C  <b>Specific Conductance</b> <u>45.1/45.1</u> ms/cm  <b>Dissolved Oxygen</b> <u>7.16d/7.20u</u> mg/L  <b>pH</b> <u>7.07d/7.02u</u>  <b>Turbidity</b> _____  <b>WQ Instrument Used</b> <u>YSI</u> </div> <div style="width: 45%;"> <b>Water Odors</b>  <input checked="" type="checkbox"/> Normal/None    <input type="checkbox"/> Sewage  <input type="checkbox"/> Petroleum    <input type="checkbox"/> Chemical  <input type="checkbox"/> Fishy    <input type="checkbox"/> Other _____  <b>Water Surface Oils</b>  <input type="checkbox"/> Slick    <input type="checkbox"/> Sheen    <input type="checkbox"/> Globs    <input type="checkbox"/> Flecks  <input checked="" type="checkbox"/> None    <input type="checkbox"/> Other _____  <b>Turbidity (if not measured)</b>  <input type="checkbox"/> Clear    <input checked="" type="checkbox"/> Slightly turbid    <input type="checkbox"/> Turbid  <input type="checkbox"/> Opaque    <input type="checkbox"/> Stained    <input type="checkbox"/> Other _____                         </div> </div>	
<b>SEDIMENT/SUBSTRATE</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <b>Odors</b>  <input checked="" type="checkbox"/> Normal    <input type="checkbox"/> Sewage    <input type="checkbox"/> Petroleum  <input type="checkbox"/> Chemical    <input type="checkbox"/> Anaerobic    <input type="checkbox"/> None  <input type="checkbox"/> Other _____  <b>Oils</b>  <input checked="" type="checkbox"/> Absent    <input type="checkbox"/> Slight    <input type="checkbox"/> Moderate    <input type="checkbox"/> Profuse                         </div> <div style="width: 45%;"> <b>Deposits</b>  <input type="checkbox"/> Sludge    <input type="checkbox"/> Sawdust    <input type="checkbox"/> Paper fiber    <input type="checkbox"/> Sand  <input type="checkbox"/> Relict shells    <input type="checkbox"/> Other _____  <b>Looking at stones which are not deeply embedded, are the undersides black in color?</b>  <input type="checkbox"/> Yes    <input type="checkbox"/> No                         </div> </div>	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")	15	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	59			
Sand	0.06-2mm (gritty)	24	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	2			
Clay	< 0.004 mm (slick)				



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

STREAM NAME S-G4		LOCATION Pittsylvania County	
STATION # _____ RIVERMILE _____		STREAM CLASS Perennial	
LAT 36.916463 LONG -79.492669		RIVER BASIN Upper Roanoke	
STORET # _____		AGENCY VADEQ	
INVESTIGATORS KB TC			
FORM COMPLETED BY KB		DATE 9/9/2021 TIME 1445 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 <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 19	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 18	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 13	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 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
<b>6. Channel Alteration</b>  SCORE <b>16</b>	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>7. Frequency of Riffles (or bends)</b>  SCORE <b>16</b>	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>8. Bank Stability (score each bank)</b>  Note: determine left or right side by facing downstream. SCORE <b>9</b> SCORE <b>9</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
<b>9. Vegetative Protection (score each bank)</b>  SCORE <b>9</b> SCORE <b>9</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>  SCORE <b>4</b> SCORE <b>5</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
	Right Bank	10	9			8	7	6			5	4	3			2	1	0			

Total Score **158**



## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME S-G4		LOCATION Pittsylvania County	
STATION # _____ RIVERMILE _____		STREAM CLASS Perennial	
LAT <u>36.916463</u> LONG <u>-79.492669</u>		RIVER BASIN Upper Roanoke	
STORET # _____		AGENCY VADEQ	
INVESTIGATORS KB TC		LOT NUMBER _____	
FORM COMPLETED BY <b>KB</b>		DATE <u>9/9/2021</u> TIME <u>1445</u>	REASON FOR SURVEY Baseline Assessment

<b>HABITAT TYPES</b>	<b>Indicate the percentage of each habitat type present</b> <input checked="" type="checkbox"/> Cobble <u>20</u> % <input type="checkbox"/> Snags _____ % <input checked="" type="checkbox"/> Vegetated Banks <u>80</u> % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other ( _____ ) _____ %
<b>SAMPLE COLLECTION</b>	<b>Gear used</b> <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> kick-net <input type="checkbox"/> Other _____  <b>How were the samples collected?</b> <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat  <b>Indicate the number of jabs/kicks taken in each habitat type.</b> <input checked="" type="checkbox"/> Cobble <u>4</u> <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other ( _____ ) _____
<b>GENERAL COMMENTS</b>	4 kicks done in cobble riffles, crayfish, salamanders, and fish removed from sample.

### 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						

Sample ID Collection Date		S-G4 09-09-2021
ORDER	GENUS/SPECIES	COUNT
Ephemeroptera	Baetis sp.	18
Ephemeroptera	Baetisca sp.	1
Ephemeroptera	Maccaffertium sp.	28
Ephemeroptera	Plauditus sp.	1
Ephemeroptera	Stenacron sp.	11
Ephemeroptera	Teloganopsis deficiens	3
Plecoptera	Eccoptura xanthenes	2
Plecoptera	Leuctra sp.	1
Plecoptera	Perlodidae	1
Trichoptera	Cheumatopsyche sp.	68
Trichoptera	Chimarra sp.	3
Trichoptera	Diplectrona sp.	3
Trichoptera	Hydropsyche sp.	12
Trichoptera	Polycentropodidae	1
Odonata	Boyeria sp.	1
Odonata	Calopterygidae	1
Odonata	Gomphidae	2
Coleoptera	Ectopria sp.	1
Coleoptera	Helichus sp.	2
Coleoptera	Optioservus sp.	1
Coleoptera	Oulimnius sp.	17
Coleoptera	Psephenus sp.	15
Coleoptera	Stenelmis sp.	1
Megaloptera	Corydalus sp.	1
Megaloptera	Nigronia sp.	1
Diptera-Chironomidae	Micropsectra sp.	1
Diptera-Chironomidae	Microtendipes sp.	2
Diptera-Chironomidae	Parachaetocladius sp.	1
Diptera-Chironomidae	Parametrioctenus sp.	1
Diptera-Chironomidae	Polypedilum sp.	8
Diptera-Chironomidae	Rheotanytarsus sp.	7
Diptera-Chironomidae	Tanytarsus sp.	7
Diptera-Chironomidae	Thienemannimyia gr. sp.	5
Diptera-Chironomidae	Trissopelopia sp.	2
Diptera	Atylotus/Tabanus sp.	1
Diptera	Ceratopogoninae	2
Diptera	Dicranota sp.	2
Diptera	Diptera	1
Diptera	Dixa sp.	1
Diptera	Hemerodromia sp.	11
Diptera	Hexatoma sp.	1
Diptera	Simulium sp.	1
Diptera	Tipula sp.	1
Annelida	Lumbriculidae	1
Gastropoda	Ferrissia sp.	4
Gastropoda	Pleuroceridae	2
Acari	Lebertia sp.	1
Other Organisms	Nematoda	1
Other Organisms	Prostoma sp.	2
Other Organisms	Turbellaria	1
TOTAL		263

Sample ID Collection Date		S-G4 09-09-2021
<b>WVSCI Metric Values</b>		
Total taxa		32
EPT taxa		10
% EPT		58.2
% Chironomidae		12.9
% 2 Dominant		46.4
HBI		4.71
<b>WVSCI Metric Scores</b>		
Total taxa		152.4
EPT taxa		76.9
% EPT		63.3
% Chironomidae		87.9
% 2 Dominant		83.8
HBI		74.5
<b>WVSCI Metric Scores</b>		
Total taxa		100.0
EPT taxa		76.9
% EPT		63.3
% Chironomidae		87.9
% 2 Dominant		83.8
HBI		74.5
<b>WVSCI Total Score</b>		<b>81.1</b>

**WVSCI Thresholds**

Unimpaired = > 68.00

Gray Zone = 60.61 to 68.00

Impaired = <60.61



## WOLMAN PEBBLE COUNT FORM

County: Pittsylvania  
Stream Name: Harpen Creek  
HUC Code: 03010101  
Survey Date: 8/24/2021  
Surveyors: CB BH  
Type: Representative

Stream ID: S-G4

Basin: Upper Roanoke

PEBBLE COUNT							
Inches	PARTICLE	Millimeters		Particle Count	Total #	Item %	% Cum
	Silt/Clay	< .062	S/C	▲ ▼	2	2.00	2.00
	Very Fine	.062-.125	S A N D	▲ ▼	9	9.00	11.00
	Fine	.125-.25		▲ ▼	10	10.00	21.00
	Medium	.25-.5		▲ ▼		0.00	21.00
	Coarse	.50-1.0		▲ ▼	2	2.00	23.00
.04-.08	Very Coarse	1.0-2		▲ ▼	3	3.00	26.00
.08 -.16	Very Fine	2 -4		G R A V E L	▲ ▼	11	11.00
.16 - .22	Fine	4 -5.7	▲ ▼		6	6.00	43.00
.22 - .31	Fine	5.7 - 8	▲ ▼		6	6.00	49.00
.31 - .44	Medium	8 -11.3	▲ ▼		8	8.00	57.00
.44 - .63	Medium	11.3 - 16	▲ ▼		10	10.00	67.00
.63 - .89	Coarse	16 -22.6	▲ ▼		7	7.00	74.00
.89 - 1.26	Coarse	22.6 - 32	▲ ▼		4	4.00	78.00
1.26 - 1.77	Vry Coarse	32 - 45	▲ ▼		5	5.00	83.00
1.77 -2.5	Vry Coarse	45 - 64	▲ ▼		2	2.00	85.00
2.5 - 3.5	Small	64 - 90	C O B B L E		▲ ▼	2	2.00
3.5 - 5.0	Small	90 - 128		▲ ▼	9	9.00	96.00
5.0 - 7.1	Large	128 - 180		▲ ▼	3	3.00	99.00
7.1 - 10.1	Large	180 - 256		▲ ▼	1	1.00	100.00
10.1 - 14.3	Small	256 - 362	B O U L D E R	▲ ▼		0.00	100.00
14.3 - 20	Small	362 - 512		▲ ▼		0.00	100.00
20 - 40	Medium	512 - 1024		▲ ▼		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: Harpen Creek  
Reach Name: S-G4  
Sample Name: Representative  
Survey Date: 08/24/2021  
-----

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	2	2.00	2.00
0.062 - 0.125	9	9.00	11.00
0.125 - 0.25	10	10.00	21.00
0.25 - 0.50	0	0.00	21.00
0.50 - 1.0	2	2.00	23.00
1.0 - 2.0	3	3.00	26.00
2.0 - 4.0	11	11.00	37.00
4.0 - 5.7	6	6.00	43.00
5.7 - 8.0	6	6.00	49.00
8.0 - 11.3	8	8.00	57.00
11.3 - 16.0	10	10.00	67.00
16.0 - 22.6	7	7.00	74.00
22.6 - 32.0	4	4.00	78.00
32 - 45	5	5.00	83.00
45 - 64	2	2.00	85.00
64 - 90	2	2.00	87.00
90 - 128	9	9.00	96.00
128 - 180	3	3.00	99.00
180 - 256	1	1.00	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)	0.19		
D35 (mm)	3.64		
D50 (mm)	8.41		
D84 (mm)	54.5		
D95 (mm)	123.78		
D100 (mm)	255.99		
Silt/Clay (%)	2		
Sand (%)	24		
Gravel (%)	59		
Cobble (%)	15		
Boulder (%)	0		
Bedrock (%)	0		

Total Particles = 100.



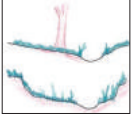
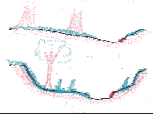
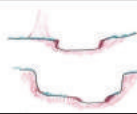
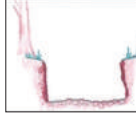

# Stream Assessment Form (Form 1)

Unified Stream Methodology for use in Virginia

For use in wadeable channels classified as intermittent or perennial

Project #	Project Name (Applicant)	Locality	Cowardin Class.	HUC	Date	SAR #	Impact Length	Impact Factor
22865.06	Mountain Valley Pipeline (Mountain Valley Pipeline, LLC)	Pittsylvania	R3	03010101	8/24/2021	S-G4	30	1
Name(s) of Evaluator(s)		Stream Name and Information					SAR Length	
CB BH		Harpen Creek					86	

## 1. Channel Condition: Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

	Conditional Category					CI
	Optimal	Suboptimal	Marginal	Poor	Severe	
<b>Channel Condition</b>	 <p>Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%). AND/OR Stable point bars / bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid-channel bars and transverse bars few. Transient sediment deposition covers less than 10% of bottom.</p>	 <p>Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed floodplains along portions of the reach. Transient sediment covers 10-40% of the stream bottom.</p>	 <p>Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may be vertical or undercut. AND/OR 40-60% Sediment may be temporary / transient, contribute to instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on &gt; 40% of the banks and depositional features which contribute to stability.</p>	 <p>Overwidened/incised. Vertically / laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-80% of banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. AND/OR 60-80% of the stream is covered by sediment. Sediment is temporary / transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on &gt; 40% of the banks and stable sediment deposition is absent.</p>	 <p>Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average rooting depth, majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. Greater than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.</p>	<b>2.40</b>
<b>Scores</b>	<b>3</b>	<b>2.4</b>	<b>2</b>	<b>1.6</b>	<b>1</b>	
<b>NOTES&gt;&gt;</b>						

## 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>>		
Riparian Buffers	Optimal	Suboptimal		Marginal		Poor				
	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover. Wetlands located within the riparian 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% to 60% 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.			
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.								Ensure the sums  of % Riparian  Blocks equal 100		
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.										
Right Bank	% Riparian Area>	30%	70%					100%		
	Score >	0.5	0.75							
Left Bank	% Riparian Area>	30%	5%	65%				100%	CI= (Sum % RA * Scores*0.01)/2	
									Rt Bank CI >	0.68
	Score >	0.5	0.85	0.75					Lt Bank CI >	0.68
									0.68	0.68

## 3. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embeddedness; shade; undercut banks; root mats; SAV; riffle/pool complexes, stable features.

	Conditional Category				NOTES>>
	Optimal	Suboptimal	Marginal	Poor	
<b>Instream Habitat/ Available Cover</b>	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.	<b>Stream Gradient</b> <b>High / Low</b> <b>CI</b>
<b>Scores</b>	<b>1.5</b>	<b>1.2</b>	<b>0.9</b>	<b>0.5</b>	

## Stream Impact Assessment Form Page 2

Project #	Project Name (Applicant)	Locality	Cowardin Class.	HUC	Date	SAR #	Impact Length	Impact Factor
22865.06	Mountain Valley Pipeline (Mountain Valley Pipeline, LLC)	Pittsylvania	R3	03010101	8/24/2021	S-G4	30	1

**4. CHANNEL ALTERATION:** Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock

Channel Alteration	Conditional Category					NOTES>>	CI
	Negligible	Minor	Moderate		Severe		
	Channelization, dredging, alteration, or hardening absent. Stream has an unaltered pattern or has naturalized.	Less than 20% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	20-40% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	40 - 60% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	60 - 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines AND/OR 80% of banks shored with gabion, riprap, or cement.	
<b>Scores</b>	<b>1.5</b>	<b>1.3</b>	<b>1.1</b>	<b>0.9</b>	<b>0.7</b>	<b>0.5</b>	<b>1.50</b>

### 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) >>** **1.22**

RCI = (Sum of all CI's)/5, except if stream is ephemeral RCI = (Riparian CI/2)

**COMPENSATION REQUIREMENT (CR) >>** **37**

CR = RCI X L<sub>i</sub> X IF

### INSERT PHOTOS:

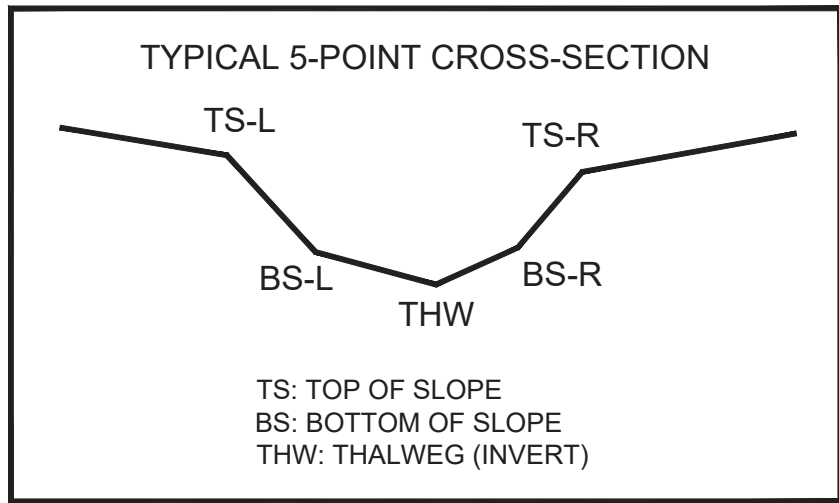
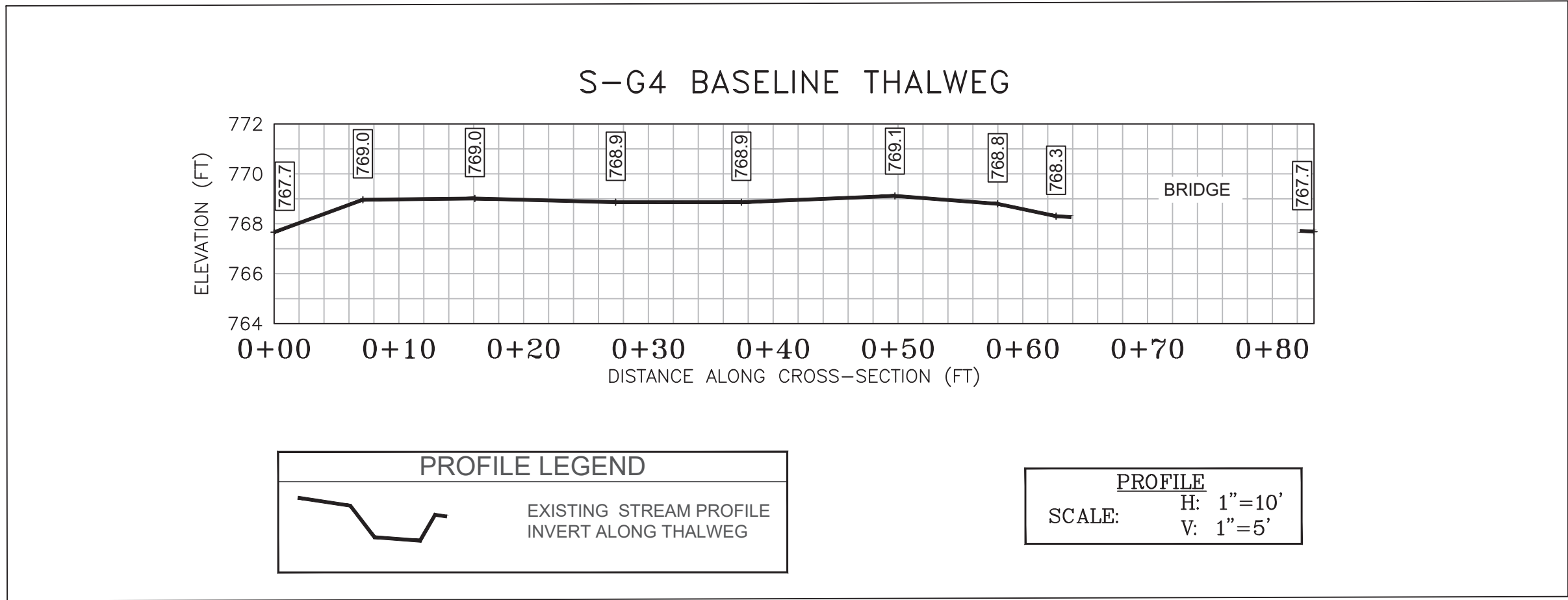
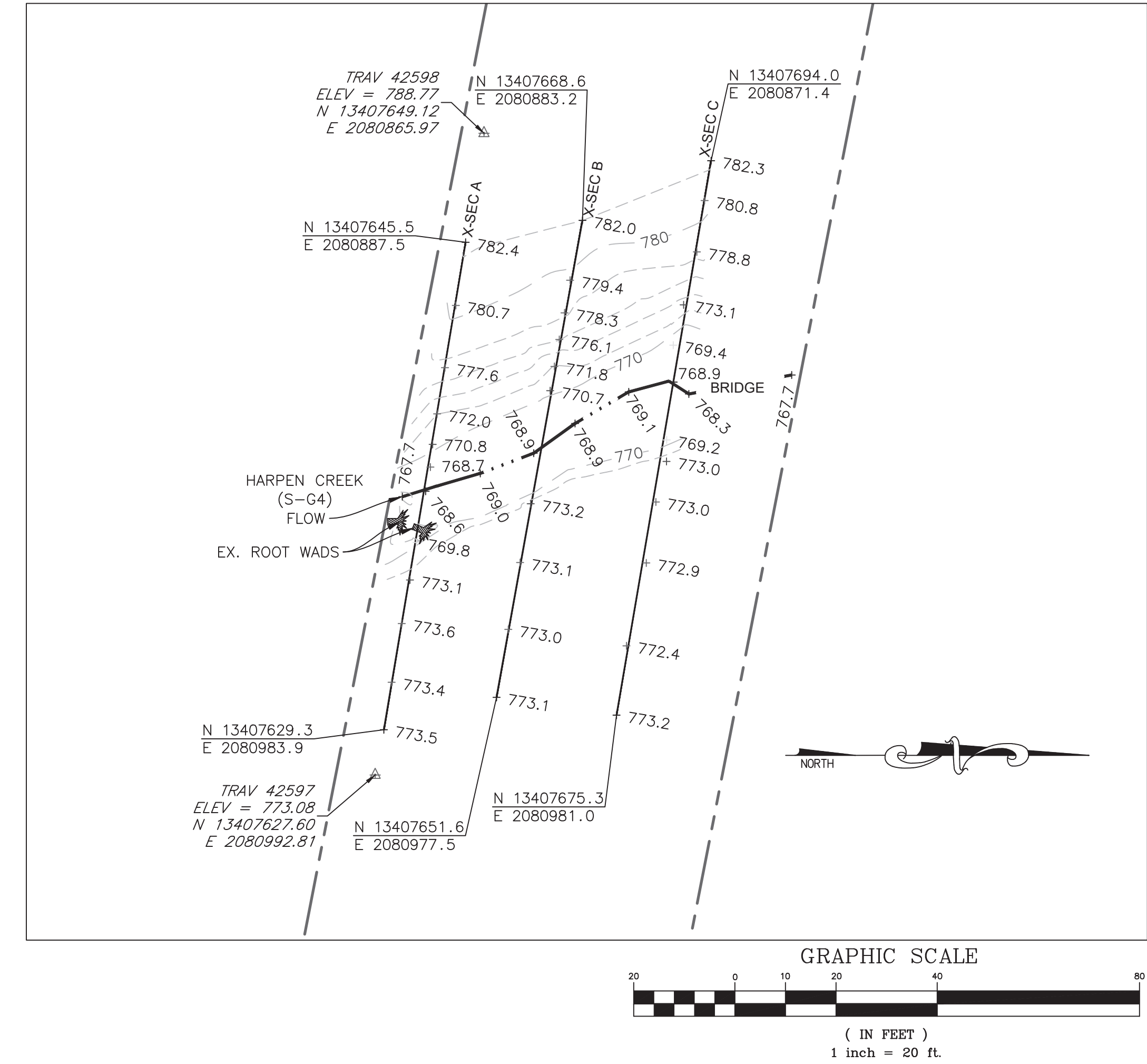


**CAPTION.** Assessment is limited to areas within the temporary ROW.

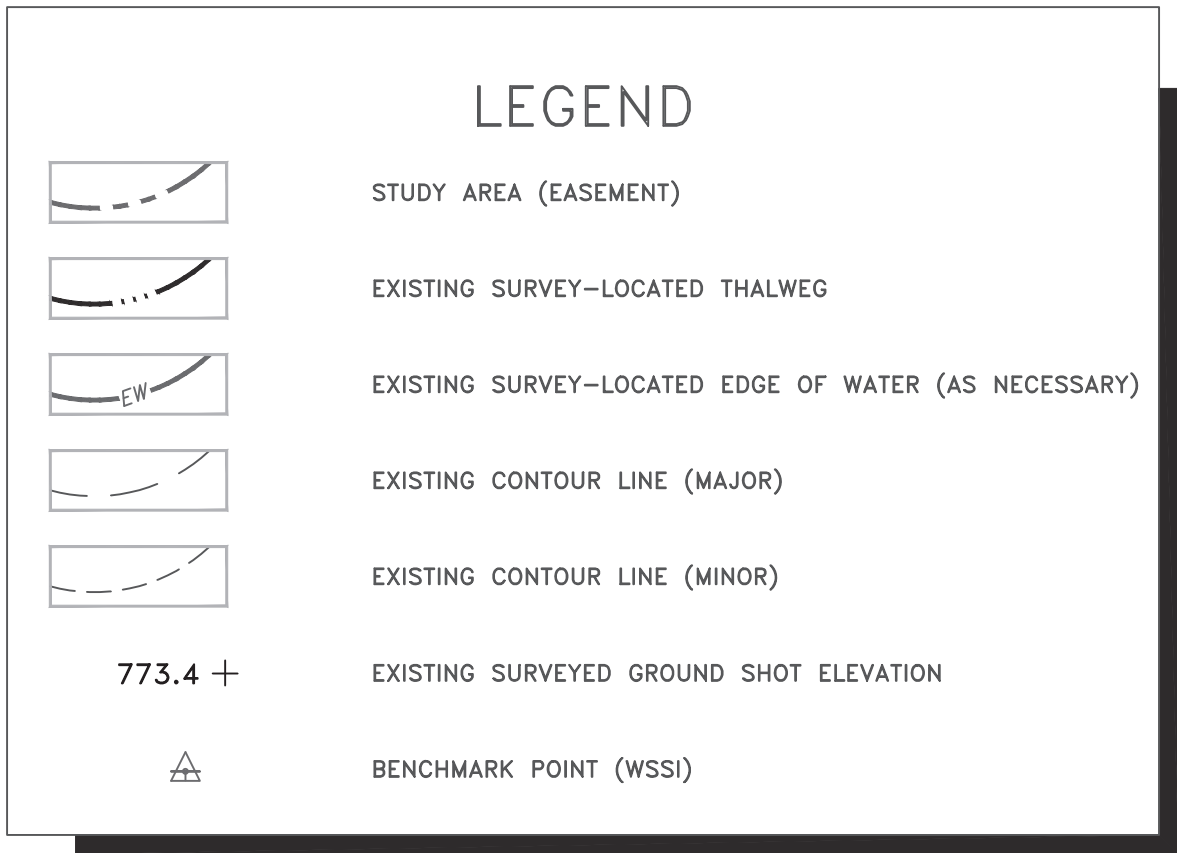
### DESCRIBE PROPOSED IMPACT:

PROVIDED UNDER SEPARATE COVER



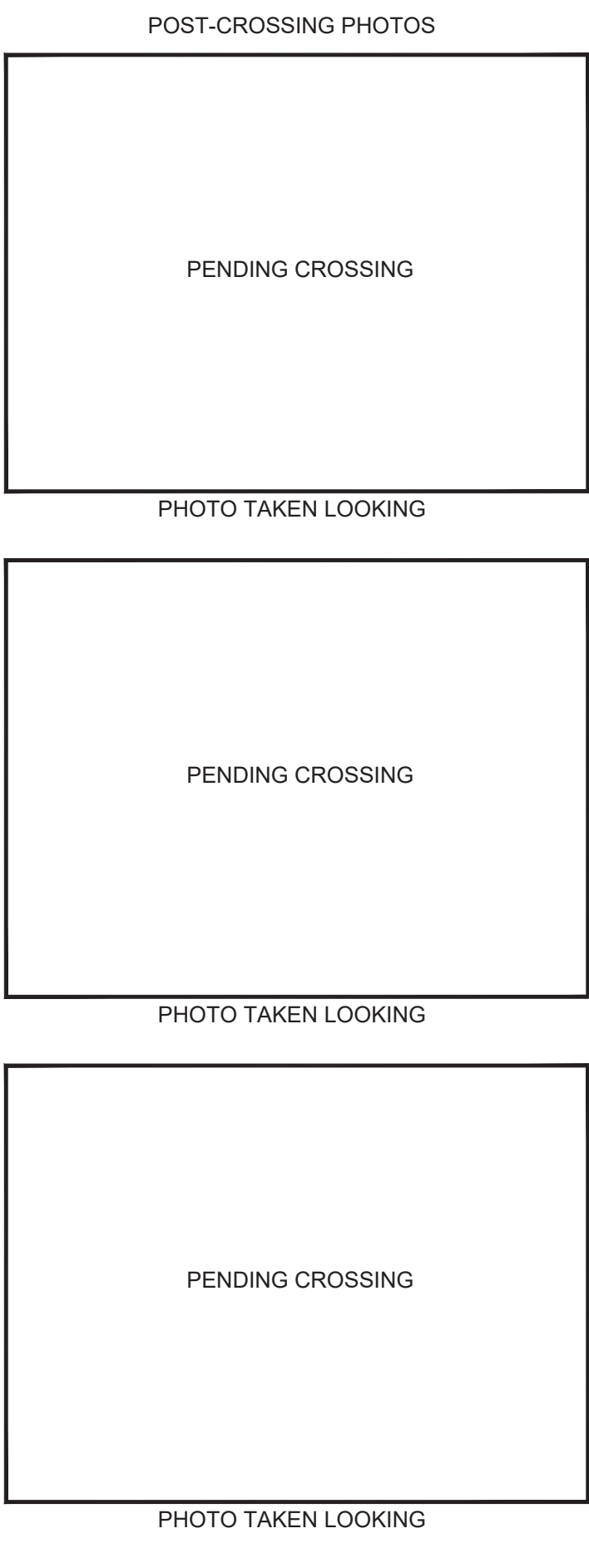
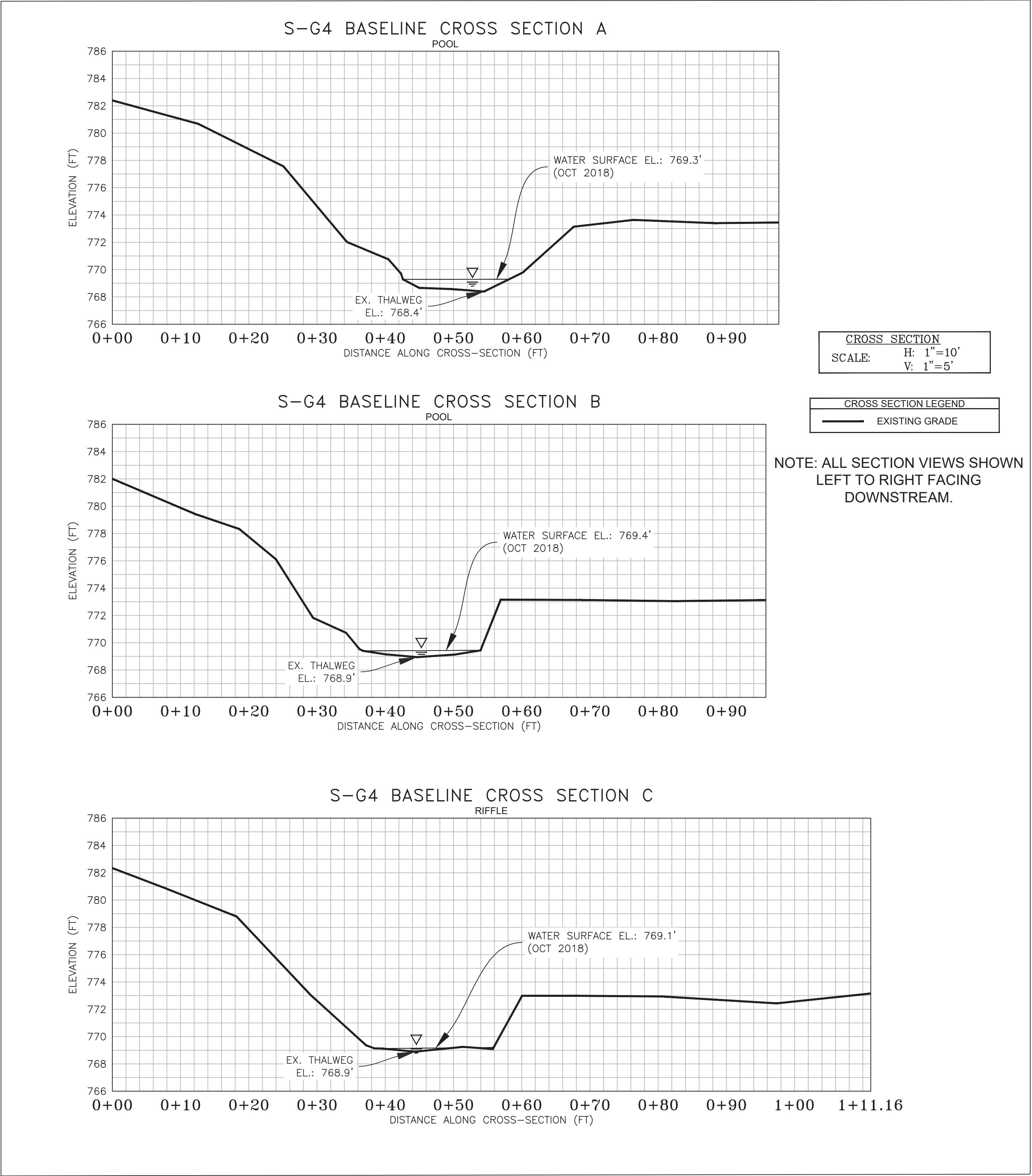


CL STAKEOUT POINTS: S-G4 CROSS SECTION B (PIPE CL)					
PRE-CROSSING			POST-CROSSING		
PT. LOC.	NORTHING	EASTING	ELEV.	VERT. DIFF.	HORZ. DIFF.
TS-L	13407662.21	2080916.86	770.72	----	----
BS-L	13407661.80	2080918.77	769.53	----	----
THW	13407660.42	2080927.06	768.94	----	----
BS-R	13407658.79	2080936.25	769.44	----	----
TS-R	13407658.36	2080939.19	773.16	----	----



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 October 30, 2018.
- 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).



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Prepared For: MVP

Profile and Cross-Sections Baseline Survey

Crossing S-G4 - Harpen Creek (MP 291.7)

Pittsylvania County, Virginia

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REVISIONS		App. By	Rev. By	Date	Description
No.					

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	SIH	PFS

Sheet #  
1 of 1

Computer File Name:  
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SCALE: AS NOTED  
DATE: October 2021