Baseline Assessment - Stream Attributes

Reach S-EF34b (Pipeline ROW)
Perennial
Spread H
Roanoke County, Virginia

Data	Included
Photos	✓
SWVM Form	✓
FCI Calculator and HGM Form	N/A – Perennial stream (not shadeable, slope >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: RB DS VIEW
Location, Orientation, Photographer Initials: Standing on RB looking downstream along the ROW looking E, SB

Photo Type: LB DS VIEW
Location, Orientation, Photographer Initials: Standing on LB looking downstream along the ROW looking NE, SB

Photo Type: RB US VIEW
Location, Orientation, Photographer Initials: Standing on RB looking upstream along the ROW looking SW, SB

Photo Type: LB US VIEW
Location, Orientation, Photographer Initials: Standing on LB looking upstream along the ROW looking SW, SB

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

Photo Type: LB CL
Location, Orientation, Photographer Initials: Standing on LB looking at RB along pipe centerline looking SE, SB
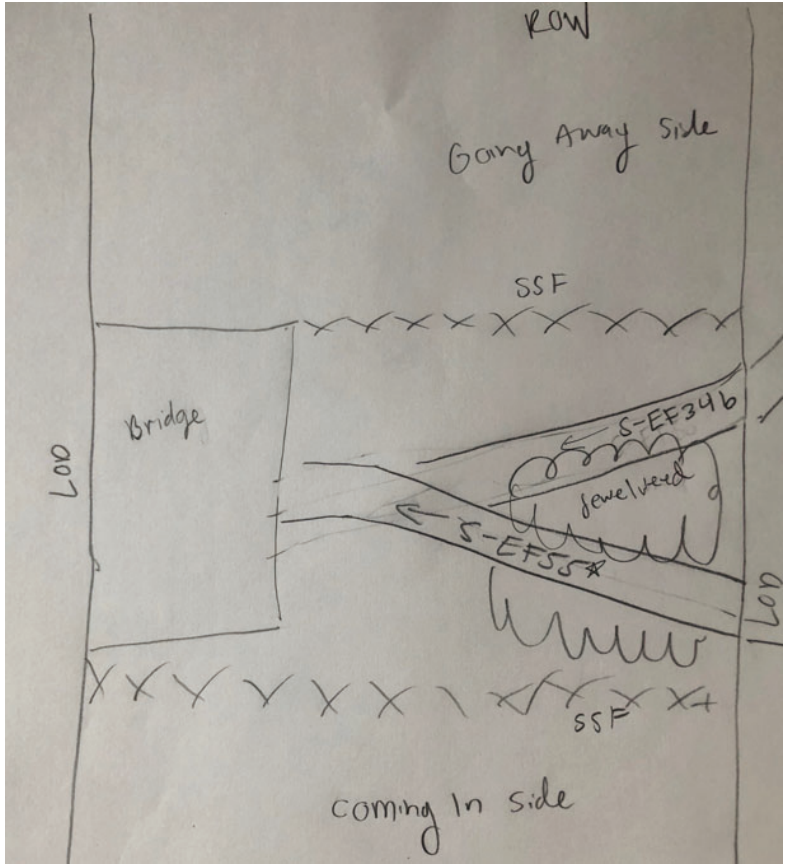
Photo Type: DS COND
Location, Orientation, Photographer Initials: Downstream conditions outside of ROW looking E, SB

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USACE FILE NO./ Project Name: (v2.1, Sept 2015)		Mountain Valley Pipeline	IMPACT COORDINATES: (in Decimal Degrees)	Lat.	37.181385	Lon.	-80.14914	WEATHER:	Cloudy	DATE:	August 19, 2021
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)		S-EF34b	MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)							Comments:	
STREAM IMPACT LENGTH:	81	FORM OF MITIGATION:	RESTORATION (Levels I-III)	MIT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		PRECIPITATION PAST 48 HRS:	1.43"	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	7.87	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		Hydrology		Hydrology		Hydrology		Hydrology	
Biogeochemical Cycling	0	Biogeochemical Cycling	0	Biogeochemical Cycling	0	Biogeochemical Cycling	0	Biogeochemical Cycling	0
Habitat		Habitat		Habitat		Habitat		Habitat	

PART I - Physical, Chemical and Biological Indicators

Indicator	Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score

PHYSICAL INDICATOR (Applies to all streams classifications)

USEPA RBP (High Gradient Data Sheet) [Col 1] / Low Gradient [Col 2] / High Gradient [Cols 3-5]

Metric	Col1 Scale	Col1 Score	Col2 Scale	Col2 Score	Col3 Scale	Col3 Score	Col4 Scale	Col4 Score	Col5 Scale	Col5 Score
1. Epifaunal Substrate/Available Cover	0-20	16	0-20		0-20		0-20		0-20	
2. Embeddedness	0-20	20	2. Pool Substrate Characterization 0-20		0-20		0-20		0-20	
3. Velocity/ Depth Regime	0-20	15	3. Pool Variability 0-20		0-20		0-20		0-20	
4. Sediment Deposition	0-20	20	0-20		0-20		0-20		0-20	
5. Channel Flow Status	0-20	17	0-20		0-20		0-20		0-20	
6. Channel Alteration	0-20	20	0-20		0-20		0-20		0-20	
7. Frequency of Riffles (or bends)	0-20	19	7. Channel Sinuosity 0-20		0-20		0-20		0-20	
8. Bank Stability (LB & RB)	0-20	15	0-20		0-20		0-20		0-20	
9. Vegetative Protection (LB & RB)	0-20	13	0-20		0-20		0-20		0-20	
10. Riparian Vegetative Zone Width (LB & RB)	0-20	16	0-20		0-20		0-20		0-20	
Total RBP Score	Optimal	171	Poor	0	Poor	0	Poor	0	Poor	0
Sub-Total		0.855		0		0		0		0

Range column: 0-1 (Col 1), 0-1 (Col 3)

CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WVDEP Water Quality Indicators (General)

	Col1 Scale	Col1 Score	Col2 Scale	Col2 Score	Col3 Scale	Col3 Score	Col4 Scale	Col4 Score	Col5 Scale	Col5 Score
Specific Conductivity	0-90	39.7	0-90		0-90		0-90		0-90	
pH	0-80	6.96	5-90		5-90		5-90		5-90	
DO	10-30	7.55			10-30		10-30		10-30	
Sub-Total		1		0		0		0		0

(Col 1 notes: Specific Conductivity <=99 – 90 points; pH 6.0-8.0 = 80 points; DO >5.0 = 30 points; Range 0-1)

BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WV Stream Condition Index (WVSCI)

	Col1 Scale	Range	Col1 Score	Col2 Scale	Col2 Score	Col3 Scale	Range	Col3 Score	Col4	Col5
WVSCI	0-100	0-1	95.1 (Very Good)	0-100		0-100	0-1			
Sub-Total			1		0			0	0	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
0.952	81	77.085	0	0	0	0	0	0	0	0	0	0	0	0

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME S-EF34b	LOCATION Franklin County
STATION # _____ RIVERMILE _____	STREAM CLASS Perennial
LAT 37.181506 LONG -80.149497	RIVER BASIN Upper Roanoke
STORET #	AGENCY VADEQ
INVESTIGATORS SB,KB	
FORM COMPLETED BY SB	DATE 8/19/2021 TIME 3:15 pm	REASON FOR SURVEY Baseline Assessment

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) ☐ 50 % ☑ %cloud cover ☑ 70 % 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**
 ☑ Perennial ☐ Intermittent ☐ Tidal

 Stream Origin
 ☐ Glacial   ☑ Spring-fed
 ☐ Non-glacial montane   ☑ Mixture of origins
 ☐ Swamp and bog   ☐ Other _____ | **Stream Type**
 ☑ Coldwater ☐ Warmwater

 Catchment Area 0.45 _____ km² |

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A-5

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** Impatiens capensis _____
INSTREAM FEATURES	**Estimated Reach Length** _16.5_ m **Estimated Stream Width** _1.25_ m **Sampling Reach Area** _20.6_ m² **Area in km² (m²x1000)** _____ km² **Estimated Stream Depth** _0.4_ m **Surface Velocity** _____ m/sec **(at thalweg)** **Canopy Cover** ☑ Partly open ☐ Partly shaded ☐ Shaded **High Water Mark** _0.5_ m **Proportion of Reach Represented by Stream Morphology Types** Riffle _85_ % Run _____ % Pool _15_ % **Channelized** ☐ Yes ☑ No **Dam Present** ☐ Yes ☑ No
LARGE WOODY DEBRIS	**LWD** _0_ m² **Density of LWD** _0_ 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 **DS**	**Temperature** _19.4_ ºC **Specific Conductance** _39.7 us/cm_ **Dissolved Oxygen** _7.55 mg/L_ **pH** _6.96_ **Turbidity** _____ **WQ Instrument Used** _YSIVA#2_ **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)	15
Boulder	> 256 mm (10")	25			
Cobble	64-256 mm (2.5"-10")	35	Muck-Mud	black, very fine organic (FPOM)	2
Gravel	2-64 mm (0.1"-2.5")	30			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	5			
Clay	< 0.004 mm (slick)				

Note: Water quality measurements were only taken at the downstream location of the ROW due low flow

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

STREAM NAME S-EF34b	LOCATION Franklin County
STATION # _____ RIVERMILE _____	STREAM CLASS Perennial
LAT 37.181506 LONG -80.149497	RIVER BASIN Upper Roanoke
STORET #	AGENCY VADEQ
INVESTIGATORS SB,KB	
FORM COMPLETED BY SB	DATE 8/19/2021 TIME 3:15 pm 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 16	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	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 15	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	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 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Notes: Low flow present.

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A-7

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE **20**	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE **19**	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 **7**	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE **8**	Right Bank 10 9	8 7 6	5 4 3	2 1 0
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 **6**	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE **7**	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE **8**	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE **8**	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score **171**   Notes: Low flow present.

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME S-EF34b	LOCATION Franklin County
STATION #_____ RIVERMILE_____	STREAM CLASS Perennial
LAT 37.181506 LONG -80.149497	RIVER BASIN Upper Roanoke
STORET #	AGENCY VADEQ

INVESTIGATORS SB,KB		LOT NUMBER
FORM COMPLETED BY **SB**	DATE 8/19/2021 TIME 3:15 pm	REASON FOR SURVEY Baseline Assessment

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑Cobble 100 % ☐Snags____% ☑Vegetated Banks 90 % ☐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 4____ ☐Snags_____ ☐Vegetated Banks_____ ☐Sand_____ ☐Submerged Macrophytes_____ ☐Other ( )_____
GENERAL COMMENTS	Benthic sample collected. Low flow present.

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	S-EF34b
	Collection Date	08-19-2021

ORDER	GENUS/SPECIES	COUNT
Ephemeroptera	Baetis sp.	4
Ephemeroptera	Diphetor hageni	12
Ephemeroptera	Epeorus sp.	6
Ephemeroptera	Eurylophella sp.	4
Ephemeroptera	Habrophlebiodes sp.	11
Ephemeroptera	Heptageniidae	21
Ephemeroptera	Isonychia sp.	1
Ephemeroptera	Leptophlebiidae	2
Ephemeroptera	Leucrocuta sp.	1
Ephemeroptera	Maccaffertium sp.	4
Ephemeroptera	Procloeon sp.	2
Plecoptera	Chloroperlidae	1
Plecoptera	Leuctra sp.	25
Plecoptera	Malirekus sp.	4
Plecoptera	Peltoperla sp.	3
Plecoptera	Perlidae	1
Plecoptera	Perlodidae	7
Plecoptera	Sweltsa sp.	19
Plecoptera	Tallaperla sp.	11
Trichoptera	Diplectrona sp.	3
Trichoptera	Dolophilodes sp.	2
Trichoptera	Glossosoma sp.	1
Trichoptera	Goera sp.	1
Trichoptera	Neophylax sp.	4
Trichoptera	Polycentropus sp.	1
Trichoptera	Psilotreta sp.	2
Odonata	Lanthus sp.	1
Coleoptera	Ectopria sp.	3
Coleoptera	Oulimnius sp.	10
Coleoptera	Psephenus sp.	3
Coleoptera	Stenelmis sp.	2
Diptera-Chironomidae	Limnophyes sp.	1
Diptera-Chironomidae	Micropsectra sp.	2
Diptera-Chironomidae	Orthocladiinae	1
Diptera-Chironomidae	Parametriocnemus sp.	1
Diptera-Chironomidae	Polypedilum sp.	2
Diptera-Chironomidae	Pseudorthocladius sp.	1
Diptera-Chironomidae	Thienemannimyia gr. sp.	5
Diptera	Ceratopogoninae	5
Diptera	Dicranota sp.	3
Diptera	Dixa sp.	1
Diptera	Hexatoma sp.	5
Diptera	Neoplasta sp.	1
Annelida	Lumbricina	1
Other Organisms	Turbellaria	3
	TOTAL	**204**

	Sample ID	S-EF34b
	Collection Date	08-19-2021

WVSCI Metric Values	
Total taxa	27
EPT taxa	17
% EPT	75.0
% Chironomidae	6.4
% 2 Dominant	27.9
HBI	3.31
WVSCI Metric Scores	
Total taxa	128.6
EPT taxa	130.8
% EPT	81.6
% Chironomidae	94.6
% 2 Dominant	112.6
HBI	94.2
WVSCI Metric Scores	
Total taxa	100.0
EPT taxa	100.0
% EPT	81.6
% Chironomidae	94.6
% 2 Dominant	100.0
HBI	94.2
WVSCI Total Score	**95.1**

WVSCI Thresholds
Unimpaired = > 68.00
Gray Zone = 60.61 to 68.00
Impaired = <60.61

WOLMAN PEBBLE COUNT FORM

County: Roanoke County   Stream ID: S-EF34b

Stream Name: UNT to Bottom Creek

HUC Code: 03010101   Basin:

Survey Date: 8/19/2021

Surveyors: SB KB

Type: Representative

Inches	PARTICLE	Millimeters		Particle Count	Total #	Item %	% Cum
			PEBBLE COUNT				
	Silt/Clay	< .062	S/C	▲ ▼	0	0.00	0.00
	Very Fine	.062-.125		▲ ▼	0	0.00	0.00
	Fine	.125-.25		▲ ▼	0	0.00	0.00
	Medium	.25-.5	S A N D	▲ ▼	1	1.00	1.00
	Coarse	.50-1.0		▲ ▼	1	1.00	2.00
.04-.08	Very Coarse	1.0-2		▲ ▼	2	2.00	4.00
.08 -.16	Very Fine	2 -4		▲ ▼	8	8.00	12.00
.16 - .22	Fine	4 -5.7		▲ ▼	3	3.00	15.00
.22 - .31	Fine	5.7 - 8		▲ ▼	9	9.00	24.00
.31 - .44	Medium	8 -11.3		▲ ▼	13	13.00	37.00
.44 - .63	Medium	11.3 - 16	G R A V E L	▲ ▼	6	6.00	43.00
.63 - .89	Coarse	16 -22.6		▲ ▼	6	6.00	49.00
.89 - 1.26	Coarse	22.6 - 32		▲ ▼	5	5.00	54.00
1.26 - 1.77	Vry Coarse	32 - 45		▲ ▼	2	2.00	56.00
1.77 -2.5	Vry Coarse	45 - 64		▲ ▼	6	6.00	62.00
2.5 - 3.5	Small	64 - 90		▲ ▼	14	14.00	76.00
3.5 - 5.0	Small	90 - 128	C O B B L E	▲ ▼	7	7.00	83.00
5.0 - 7.1	Large	128 - 180		▲ ▼	10	10.00	93.00
7.1 - 10.1	Large	180 - 256		▲ ▼	3	3.00	96.00
10.1 - 14.3	Small	256 - 362		▲ ▼	2	2.00	98.00
14.3 - 20	Small	362 - 512		▲ ▼	2	2.00	100.00
20 - 40	Medium	512 - 1024	B O U L D E R	▲ ▼	0	0.00	100.00
40 - 80	Large	1024 -2048		▲ ▼	0	0.00	100.00
80 - 160	Vry Large	2048 -4096		▲ ▼	0	0.00	100.00
	Bedrock		BDRK	▲ ▼	0	0.00	100.00
			Totals		100		
	Total Tally:						

```
                    RIVERMORPH PARTICLE SUMMARY

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

River Name:        UNT to Bottom Creek
Reach Name:        S-EF34b
Sample Name:       Representative
Survey Date:       08/19/2021


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

Size (mm)               TOT #      ITEM %     CUM %
------------------------------------------------------------------
0 - 0.062               0          0.00       0.00
0.062 - 0.125           0          0.00       0.00
0.125 - 0.25            0          0.00       0.00
0.25 - 0.50             1          1.00       1.00
0.50 - 1.0              1          1.00       2.00
1.0 - 2.0               2          2.00       4.00
2.0 - 4.0               8          8.00       12.00
4.0 - 5.7               3          3.00       15.00
5.7 - 8.0               9          9.00       24.00
8.0 - 11.3              13         13.00      37.00
11.3 - 16.0             6          6.00       43.00
16.0 - 22.6             6          6.00       49.00
22.6 - 32.0             5          5.00       54.00
32 - 45                 2          2.00       56.00
45 - 64                 6          6.00       62.00
64 - 90                 14         14.00      76.00
90 - 128                7          7.00       83.00
128 - 180               10         10.00      93.00
180 - 256               3          3.00       96.00
256 - 362               2          2.00       98.00
362 - 512               2          2.00       100.00
512 - 1024              0          0.00       100.00
1024 - 2048             0          0.00       100.00
Bedrock                 0          0.00       100.00

D16 (mm)                5.96
D35 (mm)                10.79
D50 (mm)                24.48
D84 (mm)                133.2
D95 (mm)                230.67
D100 (mm)               511.99
Silt/Clay (%)           0
Sand (%)                4
Gravel (%)              58
Cobble (%)              34
Boulder (%)             4
Bedrock (%)             0

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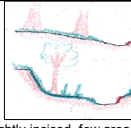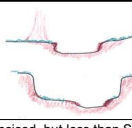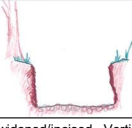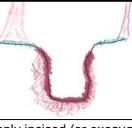
Stream Assessment Form (Form 1)

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)	Roanoke County	R3	03010101	8/19/2021	S-EF34b	81	1

Name(s) of Evaluator(s)	Stream Name and Information		SAR Length
SB, KB	Unnamed Tributary to Bottom Creek		81

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 stability. 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.	
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)

NOTES>>

Conditional Category

Riparian Buffers	Optimal	Suboptimal		Marginal		Poor	
		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.
	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover. Wetlands located within the riparian areas.	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>	80%	20%				100%	
	Score >	0.85	0.5					

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

Left Bank	% Riparian Area>	80%	20%				100%	Rt Bank CI >	0.78	CI
	Score >	0.85	0.5					Lt Bank CI >	0.78	0.78

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

NOTES>>

Conditional Category

Instream Habitat/ Available Cover	Optimal	Suboptimal	Marginal	Poor	
	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	1.50

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)	Roanoke County	R3	03010101	8/19/2021	S-EF34b	81	1

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

	Conditional Category						NOTES>>
Channel Alteration	**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.	
							CI
Scores	1.5	1.3	1.1	0.9	0.7	0.5	1.50

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) >>	1.36
RCI= (Sum of all CI's)/5, except if stream is ephemeral RCI = (Riparian CI/2)	
COMPENSATION REQUIREMENT (CR) >>	110
CR = RCI X L$_I$ X IF	

INSERT PHOTOS:

(WSSI Photo Location L:\22000s\22800\22865.06\Admin\05-ENVR\Field Data\Spread H\Field Forms\S-EF34b\Photos\20210819_192234350_iOS.jpg)

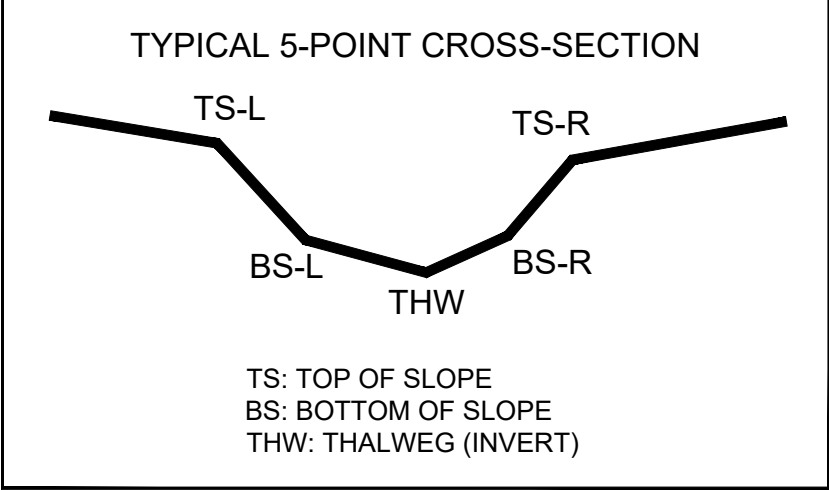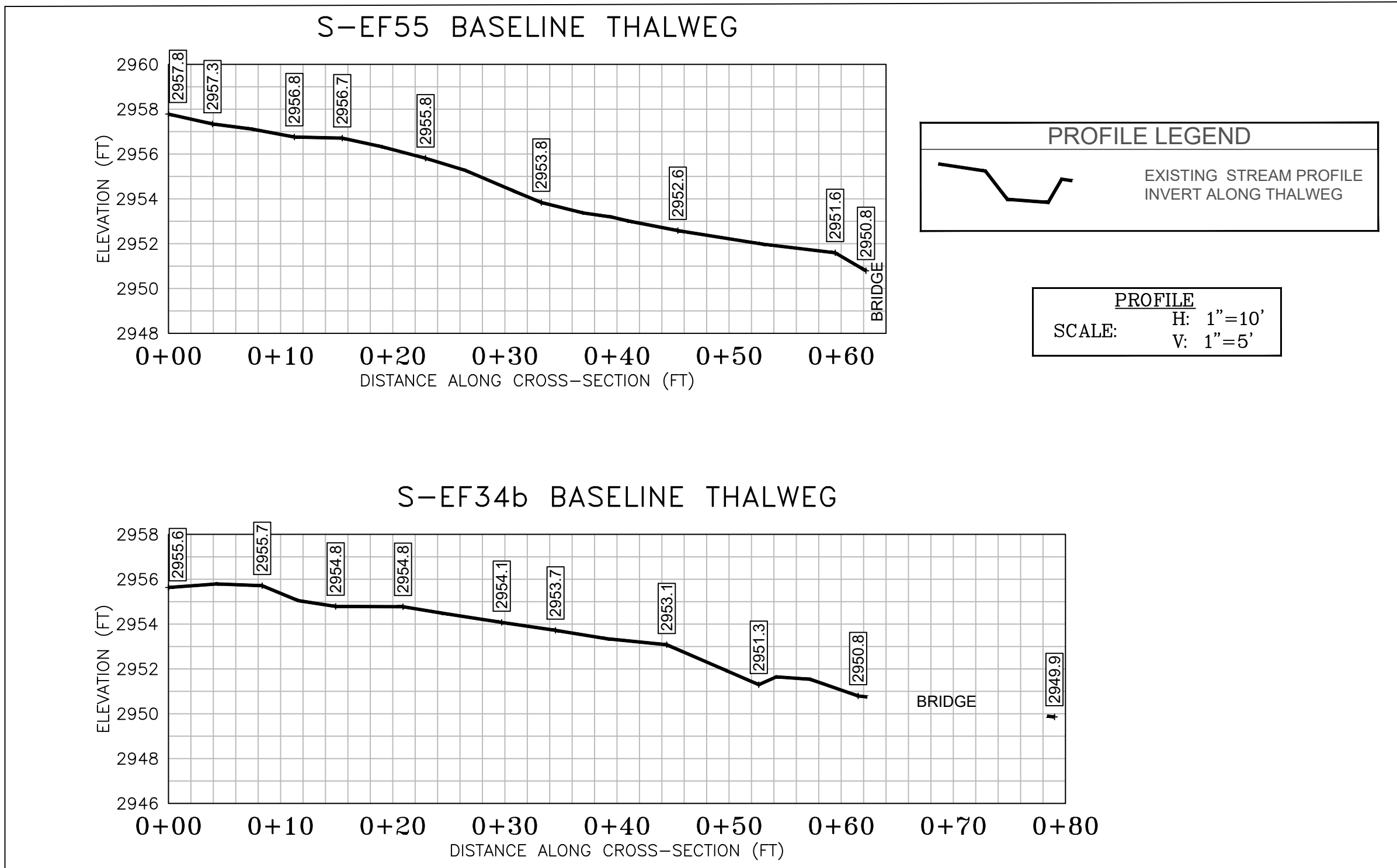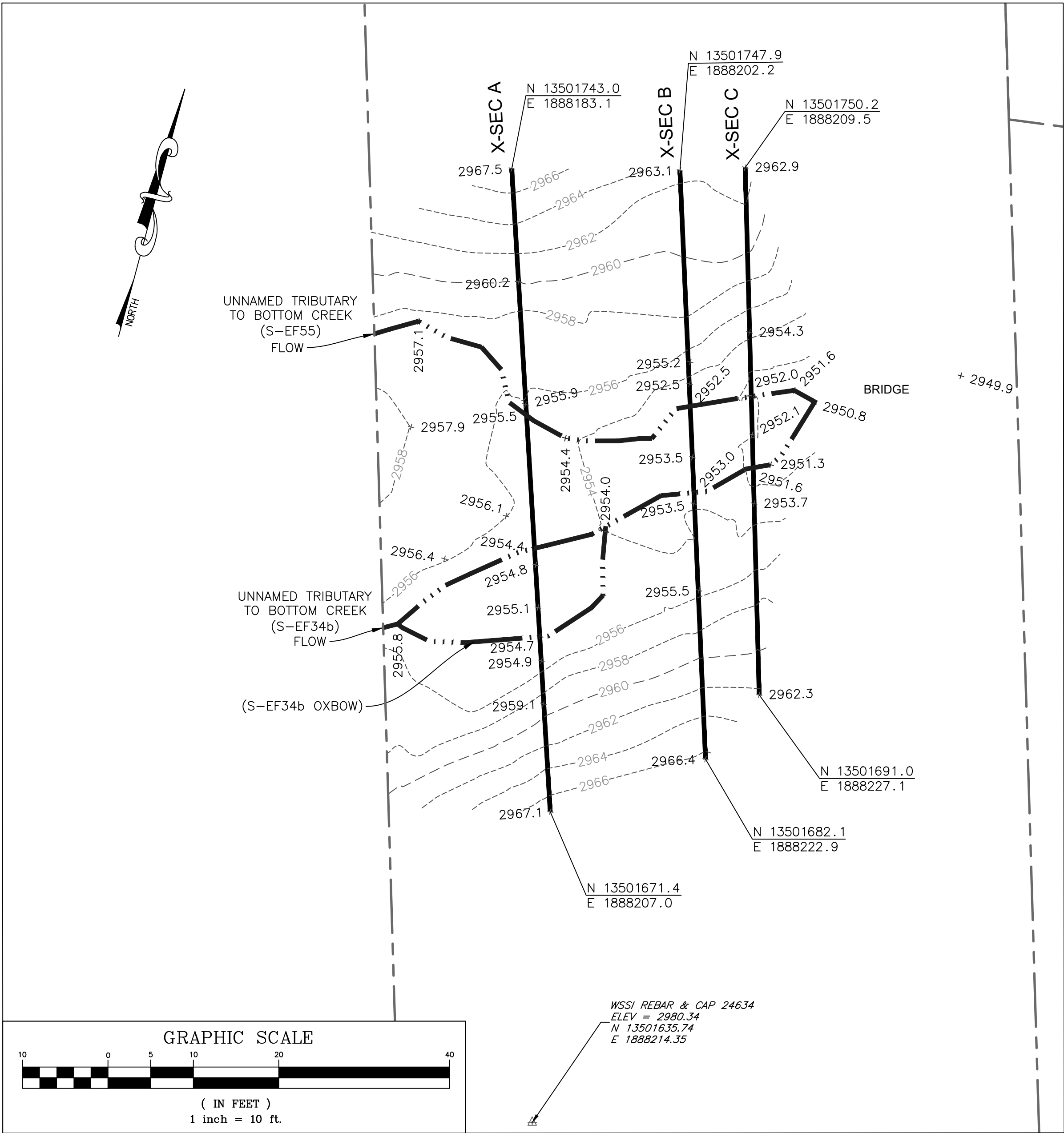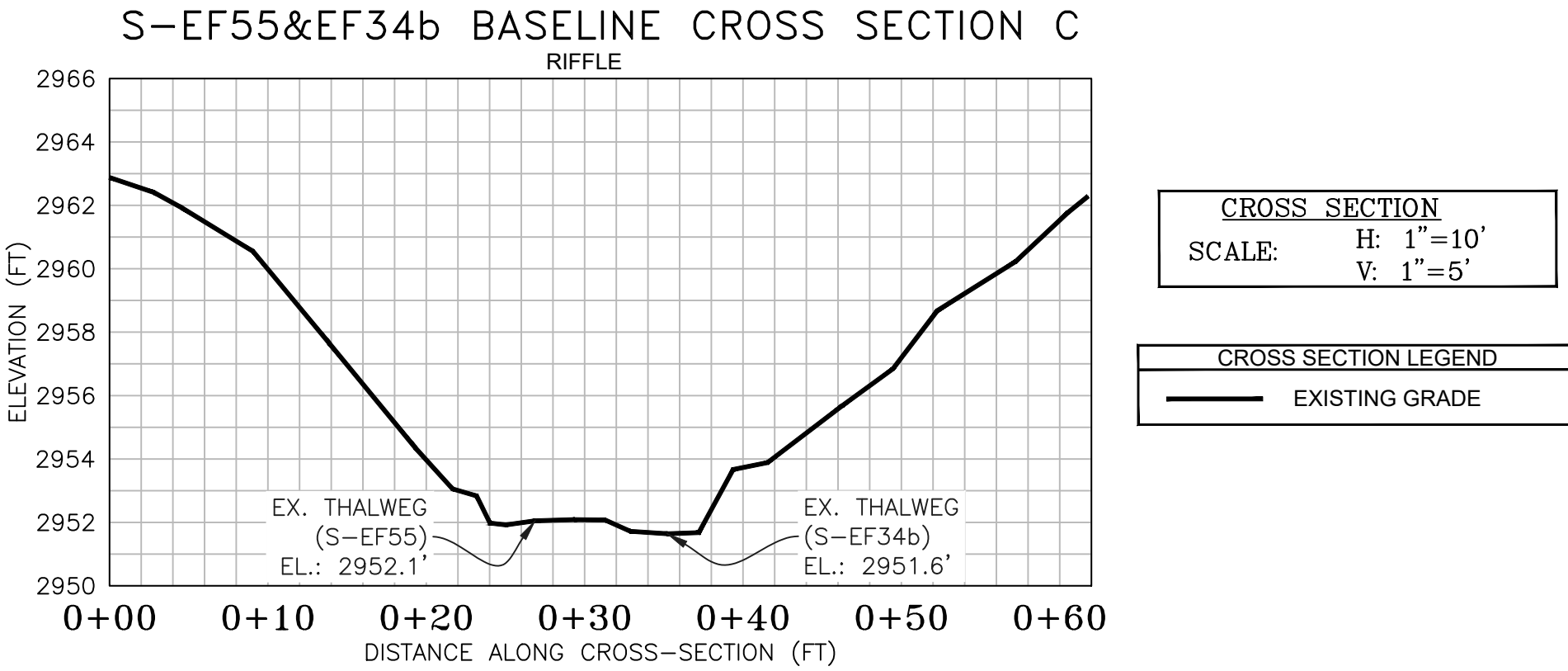Upstream view from the left bank facing SW. Assessment is limited to areas within the temporary ROW.

DESCRIBE PROPOSED IMPACT:

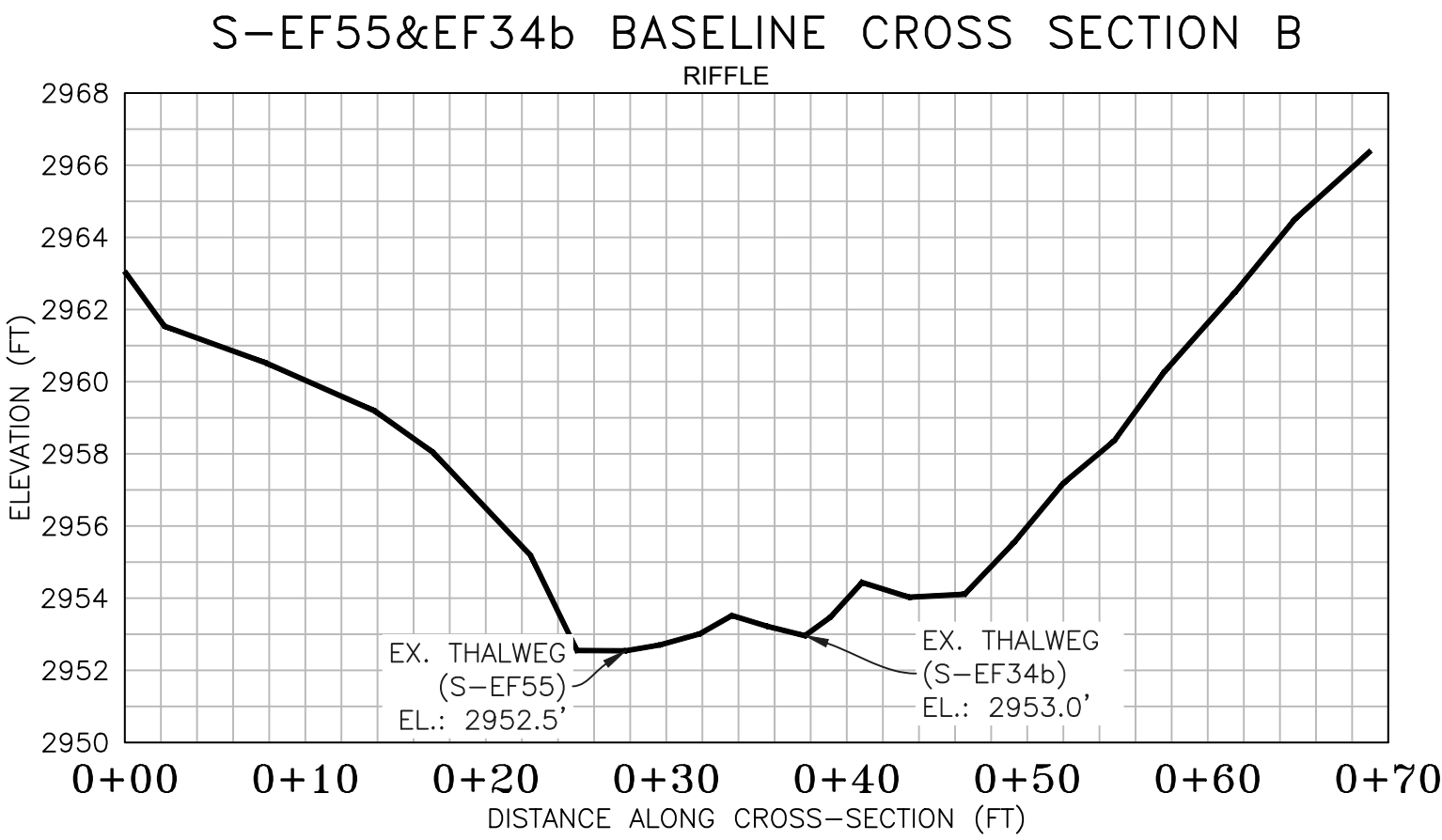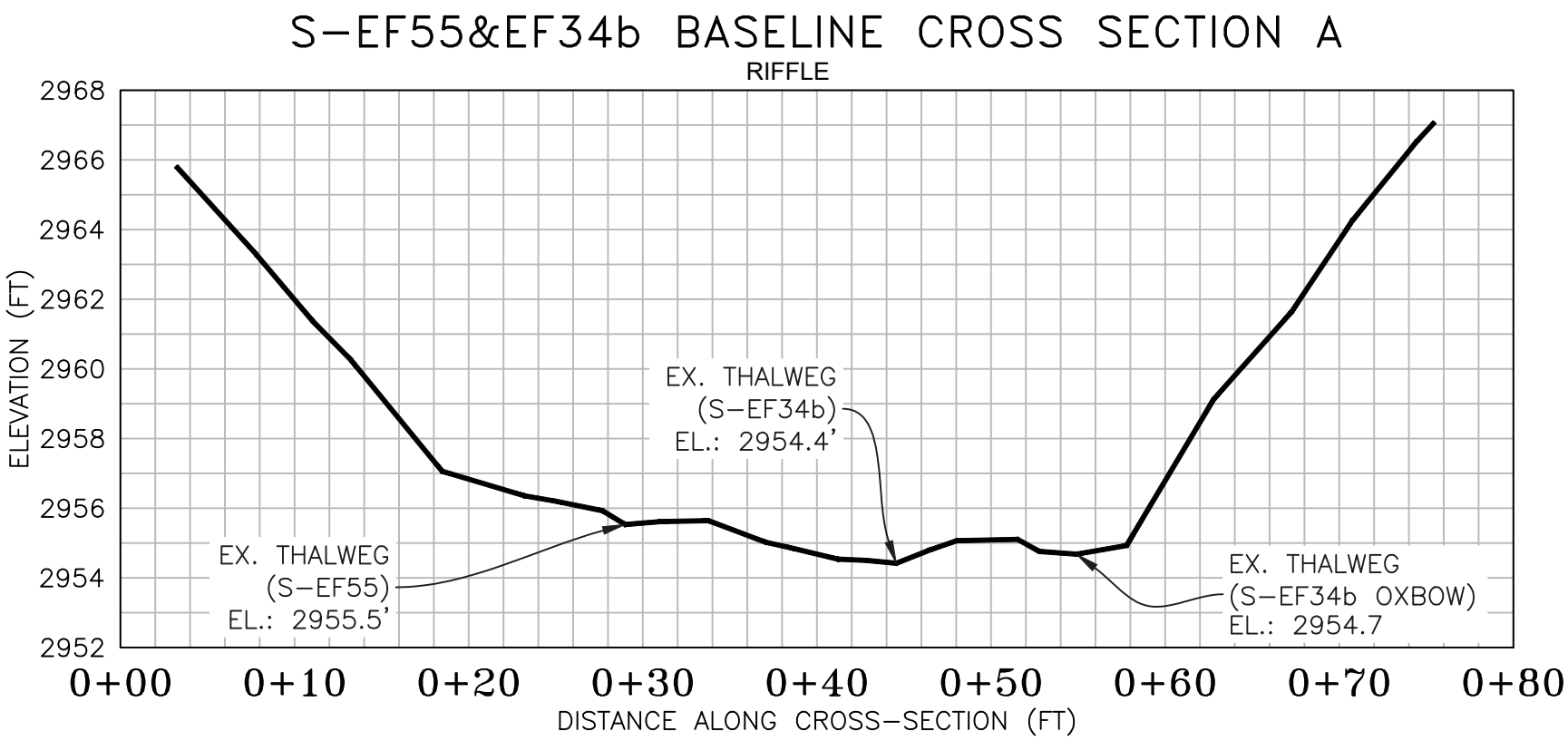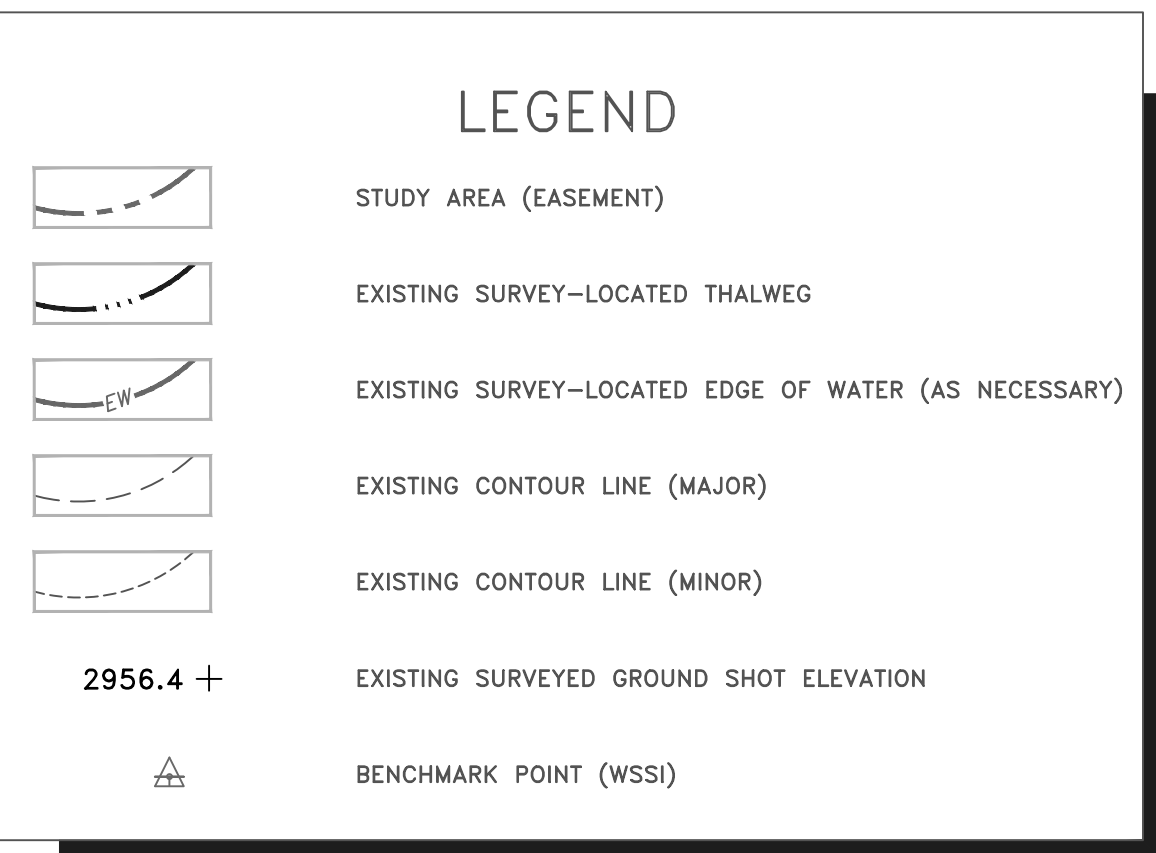**PROVIDED UNDER SEPARATE COVER**

Reach R3-R4
File: L:\22000s\22800\22865.06\Admin\05-ENVR\Field Data\Spread H\Field Forms\S-EF34b\0_Potesta Submission\Files\S-EF34b.xlsx

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)

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 August 27, 2021.

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

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

4. WSSI Contour Interval = 2.0'. Contours within the channel were interpolated using stream channel breaklines (i.e. top of slopes, toe of slopes, thalweg) and cross-sectional points. Contours outside the channel were interpolated using cross-sectional spot shots.

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

6. Cross section B shot at location of pipe centerline (based on field stakes).

CL STAKEOUT POINTS: S-EF55 & S-EF34b CROSS SECTION B (PIPE CL)

PT. LOC.	PRE-CROSSING			POST-CROSSING	
	NORTHING	EASTING	ELEV	VERT. DIFF.	HORZ. DIFF.
TS-L	13501726.56	1888209.18	2955.18	----	----
BS-L	13501724.06	1888209.75	2952.55	----	----
THW	13501721.47	1888210.53	2952.54	----	----
TS	13501715.86	1888212.31	2953.52	----	----
THW	13501712.01	1888213.57	2952.96	----	----
BS-R	13501710.64	1888213.86	2953.47	----	----
TS-R	13501700.99	1888217.07	2955.53	----	----

LEGEND

STUDY AREA (EASEMENT)

EXISTING SURVEY-LOCATED THALWEG

EXISTING SURVEY-LOCATED EDGE OF WATER (AS NECESSARY)

EXISTING CONTOUR LINE (MAJOR)

EXISTING CONTOUR LINE (MINOR)

2956.4 + EXISTING SURVEYED GROUND SHOT ELEVATION

△ BENCHMARK POINT (WSSI)

Plan View

NORTH

X-SEC A
N 13501743.0
E 1888183.1

X-SEC B
N 13501747.9
E 1888202.2

X-SEC C
N 13501750.2
E 1888209.5

2967.5   2966.2   2963.1   2962.9

UNNAMED TRIBUTARY TO BOTTOM CREEK (S-EF55) FLOW

BRIDGE   + 2949.9

UNNAMED TRIBUTARY TO BOTTOM CREEK (S-EF34b) FLOW

(S-EF34b OXBOW)

2967.1   2966.4   2962.3

N 13501691.0
E 1888227.1

N 13501682.1
E 1888222.9

N 13501671.4
E 1888207.0

WSSI REBAR & CAP 24634
ELEV = 2980.34
N 13501635.74
E 1888214.35

GRAPHIC SCALE

(IN FEET)
1 inch = 10 ft.

S-EF55 BASELINE THALWEG

ELEVATION (FT)

DISTANCE ALONG CROSS-SECTION (FT)

BRIDGE

PROFILE LEGEND

EXISTING STREAM PROFILE INVERT ALONG THALWEG

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

S-EF34b BASELINE THALWEG

ELEVATION (FT)

DISTANCE ALONG CROSS-SECTION (FT)

BRIDGE

S-EF55&EF34b BASELINE CROSS SECTION A
RIFFLE

EX. THALWEG (S-EF34b) EL.: 2954.4'

EX. THALWEG (S-EF55) EL.: 2955.5'

EX. THALWEG (S-EF34b OXBOW) EL.: 2954.7

ELEVATION (FT)

DISTANCE ALONG CROSS-SECTION (FT)

S-EF55&EF34b BASELINE CROSS SECTION B
RIFFLE

EX. THALWEG (S-EF55) EL.: 2952.5'

EX. THALWEG (S-EF34b) EL.: 2953.0'

ELEVATION (FT)

DISTANCE ALONG CROSS-SECTION (FT)

S-EF55&EF34b BASELINE CROSS SECTION C
RIFFLE

EX. THALWEG (S-EF55) EL.: 2952.1'

EX. THALWEG (S-EF34b) EL.: 2951.6'

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.

PRE-CROSSING PHOTOS S-EF55

PRE-CROSSING PHOTOS S-EF34b

PHOTO TAKEN LOOKING DOWNSTREAM ON 08/27/2021

PHOTO TAKEN LOOKING DOWNSTREAM ON 08/27/2021

PHOTO TAKEN LOOKING UPSTREAM ON 08/27/2021

PHOTO TAKEN LOOKING UPSTREAM ON 08/27/2021

POST-CROSSING PHOTOS

POST-CROSSING PHOTOS

PENDING CROSSING

PENDING CROSSING

PHOTO TAKEN LOOKING DOWNSTREAM @ IMPACT LIMITS AT LEFT BANK

PHOTO TAKEN LOOKING DOWNSTREAM @ IMPACT LIMITS AT LEFT BANK

PENDING CROSSING

PENDING CROSSING

PHOTO TAKEN LOOKING DOWNSTREAM @ IMPACT LIMITS AT RIGHT BANK

PHOTO TAKEN LOOKING DOWNSTREAM @ IMPACT LIMITS AT RIGHT BANK

Profile and Cross-Sections Baseline Survey

Prepared For: MVP

Crossing S-EF55 & EF34b - UNT to Bottom Creek (MP 241.0)

Roanoke County, Virginia

REVISIONS

No.	Date	Description	Rev. By	App. By

SCALE: AS NOTED

DATE: September, 2021

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

Design	Draft	Approved
TLK	TLK	PFS

Sheet #
1 of 1