



New Castle Conservation District

2430 Old County Road - Newark, Delaware 19702 - Phone (302) 832-3100, Ext. 3 - Fax (302) 832-5060

April 27, 2026

DNREC Division of Water Resources
Wetlands and Subaqueous Lands
89 Kings Highway
Dover, DE 19901

Dear Mr. Jones:

On behalf of New Castle Conservation District (NCCD), enclosed for your review is a Wetlands and Subaqueous Lands Section Permit Application for the Little Mill Creek Tributary 2 Stream Restoration in Wilmington, Delaware (**Attachment A**). This project will restore an unnamed tributary to Little Mill Creek (Tributary 2) beginning at the intersection of Centerville Road and Faulkland Road and extending downstream to Armstrong Avenue (**Attachment B**). The project purpose, description, impacts, and other details follow.

Project Justification and Purpose:

The project will provide ecological enhancement, support the requirements of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit, and help meet pollutant load reductions associated with the Christina River Total Maximum Daily Load (TMDL).

Project Description:

The project entails restoring approximately 750 linear feet of an unnamed tributary to Little Mill Creek (Tributary 2) within Woodland Run Park. The design consists of an integrated stream and wetland restoration approach that will lower the existing stream banks and adjacent floodplain to create a sustainable stream/floodplain system within the limits of the park property. The restoration will provide the following benefits: bank and bed stabilization, channel plan form improvements, floodplain reconnection, flood storage and gradual release of flood flows for reduction of shear stresses and velocities, sediment and carbon retention, groundwater discharge/recharge, wildlife and instream habitat improvements, nutrient trapping and processing, sewer infrastructure protection, wetland creation throughout the restored floodplain, and replacement of degraded riparian buffers with native woody and herbaceous vegetation.

Restoration will result in permanent subaqueous lands impacts including converting stream channels to non-tidal wetlands for channel re-alignments and floodplain restoration,

installing rip-rap and floodplain logs for channel and floodplain stabilization, and filling portions of existing channels to create side slopes for the proposed floodplain. Temporary impacts to subaqueous lands include installing sandbag dikes for stream pump-arounds during construction, and accessing through channels for construction purposes. The proposed channel re-alignment and floodplain restoration will also create new stream channel and non-tidal wetlands within the restored floodplain, and enhance portions of existing stream channel.

Discussion of Impacts:

The project will have 6,711.68 square feet (0.1541 Ac) of permanent open water impacts and 34.89 square feet (0.0008 Ac) of temporary open water impacts while creating 2,686.61 square feet (0.0617 Ac) of open water and enhancing 398.08 square feet (0.0091 Ac) of open water. The open water impacts are necessary to restore the degraded stream and floodplain as a self-sustaining stream and wetland complex. The restoration will not impact DNREC jurisdictional wetlands.

The proposed restoration will impact three subaqueous land features, including two perennial waters (WUS-A and WUS-B), and one intermittent water (WUS-C). These features will be permanently impacted by channel re-alignments that include the installation of rip-rap underlayment, riffle grade control, clay channel barriers, buried channel/floodplain logs, a rip-rap energy dissipator, and imbricated rock. WUS-A and WUS-C will also be permanently impacted by the proposed floodplain excavation and channel grading. All the subaqueous land features will be temporarily impacted by construction access and erosion and sediment control (E&S) measures.

See **Attachment C, Appendix F, Natural Resources Inventory Plan** for further details on the subaqueous land features and **Attachment D, 95% Design Plans** for more detail regarding the design and impacts.

Watercourse Fill Material Types:

The following materials will be used to fill watercourses for the proposed stream and floodplain restoration. For further design details, see the 95% Design Plans in **Attachment D** and the 95% Design Report in **Attachment E**.

Buried Channel/Floodplain Log: Tree trunks from native hardwood vegetation or harvested/cut from limbs stripped of leaves and loose bark that has been harvested onsite during construction. Buried logs in the channel will have a minimum trunk diameter of 10 inches and buried logs in the floodplain will have a minimum trunk diameter of 8 inches. The length of the logs shall range from 10 to 35 feet.

Channel Bed Fill: Material will be salvaged from the native channel bed material present at the restoration site. The salvaged channel bed material may consist of, but is not limited to, natural sediments, sand, gravel, pebbles, and small stones.

Clay Channel Barrier: Clay material from on or off-site that is free of roots, debris, organic or frozen material, and has a maximum clod size of 2 inches at the time of compaction. Clay loam, silty clay loam, sandy clay, silty clay, and/or clay may be used (GC, SC, CL, OL, CH or OH by the Unified Soil Classification System).

Boulders & Matrix Stones: Boulders will consist of angular flat rock, and matrix stones will consist of irregular shaped rock. Both materials will be harvested from a commercial quarry operation and will be free of laminations, weak cleavages, and will not disintegrate from the action of air, salt water, and in handling and placing.

Rip-rap (R-5 to R-7): Rip-rap will consist of imported material that is hard and durable stone, free from structural defects and foreign substances such as soil, shale, and organic materials.

Discussion of Avoidance & Minimization Alternatives:

The purpose of the project is to restore the degraded conditions of the existing stream channel and floodplain within the project study area to obtain TMDL credit, and therefore impacts to regulated resources are unavoidable. Consideration of alternative sites is not applicable because the goal of the project is to address specific restoration needs at the project site.

The project has focused on minimizing impacts to regulatory resources throughout the design process. An evaluation of concept design alternatives was performed to compare advantages and disadvantages of each option and the potential for functional uplift. These efforts have led to the development of a design recommendation to restore the stream reach within the identified project area for design advancement. The proposed design expands the limits of restoration where feasible to ensure that required TMDL credits are obtained while minimizing and/or eliminating impacts to existing sewer infrastructure. The proposed design also minimizes impacts to adjacent natural resources (non-tidal wetlands, forests, individual trees, etc.), while still providing the benefits of the restoration.

Impacts to WUS-A cannot be minimized because this reach is the focus of the proposed restoration. The reach has been severely manipulated by anthropogenic impacts in the watershed, including floodplain encroachment by residential developments, straightening of the historic stream channel, ditching the floodplain for storm drain outfalls, and sewer line construction within the stream valley. The reach will be re-aligned and reconnected to the restored floodplain to create a self-sustainable stream and wetland complex. Streambed material from the pre-construction channel will be salvaged onsite and placed back into the restored channel. Restoration will also include installing a rip-rap energy dissipator and rock

underlayment at the upstream end of the reach, riffle grade control and buried logs at stream gradient transitions, and clay barriers to prevent the pre-construction channel from reforming.

Impacts to WUS-B cannot be minimized because the reach is located in the proposed rip-rap energy dissipator that is required for slowing stormwater flows from the upstream culvert outfall. The existing reach consists of a short section (~27 LF) of concrete lined channel that provides little to no instream habitat. The concrete lined channel will be removed and replaced with a plunge pool (energy dissipator) that will be stabilized with Class R-5 and R-7 rip-rap.

WUS-C consists of a small ditch (1-2 ft wide) that will be permanently impacted by excavation to create the restored channel and floodplain. Impacts to the channel are required to successfully construct a wide enough floodplain that will relieve storm flows throughout the stream corridor. Most of the channel will be converted to restored floodplain wetlands. A small section of the upstream channel will be impacted by the placement of R-5 rip-rap protection at a stormwater pipe outfall. The outfall and upslope existing wetland will remain and provide a hydrology source to the wetland creation areas in the restored floodplain.

Coordination with Agencies:

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPAC) was used to generate a species list for the project on April 14, 2026. The species list identified the potential presence of the candidate species monarch butterfly (*Danaus plexippus*) and the proposed endangered species tricolored bat (*Perimyotis subflavus*) within the project study area. The Tricolored Bat Range-Wide Determination Key was completed for the project on April 14, 2026, resulting in a determination of “May Affect”. Further coordination with USFWS regarding the monarch butterfly and tricolored bat is not anticipated considering these species are currently not listed and therefore do not have Section 7 requirements.

The National Oceanic and Atmospheric Administration (NOAA) Endangered Species Act (ESA) Section 7 Mapper was used to determine if ESA-listed species or critical habitat is located within the project study area on April 4, 2025. Based on the Section 7 Mapper, no ESA-listed species or critical habitat were identified within the project study area.

An email requesting information on the presence of state rare, threatened, or endangered (RTE) species within the project study area was sent to the Delaware Department of Natural Resources and Environmental Control (DNREC) on June 6, 2025. A response letter was received from DNREC on August 27, 2025, stating that there are currently no records of state-rare or federally listed plants, animals or natural communities at the project site, and there are no fisheries concerns with the project. As a result, at present, the project does not lie within a State Natural Heritage Site, nor does it lie within a Delaware National Estuarine Research Reserve.

A letter requesting review of cultural resources within the project study area was sent to the State Historic Preservation Office (SHPO) on June 10, 2025. SHPO responded in a letter dated September 3, 2025, stating there are no known archeological sites within or adjacent to the area of potential affect (APE) and no historic properties will be affected by the project. All preliminary agency correspondence can be found in **Attachment C**.

In consideration of the project's scope, NCCD is also submitting information for the U.S. Army Corps of Engineer (USACE) Nationwide Permit #27. A field meeting was held with the USACE on October 14, 2025 to review the existing site conditions and discuss the 65% design plans. The meeting minutes from the field visit are included in **Attachment G**.

If you have any questions or require additional information, please contact Karl Hellmann at khellman@rkk.com. Thank you for your time and continued cooperation.

Sincerely,

A handwritten signature in black ink, appearing to read 'C. Brosch', with a long horizontal flourish extending to the right.

Christopher Brosch
District Coordinator
New Castle Conservation District

Enclosures:

- Attachment A – Basic Application Form with Property Deeds
- Attachment B – Location Map
- Attachment C – Natural Resources Inventory Memo with Photo Documentation
- Attachment D – 95% Design Plans
- Attachment E – 95% Design Report
- Attachment F – Adjacent Property Owner Information
- Attachment G – USACE Field Meeting Minutes

CC: Nick Riley, Justin Reel, Tara Cutillo, Karl Hellmann – RK&K

ATTACHMENT A

Basic Application Form with Property Deeds

WETLANDS AND SUBAQUEOUS LANDS SECTION PERMIT APPLICATION FORM

**For Subaqueous Lands, Wetlands, Marina and
401 Water Quality Certification Projects**

**State of Delaware
Department of Natural Resources and Environmental Control
Division of Water**

Wetlands and Subaqueous Lands Section



**APPLICATION FOR APPROVAL OF
SUBAQUEOUS LANDS, WETLANDS, MARINA
AND WATER QUALITY CERTIFICATION PROJECTS**

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY**Application Instructions:**

1. Complete each section of this basic application and appropriate appendices as thoroughly and accurately as possible. Incomplete or inaccurate applications will be returned.
2. All applications must be accompanied by a scaled plan view and cross-section view plans that show the location and design details for the proposed project. Full construction plans must be submitted for major projects.
3. All applications must have an original signature page and proof of ownership or permitted land use agreement.
4. Submit an original and two (2) additional copies of the application (total of 3) with the appropriate application fee and public notice fee* (prepared in separate checks) to:

**Department of Natural Resources and Environmental Control
Wetlands and Subaqueous Lands Section
89 Kings Highway
Dover, Delaware 19901**

*Application and public notice fees are non-refundable regardless of the Permit decision or application status.

5. No construction may begin at the project site before written approval has been received from this office.

Helpful Information:

1. Tax Parcel Information:

New Castle County	(302) 395-5400
Kent County	(302) 736-2010
Sussex County	(302) 855-7878
2. Recorder of Deeds:

New Castle County	(302) 571-7550
Kent County	(302) 744-2314
Sussex County	(302) 855-7785
3. A separate application and/or approval may be required through the Army Corps of Engineers. Applicants are strongly encouraged to contact the Corps for a determination of their permitting requirements. For more information, contact the Philadelphia District Regulator of the Day at (215) 656-6728 or visit their website at: <http://www.nap.usace.army.mil/Missions/Regulatory.aspx>.
4. For questions about this application or the Wetlands and Subaqueous Lands Section, contact us at (302) 739-9943 or visit our website at: <http://www.dnrec.delaware.gov/wr/Services/Pages/WetlandsAndSubaqueousLands.aspx>. Office hours are Monday through Friday 8:00 AM to 4:30 PM, except on State Holidays.

APPLICANT'S REVIEW BEFORE MAILING

DID YOU COMPLETE THE FOLLOWING?

<u> X </u>	Yes	BASIC APPLICATION
<u> X </u>	Yes	SIGNATURE PAGE (Page 3)
<u> X </u>	Yes	APPLICABLE APPENDICES
<u> X </u>	Yes	SCALED PLAN VIEW
<u> X </u>	Yes	SCALED CROSS-SECTION OR ELEVATION VIEW PLANS
<u> X </u>	Yes	VICINITY MAP
<u> X </u>	Yes	COPY OF THE PROPERTY DEED & SURVEY
<u> X </u>	Yes	THREE (3) COMPLETE COPIES OF THE APPLICATION PACKET
<u> X </u>	Yes	APPROPRIATE APPLICATION FEE & PUBLIC NOTICE FEE (Separate checks made payable to the State of Delaware)

Submit 3 complete copies of the application packet to:

**Department of Natural Resources and Environmental Control
Wetlands and Subaqueous Lands Section
89 Kings Highway
Dover, Delaware 19901**

Before signing and mailing your application packet, please read the following:

The Department requests that the contractor or party who will perform the construction of your proposed project, if other than the applicant, sign the application signature page along with the applicant in the spaces provided. When the application is signed by the contractor as well as the applicant, the Department will issue the Permit to both parties. For Leases, the contractor will receive a separate construction authorization that will make them subject to all of the terms and conditions of the Lease relating to the construction

Section 1: Applicant Identification

1. Applicant's Name: Christopher Brosch Telephone #: 302-832-3100
 Mailing Address: 2430 Old County Road Fax #: _____
Newark, DE 19702 E-mail: christopher.brosch@delaware.gov
2. Consultant's Name: Karl Hellmann Company Name: RK&K
 Mailing Address: 700 East Pratt Street, Suite 500 Telephone #: 410-728-2900
Baltimore, MD 21202 Fax #: _____
 E-mail: khellmann@rkk.com
3. Contractor's Name: TBD Company Name: _____
 Mailing Address: _____ Telephone #: _____
 _____ Fax #: _____
 _____ E-mail: _____

Section 2: Project Description

4. Check those that apply:
☒ New Project/addition to existing project? ☐ Repair/Replace existing structure? (If checked, must answer #16)

5. Project Purpose (attach additional sheets as necessary):

New Castle County (NCC) is proposing to restore Little Mill Creek and tributaries within Woodland Park as a project to provide ecological enhancement, support the requirements of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit, and help meet pollutant load reductions associated with the Chesapeake Bay Total Maximum Daily Load (TMDL). In addition to the restoration efforts of Little Mill Creek, a proposed shared use path (SUP) and two new pedestrian bridge crossings are proposed to increase accessibility within Woodland Park for sanitary sewer maintenance crews as well as pedestrians and bicyclist.

☐	A. Boat Docking Facilities	☐	G. Bulkheads	☐	N. Preliminary Marina Checklist
☐	B. Boat Ramps	☒	H. Fill	☐	O. Marinas
☐	C. Road Crossings	☐	I. Rip-Rap Sills and Revetments	☐	P. Stormwater Management
☒	D. Channel Modifications/Dams	☒	J. Vegetative Stabilization	☐	Q. Ponds and Impoundments
☐	E. Utility Crossings	☐	K. Jetties, Groins, Breakwaters	☐	R. Maintenance Dredging
☐	F. Intake or Outfall Structures	☐	M. Activities in State Wetlands	☐	S. New Dredging

Section 3: Project Location

7. Project Site Address: _____ County: ☒ N.C. ☐ Kent ☐ Sussex
2226 Centerville Rd Site owner name (if different from applicant): _____
Wilmington, DE, 19808 Address of site owner: _____

8. Driving Directions: From I-95, take DE-141 N to Centerville Rd. Take exit 5 from DE-141 N. Turn right onto Vermont Ave and left onto Armstrong Ave.
The project is located just west of Armstrong Ave, in the forested area between residential properties.
 (Attach a vicinity map identifying road names and the project location)

9. Tax Parcel ID Number: 0703440335 Subdivision Name: Woodland

WSLS Use Only:		Permit #s: _____		_____		_____		_____	
Type	SP ☐	SL ☐	SU ☐	WE ☐	WQ ☐	LA ☐	SA ☐	MP ☐	WA ☐
Corps Permit: SPGP 18 ☐ 20 ☐		Nationwide Permit #: _____		Individual Permit # _____					
Received Date: _____		Project Scientist: _____							
Fee Received? Yes ☐ No ☐		Amt: \$ _____		Receipt #: _____					
Public Notice #: _____		Public Notice Dates: ON _____		OFF _____					

Section 3: Project Location (Continued)

Unnamed Tributary
(Tributary 2) to Little Mill
Creek

10. Name of waterbody at Project Location: Creek waterbody is a tributary to: Christina River

11. Is the waterbody: ☐ Tidal ☒ Non-tidal Waterbody width at mean low or ordinary high water 4' - 8'

12. Is the project: ☒ On public subaqueous lands? ☐ On private subaqueous lands?*

☐ In State-regulated wetlands? ☒ In Federally-regulated wetlands?

*If the project is on private subaqueous lands, provide the name of the subaqueous lands owner:

(Written permission from the private subaqueous lands owner must be included with this application)

13. Present Zoning: ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☐ Other

Section 4: Miscellaneous

14. A. List the names and complete mailing addresses of the immediately adjoining property owners on all sides of the project (attach additional sheets as necessary):

See Attachment F

B. For wetlands and marina projects, list the names and complete mailing addresses of property owners within a 1,000 foot radius of the project (attach additional sheets as necessary):

N/A

15. Provide the names of DNREC and/or Army Corps of Engineers representatives whom you have discussed the project with:
James Colligan

A. Have you had a State Jurisdictional Determination performed on the property? ☐ Yes ☒ No

B. Has the project been reviewed in a monthly Joint Permit Processing Meeting? ☐ Yes ☒ No

*If yes, what was the date of the meeting? _____

16. Are there existing structures or fill at the project site in subaqueous lands? ☐ Yes ☒ No

*If yes, provide the permit and/or lease number(s): _____

*If no, were structures and/or fill in place prior to 1969? ☐ Yes ☒ No

17. Have you applied for or obtained a Federal permit from the Army Corps of Engineers?

☐ No ☒ Pending ☐ Issued ☐ Denied Date: _____

Type of Permit: NWP 27 Federal Permit or ID #: _____

18. Have you applied for permits from other Sections within DNREC?

☒ No ☐ Pending ☐ Issued ☐ Denied Date: _____ Permit or ID #: _____

Type of permit (circle all that apply): Septic Well NPDES Storm Water

Other: _____

Section 5: Signature Page

19. Agent Authorization:

If you choose to complete this section, all future correspondence to the Department may be signed by the duly authorized agent. In addition, the agent will become the primary point of contact for all correspondence from the Department.

I do not wish to authorize an agent to act on my behalf ☐

I wish to authorize an agent as indicated below ☐

I, Christopher Brosch, hereby designate and authorize Karl Hellmann
(Name of Applicant) (Name of Agent)
to act on my behalf in the processing of this application and to furnish any additional information requested by the Department.

Authorized Agent's Name: Karl Hellmann Telephone #: 410-728-9200
Mailing Address: 700 East Pratt Street, Suite 500 Fax #: _____
Baltimore, MD 21202 E-mail: khellmann@rkk.com

20. Agent's Signature:

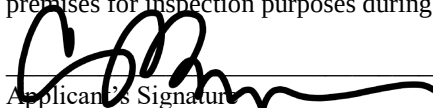
I hereby certify that the information on this form and on the attached plans are true and accurate to the best of my knowledge. I further understand that the Department may request information in addition to that set forth herein if deemed necessary to appropriately consider this application.

Karl Hellmann
Agent's Signature

4/27/26
Date

21. Applicant's Signature:

I hereby certify that the information on this form and on the attached plans are true and accurate to the best of my knowledge and that I am required to inform the Department of any changes or updates to the information provided in this application. I further understand that the Department may request information in addition to that set forth herein if deemed necessary to appropriately consider this application. I grant permission to authorized Department representatives to enter upon the premises for inspection purposes during working hours.


Applicant's Signature

04/27/2026
Date

Christopher Brosch
Print Name

22. Contractor's Signature:

I hereby certify that the information on this form and on the attached plans are true and accurate to the best of my knowledge, and that I am required to inform the Department of any changes or updates to the information provided in this application. I further understand that the Department may request information in addition to that set forth herein if deemed necessary to appropriately consider this application.

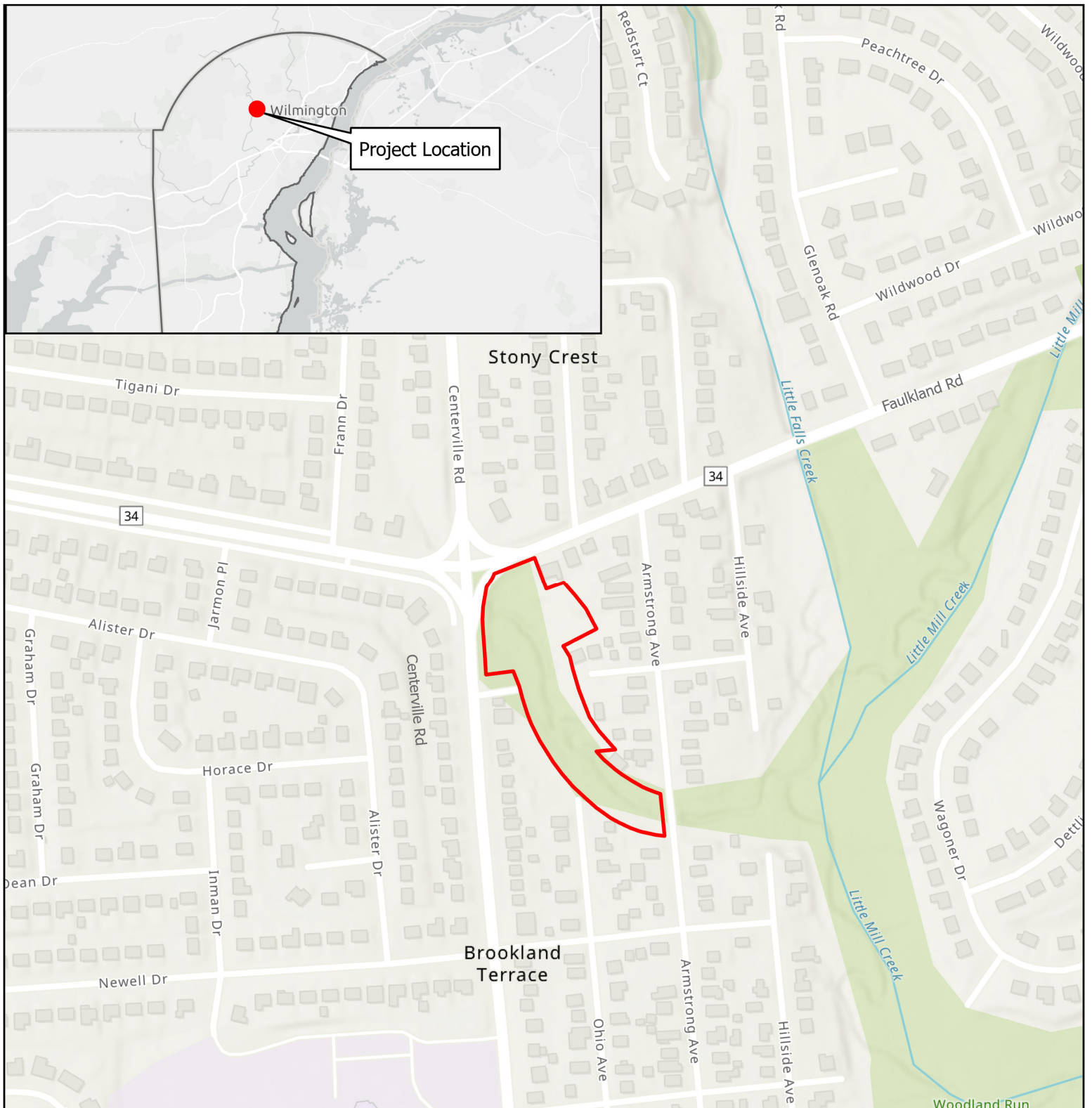
TBD
Contractor's Name

Date

Print Name

ATTACHMENT B

Location Map



 Project Study Area



0 180 360
ft

1 in = 360 ft

Little Mill Creek Tributary 2
Stream Restoration

Figure 1:
Project Vicinity Map



RK&K
Responsive People | Creative Solutions

ATTACHMENT C

Natural Resources Inventory Memo with Photographic Documentation



700 East Pratt Street, Suite 500
Baltimore, MD 21202
Phone 410.728.2900
www.rkk.com

MEMORANDUM

Date: April 14, 2026
To: New Castle Conservation District (NCCD)
From: Karl Hellmann – RK&K
CC: Nick Riley, Tara Cutillo, Justin Reel & Kate Allcock – RK&K
Re: Little Mill Creek Tributary 2 Stream Restoration – Natural Resources Inventory

EXECUTIVE SUMMARY

On behalf of New Castle Conservation District (NCCD), RK&K conducted a Natural Resources Inventory (NRI), including a wetland and waterway delineation, walk-through forest stand characterization, and individual tree inventory within the Little Mill Creek Tributary 2 Stream Restoration project study area in New Castle County, Delaware (**Attachment A, Figures 1 & 2**). The project entails restoring an unnamed tributary to Little Mill Creek (Tributary 2) beginning at the intersection of Centerville Road and Faulkland Road and extending downstream to Armstrong Avenue. The site includes approximately 750 linear feet of Tributary 2 and four stormwater outfalls.

RK&K Environmental scientists conducted the NRI field work in March 2025. RK&K identified two palustrine forested wetlands (PFOs), three Waters of the U.S., one forest stand, six specimen trees, and seven stand-alone trees within the project study area. Any proposed impacts to wetlands, waters, or subaqueous lands will require coordination with the US Army Corps of Engineers (USACE) and Department of Natural Resources and Environmental Control (DNREC). Impacts to forest stands and specimen trees will require coordination with NCC Department of Land Use.

Supplemental information supporting the NRI is included in **Attachment A** through **E**, as follows:

- Attachment A: Background Figures
- Attachment B: Agency Correspondence
- Attachment C: Datasheets
- Attachment D: Photographic Documentation
- Attachment E : Tree Inventory Table
- Attachment F : Natural Resources Inventory (NRI) Plan

BACKGROUND INFORMATION

RK&K environmental scientists conducted a desktop investigation of mapped information prior to beginning the field investigation. The desktop investigation of the available mapped information

identified site topography; vegetative cover; tidal and non-tidal waters and wetlands; 100-year floodplains; and hydric and highly erodible soils. Mapped resources reviewed for this project include:

- The United States Geologic Survey (USGS) Geographic Information System (GIS) Topographic Quadrangle Mapping
- The United States Department of Agriculture, Natural Resource Conservation Service (USDA-NRCS) *Web Soil Survey (WSS) for New Castle County, Delaware*
- US Fish and Wildlife Service, National Wetlands Inventory (NWI)
- Delaware Department of Natural Resources and Environmental Control (DNREC) Tidal and Nontidal Wetlands Mapping
- Federal Emergency Management Agency (FEMA) 100-year Floodplain

Desktop investigation results are summarized below:

Geology & Topography

The Little Mill Creek Tributary 2 Stream Restoration is located in New Castle County, DE (**Attachment A, Figure 1**), within the Eastern Mountains and Piedmont physiographic province. The Eastern Mountains and Piedmont physiographic province is composed of hard, crystalline igneous and metamorphic rocks, and extends from the inner edge of the Coastal Plain westward to Catoctin Mountain, the eastern boundary of the Blue Ridge Province. Bedrock in the eastern part of the Piedmont consists of schist, gneiss, gabbro, and other highly metamorphosed sedimentary and igneous rocks of probable volcanic origin. The rocks of the western part of the Piedmont are diverse and include phyllite, slate, marble, and moderately to slightly metamorphosed volcanic rocks. Gently undulating plains underlain by un-metamorphosed bedrock of triassic red shale, siltstone, and sandstone occur in three areas in the western Piedmont. Elevations within the project study area range from 98 to 126 feet above sea level (**Attachment A, Figure 3**).

Soils

The USDA-NRCS Web Soil Survey for New Castle County, Delaware identified three mapped soil units within the project study area (**Attachment A, Figure 3**). Two highly erodible soils were identified within the project study area, as shown in **Table 1** below. Two non-hydric soil units and one predominantly non-hydric soil unit was mapped within the project study area.

Table 1. Soil Map Units within the Project Study Area

Map Unit Symbol	Map Unit Name	K-factor (Whole Soil) *	Drainage Class	Hydric Rating**	
DcB	Delanco-Codorus-Hatboro complex, 0 to 8 percent slopes, flooded	.37 (HE)	Moderately well drained	25	Predominantly Non-Hydric
ErB	Elsinboro-Delanco-Urban land complex, 0 to 8 percent slopes	.49 (HE)	Well drained	0	Non-Hydric
GhB	Glenelg-Wheaton-Urban land complex, 0 to 8 percent slopes	.28	Well drained	0	Non-Hydric

*Erodibility Coefficient – Value assigned to soil types by NRCS. $K > 0.35$ are considered to be highly erodible (HE) soils.

**Hydric Rating – Value is based on the percentage of hydric soils within the soil type. Non-hydric soils have a value of 0, predominantly non-hydric soils have a value between 0 and 33, partially hydric soils have a value between 33 and 66, predominantly hydric soils have a value between 66 and 99, and hydric soils have a value of 100.

Wetlands and Waters of the United States

The project is located in the Brandywine-Christina (02040205) 8-digit watershed. NWI and DNREC mapping did not identify any wetlands or waterways within the project study area. (**Attachment A, Figure 4**).

100-Year Floodplain

The project study area does not fall within the 100-year floodplain according to Federal Emergency Management Agency (FEMA) GIS data for New Castle County (**Attachment A, Figure 4**).

Rare, Threatened, and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPAC) was used to generate a species list for the project on April 14, 2026. The tricolored bat (*Perimyotis subflavus*) and monarch butterfly (*Danaus plexippus*) were identified on the species list. The monarch butterfly and tricolored bat are candidate and proposed endangered species, respectively, and therefore do not currently have Section 7 requirements. The Tricolored Bat Range-Wide Determination Key was also completed for the project on April 14, 2026, resulting in a determination of “May Affect”. The USFWS species list is included in **Attachment B**.

On April 4, 2025, the National Oceanic and Atmospheric Administration (NOAA) Endangered Species Act (ESA) Section 7 Mapper and Essential Fish Habitat (EFH) Mapper were used to determine if ESA-listed species, critical habitat, or essential fish habitat is located within the project study area. Based on the Section 7 and EFH Mapper, no ESA-listed species, critical habitat, or essential fish habitat were identified within the project study area. The Section 7 and EFH Mapper results are included in **Attachment B**.

An email requesting information on the presence of rare, threatened, or endangered species within the project study area was sent to the Delaware Department of Natural Resources and Environmental Control (DNREC) on June 6, 2025. A response was received from DNREC on August 27, 2025, stating that there are currently no records of state-rare or federally-listed plants, animals or natural communities at the project site, and there are no fisheries concerns with the project. As a result, at present, the project does not lie within a State Natural Heritage Site, nor does it lie within a Delaware National Estuarine Research Reserve. The DNREC response letter is included in **Attachment B**.

Cultural Resources

A letter requesting review of cultural resources within the project study area was sent to the State Historic Preservation Office (SHPO) on June 10, 2025. SHPO responded in a letter dated September 3, 2025, stating there are no known archaeological sites within or adjacent to the area of potential affect (APE) and that no historic properties will be affected by the project. Agency correspondence documents can be found in **Attachment B**.

WETLAND DELINEATION – FIELD INVESTIGATION

Methods

A team of two environmental scientists delineated waters of the U.S., including wetlands, within the project study area, and completed the applicable data form for each delineated feature. Each delineated feature was given a unique identifier and photographed. Boundary points were identified for each wetland feature, marked with pink flagging, and numbered consecutively. Wetland boundary point

positions were located in the field using a sub-meter GPS unit, and all waterway boundaries were delineated using traditional field survey.

Wetlands were delineated in accordance with the *U.S. Army Corps of Engineers Wetlands Delineation Manual, Y-87-I* (Environmental Laboratory, 1987), U. S. Army Corps of Engineers. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Piedmont Plateau Region Version 2.0*, ed. J.F. Berkowitz, J.S. Wakeley, R.W. Lichvar, C.V. Noble. ERDC/EL TR-12-9. Vicksburg, MS: U.S. Army Engineer Research and Development Center. Routine wetland determination methods with onsite inspection were used to determine the presence of wetlands in the project study area.

Waters of the U.S., other than wetlands, were delineated using the limits defined in 33 C.F.R. § 328 at the time of delineation. The boundaries of non-tidal waters of the U.S. other than wetlands were set at the ordinary high-water mark (OHW). The OHW was determined in the field using physical characteristics established by the fluctuations of water (e.g., change in plant community, changes in the soil character, shelving) in accordance with U.S. Army Corps of Engineers Regulatory Guidance Letter No. 05-05.

Results

RK&K conducted a wetland and waterway delineation within the project study area on March 18th and 25th, 2025. Two palustrine forested wetlands and three waterways were identified within the project study area. Summary information on each delineated feature is included in **Tables 2** and **3**. Datasheets and photographs of each delineated feature are included in **Attachments C** and **D**, respectively, and the locations of the delineated features are displayed on the NRI Plans in **Attachment F**.

Table 2. Wetlands within the Project Study Area

Feature ID	NWI Classification	Hydrologic Connectivity	Area (SF)
WET-A	PFO	WUS-C	962
WET-B	PFO	WUS-A	992

Table 3. Waterway Features within the Project Study Area

Feature ID	Hydrologic Class	Upstream Connectivity	Downstream Connectivity	Length (LF)	Area (SF)
WUS-A	Perennial	Outside of Study Area	Outside of Study Area	914	6,753
WUS-B	Perennial	Outside of Study Area	Waters-A	27	138
WUS-C	Intermittent	Wetland A	Waters-A	72	220

FOREST STAND CHARACTERIZATION & TREE INVENTORY – FIELD INVESTIGATION

Methods

RK&K conducted a walkthrough forest stand characterization within the project study area. Forest stands were identified and delineated in accordance with the New Castle County Code Chapter 40 Amendment, January 26, 2021, that defines a forest as “*An area covered by canopy of trees, covering a continuous land area of at least 1.0 acre or greater in size. Forests do not include trees planted and grown for commercial purposes, and do not include canopy cover over existing structures.*” Forest stands were characterized based on community type, successional stage, and overall condition. Stands were visually assessed, and data collected for each forest stand included size class, dominant canopy species, common understory and herbaceous species, presence and abundance of invasive species, and overall condition.

A tree inventory was conducted within the project study area in accordance with the New Castle County Code Chapter 40 Amendment, January 26, 2021. All individual or groups of trees with a DBH (diameter at breast height) equal to or greater than 16 inches (including specimen trees) located outside forested areas were inventoried. The County Code defines Specimen trees as “Trees listed in the State Big Trees Program, or trees in good health that are not in woodland but have diameters in excess of twenty-four (24) inches DBH. The tree species, DBH, and condition were recorded for each of the inventoried trees. The condition of the tree was assessed by an ocular estimation of growth form, visible signs of decay, live crown ratio, and indications of disease or insect infestation. Each inventoried tree was numbered consecutively. Data obtained from the field reconnaissance was collected with an iPad and the tree locations were inventoried with a GPS unit with sub-meter accuracy.

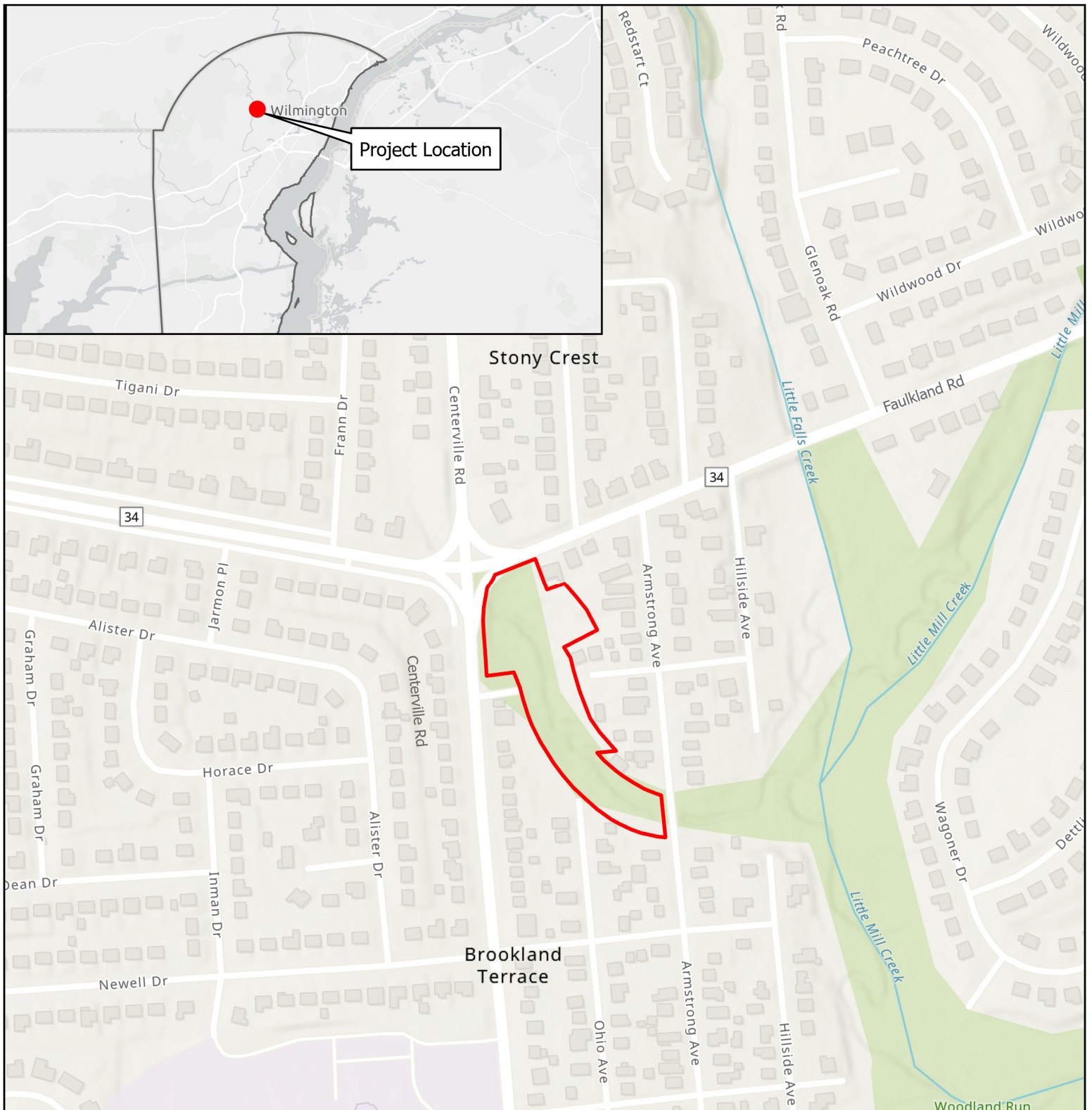
Results

RK&K conducted a walkthrough forest stand characterization and tree inventory within the project study area on March 18th and 25th, 2025. One forest stand, seven stand-alone trees and six specimen trees were identified within the project study area and are shown on the NRI Plans in **Attachment F**. Forest stand characterization results are summarized in **Table 4** on the following page. Photographs of the forest stand are included in **Attachment D** and a Tree Inventory Table is included in **Attachment E**.

Table 4. Forest Stands within the Project Study Area

Stand ID	Forest Association	Size Class (DBH)	Dominant Canopy Species	Common Understory Species	Common Herbaceous Species	Invasive Cover	Condition	Acreage in Study Area
FS1	Black cherry-maple	12-20 & 20-30	Red maple, white mulberry, black cherry, green ash	Wineberry, spicebush, bush honeysuckle, multi-flora rose, Norway maple, porcelain berry	Ground ivy, Japanese honeysuckle, wild onion, English ivy, fig buttercup, poison ivy	High	Poor	1.41

Attachment A – Background Figures



 Project Study Area



0 180 360
ft

1 in = 360 ft

Little Mill Creek Tributary 2
Stream Restoration

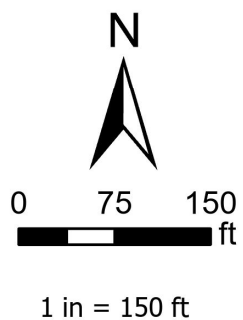
Figure 1:
Project Vicinity Map



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Responsive People | Creative Solutions



 Project Study Area



Little Mill Creek Tributary 2
Stream Restoration

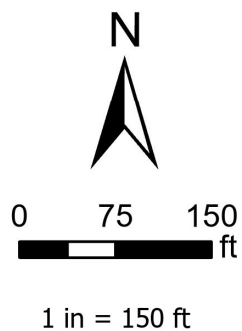
Figure 2:
Project Location Map



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 Project Study Area
 SSURGO Soils



Little Mill Creek Tributary 2
 Stream Restoration

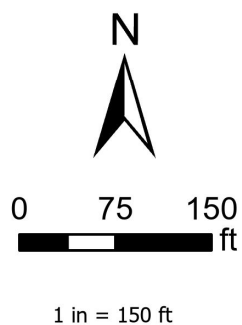
Figure 3:
Soils & Topography Map



RK&K
 Responsive People | Creative Solutions



- ▬ Project Study Area
- ▬ FEMA Flood Zone X
- ▬ FEMA Flood Zone A
- ▬ FEMA Flood Zone AE
- ▬ NWI Wetlands and Waters
- ▬ DNREC Wetlands and Waters



Little Mill Creek Tributary 2 Stream Restoration

Figure 4:
Environmental Features
Map



RK&K
Responsive People | Creative Solutions

Attachment B – Agency Correspondence



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127



In Reply Refer To:

04/14/2026 16:23:22 UTC

Project Code: 2025-0078504

Project Name: Little Mill Creek Tributary 2

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf>

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see <https://www.fws.gov/program/migratory-bird-permit/what-we-do>.

It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see <https://www.fws.gov/library/collections/threats-birds>.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit <https://www.fws.gov/partner/council-conservation-migratory-birds>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

- USFWS National Wildlife Refuges and Fish Hatcheries
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Chesapeake Bay Ecological Services Field Office

177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
(410) 573-4599

PROJECT SUMMARY

Project Code: 2025-0078504

Project Name: Little Mill Creek Tributary 2

Project Type: Restoration / Enhancement of Waterbody

Project Description: The project entails restoring an unnamed tributary to Little Mill Creek (Tributary 2) beginning at the intersection of Centerville Road and Faulkland Road and extending downstream to Armstrong Avenue. The site includes approximately 750 linear feet of Tributary 2 and three stormwater outfalls.

Project Location:

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@39.7454082,-75.62317274749634,14z>



Counties: New Castle County, Delaware

ENDANGERED SPECIES ACT SPECIES

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Tricolored Bat <i>Perimyotis subflavus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> There is proposed critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

WETLANDS

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

IPAC USER CONTACT INFORMATION

Agency: RK&K
Name: Kate Allcock
Address: 700 E Pratt St, Suite 500
City: Baltimore
State: MD
Zip: 21202
Email: kallcock@rkk.com
Phone: 4107282900

LEAD AGENCY CONTACT INFORMATION

Lead Agency: County of New Castle



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127



In Reply Refer To:

04/14/2026 17:21:50 UTC

Project code: 2025-0078504

Project Name: Little Mill Creek Tributary 2

Federal Nexus: yes

Federal Action Agency (if applicable): County of New Castle

Subject: Technical assistance for 'Little Mill Creek Tributary 2'

Dear Kate Allcock:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on April 14, 2026, for 'Little Mill Creek Tributary 2' (here forward, Project). This project has been assigned Project Code 2025-0078504 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project. **Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key (Dkey), invalidates this letter.**

Determination for the Northern Long-Eared Bat and Tricolored Bat

Based on your IPaC submission and a standing analysis completed by the Service, you determined the proposed Project will have the following effect determinations:

Species	Listing Status	Determination
Tricolored Bat (<i>Perimyotis subflavus</i>)	Proposed	May affect
	Endangered	

Federal agencies must consult with U.S. Fish and Wildlife Service under section 7(a)(2) of the Endangered Species Act (ESA) when an action *may affect* a listed species. Tricolored bat is proposed for listing as endangered under the ESA, but not yet listed. For actions that may affect a proposed species, agencies cannot consult, but they can *confer* under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed species is listed. Should the tricolored bat be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the tricolored bat range that previously received a NE or NLAA determination from the key to confirm that the determination is still accurate. Projects that receive a may affect determination for tricolored bat through the key, should contact the appropriate Ecological Services Field Office if they want to conference on this species.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination key for the northern long-eared bat and tricolored bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Monarch Butterfly *Danaus plexippus* Proposed Threatened

You may coordinate with our Office to determine whether the Action may cause prohibited take of the species listed above.

Conclusion

Consultation with the Service is not complete. Further consultation or coordination with the Service is necessary for those species or designated critical habitats with a determination of “May Affect.” A “May Affect” determination in this key indicates that the project, as entered, is not consistent with the questions in the key. Not all projects that reach a “May Affect” determination are anticipated to result in adverse impacts to listed species. These projects may result in a “No Effect”, “May Affect, Not Likely to Adversely Affect”, or “May Affect, Likely to Adversely Affect” determination depending on the details of the project. Please contact our Chesapeake Bay Ecological Services Field Office to discuss methods to avoid or minimize potential adverse effects to those species or designated critical habitats.

Action Description

You provided to IPaC the following name and description for the subject Action.

1. Name

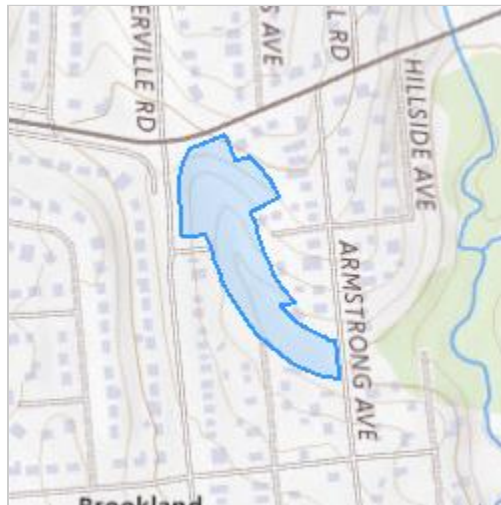
Little Mill Creek Tributary 2

2. Description

The following description was provided for the project 'Little Mill Creek Tributary 2':

The project entails restoring an unnamed tributary to Little Mill Creek (Tributary 2) beginning at the intersection of Centerville Road and Faulkland Road and extending downstream to Armstrong Avenue. The site includes approximately 750 linear feet of Tributary 2 and three stormwater outfalls.

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@39.7454082,-75.62317274749634,14z>



DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of “may affect” for a least one species covered by this determination key.

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of listed bats or any other listed species?

Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

No

2. Is the action area wholly within Zone 2 of the year-round active area for northern long-eared bat and/or tricolored bat?

Automatically answered

No

3. Does the action area intersect Zone 1 of the year-round active area for northern long-eared bat and/or tricolored bat?

Automatically answered

No

4. Does any component of the action involve leasing, construction or operation of wind turbines? Answer 'yes' if the activities considered are conducted with the intention of gathering survey information to inform the leasing, construction, or operation of wind turbines.

No

5. Does the proposed action involve solar energy facilities?

No

6. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

Note for projects in Pennsylvania: Projects requiring authorization under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act would be considered as having a federal nexus. Since the U.S. Army Corps of Engineers (Corps) has issued the Pennsylvania State Programmatic General Permit (PASPGP), which may be verified by the PA Department of Environmental Protection or certain Conservation Districts, the need to receive a Corps authorization to perform the work under the PASPGP serves as a federal nexus. As such, if proposing to use the PASPGP, you would answer ‘yes’ to this question.

Yes

7. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

No

8. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

No

9. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

No

10. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

No

11. [Semantic] Is the action area located within 0.5 miles of a known bat hibernaculum or winter roost? Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your state wildlife agency.

Automatically answered

No

12. Does the action area contain any winter roosts or caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating bats?

No

13. Will the action cause effects to a bridge?

Note: Covered bridges should be considered as bridges in this question.

No

14. Will the action result in effects to a culvert or tunnel at any time of year?

No

15. Are trees present within 1000 feet of the action area? **Note:** If there are trees within the action area that are of a sufficient size to be potential roosts for bats answer "Yes". If unsure, additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in the USFWS' [Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines](#).

Yes

16. Does the action include the intentional exclusion of bats from a building or building-like structure? **Note:** Exclusion is conducted to deny bats' entry or reentry into a building. To be effective and to avoid harming bats, it should be done according to established standards. If your action includes bat exclusion and you are unsure whether northern long-eared bats or tricolored bats are present, answer "Yes." Answer "No" if there are no signs of bat use in the building/structure. If unsure, contact your local Ecological Services Field Office to help assess whether northern long-eared bats or tricolored bats may be present. Contact a Nuisance Wildlife Control Operator (NWCO) for help in how to exclude bats from a structure safely without causing harm to the bats (to find a NWCO certified in bat standards, search the Internet using the search term "National Wildlife Control Operators Association bats"). Also see the White-Nose Syndrome Response Team's guide for bat control in structures.

No

17. Does the action involve removal, modification, or maintenance of a human-made building-like structure (barn, house, or other building) **known or suspected to contain roosting bats?**

No

18. Will the action cause construction of one or more new roads open to the public?

For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

No

19. Will the action include or cause any construction or other activity that is reasonably certain to increase average night-time traffic permanently or temporarily on one or more existing roads? **Note:** For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.). .

No

20. Will the action include or cause any construction or other activity that is reasonably certain to increase the number of travel lanes on an existing thoroughfare?

For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

No

21. Will the proposed Action involve the creation of a new water-borne contaminant source (e.g., leachate pond, pits containing chemicals that are not NSF/ANSI 60 compliant)?

Note: For information regarding NSF/ANSI 60 please visit <https://www.nsf.org/knowledge-library/nsf-ansi-standard-60-drinking-water-treatment-chemicals-health-effects>

No

22. Will the proposed action involve the creation of a new point source discharge from a facility other than a water treatment plant or storm water system?

No

23. Will the action include drilling or blasting?

No

24. Will the action involve military training (e.g., smoke operations, obscurant operations, exploding munitions, artillery fire, range use, helicopter or fixed wing aircraft use at night)?

No

25. Will the proposed action involve the use of herbicides or pesticides (e.g., fungicides, insecticides, or rodenticides)?

No

26. Will the action include or cause activities that are reasonably certain to cause chronic or intense nighttime noise (above current levels of ambient noise in the area) in suitable summer habitat for the northern long-eared bat or tricolored bat during the active season? Chronic noise is noise that is continuous or occurs repeatedly again and again for a long time. Sources of chronic or intense noise that could cause adverse effects to bats may include, but are not limited to: road traffic; trains; aircraft; industrial activities; gas compressor stations; loud music; crowds; oil and gas extraction; construction; and mining.

Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in the USFWS' [Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines](#).

No

27. Does the action include, or is it reasonably certain to cause, the use of permanent or temporary artificial lighting within 1000 feet of suitable forested northern long-eared bat or tricolored bat roosting habitat? **Note:** Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in the USFWS' [Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines](#).

No

28. Will the action include tree cutting or other means of knocking down or bringing down trees, tree topping, or tree trimming?

Yes

29. Is the project related to the production of coal, including projects that support the mining of coal, as well as the production and/or distribution of energy produced from coal?

No

30. Will the proposed action occur exclusively in an already established and currently maintained utility right-of-way?

No

31. Does the action include emergency cutting or trimming of hazard trees in order to remove an imminent threat to human safety or property? See hazard tree note at the bottom of the key for text that will be added to response letters

Note: A "hazard tree" is a tree that is an immediate threat to lives, public health and safety, or improved property.

No

32. Does the project intersect with the 0- 9.9% forest density category?

Automatically answered

No

33. Does the project intersect with the 10.0- 19.9% forest density category map?

Automatically answered

Yes

34. Does the project intersect with the 20.0- 29.9% forest density category map?

Automatically answered

No

35. Does the project intersect with the 30.0- 100% forest density category map?

Automatically answered

No

36. Will the action cause trees to be cut, knocked down, or otherwise brought down across an area greater than 5 acres in total extent?

No

37. Will the proposed action result in the use of prescribed fire?

Note: If the prescribed fire action includes other activities than application of fire (e.g., tree cutting, fire line preparation) please consider impacts from those activities within the previous representative questions in the key. This set of questions only considers impacts from flame and smoke.

No

38. Does the action area intersect the tricolored bat species list area?

Automatically answered

Yes

39. Is the action area located within 0.5-mile of radius of an entrance/opening to any known tricolored bat hibernacula or winter roost?

Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your state wildlife agency.

Automatically answered

No

40. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats? **Note:** The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

Automatically answered

No

41. Is suitable summer habitat for the tricolored bat present within 1000 feet of project activities? (If unsure, answer ""Yes.""") **Note:** If there are trees within the action area that may provide potential roosts for tricolored bats (e.g., clusters of leaves in live and dead deciduous trees, Spanish moss (*Tillandsia usneoides*), clusters of dead pine needles of large live pines) answer ""Yes."" For a complete definition of suitable summer habitat for the tricolored bat, please see the [Service's Range-wide Indiana Bat and Northern long-eared Bat Survey Guidelines](#).

Yes

42. Do any of the trees proposed for cutting or other means of knocking down, bringing down, topping, or trimming provide potential roosts for tricolored bats (e.g., clusters of leaves in live and dead deciduous trees, Spanish moss (*Tillandsia usneoides*), clusters of dead pine needles of large live pine trees)? **Note:** Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in the USFWS' [Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines](#).

Yes

43. Will any tree cutting/trimming or other knocking or bringing down of trees be conducted during the Pup Season for tricolored bat? **Note:** Bat activity periods for your state can be found in Appendix 2 of the Service's [Northern Long-eared Bat and Tricolored Bat Voluntary Environmental Review Process for Developmental Projects](#).

Yes

44. Do you have any documents that you want to include with this submission?

No

PROJECT QUESTIONNAIRE

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

.4

If tree cutting will be part of the proposed action, at what time of year will tree cutting be conducted?

TBD.

Can the proposed action be modified to ensure that tree cutting will be conducted outside of the season when bats will be present and roosting in trees?

TBD

IPAC USER CONTACT INFORMATION

Agency: RK&K

Name: Kate Allcock

Address: 700 E Pratt St, Suite 500

City: Baltimore

State: MD

Zip: 21202

Email kallcock@rkk.com

Phone: 4107282900

LEAD AGENCY CONTACT INFORMATION

Lead Agency: County of New Castle

EFH Mapper Report

EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

[Greater Atlantic Regional Office](#)
[Atlantic Highly Migratory Species Management Division](#)

*** WARNING ***

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

No additional Essential Fish Habitats (EFH) were identified at the report location.

Pacific Salmon EFH

No Pacific Salmon Essential Fish Habitat (EFH) were identified at the report location.

Atlantic Salmon

No Atlantic Salmon were identified at the report location.

HAPCs

No Habitat Areas of Particular Concern (HAPC) were identified at the report location.

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data.

****For links to all EFH text descriptions see the complete data inventory: [open data inventory -->](#)**

All EFH species have been mapped for the Greater Atlantic region,

Atlantic Highly Migratory Species EFH,

Bigeye Sand Tiger Shark,

Bigeye Sixgill Shark,

Caribbean Sharpnose Shark,

Galapagos Shark,

Narrowtooth Shark,

Sevengill Shark,

Sixgill Shark,

Smooth Hammerhead Shark,

Smalltail Shark



STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND
ENVIRONMENTAL CONTROL

DIVISION OF FISH & WILDLIFE
RICHARDSON & ROBBINS BUILDING
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

DIRECTOR'S
OFFICE

PHONE
(302) 739-9910

August 27, 2025

Kate Allcock
Rummel, Klepper, & Kahl, LLP
700 East Pratt Street, Suite 500
Baltimore, MD 21202

*Re: RK&K 2025 Little Mill Creek Tributary 2 Stream Restoration Tax Parcels # 0703440537
and 0703440335*

Dear Kate:

Thank you for contacting the Division of Fish and Wildlife (DFW) Species Conservation and Research Program about information on rare, threatened and endangered species, unique natural communities, and other significant natural resources as they relate to the above referenced project.

State Natural Heritage Site

A review of our database indicates that there are currently no records of state-rare or federally-listed plants, animals or natural communities at this project site. As a result, at present, this project does not lie within a State Natural Heritage Site, nor does it lie within a Delaware National Estuarine Research Reserve which are two criteria used to identify "Designated Critical Resource Waters" in the U.S. Army Corps of Engineers (USACE) Nationwide Permit General Condition No. 22. A copy of this letter shall be included in any permit application or pre-construction notification submitted to the USACE for activities on this property.

Fisheries

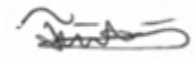
After reviewing the project description, it does not appear that any waterways will be impacted; therefore, there are no fisheries concerns at present.

The DFW does not have fish community data for the project location. However, it is unlikely that habitat occurs in the project site that would support anadromous fish species. No time of year restrictions or other measures are requested for these species or for resident gamefish species.

We are continually updating our records on Delaware's rare, threatened and endangered species, unique natural communities and other significant natural resources. If the start of the project is delayed more than a year past the date of this letter, please contact us again for the latest information.

Please feel free to contact me with any questions or if you require additional information.

Sincerely,



Faith Garcia
Environmental Review Coordinator
Phone: (302) 735-8665
Cell: (302) 443-3812
Email: christinefaith.garcia@delaware.gov
89 Kings Highway
Dover, DE 19901

(See invoice on next page)

INVOICE - PAYMENT DUE

It is our policy to charge a fee for this environmental review service. This letter constitutes an invoice for \$35.00 (\$35.00/hour for a minimum of one hour). Please make your check payable to "Delaware Division of Fish and Wildlife" and submit to:

DE Division of Fish and Wildlife
97 Commerce Way, Suite 106
Dover, DE 19904
ATTN: DFW Fiscal

**In order for us to properly process your payment, you must reference
"RK&K 2025 Little Mill Creek Tributary 2 Stream Restoration" on your check.**

cc: DFW Fiscal; Code to 72900

September 3, 2025

Karen Hutchins-Keim
RK&K
700 East Pratt Street
Suite 500
Baltimore, MD 21202

**Subject: Little Mill Creek Tributary 2 Stream Restoration
SHPO Project No. 2025.06.10.02**

Dear Ms. Hutchins-Keim:

We understand from your letter that the applicant, New Castle Conservation District, is seeking a permit from the US Army Corps of Engineers (USACOE) for the proposed undertaking along an unnamed tributary to Little Mill Creek near Centerville Road in Wilmington. The applicant is proposing to restore 750 linear feet of the stream to minimize erosion. Because of the need for authorization from the USACOE, the project is subject to compliance with Section 106 of the National Historic Preservation Act of 1966 (as amended).

There are 23 known historic properties within a half-mile radius of the area of potential effect (APE). Due to the limited nature of the proposed undertaking, there is no anticipated impact to these properties. There are no known archaeological sites within or adjacent to the APE. Historic aerials show the APE has been previously disturbed by existing residential development so there is low potential for any intact archaeological sites.

Our Office finds there to be No Historic Properties Affected by the proposed undertaking. Please feel free to contact me if you have any questions at (302) 736-7431 or sarah.carr@delaware.gov.

Sincerely,



Sarah Carr
Cultural Preservation Specialist
cc: Gwen Davis, Deputy SHPO

Attachment C – Datasheets

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Little Mill Creek Tributary 2 City/County: Newcastle Sampling Date: 3/18/25
 Applicant/Owner: New Castle Conservation District State: DE Sampling Point: WET-A
 Investigator(s): KSH/KEA Section, Township, Range: -
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%): 3
 Subregion (LRR or MLRA): 149A Lat: 39.744827 Long: -75.623013 Datum: WGS84
 Soil Map Unit Name: DeB NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
 Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐ Hydric Soil Present? Yes ☒ No ☐ Wetland Hydrology Present? Yes ☒ No ☐	Is the Sampled Area within a Wetland? Yes ☒ No ☐
Remarks: <u>Photo 9754-9759 Based on PDSI, Northern Delaware is in a severe drought (PDSI is - 4.16)</u>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ☒ Surface Water (A1) ☐ True Aquatic Plants (B14) ☒ High Water Table (A2) ☐ Hydrogen Sulfide Odor (C1) ☒ Saturation (A3) ☐ Oxidized Rhizospheres on Living Roots (C3) ☐ Water Marks (B1) ☐ Presence of Reduced Iron (C4) ☐ Sediment Deposits (B2) ☐ Recent Iron Reduction in Tilled Soils (C6) ☐ Drift Deposits (B3) ☐ Thin Muck Surface (C7) ☐ Algal Mat or Crust (B4) ☐ Other (Explain in Remarks) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)		<u>Secondary Indicators (minimum of two required)</u> ☐ Surface Soil Cracks (B6) ☐ Sparsely Vegetated Concave Surface (B8) ☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2) ☐ Crayfish Burrows (C8) ☐ Saturation Visible on Aerial Imagery (C9) ☐ Stunted or Stressed Plants (D1) ☐ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☐ Microtopographic Relief (D4) ☐ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes ☒ No ☐ Depth (inches): <u>0.5</u> Water Table Present? Yes ☒ No ☐ Depth (inches): <u>0</u> Saturation Present? Yes ☐ No ☐ Depth (inches): <u>0</u> (includes capillary fringe)	Wetland Hydrology Present? Yes ☒ No ☐	
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

 Sampling Point: WET-A

Tree Stratum (Plot size: <u>10X10</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Fraxinus pennsylvanica</u>	<u>40</u>	<u>Y</u>	<u>FACW</u>
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
<u>40</u> = Total Cover 50% of total cover: <u>20</u> 20% of total cover: <u>8</u>			

Sapling/Shrub Stratum (Plot size: <u>10X10</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Acer rubrum</u>	<u>30</u>	<u>Y</u>	<u>FAC</u>
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
<u>30</u> = Total Cover 50% of total cover: <u>15</u> 20% of total cover: <u>6</u>			

Herb Stratum (Plot size: <u>10X10</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Lysimachia nummularia</u>	<u>40</u>	<u>Y</u>	<u>FACW</u>
2. <u>Symplocarpus foetidus</u>	<u>5</u>	<u>N</u>	<u>OBL</u>
3. <u>Juncus effusus</u>	<u>5</u>	<u>N</u>	<u>FACW</u>
4. <u>Ficaria verna</u>	<u>15</u>	<u>Y</u>	<u>FAC</u>
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
<u>65</u> = Total Cover 50% of total cover: <u>32.5</u> 20% of total cover: <u>13</u>			

Woody Vine Stratum (Plot size: <u>10X10</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Hedera helix</u>	<u>3</u>	<u>Y</u>	<u>FACW</u>
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
<u>3</u> = Total Cover 50% of total cover: <u>1.5</u> 20% of total cover: <u>0.6</u>			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 5 (B)
 Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:
 OBL species _____ x 1 = _____
 FACW species _____ x 2 = _____
 FAC species _____ x 3 = _____
 FACU species _____ x 4 = _____
 UPL species _____ x 5 = _____
 Column Totals: _____ (A) _____ (B)
 Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is $\leq 3.0^1$
- ☐ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present?

Yes ☒ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WET-A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

[illegible]¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- | | |
|---|---|
| ☐ Histosol (A1) | ☐ Dark Surface (S7) |
| ☐ Histic Epipedon (A2) | ☐ Polyvalue Below Surface (S8) (MLRA 147, 148) |
| ☐ Black Histic (A3) | ☐ Thin Dark Surface (S9) (MLRA 147, 148) |
| ☐ Hydrogen Sulfide (A4) | ☐ Loamy Gleyed Matrix (F2) |
| ☐ Stratified Layers (A5) | ☒ Depleted Matrix (F3) |
| ☐ 2 cm Muck (A10) (LRR N) | ☒ Redox Dark Surface (F6) |
| ☐ Depleted Below Dark Surface (A11) | ☐ Depleted Dark Surface (F7) |
| ☐ Thick Dark Surface (A12) | ☐ Redox Depressions (F8) |
| ☐ Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) | ☐ Iron-Manganese Masses (F12) (LRR N, MLRA 136) |
| ☐ Sandy Gleyed Matrix (S4) | ☐ Umbric Surface (F13) (MLRA 136, 122) |
| ☐ Sandy Redox (S5) | ☐ Piedmont Floodplain Soils (F19) (MLRA 148) |
| ☐ Stripped Matrix (S6) | ☐ Red Parent Material (F21) (MLRA 127, 147) |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) **(MLRA 147)**
☐ Coast Prairie Redox (A16)
(MLRA 147, 148)
☐ Piedmont Floodplain Soils (F19)
(MLRA 136, 147)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Little Mill Creek Tributary 2 City/County: Newcastle Sampling Date: 3/18/28
 Applicant/Owner: New Castle Conservation District State: DE Sampling Point: WET-B
 Investigator(s): KSH IEA Section, Township, Range: —
 Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 1
 Subregion (LRR or MLRA): 149A Lat: 39.745322 Long: -75.623304 Datum: WGS84
 Soil Map Unit Name: DeB NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes — No ✓ (If no, explain in Remarks.)
 Are Vegetation —, Soil —, or Hydrology — significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No —
 Are Vegetation —, Soil —, or Hydrology — naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>✓</u> No <u>—</u>	Is the Sampled Area within a Wetland? Yes <u>✓</u> No <u>—</u>
Hydric Soil Present? Yes <u>✓</u> No <u>—</u>	
Wetland Hydrology Present? Yes <u>✓</u> No <u>—</u>	
Remarks: <u>Photo 9756-9760</u> Based on PDSI (-4.16), Northern Delaware is in a severe drought.	

HYDROLOGY

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply) ☒ Surface Water (A1) ☐ True Aquatic Plants (B14) ☒ High Water Table (A2) ☐ Hydrogen Sulfide Odor (C1) ☒ Saturation (A3) ☐ Oxidized Rhizospheres on Living Roots (C3) ☐ Water Marks (B1) ☐ Presence of Reduced Iron (C4) ☐ Sediment Deposits (B2) ☐ Recent Iron Reduction in Tilled Soils (C6) ☐ Drift Deposits (B3) ☐ Thin Muck Surface (C7) ☐ Algal Mat or Crust (B4) ☐ Other (Explain in Remarks) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)		Secondary Indicators (minimum of two required) ☐ Surface Soil Cracks (B6) ☐ Sparsely Vegetated Concave Surface (B8) ☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2) ☐ Crayfish Burrows (C8) ☐ Saturation Visible on Aerial Imagery (C9) ☐ Stunted or Stressed Plants (D1) ☒ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☐ Microtopographic Relief (D4) ☐ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes <u>✓</u> No <u>—</u> Depth (inches): <u>1</u> Water Table Present? Yes <u>✓</u> No <u>—</u> Depth (inches): <u>0</u> Saturation Present? Yes <u>✓</u> No <u>—</u> Depth (inches): <u>0</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <u>✓</u> No <u>—</u>	
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WET-B

Tree Stratum (Plot size: <u>10 X 10</u>)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
1. <u>Fraxinus pennsylvanica</u>	<u>90</u>	<u>Y</u>	<u>FACW</u>	Number of Dominant Species That Are OBL, FACW, or FAC: <u>4</u> (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata: <u>4</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100%</u> (A/B)
4. _____	_____	_____	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
50% of total cover: <u>45</u> 20% of total cover: <u>18</u> <u>90</u> = Total Cover				Hydrophytic Vegetation Indicators: ☒ 1 - Rapid Test for Hydrophytic Vegetation ☒ 2 - Dominance Test is >50% ☐ 3 - Prevalence Index is ≤3.0 ¹ ☐ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ☐ Problematic Hydrophytic Vegetation ¹ (Explain)
Sapling/Shrub Stratum (Plot size: <u>10 X 10</u>)				
1. <u>Fraxinus pennsylvanica</u>	<u>3</u>	<u>Y</u>	<u>FACW</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
50% of total cover: <u>1.5</u> 20% of total cover: <u>0.6</u> <u>3</u> = Total Cover				Hydrophytic Vegetation Present? Yes ☒ No _____
Herb Stratum (Plot size: <u>10 X 10</u>)				
1. <u>Ficaria verna</u>	<u>25</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Juncus effusus</u>	<u>5</u>	<u>N</u>	<u>FACW</u>	
3. <u>Scirpus polyphyllus</u>	<u>60</u>	<u>Y</u>	<u>OBL</u>	
4. <u>Lysimachia nummularia</u>	<u>5</u>	<u>N</u>	<u>FACW</u>	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
50% of total cover: <u>47.5</u> 20% of total cover: <u>19</u> <u>95</u> = Total Cover				
Woody Vine Stratum (Plot size: _____)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
_____ = Total Cover 50% of total cover: _____ 20% of total cover: _____				

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WET-B

[illegible]

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Little Mill Trib 2 City/County: New Castle Sampling Date: 3/25/25
 Applicant/Owner: New Castle County State: DE Sampling Point: UPLA
 Investigator(s): EJH, CFC Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): convex Slope (%): 0-3
 Subregion (LRR or MLRA): 149A Lat: 39.744907 Long: -75.623048 Datum: WGS84
 Soil Map Unit Name: DeB NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ☒ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No ☒	Is the Sampled Area within a Wetland? Yes _____ No ☒
Hydric Soil Present?	Yes ☒ No _____	
Wetland Hydrology Present?	Yes _____ No ☒	
Remarks: <u>Based on PDS1 (-4.16), Northern Delaware is in a severe drought</u>		

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ☐ Surface Water (A1) ☐ True Aquatic Plants (B14) ☐ High Water Table (A2) ☐ Hydrogen Sulfide Odor (C1) ☐ Saturation (A3) ☐ Oxidized Rhizospheres on Living Roots (C3) ☐ Water Marks (B1) ☐ Presence of Reduced Iron (C4) ☐ Sediment Deposits (B2) ☐ Recent Iron Reduction in Tilled Soils (C6) ☐ Drift Deposits (B3) ☐ Thin Muck Surface (C7) ☐ Algal Mat or Crust (B4) ☐ Other (Explain in Remarks) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)		<u>Secondary Indicators (minimum of two required)</u> ☐ Surface Soil Cracks (B6) ☐ Sparsely Vegetated Concave Surface (B8) ☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2) ☐ Crayfish Burrows (C8) ☐ Saturation Visible on Aerial Imagery (C9) ☐ Stunted or Stressed Plants (D1) ☐ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☐ Microtopographic Relief (D4) ☐ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No ☒ Depth (inches): _____ Water Table Present? Yes _____ No ☒ Depth (inches): _____ Saturation Present? (includes capillary fringe) Yes _____ No ☒ Depth (inches): _____		Wetland Hydrology Present? Yes _____ No ☒
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: UPLA

Tree Stratum (Plot size: <u>10' radius</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Acer rubrum</u>	<u>100</u>	<u>Y</u>	<u>FAC</u>
2. <u>Ilex opaca</u>	<u>30</u>	<u>Y</u>	<u>FACU</u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____

_____ = Total Cover
50% of total cover: 75 20% of total cover: 26

Sapling/Shrub Stratum (Plot size: <u>10' Radius</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Rosa multiflora</u>	<u>20</u>	<u>Y</u>	<u>FACU</u>
2. <u>Ilex crenata</u>	<u>10</u>	<u>Y</u>	<u>UPL</u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____

_____ = Total Cover
50% of total cover: 15 20% of total cover: 6

Herb Stratum (Plot size: <u>10' Radius</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Hedera helix</u>	<u>60</u>	<u>Y</u>	<u>FACU</u>
2. <u>Ficaria verna</u>	<u>5</u>	<u>N</u>	<u>FAC</u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____

_____ = Total Cover
50% of total cover: 32.5 20% of total cover: 13

Woody Vine Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____

_____ = Total Cover
50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species <u>0</u>	x 1 = <u>0</u>
FACW species <u>0</u>	x 2 = <u>0</u>
FAC species <u>2</u>	x 3 = <u>6</u>
FACU species <u>4</u>	x 4 = <u>16</u>
UPL species <u>1</u>	x 5 = <u>5</u>
Column Totals: <u>7</u> (A)	<u>27</u> (B)

Prevalence Index = B/A = 3.9

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0¹
- ☐ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present?

Yes _____ No ☒

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: VPL-A

[illegible]

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Little Mill Trib 2 City/County: New Castle Sampling Date: 3/25/25
 Applicant/Owner: New Castle County State: DE Sampling Point: UPL-B
 Investigator(s): KJH, CFC Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0-3
 Subregion (LRR or MLRA): 149A Lat: 39.745339 Long: -75.623233 Datum: NAD84
 Soil Map Unit Name: DeB NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ☒ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No ☒	Is the Sampled Area within a Wetland? Yes _____ No ☒
Hydric Soil Present? Yes _____ No ☒	
Wetland Hydrology Present? Yes _____ No ☒	
Remarks: <u>Based on PDSI (-4.16), Northern Delaware is in a severe drought.</u>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ☐ Surface Water (A1) ☐ True Aquatic Plants (B14) ☐ High Water Table (A2) ☐ Hydrogen Sulfide Odor (C1) ☐ Saturation (A3) ☐ Oxidized Rhizospheres on Living Roots (C3) ☐ Water Marks (B1) ☐ Presence of Reduced Iron (C4) ☐ Sediment Deposits (B2) ☐ Recent Iron Reduction in Tilled Soils (C6) ☐ Drift Deposits (B3) ☐ Thin Muck Surface (C7) ☐ Algal Mat or Crust (B4) ☐ Other (Explain in Remarks) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)		<u>Secondary Indicators (minimum of two required)</u> ☐ Surface Soil Cracks (B6) ☐ Sparsely Vegetated Concave Surface (B8) ☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2) ☐ Crayfish Burrows (C8) ☐ Saturation Visible on Aerial Imagery (C9) ☐ Stunted or Stressed Plants (D1) ☒ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☐ Microtopographic Relief (D4) ☐ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No ☒ Depth (inches): _____ Water Table Present? Yes _____ No ☒ Depth (inches): _____ Saturation Present? (includes capillary fringe) Yes _____ No ☒ Depth (inches): _____		Wetland Hydrology Present? Yes _____ No ☒
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

 Sampling Point: UPL-B

Tree Stratum (Plot size: <u>10' radius</u>)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
1. <u>Paulownia tomentosa</u>	<u>10</u>	<u>Y</u>	<u>UPL</u>	Number of Dominant Species That Are OBL, FACW, or FAC: <u>3</u> (A)
2. <u>Fraxinus pennsylvanica</u>	<u>10</u>	<u>Y</u>	<u>FACW</u>	
3. <u>Juglans nigra</u>	<u>15</u>	<u>Y</u>	<u>FACU</u>	Total Number of Dominant Species Across All Strata: <u>6</u> (B)
4. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>50%</u> (A/B)
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species <u>1</u> x 1 = <u>1</u> FACW species <u>2</u> x 2 = <u>4</u> FAC species <u>2</u> x 3 = <u>6</u> FACU species <u>4</u> x 4 = <u>16</u> UPL species <u>1</u> x 5 = <u>5</u> Column Totals: <u>10</u> (A) <u>32</u> (B) Prevalence Index = B/A = <u>3.2</u>
7. _____	_____	_____	_____	
50% of total cover: <u>35</u> = Total Cover 20% of total cover: <u>7</u>				
Sapling/Shrub Stratum (Plot size: <u>10' radius</u>)				
1. <u>Lindera benzoin</u>	<u>20</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Rosa multiflora</u>	<u>5</u>	<u>Y</u>	<u>FACU</u>	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	Hydrophytic Vegetation Indicators: ☐ 1 - Rapid Test for Hydrophytic Vegetation ☐ 2 - Dominance Test is >50% ☐ 3 - Prevalence Index is ≤3.0 ¹ ☐ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ☐ Problematic Hydrophytic Vegetation ¹ (Explain)
50% of total cover: <u>25</u> = Total Cover 20% of total cover: <u>5</u>				
Herb Stratum (Plot size: <u>10' Radius</u>)				
1. <u>Ficaria verna</u>	<u>30</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Glechoma hederacea</u>	<u>2</u>	<u>N</u>	<u>FACU</u>	
3. <u>Cinna arundinacea</u>	<u>2</u>	<u>N</u>	<u>FACW</u>	
4. <u>Symplocarpus foetidus</u>	<u>5</u>	<u>N</u>	<u>OBL</u>	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
50% of total cover: <u>39</u> = Total Cover 20% of total cover: <u>7.8</u>				
Woody Vine Stratum (Plot size: <u>10' Radius</u>)				
1. <u>Lonicera japonica</u>	<u>5</u>	<u>Y</u>	<u>FACU</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes _____ No <u>✓</u>
50% of total cover: <u>5</u> = Total Cover 20% of total cover: <u>1</u>				

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: VPL-B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

[illegible]

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- | | |
|---|---|
| ☐ Histosol (A1) | ☐ Dark Surface (S7) |
| ☐ Histic Epipedon (A2) | ☐ Polyvalue Below Surface (S8) (MLRA 147, 148) |
| ☐ Black Histic (A3) | ☐ Thin Dark Surface (S9) (MLRA 147, 148) |
| ☐ Hydrogen Sulfide (A4) | ☐ Loamy Gleyed Matrix (F2) |
| ☐ Stratified Layers (A5) | ☐ Depleted Matrix (F3) |
| ☐ 2 cm Muck (A10) (LRR N) | ☐ Redox Dark Surface (F6) |
| ☐ Depleted Below Dark Surface (A11) | ☐ Depleted Dark Surface (F7) |
| ☐ Thick Dark Surface (A12) | ☐ Redox Depressions (F8) |
| ☐ Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) | ☐ Iron-Manganese Masses (F12) (LRR N, MLRA 136) |
| ☐ Sandy Gleyed Matrix (S4) | ☐ Umbric Surface (F13) (MLRA 136, 122) |
| ☐ Sandy Redox (S5) | ☐ Piedmont Floodplain Soils (F19) (MLRA 148) |
| ☐ Stripped Matrix (S6) | ☐ Red Parent Material (F21) (MLRA 127, 147) |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) (**MLRA 147**)
☐ Coast Prairie Redox (A16)
(MLRA 147, 148)
☐ Piedmont Floodplain Soils (F19)
(MLRA 136, 147)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
Depth (inches): _____

Hydric Soil Present? Yes _____ No ☒

Remarks:

Waters of the U.S. Data Sheet

Project: Little Mill Creek Trib 2	Feature ID: Watos A		Cowardin Class: R3UB1
Date: 3/18/2025	State: DE	Last Flag Number: N/A	Stream Order:
Crew: KTH/KEA	County: Newcastle	Photos: 9743-9744	Use Class: N/A

Feature Hydrologic Class and Jurisdiction:

Hydrologic Class	USACE Jurisdiction	Jurisdictional Rationale			
Tidal	TNW	TNW	Impoundment of:	Tributary	Other Waters
☒ Perennial	Impoundment	Tidal	TNW	☒ Relatively Permanent	Relatively Permanent
Intermittent	☒ Tributary	Interstate	Tributary	Relatively Permanent Notes: Flowing during site visit. Main channel/ for proposed restoration.	
Ephemeral	Other Waters	Navigable			
Other					
Hydrologic Connectivity		Upstream: Outside study area	Downstream: Outside study area	Adjacent (Abutting): Waters B, Wetland A3B	

Feature Description: (check all that apply)

Shape (with respect to OHW)		Substrate				Vegetation Cover Type (MBSS)	
☒ Natural Channel Shape	Width: 4 - 8 Feet	☒ Silts	☒ Sands		Muck	RB: Forest	
☐ Artificial (man-made)	Depth: 1" - 6"	☒ Cobbles	☒ Gravel	☒ Other:			
☒ Manipulated (man-altered)	Bank Erosion/stability:	☐ Bedrock	☒ Concrete	Riprap		LB: Forest	
☐ Other:	Moderate erosion	Side slope: ☒ ≥1:1 ☐ 2:1 ☐ 3:1 ☐ ≤4:1					
Notes:							

Weather/Precipitation Conditions:

Inches of Rain Within Last Week		Monthly Drought Condition NCDC Divisional PDSI										State: DE		
During Field Visit		https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/mapping										Division: Northern		
☒ No rain	☒ 0-0.5			☒										
☐ Light rain	☐ 0.5-1	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
☐ Heavy Rain	☐ >1	Severe Drought			Moderate Drought		Normal			Moderately Wet		Severely Wet		

Non-tidal tributary has: (check all that apply)

Bed and Banks	Ordinary High Water Mark		
☒ Yes	☒ Clear, natural line impressed on the bank	☒ Sediment deposition	☒ Sediment sorting
☐ No	☐ Changes in the character of soil	☒ Water staining	☒ Scour
	☒ Shelving	☒ Presence of flood litter/debris	☒ Observed/predicted flow events
	☒ Vegetation matted down, bent, or absent	☐ Destruction of terrestrial veg.	☐ Abrupt change in plant community
	☒ Leaf litter disturbed	☒ Presence of wrack line	Other:

Tidal tributary has: (check all that apply)

High Tide Line	Mean High Water Mark indicated by:	Chemical Characteristics
☐ Oil or scum line along shore objects	☐ Survey to available datum	☐ Water is clear
☐ Fine shell or debris deposits (foreshore)	☐ Physical markings	☐ Water is discolored
☐ Physical markings/characteristics	☐ Vegetation lines/changes in types	☐ Oily film
☐ Tidal gauges		Other:
Notes:		

Waters of the U.S. Data Sheet

Project: Little Mill Creek Trib 2		Feature ID: Waters B		Cowardin Class: R30B1	
Date: 3/18/25		State: DE		Last Flag Number: N/A	
Crew: KSH/KEA		County: Newcastle		Photos: 9743 - 9746	
				Stream Order:	
				Use Class: N/A	

Feature Hydrologic Class and Jurisdiction:

Hydrologic Class		USACE Jurisdiction		Jurisdictional Rationale			
☐ Tidal	☐ TNW	☐ TNW	☐ Impoundment of:	☐ Tributary	☐ Other Waters		
☒ Perennial	☐ Impoundment	☐ Tidal	☐ TNW	☒ Relatively Permanent	☐ Relatively Permanent		
☐ Intermittent	☒ Tributary	☐ Interstate	☐ Tributary	Relatively Permanent Notes: Flowing during site visit.			
☐ Ephemeral	☐ Other Waters	☐ Navigable					
☐ Other							
Hydrologic Connectivity		Upstream: Outside study area		Downstream: Waters A		Adjacent/Abutting: None	

Feature Description: (check all that apply)

Shape (with respect to OHW)		Substrate				Vegetation Cover Type (MBSS)	
☐ Natural Channel Shape	Width: 4 feet	☐ Silts	☒ Sands	☐ Muck	RB: Forest.		
☒ Artificial (man-made)	Depth: 0.5"	☐ Cobbles	☒ Gravel	☐ Other:			
☐ Manipulated (man-altered)	Bank Erosion/stability:	☐ Bedrock	☒ Concrete		LB: Grass.		
☐ Other:	Stable	Side slope: ☐ ≥1:1 ☒ 2:1 ☐ 3:1 ☐ ≤4:1					
Notes:							

Weather/Precipitation Conditions:

During Field Visit		Inches of Rain Within Last Week		Monthly Drought Condition NCDC Divisional PDSI										State: DE Division: Northern	
☒ No rain	☒ 0-0.5	https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/mapping										Month: Feb Year: 2025			
☐ Light rain	☐ 0.5-1	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	
☐ Heavy Rain	☐ >1	Severe Drought			Moderate Drought		Normal			Moderately Wet		Severely Wet			

Non-tidal tributary has: (check all that apply)

Bed and Banks		Ordinary High Water Mark			
☒ Yes	☒ Clear, natural line impressed on the bank	☒ Sediment deposition	☐ Sediment sorting		
☐ No	☐ Changes in the character of soil	☒ Water staining	☐ Scour		
	☐ Shelving	☒ Presence of flood litter/debris	☒ Observed/predicted flow events		
	☒ Vegetation matted down, bent, or absent	☐ Destruction of terrestrial veg.	☐ Abrupt change in plant community		
	☒ Leaf litter disturbed	☐ Presence of wrack line	☐ Other:		

Tidal tributary has: (check all that apply)

High Tide Line		Mean High Water Mark indicated by:		Chemical Characteristics	
☐ Oil or scum line along shore objects	☐ Survey to available datum	☐ Water is clear			
☐ Fine shell or debris deposits (foreshore)	☐ Physical markings	☐ Water is discolored			
☐ Physical markings/characteristics	☐ Vegetation lines/changes in types	☐ Oily film			
☐ Tidal gauges		☐ Other:			
Notes:					

Waters of the U.S. Data Sheet

Project: Little Mill Creek Trib 2	Feature ID: Watersc	Cowardin Class: R4SB 2
Date: 3/8/25	State: DE	Last Flag Number: N/A
Crew: KJH/KEA	County: Newcastle	Stream Order: 1
	Photos: 9752, 9753	Use Class: N/A

Feature Hydrologic Class and Jurisdiction:

Hydrologic Class	USACE Jurisdiction	Jurisdictional Rationale			
Tidal	TNW	TNW	Impoundment of:	Tributary	Other Waters
Perennial	Impoundment	Tidal	TNW	☒ Relatively Permanent	Relatively Permanent
☒ Intermittent	☒ Tributary	Interstate	Tributary	Relatively Permanent Notes: Shallow flow in channel. Drains a wetland.	
Ephemeral	Other Waters	Navigable			
Other					

Hydrologic Connectivity	Upstream: Wetland A	Downstream: Waters A	Adjacent/Abutting: None
-------------------------	---------------------	----------------------	-------------------------

Feature Description: (check all that apply)

Shape (with respect to OHW)		Substrate			Vegetation Cover Type (MBSS)
☒ Natural Channel Shape	Width: 1-2 feet	☒ Silts	☒ Sands	☒ Muck	RB: Forest LB: Forest
Artificial (man-made)	Depth: 1" - 4"	Cobbles	☒ Gravel	Other:	
☒ Manipulated (man-altered)	Bank Erosion/stability:	Bedrock	Concrete		
Other:	Minor erosion	Side slope: ☒ ≥1:1 ☐ 2:1 ☐ 3:1 ☐ ≤4:1			
Notes:					

Weather/Precipitation Conditions:

During Field Visit	Inches of Rain Within Last Week	Monthly Drought Condition NCDC Divisional PDSI										State: DE			
												Division: Northern			
		https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/mapping										Month: Feb Year: 2025			
☒ No rain	☒ 0-0.5			☒											
Light rain	0.5-1	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	
Heavy Rain	>1	Severe Drought			Moderate Drought		Normal			Moderately Wet		Severely Wet			

Non-tidal tributary has: (check all that apply)

Bed and Banks	Ordinary High Water Mark		
☒ Yes	Clear, natural line impressed on the bank	Sediment deposition	Sediment sorting
No	Changes in the character of soil	☒ Water staining	☒ Scour
	Shelving	Presence of flood litter/debris	☒ Observed/predicted flow events
	☒ Vegetation matted down, bent, or absent	Destruction of terrestrial veg.	Abrupt change in plant community
	Leaf litter disturbed	Presence of wrack line	Other:

Tidal tributary has: (check all that apply)

High Tide Line	Mean High Water Mark indicated by:	Chemical Characteristics
Oil or scum line along shore objects	Survey to available datum	Water is clear
Fine shell or debris deposits (foreshore)	Physical markings	Water is discolored
Physical markings/characteristics	Vegetation lines/changes in types	Oily film
Tidal gauges		Other:
Notes:		

Attachment D – Photographic Documentation



Wetland A (WET-A) – PFO



Wetland B (WET-B) – PFO



Waters A (WUS-A) – Perennial RPW



Waters B (WUS-B) – Perennial RPW



Waters C (WUS-C) – Intermittent RPW



Forest Stand 1 (FS1) – Black Cherry – Maple Forest Association

Attachment E – Tree Inventory Table

Little Mill Creek Tributary 2 Stream Restoration - Tree Inventory Table

Tree ID	Scientific Name	Common Name	DBH	Condition	Comments
T1*	<i>Acer rubrum</i>	Red maple	37	Fair	Broken leader, exposed roots, trunk decay
T2	<i>Prunus serotina</i>	Black cherry	20	Good/Fair	Exposed roots, dead wood
T3*	<i>Acer rubrum</i>	Red maple	25	Good/Fair	Dead wood, vines
T4	<i>Pyrus calleryana</i>	Bradford pear	23	Fair	Dead wood, water sprouts
T5	<i>Sassafras albidum</i>	Sassafras	17	Good/Fair	Dead wood, lean
T6	<i>Sassafras albidum</i>	Sassafras	20	Good/Fair	Dead wood, included bark
T7	<i>Sassafras albidum</i>	Sassafras	16	Good/Fair	Dead wood, lean
T8	<i>Juglans nigra</i>	Black walnut	22	Good/Fair	Broken branches
T9*	<i>Juglans nigra</i>	Black walnut	35	Good/Fair	Split above DBH, included bark, dead wood
T10	<i>Morus alba</i>	White mulberry	21	Fair	Lean, included bark, vines, trunk decay
T11*	<i>Acer rubrum</i>	Red maple	32	Good/Fair	Exposed roots, dead wood
T12*	<i>Fraxinus pennsylvanica</i>	Green ash	42	Fair/Poor	Extensive dead wood
T13*	<i>Fraxinus pennsylvanica</i>	Green ash	52	Fair/Poor	Vines on trunk, extensive dead wood

* Specimen Tree (≥ 24.01 " DBH)

Attachment F – Natural Resources Inventory (NRI) Plan



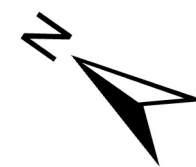
Little Mill Creek Tributary 2 Stream Restoration **Natural Resources Inventory (NRI)**

March 2025

Legend

- | | | |
|--|---|---|
| Project Study Area | Forest Stand Boundary | ● Specimen Tree |
| 2' Contour | Wetland | ▲ Stand Alone Tree |
| ● Upland Plot Point | Waterway | → Stream Flow |
| Wetland Plot Point | Critical Root Zone | |

0 30 60 ft
 1 in = 60 ft



ATTACHMENT D

95% Design Plans

NEW CASTLE
CONSERVATION DISTRICT



CONSTRUCTION PLANS FOR:
LITTLE MILL CREEK
TRIBUTARY 2
STREAM RESTORATION

CONTRACT NUMBER: 2139-00

U.S. CUSTOMARY
UNITS

FINAL PLANS

DESIGN DESIGNATION

MRD #: N/A	ROAD NAME: N/A	D.H.V. PROJECTED: N/A	YEAR: N/A
FUNCTIONAL CLASS: N/A		DESIGN SPEED: N/A M.P.H.	
TYPE OF CONSTRUCTION: STREAM RESTORATION		TRUCKS: N/A	
A.A.D.T. CURRENT: N/A	YEAR: N/A	DIRECTION OF DISTRIBUTION: N/A	
A.A.D.T. PROJECTED: N/A	YEAR: N/A		

APPROVED DESIGN EXCEPTIONS

DESIGN PARAMETER	REQUIRED	PROVIDED	DATE

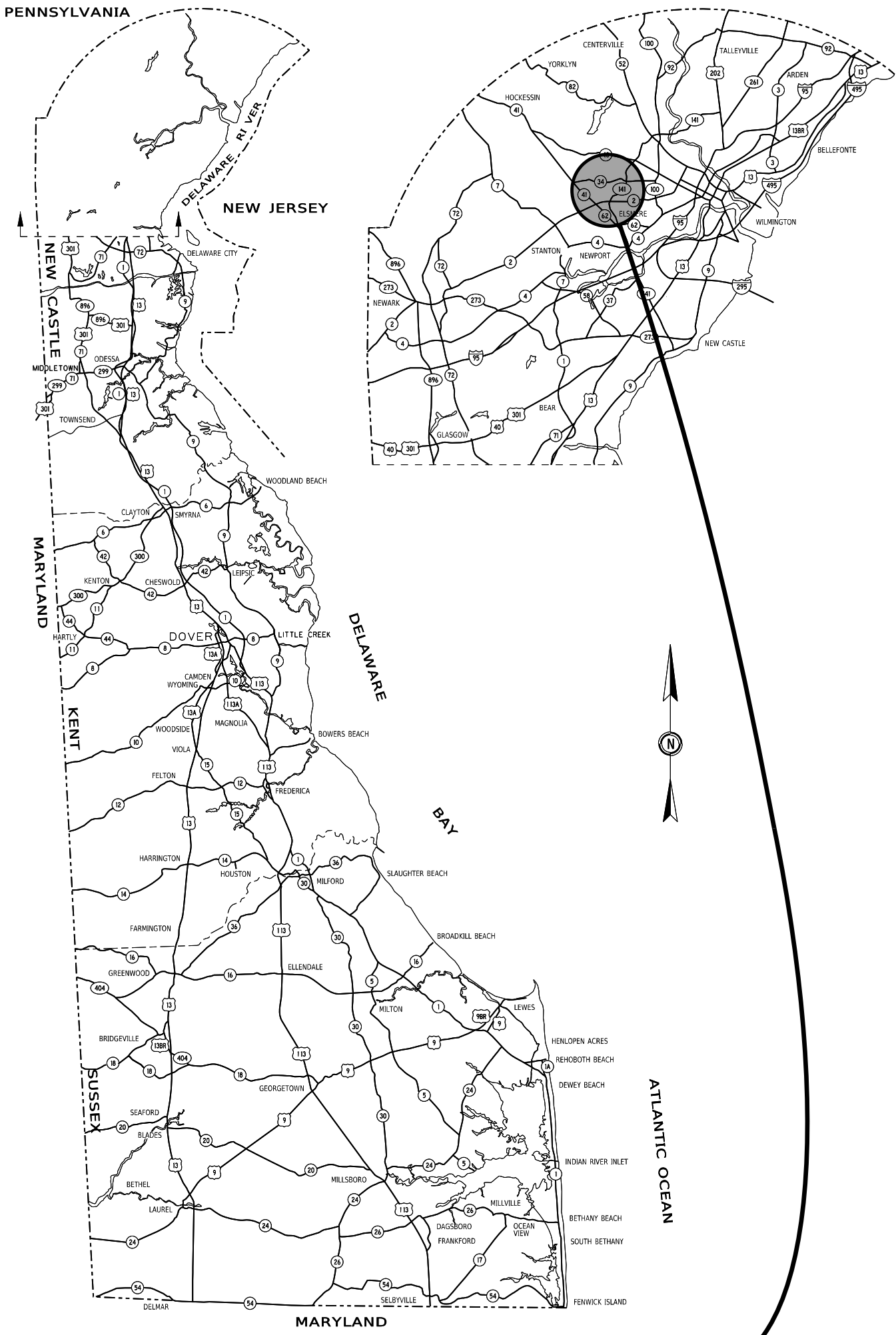
ADDENDA / REVISIONS

ASSOCIATED CONTRACTS

CONTRACT NO.	CONTRACT NAME
NCC 2025-09	WOODLAND RUN STREAM RESTORATION

APPROVED FOR ADVERTISEMENT

CHIEF OF PROJECT MANAGEMENT _____ DATE _____



GENERAL LOCATION OF CONTRACT

PREPARED BY
RK&K

RK&K

THIS SEAL APPLIES TO ALL SHEETS
BEARING THE "RKK" SECTION DESIGNATION.

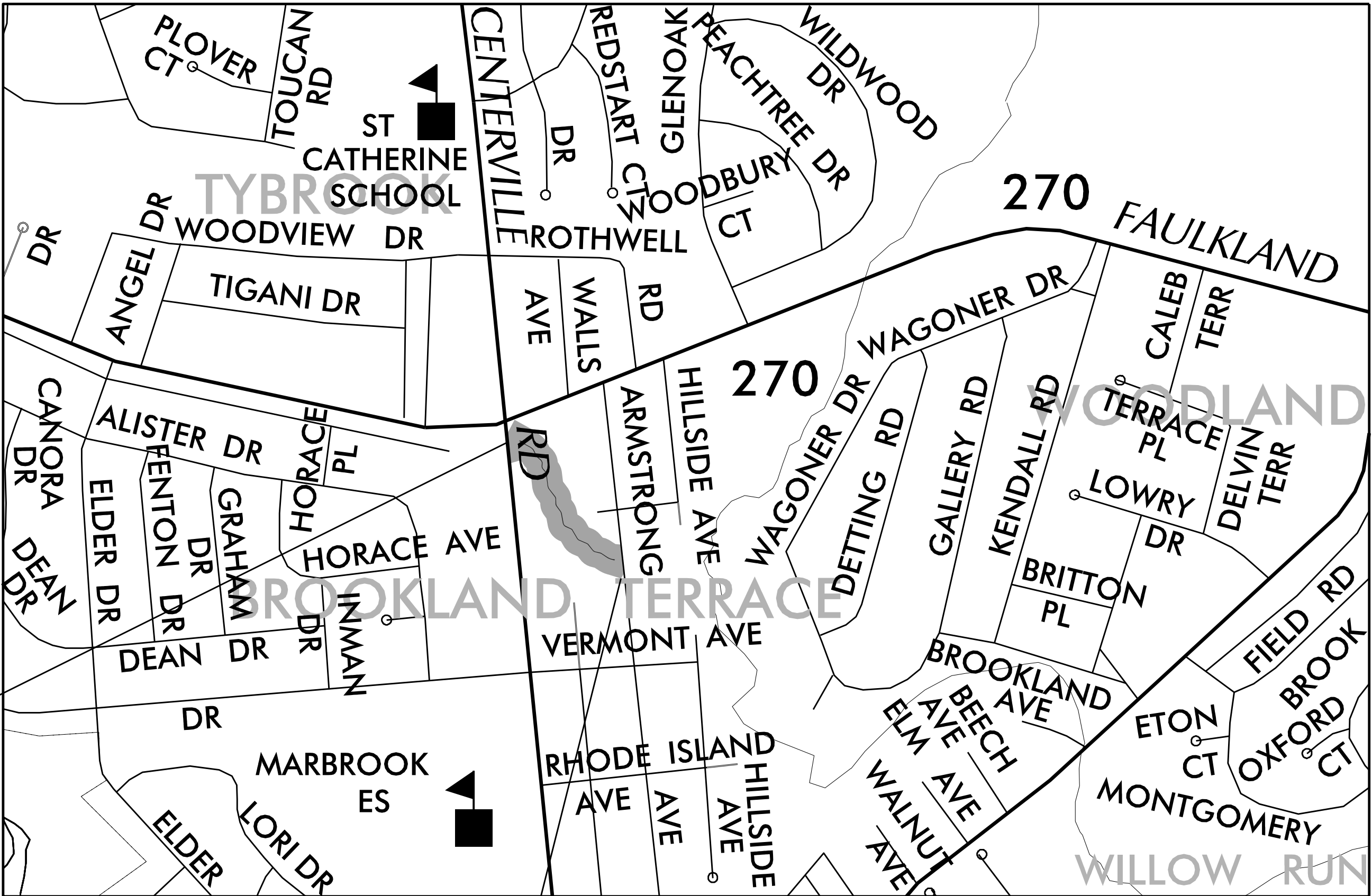
DATE

SEAL

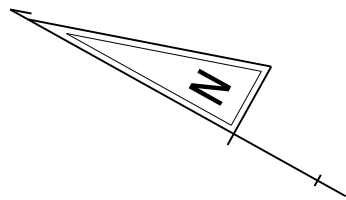
BEGIN CONTRACT
STATION 5+19

END CONTRACT
STATION 12+78

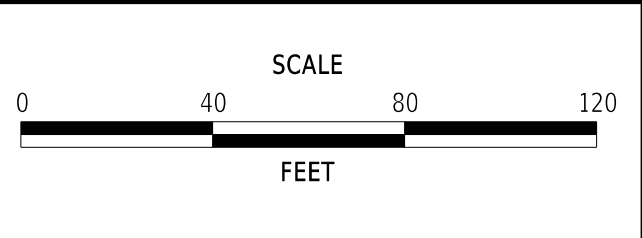
LOCATION MAP
NOT TO SCALE



INDEX OF SHEETS	
SHEET DESCRIPTION	SHEET NO(S)
TITLE	1
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CONSTRUCTION PLANS (CP)	8- 9
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LANDSCAPE TABLES	24
LANDSCAPE DETAILS	25



ADDENDA / REVISIONS	



LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



CONTRACT	2139-00
DESIGNED BY:	J. GALBO
CHECKED BY:	T. CUTILLO

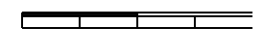
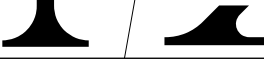
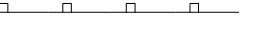
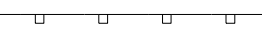
INDEX OF SHEETS	
SECTION	RKK
SHEET NO.	2

23-APR-2026 13:44 \\lad.rkk.com\fs1\Cloud\Projects\2023\23046_NCCsewrUDCTask 2 - Trib 2 Conservation\CADD\Planlar01_LMC-Trib2.dgn

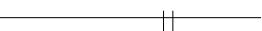
ADDENDUM PREPARED BY RK&K		
THIS SEAL APPLIES TO THE FOLLOWING SHEETS CHANGED UNDER ADDENDUM #X: XX, XX-XX, XX	DATE	SEAL

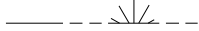
REVISION PREPARED BY RK&K		
THIS SEAL APPLIES TO THE FOLLOWING SHEETS CHANGED UNDER REVISION #X: XX, XX-XX, XX	DATE	SEAL

ADDENDA / REVISIONS		NOT TO SCALE	LITTLE MILL CREEK - TRIBUTARY 2 STREAM RESTORATION		CONTRACT	2139-00	ADDENDA AND REVISIONS	SECTION
					DESIGNED BY:	J. GALBO		RKK
					CHECKED BY:	T. CUTILLO		SHEET NO.
								3

MANMADE ROADSIDE FEATURES			
FEATURE DESCRIPTION	EXISTING	PROPOSED	ID
BOLLARD - STEEL POLE			
BOLLARD - WOOD POST			
CURB, TYPE 1 AND TYPE 3	CURB, TYPE "X"		
CURB, TYPE 2			
CURB & GUTTER, TYPE 1			
CURB & GUTTER, TYPE 2	C&G, TYPE "X"		
CURB & GUTTER, TYPE 3			
CURB OPENING - SUMP / ON GRADE			
CURB OPENING WITH SIDEWALK			
FENCE - CHAINLINK OR STRANDED			
FENCE - STOCKADE OR SPLIT RAIL			
FLAG POLE	F.P. 		
GUARDRAIL - STEEL BEAM, TYPE 1			
GUARDRAIL - STEEL BEAM, TYPE 2			
GUARDRAIL - STEEL BEAM, TYPE 3			
GUARDRAIL - WIRE ROPE			
GUARDRAIL - END ANCHORAGE			
GUARDRAIL - END TREATMENT, TYPE 1			
GUARDRAIL - END TREATMENT, TYPE 2			
GUARDRAIL - END TREATMENT, TYPE 3			
GUARDRAIL - IMPACT ATTENUATOR			
LAMP AND POST - RESIDENTIAL	LAMP 		
MAILBOX	MB 		
PARKING METER AND POST	P.M. 		
PAVEMENT - FLEXIBLE			
PAVEMENT - RIGID			
PILE - BRIDGE			
PILLAR OR MISCELLANEOUS POST			
TRAFFIC SIGN AND POST			
WALL - BRICK OR BLOCK			
WALL - STONE			

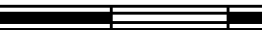
DRAINAGE FEATURES			
FEATURE DESCRIPTION	EXISTING	PROPOSED	ID
BIOFILTRATION SWALE			
DITCH OR STREAM CENTERLINE			
DIRECTIONAL STREAM FLOW ARROW			
DRAINAGE INLET	C.B.  / D.I. 		
DRAINAGE JUNCTION BOX	J.B. 		
DRAINAGE MANHOLE			
DRAINAGE PIPE AND FLOW ARROW	SIZE/TYPE LABEL 		
DRAINAGE PIPE HEADWALL			
FLARED END SECTION			
RIPRAP - AREA FEATURE			
RIPRAP - LINEAR FEATURE			
SAFETY END SECTION			
UNDERDRAIN			
UNDERDRAIN OUTLET			

UTILITY FEATURES		
FEATURE DESCRIPTION	EXISTING	PROPOSED
CABLE TV DISTRIBUTION BOX		
COMMUNICATIONS - UNDERGROUND	COMM(A)	COMM
ELECTRIC - UNDERGROUND	E(A)	E
ELECTRIC MANHOLE		
ELECTRIC METER		
ELECTRIC TRANSFORMER		
GAS - UNDERGROUND	G(A)	G
GAS MANHOLE		
GAS METER	G.M. 	
GAS VALVE	G.V. 	
GAS PUMP - SERVICE STATION	G.P. 	
IRRIGATION - UNDERGROUND	IR(A)	IR
ITMS - UNDERGROUND	ITMS(A)	ITMS
LIGHTING - UNDERGROUND	LI(A)	LI
LUMINAIRE - POLE MOUNTED		
MANHOLE - UNDETERMINED OWNER		
RAILROAD TRACKS		
SANITARY - UNDERGROUND	S(A)	S
SANITARY SEWER MANHOLE		
SANITARY SEWER VALVE	S.V. 	
SANITARY SEWER CLEANOUT OR VENT	S.C.O. 	
SEPTIC DRAIN FIELD	S.D.F. 	
SIGNALIZATION - UNDERGROUND	SIG(A)	SIG
SOIL BORING LOCATION		
TELEPHONE BOOTH		
TELEPHONE MANHOLE		
TELEPHONE TEST POINT		
TRAFFIC - CONDUIT JUNCTION WELL	J.W. 	
TRAFFIC - LIGHT POLE AND BASE		
TRAFFIC - PEDESTRIAN POLE & BASE		
TRAFFIC - SIGNAL CABINET & BASE		
TRAFFIC - SIGNAL POLE AND BASE		
UTILITY BOX		
UTILITY POLE GUY WIRE ANCHOR		
UTILITY POLE		
UTILITY TEST HOLE LOCATION		
WATER - UNDERGROUND	W(A)	W
WATER - FIRE HYDRANT	F.H. 	F.H. 
WATER METER	W.M. 	
WATER VALVE	WV 	W.V. 
WELL HEAD	WELL 	

NATURAL ROADSIDE FEATURES		
FEATURE DESCRIPTION	EXISTING	PROPOSED
HEDGEROW OR THICKET		
MARSH BOUNDARY LINE		
TREE - CONIFEROUS		
TREE - DECIDUOUS		
TREE STUMP		
SHRUBBERY		
WETLAND BOUNDARY - DELINEATED	WL 	
WOODS LINE BOUNDARY		
EX. 100-YR FLOODPLAIN	100-YR	
WATERS OF THE US	OHW	
TAX DITCH		

RIGHT-OF-WAY FEATURES		
FEATURE DESCRIPTION	EXISTING	PROPOSED
DENIAL OF ACCESS	DA	DA
EASEMENT - OTHERS	EASEMENT TYPE	
PERMANENT EASEMENT	PE	PE
PROPERTY LINE		
PROPERTY MARKER - CONCRETE	C.M. 	
PROPERTY MARKER - IRON PIPE	I.P. 	
RIGHT-OF-WAY BASELINE	100+00	100+00
RIGHT-OF-WAY LINE		R/W
RIGHT-OF-WAY & DENIAL OF ACCESS	R/W-DA	R/W-DA
RIGHT-TO-ENTER		RTE
TEMPORARY CONSTRUCTION EASEMENT		TCE

SURVEY CONTROL & MONUMENTATION	
FEATURE DESCRIPTION	EXISTING
POINT OF CURVATURE OR TANGENCY	
POINT OF INTERSECTING TANGENTS	
SURVEY BENCHMARK LOCATION	B.M. 
SURVEY NGS POINT LOCATION	
SURVEY TIE POINT LOCATION	T.P. 
SURVEY TRAVERSE POINT	

MISCELLANEOUS FEATURES	
FEATURE DESCRIPTION	PROPOSED
BARRIER, DOUBLE-FACED, PERMANENT	
BARRIER, SINGLE-FACED, PERMANENT, TEST LEVEL 4 / TEST LEVEL 5	
BRICK PATTERNED SURFACE	
BUTT JOINT	
CLEAR ZONE	CZ
CONSTRUCTION BASELINE	100+00
LATERAL OFFSET	LO
LIMIT OF CONSTRUCTION	LOC

IDENTIFIERS	
FEATURE DESCRIPTION	ID
ABANDON BY CONTRACTOR	
ABANDON BY OTHERS	
ADJUST BY CONTRACTOR	
ADJUST BY OTHERS	
BEST MANAGEMENT PRACTICE	
BUS STOP PAD / TYPE	
BUS STOP WITH SHELTER PAD / TYPE	
CONCRETE SAFETY BARRIER	
CONVERT TO JUNCTION BOX	
CONVERT TO DRAINAGE MANHOLE	
DO NOT DISTURB	
ENERGY DISSIPATOR	
FILL WITH FLOWABLE FILL	
LANDSCAPE PLANTINGS	
PEDESTRIAN CONNECTION / TYPE	
PEDESTRIAN CONNECTION / TYPE WITHOUT DETECTABLE WARNING SYSTEM	
RELOCATE BY CONTRACTOR	
RELOCATE BY OTHERS	
RELOCATE BY PROPERTY OWNER	
REMOVE BY CONTRACTOR	
REMOVE BY OTHERS	
REMOVE BY TRAFFIC CONTRACTOR	
RIGHT-OF-WAY MONUMENT	

MISCELLANEOUS SYMBOLS	
FEATURE DESCRIPTION	ID
BURIED LOGS	
WALL	
WOODY DEBRIS	
WORKING POINT	

STREAM RESTORATION FEATURES	
FEATURE DESCRIPTION	PROPOSED
CONTOUR - MAJOR	15
CONTOUR - MINOR	
PROPOSED BURIED FLOODPLAIN LOG	
PROPOSED STRAIGHT CHANNEL BURIED LOG	
PROPOSED ORDINARY HIGH WATER/WETLAND	POHW/WL
PROPOSED STREAM CHANNEL	
R-5 RIPRAP UNDERLAYMENT - 22" THICKNESS	
CLAY CHANNEL BARRIER	
IMBRICATED STONE	
RIFFLE GRADE CONTROL	

ADDENDA / REVISIONS	

NOT TO SCALE

LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



CONTRACT	2139-00
DESIGNED BY:	J. GALBO
CHECKED BY:	T. CUTILLO

LEGEND

SECTION
RKK
SHEET NO.
4

GENERAL NOTES

1.

THIS PROJECT IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE DELAWARE DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS", DATED JANUARY 2026 AND THE DELAWARE DEPARTMENT OF TRANSPORTATION "STANDARD CONSTRUCTION DETAILS", INCLUDING ALL REVISIONS UP TO THE DATE OF ADVERTISEMENT. SEE NOTES ON THIS SHEET FOR ADDITIONAL PROJECT REQUIREMENTS.
2.

ELECTRONIC DESIGN DATA FILES THAT WILL BE MADE AVAILABLE TO THE AWARDED CONTRACTOR, INCLUDE:

()	NONE
()	ASCII DATA FILES WITH COORDINATES AND ELEVATIONS FOR PROPOSED POINTS AS SELECTED BY THE ENGINEER.
(X)	EXISTING DIGITAL TERRAIN MODEL, IN .DTM FILE FORMAT, COMPATIBLE WITH SOFTWARE CURRENTLY USED BY DELDOT.
(X)	PROPOSED DIGITAL TERRAIN MODEL, IN .DTM FILE FORMAT, COMPATIBLE WITH SOFTWARE CURRENTLY USED BY DELDOT.
()	DESIGN FILE, IN .DGN FILE FORMAT, THAT CONTAINS 3D FEATURE LINES FOR THE PROPOSED DESIGN. 3D FEATURE LINES ARE FOR THE PROPOSED TOP SURFACE ELEVATION ONLY.
- NOTE: AN ELECTRONIC FILES TRANSFER AGREEMENT MUST BE SIGNED BY ALL PARTIES PRIOR TO THE DELIVERY OF ANY ELECTRONIC PROJECT FILES.

NOTE: THERE MAY BE SOME AREAS OF THE PROJECT NOT INCLUDED IN THE ELECTRONIC DESIGN DATA FILE(S). IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW THE DESIGN DATA FILE AND DETERMINE THE LIMITS OF THE PROJECT INCLUDED.
3.

THIS PLAN PROVIDES DESIGN DRAWINGS FOR STREAM RESTORATION INITIATIVES FOR AN UNNAMED TRIBUTARY TO LITTLE MILL CREEK BEGINNING AT THE INTERSECTION OF CENTERVILLE ROAD AND FAULKLAND ROAD AND EXTENDING DOWNSTREAM TO ARMSTRONG AVENUE FOR A LENGTH OF APPROXIMATELY 750 LINEAR FEET.
4.

THESE PLANS ARE BASED UPON THE STREAM CONDITIONS OBSERVED/SURVEYED IN MARCH 2025. BECAUSE STREAM SYSTEMS ARE DYNAMIC AND EROSION IS LIKELY TO CONTINUE TO OCCUR AFTER THIS DATE, THE CONDITIONS AT THE TIME OF CONSTRUCTION MAY VARY FROM THOSE SHOWN ON THESE PLANS; ADJUSTMENTS TO THE DESIGN SHALL BE MADE IN THE FIELD UNDER THE DESIGN PROFESSIONALS SUPERVISION AS NEEDED TO ADDRESS SITE CONDITION CHANGES.
5.

FLOODPLAIN: ACCORDING TO THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP NO. 10003C0151K, EFFECTIVE JANUARY 22, 2020 THIS PROJECT IS NOT LOCATED WITHIN AREAS OF ZONE AE OF THE 100 YEAR FLOODPLAIN.
6.

ACCORDING TO A WETLAND DELINEATION BY RK&K IN MARCH OF 2025, THERE ARE NON-TIDAL WETLANDS AND WATERWAYS WITHIN THE PROJECT AREA'S LIMIT OF CONSTRUCTION. OTHER WETLAND AND NON-WETLANDS WATERS BEYOND THE LIMITS OF THE PROJECT'S LIMIT OF CONSTRUCTION MAY EXIST ON THE PROPERTY.
7.

PER THE NEW CASTLE COUNTY GIS DATA VIEWER, [HTTPS://ARCGIS/CD5XO](https://arccgis/cd5xo), THE PROJECT IS NOT LOCATED WITHIN A WATER RESOURCE PROTECTION AREA.
8.

THIS SITE IS NOT LOCATED IN A CRITICAL NATURAL AREA.
9.

EXISTING UTILITIES ARE SHOWN BASED ON FIELD-RUN TOPOGRAPHIC SURVEY INVERT INFORMATION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE UTILITY COMPANIES INVOLVED IN ORDER TO SECURE THE MOST ACCURATE INFORMATION AVAILABLE AS TO UTILITY LOCATIONS AND ELEVATIONS. THERE ARE ONLY PUBLIC UTILITIES IN THE VICINITY OF THIS PROJECT.
10.

NO CONSTRUCTION AROUND OR ADJACENT TO UTILITIES SHALL BEGIN WITHOUT NOTIFYING THEIR OWNERS AT LEAST 48 HOURS IN ADVANCE. THE CONTRACTOR SHALL TAKE THE NECESSARY PRECAUTIONS TO PROTECT THE EXISTING UTILITIES AND MAINTAIN UNINTERRUPTED SERVICE AND ANY DAMAGE DONE TO THEM SHALL BE IMMEDIATELY AND COMPLETELY REPAIRED AT THE CONTRACTOR'S EXPENSE.
11.

BEFORE ANY WORK TAKES PLACE, THE CONTRACTOR SHALL CALL MISS UTILITY AT 811 OR 1.800.282.8555 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION, TO HAVE ALL EXISTING UTILITIES MARKED ONSITE.
12.

THE LIMIT OF CONSTRUCTION PROPOSED BY THIS PLAN IS APPROXIMATELY 2.25 ACRES.
13.

THE OWNER SHALL BE FAMILIAR AND COMPLY WITH ALL ASPECTS OF THE NPDES CONSTRUCTION GENERAL PERMIT ASSOCIATED WITH THE PROJECT, INCLUDING, BUT NOT LIMITED TO, PERFORMING WEEKLY SITE INSPECTIONS DURING CONSTRUCTION AND AFTER RAIN EVENTS, AND MAINTAINING WRITTEN LOGS OF THESE INSPECTIONS.
14.

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD-CHECK AND VERIFY PROPOSED CLEARANCES, DIMENSIONS AND EXISTING CONDITIONS. REPORT ANY DISCREPANCIES TO THE DESIGNER & OWNER'S REPRESENTATIVE FOR DIRECTION BEFORE PROCEEDING WITH WORK. FIELD REVISIONS SHALL REQUIRE PRIOR DESIGN REVIEW AND WRITTEN CONFIRMATION FROM THE OWNER'S REPRESENTATIVE. WORK STARTED WITHOUT NOTIFICATION OF AND CONFIRMATION FROM THE OWNER'S REPRESENTATIVE WILL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND WILL BE CORRECTED BY HIM/HER WITHOUT ADDITIONAL COMPENSATION.
15.

PERFORM ALL WORK IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS. WHERE DISCREPANCIES OCCUR AND WHERE THERE ARE CONFLICTS OR OMISSIONS IN THE DRAWINGS AND APPLICATIONS, THE CONTRACTOR SHALL NOTIFY THE DESIGNER & OWNER'S REPRESENTATIVE IMMEDIATELY AND REFRAIN FROM STARTING AND COMPLETING SUCH WORK, OR DEPENDENT WORK, UNTIL TOLD BY THE OWNER'S REPRESENTATIVE TO PROCEED.
16.

PROTECTION BARRIER SHALL BE INSTALLED AROUND ALL TREES MARKED BY THE DESIGN TEAM AND APPROVED BY THE OWNER'S REPRESENTATIVE, PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR MUST HAVE WRITTEN APPROVAL THAT ALL TREES ARE MARKED AND WORK MAY BEGIN; SHOULD ANY TREES BE DAMAGED OR WORK BEGUN PRIOR TO THIS APPROVAL, REPAIRS WILL BE THE RESPONSIBILITY OF THE CONTRACTOR AND REPLACED PER OWNER'S REPRESENTATIVE DIRECTION.
17.

THE TREE PROTECTION BARRIER SHALL BE PLACED AT OR EXTERIOR OF THE DRIP-LINE OF THE TREE, UNLESS OTHERWISE NOTED OR APPROVED BY THE OWNER'S REPRESENTATIVE.
18.

THERE SHALL BE NO STORAGE OF MATERIALS OR SUPPLIES OF ANY KIND WITHIN THE AREA OF THE PROTECTION BARRIERS. CONCRETE AND CEMENT MATERIALS, BLOCK, STONE, SAND, AND SOIL SHALL NOT BE PLACED WITHIN THE DRIP-LINE OF THE TREES.
19.

FUEL STORAGE SHALL NOT BE PERMITTED WITHIN 50 FEET OF ANY TREE TO BE PRESERVED. REFUELING, SERVICING AND MAINTENANCE OF EQUIPMENT AND MACHINERY SHALL NOT BE PERMITTED WITHIN 50 FEET OF ANY WATERWAY, WATERBODY, AND/OR TREE TO BE PRESERVED.
20.

DEBRIS AND WASTE FROM THE CONSTRUCTION OR OTHER ACTIVITIES SHALL NOT BE PERMITTED WITHIN THE PROTECTED AREAS. WASHDOWN OF CONCRETE OR CEMENT HANDLING EQUIPMENT (IF REQUIRED), IN PARTICULAR, SHALL NOT BE PERMITTED WITHIN 150 FEET OF WATERWAYS, WATERBODIES AND/OR TREES TO BE PRESERVED.

21.

ANY DAMAGES OR INJURIES TO TREES TO BE PRESERVED SHOULD BE REPORTED TO THE OWNER'S REPRESENTATIVE AS SOON AS POSSIBLE. SEVERED ROOTS SHALL BE PRUNED CLEANLY TO HEALTHY TISSUE, USING PROPER PRUNING TOOLS. BROKEN BRANCHES OR LIMBS SHALL BE PRUNED ACCORDING TO INTERNATIONAL SOCIETY OF ARBORICULTURE PRUNING GUIDELINES AND ANSI-300 PRUNING STANDARDS. THE OWNER RETAINS THE RIGHT TO CONSULT A CERTIFIED ARBORIST AT THE CONTRACTOR'S EXPENSE.
22.

NO PRUNING OF THE TREE CANOPIES AND BRANCHES IS TO BE DONE TO PROVIDE CLEARANCES FOR THE CONSTRUCTION EQUIPMENT WITHOUT EXPLICIT WRITTEN PERMISSION FOR EACH TREE REQUIRING PRUNING. ALERT OWNER'S REPRESENTATIVE IF PRUNING IS NECESSARY.
23.

NO DEBRIS IS TO BE BURIED ON SITE.
24.

ONLY EXISTING FEATURES WITHIN THE LOC IDENTIFIED WITH REMOVE BY CONTRACTOR OR BY OTHER METHODS ARE TO BE REMOVED OR DISTURBED.

GENERAL CONSTRUCTION NOTES:

1.

ALL MATERIALS AND METHODS OF CONSTRUCTION SHALL CONFORM TO THE DELAWARE DEPARTMENT OF TRANSPORTATION'S "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION", JANUARY 2026, SECTION 911-PLANTINGS, EXCEPT AS NOTED IN THESE PLANS. FOR ALL INSTANCES IN THIS SECTION OF THE SPECIFICATIONS THAT REFERENCE "THE ENGINEER", THE TERM SHALL BE SUBSTITUTED WITH "PROPERTY OWNER / OWNER'S REPRESENTATIVE". THE SPECIFICATIONS CAN BE ACCESSED ONLINE FREE OF CHARGE. NOTE THIS DOCUMENT REFERENCES THE AMERICAN ASSOCIATION OF NURSERYMEN: AMERICAN STANDARD FOR NURSERY STOCK, LATEST EDITION, WHICH SHALL ALSO BE CONSIDERED PART OF THESE SPECIFICATIONS.
2.

CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. ALL CONSTRUCTION MUST BE DONE IN COMPLIANCE WITH THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 AND ALL RULES AND REGULATIONS THERETO APPURTENANT. THESE DRAWINGS DO NOT INCLUDE NECESSARY COMPONENTS FOR CONSTRUCTION SAFETY.
3.

CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK. THEY WILL BE SOLELY RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, PROCEDURES, AND SEQUENCE OF CONSTRUCTION.
4.

IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE THEMSELVES THOROUGHLY FAMILIAR WITH THE MOST RECENT REVISION OR AMENDMENTS TO ALL DOCUMENTS REFERENCED IN THESE NOTES.
5.

THE CONTRACTOR SHALL AT ALL TIMES PROTECT AGAINST SEDIMENT OR DEBRIS LADEN RUNOFF OR WIND FROM LEAVING THE SITE. PERIMETER CONTROLS (WHEN CALLED FOR) SHOULD BE CHECKED DAILY AND ADJUSTED AND/OR REPAIRED TO FULLY CONTAIN AND CONTROL SEDIMENTATION ON THE SITE. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT HAS REACHED HALF OF THE EFFECTIVE CAPACITY OF THE CONTROL. IN ADDITION, THE CONTRACTOR MAY NEED TO ADJUST OR REPAIR MEASURES IN TIMES OF ADVERSE WEATHER CONDITIONS, OR AS DIRECTED BY THE NCCD.
6.

SOILS / SOIL MIXTURES: THIS PROJECT UTILIZES IN-SITU SOILS, ONLY AMENDMENTS NOTED ARE TO BE ADDED UNLESS APPROVED BY THE OWNER'S REPRESENTATIVE. AMENDMENTS NOT TO BE USED INCLUDE, BUT ARE NOT LIMITED TO, PEAT, HUMUS, AND LEAF MULCH.
7.

FERTILIZER:

a.

PLANT FERTILIZER SHALL CONSIST OF COMMERCIALY AVAILABLE PRODUCTS AND SHALL BE MATERIALS SOLD AS "ORGANIC" OR "NATURAL" FERTILIZERS. PRODUCT NUTRIENT CONTENT SHALL BE IDENTIFIED IN THE STANDARD FORM OF NITROGEN (N), PHOSPHORUS (P) AND POTASSIUM (K) RATIOS. THE MINIMUM ACCEPTABLE NUTRIENT CONTENT SHALL BE 6-2-4, UNLESS OTHERWISE DIRECTED BY THE OWNER / OWNER'S REPRESENTATIVE.
8.

WATER:

a.

APPLY WATER BY OPEN-END HOSE SUPPLIED BY GRAVITY OR LOW PRESSURE PUMP (PRESSURE NOT TO EXCEED 10 PSI). APPLY WATER AT A RATE SO THAT THE WATER DOES NOT COMPLETELY RUN-OFF AND WILL THOROUGHLY SOAK AND PERCOLATE INTO THE SOIL IN THE PLANTING PIT. PERFORM WATERING WITHIN 1 CALENDAR DAY IF SITE CONDITIONS REQUIRE WATER TO SAVE THE HEALTH OF THE PLANTS.

b.

WATER SMALLER TYPE PERENNIAL OR HERBACEOUS PLANTS SUCH AS BULBS, TUBERS, RHIZOMES, PLUGS, STARTER PLANTS, SEEDLINGS AND SMALL TRANSPLANTS WITH 2-GALLONS OF WATER PER PLANT PER WATERING CYCLE.

c.

WATER THE PLANTS ON A 7 TO 10 DAY CYCLE BASED ON A NATURAL RAINFALL CONDITION OF LESS THAN 1-INCH OF RAINFALL PER WEEK, OR WHEN TEMPERATURES AND HUMIDITY REMAIN GREATER THAN 90 DEGREES FOR A PERIOD OF ONE WEEK. DO NOT WATER IF SOIL CONDITIONS ARE DETERMINED TO BE SATURATED. DO NOT WATER AT OR ONTO THE TRUNK OR STEMS OF THE PLANT.

d.

PROVIDE A WATERING SCHEDULE, SOURCE OF WATER, AND LIST OF WATERING EQUIPMENT TO BE USED FOR APPROVAL AT LEAST 30 DAYS PRIOR TO FIRST WATERING ON SITE; IF WATERING METHODOLOGIES CHANGE AT ANYTIME DURING THE PROJECT DURATION OR DURING ESTABLISHMENT PERIOD DOCUMENTATION MUST BE PROVIDED.

9.

PLANTING:

a.

ALL STOCK MUST BE HEALTHY AND VIGOROUS AND BE FREE OF DAMAGE FROM DISEASE, MISHANDLING OR POOR PRUNING. PLANTS THAT HAVE EVIDENCE OF STRESS, DISEASE, DIEBACK OR MISHANDLING WILL BE REJECTED.

b.

PLANT MATERIALS MUST BE SELECTED FROM CERTIFIED NURSERIES THAT HAVE BEEN INSPECTED BY STATE AND/OR FEDERAL AGENCIES. NURSERY INSPECTION CERTIFICATES SHALL BE FURNISHED TO THE NEW CASTLE COUNTY CONSERVATION DISTRICT UPON REQUEST.

c.

ALL PLANT MATERIAL MUST BE GROWN IN CONDITIONS SIMILAR TO THE USDA HARDINESS ZONE OF DELAWARE AND OF LOCAL ECOTYPE TO THE PROJECT SITE.

d.

PLANT MATERIAL COLLECTED FROM THE "WILD" IS PROHIBITED.

e.

EACH PLANT OR SAME-SPECIES GROUP OF PLANTS SHIPPED TO THE JOB SITE MUST BE CLEARLY LABELED WITH ITS SCIENTIFIC NAME AND COMMON NAME. THE CONTRACTOR IS RESPONSIBLE TO CHECK TO SEE THAT THE PLANTS ARE CORRECTLY LABELED. THE CONTRACTOR IS PROHIBITED TO ADD, ALTER OR REMOVE LABELS UNTIL AFTER INSTALLATION AND APPROVAL BY THE OWNER / OWNER'S REPRESENTATIVE. THE CONTRACTOR WILL NOT BE PAID FOR MATERIAL ON WHICH THE CONTRACTOR HAS ALTERED OR REMOVED THE LABELS.

f.

CONTRACTOR SHALL PROVIDE AN AS-BUILT RED-LINED PLAN NOTING ANY DEVIATIONS/SUBSTITUTIONS FROM THE APPROVED PLAN(S).

10.

PLANT ESTABLISHMENT:

a.

THE PERIOD OF ESTABLISHMENT AND REPLACEMENT WILL BEGIN FROM THE DOCUMENTED DATE OF ACCEPTANCE OF THE ENTIRE PROJECT BY THE OWNER. OBTAIN WRITTEN CONCURRENCE ON THE VERIFIED DATE OF PLANTING COMPLETION FROM THE OWNER / OWNER'S REPRESENTATIVE.

b.

THE LANDSCAPE CONTRACTOR IS TO GUARANTEE PLANT MATERIAL, WATERING, AND GENERAL CARE FOR PLANTS FOR ONE YEAR FROM PROJECT ACCEPTANCE.

c.

MONITOR THE CONDITION OF THE PLANTS AND INITIATE ALL HORTICULTURAL PRACTICES NECESSARY TO MAINTAIN THE PLANTS IN A HEALTHY CONDITION DURING THE PERIOD OF ESTABLISHMENT.

d.

PROTECT PLANTS FROM WILDLIFE DEPREDAATION; DEER PROTECTION SHALL BE PROVIDED FOR ALL WOODY SPECIES IN LOWLAND FOREST PLANTING ZONES.

11.

THE CONTRACTOR SHALL TAKE ALL MEASURES NECESSARY TO KEEP THE WORK AREA IN A CLEAN, NEAT CONDITION.

12.

THE CONTRACTOR SHALL PROVIDE SIGNED AND SEALED LOADING COMPUTATIONS FOR ALL UTILITY CROSSINGS TO DEMONSTRATE THE UTILITY WILL NOT BE DAMAGED BY ADDITIONAL CONSTRUCTION LOADING. THE CONTRACTOR SHALL PROVIDE TIMBER MATTING FOR ALL UTILITY CROSSINGS AS SHOWN ON THE TIMBER MATTING DETAIL ON SHEET 19.

OWNER ON-GOING MAINTENANCE GUIDANCE:

YEAR 1:

YEAR ONE, INSTALLATION TO 365 DAYS FOLLOWING THE FINAL PROJECT PAYMENT WILL BE THE MOST CRITICAL TIME TO MONITOR THE RESTORATION WORK. THE / A DESIGN CONSULTANT SHOULD BE CONTACTED AT ANY TIME SHOULD THE OWNER OR MAINTENANCE TEAM HAVE LANDSCAPE CARE QUESTIONS OR CONCERNS. THE INSTALLATION CONTRACTOR SHALL PROVIDE A 1-YEAR WARRANTY ON PLANT MATERIAL

a.

DURING DROUGHT AND LOW RAINFALL AMOUNTS FOR THE SPRING, SUMMER, AND FALL SEASONS CHECK PLANT HEALTH FOR WATER STRESS. FOR THE FIRST YEAR THE CONTRACTOR IS EXPECTED TO WARRANTY THE PLANTS UNLESS OTHER ARRANGEMENTS WERE AGREED UPON DURING CONSTRUCTION. THE MAINTENANCE TEAM CAN CALL THE CONTRACTOR AND MAKE THEM AWARE OF THE PLANT STRESS AND/OR THEY CAN WATER THE LANDSCAPE BY PUMPING AND SPRAYING WATER FROM THE STREAM CHANNEL. MEADOW LANDSCAPES SHOULD NOT BE PROVIDED WITH SUPPLEMENTAL WATER.

b.

MONITOR THE LANDSCAPE FOR ANIMAL DEPREDAATION. GEESE AND DEER ARE FREQUENT VISITORS TO NEW LANDSCAPES IN THE NEW CASTLE COUNTY AREA, BOTH CAN KILL YOUNG LANDSCAPE PLANTS THROUGH INGESTION, REMOVAL FROM SOIL, AND BARK RUBBING. PROTECTION FENCING AND OTHER MEASURES SHOULD REMAIN INTACT DURING THE FIRST YEAR AND SHOULD BE CHECKED FOR BREACHES.

c.

A COPY OF THE AS-BUILT PLANTING PLAN (PLANT INCLUDING ANY SUBSTITUTIONS MADE DURING CONSTRUCTION) SHOULD REMAIN WITH THE LANDSCAPE MAINTENANCE TEAM TO IDENTIFY PLANTS TO REMAIN.

d.

INVASIVE AND UNWANTED WEEDS SHOULD BE REMOVED IMMEDIATELY BY APPROPRIATE TECHNIQUES. ANNUAL WEEDS / INVASIVES CAN BE TREATED WITH HAND PULLING. PERENNIAL WEEDS / INVASIVES CAN BE TREATED WITH AQUATIC SAFE HERBICIDES. COMMON ANNUALS INCLUDE BUT ARE NOT LIMITED TO: STILT GRASS, LESSER CELENDINE, GARLIC MUSTARD. COMMON PERENNIAL INCLUDE, BUT ARE NOT LIMITED TO: THISTLE, JAPANESE KNOTWEED (AT AQUATIC MARGINS), PURPLE LOOSTRIFE. CONTACT THE DESIGN TEAM AND/OR THE COOPERATIVE EXTENSION OFFICE AT THE UNIVERSITY OF DELAWARE FOR ASSISTANCE IN IDENTIFICATION AND TREATMENT OF UNKNOWN PLANTS.

e.

THE STREAM CHANNEL SHOULD BE CHECKED FREQUENTLY AND LARGE DEBRIS OR TRASH REMOVED FROM THE CHANNEL. OVER TIME WOODY DEBRIS IS BENEFICIAL TO A STREAM HABITAT, HOWEVER AFTER INITIAL INSTALLATION THE NEWLY GRADED BANK SLOPE MAY BE MORE PRONE TO DAMAGE FROM LARGE DEBRIS.

f.

DURING WINTER MONTHS IF TRUNK GUARDS WERE INSTALLED FOR TREE INSTALLATIONS, REMOVE SNOW PACK FROM AROUND TRUNKS AND LOOSEN COLLAR BASE IF AIRFLOW IS CONSTRICTED AROUND ROOT FLARE. TRUNK GUARDS ARE AN EFFECTIVE MEASURE AGAINST DEER RUBBING, HOWEVER IF NOT MONITORED THEY CAN PROMOTE TRUNK ROT AT THE ROOT CROWN AND IMPAIR TREE HEALTH AND LONGEVITY.

g.

PRIOR TO THE END OF YEAR ONE, THE OWNER SHOULD SCHEDULE A WALK THROUGH WITH THE CONTRACTOR TO IDENTIFY ANY PLANT MATERIAL NEEDING REPLACEMENTS PRIOR TO THE END OF THE 1 YEAR WARRANTY PERIOD.

YEAR 2:

YEAR TWO IS A CRITICAL YEAR TO GET AHEAD OF ANY PROBLEMATIC CONDITIONS OBSERVED IN YEAR ONE, I.E. HIGH GOOSE DEPREDAATION OR INVASIVE PLANT PRESSURE.

a.

MONITOR ANY WARRANTEE PLANT REPLACEMENTS FOR ENVIRONMENTAL STRESSES SUCH AS LACK OF WATER AND SPOT TREAT.

b.

WATER ALL PLANT MATERIAL, EXCEPT MEADOW PLANTINGS, IF EXCESSIVE DROUGHT CONDITIONS OCCUR.

c.

MONITOR FOR ANIMAL DEPREDAATION AND REPLACE BREACHES IN PROTECTION MEASURES. PROTECTION MEASURES SHOULD REMAIN UP UNTIL THE END OF YEAR 3.

d.

MONITOR AND SPOT TREAT INVASIVE AND UNWANTED WEEDS.

e.

MONITOR THE STREAM FOR OVERALL HEALTH AND ESTABLISHMENT. DURING YEAR 2 THE CHANNEL SHOULD BE ABLE TO RESPOND TO NATURAL DEBRIS. HOWEVER IF UNUSUAL FLOOD PATTERNS OR BANK FAILURES ARE OBSERVED DUE TO THE PRESENCE OF LARGE WOODY DEBRIS THE DEBRIS SHOULD BE REMOVED, IF SEVERE CONTACT THE / A DESIGN PROFESSIONAL. HUMAN TRASH SHOULD BE REMOVED FROM THE STREAM CHANNEL.

YEAR 3:

ALTHOUGH LANDSCAPE MAINTENANCE IN NATURAL AREAS IS PERPETUAL DUE TO HUMAN INDUCED PRESSURES, BY YEAR 3 NEW LANDSCAPES ARE GENERALLY THOUGHT TO HAVE MATURED ENOUGH TO REDUCE REGULAR MAINTENANCE.

a.

MONITOR THE LANDSCAPE MONTHLY FOR INVASIVE PLANT PRESSURE. IF PROBLEMATIC WEEDS WERE IDENTIFIED IN PRIOR YEARS, ADDITIONAL SCOUTING MAY BE REQUIRED BASED ON THE SPECIFIC PHENOLOGY OF THAT WEED.

b.

AT THE END OF YEAR THREE ANIMAL DEPREDAATION PROTECTION MEASURES CAN BE REMOVED IF NO VISIBLE BROWSE IS OBSERVED; SHOULD DEER BE PRESENT IN THE RESTORATION AREA, NEW DEER PROTECTIONS SHOULD BE INSTALLED ON TREES UNTIL THEY REACH 6" DIAMETER.

c.

SHRUBS AND TREES SHOULD BE PRUNED AS NEEDED TO REMOVE DEAD, DAMAGED, OR DISEASED LIMBS UTILIZING INDUSTRY BEST PRACTICES.

d.

REMOVE / REPLACE DEAD / DYING PLANTINGS. AS LANDSCAPES MATURE PAST YEAR 3 DETERMINE IF THE DEAD OR DECLINING PLANT PROVIDES HABITAT VALUE PRIOR TO REMOVAL.

e.

THE STREAM CORRIDOR SHOULD BE MONITORED OCCASIONALLY FOR STABILITY AND TRASH SHOULD BE REMOVED REGULARLY.

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ADDENDA / REVISIONS		NOT TO SCALE	LITTLE MILL CREEK - TRIBUTARY 2 STREAM RESTORATION		CONTRACT	2139-00	NOTES	SECTION
					DESIGNED BY:	J. GALBO		RKK
					CHECKED BY:	T. CUTILLO		SHEET NO.
								5

ADDENDA / REVISIONS

NOT TO SCALE

LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



CONTRACT
2139-00

DESIGNED BY: J. GALBO

CHECKED BY: T. CUTILLO

LEGEND

- (A) ITEM 908003 - TOPSOIL, 4" DEPTH
(B) ITEM 908504 - COIR FIBER MATTING
(C) FLOODPLAIN MEADOW SEEDING
(D) FLOODPLAIN FOREST PLANTING
(E) ITEM 707011 - RIPRAP UNDERLAYMENT, R-5 - 22" THICKNESS
(F) SALVAGED STREAMBED MATERIAL - 12" THICKNESS
(G) ITEM 202000- SUITABLE PROJECT EXCAVATION MEETING BORROW, TYPE F
(H) ITEM 908020 - EROSION CONTROL BLANKET MULCH (SSM-II)

NOTES:

1. CREATE SURFACE ROUGHNESS WITHIN THE PROPOSED FLOODPLAIN AREA EXTENDING FROM THE CHANNEL BANKS TO THE FLOODPLAIN BANKS WITH HIGH AND LOW POINTS IN THE TOPOGRAPHY RANGING IN ELEVATION FROM PLUS OR MINUS TWO TENTHS (0.2) OF A FOOT OF THE PROPOSED FINISHED GRADE.
2. CONTRACTOR SHALL OVEREXCAVATE A MINIMUM OF 2-FT INTO 2:1 FLOODPLAIN SIDE SLOPE FOR PLACEMENT OF ITEM 707011 - RIPRAP, R-5 - 22" THICKNESS.
3. IN LOCATIONS WHERE TOE OF PROPOSED CHANNEL IS LESS THAN 10-FT FROM THE TOE OF 2:1 SIDE SLOPE GRADING FOR THE FLOODPLAIN, THE COIR FIBER MATTING SHALL EXTEND AT A MINIMUM FROM THE TOE OF THE PROPOSED CHANNEL AND UP THE 2:1 SIDE SLOPE GRADING FOR THE FLOODPLAIN. EROSION CONTROL BLANKET MULCH SHALL BE USED FOR THE REMAINDER OF THE SIDE SLOPE.
4. SUITABLE PROJECT EXCAVATION MEETING BORROW, TYPE F SHALL BE USED TO FILL THE EXISTING CHANNEL AND/OR PROPOSED FLOODPLAIN AS NEEDED TO MEET FINAL PROPOSED GRADES. THE TOP 12" OF FILL WITHIN THE PROPOSED CHANNEL SHALL BE SALVAGED STREAMBED MATERIAL - 12" THICKNESS.

FLOODPLAIN TYPICAL SECTION TABLE		
TYPICAL SECTION	START STATION	STOP STATION
1	5+79.9	6+74.8
2	6+74.8	12+65.9

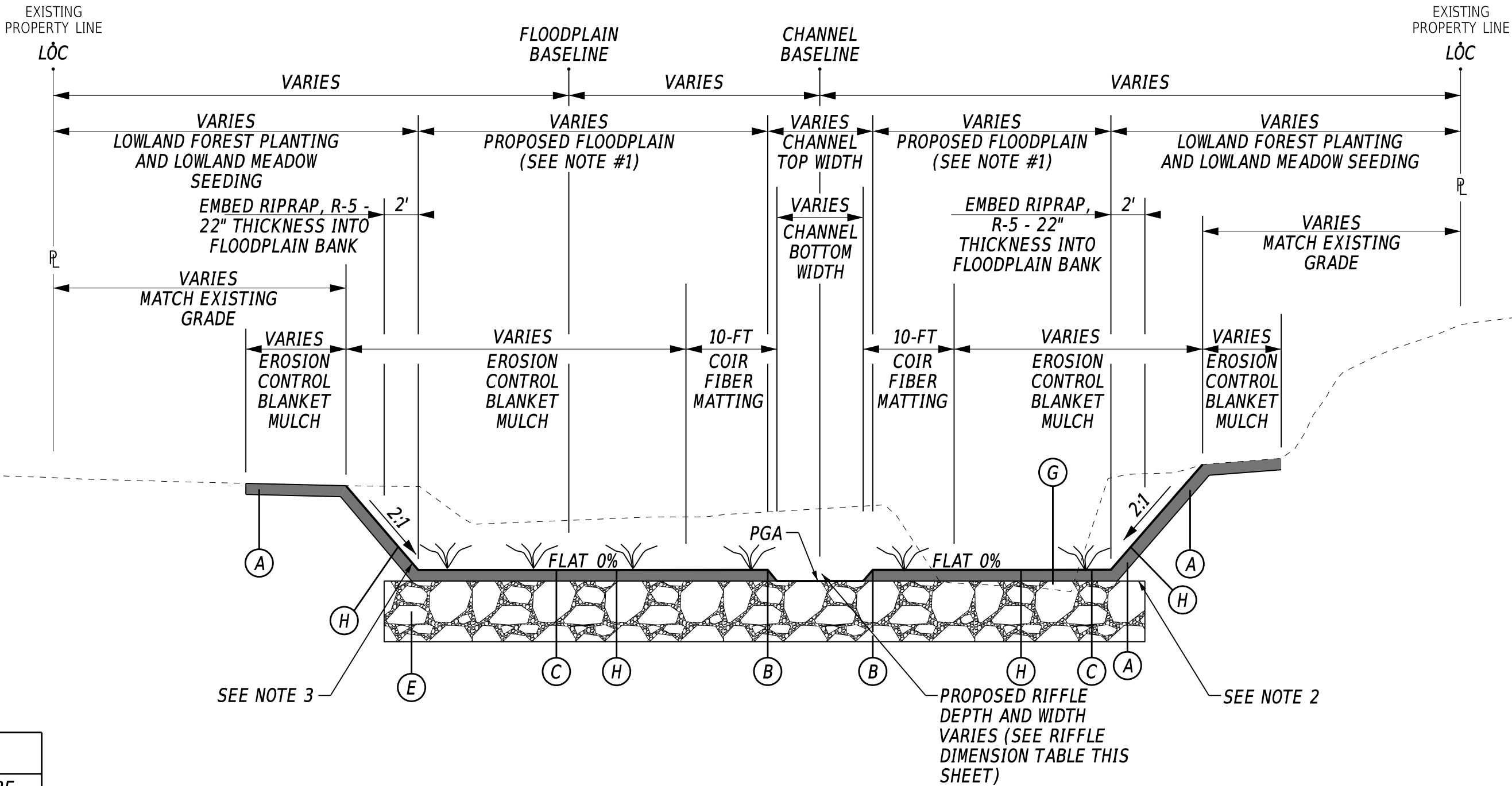
RIFFLE DIMENSION TABLE

START STATION	STOP STATION	TOP WIDTH (FT)	DEPTH (FT) ¹	SIDE SLOPE
20+52.6	21+68.5	2.5	0.3	2:1
21+68.5	23+03.5	2.8	0.4	2:1
23+03.5	28+16.5	2.5	0.3	2:1

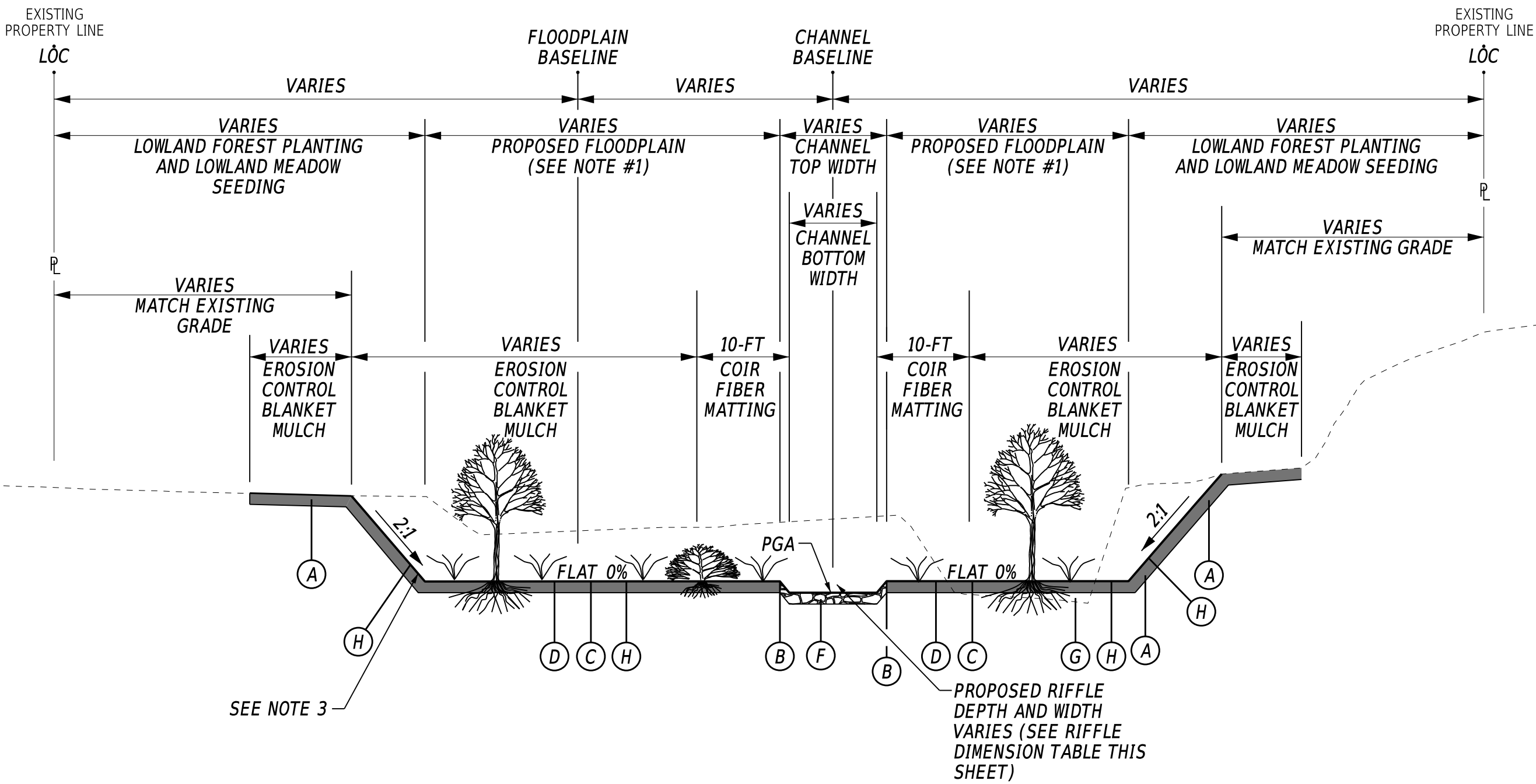
NOTES:

1. RIFFLE DEPTH GIVEN AT CREST OF RIFFLE.
2. PROPOSED RIFFLES LISTED ON SHEET 14, WITHIN THE LIMITS OF RIPRAP, R-5 SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE RIFFLE GRADE CONTROL STRUCTURE DETAIL ON SHEET 12

TYPICAL FLOODPLAIN SECTION 1



TYPICAL FLOODPLAIN SECTION 2



EARTHWORK SUMMARY

EXCAVATION	
EXCAVATION FROM CROSS SECTIONS	2,080 C.Y.
ROCK EXCAVATION FOR ROADWAY AND TRENCHES	0 C.Y.
CHANNEL EXCAVATION	223 C.Y.
TOPSOIL STRIPPING	365 C.Y.
TOTAL EXCAVATION	2,668 C.Y.
EXCAVATION AVAILABLE FOR EMBANKMENT	
EXCAVATION MEETING BORROW TYPE 'A'	0 C.Y.
EXCAVATION MEETING BORROW TYPE 'F'	1,872 C.Y.
EXCAVATION MEETING CHANNEL BED FILL	111 C.Y.
EXCAVATION MEETING TOPSOIL	183 C.Y.
EMBANKMENT REQUIREMENTS	
BORROW TYPE 'A' REQUIRED (INCLUDING UNDERCUT)	0 C.Y.
BORROW TYPE 'F' REQUIRED	1,139 C.Y.
CHANNEL BED FILL REQUIRED	123 C.Y.
TOPSOIL REQUIRED	612 C.Y.
MATERIAL BALANCE ("+"= EXCESS, "-"= NEED)	
BORROW TYPE 'A'	0 C.Y.
BORROW TYPE 'F'	732 C.Y.
CHANNEL BED FILL	-11 C.Y.
TOPSOIL	-429 C.Y.
UNSUITABLE MATERIAL	208 C.Y.

NOTES:

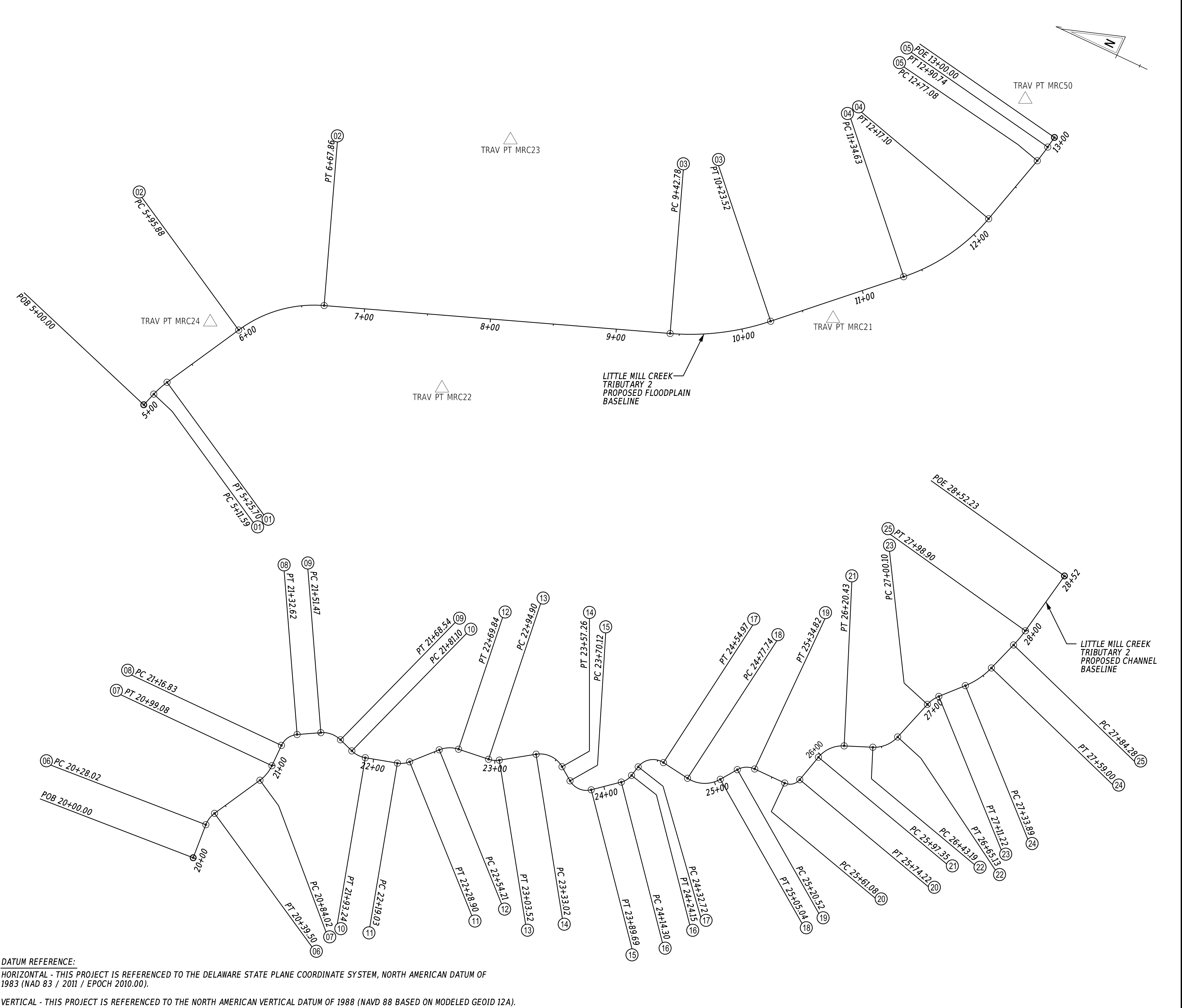
- 1) THE VALUES LISTED IN THE EARTHWORK SUMMARY ARE APPROXIMATE AND ARE NOT TO BE USED AS A BASIS OF PAYMENT. THE EARTHWORK SUMMARY IS CONSIDERED FOR INFORMATIONAL PURPOSES ONLY.
- 2) OTHER SOURCES OF EXCAVATION MAY INCLUDE PIPE TRENCH EXCAVATION, STRUCTURE EXCAVATION, UNDERCUT EXCAVATION, STORMWATER MANAGEMENT POND EXCAVATION, ENVIRONMENTAL SITE EXCAVATION, MAINTENANCE OF TRAFFIC EXCAVATION, ETC.
- 3) UNSUITABLE MATERIALS INCLUDE UNDERCUT SOILS, BITUMINOUS PAVEMENT, ETC.

LITTLE MILL CREEK TRIBUTARY 2 PROPOSED FLOODPLAIN					
DESCRIPTION	STATION	NORTHING	EASTING	BEARING & DISTANCE OR CURVE NO.	
POB	05+00.00	636013.0678	597913.9983	S 71.9746 E	11.5935
PC	05+11.59	636009.4804	597925.0227	CURVE 01	
PT	05+25.70	636003.8851	597937.9452	S 61.2010 E	70.1802
PC	05+95.88	635970.0766	597999.4452	CURVE 02	
PT	06+67.86	635916.9874	598045.7417	S 20.4681 E	274.9156
PC	09+42.78	635659.4279	598141.8756	CURVE 03	
PT	10+23.52	635591.4422	598184.4136	S 43.5996 E	111.1055
PC	11+34.63	635510.9821	598261.0335	CURVE 04	
PT	12+17.10	635469.4655	598331.0987	S 75.1034 E	59.9758
PC	12+77.08	635454.0472	598389.0588	CURVE 05	
PT	12+90.74	635451.1400	598402.4075	S 80.3235 E	9.2591
POE	13+00.00	635449.5837	598411.5348		

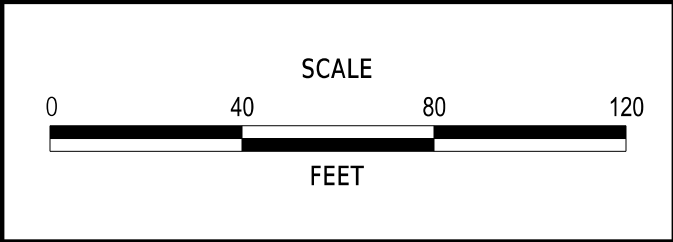
HORIZONTAL / VERTICAL CONTROL DATA				
POINT NO.	NORTHING	EASTING	ELEV.	DESCRIPTION
MRC21	635,547.5332	598,207.3258	104.15	REBAR & CAP
MRC22	635,804.7573	598,026.0225	109.58	REBAR & CAP
MRC23	635,838.9369	598,226.9921	116.35	MAG NAIL
MRC24	635,993.1641	597,995.6260	113.90	REBAR & CAP
MRC50	635,483.2777	598,429.0066	101.54	REBAR & CAP
RKK201*	635,828.5094	598,398.4408	118.72	MAG NAIL

*NOT SHOWN

LITTLE MILL CREEK TRIBUTARY 2 CHANNEL					
DESCRIPTION	STATION	NORTHING	EASTING	BEARING & DISTANCE OR CURVE NO.	
POB	20+00.00	635973.9327	597922.7095	N 85.9287 E	28.0225
PC	20+28.02	635975.9223	597950.6613	CURVE 06	
PT	20+39.50	635973.4990	597961.7161	S 61.2007 E	44.5273
PC	20+84.02	635952.0483	598000.7359	CURVE 07	
PT	20+99.08	635948.3377	598015.1602	S 89.9464 E	17.7541
PC	21+16.83	635948.3211	598032.9142	CURVE 08	
PT	21+32.62	635940.7364	598045.9391	S 29.6273 E	18.8515
PC	21+51.47	635924.3495	598055.2585	CURVE 09	
PT	21+68.54	635907.8618	598056.7527	S 19.270 W	12.5553
PC	21+81.10	635896.0100	598052.6091	CURVE 10	
PT	21+93.24	635884.0545	598052.2187	S 15.5303 E	25.7878
PC	22+19.03	635859.2082	598059.1233	CURVE 11	
PT	22+28.90	635850.8860	598064.1874	S 47.1111 E	25.3139
PC	22+54.21	635833.6579	598082.7343	CURVE 12	
PT	22+69.84	635820.0056	598089.6470	S 6.5991 E	25.0618
PC	22+94.90	635795.1098	598092.5272	CURVE 13	
PT	23+03.52	635787.1115	598095.4999	S 34.1773 E	29.5035
PC	23+33.02	635762.7031	598112.0736	CURVE 14	
PT	23+57.26	635739.9197	598111.8566	S 35.2690 W	12.8644
PC	23+70.12	635729.4166	598104.4285	CURVE 15	
PT	23+89.69	635711.2190	598105.0968	S 39.4758 E	24.6034
PC	24+14.30	635692.2278	598120.7385	CURVE 16	
PT	24+24.15	635687.1429	598128.9670	S 77.0956 E	8.5711
PC	24+32.72	635685.2288	598137.3216	CURVE 17	
PT	24+54.97	635668.5393	598148.8285	S 7.9259 W	22.7669
PC	24+77.74	635645.9898	598145.6891	CURVE 18	
PT	25+05.04	635622.1562	598155.9797	S 54.6322 E	15.483
PC	25+20.52	635613.1943	598168.6053	CURVE 19	
PT	25+34.82	635600.9625	598174.9230	S 0.0000 W	26.2518
PC	25+61.08	635574.7106	598174.9230	CURVE 20	
PT	25+74.22	635565.0374	598182.3874	S 75.3117 E	23.1275
PC	25+97.35	635559.1732	598204.7590	CURVE 21	
PT	26+20.43	635544.5209	598221.5320	S 22.4098 E	22.7562
PC	26+43.19	635523.4832	598230.2073	CURVE 22	
PT	26+65.13	635509.1459	598245.8817	S 72.6921 E	34.9706
PC	27+00.10	635498.7420	598279.2689	CURVE 23	
PT	27+11.22	635493.2200	598288.8142	S 47.2094 E	22.6769
PC	27+33.89	635477.8151	598305.4555	CURVE 24	
PT	27+59.00	635465.0516	598326.8642	S 71.1852 E	25.2769
PC	27+84.28	635456.8995	598350.7904	CURVE 25	
PT	27+98.90	635453.2109	598364.9249	S 79.5624 E	53.3352
POE	28+52.23	635443.5484	598417.3775		



ADDENDA / REVISIONS	



LITTLE MILL CREEK - TRIBUTARY 2 STREAM RESTORATION

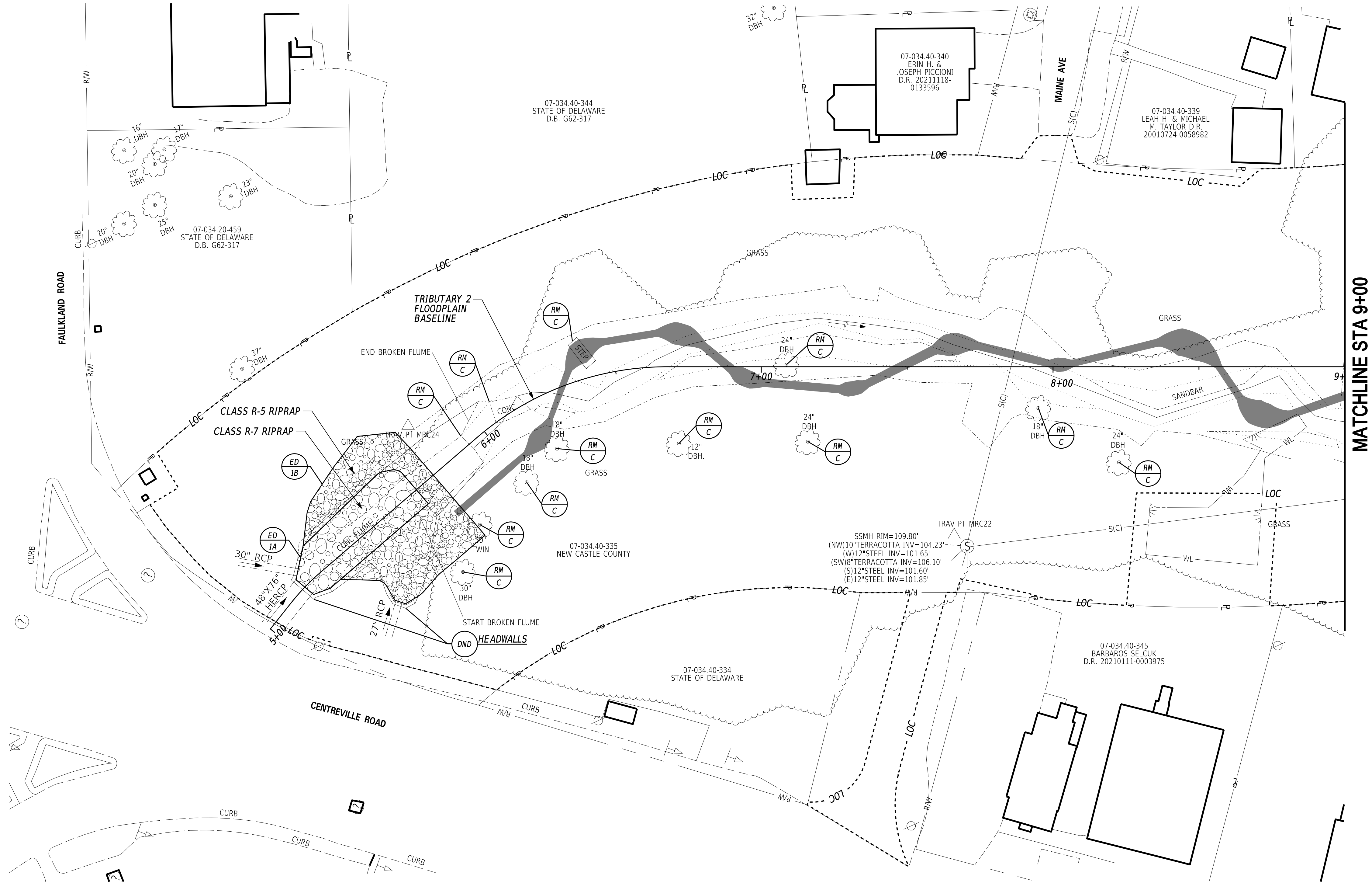


CONTRACT	2139-00
DESIGNED BY:	J. GALBO
CHECKED BY:	T. CUTILLO

HORIZONTAL AND VERTICAL CONTROL FLOODPLAIN AND STREAM

SECTION
RKK
SHEET NO.
7

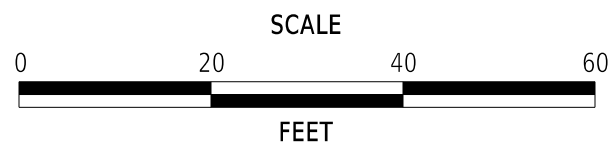
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ENERGY DISSIPATOR SCHEDULE

NO.	STATION	OFFSET	RR SIZE	D (FT)	T1 (FT)	L (FT)	W1 (FT)	W2 (FT)
ED-1A	5+45.3	2.5 LT	R-7	2.5	3.5	30.6	17.8	19.0
ED-1B	5+55.1	1.0 RT	R-5	2.5	2.0	30.6	16.9	16.9

ADDENDA / REVISIONS



LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



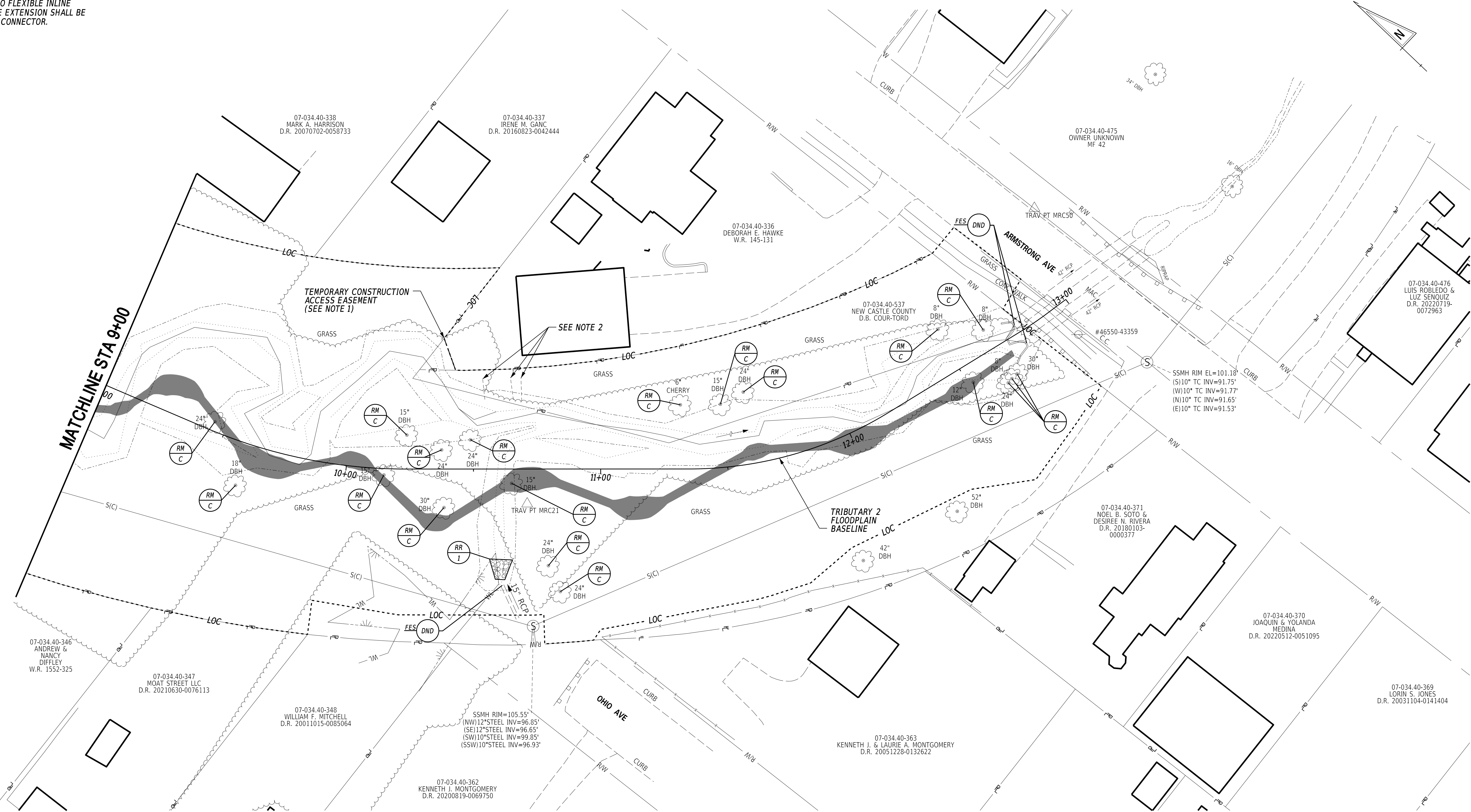
CONTRACT	2139-00
DESIGNED BY:	J. GALBO
CHECKED BY:	T. CUTILLO

CONSTRUCTION PLAN

CP-01

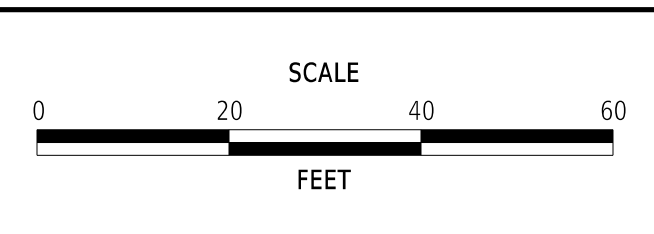
SECTION
RKK
SHEET NO.
8

- NOTES
1. TEMPORARY CONSTRUCTION EASEMENT (TCE) REQUIRED TO ACCESS PRIVATE PROPERTY TO FILL EXISTING CHANNEL
 2. HDPE/PVC PIPES SHALL BE MAINTAINED AND EXTENDED TO THE 2:1 FLOODPLAIN SIDE SLOPES. PVC PIPE EXTENSIONS SHALL BE MADE WITH FERNCO FLEXIBLE INLINE COUPLING. HDPE PIPE EXTENSION SHALL BE MADE WITH FLEXIBLE CONNECTOR.



RIPRAP SCHEDULE			
NO.	TYPE	AREA (SY)	NOTES
RR-1	R-5	5.60	STA. 10+60.6, 38.9 RT

ADDENDA / REVISIONS	



LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



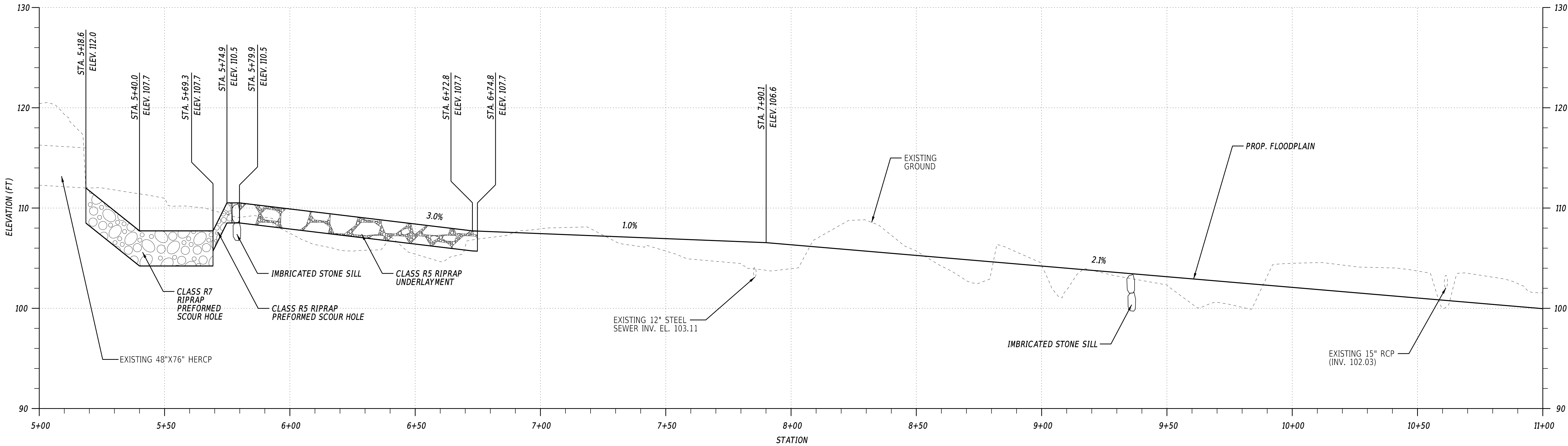
CONTRACT	2139-00
DESIGNED BY:	J. GALBO
CHECKED BY:	T. CUTILLO

CONSTRUCTION PLAN	

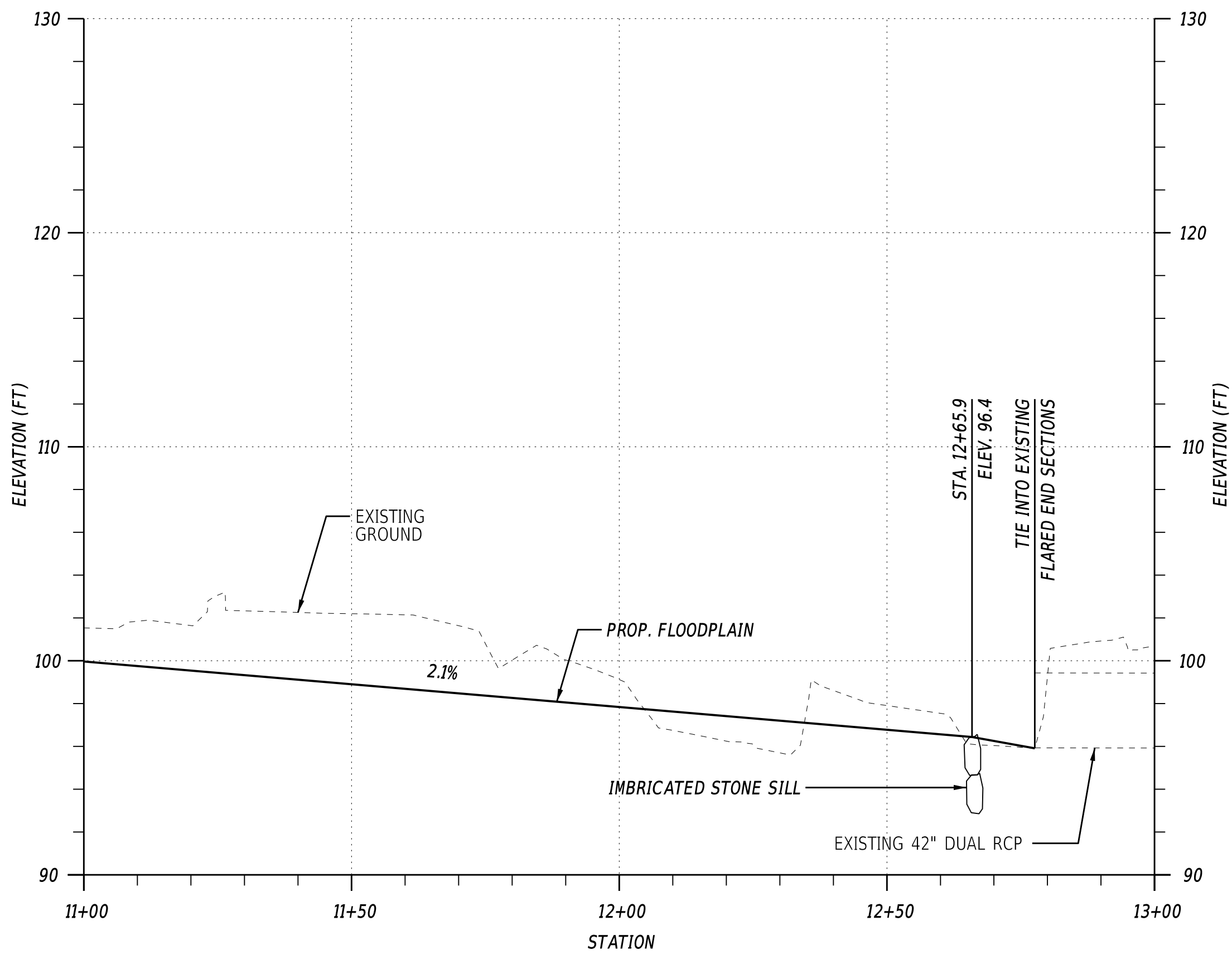
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SECTION
RKK
SHEET NO.
9

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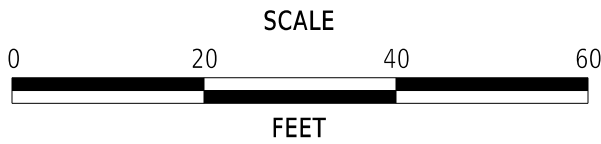


TRIBUTARY 2 FLOODPLAIN



TRIBUTARY 2 FLOODPLAIN

ADDENDA / REVISIONS	



LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



CONTRACT	2139-00
DESIGNED BY:	J. GALBO
CHECKED BY:	T. CUTILLO

PROFILES
STREAM RESTORATION

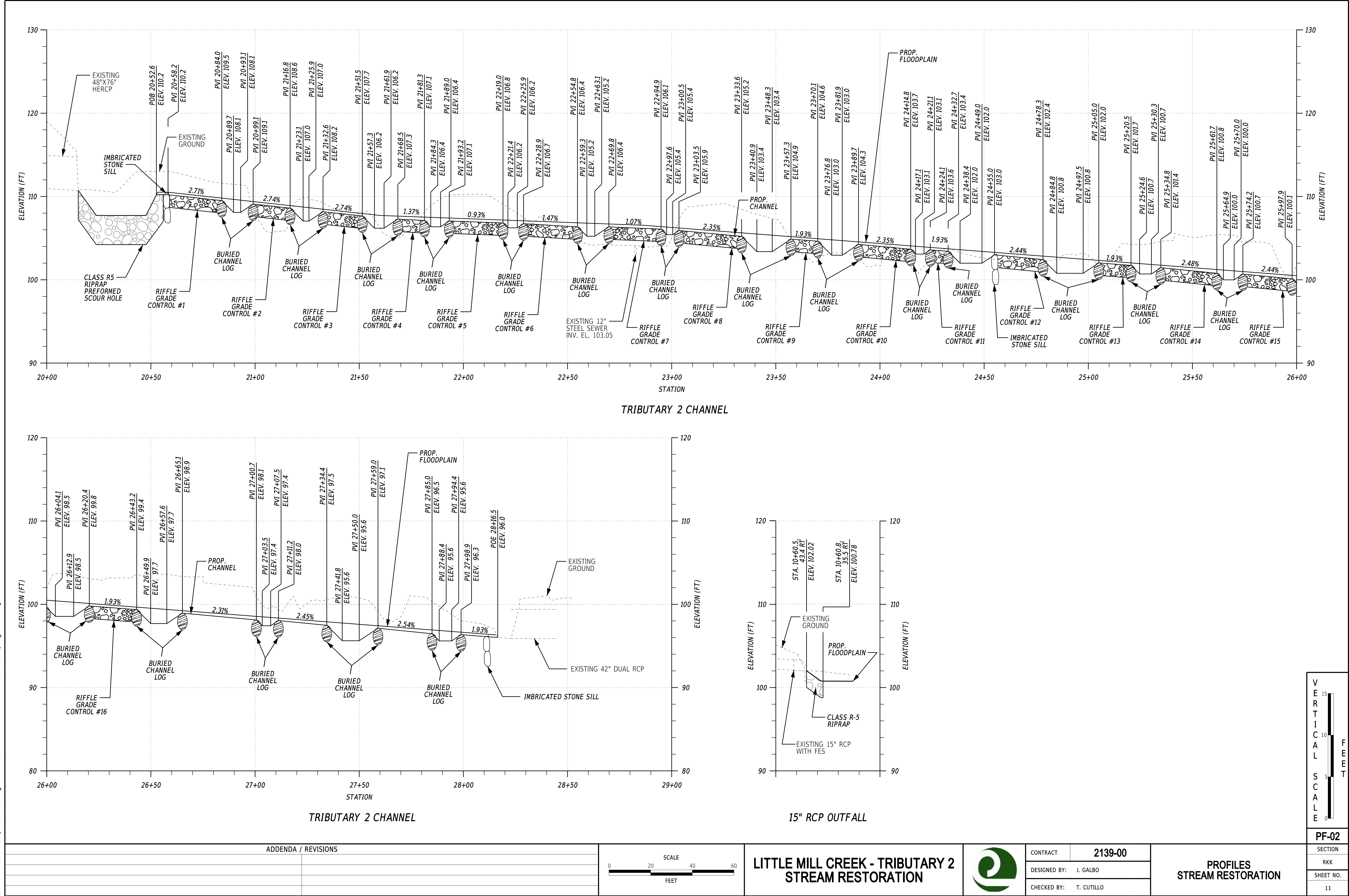
VERTICAL
SCALE
0
5
10
15
FEET

PF-01

SECTION
RKK

SHEET NO.
10

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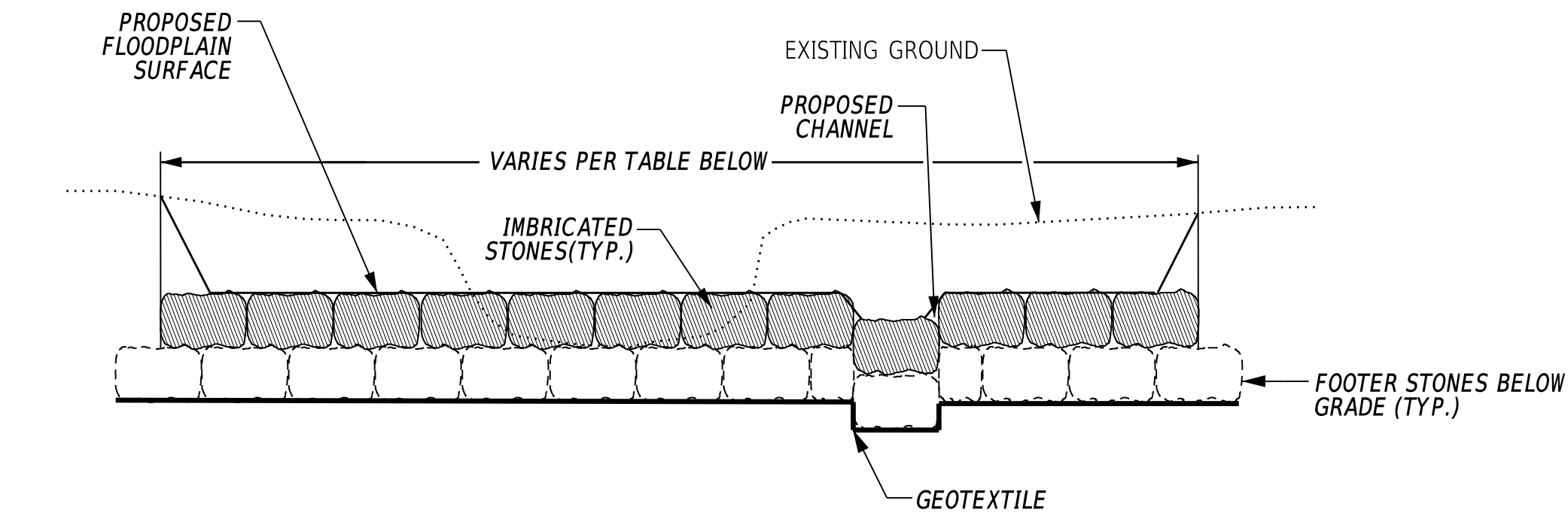


ENERGY DISSIPATOR DETAIL

RIFFLE GRADE CONTROL STRUCTURE

NOTE:

CLAY CHANNEL BARRIERS

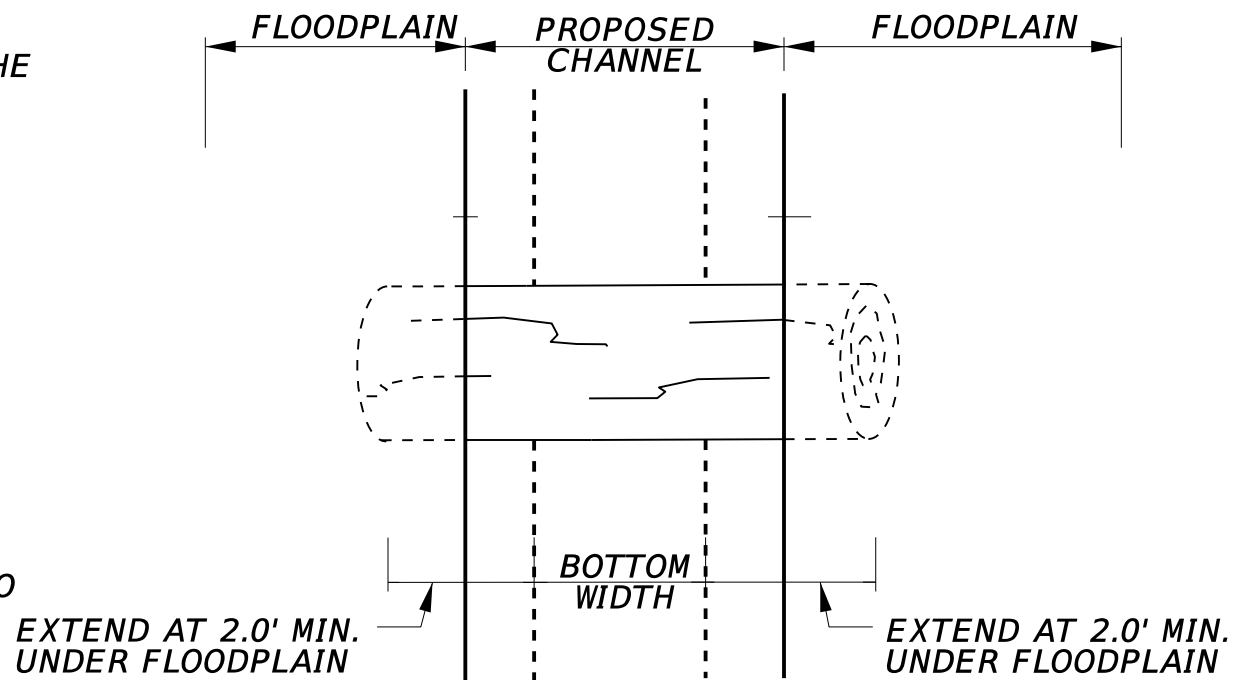


LEFT END OF STONE SILL			RIGHT END OF STONE SILL			TOTAL LENGTH (FT)
NORTHING	EASTING	TOP OF STONE ELEV.	NORTHING	EASTING	TOP OF STONE ELEV.	
635991.32	597991.62	110.5	635952.88	597970.21	110.5	44.0'
635672.18	598165.74	103.3	635656.86	598114.36	103.3	55.0'
635466.57	598380.04	96.4	635444.24	598375.89	96.4	23.0'

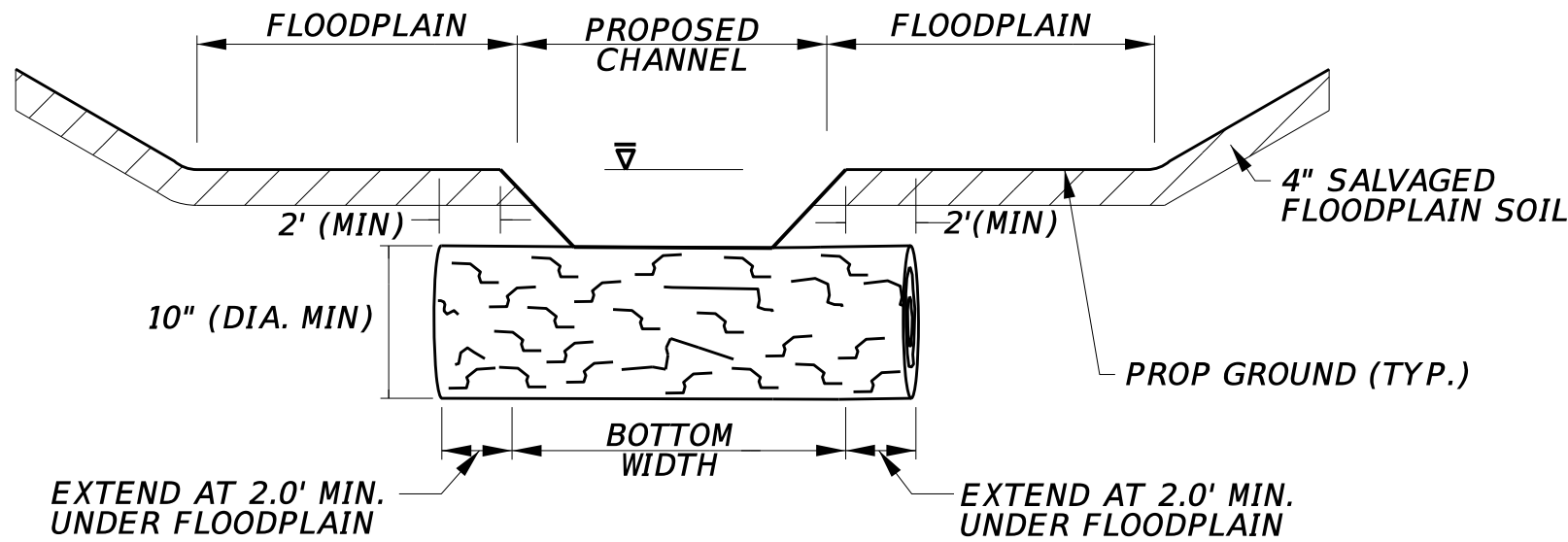
IMBRICATED STONE SILL DETAIL

NOTES:
1. LOGS BURIED IN THE CHANNEL SHALL HAVE A MIN. DIAMETER OF 10". LOGS SHALL BE HARVESTED FROM TREES TO BE REMOVED WITHIN THE PERMITTED LIMIT OF CONSTRUCTION.

2. BURIED CHANNEL LOGS SHALL BE PLACED PERPENDICULAR TO THE CHANNEL.



PLAN VIEW



SECTION VIEW
STRAIGHT CHANNEL LOG

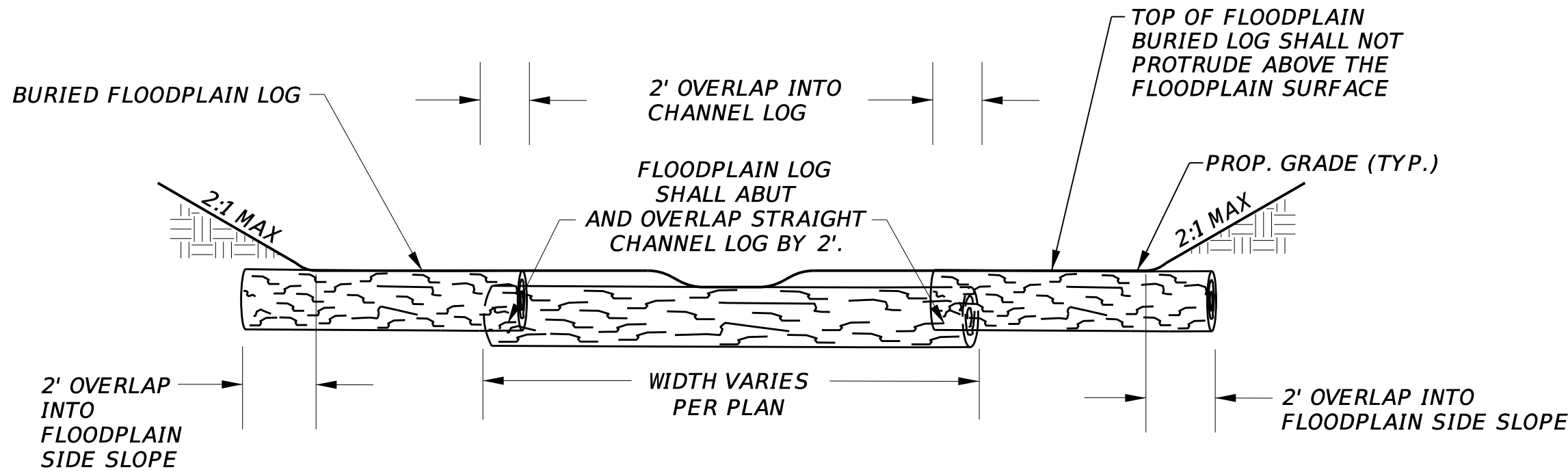
BURIED CHANNEL LOG PLACEMENT DETAILS

NOTES:
1. LOGS BURIED IN THE FLOODPLAIN AND CHANNEL SHALL HAVE A MINIMUM DIAMETER OF 10". LOGS SHALL BE STACKED VERTICALLY IF MINIMUM DEPTH NOT MET WITH SINGLE LOG.

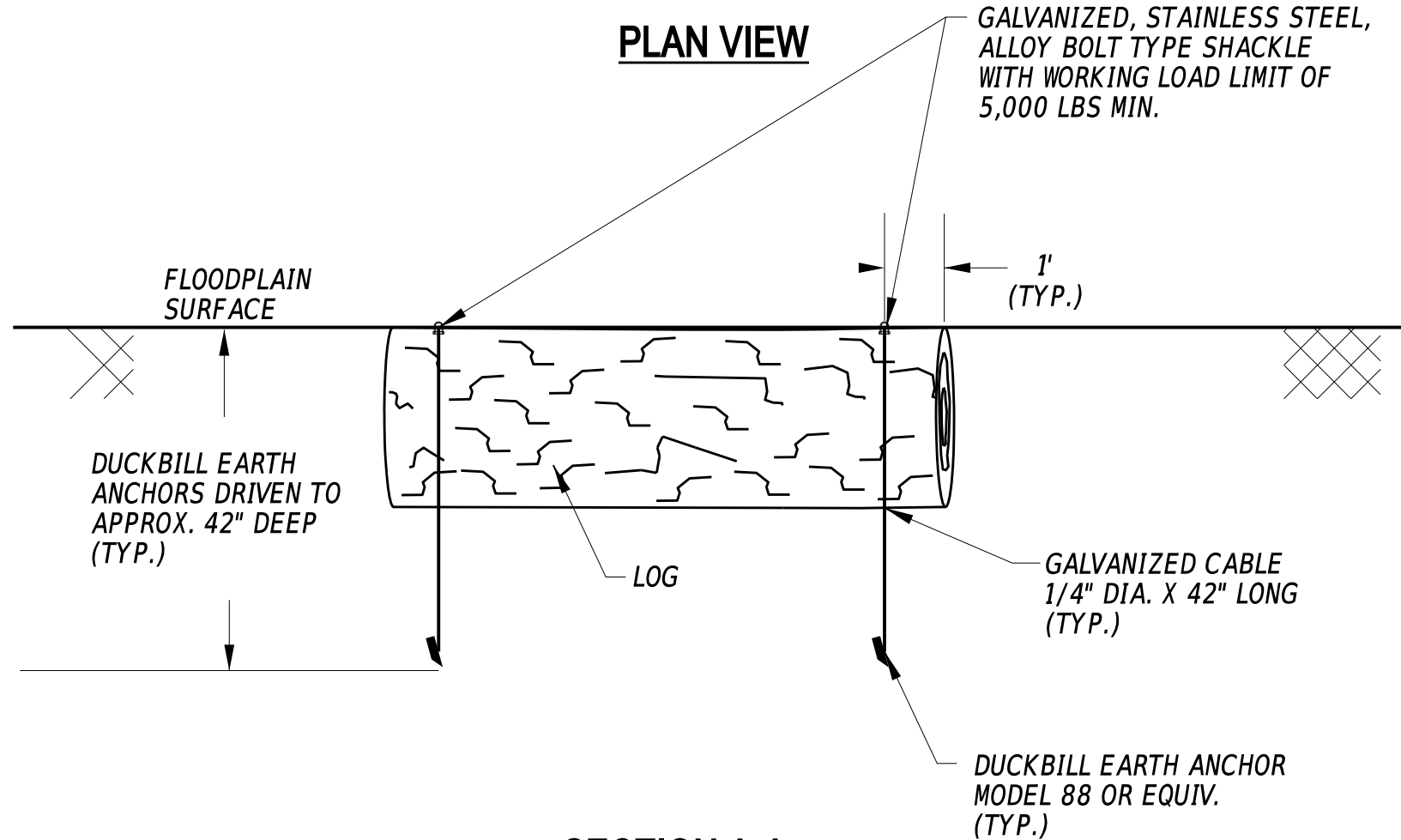
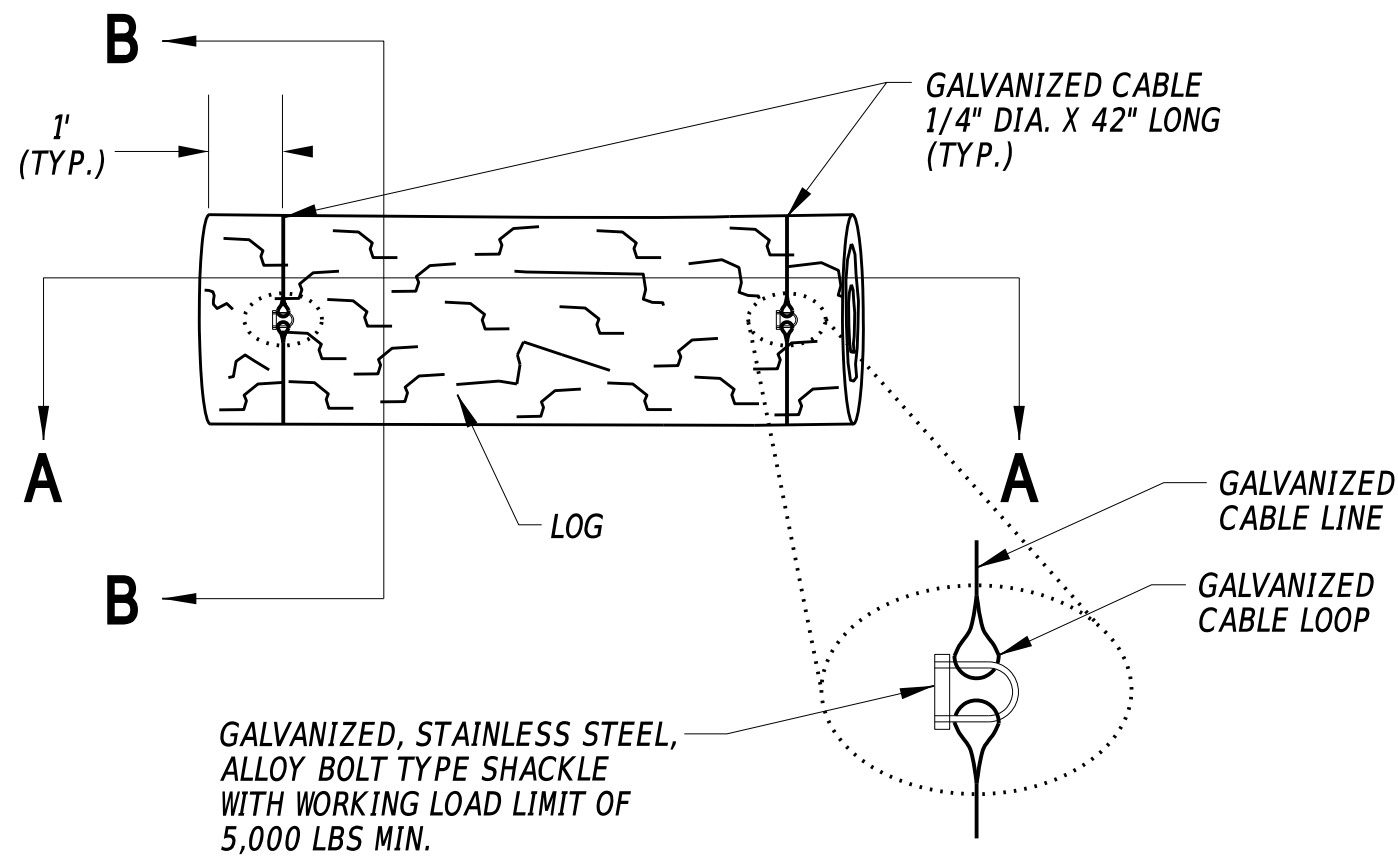
2. LOGS SHALL BE HARVESTED FROM TREES TO BE REMOVED WITHIN THE PERMITTED LIMIT OF CONSTRUCTION.

3. BURIED LOGS SHALL BE ANCHORED PER DETAIL ON THIS SHEET.

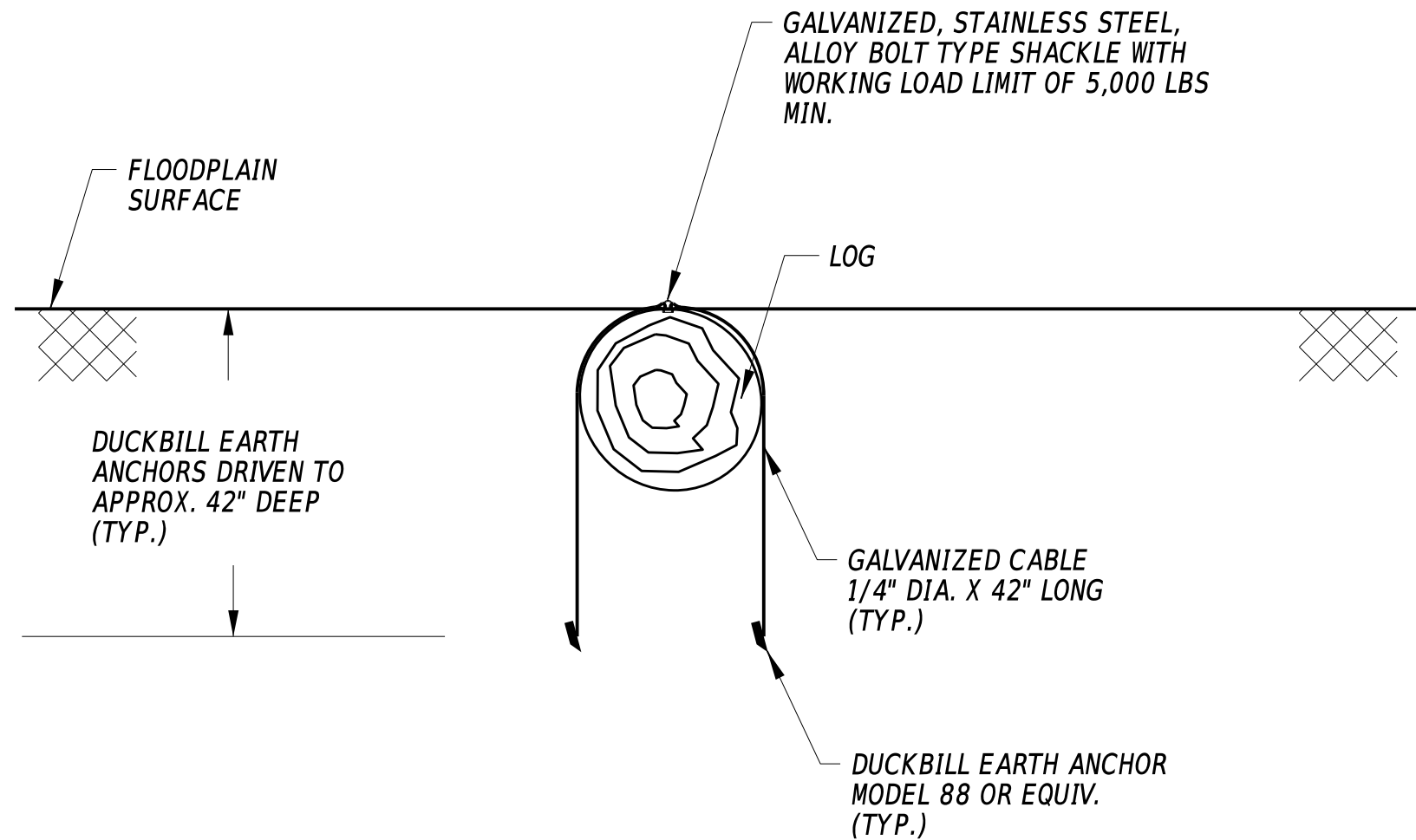
4. LOGS SHALL NOT PROTRUDE ABOVE THE FLOODPLAIN SURFACE AND SHALL BE PLACED IN ACCORDANCE WITH THE PLANS.



CONTINUOUS LOG SILL PLACEMENT DETAIL



SECTION A-A



SECTION B-B

LOG ANCHOR DETAIL

ADDENDA / REVISIONS

NOT TO SCALE

LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION

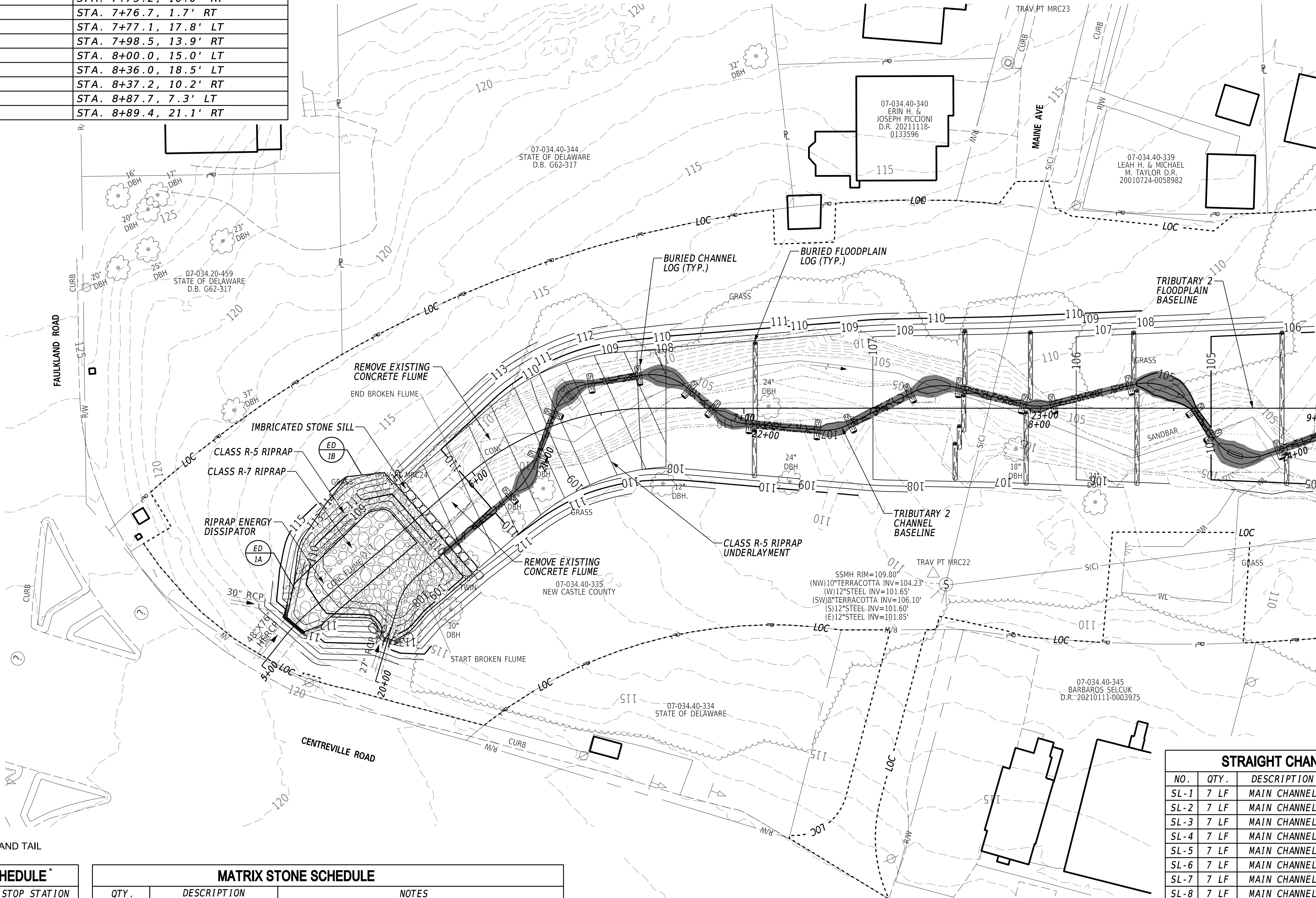


CONTRACT 2139-00
DESIGNED BY: J. GALBO
CHECKED BY: T. CUTILLO

CONSTRUCTION DETAILS

SECTION RKK
SHEET NO. 13

BURIED FLOODPLAIN LOG SCHEDULE			
NO.	QTY.	DESCRIPTION	NOTES
BL-1	17 LF	MAIN CHANNEL	STA. 7+03.7, 15.7' RT
BL-2	28 LF	MAIN CHANNEL	STA. 7+04.0, 9.5' LT
BL-3	14 LF	MAIN CHANNEL	STA. 7+73.7, 18.5' RT
BL-4	9 LF	MAIN CHANNEL	STA. 7+75.2, 10.0' RT
BL-5	14 LF	MAIN CHANNEL	STA. 7+76.7, 1.7' RT
BL-6	20 LF	MAIN CHANNEL	STA. 7+77.1, 17.8' LT
BL-7	26 LF	MAIN CHANNEL	STA. 7+98.5, 13.9' RT
BL-8	24 LF	MAIN CHANNEL	STA. 8+00.0, 15.0' LT
BL-9	17 LF	MAIN CHANNEL	STA. 8+36.0, 18.5' LT
BL-10	34 LF	MAIN CHANNEL	STA. 8+37.2, 10.2' RT
BL-11	40 LF	MAIN CHANNEL	STA. 8+87.7, 7.3' LT
BL-12	12 LF	MAIN CHANNEL	STA. 8+89.4, 21.1' RT



* SEE PROFILES ON SHEET 11 FOR CREST AND TAIL ELEVATIONS

RIFFLE GRADE CONTROL SCHEDULE*			
STRUCTURE	START STATION	STOP STATION	
1	20+58.2	20+84.0	
2	20+99.1	21+16.8	
3	21+32.6	21+51.5	
4	21+68.5	21+81.3	
5	21+93.2	22+19.0	
6	22+28.9	22+54.8	
7	22+69.8	22+94.9	
8	23+03.5	23+33.6	
9	23+57.3	23+70.1	
10	23+89.7	24+14.8	

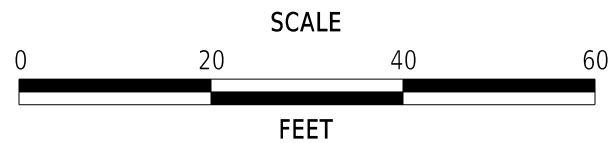
MATRIX STONE SCHEDULE			
QTY.	DESCRIPTION	NOTES	
2 TN	MAIN CHANNEL	STA. 20+58.2 TO 20+84.0, LT & RT	
1 TN	MAIN CHANNEL	STA. 20+99.1 TO 21+16.8, LT & RT	
1 TN	MAIN CHANNEL	STA. 21+32.6 TO 21+51.5, LT & RT	
1 TN	MAIN CHANNEL	STA. 21+68.5 TO 21+81.3, LT & RT	
2 TN	MAIN CHANNEL	STA. 21+93.2 TO 22+19.0, LT & RT	
2 TN	MAIN CHANNEL	STA. 22+28.9 TO 22+54.8, LT & RT	
2 TN	MAIN CHANNEL	STA. 22+69.8 TO 22+94.9, LT & RT	
2 TN	MAIN CHANNEL	STA. 23+03.5 TO 23+33.6, LT & RT	
1 TN	MAIN CHANNEL	STA. 23+57.3 TO 23+70.1, LT & RT	
2 TN	MAIN CHANNEL	STA. 23+89.7 TO 24+14.8, LT & RT	

ROCK SILL SCHEDULE		
NO.	QUANTITY	NOTES
RS-1	10 TN	STA. 5+78.7, LT & RT

RIPRAP SCHEDULE			
NO.	QTY.	DESCRIPTION	NOTES
RR-2	260 CY	RIPRAP R-5 CHANNEL UNDERLAYMENT 22"	STA. 5+80.0 TO STA. 6+72.8, LT & RT

STRAIGHT CHANNEL LOG SCHEDULE			
NO.	QTY.	DESCRIPTION	NOTES
SL-1	7 LF	MAIN CHANNEL	STA. 20+83.0, LT & RT
SL-2	7 LF	MAIN CHANNEL	STA. 21+00.0, LT & RT
SL-3	7 LF	MAIN CHANNEL	STA. 21+15.9, LT & RT
SL-4	7 LF	MAIN CHANNEL	STA. 21+33.6, LT & RT
SL-5	7 LF	MAIN CHANNEL	STA. 21+50.5, LT & RT
SL-6	7 LF	MAIN CHANNEL	STA. 21+69.6, LT & RT
SL-7	7 LF	MAIN CHANNEL	STA. 21+80.1, LT & RT
SL-8	7 LF	MAIN CHANNEL	STA. 21+94.2, LT & RT
SL-9	7 LF	MAIN CHANNEL	STA. 22+18.1, LT & RT
SL-10	7 LF	MAIN CHANNEL	STA. 22+29.9, LT & RT
SL-11	7 LF	MAIN CHANNEL	STA. 22+53.3, LT & RT
SL-12	7 LF	MAIN CHANNEL	STA. 22+70.8, LT & RT
SL-13	7 LF	MAIN CHANNEL	STA. 22+93.9, LT & RT
SL-14	7 LF	MAIN CHANNEL	STA. 23+04.5, LT & RT
SL-15	7 LF	MAIN CHANNEL	STA. 23+32.0, LT & RT
SL-16	7 LF	MAIN CHANNEL	STA. 23+58.3, LT & RT
SL-17	7 LF	MAIN CHANNEL	STA. 23+69.1, LT & RT
SL-18	7 LF	MAIN CHANNEL	STA. 23+95.2, LT & RT

ADDENDA / REVISIONS



LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



CONTRACT	2139-00
DESIGNED BY:	J. GALBO
CHECKED BY:	T. CUTILLO

STREAM RESTORATION PLAN

SR-01
SECTION
RKK
SHEET NO.
14

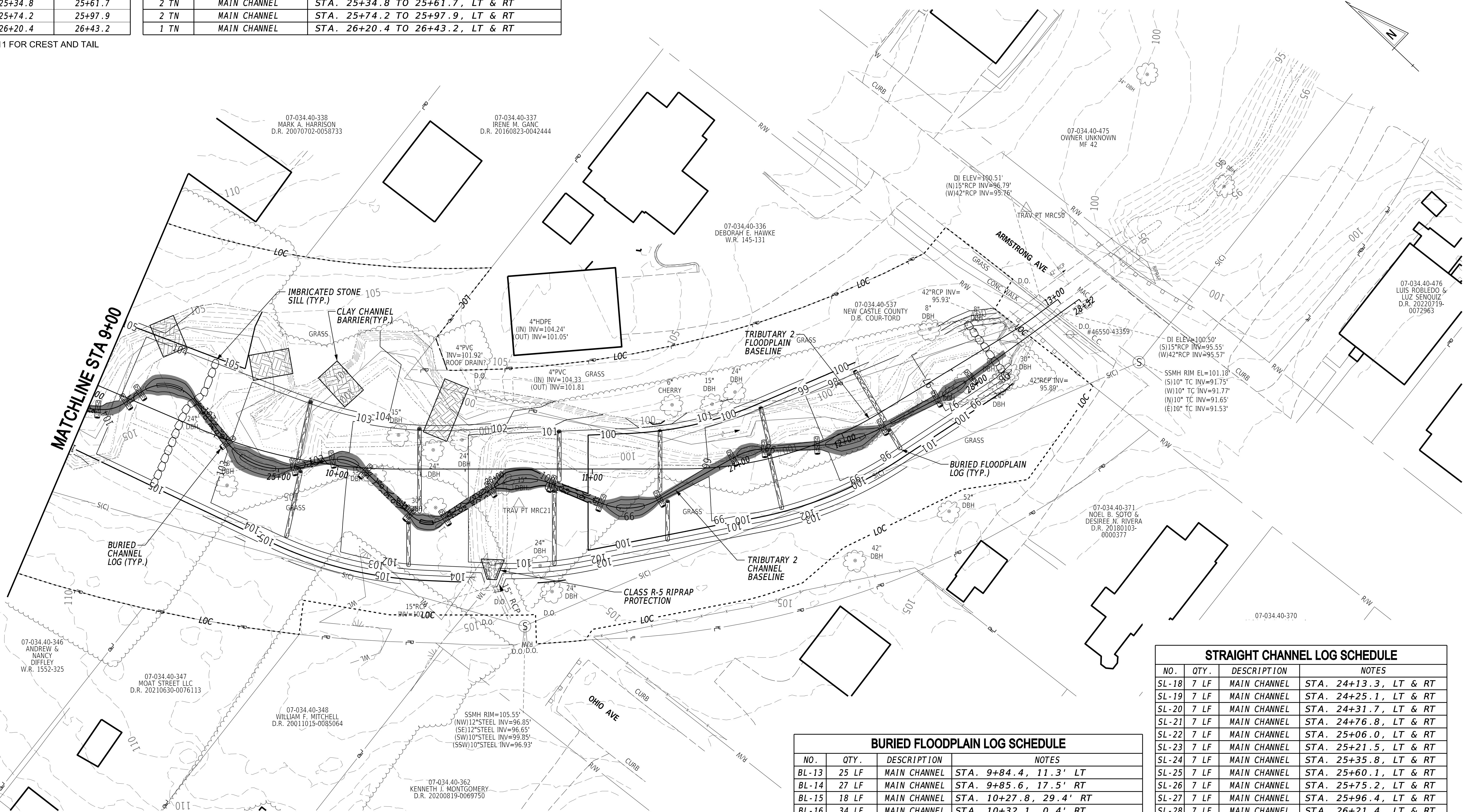
RIFFLE GRADE CONTROL SCHEDULE		
STRUCTURE	START STATION	STOP STATION
10	23+89.7	24+14.8
11	24+24.1	24+32.7
12	24+55.0	24+78.3
13	25+05.0	25+20.5
14	25+34.8	25+61.7
15	25+74.2	25+97.9
16	26+20.4	26+43.2

*SEE PROFILES ON SHEET 11 FOR CREST AND TAIL ELEVATIONS

MATRIX STONE SCHEDULE		
QTY.	DESCRIPTION	NOTES
2 TN	MAIN CHANNEL	STA. 23+89.7 TO 24+14.8, LT & RT
1 TN	MAIN CHANNEL	STA. 24+24.1 TO 24+32.7, LT & RT
2 TN	MAIN CHANNEL	STA. 24+55.0 TO 24+78.3, LT & RT
1 TN	MAIN CHANNEL	STA. 25+05.0 TO 25+20.5, LT & RT
2 TN	MAIN CHANNEL	STA. 25+34.8 TO 25+61.7, LT & RT
2 TN	MAIN CHANNEL	STA. 25+74.2 TO 25+97.9, LT & RT
1 TN	MAIN CHANNEL	STA. 26+20.4 TO 26+43.2, LT & RT

CLAY CHANNEL BARRIER SCHEDULE			
NO.	STATION	OFFSET	QUANTITY
CB-1	9+18.0	28.6' LT	20 CY
CB-2	9+62.7	33.5' LT	24 CY
CB-3	9+96.9	31.9' LT	23 CY
CB-4	10+42.4	23.2' LT	34 CY

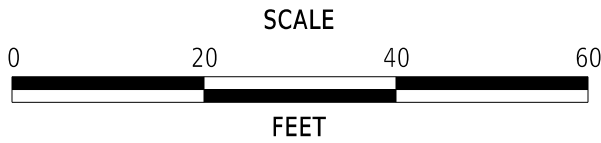
ROCK SILL SCHEDULE		
NO.	QUANTITY	NOTES
RS-2	14 TN	STA. 9+35.6, LT & RT
RS-3	7 TN	STA. 12+65.8, LT & RT



BURIED FLOODPLAIN LOG SCHEDULE			
NO.	QTY.	DESCRIPTION	NOTES
BL-13	25 LF	MAIN CHANNEL	STA. 9+84.4, 11.3' LT
BL-14	27 LF	MAIN CHANNEL	STA. 9+85.6, 17.5' RT
BL-15	18 LF	MAIN CHANNEL	STA. 10+27.8, 29.4' RT
BL-16	34 LF	MAIN CHANNEL	STA. 10+32.1, 0.4' RT
BL-17	30 LF	MAIN CHANNEL	STA. 10+85.0, 23.0' RT
BL-18	20 LF	MAIN CHANNEL	STA. 10+87.0, 5.2' LT
BL-19	25 LF	MAIN CHANNEL	STA. 11+26.6, 3.2' LT
BL-20	16 LF	MAIN CHANNEL	STA. 11+29.6, 20.2' RT
BL-21	23 LF	MAIN CHANNEL	STA. 11+70.2, 9.2' RT
BL-22	15 LF	MAIN CHANNEL	STA. 11+71.3, 13.0' LT
BL-23	10 LF	MAIN CHANNEL	STA. 12+16.7, 11.9' RT
BL-24	23 LF	MAIN CHANNEL	STA. 12+17.2, 7.7' LT

STRAIGHT CHANNEL LOG SCHEDULE			
NO.	QTY.	DESCRIPTION	NOTES
SL-18	7 LF	MAIN CHANNEL	STA. 24+13.3, LT & RT
SL-19	7 LF	MAIN CHANNEL	STA. 24+25.1, LT & RT
SL-20	7 LF	MAIN CHANNEL	STA. 24+31.7, LT & RT
SL-21	7 LF	MAIN CHANNEL	STA. 24+76.8, LT & RT
SL-22	7 LF	MAIN CHANNEL	STA. 25+06.0, LT & RT
SL-23	7 LF	MAIN CHANNEL	STA. 25+21.5, LT & RT
SL-24	7 LF	MAIN CHANNEL	STA. 25+35.8, LT & RT
SL-25	7 LF	MAIN CHANNEL	STA. 25+60.1, LT & RT
SL-26	7 LF	MAIN CHANNEL	STA. 25+75.2, LT & RT
SL-27	7 LF	MAIN CHANNEL	STA. 25+96.4, LT & RT
SL-28	7 LF	MAIN CHANNEL	STA. 26+21.4, LT & RT
SL-29	7 LF	MAIN CHANNEL	STA. 26+42.2, LT & RT
SL-30	7 LF	MAIN CHANNEL	STA. 26+66.1, LT & RT
SL-31	7 LF	MAIN CHANNEL	STA. 26+99.0, LT & RT
SL-32	7 LF	MAIN CHANNEL	STA. 27+12.2, LT & RT
SL-33	7 LF	MAIN CHANNEL	STA. 27+32.9, LT & RT
SL-34	7 LF	MAIN CHANNEL	STA. 27+60.0, LT & RT
SL-35	7 LF	MAIN CHANNEL	STA. 27+84.0, LT & RT
SL-36	7 LF	MAIN CHANNEL	STA. 27+99.9, LT & RT

ADDENDA / REVISIONS



LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



CONTRACT	2139-00
DESIGNED BY:	J. GALBO
CHECKED BY:	T. CUTILLO

STREAM RESTORATION PLAN

SR-02

SECTION

RKK

SHEET NO.

15

ENVIRONMENTAL COMPLIANCE NOTES

1. GENERAL NOTES:
- A.

THE PURPOSE OF THIS SHEET IS TO IDENTIFY THOSE ITEMS ASSOCIATED WITH ENVIRONMENTAL COMPLIANCE. IMPACT CALCULATIONS ARE FOR THE AGENCY PERMIT REPORTING PURPOSES ONLY AND ARE NOT TO BE USED FOR BIDDING PURPOSES.
- B.

IF A DEPARTURE FROM THE APPROVED PLANS (WHICH WOULD AFFECT ANY NATURAL AND/OR CULTURAL RESOURCES) IS NECESSARY, APPROPRIATE ENVIRONMENTAL APPROVALS AND COORDINATION MUST BE COMPLETED BY NEW CASTLE CONSERVATION DISTRICT. NO CONSTRUCTION THAT DEPARTS FROM THESE APPROVAL PLANS CAN PROCEED UNTIL REQUIRED APPROVALS AND COORDINATION IS COMPLETE.
- C.

USE OF THIS SHEET DOES NOT ALLEVIATE THE CONTRACTOR'S RESPONSIBILITY TO COMPLY WITH ALL CONDITIONS SET FORTH IN THE PERMITS.
2. NATURAL RESOURCE ISSUES:
- A.

PERMIT REQUIREMENTS/APPROVALS*:
U.S. ARMY CORPS OF ENGINEERS (COE): NATIONWIDE PERMIT NWP 27 w/PCN** - TBD
DNREC - WETLANDS & SUBAQUEOUS LANDS (WSLS): SUBAQUEOUS LANDS PERMIT REQUIRED - TBD
DNREC - WATER QUALITY (WQC) & COASTAL ZONE CONSISTENCY (CZM): ISSUED FOR NWP 27 - TBD
- *

THE PERMITS/APPROVALS LISTED ARE THOSE REQUIRED FOR THIS PROJECT. THE NEW CASTLE CONSERVATION DISTRICT IS RESPONSIBLE FOR COORDINATING AND/OR OBTAINING HIS APPROVAL.
- **

THE CONTRACTOR MUST ENSURE THAT THESE PERMITS/APPROVALS ARE IN THEIR POSSESSION PRIOR TO BEGINNING CONSTRUCTION IN THE PERMITTED AREA(S) AND ENSURE IT IS DISPLAYED ON-SITE DURING THE ENTIRE CONSTRUCTION PERIOD.
- B.

CONSTRUCTION RESTRICTIONS:
FISHERIES - NO IN-WATER WORK BETWEEN MARCH 1ST AND JUNE 30TH
ENDANGERED SPECIES - NONE
MIGRATORY BIRDS - NONE
3. CULTURAL RESOURCE ISSUES:
- A.

ON SEPTEMBER 3, 2025, DE SHPO ISSUED A SECTION 106 FINDING OF NO HISTORIC PROPERTIES AFFECTED. THERE ARE NON CULTURAL RESOURCE CONCERNS AS LONG AS THE PROJECT SCOPE IS NOT MODIFIED AND ALL STAGING AND STOCKPILING REMAIN WITHIN THE EXISTING LIMIT OF CONSTRUCTION. SHOULD IT BE NECESSARY TO ADD ADDITIONAL ACCESS LOCATIONS, OTHER STOCKPILING/STAGING AREAS, OR OTHERWISE ALTER THE SCOPE OF THE PROJECT, NCCD STAFF WILL NEED TO BE CONTACTED IN ORDER TO REVIEW THESE CHANGES FOR POTENTIAL CULTURAL RESOURCE CONCERNS.
4. THE CONTRACTOR SHALL ACCESS THE STREAM FROM THE STAGING AREAS AND ACCESS ROADS ONLY. CONTRACTOR ACCESS BEYOND THE LOC (AS DEFINED ON THESE PLANS) IS STRICTLY PROHIBITED. ANY CHANGE IN THE LOC MUST BE COORDINATED WITH THE NEW CASTLE CONSERVATION DISTRICT.
5. PROTECTION OF RESOURCES:
- A.

KEEP CLEARING IN WETLAND AREAS TO A MINIMUM ABSOLUTELY NECESSARY FOR CONSTRUCTION ACCESS. IN WETLAND AREAS THAT ARE CLEARED, NO GRUBBING EXCEPT WHERE NECESSARY TO CONSTRUCT PROJECT COMPONENTS IS PERMITTED.
- B.

CONSTRUCTION SAFETY FENCE SHALL BE USED ALONG THE LIMITS OF CONSTRUCTION IN ALL AREAS WHERE WATER/WETLANDS EXIST WITHIN 20 FEET OF THE LOC. CONTRACTOR ACCESS BEYOND THE LOD IS STRICTLY PROHIBITED.
- C.

CLEARLY MARK ALL TREES TO BE REMOVED WITH PAINT PRIOR TO THE EROSION AND SEDIMENT CONTROL MEETING.
6. PLANTINGS - SEE LANDSCAPE PLANS FOR DETAILS REGARDING PLANTINGS. ANY CHANGE TO THE LANDSCAPE PLANS SHALL BE COORDINATED THROUGH THE NEW CASTLE CONSERVATION DISTRICT AND RESOURCE AGENCIES, AS APPROPRIATE.
7. WETLAND AREAS WERE DELINEATED BY KARL HELLMANN - RK&K IN MARCH 2025 IN ACCORDANCE WITH THE US ARMY CORPS OF ENGINEERS WETLAND DELINEATION MANUAL (1987) AND THE EASTERN MOUNTAIN PIEDMONT REGIONAL SUPPLEMENT (2010).

USACE SUMMARY TABLE			
IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)
TOTAL OPEN WATER CREATION AREA	2,686.61	0.0617	N/A
TOTAL OPEN WATER ENHANCEMENT AREA	398.08	0.0091	N/A
TOTAL PERMANENT OPEN WATER IMPACT AREA	6,711.68	0.1541	61.57
TOTAL TEMPORARY OPEN WATER IMPACT AREA	34.89	0.0008	0.32
TOTAL WETLAND CREATION AREA	21,955.74	0.5040	N/A
TOTAL WETLAND ENHANCEMENT AREA	96.36	0.0022	N/A
TOTAL PERMANENT WETLAND IMPACT AREA	175.37	0.0040	N/A
TOTAL TEMPORARY WETLAND IMPACT AREA	526.42	0.0121	N/A

DNREC SUMMARY TABLE			
IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)
TOTAL OPEN WATER CREATION AREA	2,686.61	0.0617	N/A
TOTAL OPEN WATER ENHANCEMENT AREA	398.08	0.0091	N/A
TOTAL PERMANENT OPEN WATER IMPACT AREA	6,711.68	0.1541	61.57
TOTAL TEMPORARY OPEN WATER IMPACT AREA	34.89	0.0008	0.32

ADDENDA / REVISIONS

NOT TO SCALE

LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



CONTRACT	2139-00
DESIGNED BY:	H. AZIZ
CHECKED BY:	J. REEL

ENVIRONMENTAL
COMPLIANCE PLAN

SECTION
RKK
SHEET NO.
16

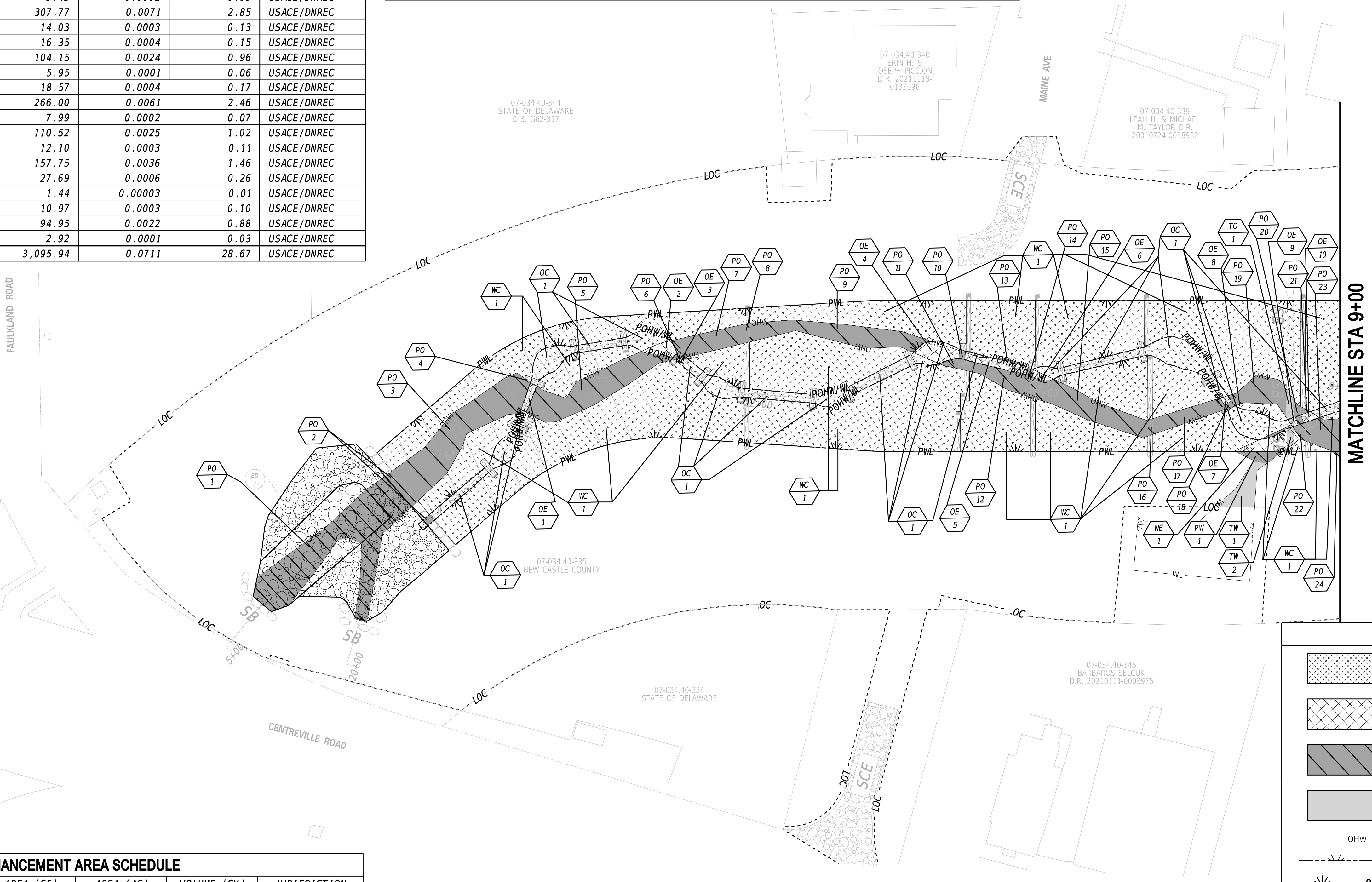
PERMANENT OPEN WATER IMPACT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
1-PO-1	RIPRAP	802.38	0.018	7.43	USACE/DNREC
1-PO-2	IMBRICATED STONE SILL	42.30	0.0010	0.39	USACE/DNREC
1-PO-3	CONVERSION OF OHW TO WETLAND	548.12	0.013	5.08	USACE/DNREC
1-PO-4	FLOODPLAIN LOG	2.15	0.00005	0.02	USACE/DNREC
1-PO-5	CONVERSION OF OHW TO WETLAND	381.72	0.0088	3.53	USACE/DNREC
1-PO-6	FLOODPLAIN LOG	9.59	0.0002	0.09	USACE/DNREC
1-PO-7	CONVERSION OF OHW TO WETLAND	141.10	0.0032	1.31	USACE/DNREC
1-PO-8	FLOODPLAIN LOG	9.43	0.0002	0.09	USACE/DNREC
1-PO-9	CONVERSION OF OHW TO WETLAND	307.77	0.0071	2.85	USACE/DNREC
1-PO-10	FLOODPLAIN LOG	14.03	0.0003	0.13	USACE/DNREC
1-PO-11	CONVERSION OF OHW TO WETLAND	16.35	0.0004	0.15	USACE/DNREC
1-PO-12	CONVERSION OF OHW TO WETLAND	104.15	0.0024	0.96	USACE/DNREC
1-PO-13	CONVERSION OF OHW TO WETLAND	5.95	0.0001	0.06	USACE/DNREC
1-PO-14	FLOODPLAIN LOG	18.57	0.0004	0.17	USACE/DNREC
1-PO-15	CONVERSION OF OHW TO WETLAND	266.00	0.0061	2.46	USACE/DNREC
1-PO-16	FLOODPLAIN LOG	7.99	0.0002	0.07	USACE/DNREC
1-PO-17	CONVERSION OF OHW TO WETLAND	110.52	0.0025	1.02	USACE/DNREC
1-PO-18	FLOODPLAIN LOG	12.10	0.0003	0.11	USACE/DNREC
1-PO-19	CONVERSION OF OHW TO WETLAND	157.75	0.0036	1.46	USACE/DNREC
1-PO-20	FLOODPLAIN LOG	27.69	0.0006	0.26	USACE/DNREC
1-PO-21	CONVERSION OF OHW TO WETLAND	1.44	0.00003	0.01	USACE/DNREC
1-PO-22	CONVERSION OF OHW TO WETLAND	10.97	0.0003	0.10	USACE/DNREC
1-PO-23	CONVERSION OF OHW TO WETLAND	94.95	0.0022	0.88	USACE/DNREC
1-PO-24	FILL	2.92	0.0001	0.03	USACE/DNREC
TOTAL FOR THIS SHEET		3,095.94	0.0711	28.67	USACE/DNREC

TEMPORARY OPEN WATER IMPACT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
1-TO-1	SANDBAG DIKE	22.67	0.0005	0.21	USACE/DNREC
TOTAL FOR THIS SHEET		22.67	0.0005	0.21	USACE/DNREC

TEMPORARY WETLAND IMPACT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
1-TW-1	CONSTRUCTION ACCESS	100.32	0.0023	N/A	USACE
1-TW-2	SANDBAG DIKE	15.83	0.0004	N/A	USACE
TOTAL FOR THIS SHEET		116.15	0.0027	N/A	USACE

WETLAND ENHANCEMENT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
1-WE-1	WETLAND ENHANCEMENT	83.53	0.0019	N/A	USACE
TOTAL FOR THIS SHEET		83.53	0.0019	N/A	USACE

PERMANENT WETLAND IMPACT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
1-PW-1	FILL	36.25	0.0008	N/A	USACE
TOTAL FOR THIS SHEET		36.25	0.0008	N/A	USACE



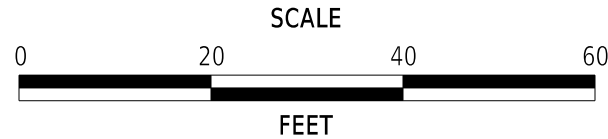
OPEN WATER ENHANCEMENT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
1-OE-1	CHANNEL ENHANCEMENT	21.64	0.0005	N/A	USACE/DNREC
1-OE-2	CHANNEL ENHANCEMENT	36.67	0.0008	N/A	USACE/DNREC
1-OE-3	CHANNEL ENHANCEMENT	0.86	0.00002	N/A	USACE/DNREC
1-OE-4	CHANNEL ENHANCEMENT	67.14	0.0015	N/A	USACE/DNREC
1-OE-5	CHANNEL ENHANCEMENT	54.88	0.0013	N/A	USACE/DNREC
1-OE-6	CHANNEL ENHANCEMENT	13.09	0.0003	N/A	USACE/DNREC
1-OE-7	CHANNEL ENHANCEMENT	6.41	0.0001	N/A	USACE/DNREC
1-OE-8	CHANNEL ENHANCEMENT	0.04	0.000001	N/A	USACE/DNREC
1-OE-9	CHANNEL ENHANCEMENT	6.63	0.0002	N/A	USACE/DNREC
1-OE-10	CHANNEL ENHANCEMENT	12.36	0.0003	N/A	USACE/DNREC
TOTAL FOR THIS SHEET		219.72	0.0050	N/A	USACE/DNREC

WETLAND CREATION AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
1-WC-1	WETLAND CREATION	10,661.02	0.2447	N/A	USACE
TOTAL WETLAND CREATION AREAS		10,661.02	0.2447	N/A	USACE

OPEN WATER CREATION AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
1-OC-1	STREAM CREATION	1,031.29	0.0237	N/A	USACE/DNREC
TOTAL OPEN WATER CREATION AREAS		1,031.29	0.0237	N/A	USACE/DNREC

LEGEND	
	CREATION AREA
	ENHANCEMENT AREA
	PERMANENT IMPACT AREA
	TEMPORARY IMPACT AREA
	ORDINARY HIGH WATER
	WETLAND BOUNDARY
	PROPOSED ORD. HIGH WATER / WETLAND
	PROPOSED WETLAND BOUNDARY
	IMPACT AREA TYPE ID. (SEE BELOW)
	IMPACT AREA ID. AND/OR NUMBER
O = OPEN WATER IMPACT	P = PERMANENT IMPACT
E = ENHANCEMENT AREA	T = TEMPORARY IMPACT
C = CREATION AREA	W = WETLAND IMPACT

ADDENDA / REVISIONS	



LITTLE MILL CREEK - TRIBUTARY 2 STREAM RESTORATION



CONTRACT	2139-00
DESIGNED BY:	H. AZIZ
CHECKED BY:	J. REEL

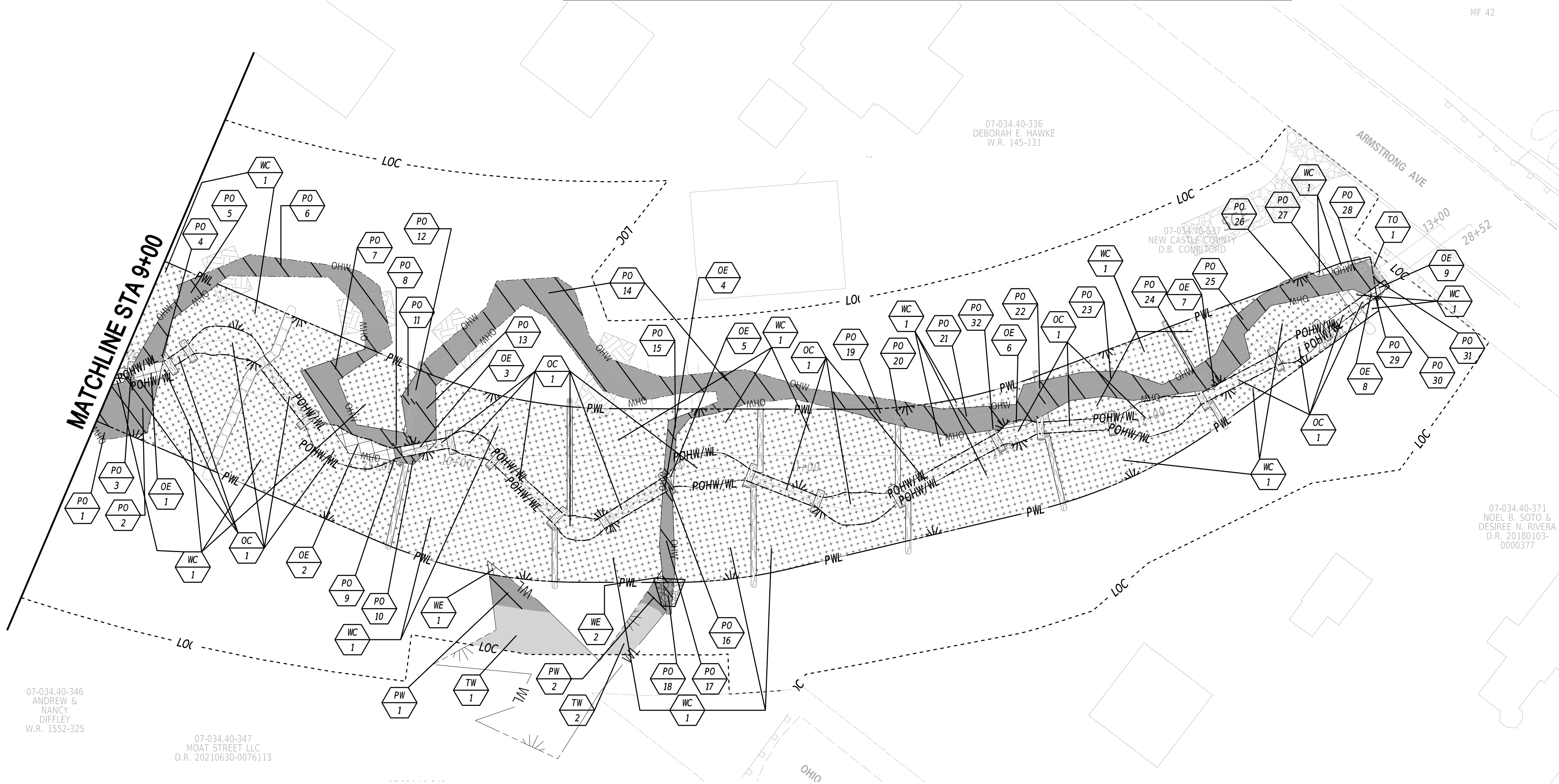
ENVIRONMENTAL COMPLIANCE PLAN

EC-01
SECTION
RKK
SHEET NO.
17

PERMANENT OPEN WATER IMPACT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
2-PO-1	FILL	27.92	0.0006	0.26	USACE/DNREC
2-PO-2	CONVERSION OF OHW TO WETLAND	198.45	0.0046	1.84	USACE/DNREC
2-PO-3	FLOODPLAIN LOG	9.93	0.0002	0.09	USACE/DNREC
2-PO-4	FLOODPLAIN LOG	1.51	0.00003	0.01	USACE/DNREC
2-PO-5	CONVERSION OF OHW TO WETLAND	157.41	0.0036	1.46	USACE/DNREC
2-PO-6	FILL	374.22	0.0086	3.47	USACE/DNREC
2-PO-7	CONVERSION OF OHW TO WETLAND	262.52	0.0060	2.43	USACE/DNREC
2-PO-8	FLOODPLAIN LOG	15.92	0.0004	0.15	USACE/DNREC
2-PO-9	CONVERSION OF OHW TO WETLAND	0.59	0.00001	0.01	USACE/DNREC
2-PO-10	CONVERSION OF OHW TO WETLAND	7.88	0.0002	0.07	USACE/DNREC
2-PO-11	CONVERSION OF OHW TO WETLAND	20.39	0.0005	0.19	USACE/DNREC
2-PO-12	FLOODPLAIN LOG	32.38	0.0007	0.30	USACE/DNREC
2-PO-13	CONVERSION OF OHW TO WETLAND	127.81	0.0029	1.18	USACE/DNREC
2-PO-14	FILL	1,106.67	0.0254	10.25	USACE/DNREC
2-PO-15	CONVERSION OF OHW TO WETLAND	70.37	0.0016	0.44	USACE/DNREC

2-PO-16	FLOODPLAIN LOG	9.76	0.0002	0.06	USACE/DNREC
2-PO-17	CONVERSION OF OHW TO WETLAND	94.58	0.0022	0.60	USACE/DNREC
2-PO-18	RIPRAP	20.30	0.0005	0.13	USACE/DNREC
2-PO-19	CONVERSION OF OHW TO WETLAND	38.03	0.0009	0.35	USACE/DNREC
2-PO-20	FLOODPLAIN LOG	10.05	0.0002	0.09	USACE/DNREC
2-PO-21	CONVERSION OF OHW TO WETLAND	293.92	0.0067	2.72	USACE/DNREC
2-PO-22	FLOODPLAIN LOG	15.51	0.0004	0.14	USACE/DNREC
2-PO-23	CONVERSION OF OHW TO WETLAND	294.10	0.0068	2.72	USACE/DNREC
2-PO-24	FLOODPLAIN LOG	12.93	0.0003	0.12	USACE/DNREC
2-PO-25	CONVERSION OF OHW TO WETLAND	307.14	0.0071	2.84	USACE/DNREC
2-PO-26	FILL	8.32	0.0002	0.08	USACE/DNREC
2-PO-27	IMBRICATED STONE SILL	16.87	0.0004	0.16	USACE/DNREC
2-PO-28	CONVERSION OF OHW TO WETLAND	72.65	0.0017	0.67	USACE/DNREC
2-PO-29	CONVERSION OF OHW TO WETLAND	0.52	0.00001	0.005	USACE/DNREC
2-PO-30	FILL	2.04	0.00005	0.02	USACE/DNREC
2-PO-31	FILL	4.81	0.0001	0.04	USACE/DNREC
2-PO-32	FLOODPLAIN LOG	0.24	0.00001	0.002	USACE/DNREC
TOTAL FOR THIS SHEET		3,615.74	0.0830	32.90	USACE/DNREC

OPEN WATER ENHANCEMENT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
2-OE-1	CHANNEL ENHANCEMENT	36.50	0.0008	N/A	USACE/DNREC
2-OE-2	CHANNEL ENHANCEMENT	79.11	0.0018	N/A	USACE/DNREC
2-OE-3	CHANNEL ENHANCEMENT	27.48	0.0006	N/A	USACE/DNREC
2-OE-4	CHANNEL ENHANCEMENT	2.07	0.00005	N/A	USACE/DNREC
2-OE-5	CHANNEL ENHANCEMENT	6.58	0.0002	N/A	USACE/DNREC
2-OE-6	CHANNEL ENHANCEMENT	10.91	0.0003	N/A	USACE/DNREC
2-OE-7	CHANNEL ENHANCEMENT	1.30	0.00003	N/A	USACE/DNREC
2-OE-8	CHANNEL ENHANCEMENT	5.89	0.0001	N/A	USACE/DNREC
2-OE-9	CHANNEL ENHANCEMENT	8.52	0.0002	N/A	USACE/DNREC
TOTAL FOR THIS SHEET		178.36	0.0041	N/A	USACE/DNREC



TEMPORARY WETLAND IMPACT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
2-TW-1	CONSTRUCTION ACCESS	295.08	0.0068	N/A	USACE
2-TW-2	CONSTRUCTION ACCESS	115.19	0.0026	N/A	USACE
TOTAL FOR THIS SHEET		410.27	0.0094	N/A	USACE

PERMANENT WETLAND IMPACT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
2-PW-1	EXCAVATION	97.93	0.0022	N/A	USACE
2-PW-2	EXCAVATION	41.19	0.0009	N/A	USACE
TOTAL FOR THIS SHEET		139.12	0.0032	N/A	USACE

TEMPORARY OPEN WATER IMPACT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
2-TO-1	SANDBAG DIKE	12.22	0.0003	0.11	USACE/DNREC
TOTAL FOR THIS SHEET		12.22	0.0003	0.11	USACE/DNREC

WETLAND ENHANCEMENT AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
2-WE-1	WETLAND ENHANCEMENT	10.63	0.0002	N/A	USACE
2-WE-2	WETLAND ENHANCEMENT	2.20	0.0001	N/A	USACE
TOTAL FOR THIS SHEET		12.83	0.0003	N/A	USACE

WETLAND CREATION AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
2-WC-1	WETLAND CREATION	11,294.72	0.2593	N/A	USACE
TOTAL WETLAND CREATION AREAS		11,294.72	0.2593	N/A	USACE

OPEN WATER CREATION AREA SCHEDULE					
ID	IMPACT DESCRIPTION	AREA (SF)	AREA (AC)	VOLUME (CY)	JURISDICTION
2-OC-1	STREAM CREATION	1,655.32	0.0380	N/A	USACE/DNREC
TOTAL OPEN WATER CREATION AREAS		1,655.32	0.0380	N/A	USACE/DNREC

LEGEND

CREATION AREA

ENHANCEMENT AREA

PERMANENT IMPACT AREA

TEMPORARY IMPACT AREA

ORDINARY HIGH WATER

WETLAND BOUNDARY

PROPOSED ORD. HIGH WATER / WETLAND

PROPOSED WETLAND BOUNDARY

IMPACT AREA TYPE ID. (SEE BELOW)
IMPACT AREA ID. AND/OR NUMBER

O = OPEN WATER IMPACT

P = PERMANENT IMPACT

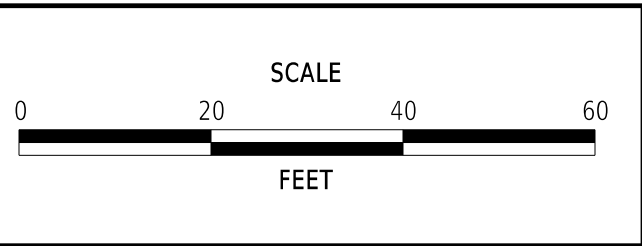
E = ENHANCEMENT AREA

T = TEMPORARY IMPACT

C = CREATION AREA

W = WETLAND IMPACT

ADDENDA / REVISIONS	



LITTLE MILL CREEK - TRIBUTARY 2 STREAM RESTORATION



CONTRACT	2139-00
DESIGNED BY:	H. AZIZ
CHECKED BY:	J. REEL

ENVIRONMENTAL COMPLIANCE PLAN	
SECTION	RKK
SHEET NO.	18

EC-02

MAINTENANCE OF TRAFFIC NOTES

1. AMERICAN TRAFFIC SAFETY SERVICES ASSOCIATION (ATSSA) CERTIFIED TRAFFIC CONTROL SUPERVISOR REQUIREMENT FOR THIS PROJECT.

(X)	THE CONTRACTOR SHALL NOT BE REQUIRED TO HAVE AN ATSSA SUPERVISOR ASSIGNED TO THIS PROJECT.
()	THE CONTRACTOR SHALL HAVE AN ATSSA SUPERVISOR ASSIGNED TO THIS PROJECT. THE CONTRACTOR'S GENERAL SUPERINTENDENT FOR THIS PROJECT OR ANOTHER ATSSA CERTIFIED MEMBER OF THE CONTRACTOR'S PROJECT STAFF MAY BE THE ATSSA SUPERVISOR. PAYMENT FOR ATSSA SUPERVISOR IS INCIDENTAL TO ITEM 801000.

2. ACCEPTABLE MATERIALS FOR TEMPORARY PEDESTRIAN PATHS SHALL INCLUDE CONCRETE, HOT-MIX, COMPACTED MILLINGS OR PLYWOOD WALKWAY STRUCTURE. PLYWOOD WALKWAY STRUCTURES SHALL ALSO INCLUDE DETECTABLE EDGING AND RAILINGS IN ACCORDANCE WITH ADA GUIDELINES AND THE DELAWARE MUTCD. TEMPORARY PEDESTRIAN PATHS SHALL BE INCIDENTAL TO ITEM 801000 UNLESS OTHERWISE SPECIFIED IN THE PLANS. STONE OR GRADED AGGREGATE BASE COURSE SHALL NOT BE USED FOR TEMPORARY PEDESTRIAN PATHS.
3. NO LANE CLOSURE TIME RESTRICTIONS ARE ASSOCIATED WITH THIS PROJECT.
4. MAINTENANCE OF TRAFFIC DURING LANE CLOSURES AND LANE SHIFTS SHALL CONFORM TO TYPICAL APPLICATION TA-28 OF THE DELAWARE MUTCD.

TREE PROTECTION NOTES

1. REFER TO CONSTRUCTION PLANS FOR PROPOSED TREE REMOVALS AND TREES TO REMAIN.
2. ALL TREES TO REMAIN SHALL BE PROTECTED WITH CONSTRUCTION SAFETY FENCE (CSF). CSF SHALL BE PLACED AROUND INDIVIDUAL OR GROUPS OF TREES TO REMAIN AND INCLUDE AS MUCH OF THE CRITICAL ROOT ZONE (CRZ) AS POSSIBLE DURING CONSTRUCTION. CRZ (IN FEET) IS CALCULATED AS 1.5 X DIAMETER AT BREAST HEIGHT ((DBH) IN INCHES). DBH IS MEASURED AT 4.5' ABOVE THE GROUND. THE CONTRACTOR SHALL SUBMIT THE LIMITS OF CSF TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.
3. THE CONTRACTOR SHALL IDENTIFY LIMITS OF ROOT PRUNING ON ALL TREES TO REMAIN ADJACENT TO PROPOSED GRADING AND SUBMIT THE LIMITS OF ROOT PRUNING TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.

EROSION AND SEDIMENT CONTROL NOTES

1. THE SEDIMENT AND STORMWATER MANAGEMENT PLANS HAVE BEEN APPROVED BY NEW CASTLE COUNTY'S STORMWATER ENGINEER. THE SEDIMENT AND STORMWATER MANAGEMENT PLANS ARE VALID FOR A FIVE YEAR PERIOD, BEGINNING ON THE DATE THE STORMWATER ENGINEER SIGNED THIS SHEET. IF THE FINAL ACCEPTANCE OF THE PROJECT IS ANTICIPATED TO EXTEND BEYOND THE FIVE YEARS, THE CONTRACTOR WILL INFORM THE ENGINEER THREE MONTHS PRIOR TO THE EXPIRATION OF THE APPROVED SEDIMENT AND STORMWATER MANAGEMENT PLANS. THE STORMWATER ENGINEER WILL REVIEW THE CURRENT SEDIMENT AND STORMWATER MANAGEMENT PLAN AND ISSUE AN EXTENSION WITH ANY APPROPRIATE MODIFICATIONS.

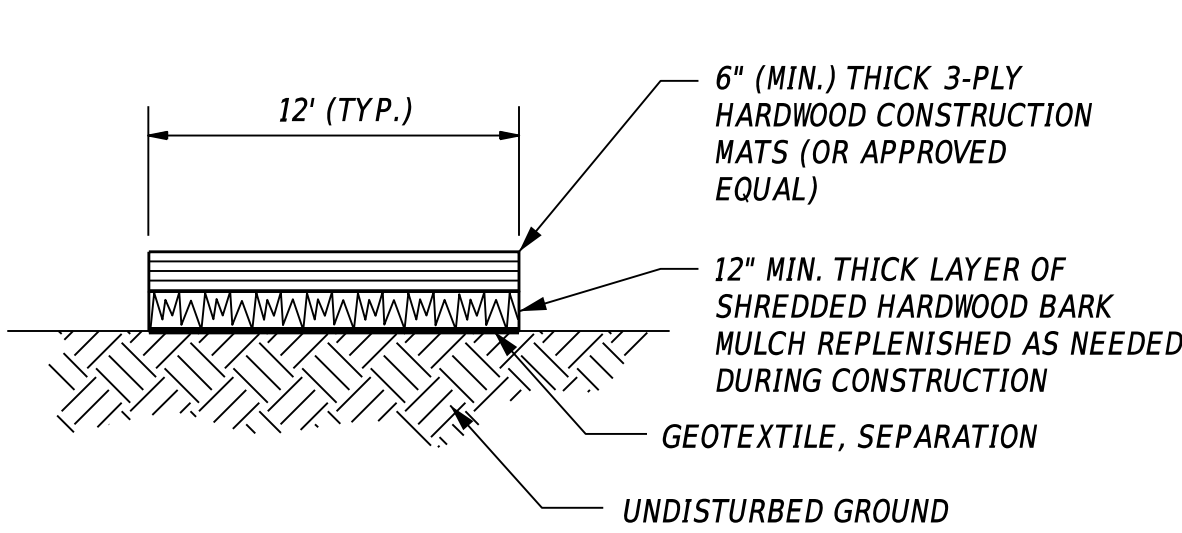
EROSION POTENTIAL FOR THIS PROJECT	CONTRACTOR EROSION AND SEDIMENT CONTROL SUPERVISOR REQUIREMENT
() INSIGNIFICANT	NONE
() MINOR	CONTRACTOR TRAINING PROGRAM, AS DEFINED IN SECTION 6.2 OF THE DELAWARE SEDIMENT AND STORMWATER REGULATIONS.
(X) MAJOR	CERTIFIED CONSTRUCTION REVIEWER (CCR), AS DEFINED IN SECTION 6.3 OF THE DELAWARE SEDIMENT AND STORMWATER REGULATIONS.

3. THE DISTURBED AREA FOR THIS PROJECT IS 2.25 ACRES.
4. THE INCREASED IMPERVIOUS AREA FOR THIS PROJECT IS 0.00 ACRES.
5. STOCKPILES OF ERODIBLE MATERIALS SHALL BE PLACED AS FAR AWAY FROM WATERWAYS AND DRAINAGE COURSES AS POSSIBLE, AND A MINIMUM OF 10 FEET FROM PROPERTY LINES.
6. A PRE-CONSTRUCTION MEETING MUST BE HELD PRIOR TO COMMENCING CONSTRUCTION. CONTACT DNREC OR THE NEW CASTLE CONSERVATION DISTRICT. FAILURE TO DO SO CONSTITUTES A VIOLATION OF THE APPROVED SEDIMENT AND STORMWATER MANAGEMENT PLAN.
7. NCCD MUST BE NOTIFIED IN WRITING FIVE (5) DAYS PRIOR TO COMMENCING WITH CONSTRUCTION. FAILURE TO DO SO CONSTITUTES A VIOLATION OF THE APPROVED PLAN.
8. REVIEW AND APPROVAL OF THIS PLAN SHALL NOT RELIEVE THE CONTRACTOR FROM HIS OR HER RESPONSIBILITIES FOR COMPLIANCE WITH THE DELAWARE SEDIMENT AND STORMWATER REGULATIONS, NOR SHALL IT RELIEVE THE CONTRACTOR FROM ERRORS OR OMISSIONS ON THE PLAN. THE OWNER / OWNER'S REPRESENTATIVE SHALL BE RESPONSIBLE FOR ACQUIRING ANY AND ALL AGREEMENTS, EASEMENTS, ETC. NECESSARY TO COMPLY WITH ALL APPLICABLE REGULATIONS, CODES, STANDARDS, GUIDELINES AND POLICIES. ANY DEVIATION FROM THE APPROVED PLANS REQUIRES WRITTEN APPROVAL FROM THE OWNER'S REPRESENTATIVE AND DESIGNER.
9. UNLESS OTHERWISE AUTHORIZED IN WRITING BY THE OWNER'S REPRESENTATIVE AND/OR DESIGNER, ALL WORK MUST BE DONE IN ACCORDANCE WITH THESE PLANS.
10. IF THE APPROVED PLAN NEEDS TO BE MODIFIED, ADDITIONAL SEDIMENT AND STORMWATER CONTROL MEASURES MAY BE REQUIRED AS DEEMED NECESSARY BY DNREC OR THE DELEGATED AGENCY. FOLLOWING SOIL DISTURBANCE OR REDISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED FOR ALL PERIMETER SEDIMENT CONTROLS, SOIL STOCKPILES, AND ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE WITHIN 14 CALENDAR DAYS UNLESS MORE RESTRICTIVE FEDERAL REQUIREMENTS APPLY.
11. ALL PROPOSED EROSION AND SEDIMENT CONTROLS WILL BE INSTALLED IN ACCORDANCE WITH THE DELAWARE EROSION AND SEDIMENT CONTROL HANDBOOK LATEST EDITION. WHERE THIS PLAN CONFLICTS WITH SAID REGULATIONS, THE CONTRACTOR SHALL NOTIFY THE DESIGNER PRIOR TO IMPLEMENTING THE WORK/PRACTICE.
12. AT ANY TIME A DEWATERING OPERATION IS USED, IT SHALL BE PREVIOUSLY APPROVED BY THE AGENCY CONSTRUCTION SITE REVIEWER FOR A NON-EROSIVE POINT OF DISCHARGE, AND A DEWATERING PERMIT SHALL BE APPROVED BY THE DNREC WELL PERMITTING BRANCH AS REQUIRED.
13. APPROVED E&S PLANS EXPIRE FIVE (5) YEARS FROM THE DATE OF PLAN APPROVAL.
14. POST CONSTRUCTION VERIFICATION DOCUMENTS, WHEN REQUIRED, ARE TO BE SUBMITTED TO DNREC OR THE DELEGATED AGENCY WITHIN 60 DAYS OF STORMWATER MANAGEMENT FACILITY COMPLETION.
15. APPROVAL OF A SEDIMENT AND STORMWATER MANAGEMENT PLAN DOES NOT GRANT OR IMPLY A RIGHT TO DISCHARGE STORMWATER RUNOFF. THE OWNER/DEVELOPER IS RESPONSIBLE FOR ACQUIRING ANY AND ALL AGREEMENTS, EASEMENTS, ETC. NECESSARY TO COMPLY WITH STATE DRAINAGE AND OTHER APPLICABLE LAWS.
16. THE OWNER SHALL BE FAMILIAR WITH AND COMPLY WITH ALL ASPECTS OF THE NPDES CONSTRUCTION GENERAL PERMIT ASSOCIATED WITH THE PROJECT, INCLUDING, BUT NOT LIMITED TO, PERFORMING WEEKLY SITE INSPECTIONS DURING CONSTRUCTION AND AFTER RAIN EVENTS, AND MAINTAINING WRITTEN LOGS OF THESE INSPECTIONS.

17. BEST AVAILABLE TECHNOLOGY (BAT) SHALL BE EMPLOYED TO MANAGE TURBID DISCHARGES IN ACCORDANCE WITH REQUIREMENTS OF 7. DEL C. CH 60, REGULATIONS GOVERNING THE CONTROL OF WATER POLLUTION, SECTION 9.1.02, KNOWN AS SPECIAL CONDITIONS FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES, AND DEPARTMENT POLICIES, PROCEDURES, AND GUIDANCE.
18. DOCUMENTATION OF SOIL TESTING AND MATERIALS USED FOR TEMPORARY OR PERMANENT STABILIZATION INCLUDING BUT NOT LIMITED TO SOIL TEST RESULTS, SEED TAGS, SOIL AMENDMENT TAGS, ETC. SHALL BE PROVIDED TO THE NCCD TO VERIFY THAT THE PERMANENT OR TEMPORARY STABILIZATION HAS BEEN COMPLETED IN ACCORDANCE WITH THE APPROVED PLAN. THE NCCD MAY REQUIRE ADDITIONAL SOIL TESTING AND REAPPLICATION OF PERMANENT OR TEMPORARY STABILIZATION IN ACCORDANCE WITH SPECIFICATIONS PROVIDED IN THE DELAWARE EROSION AND SEDIMENT CONTROL HANDBOOK, OR ALTERNATIVE MEASURES THAT PROVIDE FUNCTIONAL EQUIVALENCY.
19. DNREC AND NEW CASTLE CONSERVATION DISTRICT PERSONNEL SHALL HAVE THE RIGHT TO CONDUCT ON-SITE INSPECTIONS OF LAND DISTURBING ACTIVITIES.
20. ALL PERIMETER CONTROLS INCLUDING TREE PROTECTION, MUST BE INSTALLED, STABILIZED, INSPECTED BY THE CCR OR CONSERVATION DISTRICT INSPECTOR, AND APPROVED BY NCCD PRIOR TO BULK GRADING, BUILDING PERMIT ISSUANCE, OR ANY UTILITY INSTALLATION ON NONRESIDENTIAL PROJECTS. THE CCR OR INSPECTOR IS REQUIRED TO SUBMIT A REPORT VERIFYING THAT THE PERIMETER CONTROLS HAVE BEEN INSTALLED CORRECTLY AND ARE FUNCTIONING PROPERLY. PRIOR TO THIS PRE-BULK INSPECTION NO DISTURBANCE MAY OCCUR ON-SITE OTHER THAN THOSE AREAS NECESSARY TO ESTABLISH THE PERIMETER EROSION AND SEDIMENT CONTROLS. INSTALL THE PERIMETER CONTROLS PURSUANT TO THIS PLAN. ALL PERIMETER SEDIMENT CONTROLS, INCLUDING SOIL STOCKPILES, SHALL BE VEGETATIVELY STABILIZED.
21. THE CCR OR INSPECTOR IS RESPONSIBLE TO REPORT THE CONDITIONS OF SITE WORK AS COMPARED TO THE LATEST APPROVED SEDIMENT AND STORMWATER PLAN. ANY DEVIATION FROM THE APPROVED PLANS REQUIRES WRITTEN APPROVAL FROM DNREC OR THE DELEGATED AGENCY.
22. THE CCR OR INSPECTOR WILL BE RESPONSIBLE FOR WEEKLY EROSION AND SEDIMENT CONTROL INSPECTIONS. THE CCR SHALL CONTACT, IN WRITING, NEW CASTLE CONSERVATION DISTRICT TO CONSIDER ANY REQUEST TO DEVIATE FROM THE REQUIRED FREQUENCY OF INSPECTIONS. APPROVAL OF SUCH A REQUEST SHALL BE AT THE DISCRETION OF DNREC OR THE DELEGATED AGENCY.
23. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED PERIODICALLY AND AFTER EACH RAINFALL MAINTENANCE MUST BE PERFORMED AFTER EACH INSPECTION AS NECESSARY. ANY ERODED AREAS SHALL BE STABILIZED AND ANY ACCUMULATED SEDIMENT SHALL BE REMOVED ANY DISPOSED OF ACCORDING TO THE PRE-CONSTRUCTION PLAN AND/OR AS DIRECTED BY THE DESIGNER. SEDIMENT THAT CUMULATES IN THE AREA OF WORK IS A PROJECT GOAL AND THUS MAY NOT NEED TO BE REMOVED.
24. ALL INSPECTION REPORTS FROM BOTH THE CCR (IF REQUIRED) AND THE CONSERVATION DISTRICT/INSPECTOR SHALL BE ELECTRONICALLY SUBMITTED WEEKLY TO ALL PARTIES INCLUDED ON THE CONSTRUCTION INFORMATION SHEET. THESE REPORTS SHALL INCLUDE A DATE BY WHICH ALL DEFICIENCIES MUST BE RESOLVED. FAILURE TO RESOLVE THE DEFICIENCIES INDICATED ON THE INSPECTION REPORT BY THE GIVEN DATE MAY RESULT IN ENFORCEMENT ACTION CONSIDERED APPROPRIATE BY THE CONSERVATION DISTRICT.
25. THE NCCD ENGINEER/E&S INSPECTOR MUST BE NOTIFIED 48 HOURS PRIOR TO ALL ELEMENTS OF SITE WORK WHICH REQUIRE INSPECTION. FAILURE TO PROVIDE THE APPROPRIATE NOTIFICATION MAY RESULT IN THE CONTRACTOR EXCAVATING SUFFICIENT MATERIAL TO VERIFY CONSTRUCTION IN ACCORDANCE WITH THE APPROVED SEDIMENT AND STORMWATER MANAGEMENT PLAN.
26. SHOULD QUESTIONS ARISE REGARDING THE MAINTENANCE OF EROSION AND SEDIMENT CONTROL PRACTICES, THE SITE CONTRACTOR SHALL CONTACT THE NEW CASTLE CONSERVATION DISTRICT AND THE CONSULTING ENGINEER EXPEDITIOUSLY FOR TECHNICAL ASSISTANCE.
27. UPON RECEIPT OF TWO CONSECUTIVE UNSATISFACTORY CCR (IF REQUIRED) AND/OR DNREC OR THE NCCD EROSION AND SEDIMENT CONTROL INSPECTION REPORTS, THE SITE MAY BE ISSUED A STOP WORK ORDER AND A SHOW CAUSE HEARING SCHEDULED.
28. THE APPROVED E&S PLAN INCORPORATES POLLUTION PREVENTION PRACTICES LISTED UNDER STANDARDS AND SPECIFICATIONS FOR CONSTRUCTION SITE POLLUTION PREVENTION IN THE DELAWARE EROSION AND SEDIMENT CONTROL HANDBOOK, DATED JANUARY 2026 AND ITS REVISIONS.
29. IT SHALL BE THE OWNER'S RESPONSIBILITY TO REPAIR AND STABILIZE EROSION AND SEDIMENT CONTROLS AND STORMWATER MANAGEMENT PRACTICES DURING CONSTRUCTION, INCLUDING AREAS DISTURBED BY UTILITY COMPANIES.
30. IT SHALL BE THE OWNER'S RESPONSIBILITY TO INSPECT AND PERFORM MAINTENANCE AND/OR REPAIRS OF THE STORMWATER MANAGEMENT PRACTICES, IF ANY, AFTER CONSTRUCTION.

CONSTRUCTION PHASING & M.O.T	
	BARRICADE, TYPE 3
	CONCRETE SAFETY BARRIER - PORTABLE
	CONSTRUCTION SAFETY FENCE / LENGTH
	CONSTRUCTION SAFETY FENCE
	CONSTRUCTION WARNING SIGN LOCATION
	CONSTRUCTION WARNING SIGN
	CRASH CUSHION ARRAY
	DRUM - TRAFFIC CONTROL
	FLAGGER LOCATION
	PHASING TRAFFIC FLOW ARROW
	TEMPORARY CONSTRUCTION
	TEMPORARY PAVEMENT MARKING ARROW
	TRUCK WITH MOUNTED ATTENUATOR
	WORK AREA - ACTIVE PHASE
	MULCH ACCESS ROAD

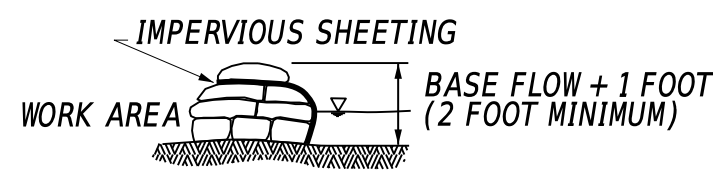
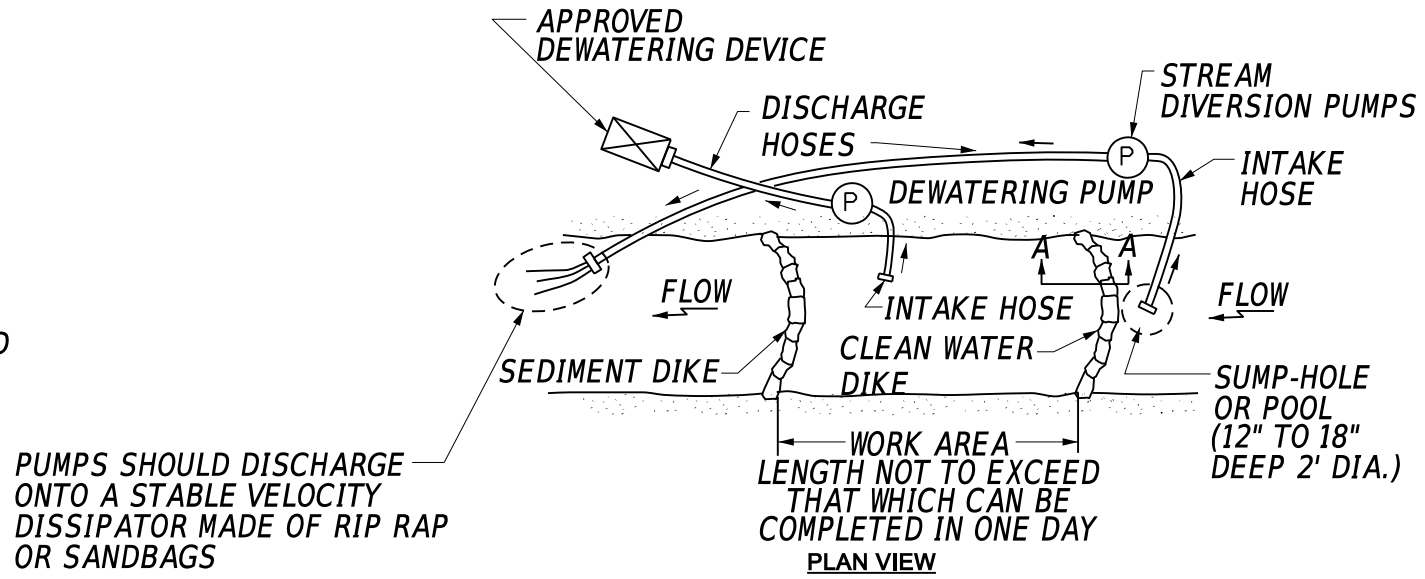
EROSION & SEDIMENT CONTROL	
	COMPOST FILTER LOG
	COMPOST FILTER LOG / LENGTH
	DEWATERING BAG
	DEWATERING BASIN
	EARTH DIKE
	INLET SEDIMENT CONTROL
	PERIMETER DIKE/SWALE
	PORTABLE SEDIMENT TANK
	SANDBAG DIKE
	SANDBAG DIVERSION
	STONE CHECK DAM
	STABILIZED CONSTRUCTION ENTRANCE
	SILT FENCE / LENGTH
	SILT FENCE
	REINFORCED SILT FENCE / LENGTH
	REINFORCED SILT FENCE
	SUPER SILT FENCE / LENGTH
	SUPER SILT FENCE
	SUMP PIT
	SEDIMENT TRAP / NUMBER
	SEDIMENT TRAP
	SEDIMENT TRAP WITH INLET AS OUTLET
	SEDIMENT TRAP PIPE OUTLET
	STILLING WELL
	TEMPORARY SWALE
	TEMPORARY SLOPE DRAIN
	TURBIDITY CURTAIN / LENGTH
	TURBIDITY CURTAIN



NOTES:

1. TIMBER MATTING SHALL BE PROVIDED FOR CONSTRUCTION ACCESS AT ALL UTILITY CROSSINGS.
2. ACCESS ROUTES TO BE VERIFIED BY THE ENGINEER AT PRE-CONSTRUCTION MEETING. REVISIONS TO THE ALIGNMENT THAT MINIMIZE TREE DISTURBANCE ARE ENCOURAGED AND REQUIRE REVIEW AND APPROVAL OF THE ENGINEER.
3. GEOTEXTILE, SEPARATION SHALL BE PLACED WITH SEAMS PARALLEL TO THE FLOW OF TRAFFIC. OVERLAP FABRIC BY 18" MIN. AT SEAMS.
4. CONTRACTOR SHALL MAINTAIN TIMBER MATTING AS NECESSARY FOR CONSTRUCTION ACCESS.

TIMBER MATTING DETAIL



PUMP-AROUND PRACTICE DETAIL

ADDENDA / REVISIONS

NOT TO SCALE

LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



NEW CASTLE COUNTY STORMWATER ENGINEER DATE

"I CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THESE PLANS MEET THE REQUIREMENTS OF THE DELAWARE SEDIMENT AND STORMWATER REGULATIONS AND THAT ALL CLEARING, GRADING, AND CONSTRUCTION WILL BE ACCOMPLISHED PURSUANT TO THE PLAN."

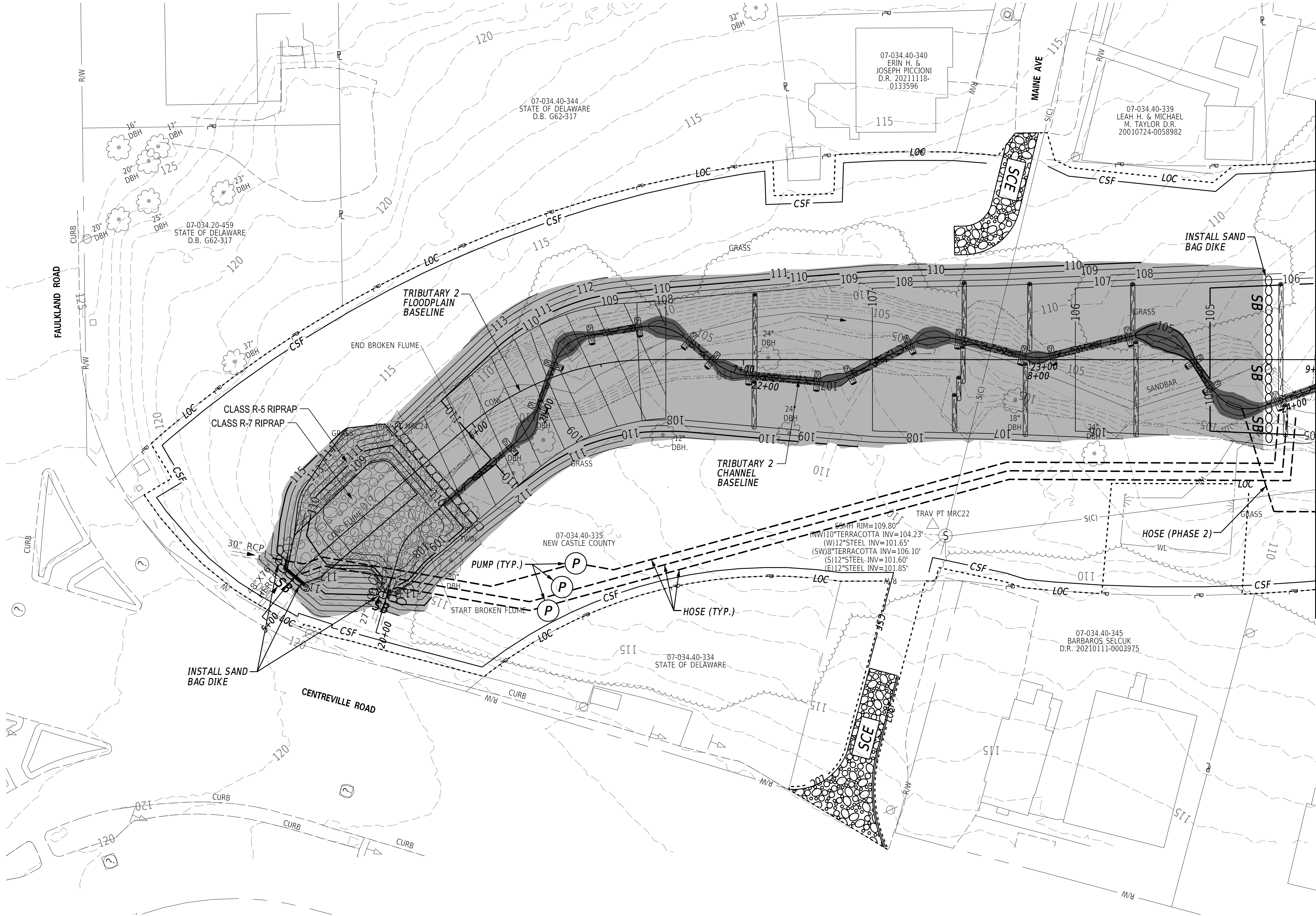
CONTRACT	2139-00
DESIGNED BY:	J. GALBO
CHECKED BY:	T. CUTILLO

CONSTRUCTION PHASING,
M.O.T., AND EROSION
CONTROL PLAN

SECTION
RKK
SHEET NO.
19

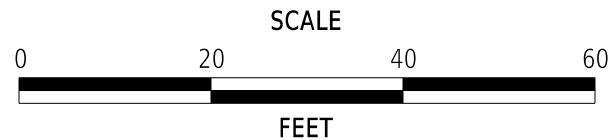
SEQUENCE OF CONSTRUCTION

1. INSTALL PERIMETER CONTROLS AND TREE PROTECTION MEASURES WITHIN THE INDIVIDUAL PHASE LIMITS AS SHOWN ON THE PLANS. INSTALL STABILIZED CONSTRUCTION ENTRANCE(S) AS NECESSARY TO ACCESS ACTIVE PHASE WORK AREA(S).
2. SAFE PEDESTRIAN TRAFFIC ALONG THE EXISTING SIDEWALK LOCATED ALONG ARMSTRONG AVENUE SHALL BE MAINTAINED AT ALL TIMES. CONTRACTOR SHALL PROVIDE APPROPRIATE SIGNAGE AS REQUIRED IN ACCORDANCE WITH THE DELAWARE MUTCD.
3. THE CONTRACTOR MAY PROPOSE TO COMBINE PHASES WITH APPROVAL FROM THE ENGINEER.
4. CLEAR AND GRUB THE SITE AS NEEDED TO CONSTRUCT EACH PHASE. THE CONTRACTOR SHALL NOT CLEAR AND GRUB THE SITE IN ITS ENTIRETY AT CONSTRUCTION COMMENCEMENT. CLEARING AND GRUBBING SHALL NOT EXCEED THE INDIVIDUAL PHASE LIMITS AS SHOWN ON THE PLANS UNTIL CONSTRUCTION AND STABILIZATION OF THAT PHASE IS COMPLETE.
5. THE CONTRACTOR SHALL LIMIT TRUCKS ACCESSING THE WORK AREAS TO AVOID DAMAGE TO EXISTING UTILITIES. AT UTILITY CROSSINGS, PLACE TIMBER MATTING, MULCH, AND GEOTEXTILE IN ACCORDANCE WITH THE TIMBER MATTING DETAIL ON SHEET 19.
6. INSTALL SAND BAG DIKES AS SHOWN ON THE PLANS. PUMP FROM THE UPSTREAM INSTALLED SAND BAG DIKE TO THE MOST DOWNSTREAM INSTALLED SAND BAG DIKE.
7. THE CONTRACTOR SHALL DEWATER THE WORK AREAS IN ACCORDANCE WITH THE PUMP-AROUND PRACTICE DETAIL ON SHEET 19.
8. PRIOR TO THE FLOODPLAIN AND CHANNEL GRADING, THE CONTRACTOR SHALL INSTALL TEMPORARY HDPE DRAINAGE PIPES AND PROVIDE WATER TIGHT CONNECTIONS AT THE EXISTING PIPE OUTLETS AND DOWNSTREAM DRAINAGE STRUCTURE. DIRECT TEMPORARY HDPE PIPES TO DISCHARGE DOWNSTREAM OF THE ACTIVE PHASE WORK AREA(S) AND MOST DOWNSTREAM SAND BAG DIKE. THE TEMPORARY DRAINAGE PIPES MAY BE MOVED AS NECESSARY TO COMPLETE GRADING ACTIVITIES. COST FOR RESETTING THE PIPES SHALL BE INCIDENTAL TO THE ORIGINAL INSTALLATION COST.
9. OVERALL, THE PROJECT SHALL BE CONSTRUCTED IN PHASES WORKING FROM UPSTREAM TO DOWNSTREAM. WITHIN THE INDIVIDUAL PHASE LIMITS, WORK SHALL BE PERFORMED WORKING FROM DOWNSTREAM TO UPSTREAM. CONSTRUCT THE PROPOSED ENERGY DISSIPATORS, CHANNEL, FLOODPLAIN, AND STREAM RESTORATION MEASURES IN ACCORDANCE WITH THE PLANS. THE CONTRACTOR SHALL CONSTRUCT THE PROPOSED CHANNEL IN AREAS OUTSIDE OF THE EXISTING CHANNEL AND MAINTAIN EXISTING STREAMFLOW TO THE MAXIMUM EXTENT PRACTICABLE. UPON COMPLETING CONSTRUCTION OF PROPOSED ENERGY DISSIPATORS, CHANNEL, FLOODPLAIN, AND ALL STREAM RESTORATION MEASURES, PLACE PERMANENT SEEDING IN ACCORDANCE WITH THE PLANS AND STABILIZE AREA WITH COIR FIBER MATTING AND EROSION CONTROL BLANKET MULCH.
10. UPON COMPLETION AND STABILIZATION OF EACH WORK AREA, REMOVE AND RESET SAND BAG DIKES AS NECESSARY FOR THE NEXT CONSTRUCTION PHASE AS SHOWN ON THE PLANS. COST FOR RESETTING THE SAND BAG DIKES, PUMPING PRACTICES, AND MAINTENANCE OF STREAMFLOW CONTROLS SHALL BE INCIDENTAL TO THE ORIGINAL CONTRACT ITEM.
11. FOLLOWING CONSTRUCTION OF THE PHASE 2 WORK AREA, ENSURE THE PROPOSED CHANNEL TIES BACK INTO THE EXISTING CHANNEL AND PERMANENTLY STABILIZE ALL DISTURBED SOIL.
12. UPON FINAL VEGETATIVE STABILIZATION OF ALL DISTURBED STREAM AREAS AND WITH CONCURRENCE FROM THE CONSERVATION DISTRICT'S INSPECTOR, REMOVE STREAM EROSION CONTROL, MAINTENANCE OF STREAMFLOW, AND ANY REMAINING EROSION CONTROL DEVICES.



MATCHLINE STA 9+00

ADDENDA / REVISIONS



LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION

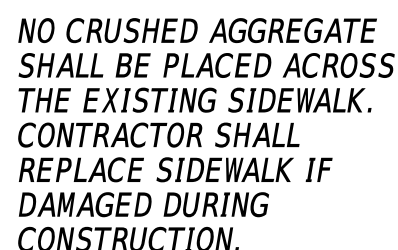


CONTRACT	2139-00
DESIGNED BY:	J. GALBO
CHECKED BY:	T. CUTILLO

CONSTRUCTION PHASING,
M.O.T., AND EROSION
CONTROL PLAN - PHASE 1

CS-01
SECTION
RKK
SHEET NO.
20

1. TEMPORARY CONSTRUCTION EASEMENT (TCE) REQUIRED TO ACCESS PRIVATE PROPERTY TO FILL EXISTING CHANNEL

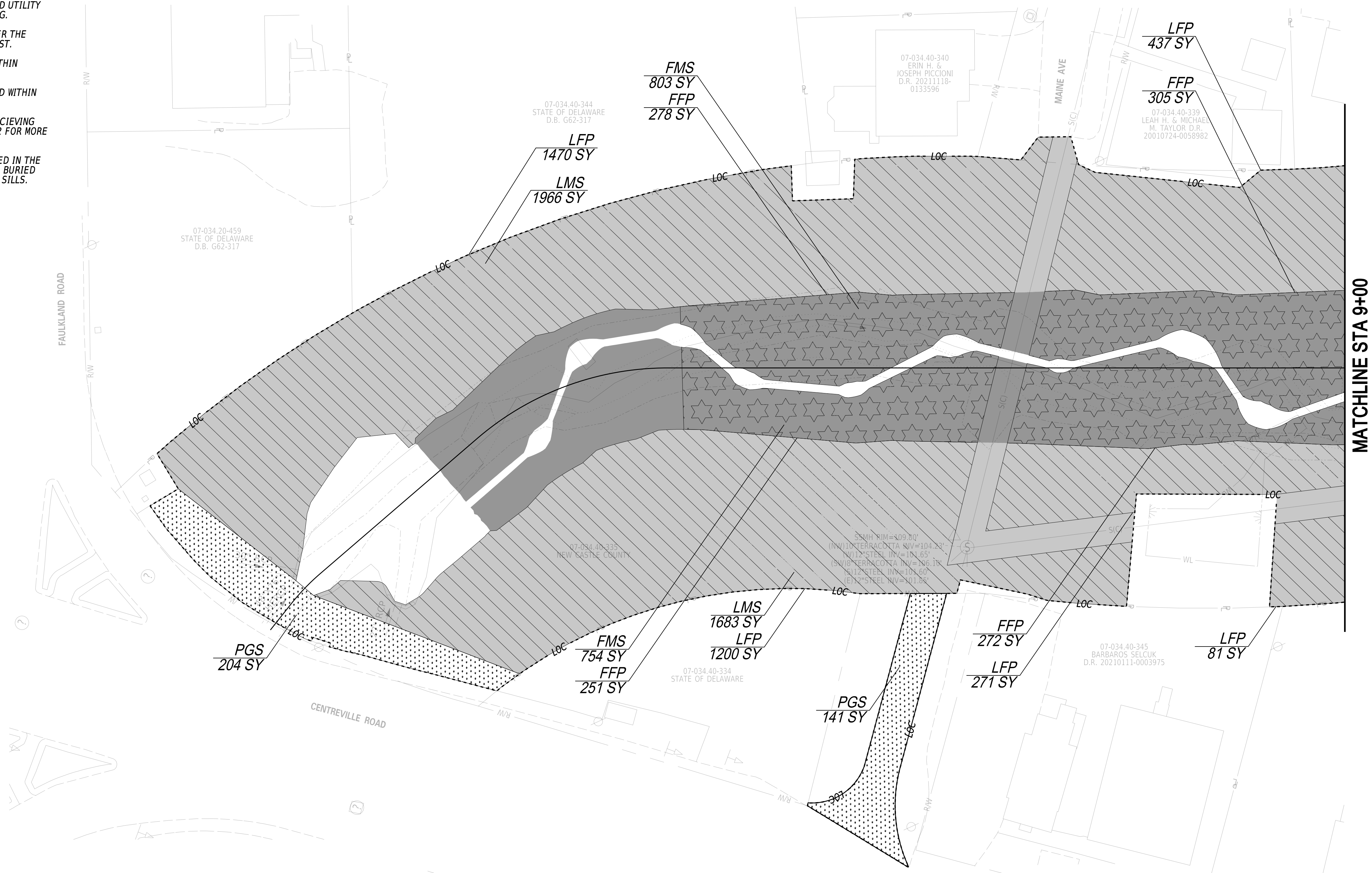
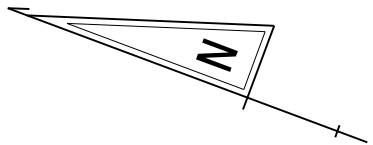
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CONSTRUCTION PHASING, M.O.T., AND EROSION CONTROL PLAN - PHASE 2

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LANDSCAPE NOTES:

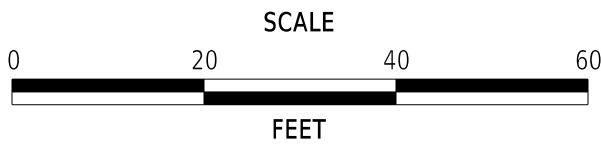
1. ALL LANDSCAPE SHALL BE DONE IN ACCORDANCE WITH DELDOT STANDARD SPECIFICATIONS AND THE SPECIAL PROVISIONS FOR SECTION 911 - PLANTINGS.
2. TREE AND SHRUB PLANTINGS SHALL BE DONE IN ACCORDANCE WITH THE PLANTING SCHEDULES AND DETAILS ON LD-01 AND LD-02. UNDISTURBED SOIL AT THE BASE OF PLANTING PITS SHALL BE SCARIFIED.
3. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING MISS UTILITY TO LOCATE ALL UNDERGROUND UTILITY LINES PRIOR TO INSTALLATION OF PLANTING.
4. ALL PLANTING OPERATIONS SHALL BE UNDER THE SUPERVISION OF AN EXPERIENCED ARBORIST.
5. NO PLANT MATERIAL SHALL BE PLANTED WITHIN ROADWAY SIGN SIGHT LINES.
6. TREES AND SHRUBS SHALL NOT BE PLANTED WITHIN FIVE FEET OF UNDERGROUND UTILITIES.
7. ONLY LOWLAND TREES AND SHRUBS ARE RECIEVING TREE/SHRUB PROTECTION, REFER TO LD-02 FOR MORE DETAILS.
8. TREE AND SHRUB SPACING WILL BE MODIFIED IN THE FIELD TO ACCOMODATE THE PLACEMENT OF BURIED FLOODPLAIN LOGS AND IMBRICATED STONE SILLS.



LEGEND

LANDSCAPE PLANTING SCHEDULE - LS-01		
	PLANTING DESCRIPTION	SY
	FMS (FLOODPLAIN MEADOW SEEDING)	1557
	LMS (LOWLAND MEADOW SEEDING)	3649
	FFP (FLOODPLAIN FOREST PLANTINGS)	1106
	LFP (LOWLAND FOREST PLANTINGS)	3459
	PGS (PERMANENT GRASS SEEDING-SUBDIVISION MIX)	345

ADDENDA / REVISIONS



LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



CONTRACT	2139-00
DESIGNED BY:	E. HAIGHT
CHECKED BY:	K. HELLMANN

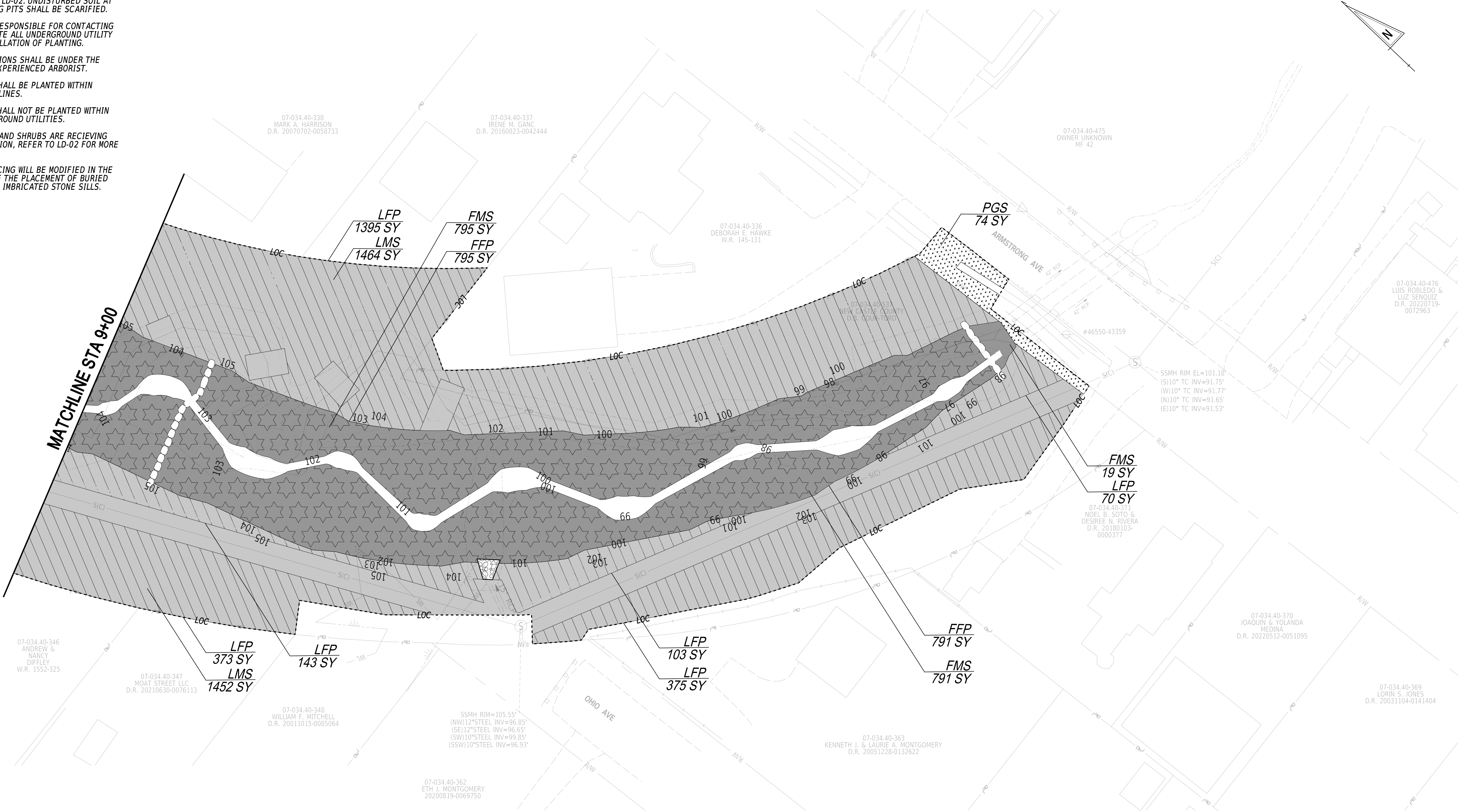
LANDSCAPE PLAN

LS-01

SECTION
RKK
SHEET NO.
22

LANDSCAPE NOTES:

1. ALL LANDSCAPE SHALL BE DONE IN ACCORDANCE WITH DELDOT STANDARD SPECIFICATIONS AND THE SPECIAL PROVISIONS FOR SECTION 911 - PLANTINGS.
2. TREE AND SHRUB PLANTINGS SHALL BE DONE IN ACCORDANCE WITH THE PLANTING SCHEDULES AND DETAILS ON LD-01 AND LD-02. UNDISTURBED SOIL AT THE BASE OF PLANTING PITS SHALL BE SCARIFIED.
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8. TREE AND SHRUB SPACING WILL BE MODIFIED IN THE FIELD TO ACCOMODATE THE PLACEMENT OF BURIED FLOODPLAIN LOGS AND IMBRICATED STONE SILLS.

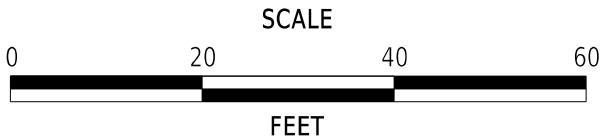


LEGEND

LANDSCAPE PLANTING SCHEDULE - LS-02

	PLANTING DESCRIPTION	SY
	FMS (FLOODPLAIN MEADOW SEEDING)	1605
	LMS (LOWLAND MEADOW SEEDING)	2916
	FFP (FLOODPLAIN FOREST PLANTINGS)	1586
	LFP (LOWLAND FOREST PLANTINGS)	2459
	PGS (PERMANENT GRASS SEEDING-SUBDIVISION MIX)	74

ADDENDA / REVISIONS



LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION



CONTRACT	2139-00
DESIGNED BY:	E. HAIGHT
CHECKED BY:	K. HELLMANN

LANDSCAPE PLAN

LS-02

SECTION
RKK
SHEET NO.
23

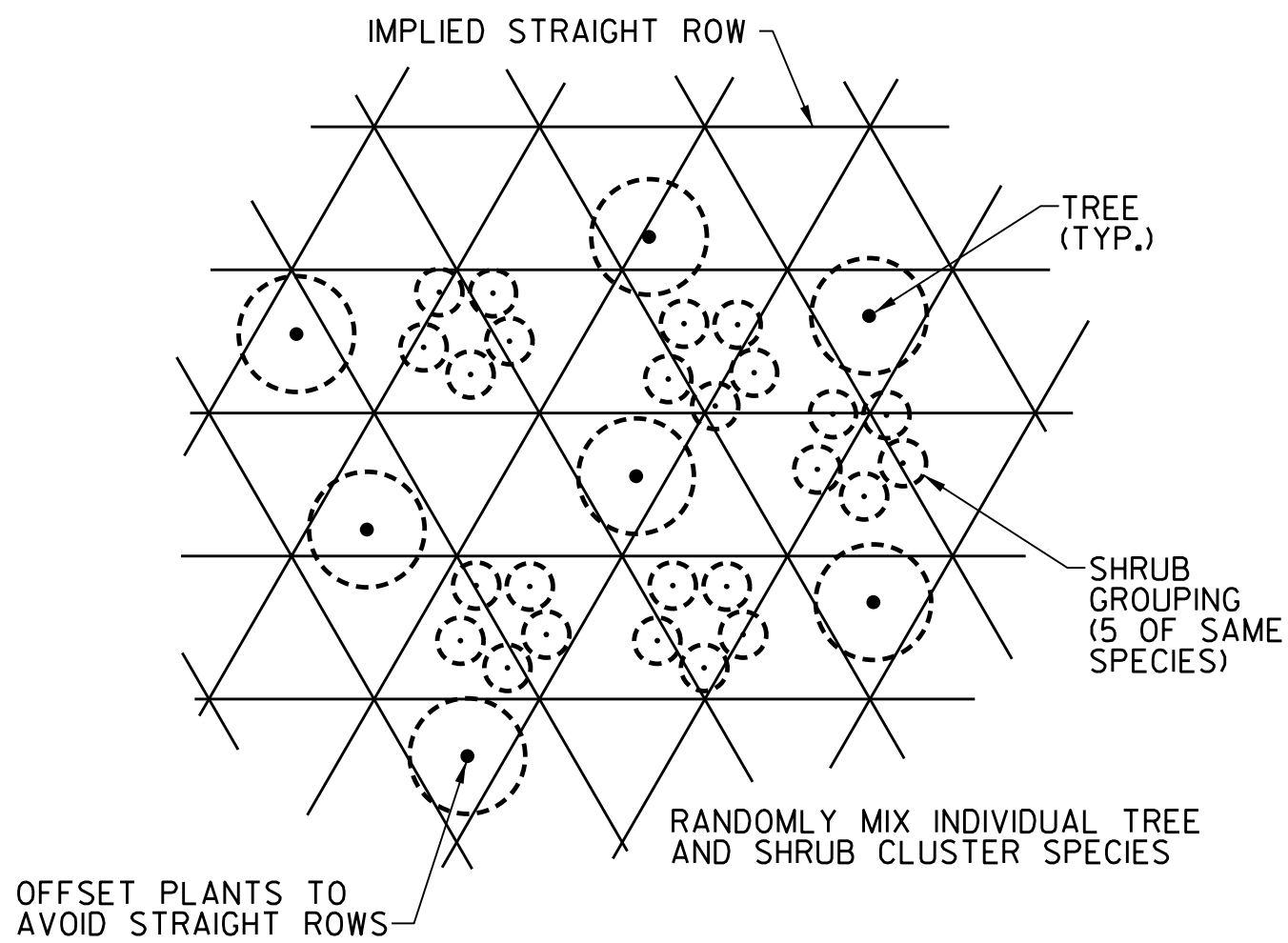
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MASTER FLOODPLAIN FOREST PLANTING SCHEDULE								
ACERS: 0.56		SQUARE YARD:	2,692					
QUANTITY PER ACRE	FREQUENCY (%)	SPECIES QUANTITY	VEGETATION STARTA/SPECIES NAME	COMMON NAME	INDICATOR STATUS	SIZE	TYPE	PLACEMENT
TREES								
200	10	11	ACER RUBRUM	RED MAPLE	FAC	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	20	22	ACER SACCHARINUM	SILVER MAPLE	FACW	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	10	11	MAGNOLIA VIRGINIANA	SWEETBAY MAGNOLIA	FACW	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	20	22	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FACW	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	10	11	POPULUS DELTOIDES	EASTERN COTTONWOOD	FAC	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	10	12	QUERCUS PALUSTRIS	PIN OAK	FACW	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	20	23	SALIX NIGRA	BLACK WILLOW	OBL	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
Total:	100	112						
107			SHRUBS					
	16.5	10	ALNUS SERRULATA	SMOOTH ALDER	OBL	2' ht.	#3 CONTAINER	GROUPS of 5 @ 6' OC
	16.5	10	CEPHALANTHUS OCCIDENTALIS	BUTTONBUSH	OBL	2' ht.	#3 CONTAINER	GROUPS of 5 @ 6' OC
	25	15	CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	FACW	2' ht.	#3 CONTAINER	GROUPS of 5 @ 6' OC
	16.5	10	ILEX VERTICILLATA	WINTERBERRY	FACW	2' ht.	#3 CONTAINER	GROUPS of 5 @ 6' OC
	25	15	SALIX SERICEA	SILKY WILLOW	OBL	2' ht.	#3 CONTAINER	GROUPS of 5 @ 6' OC
Total:	100	60						

MASTER LOWLAND FOREST PLANTING SCHEDULE								
ACRES: 1.22		SQUARE YARD:	5,918					
QUANTITY PER ACRE	FREQUENCY (%)	SPECIES QUANTITY	VEGETATION STARTA/SPECIES NAME	COMMON NAME	INDICATOR STATUS	SIZE	TYPE	PLACEMENT
TREES								
200	20	49	ACER RUBRUM	RED MAPLE	FAC	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	20	49	LIRIODENDRON TULIPIFERA	TULIP POPLAR	FACU	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	20	49	LIQUIDAMBAR STYRACIFLUA	SWEETGUM	FAC	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	10	24	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	FACW	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	20	49	PRUNUS SEROTINA	BLACK CHERRY	FACU	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
	10	24	QUERCUS PHELLOS	WILLOW OAK	FACW	¾" CAL.	#7 CONTAINER	15' O.C. NATURALIZED SPACING
Total:	100	244						
SHRUBS								
102	20	25	ARONIA MELANOCARPA	BLACK CHOKEBERRY	FAC	2' HT.	#3 CONTAINER	PER LOWLAND SHRUB CLUMP PROTECTION DETAIL
	16	20	ILEX GLABRA	INKBERRY	FAC	2' HT.	#3 CONTAINER	PER LOWLAND SHRUB CLUMP PROTECTION DETAIL
	16	20	MORELLA PENSYLVANICA	NORTHERN BAYBERRY	FAC	2' HT.	#3 CONTAINER	PER LOWLAND SHRUB CLUMP PROTECTION DETAIL
	24	30	VIBURNUM DENTATUM	SOUTHERN ARROWWOOD	FAC	2' HT.	#3 CONTAINER	PER LOWLAND SHRUB CLUMP PROTECTION DETAIL
	24	30	VIBURNUM PRUNIFOLIUM	BLACKHAW	FACU	2' HT.	#3 CONTAINER	PER LOWLAND SHRUB CLUMP PROTECTION DETAIL
Total:	100	125						

MASTER SEEDING SCHEDULE		
SEED MIX	SQUARE YARDS	ACRES
FLOODPLAIN MEADOW SEEDING	3,162	0.65
LOWLAND MEADOW SEEDING	6,565	1.36
PERMANENT GRASS SEEDING-SUBDIVISION MIX	419	0.09

NOTE: SEE SEEDING SPECIFICATIONS FOR SPECIES AND APPLICATION RATES. SEE 908600-908602 FOR ADDITIONAL INFORMATION.

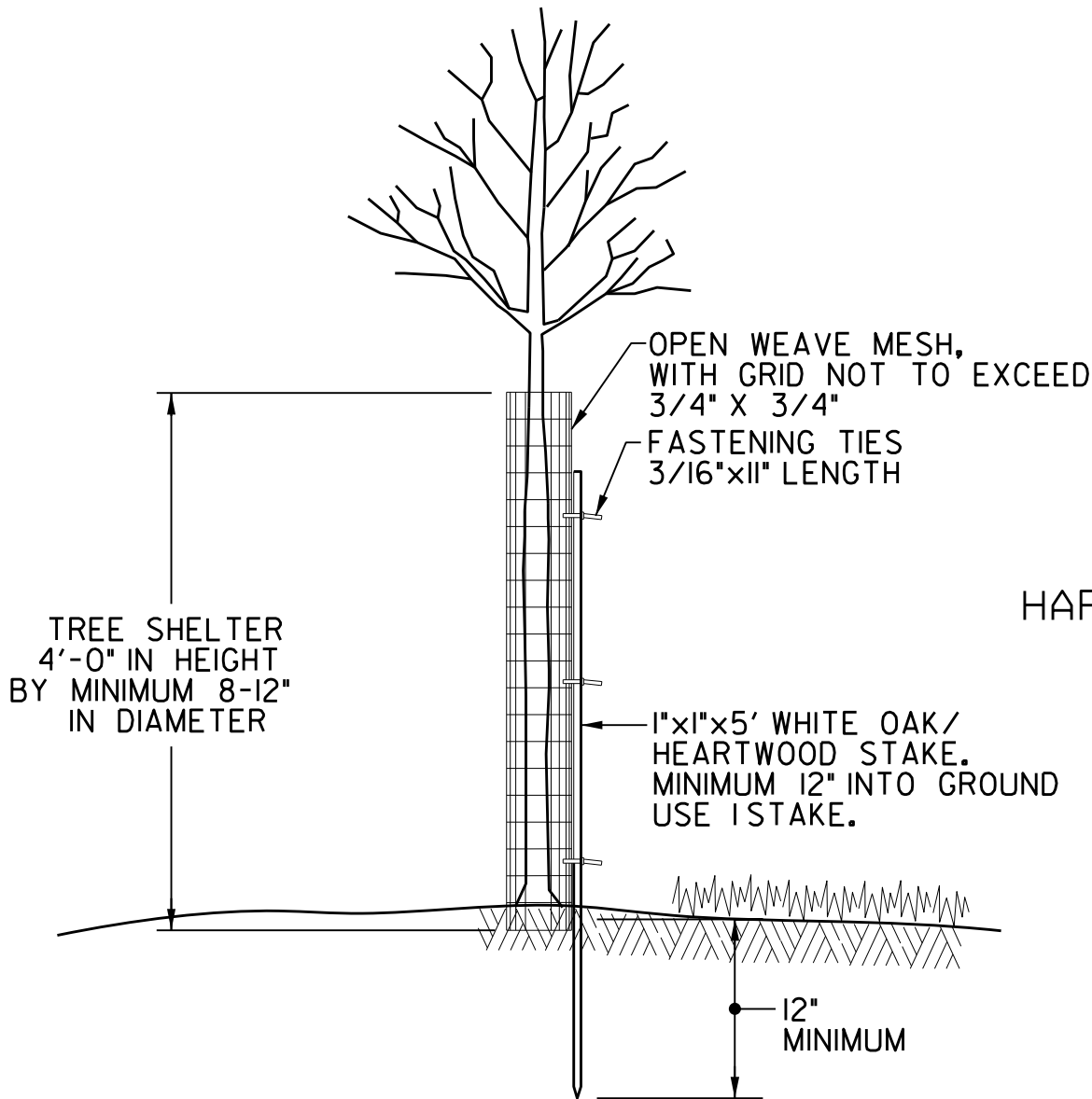


**NATURALIZED
TREE AND SHRUB SPACING**

NOT TO SCALE

NOTES:

1. CANOPY AND UNDERSTORY TREE SPACINGS SHALL BE AS INDICATED ON PLANTING SCHEDULE.
2. SHRUB SPACING BETWEEN THE 5 SHRUBS IN THE CLUSTERS SHALL BE AS INDICATED ON THE PLANTING SCHEDULE.
3. SHRUB CLUSTERS SHALL BE OFFSET FROM TREES BY 6 FEET.

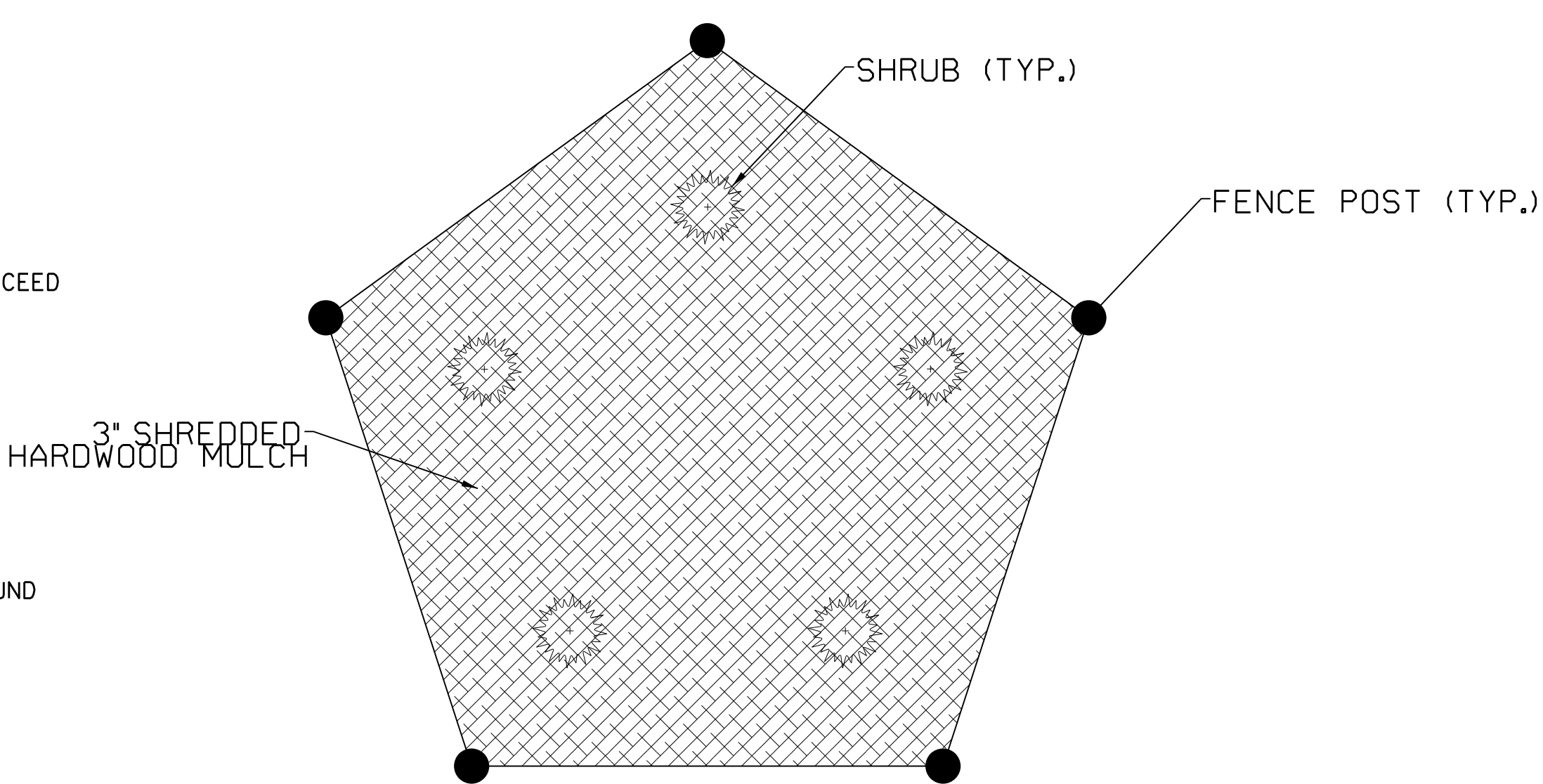


LOWLAND TREE PROTECTION

NOT TO SCALE

NOTES:

1. UP TO 2' OF SOIL CAN BE MOUNTED AROUND THE OUTSIDE OF TREE SHELTER.
2. REFER TO CONTRACT PLANTING SPECIFICATIONS FOR ADDITIONAL INFORMATION.
3. INSTALL TREE SLEEVES ON LOWLAND SINGLE STEM HARDWOOD TREES ONLY.

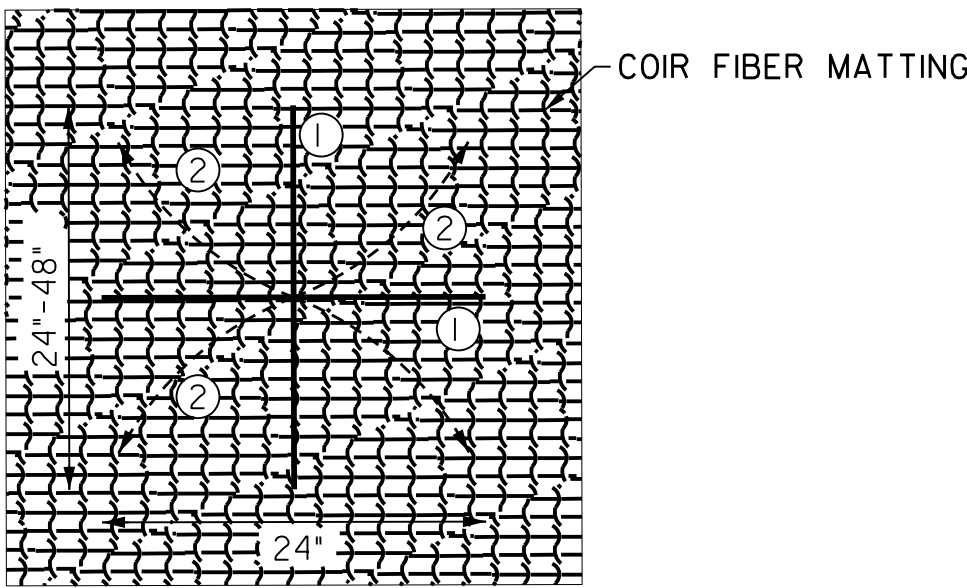


LOWLAND SHRUB CLUMP PROTECTION

NOT TO SCALE

NOTES:

1. FENCING SHALL ONLY BE USED WITHIN THE LOWLAND FOREST PLANTING AREAS.
2. FENCING SHALL BE 4' HIGH, 14 GAUGE WELDED WIRE FENCE SECURED TO 6' T-POSTS DRIVEN 2' INTO THE GROUND.
3. ALL SHRUBS SHALL BE PLACED 3' APART FROM THE ADJACENT SHRUBS. THE FENCE SHALL BE 2' OFF THE EDGE OF ALL PLANTINGS.
4. ALL SHRUBS WITHIN A CLUMP SHALL BE THE SAME SPECIES.

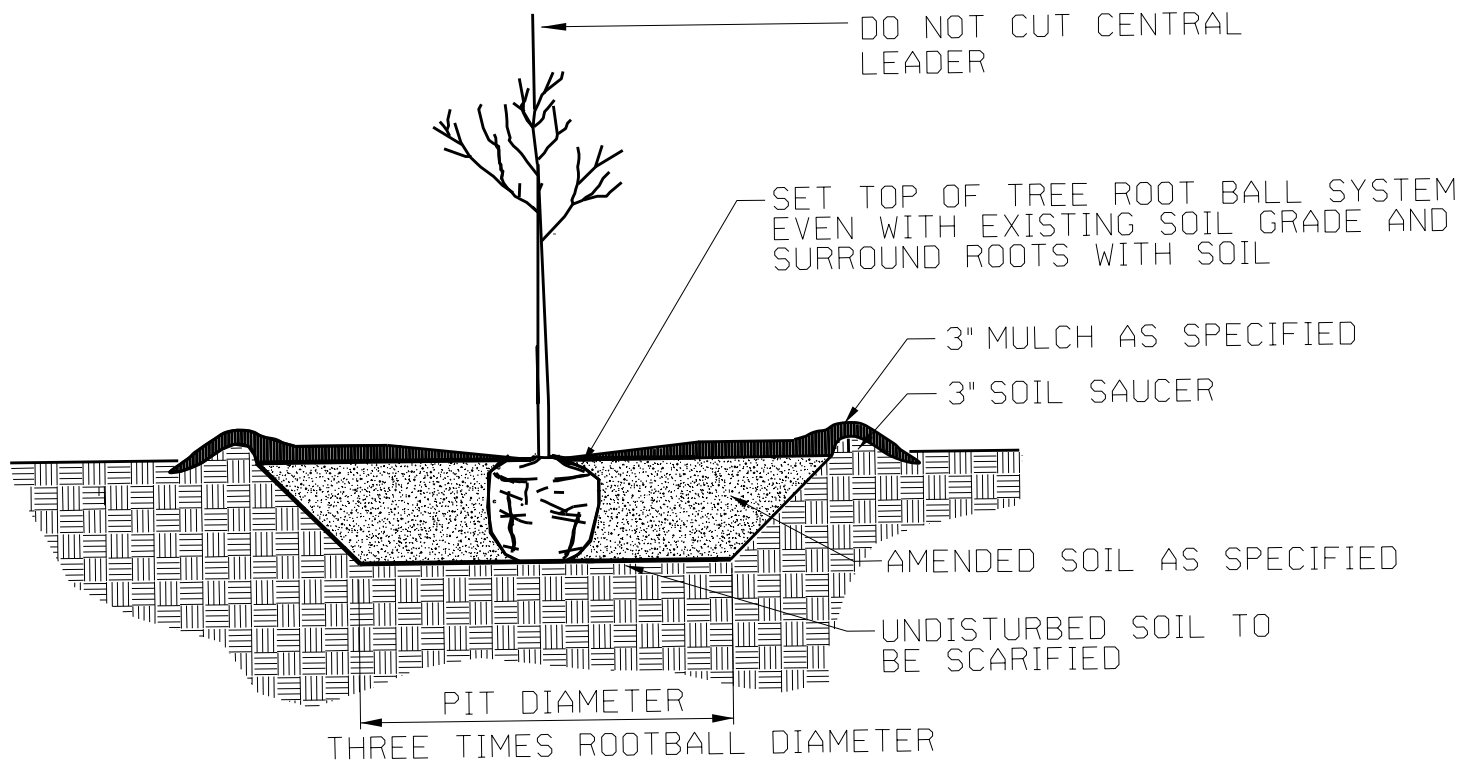


**TREE & SHRUB INSTALLATION
THROUGH COIR FIBER MATTING**

NOT TO SCALE

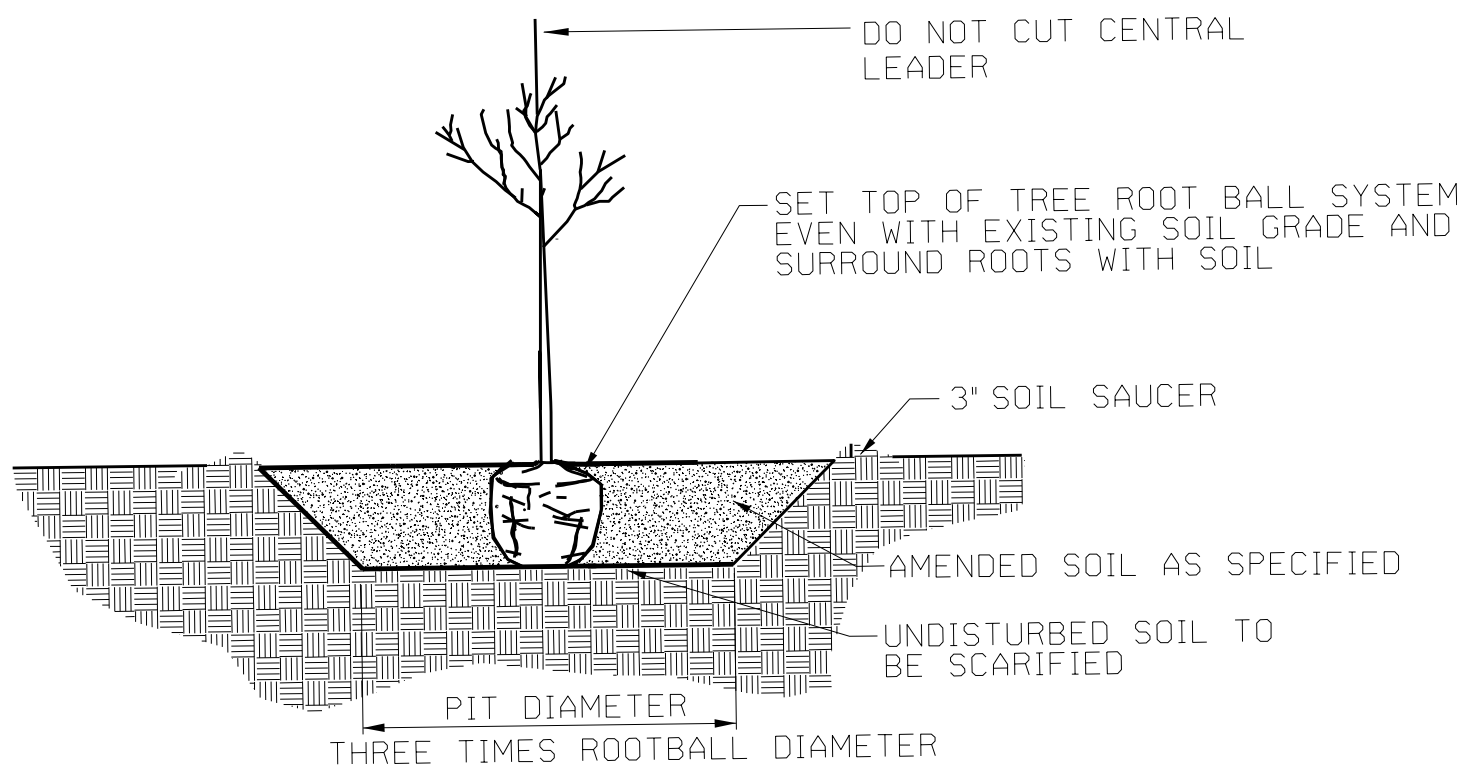
NOTES:

1. MAKE CUT WITH SHARP KNIFE THROUGH COIR FIBER MATTING - SEE SOLID LINE IN DIAGRAM ABOVE. NOTE THAT ALL CUTS IN THE MATTING SHALL BE A MINIMUM OF 2 FEET CLEAR OF ALL MATTING SEAMS, OVERLAPS AND EDGES.
2. TEMPORARILY PIN BACK COIR FIBER WITH 4 STAPLES TO INSTALL TREE OR SHRUB-SEE DASHED LINE IN DIAGRAM ABOVE.
3. INSTALL PLANT THROUGH PINNED BACK COIR FIBER. INSTALL PLANT AT PROPER GRADE TO GROUND PLANE.
4. REMOVE 4 STAPLES PLACED IN STEP 2 ABOVE THAT WERE USED TO TEMPORARILY PIN BACK THE MATTING DURING ROOT BALL INSTALLATION.
5. FOR TREE INSTALLATIONS, INSTALL TREE STAKES THROUGH COIR MATTING, ONCE RE-ANCHORED OVER ROOT BALL.



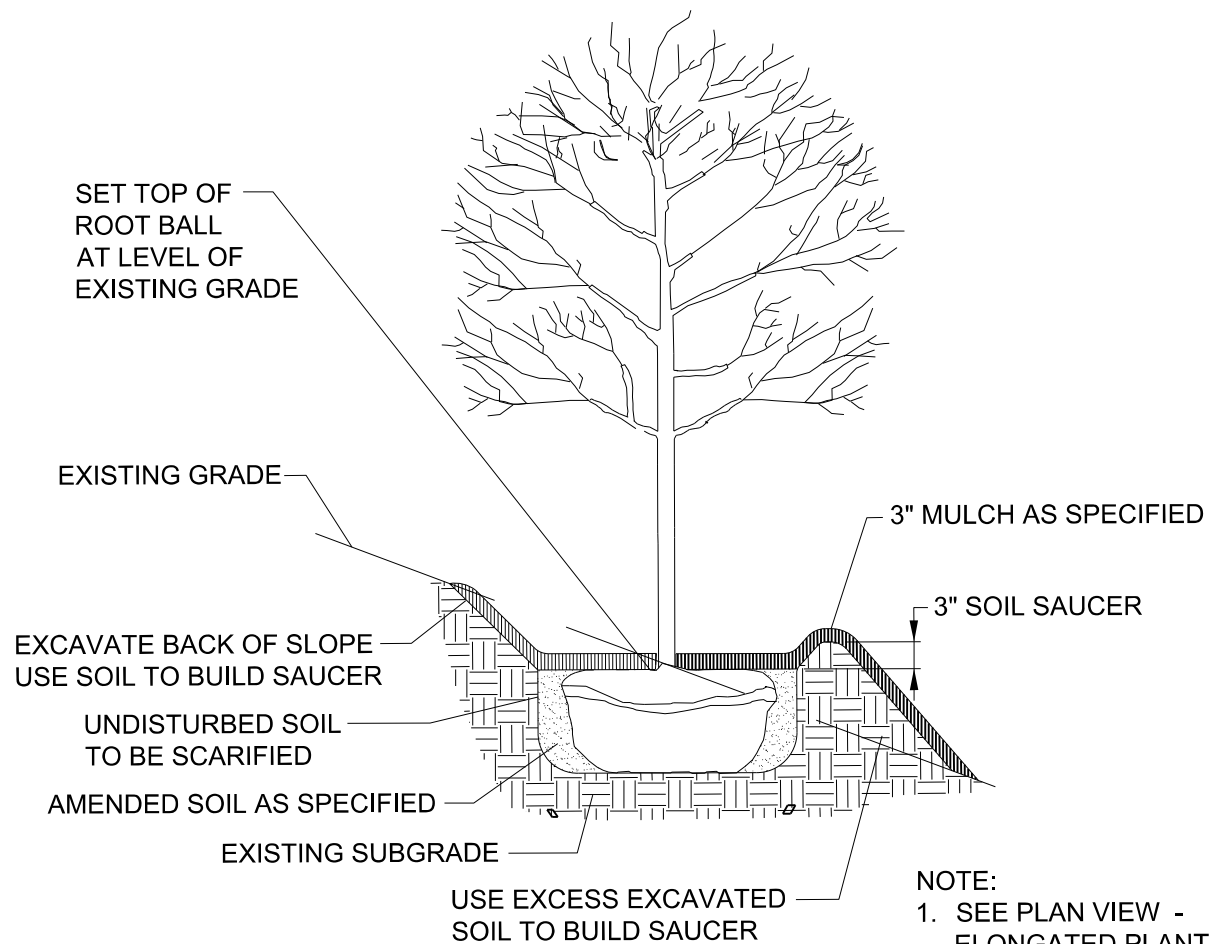
LOWLAND TREE/SHRUB PLANTING

NOT TO SCALE



FLOODPLAIN TREE/SHRUB PLANTING

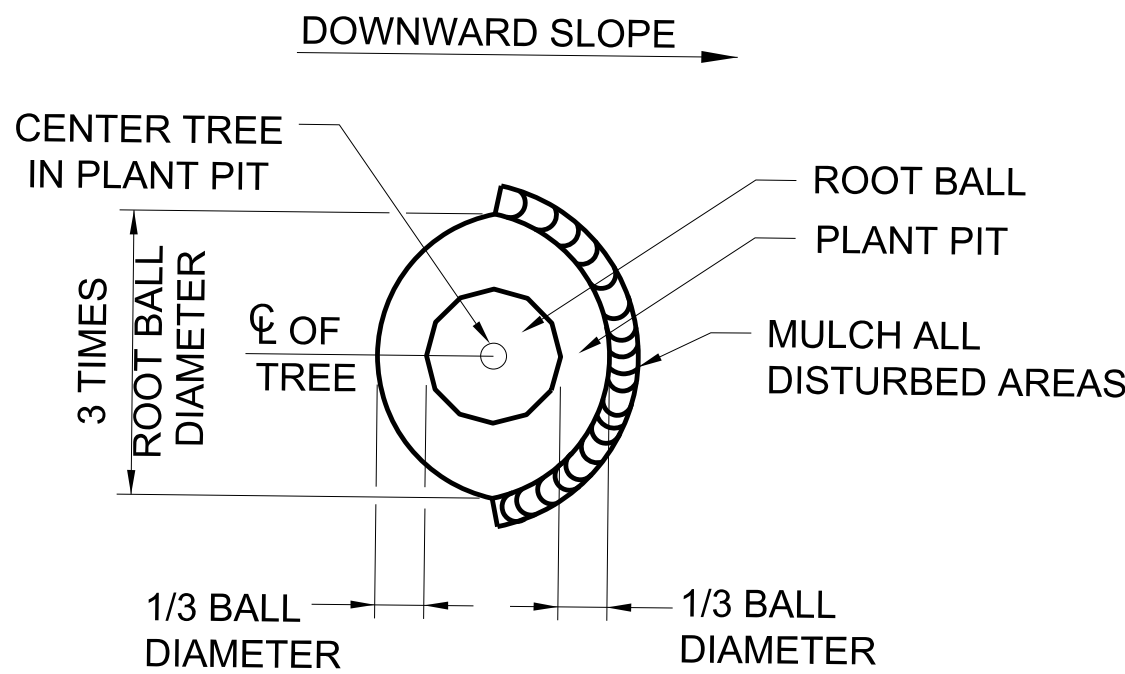
NOT TO SCALE



TREE/SHRUB PLANTING ON SLOPED AREAS

NOT TO SCALE

NOTE:
1. SEE PLAN VIEW -
ELONGATED PLANT PIT



**TREE/SHRUB INSTALLATION ON SLOPED
AREAS**

NOT TO SCALE

ADDENDA / REVISIONS	

NOT TO SCALE

**LITTLE MILL CREEK - TRIBUTARY 2
STREAM RESTORATION**



CONTRACT	2139-00
DRAWN BY:	E. HAIGHT
CHECKED BY:	K. HELLMANN

LANDSCAPE DETAILS

LD-02
SECTION
RKK
SHEET NO.
25

ATTACHMENT E

95% Design Report

LITTLE MILL CREEK - TRIBUTARY 2 STREAM RESTORATION

FINAL DESIGN REPORT

*NEW CASTLE COUNTY, DELAWARE
CONTRACT NO. 2139-00*



April 2026

PREPARED FOR:



NEW CASTLE COUNTY CONSERVATION DISTRICT
2430 OLD COUNTRY ROAD
NEWARK, DE 19702

PREPARED BY:



RUMMEL, KLEPPER & KAHL, LLC
700 EAST PRATT STREET, SUITE 500
BALTIMORE, MARYLAND 21202

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EXECUTIVE SUMMARY

New Castle County Conservation District (NCCD) identified the restoration of an unnamed tributary to Little Mill Creek (Tributary 2) beginning at the intersection of Centerville Road and Faulkland Road and extending downstream to Armstrong Avenue as a project to stabilize a degraded reach heavily influenced by urban development, provide ecological enhancement, and help meet pollutant load reductions associated with the Christina River Total Maximum Daily Load (TMDL). Prior to the plan development, several design options for restoration within the identified project area were considered.

Tributary 2 is located primarily within the Piedmont physiographic province. The project area is the focus of this report and encompasses approximately 750 linear feet of stream and four stormwater outfalls. In addition to the identified project area, the assessment expanded upstream and downstream of the project stream corridors to evaluate existing conditions of the base level control reach downstream of the project area, project reach through the project area, and supply reaches upstream of the project area.

The stream valley throughout the project reach has been severely influenced by anthropogenic changes in the watershed and the project area. These impacts include floodplain encroachment by residential developments, residential development of the watershed, ditching the floodplain for storm drain outfalls, and sewer line construction within the stream valley.

A constraints analysis was performed to identify limitations and challenges to restoring the stream. A 12-inch sewer crosses perpendicular to the valley near Maine Avenue and runs along the edge of the channel down to Armstrong Avenue. The design carefully considered the location and determined elevations of the existing sewer to avoid impacting it with design. The upstream limit of the reach consists of two storm water outfalls discharging flow from three different pipes. Approximately two-thirds of the way down the valley, a 15-inch storm drain discharges to an outfall channel that discharges to the main stem. The reach is not within a Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) flood hazard area. The recommended design proposes to create an integrated stream and wetland restoration to the extent feasible to reduce flood elevations, create riparian wetlands, recharge groundwater, provide flood storage and reduction, enhance the riparian buffer, improve the channel plan form, improve wildlife habitat, and obtain TMDL credits for sediment and nutrient reduction using all three Expert Panel stream restoration protocols while avoiding high-quality natural resources and existing infrastructure. This will be accomplished in the project reach by raising the streambed to the extent feasible and creating a floodplain bench by excavating into the adjacent higher floodplain terrace to better connect the riparian buffer to groundwater.

A function-based assessment has been established for the recommended design approach that consider hydrology, hydraulics, geomorphology, water quality and ecology. Objectives to meet the project goals and functional assessment parameters will be developed and refined as the design progresses.

A TMDL credit analysis was completed for the proposed design utilizing Protocols 1, 2, and 3 described in *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects*

(Expert Panel). The proposed project creates nutrient reductions estimated at approximately 62 tons of sediment per year, 45 pounds of phosphorus per year, and 364 pounds of nitrogen per year. These reductions result in an Equivalent Impervious Acre (EIA) credit of 18.6 acres. A summary of the crediting and supporting computations are provided in Appendix I.

1. INTRODUCTION

The Tributary 2 project reach extends from Centerville Road and Faulkland Road downstream to the Armstrong Road crossing. The project area is the focus of this report and encompasses approximately 750 linear feet. See Figure 1 for a Project Location Map. The project reach is shown in Figure 2.

A primary purpose of this study is to characterize the stream reach of Tributary 2 within the identified project area to determine the need for stream restoration, stabilization, floodplain connection, water quality improvements, riparian wetland creation, habitat enhancement, and other potential improvements.

Data collection efforts performed to develop this report included the following: geologic data, historical records; natural resource inventories for vegetation/forest cover, wetlands, and Waters of the U.S.; evaluation of site constraints; hydrologic analysis; visual site investigations and photo-documentation; geomorphic surveys, plotting and analysis; channel stability assessments using Banks Assessment for Non-point source Consequences of Sediment (BANCS) methodology, preliminary hydraulic analysis; functional impairment assessment; bankfull/threshold condition studies; and topographic field surveys. An evaluation of concept design alternatives has been performed to compare advantages and disadvantages of each option and the potential for functional uplift. These efforts have led to the development of a design recommendation to restore the stream reaches within the identified project area for design advancement. This report documents the studies performed to date for the project. A map of the project reach with locations of data collection is included in Appendix A.

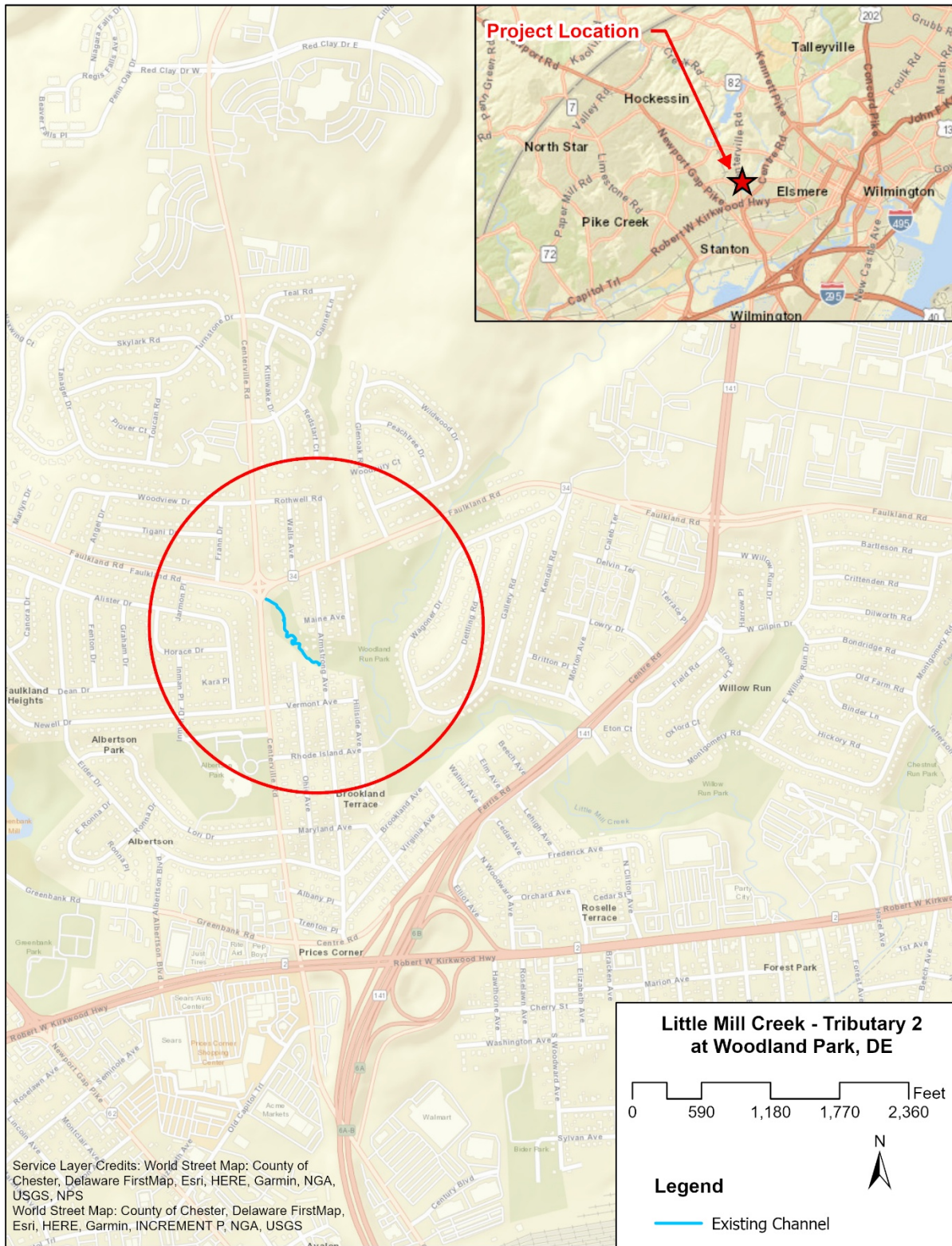


FIGURE 1: LOCATION MAP



FIGURE 2: PROJECT REACH

2. WATERSHED SUMMARY

2.1 Watershed Characterization and Land Use

The project area is in the Christina River Subwatershed of the Brandywine-Christina Watershed (HUC 02040205). The project watershed area is approximately 0.14 square miles at the downstream limit of the project reach, located at Armstrong Avenue. According to GISHydroWEB, the watershed consists primarily of residential development (88%) and urban land (12%). The impervious cover of the watershed is 34%.

TABLE 1: LAND USE

Land Use	Area (acres)	Percent of Watershed
Open Urban Land	10.68	11.62
Low Density Residential	52.51	57.11
Medium Density Residential	26.09	28.37
High Density Residential	2.00	2.18
Mixed Forest	0.67	0.73
Total	91.95	100

2.2 Physiography, Climate, and Surface Geology

The project watershed is located within the Piedmont and Coastal Plain physiographic province of Delaware. Bankfull and larger flow events result from several climatological events including frontal storms, rain on snow, and tropical storm events.

The source of sediments in the project area are Eastern Piedmont metasedimentary rocks and sediment from the Coastal Plain physiographic region. The Eastern Piedmont rocks are primarily derived from Faulkland Gneiss (Ofg). The Coastal Plain sediment is derived from Old College Formation (Qoc). The Geologic survey map is shown in Figure 3. Faulkland Gneiss is described as predominantly amphibolites and quartz. Old College Formation is comprised of Clayey silt, silty sand to sandy silt, and quartz sand with pebbles.

Based on field observations, the source of sediment and rock appears to be consistent with the geologic survey findings; however, the site has been greatly impacted and manipulated by centuries of anthropogenic impacts. As a result, the stream banks are primarily composed of legacy sediment infill from past poor land-use practices during the post-settlement era.

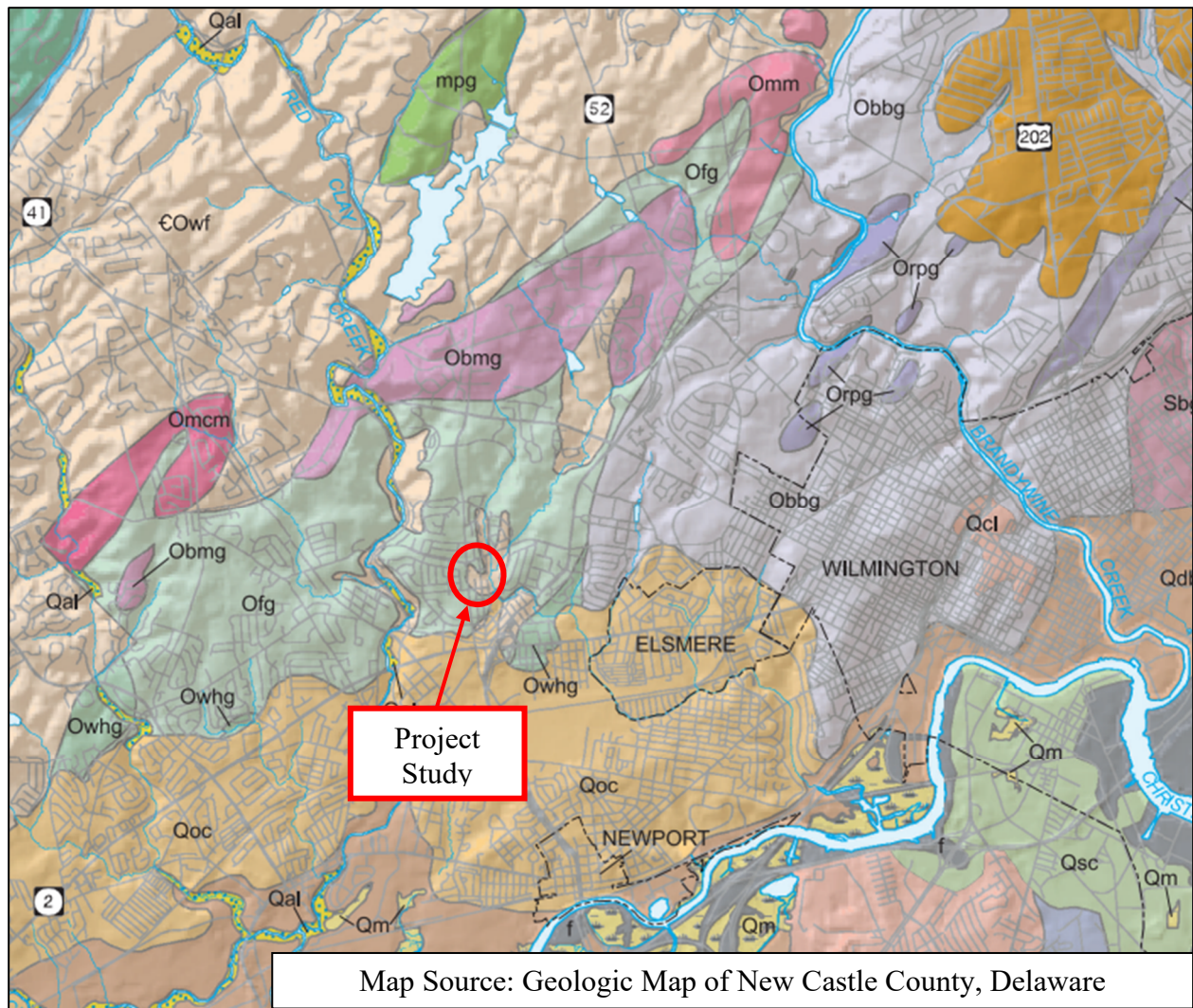


FIGURE 3: SURFACE GEOLOGY MAP

2.3 Landscape Morphology (Valley Type)

The current stream valley characteristics most closely resemble Rosgen's Valley Type C-AL-AD or confined alluvial valley with fluvial deposition. Due to significant historic and modern anthropogenic impacts in the watershed, these valley settings have been heavily manipulated throughout the project area, which is not directly accounted for in the Rosgen Valley Types.

2.4 Jurisdictional Wetlands and Waters

A wetlands and waters delineation was conducted within the project study area by RK&K environmental scientists in March 2025. A detailed description of jurisdictional wetlands and streams is included in the Natural Resources Inventory Memo in Appendix C. Table 2 summarizes the wetlands and waters and Table 3 summarizes functions and values of the wetlands.

TABLE 2: WETLANDS AND WATERS SUMMARY

Wetlands/Waters*	Type	Hydrologic Connectivity
WET-A	PFO	WUS-C
WET-B	PFO	WUS-A
WUS-A	Perennial	Little Mill Creek
WUS-B	Perennial	WUS-A
WUS-C	Intermittent	WUS-A

*As documented in the Natural Resources Inventory Memo in Appendix C

TABLE 3: WETLAND FUNCTIONS AND VALUES ASSESSMENT

Wetland ID	Function and Value Qualifier	Qualifier Comments
WET-A	Medium	• Small (~1,000 SF) PFO wetland located on hillslope that drains to WUS-C • Dominated by green ash, red maple, creeping jenny and English Ivy. • Provides some wildlife habitat and production export, but limited

Wetland ID	Function and Value Qualifier	Qualifier Comments
		groundwater recharge, floodflow alteration, and sediment/toxicant retention due to small size and landscape position.
WET-B	Medium	• Small (<1,000 SF) PFO wetland located in floodplain depression that drains to WUS-A • Dominated by green ash, fig buttercup, and leafy bulrush. • Provides some wildlife habitat and production export, but limited groundwater recharge, floodflow alteration, and sediment/toxicant retention due to small size.

*As documented in the Natural Resources Inventory Memo in Appendix C

2.5 Plant Community Descriptions

The forest within the project study area consists of an early/mid-successional Black Cherry – Maple Association Forest. The dominant size class in the canopy is 12-20 and 20-30 inches diameter at breast height (DBH). Dominant canopy tree species consists of red maple (*Acer rubrum*), white mulberry (*Morus alba*), black cherry (*Prunus serotina*), and green ash (*Fraxinus pennsylvanica*). Dominant understory species include wineberry (*Rubus phoenicolasius*), spicebush (*Lindera benzoin*), bush honeysuckle (*Lonicera maackii*), multi-flora rose (*Rosa multiflora*), Norway maple (*Acer platanoides*), and porcelain berry (*Ampelopsis brevipedunculata*). The herbaceous layer consists of ground ivy (*Glechoma hederacea*), Japanese honeysuckle (*Lonicera japonica*), wild onion (*Allium vineale*), English ivy (*Hedera helix*), fig buttercup (*Ficaria verna*), and poison ivy (*Toxicodendron radicans*). There are several areas in the floodplain that consist of maintained mowed lawn with patches of invasive vegetation growing around larger trees and the stream channel. The forest is in poor condition due to past disturbances and extensive invasive species. Six specimen trees and seven stand-alone trees were inventoried outside of the forest. For further information on the forest stands and tree inventory, see the Natural Resources Inventory Memo in Appendix C and the Tree Inventory Table in Appendix D.

2.6 Subsurface Soil Conditions

Subsurface soil data was collected by hand auger in March 2025, to a depth of approximately 3 feet at 3 locations within the floodplain of the project reach. The soil borings were laid along a survey rod, photographed, and visually inspected to determine the cursory soil characteristics. The field observations and subsurface soil characteristics are noted in Table 4. A map showing the soil boring locations is included in Appendix A.

TABLE 4: SOILS DATA AT BORING LOCATIONS

Boring Location	Depth (inches)	Soil Characteristics	Groundwater Level
SP-1 (Hand Auger)	0-7	Silt loam	Did Not Encounter
	7-20	Silty clay loam	
	20-32	Sandy loam	
	32-38	Silty Clay	
SP-2 (Hand Auger)	0-12	Silty clay loam	Did Not Encounter
	12-19	Silty clay loam	
	19-36	Silty Clay	
SP-3 (Hand Auger)	0-7	Silty clay loam	Did Not Encounter
	7-22	Silty clay loam	
	22-36	Silty Clay	

3. CONSTRAINTS ANALYSIS

3.1 Utilities

Several utilities are present in the stream valley as described below.

3.1.1 Sanitary Sewer

The topographic survey shows a 12-inch steel sewer main crossing the valley near Maine Avenue then continuing along the west edge of the valley down towards Armstrong Avenue. The 12-inch steel sewer is exposed in the existing channel and does not appear to be encased in concrete. Two sewer manholes along the west edge of the valley were identified as well.

3.1.2 Storm Drain Outfalls

Within the project area, there are 4 storm drain outfalls that discharge runoff from the adjacent and/or upstream neighborhoods. 3 of the 4 outfalls are at the most upstream limit of the reach and are the main source of hydrology within the reach. The 4th outfall is approximately 530-ft downstream of the 3 main outfalls. Additional discussion of each outfall is included in Section 4.1.3 of this report.

3.2 Existing Infrastructure

Existing infrastructure throughout the project area consists mostly of single-family homes and associated roadway networks. Tributary 2 is conveyed under Armstrong Avenue by twin 42-inch reinforced concrete pipe (RCP) culverts with shallow baseflow flowing through one cell.

3.3 Property Ownership

The project site is primarily contained on county-owned property as open space. Privately-owned residential parcels line most of the floodplain throughout the stream valley. Based on Geographic Information System (GIS) data, the existing channel alignment for Tributary 2 meanders onto the northwest corner of private parcel at 615 Armstrong Avenue, parcel 0703440336. Based on conversations with the local community leader, the channel has been laterally migrating towards 615 Armstrong Avenue. To realign the channel, the design for Tributary 2 proposes channel fill on the private parcel. Additional impacts associated with the improvements to the stream valley include changes to flooding/drainage and/or view impacts based on trees.

3.4 Site Access

Site access for construction will most-easily occur from Armstrong Ave near the downstream limit of the project, Centerville Road on the west side, and off Maine Avenue on the east side. Construction access points have been provided on the design plans.

3.5 FEMA Floodplain

FEMA's effective Flood Insurance Rate Map (FIRM) 10003C0151K, with Effective Date of 01/22/2020, shows the project area of Unnamed Tributary 2 to Little Mill Creek unmapped with Base Flood Elevations (BFEs) undetermined upstream of Armstrong Road.

Figure 4 shows the effective FIRM through the project reach.

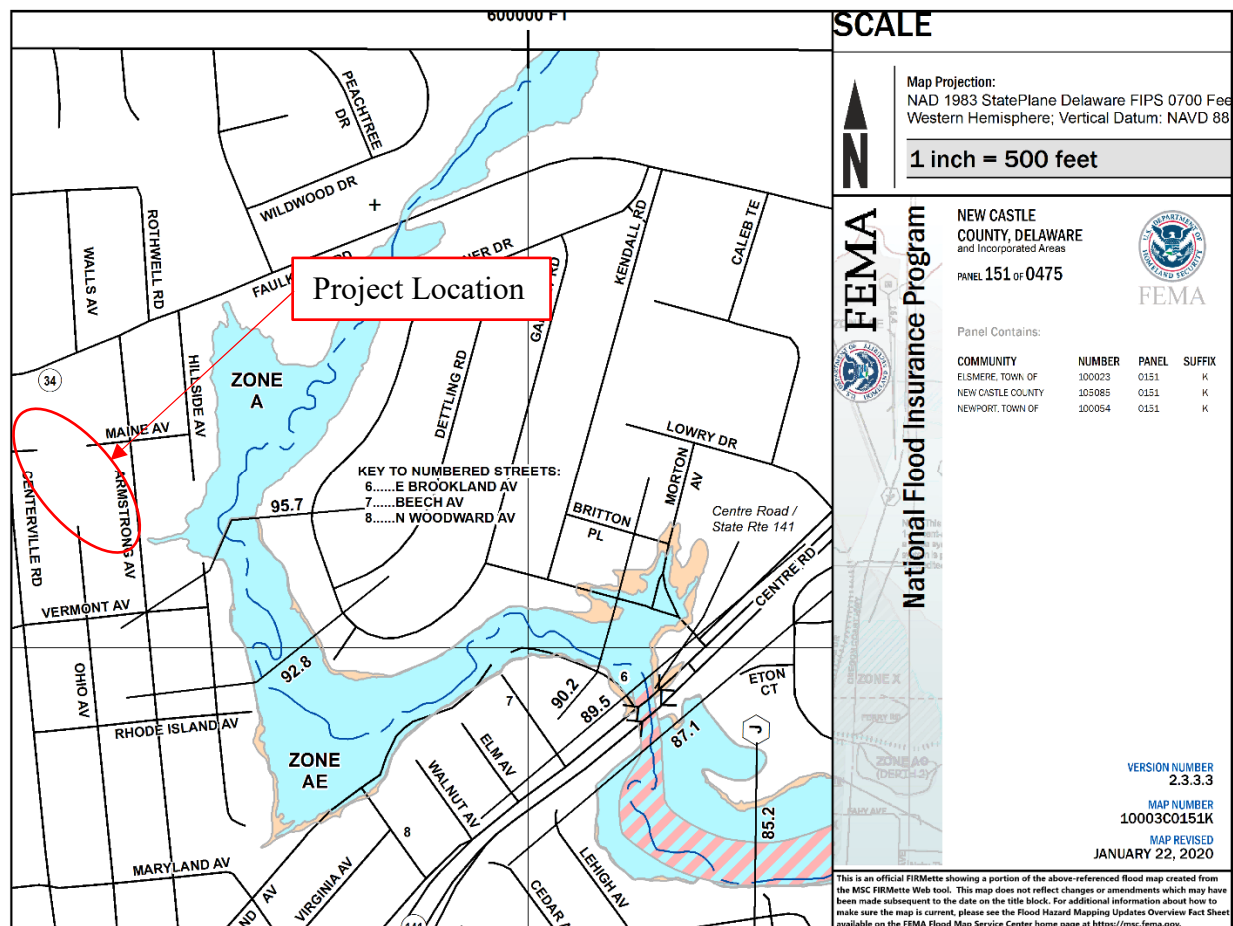


FIGURE 4: FEMA FLOOD INSURANCE RATE MAP

3.6 In-Stream Work Restrictions

Little Mill Creek and its tributaries are classified as perennial and intermittent; therefore, they are regulated waterways by the Delaware Department of Natural Resources and Environmental Control (DNREC). However, no time of year or other in-stream work restrictions apply for construction for these regulated waterways.

4. EXISTING STREAM CONDITIONS

4.1 Existing Conditions Visual Assessment

As part of developing the concept design for the restoration of Tributary 2, a visual assessment was conducted by RK&K in May 2024 and January 2025. The visual assessments were used as a key design component to identify potential sediment and debris sources, degradation and depositional areas, and regional and localized impacts throughout the stream corridor that may influence long-term stability of the project reach proposed for restoration. This visual assessment of the existing conditions includes a description of the sediment supply reach upstream of the project, the project reach, and the base level control reach downstream of the project limits.

4.1.1 Base Level Control Reach

The purpose of the visual assessment of the base level control reach is to identify grade control downstream of the project limits and evaluate whether the stream features can be relied upon for long-term grade control of the channel bed and protect the proposed design of the project. Generally, grade controls such as culverts, sewer encasements, armored riffles, backwater from a larger stream or body of water, tidal influences, and/or stable streambed material, where the streambed is expected to stay at its current elevation, allow for a reliable elevation at which to tie in a project at the downstream limit. When one or more of these controls is not present, it is important to evaluate the potential long-term degradation of the channel downstream of a proposed project such that a sufficient grade control is incorporated into the proposed design of the restoration reach and prevent headcuts or degradation from affecting the project site.

For the purposes of the project assessment, the base level control reach for Tributary 2 was defined as the reach from Armstrong Avenue to the confluence with Little Mill Creek. The base level control reach is heavily manipulated to accommodate residential development on both sides of the stream and includes utility crossings within the stream. Ultimately, the base level control for the project reach is the twin 42-inch RCPs that convey Tributary 2 under Armstrong Avenue. The roadway embankment and these culverts act as functioning hardened grade control.



Photo 1: Exposed sewer in existing channel



Photo 2: Outfall of twin 42-inch RCPs below Armstrong Avenue

4.1.2 Project Reach

The purpose of the visual assessment of the project reach is to evaluate the stream and floodplain setting, identify impairments to the stream and stream valley, and identify potential project constraints. The assessment also leads to justification of temporary project impacts during permitting, identifies impairments to be resolved during the design process, and helps to create goals and objectives for the restoration project.

The project reach appears to have been subjected to several anthropogenic impacts in the stream channels, floodplain areas, and hillside slopes throughout the project area. These impacts include roadway construction, utility construction within the stream valley, construction of concrete flumes for channel protection, and construction of residential developments on both sides of the stream valley. The exposed sewer crossing the stream indicates that Tributary 2 has incised over time.



PHOTO 3: BANK EROSION WITHIN PROJECT REACH



PHOTO 4: EXPOSURE OF TREE ROOTS DUE TO BANK EROSION



PHOTO 5: SEWER INFRASTRUCTURE IN THE STREAM VALLEY



PHOTO 6: FAILED CONCRETE FLUME WITHIN THE EXISTING CHANNEL



PHOTO 7: ANTHROPOGENIC INFLUENCE WITHIN STREAM CORRIDOR

4.1.3 Stormwater Outfalls in the Project Reach

Within the project area, there are 4 storm drain outfalls that discharge stormwater runoff directly to the channel from the upstream and/or adjacent neighborhoods. The storm drain outfalls consist of a variety of pipe sizes that vary in drainage area from collection of a single secondary roadway to entire residential neighborhoods.

A detailed description of each of the storm drain outfalls and outfall channels located within the project reach is included below. The outfalls are numbered 1-3 from upstream to downstream. The location and naming of the 4 outfalls are shown in the map in Appendix A.

Storm Drain Outfall 1a (DeIDOT ID #0111199427) – Outfall 1a is located at the upstream limit of the reach and discharges directly into Tributary 2. The storm drain is a 30-inch RCP that discharges through the wingwall of the outfall associated with storm drain outfall 1b. The outfall drainage network consists of a significant amount of roadway and residential neighborhood to the north and east.

Storm Drain Outfall 1b (DeIDOT ID #0111199431) – Outfall 1b is located at the upstream limit of the reach and discharges directly into Tributary 2. The storm drain is a 48-inch x 76-inch horizontal elliptical RCP (HERCP). Outfall 1b is the main outfall in this location with Outfall 1a discharging through a wingwall. The outfall drainage network consists of a significant amount of roadway and residential neighborhood to the north and west. Outfall 1a and 1b both discharge to a degraded concrete flume that has broken and/or missing panels.



PHOTO 8: OUTFALL 1A AND 1B

Storm Drain Outfall 2 (DeIDOT ID #0111199430) – Outfall 2 is located approximately 33-feet southwest of Outfall 1a and 1b. The storm drain is a 27-inch RCP and discharges into a concrete flume. The confluence with Outfall 1a's and 1b's concrete flume is approximately 30-feet downstream. From the confluence, the concrete channel extends approximately another 110-feet downstream. The outfall drainage network consists of a significant amount of roadway and residential neighborhood to the west.



PHOTO 9: OUTFALL 2

Storm Drain Outfall 3 (DeIDOT ID #0111033231) – Outfall 3 is located approximately 530-feet downstream of Outfalls 1a, 1b, and 2. The storm drain is a 15" RCP that discharges to a small ditch that flows into Tributary 2 approximately 70-feet downstream of the outfall. The opening of the outfall pipe is obstructed with soil and rock debris which may have a negative impact on the capacity of the upstream system. The drainage network consists of a small group of road inlets around the intersection of Hillside and Ohio Avenues.



PHOTO 10: OUTFALL 2

4.1.4 Sediment Supply Reach

Upstream of the intersection of Centreville Road and Faulkland Road, the channel appears to be less defined, acting as a drainage swale between private properties indicating that sediment load upstream of the intersection is likely limited.

4.2 Hydrology

Existing conditions hydrology was performed for the project site. Bankfull discharge estimates were determined using regional curve data. Peak discharges were estimated using the regional regression equations in StreamStats. Full flow discharge was assumed and used to estimate peak discharges coming from outfalls throughout the reach. Discussion and results are included below.

4.2.1 Bankfull Regional Curve and Regression Equation Analysis

Bankfull discharge and geometry were calculated following relationships presented in Bankfull Discharge and Channel Characteristics of Streams in the Piedmont Hydrologic Region from the U.S. Fish and Wildlife Service (USFWS, McCandless, 2002). The regional curve estimates and fixed region equation discharges are presented in Table 5.

TABLE 5: BANKFULL REGIONAL DISCHARGE DATA

Study Point Location	Drainage Area (sq. mi)	Regional Curve Discharge (cfs)	Cross Sectional Area (sf)	Width (ft)	Mean Depth (ft)
Upstream Project Limit	0.12	17	3.7	6.5	0.6
Downstream Project Limit	0.14	19	4.2	6.9	0.6

It is important to note that the developers of the bankfull regional curve relationships following the methods taught in natural channel design courses by Rosgen and others did not appear to consider pervasive historic and modern anthropogenic influences and the subsequent impacts to stream corridors that greatly affected hydrologic, hydraulic, geomorphic, sediment mobility, and ecological functions of watersheds in the Eastern U.S., including the Piedmont region where Little Mill Creek resides. For example, most of the USGS gage sites used to develop the USFWS Piedmont Regional Curves (McCandless, 2002) computed bankfull discharges with boundary shear stresses that far exceeded the estimated critical shear stress for the D50 or even the D84 of the streambed materials, which may lead to a long-term state of degradation and system wide instabilities at many of these stream gage study sites.

4.2.2 Peak Discharge Estimates – Statistical Regression Methods

StreamStats was used to develop additional discharge estimates for Tributary 2 at the upstream and downstream limits of the project reach. The results of StreamStats are summarized in Table 6. See Appendix B for detailed output data.

TABLE 6: PEAK DISCHARGES

Study Point Location	Peak Discharges for Return Interval (cfs)		
	2-Year	10-Year	100-Year
Upstream Project Limit	78	181	266
Downstream Project Limit	88	202	295

Due to the extensive upstream urbanization of the watershed, the reach likely experiences flashiness as impervious areas without stormwater management practices produce high intensity runoff events. Therefore, the 3 main outfalls at the top of the reach were evaluated for full flow capacity based on the existing pipe slopes. The results of the full flow capacity analysis are summarized in Table 7.

TABLE 7: FULL FLOW PIPE CAPACITY

Study Point Location	Peak Discharges (cfs)		
	Outfall 1a	Outfall 1b	Outfall 2
Storm Drain Outfalls	65	316	31

Under the assumption that all 3 outfalls produce peak discharges at a similar time results in a total peak discharge of 412 cfs (65 cfs + 316 cfs + 31 cfs) which is approximately 40% higher than 100-year discharge at the downstream project limits as estimated by StreamStats. The full flow capacity discharge of 412 cfs

was included in the hydraulic analysis for evaluation of a worst-case scenario. This scenario is referred to as the 100+-year event.

4.3 Existing Conditions Hydraulics Analysis

RK&K performed two field-surveyed cross sections located within the project study area which were analyzed to assess hydraulic parameters of the sections when watershed discharges completely fill the active channel. The purpose of this analysis is to determine the existing conditions top of bank shear stresses at multiple points along the project study area, to assess streambed and bank sediment mobility in relation to the top of bank discharges, and to estimate the frequency of these hydraulic conditions.

4.3.1 Top-of-Bank Cross Section Analysis

The top-of-bank represents the approximate point of incipient flooding, or the point when a hydraulic connection is made to the surrounding valley flat, floodplain, or terrace. Top-of-bank data was computed for two locations.

The top-of-bank computed data has been plotted and is included in Appendix F. Table 8 summarizes the geomorphic data collected within the project study area at a riffle section for use in identifying the top-of-bank hydraulic parameters without backwater conditions.

Based on the hydrologic study discussed above and this top-of-bank hydraulic data, the active channel through the project reach will convey significant flood events within the active channel banks. The in-channel shear stress produced by these magnitudes of discharges is capable of mobilizing sediments much larger than the native streambed substrate and stream bank materials that exist on-site at the cross sections analyzed. Therefore, the active channel where detailed geomorphic and hydraulic data were collected and analyzed finds that long-term degradation of these reaches is anticipated for the foreseeable future.

TABLE 8: SUMMARY OF TOP-OF-BANK HYDRAULIC DATA AT RIFFLE SECTIONS

Location	XS 1-1	XS 1-2
Width (ft)	22.3	17.7
Average Depth (ft)	2.8	0.72
Maximum Depth (ft)	4.4	1.8
Cross Sectional Area (sf)	62.5	12.8
Hydraulic Radius, R	2.31	0.66
Width/Depth Ratio	7.94	24.4
Estimated Valley Slope (ft/ft)	0.0202	0.0244
D50 (mm) (measured)	33.6	33.6
D84 (mm) (measured)	63.8	63.8
Top of Bank Discharge (cfs)	460.9	36.3
100-Year Discharge (cfs)	295	295
Average Top of Bank Boundary Shear Stress (psf)	2.9	1.0
*Mobile Particle (mm) at Average Top of Bank Boundary Shear Stress	180	60
Max Top of Bank Boundary Shear Stress (psf)	5.5	2.72
*Mobile Particle (mm) at Max Top of Bank Boundary Shear Stress	350	210

** Taken from Shields Diagram as modified by Leopold, Wolman & Miller 1964.*

5. CHANNEL STABILITY ASSESSMENT

A field data collection effort was performed in January 2025 to assess channel stability at 2 cross sections along the project corridor. A map showing the locations of these cross sections is included in Appendix A. The purpose of this effort was to document existing channel conditions via visual assessments, photographs, and geomorphic cross sections and profiles to measure and quantify the current process of bank erosion occurring along the project study area using the Bank Assessment for Non-Point Source Consequences of Sediment (BANCS) methodology, as documented in the *Watershed Assessment of River Stability and Sediment Supply* (WARSSS) document (Rosgen, 2006). This effort will serve as a resource to confirm and help quantify channel instability occurring along the reach. The following sections describe the work performed to assess channel stability within the project study area.

5.1 Stability Predictions

An on-site assessment was performed to analyze, quantify, and predict morphological changes at one point in time using empirical methods at Tributary 2. Consideration was given to the influence of riparian vegetation, flow regime, incision, confinement, entrenchment, debris occurrences, depositional features, and bank erodibility properties. The locations of the cross sections were selected to give a fair representation of the channel condition. Several empirical methodologies have been developed to estimate stability and predict changes at a point in time along the project reach.

As part of the BANCS methodology, the Bank Erodibility Hazard Index (BEHI) methodology was used to estimate the potential lateral (bank) erosion rates based upon current conditions. The BEHI methodology uses field data to determine expected erosion rates at a specific stream bank at the time the study was performed. Note that as stream banks deform or change over time, so do the BEHI properties. The BEHI is computed on banks that appear to be raw or unstable by analyzing the following bank properties: exposed bank height, stratification of materials, root depth, root density, bank angle, and Near Bank Shear Stress (NBSS). These measured properties have been used to predict the amount of lateral bank erosion from the *Bank Erosion Rate Curve* produced by the U.S. Fish and Wildlife Service (USFWS) for Hickey Run in Washington, DC. Ultimately, these predictions provide a quantity of mass wasting or surface erosion from the analyzed study bank. The BEHI and NBSS data forms are included in Appendix E. Both stream banks for the project reach have been analyzed using the above methodologies. A summary of results is included in the Erosion Summary Table in Appendix I.

6. PROJECT GOALS AND OBJECTIVES

The visual site assessments, natural resources investigations, geomorphic studies, and hydraulic analyses have been used to identify potential stream, wetland and floodplain restoration measures based on local site conditions, natural resource impacts, sediment sources and storage areas, and other anthropogenic impacts that may affect long-term stability on a watershed or regional scale. These efforts have been performed to recommend conceptual design approaches for each reach using the most environmentally beneficial methods to provide high functional uplift potential, cost-effective TMDL credits, and long-term sustainability and success.

6.1 Project Goals

6.1.1 TMDL Credits for Sediment and Nutrient Reduction

A goal of the project is to develop a restoration approach that provides TMDL credits for sediment and nutrient reduction while also providing functional uplift to aquatic resources. TMDL credits for the targeted restoration reaches will be calculated using the latest protocols from the *Expert Panel to Define Removal Rates for Individual Stream Restoration Projects* (Expert Panel Report), dated January 17, 2014 incorporating updates from *Consensus Recommendations for Improving the Application of the Prevented Sediment Protocol for Urban Stream Restoration Projects Built for Pollutant Removal Credit*, dated February 27, 2020 and *Consensus Recommendations to Improve Protocols 2 and 3 for Defining Stream Restoration Pollutant Removal Credits*, dated October 27, 2020. A restored stream channel and floodplain is an acceptable ecological alternative to address stormwater management requirements at the watershed scale for both water quality and quantity. Water quality enhancements can be obtained immediately by eliminating sources of sediment and nutrients stored in erosive stream banks, which corresponds to Protocol 1 of the *Expert Panel Report* for TMDL reductions.

Attaching flood flows, base flows and/or groundwater to a highly attached riparian wetland floodplain system serves to trap and filter incoming sediment and nutrient laden floodwaters. This results in improved water quality to the downstream receiving waters, which corresponds to Protocol 3 of the *Expert Panel Report* for TMDL reductions. Floodplain pinch points created by natural or manmade (i.e., bridges or culverts) features often attenuate flood flows. Attenuation of flood flows in a restored floodplain area with increased storage volume will often reduce downstream peak discharges. Flood flow volume reductions can be achieved through the removal of low permeability soils and concrete to promote more frequent flooding into the floodplain area thereby enhancing evapo-transpiration, floodplain ponding, and infiltration.

Restoring the active channel by enhancing the plan-form pattern, adding in-channel flow diversity and incorporating woody material allows for improved base flow quality and channel stability, which corresponds well to Protocol 2 of the *Expert Panel Report* for TMDL reductions.

6.1.2 Infrastructure Protection

Protection of existing infrastructure within the identified project reach is another targeted goal of the proposed restoration. There is an exposed sanitary sewer that is at-risk to being further exposed, undermined, and/or damaged. To help limit excavation associated with the restored floodplain, the elevation of the streambed is being raised throughout the project reach. This also serves to provide additional protection to the existing sanitary sewer line that crosses the proposed floodplain and channel by providing additional cover over the pipe. Additionally, rock grade control structures and buried floodplain logs are proposed over and/or in the vicinity of the utility crossings to provide additional in-stream and floodplain protection during larger storm events.

6.1.3 Functional Uplift

The project will serve to restore/enhance stream, wetland, and floodplain functions. The uplift potential of physical, chemical, and biological processes and functions is discussed in more detail in Section 9 and functional assessment parameters and measurement metrics to assess success will be further developed as the design progresses.

6.1.4 Wetland Creation/Enhancement

Creating sustainable riparian wetlands in and along the floodplain areas of the project reaches has multiple benefits, including water quality enhancement, flood storage, groundwater recharge, and creation or enhancement of wildlife habitat. Frequent out-of-bank flows settle in the wetlands, where sediments conveyed in the wash-load can drop out, nutrient uptake by vegetation can occur, and nuisance flooding can be minimized. Water stored in the wetland systems gradually filters through the ground, thereby recharging groundwater. Vegetated riparian wetlands provide vital habitat for a variety of aquatic and terrestrial wildlife. *Reestablishing the appropriate natural structure can bring back beneficial functions. For example, restoring the bottom elevation in a wetland can be critical for reestablishing the hydrological regime, natural disturbance cycles, and nutrient fluxes (USEPA, 2000).*

6.1.5 Groundwater Recharge

As water from higher stage stream flows enters onto the newly restored floodplains, the water collects in the created wetland areas, where it is slowed down by surface roughness, filtered by vegetation, and allowed to infiltrate into the soil to recharge the groundwater supply and help sustain base flow periods during dryer periods. *A wetlands restoration project is not likely to succeed if the hydrological regime that existed prior to degradation cannot be reestablished (USEPA, 2000).*

6.1.6 Riparian Buffer Enhancement

Native plants, both herbaceous and woody, provide numerous benefits to instream water quality and to the water that moves through the adjacent floodplain areas. Riparian buffers are most effective when a dense vegetated root zone is highly connected to groundwater, stream base flows and flood flows, which is often not the case due to anthropogenic impacts. Trees and shrubs shade the stream, keeping water temperature cooler in the warmer seasons, creating cool-water habitat and promoting healthier aquatic life. Leaf litter from woody plants provides a source of food for macroinvertebrates. Herbaceous plants in the riparian wetlands reduce nutrients through the uptake of nitrogen and phosphorus.

6.1.7 Wildlife Habitat Improvement

A stable stream with an expansive well-vegetated riparian wetland floodplain creates and improves habitat for instream and terrestrial wildlife species, starting with the macroinvertebrate population and extending up to fish, birds, and mammals. The restored stream and floodplain system will provide food, shelter, and nesting for a wide variety of species. *Restoration strives for the greatest progress toward ecological integrity achievable within the current limits of the watershed, by using designs that favor the natural processes and communities that have sustained native ecosystems through time* (USEPA, 2000).

6.2 Project Objectives

The main objectives of the project include:

1. Obtain TMDL credit via Protocols 1, 2, and 3 following the Expert Panel Report latest methods.
2. Minimize impacts to existing natural resources to the extent practicable.
3. Enhance sediment and carbon retention and storage and capacity within the restored project reaches.
4. Reduce sediment sources within the project reach to negligible amounts by creating a low stress channel and floodplain condition. Remove high stream banks subject to erosive forces and incorporate design measure that provide for floodplain-wide grade control to prevent incision. In reaches where low stress conditions cannot be achieved, such as steep zones, combat the high stress environment with channel/floodplain armoring measures.
5. Where feasible, create frequently inundated wetland floodplains that exchanges water, nutrients and carbon during even minor runoff events. This will be accomplished by creating stream channels with very low bank heights.
6. Where feasible, create groundwater conditions that support wetland hydrology and extensive hyporheic flow. The streambed and base flow water level will be increased and/or the floodplain elevation will be graded lower to create a consistent groundwater level below the floodplain surface in the stream and wetland complex reach.

7. FINAL DESIGN

The final design incorporates floodplain profiles, floodplain grading, landscaping tables, typical sections, and design details.

7.1 Design Components

7.1.1 Floodplain Design

The design incorporates excavating the existing floodplain to the extents feasible within the constrained property boundaries and existing utilities that cross and parallel the floodplain. The restored floodplain has a valley slope range of 1.0% to 3.0% and a bottom width ranging from 15-feet to 50-feet. The restored riparian wetlands have been designed to allow flood flow to the floodplain during almost every runoff

event, leading to regular inundation of the adjacent floodplain wetlands. The restored floodplain will also provide flood relief and significantly reduce the shear stress carried by the channel.

7.1.2 Energy Dissipators

Hydraulic modeling of the culverts at Centerville Road and Faulkland indicate the culvert exit velocities range from 7 – 18 feet per second (fps); therefore, energy dissipators comprised of Class R-5 and R-7 riprap based on DelDOT's standard construction detail E-20 are proposed. The energy dissipators will provide long-term protection against instability and ensure a stable transition exists between the culvert outlets and restored reaches. The energy dissipators will collect discharge and serve to break flow momentum leaving the structures, allow for turbulence in the pool, and reduce energy by spreading flow across the floodplain at the outlet of the energy dissipators.

7.1.3 Grade Control

Where shear stress and velocity values in the 2D model exceed the critical shear stress of the native streambed materials and/or wetland vegetation in the restored floodplain, imported streambed material of R-5 riprap is proposed. Underlayment extends across the proposed restored floodplain bench to provide a permanent grade control layer that is covered with soil/topsoil to promote wetland vegetation over the armor layer. In addition to underlayment, armored riffles are proposed along most of the main channel. Armored riffles will provide long-term stability within the channel for locations of elevated shear stresses.

A series of buried in-channel and floodplain logs are proposed throughout the project to provide additional protection of the constructed riffle-pool sequences as well to provide protection of the floodplain against rilling and/or head-cutting through the topsoil. Floodplain logs are proposed at approximately every 1-foot of drop along the restored floodplain. Additionally, floodplain logs are proposed just upstream and downstream of the sewer crossing. In-channel logs are proposed at the head and tail of each riffle. Clay barriers are proposed within the existing channel to block subsurface flow and protect against flow downcutting into the abandoned channel.

7.1.4 Drainage Outfalls

The existing 15" RCP at Outfall 3 will remain in place and tie into the toe of the proposed floodplain with a 6.25-foot long class R-5 riprap apron is proposed to dissipate energy.

8. HYDRAULIC ANALYSIS

Proposed conditions hydraulic/hydrodynamic analyses were performed using HEC-RAS (1D model) and TUFLOW (2D model). The HEC-RAS model was utilized to compare existing and proposed conditions and fulfill permit requirements. The TUFLOW model was utilized to inform and improve the restoration design strategy. TUFLOW offers the following benefits for design as compared to the HEC-RAS analysis:

- Analyzes shear stress along the entire stream channel and floodplain surface areas and not only at HEC-RAS cross section locations,
- Calculates varying shear stress values laterally across the stream channel and floodplain compared to one average shear stress value in each channel and overbank area as calculated by HEC-RAS, and

- More effectively models flow transitions, ineffective flow areas, channel and floodplain bend losses, and flow expansion and contraction using a finite difference solution.

8.1 HEC-RAS 1D

The proposed conditions HEC-RAS model was prepared using the same cross section stations as the existing conditions where feasible to make a direct comparison of water surface elevations, velocities, and shear stresses. Flow data, including storm discharges and boundary conditions, are the same as the existing conditions. Manning's n values were estimated using standard engineering practices and were based on anticipated plantings, stream/floodplain structures, channel pattern, and surface irregularities and obstructions. Tributary 2 below Armstrong Avenue is being restored as part of the Little Mill Creek Stream Restoration project; therefore, the proposed conditions for Tributary 2 upstream of Armstrong Avenue accounts the proposed restoration downstream of Armstrong Avenue.

8.1.1 100-year Water Surface Elevations Comparison

Water surface elevations for the 100-year storm event generally increased when comparing the proposed floodplain to the existing conditions; however, all increases are contained within county property and most increases are within the limits of floodplain restoration. Table 9 presents a summary of the comparison of the 100-year water surface elevations for the existing and proposed conditions. The proposed restoration profile is set to provide one foot of cover over the existing sewer pipe crossing. To provide cover, the restored design fills the channel throughout most of the profile, causing increases in water surface elevations.

TABLE 9: UNNAMED TRIBUTARY 2 TO LITTLE MILL CREEK 100-YR WATER SURFACE ELEVATION RESULTS

River Station	Recurrence Interval	Existing WSEL	Proposed WSEL	Difference
Centerville Road				
1262	100-yr	111.96	110.14	-1.82
1155	100-yr	109.00	109.51	0.51
1047	100-yr	107.27	108.10	0.83
954	100-yr	104.97	106.34	1.37
833	100-yr	103.94	104.44	0.50
629	100-yr	102.21	101.87	-0.34
498	100-yr	101.73	101.74	0.01
436	100-yr	101.70	101.69	-0.01
400	Armstrong Road Culvert			
362	100-yr	96.92	96.30	-0.62
336	100-yr	96.70	96.03	-0.67
271	100-yr	96.11	95.22	-0.89
191	100-yr	94.89	93.42	-1.47
77	100-yr	92.14	91.76	-0.38

Notes:

	Decreased 100-yr WSEL
	Increased 100-yr WSEL

8.1.2 2- and 10-year Shear Stress Comparison

An analysis of the existing and proposed average shear stresses for the 2 and 10-year storm events was conducted. The results are summarized in Table 10. The HEC-RAS output indicates channel shear stresses increase and decrease throughout the reach. In areas of shear stress increases, the channel will be protected to withstand the elevated shear stress. The HEC-RAS model results were used in tandem with the TUFLOW model results, discussed below in Section 9.2, to inform the design throughout the project reach to maintain stability within the proposed channel. The proposed supplemental streambed material has been sized to withstand the modeled shear stress and provide long-term sustainability of the project. Protection for areas downstream of Armstrong Road was evaluated for during the Little Mill Creek Stream Restoration project.

TABLE 10: UNNAMED TRIBUTARY 2 TO LITTLE MILL CREEK 2- AND 10-YR CHANNEL SHEAR STRESS RESULTS

River Station	2-Year Channel Shear Stress (psf)		Difference %	10-Year Channel Shear Stress (psf)		Difference %
	Existing	Proposed		Existing	Proposed	
1262	1.69	0.20	-88.17	2.30	0.35	-84.78
1155	0.78	0.64	-17.95	1.40	1.03	-26.43
1047	1.57	0.90	-42.68	1.49	1.47	-1.34
954	1.24	1.30	4.84	2.59	1.82	-29.73
833	0.40	0.77	92.50	0.56	1.26	125.00
629	0.97	1.56	60.82	0.95	2.10	121.05
498	0.65	0.18	-72.31	0.45	0.15	-66.67
436	0.11	0.08	-27.27	0.13	0.09	-30.77
400	Armstrong Road Culvert					
362	1.70	0.34	-80.00	2.29	0.72	-68.56
336	0.97	1.18	21.65	1.13	1.89	67.26
271	0.49	0.88	79.59	0.90	1.10	22.22
191	1.83	1.51	-17.49	2.30	2.73	18.70
77	1.57	1.01	-35.67	2.35	1.60	-31.91

8.1.3 2- and 10-year Velocity Comparison

Table 11 presents a comparison summary of the existing and proposed conditions average channel velocities for the 2-year and 10-year storm events. The HEC-RAS output indicates channel velocity increases and decreases throughout the reach. In the existing conditions model, flood flows are primarily contained in the area defined as channel via bank station selection. The proposed design allows for better floodplain connection, which was reflected in the cross-section bank station selection. The TUFLOW model results, discussed below in Section 9.2, were used to further evaluate any areas of high velocity and thus potential stability concern. Protection for areas downstream of Armstrong Road were evaluated during the Little Mill Creek Stream Restoration project.

TABLE 11: UNNAMED TRIBUTARY 2 TO LITTLE MILL CREEK 2- AND 10-YR CHANNEL VELOCITY RESULTS

River Station	2-Year Channel Velocity (fps)		Difference %	10-Year Channel Channel Velocity (fps)		Difference %
	Existing	Proposed		Existing	Proposed	
1262	5.45	2.14	-60.73	6.96	3.03	-56.47
1155	4.04	3.47	-14.11	5.46	4.66	-14.65
1047	5.76	3.91	-32.12	6.09	5.33	-12.48
954	4.59	4.59	0.00	6.70	5.84	-12.84
833	2.31	3.65	58.01	2.75	4.96	80.36
629	4.38	5.25	19.86	4.70	6.45	37.23
498	3.32	2.02	-39.16	2.99	2.05	-31.44
436	1.47	1.37	-6.80	1.67	1.54	-7.78
400	Armstrong Road Culvert					
362	5.30	2.88	-45.66	6.64	4.51	-32.08
336	4.31	4.45	3.25	4.96	6.02	21.37
271	3.22	3.88	20.50	4.56	4.72	3.51
191	5.88	5.33	-9.35	7.20	7.58	5.28
77	5.30	3.97	-25.09	6.94	5.38	-22.48

8.1.4 Results Discussion

Hydraulic conveyance through the restored floodplain and channel is increased throughout the project until flood flows exceed the limits of proposed grading and spill out onto the high, existing floodplain terrace. Therefore, it is expected and supported by the summary tables, that shear stresses and velocities will increase in locations as interaction between the restored floodplain and channel are facilitated. It should be noted that the existing and proposed HEC-RAS model results shown use a downstream boundary condition of normal depth to compare the existing and proposed conditions based on changes. Since the peak discharge in Tributary 2 would occur well before the peak discharge in Little Mill Creek, this method is a more accurate representation of changes in the hydraulic conditions. HEC-RAS output data for the existing and proposed conditions are included in Appendix H.

8.2 TUFLOW (2D) Modeling

A 2D analysis was performed using SMS version 13.3.5 with the TUFLOW add-on package. TUFLOW is a finite difference hydrodynamic modeling computation engine that runs within the SMS software platform. SMS provides the platform to perform pre- and post-processing and graphic production for the TUFLOW simulations. The results of the 2D analysis provide a distribution of shear stress on the topographic digital terrain model, direction and magnitude of velocity, depth, and elevation for base flow and the 2-, 10-, 100- and 100-year+ return intervals. The 100-year+ return interval represents maximum pipe capacity of the existing culverts at Centerville Road and Faulkland Road. The results of the 2D model have been used to inform proposed channel/floodplain bench stability as well as to make design refinements to ensure long term sustainability of the design.

8.2.1 Downstream Boundary Conditions

A downstream boundary condition approximately 215 feet below Armstrong Road was implemented for all modeling scenarios. A water surface elevation vs. flow (HQ) boundary condition was used and the water surface slope used for analysis was determined to be 2%.

8.2.2 Upstream Boundary Conditions

The upstream boundary conditions inputs were developed using discharge data from the StreamStats hydrologic analysis and maximum pipe capacity analysis. Two inputs were developed based on the two endwall locations. One was developed for the existing 48" x 72" HERCP and 30" RCP, and the other was for the existing 27" RCP. Figure 5 and 6 show the stepped flow hydrograph used as input for the upstream boundary conditions.

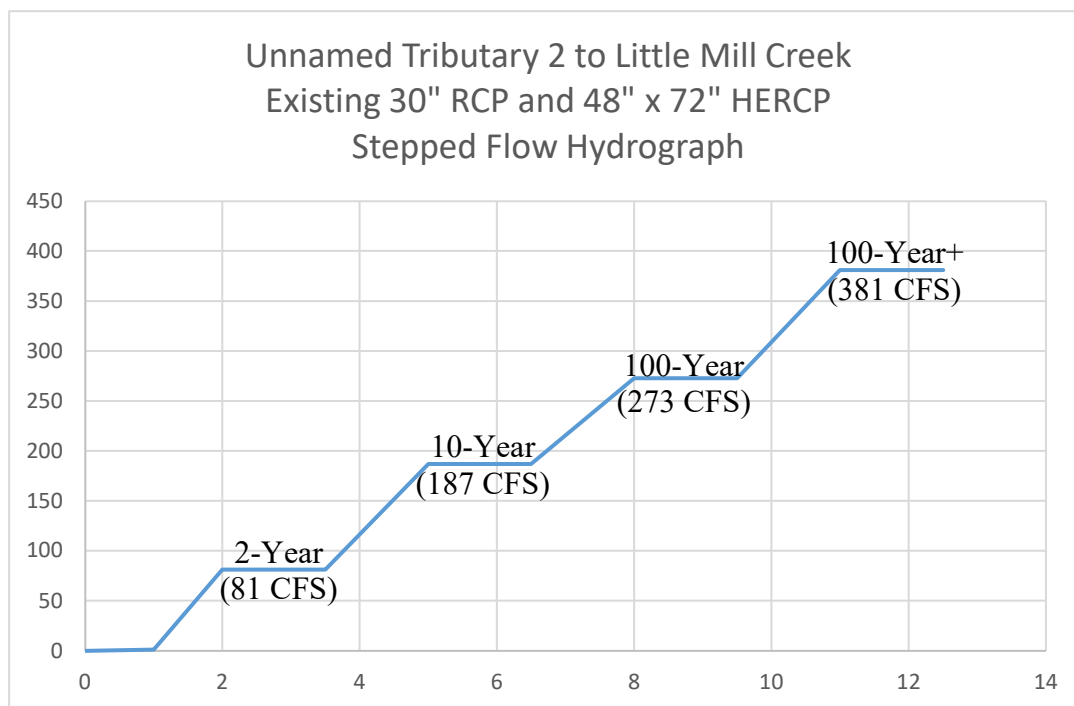


FIGURE 5: 30" RCP AND 48" x 72" HERCP STEPPED FLOW HYDROGRAPH

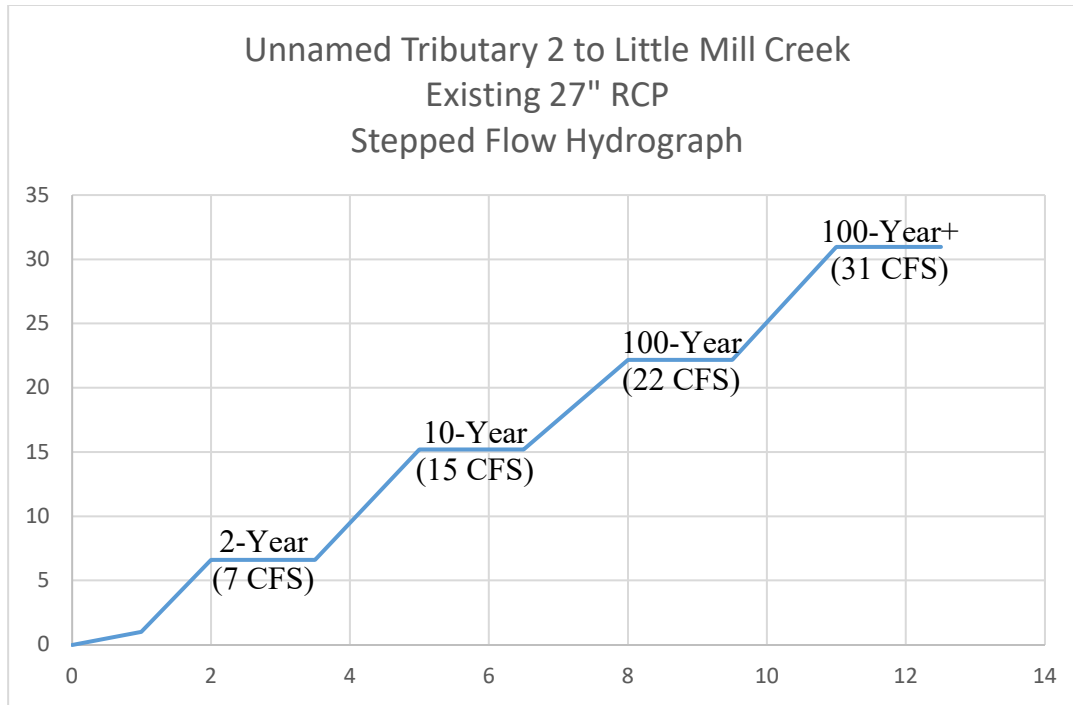


FIGURE 6: 27" RCP STEPPED FLOW HYDROGRAPHS

8.2.3 Computational Grid and Roughness Distribution

The existing conditions computational grid was created using field-run survey data merged with project specific LiDAR flown by SAM. Polygons for each Manning's n value were created using aerial photography and site reconnaissance for areas of similar land cover or roughness. Appropriate existing conditions Manning's roughness coefficients were assigned to each polygon encompassing the computational grid (see Table 12). The model was run using a 2-foot grid and compiles output data at each cell.

The proposed conditions were modeled using similar methodology. The computational grid based on a composite surface of proposed grading and existing topographic data outside of the proposed limits of grading. Manning's n values were modified as appropriate within the project limits to account for anticipated roughness in the proposed channel and floodplain bench in the proposed conditions.

TABLE 12: SUMMARY OF MANNING'S N VALUES

Land Use	n Value
Existing Channel Bed	0.04
Existing Channel Bank	0.06
Open Park Space	0.04
Impervious	0.013
Residential	0.04
Brush	0.06

Land Use	n Value
Woods	0.08
Proposed Floodplain	0.07
Proposed Scour Hole	0.038
Proposed Channel	0.04
Playground	0.04
Lawn	0.03

8.2.4 TUFLOW Model Output

The TUFLOW output includes values for water depth, elevation, velocity, and bed shear stress, as well as velocity vectors for each cell. This discussion relies primarily on the shear stress output to evaluate the stability of the proposed conditions channel and floodplain bench and to demonstrate improvement from the existing to proposed conditions.

The primary objective from this analysis is for the proposed design to maintain shear stresses in the channel and floodplain bench to a sustainable range. Generally, floodplain vegetation can withstand shear stresses up to 2 psf so the goal is to maintain shear stresses below 2 psf through as much of the floodplain as possible so that long-term stability can rely on the wetland vegetation. Where this is not achievable, imported streambed gravel will be added to the proposed floodplain to maintain long term stability. The TUFLOW modeling indicates areas where the shear stress exceeds 2 psf (shown in yellow in the TUFLOW output below).

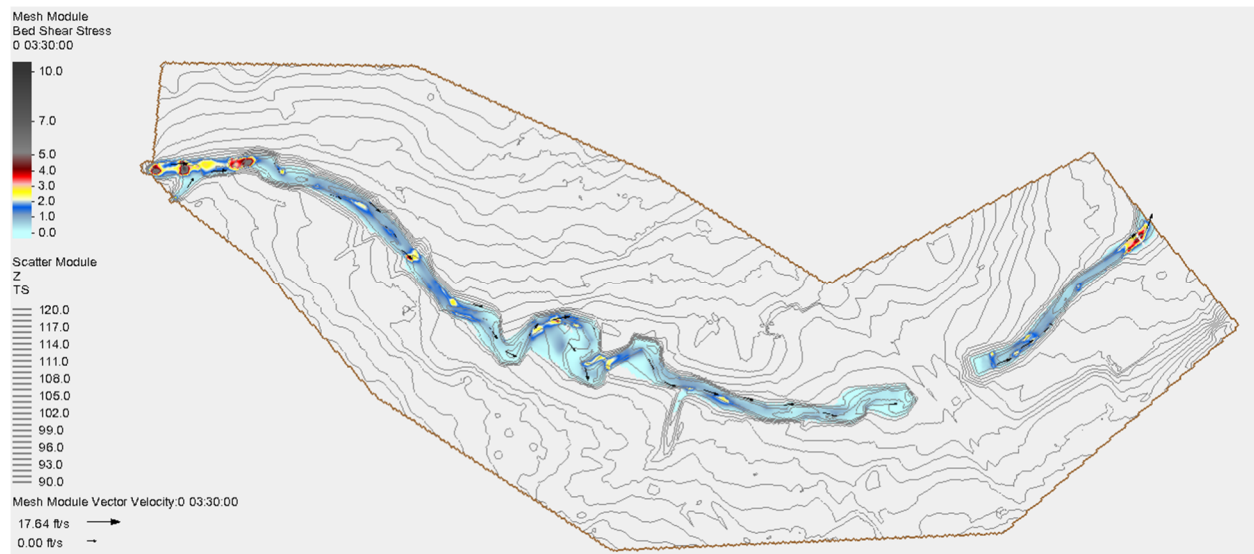


FIGURE 7: EXISTING CONDITIONS – 2 YEAR STORM

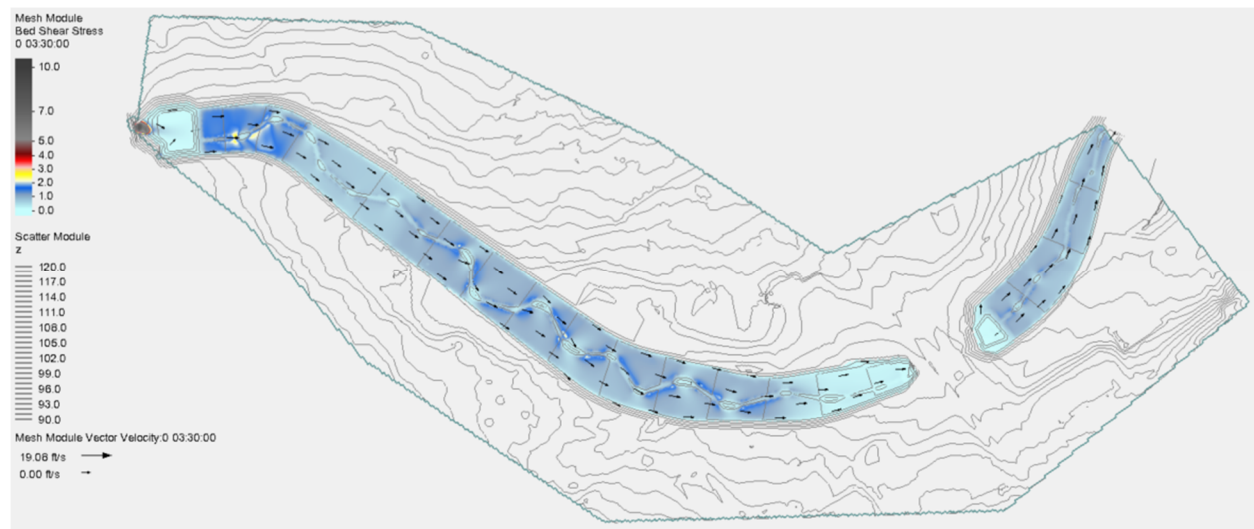


FIGURE 8: PROPOSED CONDITIONS – 2 YEAR STORM

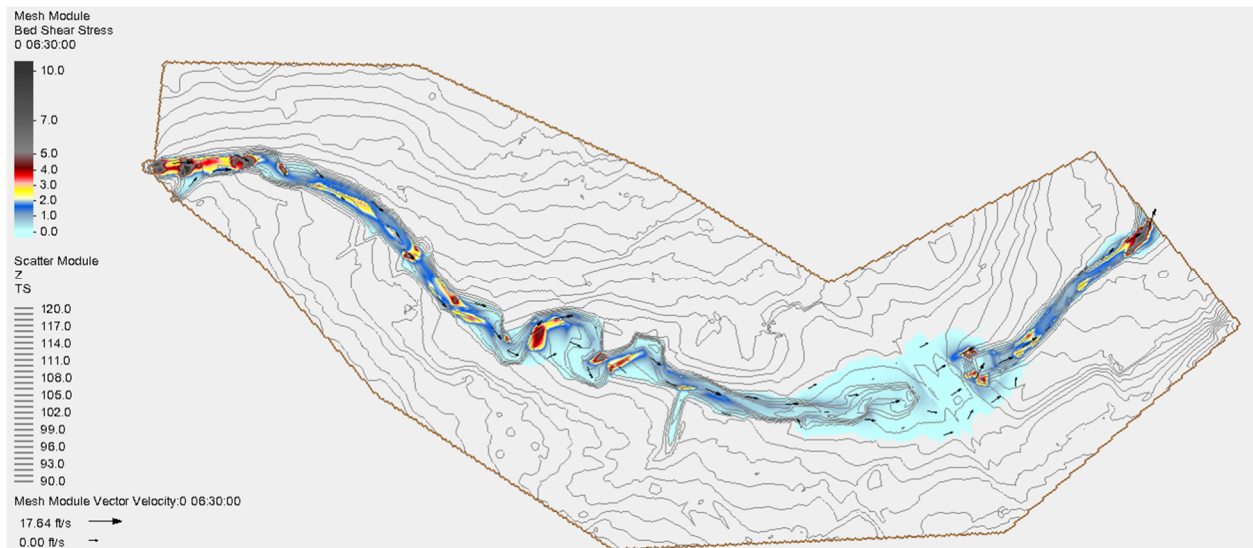


FIGURE 9: EXISTING CONDITIONS – 10 YEAR STORM

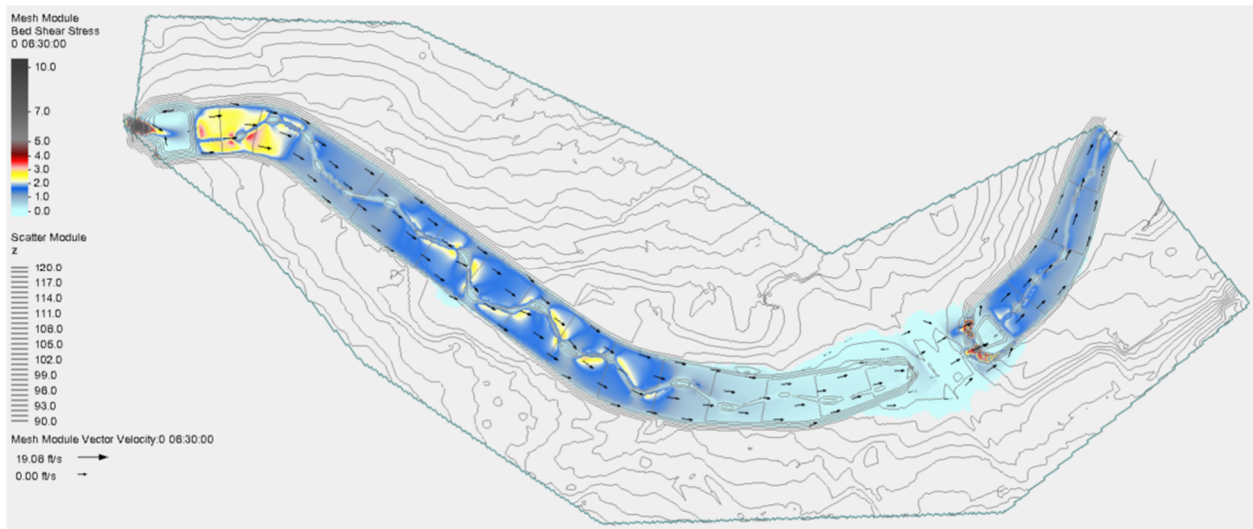


FIGURE 10: PROPOSED CONDITIONS – 10 YEAR STORM

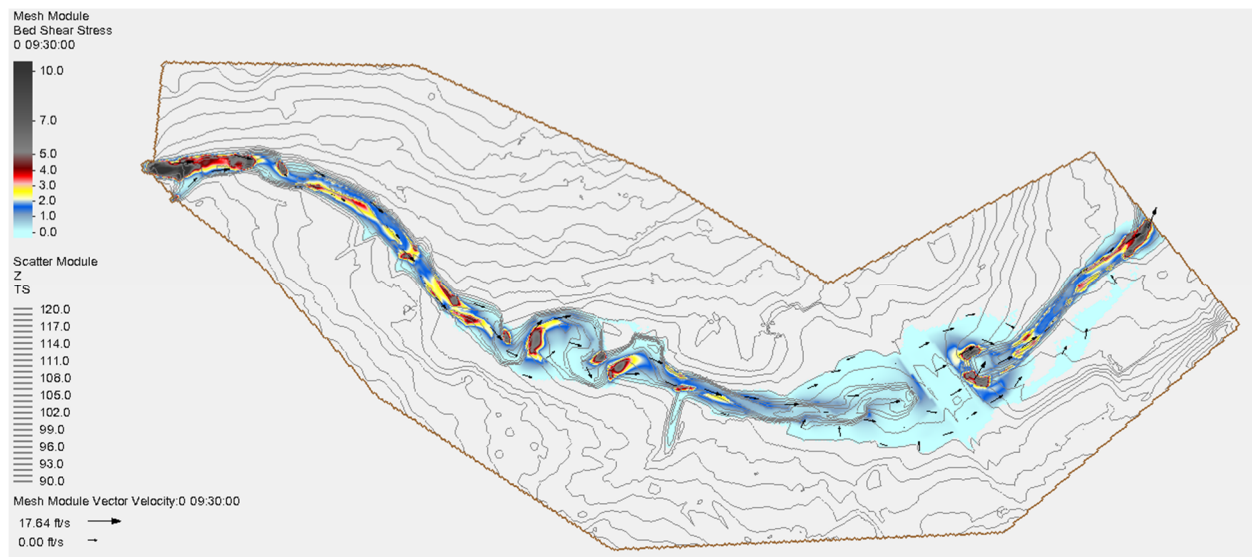


FIGURE 11: EXISTING CONDITIONS – 100 YEAR STORM

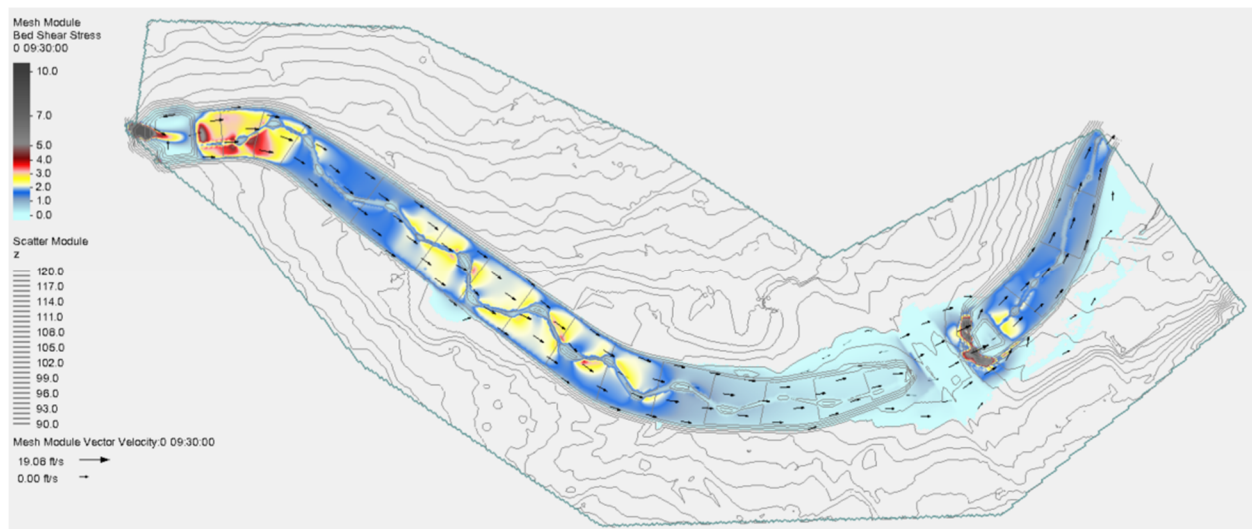


FIGURE 12: PROPOSED CONDITIONS – 100 YEAR STORM

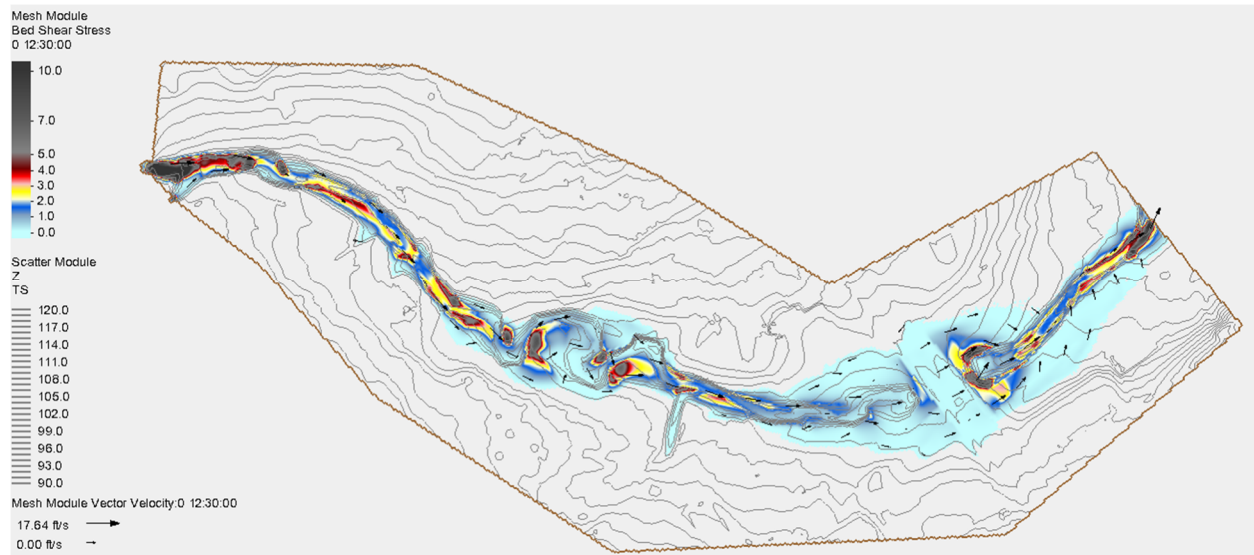


FIGURE 13: EXISTING CONDITIONS – 100 YEAR+ STORM

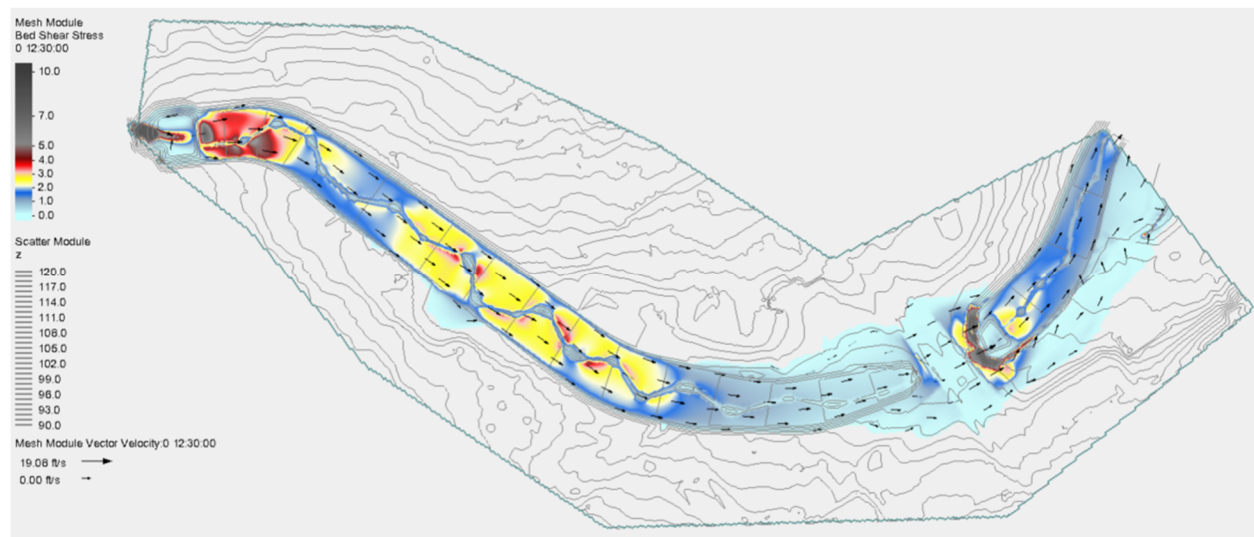


FIGURE 14: PROPOSED CONDITIONS – 100 YEAR+ STORM

The existing conditions model output shows high shear stress within the channel which routinely exceeds the required boundary shear stress to mobilize sediments. These shear stress values indicate channel instability, confirming what has been observed on-site (as detailed in Section 4). The proposed conditions model output shows a significant improvement over existing conditions regarding shear stresses. Proposed conditions model outputs show floodplain shear stresses in the 3-7 psf directly downstream of the proposed scour hole. Due to such high shear stresses, the R-5 underlayment and an imbricated stone sill are proposed within this area, in addition to establishing vegetation, for long-term protection of this area. The proposed underlayment extends the full extent of the proposed floodplain and into the proposed side slopes two feet. The model shows floodplain shear stresses in the 2-3 psf range directly downstream of the sewer crossing where the profile steepens to transition to the existing culverts at Armstrong Road. Floodplain log sills are proposed at every 1-foot drop within this area to support established vegetation and grade control. Directly upstream of Armstrong Road experiences backwater

from the culverts which causes stresses to be low. Armored riffles and buried logs placed at the head and tail of the riffles serve to maintain a stable profile for the channel while promoting diverse habitat.

9. FUNCTION BASED ASSESSMENT

The recommended integrated stream and wetland floodplain complex serves to restore as many lost hydrologic, hydraulic, geomorphic and ecological functions as is feasible given the extent of historic and modern impacts within the watershed and the project reach while protecting sanitary sewer infrastructure. The selected restoration approach serves to improve functional uplift to the greatest extent possible as follows:

- **Hydrology:** Impairments to the hydrologic conditions mainly stem from urban development of the watershed. This has resulted in shorter times of concentration and higher runoff curve numbers yielding higher discharges with more intense peaks to the open channel system. Once the watershed runoff reaches the open channels, most of the active channels are incised and disconnected from adjacent floodplains and therefore high velocities, pollutant loads, and runoff volumes are largely retained and transmitted to the downstream receiving waters. The proposed design approach will serve to enhance hydrologic functions by the creation of a riparian wetland floodplain systems where base flow residence time can be increased within a created densely vegetated hyporheic zone. Frequent and non-frequent flood flows are designed to spread across a riparian wetland zone where vegetative filtering, ponding, and infiltration potential are enhanced.
- **Hydraulics:** Impairments to hydraulic conveyance include high channel incision that conveys large discharges from the watershed within the stream banks. The area targeted for stabilization has a channel that exhibits erosive conditions. The proposed restoration approach improves hydraulic and hydrodynamic functions by reducing erosive forces as a function of boundary shear stress and velocity for the full range flow events up to and including the 100-year+ storm event to the extent feasible. The created riparian wetland floodplain area is designed to spread runoff-producing storm events over a wide and highly attached floodplain area such that the vegetation rooting system and surface roughness provide the primary means to resist erosive forces. Imported streambed material is proposed throughout the proposed floodplain to protect from erosion should the vegetative layer fail in any areas.
- **Geomorphology:** The targeted area for stabilization has a natural channel system that is incised with routine near vertical banks composed of fine and erodible sediments. The recommended design approach improves in-stream geomorphic stability by conveying flood events within a highly attached floodplain area rather than within an oversized stream channel. In-channel flows are designed to, at minimum to convey base flow and threshold discharges to create or maintain aquatic life and passage needs. The sediment supply reach upstream consists mostly of urbanized development with very little natural sediments; therefore, the need for transporting significant bed load sediment is not necessary. Therefore, the channel design will focus on enhancing water quality and habitat by the creation of an riparian wetland system. In-stream and floodplain grade control will use imported streambed material and logs control structures harvested on-site.

- **Water Quality/Chemistry:** Existing impairments to water quality/chemistry include the urbanized areas of the watershed, and a highly impaired hyporheic zone by modern sediment infill of the streambed and bank. The recommended restoration strategies provide the means to improved water quality by creating a sediment and nutrient sink within the watershed, which may also contribute to the overall health of downstream waters. Additionally, surface water runoff for both base flow and flood flows entering the restoration site will be filtered through the created riparian wetland system and hyporheic exchange zone.
- **Ecology:** Similar to the reasons listed above for water quality/chemistry, existing impairments to ecology are due to the urbanized areas of the watershed producing elevated runoff conditions, modern sediment infill, and a highly degraded hyporheic zone. Aquatic and terrestrial ecology will be enhanced by the development of a riparian wetland floodplain system and a channel network that stores and conveys base flow in a sustainable manner for the long-term. The floodplain wetland system will create conditions that promote long-term stability, habitat diversity, and greatly enhance conditions of hydrologic connectivity of base flow, groundwater and flood flows to a densely vegetated riparian root system and hyporheic zone resulting in improved water quality for wildlife and habitat. The restoration approach will focus on maintaining native substrate gravel materials where present for the long-term to provide sustainable habitat for macroinvertebrate populations, rather than armoring the existing deeply incised channels in-place typically flushing out native gravel materials on a routine flood flow basis. The design approach will also focus on creating conditions that retain organic carbon sources from the watershed (e.g., leaf litter, twigs, branches, logs) along the channel boundaries and riparian wetland floodplain areas. Retaining sources of organic carbon within the restored reaches provides an abundant food source for macroinvertebrates and promotes improved nutrient processing in the hyporheic zone.

The design team believes the integrated stream and wetland floodplain restoration approach is the most sustainable and environmentally beneficial restoration approach for this project and is highly consistent with the natural way streams and floodplains evolved within the Piedmont physiographic province. This design approach has been developed to specifically restore and/or enhance as many lost functions as is reasonably feasible in conjunction with significant historic and modern impacts to the watershed and project site itself. Additionally, this restoration approach corresponds well with the *EPA's Principles for Ecological Restoration of Aquatic Resources Guidance (EPA841-F-00-003)*. This EPA guidance document focuses on achieving multiple ecological benefits by restoring ecological integrity, natural structure and function of native species, addressing causes of degradation, and designing for self-sustainability using a multi-disciplinary team, natural fixes and anticipated future morphological changes. This EPA language matches up well with the series of studies performed to date and restoration design strategy.

9.1 Functional Assessment Parameters

A stream functions pyramid was developed by Harman et al (2012) to separate stream functions into a hierarchy of categories, including, Level 1 – Hydrology, Level 2 – Hydraulics, Level 3 – Geomorphology, Level 4 – Physiochemical, and Level 5 – Biology. It should be noted that this report assesses Water Quality/Chemistry for Level 4 and Ecology for Level 5 of the functional pyramid, as these functions relate better to the integrated stream and wetland complex systems that are being created for this project. Additionally, these targeted functions relate better to the physical surroundings of the restoration site.

The key functional assessment parameters for the proposed design approach, and that meet the project's goals and objectives, have been identified and discussed below, referencing the pyramid categories. Measurement metrics for each function have been identified. Although many of the functions discussed will affect the Water Quality/Chemistry (Level 4) and Ecology (Level 5) properties of the stream, baseline data is not available to quantify uplift between pre- and post-restoration conditions. Measurement metrics for these categories are to observe the post-restoration only. A function assessment parameter summary is included in Table 13.

9.1.1 Stream and Floodplain Functions

Channel and Wetland Floodplain Flow Exchange (Level 1 – Hydrology, with effects on Level 2 – Hydraulics, Level 3 – Geomorphology, Level 4 – Water Quality/Chemistry, and Level 5 – Ecology): The most significant functional objective for stream restoration is the hydrodynamic balance function (Fischenich, 2006, and referenced by Harman et al). It was identified as having the greatest effect on other functions and supports all other functions listed in the framework, either directly or indirectly. For this reason, we recommend maximizing the frequency of connection to a wetland floodplain during runoff. Our assessment and design process focused specifically on achieving long-term stability by finding the hydrodynamic balance within today's watershed conditions and site constraints. The proper hydrodynamic balance to achieve long-term stability and promote high functional uplift is directly related to frequency of channel and floodplain flow exchange. The presence of a frequently inundated floodplain will promote regular exchange of water from the channel to the floodplain, enhance riparian wetland vegetation sustainability, encourage redoximorphic features and other indicators of hydric soils, and improve filtering of nutrient and sediments within the hydrophytic vegetation. Runoff generating flow events are frequently exchanged between channel and floodplain to distribute and retain water, nutrients, and carbon and support riparian wetlands by frequent inundation. The design approach also targets the removal of the high clay content soils (legacy sediments) around the restored channel and floodplain boundaries, which will promote increased hyporheic exchange. The measurement metric to assess success and/or impairments includes:

- Observations and photo-documentation of floodplain flow patterns, rack lines, and inundation markings following runoff events.

Riparian Wetland Floodplain Stability (Level 2 – Hydraulics, with effects on Level 3 – Geomorphology, Level 4 – Water Quality/Chemistry, and Level 5 – Ecology): Similar to channel and floodplain flow exchange parameter above, achieving the proper hydrodynamic balance is critically important to the creation of a stable restored wetland floodplain system. The floodplain design has been greatly informed by 2D hydrodynamic modeling through the evaluation of shear stress, velocity and velocity vectors which yielded a sustainable grading approach and to incorporate floodplain controls to help prevent significant scour of the floodplain surface during large flood events. The floodplain design allows for riparian wetland establishment and retention and processing of organic matter during frequent flood events. The measurement metric to assess success and/or impairments includes:

- Observations and photo-documentation of floodplain scour, wetland vegetation, and organic material accumulation on floodplain.

Channel Stability (Level 3 – Geomorphology, with effects on Level 1 – Hydrology, Level 2 – Hydraulics, Level 4 – Water Quality/Chemistry, and Level 5 – Ecology): Similar to channel and floodplain flow

exchange and floodplain stability parameters above, achieving the proper hydrodynamic balance is also critically important to the creation of a stable restored channel. The stream channel design has been informed by 2D hydrodynamic modeling. The model allowed the evaluation of shear stress, velocity and velocity vectors resulting in a sustainable approach to help prevent significant streambed scour or bank erosion within the channel, and to incorporate rock and log controls where needed to protect the channel during large flood events. The design has focused on minimizing bank stress sufficiently to prevent significant bank erosion, and to maintain vegetative cover during large flood events. The measurement metric to assess success and/or impairments include:

- Observations and photo-documentation of bed controls, bank erosion, bank vegetation, and retention of channel bed controls

TABLE 13: FUNCTIONAL ASSESSMENT PARAMETERS

Level and Category	Parameter	Measurement Method	Pre-Restoration Condition		Post-Restoration Condition Goal	
			Value	Rating	Value	Rating
1 Hydrology	Channel and Floodplain Bench Flow Exchange	Observations and photo-documentation of floodplain flow patterns, rack lines and inundation markings following runoff events	Poor	Not Functioning	Restored Function	Designed to Function
	Hyporheic Flow Exchange	Perform wetland auger borings during site observations and prepare photo-documentation of sustained channel flow and groundwater saturation of restored floodplain root zone during prolonged periods	Poor	Not Functioning	Restored Function	Designed to Function
2 Hydraulics	Floodplain Stability	Observations and photo documentation of floodplain scour, wetland vegetation, and organic material accumulation on the floodplain	Poor	Not Functioning	Moderate	Functioning at Risk
3 Geomorphology	Channel Stability	Observations and photo documentation of bed controls, bank erosion, bank vegetation, and retention of channel bed controls	Poor	Not Functioning	Restored Function	Designed to Function
4 Water Quality/Chemistry	Sediment and Organic Carbon Retention	Observations and photo documentation of sediment and organic carbon retention	Poor	Not Functioning	Moderate	Functioning at Risk
5 Ecology	Biodiversity	Observations and photo documentation of aquatic and riparian flora and fauna	Poor	Not Functioning	Moderate	Functioning at Risk

10. POLLUTANT LOAD REMOVAL EFFICIENCIES

Removing high stream banks that are subject to erosive forces immediately removes a source of sediment and nutrients from the project site. The high flows occurring during storm events cause excessive erosion of stream banks and stream beds, leading to the degraded stream channel conditions. The high storm flows transport this sediment downstream to the Christina River. TMDL credits were calculated using the Expert Panel Report methodology using Protocol 1 (Credit for Prevented Sediment during Storm Flow), Protocol 2 (Credit for In-Stream and Riparian Nutrient Processing within the Hyporheic Zone during Base Flow), Protocol 3 (Credit for Floodplain Reconnection Volume), and the approved alternative buffer planting methodology. The total calculated credits were also converted into Equivalent Impervious Acres (EIA). Table 14 summarizes the computed credits and EIA and detailed credit computations are included in Appendix I.

TABLE 14: SUMMARY OF PROTOCOLS 1, 2, AND 3 RESTORATION CREDITS

Methodology	TSS (tons/year)	TP (pounds/year)	TN (pounds/year)
Expert Panel Protocol 1	60.6	32.0	139.0
Expert Panel Protocol 2	n/a	n/a	10.0
Expert Panel Protocol 3	1.5	13.0	215.0
Project Total	62.1	45.0	364.0
Equivalent Impervious Acres	18.6		

11. REFERENCES

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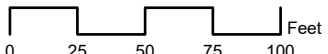
APPENDIX A

DATA COLLECTION MAP



Legend

 Existing Channel	 Cross Sections
 Outfalls	 Soil Auger Location



0 25 50 75 100 Feet



N

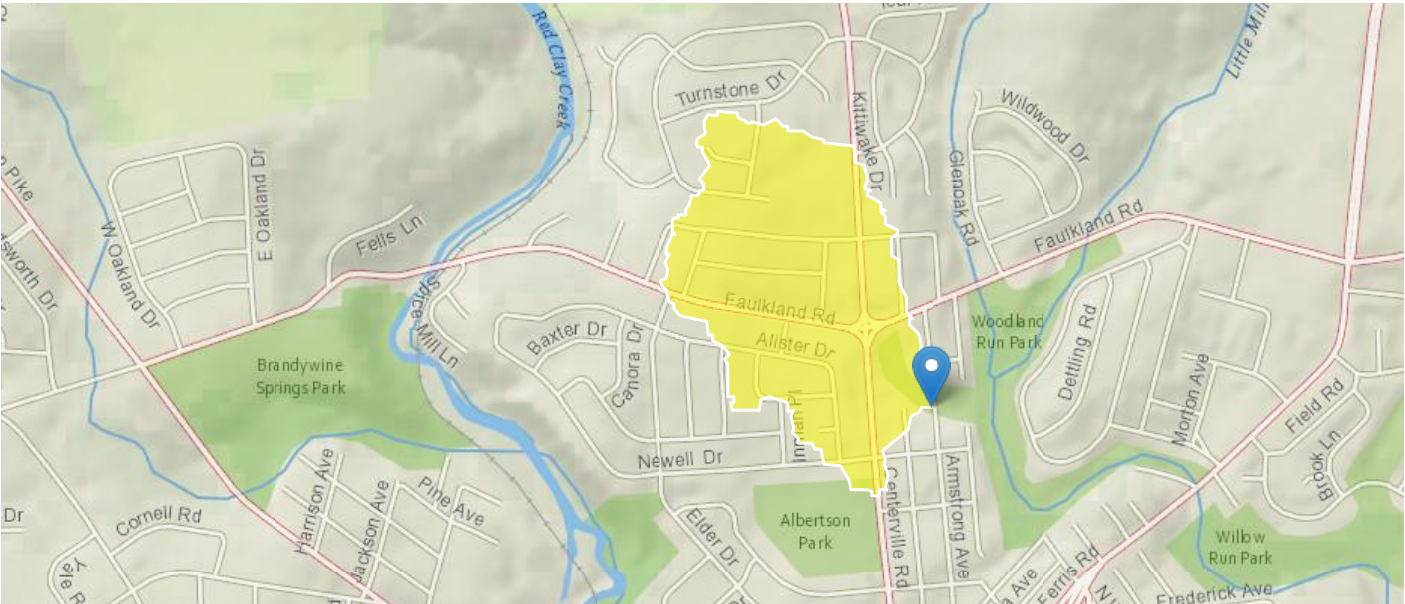
**Little Mill Creek - Tributary 2
at Woodland Park, DE**

APPENDIX B

HYDROLOGIC ANALYSIS

StreamStats Report

Region ID: DE
Workspace ID: DE20250128124832373000
Clicked Point (Latitude, Longitude): 39.74461, -75.62213
Time: 2025-01-28 07:48:57 -0500



+ Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM3M	Mean basin slope computed from 3 meter digital elevation model, in percent	5.97	percent
DRNAREA	Area that drains to a point on a stream	0.14	square miles
IMPERV	Percentage of impervious area	34.2	percent
SOILD	Percentage of area of Hydrologic Soil Type D	0	percent
STORNHD	Percent storage (wetlands and waterbodies) determined from 1:24K NHD	0	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [DE Peakflow Piedmont 2022 5005]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
BSLDEM3M	Mean basin slope from 3 meter dem	5.97	percent	4.7	17.4
DRNAREA	Drainage Area	0.14	square miles	0.4	318.5
IMPERV	Percent Impervious	34.2	percent	0.7	40.2
SOILD	Percent Hydrologic Soil Type D	0	percent	0	38.8
STORNHD	Percent Storage from NHD	0	percent	0	6

Peak-Flow Statistics Disclaimers [DE Peakflow Piedmont 2022 5005]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [DE Peakflow Piedmont 2022 5005]

Statistic	Value	Unit
50-percent AEP flood	87.9	ft ³ /s
20-percent AEP flood	151	ft ³ /s
10-percent AEP flood	202	ft ³ /s
4-percent AEP flood	276	ft ³ /s
2-percent AEP flood	250	ft ³ /s
1-percent AEP flood	295	ft ³ /s
0.5-percent AEP flood	340	ft ³ /s
0.2-percent AEP flood	405	ft ³ /s

Peak-Flow Statistics Citations

John C. Hammond, Edward J. Doheny, Jonathan J.A. Dillow, Mark R. Nardi, Peter A. Steeves, and Daniel L. Warner2021, **Peak-Flow and Low-Flow Magnitude Estimates at Defined Frequencies and Durations for Nontidal Streams in Delaware, U.S. Geological Survey Scientific Investigations Report 2022-5005 (<https://pubs.er.usgs.gov/publication/sir20225005>)**

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Application Version: 4.26.0

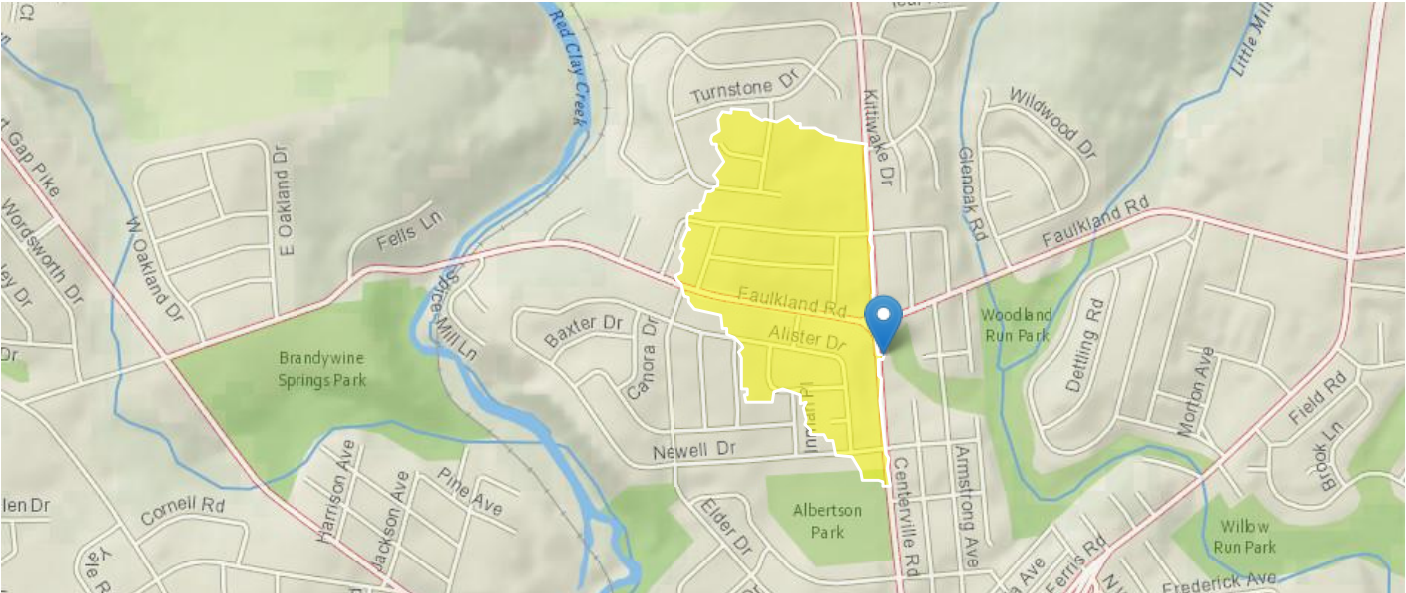
StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

StreamStats Report

Trib 2 @ Faulkland

Region ID: DE
Workspace ID: DE20250129142658172000
Clicked Point (Latitude, Longitude): 39.74560, -75.62378
Time: 2025-01-29 09:27:27 -0500



+ Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM3M	Mean basin slope computed from 3 meter digital elevation model, in percent	5.96	percent
DRNAREA	Area that drains to a point on a stream	0.12	square miles
IMPERV	Percentage of impervious area	34.1	percent
SOILD	Percentage of area of Hydrologic Soil Type D	0	percent
STORNHD	Percent storage (wetlands and waterbodies) determined from 1:24K NHD	0	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [DE Peakflow Piedmont 2022 5005]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
BSLDEM3M	Mean basin slope from 3 meter dem	5.96	percent	4.7	17.4
DRNAREA	Drainage Area	0.12	square miles	0.4	318.5
IMPERV	Percent Impervious	34.1	percent	0.7	40.2
SOILD	Percent Hydrologic Soil Type D	0	percent	0	38.8
STORNHD	Percent Storage from NHD	0	percent	0	6

Peak-Flow Statistics Disclaimers [DE Peakflow Piedmont 2022 5005]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [DE Peakflow Piedmont 2022 5005]

Statistic	Value	Unit
50-percent AEP flood	78.3	ft ³ /s
20-percent AEP flood	135	ft ³ /s
10-percent AEP flood	181	ft ³ /s
4-percent AEP flood	248	ft ³ /s
2-percent AEP flood	226	ft ³ /s
1-percent AEP flood	266	ft ³ /s
0.5-percent AEP flood	308	ft ³ /s
0.2-percent AEP flood	367	ft ³ /s

Peak-Flow Statistics Citations

John C. Hammond, Edward J. Doheny, Jonathan J.A. Dillow, Mark R. Nardi, Peter A. Steeves, and Daniel L. Warner2021, **Peak-Flow and Low-Flow Magnitude Estimates at Defined Frequencies and Durations for Nontidal Streams in Delaware, U.S. Geological Survey Scientific Investigations Report 2022-5005 (<https://pubs.er.usgs.gov/publication/sir20225005>)**

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Application Version: 4.26.0

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

APPENDIX C

NATURAL RESOURCES INVENTORY MEMO



700 East Pratt Street, Suite 500
Baltimore, MD 21202
Phone 410.728.2900
www.rkk.com

MEMORANDUM

Date: June 10, 2025
To: New Castle Conservation District (NCCD)
From: Karl Hellmann – RK&K
CC: Nick Riley, Tara Cutillo, Justin Reel & Kate Allcock – RK&K
Re: Little Mill Creek Tributary 2 Stream Restoration – Natural Resources Inventory

EXECUTIVE SUMMARY

On behalf of New Castle Conservation District (NCCD), RK&K conducted a Natural Resources Inventory (NRI), including a wetland and waterway delineation, walk-through forest stand characterization, and individual tree inventory within the Little Mill Creek Tributary 2 Stream Restoration project study area in New Castle County, Delaware (**Attachment A, Figures 1 & 2**). The project entails restoring an unnamed tributary to Little Mill Creek (Tributary 2) beginning at the intersection of Centerville Road and Faulkland Road and extending downstream to Armstrong Avenue. The site includes approximately 750 linear feet of Tributary 2 and three stormwater outfalls.

RK&K Environmental scientists conducted the NRI field work in March 2025. RK&K identified two palustrine forested wetlands (PFOs), three Waters of the U.S., one forest stand, six specimen trees, and seven stand-alone trees within the project study area. Any proposed impacts to wetlands, waters, or subaqueous lands will require coordination with the US Army Corps of Engineers (USACE) and Department of Natural Resources and Environmental Control (DNREC). Impacts to forest stands and specimen trees will require coordination with NCC Department of Land Use.

Supplemental information supporting the NRI is included in **Attachment A** through **E**, as follows:

- Attachment A: Background Figures
- Attachment B: Agency Correspondence
- Attachment C: Datasheets
- Attachment D: Photographic Documentation
- Attachment E : Tree Inventory Table
- Attachment F : Natural Resources Inventory (NRI) Plan

BACKGROUND INFORMATION

RK&K environmental scientists conducted a desktop investigation of mapped information prior to beginning the field investigation. The desktop investigation of the available mapped information

identified site topography; vegetative cover; tidal and non-tidal waters and wetlands; 100-year floodplains; and hydric and highly erodible soils. Mapped resources reviewed for this project include:

- The United States Geologic Survey (USGS) Geographic Information System (GIS) Topographic Quadrangle Mapping
- The United States Department of Agriculture, Natural Resource Conservation Service (USDA-NRCS) *Web Soil Survey (WSS) for New Castle County, Delaware*
- US Fish and Wildlife Service, National Wetlands Inventory (NWI)
- Delaware Department of Natural Resources and Environmental Control (DNREC) Tidal and Nontidal Wetlands Mapping
- Federal Emergency Management Agency (FEMA) 100-year Floodplain

Desktop investigation results are summarized below:

Geology & Topography

The Little Mill Creek Tributary 2 Stream Restoration is located in New Castle County, DE (**Attachment A, Figure 1**), within the Eastern Mountains and Piedmont physiographic province. The Eastern Mountains and Piedmont physiographic province is composed of hard, crystalline igneous and metamorphic rocks, and extends from the inner edge of the Coastal Plain westward to Catoctin Mountain, the eastern boundary of the Blue Ridge Province. Bedrock in the eastern part of the Piedmont consists of schist, gneiss, gabbro, and other highly metamorphosed sedimentary and igneous rocks of probable volcanic origin. The rocks of the western part of the Piedmont are diverse and include phyllite, slate, marble, and moderately to slightly metamorphosed volcanic rocks. Gently undulating plains underlain by un-metamorphosed bedrock of triassic red shale, siltstone, and sandstone occur in three areas in the western Piedmont. Elevations within the project study area range from 98 to 126 feet above sea level (**Attachment A, Figure 3**).

Soils

The USDA-NRCS Web Soil Survey for New Castle County, Delaware identified three mapped soil units within the project study area (**Attachment A, Figure 3**). Two highly erodible soils were identified within the project study area, as shown in **Table 1** below. Two non-hydric soil units and one predominantly non-hydric soil unit was mapped within the project study area.

Table 1. Soil Map Units within the Project Study Area

Map Unit Symbol	Map Unit Name	K-factor (Whole Soil) *	Drainage Class	Hydric Rating**	
DcB	Delanco-Codorus-Hatboro complex, 0 to 8 percent slopes, flooded	.37 (HE)	Moderately well drained	25	Predominantly Non-Hydric
ErB	Elsinboro-Delanco-Urban land complex, 0 to 8 percent slopes	.49 (HE)	Well drained	0	Non-Hydric
GhB	Glenelg-Wheaton-Urban land complex, 0 to 8 percent slopes	.28	Well drained	0	Non-Hydric

*Erodibility Coefficient – Value assigned to soil types by NRCS. $K > 0.35$ are considered to be highly erodible (HE) soils.

**Hydric Rating – Value is based on the percentage of hydric soils within the soil type. Non-hydric soils have a value of 0, predominantly non-hydric soils have a value between 0 and 33, partially hydric soils have a value between 33 and 66, predominantly hydric soils have a value between 66 and 99, and hydric soils have a value of 100.

Wetlands and Waters of the United States

The project is located in the Brandywine-Christina (02040205) 8-digit watershed. NWI and DNREC mapping did not identify any wetlands or waterways within the project study area. (**Attachment A, Figure 4**).

100-Year Floodplain

The project study area does not fall within the 100-year floodplain according to Federal Emergency Management Agency (FEMA) GIS data for New Castle County (**Attachment A, Figure 4**).

Rare, Threatened, and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPAC) was used to generate a species list for the project on April 4, 2025. The tricolored bat (*Perimyotis subflavus*) and monarch butterfly (*Danaus plexippus*) were identified on the species list. The monarch butterfly and tricolored bat are candidate and proposed endangered species, respectively, and therefore do not currently have Section 7 requirements. The Tricolored Bat Range-wide Determination Key was also completed for the project on April 4, 2025, resulting in a determination of “May Affect”. The USFWS species list is included in **Attachment B**.

On April 4, 2025, the National Oceanic and Atmospheric Administration (NOAA) Endangered Species Act (ESA) Section 7 Mapper and Essential Fish Habitat (EFH) Mapper were used to determine if ESA-listed species, critical habitat, or essential fish habitat is located within the project study area. Based on the Section 7 and EFH Mapper, no ESA-listed species, critical habitat, or essential fish habitat were identified within the project study area. The Section 7 and EFH Mapper results are included in **Attachment B**.

An email requesting information on the presence of rare, threatened, or endangered species within the project study area was sent to the Delaware Department of Natural Resources and Environmental Control (DNREC) on June 6, 2025. A response from DNREC is pending.

Cultural Resources

A letter requesting review of cultural resources within the project study area was sent to the State Historic Preservation Office (SHPO) on June 10, 2025. A response from SHPO is pending. Agency correspondence documents can be found in **Attachment B**.

WETLAND DELINEATION – FIELD INVESTIGATION

Methods

A team of two environmental scientists delineated waters of the U.S., including wetlands, within the project study area, and completed the applicable data form for each delineated feature. Each delineated feature was given a unique identifier and photographed. Boundary points were identified for each wetland feature, marked with pink flagging, and numbered consecutively. Wetland boundary point positions were located in the field using a sub-meter GPS unit, and all waterway boundaries were delineated using traditional field survey.

Wetlands were delineated in accordance with the *U.S. Army Corps of Engineers Wetlands Delineation Manual, Y-87-1* (Environmental Laboratory, 1987), U. S. Army Corps of Engineers. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Piedmont Plateau Region Version 2.0*, ed. J.F. Berkowitz, J.S. Wakeley, R.W. Lichvar, C.V. Noble. ERDC/EL TR-12-9. Vicksburg, MS:

U.S. Army Engineer Research and Development Center. Routine wetland determination methods with onsite inspection were used to determine the presence of wetlands in the project study area.

Waters of the U.S., other than wetlands, were delineated using the limits defined in 33 C.F.R. § 328 at the time of delineation. The boundaries of non-tidal waters of the U.S. other than wetlands were set at the ordinary high-water mark (OHW). The OHW was determined in the field using physical characteristics established by the fluctuations of water (e.g., change in plant community, changes in the soil character, shelving) in accordance with U.S. Army Corps of Engineers Regulatory Guidance Letter No. 05-05.

Results

RK&K conducted a wetland and waterway delineation within the project study area on March 18th and 25th, 2025. Two palustrine forested wetlands and three waterways were identified within the project study area. Summary information on each delineated feature is included in **Tables 2** and **3**. Datasheets and photographs of each delineated feature are included in **Attachments C** and **D**, respectively, and the locations of the delineated features are displayed on the NRI Plans in **Attachment F**.

Table 2. Wetlands within the Project Study Area

Feature ID	NWI Classification	Hydrologic Connectivity	Area (SF)
WET-A	PFO	WUS-C	962
WET-B	PFO	WUS-A	992

Table 3. Waterway Features within the Project Study Area

Feature ID	Hydrologic Class	Upstream Connectivity	Downstream Connectivity	Length (LF)	Area (SF)
WUS-A	Perennial	Outside of Study Area	Outside of Study Area	914	6,753
WUS-B	Perennial	Outside of Study Area	Waters-A	27	138
WUS-C	Intermittent	Wetland A	Waters-A	72	220

FOREST STAND CHARACTERIZATION & TREE INVENTORY – FIELD INVESTIGATION

Methods

RK&K conducted a walkthrough forest stand characterization within the project study area. Forest stands were identified and delineated in accordance with the New Castle County Code Chapter 40 Amendment, January 26, 2021, that defines a forest as “*An area covered by canopy of trees, covering a continuous land area of at least 1.0 acre or greater in size. Forests do not include trees planted and grown for commercial purposes, and do not include canopy cover over existing structures.*” Forest stands were characterized based on community type, successional stage, and overall condition. Stands were visually assessed, and data collected for each forest stand included size class, dominant canopy species, common understory and herbaceous species, presence and abundance of invasive species, and overall condition.

A tree inventory was conducted within the project study area in accordance with the New Castle County Code Chapter 40 Amendment, January 26, 2021. All individual or groups of trees with a DBH (diameter at breast height) equal to or greater than 16 inches (including specimen trees) located outside forested areas were inventoried. The County Code defines Specimen trees as “Trees listed in the State Big Trees Program, or trees in good health that are not in woodland but have diameters in excess of twenty-four (24) inches DBH. The tree species, DBH, and condition were recorded for each of the inventoried trees. The condition of the tree was assessed by an ocular estimation of growth form, visible signs of decay, live crown ratio, and indications of disease or insect infestation. Each inventoried tree was numbered consecutively. Data obtained from the field reconnaissance was collected with an iPad and the tree locations were inventoried with a GPS unit with sub-meter accuracy.

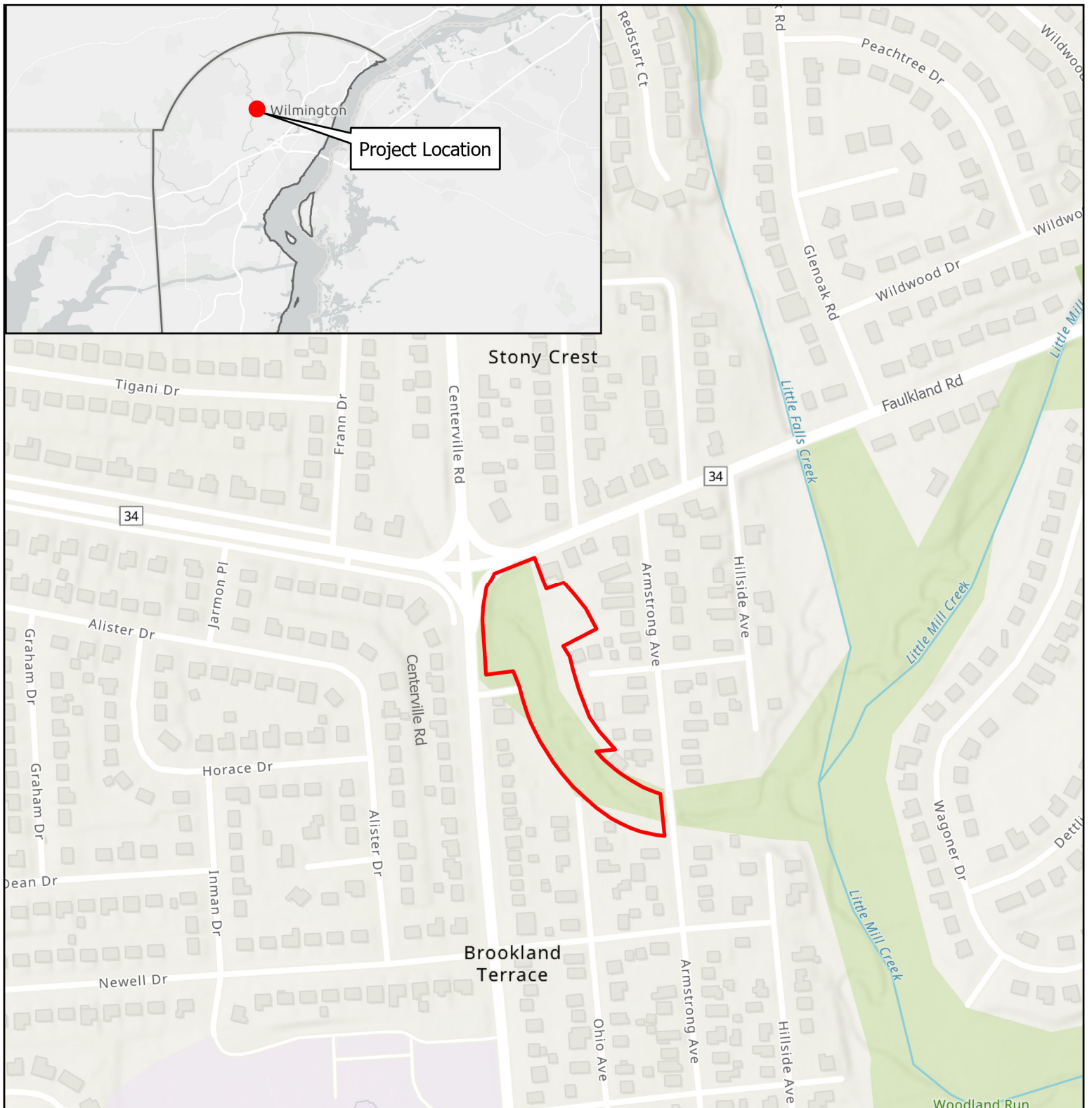
Results

RK&K conducted a walkthrough forest stand characterization and tree inventory within the project study area on March 18th and 25th, 2025. One forest stand, seven stand-alone trees and six specimen trees were identified within the project study area and are shown on the NRI Plans in **Attachment F**. Forest stand characterization results are summarized in **Table 4** on the following page. Photographs of the forest stand are included in **Attachment D** and a Tree Inventory Table is included in **Attachment E**.

Table 4. Forest Stands within the Project Study Area

Stand ID	Forest Association	Size Class (DBH)	Dominant Canopy Species	Common Understory Species	Common Herbaceous Species	Invasive Cover	Condition	Acreage in Study Area
FS1	Black cherry-maple	12-20 & 20-30	Red maple, white mulberry, black cherry, green ash	Wineberry, spicebush, bush honeysuckle, multi-flora rose, Norway maple, porcelain berry	Ground ivy, Japanese honeysuckle, wild onion, English ivy, fig buttercup, poison ivy	High	Poor	1.41

Attachment A – Background Figures



 Project Study Area



0 180 360
ft

1 in = 360 ft

Little Mill Creek Tributary 2
Stream Restoration

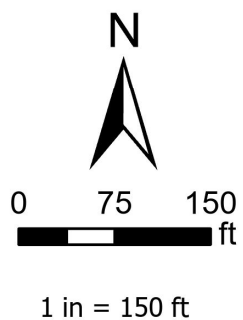
Figure 1:
Project Vicinity Map



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 Project Study Area



Little Mill Creek Tributary 2
Stream Restoration

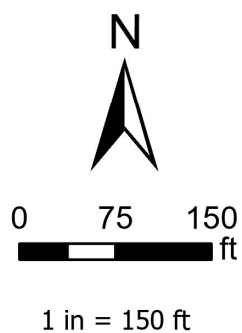
Figure 2:
Project Location Map



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 Project Study Area
 SSURGO Soils



Little Mill Creek Tributary 2
Stream Restoration

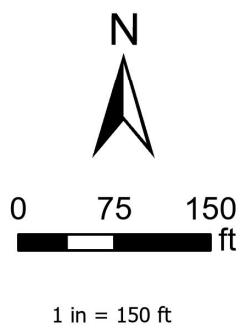
Figure 3:
Soils & Topography Map



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- ▬ Project Study Area
- ▬ FEMA Flood Zone X
- ▬ FEMA Flood Zone A
- ▬ FEMA Flood Zone AE
- ▬ NWI Wetlands and Waters
- ▬ DNREC Wetlands and Waters



Little Mill Creek Tributary 2 Stream Restoration

Figure 4:
Environmental Features
Map



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Attachment B – Agency Correspondence

Kate Allcock

From: Kate Allcock
Sent: Friday, June 6, 2025 3:21 PM
To: DNREC_EnvReview@delaware.gov
Cc: Karl Hellmann; Justin Reel
Subject: Request for Information on State and Federally Listed Rare, Threatened and Endangered Species – Little Mill Creek Tributary 2 Stream Restoration
Attachments: NOAA S7 Mapper Report.pdf; IPAC Species List.pdf; Location Map.pdf; Vicinity Map.pdf

Good afternoon,

On behalf of New Castle Conservation District (NCCD), RK&K is providing engineering and environmental services for the Little Mill Creek Tributary 2 Stream Restoration project, located in Wilmington, Delaware (Figure 1). The project entails restoring an unnamed tributary to Little Mill Creek, also referred to as Tributary 2, beginning at the intersection of Centerville Road and Faulkland Road and extending downstream to Armstrong Avenue. The site includes approximately 750 linear feet of Tributary 2 and three stormwater outfalls.

We are requesting your review and response concerning the presence of rare, threatened, or endangered species within the project study area. Additionally, please forward any information you have regarding State Natural Heritage Sites, Delaware Estuarine Research Reserves, critical resource waters and fisheries within the project study area. Attached for your review are vicinity maps that display the project location and study area. Also attached are the USFWS IPaC species list and the NOAA S7 Mapper Report. The Monarch Butterfly (*Danaus plexippus*) and Tricolored Bat (*Perimyotis subflavus*) are included in the species list, however these species are proposed and candidate species, respectively, and therefore do not currently have Section 7 requirements.

If you have any questions or require additional information to complete your review, please email me at kallcock@rkk.com. Thank you for your assistance; we look forward to working with your agency to successfully complete this project.

Thank you,
Kate Allcock

KATE ALLCOCK
Environmental Scientist I, Natural Resources



700 East Pratt Street, Suite 500
Baltimore, MD 21202

410.728.2900 P | 443.619.8528 C
www.rkk.com



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127



In Reply Refer To:

04/04/2025 12:40:13 UTC

Project Code: 2025-0078504

Project Name: Little Mill Creek Tributary 2

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf>

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see <https://www.fws.gov/program/migratory-bird-permit/what-we-do>.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see <https://www.fws.gov/library/collections/threats-birds>.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit <https://www.fws.gov/partner/council-conservation-migratory-birds>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Chesapeake Bay Ecological Services Field Office

177 Admiral Cochrane Drive

Annapolis, MD 21401-7307

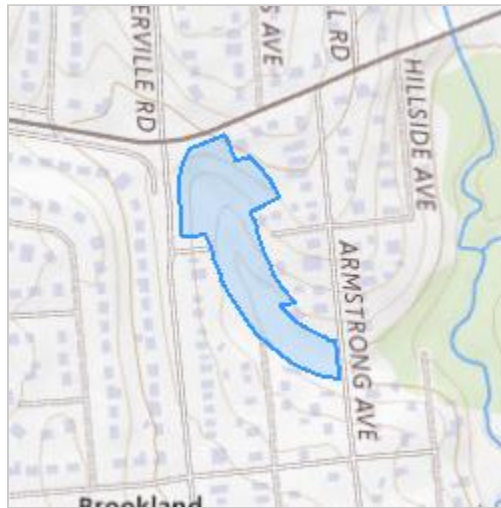
(410) 573-4599

PROJECT SUMMARY

Project Code: 2025-0078504
Project Name: Little Mill Creek Tributary 2
Project Type: Restoration / Enhancement of Waterbody
Project Description: The project entails restoring an unnamed tributary to Little Mill Creek (Tributary 2) beginning at the intersection of Centerville Road and Faulkland Road and extending downstream to Armstrong Avenue. The site includes approximately 750 linear feet of Tributary 2 and three stormwater outfalls.

Project Location:

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@39.74539125,-75.62316563682151,14z>



Counties: New Castle County, Delaware

ENDANGERED SPECIES ACT SPECIES

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Tricolored Bat <i>Perimyotis subflavus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> There is proposed critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

WETLANDS

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

IPAC USER CONTACT INFORMATION

Agency: RK&K

Name: Kate Allcock

Address: 700 E Pratt St, Suite 500

City: Baltimore

State: MD

Zip: 21202

Email: kallcock@rkk.com

Phone: 4107282900



United States Department of the Interior

FISH AND WILDLIFE SERVICE
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Phone: (410) 573-4599 Fax: (410) 266-9127



In Reply Refer To:
Project code: 2025-0078504
Project Name: Little Mill Creek Tributary 2

04/04/2025 14:30:02 UTC

Federal Nexus: yes
Federal Action Agency (if applicable):

Subject: Technical assistance for 'Little Mill Creek Tributary 2'

Dear Kate Allcock:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on April 04, 2025, for 'Little Mill Creek Tributary 2' (here forward, Project). This project has been assigned Project Code 2025-0078504 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project. **Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key (Dkey), invalidates this letter.**

Determination for the Northern Long-Eared Bat and Tricolored Bat

Based on your IPaC submission and a standing analysis completed by the Service, you determined the proposed Project will have the following effect determinations:

Species	Listing Status	Determination
Tricolored Bat (<i>Perimyotis subflavus</i>)	Proposed	May affect
	Endangered	

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination key for the northern long-eared bat and tricolored bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Monarch Butterfly *Danaus plexippus* Proposed Threatened

You may coordinate with our Office to determine whether the Action may cause prohibited take of the species listed above.

Conclusion

Consultation with the Service is not complete. Further consultation or coordination with the Service is necessary for those species or designated critical habitats with a determination of “May Affect.” A “May Affect” determination in this key indicates that the project, as entered, is not consistent with the questions in the key. Not all projects that reach a “May Affect” determination are anticipated to result in adverse impacts to listed species. These projects may result in a “No Effect”, “May Affect, Not Likely to Adversely Affect”, or “May Affect, Likely to Adversely Affect” determination depending on the details of the project. Please contact our Chesapeake Bay Ecological Services Field Office to discuss methods to avoid or minimize potential adverse effects to those species or designated critical habitats.

Federal agencies must consult with U.S. Fish and Wildlife Service under section 7(a)(2) of the Endangered Species Act (ESA) when an action *may affect* a listed species. Tricolored bat is proposed for listing as endangered under the ESA, but not yet listed. For actions that may affect a proposed species, agencies cannot consult, but they can *confer* under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed species is listed. Should the tricolored bat be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the tricolored bat range that previously received a NE or NLAA determination from the key to confirm that the determination is still accurate. Projects that receive a may affect determination for tricolored bat through the key, should contact the appropriate Ecological Services Field Office if they want to conference on this species.

Action Description

You provided to IPaC the following name and description for the subject Action.

1. Name

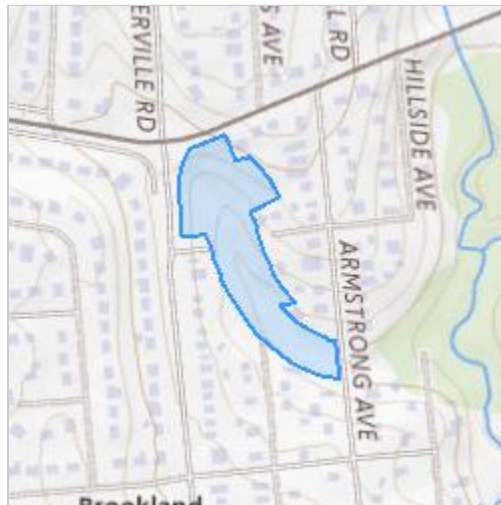
Little Mill Creek Tributary 2

2. Description

The following description was provided for the project 'Little Mill Creek Tributary 2':

The project entails restoring an unnamed tributary to Little Mill Creek (Tributary 2) beginning at the intersection of Centerville Road and Faulkland Road and extending downstream to Armstrong Avenue. The site includes approximately 750 linear feet of Tributary 2 and three stormwater outfalls.

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@39.74539125,-75.62316563682151,14z>



DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of “may affect” for a least one species covered by this determination key.

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of listed bats or any other listed species?

Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

No

2. Is the action area wholly within Zone 2 of the year-round active area for northern long-eared bat and/or tricolored bat?

Automatically answered

No

3. Does the action area intersect Zone 1 of the year-round active area for northern long-eared bat and/or tricolored bat?

Automatically answered

No

4. Does any component of the action involve leasing, construction or operation of wind turbines? Answer 'yes' if the activities considered are conducted with the intention of gathering survey information to inform the leasing, construction, or operation of wind turbines.

Note: For federal actions, answer ‘yes’ if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

No

5. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

Yes

6. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

No

7. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

No

8. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

No

9. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

No

10. [Semantic] Is the action area located within 0.5 miles of a known bat hibernaculum?

Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

Automatically answered

No

11. Does the action area contain any winter roosts or caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating bats?

No

12. Will the action cause effects to a bridge?

Note: Covered bridges should be considered as bridges in this question.

No

13. Will the action result in effects to a culvert or tunnel at any time of year?

No

14. Are trees present within 1000 feet of the action area?

Note: If there are trees within the action area that are of a sufficient size to be potential roosts for bats answer "Yes". If unsure, additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: <https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines>.

Yes

15. Does the action include the intentional exclusion of bats from a building or structure?

Note: Exclusion is conducted to deny bats' entry or reentry into a building. To be effective and to avoid harming bats, it should be done according to established standards. If your action includes bat exclusion and you are unsure whether northern long-eared bats or tricolored bats are present, answer "Yes." Answer "No" if there are no signs of bat use in the building/structure. If unsure, contact your local Ecological Services Field Office to help assess whether northern long-eared bats or tricolored bats may be present. Contact a Nuisance Wildlife Control Operator (NWCO) for help in how to exclude bats from a structure safely without causing harm to the bats (to find a NWCO certified in bat standards, search the Internet using the search term "National Wildlife Control Operators Association bats"). Also see the White-Nose Syndrome Response Team's guide for bat control in structures.

No

16. Does the action involve removal, modification, or maintenance of a human-made structure (barn, house, or other building) **known or suspected to contain roosting bats**?

No

17. Will the action cause construction of one or more new roads open to the public?

For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

No

18. Will the action include or cause any construction or other activity that is reasonably certain to increase average daily traffic permanently or temporarily on one or more existing roads?

Note: For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

No

19. Will the action include or cause any construction or other activity that is reasonably certain to increase the number of travel lanes on an existing thoroughfare?

For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

No

20. Will the proposed Action involve the creation of a new water-borne contaminant source (e.g., leachate pond, pits containing chemicals that are not NSF/ANSI 60 compliant)?

Note: For information regarding NSF/ANSI 60 please visit <https://www.nsf.org/knowledge-library/nsf-ansi-standard-60-drinking-water-treatment-chemicals-health-effects>

No

21. Will the proposed action involve the creation of a new point source discharge from a facility other than a water treatment plant or storm water system?

No

22. Will the action include drilling or blasting?

No

23. Will the action involve military training (e.g., smoke operations, obscurant operations, exploding munitions, artillery fire, range use, helicopter or fixed wing aircraft use)?

No

24. Will the proposed action involve the use of herbicides or other pesticides other than herbicides (e.g., fungicides, insecticides, or rodenticides)?

No

25. Will the action include or cause activities that are reasonably certain to cause chronic or intense nighttime noise (above current levels of ambient noise in the area) in suitable summer habitat for the northern long-eared bat or tricolored bat during the active season?

Chronic noise is noise that is continuous or occurs repeatedly again and again for a long time. Sources of chronic or intense noise that could cause adverse effects to bats may include, but are not limited to: road traffic; trains; aircraft; industrial activities; gas compressor stations; loud music; crowds; oil and gas extraction; construction; and mining.

Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: <https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines>.

No

26. Does the action include, or is it reasonably certain to cause, the use of permanent or temporary artificial lighting within 1000 feet of suitable northern long-eared bat or tricolored bat roosting habitat?

Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: <https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines>.

No

27. Will the action include tree cutting or other means of knocking down or bringing down trees, tree topping, or tree trimming?

Yes

28. Will the proposed action occur exclusively in an already established and currently maintained utility right-of-way?

No

29. Does the action include emergency cutting or trimming of hazard trees in order to remove an imminent threat to human safety or property? See hazard tree note at the bottom of the key for text that will be added to response letters

Note: A "hazard tree" is a tree that is an immediate threat to lives, public health and safety, or improved property.

No

30. Does the project intersect with the 0- 9.9% forest density category?

Automatically answered

No

31. Does the project intersect with the 10.0- 19.9% forest density category map?

Automatically answered

Yes

32. Does the project intersect with the 20.0- 29.9% forest density category map?

Automatically answered

No

33. Does the project intersect with the 30.0- 100% forest density category map?

Automatically answered

No

34. Will the action cause trees to be cut, knocked down, or otherwise brought down across an area greater than 5 acres in total extent?

No

35. Will the proposed action result in the use of prescribed fire?

Note: If the prescribed fire action includes other activities than application of fire (e.g., tree cutting, fire line preparation) please consider impacts from those activities within the previous representative questions in the key. This set of questions only considers impacts from flame and smoke.

No

36. Does the action area intersect the tricolored bat species list area?

Automatically answered

Yes

37. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats?

Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

Automatically answered

No

38. Has a presence/probable absence bat survey targeting the [tricolored bat and following the Service's Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines](#) been conducted within the project area?

No

39. Is suitable summer habitat for the tricolored bat present within 1000 feet of project activities?

(If unsure, answer ""Yes."")

Note: If there are trees within the action area that may provide potential roosts for tricolored bats (e.g., clusters of leaves in live and dead deciduous trees, Spanish moss (*Tillandsia usneoides*), clusters of dead pine needles of large live pines) answer ""Yes."" For a complete definition of suitable summer habitat for the tricolored bat, please see Appendix A in the [Service's Range-wide Indiana Bat and Northern long-eared Bat Survey Guidelines](#).

Yes

40. Do any of the trees proposed for cutting or other means of knocking down, bringing down, topping, or trimming provide potential roosts for tricolored bats (e.g., clusters of leaves in live and dead deciduous trees, Spanish moss (*Tillandsia usneoides*), clusters of dead pine needles of large live pine trees)?

Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: <https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines>.

Yes

41. Will any tree cutting/trimming or other knocking or bringing down of trees be conducted during the Pup Season for tricolored bat?

Note: Bat activity periods for your state can be found in Appendix L of the [Service's Range-wide Indiana Bat and Northern long-eared Bat Survey Guidelines](#).

Yes

42. Do you have any documents that you want to include with this submission?

No

PROJECT QUESTIONNAIRE

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

.4

IPAC USER CONTACT INFORMATION

Agency: RK&K

Name: Kate Allcock

Address: 700 E Pratt St, Suite 500

City: Baltimore

State: MD

Zip: 21202

Email: kallcock@rkk.com

Phone: 4107282900

EFH Mapper Report

EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

[Greater Atlantic Regional Office](#)
[Atlantic Highly Migratory Species Management Division](#)

*** WARNING ***

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

No additional Essential Fish Habitats (EFH) were identified at the report location.

Pacific Salmon EFH

No Pacific Salmon Essential Fish Habitat (EFH) were identified at the report location.

Atlantic Salmon

No Atlantic Salmon were identified at the report location.

HAPCs

No Habitat Areas of Particular Concern (HAPC) were identified at the report location.

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data.

****For links to all EFH text descriptions see the complete data inventory: [open data inventory -->](#)**

All EFH species have been mapped for the Greater Atlantic region,

Atlantic Highly Migratory Species EFH,

Bigeye Sand Tiger Shark,

Bigeye Sixgill Shark,

Caribbean Sharpnose Shark,

Galapagos Shark,

Narrowtooth Shark,

Sevengill Shark,

Sixgill Shark,

Smooth Hammerhead Shark,

Smalltail Shark

June 10, 2025

Ms. Suzanne Savery
State Historic Preservation Officer
Delaware Division of Historical and Cultural Affairs
29 N. State Street
Dover, DE 19901

Project: **Little Mill Creek Tributary 2 Stream Restoration Project
Wilmington, DE**

Subject: Request for Project Review and Comment

Dear Ms. Savery:

RK&K is providing engineering and environmental services to New Castle Conservation District (NCCD), for the Little Mill Creek Tributary 2 Stream Restoration project, located in Wilmington, Delaware (Figure 1 and Figure 2). The project entails restoring an unnamed tributary to Little Mill Creek, also referred to as Tributary 2, beginning at the intersection of Centerville Road and Faulkland Road and extending downstream to Armstrong Avenue. The site includes approximately 750 linear feet of Tributary 2 and three stormwater outfalls.

The project is locally funded and will require submission of a Joint Permit Application (JPA) to the Delaware Department of Recreation and Environmental Controls (DNREC) and the U.S. Army Corps of Engineers (USACE) for unavoidable impacts to jurisdictional resources, and, therefore, requires consultation with DHCA under Section 106 of the National Historic Preservation Act (NHPA). As such, a National Register of Historic Places (NRHP) and Delaware Inventory of Historic Properties search of CHRIS was completed. A review of the archaeological and historic architecture information on CHRIS indicates that there are no archaeological resources or historic architectural resources located in the project study area or within its immediate vicinity.

We request information concerning historic or archaeological resources within the vicinity of the project area and as to whether the DHCA will require cultural resource studies within the project area. Please send your response to the attention of Karen Hutchins-Keim, 700 East Pratt Street, Suite 500, Baltimore, MD 21202, or via email to khutchins-keim@rkk.com. If you have any questions concerning this project or require additional information to complete your review, please contact me by email or phone at (410) 462-9236. Thank you for your assistance.

Sincerely,
Rummel, Klepper & Kahl, LLP



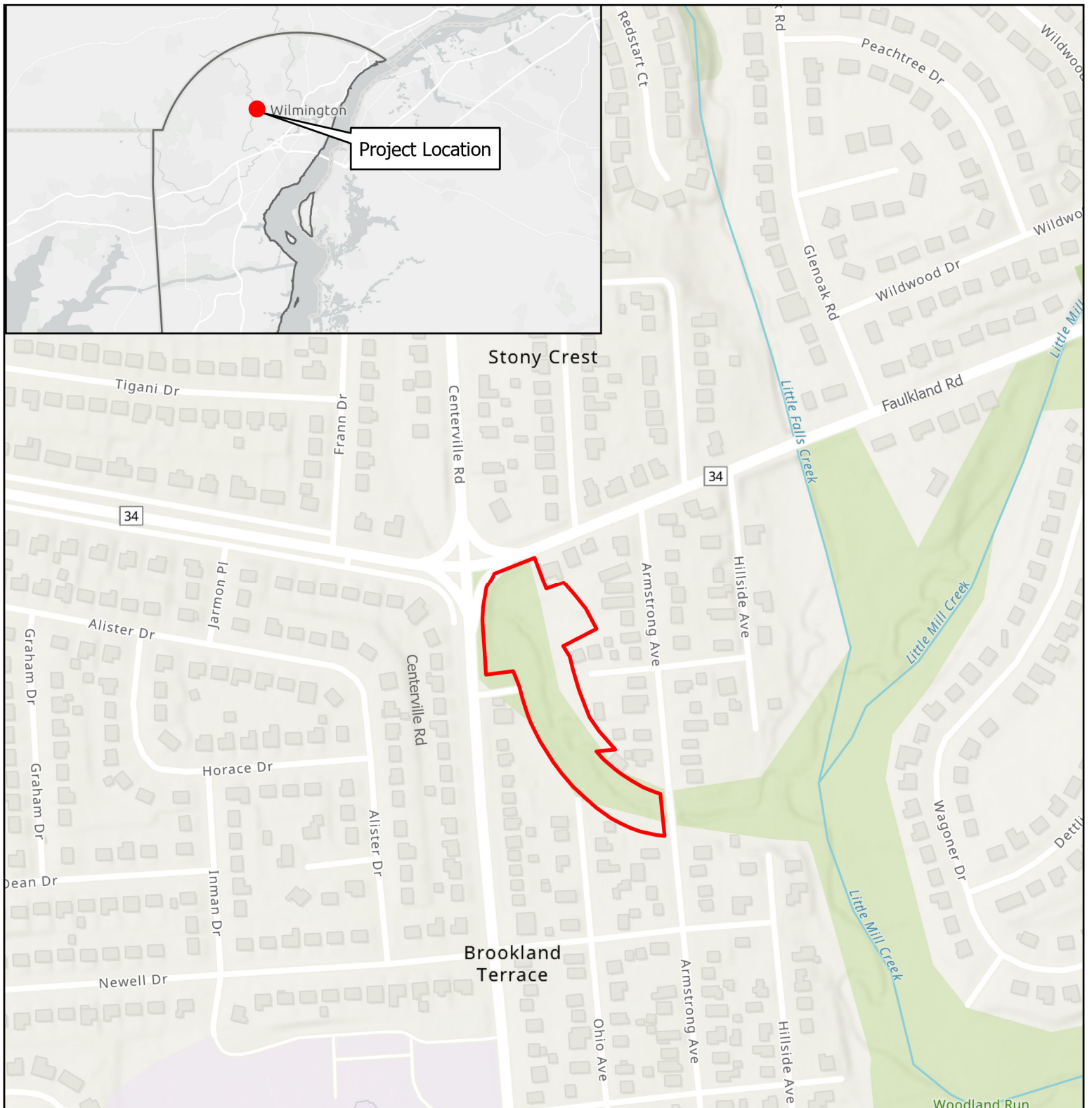
Karen Hutchins-Keim, PhD, RPA
Project Delivery Leader – Cultural Resources

Suzanne Savery
June 2025
Page 2



Enclosures: Vicinity Map (Figure 1)
Location Map (Figure 2)

cc: Kate Allcock, Karl Hellman, and Justin Reel – RK&K



 Project Study Area



0 180 360
ft

1 in = 360 ft

Little Mill Creek Tributary 2
Stream Restoration

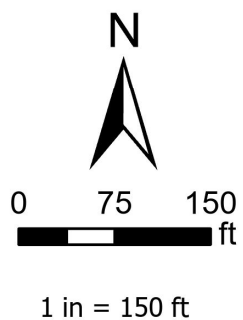
Figure 1:
Project Vicinity Map



RK&K
Responsive People | Creative Solutions



 Project Study Area



Little Mill Creek Tributary 2
Stream Restoration

Figure 2:
Project Location Map



RK&K
Responsive People | Creative Solutions

Attachment C – Datasheets

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Little Mill Creek Tributary 2 City/County: Newcastle Sampling Date: 3/18/25
 Applicant/Owner: New Castle Conservation District State: DE Sampling Point: WET-A
 Investigator(s): KSH/KEA Section, Township, Range: -
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%): 3
 Subregion (LRR or MLRA): 149A Lat: 39.744827 Long: -75.623013 Datum: WGS84
 Soil Map Unit Name: DeB NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☐ No ☒ (If no, explain in Remarks.)
 Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐	Is the Sampled Area within a Wetland? Yes ☒ No ☐
Hydric Soil Present? Yes ☒ No ☐	
Wetland Hydrology Present? Yes ☒ No ☐	
Remarks: <u>Based on PDSI, Northern Delaware is in a severe drought (PDSI is - 4.16)</u> <u>Photo 9754-9759</u>	

HYDROLOGY

Wetland Hydrology Indicators:		Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		
☒ Surface Water (A1)	☐ True Aquatic Plants (B14)	☐ Surface Soil Cracks (B6)
☒ High Water Table (A2)	☐ Hydrogen Sulfide Odor (C1)	☐ Sparsely Vegetated Concave Surface (B8)
☒ Saturation (A3)	☐ Oxidized Rhizospheres on Living Roots (C3)	☐ Drainage Patterns (B10)
☐ Water Marks (B1)	☐ Presence of Reduced Iron (C4)	☐ Moss Trim Lines (B16)
☐ Sediment Deposits (B2)	☐ Recent Iron Reduction in Tilled Soils (C6)	☐ Dry-Season Water Table (C2)
☐ Drift Deposits (B3)	☐ Thin Muck Surface (C7)	☐ Crayfish Burrows (C8)
☐ Algal Mat or Crust (B4)	☐ Other (Explain in Remarks)	☐ Saturation Visible on Aerial Imagery (C9)
☐ Iron Deposits (B5)		☐ Stunted or Stressed Plants (D1)
☐ Inundation Visible on Aerial Imagery (B7)		☐ Geomorphic Position (D2)
☐ Water-Stained Leaves (B9)		☐ Shallow Aquitard (D3)
☐ Aquatic Fauna (B13)		☐ Microtopographic Relief (D4)
		☐ FAC-Neutral Test (D5)
Field Observations:		
Surface Water Present? Yes ☒ No ☐ Depth (inches): <u>0.5</u>		
Water Table Present? Yes ☒ No ☐ Depth (inches): <u>0</u>		
Saturation Present? Yes ☐ No ☐ Depth (inches): <u>0</u> (includes capillary fringe)	Wetland Hydrology Present? Yes ☒ No ☐	
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

 Sampling Point: WET-A

Tree Stratum (Plot size: <u>10X10</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Fraxinus pennsylvanica</u>	<u>40</u>	<u>Y</u>	<u>FACW</u>
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
$\frac{40}{50\% \text{ of total cover: } 20} = \text{Total Cover}$ $\frac{40}{20\% \text{ of total cover: } 8}$			

Sapling/Shrub Stratum (Plot size: <u>10X10</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Acer rubrum</u>	<u>30</u>	<u>Y</u>	<u>FAC</u>
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
$\frac{30}{50\% \text{ of total cover: } 15} = \text{Total Cover}$ $\frac{30}{20\% \text{ of total cover: } 6}$			

Herb Stratum (Plot size: <u>10X10</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Lysimachia nummularia</u>	<u>40</u>	<u>Y</u>	<u>FACW</u>
2. <u>Symplocarpus foetidus</u>	<u>5</u>	<u>N</u>	<u>OBL</u>
3. <u>Juncus effusus</u>	<u>5</u>	<u>N</u>	<u>FACW</u>
4. <u>Ficaria verna</u>	<u>15</u>	<u>Y</u>	<u>FAC</u>
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
$\frac{65}{50\% \text{ of total cover: } 32.5} = \text{Total Cover}$ $\frac{65}{20\% \text{ of total cover: } 13}$			

Woody Vine Stratum (Plot size: <u>10X10</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Hedera helix</u>	<u>3</u>	<u>Y</u>	<u>FACW</u>
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
$\frac{3}{50\% \text{ of total cover: } 1.5} = \text{Total Cover}$ $\frac{3}{20\% \text{ of total cover: } 0.6}$			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species _____ x 1 = _____

FACW species _____ x 2 = _____

FAC species _____ x 3 = _____

FACU species _____ x 4 = _____

UPL species _____ x 5 = _____

Column Totals: _____ (A) _____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is $\leq 3.0^1$
- ☐ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic
Vegetation
Present?

Yes ☒ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WET-A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

[illegible]

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- | | |
|---|---|
| ☐ Histosol (A1) | ☐ Dark Surface (S7) |
| ☐ Histic Epipedon (A2) | ☐ Polyvalue Below Surface (S8) (MLRA 147, 148) |
| ☐ Black Histic (A3) | ☐ Thin Dark Surface (S9) (MLRA 147, 148) |
| ☐ Hydrogen Sulfide (A4) | ☐ Loamy Gleyed Matrix (F2) |
| ☐ Stratified Layers (A5) | ☒ Depleted Matrix (F3) |
| ☐ 2 cm Muck (A10) (LRR N) | ☒ Redox Dark Surface (F6) |
| ☐ Depleted Below Dark Surface (A11) | ☐ Depleted Dark Surface (F7) |
| ☐ Thick Dark Surface (A12) | ☐ Redox Depressions (F8) |
| ☐ Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) | ☐ Iron-Manganese Masses (F12) (LRR N, MLRA 136) |
| ☐ Sandy Gleyed Matrix (S4) | ☐ Umbric Surface (F13) (MLRA 136, 122) |
| ☐ Sandy Redox (S5) | ☐ Piedmont Floodplain Soils (F19) (MLRA 148) |
| ☐ Stripped Matrix (S6) | ☐ Red Parent Material (F21) (MLRA 127, 147) |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) **(MLRA 147)**
☐ Coast Prairie Redox (A16)
(MLRA 147, 148)
☐ Piedmont Floodplain Soils (F19)
(MLRA 136, 147)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Little Mill Creek Tributary 2 City/County: Newcastle Sampling Date: 3/18/28
 Applicant/Owner: New Castle Conservation District State: DE Sampling Point: WET-B
 Investigator(s): KSH IEA Section, Township, Range: —
 Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 1
 Subregion (LRR or MLRA): 149A Lat: 39.745322 Long: -75.623304 Datum: WGS84
 Soil Map Unit Name: DeB NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes — No ✓ (If no, explain in Remarks.)
 Are Vegetation —, Soil —, or Hydrology — significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No —
 Are Vegetation —, Soil —, or Hydrology — naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>✓</u> No <u>—</u>	Is the Sampled Area within a Wetland? Yes <u>✓</u> No <u>—</u>
Hydric Soil Present? Yes <u>✓</u> No <u>—</u>	
Wetland Hydrology Present? Yes <u>✓</u> No <u>—</u>	
Remarks: <u>Photo 9756-9760</u> Based on PDSI (-4.16), Northern Delaware is in a severe drought.	

HYDROLOGY

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply) ☒ Surface Water (A1) ☐ True Aquatic Plants (B14) ☒ High Water Table (A2) ☐ Hydrogen Sulfide Odor (C1) ☒ Saturation (A3) ☐ Oxidized Rhizospheres on Living Roots (C3) ☐ Water Marks (B1) ☐ Presence of Reduced Iron (C4) ☐ Sediment Deposits (B2) ☐ Recent Iron Reduction in Tilled Soils (C6) ☐ Drift Deposits (B3) ☐ Thin Muck Surface (C7) ☐ Algal Mat or Crust (B4) ☐ Other (Explain in Remarks) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)		Secondary Indicators (minimum of two required) ☐ Surface Soil Cracks (B6) ☐ Sparsely Vegetated Concave Surface (B8) ☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2) ☐ Crayfish Burrows (C8) ☐ Saturation Visible on Aerial Imagery (C9) ☐ Stunted or Stressed Plants (D1) ☒ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☐ Microtopographic Relief (D4) ☐ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes <u>✓</u> No <u>—</u> Depth (inches): <u>1</u> Water Table Present? Yes <u>✓</u> No <u>—</u> Depth (inches): <u>0</u> Saturation Present? Yes <u>✓</u> No <u>—</u> Depth (inches): <u>0</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <u>✓</u> No <u>—</u>	
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WET-B

Tree Stratum (Plot size: <u>10 X 10</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Fraxinus pennsylvanica</u>	<u>90</u>	<u>Y</u>	<u>FACW</u>
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
50% of total cover: <u>45</u>		90 = Total Cover 20% of total cover: <u>18</u>	
Sapling/Shrub Stratum (Plot size: <u>10 X 10</u>)			
1. <u>Fraxinus pennsylvanica</u>	<u>3</u>	<u>Y</u>	<u>FACW</u>
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
50% of total cover: <u>1.5</u>		3 = Total Cover 20% of total cover: <u>0.6</u>	
Herb Stratum (Plot size: <u>10 X 10</u>)			
1. <u>Ficaria verna</u>	<u>25</u>	<u>Y</u>	<u>FAC</u>
2. <u>Juncus effusus</u>	<u>5</u>	<u>N</u>	<u>FACW</u>
3. <u>Scirpus polyphyllus</u>	<u>60</u>	<u>Y</u>	<u>OBL</u>
4. <u>Lysimachia nummularia</u>	<u>5</u>	<u>N</u>	<u>FACW</u>
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
50% of total cover: <u>47.5</u>		95 = Total Cover 20% of total cover: <u>19</u>	
Woody Vine Stratum (Plot size: <u> </u>)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
50% of total cover: _____		_____ = Total Cover 20% of total cover: _____	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

☒ 1 - Rapid Test for Hydrophytic Vegetation

☒ 2 - Dominance Test is >50%

☐ 3 - Prevalence Index is ≤3.0¹

☐ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WET-B

[illegible]

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Little Mill Trib 2 City/County: New Castle Sampling Date: 3/25/25
 Applicant/Owner: New Castle County State: DE Sampling Point: UPLA
 Investigator(s): EJH, CFC Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): convex Slope (%): 0-3
 Subregion (LRR or MLRA): 149A Lat: 39.744907 Long: -75.623048 Datum: WGS84
 Soil Map Unit Name: DeB NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ☒ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No ☒	Is the Sampled Area within a Wetland? Yes _____ No ☒
Hydric Soil Present?	Yes ☒ No _____	
Wetland Hydrology Present?	Yes _____ No ☒	
Remarks: <u>Based on PDS1 (-4.16), Northern Delaware is in a severe drought</u>		

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ☐ Surface Water (A1) ☐ True Aquatic Plants (B14) ☐ High Water Table (A2) ☐ Hydrogen Sulfide Odor (C1) ☐ Saturation (A3) ☐ Oxidized Rhizospheres on Living Roots (C3) ☐ Water Marks (B1) ☐ Presence of Reduced Iron (C4) ☐ Sediment Deposits (B2) ☐ Recent Iron Reduction in Tilled Soils (C6) ☐ Drift Deposits (B3) ☐ Thin Muck Surface (C7) ☐ Algal Mat or Crust (B4) ☐ Other (Explain in Remarks) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)		<u>Secondary Indicators (minimum of two required)</u> ☐ Surface Soil Cracks (B6) ☐ Sparsely Vegetated Concave Surface (B8) ☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2) ☐ Crayfish Burrows (C8) ☐ Saturation Visible on Aerial Imagery (C9) ☐ Stunted or Stressed Plants (D1) ☐ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☐ Microtopographic Relief (D4) ☐ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No ☒ Depth (inches): _____ Water Table Present? Yes _____ No ☒ Depth (inches): _____ Saturation Present? (includes capillary fringe) Yes _____ No ☒ Depth (inches): _____		Wetland Hydrology Present? Yes _____ No ☒
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: UPLA

Tree Stratum (Plot size: <u>10' radius</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Acer rubrum</u>	<u>100</u>	<u>Y</u>	<u>FAC</u>
2. <u>Ilex opaca</u>	<u>30</u>	<u>Y</u>	<u>FACU</u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____

_____ = Total Cover
 50% of total cover: 75 20% of total cover: 26

Sapling/Shrub Stratum (Plot size: <u>10' Radius</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Rosa multiflora</u>	<u>20</u>	<u>Y</u>	<u>FACU</u>
2. <u>Ilex crenata</u>	<u>10</u>	<u>Y</u>	<u>UPL</u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____

_____ = Total Cover
 50% of total cover: 15 20% of total cover: 6

Herb Stratum (Plot size: <u>10' Radius</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Hedera helix</u>	<u>60</u>	<u>Y</u>	<u>FACU</u>
2. <u>Ficaria verna</u>	<u>5</u>	<u>N</u>	<u>FAC</u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____

_____ = Total Cover
 50% of total cover: 32.5 20% of total cover: 13

Woody Vine Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

_____ = Total Cover
 50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:	
Number of Dominant Species That Are OBL, FACW, or FAC:	<u>1</u> (A)
Total Number of Dominant Species Across All Strata:	<u>5</u> (B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	<u>20%</u> (A/B)

Prevalence Index worksheet:	
Total % Cover of:	Multiply by:
OBL species <u>0</u>	x 1 = <u>0</u>
FACW species <u>0</u>	x 2 = <u>0</u>
FAC species <u>2</u>	x 3 = <u>6</u>
FACU species <u>4</u>	x 4 = <u>16</u>
UPL species <u>1</u>	x 5 = <u>5</u>
Column Totals: <u>7</u> (A)	<u>27</u> (B)
Prevalence Index = B/A = <u>3.9</u>	

Hydrophytic Vegetation Indicators:
☐ 1 - Rapid Test for Hydrophytic Vegetation
☐ 2 - Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0 ¹
☐ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)
☐ Problematic Hydrophytic Vegetation ¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:
Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.
Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.
Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.
Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present?	Yes _____ No ☒
---------------------------------	--

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: VPL-A

[illegible]

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Little Mill Trib 2 City/County: New Castle Sampling Date: 3/25/25
 Applicant/Owner: New Castle County State: DE Sampling Point: UPL-B
 Investigator(s): KJH, CFC Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0-3
 Subregion (LRR or MLRA): 149A Lat: 39.745339 Long: -75.623233 Datum: NAD84
 Soil Map Unit Name: DeB NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ☒ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No ☒	Is the Sampled Area within a Wetland? Yes _____ No ☒
Hydric Soil Present? Yes _____ No ☒	
Wetland Hydrology Present? Yes _____ No ☒	
Remarks: <u>Based on PDSI (-4.16), Northern Delaware is in a severe drought.</u>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ☐ Surface Water (A1) ☐ True Aquatic Plants (B14) ☐ High Water Table (A2) ☐ Hydrogen Sulfide Odor (C1) ☐ Saturation (A3) ☐ Oxidized Rhizospheres on Living Roots (C3) ☐ Water Marks (B1) ☐ Presence of Reduced Iron (C4) ☐ Sediment Deposits (B2) ☐ Recent Iron Reduction in Tilled Soils (C6) ☐ Drift Deposits (B3) ☐ Thin Muck Surface (C7) ☐ Algal Mat or Crust (B4) ☐ Other (Explain in Remarks) ☐ Iron Deposits (B5) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Water-Stained Leaves (B9) ☐ Aquatic Fauna (B13)		<u>Secondary Indicators (minimum of two required)</u> ☐ Surface Soil Cracks (B6) ☐ Sparsely Vegetated Concave Surface (B8) ☐ Drainage Patterns (B10) ☐ Moss Trim Lines (B16) ☐ Dry-Season Water Table (C2) ☐ Crayfish Burrows (C8) ☐ Saturation Visible on Aerial Imagery (C9) ☐ Stunted or Stressed Plants (D1) ☒ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☐ Microtopographic Relief (D4) ☐ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No ☒ Depth (inches): _____ Water Table Present? Yes _____ No ☒ Depth (inches): _____ Saturation Present? (includes capillary fringe) Yes _____ No ☒ Depth (inches): _____		Wetland Hydrology Present? Yes _____ No ☒
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

 Sampling Point: UPL-B

Tree Stratum (Plot size: <u>10' radius</u>)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
1. <u>Paulownia tomentosa</u>	<u>10</u>	<u>Y</u>	<u>UPL</u>	Number of Dominant Species That Are OBL, FACW, or FAC: <u>3</u> (A)
2. <u>Fraxinus pennsylvanica</u>	<u>10</u>	<u>Y</u>	<u>FACW</u>	
3. <u>Juglans nigra</u>	<u>15</u>	<u>Y</u>	<u>FACU</u>	Total Number of Dominant Species Across All Strata: <u>6</u> (B)
4. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>50%</u> (A/B)
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species <u>1</u> x 1 = <u>1</u> FACW species <u>2</u> x 2 = <u>4</u> FAC species <u>2</u> x 3 = <u>6</u> FACU species <u>4</u> x 4 = <u>16</u> UPL species <u>1</u> x 5 = <u>5</u> Column Totals: <u>10</u> (A) <u>32</u> (B) Prevalence Index = B/A = <u>3.2</u>
7. _____	_____	_____	_____	
50% of total cover: <u>35</u> = Total Cover 20% of total cover: <u>7</u>				
Sapling/Shrub Stratum (Plot size: <u>10' radius</u>)				
1. <u>Lindera benzoin</u>	<u>20</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Rosa multiflora</u>	<u>5</u>	<u>Y</u>	<u>FACU</u>	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	Hydrophytic Vegetation Indicators: ☐ 1 - Rapid Test for Hydrophytic Vegetation ☐ 2 - Dominance Test is >50% ☐ 3 - Prevalence Index is ≤3.0 ¹ ☐ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ☐ Problematic Hydrophytic Vegetation ¹ (Explain)
50% of total cover: <u>25</u> = Total Cover 20% of total cover: <u>5</u>				
Herb Stratum (Plot size: <u>10' Radius</u>)				
1. <u>Ficaria verna</u>	<u>30</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Glechoma hederacea</u>	<u>2</u>	<u>N</u>	<u>FACU</u>	
3. <u>Cinna arundinacea</u>	<u>2</u>	<u>N</u>	<u>FACW</u>	
4. <u>Symplocarpus foetidus</u>	<u>5</u>	<u>N</u>	<u>OBL</u>	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
50% of total cover: <u>39</u> = Total Cover 20% of total cover: <u>7.8</u>				
Woody Vine Stratum (Plot size: <u>10' Radius</u>)				
1. <u>Lonicera japonica</u>	<u>5</u>	<u>Y</u>	<u>FACU</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes _____ No <u>✓</u>
50% of total cover: <u>5</u> = Total Cover 20% of total cover: <u>1</u>				

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: VPL-B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

[illegible]

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- | | |
|---|---|
| ☐ Histosol (A1) | ☐ Dark Surface (S7) |
| ☐ Histic Epipedon (A2) | ☐ Polyvalue Below Surface (S8) (MLRA 147, 148) |
| ☐ Black Histic (A3) | ☐ Thin Dark Surface (S9) (MLRA 147, 148) |
| ☐ Hydrogen Sulfide (A4) | ☐ Loamy Gleyed Matrix (F2) |
| ☐ Stratified Layers (A5) | ☐ Depleted Matrix (F3) |
| ☐ 2 cm Muck (A10) (LRR N) | ☐ Redox Dark Surface (F6) |
| ☐ Depleted Below Dark Surface (A11) | ☐ Depleted Dark Surface (F7) |
| ☐ Thick Dark Surface (A12) | ☐ Redox Depressions (F8) |
| ☐ Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) | ☐ Iron-Manganese Masses (F12) (LRR N, MLRA 136) |
| ☐ Sandy Gleyed Matrix (S4) | ☐ Umbric Surface (F13) (MLRA 136, 122) |
| ☐ Sandy Redox (S5) | ☐ Piedmont Floodplain Soils (F19) (MLRA 148) |
| ☐ Stripped Matrix (S6) | ☐ Red Parent Material (F21) (MLRA 127, 147) |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) (**MLRA 147**)
☐ Coast Prairie Redox (A16)
 (**MLRA 147, 148**)
☐ Piedmont Floodplain Soils (F19)
 (**MLRA 136, 147**)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
Depth (inches): _____

Hydric Soil Present? Yes _____ No ☒

Remarks:

Waters of the U.S. Data Sheet

Project: Little Mill Creek Trib 2	Feature ID: Watos A		Cowardin Class: R3UB1
Date: 3/18/2025	State: DE	Last Flag Number: N/A	Stream Order:
Crew: KTH/KEA	County: Newcastle	Photos: 9743-9744	Use Class: N/A

Feature Hydrologic Class and Jurisdiction:

Hydrologic Class	USACE Jurisdiction	Jurisdictional Rationale			
Tidal	TNW	TNW	Impoundment of:	Tributary	Other Waters
☒ Perennial	Impoundment	Tidal	TNW	☒ Relatively Permanent	Relatively Permanent
Intermittent	☒ Tributary	Interstate	Tributary	Relatively Permanent Notes: Flowing during site visit. Main channel/ for proposed restoration.	
Ephemeral	Other Waters	Navigable			
Other					
Hydrologic Connectivity		Upstream: Outside study area	Downstream: Outside study area	Adjacent (Abutting): Waters B, Wetland A3B	

Feature Description: (check all that apply)

Shape (with respect to OHW)		Substrate				Vegetation Cover Type (MBSS)	
☒ Natural Channel Shape	Width: 4 - 8 Feet	☒ Silts	☒ Sands		Muck	RB: Forest	
☐ Artificial (man-made)	Depth: 1" - 6"	☒ Cobbles	☒ Gravel	☒ Other:			
☒ Manipulated (man-altered)	Bank Erosion/stability:	☐ Bedrock	☒ Concrete	Riprap		LB: Forest	
☐ Other:	Moderate erosion	Side slope: ☒ ≥1:1 ☐ 2:1 ☐ 3:1 ☐ ≤4:1					
Notes:							

Weather/Precipitation Conditions:

Inches of Rain Within Last Week		Monthly Drought Condition NCDC Divisional PDSI										State: DE		
During Field Visit		https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/mapping										Division: Northern		
☒ No rain	☒ 0-0.5			☒ -4										
☐ Light rain	☐ 0.5-1	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
☐ Heavy Rain	☐ >1	Severe Drought			Moderate Drought		Normal			Moderately Wet		Severely Wet		

Non-tidal tributary has: (check all that apply)

Bed and Banks	Ordinary High Water Mark		
☒ Yes	☒ Clear, natural line impressed on the bank	☒ Sediment deposition	☒ Sediment sorting
☐ No	☐ Changes in the character of soil	☒ Water staining	☒ Scour
	☒ Shelving	☒ Presence of flood litter/debris	☒ Observed/predicted flow events
	☒ Vegetation matted down, bent, or absent	☐ Destruction of terrestrial veg.	☐ Abrupt change in plant community
	☒ Leaf litter disturbed	☒ Presence of wrack line	☐ Other:

Tidal tributary has: (check all that apply)

High Tide Line	Mean High Water Mark indicated by:	Chemical Characteristics
☐ Oil or scum line along shore objects	☐ Survey to available datum	☐ Water is clear
☐ Fine shell or debris deposits (foreshore)	☐ Physical markings	☐ Water is discolored
☐ Physical markings/characteristics	☐ Vegetation lines/changes in types	☐ Oily film
☐ Tidal gauges		☐ Other:
Notes:		

Waters of the U.S. Data Sheet

Project: Little Mill Creek Trib 2		Feature ID: Waters B		Cowardin Class: R30B1	
Date: 3/18/25		State: DE		Last Flag Number: N/A	
Crew: KSH/KEA		County: Newcastle		Photos: 9743 - 9746	
				Stream Order:	
				Use Class: N/A	

Feature Hydrologic Class and Jurisdiction:

Hydrologic Class		USACE Jurisdiction		Jurisdictional Rationale			
☐ Tidal	☐ TNW	☐ TNW	☐ Impoundment of:	☐ Tributary	☐ Other Waters		
☒ Perennial	☐ Impoundment	☐ Tidal	☐ TNW	☒ Relatively Permanent	☐ Relatively Permanent		
☐ Intermittent	☒ Tributary	☐ Interstate	☐ Tributary	Relatively Permanent Notes: Flowing during site visit.			
☐ Ephemeral	☐ Other Waters	☐ Navigable					
☐ Other							
Hydrologic Connectivity		Upstream: Outside study area		Downstream: Waters A		Adjacent/Abutting: None	

Feature Description: (check all that apply)

Shape (with respect to OHW)		Substrate				Vegetation Cover Type (MBSS)	
☐ Natural Channel Shape	Width: 4 feet	☐ Silts	☒ Sands	☐ Muck	RB: Forest		
☒ Artificial (man-made)	Depth: 0.5"	☐ Cobbles	☒ Gravel	☐ Other:			
☐ Manipulated (man-altered)	Bank Erosion/stability:	☐ Bedrock	☒ Concrete		LB: Grass		
☐ Other:	Stable	Side slope: ☐ ≥1:1 ☒ 2:1 ☐ 3:1 ☐ ≤4:1					
Notes:							

Weather/Precipitation Conditions:

Inches of Rain Within Last Week		Monthly Drought Condition NCDC Divisional PDSI												State: DE			
During Field Visit		https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/mapping														Division: Northern	
☒ No rain	☒ 0-0.5			☒													
☐ Light rain	☐ 0.5-1	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6			
☐ Heavy Rain	☐ >1	Severe Drought			Moderate Drought		Normal			Moderately Wet		Severely Wet					

Non-tidal tributary has: (check all that apply)

Bed and Banks		Ordinary High Water Mark			
☒ Yes	☒ Clear, natural line impressed on the bank	☒ Sediment deposition	☐ Sediment sorting		
☐ No	☐ Changes in the character of soil	☒ Water staining	☐ Scour		
	☐ Shelving	☒ Presence of flood litter/debris	☒ Observed/predicted flow events		
	☒ Vegetation matted down, bent, or absent	☐ Destruction of terrestrial veg.	☐ Abrupt change in plant community		
	☒ Leaf litter disturbed	☐ Presence of wrack line	☐ Other:		

Tidal tributary has: (check all that apply)

High Tide Line		Mean High Water Mark indicated by:		Chemical Characteristics	
☐ Oil or scum line along shore objects	☐ Survey to available datum	☐ Water is clear			
☐ Fine shell or debris deposits (foreshore)	☐ Physical markings	☐ Water is discolored			
☐ Physical markings/characteristics	☐ Vegetation lines/changes in types	☐ Oily film			
☐ Tidal gauges		☐ Other:			
Notes:					

Waters of the U.S. Data Sheet

Project: Little Mill Creek Trib 2	Feature ID: Watersc	Cowardin Class: R4SB 2
Date: 3/8/25	State: DE	Last Flag Number: N/A
Crew: KJH/KEA	County: Newcastle	Stream Order: 1
	Photos: 9752, 9753	Use Class: N/A

Feature Hydrologic Class and Jurisdiction:

Hydrologic Class	USACE Jurisdiction	Jurisdictional Rationale			
Tidal	TNW	TNW	Impoundment of:	Tributary	Other Waters
Perennial	Impoundment	Tidal	TNW	☒ Relatively Permanent	Relatively Permanent
☒ Intermittent	☒ Tributary	Interstate	Tributary	Relatively Permanent Notes: Shallow flow in channel. Drains a wetland.	
Ephemeral	Other Waters	Navigable			
Other					
Hydrologic Connectivity		Upstream: Wetland A		Downstream: Waters A	
				Adjacent/Abutting: None	

Feature Description: (check all that apply)

Shape (with respect to OHW)		Substrate			Vegetation Cover Type (MBSS)
☒ Natural Channel Shape	Width: 1 - 2 feet	☒ Silts	☒ Sands	☒ Muck	RB: Forest LB: Forest
Artificial (man-made)	Depth: 1" - 4"	☐ Cobbles	☒ Gravel	Other:	
☒ Manipulated (man-altered)	Bank Erosion/stability:	☐ Bedrock	☐ Concrete		
Other:	Minor erosion	Side slope: ☒ ≥1:1 ☐ 2:1 ☐ 3:1 ☐ ≤4:1			
Notes:					

Weather/Precipitation Conditions:

During Field Visit	Inches of Rain Within Last Week	Monthly Drought Condition NCDC Divisional PDSI										State: DE Division: Northern				
		https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/mapping												Month: Feb Year: 2025		
☒ No rain	☒ 0-0.5			☒												
Light rain	0.5-1	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6		
Heavy Rain	>1	Severe Drought			Moderate Drought		Normal			Moderately Wet		Severely Wet				

Non-tidal tributary has: (check all that apply)

Bed and Banks	Ordinary High Water Mark			
☒ Yes	Clear, natural line impressed on the bank	☐ Sediment deposition	☐ Sediment sorting	
☐ No	Changes in the character of soil	☒ Water staining	☒ Scour	
	Shelving	☐ Presence of flood litter/debris	☒ Observed/predicted flow events	
	☒ Vegetation matted down, bent, or absent	☐ Destruction of terrestrial veg.	Abrupt change in plant community	
	Leaf litter disturbed	☐ Presence of wrack line	Other:	

Tidal tributary has: (check all that apply)

High Tide Line	Mean High Water Mark indicated by:	Chemical Characteristics
☐ Oil or scum line along shore objects	☐ Survey to available datum	☐ Water is clear
☐ Fine shell or debris deposits (foreshore)	☐ Physical markings	☐ Water is discolored
☐ Physical markings/characteristics	☐ Vegetation lines/changes in types	☐ Oily film
☐ Tidal gauges		Other:
Notes:		

Attachment D – Photographic Documentation



Wetland A (WET-A) – PFO



Wetland B (WET-B) – PFO



Waters A (WUS-A) – Perennial RPW



Waters B (WUS-B) – Perennial RPW



Waters C (WUS-C) – Intermittent RPW



Forest Stand 1 (FS1) – Black Cherry – Maple Forest Association

Attachment E – Tree Inventory Table

Little Mill Creek Tributary 2 Stream Restoration - Tree Inventory Table

Tree ID	Scientific Name	Common Name	DBH	Condition	Comments
T1*	<i>Acer rubrum</i>	Red maple	37	Fair	Broken leader, exposed roots, trunk decay
T2	<i>Prunus serotina</i>	Black cherry	20	Good/Fair	Exposed roots, dead wood
T3*	<i>Acer rubrum</i>	Red maple	25	Good/Fair	Dead wood, vines
T4	<i>Pyrus calleryana</i>	Bradford pear	23	Fair	Dead wood, water sprouts
T5	<i>Sassafras albidum</i>	Sassafras	17	Good/Fair	Dead wood, lean
T6	<i>Sassafras albidum</i>	Sassafras	20	Good/Fair	Dead wood, included bark
T7	<i>Sassafras albidum</i>	Sassafras	16	Good/Fair	Dead wood, lean
T8	<i>Juglans nigra</i>	Black walnut	22	Good/Fair	Broken branches
T9*	<i>Juglans nigra</i>	Black walnut	35	Good/Fair	Split above DBH, included bark, dead wood
T10	<i>Morus alba</i>	White mulberry	21	Fair	Lean, included bark, vines, trunk decay
T11*	<i>Acer rubrum</i>	Red maple	32	Good/Fair	Exposed roots, dead wood
T12*	<i>Fraxinus pennsylvanica</i>	Green ash	42	Fair/Poor	Extensive dead wood
T13*	<i>Fraxinus pennsylvanica</i>	Green ash	52	Fair/Poor	Vines on trunk, extensive dead wood

* Specimen Tree (≥ 24.01 " DBH)

Attachment F – Natural Resources Inventory (NRI) Plan



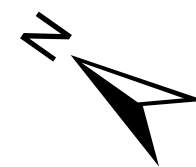
Little Mill Creek Tributary 2 Stream Restoration **Natural Resources Inventory (NRI)**

June 2025

Legend

- | | | |
|---|---|---|
| Project Study Area | Forest Stand Boundary | ● Specimen Tree |
| 2' Contour | Wetland | ▲ Stand Alone Tree |
| ● Upland Plot Point | Waterway | → Stream Flow |
| ● Wetland Plot Point | Critical Root Zone | |

0 30 60 ft
 1 in = 60 ft



APPENDIX D

TREE INVENTORY TABLE

Little Mill Creek Tributary 2 Stream Restoration - Tree Inventory Table

Tree ID	Scientific Name	Common Name	DBH	Condition	Comments
T1*	<i>Acer rubrum</i>	Red maple	37	Fair	Broken leader, exposed roots, trunk decay
T2	<i>Prunus serotina</i>	Black cherry	20	Good/Fair	Exposed roots, dead wood
T3*	<i>Acer rubrum</i>	Red maple	25	Good/Fair	Dead wood, vines
T4	<i>Pyrus calleryana</i>	Bradford pear	23	Fair	Dead wood, water sprouts
T5	<i>Sassafras albidum</i>	Sassafras	17	Good/Fair	Dead wood, lean
T6	<i>Sassafras albidum</i>	Sassafras	20	Good/Fair	Dead wood, included bark
T7	<i>Sassafras albidum</i>	Sassafras	16	Good/Fair	Dead wood, lean
T8	<i>Juglans nigra</i>	Black walnut	22	Good/Fair	Broken branches
T9*	<i>Juglans nigra</i>	Black walnut	35	Good/Fair	Split above DBH, included bark, dead wood
T10	<i>Morus alba</i>	White mulberry	21	Fair	Lean, included bark, vines, trunk decay
T11*	<i>Acer rubrum</i>	Red maple	32	Good/Fair	Exposed roots, dead wood
T12*	<i>Fraxinus pennsylvanica</i>	Green ash	42	Fair/Poor	Extensive dead wood
T13*	<i>Fraxinus pennsylvanica</i>	Green ash	52	Fair/Poor	Vines on trunk, extensive dead wood

* Specimen Tree (≥ 24.01 " DBH)

APPENDIX E

CHANNEL STABILITY DATA

Worksheet 21. Summary of Bank Erosion Hazard Index (BEHI)

BANK EROSION HAZARD GUIDE											
Stream: Tributary 2			Reach: L-1		Date: 1/22/25		Crew: AWS				
Bank Erosion Potential	Bank Height (ft):	Bank Height/ Bankfull Height	Root Depth/ Bankfull Height	Root Density %	Bank Angle (Degrees)	Surface Protection %					
	Bankfull Height (ft):										
	VERY LOW	Value	1.0 - 1.1	1.0 - 0.9	100 - 80	0 - 20	100 - 80				
		Index	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9				
		Choice	V: I: 0	V: I: 0	V: I: 0	V: I: 0	V: I: 0				
	LOW	Value	1.11 - 1.19	0.89 - 0.50	79 - 55	21 - 60	79 - 55				
		Index	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9				
		Choice	V: I: 0	V: I: 0	V: I: 0	V: I: 0	V: I: 0				
	MODERATE	Value	1.2 - 1.5	0.49 - 0.30	54 - 30	61 - 80	54 - 30				
		Index	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9				
		Choice	V: I: 0	V: I: 0	V: I: 0	V: I: 0	V: I: 0				
	HIGH	Value	1.6 - 2.0	0.29 - 0.15	- 15	81 - 90	29 - 15				
		Index	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9				
		Choice	V: I: 0	V: I: 0	V: I: 0	V: I: 0	V: I: 0				
	VERY HIGH	Value	2.1 - 2.8	0.14 - 0.05	14 - 5	91 - 119	14 - 10				
		Index	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0				
		Choice	V: I: 0	V: 0.09 I: 8.6	V: I: 0	V: 95 I: 8.1	V: I: 0				
	EXTREME	Value	>2.8	<0.05	<5	>119	<10				
		Index	10	10	10	10	10				
		Choice	V: 7.69 I: 10.0	V: I: 0	V: 0.45 I: 10.0	V: I: 0	V: 0 I: 10.0				
V = Value, I = Index						SUB-TOTAL (Sum one index from each column):		46.7			

Bank Material Description:	
Bank Materials:	
Bedrock (Bedrock banks have very low bank erosion potential)	
Boulders (Banks composed of boulders have low bank erosion potential)	
Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)	
Gravel (Add 5-10 points depending percentage of bank material that is composed of sand)	
Sand (Add 10 points)	
Silt Clay (+ 0: no adjustment)	
BANK MATERIAL ADJUSTMENT:	0

Stratification Comments:	
Stratification	
Add 5-10 points depending on position of unstable layers in relation to bankfull stage	
STRATIFICATION ADJUSTMENT:	0

VERY LOW	LOW	MODERATE	HIGH	VERY HIGH	EXTREME
5 - 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	46 - 50
Bank location description (circle one)					
Straight Reach		Outside of Bend		GRAND TOTAL BEHI RATING:	46.7

Worksheet 21. Summary of Bank Erosion Hazard Index (BEHI)

BANK EROSION HAZARD GUIDE											
Stream: Tributary 2			Reach: L-2		Date: 1/22/25		Crew: AWS				
Bank Erosion Potential	Bank Height (ft):	Bank Height/ Bankfull Height	Root Depth/ Bankfull Height	Root Density %	Bank Angle (Degrees)	Surface Protection %					
	Bankfull Height (ft):										
	VERY LOW	Value	1.0 - 1.1	1.0 - 0.9	100 - 80	0 - 20	100 - 80				
		Index	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9				
		Choice	V: 4.4 I: 0	V: 0.15 I: 0	V: 0.75 I: 10.0	V: 75 I: 5.4	V: 5 I: 10.0				
	LOW	Value	1.11 - 1.19	0.89 - 0.50	79 - 55	21 - 60	79 - 55				
		Index	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9				
		Choice	V: 4.4 I: 0	V: 0.15 I: 0	V: 0.75 I: 10.0	V: 75 I: 5.4	V: 5 I: 10.0				
	MODERATE	Value	1.2 - 1.5	0.49 - 0.30	54 - 30	61 - 80	54 - 30				
		Index	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9				
		Choice	V: 4.4 I: 0	V: 0.15 I: 0	V: 0.75 I: 10.0	V: 75 I: 5.4	V: 5 I: 10.0				
	HIGH	Value	1.6 - 2.0	0.29 - 0.15	- 15	81 - 90	29 - 15				
		Index	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9				
		Choice	V: 4.4 I: 0	V: 0.15 I: 7.9	V: 0.75 I: 0	V: 75 I: 0	V: 5 I: 0				
	VERY HIGH	Value	2.1 - 2.8	0.14 - 0.05	14 - 5	91 - 119	14 - 10				
		Index	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0				
		Choice	V: 4.4 I: 0	V: 0.15 I: 0	V: 0.75 I: 0	V: 75 I: 0	V: 5 I: 0				
	EXTREME	Value	>2.8	<0.05	<5	>119	<10				
		Index	10	10	10	10	10				
		Choice	V: 4.4 I: 10.0	V: 0.15 I: 0	V: 0.75 I: 10.0	V: 75 I: 0	V: 5 I: 10.0				
V = Value, I = Index							SUB-TOTAL (Sum one index from each column):			43.3	

Bank Material Description:

Bank Materials:

- Bedrock** (Bedrock banks have very low bank erosion potential)
- Boulders** (Banks composed of boulders have low bank erosion potential)
- Cobble** (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
- Gravel** (Add 5-10 points depending percentage of bank material that is composed of sand)
- Sand** (Add 10 points)
- Silt Clay** (+ 0: no adjustment)

BANK MATERIAL ADJUSTMENT: 0

Stratification Comments:

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

STRATIFICATION ADJUSTMENT: 0

VERY LOW 5 - 9.5	LOW 10 - 19.5	MODERATE 20 - 29.5	HIGH 30 - 39.5	VERY HIGH 40 - 45	EXTREME 46 - 50
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Bank location description (circle one)

Straight Reach Outside of Bend

GRAND TOTAL BEHI RATING: 43.3

Worksheet 21. Summary of Bank Erosion Hazard Index (BEHI)

BANK EROSION HAZARD GUIDE											
Stream: Tributary 2			Reach: L-3		Date: 1/22/25		Crew: AWS				
Bank Erosion Potential	Bank Height (ft):	Bank Height/ Bankfull Height	Root Depth/ Bankfull Height	Root Density %	Bank Angle (Degrees)	Surface Protection %					
	Bankfull Height (ft):										
	VERY LOW	Value	1.0 - 1.1	1.0 - 0.9	100 - 80	0 - 20	100 - 80				
		Index	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9				
		Choice	V: I: 0	V: I: 0	V: I: 0	V: I: 0	V: I: 0				
	LOW	Value	1.11 - 1.19	0.89 - 0.50	79 - 55	21 - 60	79 - 55				
		Index	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9				
		Choice	V: I: 0	V: I: 0	V: I: 0	V: I: 0	V: I: 0				
	MODERATE	Value	1.2 - 1.5	0.49 - 0.30	54 - 30	61 - 80	54 - 30				
		Index	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9				
		Choice	V: I: 0	V: 0.3 I: 5.9	V: I: 0	V: I: 0	V: I: 0				
	HIGH	Value	1.6 - 2.0	0.29 - 0.15	- 15	81 - 90	29 - 15				
		Index	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9				
		Choice	V: I: 0	V: I: 0	V: I: 0	V: 95 I: 9.0	V: I: 0				
	VERY HIGH	Value	2.1 - 2.8	0.14 - 0.05	14 - 5	91 - 119	14 - 10				
		Index	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0				
		Choice	V: I: 0	V: I: 0	V: I: 0	V: I: 0	V: I: 0				
	EXTREME	Value	>2.8	<0.05	<5	>119	<10				
		Index	10	10	10	10	10				
		Choice	V: 5.5 I: 10.0	V: I: 0	V: 4.5 I: 10.0	V: I: 0	V: 5 I: 10.0				
V = Value, I = Index						SUB-TOTAL (Sum one index from each column):		44.9			

Bank Material Description:

Bank Materials:

Bedrock (Bedrock banks have very low bank erosion potential)

Boulders (Banks composed of boulders have low bank erosion potential)

Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt Clay (+ 0: no adjustment)

BANK MATERIAL ADJUSTMENT:

Stratification Comments:

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

STRATIFICATION ADJUSTMENT:

VERY LOW	LOW	MODERATE	HIGH	VERY HIGH	EXTREME
5 - 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	46 - 50

Bank location description (circle one)

Straight Reach Outside of Bend

GRAND TOTAL BEHI RATING:

Worksheet 21. Summary of Bank Erosion Hazard Index (BEHI)

BANK EROSION HAZARD GUIDE										
Stream: Tributary 2		Reach: R-1		Date: 1/22/25		Crew: AWS				
Bank Erosion Potential	Bank Height (ft):	Bank Height/ Bankfull Height	Root Depth/ Bankfull Height	Root Density %	Bank Angle (Degrees)	Surface Protection %				
	Bankfull Height (ft):									
	VERY LOW	Value	1.0 - 1.1	1.0 - 0.9	100 - 80	0 - 20	100 - 80			
		Index	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9			
		Choice	V: 4.4 I: 0	V: 0.06 I: 8.9	V: 0.31 I: 10.0	V: 75 I: 5.4	V: 30 I: 5.9			
	LOW	Value	1.11 - 1.19	0.89 - 0.50	79 - 55	21 - 60	79 - 55			
		Index	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9			
		Choice	V: 4.4 I: 0	V: 0.06 I: 8.9	V: 0.31 I: 10.0	V: 75 I: 5.4	V: 30 I: 5.9			
	MODERATE	Value	1.2 - 1.5	0.49 - 0.30	54 - 30	61 - 80	54 - 30			
		Index	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9			
		Choice	V: 4.4 I: 0	V: 0.06 I: 8.9	V: 0.31 I: 10.0	V: 75 I: 5.4	V: 30 I: 5.9			
	HIGH	Value	1.6 - 2.0	0.29 - 0.15	- 15	81 - 90	29 - 15			
		Index	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9			
		Choice	V: 4.4 I: 0	V: 0.06 I: 8.9	V: 0.31 I: 10.0	V: 75 I: 5.4	V: 30 I: 5.9			
	VERY HIGH	Value	2.1 - 2.8	0.14 - 0.05	14 - 5	91 - 119	14 - 10			
		Index	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0			
		Choice	V: 4.4 I: 0	V: 0.06 I: 8.9	V: 0.31 I: 10.0	V: 75 I: 5.4	V: 30 I: 5.9			
	EXTREME	Value	>2.8	<0.05	<5	>119	<10			
		Index	10	10	10	10	10			
		Choice	V: 4.4 I: 10.0	V: 0.06 I: 8.9	V: 0.31 I: 10.0	V: 75 I: 5.4	V: 30 I: 5.9			
V = Value, I = Index		SUB-TOTAL (Sum one index from each column):						40.2		

Bank Material Description:

Bank Materials:

Bedrock (Bedrock banks have very low bank erosion potential)

Boulders (Banks composed of boulders have low bank erosion potential)

Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt Clay (+ 0: no adjustment)

BANK MATERIAL ADJUSTMENT: 0

Stratification Comments:

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

STRATIFICATION ADJUSTMENT: 0

VERY LOW	LOW	MODERATE	HIGH	VERY HIGH	EXTREME
5 - 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	46 - 50

Bank location description (circle one)

Straight Reach Outside of Bend

GRAND TOTAL BEHI RATING: 40.2

Worksheet 21. Summary of Bank Erosion Hazard Index (BEHI)

BANK EROSION HAZARD GUIDE										
Stream: Tributary 2			Reach: R-2		Date: 1/22/25		Crew: AWS			
Bank Erosion Potential	Bank Height (ft):	Bank Height/ Bankfull Height	Root Depth/ Bankfull Height	Root Density %	Bank Angle (Degrees)	Surface Protection %				
	Bankfull Height (ft):									
	Value	1.0 - 1.1	1.0 - 0.9	100 - 80	0 - 20	100 - 80				
	Index	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9				
	Choice	V: I: 0	V: I: 0	V: I: 0	V: I: 0	V: I: 0				
	Value	1.11 - 1.19	0.89 - 0.50	79 - 55	21 - 60	79 - 55				
	Index	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9				
	Choice	V: I: 0	V: I: 0	V: I: 0	V: 60 I: 3.9	V: 60 I: 3.5				
	Value	1.2 - 1.5	0.49 - 0.30	54 - 30	61 - 80	54 - 30				
	Index	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9				
	Choice	V: I: 0	V: I: 0	V: I: 0	V: I: 0	V: 30 I: 5.9				
	Value	1.6 - 2.0	0.29 - 0.15	- 15	81 - 90	29 - 15				
	Index	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9				
	Choice	V: I: 0	V: I: 0	V: I: 0	V: I: 0	V: I: 0				
	Value	2.1 - 2.8	0.14 - 0.05	14 - 5	91 - 119	14 - 10				
	Index	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0				
	Choice	V: I: 0	V: 0.07 I: 8.8	V: I: 0	V: I: 0	V: I: 0				
	Value	>2.8	<0.05	<5	>119	<10				
Index	10	10	10	10	10					
Choice	V: 6 I: 10.0	V: I: 0	V: 0.35 I: 10.0	V: I: 0	V: I: 0					
V = Value, I = Index						SUB-TOTAL (Sum one index from each column):				
						42.1				

Bank Material Description:

Bank Materials:

Bedrock (Bedrock banks have very low bank erosion potential)

Boulders (Banks composed of boulders have low bank erosion potential)

Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt Clay (+ 0: no adjustment)

BANK MATERIAL ADJUSTMENT: 0

Stratification Comments:

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

STRATIFICATION ADJUSTMENT: 0

VERY LOW	LOW	MODERATE	HIGH	VERY HIGH	EXTREME
5 - 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	46 - 50

Bank location description (circle one)

Straight Reach Outside of Bend

GRAND TOTAL BEHI RATING: 42.1

Worksheet 21. Summary of Bank Erosion Hazard Index (BEHI)

BANK EROSION HAZARD GUIDE									
Stream: Tributary 2		Reach: R-2		Date: 1/22/25		Crew: AWS			
Bank Erosion Potential	Bank Height (ft):	Bank Height/ Bankfull Height	Root Depth/ Bankfull Height	Root Density %	Bank Angle (Degrees)	Surface Protection %			
	Bankfull Height (ft):								
	VERY LOW	Value: 1.0 - 1.1	1.0 - 0.9	100 - 80	0 - 20	100 - 80			
		Index: 1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9	1.0 - 1.9			
	Choice	V: 2.2 I: 0	V: 0.15 I: 0	V: 1.5 I: 10.0	V: 80 I: 0	V: 0 I: 10.0			
	LOW	Value: 1.11 - 1.19	0.89 - 0.50	79 - 55	21 - 60	79 - 55			
		Index: 2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9	2.0 - 3.9			
	Choice	V: 2.2 I: 0	V: 0.15 I: 0	V: 1.5 I: 10.0	V: 80 I: 0	V: 0 I: 10.0			
	MODERATE	Value: 1.2 - 1.5	0.49 - 0.30	54 - 30	61 - 80	54 - 30			
		Index: 4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9	4.0 - 5.9			
	Choice	V: 2.2 I: 0	V: 0.15 I: 0	V: 1.5 I: 10.0	V: 80 I: 0	V: 0 I: 10.0			
	HIGH	Value: 1.6 - 2.0	0.29 - 0.15	- 15	81 - 90	29 - 15			
		Index: 6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9	6.0 - 7.9			
	Choice	V: 2.2 I: 0	V: 0.15 I: 0	V: 1.5 I: 10.0	V: 80 I: 0	V: 0 I: 10.0			
	VERY HIGH	Value: 2.1 - 2.8	0.14 - 0.05	14 - 5	91 - 119	14 - 10			
		Index: 8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0	8.0 - 9.0			
	Choice	V: 2.2 I: 8.2	V: 0.15 I: 7.9	V: 1.5 I: 0	V: 80 I: 0	V: 0 I: 0			
	EXTREME	Value: >2.8	<0.05	<5	>119	<10			
	Index: 10	10	10	10	10				
Choice	V: 2.2 I: 0	V: 0.15 I: 0	V: 1.5 I: 10.0	V: 80 I: 0	V: 0 I: 10.0				
V = Value, I = Index						SUB-TOTAL (Sum one index from each column):		47.9	

Bank Material Description:

Bank Materials:

- Bedrock** (Bedrock banks have very low bank erosion potential)
- Boulders** (Banks composed of boulders have low bank erosion potential)
- Cobble** (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
- Gravel** (Add 5-10 points depending percentage of bank material that is composed of sand)
- Sand** (Add 10 points)
- Silt Clay** (+ 0: no adjustment)

BANK MATERIAL ADJUSTMENT: 0

Stratification Comments:

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

STRATIFICATION ADJUSTMENT: 0

VERY LOW	LOW	MODERATE	HIGH	VERY HIGH	EXTREME
5 - 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	46 - 50

Bank location description (circle one)

Straight Reach Outside of Bend

GRAND TOTAL BEHI RATING: 47.9

Worksheet 22A. Various field methods of estimating Near-Bank Stress risk ratings for the calculation of erosion rate.

Estimating Near-Bank Stress (NBS)									
Stream: Tributary 2		Location: 1-L		Date: 1/22/25		Crew:			
Methods for Estimating Near-Bank Stress									
(1) Transverse bar or split channel/central bar creating NBS/high velocity gradient: Level I - Reconnaissance.									
(2) Channel pattern (Rc/W): Level II - General Prediction.									
(3) Ratio of pool slope to average water surface slope (S_p/S): Level II - General Prediction.									
(4) Ratio of pool slope to riffle slope (S_p/S_{rif}): Level II - General Prediction.									
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb}/d_{bkf}): Level III - Detailed Prediction.									
(6) Ratio of near-bank shear stresses to bankfull shear stresses (τ_{nb}/τ_{bkf}): Level III - Detailed Prediction.									
(7) Velocity profiles/isovels /Velocity gradient: Level IV - Validation.									
Level I	(1)	Transverse and/or central bars - short and/or discontinuous. NBS = High/Very High							
		Extensive deposition (continuous, cross channel). NBS = Extreme							
		Chute cutoffs, down-valley meander migration, converging flow (Figure X). NBS = Extreme							
Level II	(2)	Radius of Curvature	Bankfull Width	Ratio	Near-Bank Stress				
		Rc (feet)	W_{bkf} (feet)	Rc/W					
	(3)	Pool Slope	Average Slope	Ratio	Near-Bank Stress				
		S_p	S	S_p/S					
	(4)	Pool Slope	Riffle Slope	Ratio	Near-Bank Stress				
		S_p	S_{rif}	S_p/S_{rif}					
Level III	(5)	Near-Bank Max Depth	Mean Depth	Ratio	Near-Bank Stress				
		d_{nb} (feet)	d (feet)	d_{nb}/d					
	(6)	Near-Bank Max Depth	Near-Bank Slope	Near-Bank Shear Stress	Mean Depth	Average Slope	Shear Stress	Ratio	Near-Bank Stress
		d_{nb} (feet)	S_{nb}	τ_{nb} (lb/ft ²)	d (feet)	S	τ (lb/ft ²)	τ_{nb}/τ	
		0.28	0.0289	0.50	0.40	0.0613	1.53	0.33	Very Low
Level IV	(7)	Velocity Gradient (ft/s/ft)	Near-Bank Stress						
Converting Values to a Near-Bank Stress Rating									
Near-Bank Stress Rating		Method Number							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Very Low		N/A	>3.0	< 0.20	< 0.4	<1.0	<0.8	<1.0	
Low			2.21 - 3.0	0.20 - 0.40	0.41 - 0.60	1.0 - 1.5	0.8 - 1.05	1.0 - 1.2	
Moderate			2.01 - 2.2	0.41 - 0.60	0.61 - 0.80	1.51 - 1.8	1.06 - 1.14	1.21 - 1.6	
High		See (1) Above	1.81 - 2.0	0.61 - 0.80	0.81 - 1.0	1.81 - 2.5	1.15 - 1.19	1.61 - 2.0	
Very High			1.5 - 1.8	0.81 - 1.0	1.01 - 1.2	2.51 - 3.0	1.20 - 1.60	2.01 - 2.3	
Extreme			< 1.5	> 1.0	> 1.2	> 3.0	> 1.6	> 2.3	
								Overall Near-Bank Stress Rating	
								Very Low	

Worksheet 22A. Various field methods of estimating Near-Bank Stress risk ratings for the calculation of erosion rate.

Estimating Near-Bank Stress (NBS)											
Stream:	Tributary 2			Location:	2-L		Date:	1/22/25		Cre w:	
Methods for Estimating Near-Bank Stress											
(1) Transverse bar or split channel/central bar creating NBS/high velocity gradient: Level I - Reconnaissance.											
(2) Channel pattern (Rc/W): Level II - General Prediction.											
(3) Ratio of pool slope to average water surface slope (S_p/S): Level II - General Prediction.											
(4) Ratio of pool slope to riffle slope (S_p/S_{rif}): Level II - General Prediction.											
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb}/d_{bkf}): Level III - Detailed Prediction.											
(6) Ratio of near-bank shear stresses to bankfull shear stresses (τ_{nb}/τ_{bkf}): Level III - Detailed Prediction.											
(7) Velocity profiles/isovels /Velocity gradient: Level IV - Validation.											
Level I	(1)	Transverse and/or central bars - short and/or discontinuous. NBS = High/Very High									
		Extensive deposition (continuous, cross channel). NBS = Extreme									
		Chute cutoffs, down-valley meander migration, converging flow (Figure X). NBS = Extreme									
Level II	(2)	Radius of Curvature	Bankfull Width	Ratio	Near-Bank Stress						
		Rc (feet)	W_{bkf} (feet)	Rc/W							
	(3)	Pool Slope	Average Slope	Ratio	Near-Bank Stress						
		S_p	S	S_p/S							
	(4)	Pool Slope	Riffle Slope	Ratio	Near-Bank Stress						
		S_p	S_{rif}	S_p/S_{rif}							
Level III	(5)	Near-Bank Max Depth	Mean Depth	Ratio	Near-Bank Stress						
		d_{nb} (feet)	d (feet)	d_{nb}/d							
	(6)	Near-Bank Max Depth	Near-Bank Slope	Near-Bank Shear Stress	Mean Depth	Average Slope	Shear Stress	Ratio	Near-Bank Stress		
		d_{nb} (feet)	S_{nb}	τ_{nb} (lb/ft ²)	d (feet)	S	τ (lb/ft ²)	τ_{nb}/τ			
		.91	0.0124	0.70	0.74	0.0127	0.59	1.20	Very High		
Level IV	(7)	Velocity Gradient (ft/s/ft)	Near-Bank Stress								
Converting Values to a Near-Bank Stress Rating											
Near-Bank Stress Rating		Method Number									
		(1)	(2)	(3)	(4)	(5)	(6)	(7)			
Very Low		N/A	>3.0	< 0.20	< 0.4	<1.0	<0.8	<1.0			
Low			2.21 - 3.0	0.20 - 0.40	0.41 - 0.60	1.0 - 1.5	0.8 - 1.05	1.0 - 1.2			
Moderate			2.01 - 2.2	0.41 - 0.60	0.61 - 0.80	1.51 - 1.8	1.06 - 1.14	1.21 - 1.6			
High		See (1) Above	1.81 - 2.0	0.61 - 0.80	0.81 - 1.0	1.81 - 2.5	1.15 - 1.19	1.61 - 2.0			
Very High			1.5 - 1.8	0.81 - 1.0	1.01 - 1.2	2.51 - 3.0	1.20 - 1.60	2.01 - 2.3			
Extreme			< 1.5	> 1.0	> 1.2	> 3.0	> 1.6	> 2.3			
									Overall Near-Bank Stress Rating		
									Very High		

Worksheet 22A. Various field methods of estimating Near-Bank Stress risk ratings for the calculation of erosion rate.

Estimating Near-Bank Stress (NBS)										
Stream:	Tributary 2			Location:	3-L		Date:	1/22/25		Cre w:
Methods for Estimating Near-Bank Stress										
(1) Transverse bar or split channel/central bar creating NBS/high velocity gradient: Level I - Reconnaissance.										
(2) Channel pattern (Rc/W): Level II - General Prediction.										
(3) Ratio of pool slope to average water surface slope (S_p/S): Level II - General Prediction.										
(4) Ratio of pool slope to riffle slope (S_p/S_{rif}): Level II - General Prediction.										
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb}/d_{bkf}): Level III - Detailed Prediction.										
(6) Ratio of near-bank shear stresses to bankfull shear stresses (τ_{nb}/τ_{bkf}): Level III - Detailed Prediction.										
(7) Velocity profiles/isovels /Velocity gradient: Level IV - Validation.										
Level I	(1)	Transverse and/or central bars - short and/or discontinuous. NBS = High/Very High								
		Extensive deposition (continuous, cross channel). NBS = Extreme								
		Chute cutoffs, down-valley meander migration, converging flow (Figure X). NBS = Extreme								
Level II	(2)	Radius of Curvature	Bankfull Width	Ratio	Near-Bank Stress					
		Rc (feet)	W_{bkf} (feet)	Rc/W						
	(3)	Pool Slope	Average Slope	Ratio	Near-Bank Stress					
		S_p	S	S_p/S						
	(4)	Pool Slope	Riffle Slope	Ratio	Near-Bank Stress					
		S_p	S_{rif}	S_p/S_{rif}						
Level III	(5)	Near-Bank Max Depth	Mean Depth	Ratio	Near-Bank Stress					
		d_{nb} (feet)	d (feet)	d_{nb}/d						
	(6)	Near-Bank Max Depth	Near-Bank Slope	Near-Bank Shear Stress	Mean Depth	Average Slope	Shear Stress	Ratio	Near-Bank Stress	
		d_{nb} (feet)	S_{nb}	τ_{nb} (lb/ft ²)	d (feet)	S	τ (lb/ft ²)	τ_{nb}/τ		
		0.40	0.0214	0.53	0.66	0.0127	0.52	1.03	Low	
Level IV	(7)	Velocity Gradient (ft/s/ft)	Near-Bank Stress							
Converting Values to a Near-Bank Stress Rating										
Near-Bank Stress Rating		Method Number								
		(1)	(2)	(3)	(4)	(5)	(6)	(7)		
Very Low		N/A	>3.0	< 0.20	< 0.4	<1.0	<0.8	<1.0		
Low			2.21 - 3.0	0.20 - 0.40	0.41 - 0.60	1.0 - 1.5	0.8 - 1.05	1.0 - 1.2		
Moderate			2.01 - 2.2	0.41 - 0.60	0.61 - 0.80	1.51 - 1.8	1.06 - 1.14	1.21 - 1.6		
High		See (1) Above	1.81 - 2.0	0.61 - 0.80	0.81 - 1.0	1.81 - 2.5	1.15 - 1.19	1.61 - 2.0		
Very High			1.5 - 1.8	0.81 - 1.0	1.01 - 1.2	2.51 - 3.0	1.20 - 1.60	2.01 - 2.3		
Extreme			< 1.5	> 1.0	> 1.2	> 3.0	> 1.6	> 2.3		
								Overall Near-Bank Stress Rating		
								Low		

Worksheet 22A. Various field methods of estimating Near-Bank Stress risk ratings for the calculation of erosion rate.

Estimating Near-Bank Stress (NBS)											
Stream:	Tributary 2			Location:	1-R		Date:	1/22/25		Cre w:	
Methods for Estimating Near-Bank Stress											
(1) Transverse bar or split channel/central bar creating NBS/high velocity gradient: Level I - Reconnaissance.											
(2) Channel pattern (Rc/W): Level II - General Prediction.											
(3) Ratio of pool slope to average water surface slope (S_p/S): Level II - General Prediction.											
(4) Ratio of pool slope to riffle slope (S_p/S_{rif}): Level II - General Prediction.											
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb}/d_{bkf}): Level III - Detailed Prediction.											
(6) Ratio of near-bank shear stresses to bankfull shear stresses (τ_{nb}/τ_{bkf}): Level III - Detailed Prediction.											
(7) Velocity profiles/isovels /Velocity gradient: Level IV - Validation.											
Level I	(1)	Transverse and/or central bars - short and/or discontinuous. NBS = High/Very High									
		Extensive deposition (continuous, cross channel). NBS = Extreme									
		Chute cutoffs, down-valley meander migration, converging flow (Figure X). NBS = Extreme									
Level II	(2)	Radius of Curvature	Bankfull Width	Ratio	Near-Bank Stress						
		Rc (feet)	W_{bkf} (feet)	Rc/W							
	(3)	Pool Slope	Average Slope	Ratio	Near-Bank Stress						
		S_p	S	S_p/S							
	(4)	Pool Slope	Riffle Slope	Ratio	Near-Bank Stress						
		S_p	S_{rif}	S_p/S_{rif}							
Level III	(5)	Near-Bank Max Depth	Mean Depth	Ratio	Near-Bank Stress						
		d_{nb} (feet)	d (feet)	d_{nb}/d							
	(6)	Near-Bank Max Depth	Near-Bank Slope	Near-Bank Shear Stress	Mean Depth	Average Slope	Shear Stress	Ratio	Near-Bank Stress		
		d_{nb} (feet)	S_{nb}	τ_{nb} (lb/ft ²)	d (feet)	S	τ (lb/ft ²)	τ_{nb}/τ			
		0.85	0.0726	3.85	0.65	0.0613	2.49	1.55	Very High		
Level IV	(7)	Velocity Gradient (ft/s/ft)		Near-Bank Stress							
Converting Values to a Near-Bank Stress Rating											
Near-Bank Stress Rating		Method Number									
		(1)	(2)	(3)	(4)	(5)	(6)	(7)			
Very Low		N/A	>3.0	< 0.20	< 0.4	<1.0	<0.8	<1.0			
Low			2.21 - 3.0	0.20 - 0.40	0.41 - 0.60	1.0 - 1.5	0.8 - 1.05	1.0 - 1.2			
Moderate			2.01 - 2.2	0.41 - 0.60	0.61 - 0.80	1.51 - 1.8	1.06 - 1.14	1.21 - 1.6			
High		See (1) Above	1.81 - 2.0	0.61 - 0.80	0.81 - 1.0	1.81 - 2.5	1.15 - 1.19	1.61 - 2.0			
Very High			1.5 - 1.8	0.81 - 1.0	1.01 - 1.2	2.51 - 3.0	1.20 - 1.60	2.01 - 2.3			
Extreme			< 1.5	> 1.0	> 1.2	> 3.0	> 1.6	> 2.3			
									Overall Near-Bank Stress Rating		
									Very High		

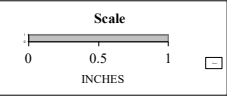
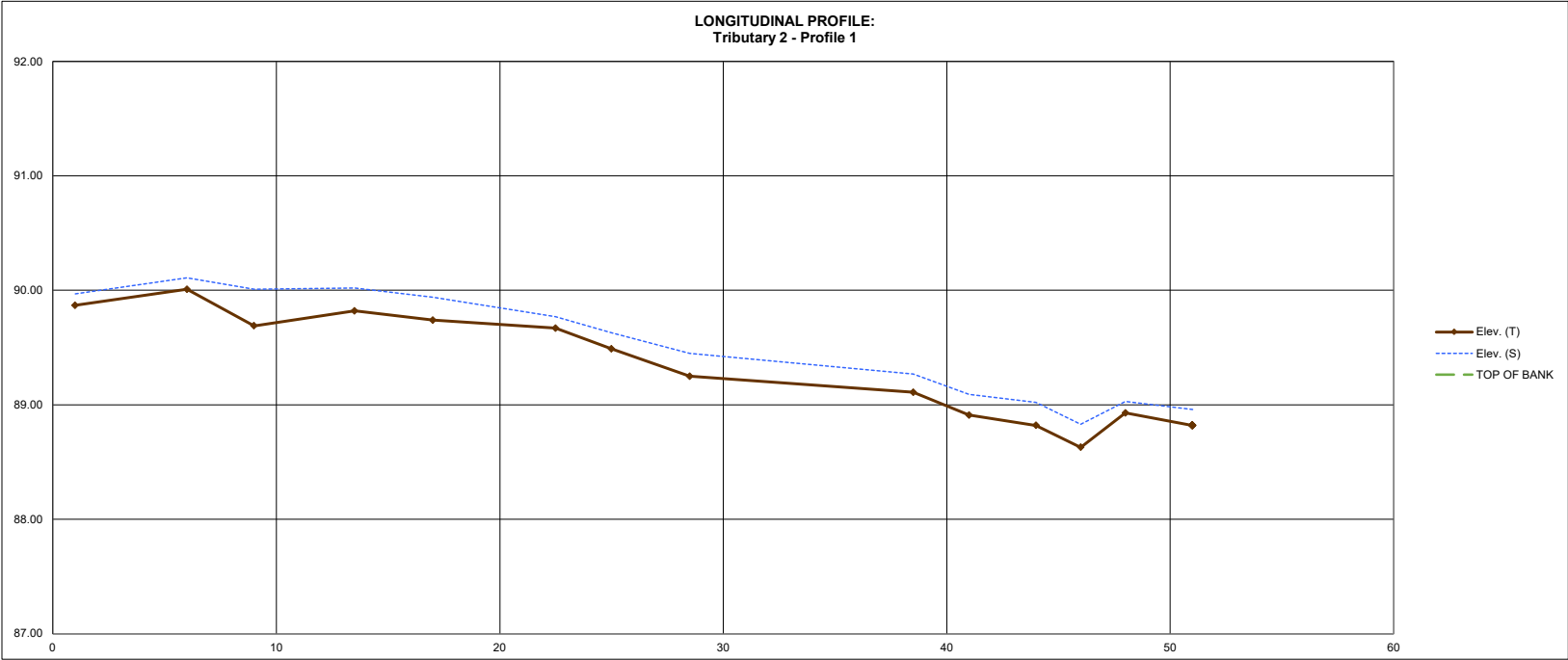
Worksheet 22A. Various field methods of estimating Near-Bank Stress risk ratings for the calculation of erosion rate.

Estimating Near-Bank Stress (NBS)									
Stream: Tributary 2		Location: 2-R		Date: 1/22/25		Crew:			
Methods for Estimating Near-Bank Stress									
(1) Transverse bar or split channel/central bar creating NBS/high velocity gradient: Level I - Reconnaissance.									
(2) Channel pattern (Rc/W): Level II - General Prediction.									
(3) Ratio of pool slope to average water surface slope (S_p/S): Level II - General Prediction.									
(4) Ratio of pool slope to riffle slope (S_p/S_{rif}): Level II - General Prediction.									
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb}/d_{bkf}): Level III - Detailed Prediction.									
(6) Ratio of near-bank shear stresses to bankfull shear stresses (τ_{nb}/τ_{bkf}): Level III - Detailed Prediction.									
(7) Velocity profiles/isovels /Velocity gradient: Level IV - Validation.									
Level I	(1)	Transverse and/or central bars - short and/or discontinuous. NBS = High/Very High							
		Extensive deposition (continuous, cross channel). NBS = Extreme							
		Chute cutoffs, down-valley meander migration, converging flow (Figure X). NBS = Extreme							
Level II	(2)	Radius of Curvature	Bankfull Width	Ratio	Near-Bank Stress				
		Rc (feet)	W_{bkf} (feet)	Rc/W					
	(3)	Pool Slope	Average Slope	Ratio	Near-Bank Stress				
		S_p	S	S_p/S					
	(4)	Pool Slope	Riffle Slope	Ratio	Near-Bank Stress				
		S_p	S_{rif}	S_p/S_{rif}					
Level III	(5)	Near-Bank Max Depth	Mean Depth	Ratio	Near-Bank Stress				
		d_{nb} (feet)	d (feet)	d_{nb}/d					
	(6)	Near-Bank Max Depth	Near-Bank Slope	Near-Bank Shear Stress	Mean Depth	Average Slope	Shear Stress	Ratio	Near-Bank Stress
		d_{nb} (feet)	S_{nb}	τ_{nb} (lb/ft ²)	d (feet)	S	τ (lb/ft ²)	τ_{nb}/τ	
		0.56	0.0207	0.72	0.67	0.0613	2.54	0.28	Very Low
Level IV	(7)	Velocity Gradient (ft/s/ft)		Near-Bank Stress					
Converting Values to a Near-Bank Stress Rating									
Near-Bank Stress Rating		Method Number							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Very Low		N/A	>3.0	< 0.20	< 0.4	<1.0	<0.8	<1.0	
Low			2.21 - 3.0	0.20 - 0.40	0.41 - 0.60	1.0 - 1.5	0.8 - 1.05	1.0 - 1.2	
Moderate			2.01 - 2.2	0.41 - 0.60	0.61 - 0.80	1.51 - 1.8	1.06 - 1.14	1.21 - 1.6	
High		See (1) Above	1.81 - 2.0	0.61 - 0.80	0.81 - 1.0	1.81 - 2.5	1.15 - 1.19	1.61 - 2.0	
Very High			1.5 - 1.8	0.81 - 1.0	1.01 - 1.2	2.51 - 3.0	1.20 - 1.60	2.01 - 2.3	
Extreme			< 1.5	> 1.0	> 1.2	> 3.0	> 1.6	> 2.3	
								Overall Near-Bank Stress Rating	
								Very Low	

Worksheet 22A. Various field methods of estimating Near-Bank Stress risk ratings for the calculation of erosion rate.

Estimating Near-Bank Stress (NBS)											
Stream:	Tributary 2			Location:	3-R		Date:	1/22/25		Cre w:	
Methods for Estimating Near-Bank Stress											
(1) Transverse bar or split channel/central bar creating NBS/high velocity gradient: Level I - Reconnaissance.											
(2) Channel pattern (Rc/W): Level II - General Prediction.											
(3) Ratio of pool slope to average water surface slope (S_p/S): Level II - General Prediction.											
(4) Ratio of pool slope to riffle slope (S_p/S_{rif}): Level II - General Prediction.											
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb}/d_{bkf}): Level III - Detailed Prediction.											
(6) Ratio of near-bank shear stresses to bankfull shear stresses (τ_{nb}/τ_{bkf}): Level III - Detailed Prediction.											
(7) Velocity profiles/isovels /Velocity gradient: Level IV - Validation.											
Level I	(1)	Transverse and/or central bars - short and/or discontinuous. NBS = High/Very High									
		Extensive deposition (continuous, cross channel). NBS = Extreme									
		Chute cutoffs, down-valley meander migration, converging flow (Figure X). NBS = Extreme									
Level II	(2)	Radius of Curvature	Bankfull Width	Ratio	Near-Bank Stress						
		Rc (feet)	W_{bkf} (feet)	Rc/W							
	(3)	Pool Slope	Average Slope	Ratio	Near-Bank Stress						
		S_p	S	S_p/S							
	(4)	Pool Slope	Riffle Slope	Ratio	Near-Bank Stress						
		S_p	S_{rif}	S_p/S_{rif}							
Level III	(5)	Near-Bank Max Depth	Mean Depth	Ratio	Near-Bank Stress						
		d_{nb} (feet)	d (feet)	d_{nb}/d							
	(6)	Near-Bank Max Depth	Near-Bank Slope	Near-Bank Shear Stress	Mean Depth	Average Slope	Shear Stress	Ratio	Near-Bank Stress		
		d_{nb} (feet)	S_{nb}	τ_{nb} (lb/ft ²)	d (feet)	S	τ (lb/ft ²)	τ_{nb}/τ			
		0.64	0.0489	1.95	0.74	0.0127	0.58	3.35	Extreme		
Level IV	(7)	Velocity Gradient (ft/s/ft)	Near-Bank Stress								
Converting Values to a Near-Bank Stress Rating											
Near-Bank Stress Rating		Method Number									
		(1)	(2)	(3)	(4)	(5)	(6)	(7)			
Very Low		N/A	>3.0	< 0.20	< 0.4	<1.0	<0.8	<1.0			
Low			2.21 - 3.0	0.20 - 0.40	0.41 - 0.60	1.0 - 1.5	0.8 - 1.05	1.0 - 1.2			
Moderate			2.01 - 2.2	0.41 - 0.60	0.61 - 0.80	1.51 - 1.8	1.06 - 1.14	1.21 - 1.6			
High		See (1) Above	1.81 - 2.0	0.61 - 0.80	0.81 - 1.0	1.81 - 2.5	1.15 - 1.19	1.61 - 2.0			
Very High			1.5 - 1.8	0.81 - 1.0	1.01 - 1.2	2.51 - 3.0	1.20 - 1.60	2.01 - 2.3			
Extreme			< 1.5	> 1.0	> 1.2	> 3.0	> 1.6	> 2.3			
								Overall Near-Bank Stress Rating			
								Extreme			

[illegible]



Note: Scale set for print and view magnification at 65%

ENGLISH UNITS (FT)

Reach Averaged Water Surface Slope = 0.0202 ft/ft

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

Tributary 2 - Cross Section 1-1 @ STA. 13.5

REACH ID: LMC 1-1 **Date:** 1/22/2025
 Reference Base Elevation: 100
 Enter Rod Reading at Base Elevation: 0
 Diagonal Camline Used: (yes = 1, no = 0)
 Convert English(0) to Metric (1): 0
 Bankfull Elev. (from Column M): 90.8
 Water Surface Elev. (from Column M): 90.0

Adj. Reading (Rc)
 R+TPC
 & Camline

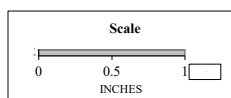
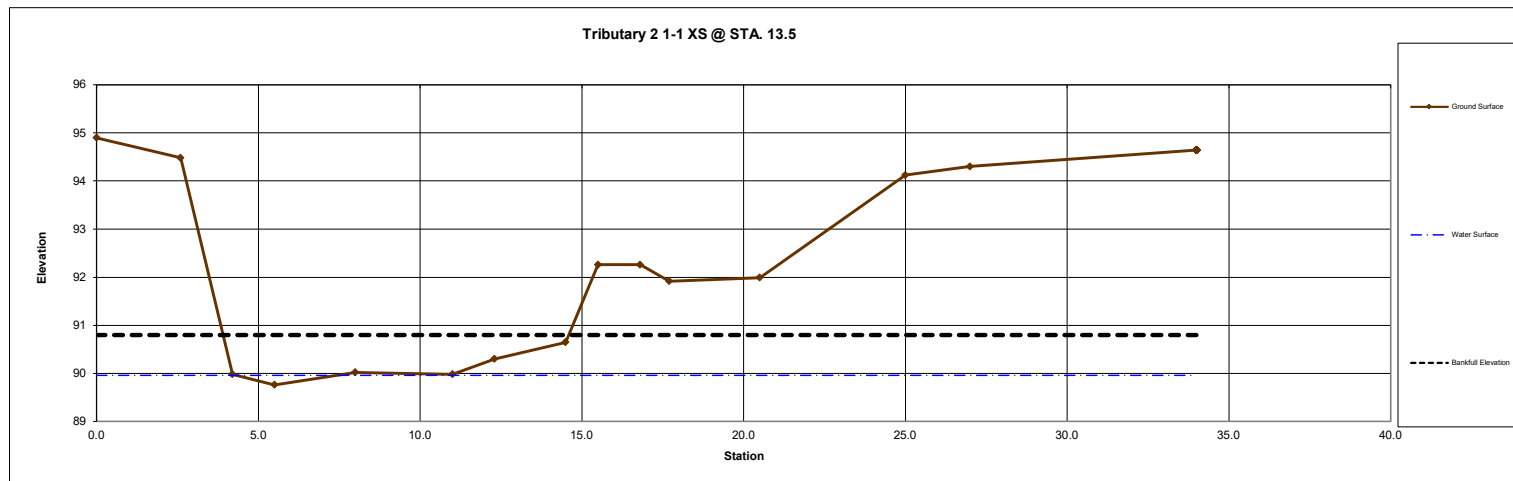
Geometry (English Units)	Hydraulics (English Units)	Other
B elev = 90.80	Slope (ft/ft) 0.0202	L.Pin Sta. 0.0
B. Width = 10.7	Mannings "n" 0.05	R.Pin Sta. 0.0
W/d = 15.07	D84 (mm) measured 63.8	L.Pin Rod 94.9
F.P.Width 11.7	Velocity (ft/s) Manning's) 2.51	R.Pin Rod 94.6
Entrenchment 1.09	Velocity (ft/s) via. (U/U*) 2.99	Tape Angle (deg.)
B. Area = 7.6	Froud # 0.65	Rc Meas.
B. Depth= 0.71	Discharge (cu ft/s) 19.0	Chord
Max Depth 1.04	Shear Stress (lb/sq ft) 0.58	m
W. Per= 16.5	CX Power (ft lb/s) 24.0	Rc Calc.
H.Radius= 0.46	CX Power (watts) 32.5	Rc/B. Width**
SS L Bank* = 0.87	Critical size (mm) 47.8	
SS R Bank* = 0.66	D84 predicted (mm) 49.4	
Shape Factor: 0.17	Flow Type Subcritical Flow	

*Based on HRad₀(within the nearest 1/3 of W/d) / HRad₀

**Based on entry in Rc Meas.

Rod Readings

Station (ft)	Station (ft)	Invert (I)	Notes	Adj. Rod	Elev I	Max Rod	BF Width	Entr. Test 1	Entr Tst 2	FP Pz	FP Width	Area	Partial	Invert
Horiz. Adj.	Raw			Invert		perimeter				Sta X R Bnk	(old)	(old)	LNB Set	Segment is:
0.0	0.0	5.1		5.10	94.9	5.10	0.00	1	0	0.00	0.00	0.0	0	
2.6	2.6	5.52	L-TOB	5.52	94.5	5.52	0.29	1	0	0.00	0.66	0.0	0	Within B F
4.2	4.2	10.02	L-TOE & L-EOW	10.02	90.0	10.02	1.30	0	0	0.00	1.30	0.0	0	Within B F
5.5	5.5	10.24	Thalweg	10.24	89.8	10.24	2.50	0	0	0.00	2.50	1.2	0.79	Within B F
8.0	8.0	9.98	R-EOW	9.98	90.0	10.24	3.00	0	0	0.00	3.00	2.3	0.00	Within B F
11.0	11.0	10.02		10.02	90.0	10.24	1.30	0	0	0.00	1.30	2.4	0.00	Within B F
12.3	12.3	9.7		9.70	90.3	10.24	2.20	0	0	0.00	2.20	0.9	0.00	Within B F
14.5	14.5	9.35	R-TOE	9.35	90.7	10.24	0.09	0	1	####	0.74	0.7	0.00	Within B F
15.5	15.5	7.74		7.74	92.3	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
16.8	16.8	7.74		7.74	92.3	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
17.7	17.7	8.08		8.08	91.9	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
20.5	20.5	8.01		8.01	92.0	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
25.0	25.0	5.88	R-TOB	5.88	94.1	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
27.0	27.0	5.7		5.70	94.3	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0	34.0	5.36		5.36	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	1	0.00	0.00	0.0	0.00	Above B F



Note: Scale set for print and view
magnification at 65%

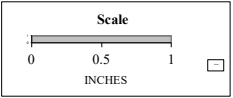
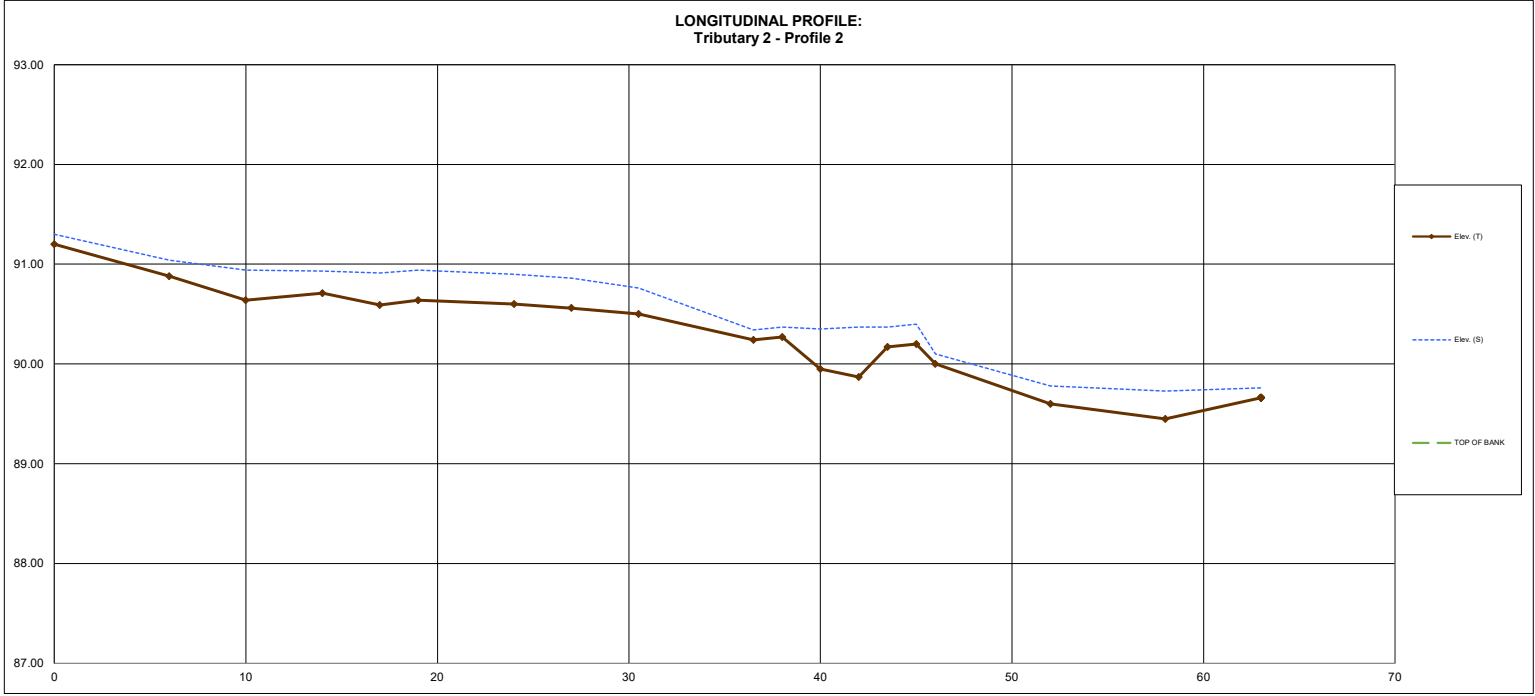
Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

English Units	
GEOMETRY	
Bank Full Elevation	90.80
Bank Full Width	10.68
Bank Full Depth	0.71
Maximum Depth	1.04
Bank Full Area	7.6
Hydraulic Radius	0.46
Wetted Perimeter	16.5
Width/Depth Ratio	15.1
Flood Prone Width	11.7
Entrenchment	1.09
Stream Type	B4
Rc	

English Units	
HYDRAULICS	
Slope (ft/ft)	0.0202
Manning's n	0.05
Velocity (ft/s)	2.51
Froude #	0.65
Discharge (cu ft/s)	19.0
Shear Stress (lb/sq ft)	0.58
CX Power (ft lb/s)	24.0
Critical Size (mm)	47.8
Flow Type	Subcritical Flow
Rec. Interval	

Tributary 2 (Profile 2) - LONGITUDINAL PROFILE SURVEY

[illegible]



Note: Scale set for print and view
magnification at 65%

ENGLISH UNITS (FT)

Reach Averaged Water Surface Slope = 0.024444 ft/ft

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

Tributary 2 - Cross Section 2-1 @ STA. 19.0

REACH ID: LMC 2-1
Date: 1/22/2025
 Reference Base Elevation: 100
 Enter Rod Reading at Base Elevation: 0
 Diagonal Camline Used: (yes = 1, no = 0)
 Convert English(0) to Metric (1): 0
 Bankfull Elev. (from Column M): 91.97
 Water Surface Elev. (from Column M): 91.0

Adj. Reading
 (Rc)
 R+TPC
 & Camline

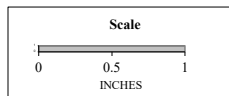
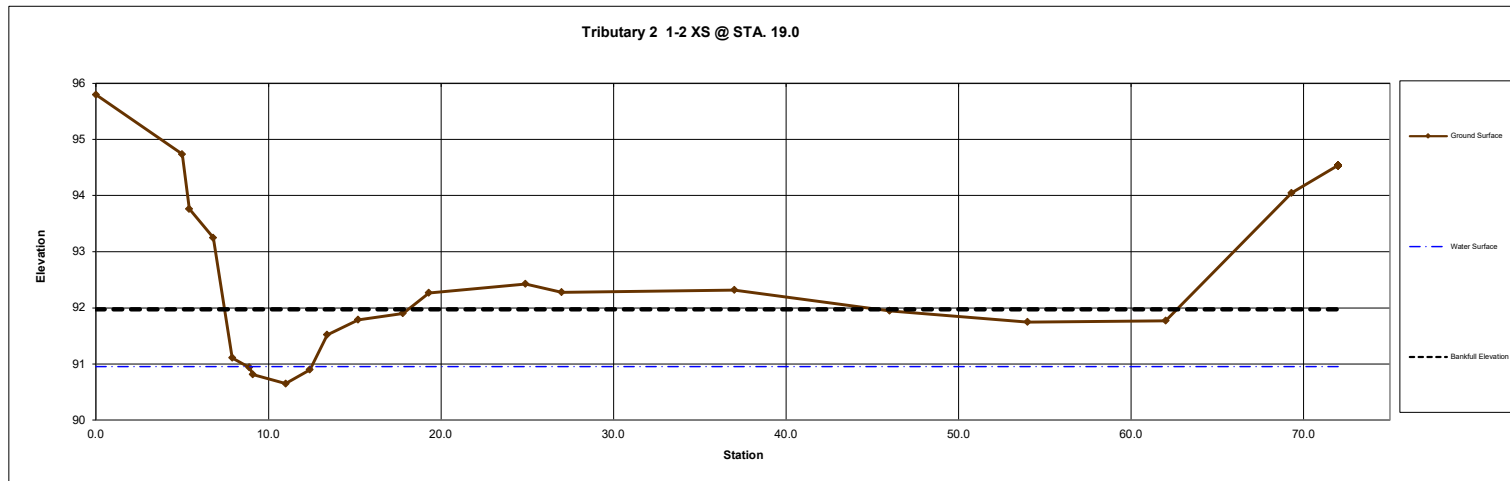
Geometry (English Units)	Hydraulics (English Units)	Other
B elev = 91.97	Slope (ft/ft) 0.02444	L.Pin Sta. 0.0
B. Width = 27.8	Mannings "n" 0.06181	R.Pin Sta. 0.0
W/d = 78.84	D84 (mm) measured 63.8	L.Pin Rod 95.8
F.P.Width 60.2	Velocity (ft/s) Manning's 1.72	R.Pin Rod 94.5
Entrenchment 2.16	Velocity (ft/s) via. (U/U*) 2.46	Tape Angle (deg.)
B. Area = 9.8	Froud # 0.54	Rc Meas.
B. Depth= 0.35	Discharge (cu ft/s) 16.9	Chord
Max Depth 1.32	Shear Stress (lb/sq ft) 0.47	m
W. Per= 31.9	CX Power (ft lb/s) 25.7	Rc Calc.
H.Radius= 0.309	CX Power (watts) 34.9	Rc/B. Width**
SS L Bank* = 1.99	Critical size (mm) 38.3	
SS R Bank* = 0.52	D84 predicted (mm) 43.0	
Shape Factor: 0.10	Flow Type Subcritical Flow	

*Based on HRad, (within the nearest 1/3 of W/d) / HRad

**Based on entry in Rc Meas.

Rod Readings

Station (ft)	Station (ft)	Invert (I)	Notes	Adj. Rod	Elev I	Max Rod	BF Width	Entr. Test 1	Entr Tst 2	FP Partia	FP Width	Area	L. Partial	Invert
Horiz. Adj.	Raw			Invert		perimeter				Sta X R Bnk	(old)		LNB Se	Segment is:
0.0	0.0	4.20		4.20	95.8	4.20	0.00	1	0	0.00	0.00	0.0	0	
5.0	5.0	5.26	L-TOB	5.26	94.7	5.26	0.00	1	0	0.00	0.00	0.0	0	Above B F
5.4	5.4	6.24		6.24	93.8	6.24	0.00	1	0	0.00	0.13	0.0	0	Above B F
6.8	6.8	6.75		6.75	93.3	6.75	0.44	0	0	0.00	1.10	0.0	0	Within B F
7.9	7.9	8.89	L-Toe	8.89	91.1	8.89	1.00	0	0	0.00	1.00	0.0	0	Within B F
8.9	8.9	9.06	L-EOW	9.06	90.9	9.06	0.20	0	0	0.00	0.20	0.9	0	Within B F
9.1	9.1	9.19		9.19	90.8	9.19	1.90	0	0	0.00	1.90	0.2	0	Within B F
11.0	11.0	9.35	Thalweg	9.35	90.7	9.35	1.40	0	0	0.00	1.40	2.4	0	Within B F
12.4	12.4	9.10	R-EOW & R-Toe	9.10	90.9	9.35	1.00	0	0	0.00	1.00	1.7	0	Within B F
13.4	13.4	8.48		8.48	91.5	9.35	1.80	0	0	0.00	1.80	0.8	0	Within B F
15.2	15.2	8.21		8.21	91.8	9.35	2.60	0	0	0.00	2.60	0.6	0.59	Within B F
17.8	17.8	8.10		8.10	91.9	9.35	0.30	0	0	0.00	1.50	0.3	0.00	Within B F
19.3	19.3	7.73	Bankfull & R-TOB	7.73	92.3	9.35	0.00	0	0	0.00	5.60	0.0	0.00	Above B F
24.9	24.9	7.57		7.57	92.4	9.35	0.00	0	0	0.00	2.10	0.0	0.00	Above B F
27.0	27.0	7.72		7.72	92.3	9.35	0.00	0	0	0.00	10.00	0.0	0.00	Above B F
37.0	37.0	7.68		7.68	92.3	9.35	0.56	0	0	0.00	9.00	0.0	0.00	Within B F
46.0	46.0	8.05		8.05	92.0	9.35	8.00	0	0	0.00	8.00	0.0	0.00	Within B F
54.0	54.0	8.25		8.25	91.8	9.35	8.00	0	0	0.00	8.00	1.0	0.00	Within B F
62.0	62.0	8.23		8.23	91.8	9.35	0.65	0	1	66.89	4.89	1.7	0.00	Within B F
69.3	69.3	5.95		5.95	94.1	9.35	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
72.0	72.0	5.46		5.46	94.5	9.35	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
72.0				0.00	94.5	9.35	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
72.0				0.00	94.5	9.35	0.00	0	1	0.00	0.00	0.0	0.00	Above B F



Note: Scale set for print and view magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

English Units	
GEOMETRY	
Bank Full Elevation	91.97
Bank Full Width	27.85
Bank Full Depth	0.35
Maximum Depth	1.32
Bank Full Area	9.8
Hydraulic Radius	0.31
Wetted Perimeter	31.9
Width/Depth Ratio	78.8
Flood Prone Width	60.2
Entrenchment	2.16
Stream Type	B4
Rc	

English Units	
HYDRAULICS	
Slope (ft/ft)	0.0244
Manning's n	0.06181
Velocity (ft./s)	1.72
Froud #	0.54
Discharge (cu ft/s)	16.88
Shear Stress (lb/sq ft)	0.47
CX Power (ft lb/s)	25.7
Critical Size (mm)	38.3
Flow Type	Subcritical Flow
Rec. Interval	

STREAMETRICS (TM)

PEBBLE COUNT: XS 1-2

XS 1-2

PARTICLE	Type	Size (mm)	Riffles Total	Pools Total	Combined	Combined %	Cumulative	% Cumulative
silt/clay		0.06			0	0.00	0	0.00
very fine	sand	0.13			0	0.00	0	0.00
fine	sand	0.25			0	0.00	0	0.00
medium	sand	0.50			0	0.00	0	0.00
coarse	sand	1.00			0	0.00	0	0.00
very coarse	sand	2			0	0.00	0	0.00
very fine	gravel	3	1		1	0.93	1	0.93
fine	gravel	6			0	0.00	1	0.93
fine	gravel	8	1		1	0.93	2	1.87
medium	gravel	11	2		2	1.87	4	3.74
medium	gravel	16	4		4	3.74	8	7.48
coarse	gravel	23	14		14	13.08	22	20.56
coarse	gravel	32	28		28	26.17	50	46.73
very coarse	gravel	45	28		28	26.17	78	72.90
very coarse	gravel	64	12		12	11.21	90	84.11
small	cobble	90	13		13	12.15	103	96.26
small	cobble	128	3		3	2.80	106	99.07
large	cobble	180	1		1	0.93	107	100.00
large	cobble	256			0	0.00	107	100.00
small	boulder	362			0	0.00	107	100.00
small	boulder	512			0	0.00	107	100.00
medium	boulder	724			0	0.00	107	100.00
very large	boulder	1024			0	0.00	107	100.00
bedrock		2048			0	0.00	107	100.00

Totals

107

0

107

D(16) =	20.6
D(35) =	28.0
D(50) =	33.6
D(84) =	63.8
D(95) =	87.3
D(100) =	180.0

CHART # 1: CUMULATIVE PEBBLE COUNT
XS 1-2

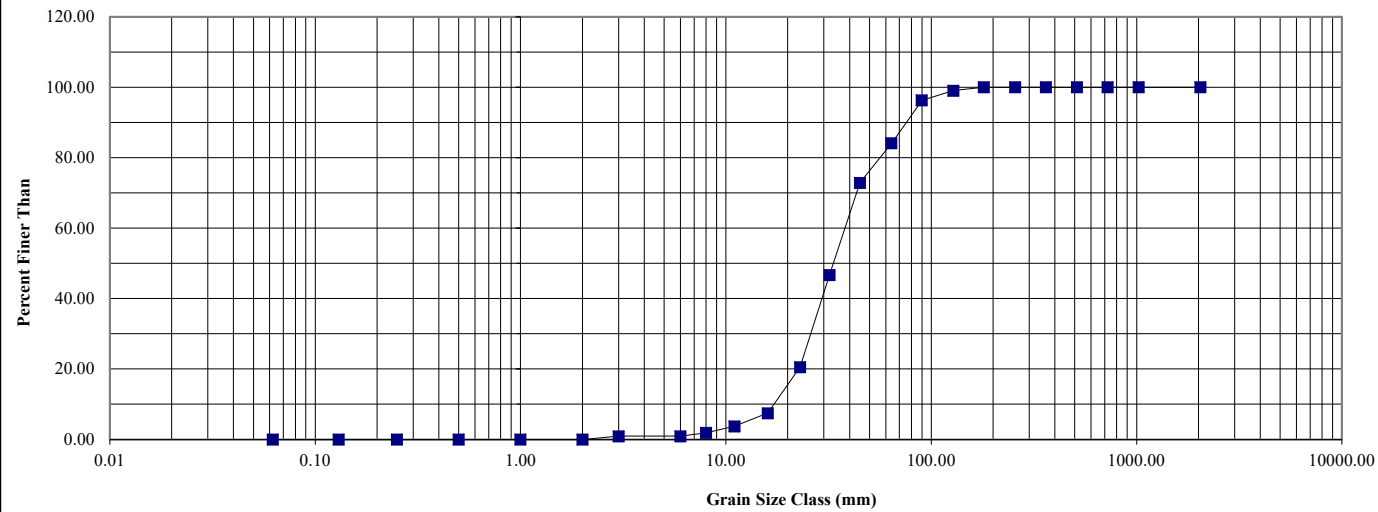
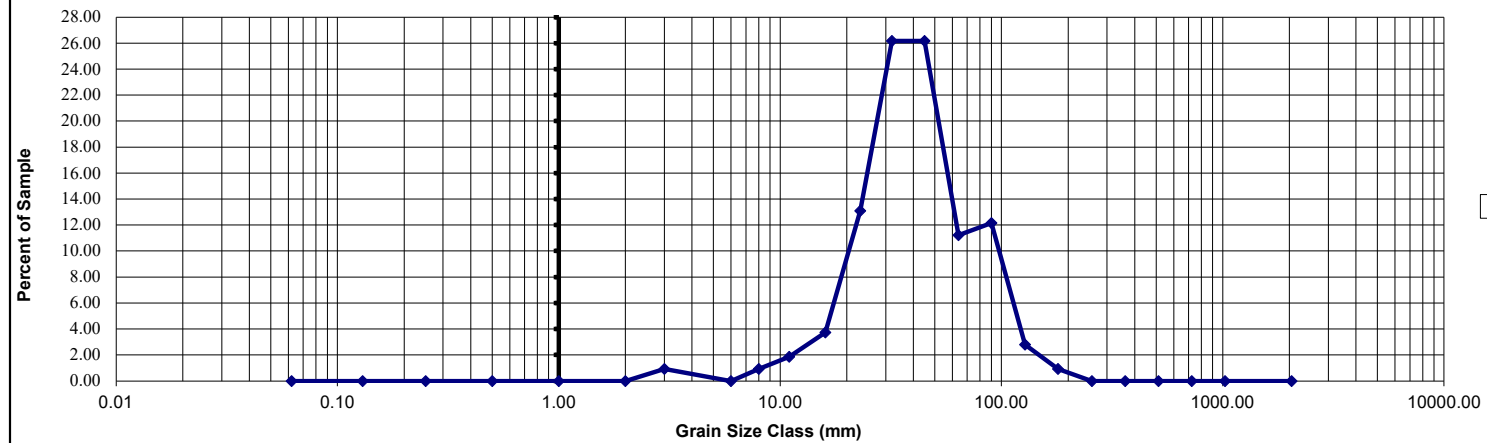


CHART # 2: RIFFLE and/or POOL PARTICLE SIZE DISTRIBUTION
XS 1-2



APPENDIX F

TOP OF BANK ANALYSIS DATA

Tributary 2 - Cross Section 1-1 @ STA. 13.5

REACH ID:	LMC 1-1	Date: 1/22/2025
Reference Base Elevation:	100	
Enter Rod Reading at Base Elevation:	0	
Diagonal Camline Used: (yes = 1, no = 0)	0	
Convert English(0) to Metric (1):	0	
Bankfull Elev. (from Column M)	94.1	
Water Surface Elev. (from Column M)	90.0	

Adj. Reading
(Rc)
R+TPc
& Camline

check

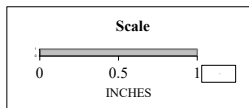
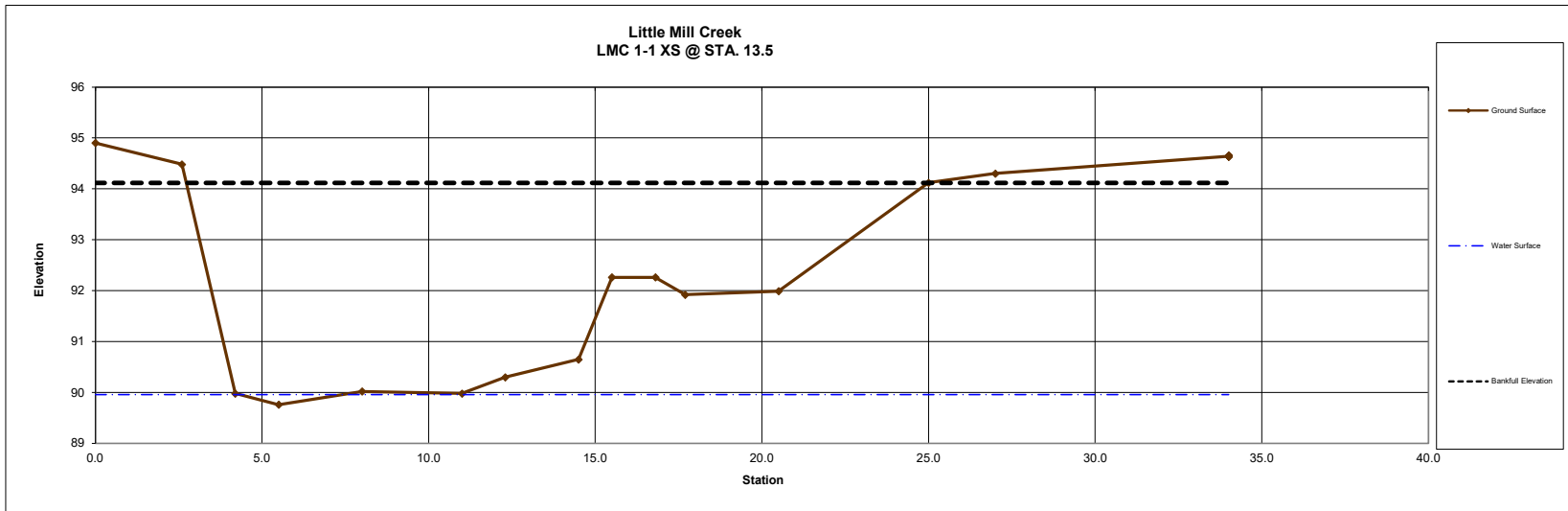
Geometry (English Units)	Hydraulics (English Units)	Other
B elev = 94.12	Slope (ft/ft) 0.0202	L.Pin Sta. 0.0
B. Width = 22.3	Mannings "n" 0.05	R.Pin Sta. 0.0
W/d = 7.94	D84 (mm) measured 63.8	L.Pin Rod 94.9
F.P.Width 34.0	Velocity (ft/s) Manning's) 7.38	R.Pin Rod 94.6
Entrenchment 1.53	Velocity (ft/s) via. (U/U*) 11.48	Tape Angle (deg.)
B. Area = 62.5	Froud # 0.86	Rc Meas.
B. Depth= 2.80	Discharge (cu ft/s) 460.9	Chord
Max Depth 4.36	Shear Stress (lb/sq ft) 2.91	m
W. Per= 27.1	CX Power (ft lb/s) 580.9	Rc Calc.
H.Radius= 2.31	CX Power (watts) 787.7	Rc/B. Width**
SS L Bank* = 1.13	Critical size (mm) 273.5	
SS R Bank* = 0.61	D84 predicted (mm) 195.6	
Shape Factor: 0.29	Flow Type Subcritical Flow	

*Based on HRad₅₀(within the nearest 1/3 of W₅₀) / HRad₅₀

**Based on entry in Rc Meas.

Rod Readings

Station (ft) Horiz. Adj.	Station (ft) Raw	Invert (I)	Notes	Adj. Rod Invert	Elev I	Max Rod perimeter	BF Width	Entr. Test 1	Entr Tst 2	FP P ₂	FP Width	Area (old)	i. Partial LNB Se	Invert Segment is:
0.0	0.0	5.1		5.10	94.9	5.10	0.00	0	0	0.00	2.60	0.0	0	Within B F
2.6	2.6	5.52	L-TOB	5.52	94.5	5.52	1.47	0	0	0.00	1.60	0.0	0	Within B F
4.2	4.2	10.02	L-Toe & L-EOW	10.02	90.0	10.02	1.30	0	0	0.00	1.30	0.0	0	Within B F
5.5	5.5	10.24	Thalweg	10.24	89.8	10.24	2.50	0	0	0.00	2.50	5.5	0	Within B F
8.0	8.0	9.98	R-EOW	9.98	90.0	10.24	3.00	0	0	0.00	3.00	10.6	0.72	Within B F
11.0	11.0	10.02		10.02	90.0	10.24	1.30	0	0	0.00	1.30	12.4	0.00	Within B F
12.3	12.3	9.7		9.70	90.3	10.24	2.20	0	0	0.00	2.20	5.2	0.00	Within B F
14.5	14.5	9.35	R-Toe	9.35	90.7	10.24	1.00	0	0	0.00	1.00	8.0	0.00	Within B F
15.5	15.5	7.74		7.74	92.3	10.24	1.30	0	0	0.00	1.30	2.7	0.00	Within B F
16.8	16.8	7.74		7.74	92.3	10.24	0.90	0	0	0.00	0.90	2.4	0.00	Within B F
17.7	17.7	8.08		8.08	91.9	10.24	2.80	0	0	0.00	2.80	1.8	0.00	Within B F
20.5	20.5	8.01		8.01	92.0	10.24	4.50	0	0	0.00	4.50	6.1	0.00	Within B F
25.0	25.0	5.88	R-TOB	5.88	94.1	10.24	0.00	0	0	0.00	2.00	4.8	0.00	Above B F
27.0	27.0	5.7		5.70	94.3	10.24	0.00	0	0	0.00	7.00	0.0	0.00	Above B F
34.0	34.0	5.36		5.36	94.6	10.24	0.00	0	0	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	0	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	0	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	0	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	0	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	0	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	0	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	0	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	0	0.00	0.00	0.0	0.00	Above B F
34.0				0.00	94.6	10.24	0.00	0	0	0.00	0.00	0.0	0.00	Above B F



Note: Scale set for print and view
magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

English Units	
GEOMETRY	
Bank Full Elevation	94.12
Bank Full Width	22.27
Bank Full Depth	2.80
Maximum Depth	4.36
Bank Full Area	62.5
Hydraulic Radius	2.31
Wetted Perimeter	27.1
Width/Depth Ratio	7.9
Flood Prone Width	34.0
Entrenchment	
Stream Type	B4
Rc	

English Units	
HYDRAULICS	
Slope (ft/ft)	0.0202
Manning's n	0.05
Velocity (ft./s)	7.38
Froud #	0.86
Discharge (cu ft/s)	460.9
Shear Stress (lb/sq ft)	2.91
CX Power (ft lb/s)	580.9
Critical Size (mm)	273.5
Flow Type	Subcritical Flow
Rec. Interval	

Tributary 2 - Cross Section 2-1 @ STA. 19

REACH ID:	LMC 2-1	Date:	1/22/2025
Reference Base Elevation:	100		
Enter Rod Reading at Base Elevation:	0		
Diagonal Camline Used: (yes = 1, no = 0)	0		
Convert English(0) to Metric (1):	0		
Bankfull Elev. (from Column M)	92.43		
Water Surface Elev. (from Column M)	91.0		

Adj. Reading
(Rci)
R+TPc
& Camline

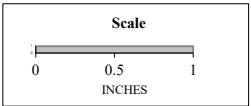
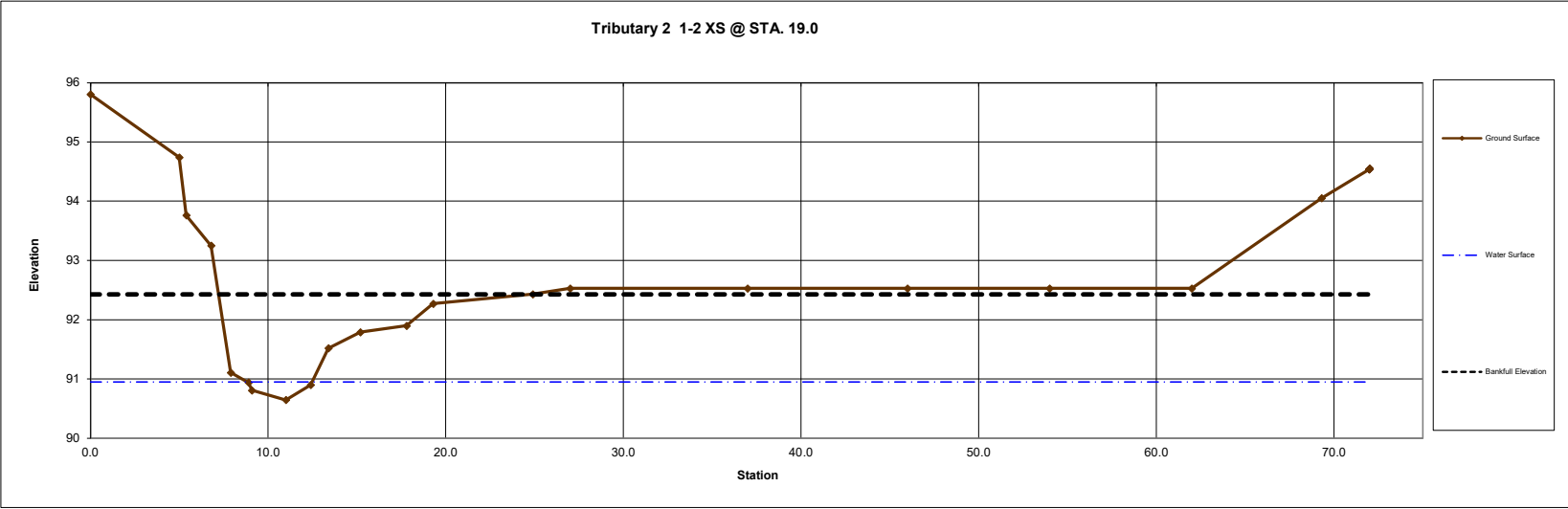
Geometry (English Units)	Hydraulics (English Units)	Other
B elev = 92.43	Slope (ft/ft) 0.02444	L.Pin Sta. 0.0
B. Width = 17.7	Mannings "n" 0.06181	R.Pin Sta. 0.0
W/d = 24.39	D84 (mm) measured 63.8	L.Pin Rod 95.8
F.P.Width 65.0	Velocity (ft/s) Manning's 2.83	R.Pin Rod 94.5
Entrenchment 3.67	Velocity (ft/s) via. (U/U*) 4.67	Tape Angle (deg.)
B. Area = 12.8	Froud # 0.62	
B. Depth= 0.72	Discharge (cu ft/s) 36.3	Rc Meas.
Max Depth 1.78	Shear Stress (lb/sq ft) 1.00	Chord
W. Per= 19.6	CX Power (ft lb/s) 55.4	m
H.Radius= 0.655	CX Power (watts) 75.1	Rc Calc.
SS L Bank* = 1.71	Critical size (mm) 86.3	Rc/B. Width**
SS R Bank* = 0.14	D84 predicted (mm) 88.2	
Shape Factor: 0.18	Flow Type Subcritical Flow	

*Based on HRad₅₀(within the nearest 1/3 of Wb) / HRad₅₀

**Based on entry in Rc Meas.

Rod Readings

Station (ft)	Station (ft)	Invert (l)	Notes	Adj. Rod	Elev l	i Max Rod	BF Width	Entr. Test 1	Entr Tst 2	FP Partia	FP Width	Area	i. Partial	Invert
Horiz. Adj.	Raw			Invert		perimeter				Sta X R Bnk		(old)	LNB Se	Segment is:
0.0	0.0	4.20		4.20	95.8	4.20	0.00	1	0	0.00	0.00	0.00	0	
5.0	5.0	5.26	L-TOB	5.26	94.7	5.26	0.00	1	0	0.00	0.18	0.0	0	Above B F
5.4	5.4	6.24		6.24	93.8	6.24	0.00	0	0	0.00	1.40	0.0	0	Above B F
6.8	6.8	6.75		6.75	93.3	6.75	0.68	0	0	0.00	1.10	0.0	0	Within B F
7.9	7.9	8.89	L-Toe	8.89	91.1	8.89	1.00	0	0	0.00	1.00	0.0	0	Within B F
8.9	8.9	9.06	L-EOW	9.06	90.9	9.06	0.20	0	0	0.00	0.20	1.4	0	Within B F
9.1	9.1	9.19		9.19	90.8	9.19	1.90	0	0	0.00	1.90	0.3	0	Within B F
11.0	11.0	9.35	Thalweg	9.35	90.7	9.35	1.40	0	0	0.00	1.40	3.2	0	Within B F
12.4	12.4	9.10	R-EOW & R-Toe	9.10	90.9	9.35	1.00	0	0	0.00	1.00	2.3	0.71	Within B F
13.4	13.4	8.48		8.48	91.5	9.35	1.80	0	0	0.00	1.80	1.2	0.00	Within B F
15.2	15.2	8.21		8.21	91.8	9.35	2.60	0	0	0.00	2.60	1.4	0.00	Within B F
17.8	17.8	8.10		8.10	91.9	9.35	1.50	0	0	0.00	1.50	1.5	0.00	Within B F
19.3	19.3	7.73	Bankfull & R-TOB	7.73	92.3	9.35	5.60	0	0	0.00	5.60	0.5	0.00	Within B F
24.9	24.9	7.57		7.57	92.4	9.35	0.00	0	0	0.00	2.10	0.4	0.00	Above B F
27.0	27.0	7.47		7.47	92.5	9.35	0.00	0	0	0.00	10.00	0.0	0.00	Above B F
37.0	37.0	7.47		7.47	92.5	9.35	0.00	0	0	0.00	9.00	0.0	0.00	Above B F
46.0	46.0	7.47		7.47	92.5	9.35	0.00	0	0	0.00	8.00	0.0	0.00	Above B F
54.0	54.0	7.47		7.47	92.5	9.35	0.00	0	0	0.00	8.00	0.0	0.00	Above B F
62.0	62.0	7.47		7.47	92.5	9.35	0.00	0	0	0.00	7.30	0.0	0.00	Above B F
69.3	69.3	5.95		5.95	94.1	9.35	0.00	0	1	70.18	0.88	0.0	0.00	Above B F
72.0	72.0	5.46		5.46	94.5	9.35	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
72.0				0.00	94.5	9.35	0.00	0	1	0.00	0.00	0.0	0.00	Above B F
72.0				0.00	94.5	9.35	0.00	0	1	0.00	0.00	0.0	0.00	Above B F



Note: Scale set for print and view
magnification at 65%

Plot Scale		
1inch =		feet horiz.
1inch =		feet vert.

English Units	
GEOMETRY	
Bank Full Elevation	92.43
Bank Full Width	17.68
Bank Full Depth	0.72
Maximum Depth	1.78
Bank Full Area	12.8
Hydraulic Radius	0.65
Wetted Perimeter	19.6
Width/Depth Ratio	24.4
Flood Prone Width	65.0
Entrenchment	3.67
Stream Type	B4
Rc	

English Units	
HYDRAULICS	
Slope (ft/ft)	0.0244
Manning's n	0.06181
Velocity (ft./s)	2.83
Froud #	0.62
Discharge (cu ft/s)	36.30
Shear Stress (lb/sq ft)	1.00
CX Power (ft lb/s)	55.4
Critical Size (mm)	86.3
Flow Type	Subcritical Flow
Rec. Interval	

APPENDIX G

SUBSURFACE SOIL INVESTIGATION

3118125

Sampling Point: SP-1

Eastern Mountains and Piedmont – Version 2.0

Sampling Point: SP-2

[illegible]²Location: PL=Pore Lining, M=Matrix.

Indicators for Problematic Hydric Soils³:

- | | | |
|--|--|---|
| <ul style="list-style-type: none"> ___ Histosol (A1) ___ Histic Epipedon (A2) ___ Black Histic (A3) ___ Hydrogen Sulfide (A4) ___ Stratified Layers (A5) ___ 2 cm Muck (A10) (LRR N) ___ Depleted Below Dark Surface (A11) ___ Thick Dark Surface (A12) ___ Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) ___ Sandy Gleyed Matrix (S4) ___ Sandy Redox (S5) ___ Stripped Matrix (S6) | <ul style="list-style-type: none"> ___ Dark Surface (S7) ___ Polyvalue Below Surface (S8) (MLRA 147, 148) ___ Thin Dark Surface (S9) (MLRA 147, 148) ___ Loamy Gleyed Matrix (F2) ___ Depleted Matrix (F3) ___ Redox Dark Surface (F6) ___ Depleted Dark Surface (F7) ___ Redox Depressions (F8) ___ Iron-Manganese Masses (F12) (LRR N, MLRA 136) ___ Umbric Surface (F13) (MLRA 136, 122) ___ Piedmont Floodplain Soils (F19) (MLRA 148) ___ Red Parent Material (F21) (MLRA 127, 147) | <ul style="list-style-type: none"> ___ 2 cm Muck (A10) (MLRA 147) ___ Coast Prairie Redox (A16) (MLRA 147, 148) ___ Piedmont Floodplain Soils (F19) (MLRA 136, 147) ___ Very Shallow Dark Surface (TF12) ___ Other (Explain in Remarks) |
|--|--|---|
- ³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Hydric Soil Present? Yes No ☒

Photo 9750.

KSH IKA

SOIL

Sampling Point: SP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

[illegible]¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10) **(LRR N)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)

- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**MLRA 147, 148**)
- ___ Thin Dark Surface (S9) (**MLRA 147, 148**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) (**LRR N, MLRA 136**)
- ___ Umbria Surface (F13) (**MLRA 136, 122**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 148**)
- ___ Red Parent Material (F21) (**MLRA 127, 147**)

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) **(MLRA 147)**
☐ Coast Prairie Redox (A16)
(MLRA 147, 148)
☐ Piedmont Floodplain Soils (F19)
(MLRA 136, 147)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

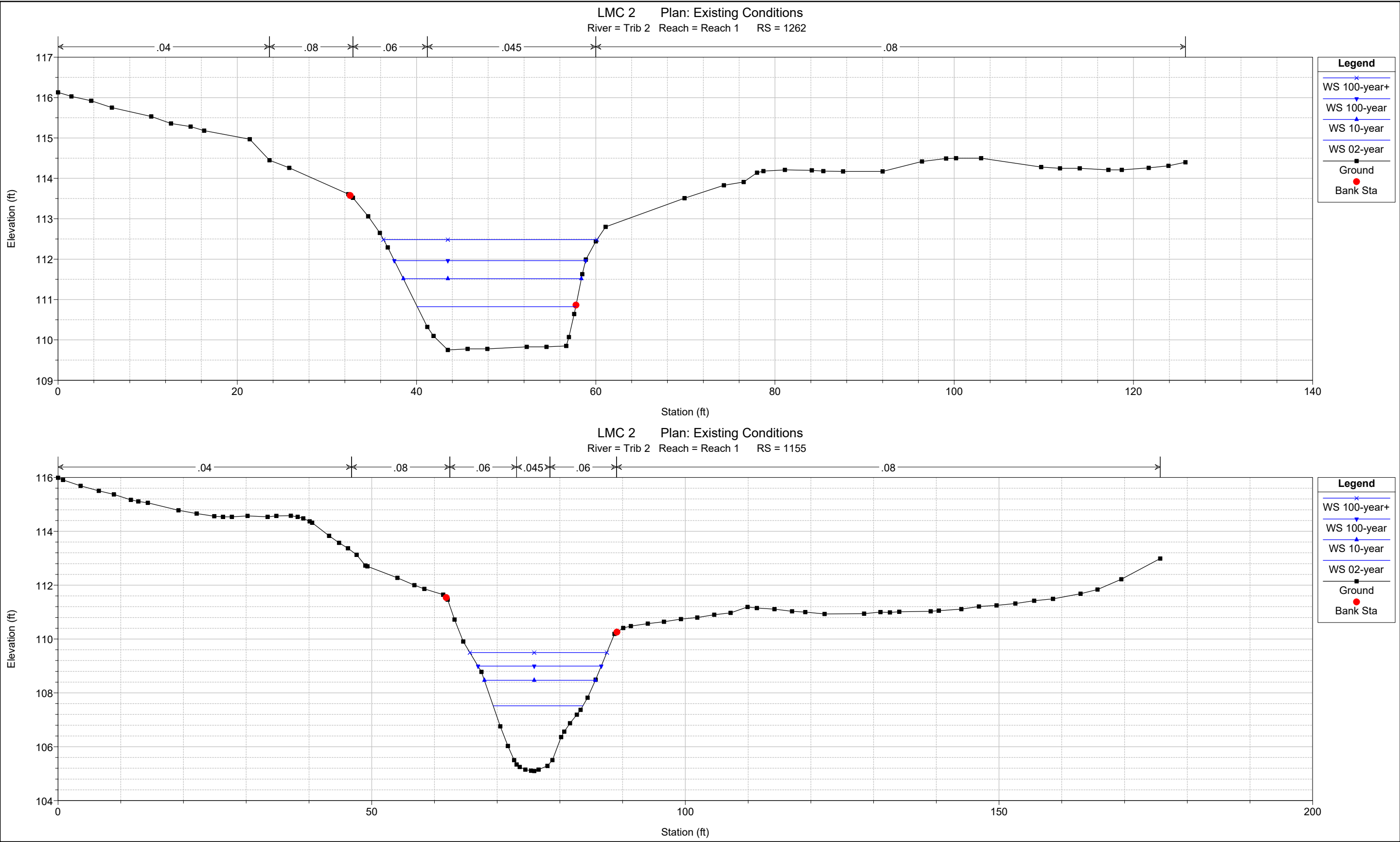
Hydric Soil Present? Yes No ☒

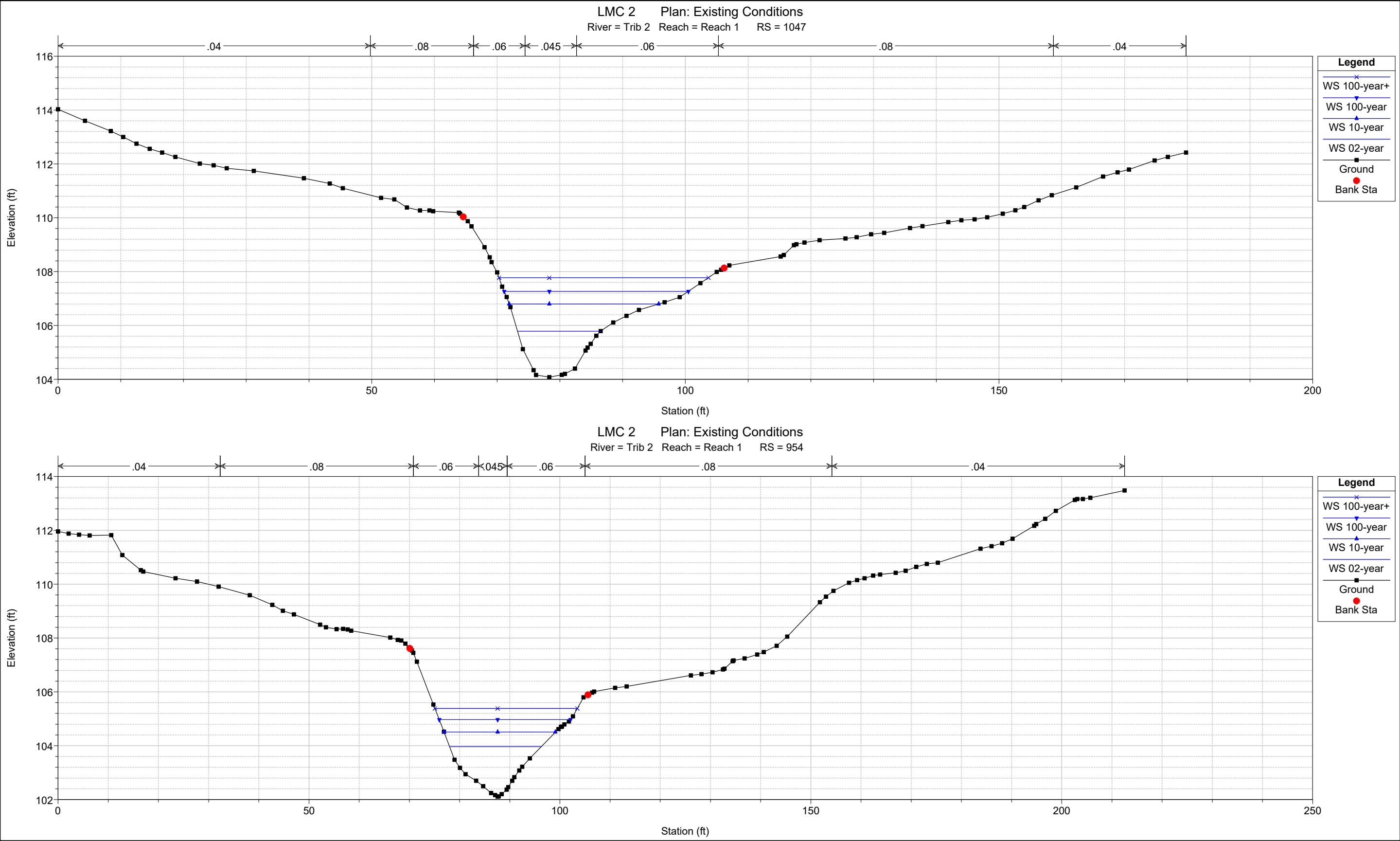
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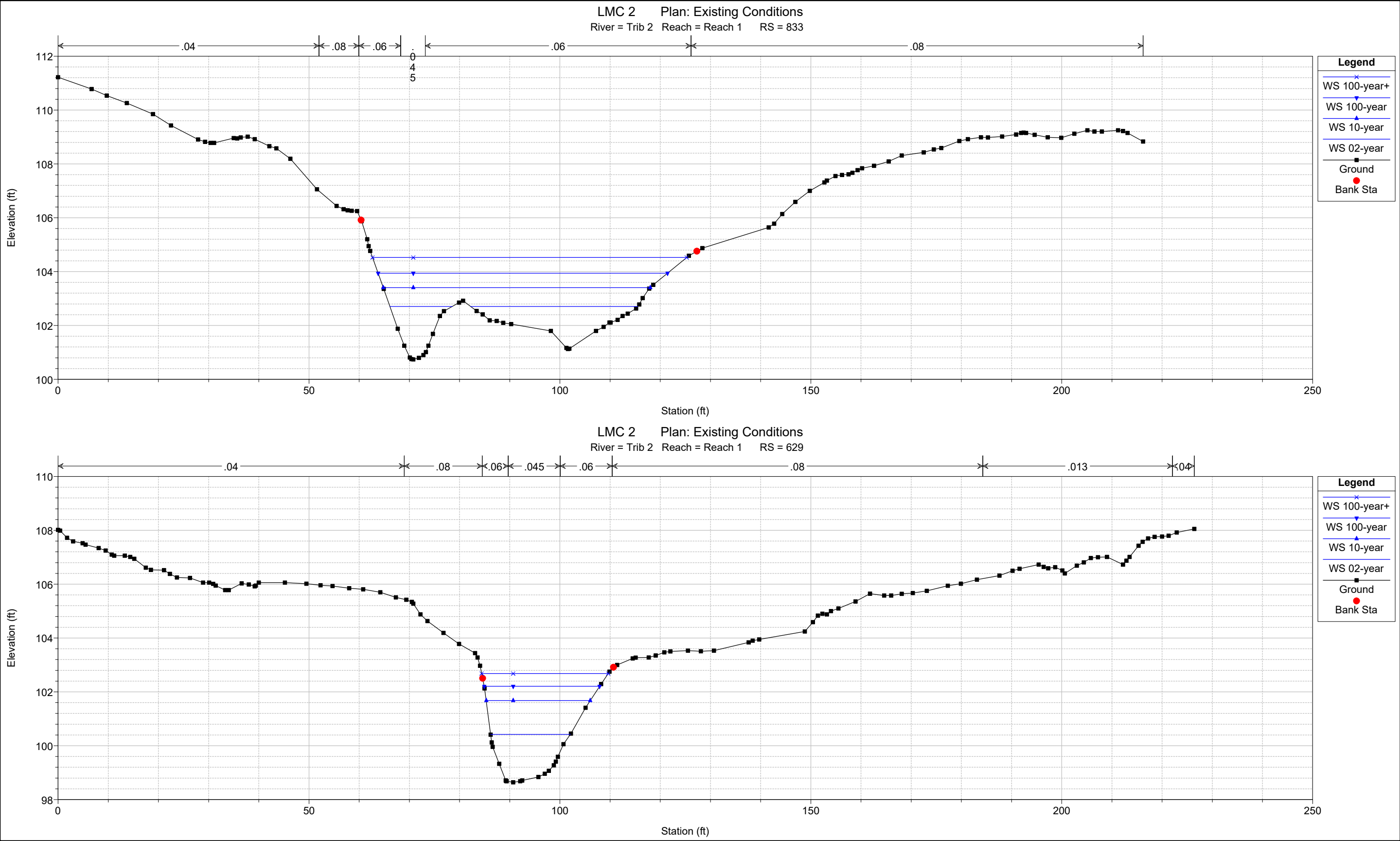
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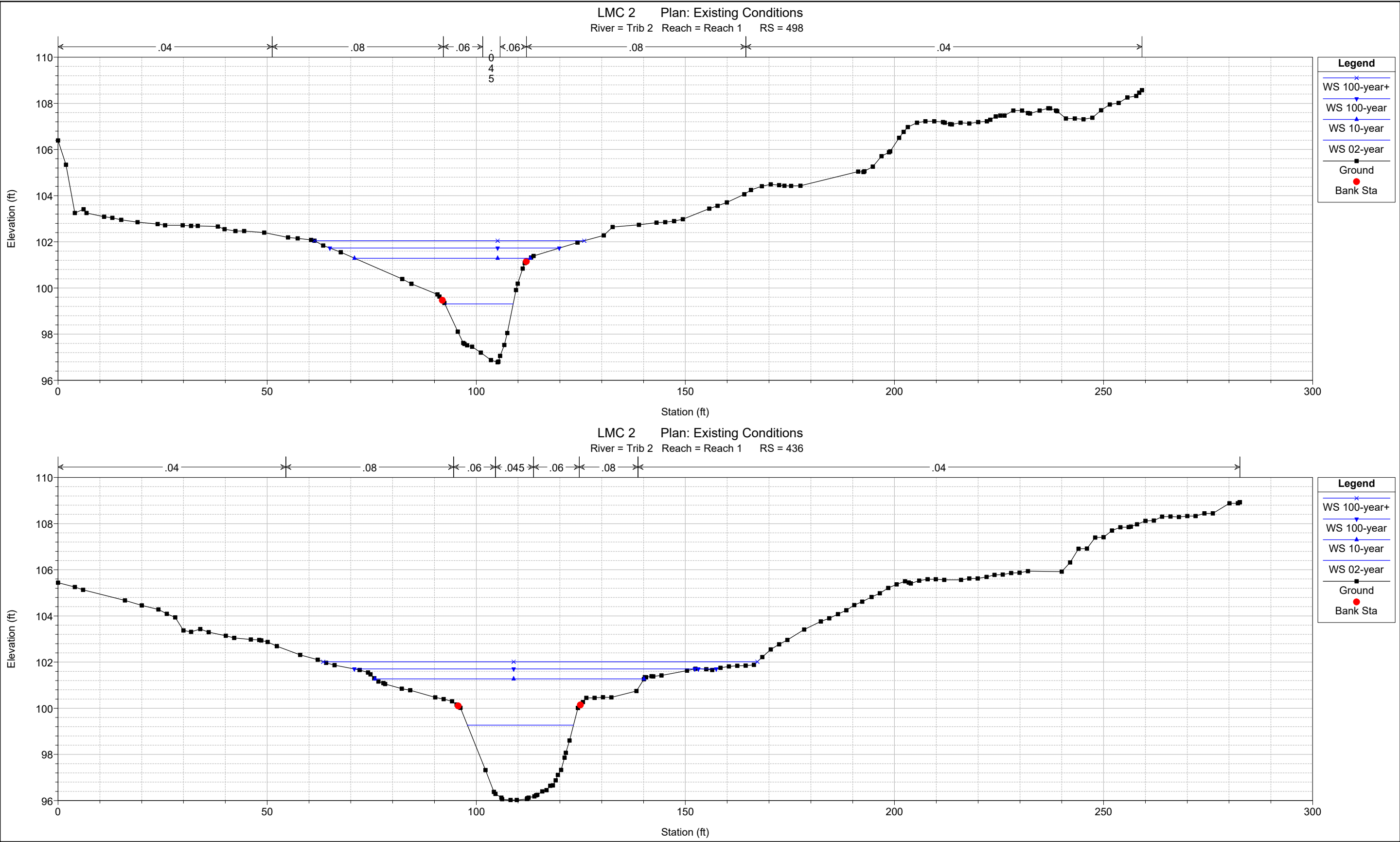
APPENDIX H

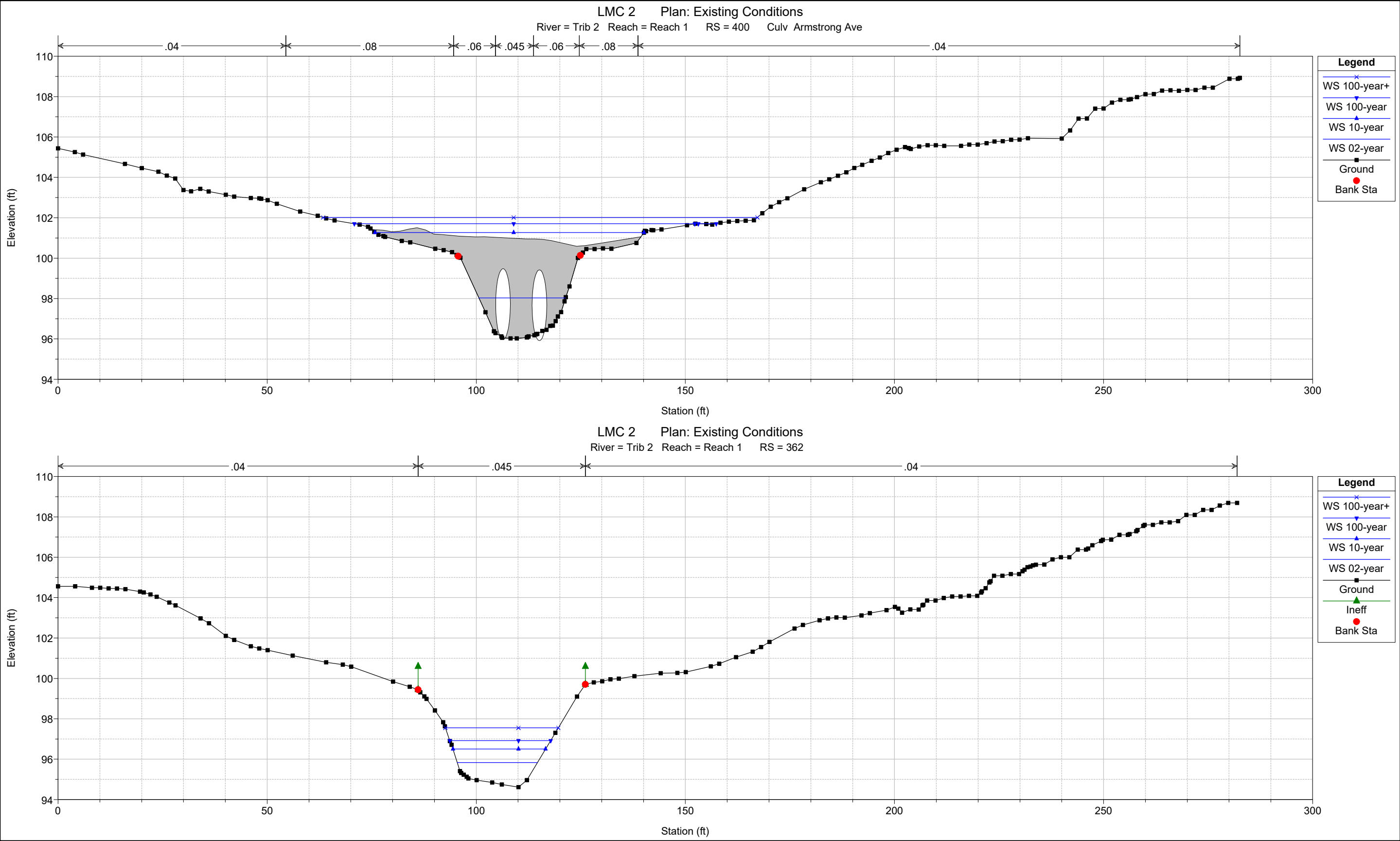
HEC-RAS HYDRAULIC ANALYSIS

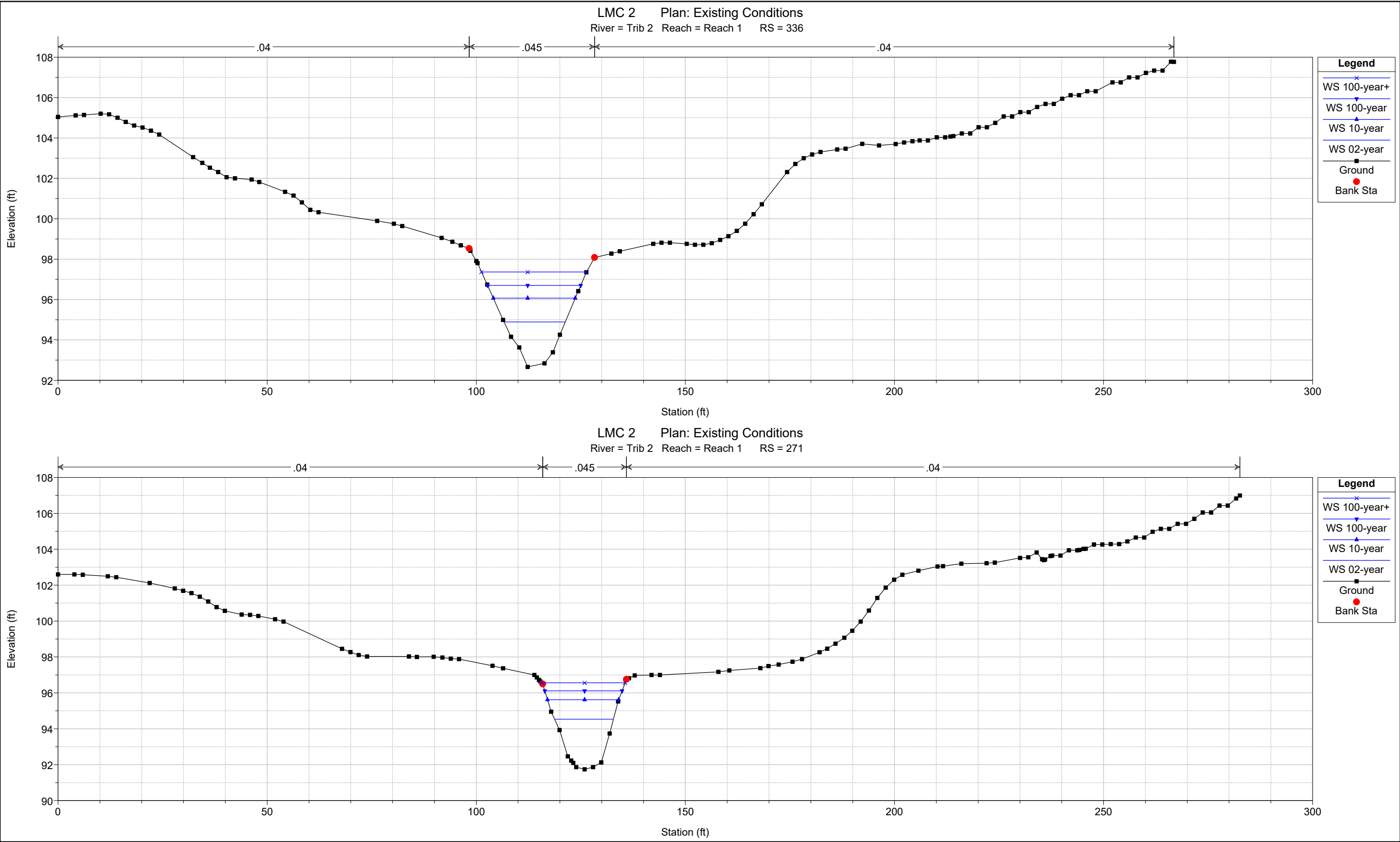


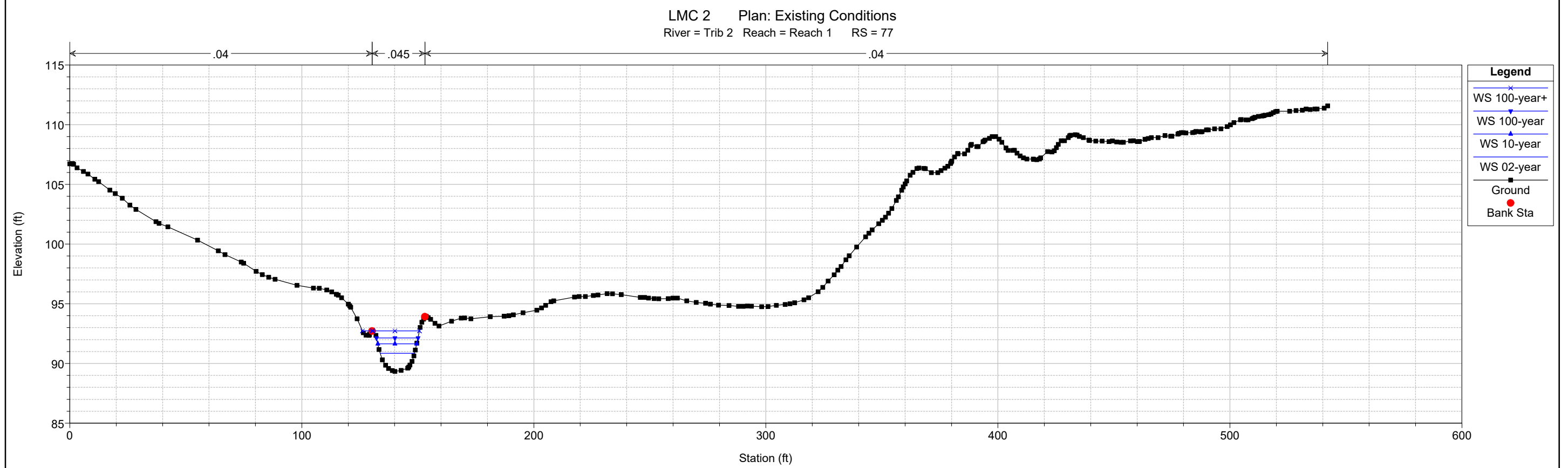
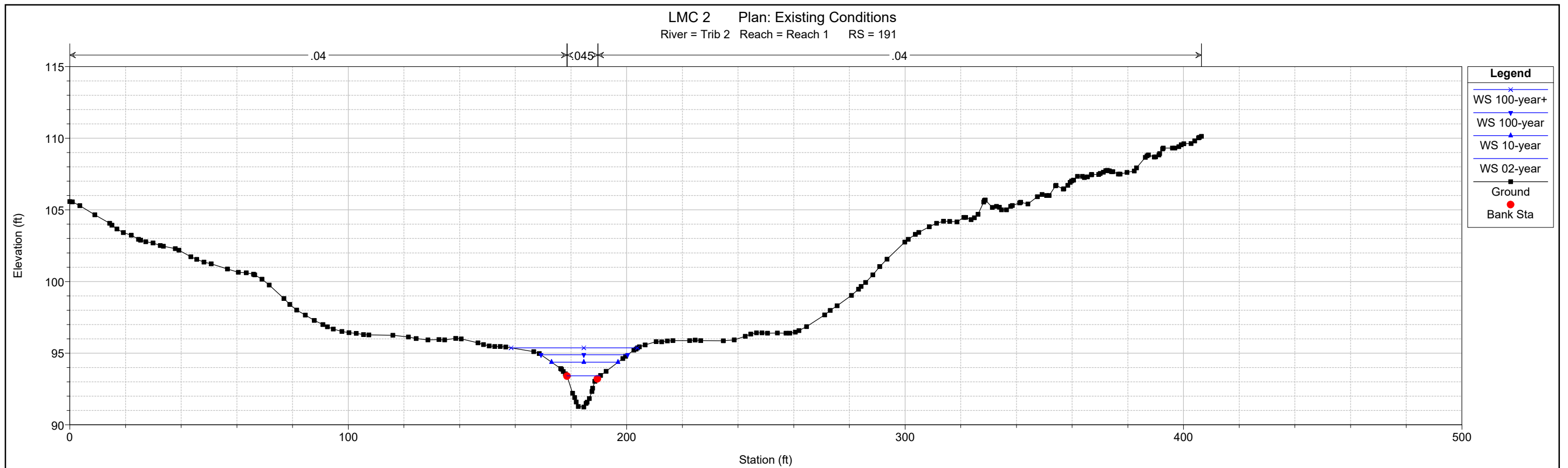


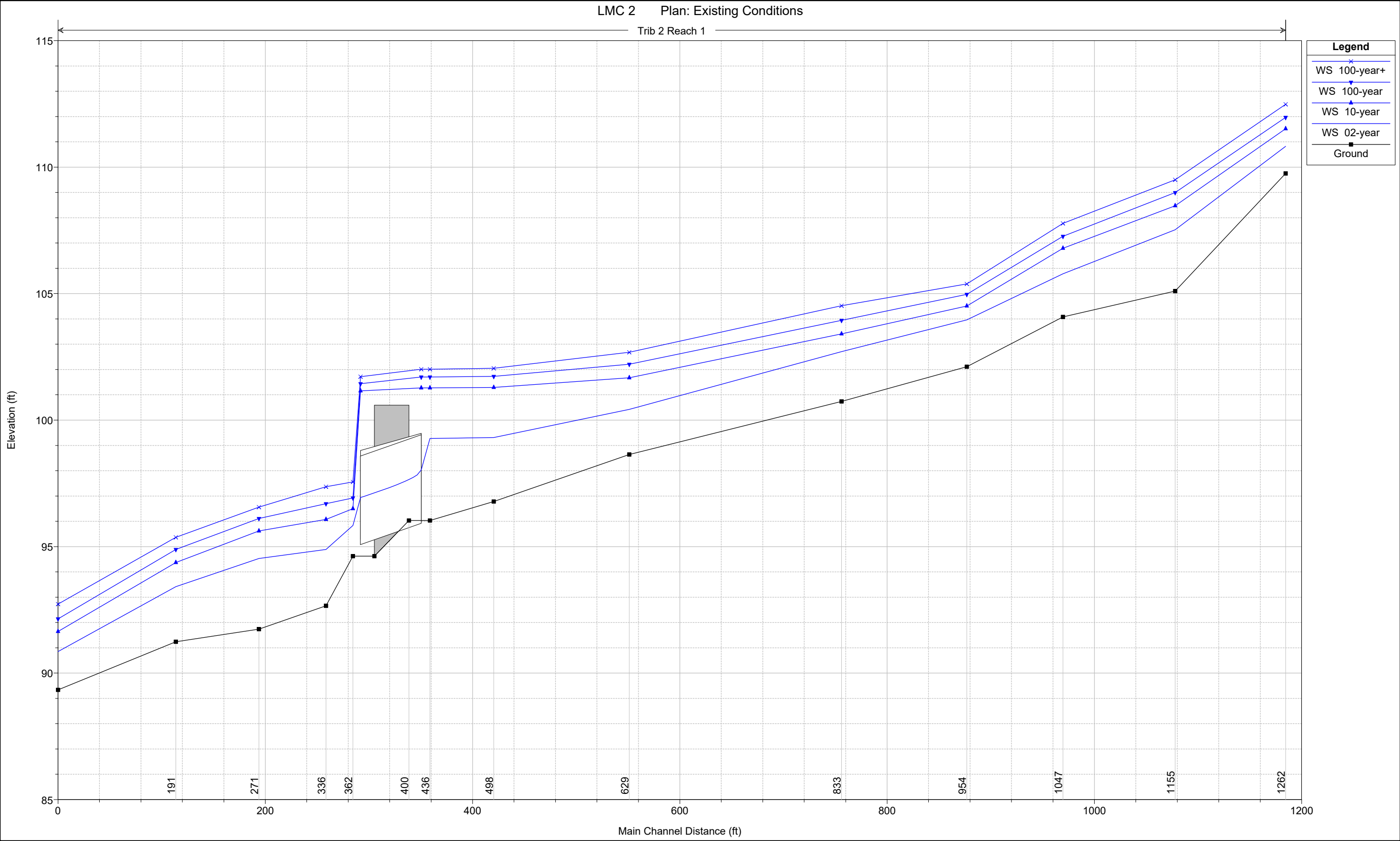






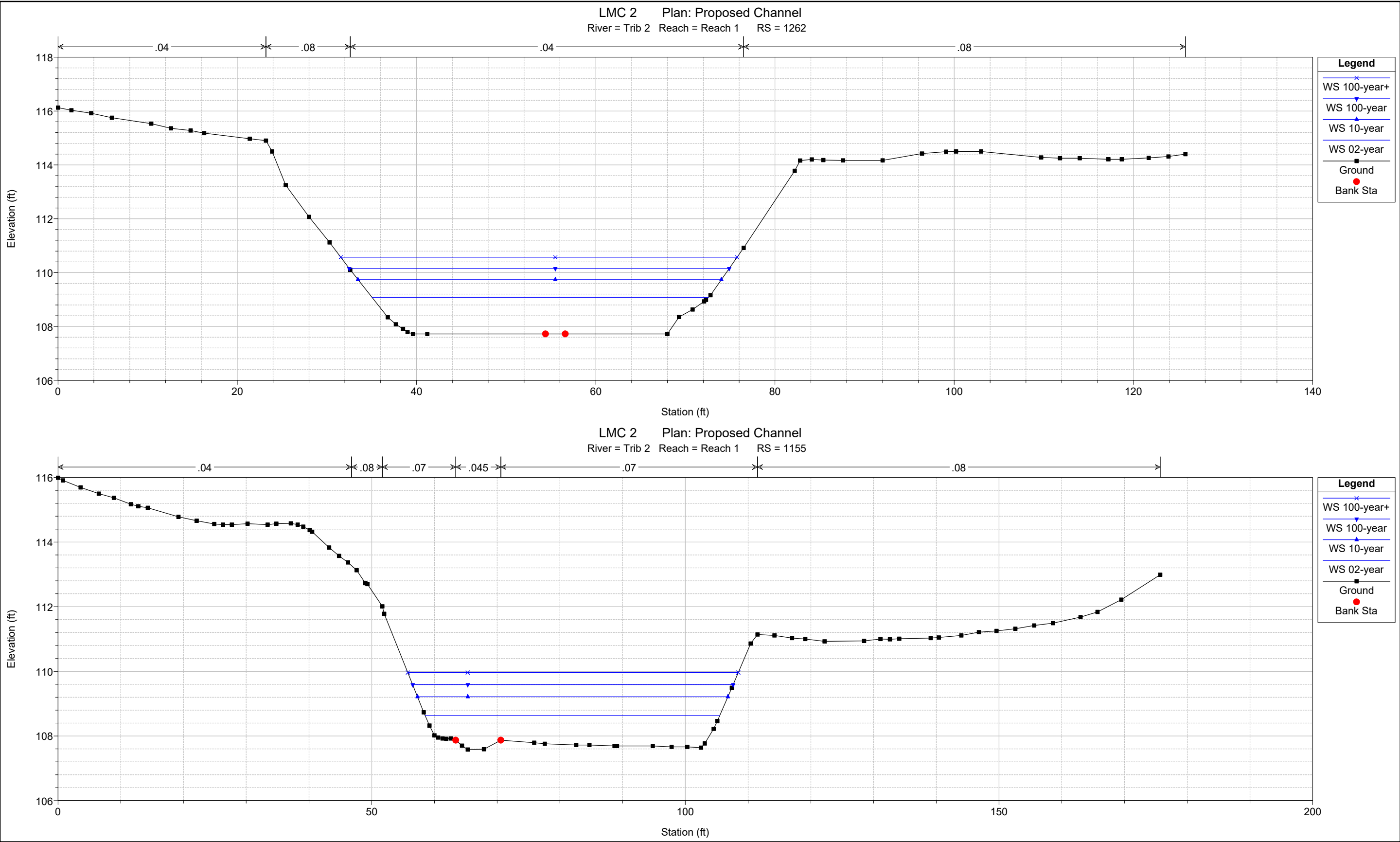


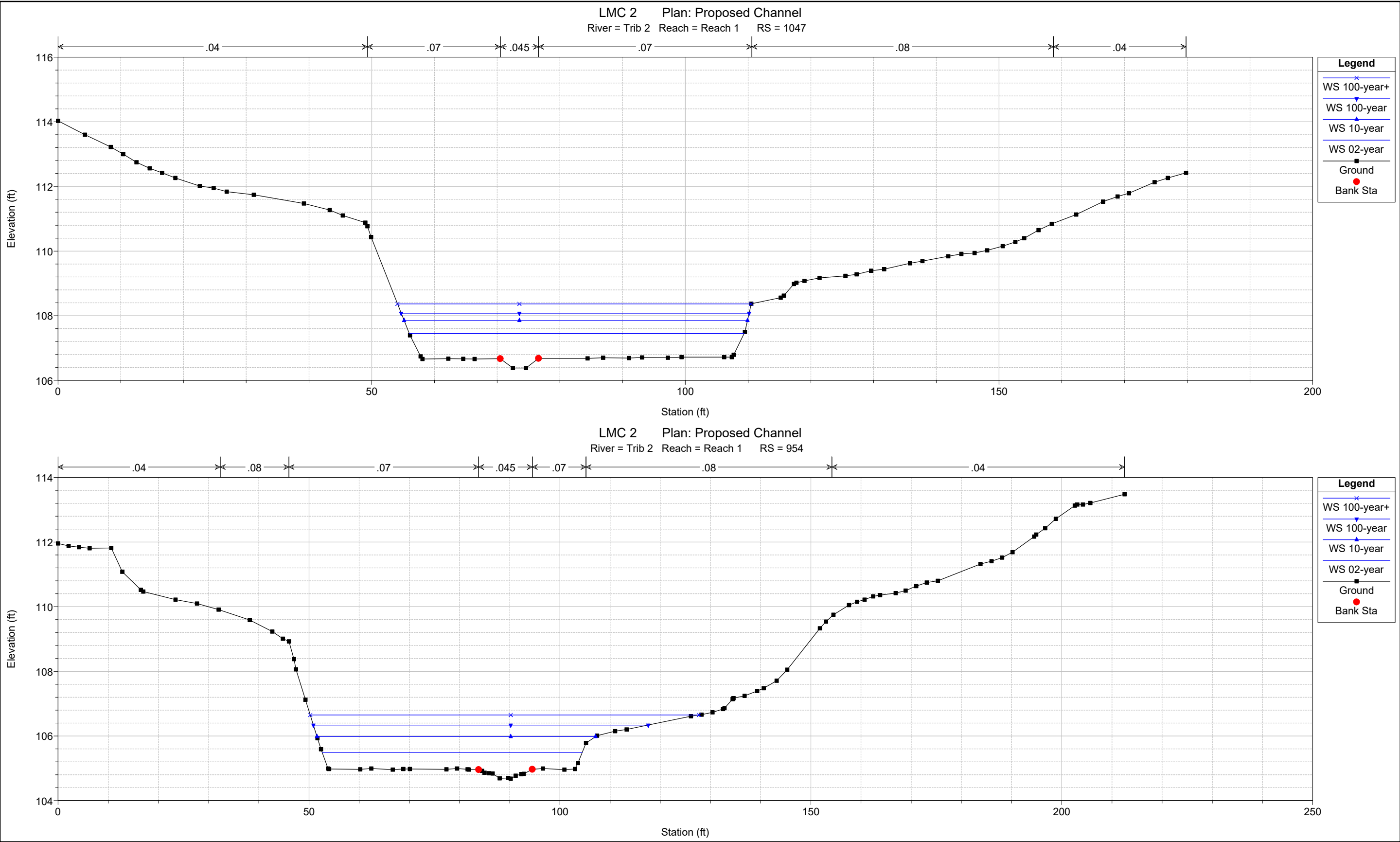


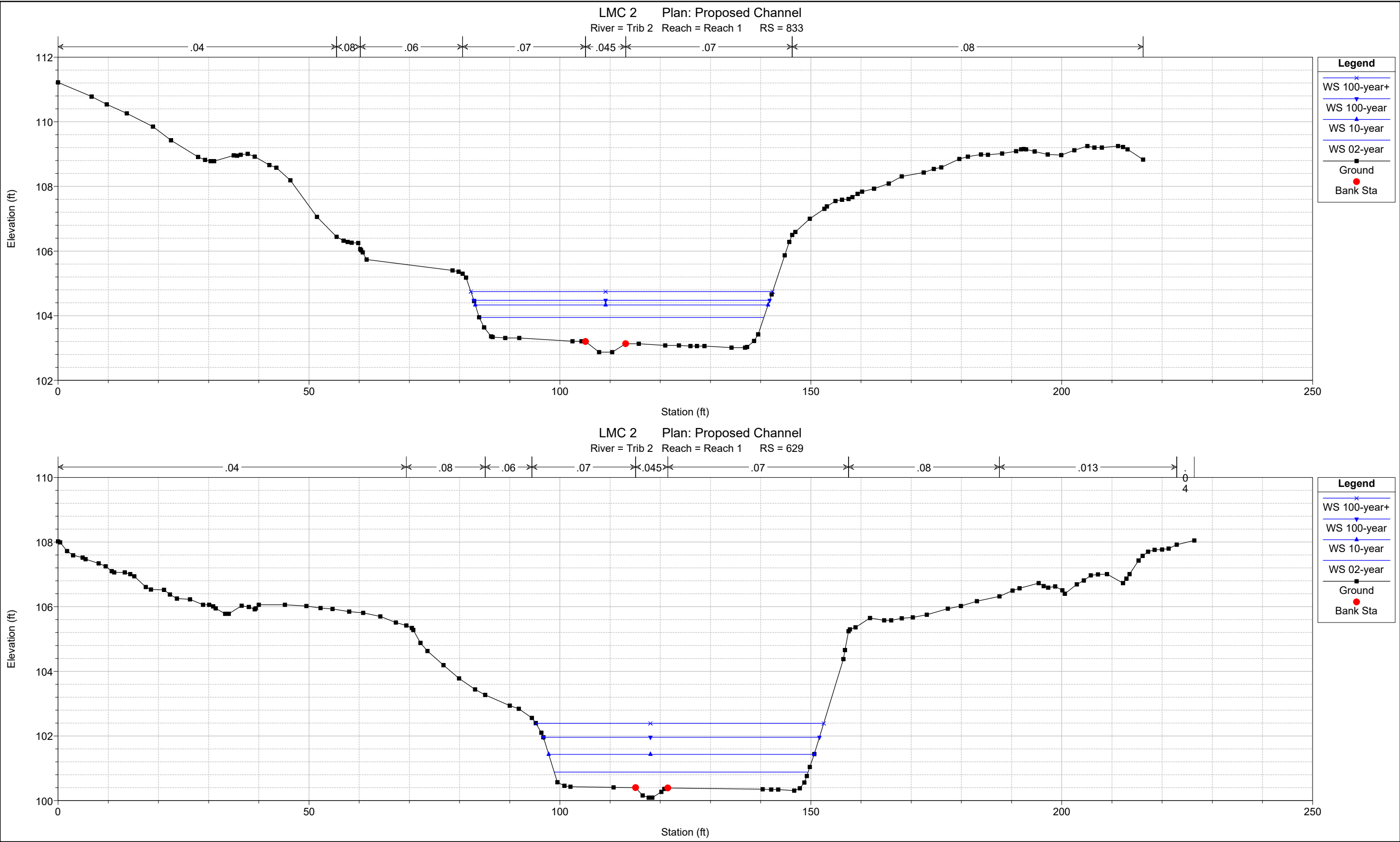


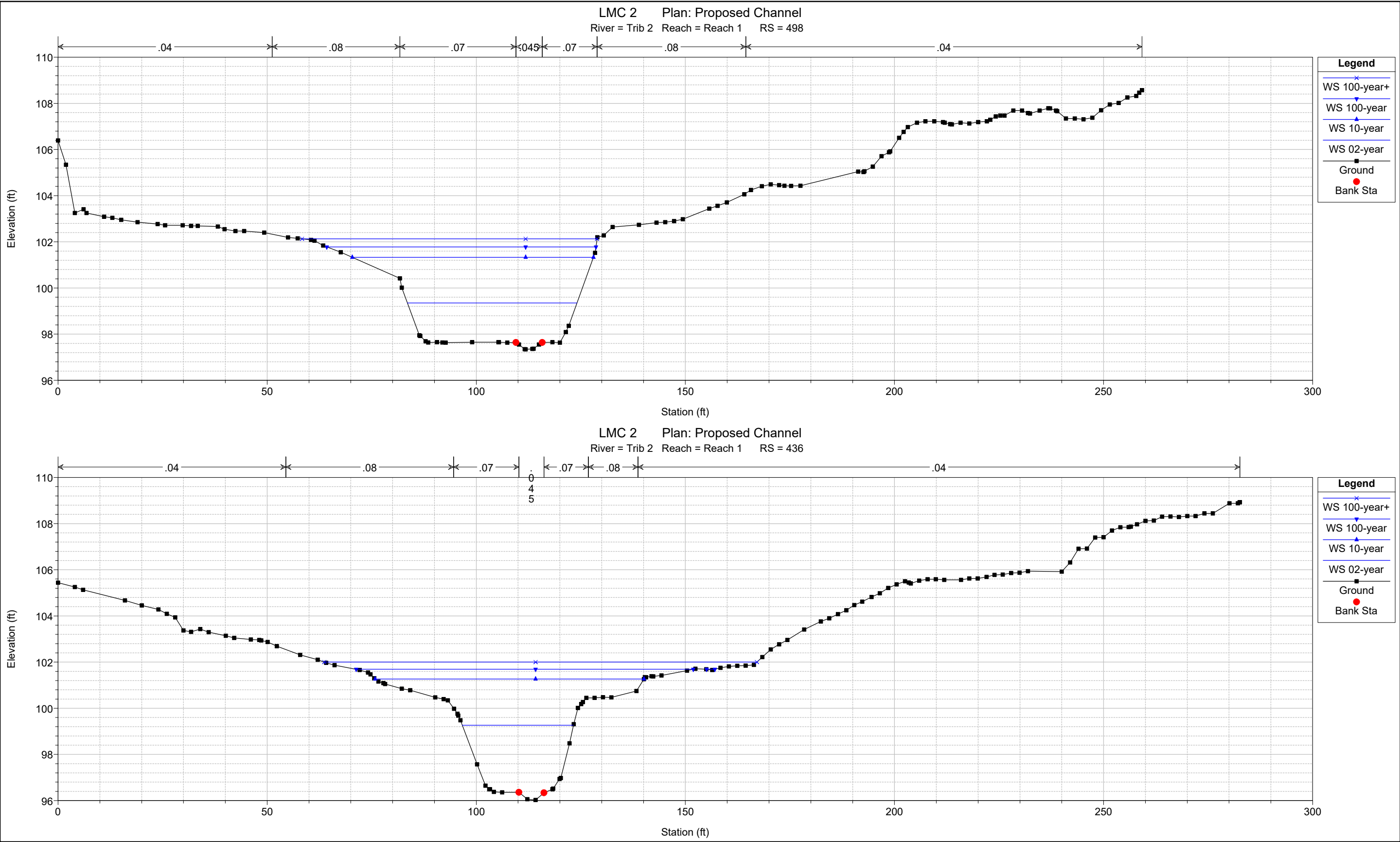
HEC-RAS Plan: Existing River: Trib 2 Reach: Reach 1

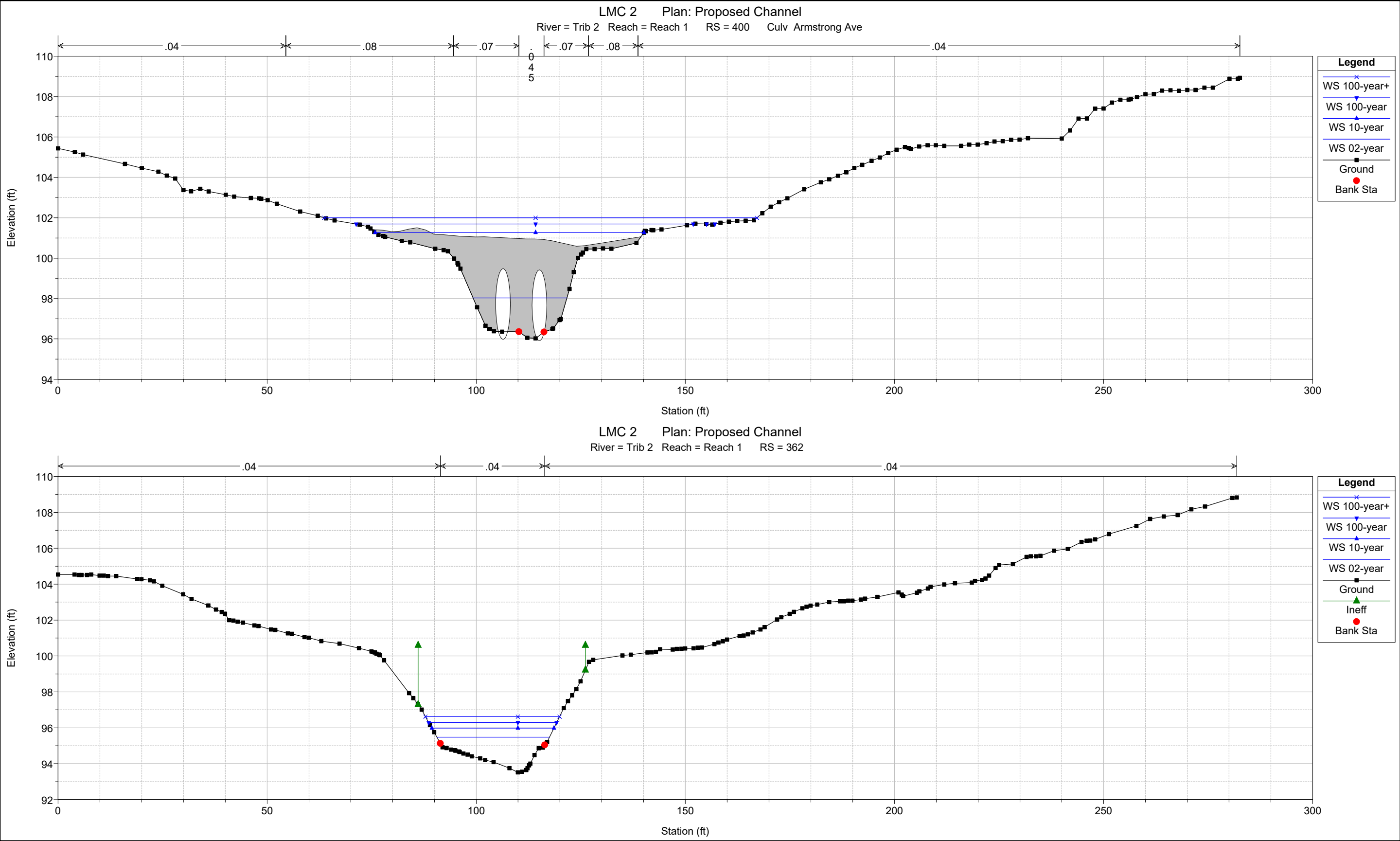
Reach	River Sta	Profile	Q Total	Min Ch EI	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1262	02-year	88.00	109.75	110.82	110.82	111.28	0.030625	5.45	16.15	17.69	1.01
Reach 1	1262	10-year	202.00	109.75	111.52	111.52	112.27	0.025421	6.96	29.16	19.87	1.00
Reach 1	1262	100-year	295.00	109.75	111.96	111.96	112.90	0.023584	7.76	38.41	21.35	1.00
Reach 1	1262	100-year+	412.00	109.75	112.48	112.48	113.56	0.021148	8.37	50.12	23.82	0.98
Reach 1	1155	02-year	88.00	105.10	107.52		107.78	0.008822	4.04	21.76	14.31	0.58
Reach 1	1155	10-year	202.00	105.10	108.47		108.93	0.011683	5.46	36.97	17.70	0.67
Reach 1	1155	100-year	295.00	105.10	109.00		109.61	0.013574	6.31	46.74	19.64	0.72
Reach 1	1155	100-year+	412.00	105.10	109.50		110.31	0.015881	7.21	57.17	21.82	0.79
Reach 1	1047	02-year	88.00	104.08	105.79	105.73	106.30	0.022960	5.76	15.28	13.23	0.95
Reach 1	1047	10-year	202.00	104.08	106.80	106.66	107.37	0.017965	6.09	33.18	23.84	0.91
Reach 1	1047	100-year	295.00	104.08	107.27	107.15	107.91	0.018332	6.42	45.92	29.36	0.91
Reach 1	1047	100-year+	412.00	104.08	107.78	107.57	108.46	0.017488	6.66	61.89	33.38	0.86
Reach 1	954	02-year	88.00	102.11	103.96		104.29	0.019400	4.59	19.17	18.25	0.79
Reach 1	954	10-year	202.00	102.11	104.51	104.51	105.20	0.031353	6.70	30.14	22.18	1.01
Reach 1	954	100-year	295.00	102.11	104.97	104.97	105.76	0.029936	7.14	41.33	26.13	1.00
Reach 1	954	100-year+	412.00	102.11	105.39	105.39	106.34	0.030642	7.82	52.68	28.38	1.01
Reach 1	833	02-year	88.00	100.74	102.71		102.79	0.007943	2.31	38.15	45.73	0.45
Reach 1	833	10-year	202.00	100.74	103.41		103.52	0.006642	2.75	73.52	53.19	0.41
Reach 1	833	100-year	295.00	100.74	103.94		104.07	0.005282	2.86	103.32	57.67	0.38
Reach 1	833	100-year+	412.00	100.74	104.52		104.66	0.004455	2.98	138.24	62.60	0.35
Reach 1	629	02-year	88.00	98.64	100.42		100.72	0.012911	4.38	20.08	15.90	0.69
Reach 1	629	10-year	202.00	98.64	101.68		102.02	0.007910	4.70	42.99	20.72	0.58
Reach 1	629	100-year	295.00	98.64	102.21		102.66	0.008852	5.40	54.58	22.99	0.62
Reach 1	629	100-year+	412.00	98.64	102.68		103.29	0.010383	6.24	66.04	25.24	0.68
Reach 1	498	02-year	88.00	96.78	99.31		99.48	0.006927	3.32	26.49	16.32	0.46
Reach 1	498	10-year	202.00	96.78	101.29		101.42	0.002525	2.99	80.48	42.01	0.30
Reach 1	498	100-year	295.00	96.78	101.73		101.92	0.003323	3.68	101.52	54.82	0.34
Reach 1	498	100-year+	412.00	96.78	102.05		102.33	0.004616	4.55	120.59	64.47	0.41
Reach 1	436	02-year	88.00	96.03	99.27	97.25	99.31	0.000758	1.47	59.86	25.40	0.17
Reach 1	436	10-year	202.00	96.03	101.27	97.95	101.31	0.000539	1.67	138.50	64.32	0.15
Reach 1	436	100-year	295.00	96.03	101.70	98.39	101.77	0.000774	2.12	169.67	85.72	0.18
Reach 1	436	100-year+	412.00	96.03	102.01	98.87	102.11	0.001134	2.67	199.59	103.77	0.22
Reach 1	400		Culvert									
Reach 1	362	02-year	88.00	94.62	95.83	95.83	96.27	0.031908	5.30	16.61	19.18	1.00
Reach 1	362	10-year	202.00	94.62	96.50	96.50	97.19	0.027469	6.64	30.44	22.15	1.00
Reach 1	362	100-year	295.00	94.62	96.92	96.92	97.76	0.026176	7.34	40.20	24.13	1.00
Reach 1	362	100-year+	412.00	94.62	97.56	97.38	98.39	0.019429	7.31	56.33	27.00	0.89
Reach 1	336	02-year	88.00	92.66	94.89		95.18	0.011835	4.31	20.42	14.66	0.64
Reach 1	336	10-year	202.00	92.66	96.07		96.45	0.009388	4.96	40.69	19.64	0.61
Reach 1	336	100-year	295.00	92.66	96.70		97.17	0.009372	5.48	53.82	22.28	0.62
Reach 1	336	100-year+	412.00	92.66	97.37		97.91	0.009115	5.92	69.65	25.10	0.63
Reach 1	271	02-year	88.00	91.74	94.53		94.69	0.004552	3.22	27.30	14.07	0.41
Reach 1	271	10-year	202.00	91.74	95.62		95.94	0.006335	4.56	44.29	17.03	0.50
Reach 1	271	100-year	295.00	91.74	96.11		96.59	0.008314	5.56	53.04	18.47	0.58
Reach 1	271	100-year+	412.00	91.74	96.56		97.26	0.010767	6.69	61.63	19.97	0.67
Reach 1	191	02-year	88.00	91.24	93.42	93.30	93.95	0.023275	5.88	15.05	11.99	0.88
Reach 1	191	10-year	202.00	91.24	94.37	94.37	95.11	0.017285	7.20	31.75	23.86	0.83
Reach 1	191	100-year	295.00	91.24	94.89	94.89	95.68	0.015212	7.72	45.93	31.11	0.81
Reach 1	191	100-year+	412.00	91.24	95.37	95.37	96.24	0.014491	8.36	63.78	45.38	0.81
Reach 1	77	02-year	88.00	89.34	90.85	90.75	91.29	0.023124	5.30	16.61	14.75	0.88
Reach 1	77	10-year	202.00	89.34	91.64	91.54	92.39	0.023134	6.94	29.09	16.78	0.93
Reach 1	77	100-year	295.00	89.34	92.14	92.05	93.09	0.023104	7.82	37.72	17.91	0.95
Reach 1	77	100-year+	412.00	89.34	92.73	92.73	93.82	0.022379	8.40	49.81	24.30	0.95











LMC 2 Plan: Proposed Channel

River = Trib 2 Reach = Reach 1 RS = 362

Elevation (ft)

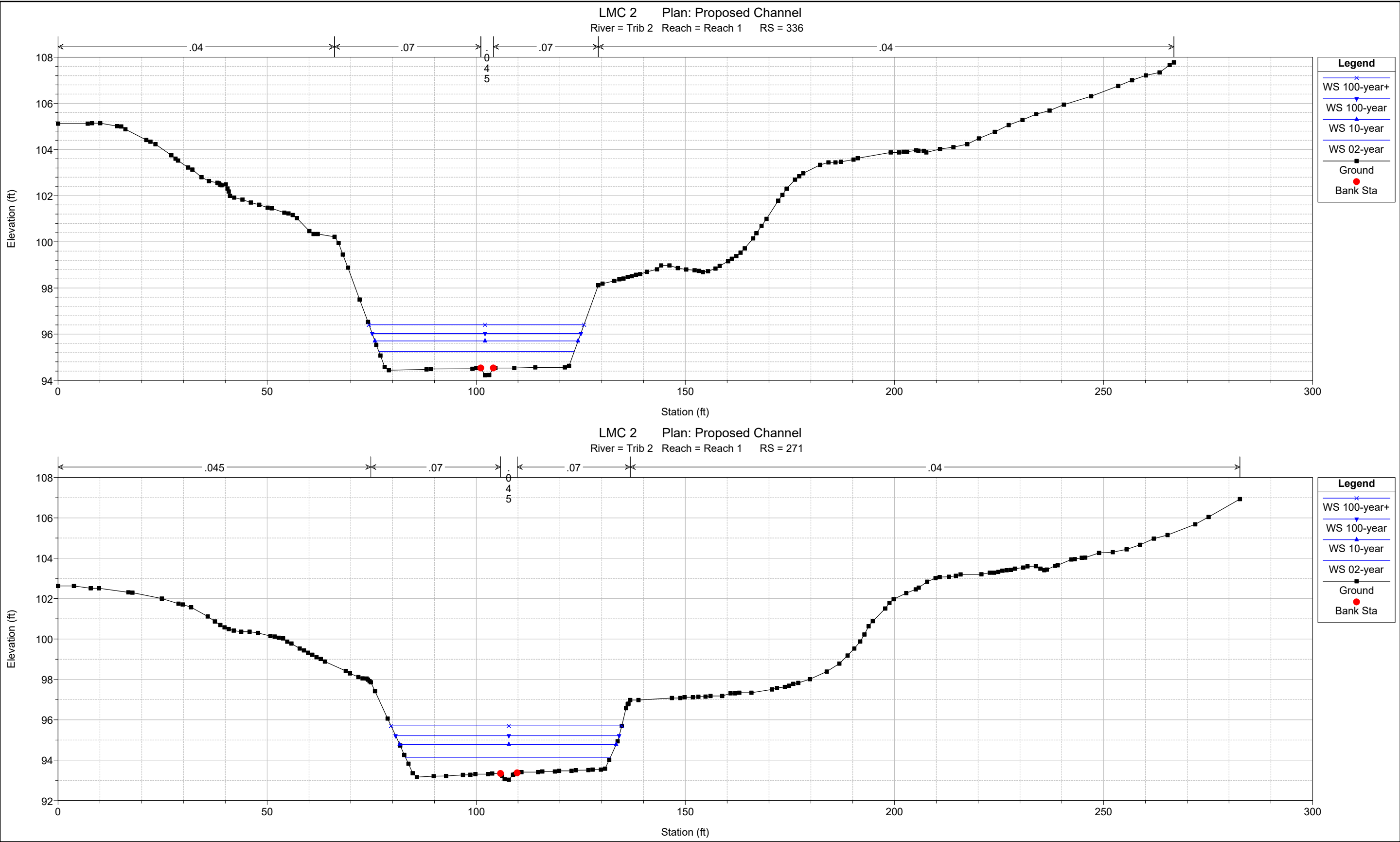
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92

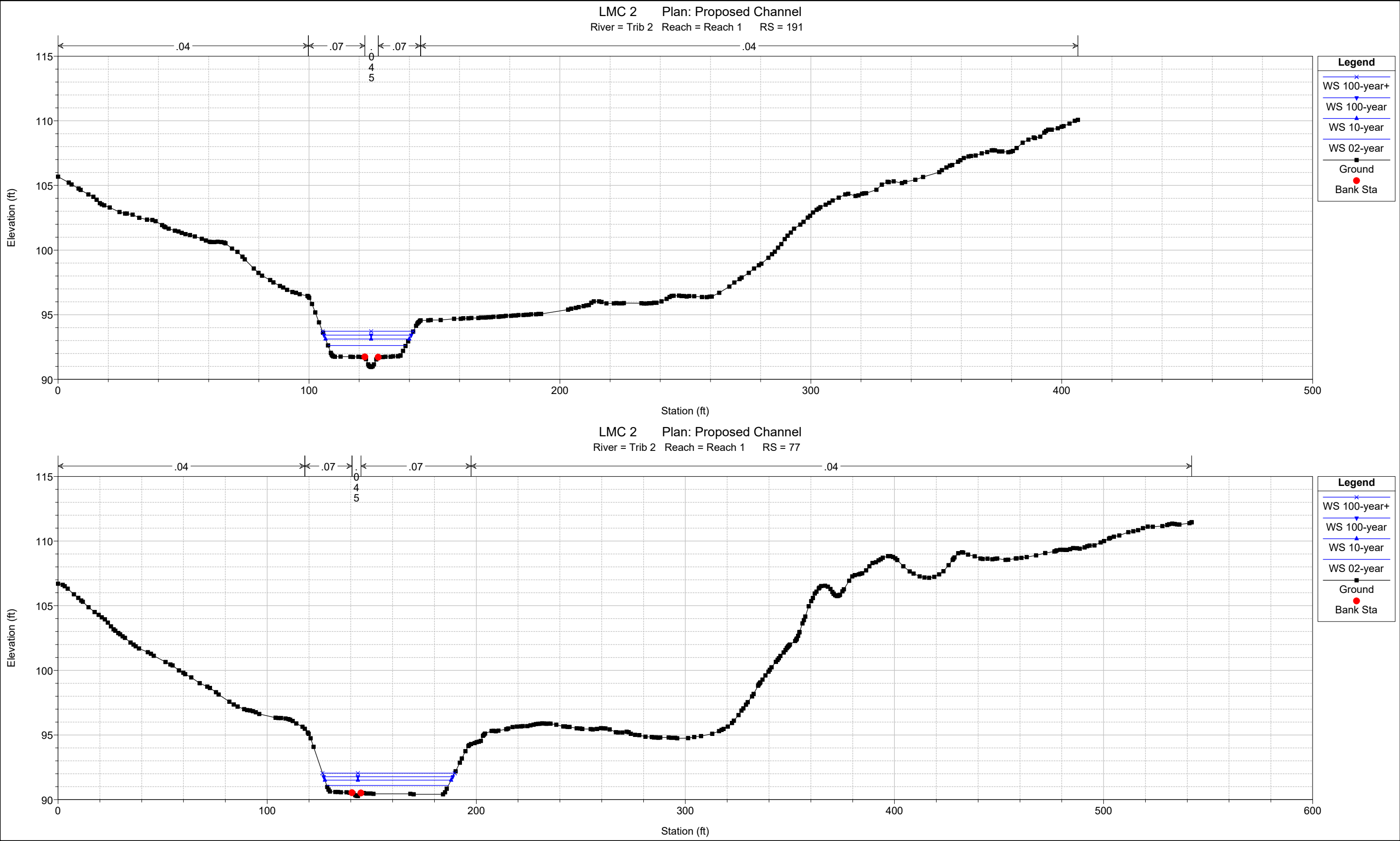
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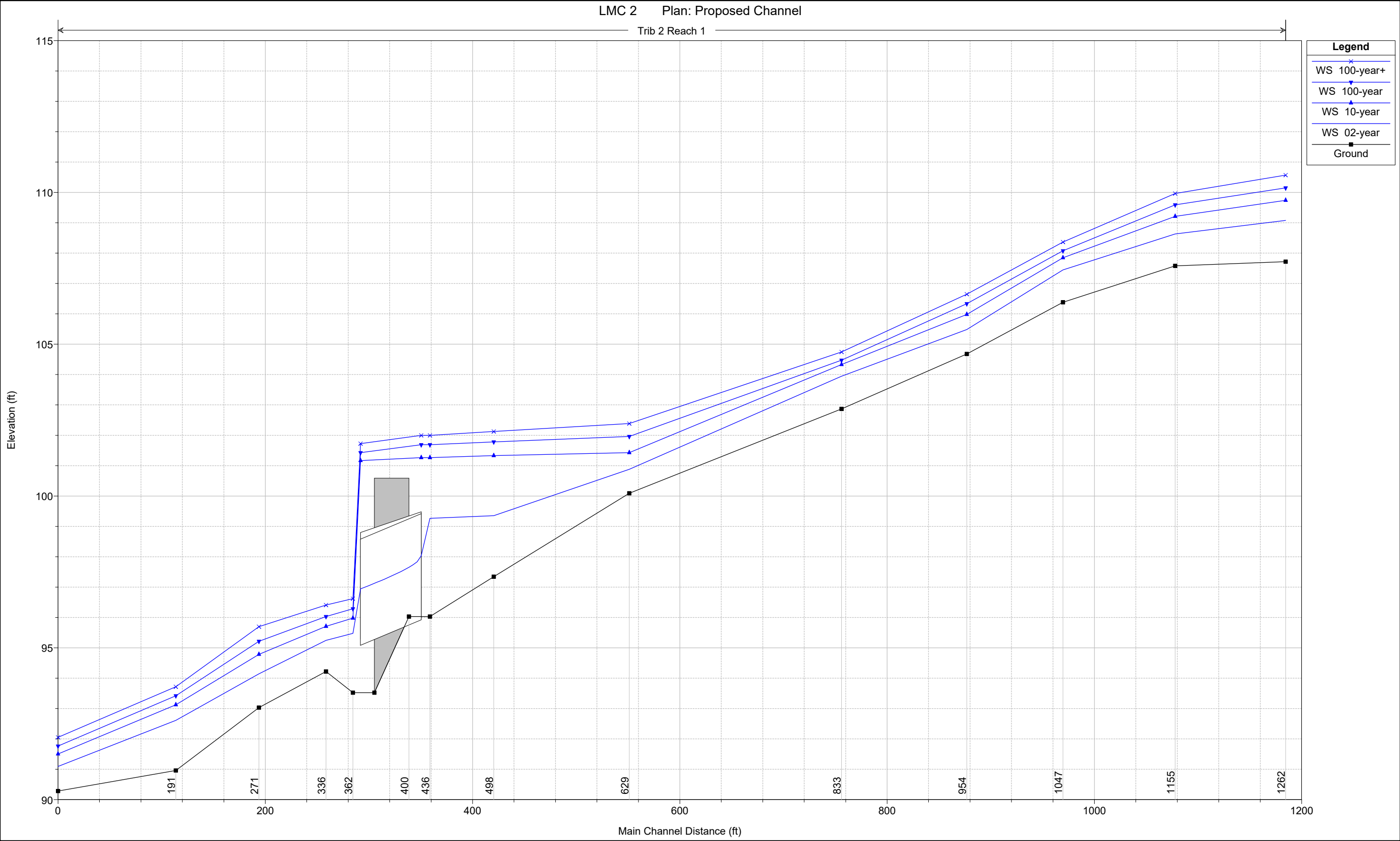
Station (ft)

Legend

WS 100-year+
WS 100-year
WS 10-year
WS 02-year
Ground
Ineff
Bank Sta







HEC-RAS Plan: Pr Channel River: Trib 2 Reach: Reach 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch EI (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	1262	02-year	88.00	107.72	109.08		109.14	0.002212	2.14	44.94	37.52	0.32
Reach 1	1262	10-year	202.00	107.72	109.74		109.87	0.002861	3.18	70.83	40.56	0.39
Reach 1	1262	100-year	295.00	107.72	110.15		110.33	0.003158	3.77	87.87	42.40	0.43
Reach 1	1262	100-year+	412.00	107.72	110.57		110.81	0.003418	4.37	105.98	44.22	0.46
Reach 1	1155	02-year	88.00	107.58	108.63		108.72	0.010620	3.29	40.31	46.96	0.59
Reach 1	1155	10-year	202.00	107.58	109.21		109.37	0.010424	4.48	68.46	49.48	0.64
Reach 1	1155	100-year	295.00	107.58	109.59		109.80	0.010349	5.16	87.37	51.09	0.66
Reach 1	1155	100-year+	412.00	107.58	109.96		110.24	0.010802	5.94	106.84	52.69	0.69
Reach 1	1047	02-year	88.00	106.38	107.45	107.18	107.54	0.012741	3.64	40.33	53.39	0.65
Reach 1	1047	10-year	202.00	106.38	107.85		108.05	0.017090	5.30	61.97	54.74	0.80
Reach 1	1047	100-year	295.00	106.38	108.08		108.37	0.020262	6.40	74.52	55.47	0.89
Reach 1	1047	100-year+	412.00	106.38	108.37		108.75	0.021113	7.30	90.81	56.40	0.94
Reach 1	954	02-year	88.00	104.68	105.48	105.46	105.70	0.037459	4.94	27.60	51.79	1.06
Reach 1	954	10-year	202.00	104.68	105.98		106.26	0.023837	5.67	53.93	55.51	0.92
Reach 1	954	100-year	295.00	104.68	106.34		106.64	0.018684	5.99	75.63	66.72	0.85
Reach 1	954	100-year+	412.00	104.68	106.65		107.01	0.018003	6.65	98.02	77.48	0.86
Reach 1	833	02-year	88.00	102.87	103.95		104.02	0.009567	3.17	44.42	56.73	0.57
Reach 1	833	10-year	202.00	102.87	104.33		104.51	0.014064	4.79	66.57	58.34	0.72
Reach 1	833	100-year	295.00	102.87	104.47		104.77	0.020590	6.20	75.00	58.95	0.89
Reach 1	833	100-year+	412.00	102.87	104.74	104.44	105.13	0.021808	7.13	91.08	60.12	0.94
Reach 1	629	02-year	88.00	100.09	100.88	100.88	101.12	0.052100	5.72	25.60	50.58	1.24
Reach 1	629	10-year	202.00	100.09	101.43	101.23	101.69	0.025466	5.97	54.07	52.91	0.96
Reach 1	629	100-year	295.00	100.09	101.96		102.20	0.014198	5.68	82.60	55.02	0.76
Reach 1	629	100-year+	412.00	100.09	102.39		102.66	0.012573	6.18	106.62	57.32	0.74
Reach 1	498	02-year	88.00	97.34	99.35		99.39	0.001834	2.16	64.12	40.53	0.28
Reach 1	498	10-year	202.00	97.34	101.33		101.36	0.000677	2.11	156.22	57.68	0.19
Reach 1	498	100-year	295.00	97.34	101.78		101.83	0.000940	2.68	183.61	64.34	0.23
Reach 1	498	100-year+	412.00	97.34	102.13		102.21	0.001351	3.38	206.77	70.56	0.28
Reach 1	436	02-year	88.00	96.03	99.26	97.37	99.31	0.000968	2.18	63.25	26.59	0.22
Reach 1	436	10-year	202.00	96.03	101.27	98.07	101.32	0.000686	2.56	143.15	64.27	0.20
Reach 1	436	100-year	295.00	96.03	101.69	98.54	101.77	0.000983	3.23	173.35	82.54	0.24
Reach 1	436	100-year+	412.00	96.03	102.00	99.04	102.11	0.001428	4.03	203.01	103.44	0.29
Reach 1	400		Culvert									
Reach 1	362	02-year	88.00	93.52	95.47	95.00	95.61	0.004925	2.92	30.44	26.91	0.47
Reach 1	362	10-year	202.00	93.52	95.98	95.55	96.31	0.007836	4.65	44.61	29.20	0.63
Reach 1	362	100-year	295.00	93.52	96.29	95.92	96.78	0.009386	5.69	53.84	30.60	0.71
Reach 1	362	100-year+	412.00	93.52	96.62	96.32	97.30	0.010717	6.73	64.26	32.08	0.77
Reach 1	336	02-year	88.00	94.22	95.24		95.37	0.021184	4.45	33.71	46.70	0.82
Reach 1	336	10-year	202.00	94.22	95.71		95.94	0.022581	6.02	55.66	48.59	0.90
Reach 1	336	100-year	295.00	94.22	96.03		96.32	0.021726	6.80	71.61	49.89	0.92
Reach 1	336	100-year+	412.00	94.22	96.41		96.76	0.020122	7.49	90.82	51.42	0.91
Reach 1	271	02-year	88.00	93.03	94.14		94.25	0.014861	3.88	37.79	49.02	0.70
Reach 1	271	10-year	202.00	93.03	94.78		94.93	0.011171	4.72	70.03	51.79	0.66
Reach 1	271	100-year	295.00	93.03	95.22		95.40	0.009849	5.20	92.79	53.46	0.64
Reach 1	271	100-year+	412.00	93.03	95.70		95.91	0.008876	5.68	118.83	55.17	0.63
Reach 1	191	02-year	88.00	90.96	92.61	92.47	92.85	0.019043	5.33	27.34	30.96	0.82
Reach 1	191	10-year	202.00	90.96	93.12	92.99	93.59	0.024914	7.58	43.79	33.39	0.98
Reach 1	191	100-year	295.00	90.96	93.42	93.33	94.06	0.028721	8.99	53.92	34.77	1.08
Reach 1	191	100-year+	412.00	90.96	93.72	93.70	94.58	0.033094	10.53	64.49	36.15	1.19
Reach 1	77	02-year	88.00	90.28	91.09	90.91	91.20	0.023108	3.97	35.74	58.24	0.83
Reach 1	77	10-year	202.00	90.28	91.50	91.23	91.70	0.023105	5.38	60.00	60.36	0.90
Reach 1	77	100-year	295.00	90.28	91.76	91.45	92.02	0.023109	6.20	76.10	61.74	0.93
Reach 1	77	100-year+	412.00	90.28	92.05	91.68	92.38	0.023103	7.02	94.01	63.23	0.96



Centerville Road

Maine Avenue

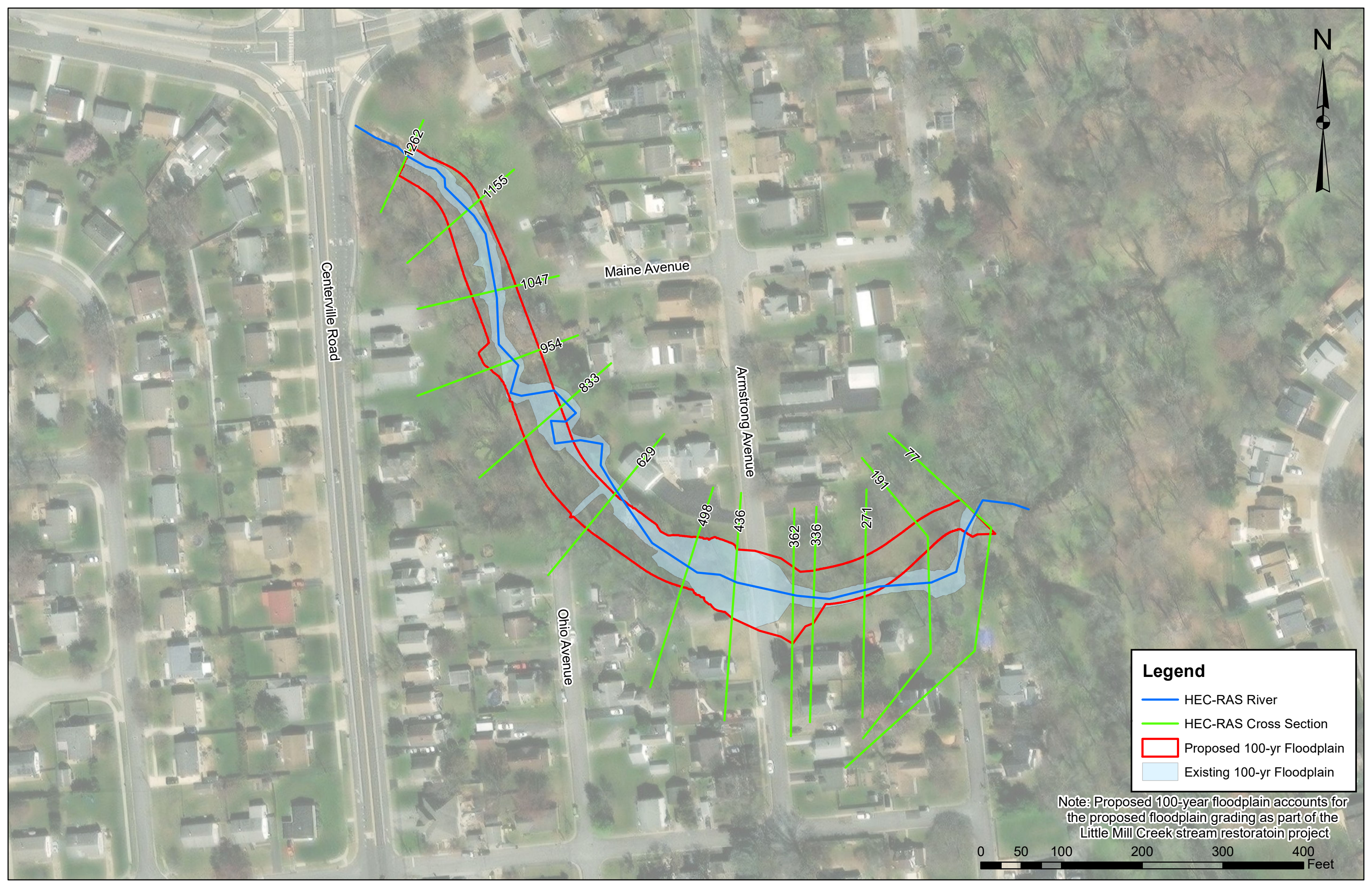
Armstrong Avenue

Ohio Avenue

Legend

- HEC-RAS River
- HEC-RAS Cross Section
- Proposed 100-yr Floodplain
- Existing 100-yr Floodplain

Note: Proposed 100-year floodplain accounts for the proposed floodplain grading as part of the Little Mill Creek stream restoration project



APPENDIX I

TMDL CREDIT CALCULATIONS

Tributary 2 Erosion Summary Table - June 2025

No.	Stability Assessment Reach	BEHI Rating (Value)	NBSS Rating	*Predicted Lateral Erosion Rate (ft/yr)	Study Bank Length (ft)	Study Bank Height (ft)	Predicted Erosion Volume (cf/yr)	**Predicted Erosion (tons/yr)
1	1-L	Extreme	Very Low	0.15	38	7	39.90	0.89
2	2-L	Very High	Very High	1.75	47	4	329.00	7.38
3	3-L	Very High	Low	0.40	43	5	86.00	1.93
4	1-R	Very High	Very High	1.75	26	4	182.00	4.08
5	2-R	Very High	Very Low	0.25	37	5.5	50.88	1.14
6	3-R	Extreme	Extreme	4.50	34	2	306.00	6.86
7	Left Bank	Moderate	Moderate	0.30	26	2	15.60	0.35
8	Left Bank	High	Moderate	0.55	42	5	115.50	2.59
9	Left Bank	Very High	Moderate	0.55	23	4.5	56.93	1.28
10	Left Bank	High	Moderate	0.55	35	3	57.75	1.29
11	Left Bank	High	Moderate	0.55	49	4	107.80	2.42
12	Left Bank	Moderate	Moderate	0.30	29	2	17.40	0.39
13	Left Bank	Very High	Moderate	0.55	29	5.5	87.73	1.97
14	Left Bank	High	Moderate	0.55	11	2	12.10	0.27
15	Left Bank	High	Moderate	0.55	28	3.5	53.90	1.21
16	Left Bank	Very High	Moderate	0.55	30	5.5	90.75	2.03
17	Left Bank	High	Moderate	0.55	41	4.5	101.48	2.28
18	Left Bank	High	Moderate	0.55	57	4.5	141.08	3.16
19	Left Bank	High	Moderate	0.55	32	2	35.20	0.79
20	Left Bank	Moderate	Moderate	0.30	29	1	8.70	0.20
21	Left Bank	High	Moderate	0.55	38	4	83.60	1.87
22	Left Bank	Moderate	Moderate	0.30	39	1.5	17.55	0.39
23	Right Bank	High	Moderate	0.55	37	2.5	50.88	1.14
24	Right Bank	Moderate	Moderate	0.30	15	1.5	6.75	0.15
25	Right Bank	High	Moderate	0.55	33	4.5	81.68	1.83
26	Right Bank	High	Moderate	0.55	31	3	51.15	1.15
27	Right Bank	High	Moderate	0.55	29	1	15.95	0.36
28	Right Bank	Very High	Moderate	0.55	35	5	96.25	2.16
29	Right Bank	Low	Moderate	0.08	32	1.5	3.84	0.09
30	Right Bank	High	Moderate	0.55	22	2.5	30.25	0.68
31	Right Bank	Very High	Moderate	0.55	25	5	68.75	1.54
32	Right Bank	Moderate	Moderate	0.30	33	1.5	14.85	0.33
33	Right Bank	High	Moderate	0.55	24	3	39.60	0.89
34	Right Bank	Moderate	Moderate	0.30	70	1.5	31.50	0.71
35	Right Bank	High	Moderate	0.55	51	4.5	126.23	2.83
36	Right Bank	Moderate	Moderate	0.30	25	1.5	11.25	0.25
37	Right Bank	Very High	Moderate	0.55	30	4	66.00	1.48
38	Right Bank	Moderate	Moderate	0.30	25	1.5	11.25	0.25

Notes:

*Based on the U.S. Fish and Wildlife Bank Erosion Rate Curve for Hickey Run in Washington, DC

**Bulk density is based on soil samples collected in field and analyzed at lab.

***Average NBSS value used banks outside limits of field evaluated BEHI study bank lengths (No. 1-6)

Ave Bulk Density	44.84	lb/cf
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0.02	N/A
0.09	N/A
0.125	Low
0.15	Low
0.3	moderate
0.4	moderate
0.55	High
0.8	very high
1	very high

**Predicted Erosion Total (tons/yr)	60.60
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Project: Tributary 2
Date: 6/4/2025

Calculated by: NSR
Checked by: REP

Protocol 1

Step 1 - Estimate Stream Sediment Erosion Rate

	Bulk Density (lb/ft³)	Estimated Erosion (tn/yr)*	Estimated Erosion (lb/yr)
Tributary 2	44.84	60.60	121,209.96
	Total	60.60	121,209.96

Step 2 - Convert Bank Erosion to Nutrient Loading

	Nitrogen (lb/yr) **	Phosphorus (lb/yr)**
Tributary 2	139.39	32.31

Step 3 - Estimate Stream Restoration Efficiency

Assume 100% efficiency

Protocol 1 Credits:

TSS	60.6	tn/yr
TSS	121,210.0	lb/yr
TP	32.3	lb/yr
TN	139.4	lb/yr

Assume 50% efficiency

Protocol 1 Credits:

TSS	30.3	tn/yr
TSS	060,605.0	lb/yr
TP	16.2	lb/yr
TN	69.7	lb/yr

Notes

1. * See Tributary 2 Erosion Summary Worksheet for detail calculations
2. **Site Specific Samples
3. ***Efficiency may be reduced by up to 50% after 3 years of post-construction monitoring by NCCD.

Project: Tributary 2
Date: 6/4/2025

Calculated by: NSR
Checked by: REP

Protocol 2

Proposed Conditions Nitrate Removal

Step 1 - Define the extent of the EHZ components

	EHZ Area (sqft)
Channel	3259.45
Floodplain	26783.66

Step 2 - Apply the denitrification rate to the EHZ

	EHZ Area (sqft)	Removal Rate (lb/sqft/yr)	TN Load Reduction (lb/yr)
Channel	3259	0.00269	8.77
Floodplain	26784	0.00269	72.05

Step 3 - Apply the Site Specific Discount Factors

	Baseflow Reduction Factor	Floodplain Height Factor	Aquifer Conductivity Reduction Factor	TN Load Reduction (lb/yr)
Channel	1.0	1.00	1.00	8.77
Floodplain	1.0	1.00	0.01	0.72

Step 4 - Calculate the Total Nitrate Removed

<i>Proposed Protocol 2 Credits, Concept 1:</i>	<i>TN</i>	9.5	lb/yr
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Existing Conditions Nitrate Removal

Step 1 - Define the extent of the EHZ components

Existing Channel	EHZ Area (sqft)
	6197.31

Step 2 - Apply the denitrification rate to the EHZ

	EHZ Area (sqft)	Removal Rate (lb/sqft/yr)	TN Load Reduction (lb/yr)
Existing Channel	6197	0.00269	16.67

Step 3 - Apply the Site Specific Discount Factors

	Baseflow Reduction Factor	Floodplain Height Factor	Aquifer Conductivity Reduction Factor	TN Load Reduction (lb/yr)
Existing Channel	1.00	0.00	1.00	0.00

Step 4 - Calculate the Total Nitrate Removed

Existing Protocol 2 Credits:	TN	0.0	lb/yr
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Total Nitrate Removal

Proposed Protocol 2 Credits	9.5
- Existing Protocol 2 Credits	0.0
Total Protocol 2 Credits	9.5

Tributary 2 Stream Restoration Pollutant Load Reductions

Protocol 3 Credit Calculation Summary

From Consensus Recommendations to Improve Protocols 2 and 3 for Defining Stream Restoration Pollutant Removal Credits, Version Dated 10/27/2020

	Existing ⁺	Prop	
Channel Capacity Discharge:	249	1.1	cfs
Baseflow Discharge:	0.1	0.1	cfs
Treatable Floodplain Flow Depth: 1.0 ft.*	0.0	125	cfs

⁺ computed from detailed 1D or 2D hydraulic modeling

* if greater than one foot, then floodplain velocity must be less than 2 fps.

Depth is capped at 3 ft. max or the 10-year storm discharge depth if less than 3 ft.

From flow duration curve analysis (attached):	Existing	Prop	
Percent Flow Treated:	0%	80%	
Treatable Flow Credit:	N/A	80%	(Prop. - Exst. % Flow Treated)

Drainage Area 89.6 acres
% Impervious 34%

*Loading Rates

	Impervious	Pervious
TN	12.4	8.7 lb/yr
TP	1.09	0.25 lb/yr
TSS	0.18	0.021 tons/yr

Nutrient Loading:

TN (lb/yr)	TP (lb/yr)	TSS (tons/yr)
892.9	48.1	6.8

Treatable Loads (Nutrient Loading x Treatable Flow Credit):

Prop		
TN (lb/yr)	TP (lb/yr)	TSS (tons/yr)
715.6	38.6	5.4

Efficiency Rates (from Table 14 of Stream Protocol Document):

TN	TP	TSS
30%	33%	27%

Restoration

Nutrient Reduction Credit (Treatable Loads x Efficiency Rate):

Prop		
TN (lb/yr)	TP (lb/yr)	TSS (ton/yr)
214.7	12.7	1.5

Notes: *Rates from Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects - CBWA

Credits Summary (100% Efficiency for Protocol 1)

Alternative	Protocol 1			Protocol 2			Protocol 3			Total		
	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN
1	121,210	32	139	-	-	9	2923	13	215	124,133	45	364

F_{TN}	F_{TP}	F_{TSS}	EIA _f (acres)
18.08	2.23	8046	18.6

Equation 5. EIA_f Calculation for Alternative BMPs

$$EIA_f = \frac{\left(\frac{TN \text{ Load Red.}}{I - F_{TN}}\right) + \left(\frac{TP \text{ Load Red.}}{I - F_{TP}}\right) + \left(\frac{TSS \text{ Load Red.}}{I - F_{TSS}}\right)}{3}$$

Where:

EIA_f = Equivalent impervious acre conversion factor

$TN \text{ Load Red.}$ = BMP load reduction for TN (lbs/unit/yr)

$TP \text{ Load Red.}$ = BMP load reduction for TP (lbs/unit/yr)

$TSS \text{ Load Red.}$ = BMP load reduction for TSS (lbs/unit/yr)

$I - F_{TN}$ = Aggregate impervious unit load minus true forest unit load for TN (lbs/acre/yr)

$I - F_{TP}$ = Aggregate impervious unit load minus true forest unit load for TP (lbs/acre/yr)

$I - F_{TSS}$ = Aggregate impervious unit load minus true forest unit load for TSS (lbs/acre/yr)

APPENDIX J

OUTFALL DISCHARGE AND PROTECTION COMPUTATIONS

Outfall3 Riprap Apron

Input data

Output data

Pipe Size	15	inches	
Q10	6.5	cfs	Based on maximum pipe capacity at assumed 1% slope
Tailwater Computed		feet	
Tailwater Assumed	0.5	feet	
d50	0.36	feet	
d50	4.30	inches	R-5
Apron Length	6.25	feet	

Riprap apron stone sizing:

$$d_{50} = 0.02 / Tw * (Q / PD)^{1.33}$$

d₅₀ – Median riprap size (ft)

Tw – Tailwater depth above the invert of the culvert (ft). (If Tw is unknown or < 0.4 * PD, then use 0.4 * PD.)

Q – Calculated design storm flow in pipe (cfs)

PD – Pipe diameter (ft) (Note: if elliptical pipe, use the pipe width measurement)

Riprap apron depth: (This is the same as Table 2.)

d ₅₀	Minimum Design Depth
6" (R-4)	18" (1.5')
9" (R-5)	24" (2')
12" (R-6)	30" (2.5')
18" (R-7)	42" (3.5')

Table 3. Riprap apron length:

d ₅₀	Apron Length (ft)*
6" (R-4)	4 * PD
9" (R-5)	5 * PD
12" (R-6)	6 * PD
18" (R-7)	7 * PD

Source:

https://es2mdesignguide.deldot.gov/index.php/Pipe_Outfall_Design_Guidance

Worksheet for Outfall 1a - Circular Pipe - 1

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.025 ft/ft
Normal Depth	30.0 in
Diameter	30.0 in
Discharge	64.85 cfs
Results	
Discharge	64.85 cfs
Normal Depth	30.0 in
Flow Area	4.9 ft ²
Wetted Perimeter	7.9 ft
Hydraulic Radius	7.5 in
Top Width	0.00 ft
Critical Depth	29.0 in
Percent Full	100.0 %
Critical Slope	0.022 ft/ft
Velocity	13.21 ft/s
Velocity Head	2.71 ft
Specific Energy	5.21 ft
Froude Number	(N/A)
Maximum Discharge	69.76 cfs
Discharge Full	64.85 cfs
Slope Full	0.025 ft/ft
Flow Type	Undefined
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	30.0 in
Critical Depth	29.0 in
Channel Slope	0.025 ft/ft
Critical Slope	0.022 ft/ft

Worksheet for Outfall 1b - Elliptical Pipe - 1

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.015 ft/ft
Rise	4.0 ft
Span	6.3 ft
Results	
Discharge	316.34 cfs
Normal Depth	48.0 in
Flow Area	19.9 ft ²
Wetted Perimeter	16.4 ft
Hydraulic Radius	14.5 in
Top Width	0.00 ft
Critical Depth	46.2 in
Percent Full	100.0 %
Critical Slope	0.013 ft/ft
Velocity	15.91 ft/s
Velocity Head	3.93 ft
Specific Energy	7.93 ft
Froude Number	(N/A)
Maximum Discharge	337.99 cfs
Discharge Full	316.13 cfs
Slope Full	0.015 ft/ft
Flow Type	Undefined
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	48.0 in
Critical Depth	46.2 in
Channel Slope	0.015 ft/ft
Critical Slope	0.013 ft/ft

Worksheet for Outfall 2 - Circular Pipe - 1

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Normal Depth	27.0 in
Diameter	27.0 in
Discharge	30.97 cfs
Results	
Discharge	30.97 cfs
Normal Depth	27.0 in
Flow Area	4.0 ft ²
Wetted Perimeter	7.1 ft
Hydraulic Radius	6.8 in
Top Width	0.00 ft
Critical Depth	23.1 in
Percent Full	100.0 %
Critical Slope	0.009 ft/ft
Velocity	7.79 ft/s
Velocity Head	0.94 ft
Specific Energy	3.19 ft
Froude Number	(N/A)
Maximum Discharge	33.31 cfs
Discharge Full	30.97 cfs
Slope Full	0.010 ft/ft
Flow Type	Undefined
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	27.0 in
Critical Depth	23.1 in
Channel Slope	0.010 ft/ft
Critical Slope	0.009 ft/ft

Worksheet for Outfall 3 - Circular Pipe - 1

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Normal Depth	15.0 in
Diameter	15.0 in
Discharge	6.46 cfs
Results	
Discharge	6.46 cfs
Normal Depth	15.0 in
Flow Area	1.2 ft ²
Wetted Perimeter	3.9 ft
Hydraulic Radius	3.8 in
Top Width	0.00 ft
Critical Depth	12.3 in
Percent Full	100.0 %
Critical Slope	0.010 ft/ft
Velocity	5.26 ft/s
Velocity Head	0.43 ft
Specific Energy	1.68 ft
Froude Number	(N/A)
Maximum Discharge	6.95 cfs
Discharge Full	6.46 cfs
Slope Full	0.010 ft/ft
Flow Type	Undefined
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	15.0 in
Critical Depth	12.3 in
Channel Slope	0.010 ft/ft
Critical Slope	0.010 ft/ft

ATTACHMENT F

Adjacent Property Owner Information

Little Mill Creek Tributary 2 Stream Restoration
Adjacent Property Owner Information

PARCEL NO	PROPERTY ADDRESS	PROPERTY CITY	PROPERTY STATE	PROPERTY ZIP	OWNER	OWNER ADDRESS	OWNER ADDRESS 2	OWNER CITY	OWNER STATE	OWNER ZIP
703420159	2301 CENTERVILLE RD	WILMINGTON	DE	19808-	NEW CASTLE COUNTY-LEVY COURT	800 FRENCH ST		WILMINGTON	DE	19801
703420351	1 WALLS AVE	WILMINGTON	DE	19805-	JIMENEZ JUAN	1 WALLS AV		WILMINGTON	DE	19805
703420352	2300 CENTERVILLE RD	WILMINGTON	DE	19808-	GRAVENOR MICHAEL & CHARLES & ROSE & MCELROY OLILA	2300 CENTERVILLE ROAD		WILMINGTON	DE	19808
703420459	2312 FAULKLAND RD	WILMINGTON	DE	19805-	STATE OF DELAWARE	HISTORICAL & CULTURAL AFFAIRS	29 N STATE STREET	DOVER	DE	19901
703420460	2306 FAULKLAND RD	WILMINGTON	DE	19805-	GHANI LLC	323 PINE VIEW DRIVE		NEWARK	DE	19702
703420464	713 ARMSTRONG AVE	WILMINGTON	DE	19805-	BUSH TIMOTHY W & JILL M	713 ARMSTRONG AV		WILMINGTON	DE	19805
703420482	2308 FAULKLAND RD	WILMINGTON	DE	19805-	FERNANDEZ JOSE ANDRES MURILLO	2308 FAULKLAND RD		WILMINGTON	DE	19805
703440155	2223 CENTERVILLE RD	WILMINGTON	DE	19808-	GILLEN HARRY L & SOPHIA D	2223 CENTERVILLE RD		WILMINGTON	DE	19808
703440156	2225 CENTERVILLE RD	WILMINGTON	DE	19808-	BECK BARBARA A	2225 CENTERVILLE RD		WILMINGTON	DE	19808
703440157	2227 CENTERVILLE RD	WILMINGTON	DE	19808-	MITCHELL KAREN A	2227 CENTERVILLE ROAD		WILMINGTON	DE	19808
703440158	2400 FAULKLAND RD	WILMINGTON	DE	19808-	HULTBERG MICHAEL F, FRANCIS J & STEPHEN E	2400 FAULKLAND RD		WILMINGTON	DE	19808
703440334	2224 CENTERVILLE RD	WILMINGTON	DE	19808-	STATE OF DELAWARE	BOX 8		BEAR	DE	19701
703440335	2226 CENTERVILLE RD	WILMINGTON	DE	19808-	J W HOLLOWAY CO					
703440336	615 ARMSTRONG AVE	WILMINGTON	DE	19805-	HAWKE DEBORAH E	615 ARMSTRONG AV		WILMINGTON	DE	19805
703440337	617 ARMSTRONG AVE	WILMINGTON	DE	19805-	GANC IRENE M	4512 HENDRY AVENUE		WILMINGTON	DE	19808
703440338	621 ARMSTRONG AVE	WILMINGTON	DE	19805-	HARRISON MARK A	621 ARMSTRONG AVE		WILMINGTON	DE	19805
703440339	623 ARMSTRONG AVE	WILMINGTON	DE	19805-	TAYLOR MICHAEL M SR & HOUGH LEAH	623 ARMSTRONG AVENUE		WILMINGTON	DE	19805
703440340	107 MAINE AVE	WILMINGTON	DE	19805-	PICCIONI JSEPH & HIRST ERIN	107 MAINE AVENUE		WILMINGTON	DE	19805-1017
703440341	105 MAINE AVE	WILMINGTON	DE	19805-	GIROUD DEAN D	105 MAINE AVENUE	BROOKLAND TERRACE	WILMINGTON	DE	19805
703440342	701 ARMSTRONG AVE	WILMINGTON	DE	19805-	CULLUM JOSEPH R	701 ARMSTRONG AVE		WILMINGTON	DE	19805
703440343	703 ARMSTRONG AVE	WILMINGTON	DE	19805-	CAR HOMES RENTALS LLC	4 JUNIPER STREET		NEW CASTLE	DE	19720
703440344	0 MAINE AVE	WILMINGTON	DE	19805-	STATE OF DELAWARE	HISTORICAL & CULTURAL AFFAIRS	29 N STATE STREET	DOVER	DE	19901
703440345	634 CENTERVILLE RD	WILMINGTON	DE	19808-	SELCUK BARBAROS	35 OKLAHOMA STATE DRIVE		NEWARK	DE	19713
703440346	630 CENTERVILLE RD	WILMINGTON	DE	19808-	DIFFLEY ANDREW & NANCY	P O BOX 25125		WILMINGTON	DE	19899
703440347	628 CENTERVILLE RD	WILMINGTON	DE	19808-	MOAT STREET LLC	P O BOX 25125		WILMINGTON	DE	19899
703440348	626 CENTERVILLE RD	WILMINGTON	DE	19808-	MITCHELL WILLIAM F	206 BEVERLY PL		WILMINGTON	DE	19809
703440362	613 OHIO AVE	WILMINGTON	DE	19805-	MONTGOMERY KENNETH J	610 OHIO AVE		WILMINGTON	DE	19805
703440363	610 OHIO AVE	WILMINGTON	DE	19805-	MONTGOMERY KENNETH J & LAURIE A	610 OHIO AVE		WILMINGTON	DE	19805
703440371	607 ARMSTRONG AVE	WILMINGTON	DE	19805-	SOTO NOEL B & RIVERA DESIREE N	607 ARMSTRONG AVENUE		WILMINGTON	DE	19805
703440537	613 ARMSTRONG AVE	WILMINGTON	DE	19805-	NEW CASTLE COUNTY	DIVISION OF LAW	800 N FRENCH ST	WILMINGTON	DE	19801
703420488	711 ARMSTRONG AVE	WILMINGTON	DE	19805-	BENNETT-MURPHY ANDREA FAYE	711 ARMSTRONG AVENUE		WILMINGTON	DE	19805
703440539	709 ARMSTRONG AVE	WILMINGTON	DE	19805-	HERSHBERGER RICHARD J & PASQUALE ALICE MARIE	709 ARMSTRONG AVENUE		WILMINGTON	DE	19805
703440541	705 ARMSTRONG AVE	WILMINGTON	DE	19805-	PRICE DARRYN & NADXELLI	705 ARMSTRONG AVENUE		WILMINGTON	DE	19805

ATTACHMENT G

USACE Field Meeting Minutes

Little Mill Creek Tributary 2 Stream Restoration

USACE Field Meeting Minutes

Date/Time: October 14, 2025, 10:00am

Location: Woodland Run Park, Wilmington, DE

Handouts: 65% Stream Restoration & Environmental Compliance Plans, Natural Resources Inventory Memo

Attendees	Organization	Email
James Colligan	USACE	James.A.Colligan@usace.army.mil
Todd Hoernemann	USACE	Todd.A.Hoernemann@usace.army.mil
Nick Riley	RK&K	nriley@rkk.com
Karl Hellmann	RK&K	khellmann@rkk.com

INTRODUCTIONS & PROJECT BACKGROUND

The field meeting began with an introduction of all attendees and a brief overview of the project. The New Castle Conservation District (NCCD) is proposing the restoration of an unnamed tributary to Little Mill Creek (Tributary 2) in Wilmington, Delaware. The project limits span from the Centerville Road/Faulkland Road intersection downstream to Armstrong Avenue. The project entails restoring approximately 750 linear feet of Tributary 2 and three stormwater outfalls. The design consists of an integrated stream and wetland restoration approach that will lower the existing stream banks and adjacent floodplain to create a sustainable stream/floodplain system within park property. The project will provide ecological enhancement, support the requirements of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit, and help meet pollutant load reductions associated with the Christina River Total Maximum Daily Load (TMDL). The existing stream and floodplain have been severely manipulated by past anthropogenic changes that have created an unstable stream channel that is disconnected from the surrounding floodplain. The riparian zone consists of a dry forest that is dominated by invasive species. The proposed restoration will replace these highly degraded resources with self-sustainable stream and wetland complexes.

FIELD REVIEW

The group began the field review at the southern limits of the project near Armstrong Avenue and walked north through the western floodplain to the Centerville Road/Faulkland Road intersection.

The group reviewed the two small PFO wetlands (Wetland A & B) that were delineated just west of Tributary 2 (Waters A). Karl Hellmann (RK&K) noted that the wetlands had shallow surface water and saturation during the delineation in March 2025 and that they appeared drier during the site walk. The limits of construction (LOC) were modified during the 65% design to minimize impacts to these wetlands. The USACE noted that the wetlands appeared degraded and that minor impacts to the wetlands were not a concern. Karl noted that the total proposed wetland impacts are approximately 200 – 500 square feet and that the proposed wetland creation in the floodplain is approximately 0.5 acres.

The group reviewed an intermittent channel (Waters C) that originates at a small stormwater pipe outfall and drains east into Tributary 2. The tributary receives drainage from the adjacent community and Wetland A, and had shallow surface water during the site visit.

The group observed several standing dead green ash trees in the floodplain that were marked for removal.

Nick Riley (RK&K) noted that a small portion of Tributary 2 is located on private property north-east of stream STA 25+60. A temporary construction easement will be acquired to fill the channel in this area. Positive feedback was received from the adjacent landowners, who were concerned with the channel continuing to erode into their property. Several property owners appeared to be encroaching on park property in the eastern floodplain.

The group reviewed the sanitary sewer crossing that is currently exposed near Stream STA 22+82. The proposed restoration will provide a minimum of 1-foot of cover in the proposed channel and floodplain. A constructed riffle grade control with channel logs at the head and tail of riffles is proposed over the sewer crossing. Additionally, floodplain grade control logs will be placed upstream and downstream of the sewer crossing for long-term protection.

James Colligan (USACE) asked about the size of the proposed preformed scour hole at the upstream limits of the project. Nick responded that the preformed scour hole was approximately 40 feet wide by 60 feet long. Rip-rap underlayment is proposed just downstream of the scour hole to provide a stable transition into the re-aligned channel. Nick noted that the drainage upstream of the main culvert consists of a ditch and multiple storm drain systems that receive drainage from residential neighborhoods. Due to urbanization and development upstream of the project reach that does not appear to have stormwater management facilities, discharges to the project reach are expected to be highly flashy. The watershed size at the downstream limit of the project is approximately 0.14 square miles.

The group noticed a small stand of common reed (*Phragmites australis*) at the upstream culvert. The stand will be removed by proposed excavation for the pre-formed scour hole.

Karl stated that DNREC confirmed there are no records for rare, threatened, endangered species or habitat documented within the project study area. The USFWS IPAC species list identified the tricolored bat (*Perimyotis subflavus*) and monarch butterfly (*Danaus plexippus*), which are candidate and proposed endangered species, respectively, and therefore do not currently have Section 7 requirements. The State Historic preservation Office (SHPO) also confirmed that there are no known archaeological sites or historic properties within the project study area.

Nick stated that the 65% design will be submitted to NCCD for review in the next 2-3 weeks, and that the Nationwide Permit 27 Pre-construction notification will be submitted to the USACE following the NCCD review. The USACE noted that the 2021 NWP will expire in March 2026 and a re-verification will need to be requested if the permit is acquired prior to this date.

ACTION ITEMS

1. RK&K will submit the Nationwide Permit 27 Pre-construction notification to USACE following the NCCD's review of the 65% design plans.