

Reach S-L10 (Pipeline ROW)
Perennial
Spread E
Greenbrier County, West Virginia

| Data | Included |
|--|---------------------------|
| Photos | ✓ |
| SWVM Form | ✓ |
| FCI Calculator and HGM Form | N/A – Perennial stream |
| RBP Physical Characteristics Form | ✓ |
| Water Quality Data | ✓ |
| RBP Habitat Form | ✓ |
| RBP Benthic Form | ✓ |
| Benthic Identification Sheet | N/A – Poor Riffle Habitat |
| Wolman Pebble Count | ✓ |
| Reference Reach Software Pebble Count Data | ✓ |
| Longitudinal Profile and Cross Sections | ✓ |

Spread E Stream S-L10 (Pipeline ROW) Greenbrier County



Photo Type: DS, US View
Location, Orientation, Photographer Initials: Downstream Edge of ROW, Upstream View, MD
Lat: 37.938308 Long: -80.747009

Spread E Stream S-L10 (Pipeline ROW) Greenbrier County

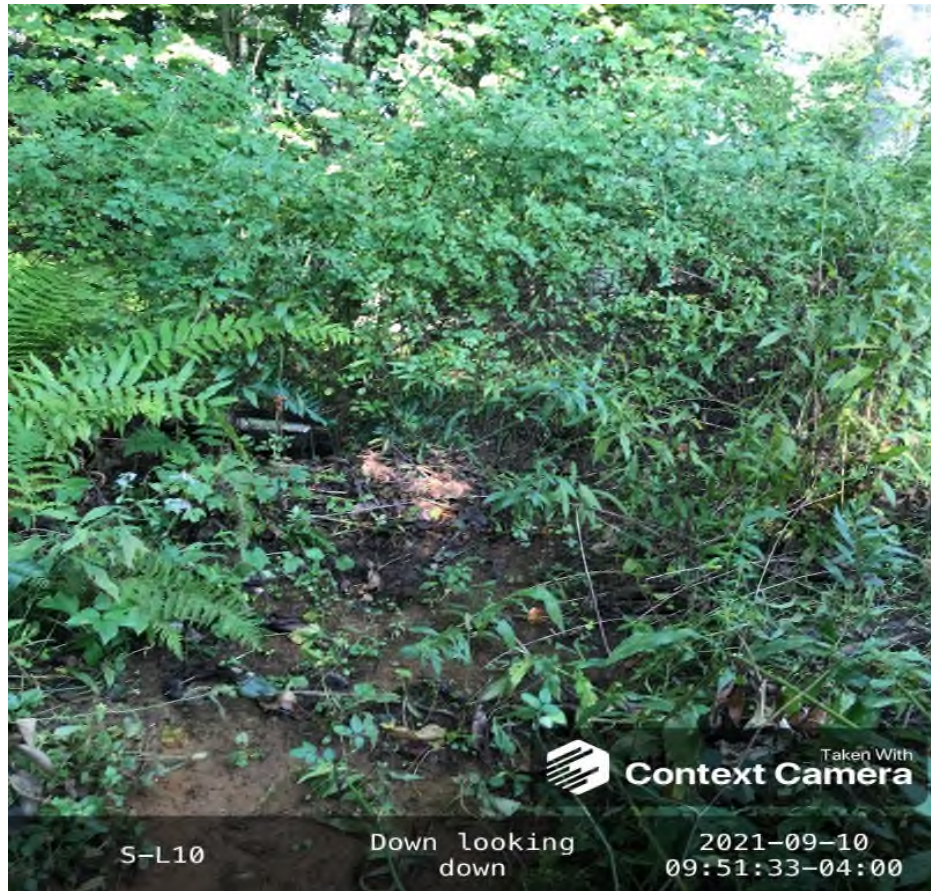


Photo Type: DS, DS View
Location, Orientation, Photographer Initials: Downstream Edge of ROW, Downstream View, MD
Lat: 37.938308 Long: -80.747009

Spread E Stream S-L10 (Pipeline ROW) Greenbrier County



Photo Type: US View at Center
Location, Orientation, Photographer Initials: Center ROW, Upstream View, MD
Lat: 37.938308 Long: -80.747009

Spread E Stream S-L10 (Pipeline ROW) Greenbrier County



Photo Type: DS View at Center
Location, Orientation, Photographer Initials: ROW Center, Downstream View, MD
Lat: 37.938308 Long: -80.747009

Spread E Stream S-L10 (Pipeline ROW) Greenbrier County



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Spread E Stream S-L10 (Pipeline ROW) Greenbrier County

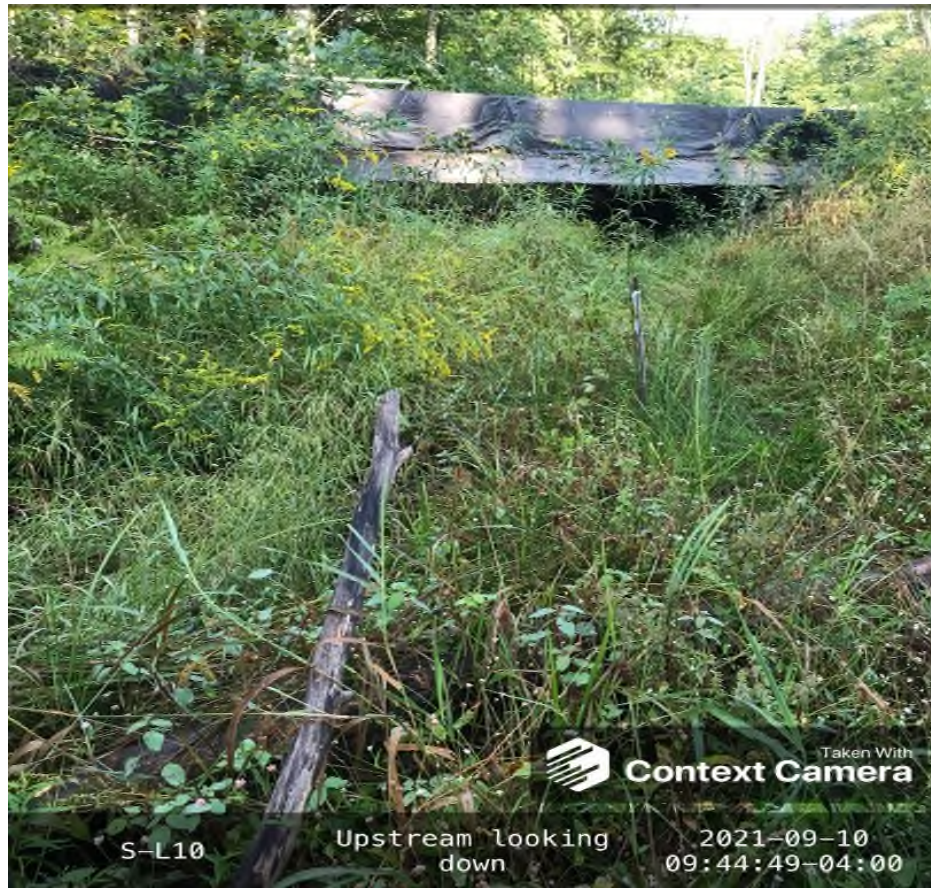


Photo Type: US, DS View
Location, Orientation, Photographer Initials: Upstream Edge of ROW, Downstream View, MD
Lat: 37.938308 Long: -80.747009

Spread E Stream S-L10 (Pipeline ROW) Greenbrier County



Photo Type: Riffle, DS View

Location, Orientation, Photographer Initials: Upstream of Riffle, Downstream View, MD

Lat: 37.938308 Long: -80.747009

Spread E Stream S-L10 (Pipeline ROW) Greenbrier County

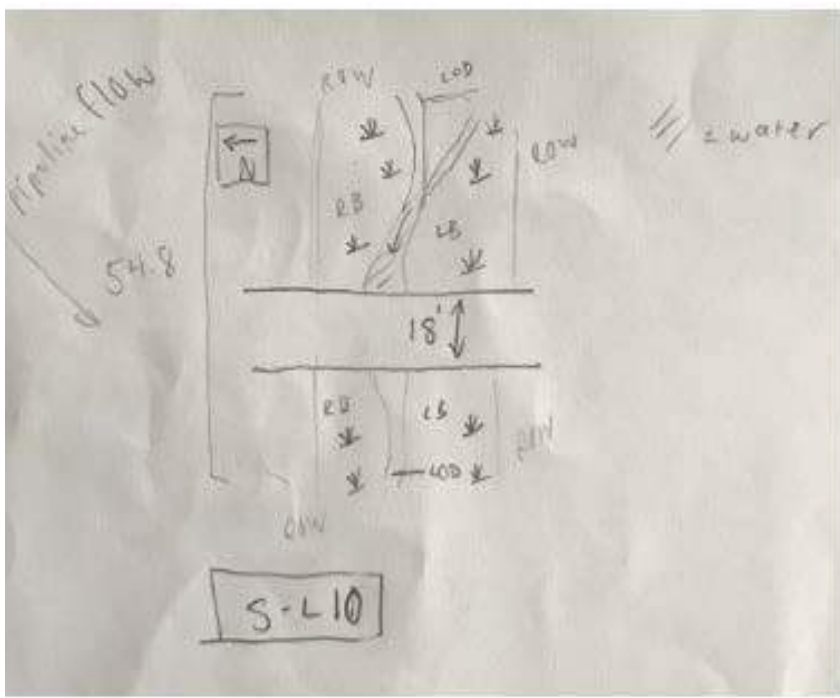


Photo Type: Riffle, US View
Location, Orientation, Photographer Initials: Downstream of Riffle, Upstream View, MD
Lat: 37.938308 Long: -80.747009

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--------------------------|--|--|--|---|--|--|-----------|---|------------|------------|----------------------------|-------|--|---|--------------------|-------------|--|------------|--|--|--|--|--|-------------|--|------------|--|
| USACE FILE NO./ Project Name: <small>(v2.1, Sept 2015)</small> | | | | Mountain Valley Pipeline | | | | IMPACT COORDINATES: (in Decimal Degrees) | | Lat. | 37.938308 | Lon. | -80.747009 | WEATHER: | | Sunny | | DATE: | | 9/10/2021 | | | | | | | | | | | |
| IMPACT STREAM/SITE ID AND SITE DESCRIPTION: <small>(watershed size (acreage), unaltered or impairments)</small> | | | | | | S-L10 | | | | | | MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: <small>(watershed size (acreage), unaltered or impairments)</small> | | | | | | Comments: | | | | | | | | | | | | | |
| STREAM IMPACT LENGTH: | | | | 103 | | 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) | | | | | | 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 | | | | 2.3 | | Percent Stream Channel Slope | | | | | | Percent Stream Channel Slope | | | | 0 | | Percent Stream Channel Slope | | | | 0 | | Percent Stream Channel Slope | | | | 0 | | | |
| HGM Score (attach data forms): | | | | | | HGM Score (attach data forms): | | | | | | HGM Score (attach data forms): | | | | | | HGM Score (attach data forms): | | | | | | HGM Score (attach data forms): | | | | | | | |
| Average | | | | | | Average | | | | | | Average | | | | | | Average | | | | | | Average | | | | | | | |
| Hydrology | | | | | | Hydrology | | | | | | Hydrology | | | | | | Hydrology | | | | | | Hydrology | | | | | | | |
| Biogeochemical Cycling | | | | | | Biogeochemical Cycling | | | | | | Biogeochemical Cycling | | | | | | Biogeochemical Cycling | | | | | | Biogeochemical Cycling | | | | | | | |
| Habitat | | | | | | Habitat | | | | | | Habitat | | | | | | Habitat | | | | | | Habitat | | | | | | | |
| PART I - Physical, Chemical and Biological Indicators | | | | | | PART I - Physical, Chemical and Biological Indicators | | | | | | PART I - Physical, Chemical and Biological Indicators | | | | | | PART I - Physical, Chemical and Biological Indicators | | | | | | PART I - Physical, Chemical and Biological Indicators | | | | | | | |
| 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) | | | | | | PHYSICAL INDICATOR (Applies to all streams classifications) | | | | | | PHYSICAL INDICATOR (Applies to all streams classifications) | | | | | | PHYSICAL INDICATOR (Applies to all streams classifications) | | | | | | PHYSICAL INDICATOR (Applies to all streams classifications) | | | | | | | |
| USEPA RBP (High Gradient Data Sheet) | | | | | | USEPA RBP (Low Gradient Data Sheet) | | | | | | USEPA RBP (High Gradient Data Sheet) | | | | | | USEPA RBP (High Gradient Data Sheet) | | | | | | USEPA RBP (High Gradient Data Sheet) | | | | | | | |
| 1. Epifaunal Substrate/Available Cover 0-20 18 | | | | | | 1. Epifaunal Substrate/Available Cover 0-20 | | | | | | 1. Epifaunal Substrate/Available Cover 0-20 | | | | | | 1. Epifaunal Substrate/Available Cover 0-20 | | | | | | 1. Epifaunal Substrate/Available Cover 0-20 | | | | | | | |
| 2. Embeddedness 0-20 8 | | | | | | 2. Embeddedness 0-20 | | | | | | 2. Embeddedness 0-20 | | | | | | 2. Embeddedness 0-20 | | | | | | 2. Embeddedness 0-20 | | | | | | | |
| 3. Velocity/ Depth Regime 0-20 11 | | | | | | 3. Pool Substrate Characterization 0-20 | | | | | | 3. Velocity/ Depth Regime 0-20 | | | | | | 3. Velocity/ Depth Regime 0-20 | | | | | | 3. Velocity/ Depth Regime 0-20 | | | | | | | |
| 4. Sediment Deposition 0-20 17 | | | | | | 4. Sediment Deposition 0-20 | | | | | | 4. Sediment Deposition 0-20 | | | | | | 4. Sediment Deposition 0-20 | | | | | | 4. Sediment Deposition 0-20 | | | | | | | |
| 5. Channel Flow Status 0-20 8 | | | | | | 5. Channel Flow Status 0-20 | | | | | | 5. Channel Flow Status 0-20 | | | | | | 5. Channel Flow Status 0-20 | | | | | | 5. Channel Flow Status 0-20 | | | | | | | |
| 6. Channel Alteration 0-20 18 | | | | | | 6. Channel Alteration 0-20 | | | | | | 6. Channel Alteration 0-20 | | | | | | 6. Channel Alteration 0-20 | | | | | | 6. Channel Alteration 0-20 | | | | | | | |
| 7. Frequency of Riffles (or bends) 0-20 0 | | | | | | 7. Channel Sinuosity 0-20 | | | | | | 7. Frequency of Riffles (or bends) 0-20 | | | | | | 7. Frequency of Riffles (or bends) 0-20 | | | | | | 7. Frequency of Riffles (or bends) 0-20 | | | | | | | |
| 8. Bank Stability (LB & RB) 0-20 11 | | | | | | 8. Bank Stability (LB & RB) 0-20 | | | | | | 8. Bank Stability (LB & RB) 0-20 | | | | | | 8. Bank Stability (LB & RB) 0-20 | | | | | | 8. Bank Stability (LB & RB) 0-20 | | | | | | | |
| 9. Vegetative Protection (LB & RB) 0-20 12 | | | | | | 9. Vegetative Protection (LB & RB) 0-20 | | | | | | 9. Vegetative Protection (LB & RB) 0-20 | | | | | | 9. Vegetative Protection (LB & RB) 0-20 | | | | | | 9. Vegetative Protection (LB & RB) 0-20 | | | | | | | |
| 10. Riparian Vegetative Zone Width (LB & RB) 0-20 14 | | | | | | 10. Riparian Vegetative Zone Width (LB & RB) 0-20 | | | | | | 10. Riparian Vegetative Zone Width (LB & RB) 0-20 | | | | | | 10. Riparian Vegetative Zone Width (LB & RB) 0-20 | | | | | | 10. Riparian Vegetative Zone Width (LB & RB) 0-20 | | | | | | | |
| Total RBP Score Suboptimal 117 | | | | | | Total RBP Score Poor 0 | | | | | | Total RBP Score Poor 0 | | | | | | Total RBP Score Poor 0 | | | | | | Total RBP Score Poor 0 | | | | | | | |
| Sub-Total 0.585 | | | | | | Sub-Total 0 | | | | | | Sub-Total 0 | | | | | | Sub-Total 0 | | | | | | Sub-Total 0 | | | | | | | |
| CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams) | | | | | | CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams) | | | | | | CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams) | | | | | | CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams) | | | | | | CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams) | | | | | | | |
| WVDEP Water Quality Indicators (General) | | | | | | WVDEP Water Quality Indicators (General) | | | | | | WVDEP Water Quality Indicators (General) | | | | | | WVDEP Water Quality Indicators (General) | | | | | | WVDEP Water Quality Indicators (General) | | | | | | | |
| Specific Conductivity | | | | | | Specific Conductivity | | | | | | Specific Conductivity | | | | | | Specific Conductivity | | | | | | Specific Conductivity | | | | | | | |
| <=99 - 90 points 0-90 35.5 | | | | | | <=99 - 90 points 0-90 | | | | | | <=99 - 90 points 0-90 | | | | | | <=99 - 90 points 0-90 | | | | | | <=99 - 90 points 0-90 | | | | | | | |
| pH | | | | | | pH | | | | | | pH | | | | | | pH | | | | | | pH | | | | | | | |
| 6.0-8.0 = 80 points 0-80 7.37 | | | | | | 6.0-8.0 = 80 points 0-80 | | | | | | 6.0-8.0 = 80 points 0-80 | | | | | | 6.0-8.0 = 80 points 0-80 | | | | | | 6.0-8.0 = 80 points 0-80 | | | | | | | |
| DO | | | | | | DO | | | | | | DO | | | | | | DO | | | | | | DO | | | | | | | |
| >5.0 = 30 points 10-30 7.7 | | | | | | >5.0 = 30 points 10-30 | | | | | | >5.0 = 30 points 10-30 | | | | | | >5.0 = 30 points 10-30 | | | | | | >5.0 = 30 points 10-30 | | | | | | | |
| Sub-Total 1 | | | | | | Sub-Total 0 | | | | | | Sub-Total 0 | | | | | | Sub-Total 0 | | | | | | Sub-Total 0 | | | | | | | |
| BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams) | | | | | | BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams) | | | | | | BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams) | | | | | | BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams) | | | | | | BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams) | | | | | | | |
| WV Stream Condition Index (WVSCI) | | | | | | WV Stream Condition Index (WVSCI) | | | | | | WV Stream Condition Index (WVSCI) | | | | | | WV Stream Condition Index (WVSCI) | | | | | | WV Stream Condition Index (WVSCI) | | | | | | | |
| 0 0-100 0-1 | | | | | | 0 0-100 0-1 | | | | | | 0 0-100 0-1 | | | | | | 0 0-100 0-1 | | | | | | 0 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 | | | | | | PART II - Index and Unit Score | | | | | | PART II - Index and Unit Score | | | | | | PART II - Index and Unit Score | | | | | | PART II - Index and Unit Score | | | | | | | |
| Index | | | | Linear Feet | | Unit Score | | Index | | | | Linear Feet | | Unit Score | | Index | | | | Linear Feet | | Unit Score | | Index | | | | Linear Feet | | Unit Score | |
| 0.793 | | | | 103 | | 81.6275 | | 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 | <div style="display: flex; justify-content: space-between;"> <div> Now storm (heavy rain) _____ rain (steady rain) _____ showers (intermittent) _____ %cloud cover _____ clear/sunny _____ </div> <div> Past 24 hours _____% _____% </div> <div> Has there been a heavy rain in the last 7 days? Yes No Air Temperature _____ °C Other _____ </div> </div> | |
| SITE LOCATION/MAP | Draw a map of the site and indicate the areas sampled (or attach a photograph) <div style="text-align: center;">  </div> | |
| STREAM CHARACTERIZATION | <div style="display: flex; justify-content: space-between;"> <div> Stream Subsystem Perennial Intermittent Tidal Stream Origin Glacial Non-glacial montane Swamp and bog </div> <div> Stream Type Coldwater Warmwater Catchment Area _____ km² Spring-fed Mixture of origins Other _____ </div> </div> | |

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

| | | |
|--|---|---|
| WATERSHED FEATURES | Predominant Surrounding Landuse Forest _____ Field/Pasture _____ Agricultural _____ Residential _____ Commercial _____ Industrial _____ Other _____ | Local Watershed NPS Pollution No evidence <input type="checkbox"/> 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 | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Estimated Reach Length _____ m Estimated Stream Width _____ m Sampling Reach Area _____ m² Area in km² (m²x1000) _____ km² Estimated Stream Depth _____ m Surface Velocity (at thalweg) _____ m/sec </div> <div style="width: 45%;"> 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 _____ </div> </div> | |
| LARGE WOODY DEBRIS | LWD _____ m ² Density of LWD _____ m ² /km ² (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, US) | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Temperature _____ °C Specific Conductance _____ Dissolved Oxygen _____ pH _____ Turbidity _____ WQ Instrument Used _____ </div> <div style="width: 45%;"> Water Odors Normal/None _____ Sewage _____ Petroleum _____ Chemical _____ Fishy _____ Other _____ Water Surface Oils Slick _____ Sheen _____ Globes _____ Flecks _____ None _____ Other _____ Turbidity (if not measured) Clear <input type="checkbox"/> Slightly turbid _____ Turbid _____ Opaque _____ Stained _____ Other _____ </div> </div> | |
| SEDIMENT/ SUBSTRATE | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Odors Normal _____ Sewage _____ Petroleum _____ Chemical _____ Anaerobic _____ None _____ Other _____ </div> <div style="width: 45%;"> 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 _____ </div> </div> | |

| INORGANIC SUBSTRATE COMPONENTS (should add up to 100%) | | | ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%) | | |
|---|----------------------|---------------------------------|---|---|--------------------------------|
| Substrate Type | Diameter | % Composition in Sampling Reach | Substrate Type | Characteristic | % Composition in Sampling Area |
| Bedrock | | | Detritus | sticks, wood, coarse plant materials (CPOM) | |
| 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 |

| Parameters to be evaluated in sampling reach | Habitat Parameter | Condition Category | | | |
|--|--|---|---|---|--|
| | | Optimal | Suboptimal | Marginal | Poor |
| | 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 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| | 2. Embeddedness | Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. | Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. | Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. | Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. |
| | SCORE | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| | 3. Velocity/Depth Regime | All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) | Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). | Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). | Dominated by 1 velocity/depth regime (usually slow-deep). |
| | SCORE | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| | 4. Sediment Deposition | Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. | Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools. | Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. | Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. |
| | SCORE | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| | 5. Channel Flow Status | Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. | Water fills >75% of the available channel; or <25% of channel substrate is exposed. | Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. | Very little water in channel and mostly present as standing pools. |
| | SCORE | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |

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

| 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) | 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. | | | | | |
| Note: determine left or right side by facing downstream. | | | | | | | | | | | | | | | | | | | | | |
| 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 | | |

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: Greenbrier

Stream ID: S-L10

Stream Name: UNT to Boggs Creek

HUC Code:

Basin:

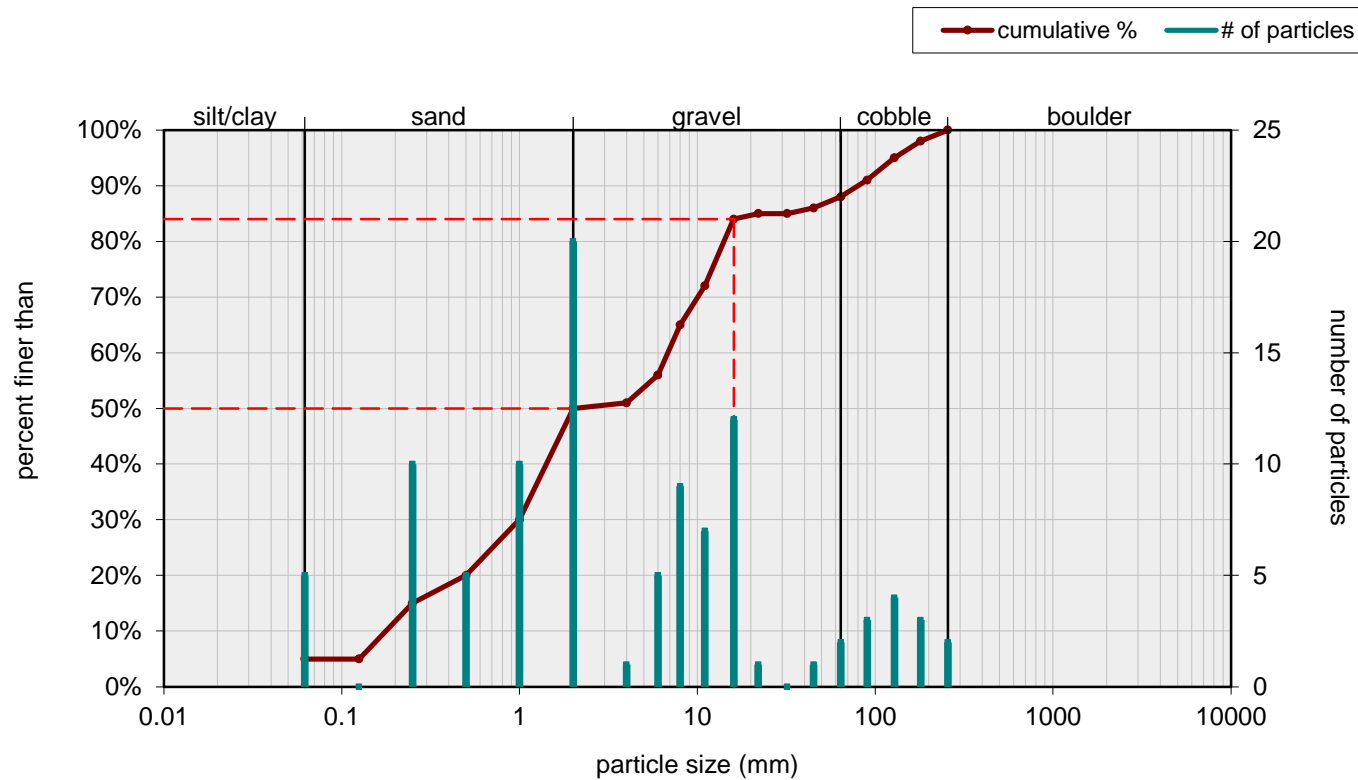
Survey Date: 9/10/2021

Surveyors: EG, JD, MD

Type: Bankfull Channel

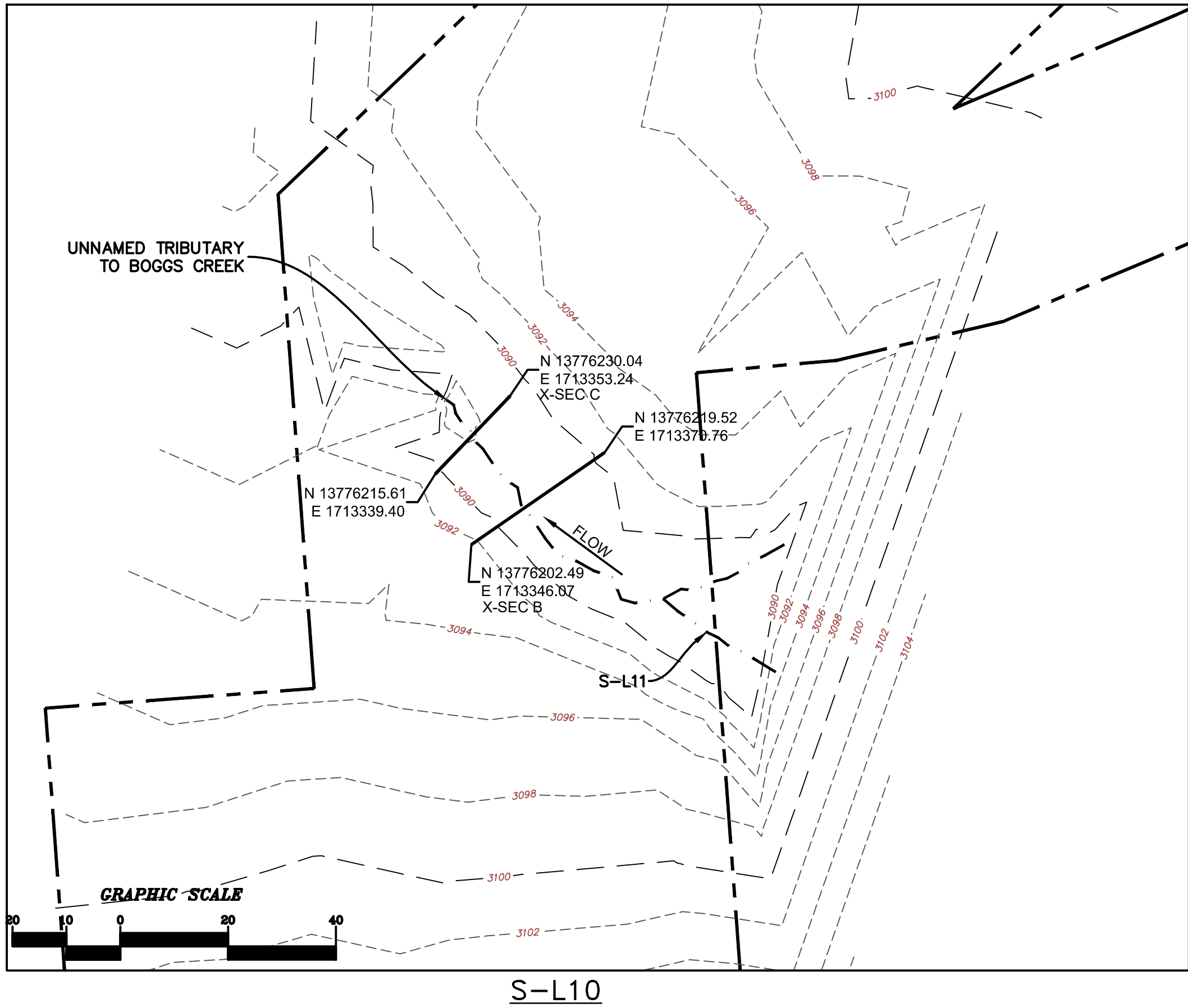
| PEBBLE COUNT | | | | | | | |
|--------------|--------------|-------------|---------------|----------------|---------|--------|--------|
| Inches | PARTICLE | Millimeters | | Particle Count | Total # | Item % | % Cum |
| | Silt/Clay | < .062 | S/C | ▲ ▼ | 5 | 5.00 | 5.00 |
| | Very Fine | .062-.125 | S A N D | ▲ ▼ | 0 | 0.00 | 5.00 |
| | Fine | .125-.25 | | ▲ ▼ | 10 | 10.00 | 15.00 |
| | Medium | .25-.5 | | ▲ ▼ | 5 | 5.00 | 20.00 |
| | Coarse | .50-1.0 | | ▲ ▼ | 10 | 10.00 | 30.00 |
| .04-.08 | Very Coarse | 1.0-2 | | ▲ ▼ | 20 | 20.00 | 50.00 |
| .08 -.16 | Very Fine | 2 -4 | | G R A V E L | ▲ ▼ | 1 | 1.00 |
| .16 - .22 | Fine | 4 -5.7 | ▲ ▼ | | 5 | 5.00 | 56.00 |
| .22 - .31 | Fine | 5.7 - 8 | ▲ ▼ | | 9 | 9.00 | 65.00 |
| .31 - .44 | Medium | 8 -11.3 | ▲ ▼ | | 7 | 7.00 | 72.00 |
| .44 - .63 | Medium | 11.3 - 16 | ▲ ▼ | | 12 | 12.00 | 84.00 |
| .63 - .89 | Coarse | 16 -22.6 | ▲ ▼ | | 1 | 1.00 | 85.00 |
| .89 - 1.26 | Coarse | 22.6 - 32 | ▲ ▼ | | 0 | 0.00 | 85.00 |
| 1.26 - 1.77 | Vry Coarse | 32 - 45 | ▲ ▼ | | 1 | 1.00 | 86.00 |
| 1.77 -2.5 | Vry Coarse | 45 - 64 | ▲ ▼ | | 2 | 2.00 | 88.00 |
| 2.5 - 3.5 | Small | 64 - 90 | C O B B L E | | ▲ ▼ | 3 | 3.00 |
| 3.5 - 5.0 | Small | 90 - 128 | | ▲ ▼ | 4 | 4.00 | 95.00 |
| 5.0 - 7.1 | Large | 128 - 180 | | ▲ ▼ | 3 | 3.00 | 98.00 |
| 7.1 - 10.1 | Large | 180 - 256 | | ▲ ▼ | 2 | 2.00 | 100.00 |
| 10.1 - 14.3 | Small | 256 - 362 | B O U L D E R | ▲ ▼ | 0 | 0.00 | 100.00 |
| 14.3 - 20 | Small | 362 - 512 | | ▲ ▼ | 0 | 0.00 | 100.00 |
| 20 - 40 | Medium | 512 - 1024 | | ▲ ▼ | 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: | | | | | | |

Bankfull Channel Pebble Count, S-L10; UNT to Boggs Creek



| Size (mm) | | Size Distribution | | Type | |
|-----------|------|-------------------|------|-----------|-----|
| D16 | 0.29 | mean | 2.2 | silt/clay | 5% |
| D35 | 1.2 | dispersion | 7.4 | sand | 45% |
| D50 | 2 | skewness | 0.02 | gravel | 38% |
| D65 | 8 | | | cobble | 12% |
| D84 | 16 | | | boulder | 0% |
| D95 | 130 | | | | |

File: D:\CADD - Mountain Valley Pipeline - 148' Crossing Permit\West Virginia\2021-09-10 - S-L10 & S-L11 Stream TPO BP 148.29' S-L10 S-L11 - BP 148.29 - 2024.dwg
Plot Date: 09/10/2021
Plot Time: 09:02:21
Plot User: J. R. HARRIS



LEGEND

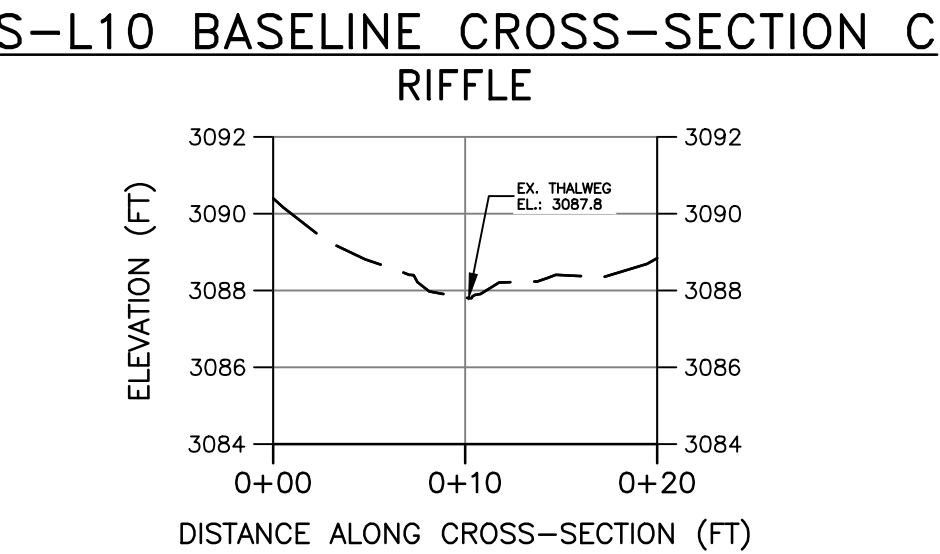
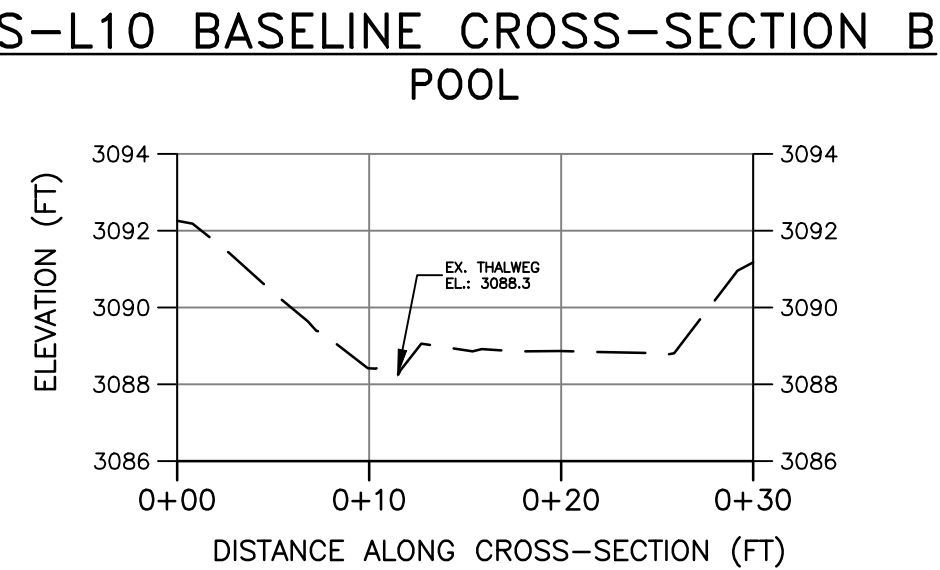
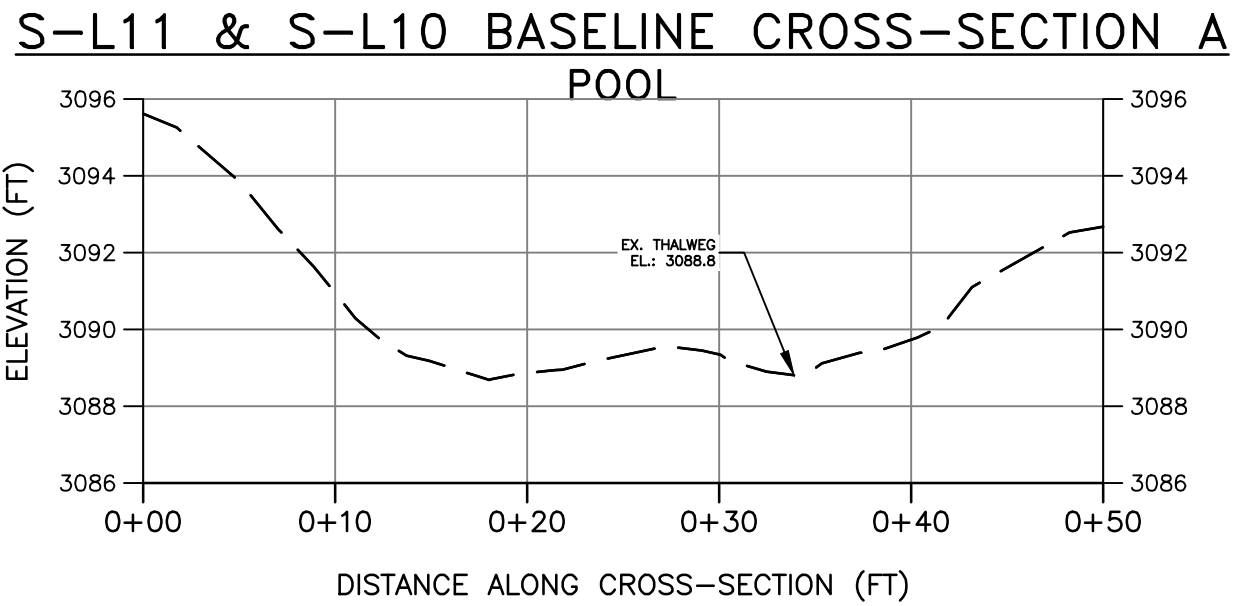
STUDY AREA (EASEMENT)

EXISTING SURVEY-LOCATED THALWEG

EXISTING SURVEYED GROUND SHOT ELEVATION

1176.87 +

- SURVEY NOTES:
- THIS MAP HAS BEEN ORIENTED TO NAD 1983 UTM ZONE 17N, AND VERTICALLY TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), USING REAL TIME DGPS. FIELD LOCATIONS WERE COMPLETED ON SEPTEMBER 10, 2021.
 - EASEMENT LINES SHOWN ON PLAN VIEW WERE PROVIDED BY MOUNTAIN VALLEY PIPELINE.
 - 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.
 - ALL SECTION VIEWS SHOWN LEFT TO RIGHT FACING DOWNSTREAM.
 - POST-CROSSING SURVEY INFORMATION SHOWN IN RED. DATA PENDING.
 - POST-CROSSING SURVEY POINTS FOR CROSS SECTIONS AND THALWEG ARE PROJECTED ONTO PRE-CROSSING SECTION AND PROFILE VIEWS FOR COMPARISON.



CROSS SECTION LEGEND

EXISTING GRADE

CROSS SECTION

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

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

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

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

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881 ANDERSEN DRIVE FOSTER PLAZA 7
PITTSBURGH, PA 15220
TEL: (412) 921-7090 FAX: (412) 921-4040
E-Mail Address: WWW.TETRA TECH.COM



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

Client
MOUNTAIN VALLEY PIPELINE, LLC
2200 ENERGY DRIVE, 2ND FLOOR
CANONSBURG, PA 15317
Title
PROFILE AND CROSS-SECTIONS
BASELINE SURVEY
CROSSING S-L10 - UNNAMED TRIB. TO
BOGGS CREEK (MP 148.29)
GREENBRIER COUNTY, WV