



Bear Creek Environmental, LLC

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FIRST BEND AT TEN BENDS LAMOILLE RIVER BANK RESTORATION – Final (100 Percent) Design PROGRESS REPORT

To: Peter Danforth

From: Mary Nealon, Principal, Water Resources Scientist

Date: December 23, 2024

This memorandum provides a final progress report for the First Bend Bank Restoration Project on the Lamoille River and includes updated information for permitting, 100% Design, and Bid Documents. Bear Creek Environmental (BCE), in partnership with Ripple Natural Resources (RNR), have been contracted through the Lamoille County Conservation District (LCCD) to develop a final design for addressing an actively adjusting section of river bank at the 10 Bends community (Lamoille Valley Property Owners Association- LVPOA) in Hyde Park/Morrisville, VT.

1.0 Project Purpose

The primary goal of the project is to protect existing uses of the riparian area, while balancing the need for the Lamoille River to move toward an equilibrium condition. A secondary goal is to use large wood along the bank to improve fish habitat and provide structure to resist erosion due to shear stress along the bank.

2.0 Project Tasks

The final design for the project consists of five major tasks:

Task 4: 60% Design

Task 5: 90% Design

Task 6: Permitting

Task 7: 100% Design

Task 8: Bid Documents

Tasks 1 (Kick off meeting), Task 2 (Hydraulic Modeling) and Task 3 (30% Design) were completed under a previous grant agreement.

3.0 Completion Subtasks

- A. Project Startup – A virtual project start up meeting with the project team, stakeholders, and regulators was held on February 12, 2024. Project objectives, site constraints, scope of work were discussed.
- B. Field Survey I – Given the changes to the Lamoille River and floodplain following the July 2023 flooding, the RNR/BCE project team conducted a field survey on May 17, 2024 to update the basemap. This survey included updated cross sections, top of bank and edge of water.
- C. Sixty Percent Design Plans – 60% design plans were developed and are dated August 7, 2024. The 60% design plans include moving the toe of the root wads out to the former location of the bank, prior to the July 2023 flooding. The root wads were extended in the upstream direction from those shown on the 30% design plans, to account for additional bank erosion that had taken place. Based on survey data, the bank had moved back 15 to 20 feet in some locations.
- D. Project Meeting – A 60% design review meeting took place virtually on August 7, 2024 with Peter Danforth, Matt Murawski, Mary Nealon and Staci Pomeroy. DEC project regulators (Chris Brunelle, Shannon Morrison, Rebecca Pfeiffer) were invited to the meeting, but were not in attendance.
- E. Field Survey II – A second field survey to document top and bottom of bank took place on August 8, 2024. This survey followed high flows that took place in July 2024.
- F. Wetland Delineation Updated – The wetland delineation in the vicinity of the project area was updated on August 29, 2024. This delineation was verified by Shannon Morrison of the Vermont Department of Environmental Conservation on the same day as the delineation. The project study area includes a Class II wetland greater than 0.57 acres in size and a Class III wetland of 0.033 acres.
- G. Contractor Site Visit. A site visit was conducted with Canonica Landworks, the state’s most experienced contractor for harvesting and installing wood for bank stabilization. The contractor provided input on site access, availability locally of trees for rootwads, water control, and design details.
- H. Ninety Percent Design Plans – 90% design plans were developed following field survey II. Revisions from the 60% design plans to 90% included the following:
 - Rootwad detailed changed to include a second level to better suit a river of this size given the recent significant bank movement.
 - Increased length of work area to reflect current conditions.
 - Topography and bank location updated to reflect post flood conditions.

- The control of water scheme added.
 - General project notes and specifications included.
 - Construction sequence and narrative added.
 - Updated wetland delineation and buffer included.
 - Layout information improved
- I. Final Design Plans – 100% design plans are dated December 16, 2024 (see pages 1-5 of the Attachment). Revisions from 90% design plans to 100% include the following:
- Minor corrections to stationing and other labels.
 - Additional design notes added to typical section, including reduction of coir lift height to 18 inches.
 - Adjusted proposed cross sections to reflect coir lift height.
- J. Cost Estimate - A 100% design cost estimate dated December 17, 2024 is included on page 6 of the Attachment. This estimate is the engineer's opinion of probable cost and includes \$340,000 for construction and \$27,000 for Engineering, Management, Oversight for a total of \$367,000. Revisions to the cost estimate from 90% design to the final design include:
- Updated items to conform the Bid Form.
 - Updated quantities (primarily plants and coir fabric) to reflect final design.

4.0 Required Permits

Four permit applications, including Section 404, VT Stream Alteration, Local Zoning, and VT Wetlands, were prepared and delivered to LCCD. They will be submitted after landowner signatures are acquired. Less than one acre of land is proposed to be disturbed. Therefore, a stormwater permit is not required.

- A. **Corps of Engineers 404.** Application included required form, narrative and impact plan, and topo site location map. We assumed coverage will be under the Vermont General Permit. A cultural resource evaluation would likely be needed as part of this permit process.
- B. **VANR Stream Alteration.** Application completed assuming coverage under the General Permit.
- C. **Local Zoning Permit.** A Morristown Zoning Permit Application Form and No Rise Certification will be submitted to the Morristown Zoning Administrator (ZA). The ZA expected to administratively approve the project, and indicated no DRB hearing would be needed.
- D. **State Wetland.** A Vermont Wetlands Individual permit application was prepared for temporary impacts to the Class II wetland buffer. The supporting materials included the

project design plans, shapefile of the Class II wetland, site location map, impact plan, and photos. An adjoining letter will be mailed to abutting landowners to provide official notice of the proposed project once the permit applications are signed.

Attachment

FIRST BEND AT TEN BENDS BANK RESTORATION MORRISTOWN, VERMONT

PREPARED FOR:

LAMOILLE COUNTY
CONSERVATION DISTRICT



PREPARED BY:

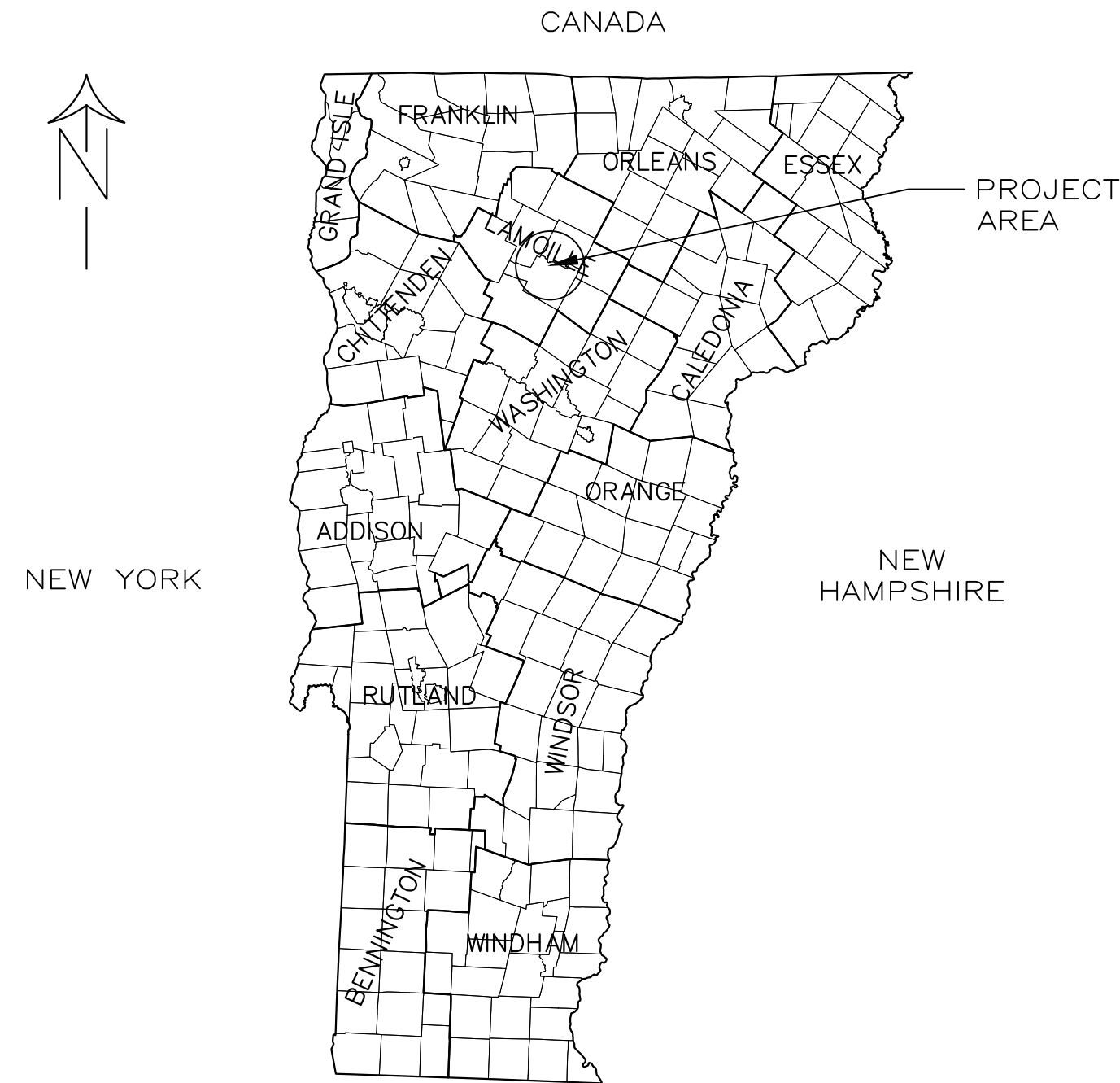


Bear Creek
Environmental

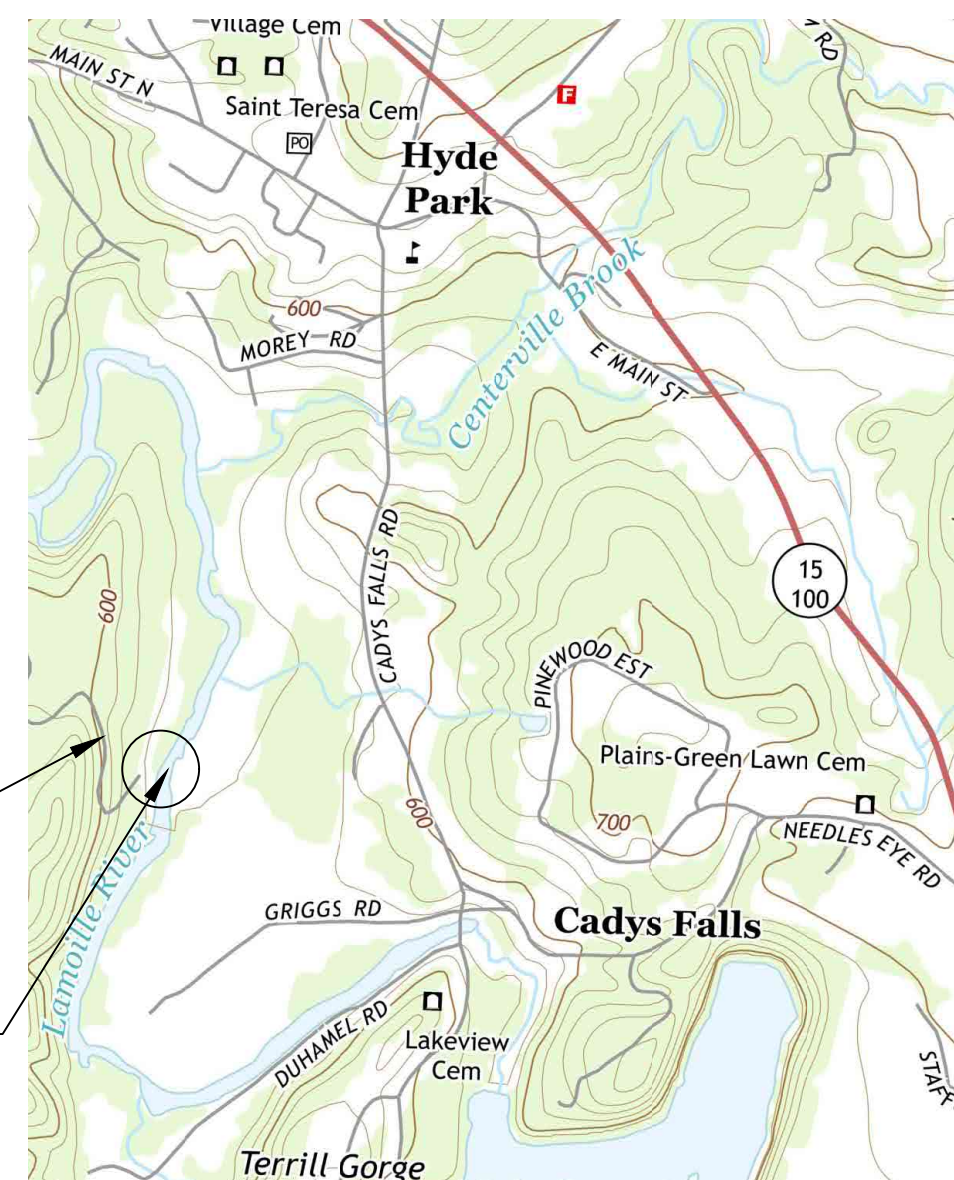
FINAL PLANS
DECEMBER 16, 2024

LIST OF DRAWINGS

TITLE	SHEET	PAGE
TITLE SHEET	-	1
GENERAL NOTES	C-1	2
BANK MOVEMENT PLAN AND PROJECT NOTES	C-2	3
SITE PLAN	C-3	4
SECTIONS	C-4	5



LOCATION MAP
NTS



LOCATION MAP
NTS

GENERAL PROJECT NOTES

1. The purpose of this project is to stabilize the bank of the Lamoille River with large wood to protect existing uses of the riparian area, improve fish habitat, and allow the river to move toward equilibrium conditions.
2. The property is privately owned. For the purpose these notes and the administration of the construction project, the "Owner" is considered the Lamoille County Natural Resources Conservation District.
3. The Owner may designate an Engineer or other Owner's Representative to make engineering and management decisions.
4. Engineering performed by Matt Murawski, Ripple Natural Resources, 802-522-3473, matt@ripplenr.com and Mary Nealon, Bear Creek Environmental, 802-223-5140, Mary@BearCreekEnvironmental.com.
5. Topographic contours shown on plans based on 2017 LiDAR. Planimetric information and cross section elevation data are based on field survey by Ripple and Bear Creek on August 8, 2024. Surveyed elevations adjusted to approximately match LiDAR. Vertical is NAVD88.
6. The Contractor shall bid and perform the work from a complete set of plans and specifications, and shall notify the Engineer of any conflicts within the construction documents.
7. No deviation or departure from the design intent presented in the plans and specifications will be allowed unless authorized by the Engineer.
8. The Contractor must receive prior written authorization from the Engineer for any proposed substitutions for items and materials specified on these drawings.
9. The Contractor is responsible for the means and methods of construction and for conditions at the site.

GENERAL CONSTRUCTION NOTES

10. Site conditions may differ from those shown on the drawings due to current water level and sedimentation and erosion since the time of survey.
11. Contractor must stake out limits of proposed work prior to construction to prevent inadvertent impact beyond property lines or allowable work areas.

SUBSURFACE CONDITIONS

12. No subsurface investigations have been conducted.

REQUIRED MEETINGS, SUBMITTALS, INSPECTIONS, AND REGULATORY CLEARANCES

13. The Contractor must participate in an on-site pre-construction conference.
14. The Contractor must submit an anticipated work schedule to the Owner's Representative each week.
15. Contractor shall submit for advanced approval shop drawings and/or product literature for all products for use in the project.
16. The following regulatory clearances are being secured by the Owner for this project:
 - a. US Army Corps of Engineers Dredge & Fill Clearance
 - b. Vermont Stream Alteration Permit
 - c. Vermont Wetland Permit
 - d. Local Zoning Permit

17. The Contractor is responsible for familiarizing himself with the requirements of these permits prior to bidding, and for complying with them during construction.

BOUNDARY NOTES

18. Parcel boundaries unless otherwise noted are approximate and are based on digital tax maps. Ripple Natural Resources makes no claim to their accuracy or completeness.
19. The Owner is obtaining all easements, rights of way, and/or related permission from landowners and abutters prior to construction.
20. All construction activities will be performed within the proposed limits of construction. Any need to go beyond these limits may trigger additional permitting requirements and will first need to be approved by the Owner in writing.

ALLOWABLE WORK AREA

21. The Contractor shall mark the allowable work area prior to construction to prevent inadvertent impact to wetlands and adjacent property.
22. Work area is as shown on C-2, and is bounded by the following angle points:
 - a. STA 99+00, R0'
 - b. STA 99+00, R133'
 - c. STA 100+18, R218'
 - d. STA 103+73, R202'
 - e. STA 105+53, R146'
 - f. STA 105+53, R50'
 - g. STA 104+59, R10'
 - h. STA 103+30, R10'
 - i. STA 102+90, L4'
 - j. STA 102+33, L4'
 - k. STA 101+92, L40'
 - l. STA 101+00, L0'

WETLAND NOTES

23. Wetlands delineated August 29, 2024 by Bear Creek Environmental.
24. The allowable work area is delineated to avoid wetlands.
25. Beyond the immediate work area located within wetland buffer (approximately STA 101+40 to STA 103+95), contractor shall:
 - a. Operate on adequately dry ground conditions such that vehicle ground pressure does not cause subsistence of the ground immediately beneath the equipment and upheaval of adjacent soil.
 - b. Use equipment shall have low ground pressure (typically <3psi),
 - c. If either a. or b. cannot be met, protect the ground surface with matting.

UTILITIES NOTES

26. The location of utilities shown on these plans, if any, is approximate, and Ripple Natural Resources makes no claim to its accuracy or completeness.
27. Prior to the start of construction, the Contractor is responsible for verifying and determining the location, size, and elevation of all utilities (above and below ground) within the project limits, and to take the

- necessary precautions to protect utilities during construction. Contact dig--safe at 1-800-dig-safe (www.digsafe.com) at least 72 hours before digging.
28. The Owner shall be notified in writing of any utilities found interfering with the proposed construction, and appropriate remedial action be shall be determined and agreed upon by the Owner's Representative before proceeding with the work.

RESTORATION OF SURFACES NOTES

29. The Contractor shall apply rock and crushed gravel to construction access locations off public roads if needed to prevent rutting, erosion, and tracking of material offsite. Unless otherwise directed by owner, remove material at conclusion of work.
30. Contractor must restore staging, and work areas to pre-construction conditions. Restoration may include applying topsoil, grass seed, fertilizer, and mulch to affected lawn areas and patching parking lot areas or driveways that may have been damaged by construction activities.

REVEGETATION NOTES

31. The Contractor shall loam, seed, and mulch all disturbed areas beyond top of bank.
32. Loam, which may be stockpiled at the start of construction if existing material is suitable, shall be placed a minimum of 6 inches thick.
33. Seed shall be Vermont Conservation & Wildlife Mix by Vermont Wetland Plant Supply (www.newp.com) applied at a rate of 20 lb/ac, or approved equivalent.
34. Loose straw mulch shall be applied to disturbed surfaces away from flowing water at a rate of 2 tons per acre. A 100% biodegradable fabric with no plastic components may be substituted.
35. Plantings shall include the following:
 - a. Willow and/or dogwood whips as indicated on detail Sheet C-4. Quantity: 2,022. Stakes may be substituted at 2' OC. Quantity: 337.
 - b. Shrubs on 2nd-5th coir soil lifts as indicated on detail Sheet C-4. Bare root or container plants are acceptable. Species to be specified by owner. 5' OC. Quantity: 362.
 - c. Trees within 15' of finished top of bank. To be specified by owner. 25' OC. Quantity: 14.
 - d. Willow and/or dogwood whips clusters or stakes on restored bar at completion of water diversion. 10'OC. Quantity: 277.

EROSION CONTROL NOTES

36. The Contractor shall at all times make a reasonable effort to prevent the discharge of turbid water from the work area.
37. There is no expectation that contractor will work in the dry, but to the extent practical the contractor shall work outside of flowing water.



REV. #	DESCRIPTION	DATE

DESIGNED BY:	MTM
DRAWN BY:	MTM
CHECKED BY:	MTM
DATE:	11/22/2024
RIPPLE PROJECT #:	2023001

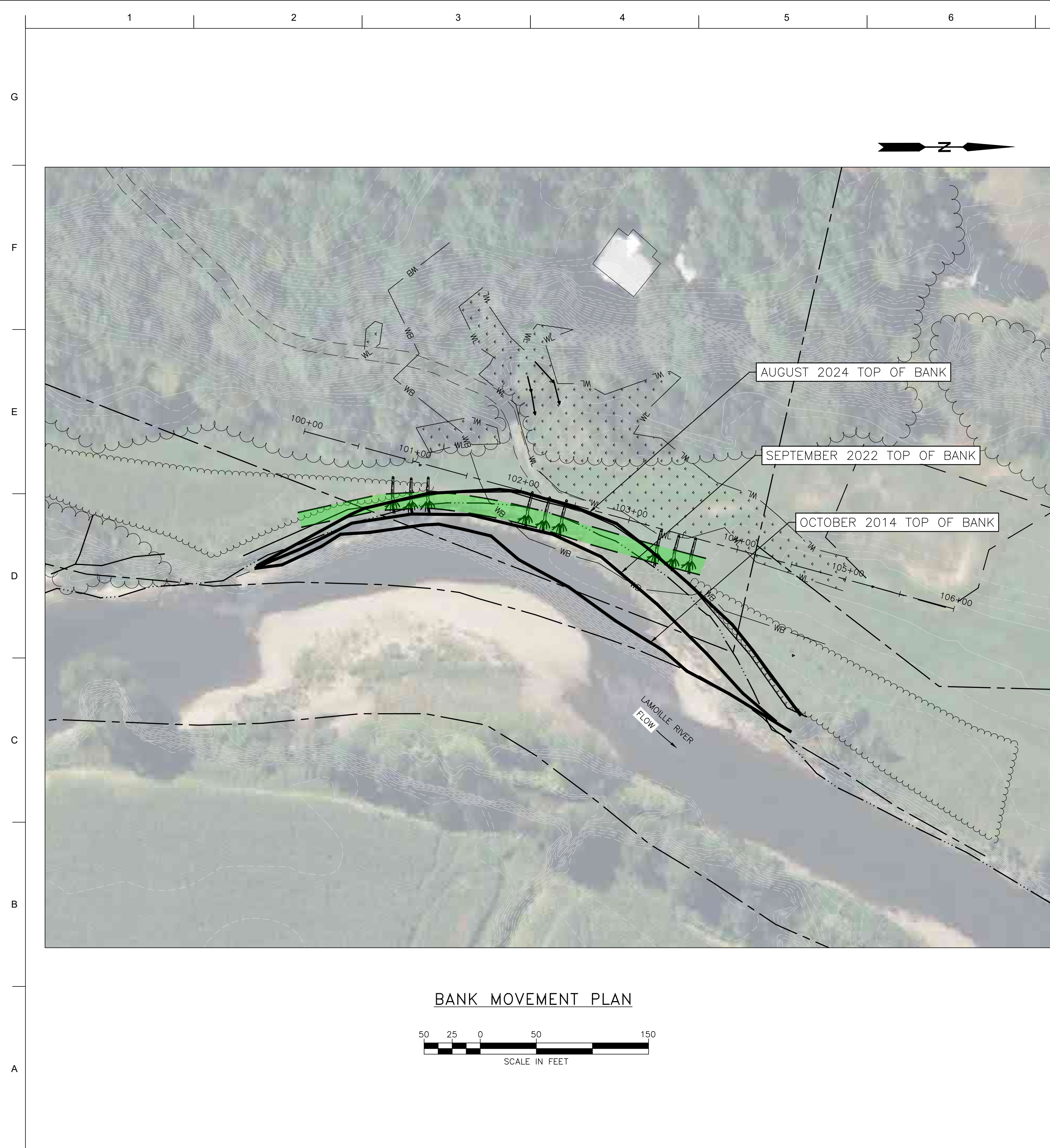


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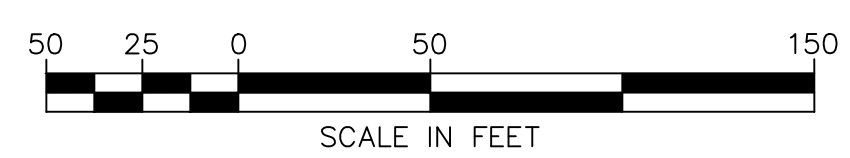
PROJECT & LOCATION:
FIRST BEND AT TEND BENDS, MORRISTOWN
BANK RESTORATION

SHEET TITLE:
GENERAL NOTES

SHEET ID
C - 1
2 of 5



BANK MOVEMENT PLAN



CONSTRUCTION SEQUENCE

The work shall be completed in general accordance with this proposed construction sequence. Material deviations must be approved by the Engineer and may also require regulatory approval.

1. Install project demarcation flagging at property line and wetland boundaries.
2. Stockpile trees within disturbed area for later transplant.
3. Implement Water Control Plan (see separate notes).
4. Excavate left bank and install root wad bench, including integrated willow cuttings.
5. Install coir soil lifts.
6. Restore flow to the left side of channel.
7. Remove flow diversion and restore grades on gravel bar.
8. Complete finish grading at top of bank.
9. Seed, mulch, and plant (including stockpiled trees) disturbed surfaces.
10. Remove erosion controls and project demarcation flagging.

WATER CONTROL PLAN

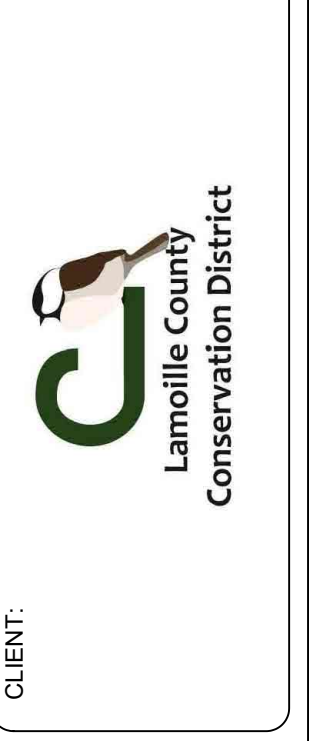
The work shall be completed in general accordance with this proposed construction sequence. Material deviations must be approved by the Engineer and may also require regulatory approval.

1. Install temporary channel access and channel ford where indicated on plans.
2. Excavate temporary diversion channel across gravel bar with sufficient depth to convey normal flow.
3. Use material excavated from temporary diversion to construct a temporary channel block to force flow into the diversion.
4. Once diversion of water is no longer required, remove the channel block and restore grades on the gravel bar to pre-project condition.
5. Restore grades and stabilize the channel access route.



REV. #	DESCRIPTION	DATE

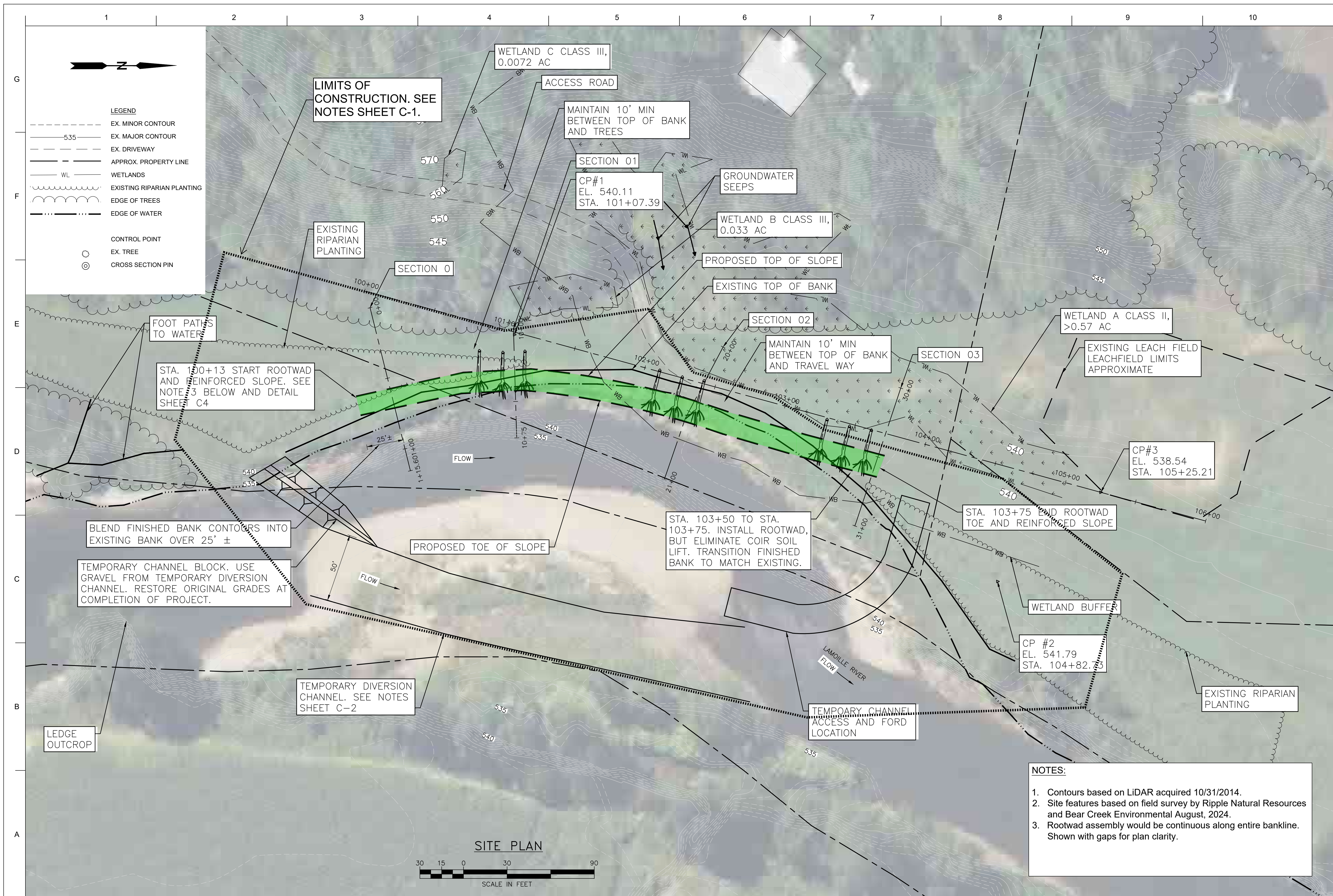
DESIGNED BY: MTM	DRAWN BY: MTM	CHECKED BY: MTM	DATE: 12/16/2024	RIPPLE PROJECT #: 2023001
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PROJECT & LOCATION:
FIRST BEND AT TEND BENDS, MORRISTOWN
BANK RESTORATION

SHEET TITLE:
BANK MOVEMENT PLAN AND
PROJECT NOTES

SHEET ID
C-2
3 of 5



LEGEND

---	EX. MINOR CONTOUR
- - - -	EX. MAJOR CONTOUR
---	EX. DRIVEWAY
- - - -	APPROX. PROPERTY LINE
WL	WETLANDS
~~~~~	EXISTING RIPARIAN PLANTING
~~~~~	EDGE OF TREES
~~~~~	EDGE OF WATER
○	CONTROL POINT
⊙	EX. TREE
⊙	CROSS SECTION PIN

LIMITS OF CONSTRUCTION. SEE NOTES SHEET C-1.

WETLAND C CLASS III, 0.0072 AC

MAINTAIN 10' MIN BETWEEN TOP OF BANK AND TREES

SECTION 01  
CP#1  
EL. 540.11  
STA. 101+07.39

GROUNDWATER SEEPS

WETLAND B CLASS III, 0.033 AC

PROPOSED TOP OF SLOPE

EXISTING TOP OF BANK

MAINTAIN 10' MIN BETWEEN TOP OF BANK AND TRAVEL WAY

SECTION 03

WETLAND A CLASS II, >0.57 AC

EXISTING LEACH FIELD LEACHFIELD LIMITS APPROXIMATE

CP#3  
EL. 538.54  
STA. 105+25.21

STA. 103+75 END ROOTWAD TOE AND REINFORCED SLOPE

STA. 103+50 TO STA. 103+75. INSTALL ROOTWAD, BUT ELIMINATE COIR SOIL LIFT. TRANSITION FINISHED BANK TO MATCH EXISTING.

CP #2  
EL. 541.79  
STA. 104+82.73

BLEND FINISHED BANK CONTOURS INTO EXISTING BANK OVER 25' ±

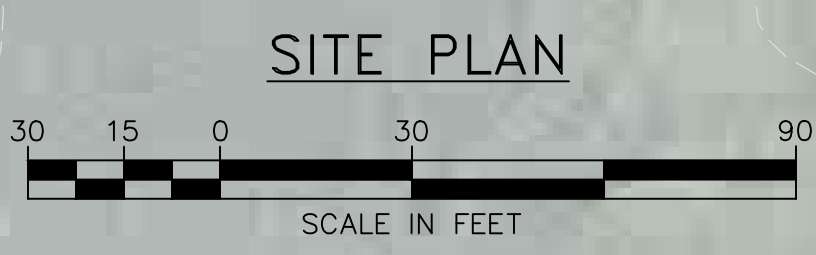
TEMPORARY CHANNEL BLOCK. USE GRAVEL FROM TEMPORARY DIVERSION CHANNEL. RESTORE ORIGINAL GRADES AT COMPLETION OF PROJECT.

TEMPORARY DIVERSION CHANNEL. SEE NOTES SHEET C-2

TEMPORARY CHANNEL ACCESS AND FORD LOCATION

LEDGE OUTCROP

- NOTES:**
1. Contours based on LiDAR acquired 10/31/2014.
  2. Site features based on field survey by Ripple Natural Resources and Bear Creek Environmental August, 2024.
  3. Rootwad assembly would be continuous along entire bankline. Shown with gaps for plan clarity.



**RIPPLE**  
Natural Resources LLC  
PO Box 292 • Randolph, VT 05060  
802.522.3473 • www.RippleNR.com

**Bear Creek Environmental**

DESIGNED BY:	MTM
DRAWN BY:	MTM
CHECKED BY:	MTM
DATE:	12/16/2024
RIPPLE PROJECT #:	2023001

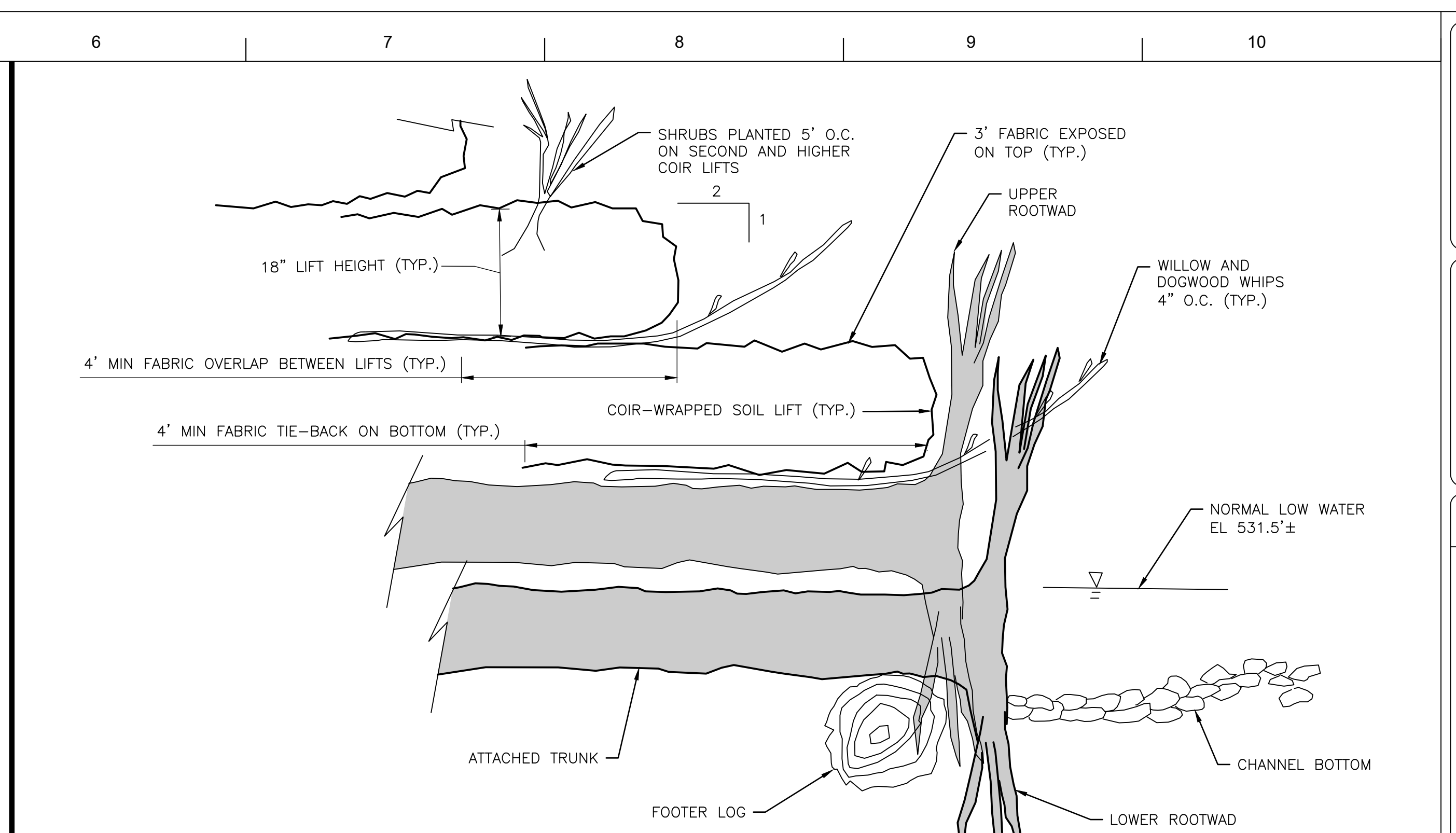
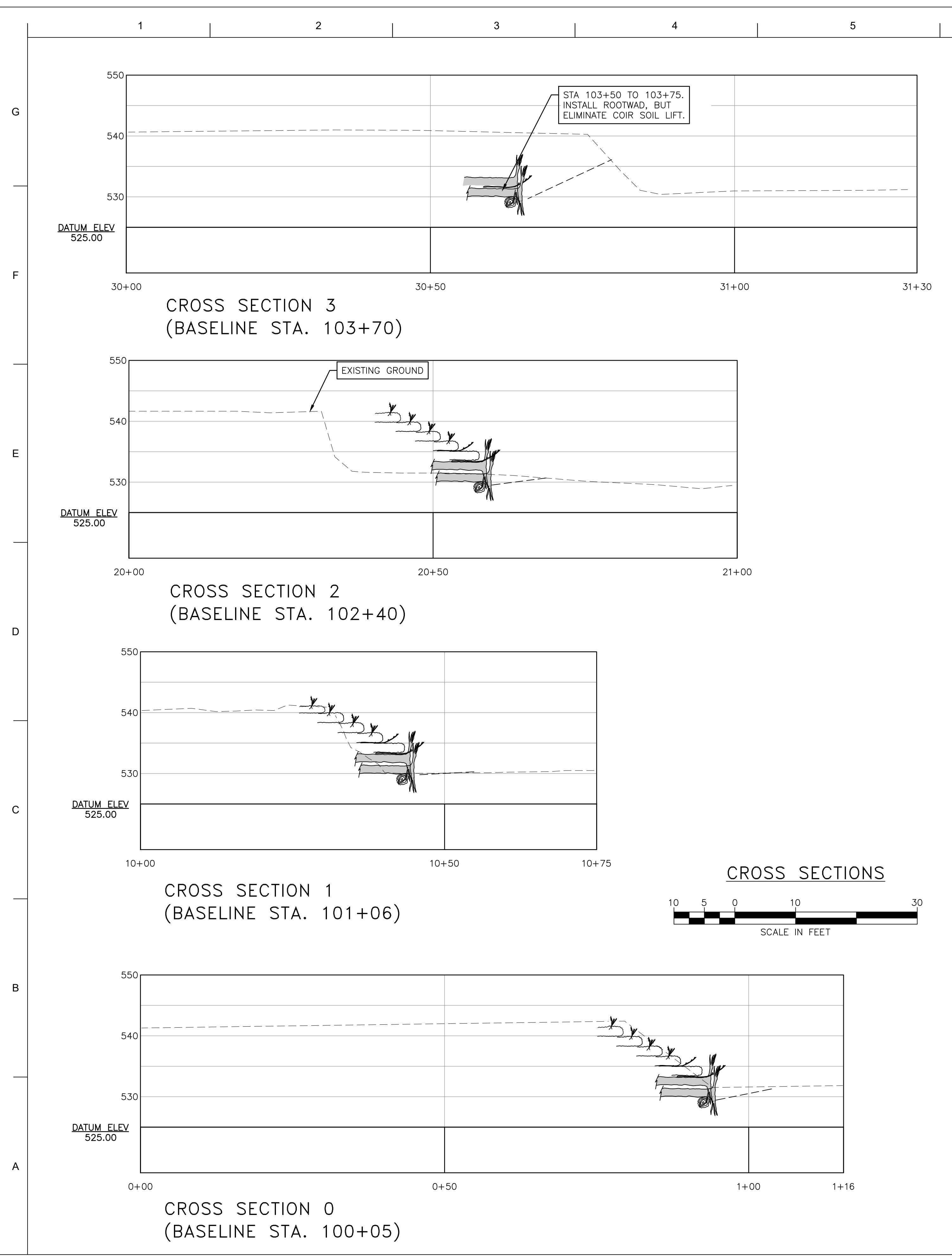
CLIENT: **Lamoille County Conservation District**

PROJECT & LOCATION: **FIRST BEND AT TEND BENDS, MORRISTOWN BANK RESTORATION**

SHEET TITLE: **SITE PLAN**

SHEET ID: **C-3**

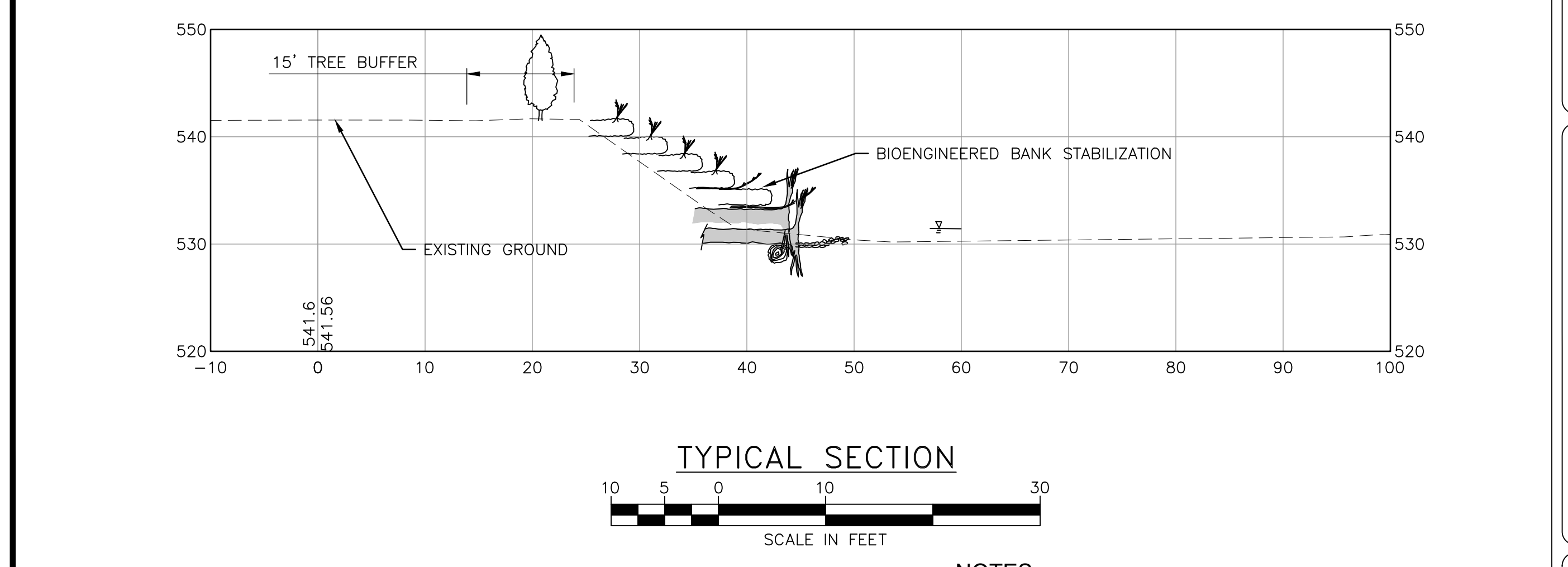
4 of 5



**Root Wad Specifications and Installation Procedure**

1. Trees for root wads shall be sufficiently sound to permit installation and backfill without crushing, splitting, or breaking the trunk.
2. Tree/root wad dimensions:
  - a. Root fan diameter: 5 ft min
  - b. Trunk length: 18 ft min
  - c. Trunk diameter: 16 in min
  - d. Footer log length: 12 ft min
  - e. Footer log diameter: 16 in min
3. Coir Specification: 900 g/sq m
4. Installation Procedure:
  - a. Install footer log in excavated trench parallel to channel just inside design bank line.
  - b. Excavate trench perpendicular to channel and place lower logs with root wad cantilevered over footer log, angled 30+/- deg so root fan faces upstream and subsequent fans can be tucked behind in a shingled fashion.
  - c. Place upper logs between lower logs.
  - d. Backfill the logs with onsite material to approximately top of logs.
  - e. Place willow cuttings per detail.
  - f. Construct coir-wrapped soil lifts per detail.

**BIOENGINEERED BANK STABILIZATION DETAIL**



- NOTES:**
1. Cross section surface based on field survey by Ripple Natural Resources and Bear Creek Environmental August 2024.

**RIPPLE**  
Natural Resources LLC  
PO Box 292 • Randolph, VT 05060  
802.522.3473 • www.RippleNR.com

**Bear Creek**  
Environmental

DESIGNED BY:	DATE
MTM	

REV. #	DESCRIPTION

DESIGNED BY:	DATE
MTM	12/16/2024

PROJECT & LOCATION:	SHEET TITLE:
FIRST BEND AT TEND BENDS, MORRISTOWN BANK RESTORATION	SECTIONS

CLIENT:	SHEET ID
Lamoille County Conservation District	C-4

5 of 5

**** CONSTRUCTION COST ESTIMATE ****

**First Bend at Ten Bends**

**Morristown, VT**

Based on December 2024 100% Plans

	DESCRIPTION OF THE ITEM	UNIT OF MEASURE	ESTIMATED QUANTITY	UNIT PRICE	ESTIMATED COST
1	Mob / Demob ( 10% ) of other costs (rounded)	LS	1	\$ 27,800	\$ 27,800
2	Site Access	LS	1	\$ 10,000	\$ 10,000
3	Erosion Control and Surface Restoration	LS	1	\$ 6,400	\$ 6,400
	<i>Erosion Prevention and Sediment Control</i>	LS	1	\$ 2,000	\$ 2,000
	<i>Seed, Mulch Disturbed Surfaces</i>	AC	1.00	\$ 3,000	\$ 3,000
	<i>Erosion Control Fabric</i>	SY	200	\$ 7	\$ 1,400
4	Water Diversion and Control	LS	1	\$ 10,000	\$ 10,000
5	Rootwad / Coir Lift Slope	TOT	1	\$ 158,275	\$ 158,275
	<i>Rootwads</i>	EA	145	\$ 1,000	\$ 144,800
	<i>Footer Logs</i>	EA	49	\$ 275	\$ 13,475
6	Coir Reinforced Bank	TOT	1	\$ 67,560	\$ 67,560
	<i>Equipment and Labor</i>	LS	1	\$ 40,600	\$ 40,600
	<i>Coir Fabric and Misc Materials</i>	LS	1	\$ 26,960	\$ 26,960
7	Plantings	TOT	1	\$ 19,609	\$ 19,609
	<i>Willow Cuttings in Coir Lifts (at time of construction)</i>	EA	2022	\$ 4	\$ 7,077
	<i>Willow Stakes on bar</i>	EA	277	\$ 9	\$ 2,493
	<i>Bare Root shrubs</i>	EA	145	\$ 11	\$ 1,593
	<i>Potted Shrubs</i>	EA	217	\$ 14	\$ 3,041
	<i>Potted Trees</i>	EA	14	\$ 28	\$ 405
	<i>Planning and Coordination</i>	LS	1	\$ 5,000	\$ 5,000
8	Transplanted Trees	EA	10	\$ 200	\$ 2,000
9	Misc Work Items	LS	1	\$ 4,000	\$ 4,000
	<i>Project layout</i>	LS	1	\$ 2,000	\$ 2,000
	<i>Other</i>	LS	1	\$ 2,000	\$ 2,000
<b>TOTAL</b>				<b>CONSTRUCTION TOTAL</b>	\$ 305,644
				ADD 10% CONTINGENCY	\$ 30,564
				SUB-TOTAL	\$ 336,208
				<b>USE</b>	<b>\$ 340,000</b>
<b>ENGINEERING, MANAGEMENT, and OVERSIGHT</b>					
10	Bid-Phase Engineering	LS	1	\$ 4,000	\$ 4,000
11	Bid/Construction Phase Engineering and Oversight	LS	1	\$ 20,000	\$ 20,000
				<b>ENGINEERING AND PERMITTING SUBTOTAL</b>	\$ 24,000
				ADD 10% CONTINGENCY	\$ 2,400
				SUB-TOTAL	\$ 26,400
				<b>USE</b>	<b>\$ 27,000</b>
Prepared: 12/17/2024				<b>CONSTRUCTION SUBTOTAL</b>	\$ 340,000
Printed: 12/17/2024				<b>ENGINEERING AND PERMITTING SUBTOTAL</b>	\$ 27,000
Prepared by: MTM				<b>TOTAL</b>	<b>\$ 367,000</b>

This estimate is our opinion of probable construction cost. Ripple has no control over the cost or availability of labor, equipment or materials, market conditions, or the Contractor's method of pricing, and we can make no warranty, express or implied, with respect to the accuracy of this cost estimate relative to actual costs. Actual costs will differ.