



FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

All sections must be addressed, or the application will be considered invalid



I. APPLICANT INFORMATION

A. Applicant Name: Big Blackfoot Chapter of Trout Unlimited

Mailing Address: PO Box 1

City: Ovando State: MT Zip: 59854

Telephone: 406-240-4824 E-mail: ryen@montanatu.org

B. Contact Person (if different than applicant): Ryen Neudecker

Address: Same as above

City: _____ State: _____ Zip: _____

Telephone: _____ E-mail: _____

C. Landowner and/or Lessee Name (if different than applicant): Brad Schaeffer & USFS Helena National Forest

Mailing Address: 551 10th Ln NE

City: Power State: MT Zip: 59468

Telephone: 406-788-9473 E-mail: schaef487@hotmail.com

II. PROJECT INFORMATION

A. Project Name: Poorman Creek Restoration Project Phase 3

River, stream, or lake: Poorman Creek

Location: Township: 13N Range: 8W Section: 17

Latitude: _____ Longitude: _____ *Within project (decimal degrees)*

County: Lewis and Clark County

B. Purpose of Project: *(high level, focus on why the project is important)*

The purpose of this project is to improve native trout habitat within an upper reach of Poorman Creek by restoring channel stability, aquatic habitat function, and riparian health while working in collaboration with several project partners and a private landowner who is committed to conservation in the Blackfoot River watershed.

- C. Brief Project Description (attach additional information to end of application). Please include the anticipated construction schedule:

Poorman Creek is a third order tributary to the upper Blackfoot River and flows 14 miles through a mix of USFS and private land. The stream supports populations of pure westslope cutthroat trout and bull trout, a species of special concern and a threatened species under the federal endangered species act. Poorman Creek is a high priority tributary as ranked in "An Integrated Stream Restoration and Native Fish Conservation Strategy for 182 streams in the Blackfoot Basin" and is listed as critical bull trout habitat. Poorman Creek has been the focus of several past projects funded through the Future Fisheries program, including fish passage, fish screening, stream restoration, placer mine restoration and water conservation. From the headwaters to the mouth of the upper Blackfoot River, Poorman Creek has been identified as an impaired waterbody by MTDEQ and is listed for the following impairments: alteration of streamside vegetation, metals, flow regime modifications, and sediment.

In the proposed project reach, historical watershed and land use disturbances, including placer mining are affecting the quality of aquatic and riparian habitat conditions. The stream suffers from entrenchment, lack of instream and riparian habitat, channel instability and chronic bank erosion. This project will restore a degraded reach of Poorman Creek and ensure connectivity with a functioning floodplain following natural channel design principles. Approximately 1,200 feet of channel will be restored through a variety of treatments including channel reconstruction or shaping, creating instream habitat through the creation of step pools, incorporating vegetated wood matrix and large woody debris structures. Tailings piles are proposed to be removed from the floodplain, allowing the channel to access its floodplain.

- Specific objectives include: reestablish floodplain connectivity and function; improve existing instream and riparian habitat for native trout by emulating reference reach conditions; correct chronic bank erosion issues and restore a self-maintaining stream system based on natural channel design principles and standards.

- D. What was the cause of habitat degradation and how will the project correct the cause?

Historic mining, channel manipulations and streamside vegetation removal have contributed to the bank erosion issues. The project design will restore the channel dimensions, pattern and profile along with implementing a riparian habitat restoration component to rectify the specific issues and their causes.

- E. Length of stream or size of lake that will be treated (project extent): 1,200
 Length/size of impact, if larger than project extent (e.g., stream miles opened): _____

- F. Project Budget Summary:

Grant Request (Dollars):	\$ 33,000
Matching Dollars:	\$ 65,000
Matching In-Kind Services:*	\$ 4,124.61

**salaries of government employees are not considered matching contributions*

Other Contributions (not used as match) \$ _____

Total Project Cost: \$ 107,124.61

- G. Attach itemized (line item) budget – see *budget template*

- H. Attach project location map(s) that include:

- Extent of the project, including context (relation to major landmark or town)
- Indication of public and private property
- Riparian buffer locations and widths (if applicable) and grazing locations

I. Attach project plans:

- Detailed sketches or plan views with the location and proposed restoration
- Pre-project photographs (GPS location strongly recommended)
- If water leasing or water salvage is involved, attach a supplemental questionnaire (<https://myfwp.mt.gov/getRepositoryFile?objectID=36110>)

J. Attach support letters or statements of (e.g., landowner consent, community or public support). For FWP statement, attach provided template. List any other project partners:

Project partners include: Private Landowner, MTFWP, USFWS, USFS & BLM

III. MAINTENANCE AND MONITORING (attach additional information to end of application):

- A. A 20-year maintenance commitment is required*. Please confirm that you will ensure this protection and describe your approach. Attach any relevant maintenance plans. Yes No
**If it is a water leasing project, describe the length of the agreement.*

The landowner has committed to signing a 20-year maintenance commitment agreement.

- B. Will grazing be part of or adjacent to the project? If so, describe or attach land management plans, including short term and long term grazing regimes. If the landowner is not the applicant, please describe their involvement in the project. *If you want assistance with grazing plan development, note your need.*

Grazing is not a component of this project reach.

- C. Will the project be monitored to determine if goals were met? If so, what are the short-term and long-term plans to assess benefits and lessons learned? Were pre-project data collected? Will monitoring information be shared with FWP?

The monitoring plan will include pre- and post-project data including: photo points, as-built channel data, revegetation survival surveys, bank erosion hazard index data and upstream and downstream FWP surveys. We will assess the project post-project to ensure that our project objectives are being met and if they are not, we will follow up appropriately.

IV. PROJECT BENEFITS (attach additional information to end of application):

- A. What species of fish will benefit from this project?

Westslope cutthroat trout, bull trout, and brown trout.

- B. How will the project protect or enhance wild fish habitat?

Wild trout populations in the Blackfoot River require cold, clean, complex and connected habitat. This project will improve instream habitat by reducing sedimentation, increasing pool complexity, and promoting a self-maintaining channel that will function hydrologically and be connected to a floodplain with a healthy riparian area. Addressing the chronic bank erosion issues through this reach will be important to improve water quality conditions.

- C. What is the expected improvement to fish populations, both short term and long term? How might the project translate to angler success?

This project is intended to address habitat issues affecting native trout populations. The design approach is to mimic natural channel conditions that will allow the stream to be self-maintaining and build long term resilience.

- D. Will the project increase public fishing opportunity for wild fish and, if so, how? Is public fishing allowed onsite? Is it allowed by permission? If not, describe how the public would benefit.

Yes: Public access is available upstream and downstream of the project reach as it is bordered on both ends by USFS land.

- E. Aside from angling, what local or large-scale public benefits will be realized from this project?

This project involves the continuation of the Blackfoot River Restoration program and the restoration of a native westslope cutthroat and bull trout stream. Public benefits include: 1) expanding suitable habitat conditions for pure fluvial westslope cutthroat trout and fluvial bull trout populations, 2) improved water quality (temperature) on-site and downstream, and 3) contribute to the recovery of westslope cutthroat trout.

Additionally, the Bull Trout Conservation Strategy lists the Poorman drainage as an important population that contributes to Blackfoot core bull trout population; the strategy identifies the main factor limiting recovery of bull trout as the lack of high-quality tributaries throughout the watershed. This project, in conjunction with the cumulative effects of other projects in the drainage, will benefit bull trout and work towards stability and recovery of the core population, which is in the public's interest. Overall, this project is expected to increase trout abundance, which will enhance the public's opportunity to enjoy quality angling experiences in the upper Blackfoot River watershed. The project will also support local economies contributing to the cold-water fishery of the Blackfoot River and will involve local contractors and consultants.

- F. Will the project interfere with water or property rights of adjacent landowners? (explain):

No.

- G. Will the project result in the development of commercial recreational use on the site (including paid access)? Explain:

No.

- H. Is this project associated with the reclamation of past mining activity?

Yes, the abandoned tailings piles that are adjacent to the project are impacting stream function.

Each approved project applicant must enter into a written agreement with Montana Fish, Wildlife & Parks specifying terms and duration of the project. The applicant must obtain all applicable permits prior to project construction. A competitive bid process must be followed when using State funds.

V. AUTHORIZING STATEMENT

I (we) hereby declare that the information and all statements to this application are true, complete, and accurate to the best of my (our) knowledge and that the project or activity complies with rules of the Future Fisheries Improvement Program.

Applicant Signature: 

Date: 11/14/2024

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Both tables MUST be completed appropriately or the application will be invalid. Please see the example budget sheet for clarification.

PROJECT COSTS					GRANT REQUEST AND FUNDING			
Work Items (Itemize by Category)	Number of Units	Unit Description*	Cost/Unit	Total Cost	FUTURE FISHERIES REQUEST	Matching Contributions (Cash or In- Kind)***	Other Contributions (Funds not used as match)	Total Funding
<i>*Units = feet, hours, cubic yards, etc. Do not use lump sum unless necessary.</i>								
Personnel								
Survey	25	hrs	\$155.00	\$ 3,875.00		3,875.00		\$ 3,875.00
Design	78	hrs	\$155.00	\$ 12,090.00		12,090.00		\$ 12,090.00
Engineering	23	hrs	\$155.00	\$ 3,565.00		3,565.00		\$ 3,565.00
Permitting	44	hrs	\$48.00	\$ 2,112.00		2,112.00		\$ 2,112.00
Oversight	43	hrs	\$165.00	\$ 7,095.00	2,000.00	5,095.00		\$ 7,095.00
Project Mgmt	84	hrs	\$48.00	\$ 4,032.00		4,032.00		\$ 4,032.00
			Sub-Total	\$ 32,769.00	\$ 2,000.00	\$ 30,769.00	\$ -	\$ 32,769.00
Travel								
Mileage	1683	miles	\$0.67	\$ 1,127.61		1,127.61		\$ 1,127.61
Per diem				\$ -				\$ -
			Sub-Total	\$ 1,127.61		\$ 1,127.61	\$ -	\$ 1,127.61
Construction Materials								
Pulp Wood	4	loads	\$2,000.00	\$ 8,000.00	5,000.00	3,000.00		\$ 8,000.00
Gravel	80	CY	\$15.00	\$ 1,200.00		1,200.00		\$ 1,200.00
Transplants	25	Ea	\$100.00	\$ 2,500.00		2,500.00		\$ 2,500.00
Willows	2940	Ea	\$1.50	\$ 4,410.00	1,000.00	3,410.00		\$ 4,410.00
			Sub-Total	\$ 16,110.00	\$ 6,000.00	\$ 10,110.00	\$ -	\$ 16,110.00
Equipment, Labor, and Mobilization								
Develop access roads/staging areas	1	LS	\$3,000.00	\$ 3,000.00		3,000.00		\$ 3,000.00
Water mgmt and diversion	1	LF	\$5,000.00	\$ 5,000.00	1,000.00	4,000.00		\$ 5,000.00
Salvage and transplant shrubs	25	EA	\$100.00	\$ 2,500.00	1,500.00	1,000.00		\$ 2,500.00
Furnish streambed/streambank gravel	110	CY	\$6.00	\$ 660.00		660.00		\$ 660.00
Construct VWM Type 2 bank treatments	129	LF	\$40.00	\$ 5,160.00	2,000.00	3,160.00		\$ 5,160.00
Tailings removal and floodplain grading	1131	CY	\$8.00	\$ 9,048.00	6,000.00	3,048.00		\$ 9,048.00

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Construct channel streambed	125	LF	\$50.00	\$ 6,250.00	3,000.00	3,250.00		\$ 6,250.00
Install large wood structures	4	EA	\$1,750.00	\$ 7,000.00	4,000.00	3,000.00		\$ 7,000.00
Install willow brush trenches	200	LF	\$5.00	\$ 1,000.00	1,000.00	-		\$ 1,000.00
Install floodplain roughness	1	EA	\$1,500.00	\$ 1,500.00	500.00	1,000.00		\$ 1,500.00
Install channel step pools	3	EA	\$2,000.00	\$ 6,000.00	6,000.00	-		\$ 6,000.00
Mobilization & GPS Set Up	1	LS	\$10,000.00	\$ 10,000.00	5,000.00	5,000.00		\$ 10,000.00
			Sub-Total	\$ 57,118.00	\$ 25,000.00	\$ 27,118.00	\$ -	\$ 57,118.00
OVERALL TOTALS				\$ 107,124.61	\$ 33,000.00	\$ 69,124.61	\$ -	\$ 107,124.61

OTHER REQUIREMENTS:

**For projects that include a maintenance request, it cannot exceed 10% of the total project cost.

***Match can include in-kind materials or labor. Justification for in-kind labor (e.g. hourly rates used) can be noted below. Do not use government salaries as match.

Additional budget detail:

APPLICATION MATCHING CONTRIBUTIONS

Total should equal match listed above; do not include requested funds

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
USFWS Partners Program	\$ -	\$ 25,000.00	\$ 25,000.00	Yes
USFS Helena National Forest	\$ -	\$ 20,000.00	\$ 20,000.00	Yes
BLM	\$ -	\$ 20,000.00	\$ 20,000.00	Yes
BBCTU	\$ 4,124.61		\$ 4,124.61	Yes
	\$ -	\$ -	\$ -	
TOTALS	\$ 4,124.61	\$ 65,000.00	\$ 69,124.61	

OTHER CONTRIBUTIONS

Total should equal other contributions listed above; these are funds not specically matched to the Future Fisheries application

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
	\$ -	\$ -	\$ -	



Photos depicting the existing conditions on Poorman Creek Phase 3

MONTANA FISH, WILDLIFE & PARKS

Future Fisheries Improvement Program

Appendix: FWP Statement

Project Title: **Poorman Creek Phase 3**

Please describe the potential impact of the project, including the priorities of the Fisheries Division and the importance to Montana's anglers.

Poorman Creek supports a mixed fishery of westslope cutthroat trout, brown trout, brook trout, and bull trout. Poorman Creek is one of the highest priority tributaries in the upper Blackfoot River basin because of its significant native species value and its importance as a source of trout recruitment to the mainstem river. The Phase 3 project reach has been simplified and lacks high-quality pools characteristic of reference conditions elsewhere in the stream. This area has been heavily impacted by past land use that has contributed to a limited riparian corridor and excessive erosion. The project design will be developed to directly address these issues.

Brown trout and westslope cutthroat trout are the primary species inhabiting the project section. However, bull trout migrate to and from spawning areas in upper Poorman Creek and use this area for seasonal rearing opportunities and adult holding habitat. The project is expected to directly benefit the fishery through improved spawning conditions for westslope cutthroat trout and brown trout, and improved rearing and foraging opportunities for all trout species. Moreover, it will improve overall stream health by establishing proper channel morphology and improving riparian conditions. Implementation of the Phase 3 project is expected to increase trout abundance and enhance fishing opportunities within Poorman Creek while also increasing trout recruitment to the Blackfoot River. This restoration effort will complement recently completed projects in Poorman Creek and contribute to FWP's fisheries management objectives in the upper Blackfoot River watershed.

Name of FWP Biologist Patrick Uthe Date: 11/8/24

Please attach to the FFIP application and materials and submit according to listed deadlines.

POORMAN CREEK CONCEPTUAL RESTORATION PLAN

PROJECT DESCRIPTION

BIG BLACKFOOT CHAPTER OF TROUT UNLIMITED (BBCTU) IN PARTNERSHIP WITH THE HELENA-LEWIS AND CLARK NATIONAL FOREST (USFS), AND MONTANA FISH, WILDLIFE & PARKS, AND PRIVATE LANDOWNERS, HAVE INITIATED A COMPREHENSIVE WATERSHED RESTORATION PROGRAM ON POORMAN CREEK, A TRIBUTARY TO THE BLACKFOOT RIVER LOCATED SOUTH OF LINCOLN IN LEWIS AND CLARK COUNTY, MONTANA. OVER THE PAST DECADE, RESTORATION EFFORTS HAVE FOCUSED ON RESTORING INSTREAM HABITAT FOR NATIVE POPULATIONS OF BULL TROUT, A THREATENED SPECIES UNDER THE ENDANGERED SPECIES ACT, AND WESTSLOPE CUTTHROAT TROUT, A MONTANA SPECIES OF SPECIAL CONCERN. HISTORICAL LAND USE DISTURBANCES INCLUDING PLACER MINING, CHANNELIZATION, DEWATERING, GRAZING, RIPARIAN VEGETATION REMOVAL, AND UNDERSIZED BRIDGES AND CULVERTS HAVE RESULTED IN FRAGMENTED AND IMPAIRED AQUATIC HABITAT CONDITIONS AND ALTERED STREAM CHANNEL FORM AND FUNCTION.

FROM THE HEADWATERS TO THE MOUTH OF THE UPPER BLACKFOOT RIVER, POORMAN CREEK IS LISTED AS AN IMPAIRED WATERBODY BY THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (MDEQ 2018). THE STREAM IS CLASSIFIED AS A B-1 WATERBODY AND IS CONSIDERED NOT FULLY SUPPORTING OF AQUATIC LIFE. REPORTED CAUSES OF IMPAIRMENT INCLUDE: 1) ALTERNATION IN STREAMSIDE VEGETATION; 2) COPPER, CADMIUM AND LEAD; 3) FLOW REGIME MODIFICATIONS; AND 4) SEDIMENTATION / SILTATION. PROBABLE POLLUTANT SOURCES INCLUDE FOREST ROADS, IMPACTS FROM ABANDONED MINES, SILVICULTURAL ACTIVITIES, WATER DIVERSIONS, AND NATURAL SOURCES.

THIS CONCEPTUAL RESTORATION ADDRESSES IMPAIRED CONDITIONS ON A 0.25-MILE REACH OF POORMAN CREEK LOCATED ON PRIVATE LAND IN THE MIDDLE WATERSHED. HISTORICAL PLACER MINING ACTIVITIES COMBINED WITH REMOVAL OF STREAMSIDE VEGETATION, CHANNELIZATION, AND REMOVAL OF RIPARIAN VEGETATION HAVE RESULTED IN DEGRADED SPAWNING, REARING, AND OVERWINTERING HABITAT FOR NATIVE FISH. THIS CONCEPTUAL RESTORATION PLAN FOCUSES ON RESTORING THE APPROPRIATE DIMENSION, PATTERN, AND PROFILE OF POORMAN CREEK, EXPANDING FLOODPLAIN SURFACES THROUGH REMOVAL OF HISTORICAL PLACER TAILINGS, AND INCREASING THE QUALITY AND DISTRIBUTION OF COMPLEX AQUATIC HABITAT FEATURES INCLUDING RIFFLES, POOLS.

STANDARD NOTES

1. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS IN THE FIELD PRIOR TO CONSTRUCTION. IF NECESSARY, ADJUSTMENTS TO THE DRAWINGS WILL BE MADE AS DIRECTED BY THE ENGINEER.
2. TOPOGRAPHY SHOWN ON THE DRAWINGS IS BASED ON MERGED LIDAR AND BATHYMETRIC SURVEY DATA. BATHYMETRIC SURVEY WORK PERFORMED IN OCTOBER 2024 BY RDG USING SURVEY GRADE GPS. AERIAL LIDAR DATA WERE COLLECTED IN OCTOBER 2023 BY USGS.
3. UTILITIES IDENTIFIED ON THE DRAWINGS ARE APPROXIMATE AND DO NOT REPRESENT ABSOLUTE HORIZONTAL AND VERTICAL LOCATIONS. THE CONTRACTOR SHALL COORDINATE WITH THE APPROPRIATE UTILITY LOCATE SERVICE PRIOR TO CONSTRUCTION TO IDENTIFY UTILITY LOCATIONS.
4. THE OWNER WILL PROVIDE COPIES OF APPLICABLE PERMITS REQUIRED TO PERFORM THE WORK PRIOR TO THE START OF CONSTRUCTION.
5. THE CONTRACTOR SHALL COMPLY WITH ALL SAFETY REQUIREMENTS DESCRIBED IN THE CONTRACT DOCUMENTS.
6. THE CONTRACTOR SHALL PROTECT ALL TREES AND LAND AREAS NOT LOCATED WITHIN THE PROJECT CONSTRUCTION, STAGING OR CONSTRUCTION LIMITS. EXERCISE CARE IN AREAS NOT MARKED TO AVOID DAMAGE TO EXISTING VEGETATION.
7. THE ENGINEER WILL PROVIDE SURVEY CONTROL AND GRADING SURFACES FOR EQUIPMENT WITH GPS MACHINE CONTROL CAPABILITY. THE CONTRACTOR SHALL PROVIDE SURVEY STAKING AND LAYOUT FOR CONSTRUCTION.
8. VERTICAL TOLERANCE FOR CONSTRUCTION COMPLIANCE WILL BE 0.3 FEET. HORIZONTAL TOLERANCE WILL BE 1.0 FEET.
9. THE CONTRACTOR SHALL CONFIRM QUANTITIES SHOWN ON THE DRAWINGS AND FOR OWNER-SUPPLIED MATERIALS.
10. EARTHWORK QUANTITIES REPORTED ON THE DRAWINGS ARE NEAT LINE QUANTITIES CALCULATED FROM THE DIFFERENCE BETWEEN THE FINISHED GROUND SURFACE AND EXISTING GROUND SURFACE.
11. THE VOLUME OF MATERIAL REQUIRED FOR FILL SURFACES MAY VARY DEPENDING ON COMPACTION AND MOISTURE CONTENT.
12. EARTHWORK QUANTITIES DO NOT INCLUDE SUBGRADE EXCAVATION QUANTITIES UNLESS NOTED OTHERWISE.
13. SLOPES DESIGNATED AS 2:1, 1.5:1, ETC., ARE THE RATIOS OF HORIZONTAL DISTANCE TO VERTICAL DISTANCE.
14. DIMENSIONS ARE GIVEN IN FEET AND TENTHS OF A FOOT.
15. EXCAVATION, TRENCHING, SHORING, AND SHIELDING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR PERFORMING THE WORK. THESE DRAWINGS ARE NOT INTENDED TO PROVIDE MEANS OR METHODS OF CONSTRUCTION.

REUSE OF DRAWINGS

THESE DRAWINGS, THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, ARE THE PROPERTY OF RIVER DESIGN GROUP, INC. (RDG) AND ARE NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF RDG. LIKEWISE, THESE DRAWINGS MAY NOT BE ALTERED OR MODIFIED WITHOUT AUTHORIZATION OF RDG. DRAWING DUPLICATION IS ALLOWED IF THE ORIGINAL CONTENT IS NOT MODIFIED.

NOT FOR CONSTRUCTION

PROJECT PARTNERS



BIG BLACKFOOT CHAPTER OF TROUT UNLIMITED
PO BOX 1
OVANDO, MONTANA 59854



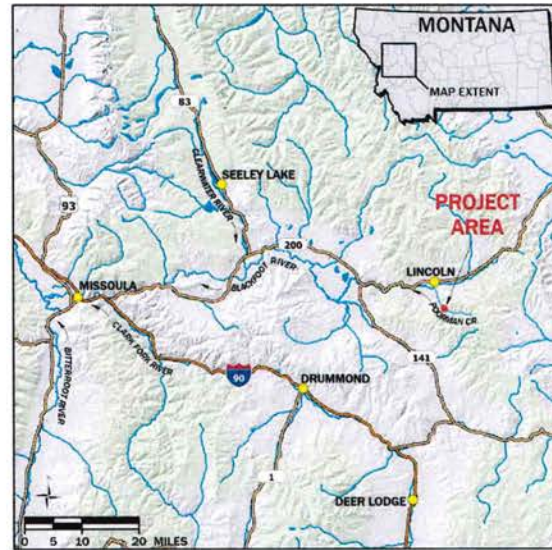
MONTANA FISH, WILDLIFE & PARKS
1420 EAST SIXTH AVENUE
PO BOX 200701
HELENA, MONTANA



HELENA-LEWIS AND CLARK NATIONAL FOREST
LINCOLN RANGER DISTRICT
1569 HIGHWAY 200
LINCOLN, MONTANA 59639

BRAD AND SHELLEE SCHAEFFER, LANDOWNERS
2333 STEMPLE PASS ROAD
LINCOLN, MONTANA 59639

POORMAN CREEK VICINITY MAP



LEGAL DESCRIPTION: S17, T13N, R8W,
LEWIS AND CLARK COUNTY, MONTANA

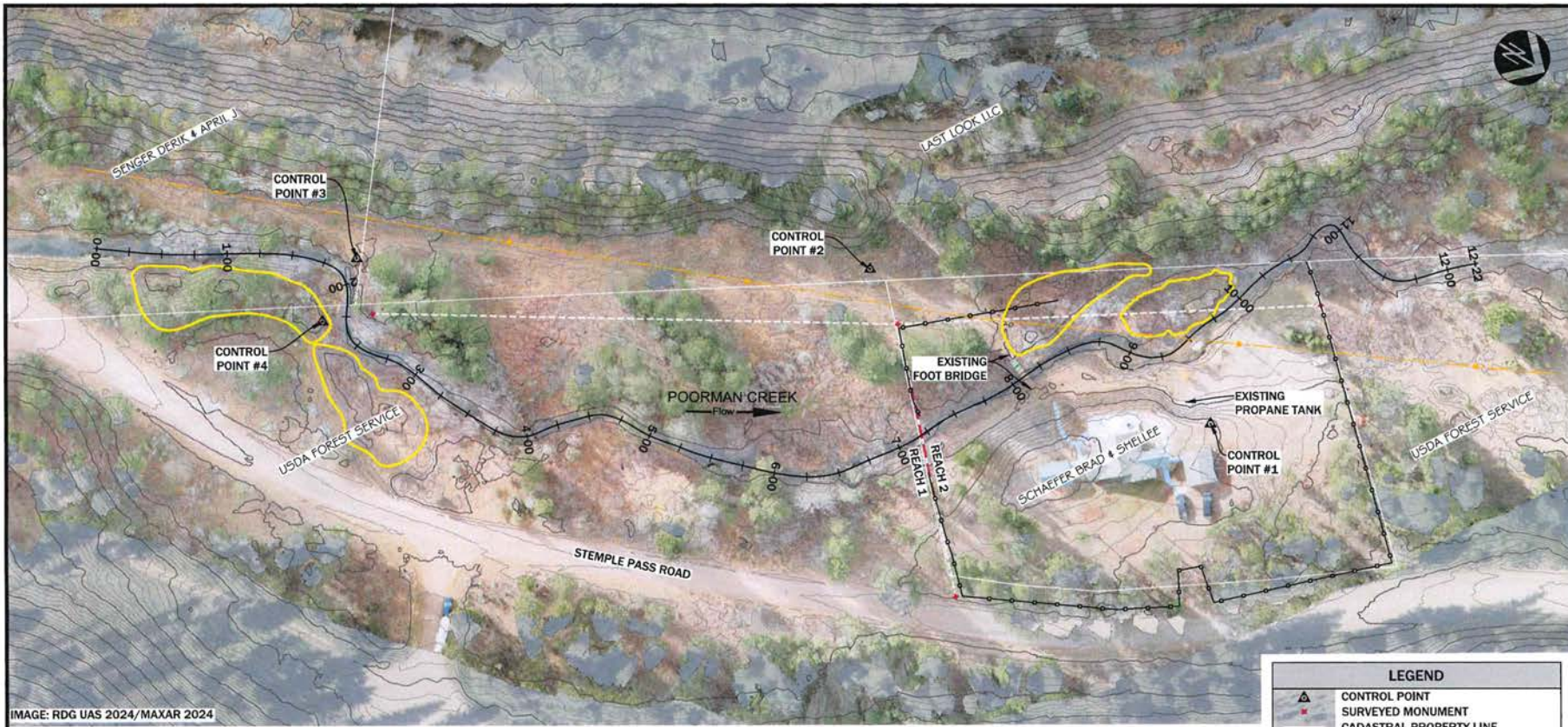
DRAWING INDEX

1.0 COVER SHEET AND NOTES	5.1 VEGETATED WOOD MATRIX TYPE 1 DETAIL
2.0 EXISTING CONDITIONS	5.2 VEGETATED WOOD MATRIX TYPE 2 DETAIL
2.1 RELATIVE ELEVATION MODEL	5.3 CONSTRUCTED CHANNEL STREAMBED DETAIL
3.0 PLAN VIEW INDEX	5.4 FLOODPLAIN TREATMENT DETAILS
3.1 MATERIALS AND QUANTITIES	5.5 LOG STEP POOL DETAIL
4.0 REACH 1 PLAN AND PROFILE	5.6 DESIGN CROSS SECTIONS
4.1 REACH 2 PLAN AND PROFILE	
5.0 LARGE WOOD STRUCTURE DETAIL	



COVER PAGES AND NOTES
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
1	11/14/24	LJ	Conceptual Design	JM
PROJECT NUMBER 00094290-001-CRB				
DRAWING NUMBER 1.0				
Drawing 1 of 14				



1 EXISTING CONDITIONS PLAN VIEW

EXISTING CONDITIONS

IN THE PROJECT AREA, POORMAN CREEK IS CLASSIFIED AS AN ENTRENCHED AND CONFINED, GRAVEL DOMINATED F4 STREAM TYPE TRANSITIONING TO A MODERATELY ENTRENCHED AND SEMI-CONFINED B4 STREAM TYPE. RESIDENTIAL DEVELOPMENT AND HISTORICAL PLACER MINING ACTIVITIES HAVE RESULTED IN A HIGHLY SIMPLIFIED CHANNEL DOMINATED BY RIFFLE HABITAT UNITS. POOL HABITAT IS LIMITED THROUGHOUT THE REACH, PARTICULARLY IN THE LOWER REACH ON PRIVATE LAND WHERE VEGETATION CONVERSION HAS DECREASED COARSE WOOD RECRUITMENT TO THE CHANNEL. DREDGE PILES AND LEGACY MINING IMPACTS LATERALLY CONFINE THE CHANNEL TO A NARROW CORRIDOR RESULTING IN FLOODPLAIN DISCONNECTION AND A HIGH ENERGY FLUVIAL ENVIRONMENT THAT HAS FORCED CHANNEL INCISION AND BANK AND TERRACE EROSION THROUGHOUT THE LOWER REACH ON PRIVATE LAND.

LIMITING FACTORS

- THE CONSTRAINTS AND LIMITING FACTORS IDENTIFIED DURING RAPID GEOMORPHIC ASSESSMENT INCLUDE:
- HIGH CHANNEL ENTRENCHMENT AND DISCONNECTED FLOODPLAIN SURFACES.
 - MODERATE TO VERY HIGH BANK ERODIBILITY CONDITIONS IN THE LOWER REACH RESULTING IN ELEVATED SEDIMENT LOADING TO POORMAN CREEK.
 - LACK OF WOODY RIPARIAN SHRUBS, STREAM COVER, AND POOL HABITAT IN THE LOWER REACH WHERE THE CHANNEL IS CONFINED BY PLACER TAILINGS AND RESIDENTIAL DEVELOPMENT.
 - AN EXISTING PEDESTRIAN FOOTBRIDGE, UTILITY CORRIDOR AND RESIDENTIAL HOMESITE ON THE NORTH SIDE OF THE VALLEY LIMIT OPPORTUNITIES TO FULL EXPAND THE FLOODPLAIN TO PRE-DISTURBANCE CONDITIONS AND MORPHOLOGY.

PROJECT DATUM	
THE PROJECT COORDINATES ARE BASED ON THE FOLLOWING:	
HORIZONTAL PROJECTION:	MONTANA STATE PLANE FIPS 2500
UNITS:	INTERNATIONAL FEET
HORIZONTAL DATUM:	NAD83 2011
VERTICAL DATUM:	NAVD88 (GEOID 18)
TOPOGRAPHY AND CROSS SECTION GROUND LINES ARE BASED ON SURVEY WORK PERFORMED BY RDG IN OCTOBER 2024. LIDAR DATA WAS CREATED IN 2023 AND COMBINED BY RDG.	

CONTROL POINT TABLE				
POINT NUMBER	NORTHING	EASTING	POINT ELEVATION	RAW DESCRIPTION
1	977890.110'	1183427.826'	4790.609'	5/8" REBAR WITH A 2" ALUMINUM CAP MARKED "RDG"
2	977608.390'	1183479.299'	4785.382'	5/8" REBAR WITH A 2" ALUMINUM CAP MARKED "RDG"
3	977281.725'	1183698.006'	4790.129'	5/8" REBAR WITH A 2" ALUMINUM CAP MARKED "RDG"
4	977288.019'	1183752.963'	4789.906'	5/8" REBAR WITH A 2" ALUMINUM CAP MARKED "RDG"

RDG
 236 Wisconsin Avenue
 Lincoln, NE 68502
 402.465.4877

RDG
 A DIVISION OF
SWCA
 311 SW Jefferson Avenue
 Corvallis, OR 97331
 541.726.2920

EXISTING CONDITIONS
 POORMAN CREEK CONCEPTUAL RESTORATION PLAN
 LINCOLN, MONTANA

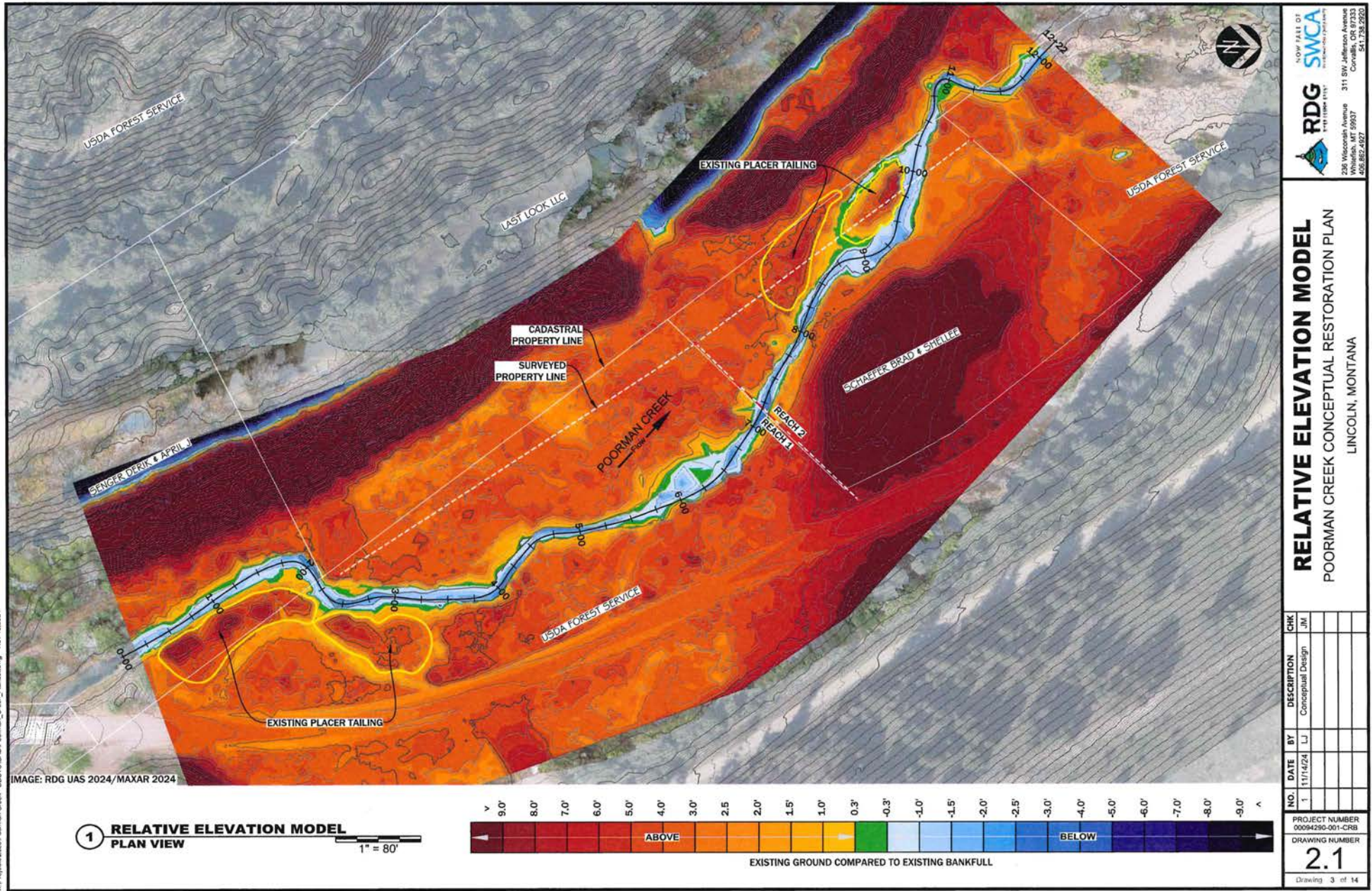
NO.	DATE	BY	DESCRIPTION
1	11/14/24	JM	Conceptual Design

PROJECT NUMBER
00094290-001-CRB

DRAWING NUMBER
2.0

Drawing 2 of 14

M:\Projects\2025\Poorman Creek - SBCT\CAD\Poorman_Creek_Plans.dwg Nov 13, 2024



1 RELATIVE ELEVATION MODEL
PLAN VIEW

1" = 80'



LOW FALL DT
SWCA
SOUTH WEST CREEK ASSOCIATION

RDG
RIVER DESIGN GROUP
P.L.L.C.

311 SW Jefferson Avenue
Lincoln, NE 68507
402.862.4827
531.738.2920

RELATIVE ELEVATION MODEL
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
1	11/14/24	LJ	Conceptual Design	JM

PROJECT NUMBER
00094290-001-CRB

DRAWING NUMBER
2.1

Drawing 3 of 14

M:\Projects\2025\Poorman Creek - BBCT\CAD\Poorman_Creek_Plans.dwg Nov 13, 2024
IMAGE: RDG UAS 2024/MAXAR 2024

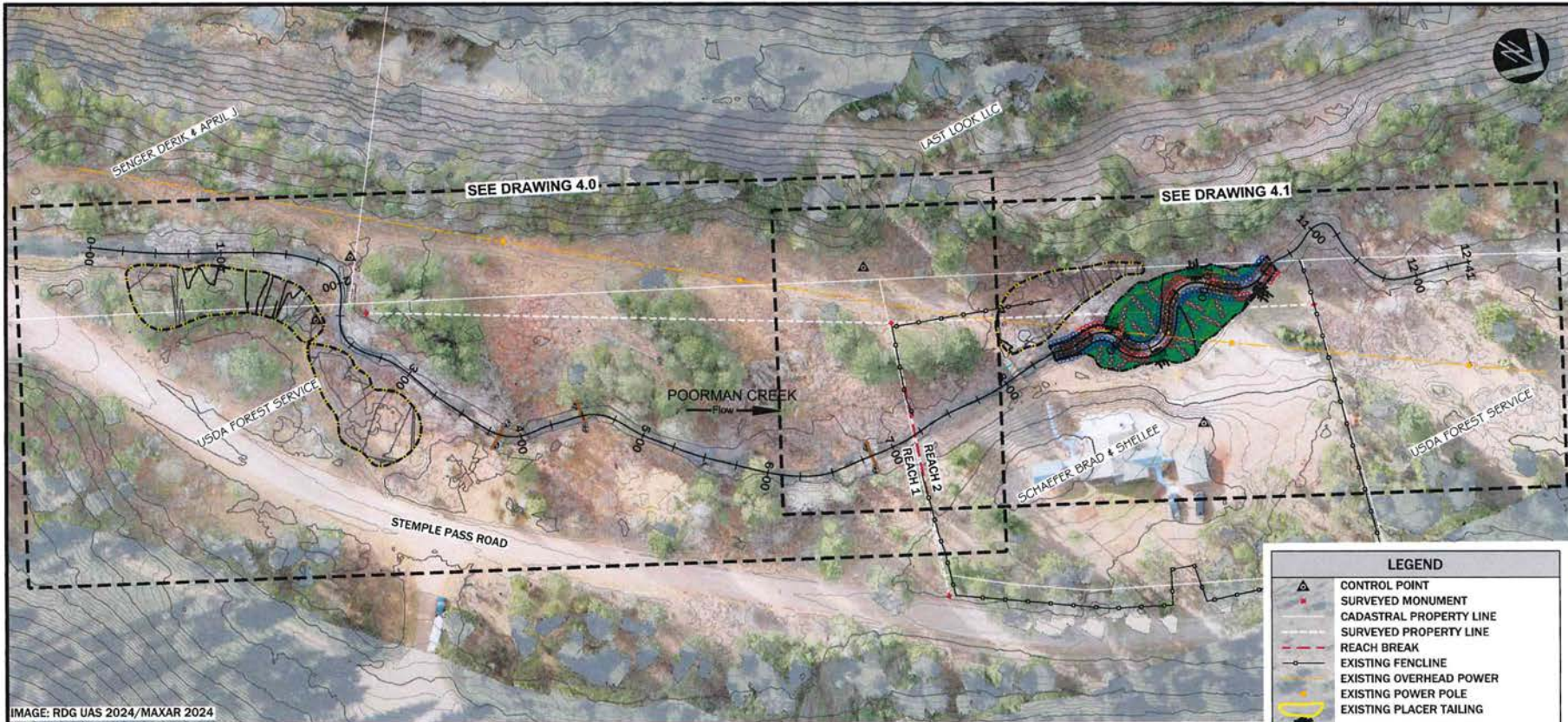
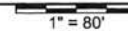


IMAGE: RDG UAS 2024/MAXAR 2024

**1 PLAN VIEW INDEX
PLAN VIEW**



LEGEND	
	CONTROL POINT
	SURVEYED MONUMENT
	CADASTRAL PROPERTY LINE
	SURVEYED PROPERTY LINE
	REACH BREAK
	EXISTING FENCLINE
	EXISTING OVERHEAD POWER
	EXISTING POWER POLE
	EXISTING PLACER TAILING
	LARGE WOOD STRUCTURE
	VEGETATED WOOD MATRIX TYPE 1
	VEGETATED WOOD MATRIX TYPE 2
	CONSTRUCTED CHANNEL STREAMBED
	FLOODPLAIN ROUGHNESS
	WILLOW TRENCH
	LOG STEP POOL

RESTORATION TREATMENTS AND OBJECTIVES

THE CONCEPTUAL RESTORATION PLAN PRIORITIZES REMOVAL OF HISTORICAL TAILINGS PILES IN REACH 1 AND REACH 2, AND RE-ESTABLISHING APPROPRIATE CHANNEL CROSS-SECTION, PLAN FORM, AND LONGITUDINAL PROFILE DIMENSIONS IN REACH 2. TAILINGS REMOVAL IN REACH 2 WILL INCREASE FLOODPLAIN CONNECTIVITY AND PROVIDE OPPORTUNITIES TO INCREASE CHANNEL AMPLITUDE AND MEANDER PATTERN, CONSISTENT WITH THE VALLEY FORM. EXISTING CONSTRAINTS INFORMED THE RESTORATION DESIGN AND MINIMIZED IMPACTS TO PRIVATE INFRASTRUCTURE. SPECIFICALLY, THE FOLLOWING GUIDELINES WERE USED IN DEVELOPING THE CONCEPTUAL RESTORATION PLAN:

REACH 1 (USFS PROPERTY)

- REMOVE HISTORICAL TAILINGS PILES TO EXISTING TERRACE ELEVATIONS.
- INCREASE POOL HABITAT FREQUENCY AND COMPLEXITY BY INSTALLING CHANNEL LOG STEP-POOL STRUCTURES.
- INTRODUCE PASSIVE WOOD TO THE CHANNEL TO INCREASE CHANNEL ROUGHNESS AND HYDRAULIC DIVERSITY.

REACH 2 (SCHAEFFER PROPERTY)

- REMOVE HISTORICAL TAILINGS PILES TO HISTORICAL FLOODPLAIN AND LOW TERRACE ELEVATIONS.
- MODIFY THE CURRENT CHANNEL PATTERN AND PROFILE TO MAXIMIZE FLOODPLAIN CONNECTION AND MEANDER BELT WIDTH. SHAPE THE CHANNEL TO FORM THE APPROPRIATE CHANNEL DIMENSIONS INCLUDING RIFFLE, RUN, POOL AND GLIDE HABITAT UNITS.
- TREAT STREAMBANKS WITH VEGETATED WOOD MATRIX STRUCTURES. INCORPORATE LARGE WOOD STRUCTURES ON OUTSIDE MEANDER BENDS TO ENCOURAGE COMPLEX POOL HABITAT DEVELOPMENT.
- IMPLEMENT FLOODPLAIN RESTORATION TREATMENTS THAT SET THE STAGE FOR NATURAL RECRUITMENT OF RIPARIAN VEGETATION.

RDG
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SWCA**
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311 SW Jefferson Avenue
Corvallis, OR 97333
541.738.2920

PLAN VIEW INDEX
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
1	11/14/24	LJ	Conceptual Design	JIM

PROJECT NUMBER
00694290-001-CR8
DRAWING NUMBER
3.0
Drawing 4 of 14

TOTAL WOOD QUANTITIES

ITEM	QUANTITY	DIAMETER	LENGTH	ROOTWAD
CATEGORY 1 WOOD	14	10-12 IN	12-15 FT	YES
CATEGORY 2 WOOD	157	3-6 IN	10-12 FT	OPTIONAL
CATEGORY 3 WOOD	1,320	< 3 IN	10-12 FT	OPTIONAL
WILLOW CUTTINGS	2,940	0.25-1.0 IN	8 FT	NO

NOTE:
WOOD LENGTHS SHOWN WILL PRODUCE THE PROPER AMOUNT MATERIAL FOR STRUCTURES WHEN SPLIT INTO APPROPRIATE SIZES DURING CONSTRUCTION. IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.

TOTAL ROCK QUANTITIES

ITEM	QUANTITY (EA)	DIAMETER (IN)
CATEGORY 1 ROCK	81	10-12
ITEM	QUANTITY (CY)	GRADATION
STREAMBED/STREAMBANK FILL	111	SIZE (IN)
		PERCENT PASSING
		6 100
		4 90-100
		3 50-80
		1 30-50
		0.05 10-30
		FINES 10

TOTAL EARTHWORK QUANTITIES

ITEM	QUANTITY (CY)
CUT	1,131
BACKFILL	82
NET CUT	1,049

NOTE:
VOLUMES ARE NEATLINE, CONTRACTOR TO APPLY EXPANSION FACTORS TO DETERMINE A MORE ACCURATE BACKFILL VOLUME.

LARGE WOOD STRUCTURE QUANTITIES

ITEM	QUANTITY
LARGE WOOD STRUCTURES	4 EA
CATEGORY 1 WOOD	8 EA
CATEGORY 2 WOOD	16 EA
CATEGORY 3 WOOD	40 EA
WILLOW CUTTINGS	80 EA

VEGETATED WOOD MATRIX QUANTITIES

ITEM	QUANTITY
VEGETATED WOOD MATRIX TYPE 1	248 LF
VEGETATED WOOD MATRIX TYPE 2	129 LF
CATEGORY 2 WOOD	127 EA
CATEGORY 3 WOOD	1,250 EA
WILLOW CUTTINGS	1,885 EA
STREAMBANK FILL	64 CY

CONSTRUCTED CHANNEL STREAMBED QUANTITIES

ITEM	QUANTITY
CONSTRUCTED RIFFLE	125 LF
CATEGORY 1 ROCK	63 EA
STREAMBED FILL	47 CY
CATEGORY 2 WOOD	25 EA

FLOODPLAIN TREATMENT

ITEM	QUANTITY
ACRES OF FLOODPLAIN	.12 AC.
CATEGORY 2 WOOD	5 EA
CATEGORY 3 WOOD	30 EA

WILLOW TRENCH QUANTITIES

ITEM	QUANTITY
WILLOW TRENCH STRUCTURES	195 LF
WILLOW CUTTINGS	975 EA

LOG STEP POOL STRUCTURE QUANTITIES

ITEM	QUANTITY
LOG STEP POOL STRUCTURES	3 EA
CATEGORY 1 WOOD	6 EA
CATEGORY 2 WOOD	9 EA
CATEGORY 1 ROCK	18 EA
FILTER FABRIC	105 LF
RING SHANK NAILS	60 EA



MATERIALS AND QUANTITIES
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
1	11/14/24	LJ	Conceptual Design	JM

PROJECT NUMBER
0094286-01-CR3

DRAWING NUMBER
3.1

Drawing 5 of 14

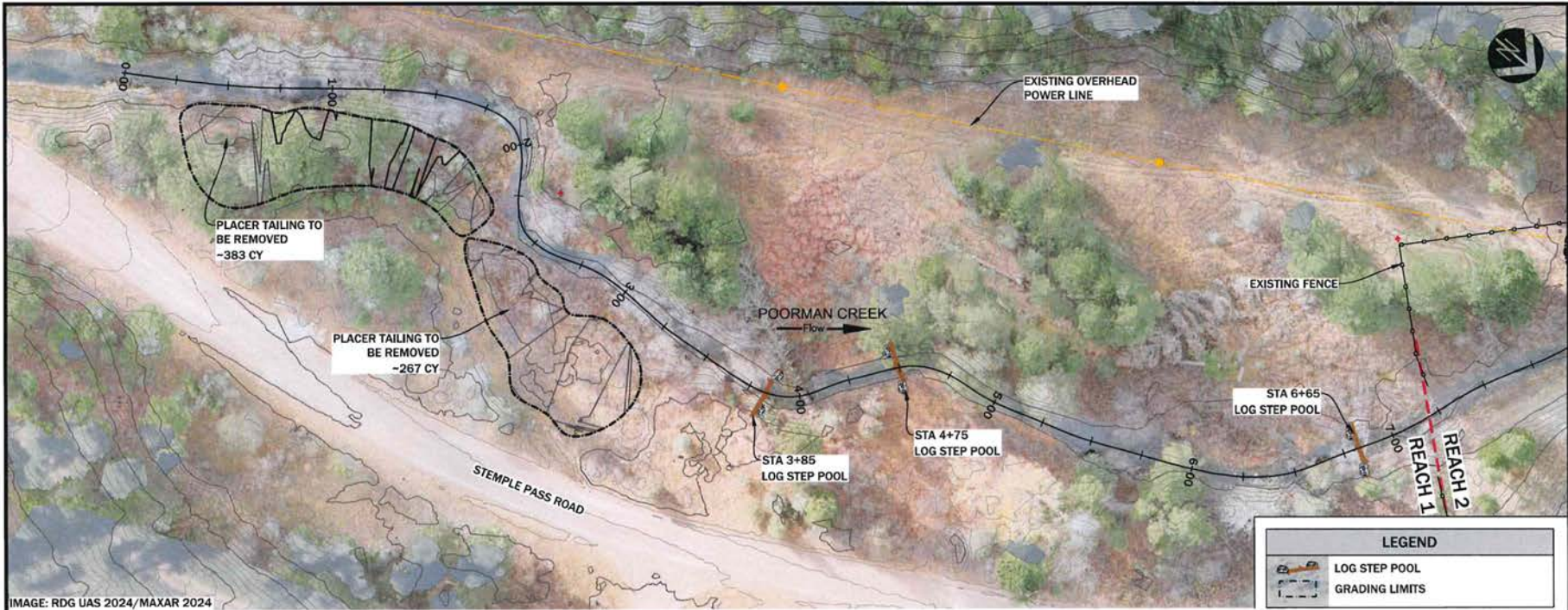
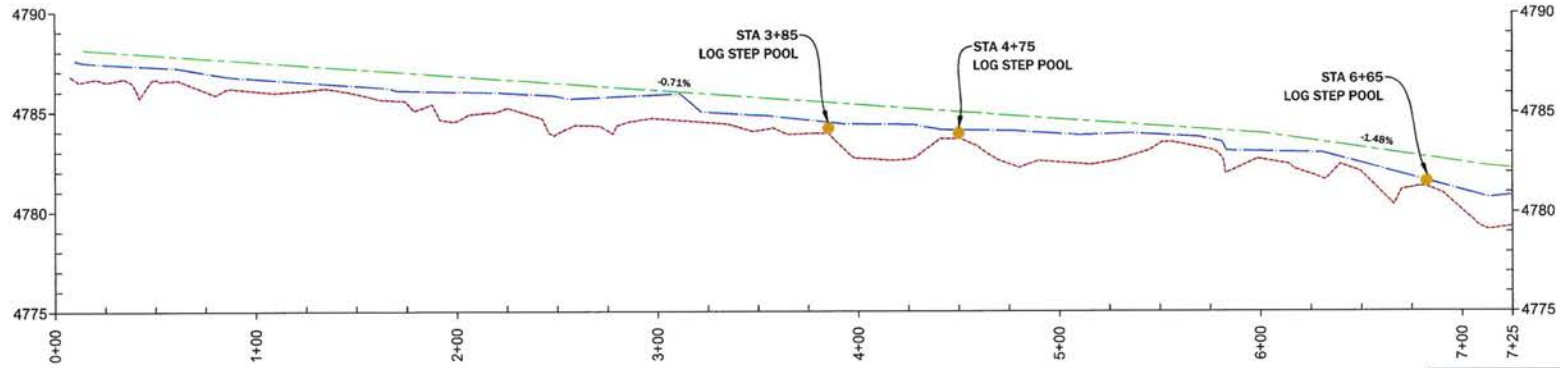


IMAGE: RDG UAS 2024/MAXAR 2024

1 REACH 1 PLAN VIEW
1" = 50'



2 REACH 1 PROFILE VIEW
HOR: 1" = 60'
VER: 1" = 6'

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238 Wisconsin Avenue
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907.837.4561

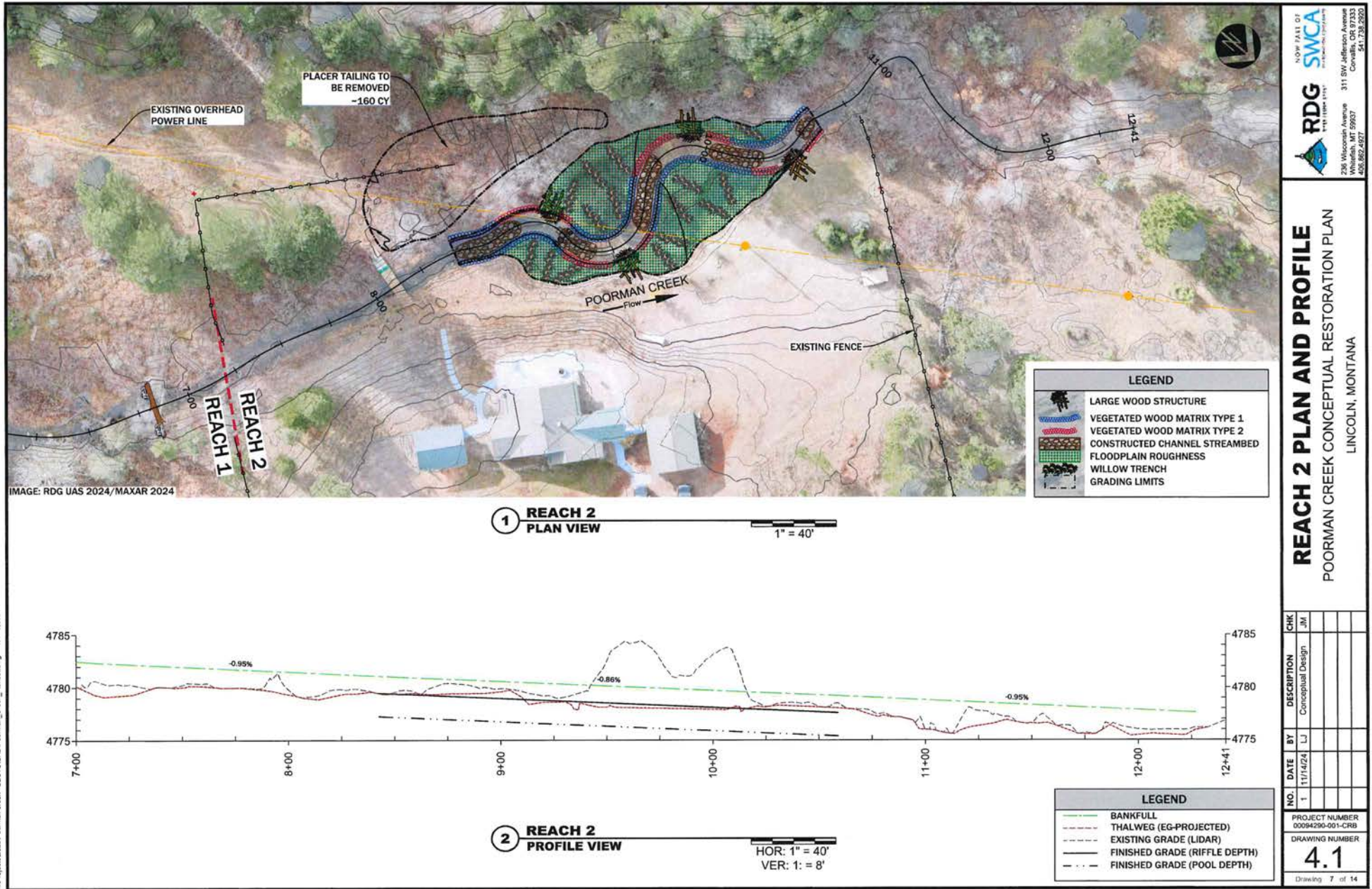
NOV 2024
SWCA
311 SW Jefferson Avenue
Corvallis, OR 97333

REACH 1 PLAN AND PROFILE
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

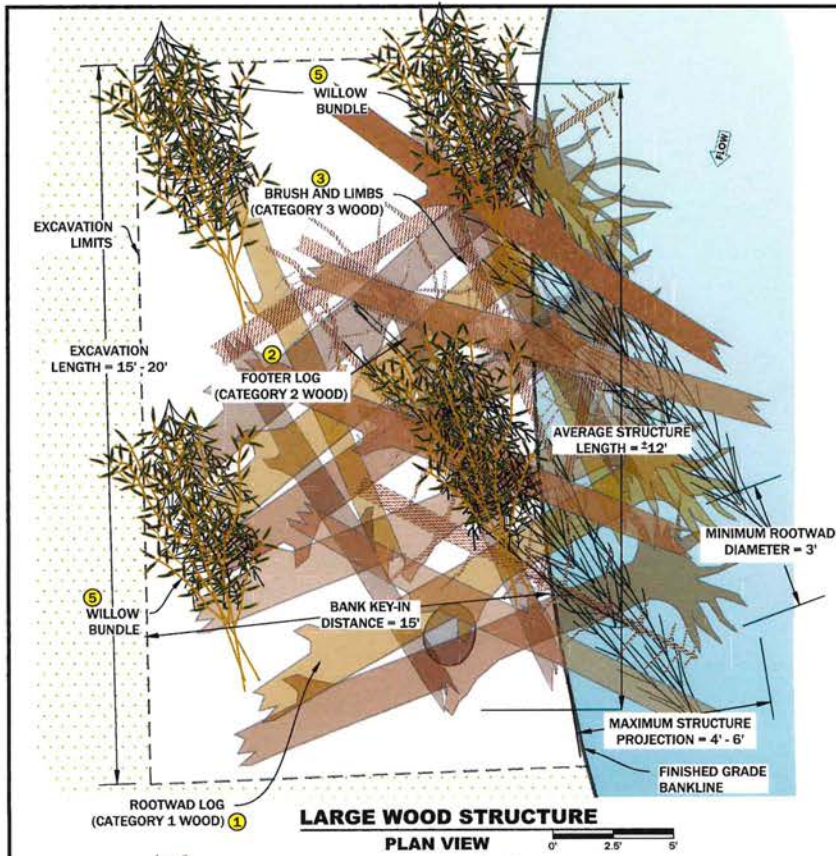
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PROJECT NUMBER
0004200-001-CR3
DRAWING NUMBER
4.0
Drawing 6 of 14

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**LARGE WOOD STRUCTURE
PLAN VIEW**

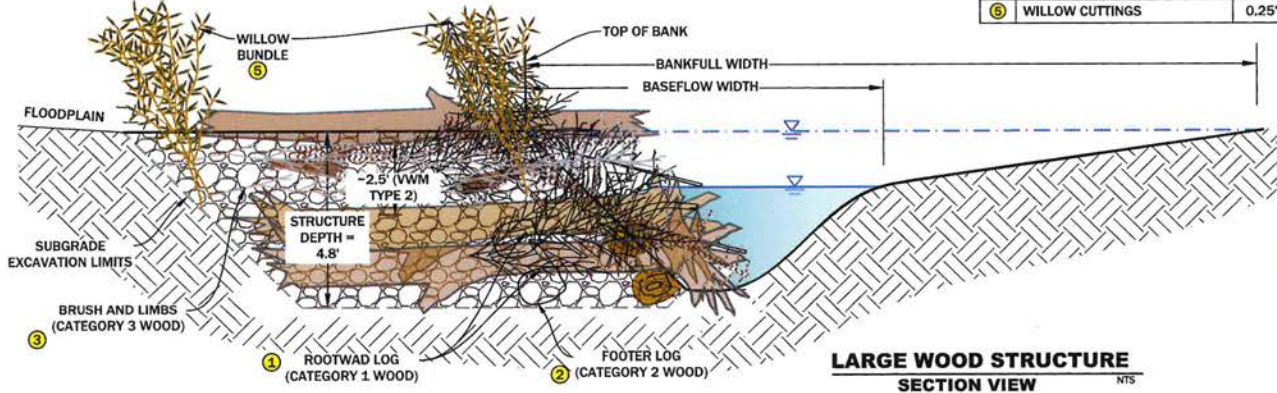
GENERAL NOTES

1. CONSTRUCTION OF THE LARGE WOOD STRUCTURE WILL OCCUR BEFORE THE CONSTRUCTED CHANNEL STREAMBED AND VEGETATED WOOD MATRIX BANK TREATMENTS ARE INSTALLED.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED THE ENGINEER.
3. FIELD ENGINEER SHALL MARK THE GENERAL CONSTRUCTION LOCATION FOR EACH LARGE WOOD STRUCTURE PRIOR TO CONSTRUCTION.

CONSTRUCTION NOTES

1. EXCAVATE TO THE EXCAVATION LIMITS. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
2. INSTALL TWO FOOTER LOGS (CATEGORY 2 WOOD) AT THE BASE OF THE EXCAVATED TRENCH AT THE ORIENTATIONS NOTED IN PLAN VIEW. FOOTER LOGS SHALL PROJECT NO GREATER THAN 1 FT. BEYOND THE FINISH GRADE BANK LINE. EXPOSED ENDS OF FOOTER LOGS SHALL BE BROKEN/ROUGHENED SO AS TO APPEAR NATURAL. SAWED ENDS OF FOOTER LOGS SHALL NOT BE EXPOSED.
3. INSTALL TWO ROOTWAD LOGS (CATEGORY 1 WOOD) INTERSECTING BOTH FOOTER LOGS AT THE ORIENTATION NOTED IN PLAN VIEW. THE UPSTREAM ROOTWAD SHALL NOT PROJECT INTO THE CHANNEL AND SHALL BE FLUSH WITH THE FINISHED BANK LINE. THE DOWNSTREAM ROOTWAD SHALL PROJECT NO GREATER THAN 3 FT. BEYOND THE FINISHED BANK LINE.
4. BACKFILL TRENCH WITH STOCKPILED MATERIAL UP TO THE TOP OF THE FOOTER LOGS (CATEGORY 2 WOOD). BACKFILL SHALL BE BUCKET COMPACTED.
5. INSTALL A SECOND TIER OF TWO FOOTER LOG (CATEGORY 2 WOOD) FOOTER LOGS SHALL PROJECT NO GREATER THAN 1 FT. BEYOND THE FINISH GRADE BANK LINE. EXPOSED ENDS OF FOOTER LOGS SHALL BE BROKEN/ROUGHENED SO AS TO APPEAR NATURAL. SAWED ENDS OF FOOTER LOGS SHALL NOT BE EXPOSED.
6. INSTALL SMALL WOOD AND BRUSH (CATEGORY 3 WOOD) AT APPROXIMATE 45° ANGLE TO ROOTWAD STEMS. BRUSH AND LIMBS SHALL PROJECT NO GREATER THAN 3 FT. BEYOND THE FINISHED BANK LINE.
7. INSTALL ONE TO TWO ROOTWAD LOGS (CATEGORY 1 WOOD) INTERSECTING THE LOWER TIER OF ROOTWADS AT THE ORIENTATION NOTED IN PLAN VIEW. THE ROOTWADS SHALL PROJECT NO GREATER THAN 2 FT. BEYOND THE FINISHED BANK LINE.
8. INSTALL SMALL WOOD AND BRUSH (CATEGORY 3 WOOD) AND WILLOW CUTTINGS INTERWOMEN INTO WOOD MATRIX UP TO FINISHED GRADE. BRUSH, LIMBS, AND WILLOW CUTTINGS SHALL PROJECT NO GREATER THAN 4 FT. BEYOND THE FINISHED BANK LINE.
9. BACKFILL WOOD MATRIX WITH STREAMBED FILL UP TO FINISHED GRADE WITH STOCKPILED NATIVE MATERIAL. NO AREAS BEHIND THE FINISHED BANKLINE ARE TO BE LEFT BELOW FINISHED GRADE.
10. INSTALL DEFLECTOR LOGS (CATEGORY 2 WOOD) AT APPROXIMATE 45° ANGLE TO ROOTWAD STEMS. DEFLECTOR LOGS SHALL BE HALF EMBEDDED IN THE FLOODPLAIN AND PROJECT NO GREATER THAN 4 FT. BEYOND THE FINISHED BANK LINE. EXPOSED ENDS OF FOOTER LOGS SHALL BE BROKEN/ROUGHENED SO AS TO APPEAR NATURAL. SAWED ENDS OF FOOTER LOGS SHALL NOT BE EXPOSED.

LARGE WOOD STRUCTURE MATERIAL SCHEDULE (PER LINEAR STRUCTURE)				
ITEM	DIA. (IN)	LENGTH (FT)	ROOTWAD (Y/N)	QTY.
① SUBGRADE EXCAVATION				5 CY
② CATEGORY 1 WOOD	10"-12"	12-15	YES - 18IN DIA. MIN	2 EA
③ CATEGORY 2 WOOD	3"-6"	10-12	NO	4 EA
④ CATEGORY 3 WOOD	1" - 3"	10-12	OPTIONAL 1-2 FT	10 EA
⑤ WILLOW CUTTINGS	0.25" - 1"	8	NO	20 EA



**LARGE WOOD STRUCTURE
SECTION VIEW**



EXAMPLE OF A LARGE WOOD STRUCTURE

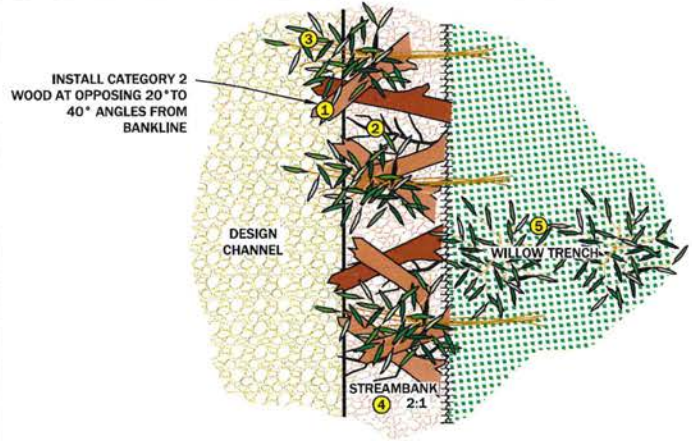


LARGE WOOD STRUCTURE DETAIL
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

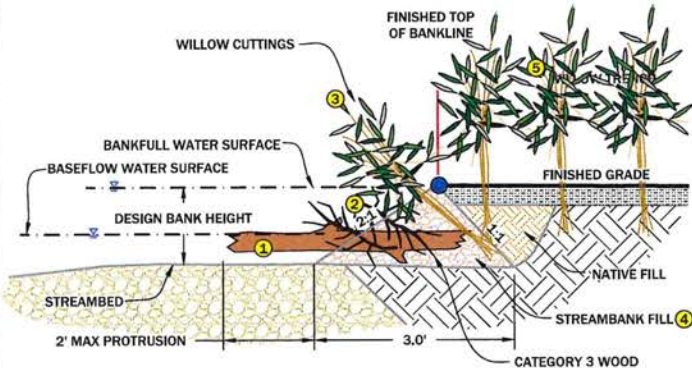
NO.	DATE	BY	DESCRIPTION	CHK
1	11/14/24	LJ	Conceptual Design	JM

PROJECT NUMBER
00094290-001-CRB
DRAWING NUMBER
5.0
Drawing 8 of 14

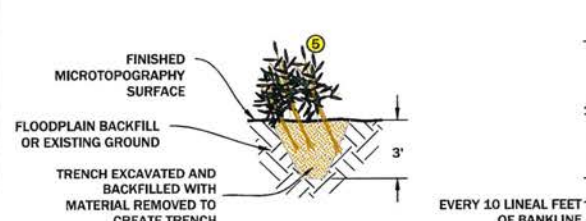
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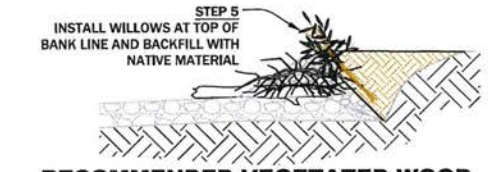
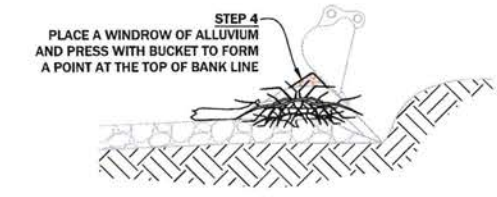
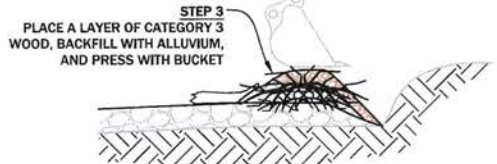
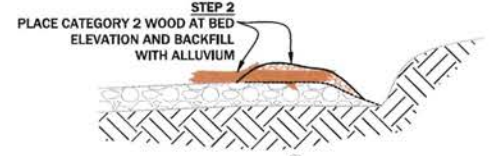
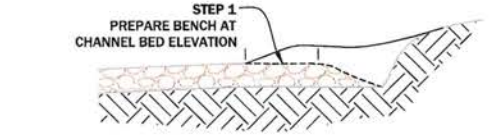
1 VEGETATED WOOD MATRIX - TYPE 1
PLAN VIEW NTS



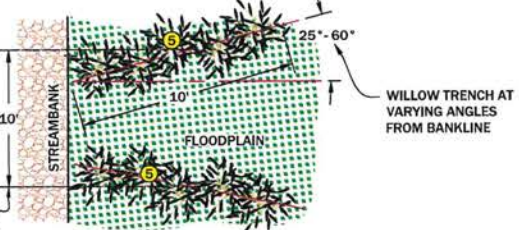
2 VEGETATED WOOD MATRIX - TYPE 1
SECTION VIEW NTS



4 WILLOW TRENCH
SECTION VIEW NTS



3 RECOMMENDED VEGETATED WOOD MATRIX INSTALLATION SEQUENCE
SECTION VIEW 1" = 5'



5 WILLOW TRENCH
PLAN VIEW NTS

STREAMBANK FILL GRADATION	
SIZE (IN)	PERCENT PASSING
6	100
4	90-100
3	50-80
1	30-50
0.05	10-30
FINES	10

NOTE: MIX SALVAGED MATERIAL AND IMPORTED MATERIAL TO ACHIEVE SPECIFIED GRADATION

GENERAL NOTES

- CONSTRUCTION OF THE VEGETATED WOOD MATRIX WILL OCCUR AFTER THE CHANNEL AND FLOODPLAIN BACKFILL IS PLACED AND THE CHANNEL STREAMBED IS CONSTRUCTED. INSTALLATION OF FLOODPLAIN TREATMENT SHALL BE COMPLETED AFTER VEGETATED WOOD MATRIXES ARE INSTALLED.
- IF VEGETATED WOOD MATRIX STRUCTURES ARE INSTALLED PRIOR TO OCTOBER 1, LEAVE BACK TRENCH UNFILLED AND COMPLETE STRUCTURE WHEN DORMANT WILLOWS ARE AVAILABLE.
- IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
- ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY CONSTRUCTION MANAGER.
- CONTRACTOR SHALL MARK AND CONSTRUCTION ENGINEER SHALL APPROVE THE GENERAL LOCATION FOR EACH VEGETATED WOOD MATRIX STRUCTURE PRIOR TO CONSTRUCTION.

NOTES ON VEGETATED WOOD MATRIX INSTALLATION

- EXCAVATE TO THE EXCAVATION LIMITS AS SHOWN. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
- PREPARE THE BENCH OF THE STRUCTURE BY PLACING CHANNEL STREAMBED ALLUVIUM FROM THE BASE OF THE EXCAVATION DEPTH/BOTTOM OF EXCAVATION TO WITHIN 1.0-FT. OF FINISHED GRADE.
- CATEGORY 2 AND CATEGORY 3 WOOD, AND CHANNEL STREAMBED ALLUVIUM SHALL BE PLACED IN ALTERNATING LAYERS AND BUCKET COMPACTED UP TO THE TOP OF BANK ELEVATION AS SHOWN BELOW IN THE INSTALLATION SEQUENCE. PLACE SIX (6) FT TO EIGHT (8) FT. DORMANT WILLOW CUTTINGS AT A DENSITY OF 5 PER LINEAL FT ALONG THE TOP OF BANK LINE ELEVATION. WILLOW CUTTINGS SHALL SLOPE AT AN APPROXIMATE 1:1 SLOPE AS SHOWN IN SECTION VIEW. STEMS MAY OVERLAP. THE CUT ENDS SHALL BE PLACED AT THE BASE OF THE SLOPES WITH THE UN-CUT ENDS EXTENDING BEYOND THE EDGE OF THE TRENCH SO NO GREATER THAN ONE-THIRD OF THE TOTAL CUTTING LENGTH IS EXPOSED BEYOND THE TOP OF BANK EDGE. WILLOW CUTTINGS SHOULD INTERCEPT THE DESIGN TOP OF BANK LINE AS SHOWN IN STEP 5 OF THE INSTALLATION SEQUENCE.
- THE UPSTREAM AND DOWNSTREAM ENDS OF THE STRUCTURE SHALL TRANSITION SMOOTHLY INTO ADJACENT STREAMBANK STRUCTURES TO MINIMIZE EROSION, FLANKING, AND BANK FAILURE. STRUCTURE ENDS MAY BE STABILIZED WITH ADDITIONAL CATEGORY 1 ROCK AS APPROVED BY ENGINEER.
- AFTER INSTALLATION OF THE VEGETATED WOOD MATRIX, BACKFILL THE STRUCTURE WITH STOCKPILED MATERIAL TO FINISHED GRADE, AND BUCKET COMPACT. INSTALL WILLOW TRENCHES AT A RATE OF 2 PER LINEAL FOOT (OR 20 PER TRENCH) AS SHOWN. NO AREAS BEHIND THE FINISHED BANKLINE ARE TO BE LEFT BELOW FINISHED GRADE.

TYPE 1 - VEGETATED WOOD MATRIX MATERIAL SCHEDULE (PER LINEAL FOOT)		
ITEM	DIA. (IN)	QTY.
1	CATEGORY 2 WOOD	3"-6" 0.2500
2	CATEGORY 3 WOOD	< 3" 2
3	WILLOW CUTTINGS	0.25"-1.0" 5
4	STREAMBANK ALLUVIUM	6" MINUS 0.1 CY

WILLOW TRENCH MATERIAL SCHEDULE (PER LINEAL FOOT)		
ITEM	DIA.	QUANTITY (EA)
5	WILLOW CUTTINGS	0.25" - 1" 5

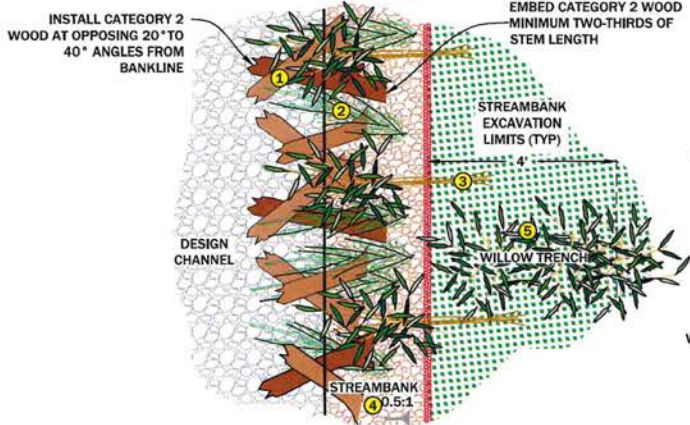


VEGETATED WOOD MATRIX TYPE 1 DETAIL
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

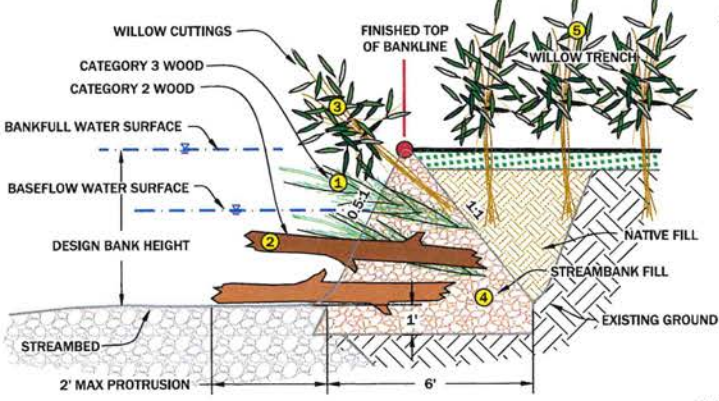
CHK	DESCRIPTION	DATE	BY
1	Conceptual Design	11/14/24	JM

PROJECT NUMBER: 0094290-001-CRB
DRAWING NUMBER: **5.1**
Drawing 9 of 14

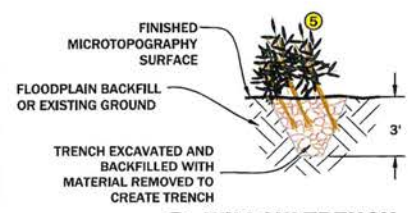
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1 VEGETATED WOOD MATRIX - TYPE 2
PLAN VIEW NTS

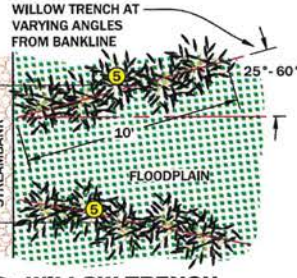


2 VEGETATED WOOD MATRIX - TYPE 2
SECTION VIEW NTS

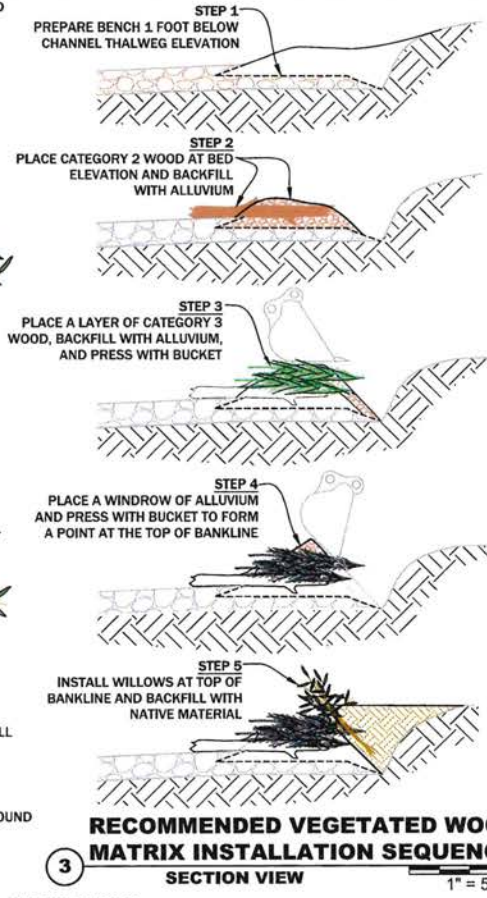


4 WILLOW TRENCH
SECTION VIEW NTS

EVERY 10 LINEAL FEET OF BANKLINE INSTALL A 10 FOOT LONG WILLOW TRENCH



5 WILLOW TRENCH
PLAN VIEW NTS



RECOMMENDED VEGETATED WOOD MATRIX INSTALLATION SEQUENCE
SECTION VIEW 1" = 5'

GENERAL NOTES

1. IF VEGETATED WOOD MATRIX STRUCTURES ARE INSTALLED PRIOR TO OCTOBER 1, LEAVE BACK TRENCH UNFILLED AND COMPLETE STRUCTURE WHEN DORMANT WILLOWS ARE AVAILABLE.
2. IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
3. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY CONSTRUCTION MANAGER.
4. CONTRACTOR SHALL MARK AND CONSTRUCTION ENGINEER SHALL APPROVE THE GENERAL LOCATION FOR EACH VEGETATED WOOD MATRIX STRUCTURE PRIOR TO CONSTRUCTION.

INSTALLATION NOTES

1. EXCAVATE TO THE EXCAVATION LIMITS AS SHOWN. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
2. PREPARE THE BENCH OF THE STRUCTURE BY PLACING STREAMBED ALLUVIUM MINIMUM 1 FOOT BELOW CHANNEL THALWEG ELEVATION.
3. CATEGORY 2 AND CATEGORY 3 WOOD, AND STREAMBED ALLUVIUM SHALL BE PLACED IN ALTERNATING LIFTS AND BUCKET COMPACTED UP TO THE TOP OF BANK ELEVATION AS SHOWN IN THE INSTALLATION SEQUENCE. PLACE 6 FT TO 8 FT. DORMANT WILLOW CUTTINGS AT A DENSITY OF 5 PER LINEAR FT ALONG THE TOP OF BANK LINE ELEVATION. WILLOW CUTTINGS SHALL SLOPE AT AN APPROXIMATE 1:1 SLOPE AS SHOWN IN SECTION VIEW. STEMS MAY OVERLAP. THE CUT ENDS SHALL BE PLACED AT THE BASE OF THE SLOPES WITH THE UN-CUT ENDS EXTENDING BEYOND THE EDGE OF THE TRENCH SO NO GREATER THAN ONE-THIRD OF THE TOTAL CUTTING LENGTH IS EXPOSED BEYOND THE TOP OF BANKLINE. WILLOW CUTTINGS SHOULD INTERCEPT THE DESIGN TOP OF BANKLINE AS SHOWN IN STEP 5 OF THE INSTALLATION SEQUENCE.
4. THE UPSTREAM AND DOWNSTREAM ENDS OF THE STRUCTURE SHALL TRANSITION SMOOTHLY INTO ADJACENT STREAMBANK STRUCTURES TO MINIMIZE EROSION, FLANKING, AND BANK FAILURE.
5. AFTER INSTALLATION OF THE VEGETATED WOOD MATRIX, BACKFILL THE STRUCTURE WITH STOCKPILED MATERIAL TO FINISHED GRADE, AND BUCKET COMPACT. INSTALL WILLOW TRENCHES AT A RATE OF 5 PER LINEAR FOOT (OR 50 PER TRENCH) AS SHOWN. NO AREAS BEHIND THE FINISHED BANKLINE ARE TO BE LEFT BELOW FINISHED GRADE.

TYPE 2 - VEGETATED WOOD MATRIX MATERIAL SCHEDULE (PER LINEAR FOOT)		
ITEM	DIA. (IN)	QTY.
1 CATEGORY 2 WOOD	3"-6"	0.5
2 CATEGORY 3 WOOD	< 3"	4
3 BANK WILLOW CUTTINGS	0.25"-1.0"	5
4 STREAMBANK ALLUVIUM	6" MINUS	0.3 CY

WILLOW TRENCH MATERIAL SCHEDULE (PER LINEAL FOOT)		
ITEM	DIA.	QUANTITY (EA)
5 TRENCH WILLOW CUTTINGS	0.25" - 1"	5

STREAMBANK FILL GRADATION	
SIZE (IN)	PERCENT PASSING
6	100
4	90-100
3	50-80
1	30-50
0.05	10-30
FINES	10

NOTE: MIX SALVAGED MATERIAL AND IMPORTED MATERIAL TO ACHIEVE SPECIFIED GRADATION

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VEGETATED WOOD MATRIX TYPE 2 DETAIL
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

NO.	DATE	BY	DESCRIPTION
1	11/14/24	LJ	Conceptual Design

PROJECT NUMBER
0094290-201-CRB

DRAWING NUMBER
5.2

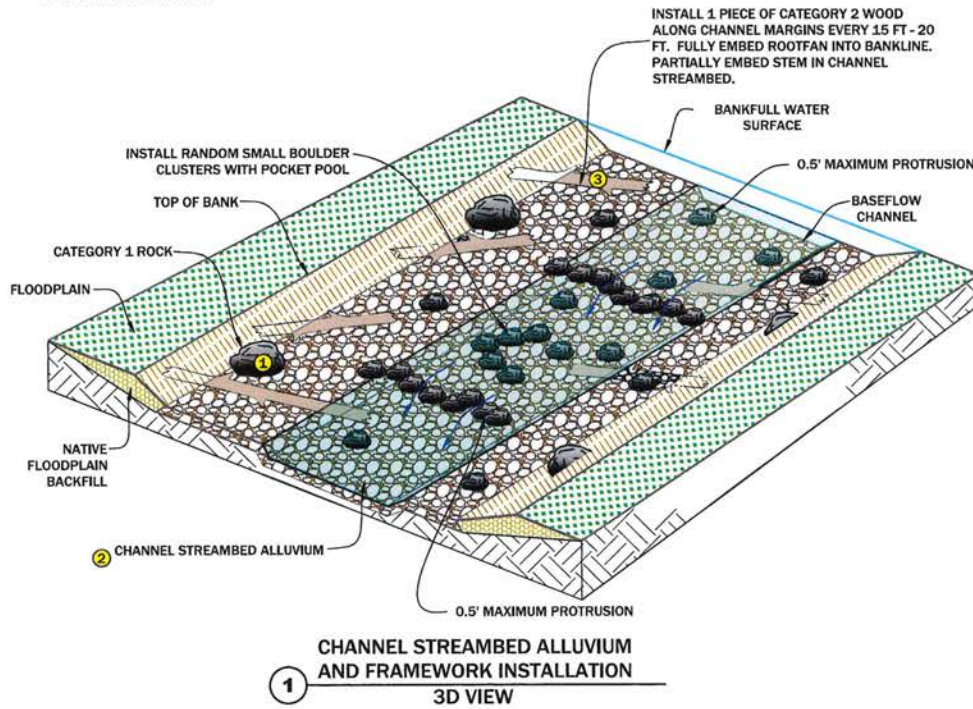
Drawing 10 of 14

GENERAL NOTES

1. CONSTRUCTION OF THE CHANNEL STREAMBED WILL OCCUR AFTER THE CHANNEL SUBGRADE IS PREPARED.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED THE CONSTRUCTION MANAGER.
3. IT IS THE CONTRACTORS RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
4. CONTRACTOR SHALL MARK THE UPSTREAM AND DOWNSTREAM EXTENTS OF THE LOCATIONS OF THE CONSTRUCTED CHANNEL STREAMBED STRUCTURES.

NOTES ON CONSTRUCTED CHANNEL STREAMBED INSTALLATION

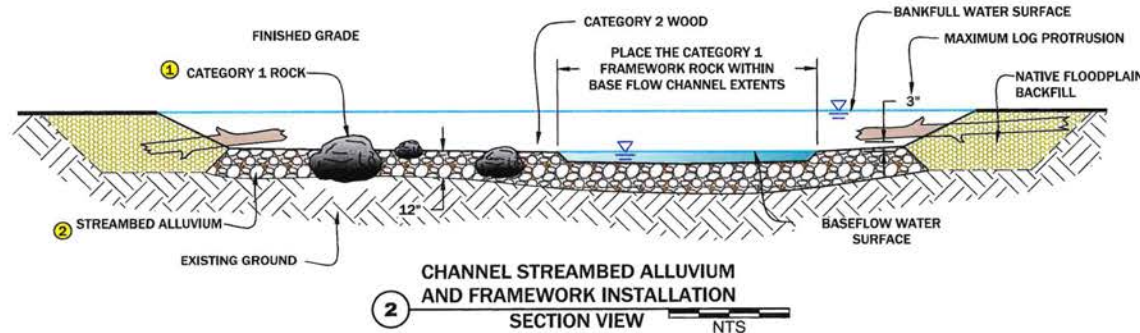
1. PRIOR TO CONSTRUCTION OF THE CHANNEL STREAMBED, CONSTRUCTION MANAGER SHALL VERIFY CHANNEL SUBGRADE ELEVATIONS. CHANNEL SUBGRADE SERVES AS THE FOUNDATION FOR THE CONSTRUCTED CHANNEL STREAMBED.
2. CONTRACTOR SHALL STOCKPILE CHANNEL ALLUVIUM PER SPECIFICATIONS NOTED ON THE DRAWING.
3. PREPARE THE FRAMEWORK. CONTRACTOR SHALL PLACE 10-INCH TO 12-INCH BOULDERS (CATEGORY 1 ROCK) ON THE SURFACE OF THE CHANNEL SUBGRADE PRIMARILY WITHIN THE LOW FLOW CHANNEL AS INDICATED ON THE DRAWING. DUE TO THE INHERENT VARIABILITY IN MATERIALS, BOULDER ELEVATIONS SHALL BE ADJUSTED TO ASSURE BOULDER PROTRUSION ABOVE FINISH GRADE WILL BE NO GREATER THAN 0.5-FT.
4. CONTRACTOR MAY INSTALL 10-INCH TO 12-INCH BOULDERS (CATEGORY 1 ROCK) IN CLUSTERS, AS DIRECTED BY THE CONSTRUCTION MANAGER, TO CREATE A COMPLEX SERIES OF POCKET POOLS THAT EFFECTIVELY DISSIPATE ENERGY AND PROVIDE PATHWAYS FOR FISH MOVEMENT. BOULDER ELEVATIONS SHALL BE ADJUSTED TO ASSURE BOULDER PROTRUSION ABOVE FINISH GRADE IS NO GREATER THAN 0.5-FT.
5. CONTRACTOR SHALL INSTALL CHANNEL MARGIN WOOD (CATEGORY 2 WOOD) TO PROVIDE AQUATIC HABITAT COMPLEXITY AND ROUGHNESS. CHANNEL MARGIN WOOD SHALL PROJECT NO GREATER THAN 8 FEET INTO THE CONSTRUCTED STREAMBED IN VARIOUS ORIENTATIONS TO FLOW, AS DIRECTED BY CONSTRUCTION MANAGER. CHANNEL MARGIN WOOD SHALL BE EMBEDDED INTO THE CHANNEL STREAMBED A MINIMUM OF ONE-HALF THE LOG DIAMETER, AS SHOWN ON THE DRAWINGS.
6. PREPARE THE MATRIX. AFTER THE FRAMEWORK, WOOD, BOULDER CLUSTERS, AND SMALL BOULDER RIBS ARE INSTALLED AND INSPECTED BY CONSTRUCTION MANAGER, PLACE APPROPRIATE CHANNEL STREAMBED ALLUVIUM GRADATION AND WASH FINES INTO STREAMBED. CHANNEL STREAMBED ALLUVIUM SHALL BE PLACED TO THE FULL COURSE THICKNESS OF 12-INCHES TO FINISHED GRADE.



STREAMBANK FILL GRADATION	
SIZE (IN)	PERCENT PASSING
6	100
4	90-100
3	50-80
1	30-50
0.05	10-30
FINES	10

NOTE: MIX SALVAGED MATERIAL AND IMPORTED MATERIAL TO ACHIEVE SPECIFIED GRADATION

MATERIAL SCHEDULE (PER 10 FEET)		
ITEM	DIA. (IN)	QUANTITY (EA)
1	CATEGORY 1 ROCK	10" - 12" 5 EA
2	CHANNEL STREAMBED ALLUVIUM	6" MINUS 3.7 CY
3	CATEGORY 2 WOOD	3" - 6" 2 EA

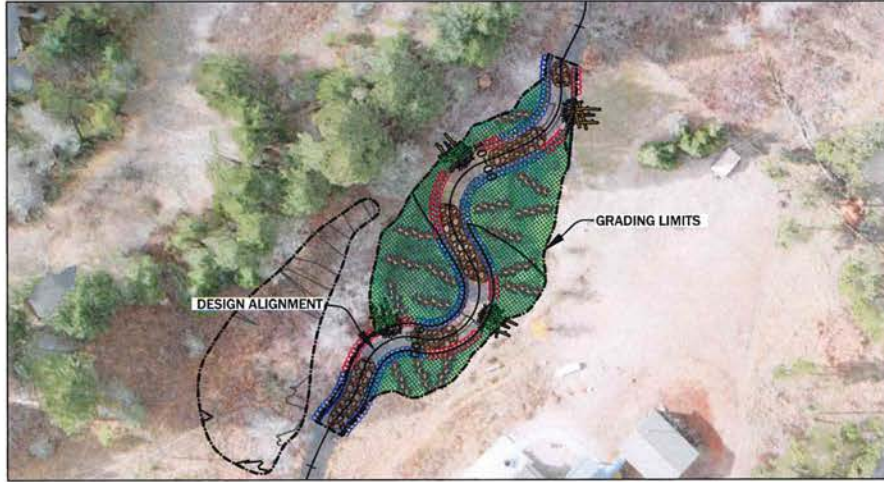


RDG
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CONSTRUCTED CHANNEL STREAMBED DETAIL
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

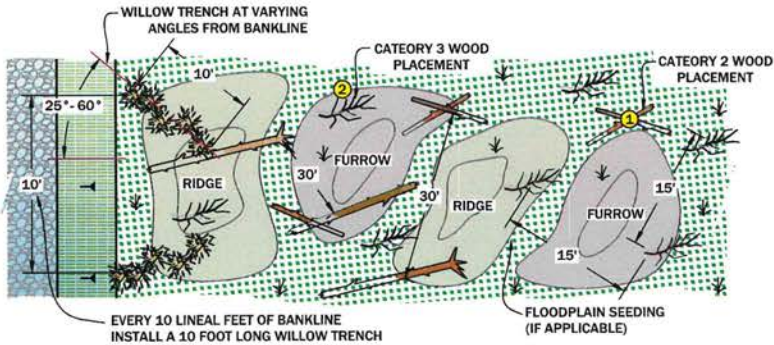
NO.	DATE	BY	DESCRIPTION	CHK
1	11/14/24	LJ	Conceptual Design	JM

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DRAWING NUMBER
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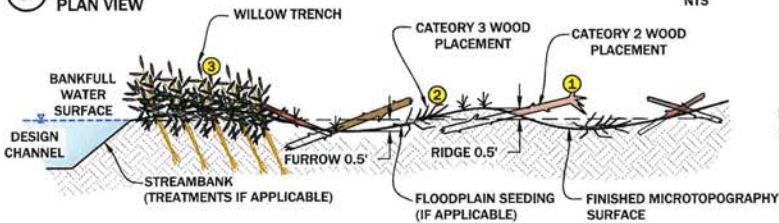


AREAS TO RECEIVE FLOODPLAIN ROUGHNESS

1 FLOODPLAIN ROUGHNESS
PLAN VIEW
1" = 50'



2 MICROTOPOGRAPHY AND FLOODPLAIN WOOD PLACEMENT
PLAN VIEW
NTS



3 MICROTOPOGRAPHY AND FLOODPLAIN WOOD PLACEMENT
SECTION VIEW
NTS



EXAMPLE OF CONSTRUCTED FLOODPLAIN ROUGHNESS



EXAMPLE OF WILLOW TRENCH

DESIGN INTENT

PURPOSE: THE PURPOSE OF THIS TREATMENT IS TO CREATE CHARACTERISTICS ON NEWLY CONSTRUCTED FLOODPLAIN SURFACES THAT ARE SIMILAR TO THE CONDITIONS ON NATURAL, VEGETATED FLOODPLAIN SURFACES.

PLACEMENT CRITERIA: TREATMENTS ARE APPLIED TO FLOODPLAIN SURFACES THAT LACK ROUGHNESS ELEMENTS AND VEGETATION.

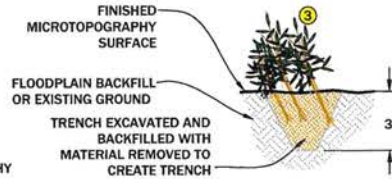
SUPPLEMENTAL INFORMATION: FLOODPLAIN ROUGHNESS TREATMENTS REDUCE THE RISK OF SURFACE EROSION AND INCREASE THE RETENTION OF SEDIMENT AND NUTRIENTS FOR THE DEVELOPMENT OF RIPARIAN VEGETATION. FLOODPLAIN ROUGHNESS IS APPLIED USING TWO METHODS: (1) MICROTOPOGRAPHY GRADING AND (2) WOODY DEBRIS PLACEMENT. MICROTOPOGRAPHY GRADING WILL CREATE AN UNEVEN SURFACE OF FURROWS AND RIDGES ON THE FLOODPLAIN. WOODY DEBRIS WILL PROVIDE STABILITY AND CONTRIBUTE ORGANIC MATTER TO FLOODPLAIN SOILS. PROPER ANCHORING OF WOODY DEBRIS IS REQUIRED TO PREVENT MOVEMENT DURING OVERBANK FLOWS.

CONSTRUCTION NOTES

1. CONSTRUCTION OF FLOODPLAIN TREATMENT WILL OCCUR AFTER CONSTRUCTION OF THE CHANNEL STREAMBED, INSTALLATION OF LARGE WOOD STRUCTURE BANK TREATMENT, INSTALLATION OF VEGETATED WOOD MATRIX BANK TREATMENT.
2. FLOODPLAIN ROUGHNESS CONSTRUCTION AFTER FINISHED FLOODPLAIN GRADING AND PRIOR TO SEEDING, PLANTING AND FENCING.
3. GRADE FURROWS AND RIDGES INTO THE FINISHED FLOODPLAIN GROUND SURFACE.
4. PARTIALLY BURY CATEGORY 2 WOOD INTO FURROWS AND RIDGES AT SPACING OF 30 FEET WITH ONE HALF THE WOOD LENGTH BELOW THE SURFACE.
5. PARTIALLY BURY CATEGORY 3 WOOD INTO FURROWS AND RIDGES AT SPACING OF 15 FEET AND A DEPTH OF TWO FEET BELOW THE SURFACE.

FLOODPLAIN TREATMENT MATERIAL SCHEDULE (PER ACRE)					
ITEM	DIA.	LENGTH	QUANTITY (EA)	UNIT	
1	CATEGORY 2 WOOD	3" - 6"	10'-12'	35	EA
2	CATEGORY 3 WOOD	<3"	10'-12'	25	% COVER*
*APPROXIMATELY 250 PIECES/ACRE					

WILLOW TRENCH MATERIAL SCHEDULE (PER LINEAL FOOT)			
ITEM	DIA.	QUANTITY (EA)	
3	WILLOW CUTTINGS	0.25" - 1"	5



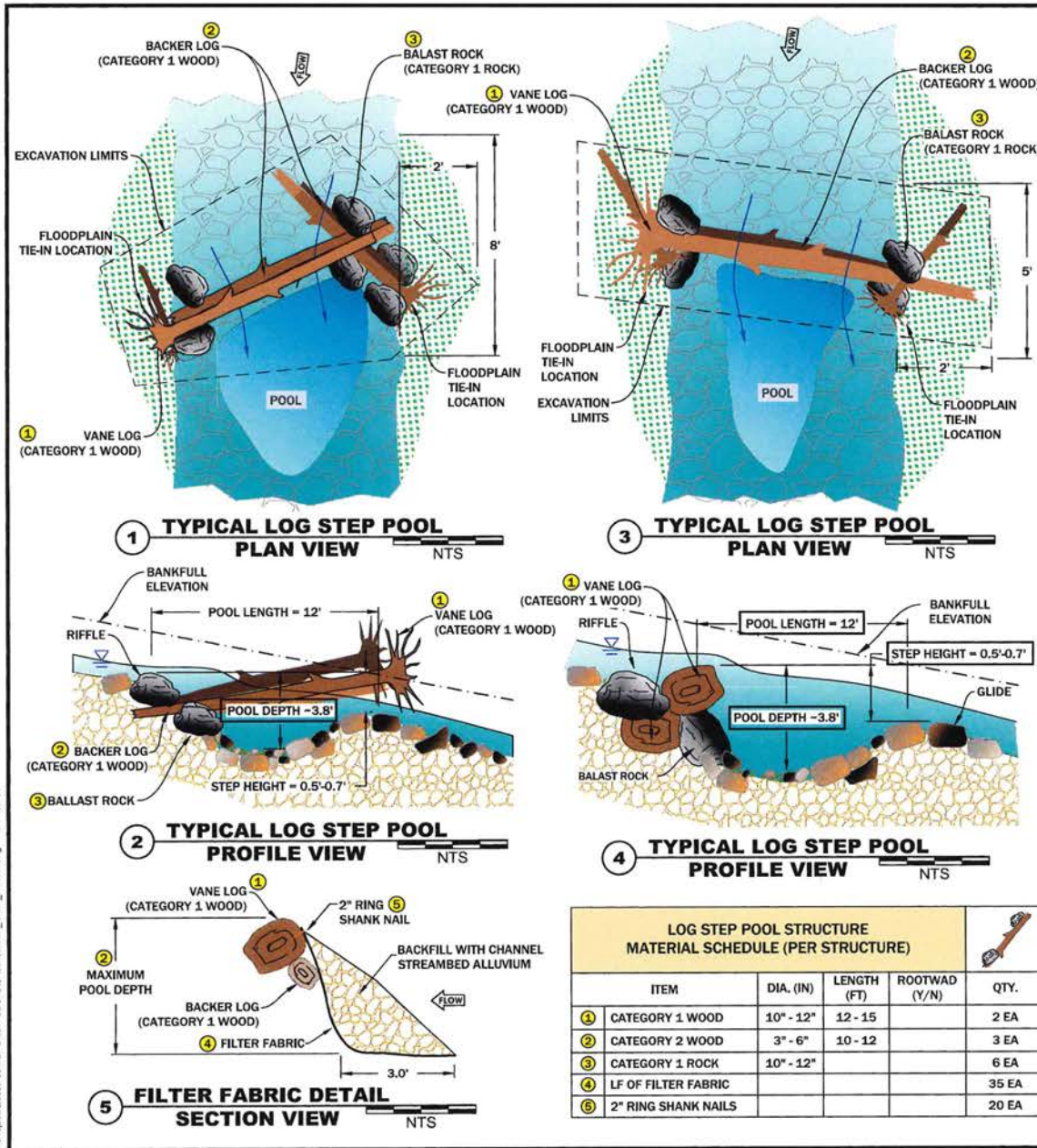
4 WILLOW TRENCH
SECTION VIEW
NTS



FLOODPLAIN TREATMENT DETAILS
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

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1	11/14/24	LJ	Conceptual Design	JM

PROJECT NUMBER
00694200-001-CR18
DRAWING NUMBER
5.4
Drawing 12 of 14



GENERAL NOTES

1. CONSTRUCTION OF THE CHANNEL LOG STEP POOL WILL OCCUR PRIOR TO THE CONSTRUCTED CHANNEL.
2. IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
3. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY ENGINEER.
4. CONTRACTOR SHALL MARK AND ENGINEER SHALL APPROVE THE FLOODPLAIN AND CHANNEL STREAMBED TIE-IN LOCATIONS.

CONSTRUCTION NOTES

1. PRIOR TO CONSTRUCTION OF THE CHANNEL LOG STEP POOL, ENGINEER SHALL VERIFY CHANNEL SUBGRADE ELEVATIONS.
2. CONTRACTOR SHALL STOCKPILE WOOD AND ROCK PER SPECIFICATIONS NOTED ON THE DRAWINGS.
3. EXCAVATE TO THE EXCAVATION LIMITS. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
4. INSTALL VANE LOGS (CATEGORY 1 WOOD) AT THE FLOODPLAIN TIE-IN LOCATIONS AND TO THE ORIENTATIONS NOTED ON THE DRAWING. VANE LOGS SHALL BE PLACED ON CHANNEL ALLUVIUM AND THE ROOTWADS SHALL BE EMBEDDED INTO THE STREAMBANK A MINIMUM OF 2-FT. RELATIVE TO FINISHED BANK LINE.
5. ORIENT VANE LOGS IN CONTACT WITH THE CHANNEL STREAMBED AS SHOWN ON THE DRAWING. EMBED VANE LOG TIPS INTO THE CHANNEL STREAMBED A MINIMUM OF 3-FT. SLOPING AT AN ANGLE NO GREATER THAN 6% RELATIVE TO FLOODPLAIN ELEVATION. VANE LOG TIPS SHALL BE A MINIMUM OF 1-FT. BELOW THE CHANNEL STREAMBED FINISHED GRADE.
6. INSTALL BACKER LOGS (CATEGORY 1 WOOD) ON THE UPSTREAM SIDE OF THE VANE LOGS AS SHOWN ON THE DRAWINGS. BACKER LOGS SHALL BE FLUSH WITH THE VANE LOGS AND EXTEND FROM THE FLOODPLAIN TIE-IN LOCATIONS TO THE TIPS OF THE VANE LOGS.
7. INSTALL CATEGORY 1 ROCK UPSTREAM AND DOWNSTREAM OF THE STREAMBANK TIE-IN LOCATIONS AND VANE LOG TIPS. ROCK SHALL BE IN CONTACT WITH VANE LOGS AND BACKER LOGS TO PROVIDE BALLAST AND TO PREVENT THE STRUCTURE FROM SHIFTING WHILE THE STRUCTURE IS BACKFILLED.
8. ATTACH NON-WOVEN GEOTEXTILE FABRIC TO VANE LOGS AND EXTEND VERTICALLY TO THE MAXIMUM DEPTH OF THE POOL CHANNEL CROSS-SECTION ON THE UPSTREAM SIDE OF THE STRUCTURE. AS SHOWN ON DRAWING. BACKFILL VANE LOGS WITH EXCAVATED CHANNEL STREAMBED ALLUVIUM TO CHANNEL STREAMBED FINISHED GRADE.
9. REGRADE UPSTREAM AND DOWNSTREAM CHANNEL STREAMBED FINISHED GRADE ELEVATIONS. IF EXCESS MATERIAL IS SIDECAST IN POOL DURING CONSTRUCTION, CONTRACTOR SHALL RE-EXCAVATE POOL TO THE DESIGN DIMENSIONS AS APPROVED BY ENGINEER.



EXAMPLE OF A CONSTRUCTED LOG STEP POOL



LOG STEP POOL DETAIL
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
LINCOLN, MONTANA

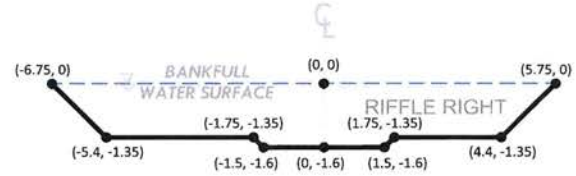
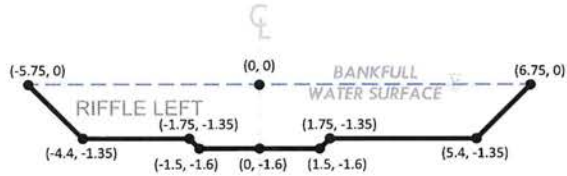
NO.	DATE	BY	DESCRIPTION	CHK
1	11/14/24	LJ	Conceptual Design	JM

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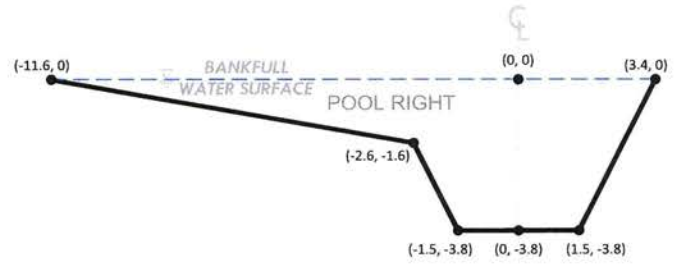
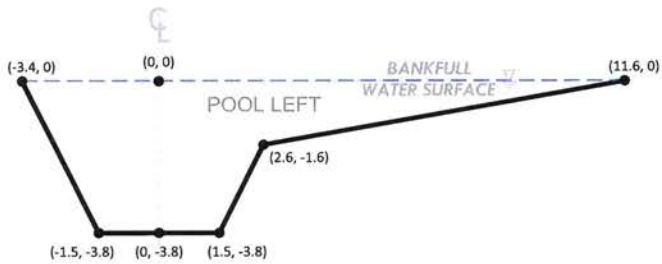
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Drawing 13 of 14



CHANNEL DESIGN CRITERIA

PARAMETER / FEATURE	RIFLE	POOL
WIDTH	11.8-13.2 FT	13.8-16.3 FT
MEAN DEPTH	1.2-1.3 FT	1.0-1.2 FT
MAX. DEPTH	1.6-1.7 FT	2.2-3.8 FT
XS AREA	15.9 SQ-FT	18.2 SQ-FT
WIDTH:DEPTH	9-11	NA



1 DESIGN CROSS SECTIONS SECTION VIEW 1" = 3'



DESIGN CROSS SECTIONS
POORMAN CREEK CONCEPTUAL RESTORATION PLAN
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Drawing 14 of 14

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