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: 59868

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

B. Contact Person (if different than applicant): See above

Address:

City: State: Zip:

Telephone: E-mail:

C. Landowner and/or Lessee Name (if different than applicant): The Mannix Family Ranch

Mailing Address: 83 Mannix Ranch Rd

City: Helmville State: MT Zip: 59854

Telephone: 406-793-0812 E-mail: mannixbryan@gmail.com

II. PROJECT INFORMATION

A. Project Name: Nevada Creek Restoration Project Phase 7

River, stream, or lake: Nevada Creek

Location: Township: 12N Range: 10W Section: 5

Latitude: 46.843718 Longitude: -112.920312 *Within project (decimal degrees)*

County: Powell

B. Purpose of Project:

The purpose of this project is to build upon the previous six phases of Nevada Creek restoration and improve trout habitat 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:

The proposed work on Nevada Creek is a continuation of the ongoing efforts in the drainage that have a goal of improving instream, riparian, and upland habitat within a working landscape through strong partnerships, following a science-based approach. To date the partnership has restored close to eight-miles of Nevada Creek across six different phases and Future Fisheries has been involved since the project inception in 2010. With this proposal, we are seeking funding to implement a stream, riparian, and wetland restoration project across 8,700 feet of Nevada Creek on the Mannix Brothers Ranch. This project will benefit westslope cutthroat trout (a Montana species of special concern), as well as rainbow trout and brown trout. The project will also improve fish passage and incorporate a grazing management system.

Restoring native westslope cutthroat trout habitat on the largest tributary to the middle Blackfoot River will be accomplished by addressing a range of limiting factors identified in Blackfoot Watershed Restoration Action and Sub Basin Plans, including fish habitat impairments (including degraded spawning and rearing habitat), disconnected floodplains, chronic bank erosion, and lack of functional riparian habitat. The proposed project is expected to increase instream habitat capacity and production of trout, similar to the documented benefits of previous restoration projects in Nevada Creek. The project will improve watershed conditions and fisheries resources in Nevada Creek, while also contributing to downstream water quality improvements and increased trout recruitment in the Blackfoot River. The proposed project will contribute to climate resiliency through increased water storage from floodplain connection and wetland restoration, water temperature decreases, carbon storage, and the rejuvenation of a healthy, self-sustaining, native riparian ecosystem. Restoring proper channel patterns and dimensions will reduce water temperatures during hot and dry periods and facilitate hyporheic flow exchanges. Climate change is one of the greatest threats to long-term persistence of westslope cutthroat trout and bull trout, and the climate resilience aspects of the project will contribute to the species' conservation goals.

Project specifics range from side channel and meander reactivation, bank treatments to address eroding banks, and floodplain grading. An estimated 573 tons of sediment are eroding from stream banks through this project reach annually.

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

Historic channel manipulations and streamside vegetation removal have contributed to the bank erosion issues. The project design includes both active and passive techniques to rectify the specific issues and their causes.

E. Length of stream or size of lake that will be treated (project extent): 8,700

Length/size of impact, if larger than project extent (e.g., stream miles opened):

F. Project Budget Summary:

Grant Request (Dollars):	**$**	**275,000.00**
Matching Dollars:	**$**	**456,193.40**
Matching In-Kind Services:*	**$**	**$172,045.00**

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

Other Contributions (not part of this app)	**$**	
Total Project Cost:	**$**	**903,238.40**

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 letters or statements of support (e.g., landowner consent, community or public support, and FWP fisheries support). List any other project partners:

Letters of support from MTFWP and USFWS Partners Program are attached.

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 [x] No [ ]

**If it is a water leasing project, describe the length of the agreement.*

The landowner will sign a 20-year maintenance commitment agreement. The entire project is on private land.

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.*

Yes, there will be a grazing plan as part of the project. For now, a riparian exclusion is planned with a grazing management plan under development that incorporates healthy utilization of surrounding upland and riparian habitat.

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 FWP surveyed the project reach to assess the fisheries population in 2022. 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, brown trout, rainbow trout.

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

The proposed reach along Nevada Creek lacks high-quality habitat. By addressing bank erosion issues, improper channel dimensions, lack of floodplain connection and riparian function we anticipate a dramatic improvement in instream and riparian habitat conditions. This will increase habitat capacity for trout, which is expected to lead to increased downstream recruitment to sections of lower Nevada Creek and the Blackfoot River.

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

Yes, Nevada Creek is a very productive stream and fisheries monitoring data completed on the reach of Nevada Creek restored in 2010, has shown an increase in trout abundance. Specifically, the average abundance of age-1 and older trout in the Phase 1 section exhibited a two-fold increase following restoration actions. See data chart included within this application. When Nevada Creek was initially surveyed in the early 1990's one brown trout was found in seven miles of stream. Trout populations in the restored reaches are now close to 140 trout per mile.

D. Will the project increase public fishing opportunity for wild fish and, if so, how? Is public fishing allowed onsite? If not, describe how the public would access the project benefits.

Yes: Public access is available. Landowners request permission is asked prior to accessing their property. Due to the monitoring data of the phase 1 project, we have seen a significant increase in the number of trout and thus we anticipate adding close to two miles of fishable habitat on Nevada Creek. The project is also expected to increase trout recruitment to publicly-accessible sections of lower Nevada Creek and the Blackfoot River. A recent radio telemetry study identified trout migration between the upstream project section and the frequently-fished section directly below the reservoir. Increased trout production in this phase will contribute to improved fishing opportunities within adjacent reaches that are more easily accessible by the public

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 an important tributary. Public benefits include: 1) expanding suitable habitat conditions for pure westslope cutthroat trout, 2) improved habitat for rainbow and brown trout,3) improved water quality conditions in Nevada Creek and the Blackfoot River, and 4) increased trout recruitment. 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?

No

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: Ryer Nendecker Date: November 14, 2023

Submittal: **Applications must be signed and received on or before November 15 and May 15 to be considered for the subsequent funding period**. Late or incomplete applications will be rejected.

Mail to:	FWP Future Fisheries Fish Habitat Bureau PO Box 200701 Helena, MT 59620-0701	Email:	Future Fisheries Coordinator FWPFFIP@mt.gov (electronic submissions must be signed) For files over 10MB, use https://transfer.mt.gov and send to mmcgree@mt.gov

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Both tables must be completed or the application will be returned

PROJECT COSTS					CONTRIBUTIONS			
WORK ITEMS (Itemize by Category)	**NUMBER OF UNITS**	**UNIT DESCRIPTION***	**COST/UNIT**	**TOTAL COST**	**FUTURE FISHERIES REQUEST**	**MATCH (Cash or Services)****	**OTHER (Not part of this application)**	**TOTAL**
Personnel***								
Survey	55	Hours	$100.00	$ 5,500.00		5,500.00		$ 5,500.00
Design	156	Hours	$125.00	$ 19,500.00		19,500.00		$ 19,500.00
Engineering	145	Hours	$125.00	$ 18,125.00		18,125.00		$ 18,125.00
Permitting	55	Hours	$115.00	$ 6,325.00		6,325.00		$ 6,325.00
Oversight	280	Hours	$115.00	$ 32,200.00		32,200.00		$ 32,200.00
Project Management	220	Hours	$45.00	$ 9,900.00		9,900.00		$ 9,900.00
			Sub-Total	$ 91,550.00	$ -	$ 91,550.00	$ -	$ 91,550.00
Travel								
Mileage	3600	Miles	$0.63	$ 2,268.00		2,268.00		$ 2,268.00
Per diem				$ -				$ -
			Sub-Total	$ 2,268.00	$ -	$ 2,268.00	$ -	$ 2,268.00
Construction Materials****								
Sods	45,224	sq/ft	$0.50	$ 22,612.00		$ 22,612.00		$ 22,612.00
Gravel	2,400	yds	$10.00	$ 24,000.00		$ 24,000.00		$ 24,000.00
Willow Cuttings	28,265	each	$1.00	$ 28,265.00		$ 28,265.00		$ 28,265.00
Transplants	100	each	$100.00	$ 10,000.00		$ 10,000.00		$ 10,000.00
Fill	5,000	yds	$5.00	$ 25,000.00		$ 25,000.00		$ 25,000.00
Trees	1000	each	$50.00	$ 50,000.00		$ 50,000.00		$ 50,000.00
GPS Set Up	1	LS	$10,000.00	$ 10,000.00		$ 10,000.00		$ 10,000.00
				$ -				$ -
				$ -				$ -
			Sub-Total	$ 169,877.00	$ -	$ 169,877.00	$ -	$ 169,877.00
Equipment, Labor, and Mobilization								
Mobilization	1	LS	$25,000.00	$ 25,000.00	5,000.00	$20,000		$ 25,000.00
Construct & Reclaim clearwater diversions	1	LS	$3,000.00	$3,000	1,000.00	$2,000		$3,000
Sallvage and transplant existing vegetation	1	LS	$10,000.00	$ 10,000.00	5,000.00	5,000.00		$ 10,000.00
Develop access roads and staging	1	LS	$5,000.00	$ 5,000.00	1,000.00	4,000.00		$ 5,000.00
Furnish Wood	35	loads	$1,500.00	$ 52,500.00	20,000.00	32,500.00		$ 52,500.00
Furnish screened alluvium	942	CY	$5.00	$ 4,710.00	1,000.00	3,710.00		$ 4,710.00

(Revised 11/15/2023)

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Furnish streambank sod	45,224	SF	$0.35	$ 15,828.40	5,000.00	10,828.40		$ 15,828.40
Excavate and haul fill	4,500	CY	$6.00	$ 27,000.00	12,000.00	15,000.00		$ 27,000.00
Ex channel and streambank subgrade	8940	CY	$5.75	$ 51,405.00	30,000.00	21,405.00		$ 51,405.00
Construct channel streambed	1,200	LF	$50.00	$ 60,000.00	30,000.00	30,000.00		$ 60,000.00
Shape Channel	1700	LF	$25.00	$ 42,500.00	20,000.00	22,500.00		$ 42,500.00
Construct lg wood structures	12	EA	$1,600.00	$ 19,200.00	8,000.00	11,200.00		$ 19,200.00
Construct vegetated wood matrix type 1	1190	LF	$25.00	$ 29,750.00	14,000.00	15,750.00		$ 29,750.00
Construct vegetated wood matrix type 2	5653	LF	$40.00	$ 226,120.00	112,000.00	114,120.00		$ 226,120.00
Install beaver dam analog	8	LF	$750.00	$ 6,000.00	1,000.00	5,000.00		$ 6,000.00
Floodplain grading & roughness	1	AC	$5,000.00	$ 5,000.00		5,000.00		$ 5,000.00
Furnish and install willows	28,265	each	$2.00	$ 56,530.00	10,000.00	46,530.00		$ 56,530.00
				$ -				$ -
			Sub-Total	$ 639,543.40	$ 275,000.00	$ 364,543.40	$ -	$ 639,543.40
			TOTALS	$ 903,238.40	$ 275,000.00	$ 628,238.40	$ -	$ 903,238.40

OTHER REQUIREMENTS:

All of the columns in the budget table and the matching contribution table MUST be completed appropriately or the application will be invalid. Please see the example budget sheet for additional clarification.

*Units = feet, hours, inches, etc. Do not use lump sum unless there is no other way to describe the costs.

**Can include in-kind materials. Justification for in-kind labor (e.g. hourly rates used). Do not use government salaries as match. Describe here or in text.

***The Review Panel suggests that design and oversight costs associated with a proposed project not exceed 15% of the total project budget. If design and oversight costs are in excess of 15%, applications must include a justification or minimum of two competitive bids for the cost of undertaking the project.

****The Review Panel recommends a maximum fencing cost of $1.50 per foot. Additional costs may be the responsibility of the applicant and/or partners.

Additional details:

APPLICATION MATCHING CONTRIBUTIONS

(do not include requested funds or contributions not associated with the application)

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
Private Landowner	$ 159,877.00	$ 6,193.40	$ 166,070.40	Yes
USFWS Partners for Fish & Wildlife Service	$ -	$ 100,000.00	$ 100,000.00	Yes
USFS	$ -	$ 250,000.00	$ 250,000.00	Yes
Bureau of Reclamation	$ -	$80,000	$ 80,000.00	No
BBCTU	$ 12,168.00	$ 20,000.00	$ 32,168.00	Yes
	$ -	$ -	$ -	
TOTALS	$ 172,045.00	$ 456,193.40	$ 628,238.40	

OTHER CONTRIBUTIONS

(contributions not associated with the application)

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

Existing conditions on Nevada Creek Phase 7

Region 2 Headquarters
3201 Spurgin Road
Missoula, MT 59804
Phone 406-542-5500
October 26, 2023

Future Fisheries Improvement Program
c/o Michelle McGree
Montana Fish, Wildlife & Parks
P.O. Box 200701
1420 E. 6th Avenue
Helena, MT 59620-0701

RE: Nevada Creek Restoration-Phase 7

Dear Future Fisheries Panel:

I am writing in support of the Nevada Creek Restoration-Phase 7 application submitted by the Big Blackfoot Chapter of Trout Unlimited. Habitat restoration efforts in the Nevada Creek drainage have increased in recent years, creating high-quality instream habitat conditions and measurable decreases in downstream sediment delivery. This project is expected to complement the success of previous projects and provide public benefits in the form of increased trout recruitment to publicly accessible stream reaches.

Nevada Creek is a severely degraded tributary impacted from sedimentation, nutrient inputs, elevated water temperatures, and lack of instream habitat complexity. Moreover, the section of the Blackfoot River from Nevada Creek to the North Fork Blackfoot River is a high priority reach that has low densities of trout attributed to poor recruitment from tributaries. Achieving restoration goals in Nevada Creek will also improve conditions within this important section of the mainstem Blackfoot River.

The Phase 7 project reach is downstream of two large irrigation canals and several irrigation ditches that create low-flow conditions throughout the irrigation season. A recent survey in the project vicinity documented a near-absence of trout. Water temperatures in the project area were suitable for trout, suggesting instream habitat issues such as passage impediments, lack of suitable spawning habitat, and poor water quality were responsible for the lack of trout. The proposed restoration treatments will help address these issues.

Your continued investment in Nevada Creek will contribute to restoring the quality of aquatic resources in this large tributary, while improving conditions in the Blackfoot River. This work advances our broader fisheries management and conservation objectives in the watershed.

Please contact Patrick Uthe, Fisheries Biologist, at (406) 542-5532, or Patrick.Uthe@mt.gov

for any questions on this project. Thank you very much for consideration of this funding application.

Sincerely,

Randy Arnold
Fish, Wildlife & Parks
Regional Supervisor, Region 2
rarnold@mt.gov
(406)542-5504

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Partners for Fish and Wildlife Program
Upsata Lake, 196 Lower Lake Side Lane
P.O. Box 66
Ovando, MT 59854

November 9th, 2023

Montana Fish, Wildlife and Parks
Attn: Michelle McGree
1420 East 6th Ave.
Helena, MT 59620

RE: Support for the Big Blackfoot Chapter of Trout Unlimited Application to Future Fisheries for Phase 7 Restoration on Nevada Creek

Dear Future Fisheries Panel:

The U.S. Fish and Wildlife Service (Service) strongly endorses projects that support our mission to conserve and manage federal trust and at-risk species, including bull trout (*Salvelinus confluentus*) and westslope cutthroat trout (*Oncorhynchus clarkii lewisi*), such as the proposal submitted by the Big Blackfoot Chapter of Trout Unlimited (BBCTU) for Phase 7 of the Nevada Creek Restoration. This project will improve instream, riparian, and wetland habitat within a working landscape through strong partnerships, following a science-based approach.

The Service's Partners for Fish and Wildlife Program has a long history of working with the associated private landowners and other partners collaborating to restore the native trout fishery in the Nevada Creek Watershed of the Blackfoot Valley. This is an extremely high priority watershed for the Service and an important tributary to the Blackfoot River, and the funding through this grant will advance BBCTU's efforts to address large-landscape conservation issues with a locally led collaborative and inclusive approach. We are excited to support the BBCTU proposal and continue to work in this landscape.

We urge the Future Fisheries Panel to provide funding for this collaborative effort. If you have any questions regarding this letter of support, please contact me at (406) 351-3078 or by email at rebecca_reeves@fws.gov. Thank you for considering this request.

Sincerely,

Rebecca A Reeves

Rebecca Reeves
Partners for Fish and Wildlife

CONCEPTUAL PLAN
NOT FOR CONSTRUCTION

NEVADA CREEK PHASE 7 RESTORATION PROJECT
CONCEPTUAL DESIGN

PROJECT PARTNERS

BIG BLACKFOOT CHAPTER OF TROUT UNLIMITED
P.O. BOX 1
OVANDO, MONTANA 59854

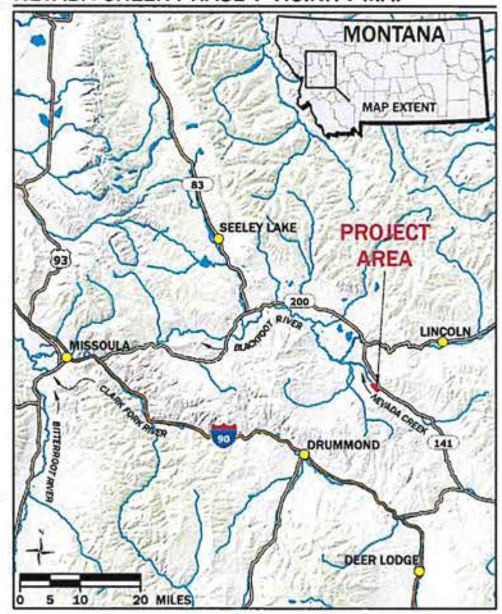
US FISH AND WILDLIFE SERVICE
MONTANA PARTNERS FOR FISH AND WILDLIFE PROGRAM
UPSATA LAKE WATERFOWL PRODUCTION AREA
196 LOWER LAKE SIDE LANE
OVANDO, MONTANA 59854

MONTANA FISH, WILDLIFE, AND PARKS
3201 SPURGIN ROAD
MISSOULA, MONTANA 59804

MANNIX FAMILY RANCH
106 SPIEKER LOOP
HELMVILLE, MONTANA 59843

DRAWING INDEX

NEVADA CREEK PHASE 7 VICINITY MAP



SE¼ S31, T13N, R10W
POWELL COUNTY, MONTANA

PROJECT DESCRIPTION

BIG BLACKFOOT CHAPTER OF TROUT UNLIMITED (BBCTU), IN COOPERATION WITH MONTANA FISH, WILDLIFE & PARKS (MFWP), THE U.S. FISH AND WILDLIFE SERVICE (FWS), AND THE MANNIX FAMILY RANCH, RETAINED RIVER DESIGN GROUP, INC. TO EVALUATE EXISTING CONDITIONS AND DEVELOP A RESTORATION PLAN FOR A 6,700-FOOT REACH OF NEVADA CREEK. LOCATED APPROXIMATELY 55 MILES EAST OF MISSOULA, MONTANA, NEVADA CREEK IS A THIRD ORDER TRIBUTARY TO THE MIDDLE BLACKFOOT RIVER AND SUPPORTS POPULATIONS OF WESTSLOPE CUTTHROAT TROUT, RAINBOW TROUT, BROWN TROUT AND OTHER FISH SPECIES. NEVADA CREEK HAS BEEN IDENTIFIED AS AN IMPAIRED WATERBODY BY THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY. THE STREAM IS CONSIDERED NON-SUPPORTING OF AQUATIC LIFE DUE TO FLOW REGIME MODIFICATIONS, TOTAL NITROGEN, TOTAL PHOSPHORUS, PHYSICAL SUBSTRATE HABITAT ALTERATIONS, SEDIMENTATION/SILTATION, TEMPERATURE AND TOTAL KJEHLDAHL NITROGEN (MDEQ, 2008). SOURCES OF WATER QUALITY IMPAIRMENT INCLUDE AGRICULTURE, UNKNOWN SOURCES, AND STREAMBANK MODIFICATIONS.

SIX PHASES OF RESTORATION HAVE BEEN IMPLEMENTED ON NEVADA CREEK (2012, 2017, 2019, 2020, 2022, AND 2023). THESE SIX PHASES INVOLVED EXTENSIVE CHANNEL RECONSTRUCTION, AQUATIC HABITAT ENHANCEMENT, STREAMBANK RESTORATION, AND RECONNECTING NEVADA CREEK TO ITS FORMER FLOODPLAIN. IN THE PHASE 7 PROJECT AREA, NEVADA CREEK EXHIBITS BOTH MULTI-THREAD (ANASTOMOSED) AS WELL AS SINGLE-THREAD CHANNEL FORMS. AGRICULTURAL PRACTICES COMBINED WITH VEGETATION REMOVAL HAVE COMPROMISED BANK STABILITY THROUGHOUT THE PHASE 7 PROJECT AREA, RESULTING IN HIGH SEDIMENT LOADING WITH AN ESTIMATED ANNUAL SEDIMENT YIELD OF 573 TONS. MOST OF THE STREAMBANKS ARE MIDDLE TO HIGH TERRACES THAT DISPLAY LOW SOIL STRENGTH DUE TO LACK OF ROOTING STRUCTURE AND HIGH BANK HEIGHT RATIOS. RESTORATION STRATEGIES WILL LOWER HIGH TERRACES TO MATCH THE CURRENT BANKFULL FLOODPLAIN SURFACE. STREAMBANK RESTORATION TECHNIQUES WILL INCREASE CHANNEL MARGIN ROUGHNESS AND PROVIDE CONDITIONS SUITABLE FOR ESTABLISHING WOODY RIPARIAN VEGETATION. THESE COMBINED ACTIONS ARE PROJECTED TO: 1) REDUCE SEDIMENT LOADING TO NEVADA CREEK BY SEVERAL HUNDRED TONS PER YEAR; 2) INCREASE FLOODPLAIN CONNECTION; AND 3) SET THE STAGE FOR RECOVERY OF THE RIPARIAN ZONE AND AQUATIC HABITAT CONDITIONS BY CORRECTING CHANNEL DIMENSIONS IN SELECT LOCATIONS OF THE PROJECT REACH. THESE RESTORATION ACTIONS WILL BE COMPLEMENTED BY A GRAZING MANAGEMENT PLAN THAT WILL INVOLVE ROTATIONAL GRAZING PRACTICES, DEVELOPMENT OF OFF-CHANNEL WATER SOURCES, AND INSTALLATION OF RIPARIAN EXCLOSURES TO PROTECT SENSITIVE RIPARIAN FLOODPLAIN ENVIRONMENTS.

GENERAL NOTES

1. SLOPES DESIGNATED AS 2:1, 1.5:1 ET CETERA, ARE THE RATIOS OF HORIZONTAL DISTANCE TO VERTICAL DISTANCE.
2. DIMENSIONS ARE GIVEN IN FEET AND TENTHS OF A FOOT.
3. ALL EXISTING CONDITIONS ARE TO BE VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION AND ANY ADJUSTMENTS TO THE DRAWINGS SHALL BE COORDINATED BY RDG.
4. PROTECT ALL VEGETATION AND LAND AREAS NOT LOCATED WITHIN THE PROJECT CONSTRUCTION, STAGING, OR EARTHWORK LIMITS. EXERCISE CARE IN AREAS NOT SO MARKED TO AVOID UNNECESSARY DAMAGE TO NATURAL VEGETATION.
5. THE PROJECT SPONSOR IS RESPONSIBLE FOR COMPLYING WITH ALL PERMITS INCLUDING ALL FEDERAL, STATE, COUNTY, AND LOCAL PERMIT CONDITIONS.
6. 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.
7. EXCAVATION SHALL MEET THE REQUIREMENTS OF OSHA 29 CFR PART 1926, SUBPART P, EXCAVATIONS. ACTUAL SLOPES SHALL NOT EXCEED THE SLOPES AS INDICATED ON DRAWINGS.
8. ALL EXCAVATORS SHALL BE EQUIPPED WITH MACHINE GRADE GPS. CONSTRUCTION AREAS WILL BE STAKED OUT BY RDG PRIOR TO CONSTRUCTION.
9. RDG WILL PROVIDE SURVEY CONTROL FOR EQUIPMENT WITH GPS MACHINE CONTROL CAPABILITY. RDG SHALL PROVIDE SURVEY STAKING AND LAYOUT FOR CONSTRUCTION, INCLUDING HORIZONTAL CONSTRUCTION EXTENTS, SUBGRADE EXCAVATION EXTENTS, AND FINISHED GRADE ELEVATIONS.
10. VERTICAL TOLERANCE FOR CONSTRUCTION COMPLIANCE WILL BE 0.3 FEET. HORIZONTAL TOLERANCE WILL BE 1.0 FEET.
11. CONTRACTOR SHALL CONFIRM QUANTITIES. REPORTED VOLUMES ARE NEATLINE AND DO NOT INCLUDE ADJUSTMENTS FOR COMPACTION OR OTHER FACTORS.

REUSE OF DRAWINGS

STANDARD OF PRACTICE

RIVER DESIGN GROUP, INC. WORKS EXCLUSIVELY IN THE RIVER ENVIRONMENT AND UTILIZES THE MOST CURRENT AND ACCEPTED PRACTICES AVAILABLE FOR PLANNING AND DESIGN OF RIVER, FLOODPLAIN, AND AQUATIC HABITAT RESTORATION PROJECTS. CURRENT STANDARDS FOR THE DESIGN OF RESTORATION PROJECTS VARY DEPENDING ON PROJECT GOALS. STABILITY CRITERIA INCLUDE DESIGNING STREAMBED AND STREAMBANK STRUCTURES FOR THE AVERAGE ANNUAL PEAK FLOW DISCHARGE (130 CFS).

RDG
RIVER DESIGN GROUP
236 Wisconsin Avenue
Whitefish, MT 59937
tel.406.862.4927
fax.406.862.4963
311 SW Jefferson Avenue
Corvallis, OR 97333
tel.541.738.2920
fax.541.758.8534

COVER PAGE
NEVADA CREEK PHASE 7

NO.	DATE	BY	DESCRIPTION	CHK
1	09-28-23	DW	DESIGN	JM

PROJECT NUMBER
RDG-23-151

DRAWING NUMBER
1.0

SHEET 1 OF 12

M:\Projects\2023\RDG-23-151 Nevada Creek Phase 7\GIS\PRO\APRX\Nevada Creek Phase 7 Main Channel Concepts\Nevada Creek Phase 7 Main Channel Concept\Nevada Creek Phase 7 Main Channel Concept.aprx

CONCEPTUAL PLAN
NOT FOR CONSTRUCTION

LENGTH OF TREATMENT BY BEHI CATEGORY					
	BEHI CATEGORY				
MEANDER REACTIVATION	MODERATE (FT)	HIGH (FT)	VERY HIGH (FT)	EXTREME (FT)	TOTAL (FT)
1200	1914	1421	992	126	5653

TOTAL MATERIALS					
BEHI CATEGORY	CATEGORY 2 WOOD	CATEGORY 3 WOOD	WILLOW CUTTINGS	STREAMBANK ALLUVIUM (CY)	SOD MATS (SQFT; ACRE)
MODERATE	3828	3828	9570	191	15,312; 0.35
HIGH	4263	4263	7105	284	11,368; 0.26
VERY HIGH	3968	3968	4960	297	7,936; 0.18
EXTREME	630	630	630	50	1,008; 0.02
MEANDER REACTIVATION	2400	2400	6000	120	9,600; 0.22
TOTAL	**15,089**	**15,089**	**28,265**	**942**	**45,224; 1.04**

MATERIAL SPECIFICATIONS				
ITEM	QUANTITY	DIAMETER	LENGTH	NOTE
CATEGORY 2 WOOD	15,089	3 - 6 INCH	8 - 10 FEET	
CATEGORY 3 WOOD	15,089	<3 INCH	8 - 10 FEET	BRUSH AND SLASH
WILLOW CUTTINGS	28,265	0.25 - 1.0 INCH	8 - FOOT MIN.	
STREAMBANK ALLUVIUM (CY)	942	6-INCH MINUS		GENERATE ON-SITE

EARTHWORK		
BEHI CATEGORY	SUBGRADE EXCAVATION QUANTITY (CY)	BACKFILL QUANTITY (CY)
MODERATE	2268	1134
HIGH	2526	1263
VERY HIGH	2351	1176
EXTREME	373	187
MEANDER REACTIVATION	1422	711
TOTAL	**8.940**	**4,471**

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PROJECT MATERIALS AND QUANTITIES
NEVADA CREEK PHASE 7

NO.	DATE	BY	DESCRIPTION	CHK
1	09-26-23	DW	DESIGN	JM

PROJECT NUMBER
RDG-23-151

DRAWING NUMBER
2.0

SHEET 2 OF 12

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CONCEPTUAL PLAN
NOT FOR CONSTRUCTION

EXAMPLE LOW
BANK EROSION HAZARD INDEX (BEHI) CONDITIONS




SITES CLASSIFIED AS LOW ARE CONSIDERED REFERENCE ANALOGS AND REPRESENT THE DESIRED FUTURE CONDITION FOR RESTORATION SITES IN THE PROJECT AREA. BANK HEIGHT RATIOS ARE LOW, ROOTING STRUCTURE EXTENDS TO THE TOE OF THE BANK, AND WOODY RIPARIAN SPECIES DOMINATE STREAMBANK AND FLOODPLAIN AREAS. BEAVER DAMS SUPPORT HIGH QUALITY INSTREAM HABITAT AND RECHARGE GROUNDWATER LEVELS. THESE SITES HAVE BEEN LARGELY EXCLUDED FROM CATTLE BROWSE DUE TO ACCESS CONSTRAINTS. HERBACEOUS SPECIES IN THE UNDERSTORY OF THE SCRUB-SHRUB WETLANDS INCLUDE BEAKED SEDGE, SMALL-FRUITED BULRUSH, CANADA GOLDENROD AND NONNATIVE PASTURE GRASSES. COLLECTIVELY, THESE CONDITIONS RESULT IN COMPLEX AQUATIC HABITAT CONDITIONS, STABLE STREAMBANKS, AND LOW SEDIMENT DELIVERY RATES TO NEVADA CREEK, WITH AN AVERAGE EROSION RATE OF 0.1 TO 0.17 FEET PER YEAR.

EXAMPLE HIGH TO EXTREME
BANK EROSION HAZARD INDEX (BEHI) CONDITIONS




SITES CLASSIFIED AS HIGH TO EXTREME EXHIBIT MODERATE TO HIGHLY ENTRENCHED CHANNEL CONDITIONS, HIGH BANK HEIGHT RATIOS, SHALLOW ROOTING STRUCTURE, AND LACK OF WOODY VEGETATION. FLOODPLAIN DISCONNECTION RESULTS IN ERODIBLE STREAMBANK CONDITIONS WHICH CONTRIBUTE TO SEDIMENT AND HABITAT RELATED IMPAIRMENTS. DISCONNECTED FLOODPLAIN AREAS ARE CHARACTERIZED BY UPLAND CONDITIONS AND BY GRAZING AND AGRICULTURE, AND THE PLANT SPECIES REFLECT THESE LAND USE PRACTICES AND DRIVE BANK EROSION. PASTURE GRASSES INCLUDE REDTOP, QUACKGRASS, SMOOTH BROME, AND POCKETS OF NOXIOUS WEEDS. THE CUMULATIVE EFFECTS OF CHANNEL ENTRENCHMENT, FLOODPLAIN DISCONNECTION, AND VEGETATION CLEARING RESULT IN HIGH SEDIMENT DELIVERY RATES TO NEVADA CREEK, WITH AN AVERAGE EROSION RATE OF 0.31 TO 0.47 FEET PER YEAR.

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EXISTING STREAMBANK CONDITIONS

NEVADA CREEK PHASE 7

NO.	DATE	BY	DESCRIPTION	CHK
1	09-27-23	DW	DESIGN	JM

PROJECT NUMBER
RDG-23-151

DRAWING NUMBER
3.0

SHEET 3 OF 12

M:\Projects\2023\RDG-23-151 Nevada Creek Phase 7\GIS\PRO_APRX\Nevada Creek Phase 7 Main Channel Concepts\Nevada Creek Phase 7 Main Channel Concept\Nevada Creek Phase 7 Main Channel Concept.aprx

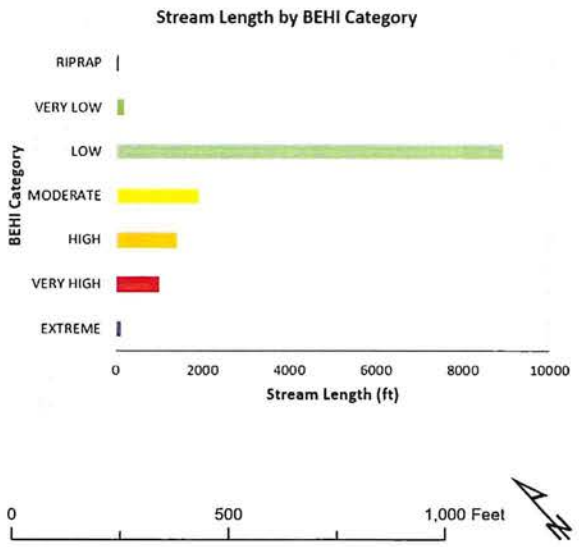
Nevada Creek BEHI Assessment Phase 7 Pre-Restoration (2023)

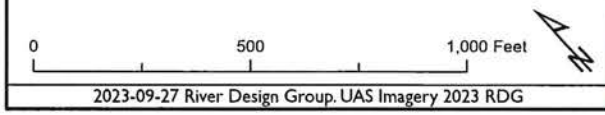
BANK EROSION HAZARD INDEX ASSESSMENT

CATEGORY

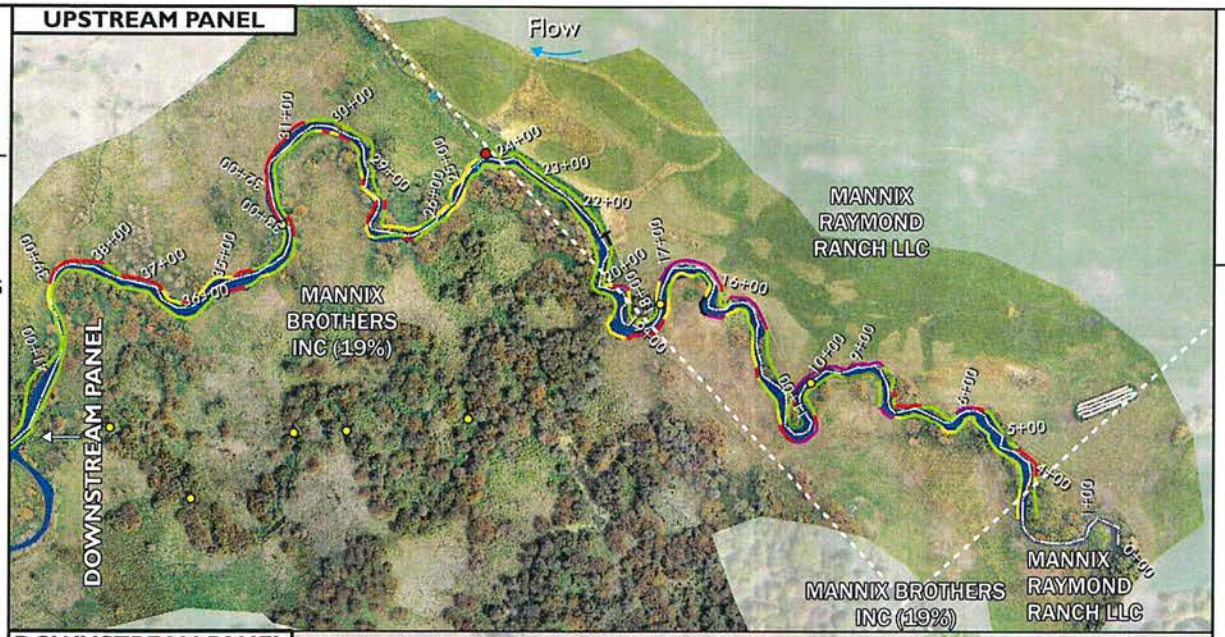
- EXTREME
- VERY HIGH
- HIGH
- MODERATE
- LOW
- VERY LOW
- NON-CONTRIBUTING
- RIPRAP

BEHI RATING	LENGTH (FT)	MIGRATION RATE (FT/YR)	BANK HEIGHT (FT)	DENSITY (LBS/FT^3)	SEDIMENT YIELD (TONS/YR)
EXTREME	126	0.47	6.5	100	19
VERY HIGH	992	0.39	6.0	100	116
HIGH	1421	0.31	5.0	100	110
MODERATE	1914	0.23	4.5	100	99
LOW	8913	0.17	3.0	100	227
VERY LOW	175	0.1	2.0	100	2
RIPRAP	33	0	3.0	100	0
TOTAL	13,573				573





2023-09-27 River Design Group. UAS Imagery 2023 RDG



CONCEPTUAL PLAN
NOT FOR CONSTRUCTION

RDG RIVER DESIGN GROUP
311 SW Jefferson Avenue, Corvallis, OR 97333
226 Wisconsin Avenue, Whitefish, MT 59937

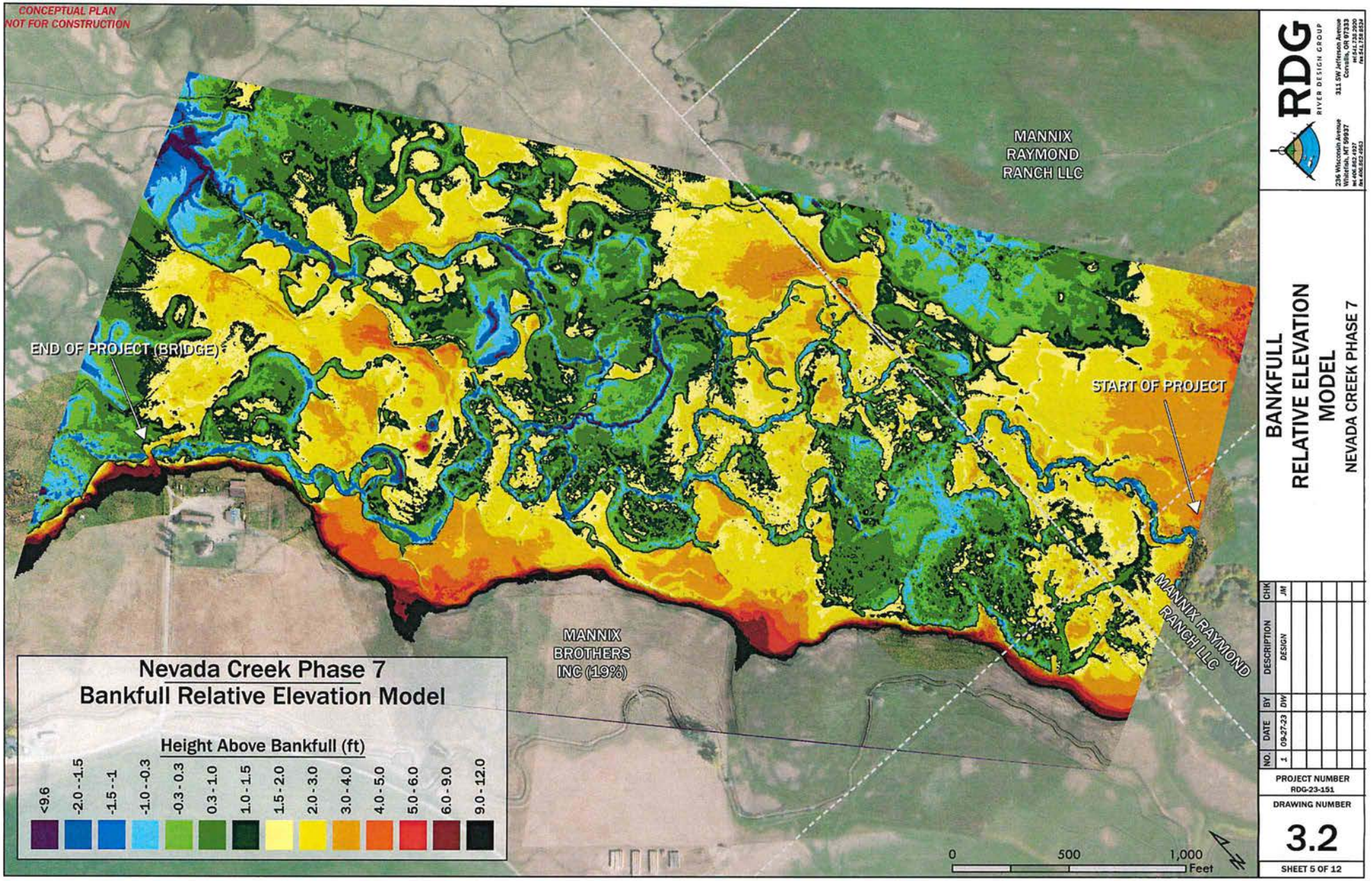
BANK EROSION HAZARD INDEX ASSESSMENT
NEVADA CREEK PHASE 7

NO.	DATE	BY	DESCRIPTION	CHK
1	05-27-23	DW	DESIGN	JM

PROJECT NUMBER
RDG-23-151

DRAWING NUMBER
3.1

SHEET 4 OF 12


CONCEPTUAL PLAN
NOT FOR CONSTRUCTION
MANNIX
RAYMOND
RANCH LLC
END OF PROJECT (BRIDGE)
START OF PROJECT
MANNIX
BROTHERS
INC (19%)
MANNIX RAYMOND
RANCH LLC
Nevada Creek Phase 7
Bankfull Relative Elevation Model
Height Above Bankfull (ft)
<9.6
-2.0 - -1.5
-1.5 - -1
-1.0 - -0.3
-0.3 - 0.3
0.3 - 1.0
1.0 - 1.5
1.5 - 2.0
2.0 - 3.0
3.0 - 4.0
4.0 - 5.0
5.0 - 6.0
6.0 - 9.0
9.0 - 12.0
0
500
1,000
Feet
RDG
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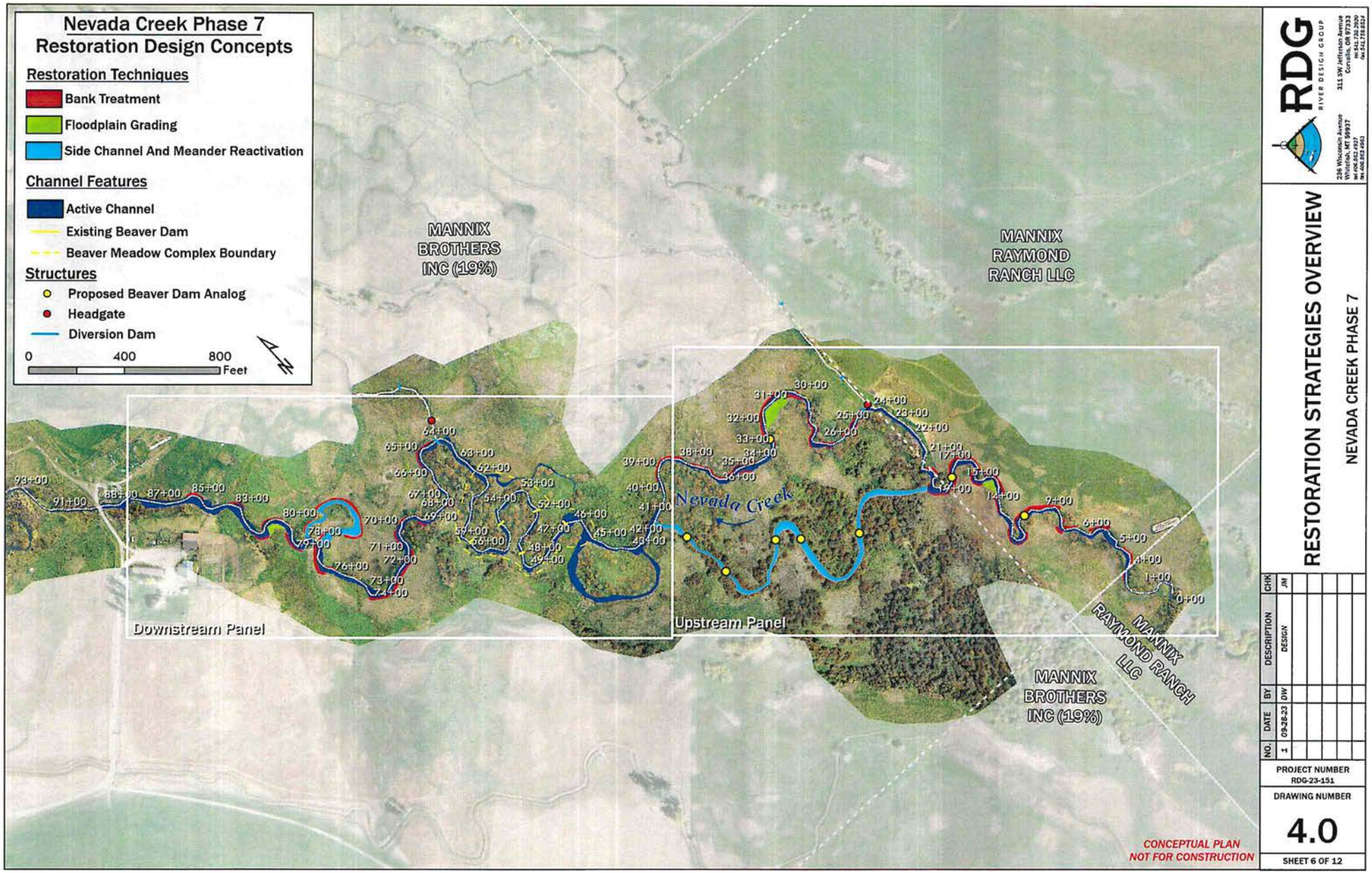
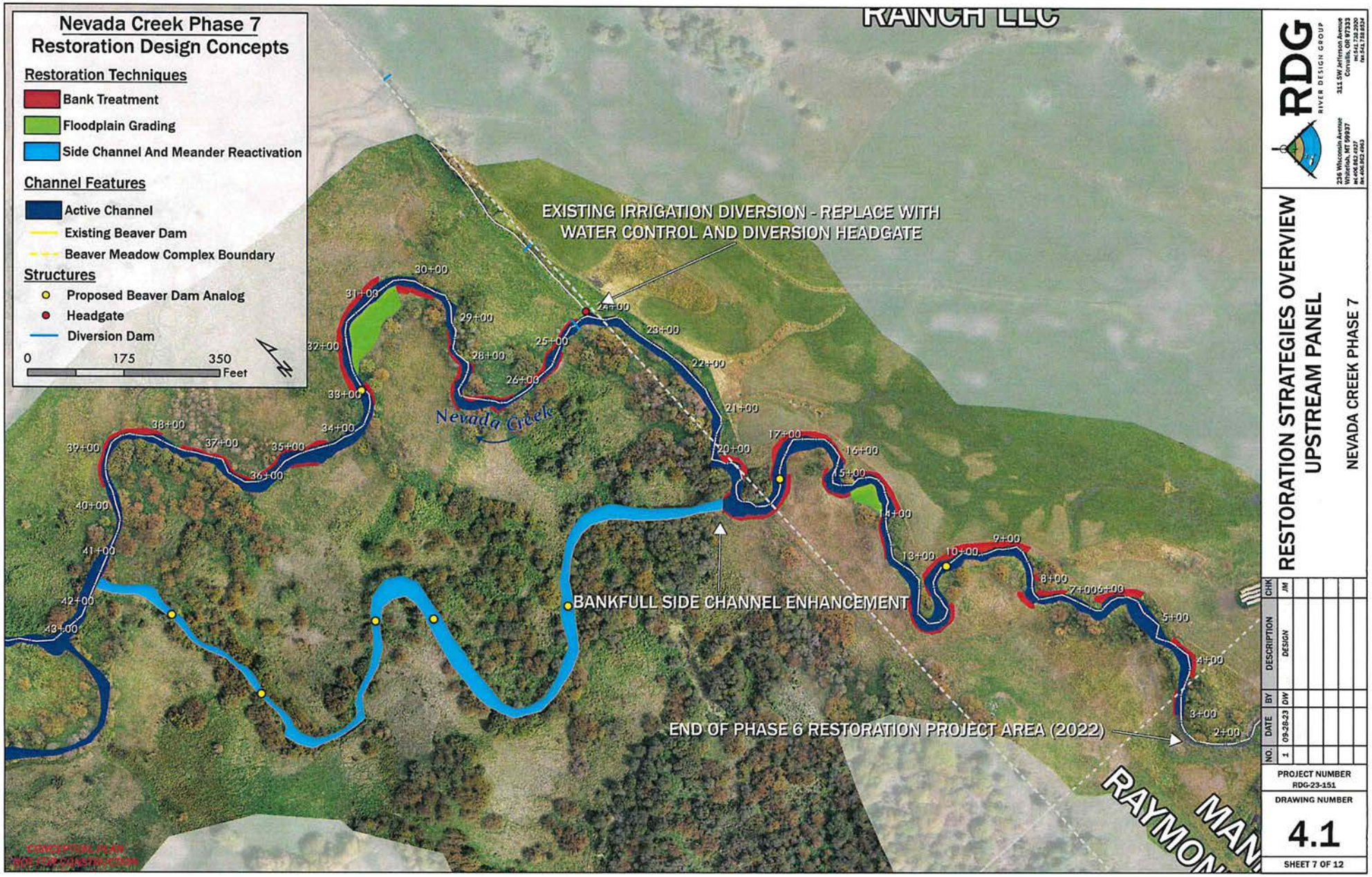
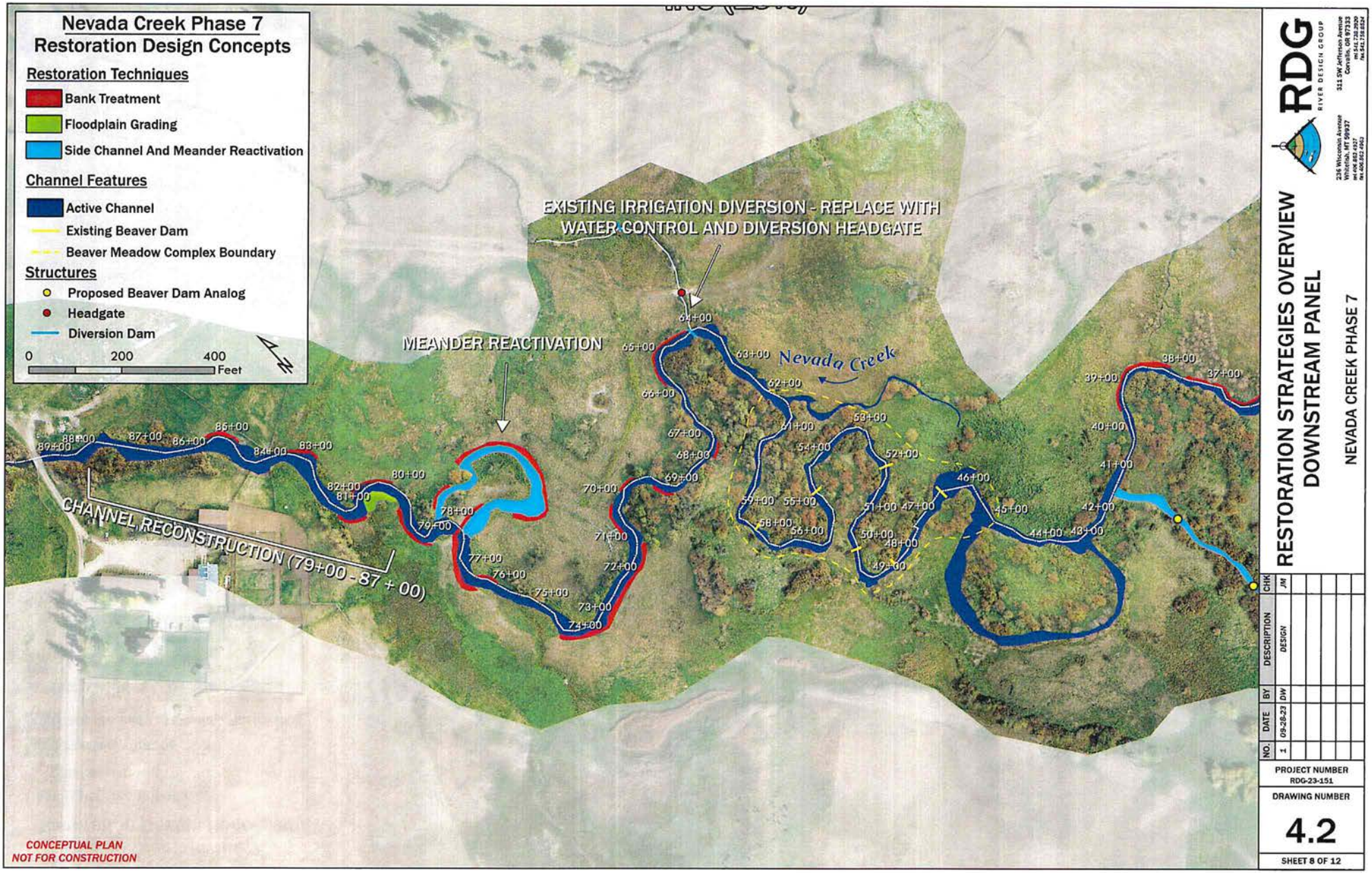
fx 406.862.4963
BANKFULL
RELATIVE ELEVATION
MODEL
NEVADA CREEK PHASE 7
NO. 1
DATE 09-27-23
BY DW
DESCRIPTION DESIGN
CHK JM
PROJECT NUMBER
RDG-23-151
DRAWING NUMBER
3.2
SHEET 5 OF 12


Nevada Creek Phase 7
Restoration Design Concepts
Restoration Techniques
Bank Treatment
Floodplain Grading
Side Channel And Meander Reactivation
Channel Features
Active Channel
Existing Beaver Dam
Beaver Meadow Complex Boundary
Structures
Proposed Beaver Dam Analog
Headgate
Diversion Dam
0
400
800
Feet
MANNIX BROTHERS INC (19%)
MANNIX RAYMOND RANCH LLC
Nevada Creek
Downstream Panel
Upstream Panel
MANNIX RAYMOND RANCH LLC
MANNIX BROTHERS INC (19%)
CONCEPTUAL PLAN
NOT FOR CONSTRUCTION
RDG
RIVER DESIGN GROUP
RESTORATION STRATEGIES OVERVIEW
NEVADA CREEK PHASE 7
NO. 1
DATE 09-28-23
BY DW
DESCRIPTION DESIGN
CHK JM
PROJECT NUMBER
RDG-23-151
DRAWING NUMBER
4.0
SHEET 6 OF 12


Nevada Creek Phase 7
Restoration Design Concepts
Restoration Techniques
Bank Treatment
Floodplain Grading
Side Channel And Meander Reactivation
Channel Features
Active Channel
Existing Beaver Dam
Beaver Meadow Complex Boundary
Structures
Proposed Beaver Dam Analog
Headgate
Diversion Dam
0
175
350
Feet
RANCH LLC
EXISTING IRRIGATION DIVERSION - REPLACE WITH WATER CONTROL AND DIVERSION HEADGATE
BANKFULL SIDE CHANNEL ENHANCEMENT
END OF PHASE 6 RESTORATION PROJECT AREA (2022)
Nevada Creek
RAYMON
MAN
CONCEPTUAL PLAN NOT FOR CONSTRUCTION
RDG
RIVER DESIGN GROUP
RESTORATION STRATEGIES OVERVIEW
UPSTREAM PANEL
NEVADA CREEK PHASE 7
NO. 1
DATE 09-28-23
BY DW
DESCRIPTION DESIGN
CHK JM
PROJECT NUMBER
RDG-23-151
DRAWING NUMBER
4.1
SHEET 7 OF 12

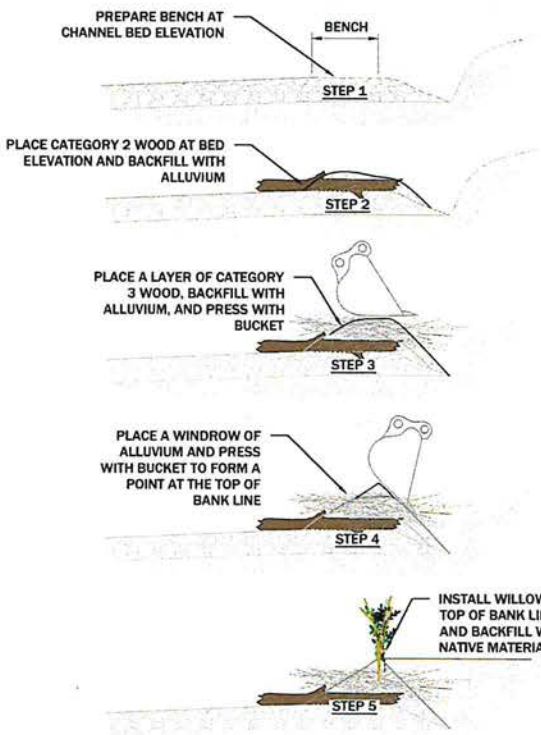

Nevada Creek Phase 7
Restoration Design Concepts
Restoration Techniques
Bank Treatment
Floodplain Grading
Side Channel And Meander Reactivation
Channel Features
Active Channel
Existing Beaver Dam
Beaver Meadow Complex Boundary
Structures
Proposed Beaver Dam Analog
Headgate
Diversion Dam
0 200 400 Feet
EXISTING IRRIGATION DIVERSION - REPLACE WITH WATER CONTROL AND DIVERSION HEADGATE
MEANDER REACTIVATION
CHANNEL RECONSTRUCTION (79+00 - 87 + 00)
Nevada Creek
CONCEPTUAL PLAN
NOT FOR CONSTRUCTION
RDG
RIVER DESIGN GROUP
RESTORATION STRATEGIES OVERVIEW
DOWNSTREAM PANEL
NEVADA CREEK PHASE 7
NO. 1
DATE 09-28-23
BY DW
DESCRIPTION DESIGN
CHK JM
PROJECT NUMBER
RDG-23-151
DRAWING NUMBER
4.2
SHEET 8 OF 12

NOTES ON VEGETATED WOOD MATRIX INSTALLATION

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 CHANNEL STREAMBED ALLUVIUM FROM THE BASE OF THE EXCAVATION DEPTH/BOTTOM OF EXCAVATION TO WITHIN 1.0-FT. ABOVE EXISTING STREAMBED GRADE..
3. 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 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 BANK EDGE. WILLOW CUTTINGS SHOULD INTERCEPT THE DESIGN TOP OF BANK LINE 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. STRUCTURE ENDS MAY BE STABILIZED WITH LARGE ROCK AS APPROVED BY ENGINEER.
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 2 PER LINEAR FOOT (OR 20 PER TRENCH) AS SHOWN. NO AREAS BEHIND THE FINISHED BANKLINE ARE TO BE LEFT BELOW FINISHED GRADE.

GENERAL NOTES

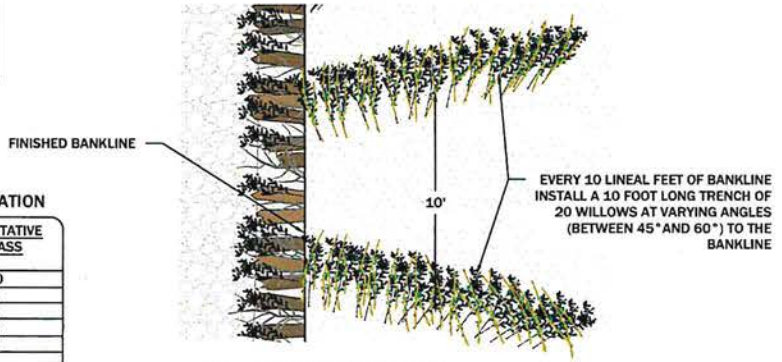
1. CONSTRUCTION OF THE VEGETATED WOOD MATRIX WILL OCCUR AFTER THE STREABANK SUBGRADE IS EXCAVATED AND APPROVED BY ENGINEER.
2. INSTALLATION OF FLOODPLAIN TREATMENT SHALL BE COMPLETED AFTER VEGETATED WOOD MATRIXES ARE INSTALLED.
3. IF VEGETATED WOOD MATRIX STRUCTURES ARE INSTALLED PRIOR TO OCTOBER 1,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



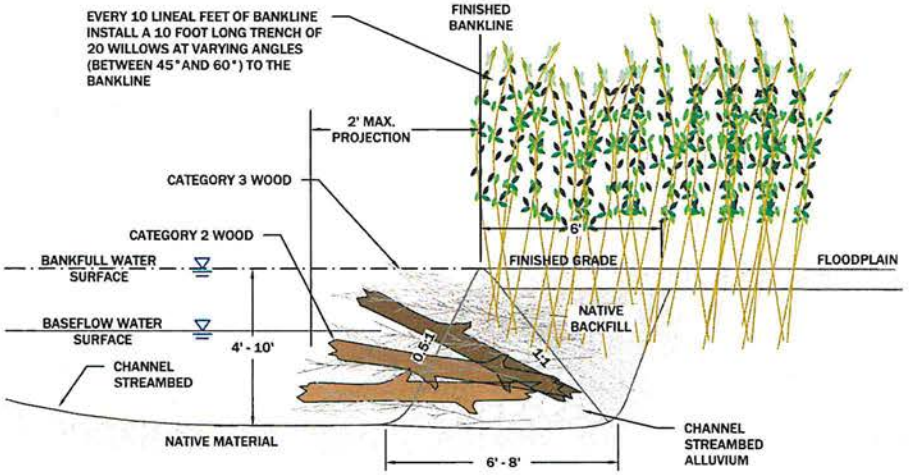
3 RECOMMENDED VEGETATED WOOD MATRIX INSTALLATION SEQUENCE
SECTION VIEW 1" = 5'

STREAMBED ALLUVIUM GRADATION

SIZE (INCHES)	PERCENT PASSING	REPRESENTATIVE SIZE CLASS
6	95	D100
5	80 - 90	D84
4	45 - 55	D50
2	30 - 40	D35
1	20 - 30	D16
0.6	20	



2 WILLOW TRENCH DETAIL
PLAN VIEW 1" = 4'



1 VEGETATED WOOD MATRIX
SECTION VIEW 1" = 3'

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VEGETATED WOOD MATRIX DETAIL

NEVADA CREEK PHASE 7

NO.	DATE	BY	DESCRIPTION	CHK
1	09-27-23	DW	DESIGN	JM

PROJECT NUMBER
RDG-23-151

DRAWING NUMBER
5.1

SHEET 9 OF 12

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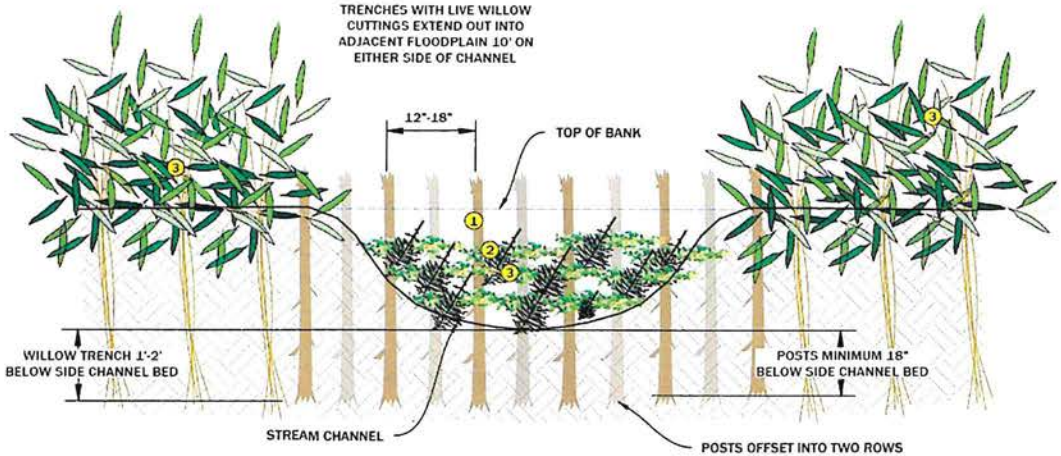
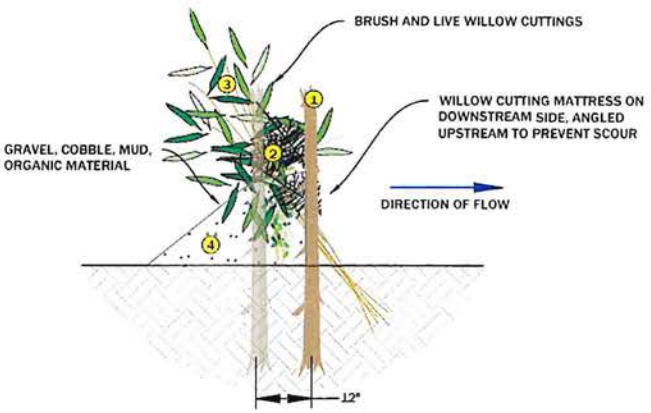
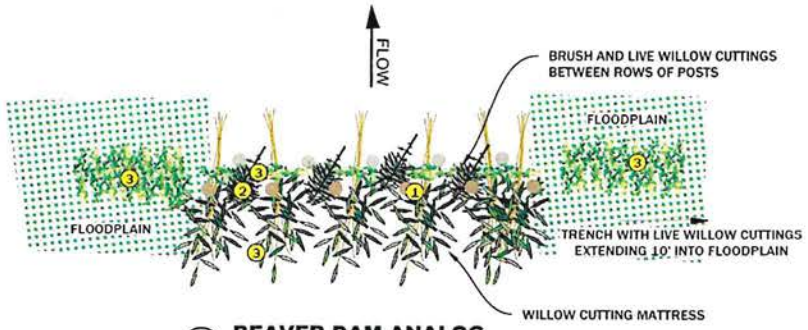


1 **BEAVER DAM ANALOG SECTION VIEW** NTS



3 **BEAVER DAM ANALOG PROFILE VIEW** NTS



2 **BEAVER DAM ANALOG PLAN VIEW** NTS

MATERIAL SCHEDULE (PER LINEAR FOOT)			
	ITEM	SIZE	QUANTITY (EA)
1	UNTREATED OR SALVAGED WOODEN POSTS	3" D, 4' L	1
2	BRUSH	1"-3" D, 4'-8' L, GREEN WOOD PREFERRED	3
3	WILLOW CUTTINGS	0.5"-1" D, 4'-6' L	5
4	GRAVEL/COBBLE/MUD	VARIES	0.4 CY

GENERAL NOTES

1. CONSTRUCTION OF BEAVER DAM ANALOGS WILL OCCUR AFTER THE SIDE CHANNEL AND FLOODPLAIN SUBGRADE BACKFILL IS PLACED AND THE CHANNEL STREAMBED IS CONSTRUCTED.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY THE ENGINEER.
3. FIELD ENGINEER SHALL MARK THE GENERAL CONSTRUCTION LOCATION FOR EACH BEAVER DAM ANALOG PRIOR TO CONSTRUCTION.

CONSTRUCTION NOTES

1. CONSTRUCT BEAVER DAM ANALOGS AT LOCATIONS STAKED BY ENGINEER AFTER COMPLETION OF SIDE CHANNEL CONSTRUCTION.
2. EXCAVATE A TRENCH EXTENDING APPROXIMATELY 10 FT INTO THE FLOODPLAIN ON EITHER SIDE OF THE STAKED BEAVER DAM ANALOG LOCATION. THE TRENCH SHOULD EXTEND APPROXIMATELY 1-2 FT BELOW THE BED OF THE SIDE CHANNEL. PLACE WILLOW CUTTINGS AT A SPACING OF 5/LINEAR FOOT INTO THE TRENCH AND BACKFILL WITH EXCAVATED NATIVE FLOODPLAIN FILL.
3. INSTALL TWO ROWS OF POSTS SPANNING THE WIDTH OF THE SIDE CHANNEL BETWEEN THE TWO FLOODPLAIN TRENCHES. SPACE ROWS 12 IN APART. SPACE POSTS IN EACH ROW APPROXIMATELY 12-18 IN APART AND ENSURE THAT AT LEAST ONE ROW OF STAKES HAS ONE STAKE INSTALLED IN THE BANK OF THE SIDE CHANNEL. STAKES SHOULD BE DRIVEN A MINIMUM OF 18 IN BELOW THE BED OF THE SIDE CHANNEL.
4. INSTALL BRUSH (GREEN CONIFER BRANCHES PREFERRED) AND LIVE WILLOW CUTTINGS IN THE 12 IN SPACE BETWEEN THE TWO ROWS OF POSTS. INSTALL BRUSH AND CUTTINGS IN 0.5 FT LAYERS AND COMPACT EACH LAYER AFTER INSTALLATION.
5. PRIOR TO INSTALLING THE FINAL LAYER (0.5 FT) OF BRUSH, INSTALL A MATTRESS OF WILLOW CUTTINGS ON THE DOWNSTREAM SIDE OF THE BEAVER DAM ANALOG. ORIENT CUTTINGS IN AN UPSTREAM DIRECTION WITH THE CUT ENDS BURIED INTO THE SIDE CHANNEL BED AND THE BRANCH TIPS EXTENDING UPSTREAM AND ON TOP OF THE LAST PLACED LAYER OF BRUSH BETWEEN THE POSTS. INSTALL THE FINAL LAYER OF BRUSH BETWEEN THE POSTS ON TOP OF THE WILLOW MATTRESS CUTTINGS TO SECURE THEM.
6. INSTALL A WEDGE OF COBBLE, GRAVEL, MUD AND ORGANIC MATTER ALONG THE UPSTREAM ROW OF POSTS. COMPACT MATERIAL TO ENSURE GOOD CONTACT WITH THE POSTS, BRUSH, CHANNEL BED AND CHANNEL BANKS.

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BEAVER DAM ANALOG DETAIL

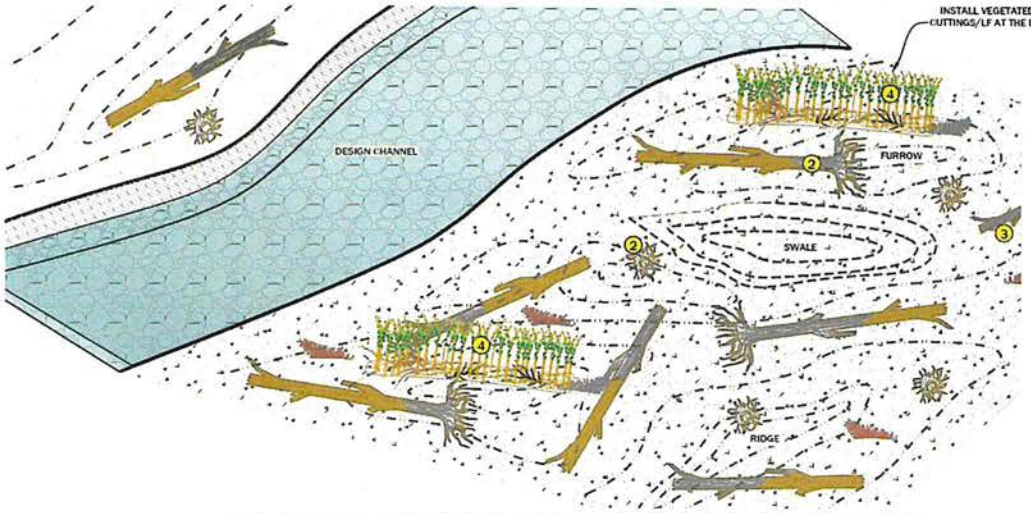
NEVADA CREEK PHASE 7

		DESCRIPTION	DESIGN	DW	09-27-23
1					

PROJECT NUMBER
RDG-23-151

DRAWING NUMBER
5.2

SHEET 10 OF 12



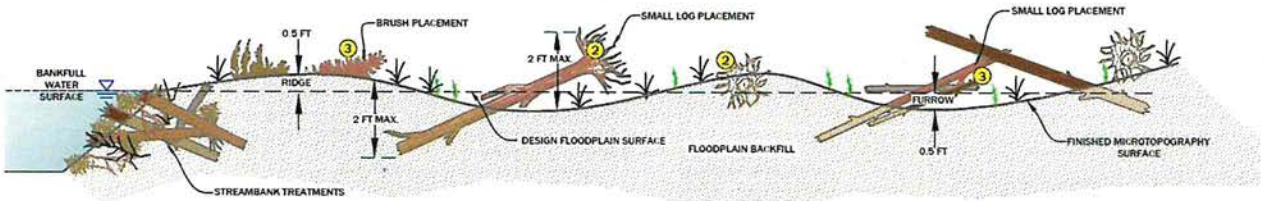
1 MICROTOPOGRAPHY AND FLOODPLAIN WOOD PLACEMENT
3D VIEW NTS

GENERAL 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. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY THE CONSTRUCTION MANAGER.

NOTES ON FLOODPLAIN ROUGHNESS INSTALLATION

1. CONTRACTOR SHALL DEVELOP MICROTOPOGRAPHY AND PLACE WOODY MATERIAL IN THE CONSTRUCTED FLOODPLAIN.
2. INSTALL VEGETATED BRUSH TRENCHES ACROSS THE FLOODPLAIN PER THE DIRECTION OF THE PROJECT MANAGER AND SHEET 7.4. BACKFILL TRENCH TO FLOODPLAIN GRADE AND COMPACT TO REMOVE ANY AIR VOIDS.
3. TRANSPORT CATEGORY 2, AND CATEGORY 3 WOOD FROM FROM DESIGNATED STOCKPILE AREAS. PLACE CATEGORY 2 WOOD AT A RATE OF 35 PIECES PER ACRE AND SPACED AT AN AVERAGE DISTANCE OF 20 FEET FROM OTHER CATEGORY 2 WOOD. PLACE CATEGORY 3 WOOD SO IT COVERS 25 PERCENT OF THE FLOODPLAIN SURFACE (APPROXIMATELY 250 PIECES PER ACRE).
4. BURY CATEGORY 2 WOOD WITHIN THE FLOODPLAIN SURFACE, WITH ONE HALF OF THE LENGTH BURIED TO A DEPTH OF 2-FT., AND ONE HALF EXPOSED A MAXIMUM OF 2-FT ABOVE FINISHED GRADE AS SHOWN ON DRAWING. PLACE CATEGORY 3 WOOD ON THE SURFACE. CATEGORY 3 WOOD DOES NOT NEED TO BE BURIED.
5. CONSTRUCT LOW AND HIGH FEATURES (RIDGES AND FURROWS) AS SHOWN ON THE DRAWINGS. MAXIMUM HEIGHT OF RIDGES AND DEPTH OF FURROWS SHALL BE NO GREATER THAN 0.5-FT. RELATIVE TO FINISHED FLOODPLAIN SURFACE.



2 FLOODPLAIN ROUGHNESS DETAIL
TYPICAL CROSS SECTION NTS

MATERIAL SCHEDULE (PER ACRE)

	ITEM	DIA.	LENGTH	QUANTITY	UNIT
2	CATEGORY 2 WOOD	3" - 6"	10' - 12'	35	EA
3	CATEGORY 3 WOOD	<3"	10' - 12'	25	% COVER*
4	VEGETATED BRUSH TRENCH	SEE SHEET 7.4			

*APPROXIMATELY 250 PIECES/ACRE


EXAMPLE OF CONSTRUCTED FLOODPLAIN ROUGHNESS


EXAMPLE OF CONSTRUCTED FLOODPLAIN ROUGHNESS


EXAMPLE OF CONSTRUCTED FLOODPLAIN SWALE

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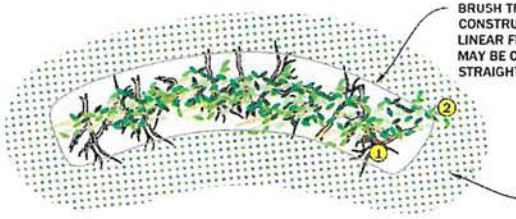
FLOODPLAIN TREATMENT DETAIL

NEVADA CREEK PHASE 7

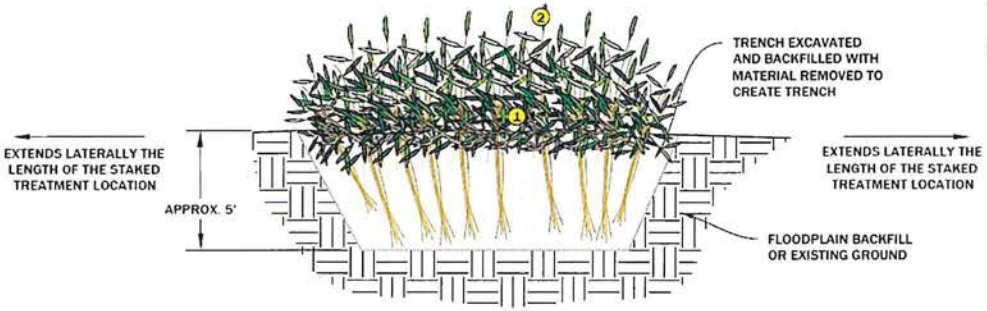
	DESCRIPTION	DW	JM
1	09-27-23	DESIGN	

PROJECT NUMBER
RDG-23-151

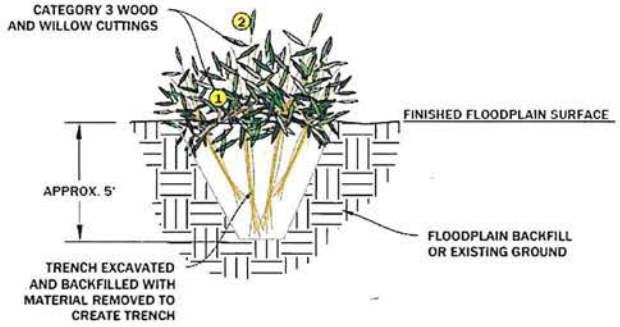
DRAWING NUMBER
5.3



1 **WILLOW BRUSH TRENCH PLAN VIEW** NTS



2 **WILLOW BRUSH TRENCH PROFILE VIEW** NTS



3 **WILLOW BRUSH TRENCH SECTION VIEW** NTS

NOTES ON WILLOW BRUSH TRENCH INSTALLATION

1. VEGETATED BRUSH TRENCHES WILL BE CONSTRUCTED TO INCREASE FLOODPLAIN CONNECTIVITY, DISPERSE SURFACE FLOWS AND PROMOTE REVEGETATION. CONSTRUCTION OF VEGETATED BRUSH TRENCHES WILL OCCUR AFTER SEPTEMBER 15TH AND BEFORE THE END OF THE CONSTRUCTION SEASON.
2. CONTRACTOR SHALL MARK AND ENGINEER SHALL APPROVE THE GENERAL CONSTRUCTION LOCATION FOR EACH VEGETATED BRUSH TRENCH PRIOR TO CONSTRUCTION.
3. VEGETATED BRUSH TRENCHES WILL BE CONSTRUCTED WITHIN THE FLOODPLAIN AT THE DIRECTION OF THE CONSTRUCTION MANAGER.
4. A TRENCH WILL BE CONSTRUCTED APPROXIMATELY 5' DEEP AND EXTEND THE LENGTH OF THE STAKED TREATMENT LOCATION. LIVE WILLOW CUTTINGS AND CATEGORY 3 WOOD WILL BE PLACED IN THE TRENCH SUCH THAT THEY ARE INTERMIXED AND ORIENTED AT A NEAR VERTICAL ANGLE.
5. THE TRENCH WILL THEN BE BACKFILLED WITH THE SAME MATERIAL REMOVED TO CREATE THE TRENCH AND SHOULD MATCH THE ELEVATION OF THE SURROUNDING FLOODPLAIN GRADE.

MATERIAL SCHEDULE (PER LINEAL FOOT)

	ITEM	DIA.	QUANTITY (EA)
1	CATEGORY 3 WOOD	< 3"	3
2	WILLOW CUTTINGS	0.25" - 1"	5

EXAMPLE OF A VEGETATED BRUSH TRENCH INSTALLATION

EXAMPLE OF A CONSTRUCTED VEGETATED BRUSH TRENCH

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WILLOW BRUSH TRENCH DETAIL

NEVADA CREEK PHASE 7

		DESCRIPTION
1	09-27-23	DESIGN

JM DW

PROJECT NUMBER RDG-23-151

DRAWING NUMBER 5.4

SHEET 12 OF 12