Baseline Assessment – Stream Attributes

Reach S-H88 (Pipeline ROW)
Perennial
Spread E
Nicholas County, West 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	✓
Reference Reach Software Pebble Count Data	✓
Longitudinal Profile and Cross Sections	✓

Photo Type: DS Edge ROW, US View
Location, Orientation, Photographer Initials: Downstream Edge of Right of Way, Upstream View, CH/AG/EW/WP

Photo Type: DS Edge ROW, DS View
Location, Orientation, Photographer Initials: Downstream Edge of ROW, Downstream View, CH/AG/EW/WP

Photo Type: C ROW, US View
Location, Orientation, Photographer Initials: Center Right of Way, Upstream View, CH/AG/EW/WP

Photo Type: C ROW, DS View
Location, Orientation, Photographer Initials: Center of Right of Way, Downstream View, CH/AG/EW/WP

Photo Type: US Edge ROW, US View
Location, Orientation, Photographer Initials: Upstream Edge of Right of Way, Upstream View, CH/AG/EW/WP

Photo Type: US Edge ROW, DS View
Location, Orientation, Photographer Initials: Upstream Edge Right of Way, Downstream View, CH/AG/EW/WP

"Q:\Charleston\2021 Projects\21-0244- MVP- STREAM AND WETLAND CONDITIONS ASSESSMENT AND SURVEY PLAN\002 - Pre-Crossing Monitoring\Spread E\S-H88"

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

USACE FILE NO./ Project Name: (v2.1, Sept 2015)	**Mountain Valley Pipeline**	**IMPACT COORDINATES: (in Decimal Degrees)**	**Lat.**	**38.136744**	**Lon.**	**-80.73056**	**WEATHER:**	**10% Cloud Cover 80 °F**	**DATE:**	**8/30/2021**
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size {acreage}, unaltered or impairments)	**S-H88 Sugar Branch**	**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:**		**Mitigation Length:**	

Column No. 1- Impact Existing Condition (Debit)			
Stream Classification:	**Perennial**		
Percent Stream Channel Slope	**1**		
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	**15**
2. Embeddedness	0-20		**12**
3. Velocity/ Depth Regime	0-20		**10**
4. Sediment Deposition	0-20		**11**
5. Channel Flow Status	0-20		**14**
6. Channel Alteration	0-20		**20**
7. Frequency of Riffles (or bends)	0-20		**17**
8. Bank Stability (LB & RB)	0-20		**18**
9. Vegetative Protection (LB & RB)	0-20		**14**
10. Riparian Vegetative Zone Width (LB & RB)	0-20		**8**
Total RBP Score	Suboptimal		**139**
Sub-Total			**0.695**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
<=99 - 90 points	0-90	0-1	**21.6**
pH			
4.6-5.5 = 10 points	0-80	0-1	**5.3**
DO			
>5.0 = 30 points	10-30	0-1	**8.43**
Sub-Total			**0.65**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
Good	0-100	0-1	**71**
Sub-Total			**0.71**

Column No. 2- Mitigation Existing Condition - Baseline (Credit)			
Stream Classification:			
Percent Stream Channel Slope			
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (Low Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Pool Substrate Characterization	0-20		
3. Pool Variability	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Channel Sinuosity	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90	0-1	
DO			
	10-30	0-1	
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)			
Stream Classification:	**0**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90	0-1	
DO			
	10-30	0-1	
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)			
Stream Classification:	**0**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90	0-1	
DO			
	10-30	0-1	
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

Column No. 5- Mitigation Projected at Maturity (Credit)			
Stream Classification:	**0**		
Percent Stream Channel Slope	**0**		
HGM Score (attach data forms):			
			Average
Hydrology			
Biogeochemical Cycling			**0**
Habitat			
PART I - Physical, Chemical and Biological Indicators			
	Points Scale	**Range**	**Site Score**
PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	
2. Embeddedness	0-20		
3. Velocity/ Depth Regime	0-20		
4. Sediment Deposition	0-20		
5. Channel Flow Status	0-20		
6. Channel Alteration	0-20		
7. Frequency of Riffles (or bends)	0-20		
8. Bank Stability (LB & RB)	0-20		
9. Vegetative Protection (LB & RB)	0-20		
10. Riparian Vegetative Zone Width (LB & RB)	0-20		
Total RBP Score	Poor		**0**
Sub-Total			**0**
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WVDEP Water Quality Indicators (General)			
Specific Conductivity			
	0-90	0-1	
pH			
	5-90	0-1	
DO			
	10-30	0-1	
Sub-Total			**0**
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			
WV Stream Condition Index (WVSCI)			
	0-100	0-1	
Sub-Total			**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0.685	**76**	**52.06**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PART II - Index and Unit Score		
Index	**Linear Feet**	**Unit Score**
0	**0**	**0**

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Sugar Branch	LOCATION S-H88	
STATION # _____ RIVERMILE _____	STREAM CLASS Perennial	
LAT 38.136744 LONG -80.73056	COUNTY Nicholas	
STORET #	AGENCY Potesta/Edge	
INVESTIGATORS EW/CH/AG/WP		
FORM COMPLETED BY EW	DATE 8-30-2021 TIME 11:00 AM	REASON FOR SURVEY Preliminary Assessment

WEATHER CONDITIONS

Now

10 %

- ☐ storm (heavy rain)
- ☐ rain (steady rain)
- ☑ showers (intermittent)
- ☐ %cloud cover
- ☐ clear/sunny

Past 24 hours

- ☐
- ☑
- ☐
- ☐ ____%
- ☐

Has there been a heavy rain in the last 7 days?

☑ Yes ☐ No

Air Temperature 60 F ° C

Other _____

SITE LOCATION/MAP

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

STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
- ☐ Glacial
- ☐ Non-glacial montane
- ☐ Swamp and bog
- ☐ Spring-fed
- ☑ Mixture of origins
- ☐ Other _____

Catchment Area _____ km^2

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 jewelweed, blackberry, goldenrod

INSTREAM FEATURES

Estimated Reach Length 25 m
Estimated Stream Width 5 m
Sampling Reach Area 125 m²
Area in km² (m²x1000) _____ km²
Estimated Stream Depth 0.2 m
Surface Velocity (at thalweg) _____ m/sec
Stream Dry ☐

Canopy Cover
☑ Partly open ☐ Partly shaded ☐ Shaded

High Water Mark 0.4 m

Proportion of Reach Represented by Stream Morphology Types
Riffle 25 % Run 10 %
Pool 65 %

Channelized ☐ Yes ☑ No
Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD <1 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 NA

Portion of the reach with aquatic vegetation 0 %

WATER QUALITY

Temperature 18.0 °C
Specific Conductance 21.6 us/cm
Dissolved Oxygen 8.43 mg/L
pH 5.3 SU
Turbidity 6.50 ntu
WQ Instrument Used YSI

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		0	Detritus	sticks, wood, coarse plant materials (CPOM)	0
Boulder	> 256 mm (10")	25			
Cobble	64-256 mm (2.5"-10")	25	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	20			
Sand	0.06-2mm (gritty)	30	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	0			
Clay	< 0.004 mm (slick)	0			

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

STREAM NAME Sugar Branch	LOCATION S-H88	
STATION # _____ RIVERMILE _____	STREAM CLASS Perennial	
LAT 38.136744 LONG -80.73056	COUNTY Nicholas	
STORET #	AGENCY Potesta/Edge	
INVESTIGATORS EW/CH/AG/WP		
FORM COMPLETED BY EW	DATE 8-30-2021 TIME 11:00 AM AM PM	REASON FOR SURVEY Preliminary Assessment

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover ☐ N/A	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 15	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 12	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 ☐ N/A	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 10	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 11	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 ☐ N/A	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 14	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)

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) ☐ N/A	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 17	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 9	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 7	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 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 4	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 4	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 139

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Sugar Branch	LOCATION S-H88	
STATION # _____ RIVERMILE _____	STREAM CLASS Perennial	
LAT 38.136744 LONG -80.73056	COUNTY Nicholas	
STORET #	AGENCY Potesta/Edge	
INVESTIGATORS EW/CH/AG/WP		LOT NUMBER
FORM COMPLETED BY EW	DATE 8-30-2021 TIME 11:00 AM	REASON FOR SURVEY Preliminary Assessment

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 50 % ☐ Snags ____% ☐ Vegetated Banks ____% ☐ Sand ____% ☐ Submerged Macrophytes ____% ☑ Other (gravel) 30 %
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 2 ☐ Snags ____ ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes ____ ☑ Other (gravel) 2
GENERAL COMMENTS	Moderately stacked CB/GR; 25% embedded; substrate angular and rough.

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						

Insects	Count	Tolerance	TV
Ephemeroptera			64
Ameletidae		2	0
Baetidae	37	4	148
Beatiscidae		4	0
Caenidae		5	0
Ephemerellidae	23	3	69
Ephemeridae		5	0
Heptageniidae	4	3	12
Isonychiidae		3	0
Leptophlebiidae		4	0
Potamanthidae		5	0
Siphlonuridae		3	0
Tricorythidae		5	0
Plecoptera			17
Capniidae		2	0
Chloroperlidae	1	2	2
Leuctridae	1	2	2
Nemouridae		2	0
Peltoperlidae		1	0
Perlidae	15	1	15
Perlodidae		1	0
Pteronarcyidae		1	0
Taeniopterygidae		2	0
Trichoptera			17
Brachycentridae		2	0
Glossosomatidae		2	0
Helicopsychidae		3	0
Hydropsychidae	12	5	60
Hydroptilidae		3	0
Lepidostomatidae		3	0
Leptoceridae		3	0
Limnephilidae		4	0
Molannidae		3	0
Philopotamidae	4	4	16
Phryganeidae		4	0
Polycentropodidae		5	0
Psychomiidae		4	0
Rhyacophilidae	1	3	3
Uenoidae		2	0
Total Tolerance Value			1067

Insects	Count	Tolerance	TV
Odonata			2
Aeshnidae	1	3	3
Calopterygidae		6	0
Coenagrionidae		7	0
Cordulegastridae	1	3	3
Gomphidae		5	0
Lestidae		7	0
Libellulidae		7	0
Coleoptera			41
Chrysomelidae		7	0
Dryopidae		5	0
Dytiscidae		6	0
Elmidae	40	4	160
Gyrinidae		5	0
Haliplidae		7	0
Hydrophilidae		7	0
Psephenidae	1	3	3
Ptilodactylidae		5	0
Hemiptera			0
Belostomatidae		8	0
Corixidae		8	0
Gerridae		10	0
Hydrometridae		8	0
Nepidae		8	0
Notonectidae		8	0
Megaloptera			1
Corydalidae	1	3	3
Sialidae		6	0
Diptera			64
Athericidae		3	0
Blephariceridae		2	0
Ceratopogonidae		8	0
Chironomidae	60	9	540
Culicidae		10	0
Dixidae		6	0
Empididae		7	0
Psychodidae		8	0
Ptychopteridae		8	0
Simuliidae	1	7	7
Stratiomyidae		10	0
Syrphidae		10	0
Tabanidae		7	0
Tipulidae	3	5	15

Non-Insects	Count	Tolerance	TV
Crustacea			0
Asellidae		7	0
Cambaridae		5	0
Gammaridae		5	0
Palaemonidae		5	0
Annelida			0
Hirudinea		10	0
Nematoda		10	0
Nematomorpha		10	0
Oligochaeta		10	0
Turbellaria			0
Turbellaria		7	0
Bivalvia			0
Corbiculidae		6	0
Sphaeriidae		5	0
Unionidae		4	0
Gastropoda			0
Ancylidae		7	0
Hydrobiidae		4	0
Physidae		7	0
Planorbidae		5	0
Pleuroceridae		5	0
Viviparidae		5	0
Miscellaneous			1
Collembola	1	6	6
Lepidoptera		5	0
Neuroptera		5	0
Hydrachnidae		6	0
Totals	**Total number**		**207**
	Total families		**18**

SITE ID:	**S-H88**

9/10/2021

Metric calculations

WVSCI Metric Scores		
Total Taxa	18	81.8
EPT Taxa	9	69.2
% EPT Abundance	47.3	53.0
% Chironomidae	29.0	72.2
Hilsenhoff Biotic Index (HBI)	5.15	65.6
% 2 Dominant Taxa	48.3	82.4
WV Stream Condition Index		**70.7**

Additional metrics	
Ephemeroptera Taxa	3
Plecoptera Taxa	3
Trichoptera Taxa	3
Long-lived Taxa	10
Odonata Taxa	2
Diptera Taxa	3
COET Taxa	10
% Sensitive	25.1
% Tolerant	30.0
% Clingers	41.5
% Net-spinners	7.7

West Virginia Stream Condition Index (WVSCI)

Gerritson, J., J. Burton, and M.T. Barbour. 2000. A stream condition index for West Virginia wadeable streams. Tetra Tech, Inc. Owing Mills, MD.

Spreadsheet uses updated Best Standard Values [BSV] for each metric per WVSCI Addenda dated March 23, 2010

SITE ID: S-H88 Spread E

DATE: 30 August 2021

COLLECTOR(S): E. Weaver, A. Grimmapa

Wolman Pebble Count (Reach Wide)

140	138	FS	FS	210	29	14	FS	FS	85
BR	355	BR	FS	BR	FS	BR	FS	BR	BR
FS	152	FS	275	FS	16	23	20	82	BR
75	40	180	365	FS	28	FS	BR	FS	FS
FS	FS	CS	BR	680	FS	120	405	FS	FS
FS	BR	125	370	FS	51	MS	270	CS	110
25	18	11	25	200	FS	160	18	310	110
34	260	290	14	11	44	38	40	215	FS
105	FS	MS	205	65	40	MS	82	15	8
260	55	60	FS	11	FS	FS	280	45	22

NOTES:

US ↓ DS

FS = Fine Sand
BR = Bedrock
MS = Medium Sand
CS = Coarse Sand

Riffle Pebble Count

NOTES:

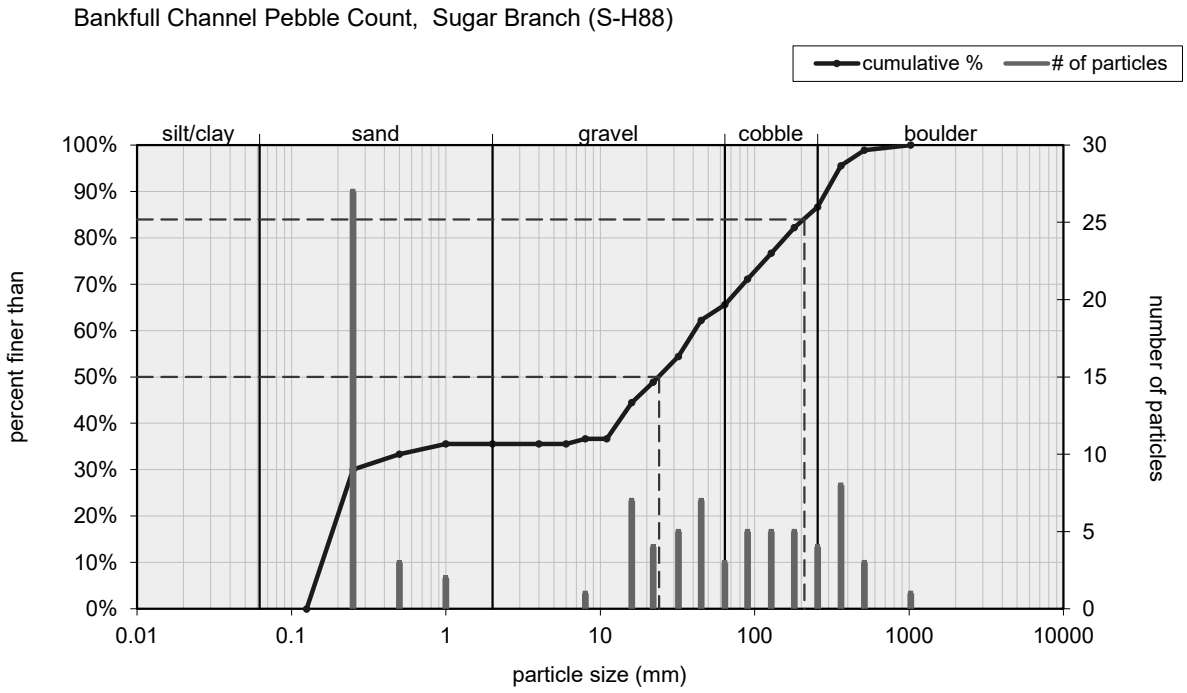
NOTES:

Inches	PARTICLE	Millimeters	
	Silt / Clay	< .062	S/C
	Very Fine	.062 - .125	SAND
	Fine	.125 - .25	
	Medium	.25 - .50	
	Coarse	.50 - 1.0	
.04 - .08	Very Coarse	1.0 - 2	
.08 - .16	Very Fine	2 - 4	GRAVEL
.16 - .22	Fine	4 - 5.7	
.22 - .31	Fine	5.7 - 8	
.31 - .44	Medium	8 - 11.3	
.44 - .63	Medium	11.3 - 16	
.63 - .89	Coarse	16 - 22.5	
.89 - 1.3	Coarse	22.5 - 32	
1.3 - 1.8	Very Coarse	32 - 45	
1.8 - 2.5	Very Coarse	45 - 64	
2.5 - 3.5	Small	64 - 90	COBBLE
3.5 - 5.0	Small	90 - 128	
5.0 - 7.1	Large	128 - 180	
7.1 - 10.1	Large	180 - 256	
10.1 - 14.3	Small	256 - 362	BOULDER
14.3 - 20	Small	362 - 512	
20 - 40	Medium	512 - 1024	
40 - 80	Large-Vry Large	1024 - 2048	
	Bedrock		BDRK

Bankfull Channel

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	**27**
medium sand	0.25 - 0.5	**3**
coarse sand	0.5 - 1	**2**
very coarse sand	1 - 2	
very fine gravel	2 - 4	
fine gravel	4 - 6	
fine gravel	6 - 8	**1**
medium gravel	8 - 11	
medium gravel	11 - 16	**7**
coarse gravel	16 - 22	**4**
coarse gravel	22 - 32	**5**
very coarse gravel	32 - 45	**7**
very coarse gravel	45 - 64	**3**
small cobble	64 - 90	**5**
medium cobble	90 - 128	**5**
large cobble	128 - 180	**5**
very large cobble	180 - 256	**4**
small boulder	256 - 362	**8**
small boulder	362 - 512	**3**
medium boulder	512 - 1024	**1**
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		90
bedrock	----------	**10**
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		100

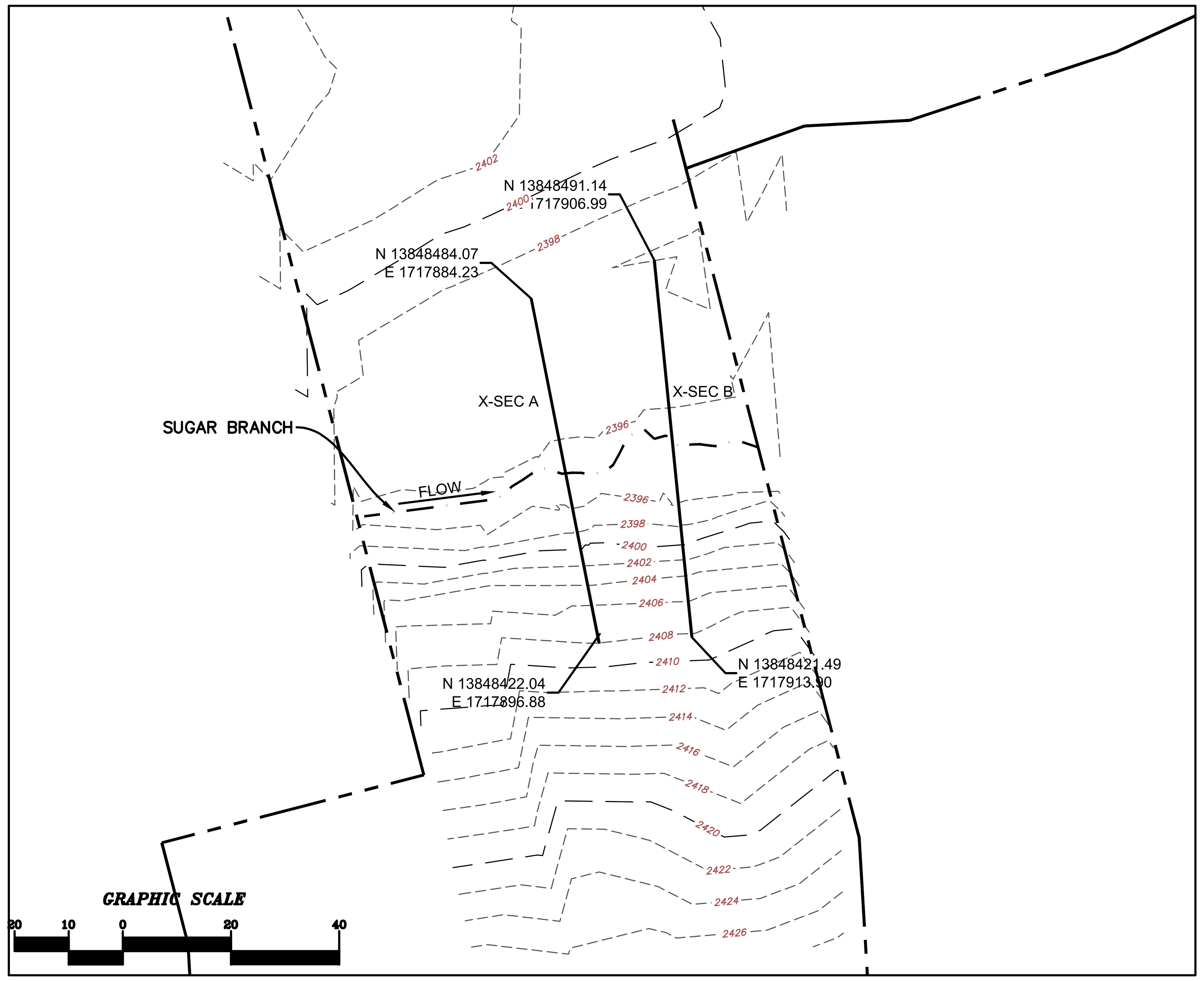
Note:



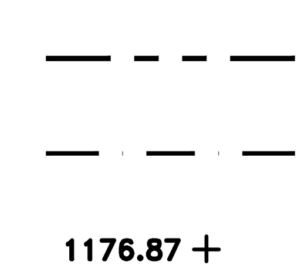
Size (mm)	
D16	0.18
D35	0.84
D50	24
D65	60
D84	210
D95	350

Size Distribution	
mean	6.1
dispersion	71.0
skewness	-0.34

Type			
silt/clay	0%	bedrock	10%
sand	32%		
gravel	27%		
cobble	19%		
boulder	12%		



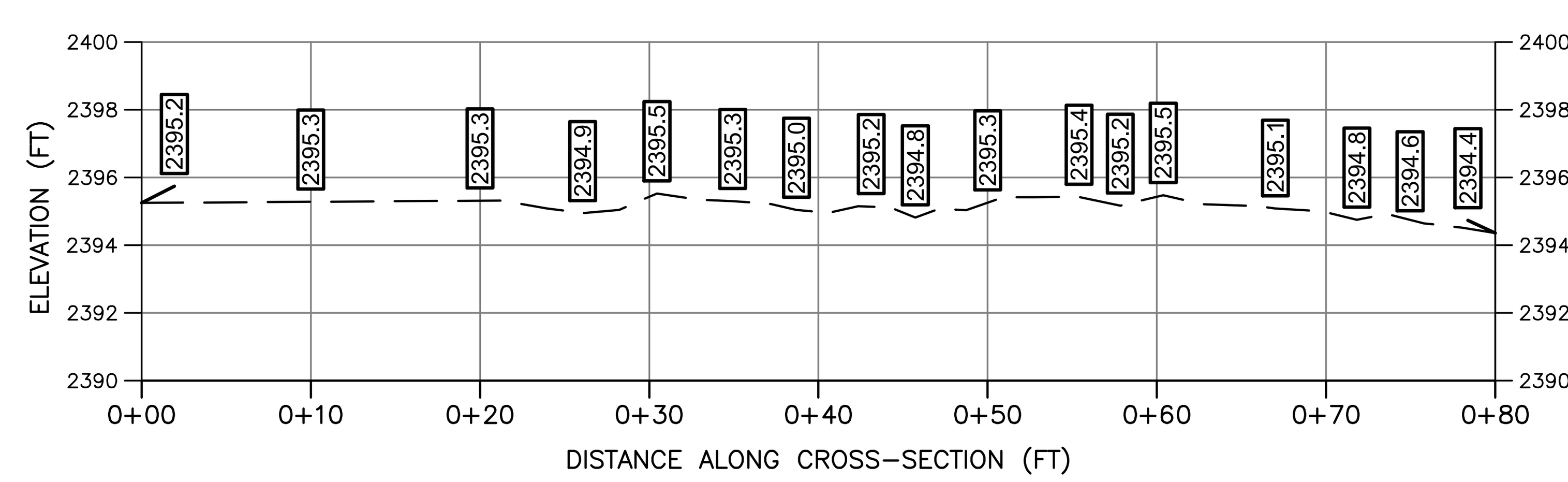
S-H88



SURVEY NOTES:

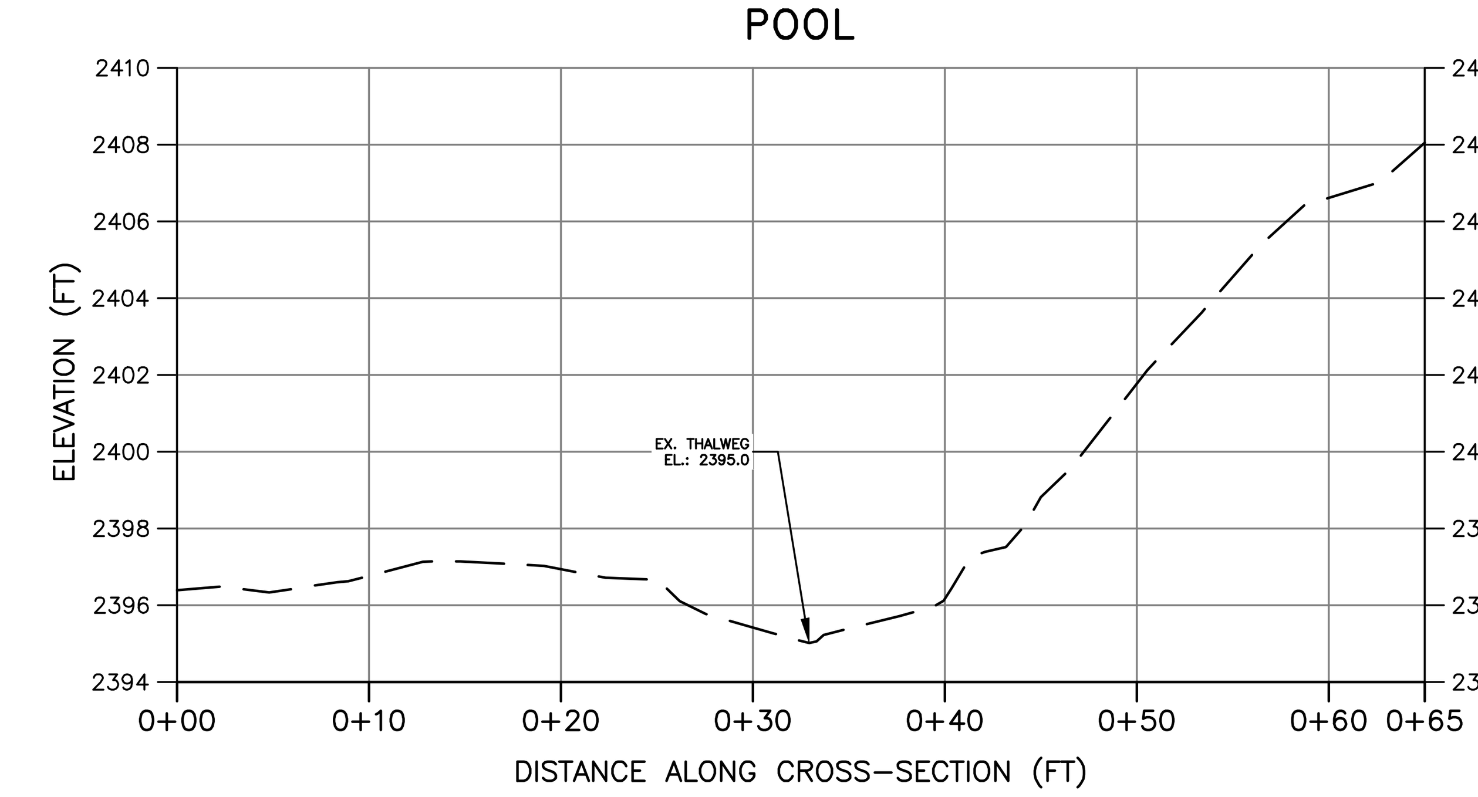
1. THIS MAP HAS BEEN ORIENTED TO NAD 1983 UTM ZONE 17N, AND VERTICALLY TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), USING REAL TIME DGPS. FIELD LOCATIONS WERE COMPLETED ON AUGUST 30, 2021.
2. EASEMENT LINES SHOWN ON PLAN VIEW WERE PROVIDED BY MOUNTAIN VALLEY PIPELINE.
3. SURVEY POINTS FOR CROSS SECTIONS AND THALWEG PROFILES COLLECTED IN 2021 HAVE BEEN USED IN COMBINATION WITH SURVEY POINTS COLLECTED PREVIOUSLY IN 2020 IN ORDER TO GENERATE THE PRE-CROSSING SURFACE SHOWN IN PLAN. DUE TO NATURAL EROSIONAL STREAM PROCESSES THAT CAN OCCUR OVER TIME, MINOR ADJUSTMENTS TO THE PROFILE ALIGNMENTS MAY HAVE BEEN REQUIRED IN ORDER TO GENERATE A CLEAN PRE-CROSSING SURFACE.
4. ALL SECTION VIEWS SHOWN LEFT TO RIGHT FACING DOWNSTREAM.
5. POST-CROSSING SURVEY INFORMATION SHOWN IN RED. DATA PENDING.
6. POST-CROSSING SURVEY POINTS FOR CROSS SECTIONS AND THALWEG ARE PROJECTED ONTO PRE-CROSSING SECTION AND PROFILE VIEWS FOR COMPARISON.

S-H88 BASELINE THALWEG PROFILE

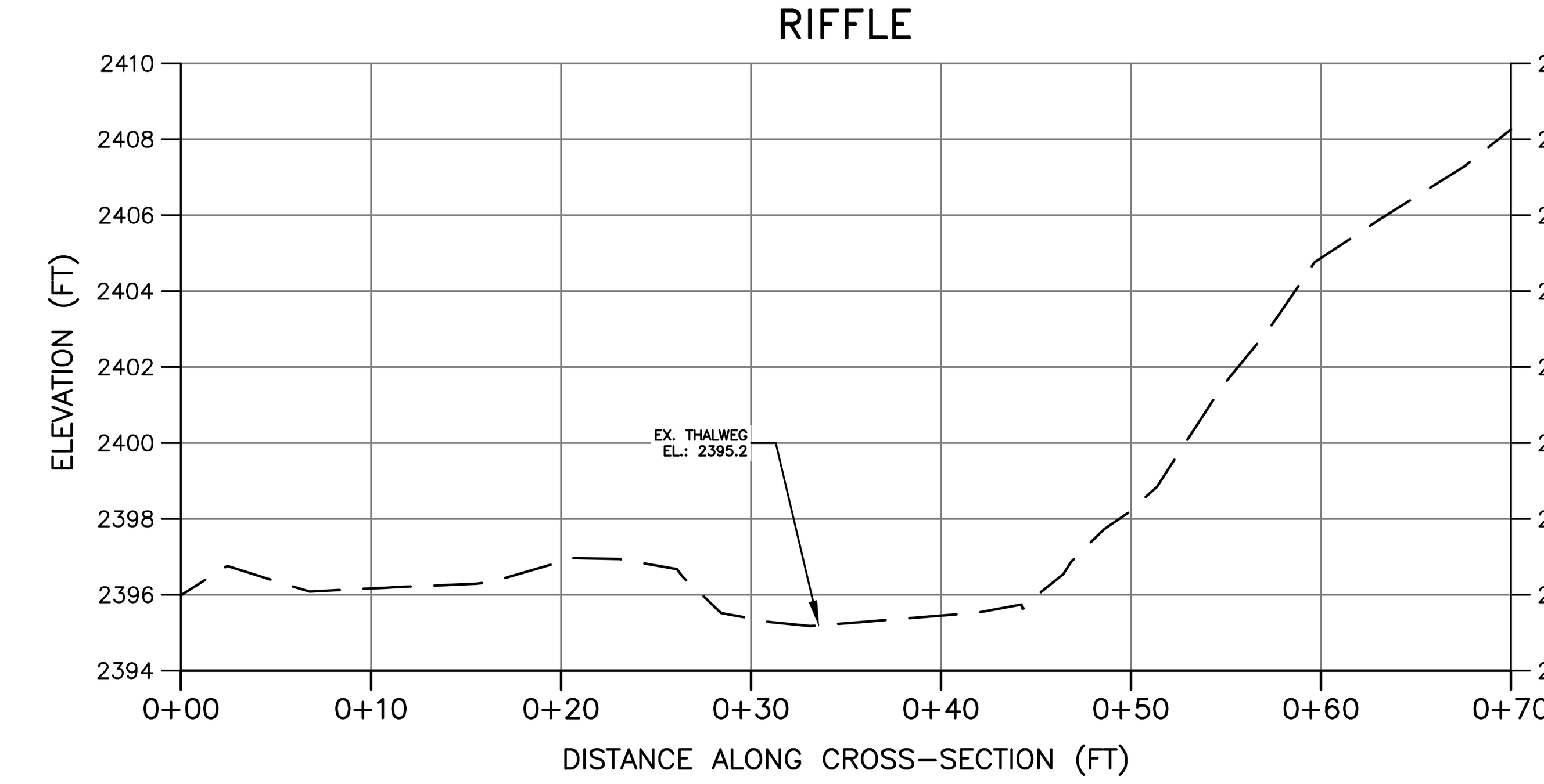


PROFILE
SCALE: H: 1"=10'
V: 1"=5'

S-H88 BASELINE CROSS-SECTION A
POOL



S-H88 BASELINE CROSS-SECTION B
RIFFLE



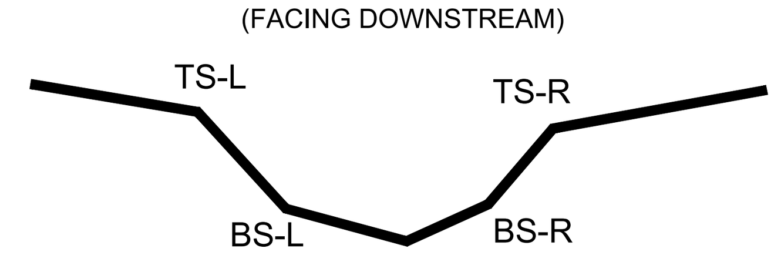
CROSS SECTION LEGEND
EXISTING GRADE

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

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

AS-BUILT TABLE: S-H88 CROSS SECTION A					
	PRE-CROSSING			AS-BUILT	
PT. LOC.	NORTHING	EASTING	ELEV	VERT. DIFF.	HORZ. DIFF.
TS-L	13848460.1300	1717890.5770'	2396.719'		
BS-L	13848459.0400	1717890.5150'	2396.202'		
THW	13848451.8800	1717891.8190'	2394.961'		
BS-R	13848445.5800	1717894.0950'	2396.029'		
TS-R	13848444.3500	1717894.2300'	2396.992'		

TYPICAL 5-POINT CROSS-SECTION
(FACING DOWNSTREAM)



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

PRE-CROSSING PHOTOS

PHOTO TAKEN LOOKING DOWNSTREAM FROM UPSTREAM IMPACT LIMITS

PHOTO TAKEN LOOKING UPSTREAM FROM DOWNSTREAM IMPACT LIMITS

POST-CROSSING PHOTOS

PENDING CROSSING

PHOTO TAKEN LOOKING DOWNSTREAM FROM UPSTREAM IMPACT LIMITS

PENDING CROSSING

PHOTO TAKEN LOOKING UPSTREAM FROM DOWNSTREAM IMPACT LIMITS

PRE-CROSSING

PRELIMINARY

-	CAD File No.
JZ	Drawn
GH	Checked
DW	Approved
NOTED	Scale:
SEPT. 2021	Date:
112IC07157	Project No.

TETRA TECH, INC.
661 ANDERSEN DRIVE FOSTER PLAZA 7
PITTSBURGH, PA 15220
TEL: (412) 921-7090 FAX: (412) 921-4040
E-Mail Address: WWW.TETRATECH.COM
TETRA TECH
www.tetratech.com

Client
MOUNTAIN VALLEY PIPELINE, LLC
2200 ENERGY DRIVE, 2ND FLOOR
CANONSBURG, PA 15317

Title
PROFILE AND CROSS-SECTIONS
BASELINE SURVEY
CROSSING S-H88 - SUGAR BRANCH
(MP 130.36)
NICHOLAS COUNTY, WV

Drawing No. 1