Baseline Assessment – Stream Attributes

Reach S-E28-Mid (Pipeline ROW)
Perennial
Spread I
Franklin County, Virginia

Data	Included
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	N/A – Lack of habitat
Wolman Pebble Count	✓
RiverMorph Data Sheet	✓
USM Form (Virginia Only)	✓
Longitudinal Profile and Cross Sections	✓

Spread I   Stream S-E28 Mid (Pipeline ROW) Franklin County

DIRECTION 253 deg(T)   37.08523°N 079.94792°W   ACCURACY 5 m DATUM WGS84

S-E28 MID US VIEW   2021-08-30 13:14:45-04:00

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

DIRECTION 88 deg(T)   37.08522°N 079.94793°W   ACCURACY 5 m DATUM WGS84

S-E28 MID DS COND   2021-08-30 13:14:29-04:00

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

Photo Type: LB CL
Location, Orientation, Photographer Initials: On thalweg at pipe centerline looking S at right streambank, RAH

Photo Type: RB CL
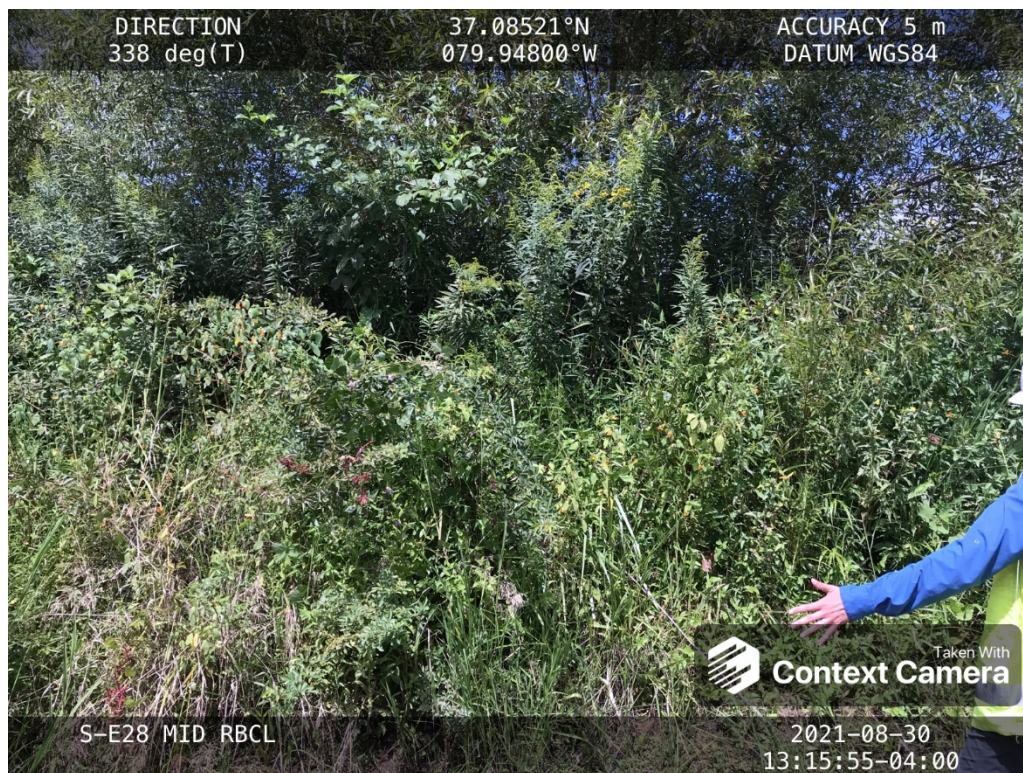Location, Orientation, Photographer Initials: On thalweg at pipe centerline looking NW at left streambank, RAH
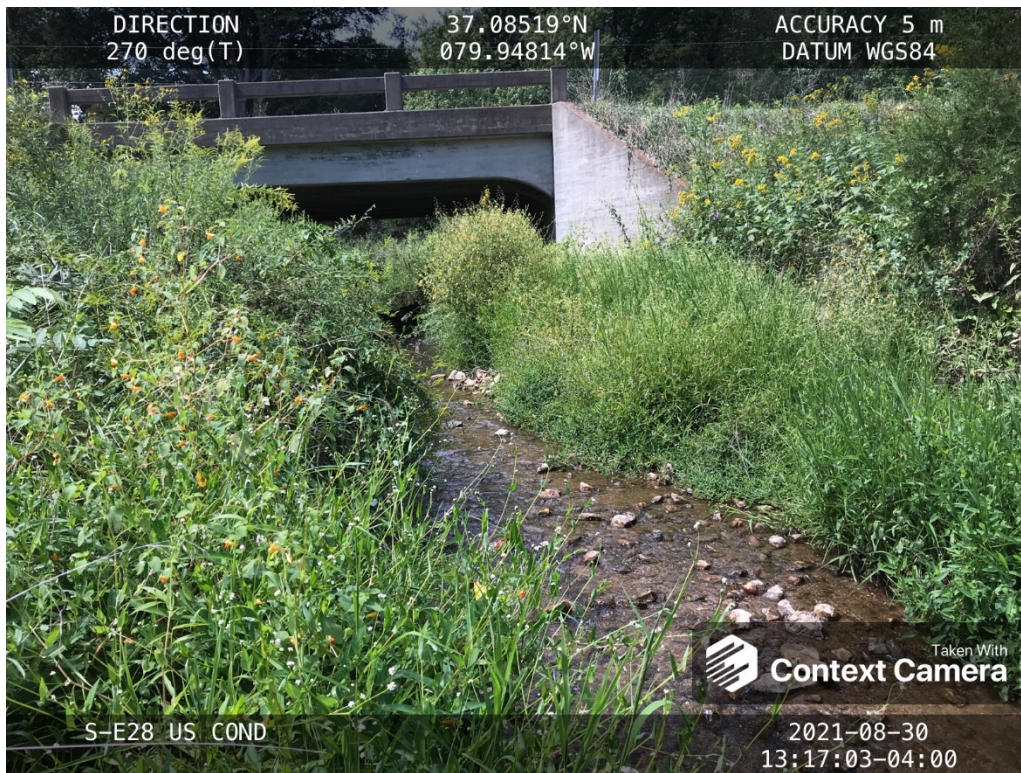
Photo Type: US COND
Location, Orientation, Photographer Initials: Upstream at ROW/LOD looking W upstream, RAH
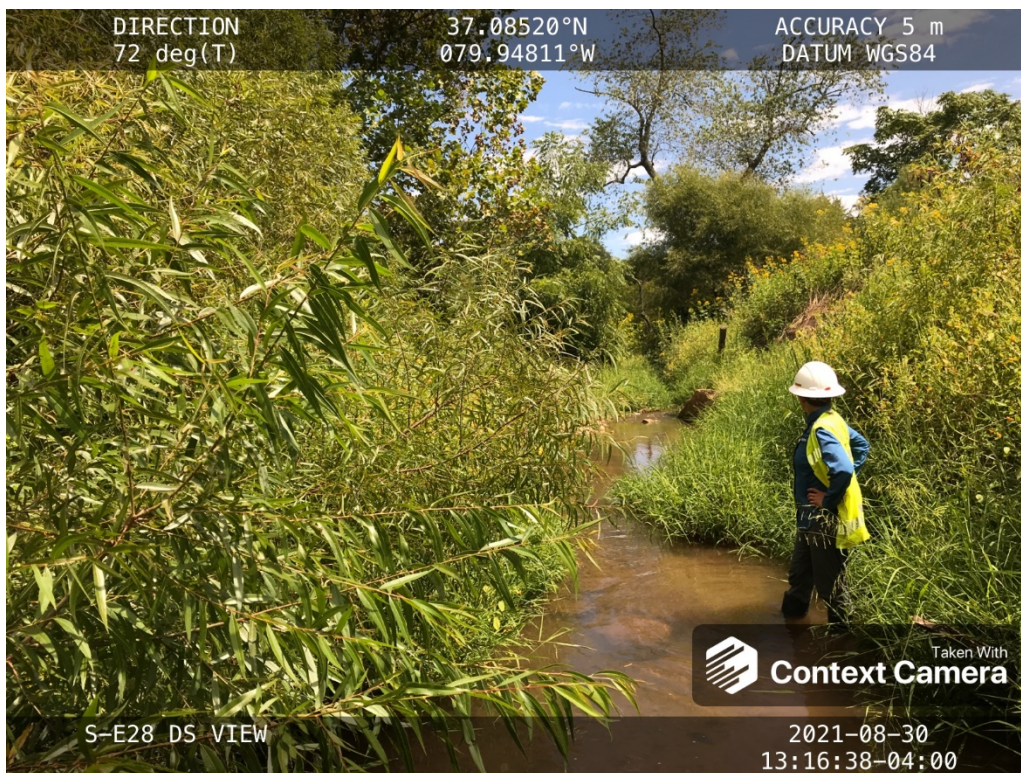

Photo Type: DS VIEW
Location, Orientation, Photographer Initials: Upstream at ROW/LOD looking NE downstream, RAH

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	Mountain Valley Pipeline		IMPACT COORDINATES: (in Decimal Degrees)	Lat.	37.085247	Lon.	-79.948057	WEATHER:	Sunny	DATE:	August 30, 2021

IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)	S-E28-Mid; 1945.14 ac	MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)		Comments:

STREAM IMPACT LENGTH:	76	FORM OF MITIGATION:	RESTORATION (Levels I-III)	MIT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		PRECIPITATION PAST 48 HRS:	Yes	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:		Stream Classification:	0	Stream Classification:	0	Stream Classification:	0

Percent Stream Channel Slope	2.32	Percent Stream Channel Slope		Percent Stream Channel Slope	0	Percent Stream Channel Slope	0	Percent Stream Channel Slope	0

HGM Score (attach data forms):

	Average		Average		Average		Average		Average
Hydrology Biogeochemical Cycling Habitat	0	Hydrology Biogeochemical Cycling Habitat	0	Hydrology Biogeochemical Cycling Habitat	0	Hydrology Biogeochemical Cycling Habitat	0	Hydrology Biogeochemical Cycling Habitat	0

PART I - Physical, Chemical and Biological Indicators

PHYSICAL INDICATOR (Applies to all streams classifications)

Column 1 - USEPA RBP (High Gradient Data Sheet)

	Points Scale	Range	Site Score
1. Epifaunal Substrate/Available Cover	0-20		11
2. Embeddedness	0-20		10
3. Velocity/ Depth Regime	0-20		11
4. Sediment Deposition	0-20		6
5. Channel Flow Status	0-20	0-1	17
6. Channel Alteration	0-20		18
7. Frequency of Riffles (or bends)	0-20		5
8. Bank Stability (LB & RB)	0-20		18
9. Vegetative Protection (LB & RB)	0-20		20
10. Riparian Vegetative Zone Width (LB & RB)	0-20		11
Total RBP Score	Suboptimal		127
Sub-Total			0.635

Column 2 - 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

Column 3 - 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

Column 4 - 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

Column 5 - 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)

Column 1
Specific Conductivity		
<=99 - 90 points	0-90	72.3
pH		
6.0-8.0 = 80 points	0-80, 0-1	7.54
DO		
>5.0 = 30 points	10-30	9.7
Sub-Total		1

Column 2
Specific Conductivity		
	0-90	
pH		
	5-90, 0-1	
DO		
	10-30	
Sub-Total		0

Column 3
Specific Conductivity		
	0-90	
pH		
	5-90, 0-1	
DO		
	10-30	
Sub-Total		0

Column 4
Specific Conductivity		
	0-90	
pH		
	5-90, 0-1	
DO		
	10-30	
Sub-Total		0

Column 5
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)

Column 1			Column 2			Column 3			Column 4			Column 5		
0				0-100	0-1		0-100	0-1		0-100	0-1		0-100	0-1
Sub-Total		0	Sub-Total		0	Sub-Total		0	Sub-Total		0	Sub-Total		0

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
0.818	76	62.13	0	0	0	0	0	0	0	0	0	0	0	0

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

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

WEATHER CONDITIONS	**Now**　　　　　　　　　　　　**Past 24 hours**　　**Has there been a heavy rain in the last 7 days?** 　　　　　　　　　　　　　　　　　　　　Yes　　　　No 　　　　　storm (heavy rain) 　　　　　rain (steady rain)　　　　　　**Air Temperature_____ ^{0} C** 　　　　　showers (intermittent) ____%　　%cloud cover　　____%　　**Other**_____ 　　　　　clear/sunny
SITE LOCATION/MAP	**Draw a map of the site and indicate the areas sampled (or attach a photograph)**
STREAM CHARACTERIZATION	**Stream Subsystem**　　　　　　　　　　　　**Stream Type** 　Perennial　　Intermittent　　Tidal　　　　Coldwater　　　Warmwater **Stream Origin**　　　　　　　　　　　　　　**Catchment Area**_____ km^2 　Glacial　　　　　　　　Spring-fed 　Non-glacial montane　　Mixture of origins 　Swamp and bog　　　　　Other_____

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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**_____ ⁰C **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

<table>
<tr><td rowspan="2"></td><td rowspan="2">Habitat Parameter</td><td colspan="4">Condition Category</td></tr>
<tr><td>Optimal</td><td>Suboptimal</td><td>Marginal</td><td>Poor</td></tr>
<tr>
<td rowspan="10">Parameters to be evaluated in sampling reach</td>
<td>1. Epifaunal Substrate/ Available Cover</td>
<td>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).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td>SCORE</td>
<td>20   19   18   17   16</td>
<td>15   14   13   12   11</td>
<td>10   9   8   7   6</td>
<td>5   4   3   2   1   0</td>
</tr>
<tr>
<td>2. Embeddedness</td>
<td>Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.</td>
<td>Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.</td>
<td>Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.</td>
<td>Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.</td>
</tr>
<tr>
<td>SCORE</td>
<td>20   19   18   17   16</td>
<td>15   14   13   12   11</td>
<td>10   9   8   7   6</td>
<td>5   4   3   2   1   0</td>
</tr>
<tr>
<td>3. Velocity/Depth Regime</td>
<td>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.)</td>
<td>Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).</td>
<td>Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).</td>
<td>Dominated by 1 velocity/ depth regime (usually slow-deep).</td>
</tr>
<tr>
<td>SCORE</td>
<td>20   19   18   17   16</td>
<td>15   14   13   12   11</td>
<td>10   9   8   7   6</td>
<td>5   4   3   2   1   0</td>
</tr>
<tr>
<td>4. Sediment Deposition</td>
<td>Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.</td>
<td>Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.</td>
<td>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.</td>
<td>Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.</td>
</tr>
<tr>
<td>SCORE</td>
<td>20   19   18   17   16</td>
<td>15   14   13   12   11</td>
<td>10   9   8   7   6</td>
<td>5   4   3   2   1   0</td>
</tr>
<tr>
<td>5. Channel Flow Status</td>
<td>Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.</td>
<td>Water fills >75% of the available channel; or <25% of channel substrate is exposed.</td>
<td>Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.</td>
<td>Very little water in channel and mostly present as standing pools.</td>
</tr>
<tr>
<td>SCORE</td>
<td>20   19   18   17   16</td>
<td>15   14   13   12   11</td>
<td>10   9   8   7   6</td>
<td>5   4   3   2   1   0</td>
</tr>
</table>

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A-7

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

(left margin: 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-E28-Mid
Stream Name: Teels Creek
HUC Code: 03010101   Basin: Upper Roanoke
Survey Date: 8/30/2021
Surveyors: RC, RH, DW
Type: Representative

PEBBLE COUNT							
Inches	PARTICLE	Millimeters		Particle Count	Total #	Item %	% Cum
	Silt/Clay	< .062	S/C	▲ ▼	16	16.00	16.00
	Very Fine	.062-.125		▲ ▼	2	2.00	18.00
	Fine	.125-.25		▲ ▼	2	2.00	20.00
	Medium	.25-.5	S A N D	▲ ▼	3	3.00	23.00
	Coarse	.50-1.0		▲ ▼	11	11.00	34.00
.04-.08	Very Coarse	1.0-2		▲ ▼	7	7.00	41.00
.08 -.16	Very Fine	2 -4		▲ ▼	3	3.00	44.00
.16 - .22	Fine	4 -5.7		▲ ▼	13	13.00	57.00
.22 - .31	Fine	5.7 - 8		▲ ▼	4	4.00	61.00
.31 - .44	Medium	8 -11.3		▲ ▼	2	2.00	63.00
.44 - .63	Medium	11.3 - 16	G R A V E L	▲ ▼	3	3.00	66.00
.63 - .89	Coarse	16 -22.6		▲ ▼	2	2.00	68.00
.89 - 1.26	Coarse	22.6 - 32		▲ ▼	3	3.00	71.00
1.26 - 1.77	Vry Coarse	32 - 45		▲ ▼	8	8.00	79.00
1.77 -2.5	Vry Coarse	45 - 64		▲ ▼	4	4.00	83.00
2.5 - 3.5	Small	64 - 90		▲ ▼	6	6.00	89.00
3.5 - 5.0	Small	90 - 128	C O B B L E	▲ ▼	5	5.00	94.00
5.0 - 7.1	Large	128 - 180		▲ ▼		0.00	94.00
7.1 - 10.1	Large	180 - 256		▲ ▼	2	2.00	96.00
10.1 - 14.3	Small	256 - 362		▲ ▼	1	1.00	97.00
14.3 - 20	Small	362 - 512		▲ ▼	3	3.00	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:       Teels Creek
Reach Name:       S-E28-Mid
Sample Name:      Representative
Survey Date:      08/30/2021


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

Size (mm)              TOT #      ITEM %     CUM %
-----------------------------------------------------------------
0 - 0.062              16         16.00      16.00
0.062 - 0.125          2          2.00       18.00
0.125 - 0.25           2          2.00       20.00
0.25 - 0.50            3          3.00       23.00
0.50 - 1.0             11         11.00      34.00
1.0 - 2.0              7          7.00       41.00
2.0 - 4.0              3          3.00       44.00
4.0 - 5.7              13         13.00      57.00
5.7 - 8.0              4          4.00       61.00
8.0 - 11.3             2          2.00       63.00
11.3 - 16.0            3          3.00       66.00
16.0 - 22.6            2          2.00       68.00
22.6 - 32.0            3          3.00       71.00
32 - 45                8          8.00       79.00
45 - 64                4          4.00       83.00
64 - 90                6          6.00       89.00
90 - 128               5          5.00       94.00
128 - 180              0          0.00       94.00
180 - 256              2          2.00       96.00
256 - 362              1          1.00       97.00
362 - 512              3          3.00       100.00
512 - 1024             0          0.00       100.00
1024 - 2048            0          0.00       100.00
Bedrock                0          0.00       100.00

D16 (mm)               0.06
D35 (mm)               1.14
D50 (mm)               4.78
D84 (mm)               68.33
D95 (mm)               218
D100 (mm)              511.99
Silt/Clay (%)          16
Sand (%)               25
Gravel (%)             42
Cobble (%)             13
Boulder (%)            4
Bedrock (%)            0

Total Particles = 100.
```
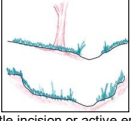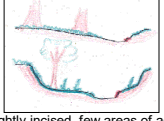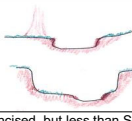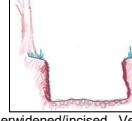
Stream Assessment Form (Form 1)

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)	Franklin County	R3	03010101	8/30/21	S-E28-Mid	76	1

Name(s) of Evaluator(s)	Stream Name and Information	SAR Length
RC, RH, DW	Teels Creek	75

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

Conditional Category

Channel Condition	Optimal	Suboptimal	Marginal	Poor	Severe	CI
	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.	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.	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 instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	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 > 40% of the banks and stable sediment deposition is absent.	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.	CI
Scores	3	2.4	2	1.6	1	3.00

NOTES>>

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.
		High	Low	High	Low	High	Low
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>	75%	25%				100%	
	Score >	0.75	0.5					

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

Left Bank	% Riparian Area>	20%	25%	55%			100%	Rt Bank CI >	0.69	CI
	Score >	1.1	0.5	0.6				Lt Bank CI >	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>>

Instream Habitat/ Available Cover	Optimal	Suboptimal	Marginal	Poor		CI
	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.	Stream Gradient	CI
Scores	1.5	1.2	0.9	0.5	High / Low	1.20

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)	Franklin County	R3	03010101	8/30/21	S-E28-Mid	76	1

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

	Conditional Category						NOTES>>	
	Negligible	**Minor**		**Moderate**		**Severe**		
Channel Alteration	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.		**CI**
Scores	1.5	1.3	1.1	0.9	0.7	0.5		1.30

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) >>	1.24

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

COMPENSATION REQUIREMENT (CR) >>	94

$CR = RCI \times L_I \times IF$

INSERT PHOTOS:

DIRECTION 72 deg(T)　37.08520°N 079.94811°W　ACCURACY 5 m DATUM WGS84
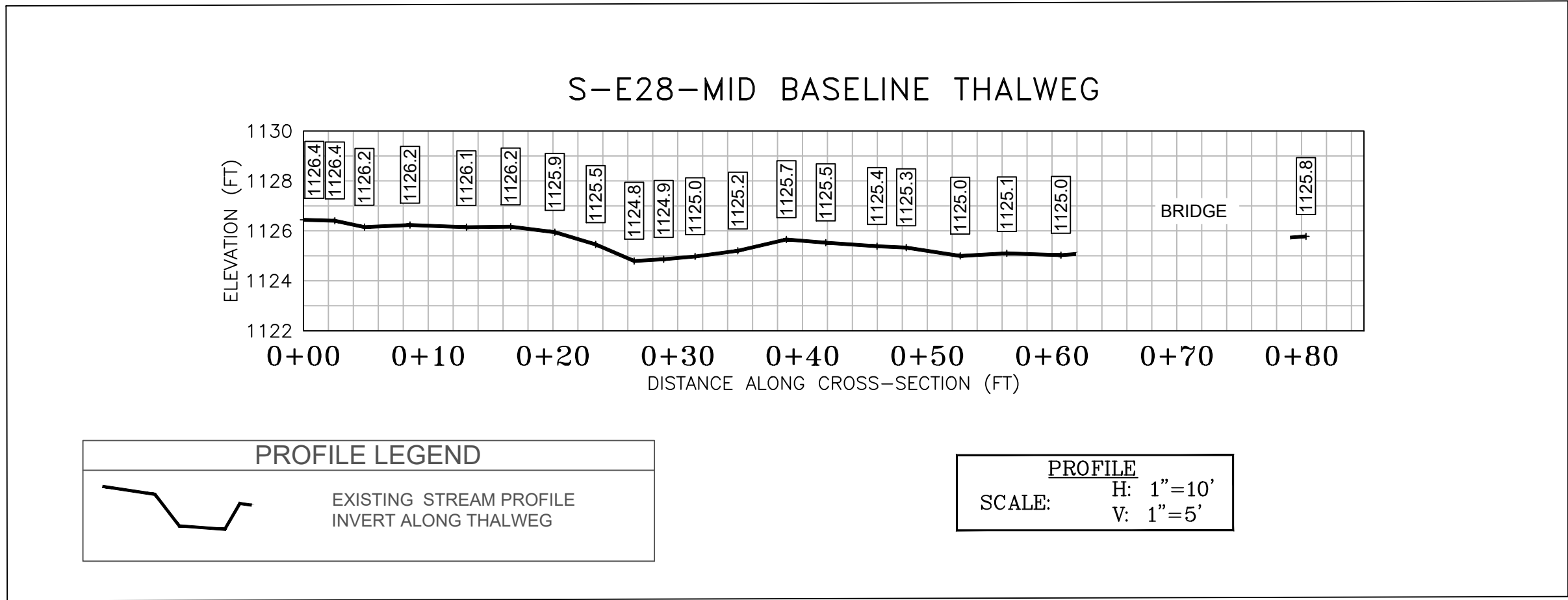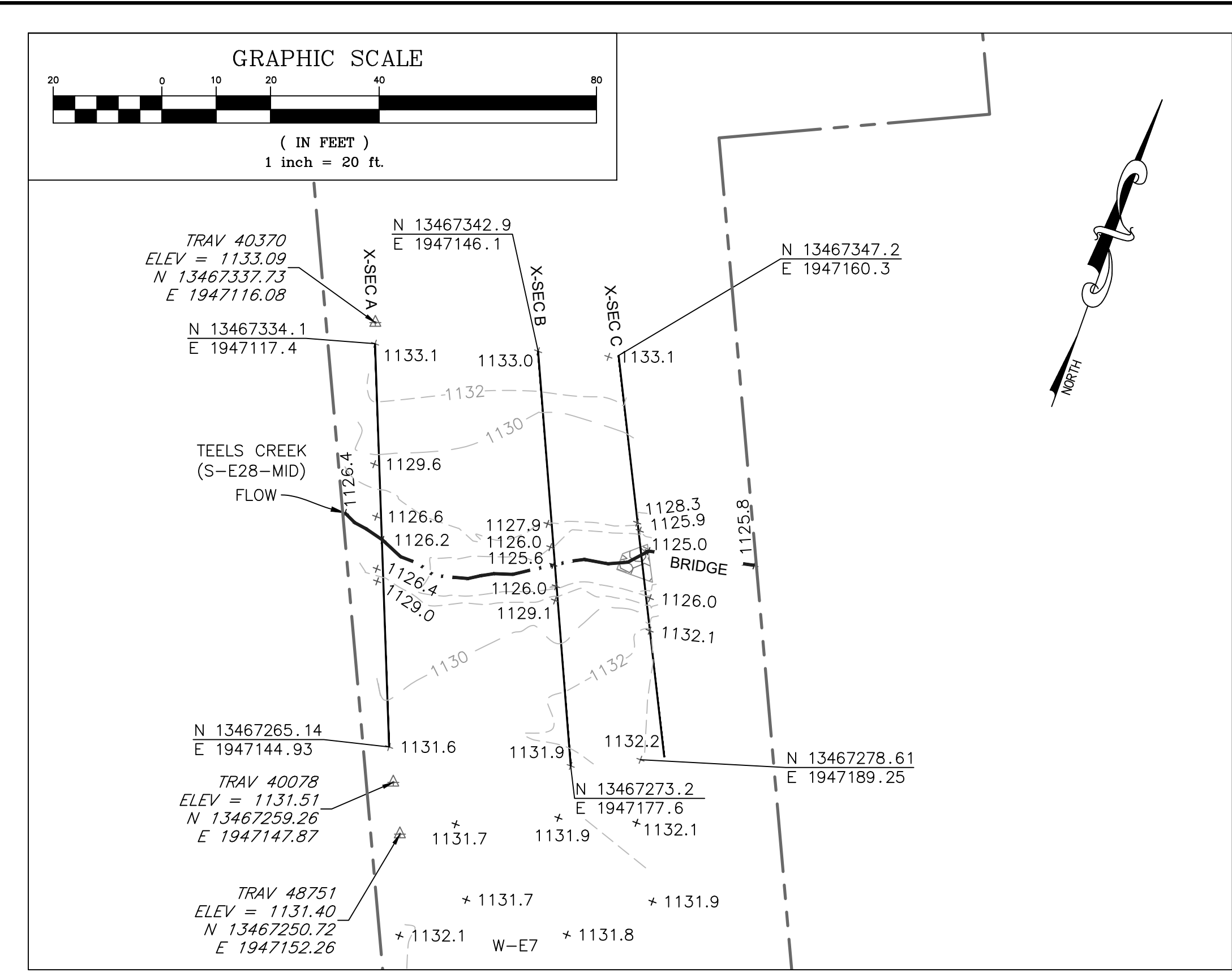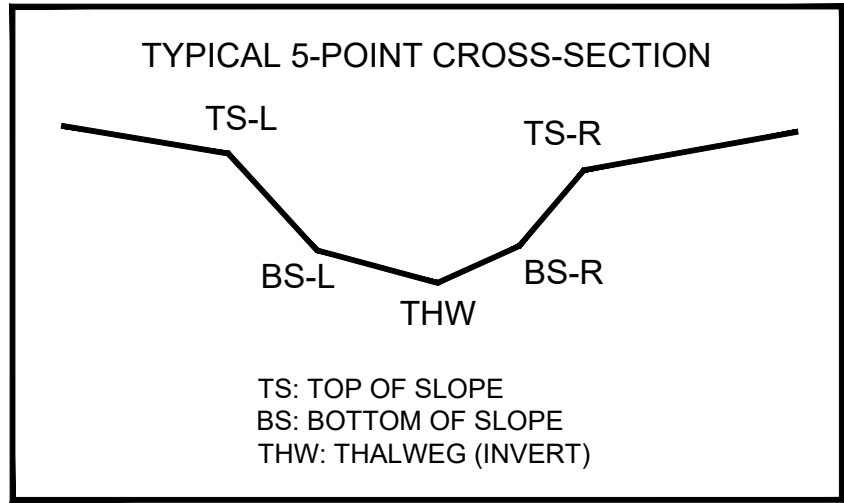
S-E28 DS VIEW

2021-08-30 13:16:38-04:00

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

DESCRIBE PROPOSED IMPACT:

PROVIDED UNDER SEPARATE COVER

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 September 6, 2018.

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).

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)
1239.6 +	EXISTING SURVEYED GROUND SHOT ELEVATION
△	BENCHMARK POINT (WSSI)

Plan view labels

TRAV 40370
ELEV = 1133.09
N 13467337.73
E 1947116.08

N 13467342.9
E 1947146.1

N 13467334.1
E 1947117.4

N 13467347.2
E 1947160.3

TEELS CREEK
(S-E28-MID)
FLOW

BRIDGE

N 13467265.14
E 1947144.93

TRAV 40078
ELEV = 1131.51
N 13467259.26
E 1947147.87

TRAV 48751
ELEV = 1131.40
N 13467250.72
E 1947152.26

N 13467273.2
E 1947177.6

N 13467278.61
E 1947189.25

W-E7

X-SEC A
X-SEC B
X-SEC C

NORTH

Ground shots: 1133.1, 1133.0, 1133.0, 133.1, 1129.6, 1126.6, 1126.2, 1127.9, 1126.0, 1125.6, 1126.0, 1126.4, 1129.0, 1128.3, 1125.9, 1125.0, 1126.0, 1129.1, 1132.1, 1125.8, 1131.6, 1131.9, 1132.2, 1132.1, 1131.7, 1131.9, 1132.1, 1131.7, 1131.9, 1132.1, 1131.8

S-E28-MID BASELINE THALWEG

Elevations along profile: 1126.4, 1126.4, 1126.2, 1126.2, 1126.1, 1126.2, 1125.9, 1125.5, 1124.8, 1124.9, 1125.2, 1125.7, 1125.4, 1125.3, 1125.0, 1125.1, 1125.0

BRIDGE

PROFILE LEGEND

EXISTING STREAM PROFILE
INVERT ALONG THALWEG

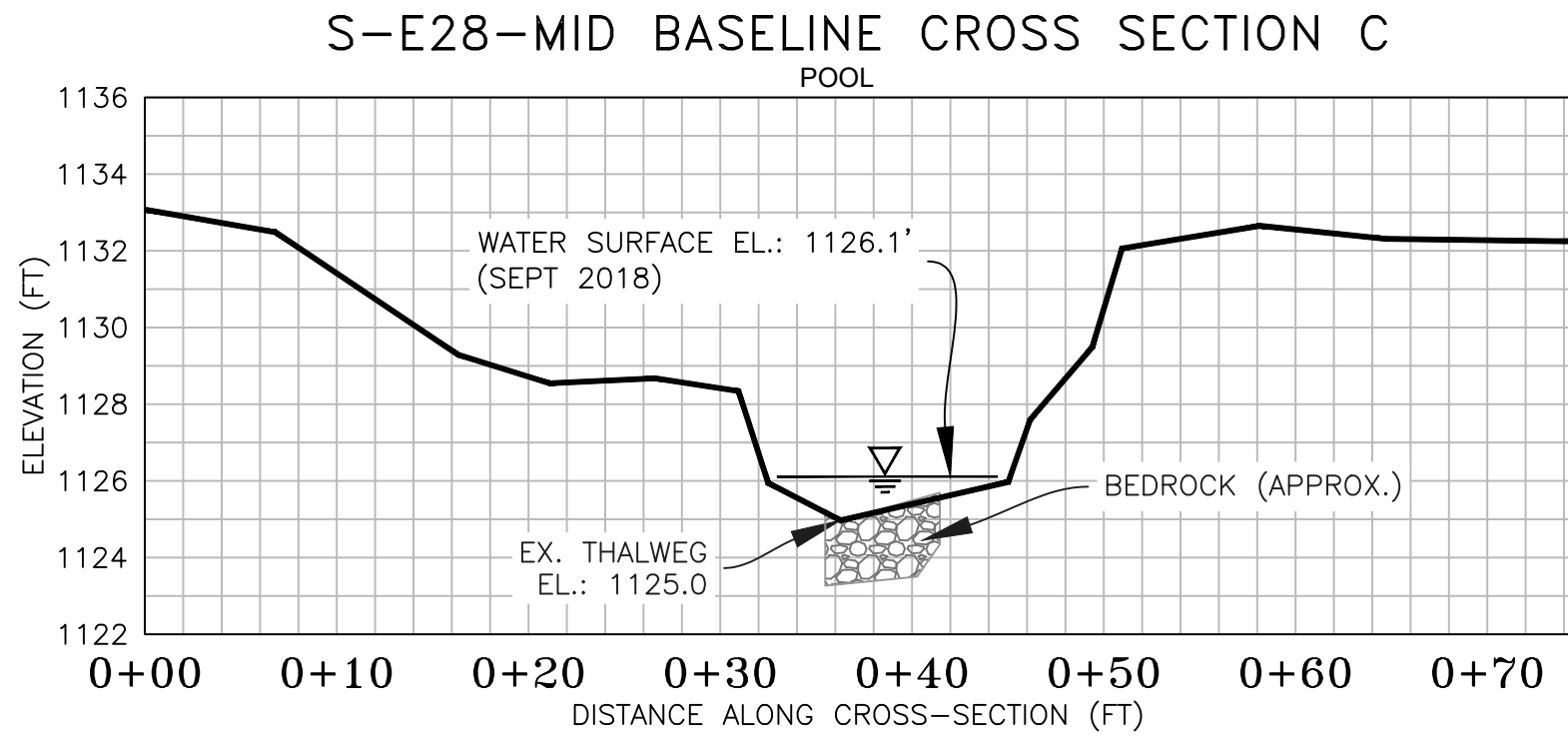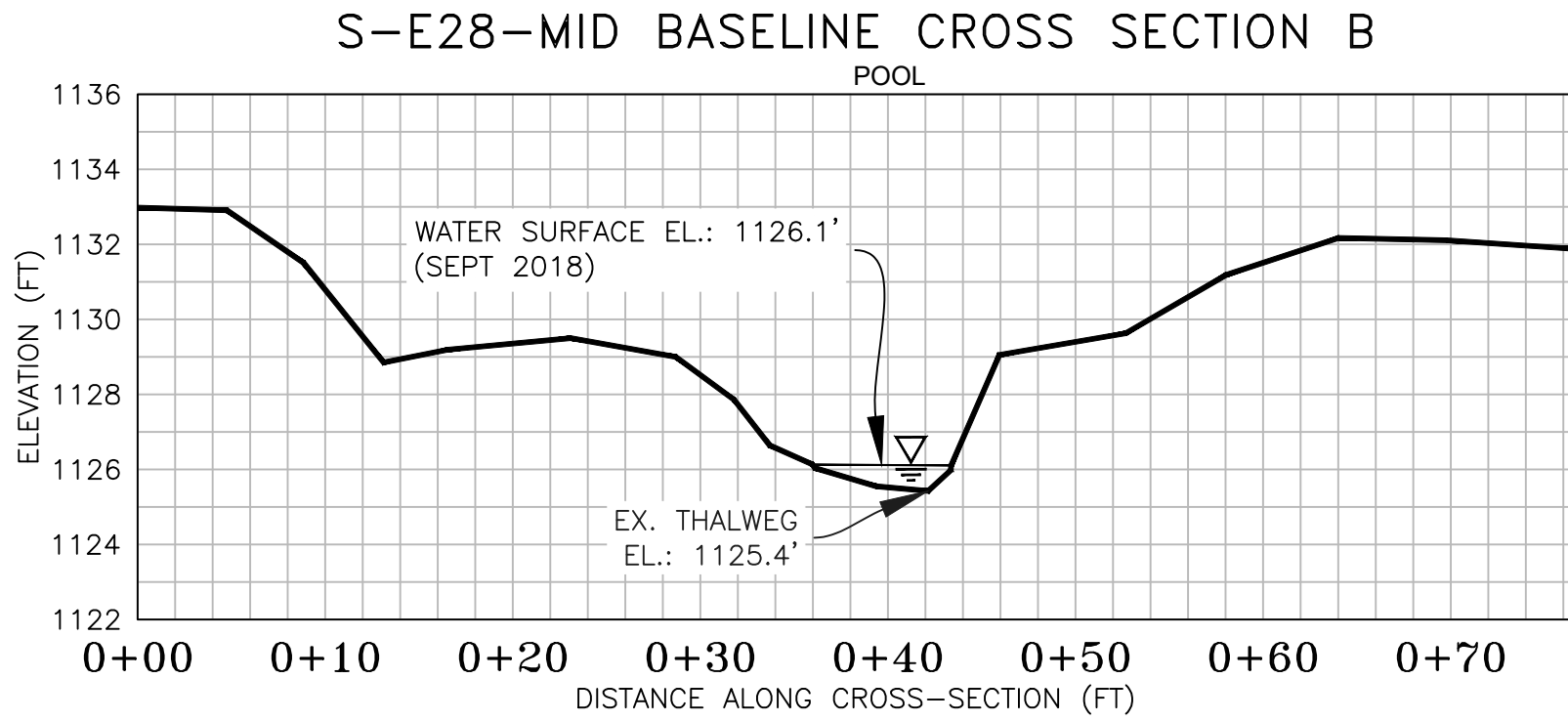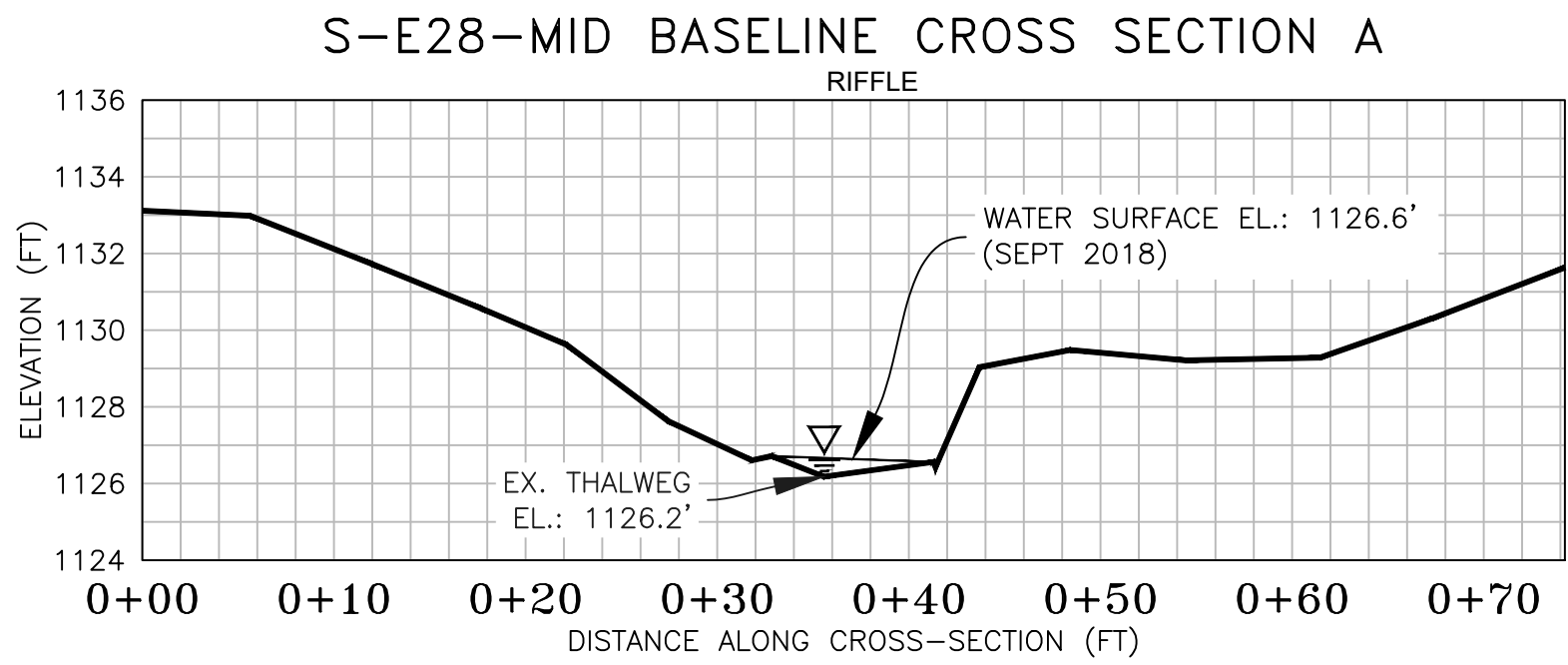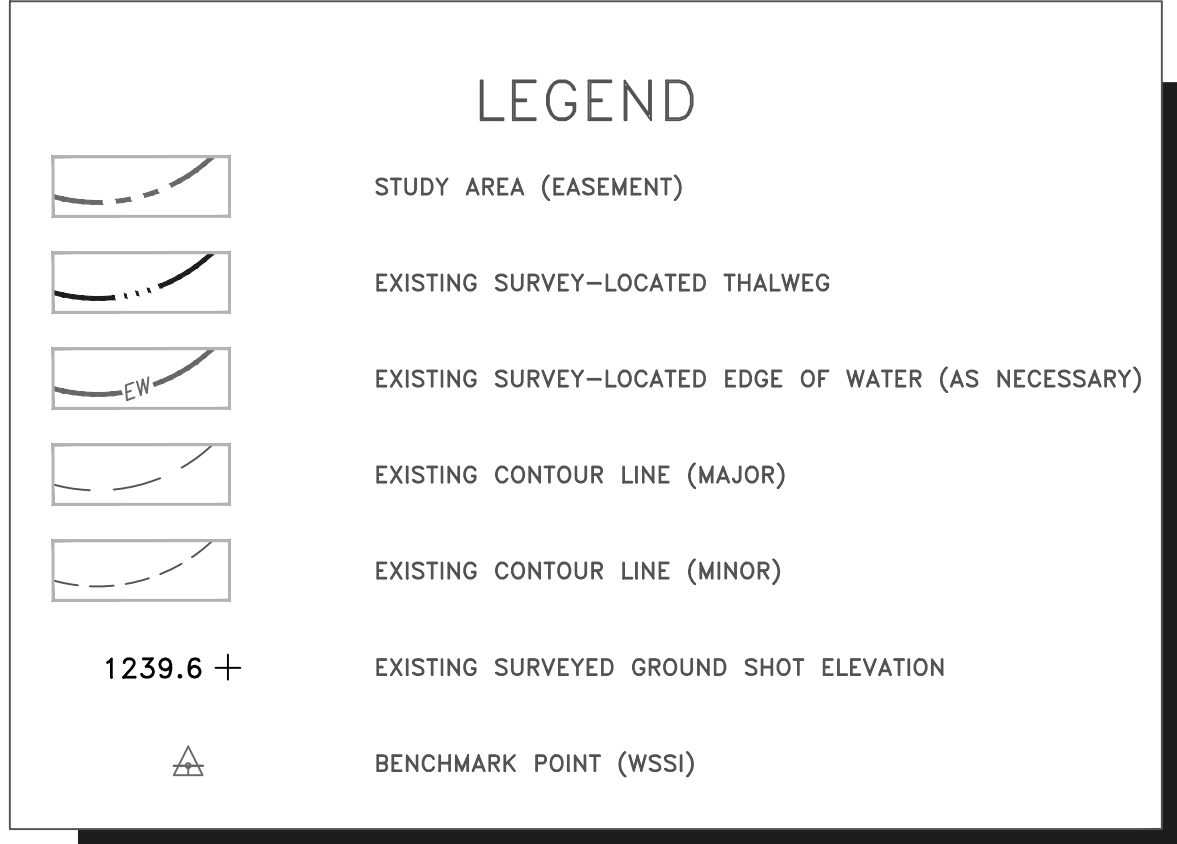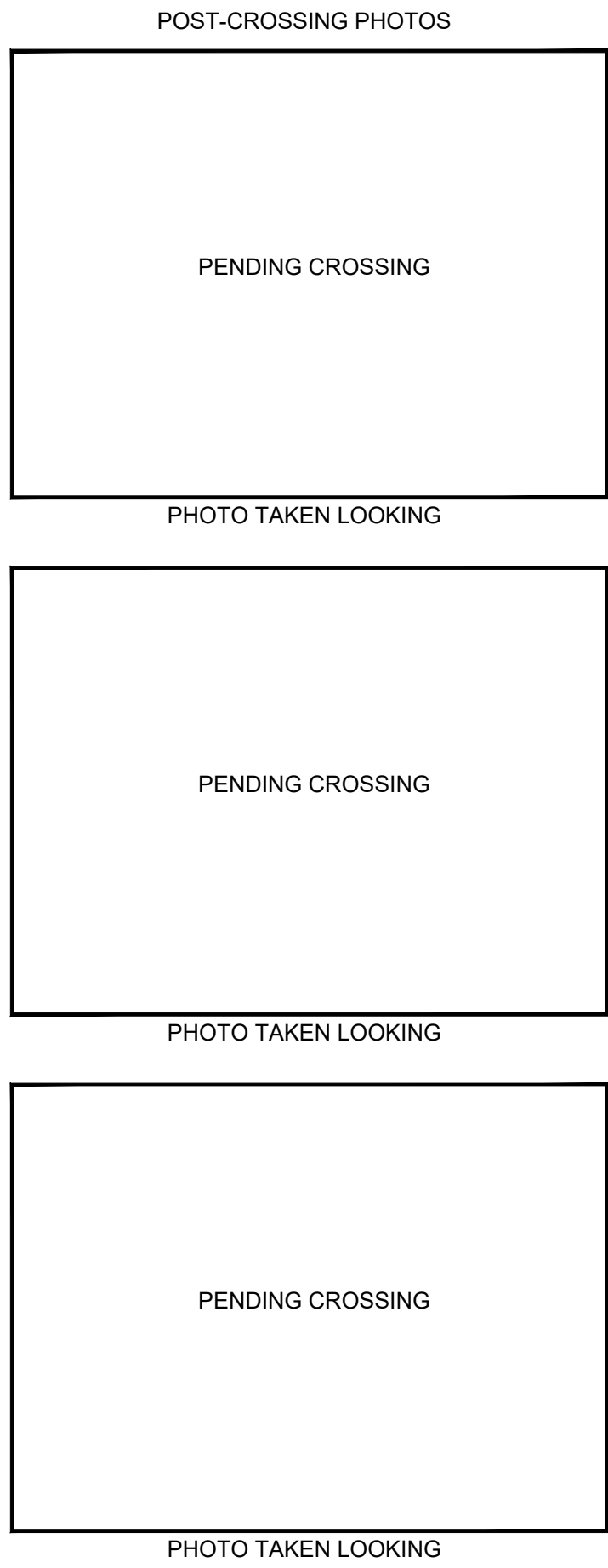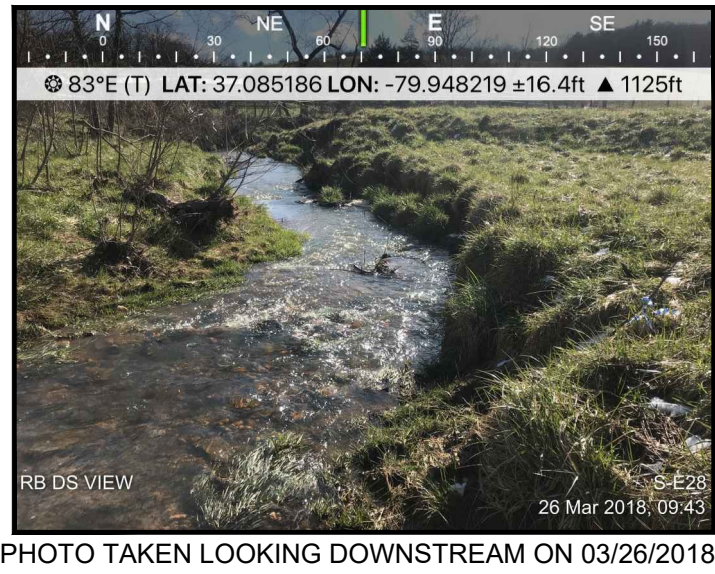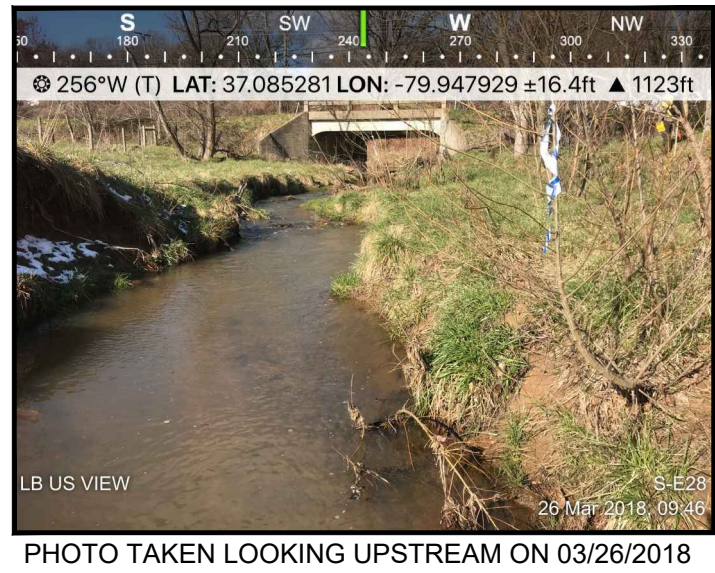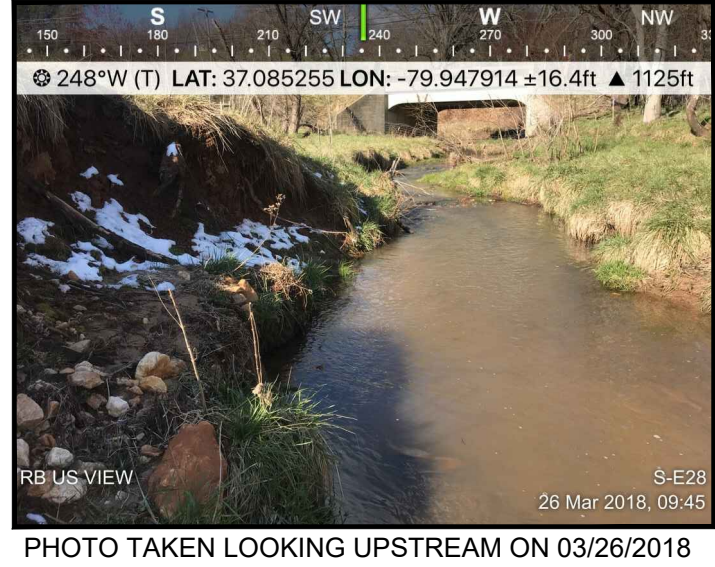### PROFILE
SCALE:
H: 1"=10'
V: 1"=5'

CL STAKEOUT POINTS: S-E28-MID CROSS SECTION B (PIPE CL)

| PT. LOC. | PRE-CROSSING | | | POST-CROSSING | |
	NORTHING	EASTING	ELEV	VERT. DIFF.	HORZ. DIFF.
TS-L	13467313.63	1947158.44	1127.86	----	----
BS-L	13467309.79	1947160.39	1126.04	----	----
THW	13467306.92	1947162.01	1125.55	----	----
BS-R	13467303.38	1947163.79	1125.98	----	----
TS-R	13467300.85	1947164.51	1129.06	----	----

TYPICAL 5-POINT CROSS-SECTION

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

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

S-E28-MID BASELINE CROSS SECTION A
RIFFLE

WATER SURFACE EL.: 1126.6'
(SEPT 2018)

EX. THALWEG
EL.: 1126.2'

S-E28-MID BASELINE CROSS SECTION B
POOL

WATER SURFACE EL.: 1126.1'
(SEPT 2018)

EX. THALWEG
EL.: 1125.4'

S-E28-MID BASELINE CROSS SECTION C
POOL

WATER SURFACE EL.: 1126.1'
(SEPT 2018)

BEDROCK (APPROX.)

EX. THALWEG
EL.: 1125.0'

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

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

CROSS SECTION LEGEND
EXISTING GRADE

REVISIONS

No.	Date	Description	Rev. By	App. By

DATE: October 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	SIH	PFS

Sheet #
1 of 1

Computer File Name:
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22865_03 S-I MP 254-267 Sheets.dwg