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: See above

City: State: Zip:

Telephone: E-mail:

C. Landowner and/or Lessee Name (if different than applicant): Derek Ellis

Mailing Address: Braziel Creek Rd

City: Helmville State: MT Zip: 59834

Telephone: 801-831-0323 E-mail: derek@iamellis.com

II. PROJECT INFORMATION

A. Project Name: Nevada Creek Phase 6 Restoration Project

River, stream, or lake: Nevada Creek

Location: Township: 12N Range: 10W Section: 04

Latitude: 46.864632 Longitude: -112.941788 *Within project (decimal degrees)*

County: Powell County

B. Purpose of Project:

The purpose of this project is to build upon the success of the previous five phases of restoration work on Nevada Creek. This project will improve trout habitat in Nevada Creek by restoring channel stability, aquatic habitat function, floodplain connection and riparian health, while contributing to improved conditions in the middle Blackfoot River.

C. Brief Project Description (attach additional information to end of application):

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. With this proposal, we are seeking funding to implement a stream, riparian and wetland restoration project across two-miles of Nevada Creek. 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 address threats to an existing irrigation canal, critical to the livelihoods of several producers in the watershed, and one in which a failure would have significant downstream impacts to fisheries and aquatic resources in Nevada Creek.

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, whilealso 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.

Within the project reach, critically important irrigation infrastructure--the Douglas Canal, which serves over 6,000 acres, is at risk of being undermined by Nevada Creek. Slope failure and mass wasting to Nevada Creek is imminent if this segment is left untreated. The restoration plan reconstructs 2,000 feet of channel in historical oxbow meanders and reconnects over 17 acres of bankfull floodplain, converting the entrenched channel adjacent to Douglas Canal to floodplain wetlands and low terrace features. This project involves multiple federal and state agency partners and has the urgent support of the Nevada Creek Water Users Association who funded part of the design.

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

Historic channel manipulations, overgrazing, and streamside vegetation removal have contributed to the bank erosion issues. The project design includes techniques and treatments used in previous project phases with a successful track record to rectify the specific issues and their causes.

E. Length of stream or size of lake that will be treated (project extent): 9,100 ft

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

F. Project Budget Summary:

Grant Request (Dollars):	**$**	**103,000.00**
Matching Dollars:	**$**	**676,067.00**
Matching In-Kind Services:*	**$**	**394,236.00**

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

Other Contributions (not part of this app)	**$**	
Total Project Cost:	**$**	**1,173,303.00**

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 fish biologist support). List any other project partners:

MTFWP, USFWS, Nevada Creek Water Users Association

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.*

A 20-year USFWS Partners for Fish & Wildlife Agreement will be signed once all funds have been secured.

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 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 plan for the project involves monitoring the fisheries response, bank erosion reduction rates and riparian revegetation response and survival rates. Bank erosion data has been collected pre-project and photo points will be established. The project will be surveyed during construction to support an “as-built” report. Our final monitoring report will be shared with FWP.

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

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

Westslope cutthroat trout, brown trout and rainbow trout.

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

The proposed reach along Nevada Creek lacks quality habitat necessary to support robust trout populations. By addressing bank erosion issues, improper channel dimensions, lack of floodplain connection and riparian function, we anticipate a significant improvement in instream and riparian habitat conditions. The increased pool frequency and proper channel dimensions will increase low-flow habitat capacity in this section that experiences chronically low flows during the irrigation season that exacerbates the habitat degradation issues in this section. Theimproved habitat conditions areexpected to increase recruitment to adjacent sections of lower Nevada Creek and the middle 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?

Nevada Creek is a very productive stream and the improvements in habitat resulting from the restoration work to date have a very high potential to increase recruitment to the middle reaches of the Blackfoot River

The previously restored phases of Nevada Creek have shown measurable improvements in riparian and instream habitat quality, sediment impacts, and floodplain connection. Based on the fisheries monitoring from past reaches, we expect to see an increase in the quality of fishable habitat, as well increased trout abundance within and adjacent to the project section.

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 Phase 6 project section and the frequently-fished section directly below the reservoir. Increased trout production in Phase 6 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?

In addition to the natural resource benefits, the combination of these efforts will enhance the local agricultural, social, and economic values in a variety of ways. Floodplain reconnection will reduce flood intensity for downstream reaches and prevent the loss of important agriculture ground by addressing chronic bank erosion. Reduced erosion will contribute to achieving water quality goals for the 303d-listed sections of the Blackfoot River and Nevada Creek. Instream habitat restoration will increase the habitat capacity and recruitment of important sport fisheries in a blue-ribbon trout river that supports over 90,000 angler days. Improved land management systems and associated infrastructure upgrades will benefit producers and increase economic viability through enhanced range productivity and stream bank resilience. The proposed construction work will boost the local economy with the majority of project dollars allocated for materials, labor, engineering and design. The outcomes of this proposal will facilitate goals of endangered species recovery programs and Montana recovery plans.

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

No, none of the proposed project elements will interfere with water or property rights.

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 9, 2022

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	540	Hours	$115.00	$ 62,100.00		62,100.00		$ 62,100.00
Project Management	220	Hours	$45.00	$ 9,900.00		9,900.00		$ 9,900.00
			Sub-Total	$ 121,450.00	$ -	$ 121,450.00	$ -	$ 121,450.00
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	154,800	sq/ft	$0.50	$ 77,400.00		$ 77,400.00		$ 77,400.00
Gravel	2,400	yds	$10.00	$ 24,000.00		$ 24,000.00		$ 24,000.00
Willow Cuttings	57,600	each	$1.00	$ 57,600.00		$ 57,600.00		$ 57,600.00
Transplants	100	each	$100.00	$ 10,000.00		$ 10,000.00		$ 10,000.00
Fill	15,620	yds	$5.00	$ 78,100.00		$ 78,100.00		$ 78,100.00
Trees	1750	each	$50.00	$ 87,500.00		$ 87,500.00		$ 87,500.00
GPS Set Up	1	LS	$10,000.00	$ 10,000.00		$10,000		$ 10,000.00
				$ -				$ -
				$ -				$ -
			Sub-Total	$ 344,600.00	$ -	$ 344,600.00	$ -	$ 344,600.00
Equipment, Labor, and Mobilization								
Mobilization	1	LS	$15,000.00	$ 15,000.00		$15,000		$ 15,000.00
Clearwater Diversion	1	LS	$6,500.00	$ 6,500.00		6,500.00		$ 6,500.00
Sallvage and transplant existing vegetation	1	LS	$5,000.00	$ 5,000.00		5,000.00		$ 5,000.00
Access roads and staging/reclaim	1	LS	$3,000.00	$ 3,000.00		3,000.00		$ 3,000.00
Furnish Wood	35	loads	$1,500.00	$ 52,500.00	20,000.00	32,500.00		$ 52,500.00
Furnish screened alluvium	2400	CY	$5.00	$ 12,000.00	4,000.00	8,000.00		$ 12,000.00
Furnish Cat 1 Rock	2042	CY	$5.00	$ 10,210.00		10,210.00		$ 10,210.00

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Ex/Haul/place fill in repositories	6700	CY	$5.25	$ 35,175.00		35,175.00		$ 35,175.00
Ex channel and streambank subgrade	1700	CY	$5.75	$ 9,775.00		9,775.00		$ 9,775.00
Construct channel streambed	2750	LF	$30.00	$ 82,500.00	27,500.00	55,000.00		$ 82,500.00
Shape Channel	4950	LF	$7.50	$ 37,125.00	10,000.00	27,125.00		$ 37,125.00
Construct lg wood structures	38	each	$1,600.00	$ 60,800.00	5,000.00	55,800.00		$ 60,800.00
Construct vegetated wood matrix type 1	4980	LF	$25.00	$ 124,500.00	20,000.00	104,500.00		$ 124,500.00
Construct vegetated wood matrix type 2	4289	LF	$30.00	$ 128,670.00	10,000.00	118,670.00		$ 128,670.00
Construct vegetated wood matrix type 3	730	LF	$10.00	$ 7,300.00		7,300.00		$ 7,300.00
Construct Log Steps	7	each	$1,500.00	$ 10,500.00		10,500.00		$ 10,500.00
Furnish and install willows	57,600	each	$1.00	$ 57,600.00	6,500.00	51,100.00		$ 57,600.00
Construct wetlands and reclaim repositories	8920	CY	$5.25	$ 46,830.00		46,830.00		$ 46,830.00
				$ -				$ -
			Sub-Total	$ 704,985.00	$ 103,000.00	$ 601,985.00	$ -	$ 704,985.00
			TOTALS	$ 1,173,303.00	$ 103,000.00	$ 1,070,303.00	$ -	$ 1,173,303.00

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:

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

APPLICATION MATCHING CONTRIBUTIONS

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

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
Private Landowner	$ 382,068.00	$ 32,000.00	$ 414,068.00	Yes
Nevada Creek Water Users Association	$ -	$ 13,200.00	$ 13,200.00	Yes
USFWS Partners for Fish & Wildlife Service	$ -	$ 106,000.00	$ 106,000.00	Yes
Montana Department of Environmental Quality	$ -	$ 100,000.00	$ 100,000.00	No
IWJV	$ -	$ 150,000.00	$ 150,000.00	No
Bureau of Reclamation	$ -	$ 175,000.00	$ 175,000.00	No
BBCTU	$ 12,168.00	$ 99,867.00	$ 112,035.00	Yes
	$ -	$ -	$ -	
TOTALS	$ 394,236.00	$ 676,067.00	$ 1,070,303.00	

OTHER CONTRIBUTIONS

(contributions not associated with the application)

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

Photo 1: Example of existing bank conditions and lack of instream and riparian habitat.

Photo 2: Reach of Nevada Creek along the toe of Douglas Canal.

FWP.MT.GOV

THE OUTSIDE IS IN US ALL.

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

November 2, 2022

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 6

Dear Future Fisheries Panel:

I am writing in support of the Nevada Creek Restoration-Phase 6 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 habitat conditions and measurable decreases in downstream sediment delivery. This project will complement the success of previous projects and is expected to 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 project area is directly downstream of a large irrigation canal, resulting in prolonged low-flow conditions throughout the irrigation season. The simplified instream habitat and low frequency of high-quality pools have decreased habitat capacity compared to intact sections. A recent study of radio-tagged trout documented more overwinter use than summer use in this section, suggesting potential limiting factors during the irrigation season. The proposed restoration treatments will directly 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 our Fisheries Biologist, Patrick Uthe, for any questions for FWP on this project.

Patrick Uthe, Fisheries Biologist
Montana Fish, Wildlife & Parks
Phone: (406) 542-5532
Email: Patrick.Uthe@mt.gov

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

Nevada Creek Water Users Association
PO Box 43
Helmville, MT 59843

July 13, 2022

Review Committee
National Fish and Wildlife Federation
1133 Fifteenth Street NW, Suite 1000
Washington, DC 20005

Re: Support for State of Montana America the Beautiful Challenge (AtBC) Grant Applications

To Whom It May Concern:

The Nevada Creek Water Users Association (NCWUA) strongly supports the AtBC planning and implementation grant proposals submitted by the Montana Department of Natural Resources and Conservation (DNRC). The funding through this grant will advance Montana's efforts and impact to address large-landscape conservation issues with a locally led collaborative and inclusive approach.

Nevada Creek Water Users Association and its members, as a longtime partner, support this effort because we would not only love to see the continuation of the restoration on Nevada Creek, (hopefully all the way to Blackfoot River in time.) We also want to protect the Douglas Canal and all the members of the NCWUA. We have witnessed the amazing benefits from the work done upstream of the Douglas Canal done by Big Blackfoot Chapter of Trout Unlimited (BBCTU) and its many wonderful partners. We believe that the health of the stream is instrumental in not only the native trout population but also the long-term management and efficiency of the over 6000 irrigated acres serviced by the Douglas Canal. The Douglas Canal and Nevada Creek are dangerously close along this proposed stretch. Nevada Creek could be moved further away from the Douglas Canal back to its historical channel, then it would contribute to the long-term structural integrity of the canal, as well as creating a healthier stream, minimizing erosion, and increasing fish habitat. Right now, there is one serious slough away in the bank of Nevada Creek, and several others that, given the right high-water conditions, the canal bank could wash into Nevada Creek. If this happened it would risk a long-term inability for us to deliver contracted water to over a dozen irrigators in the Helmville Valley causing extreme hardships and have a devastating financial impact to the local economy. The NCWUA board of directors and its members would be very grateful if you would consider helping fund this project.

We urge the National Fish and Wildlife Foundation to provide funding for this statewide collaborative effort that will impact Montana and neighboring states in the West who are facing the same natural resources concerns and threats.

On behalf of Nevada Creek Water Users Association, I thank you for considering this request.

Sincerely,

Jamie Stitt

/s Jamie Stitt

Board Member
Nevada Creek Water Users Association

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 14th, 2022

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

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 6 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

NEVADA CREEK PHASE 6 RESTORATION PROJECT
FINAL DESIGN

PROJECT PARTNERS

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

US FISH AND WILDLIFE SERVICE
P.O. BOX 66
196 LOWER LAKE SIDE LANE
OVANDO, MONTANA 59854

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

MANNIX FAMILY

PROJECT DESCRIPTION

BIG BLACKFOOT CHAPTER OF TROUT UNLIMITED (BBCTU), IN COOPERATION WITH MONTANA FISH, WILDLIFE & PARKS (MFWP) AND THE U.S. FISH AND WILDLIFE SERVICE (USFWS), RETAINED RIVER DESIGN GROUP, INC. TO DEVELOP A RESTORATION PLAN FOR A 9,100-FT REACH OF NEVADA CREEK, A THIRD ORDER TRIBUTARY TO THE MIDDLE BLACKFOOT RIVER. LOCATED APPROXIMATELY 55 MILES EAST OF MISSOULA, MONTANA, NEVADA CREEK SUPPORTS POPULATIONS OF WESTSLOPE CUTTHROAT TROUT, RAINBOW TROUT, BROWN TROUT AND OTHER FISH SPECIES. NEVADA CREEK IS AN IMPAIRED WATERBODY AND THE STREAM IS CONSIDERED NONSUPPORTING OF AQUATIC LIFE, COLD WATER FISHERY, AND CONTACT RECREATION DUE TO SEDIMENT AND HABITAT RELATED CAUSES (MDEQ 2008). PROBABLE CAUSES OF WATER QUALITY IMPAIRMENT INCLUDE LOW FLOW ALTERATION, TOTAL PHOSPHORUS, PHYSICAL SUBSTRATE, HABITAT ALTERATIONS, SEDIMENTATION/SILTATION, AND TOTAL NITROGEN. PROBABLE SOURCES OF IMPAIRMENT INCLUDE AGRICULTURE AND STREAMBANK MODIFICATION/DESTABILIZATION.

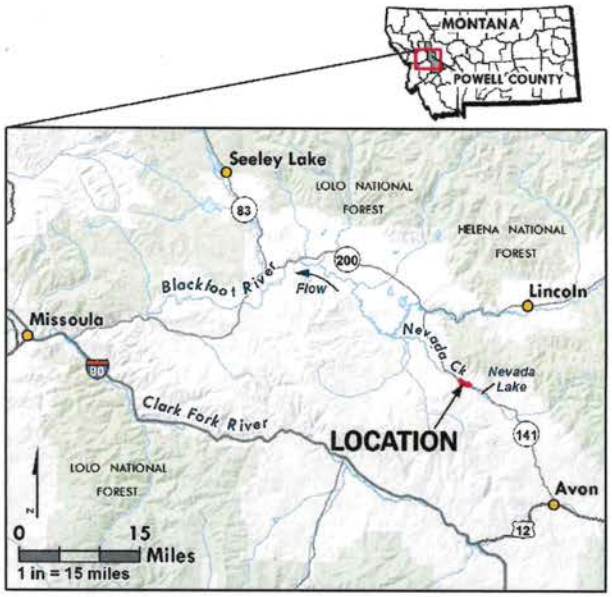
FOUR PRIOR PHASES OF WORK HAVE BEEN IMPLEMENTED ON NEVADA CREEK (2012-2020). PHASE FIVE IS SCHEDULED FOR 2022. THESE PROJECTS INVOLVED RESTORING STREAMBANK AND FLOODPLAIN CONDITIONS TO REDUCE STREAMBANK EROSION AND SEDIMENT LOADING TO NEVADA CREEK. CUMULATIVELY, THESE RESTORATION PROJECTS HAVE REDUCED SEDIMENT LOADING TO NEVADA CREEK BY SEVERAL THOUSAND TONS PER YEAR, MARKING A SIGNIFICANT ACCOMPLISHMENT IN MEETING TMDL SEDIMENT LOAD REDUCTION AND WATER QUALITY TARGETS FOR THE WATERSHED.

GENERAL NOTES

1. CONTOUR INTERVAL IS NOTED ON DRAWINGS.
2. SLOPES DESIGNATED AS 2:1, 1.5:1, ET CETERA, ARE THE RATIOS OF HORIZONTAL DISTANCE TO VERTICAL DISTANCE.
3. DIMENSIONS ARE NOTED IN FEET AND TENTHS OF A FOOT.
4. TOPOGRAPHY AND CROSS SECTION GROUND LINES ARE BASED ON SURVEY WORK PERFORMED IN 2021. LIDAR DATA WAS COLLECTED BY TROUT UNLIMITED. ALL LIDAR DATA WAS COORDINATED BY RDG.
5. ALL EXISTING CONDITIONS ARE TO BE VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION AND ANY ADJUSTMENTS TO THE DRAWINGS SHALL BE MADE AS DIRECTED BY THE ENGINEER.
6. EXISTING PRIVATE IMPROVEMENTS, WHICH LIE WITHIN THE CONSTRUCTION LIMITS, UNLESS OTHERWISE NOTED WILL BE REMOVED BY THE OWNER PRIOR TO CONSTRUCTION, OR ABANDONED IN PLACE.
7. PROTECT ALL TREES 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.
8. THE PROJECT SPONSOR IS RESPONSIBLE FOR COMPLYING WITH ALL PERMITS AND EASEMENTS INCLUDING ALL FEDERAL, STATE, COUNTY, AND LOCAL PERMIT CONDITIONS.
9. 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.
10. 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.
11. ALL EXCAVATORS AND BULLDOZERS SHALL BE EQUIPPED WITH MACHINE GRADE GPS ((L1/L2/GLONASS)). CONSTRUCTION AREAS WILL BE STAKED OUT PRIOR TO CONSTRUCTION USING SURVEY GRADE GPS (L1/L2/GLONASS).
12. ENGINEER WILL PROVIDE SURVEY CONTROL AND GRADING SURFACES FOR EQUIPMENT WITH GPS MACHINE CONTROL CAPABILITY. CONTRACTOR SHALL PROVIDE SURVEY STAKING AND LAYOUT FOR CONSTRUCTION.
13. VERTICAL TOLERANCE FOR CONSTRUCTION COMPLIANCE WILL BE 0.3 FEET. HORIZONTAL TOLERANCE WILL BE 1.0 FEET.
14. CONTRACTOR SHALL CONFIRM QUANTITIES. REPORTED VOLUMES ARE NEATLINE AND DO NOT INCLUDE ADJUSTMENTS FOR COMPACTION OR OTHER FACTORS.

DRAWING INDEX

NEVADA CREEK PHASE 6 VICINITY MAP



LEGAL DESCRIPTION: SW¼, S04, T12N R10W, P.M., M
POWELL COUNTY, MONTANA

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 10-YEAR RECURRENCE INTERVAL FLOOD. HEC-RAS, A ONE-DIMENSIONAL RIVER ANALYSIS MODEL WAS USED TO COMPLETE HYDRAULIC MODELING AND EVALUATE WATER SURFACE ELEVATIONS, CHANNEL AND OVERBANK SHEAR STRESSES, AND VELOCITIES FOR A RANGE OF FLOWS, INCLUDING BANKFULL DISCHARGE, THE 10-YEAR DESIGN STABILITY FLOW, AND HIGHER RETURN INTERVAL DISCHARGES INCLUDING THE 100-YEAR FLOW.

REUSE OF DRAWINGS

RDG RIVER DESIGN GROUP
236 Wisconsin Avenue Whitefish, MT 59937 406.862.4927
311 SW Jefferson Avenue Corvallis, OR 97333 541.738.2920

COVER PAGE AND NOTES
NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
1.0
Drawing 1 of 32

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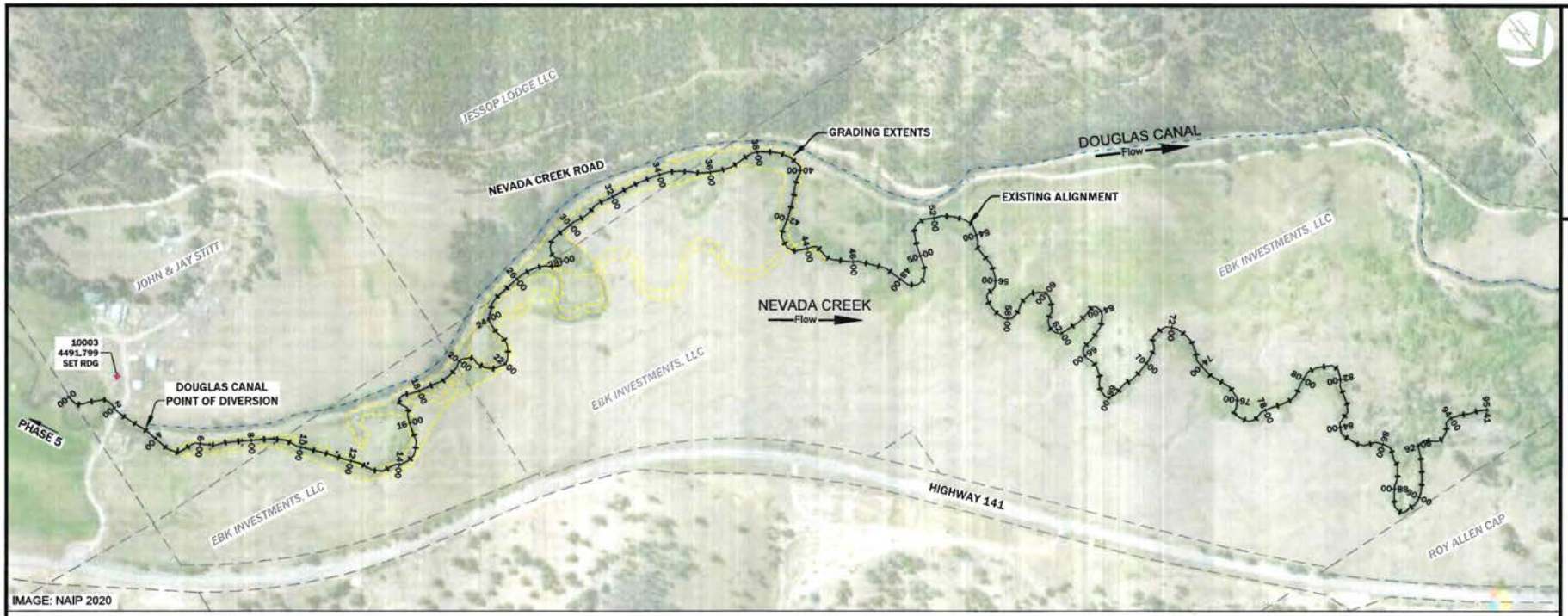

1 EXISTING CONDITIONS

1" = 400'

EXISTING CONDITIONS

THE PHASE 6 RESTORATION PROJECT AREA IS IN THE MIDDLE NEVADA CREEK WATERSHED DOWNSTREAM OF NEVADA CREEK RESERVOIR, IN POWELL COUNTY, MONTANA. THE PROJECT AREA IS WITHIN A REACH OF NEVADA CREEK THAT IS CONSIDERED NON-SUPPORTING OF AQUATIC LIFE DUE TO SEDIMENT AND HABITAT RELATED IMPAIRMENTS. WATER USE CLASS IS B-1, WHICH INCLUDE WATERS CLASSIFIED SUITABLE FOR DRINKING, CULINARY, AND FOOD PROCESSING PURPOSES; BATHING, SWIMMING AND RECREATION; GROWTH AND PROPAGATION OF SALMONID FISHES AND ASSOCIATED AQUATIC LIFE; WATERFOWL AND FURBEARERS; AND AGRICULTURAL AND INDUSTRIAL WATER SUPPLY. PROBABLE CAUSES OF IMPAIRMENT INCLUDE STREAMSIDE ALTERATIONS, TOTAL NITROGEN, TOTAL PHOSPHORUS, PHYSICAL SUBSTRATE HABITAT ALTERATIONS, SEDIMENT, AND TEMPERATURE. PROBABLE SOURCES INCLUDING GRAZING IN RIPARIAN AREAS, AGRICULTURE, AND STREAMBANK MODIFICATIONS/DESTABILIZATION. APPROXIMATELY 50% OF STREAMBANKS IN THE PROJECT AREA (8,808 FEET) DISPLAY MODERATE TO VERY HIGH BANK ERODIBILITY HAZARD RATINGS, CONTRIBUTING OVER 689 TONS PER YEAR OF SEDIMENT TO NEVADA CREEK.

WITHIN THE PROJECT AREA, NEVADA CREEK IS CHARACTERIZED AS A SLIGHTLY TO MODERATELY ENTRENCHED, GRAVEL DOMINATED, C STREAM TYPE WITH ALTERNATING POOL AND RIFFLE HABITAT FEATURES. SEGMENTS OF THE REACH ARE MODERATELY TO HIGHLY ENTRENCHED DUE TO CHANNEL ENLARGEMENT AND LACK OF FLOODPLAIN CONNECTIVITY (F4 STREAM TYPE INCLUSIONS). THE CAUSE OF THE DEGRADED SYSTEM IS ASSOCIATED WITH PREVIOUS HEAVY GRAZING PRESSURE THAT CONVERTED A WOODY RIPARIAN VEGETATION COMMUNITY TO A PREDOMINANTLY GRASS/FORB COMMUNITY; STREAMBANKS ARE SUSCEPTIBLE TO EROSION BY MASS FAILURE, FLUVIAL ENTRAINMENT, FREEZE/THAW, DRY RAVEL, AND OTHER EROSIONAL PROCESSES (WILDLAND HYDROLOGY, 2018). BED MATERIALS ARE PREDOMINANTLY GRAVEL AND COBBLE WITH A HIGH PERCENTAGE OF SANDS AND SILTS (I.E. BIMODAL DISTRIBUTION). BANK EROSION, LACK OF FLOODPLAIN CONNECTION, AND LOSS OF WETLAND AND RIPARIAN VEGETATION ARE PRIMARY LIMITING FACTORS IN THE PROJECT AREA.

TO DATE, RESTORATION PROJECTS ON NEVADA CREEK HAVE INCLUDED GRAZING MANAGEMENT PLANS, INSTALLATION OF FISH SCREEN, AND IMPLEMENTATION OF VARIOUS RESTORATION STRATEGIES TO SET THE SYSTEM ON A TRAJECTORY THAT IS SELF-MAINTAINING IN THE LONG-TERM. THE PHASE 6 RESTORATION PROJECT FURTHERS THE RESTORATION STRATEGIES SUCCESSFULLY EMPLOYED ON PREVIOUS PROJECT PHASES.

THE CONSTRAINTS AND LIMITING FACTORS IDENTIFIED DURING THE GEOMORPHIC INVESTIGATION INCLUDE:

- HIGH CHANNEL ENTRENCHMENT AND DISCONNECTED (FORMER) FLOODPLAIN SURFACES.
- CHANNELIZED AND STRAIGHTENED STREAM SECTIONS. APPROXIMATELY 2,000 FT OF CHANNEL IS ENTRAINED ALONG THE TOE OF THE DOUGLAS CANAL EMBANKMENT, RESULTING IN FLOODPLAIN DISCONNECTION.
- MODERATE TO VERY HIGH BANK ERODIBILITY CONDITIONS RESULTING IN SEDIMENT LOADING TO THE SYSTEM.
- LACK OF WOODY RIPARIAN SHRUBS, STREAM COVER AND SHADE.
- PAST BANK STABILIZATION PRACTICES, PRIMARILY RIPRAP ALONG THE DOUGLAS CANAL, LIMIT CHANNEL MARGIN COMPLEXITY.
- SIMPLIFIED AQUATIC HABITAT CONDITIONS, INCLUDING LOW POOL FREQUENCY AND LONG RIFFLE HABITAT UNITS WITH A HIGH PERCENTAGE OF FINE SEDIMENT.

CONTROL POINTS

POINT NUMBER	EASTING	NORTHING
☒ 10003	1129853.1380'	953279.8570'

POINT ELEVATION	RAW DESCRIPTION
4491.799'	5/8" REBAR WITH A 2" ALUMINUM CAP MARKED "RDG"

PROJECT DATUM

THE PROJECT COORDINATES ARE BASED ON THE FOLLOWING:

HORIZONTAL PROJECTION:	MONTANA STATE PLANE
HORIZONTAL DATUM:	NAD83 (CORS96 2002.00)
UNITS:	US SURVEY FEET
VERTICAL DATUM:	NAVD88 (GEOID 9)

RDG RIVER DESIGN GROUP

EXISTING CONDITIONS

NEVADA CREEK PHASE 6

NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
•	06-17-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

DRAWING NUMBER 2.0

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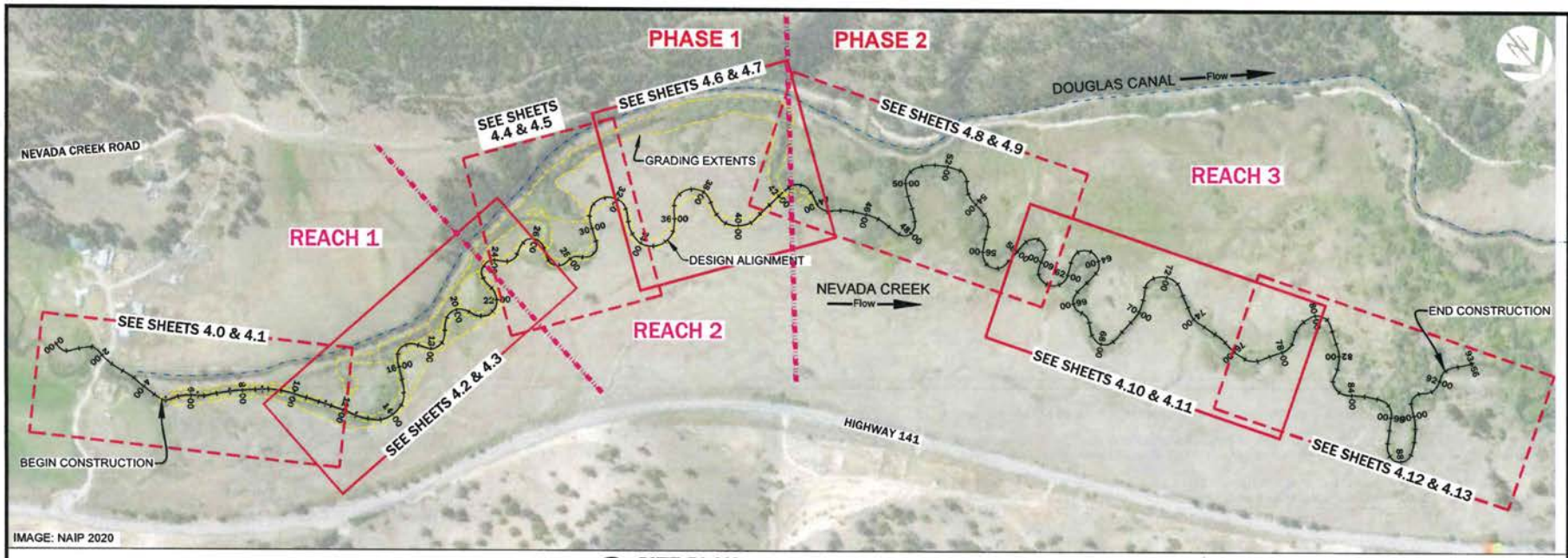

1 **SITE PLAN**

1" = 400'

RESTORATION ALTERNATIVES

RESTORATION ALTERNATIVES FOR THE NEVADA CREEK PHASE 6 RESTORATION PROJECT WERE DEVELOPED BY RIVER DESIGN GROUP IN CONSULTATION WITH BBCTU, MFWP, USFWS, PRIVATE LANDOWNERS, AND THE NEVADA CREEK WATER USERS' ASSOCIATION. IN REACH 1 OF THE PROJECT AREA, THE CHANNEL BED ELEVATION WILL BE SLIGHTLY RAISED TO RECONNECT FORMER FLOODPLAIN SURFACES (I.E. TERRACES) IN REACH 2. STREAMBANKS WILL BE TREATED WITH VEGETATION AND WOOD TO INCREASE ROUGHNESS AND PROVIDE SHADE AND COVER TO THE CHANNEL. THE EXISTING STREAMBED WILL BE RESHAPED TO FORM RIFFLE, RUN, POOL AND GLIDE HABITAT FEATURES. RESTORATION STRATEGIES IN REACH 1 WILL CONVERT THE CURRENTLY ENTRENCHED, F STREAM TYPE TO AN UNCONFINED, RIFFLE-POOL C STREAM TYPE.

IN REACH 2, APPROXIMATELY 1,950 FEET OF CHANNEL WILL BE RECONSTRUCTED IN RELIC MEANDER SCROLLS ON FORMER FLOODPLAIN SURFACES, RAISING THE CHANNEL BY 2 FEET ON AVERAGE COMPARED TO EXISTING CONDITIONS. AN ESTIMATED 6.5 ACRES OF FLOODPLAIN WILL BE RECONNECTED TO NEVADA CREEK DURING NORMAL ANNUAL PEAK FLOWS. MATERIAL EXCAVATED FROM NEW CHANNEL CONSTRUCTION WILL BE PLACED IN REPOSITORIES (I.E. EXISTING ABANDONED CHANNEL) ADJACENT TO THE DOUGLAS CANAL EMBANKMENT.

THE UPPER PORTION OF REACH 3 IS CHARACTERIZED BY MULTIPLE CHANNEL-SPANNING BEAVER DAM STRUCTURES THAT PROVIDE HIGH FLOODPLAIN CONNECTIVITY AND RIVERINE COMPLEXITY. IN REACH 3, ERODING STREAMBANKS ARE PRIMARILY MIDDLE TO HIGH TERRACES THAT CURRENTLY SUPPORT UPLAND VEGETATION. THESE SURFACES WILL BE LOWERED TO BANKFULL ELEVATION TO ENCOURAGE DEVELOPMENT OF HERBACEOUS AND SCRUB-SHRUB WETLAND COMMUNITIES. SIMILAR TO REACHES 1 AND 2, PORTIONS OF THE EXISTING STREAMBED WILL BE RESHAPED TO FORM RIFFLE, RUN, POOL AND GLIDE HABITAT FEATURES.

THE PROJECT INCORPORATES A GRAZING PLAN THAT MANAGES GRAZING WITHIN THE FLOODPLAIN CORRIDOR. EXCLOSURE FENCING, WATER GAPS, AND OFF-CHANNEL WATERING SOURCES WILL BE INSTALLED AS COMPONENTS TO THE PLAN.

RESTORATION TREATMENTS

THE RESTORATION PLAN FOCUSES ON RESTORING ERODING STREAMBANKS, RE-ESTABLISHING PROPER CHANNEL CROSS-SECTION, PLAN FORM AND LONGITUDINAL PROFILE DIMENSIONS, AND IDENTIFYING OPPORTUNITIES TO INCREASE FLOODPLAIN CONNECTIVITY. SPECIFICALLY, THE FOLLOWING GUIDELINES WERE USED IN DEVELOPING THE DESIGN:

- MINIMIZE STREAMBED TREATMENTS AND UTILIZE ON-SITE NATIVE MATERIAL FOR CHANNEL SHAPING AND RECONSTRUCTION, TO THE GREATEST EXTENT PRACTICAL.
- INCORPORATE VEGETATED WOOD AND BRUSH MATRIX STRUCTURES. INCORPORATE LARGE WOOD STRUCTURES WHERE NECESSARY FOR BANK STABILIZATION AND POOL HABITAT DEVELOPMENT/ENHANCEMENT. LARGE WOOD STRUCTURES SHOULD BE PRIMARILY SUBMERGED BELOW THE BASE FLOW WATER SURFACE ELEVATION.
- SHAPE THE CHANNEL TO FORM THE APPROPRIATE CHANNEL DIMENSIONS WITHIN THE OVER-WIDENED STREAM CORRIDOR, INCLUDING RIFFLE, RUN, POOL AND GLIDE CHANNEL HABITAT FEATURES;
- EXPAND THE FLOODPLAIN IN ENTRENCHED SECTIONS BY REACTIVATING HISTORICAL MEANDERS AND LOWERING AND EXPANDED HIGH SURFACES TO BANKFULL ELEVATION.
- INCREASE AQUATIC HABITAT COMPLEXITY IN AREAS WHERE COST LIMITS MORE ACTIVE RESTORATION OPPORTUNITIES.
- MITIGATE WATER QUALITY AND HABITAT IMPACTS WHERE THE STREAM INTERACTS WITH THE DOUGLAS CANAL EMBANKMENT.

RESTORATION OBJECTIVES

THE FOLLOWING OBJECTIVES WERE DEVELOPED BY PROJECT STAKEHOLDERS:

- IMPROVE INSTREAM AQUATIC HABITAT CONDITIONS FOR SALMONIDS BY LOWERING CHANNEL WIDTH-TO-DEPTH RATIOS, INCREASING POOL FREQUENCY, OVERHEAD COVER, CHANNEL MARGIN COMPLEXITY, AND THE DISTRIBUTION OF RIFFLE, RUN, POOL AND GLIDE CHANNEL HABITAT UNITS.
- DECREASE SURFACE WATER TEMPERATURE BY REDUCING CHANNEL WIDTH-TO-DEPTH RATIOS, INCREASING VEGETATION COVER AND SHADE, AND ENHANCING HYPORHEIC FLOW EXCHANGE BETWEEN THE FLOODPLAIN, WETLANDS, AND CHANNEL.
- REDUCE SEDIMENT SUPPLY BY RESTORING STREAMBANKS WITH VEGETATION AND WOOD.
- IMPLEMENT FLOODPLAIN RESTORATION TREATMENTS THAT SET THE STAGE FOR NATURAL RECRUITMENT OF RIPARIAN VEGETATION.
- IMPLEMENT A GRAZING MANAGEMENT PLAN TO PROTECT SENSITIVE FLOODPLAIN AND RIPARIAN AREAS.
- UTITLIZE NATURAL CHANNEL DESIGN TECHNIQUES AND AVOID THE USE OF HARDENED, NON-DEFORMABLE STRUCTURES SUCH AS ROCK AND LOG VANES, WEIRS, AND OTHER CHANNEL SPANNING STRUCTURES.

RDG RIVER DESIGN GROUP

SITE PLAN AND INDEX

NEVADA CREEK PHASE 6

NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
3.0

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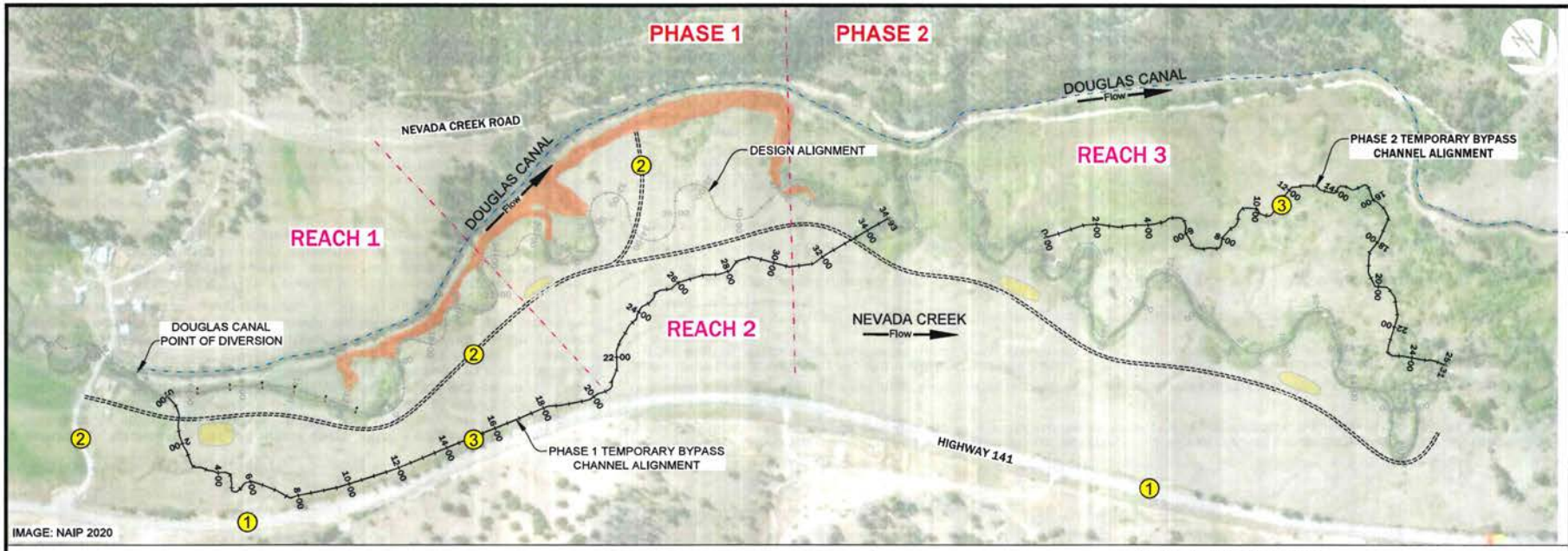


1 ACCESS, STAGING, AND DEWATERING PLAN VIEW

1" = 400'

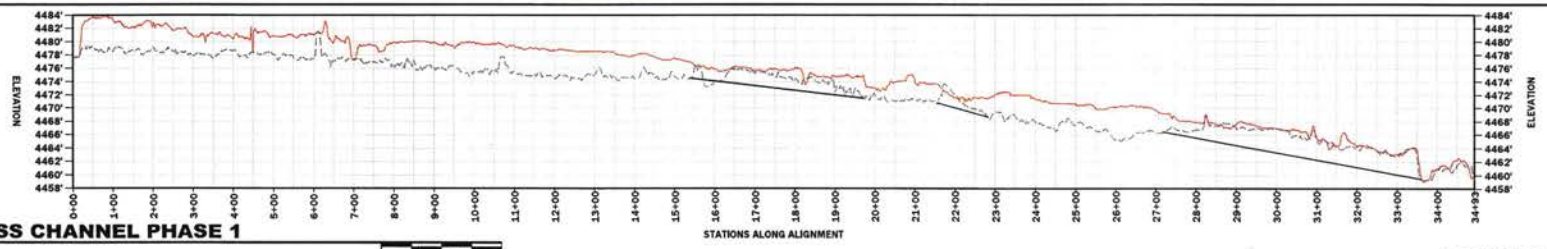
NOTES: CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ACCESS ROADS AND TEMPORARY HAUL ROADS. EQUIPMENT, MAINTENANCE AND MATERIALS TO BE STAGED MINIMUM 150' FROM RIVER.

DRAWING LEGEND

SYMBOL	
	REACH BREAK
	REPOSITORY
	STAGING AREA
	TEMPORARY HAUL ROAD

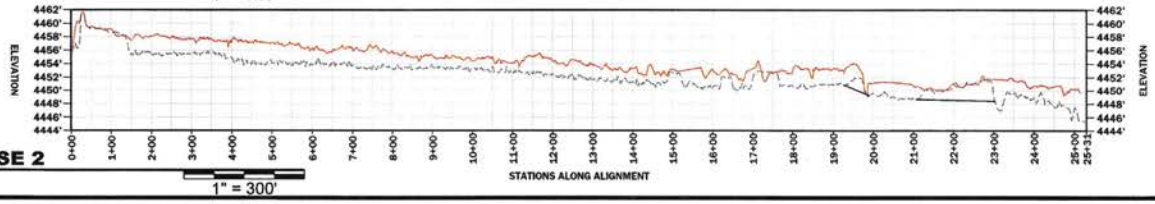
ACCESS AND STAGING

1. FROM THE INTERSECTION OF U.S. HIGHWAY 271 AND HIGHWAY 141 NEAR HELMVILLE, TRAVEL SOUTHEAST ON HIGHWAY 141 FOR 5.8 MILES. TURN SOUTH AND ACCESS COOPER CREEK RANCH.
2. TRAVEL SOUTH FOR 550 FEET TO ACCESS A TEMPORARY HAUL ROAD TO THE WEST. FOLLOW THIS TEMPORARY HAUL ROAD AND DEVELOP SPUR HAUL ROADS TO ACCESS THE WORK LOCATIONS.
3. CONSTRUCTION OF BYPASS CHANNELS TO BE DIRECTED BY CONSTRUCTION MANAGER.



2 BYPASS CHANNEL PHASE 1

1" = 300'



3 BYPASS CHANNEL PHASE 2

1" = 300'

PROFILE LEGEND

- EXISTING GROUND ELEVATION
- EXISTING ADJACENT TOP OF BANK
- DESIGN BYPASS PROFILE

RDG RIVER DESIGN GROUP

ACCESS, STAGING, AND DEWATERING PLAN

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
-	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
3.1

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TOTAL WOOD QUANTITIES

ITEM	QUANTITY	DIAMETER	LENGTH	ROOTWAD
CATEGORY 1 WOOD	204	10-12 IN	25 FT	YES
CATEGORY 2 WOOD	7,587	3-6 IN	20 FT	OPTIONAL
CATEGORY 3 WOOD	7,830	< 3 IN	10-12 FT	OPTIONAL
WILLOW CUTTINGS	57,600	0.25-1.0 IN	8 FT	NO

NOTE:
CONTRACTOR IS REQUIRED TO CUT TO LENGTH CATEGORY 1-3 WOOD TO MEET STRUCTURE DIMENSIONS AS REPORTED ON THE DETAIL DRAWINGS.

TOTAL ROCK QUANTITIES

ITEM	QUANTITY (EA)	DIAMETER (IN)
CATEGORY 1 ROCK	2,042	8-12

ITEM	QUANTITY (CY)	GRADATION	
		SIZE (IN)	PERCENT PASSING	REPRESENTANTIVE CLASS
STREAMBED/STREAMBANK FILL	2,400	6	95	D100
		5	90-95	D95
		4	85-90	D84
		3	65-85	D65
		2	50-65	D50
		1	30-50	D35
		0.5	20-30	D15
		0.08	20	

TOTAL EARTHWORK QUANTITIES

ITEM	QUANTITY (CY)
CUT	6,700
BACKFILL	15,960
NET CUT	9,260

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

LARGE WOOD STRUCTURE QUANTITIES

ITEM	QUANTITY (EA)
LARGE WOOD STRUCTURES	38
CATEGORY 1 WOOD	190
CATEGORY 2 WOOD	950
CATEGORY 3 WOOD	950
WILLOW CUTTINGS	7,600

VEGETATED WOOD MATRIX QUANTITIES

ITEM	QUANTITY
VEGETATED WOOD MATRIX TYPE 1	4,980 LF
VEGETATED WOOD MATRIX TYPE 2	4,280 LF
VEGETATED WOOD MATRIX TYPE 3	730 LF
CATEGORY 2 WOOD	6,420 EA
CATEGORY 3 WOOD	6,790 EA
WILLOW CUTTINGS	50,000 EA
STREAMBANK FILL	1,400 CY
SOD MAT	1 AC

CONSTRUCTED CHANNEL STREAMBED QUANTITIES

ITEM	QUANTITY (EA)
CONSTRUCTED RIFFLE	2,500 LF
CATEGORY 1 ROCK	2,000
STREAMBED FILL	1,000
CATEGORY 2 WOOD	70

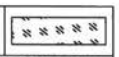
LOG STEP POOL QUANTITIES

ITEM	QUANTITY (EA)
LOG STEP POOL	7
CATEGORY 1 WOOD	14
CATEGORY 2 WOOD	21
CATEGORY 1 ROCK	42
NON WOVEN GEOTEXTILE FABRIC	245 LF
RING SHANK NAILS	140

BEAVER DAM ANALOG QUANTITIES

ITEM	QUANTITY (EA)

FLOODPLAIN TREATMENT QUANTITIES



ITEM	QUANTITY (EA)
FLOODPLAIN TREATMENT	3.6 AC
CATEGORY 2 WOOD	126
CATEGORY 3 WOOD	90

RDG RIVER DESIGN GROUP

MATERIALS AND QUANTITIES

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
3.2

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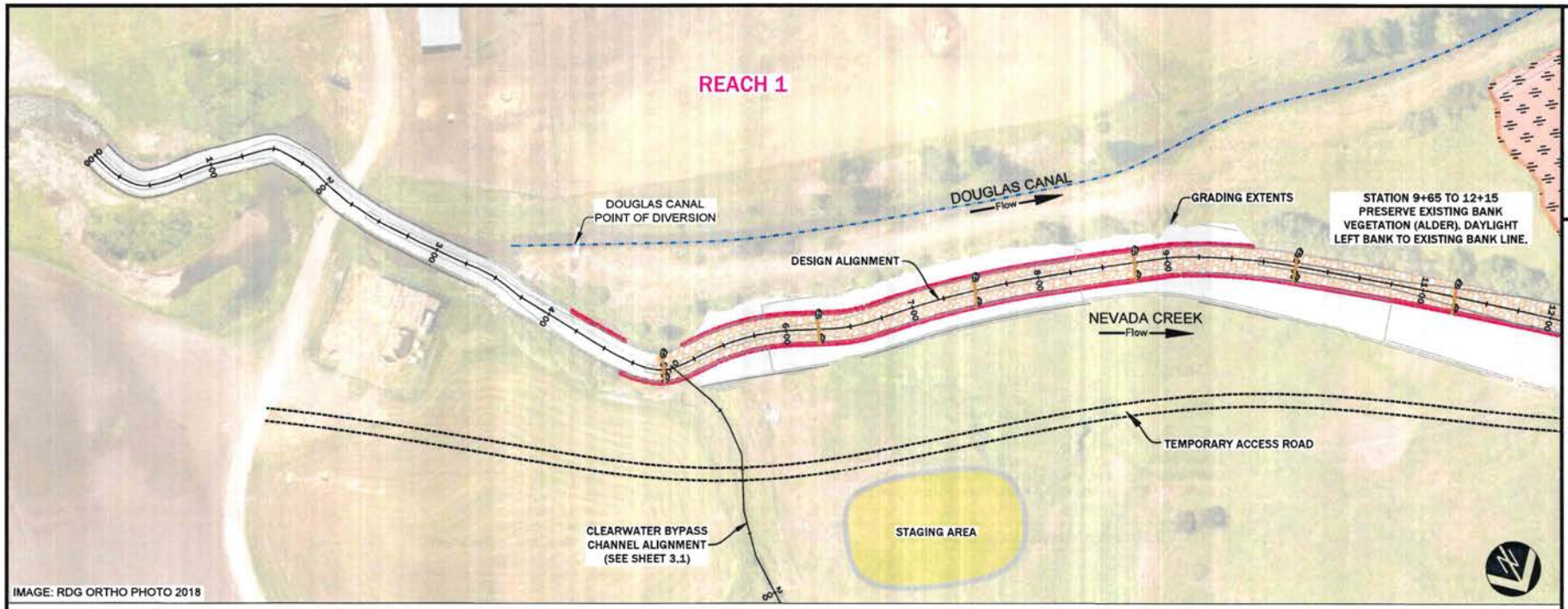

1 NEVADA CREEK PLAN VIEW

1" = 80'

CHANNEL TOP OF BANK ELEVATIONS

STATION START	ELEVATIONS (FT)	STATION START	ELEVATIONS (FT)
0+00	4481.37	6+00	4478.94
1+00	4480.97	7+00	4478.53
2+00	4480.56	8+00	4478.13
3+00	4480.16	9+00	4477.72
4+00	4479.75	10+00	4477.32
5+00	4479.34	11+00	4476.91

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
4+13	4+63	L	VWM 1
4+68	13+21	R	VWM 1
5+00	5+00	C	LSP
5+00	13+34	C	CCS
5+18	9+56	L	VWM 1
6+25	6+25	C	LSP
7+50	7+50	C	LSP
8+75	8+75	C	LSP
10+00	10+00	C	LSP
11+25	11+25	C	LSP

DRAWING LEGEND

SYMBOL	
	DOUGLAS CANAL
100	DESIGN ALIGNMENT
	GRADING EXTENTS
	REACH BREAK
	CHANNEL FLOW DIRECTION
	REPOSITORY
	STAGING AREA
	TEMPORARY HAUL ROAD
2955'	PROPOSED 5' MAJOR CONTOUR
	PROPOSED 1' MINOR CONTOUR

DETAIL LEGEND

SYMBOL		DETAIL SHEET #
	CONSTRUCTED CHANNEL STREAMBED	6.4
	VEGETATED WOOD MATRIX - TYPE 1	6.3
	VEGETATED WOOD MATRIX - TYPE 2	6.3
	VEGETATED WOOD MATRIX - TYPE 3	6.3
	BEAVER DAM ANALOG	6.5
	LARGE WOOD STRUCTURE	6.2
	LOG STEP POOL	6.6

RDG RIVER DESIGN GROUP

PLAN VIEW AND DATA SHEET

NEVADA CREEK PHASE 6

NEAR HELMVILLE

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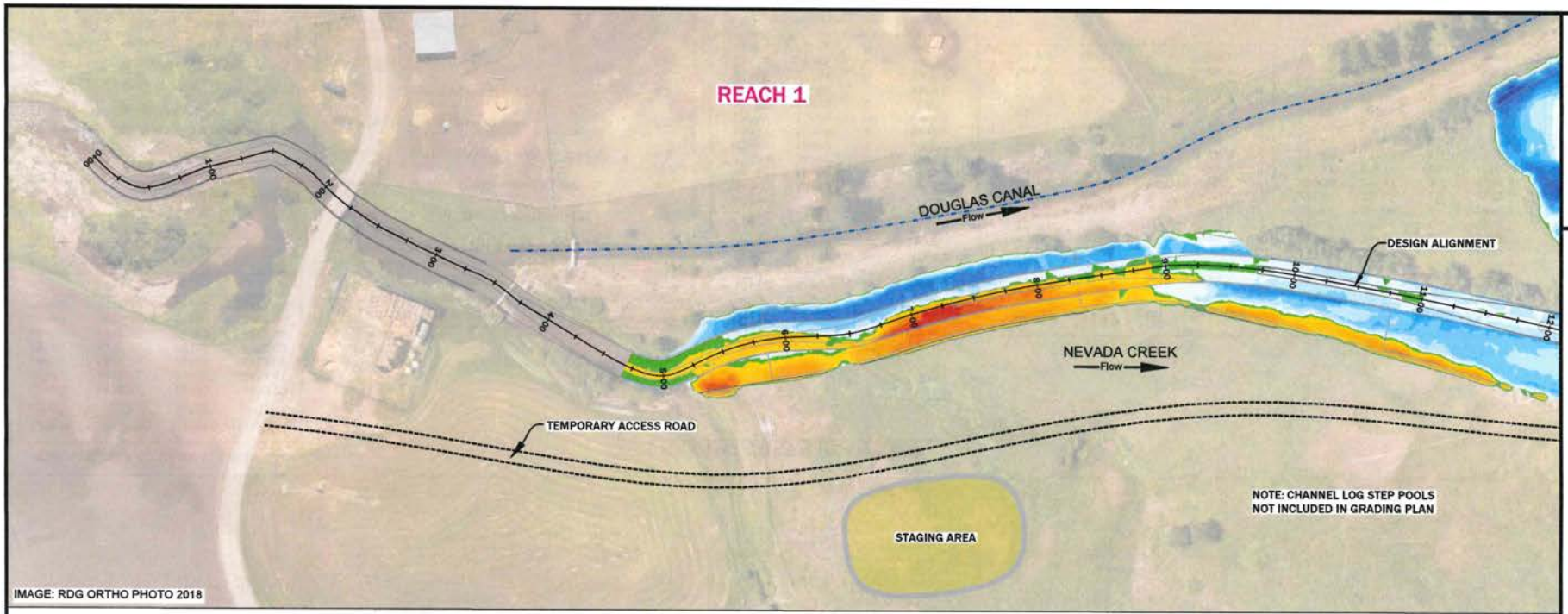

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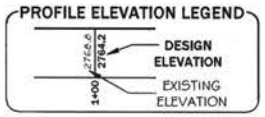

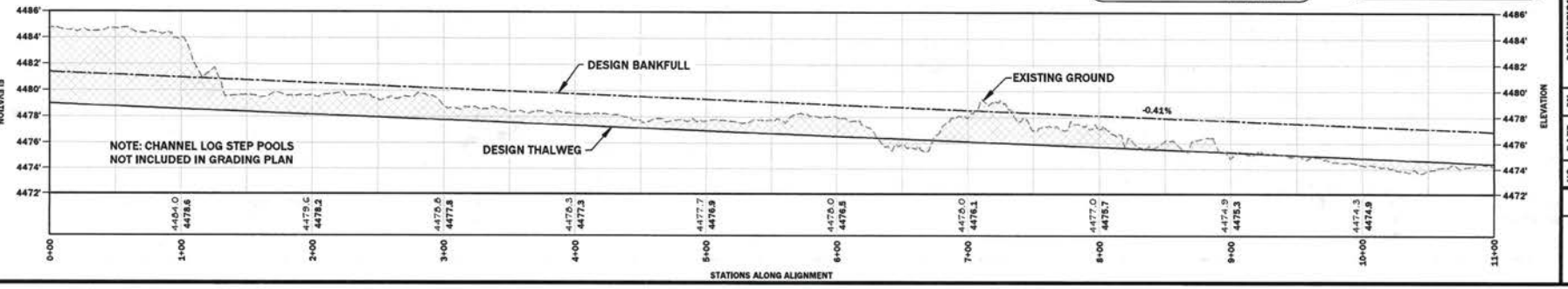

GRADING PLAN AND PROFILE

NEVADA CREEK PHASE 6

NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
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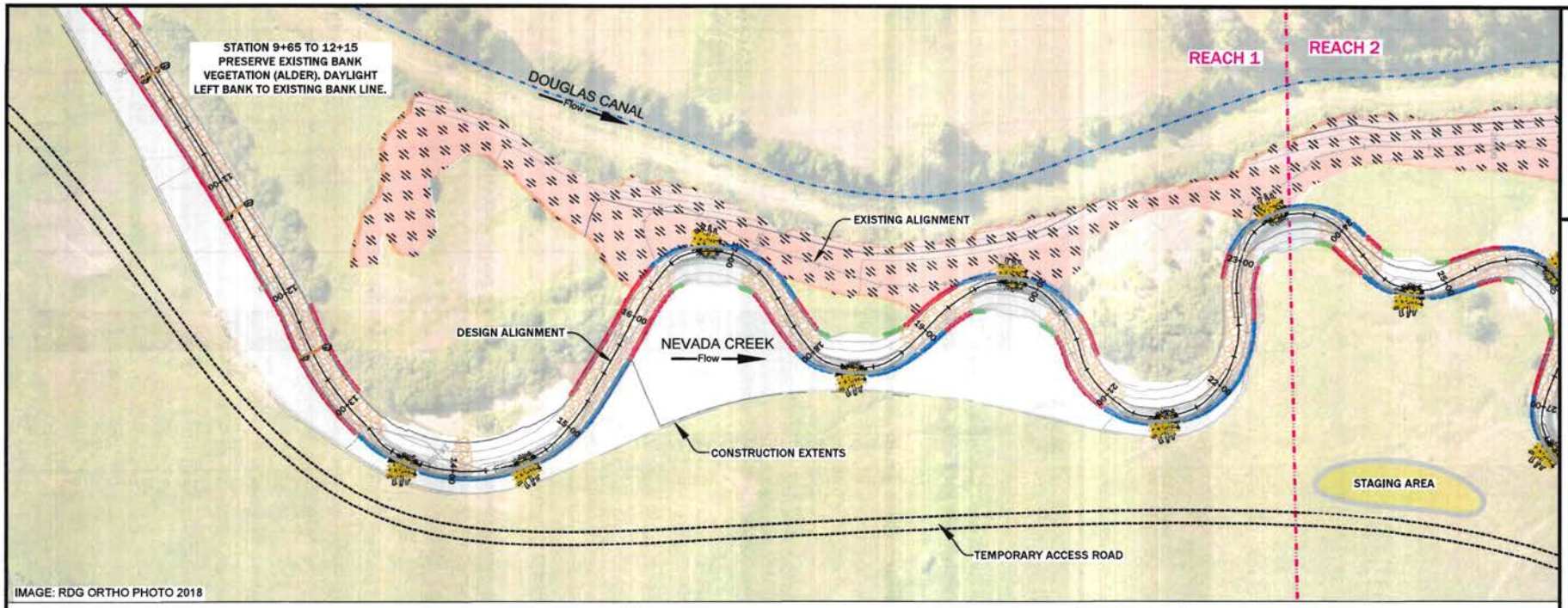

1 NEVADA CREEK PLAN VIEW

1" = 80'

CHANNEL TOP OF BANK ELEVATIONS

STATION START	ELEVATIONS (FT)	STATION START	ELEVATIONS (FT)
12+00	4476.51	19+00	4473.77
13+00	4476.10	20+00	4473.41
14+00	4475.70	21+00	4473.05
15+00	4475.29	22+00	4472.69
16+00	4474.89	23+00	4472.34
17+00	4474.49	24+00	4471.98
18+00	4474.13	25+00	4471.62

DRAWING LEGEND

SYMBOL	
	DOUGLAS CANAL
50ft	DESIGN ALIGNMENT
	GRADING EXTENTS
	REACH BREAK
	CHANNEL FLOW DIRECTION
	REPOSITORY
	STAGING AREA
	TEMPORARY HAUL ROAD
2955'	PROPOSED 5' MAJOR CONTOUR
	PROPOSED 1' MINOR CONTOUR

DETAIL LEGEND

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	VEGETATED WOOD MATRIX - TYPE 3	6.3
	BEAVER DAM ANALOG	6.5
	LARGE WOOD STRUCTURE	6.2
	LOG STEP POOL	6.6
	FLOODPLAIN TREATMENT	6.7

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
12+15	13+00	L	VWM 1
12+50	12+50	C	CLSP
13+21	13+52	R	VWM 2
13+52	13+72	R	LWS
13+72	14+45	R	VWM 2
13+98	14+14	C	CCS
14+45	14+65	R	LWS
14+65	15+73	R	VWM 2
14+89	16+50	C	CCS
15+20	16+37	L	VWM 1
15+73	16+37	R	VWM 1
16+37	16+69	L	VWM 2
16+37	16+50	R	VWM 3
16+69	16+89	L	LWS
16+89	17+63	L	VWM 2
17+15	17+34	R	VWM 3
17+15	18+05	C	CCS
17+34	17+91	R	VWM 1

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
17+63	17+91	L	VWM 1
17+91	18+05	L	VWM 3
17+91	18+24	R	VWM 2
18+24	18+44	R	LWS
18+44	19+14	R	VWM 2
18+69	18+88	L	VWM 3
18+69	19+53	C	CCS
18+88	19+40	L	VWM 1
19+14	19+40	R	VWM 1
19+40	19+72	L	VWM 2
19+40	19+53	R	VWM 3
19+72	19+92	L	LWS
19+92	20+70	L	VWM 2
20+17	20+36	R	VWM 3
20+17	21+16	C	CCS
20+36	21+03	R	VWM 1
21+03	21+39	R	VWM 2

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
21+39	21+59	R	LWS
21+59	22+61	R	VWM 2
21+93	22+17	L	VWM 3
21+93	23+17	C	CCS
22+17	23+04	L	VWM 1
22+61	23+04	R	VWM 1
23+04	23+37	L	VWM 2
23+04	23+17	R	VWM 3
23+37	23+57	L	LWS
23+57	24+18	L	VWM 2
23+83	24+02	R	VWM 3
23+83	24+47	C	CCS
24+02	24+34	R	VWM 1
24+18	24+34	L	VWM 1
24+34	24+47	L	VWM 3
24+34	24+61	R	VWM 2
24+61	24+81	R	LWS

RDG RIVER DESIGN GROUP

PLAN VIEW AND DATA SHEET

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

DRAWING NUMBER 4.2

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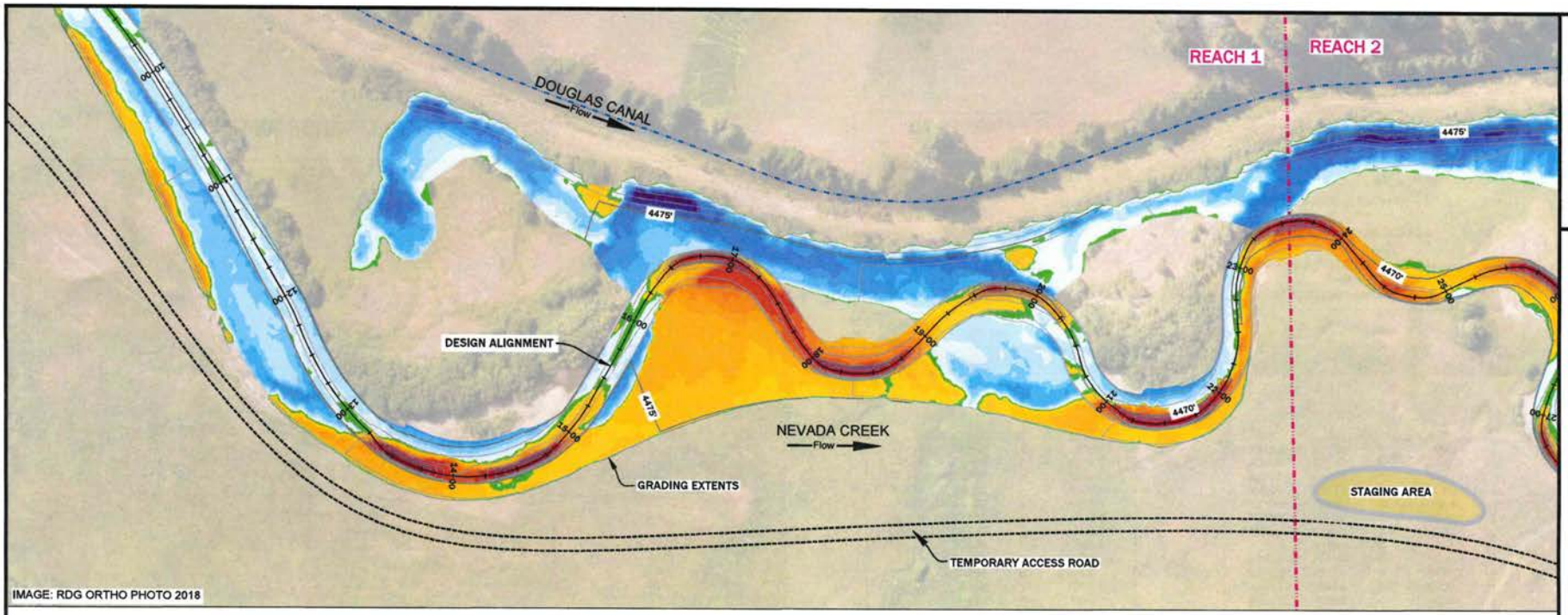
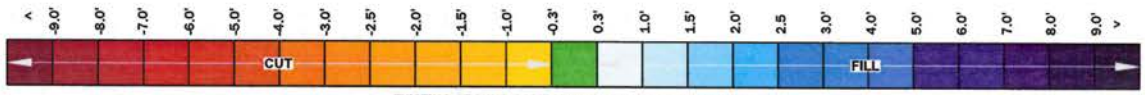
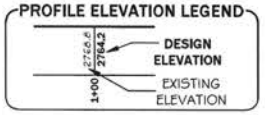
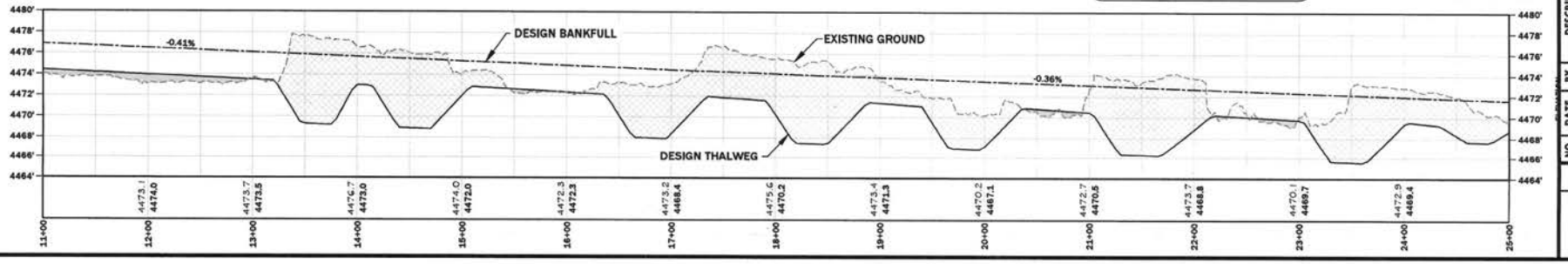


1 NEVADA CREEK PLAN VIEW

1" = 80'







GRADING PLAN AND PROFILE

NEVADA CREEK PHASE 6

NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.3

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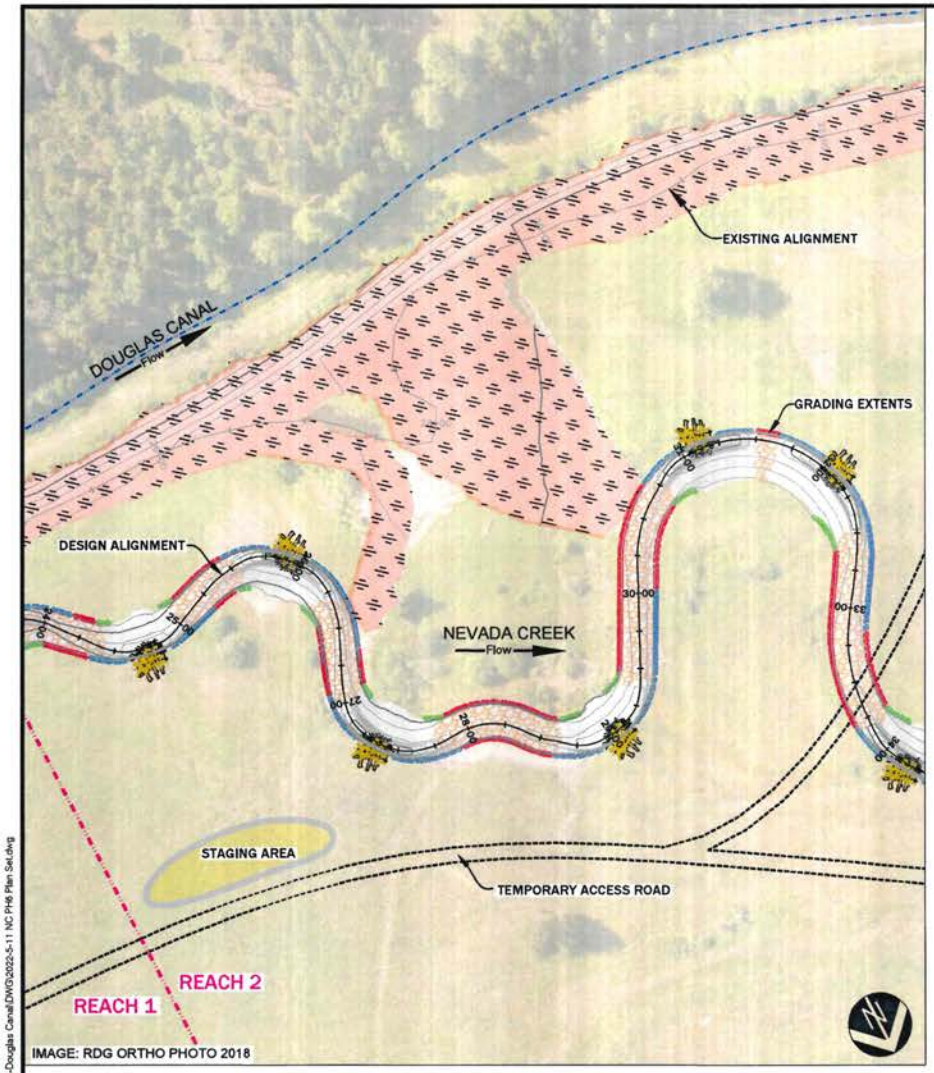

1 **NEVADA CREEK PLAN VIEW**
1" = 80'

CHANNEL TOP OF BANK ELEVATIONS

STATION START	ELEVATIONS (FT)	STATION START	ELEVATIONS (FT)
26+00	4471.26	34+00	4468.39
27+00	4470.90	35+00	4468.03
28+00	4470.54	36+00	4467.67
29+00	4470.18	37+00	4467.31
30+00	4469.83	38+00	4466.96
31+00	4469.47	39+00	4466.55
32+00	4469.11	40+00	4466.15
33+00	4468.75	41+00	4465.74
		42+00	4465.34

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
24+81	25+27	R	VWM 2
24+95	25+08	L	VWM 3
24+95	25+60	C	CCS
25+08	25+46	L	VWM 1
25+27	25+46	R	VWM 1
25+46	25+79	L	VWM 2
25+46	25+60	R	VWM 3
25+79	25+99	L	LWS
25+99	26+68	L	VWM 2
26+25	26+44	R	VWM 3
26+25	27+05	C	CCS
26+44	26+92	R	VWM 1
26+68	26+92	L	VWM 1
26+92	27+05	L	VWM 3
26+92	27+25	R	VWM 2
27+25	27+45	R	LWS
27+45	27+90	R	VWM 2
27+71	27+90	L	VWM 3
27+71	28+74	C	CCS

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
27+90	28+60	L	VWM 2
27+90	28+60	R	VWM 1
28+60	28+74	L	VWM 3
28+60	28+93	R	VWM 2
28+93	29+13	R	LWS
29+13	30+08	R	VWM 2
29+33	29+46	L	VWM 3
29+33	30+83	C	CCS
29+46	30+70	L	VWM 1
30+08	30+70	R	VWM 1
30+70	31+02	L	VWM 2
30+70	30+83	R	VWM 3
31+02	31+22	L	LWS
31+22	31+98	L	VWM 2
31+49	31+65	C	CCS
31+98	32+18	L	LWS
32+18	33+19	L	VWM 2
32+43	32+62	R	VWM 3
32+43	33+88	C	CCS

DRAWING LEGEND

SYMBOL	
	DOUGLAS CANAL
	DESIGN ALIGNMENT
	GRADING EXTENTS
	REACH BREAK
	CHANNEL FLOW DIRECTION
	REPOSITORY
	STAGING AREA
	TEMPORARY HAUL ROAD
2955'	PROPOSED 5' MAJOR CONTOUR
	PROPOSED 1' MINOR CONTOUR

DETAIL LEGEND

SYMBOL		DETAIL SHEET #
	CONSTRUCTED CHANNEL STREAMBED	6.4
	VEGETATED WOOD MATRIX - TYPE 1	6.3
	VEGETATED WOOD MATRIX - TYPE 2	6.3
	VEGETATED WOOD MATRIX - TYPE 3	6.3
	BEAVER DAM ANALOG	6.5
LWS	LARGE WOOD STRUCTURE	6.2
	FLOODPLAIN TREATMENT	6.7

RDG RIVER DESIGN GROUP

PLAN VIEW AND DATA SHEET
NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.4

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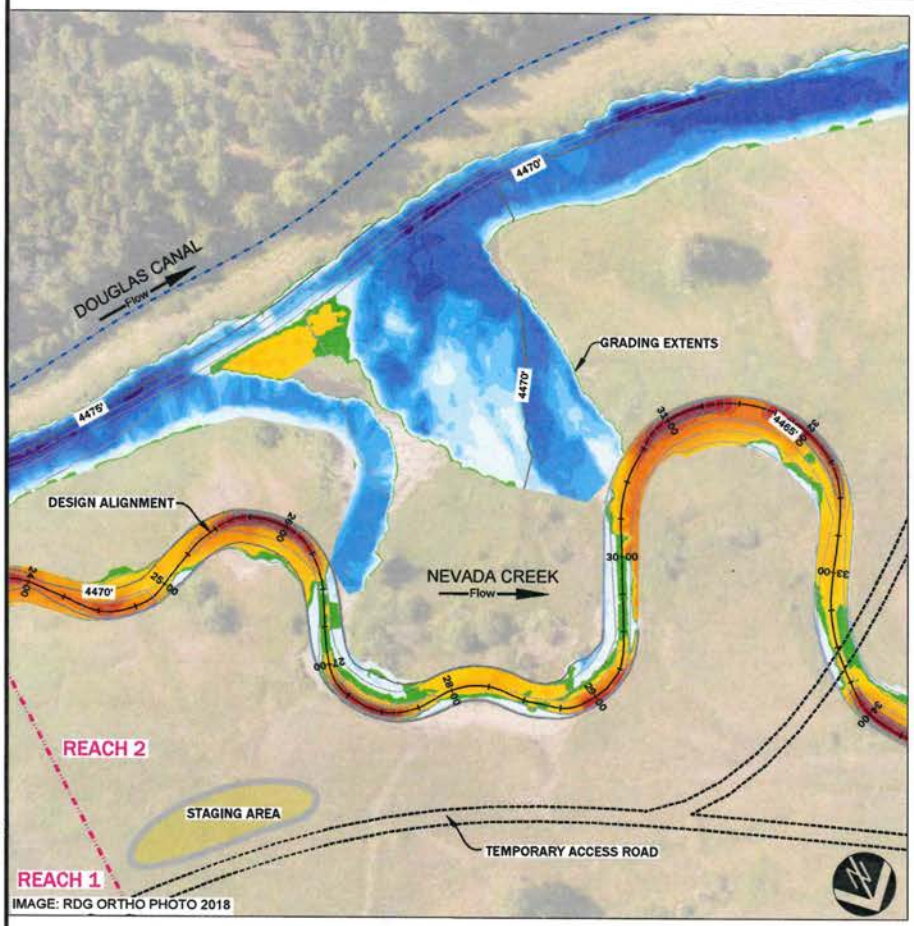
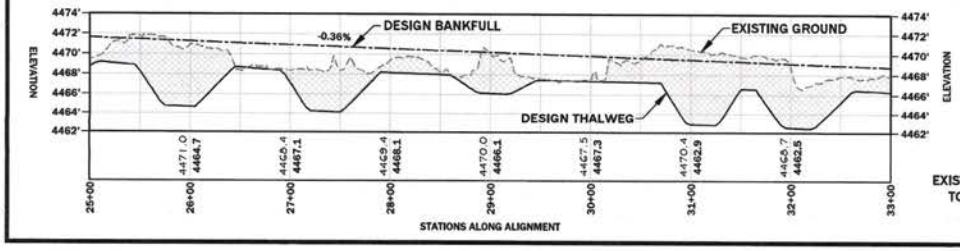
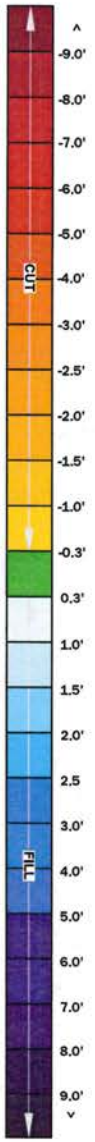


1 **NEVADA CREEK PLAN VIEW**
1" = 80'





EXISTING GROUND COMPARED TO RDG DESIGN SURFACE

PROFILE ELEVATION LEGEND
DESIGN ELEVATION
EXISTING ELEVATION

PROFILE LEGEND
EXISTING GROUND ELEVATION
BANKFULL SURFACE
DESIGN SURFACE

RDG RIVER DESIGN GROUP

GRADING PLAN AND PROFILE

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.5

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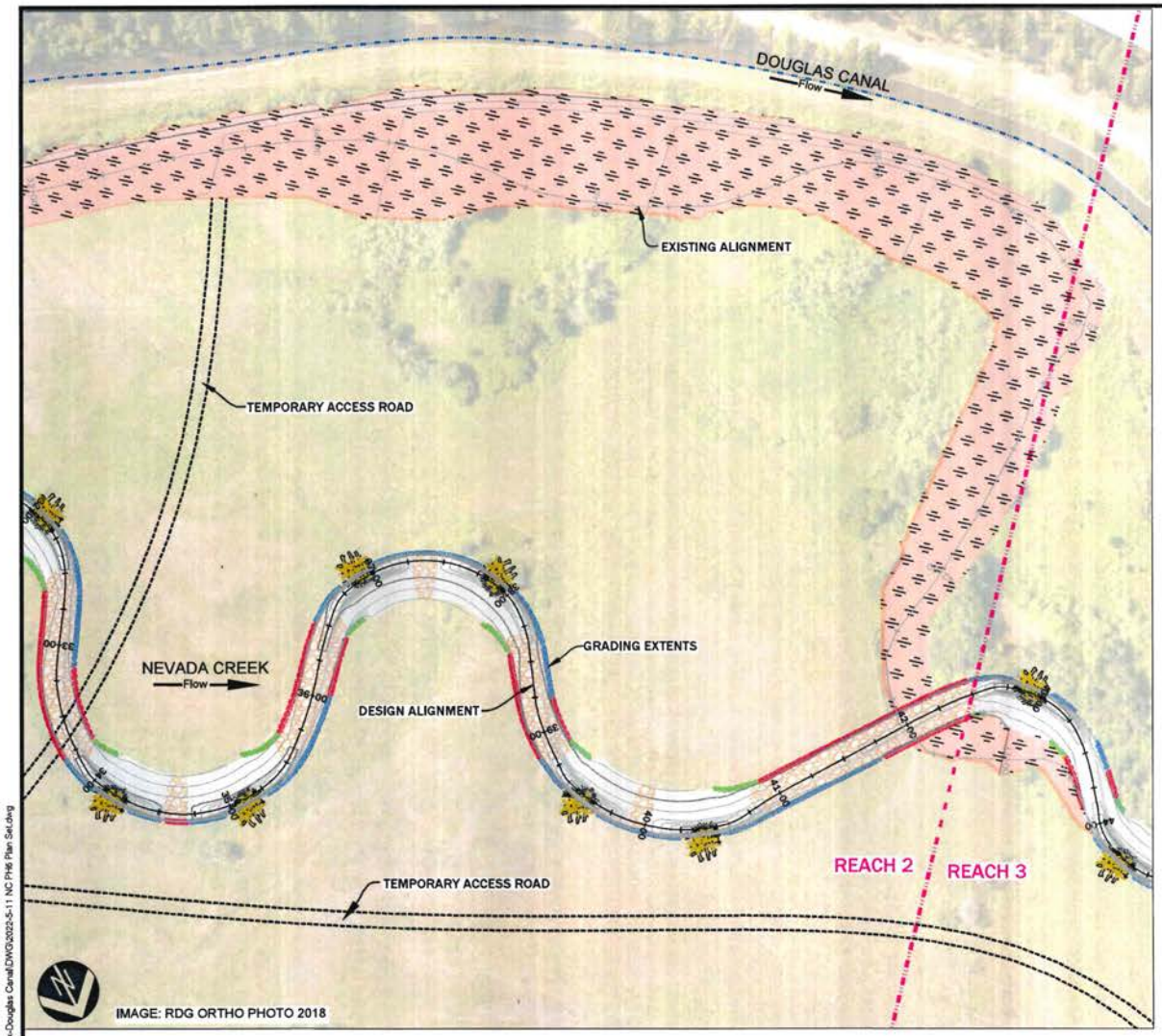

1 **NEVADA CREEK PLAN VIEW**
1" = 80'

CHANNEL TOP OF BANK ELEVATIONS

STATION START	ELEVATIONS (FT)	STATION START	ELEVATIONS (FT)
26+00	4471.26	34+00	4468.39
27+00	4470.90	35+00	4468.03
28+00	4470.54	36+00	4467.67
29+00	4470.18	37+00	4467.31
30+00	4469.83	38+00	4466.96
31+00	4469.47	39+00	4466.55
32+00	4469.11	40+00	4466.15
33+00	4468.75	41+00	4465.74
		42+00	4465.34

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
32+62	33+75	R	VWM 1
33+19	33+75	L	VWM 1
33+75	34+01	L	VWM 3
33+75	34+07	R	VWM 2
34+07	34+27	R	LWS
34+27	34+54	R	VWM 2
34+54	34+70	R	VWM 1
34+54	34+70	C	CCS
34+70	35+01	R	VWM 2
35+01	35+21	R	LWS
35+21	36+07	R	VWM 2
35+46	35+65	L	VWM 3
35+46	36+63	C	CCS
35+65	36+49	L	VWM 1
36+07	36+49	R	VWM 1
36+49	36+82	L	VWM 2
36+49	36+63	R	VWM 3
36+82	37+02	L	LWS
37+02	37+77	L	VWM 2

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
37+28	37+45	C	CCS
37+77	37+97	L	LWS
37+97	38+78	L	VWM 2
38+22	38+41	R	VWM 3
38+22	39+27	C	CCS
38+41	39+14	R	VWM 1
38+78	39+14	L	VWM 1
39+14	39+27	L	VWM 3
39+14	39+43	R	VWM 2
39+43	39+63	R	LWS
39+63	39+86	R	VWM 2
39+86	40+02	R	VWM 1
39+86	40+02	C	CCS
40+02	40+31	R	VWM 2
40+31	40+51	R	LWS
40+51	41+71	R	VWM 2
40+72	40+91	L	VWM 3
40+72	42+63	C	CCS
40+91	42+50	L	VWM 1

DRAWING LEGEND

SYMBOL	
	DOUGLAS CANAL
5400	DESIGN ALIGNMENT
	REACH BREAK
Flow	CHANNEL FLOW DIRECTION
	REPOSITORY
	STAGING AREA
	TEMPORARY HAUL ROAD
2955'	PROPOSED 5' MAJOR CONTOUR
	PROPOSED 1' MINOR CONTOUR

DETAIL LEGEND

SYMBOL		DETAIL SHEET #
	CONSTRUCTED CHANNEL STREAMBED	6.4
	VEGETATED WOOD MATRIX - TYPE 1	6.3
	VEGETATED WOOD MATRIX - TYPE 2	6.3
	VEGETATED WOOD MATRIX - TYPE 3	6.3
	BEAVER DAM ANALOG	6.5
	LARGE WOOD STRUCTURE	6.2
	FLOODPLAIN TREATMENT	6.7

RDG RIVER DESIGN GROUP

PLAN VIEW AND DATA SHEET

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.6

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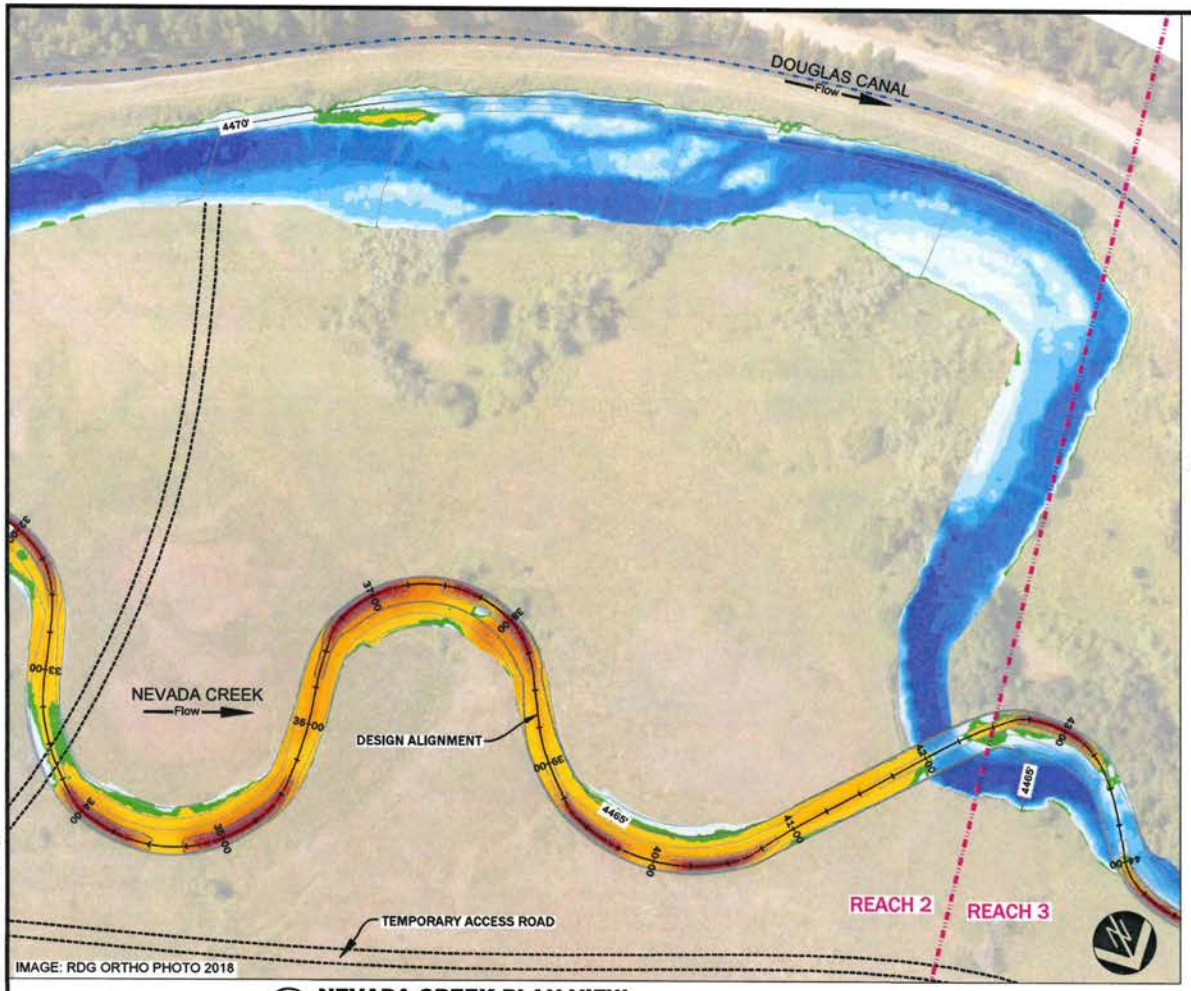
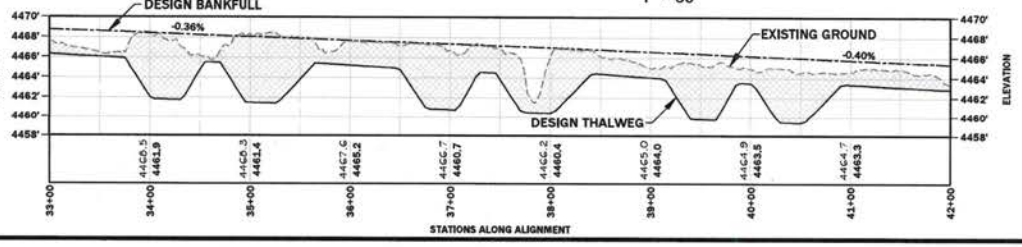
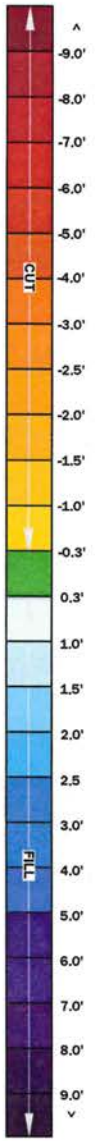


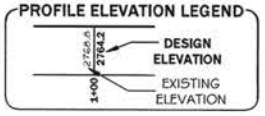
1 NEVADA CREEK PLAN VIEW

1" = 80'





EXISTING GROUND COMPARED TO RDG DESIGN SURFACE



RDG RIVER DESIGN GROUP

GRADING PLAN AND PROFILE

NEVADA CREEK PHASE 6

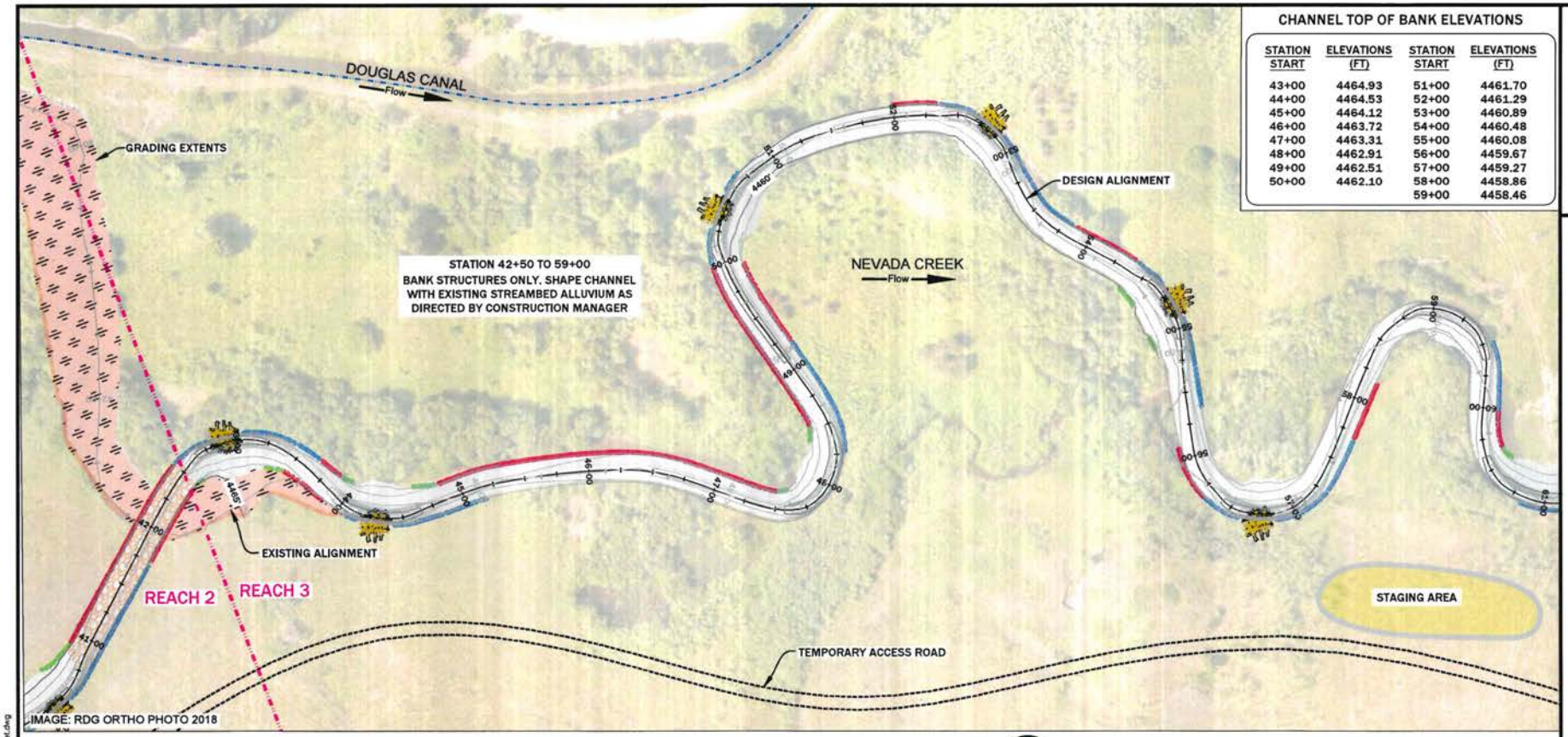
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

DRAWING NUMBER 4.7

M:\Projects\2022\RDG-22-017 Nevada Creek-Douglas Canal\DWG\2022-5-11 NC PH6 Plan Set.dwg



CHANNEL TOP OF BANK ELEVATIONS

STATION START	ELEVATIONS (FT)	STATION START	ELEVATIONS (FT)
43+00	4464.93	51+00	4461.70
44+00	4464.53	52+00	4461.29
45+00	4464.12	53+00	4460.89
46+00	4463.72	54+00	4460.48
47+00	4463.31	55+00	4460.08
48+00	4462.91	56+00	4459.67
49+00	4462.51	57+00	4459.27
50+00	4462.10	58+00	4458.86
		59+00	4458.46

RDG RIVER DESIGN GROUP

PLAN VIEW AND DATA SHEET

NEVADA CREEK PHASE 6

NEAR HELMVILLE

1 NEVADA CREEK PLAN VIEW

1" = 80'

DRAWING LEGEND

SYMBOL	
	DOUGLAS CANAL
joint	DESIGN ALIGNMENT
	GRADING EXTENTS
	REACH BREAK
	CHANNEL FLOW DIRECTION
	REPOSITORY
	STAGING AREA
	TEMPORARY HAUL ROAD
2955'	PROPOSED 5' MAJOR CONTOUR
	PROPOSED 1' MINOR CONTOUR

DETAIL LEGEND

SYMBOL		DETAIL SHEET #
	CONSTRUCTED CHANNEL STREAMBED	6.4
	VEGETATED WOOD MATRIX - TYPE 1	6.3
	VEGETATED WOOD MATRIX - TYPE 2	6.3
	VEGETATED WOOD MATRIX - TYPE 3	6.3
	BEAVER DAM ANALOG	6.5
VWS	LARGE WOOD STRUCTURE	6.2

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
41+71	42+50	R	VWM 1
42+50	42+82	L	VWM 2
42+50	42+63	R	VWM 3
42+82	43+02	L	LWS
43+02	43+67	L	VWM 2
43+27	43+46	R	VWM 3
43+46	43+87	R	VWM 1
43+67	43+87	L	VWM 1
43+87	44+00	L	VWM 3
43+87	44+19	R	VWM 2
44+19	44+39	R	LWS
44+39	45+20	R	VWM 2
44+64	44+82	L	VWM 3

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
44+82	47+54	L	VWM 1
47+54	47+81	L	VWM 3
48+25	49+27	R	VWM 2
48+34	48+53	L	VWM 3
48+53	50+00	L	VWM 1
49+27	49+93	R	VWM 1
50+00	50+32	L	VWM 2
50+32	50+52	L	LWS
50+52	50+73	L	VWM 2
52+00	52+33	L	VWM 1
52+33	52+65	L	VWM 2
52+65	52+85	L	LWS
52+85	53+84	L	VWM 2

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
53+84	54+39	L	VWM 1
54+39	54+70	L	VWM 2
54+39	54+64	R	VWM 3
54+70	54+90	L	LWS
54+90	55+65	L	VWM 2
54+95	55+32	R	VWM 3
55+90	56+29	R	VWM 1
56+29	56+62	R	VWM 2
56+62	56+82	R	LWS
56+82	57+99	R	VWM 2
57+99	58+18	R	VWM 1

NO.	DATE	BY	DESCRIPTION	CHK
-	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.8

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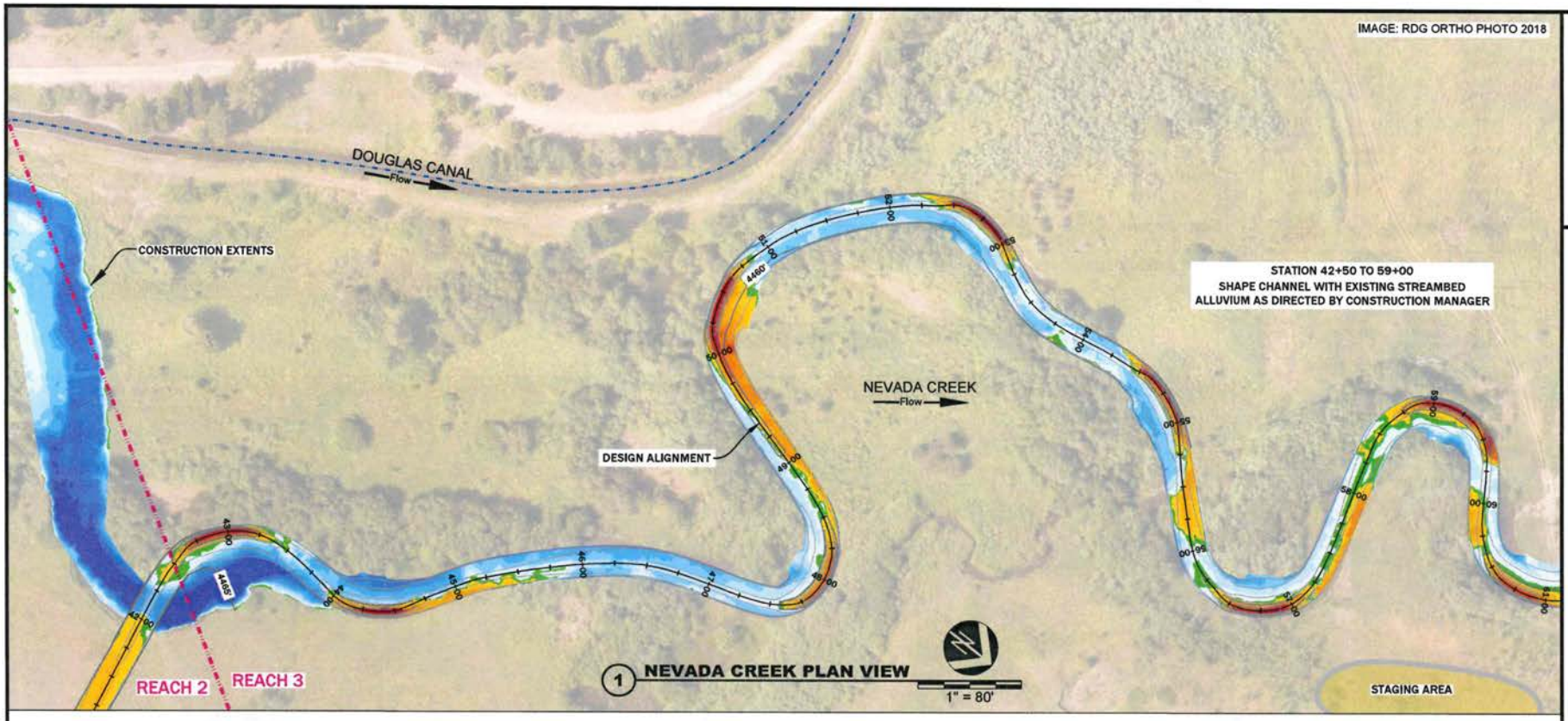

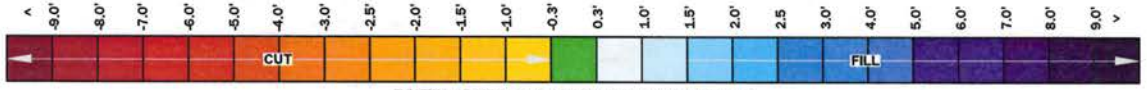

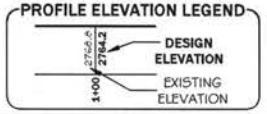

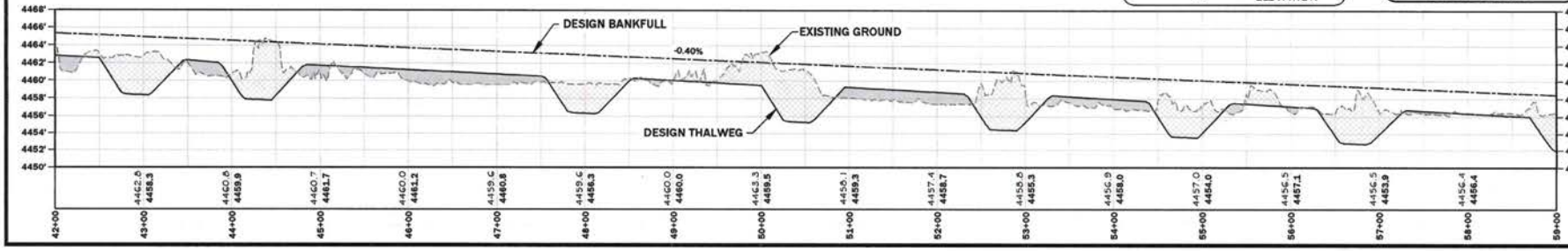

GRADING PLAN AND PROFILE

NEVADA CREEK PHASE 6
NEAR HELMVILLE,

NO.	DATE	BY	DESCRIPTION	CHK
-	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.9

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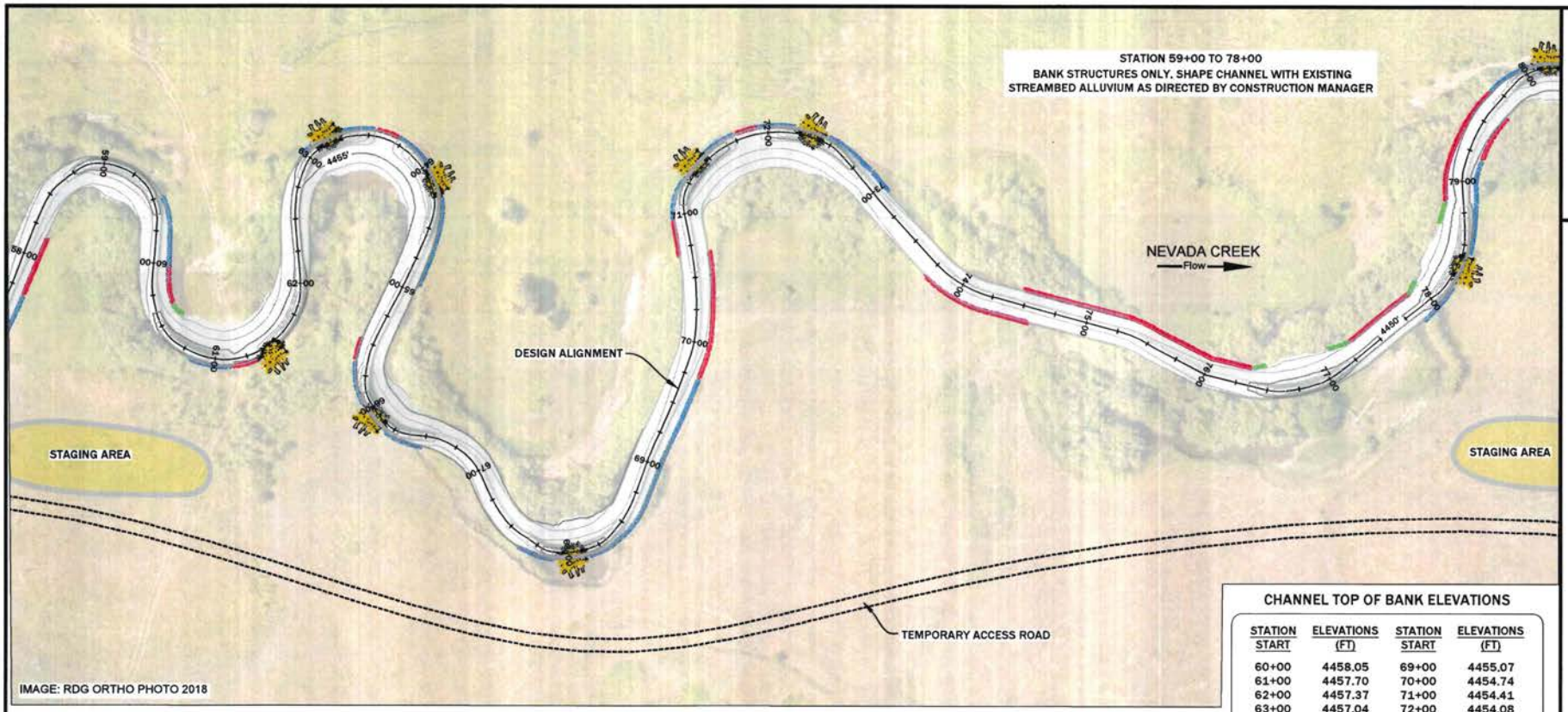

1 NEVADA CREEK PLAN VIEW

1" = 80'

CHANNEL TOP OF BANK ELEVATIONS

STATION START	ELEVATIONS (FT)	STATION START	ELEVATIONS (FT)
60+00	4458.05	69+00	4455.07
61+00	4457.70	70+00	4454.74
62+00	4457.37	71+00	4454.41
63+00	4457.04	72+00	4454.08
64+00	4456.71	73+00	4453.76
65+00	4456.39	74+00	4453.43
66+00	4456.06	75+00	4453.10
67+00	4455.73	76+00	4452.77
68+00	4455.40	77+00	4452.44
		78+00	4452.11

DRAWING LEGEND

SYMBOL	
	DOUGLAS CANAL
50ft	DESIGN ALIGNMENT
	GRADING EXTENTS
	REACH BREAK
	CHANNEL FLOW DIRECTION
	REPOSITORY
	STAGING AREA
	TEMPORARY HAUL ROAD
2955'	PROPOSED 5' MAJOR CONTOUR
	PROPOSED 1' MINOR CONTOUR

DETAIL LEGEND

SYMBOL		DETAIL SHEET #
	CONSTRUCTED CHANNEL STREAMBED	6.4
	VEGETATED WOOD MATRIX - TYPE 1	6.3
	VEGETATED WOOD MATRIX - TYPE 2	6.3
	VEGETATED WOOD MATRIX - TYPE 3	6.3
	BEAVER DAM ANALOG	6.5
VW2	LARGE WOOD STRUCTURE	6.2

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
59+50	60+00	L	VWM 2
60+00	60+37	L	VWM 1
60+37	60+64	L	VWM 3
60+80	61+29	R	VWM 2
61+29	61+56	R	LWS
63+00	63+09	L	VWM 2
63+09	63+29	L	LWS
63+29	63+56	L	VWM 2
63+56	63+72	L	VWM 1
63+72	64+03	L	VWM 2
64+03	64+23	L	LWS
64+23	64+95	L	VWM 2

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
65+48	65+64	R	VWM 1
65+64	65+97	R	VWM 2
65+97	66+17	R	LWS
66+17	66+50	R	VWM 2
67+61	67+94	R	VWM 2
67+94	68+14	R	LWS
68+14	69+77	R	VWM 2
69+77	70+75	R	VWM 1
70+68	70+95	L	VWM 1
70+95	71+28	L	VWM 2
71+28	71+48	L	LWS
71+48	71+76	L	VWM 2

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
71+76	71+92	L	VWM 1
71+92	72+24	L	VWM 2
72+24	72+44	L	LWS
72+44	73+08	L	VWM 2
73+08	73+08	L	VWM 1
73+73	74+56	R	VWM 1
74+47	76+35	L	VWM 1
76+35	76+48	L	VWM 3
77+11	77+29	L	VWM 3
77+29	77+90	L	VWM 1
77+85	78+21	R	VWM 2

RDG RIVER DESIGN GROUP

PLAN VIEW AND DATA SHEET

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
-	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.10

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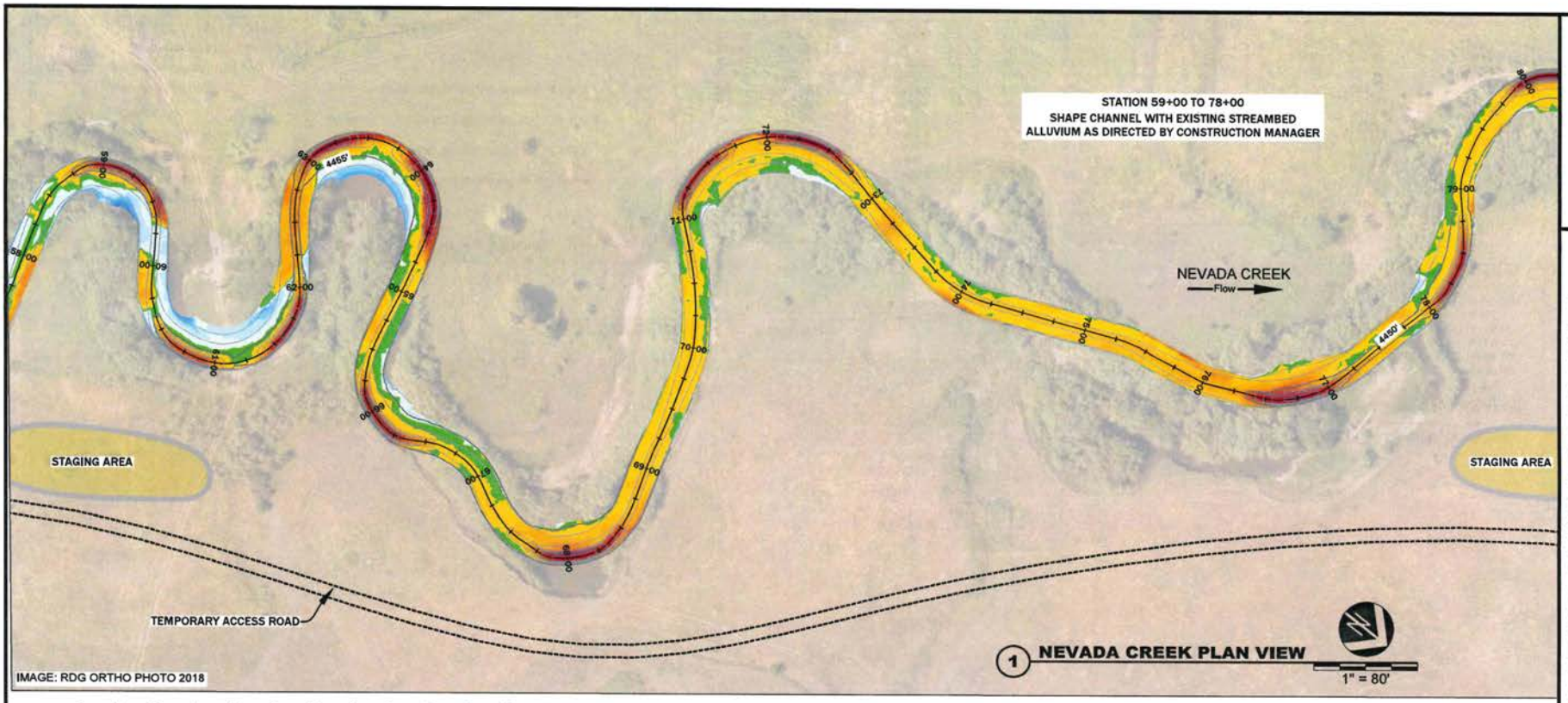

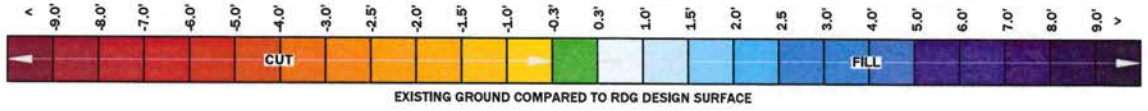

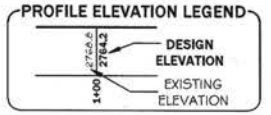

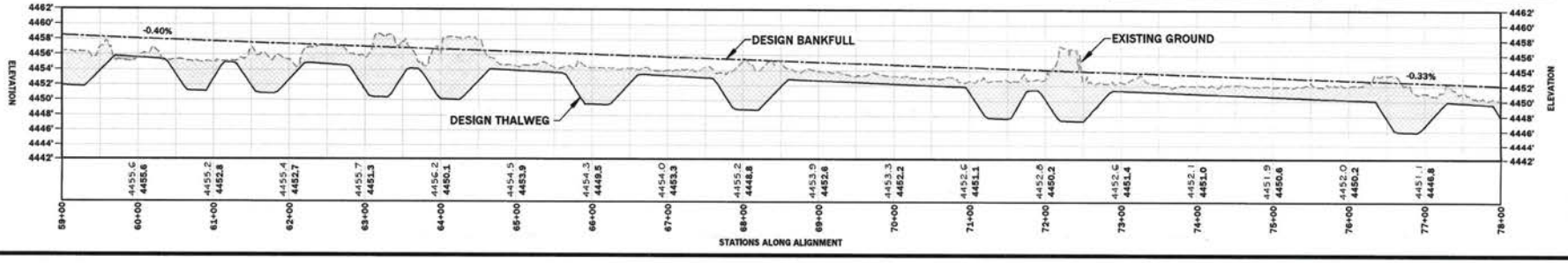

GRADING PLAN AND PROFILE

NEVADA CREEK PHASE 6

NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
-	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.11

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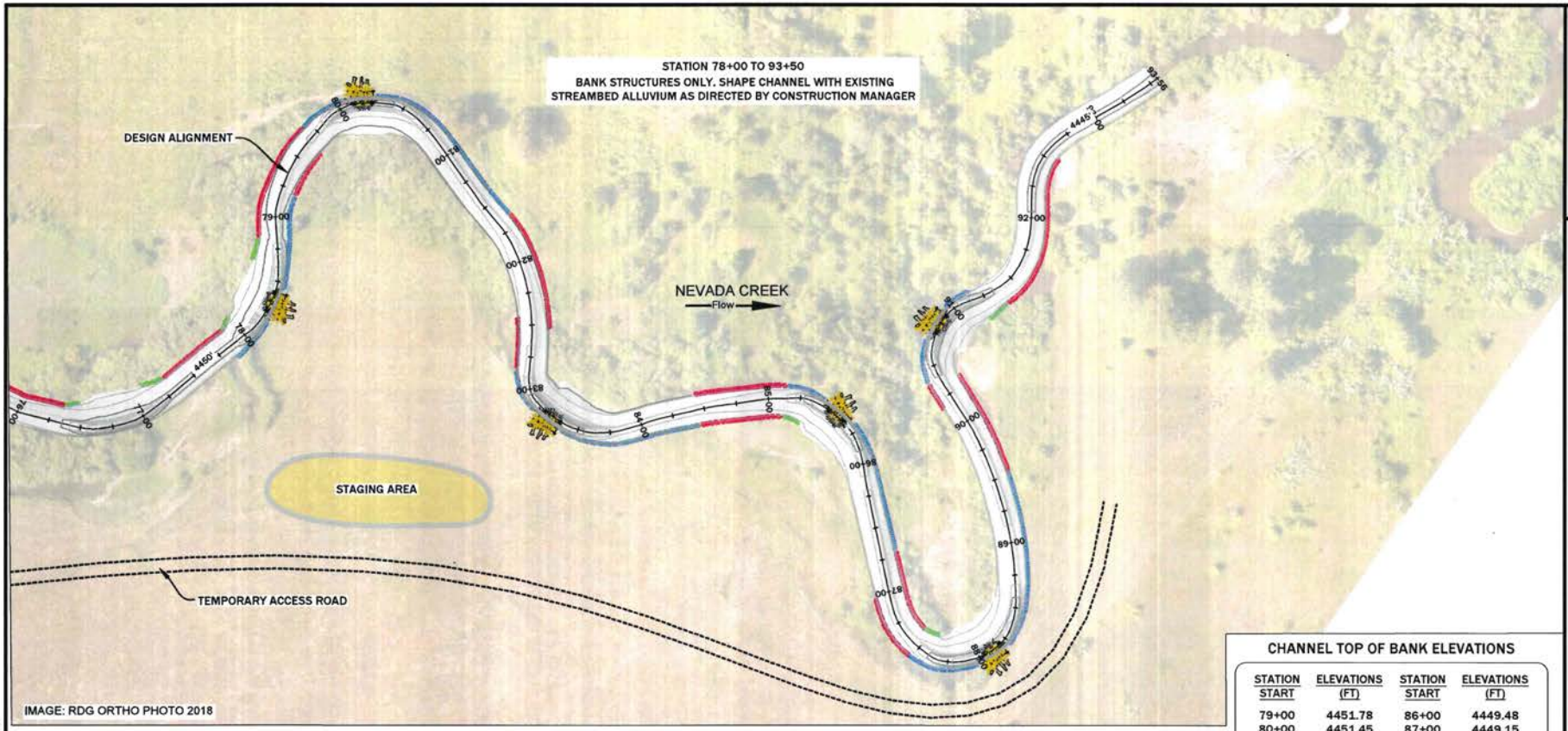

1 NEVADA CREEK PLAN VIEW
1" = 80'

CHANNEL TOP OF BANK ELEVATIONS

STATION START	ELEVATIONS (FT)	STATION START	ELEVATIONS (FT)
79+00	4451.78	86+00	4449.48
80+00	4451.45	87+00	4449.15
81+00	4451.13	88+00	4448.82
82+00	4450.80	89+00	4448.50
83+00	4450.47	90+00	4448.17
84+00	4450.14	91+00	4447.84
85+00	4449.81	92+00	4447.51
		93+00	4447.18

DRAWING LEGEND

SYMBOL	
	DOUGLAS CANAL
	DESIGN ALIGNMENT
	REACH BREAK
	CHANNEL FLOW DIRECTION
	REPOSITORY
	STAGING AREA
	TEMPORARY HAUL ROAD
2955'	PROPOSED 5' MAJOR CONTOUR
	PROPOSED 1' MINOR CONTOUR

DETAIL LEGEND

SYMBOL		DETAIL SHEET #
	CONSTRUCTED CHANNEL STREAMBED	6.4
	VEGETATED WOOD MATRIX - TYPE 1	6.3
	VEGETATED WOOD MATRIX - TYPE 2	6.3
	VEGETATED WOOD MATRIX - TYPE 3	6.3
	BEAVER DAM ANALOG	6.5
	LARGE WOOD STRUCTURE	6.2

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
77+90	78+03	L	VWM 3
78+21	78+41	R	LWS
78+41	79+32	R	VWM 2
78+66	78+84	L	VWM 3
78+84	79+79	L	VWM 1
79+32	79+64	R	VWM 1
79+79	80+08	L	VWM 2
80+08	80+28	L	LWS
80+28	81+82	L	VWM 2
81+82	82+52	L	VWM 1
82+43	82+84	R	VWM 1

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
82+84	83+17	R	VWM 2
83+17	83+37	R	LWS
83+37	84+48	R	VWM 2
84+45	85+14	L	VWM 1
84+48	85+14	R	VWM 1
85+14	85+46	L	VWM 2
85+14	85+27	R	VWM 3
85+46	85+66	L	LWS
85+66	86+78	L	VWM 2
86+78	87+46	L	VWM 1
87+02	87+98	R	VWM 2

STRUCTURE SCHEDULE

STATION START	STATION END	BANK	STRUCTURE
87+46	87+66	L	VWM 3
87+98	88+18	R	LWS
88+18	89+54	R	VWM 2
89+54	90+38	R	VWM 1
90+17	90+38	L	VWM 1
90+38	90+72	L	VWM 2
90+72	90+92	L	LWS
90+92	91+18	L	VWM 2
91+20	91+36	R	VWM 3
91+36	92+56	R	VWM 1

RDG STEVE DESIGN GROUP

PLAN VIEW AND DATA SHEET

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.12

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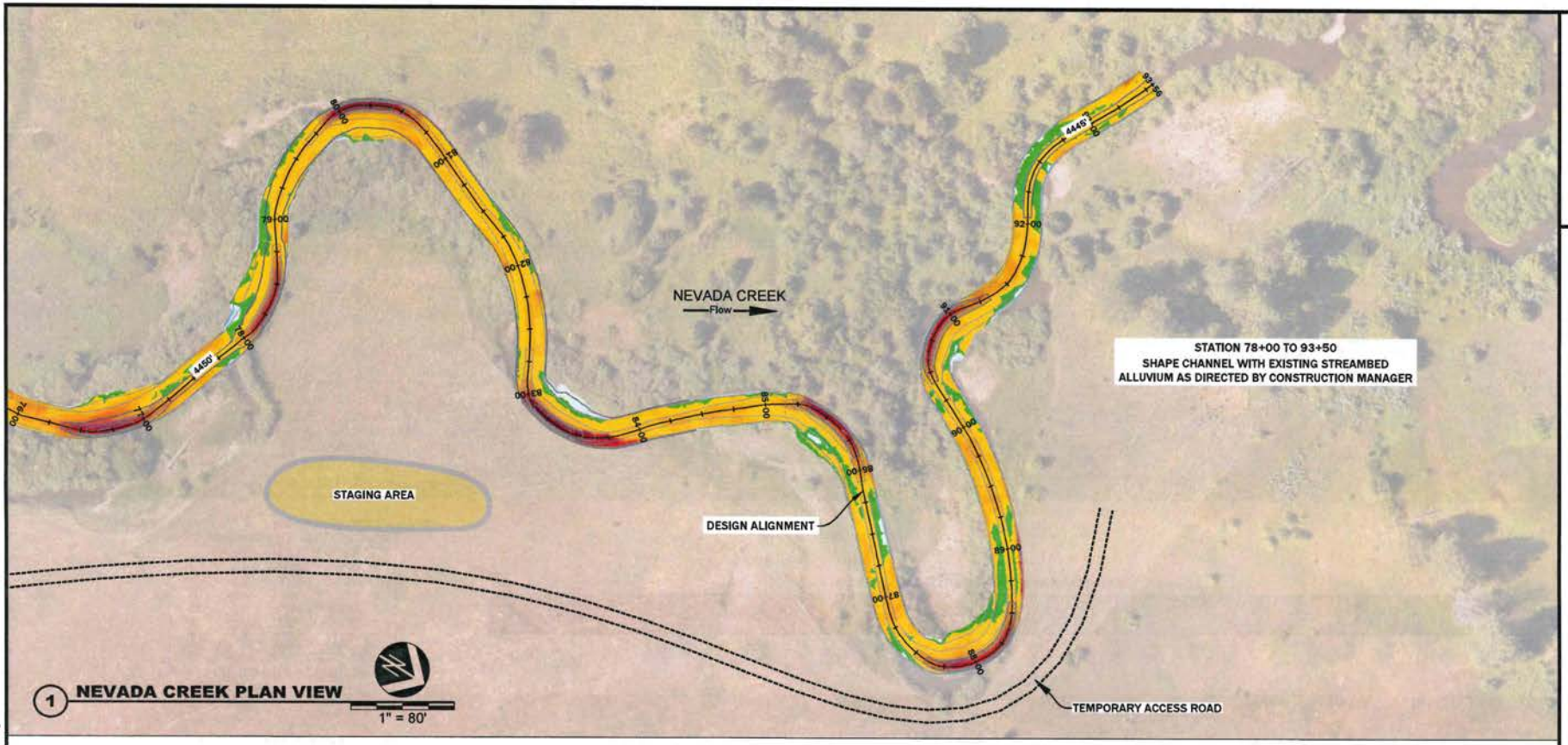
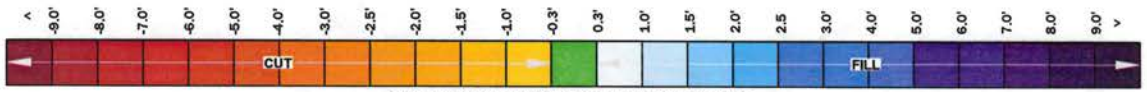
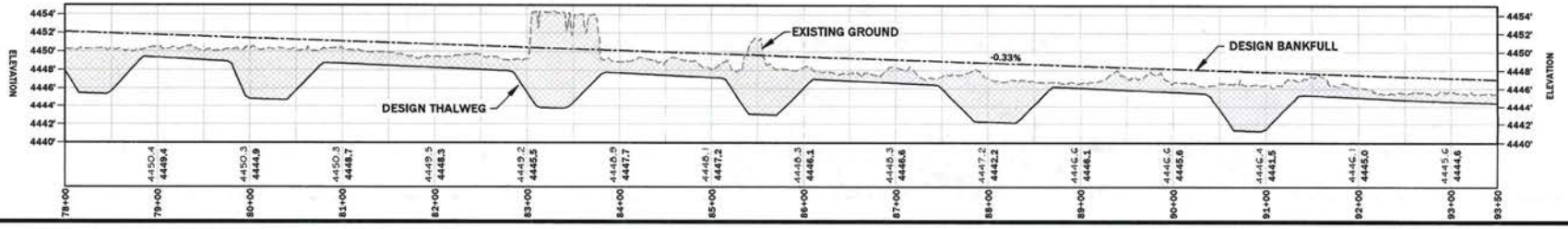




PROFILE LEGEND
EXISTING GROUND ELEVATION
BANKFULL SURFACE
DESIGN SURFACE

PROFILE ELEVATION LEGEND
DESIGN ELEVATION
EXISTING ELEVATION



GRADING PLAN AND PROFILE

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.13

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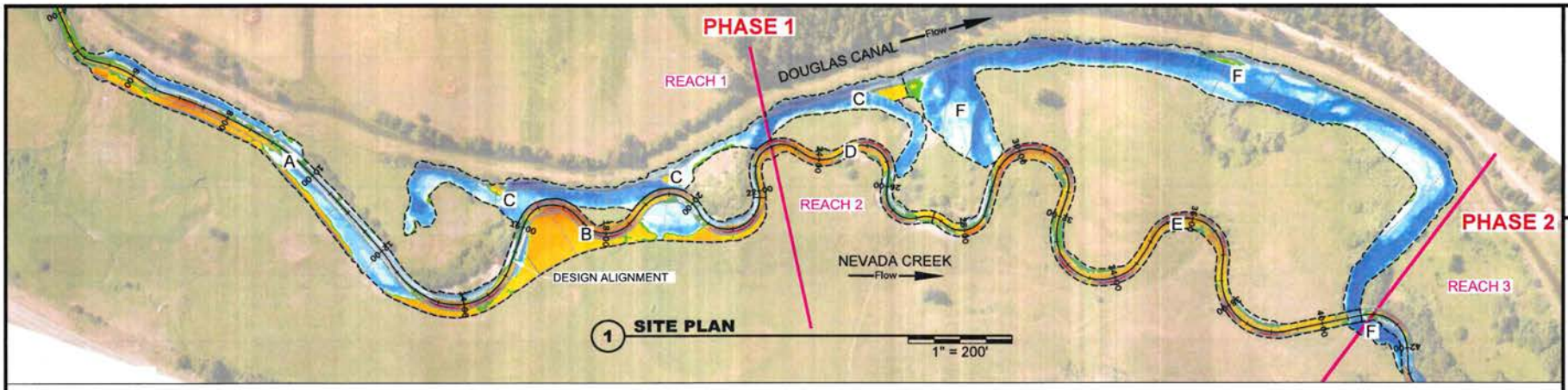
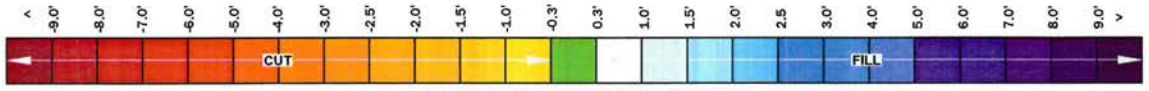


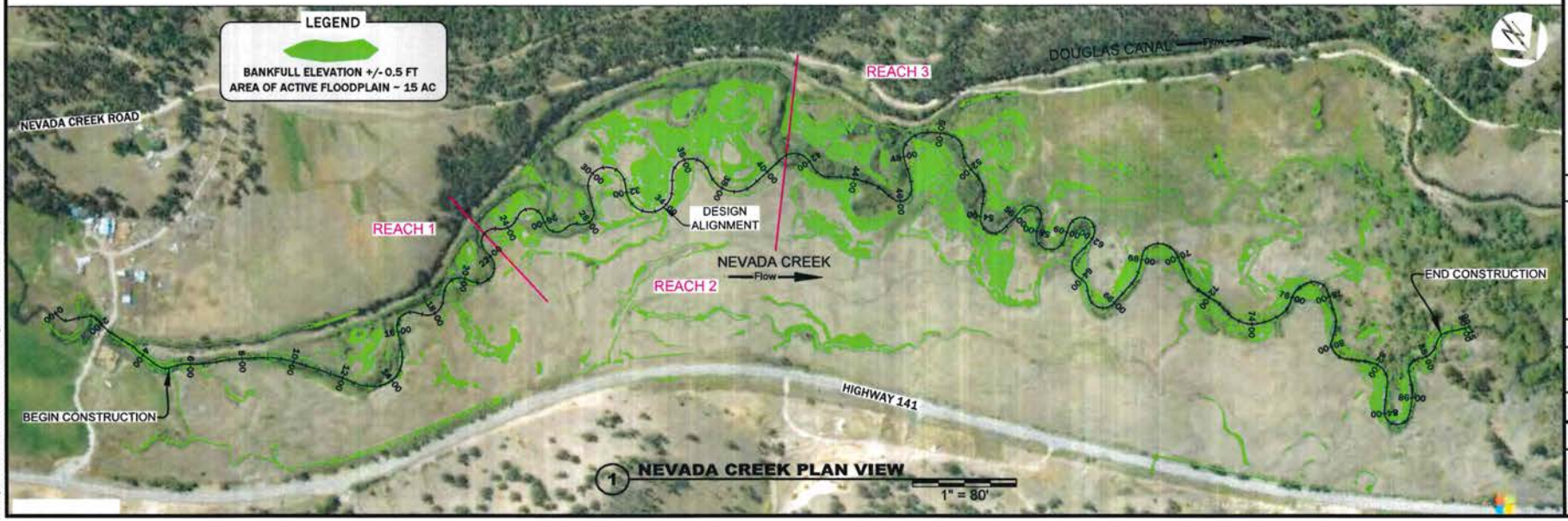
EARTHWORK VOLUMES

UNIT	CUT (CY)	FILL (CY)	NET (CY)	
A	1,170	1,600	430	F
B	2,420	600	(1,820)	C
C	0	3,880	3,880	F
D	860	90	(770)	C
E	2,250	170	(2,080)	C
F	0	9,620	9,620	F
	6,700	15,960	9,260	FILL

NOTES: REPORTED VOLUMES ARE NEATLINE.
CUT VOLUME INCLUDES STREAMBED SUBGRADE EARTHWORK.



EXISTING GROUND COMPARED TO RDG DESIGN SURFACE



RDG RIVER DESIGN GROUP

GRADING OVERVIEW

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
-	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
4.14

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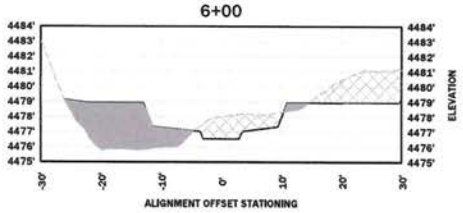

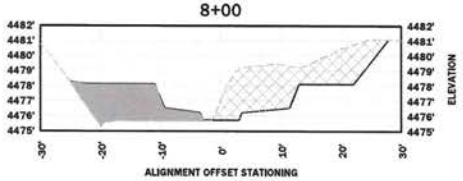

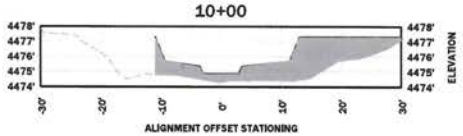

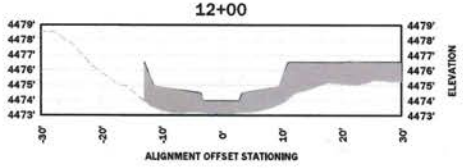

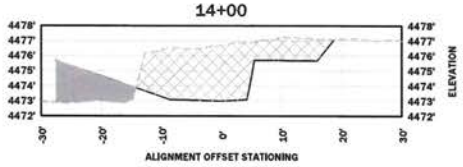

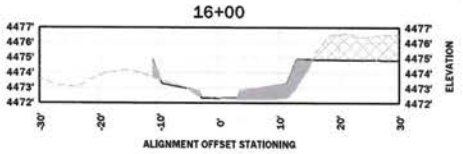

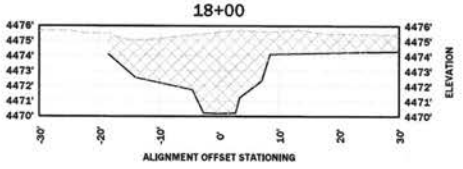

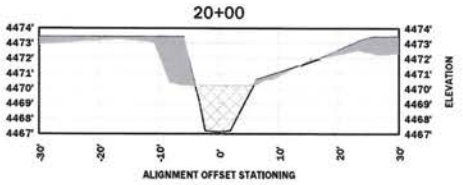

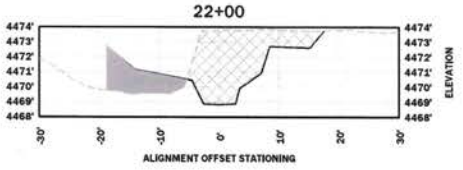

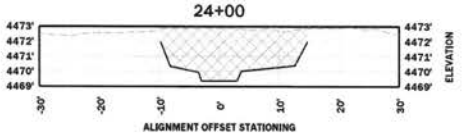

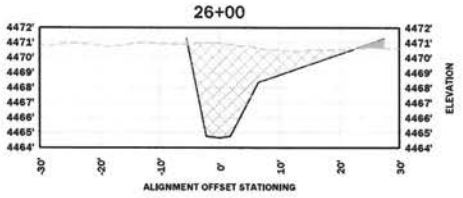

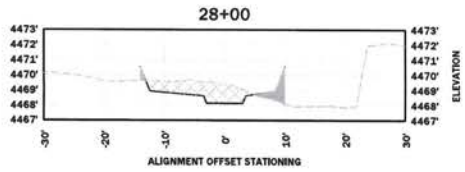

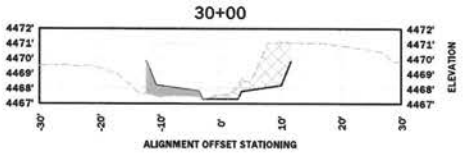

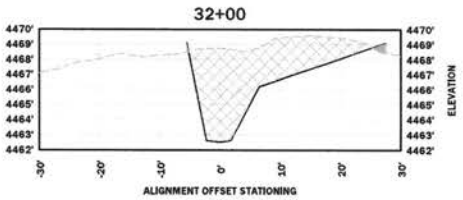

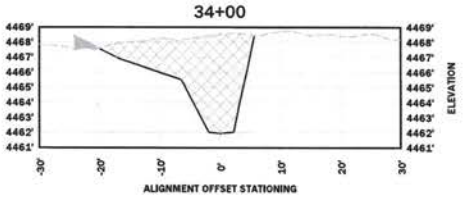

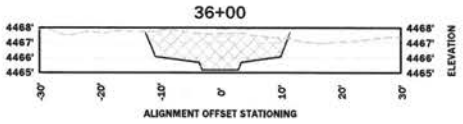

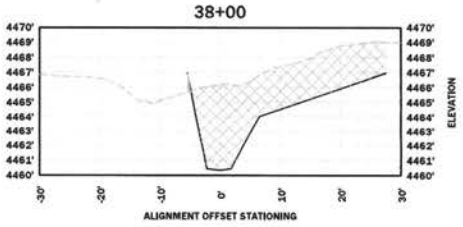

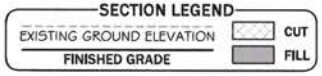

NOTE: CROSS SECTIONS MAY REPRESENT DESIGN CHANNEL ONLY FOR STREAMBED GRADING AS DIRECTED BY CONSTRUCTION MANAGER. RDG SHALL PROVIDE A BANKFULL SURFACE TO GUIDE DESIGNATED BANK CONSTRUCTION.

RDG RIVER DESIGN GROUP

CROSS SECTIONS

NEVADA CREEK PHASE 6

NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
5.0

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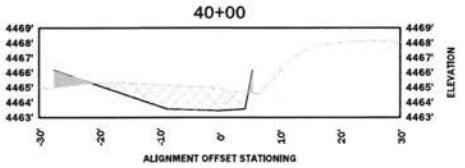

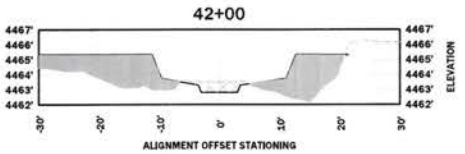

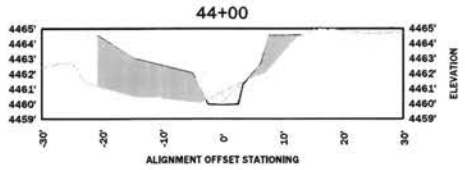

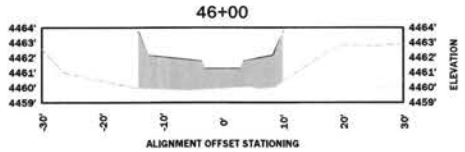

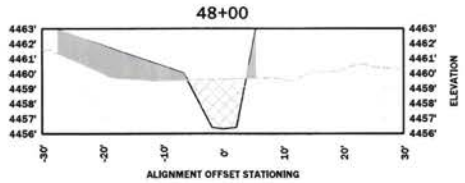

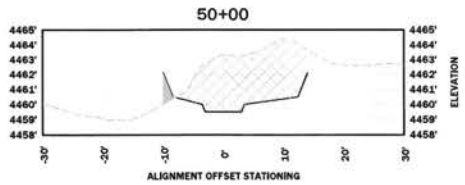

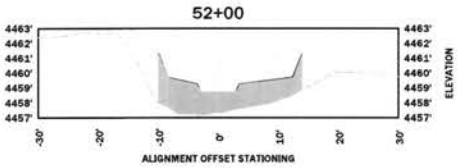

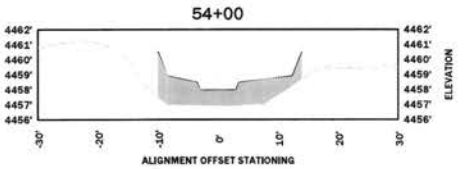

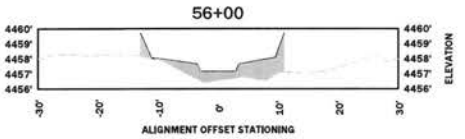

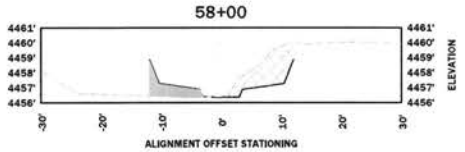

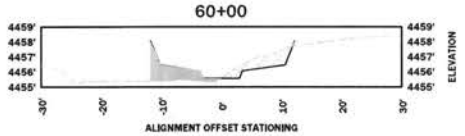

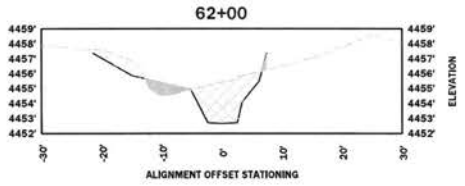

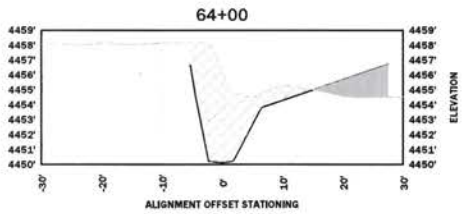

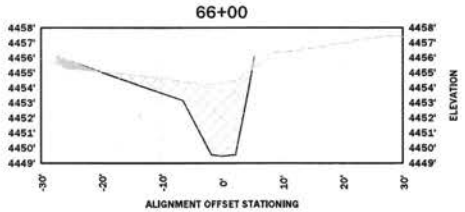

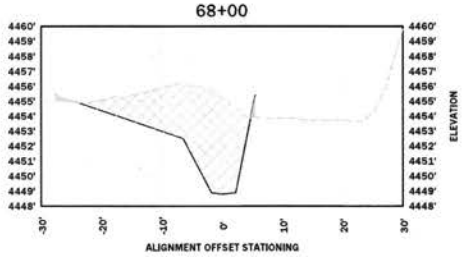

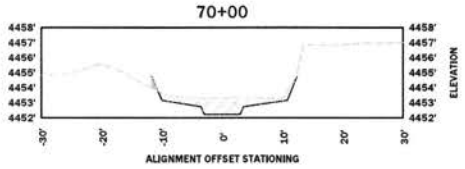

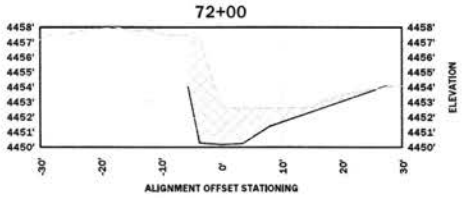

SECTION LEGEND

EXISTING GROUND ELEVATION

FINISHED GRADE

CUT

FILL

NOTE: CROSS SECTIONS MAY REPRESENT DESIGN CHANNEL ONLY FOR STREAMBED GRADING AS DIRECTED BY CONSTRUCTION MANAGER. RDG SHALL PROVIDE A BANKFULL SURFACE TO GUIDE DESIGNATED BANK CONSTRUCTION.

RDG RIVER DESIGN GROUP

CROSS SECTIONS

NEVADA CREEK PHASE 6

NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

DRAWING NUMBER 5.1

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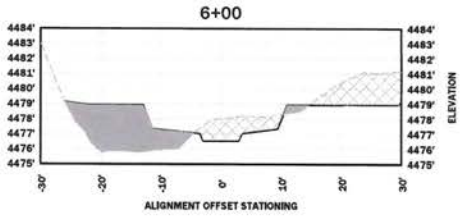
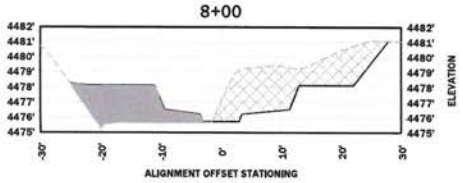
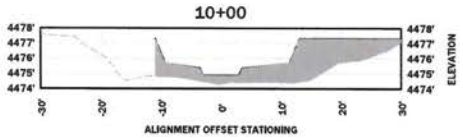
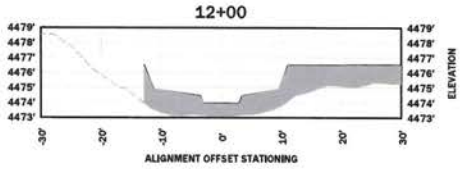
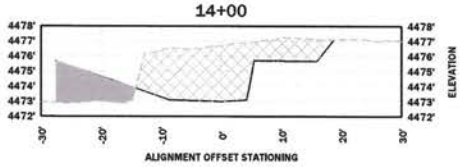
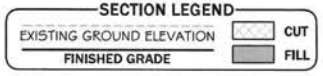




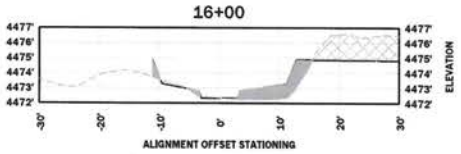


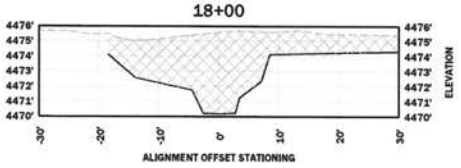


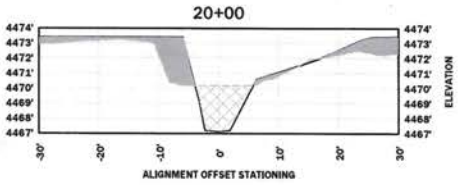


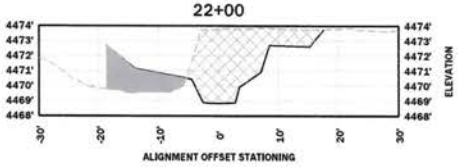


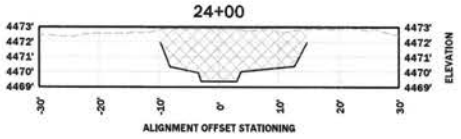
NOTE: CROSS SECTIONS MAY REPRESENT DESIGN CHANNEL ONLY FOR STREAMBED GRADING AS DIRECTED BY CONSTRUCTION MANAGER. RDG SHALL PROVIDE A BANKFULL SURFACE TO GUIDE DESIGNATED BANK CONSTRUCTION.

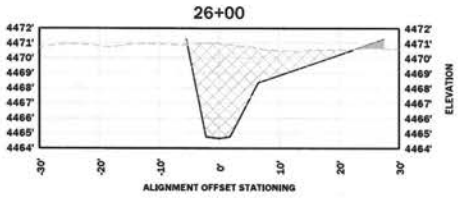


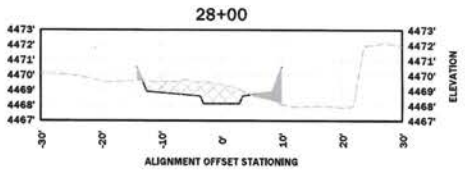


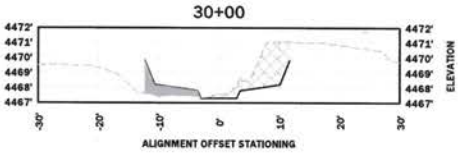


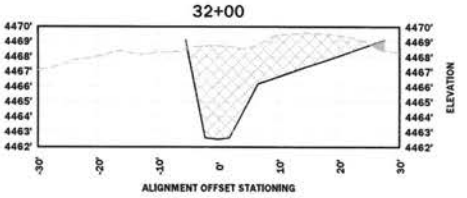


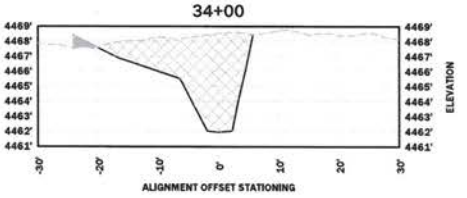


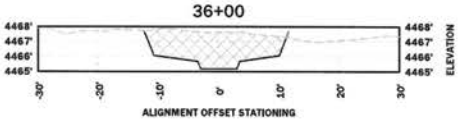


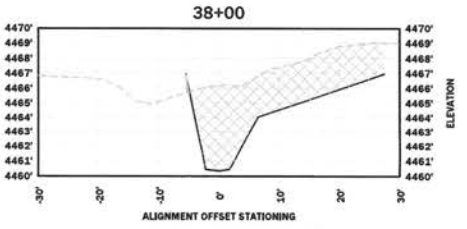












RDG RIVER DESIGN GROUP

CROSS SECTIONS

NEVADA CREEK PHASE 6

NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
-	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
5.2

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BANKFULL CHANNEL HYDRAULIC DESIGN CRITERIA	
Stream Type	B4c/C4
Valley Type	Semi-Confined / Unconfined
Bankfull Discharge	125 (+/- 15 cfs)
Valley Slope	0.0051 - 0.0063 ft/ft
Sinuosity	1.5
Channel Slope	0.0034 ft/ft - 0.0042 ft/ft
Reach Average Slope	0.0039 ft/ft
Bed Shear Stress	0.28 lbs/ft2 - 0.52 lbs/ft2
Mobile Particle Size	74 mm - 135 mm (SC-LC)
Mean Velocity	4.3 fps - 5.0 fps

LONGITUDINAL PROFILE DESIGN CRITERIA				
Variable	**Feature Length (ft)**	**Dimensionless Ratio***	**Slope Range (ft/ft)**	**Dimensionless Ratio****
Riffle				
Average	68	2.8	0.0068	1.9
Range (Low)	23	1.0	0.0050	1.4
Range (High)	117	4.5	0.0086	2.4
Run				
Average	24	1.0	0.0065	1.8
Range (Low)	18	0.8	0.0040	1.1
Range (High)	31	1.2	0.0090	2.5
Pool				
Average	61	2.5	0.0007	0.2
Range (Low)	23	1.0	0.0004	0.1
Range (High)	117	4.5	0.0011	0.3
Glide				
Average	28	1.15	0.00054	0.15
Range (Low)	25	1.1	0.00036	0.1
Range (High)	34	1.3	0.00072	0.2
Pool Spacing				
Average	122	5.0		
Range (Low)	69	3.0	N/A	N/A
Range (High)	208	8.0		

* Relative to bankfull riffle w idth

** Relative to reach-averaged w ater surface slope (00039 ft/ft).

PARTICLE SIZE DISTRIBUTION			
		Proposed*	
Size Class	**Millimeter**	**Inches**	**% Passing**
D100	152	6	95
D95	127	5	90-95
D84	102	4	85-90
D65	51	2	65-85
D35	25	1	30-50
D16**	2	0.08	10-30

RDG RIVER DESIGN GROUP

CHANNEL CROSS SECTION DESIGN CRITERIA

NEVADA CREEK PHASE 6

NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

DRAWING NUMBER 6.0

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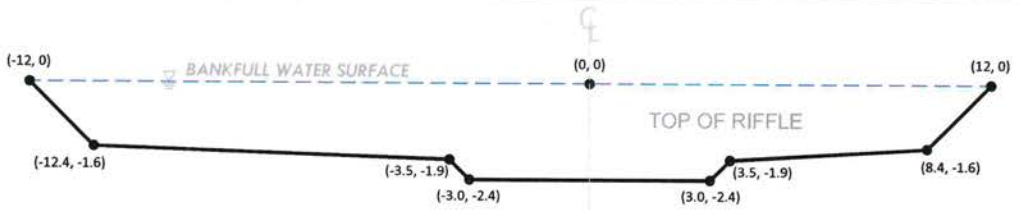
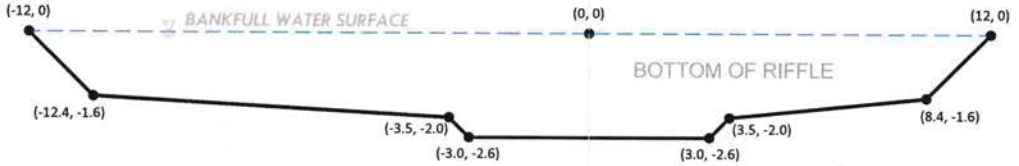
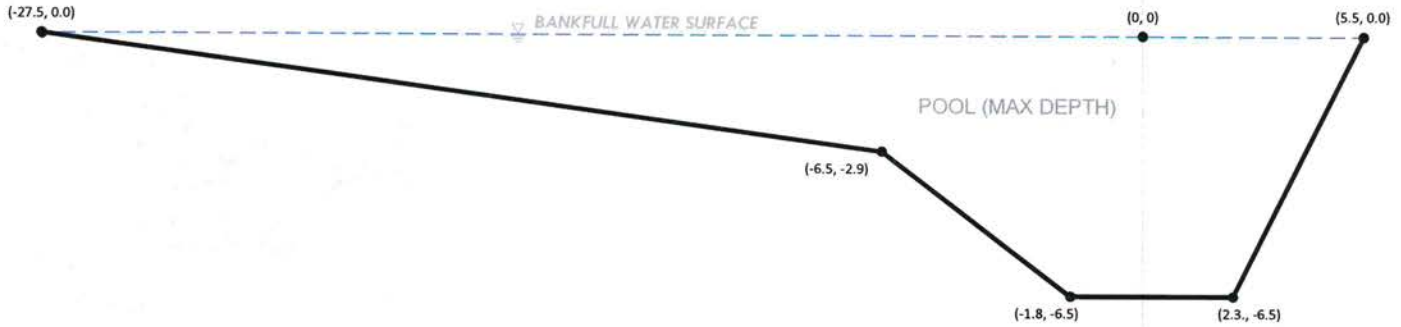
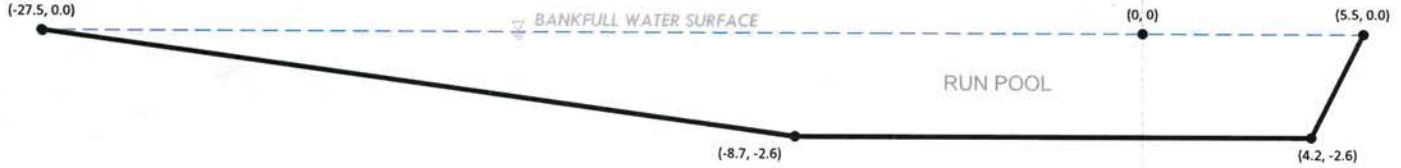
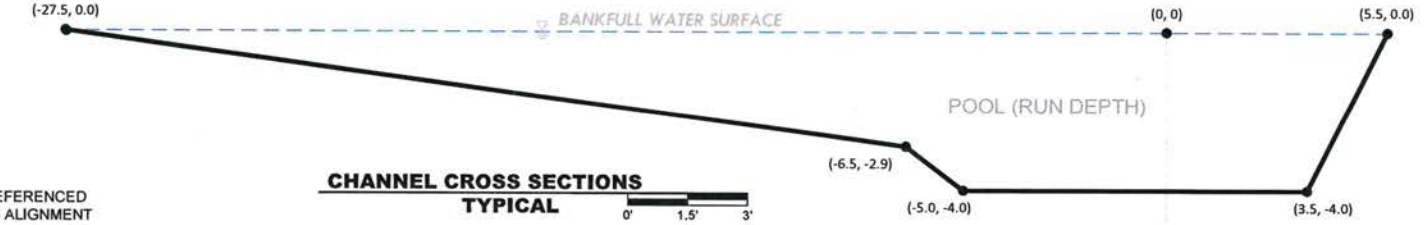
BANKFULL CROSS SECTION DESIGN CRITERIA				
	Riffle Value (ft)	Run Value (ft)	Pool Value (ft)	Glide Value (ft)
Area	40	42	50	46
Range (Low)	36	32	44	36
Range (High)	44	48	56	56
Width/Depth Ratio	15	10	19	20
Range (Low)	13	8	14	15
Range (High)	17	13	23	26
Width				
Average	24	22	31	29
Range (Low)	23	20	27	27
Range (High)	26	24	34	32
Avg. Depth				
Average	1.6	2.1	1.6	1.5
Range (Low)	1.5	1.8	1.5	1.2
Range (High)	1.7	2.4	1.9	1.7
Max.Depth				
Average	2.5	3.3	5.7	2.3
Range (Low)	2.1	2.6	4.9	2.0
Range (High)	2.8	3.8	6.6	2.6
Scour Depth	3.3	4.1	6.9	3.3











NOTE: COORDINATES ARE REFERENCED FROM TOP OF BANK THALWEG ALIGNMENT

CHANNEL CROSS SECTIONS
TYPICAL
0' 1.5' 3'

RDG RIVER DESIGN GROUP

CHANNEL DESIGN CROSS SECTIONS

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
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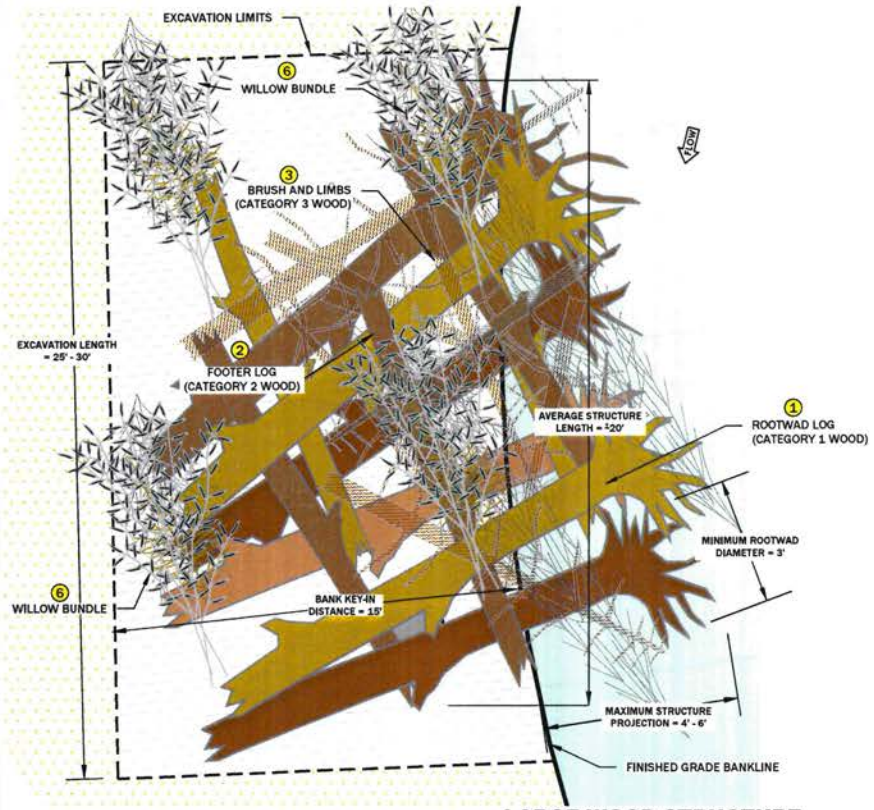
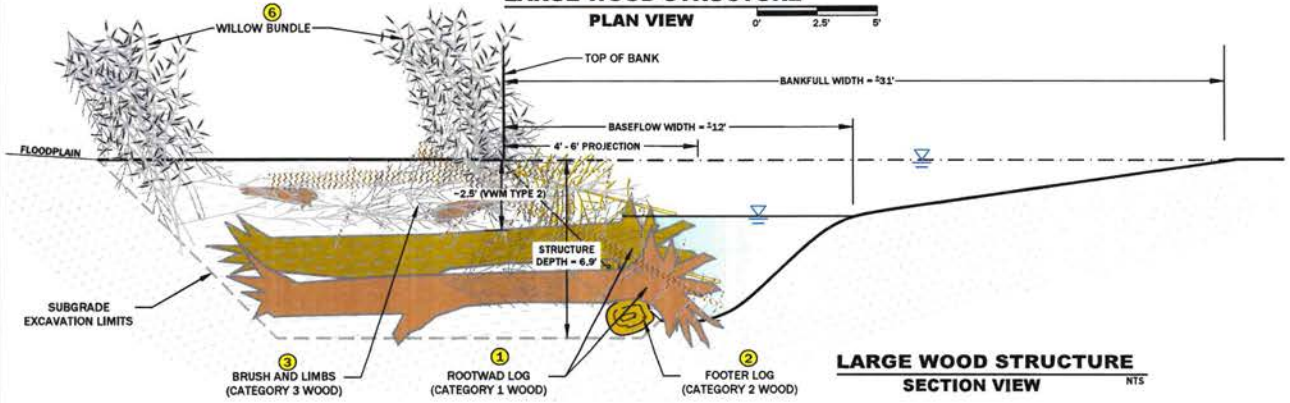


LARGE WOOD STRUCTURE
PLAN VIEW 0' 2.5' 5'



LARGE WOOD STRUCTURE
SECTION VIEW NTS

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 BY THE CONSTRUCTION MANAGER.
3. CONSTRUCTION MANAGER SHALL MARK THE GENERAL CONSTRUCTION LOCATION FOR EACH LARGE WOOD STRUCTURE PRIOR TO CONSTRUCTION.

NOTES ON LARGE WOOD STRUCTURE INSTALLATION

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 INTO THE DESIGN CHANNEL NO GREATER THEN 3 FEET OR AT DISTANCE DIRECTED BY THE CONSTRUCTION MANAGER. 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 FOUR TO FIVE 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 4 - 6 FT. BEYOND THE FINISHED BANK LINE.
4. THE FINAL TIER OF MATERIAL SHALL BE CONSTRUCTED AS VEGETATED WOOD MATRIX TYPE 2, INSTALL CATEGORY 2 WOOD, BRUSH AND LIMBS (CATEGORY 3 WOOD) UP TO TOP OF BANK AT APPROXIMATE 45 ° ANGLE TO ROOTWAD STEMS. BRUSH AND LIMBS SHALL PROJECT NO GREATER THAN 2 - 4 FT. BEYOND THE FINISHED BANK LINE.
5. PLACE FOUR WILLOW BUNDLES INTERWOVEN INTO WOOD MATRIX AS SHOWN IN THE PLAN VIEW. WILLOW BUNDLES SHALL BE SET AS TO BE IN CONTACT WITH LOW FLOW WATER SURFACE ELEVATION.
6. BACKFILL STRUCTURE WITH STOCKPILED MATERIAL UP TO THE TOP OF BANK LINE ELEVATION. BACKFILL SHALL BE BUCKET COMPACTED.

MATERIAL SCHEDULE (PER STRUCTURE)

	ITEM	DIA.	QUANTITY
1	CATEGORY 1 WOOD	10" - 12"	5
2	CATEGORY 2 WOOD	3" - 6"	25
3	CATEGORY 3 WOOD	< 3"	25
6	WILLOW BUNDLES	0.25" - 1"	4

EXAMPLE OF A LARGE WOOD STRUCTURE

RDG RIVER DESIGN GROUP

LARGE WOOD STRUCTURE DETAIL

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

DRAWING NUMBER 6.2

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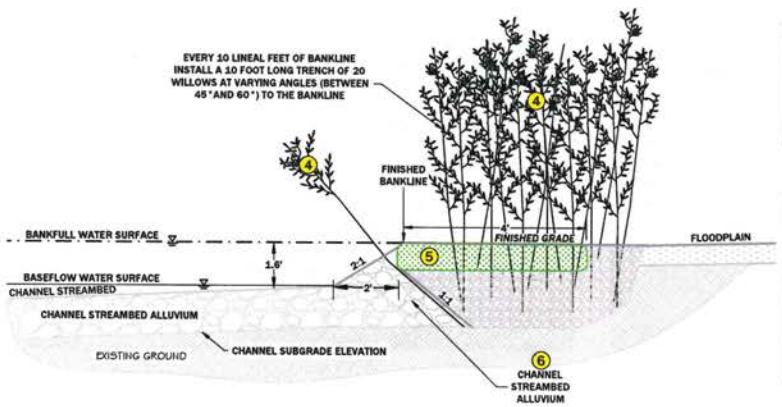
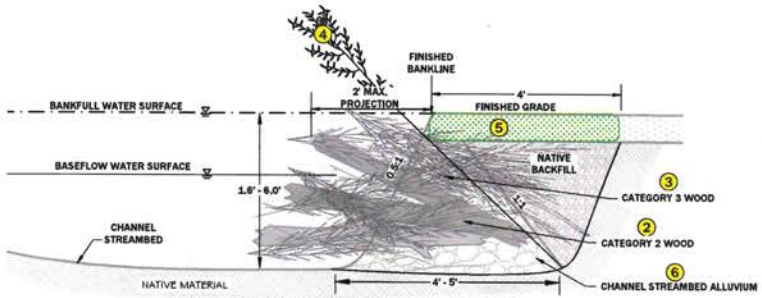
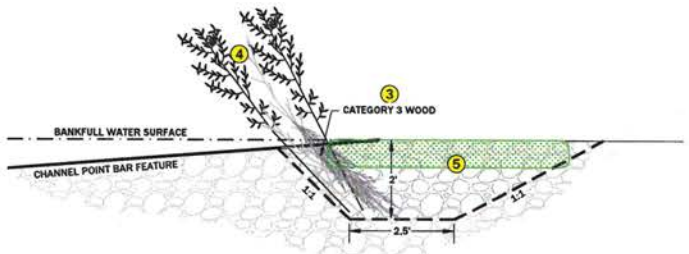


VEGETATED WOOD MATRIX - TYPE 1
SECTION VIEW 0' 1' 2'



VEGETATED WOOD MATRIX - TYPE 2
SECTION VIEW 0' 1.5' 3'



VEGETATED WOOD MATRIX - TYPE 3
SECTION VIEW 0' 1.5' 3'

GENERAL NOTES

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

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. OF FINISHED GRADE.
3. CATEGORY 2 AND CATEGORY 3 WOOD (TYPE 2 AND 3 ONLY), AND CHANNEL STREAMBED ALLUVIUM SHALL BE PLACED IN ALTERNATING LAYERS AND BUCKET COMPACTED UP TO 0.8 FEET OF 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 FRONT EDGE OF THE BASE. PLACE SOD MATS ON TOP OF MATRIX EXTENDING FROM EDGE OF CHANNEL MARGIN BACK A MINIMUM OF 4' INTO THE FLOODPLAIN. TOP OF SOD MATS SHALL BE PRESSED TO ESTABLISH TOP OF BANK DESIGN ELEVATION.
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 ADDITIONAL CATEGORY 1 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.

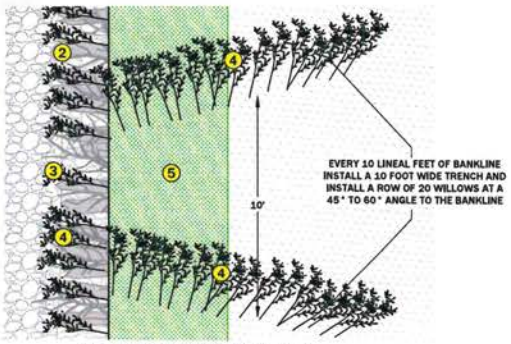
ALLUVIUM GRADATION

SIZE (INCHES)	PERCENT PASSING	REPRESENTATIVE SIZE CLASS
6	95	D100
4	80 - 90	D84
2	45 - 55	D50
1	30 - 40	D35
0.6	20 - 30	D16
0.08	20	

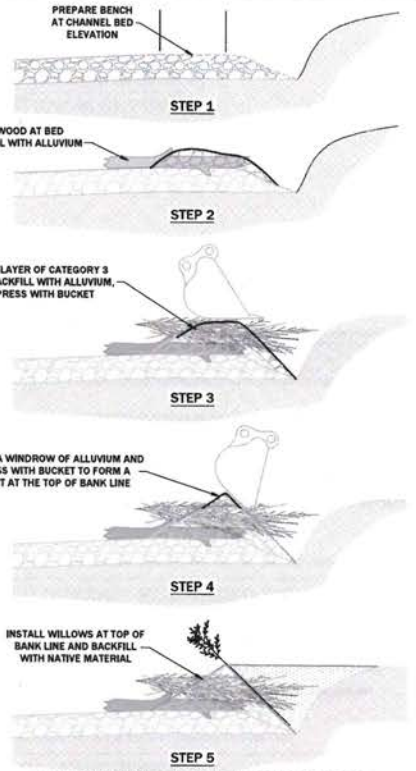
PROVIDE MINIMUM 20% RETAINED IN 0.08" SIZE CLASS

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	DIA.	QUANTITY TYPE 1	QUANTITY TYPE 2	QUANTITY TYPE 3
2	CATEGORY 2 WOOD	3" - 6"	-	3	-
3	CATEGORY 3 WOOD	<3"	-	3	0.5
4	WILLOW CUTTINGS	0.25" - 1"	5	5	5
5	SOD MAT	5" - 8" THICK	4 SF	4 SF	4 SF
6	CHANNEL STREAMBED ALLUVIUM	6" MINUS	0.11 CY	0.2 CY	-



WILLOW TRENCH DETAIL
PLAN VIEW 0' 1' 2'



RECOMMENDED VEGETATED WOOD MATRIX INSTALLATION SEQUENCE
SECTION VIEW 0' 2.5' 5'

RDG RIVER DESIGN GROUP

VEGETATED WOOD MATRIX DETAIL

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

DRAWING NUMBER 6.3

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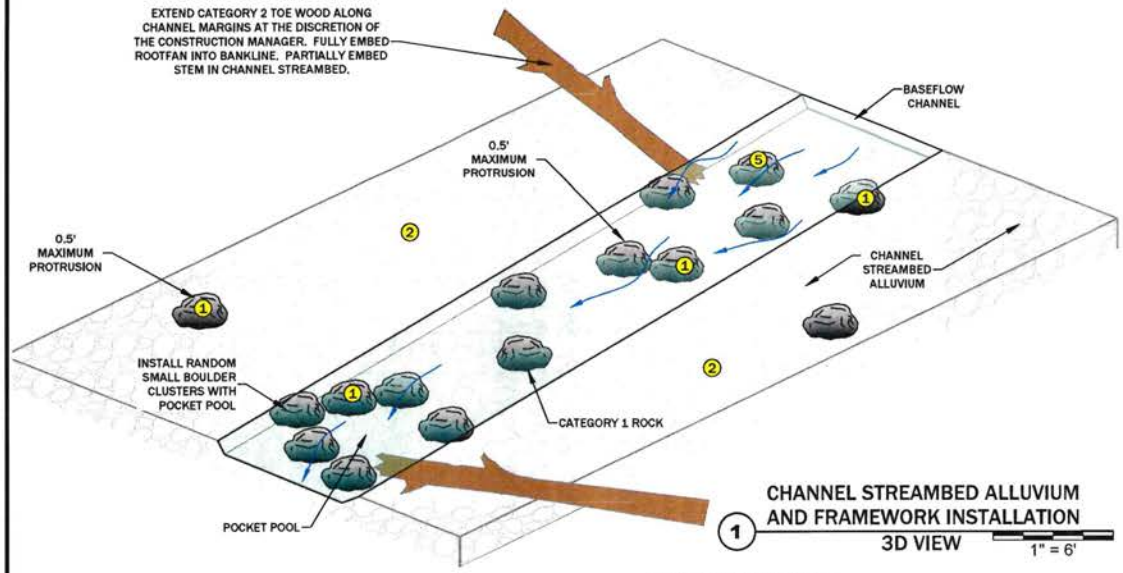
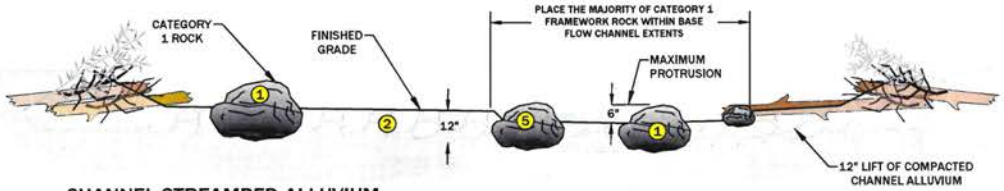


1 CHANNEL STREAMBED ALLUVIUM AND FRAMEWORK INSTALLATION 3D VIEW 1" = 6'



2 CHANNEL STREAMBED ALLUVIUM AND FRAMEWORK INSTALLATION SECTION VIEW 1" = 5'

TYPICAL CONSTRUCTED STREAMBED THROUGH A RIFFLE FEATURE

TYPICAL CONSTRUCTED STREAMBED THROUGH A RUN FEATURE

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 MAY INSTALL CHANNEL SPANNING WOOD (CATEGORY 2 WOOD) AND CHANNEL MARGIN WOOD (CATEGORY 2 WOOD) TO PROVIDE AQUATIC HABITAT COMPLEXITY AND ROUGHNESS AT THE DISCRETION OF THE CONSTRUCTION MANAGER. CHANNEL SPANNING WOOD SHALL BE INSTALLED INTO THE BED PERPENDICULAR TO FLOW WITH A MAXIMUM PROJECTION OF 0.3'. 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 STREAMED ALLUVIUM SHALL BE PLACED TO THE FULL COURSE THICKNESS OF 12-INCHES TO FINISHED GRADE.

STREAMBED ALLUVIUM GRADATION

SIZE (INCHES)	PERCENT PASSING	REPRESENTATIVE SIZE CLASS
6	95	D100
4	80 - 90	D84
2	45 - 55	D50
1	30 - 40	D35
0.6	20 - 30	D16
0.08	20	

PROVIDE MINIMUM 20% RETAINED IN 0.08" SIZE CLASS

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	DIA.	QUANTITY
1	CATEGORY 1 ROCK	12" - 18"	0.8 EA
2	CHANNEL STREAMBED ALLUVIUM	6" MINUS	0.4 CY

RDG RIVER DESIGN GROUP

CONSTRUCTED CHANNEL STREAMBED DETAIL

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

DRAWING NUMBER 6.4

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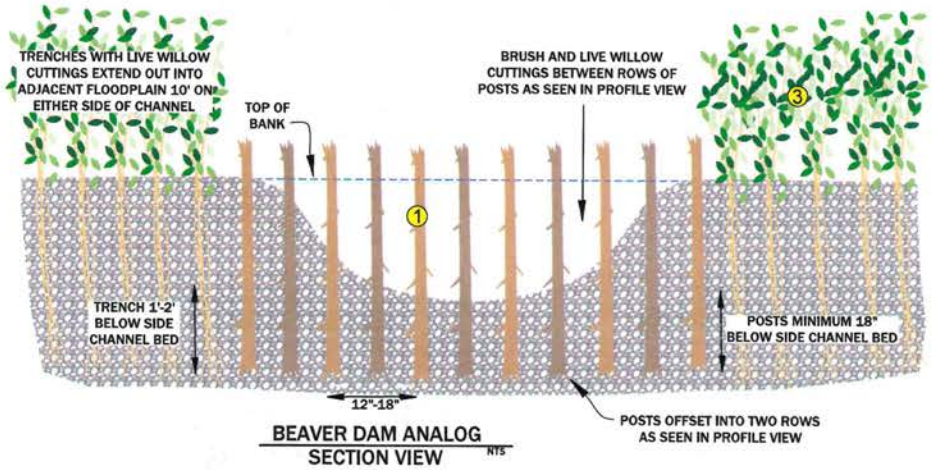
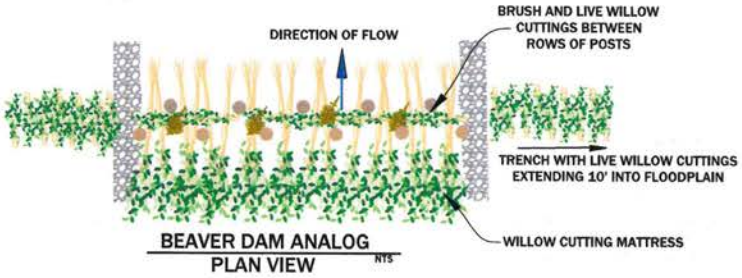
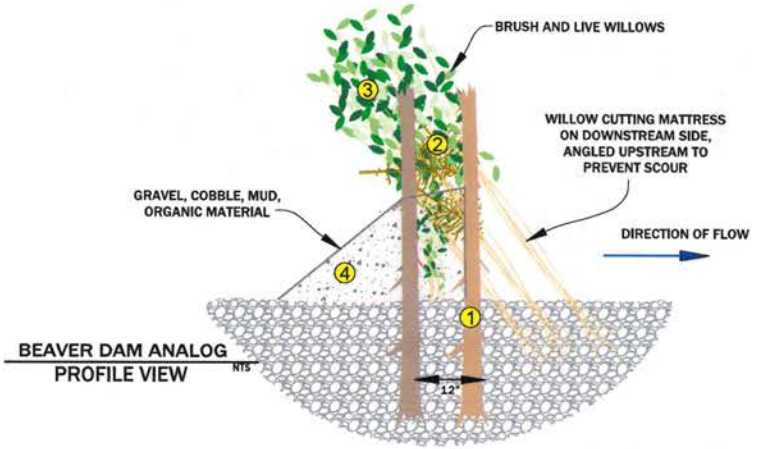


BEAVER DAM ANALOG
SECTION VIEW NTS



BEAVER DAM ANALOG
PLAN VIEW NTS



BEAVER DAM ANALOG
PROFILE VIEW NTS

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.

NOTES ON BEAVER DAM ANALOG INSTALLATION

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.

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	QUANTITY	DIMENSIONS
1	POSTS (CATEGORY 2 OR 3 WOOD)	1	3" D, 4' L
2	BRUSH	3	.1"-3" D, 4'-8' L, GREEN WOOD PREFERRED
3	LIVE WILLOWS	5	0.5"-1" D, 4'-6' L
4	GRAVEL/COBBLE/MUD	0.4 CY	VARIES

RDG RIVER DESIGN GROUP

BEAVER DAM ANALOG

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-17-22	NW	DESIGN	JM

PROJECT NUMBER
RDG-22-017

DRAWING NUMBER
6.5

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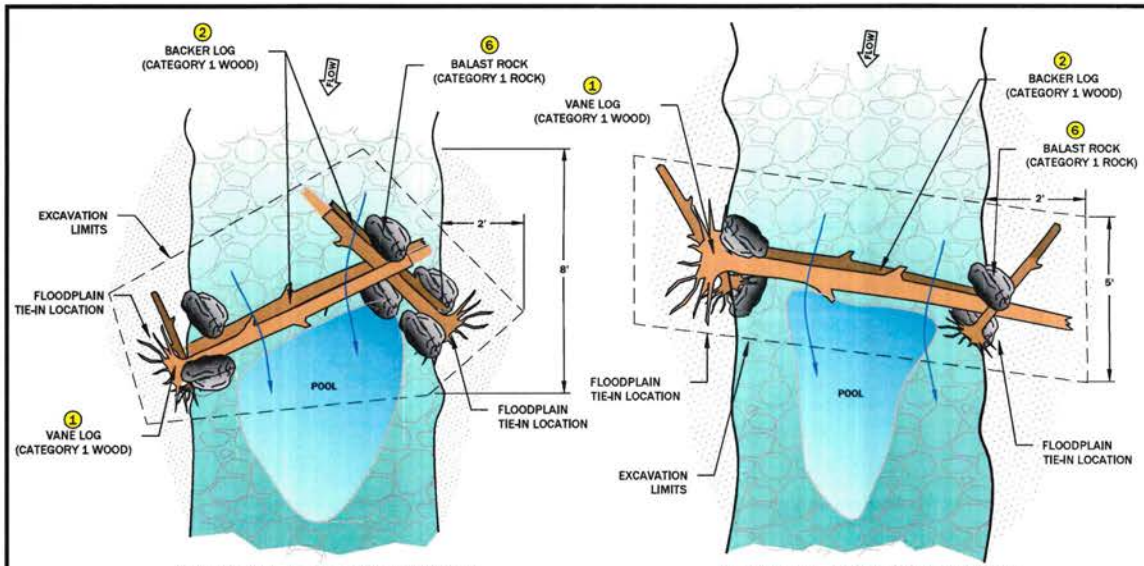
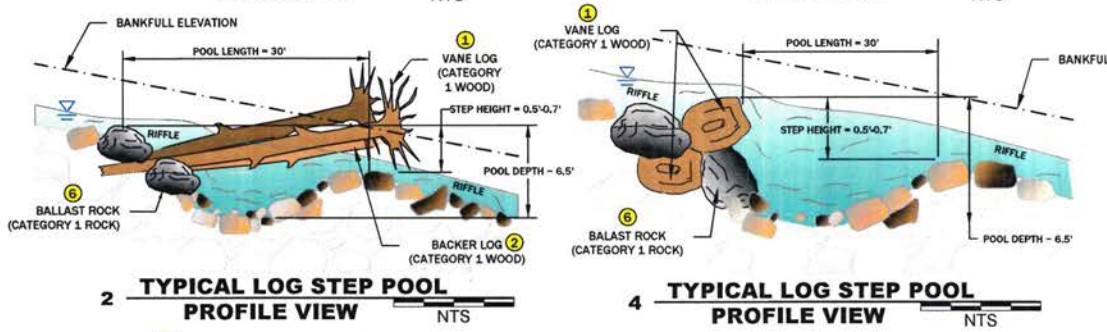


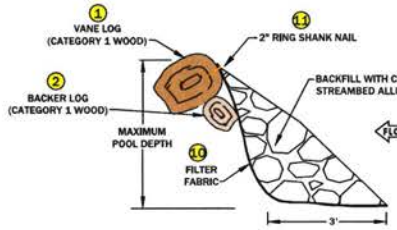
1 **TYPICAL LOG STEP POOL PLAN VIEW** NTS

3 **TYPICAL LOG STEP POOL PLAN VIEW** NTS



2 **TYPICAL LOG STEP POOL PROFILE VIEW** NTS

4 **TYPICAL LOG STEP POOL PROFILE VIEW** NTS



5 **FILTER FABRIC DETAIL SECTION VIEW** NTS

MATERIAL SCHEDULE (PER STRUCTURE)

	ITEM	QUANTITY
1	CATEGORY 1 WOOD	2
2	CATEGORY 2 WOOD	3
6	CATEGORY 1 ROCK	6
10	LF OF FILTER FABRIC	35
11	2" RING SHANK NAILS	20

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.

NOTES ON CONSTRUCTED CHANNEL LOG STEP POOL INSTALLATION

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

RDG RIVER DESIGN GROUP

LOG STEP POOL DETAIL

NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-07-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

DRAWING NUMBER 6.6

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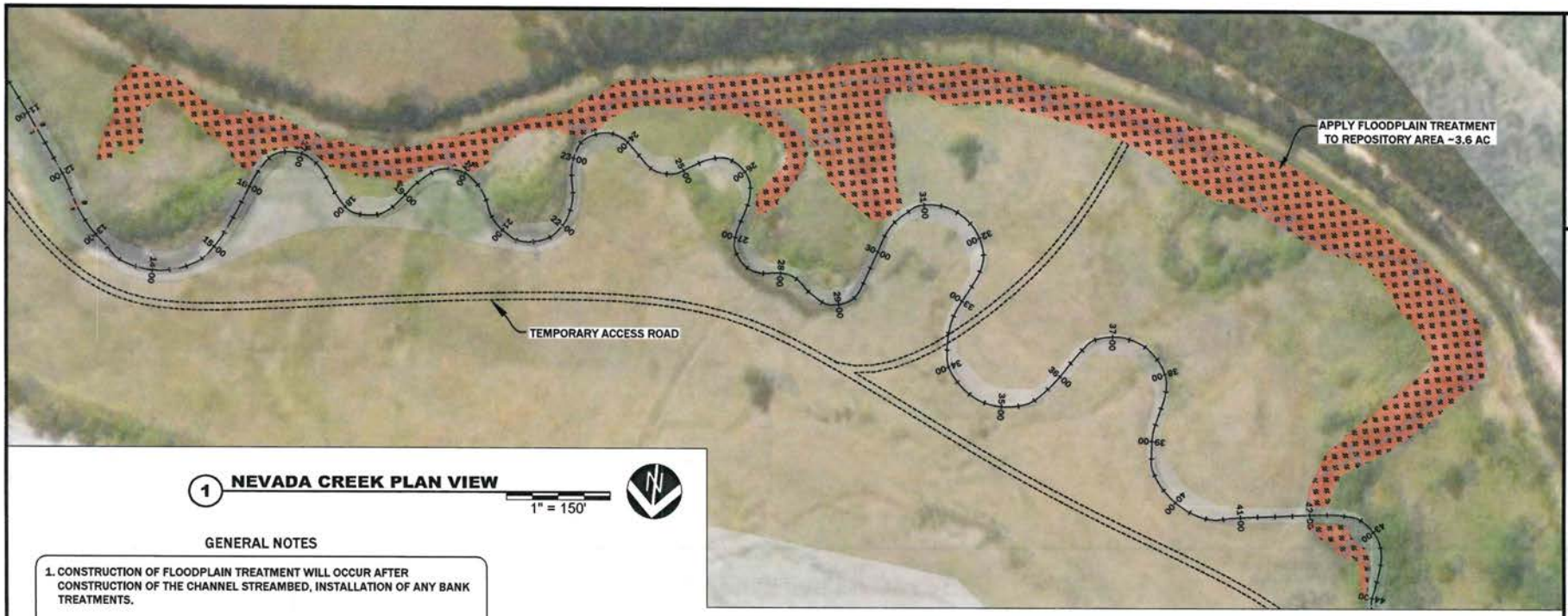


1 NEVADA CREEK PLAN VIEW 1" = 150'

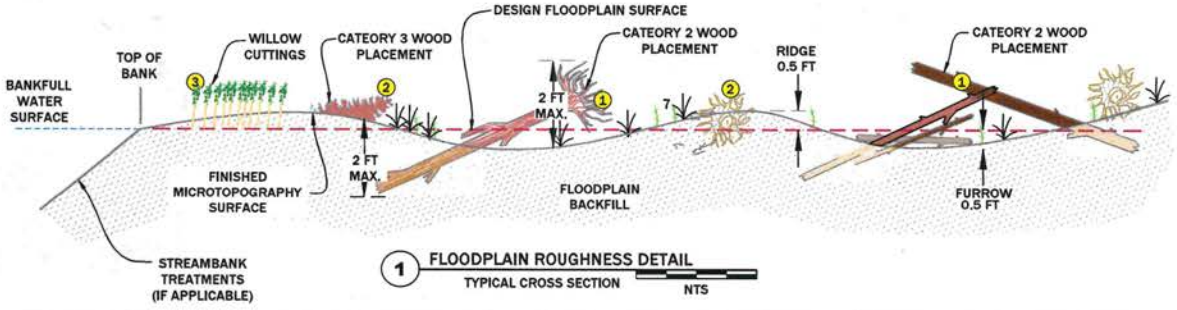
GENERAL NOTES

1. CONSTRUCTION OF FLOODPLAIN TREATMENT WILL OCCUR AFTER CONSTRUCTION OF THE CHANNEL STREAMBED, INSTALLATION OF ANY BANK TREATMENTS.
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 WILLOW TRENCHES ACROSS THE FLOODPLAIN PER THE DIRECTION OF THE PROJECT MANAGER. CONTRACTOR TO DIG A 2' DEEP TRENCH AND LAY WILLOW CUTTINGS AT A RATE OF 5/LINEAR FOOT. 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.

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*
③ WILLOW CUTTINGS	0.25" - 1"	8'	5/LF	
*APPROXIMATELY 250 PIECES/ACRE				



1 FLOODPLAIN ROUGHNESS DETAIL TYPICAL CROSS SECTION NTS

FLOODPLAIN TREATMENT

NEVADA CREEK PHASE 6

NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
*	06-07-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

DRAWING NUMBER 6.7

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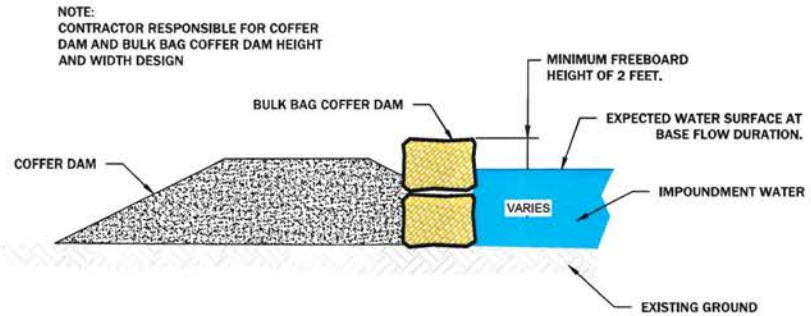
EXAMPLE OF BULK BAGS

EXAMPLE OF BULK BAG PLACEMENT



BULK BAG FILL GRADATION

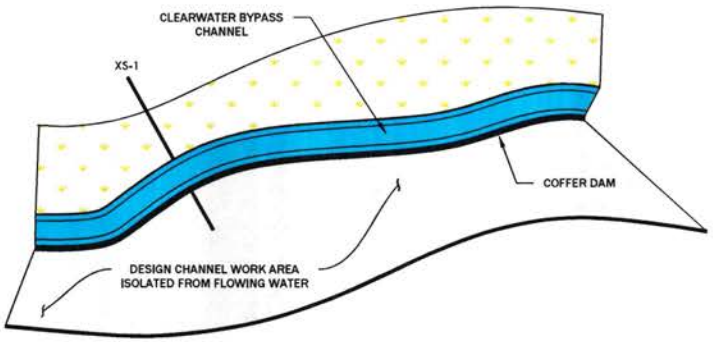
BULK PERCENTAGE	AVERAGE PARTICLE SIZE (INCHES)
20	1 1/2
30	3/4
30	1/2
20	3/8

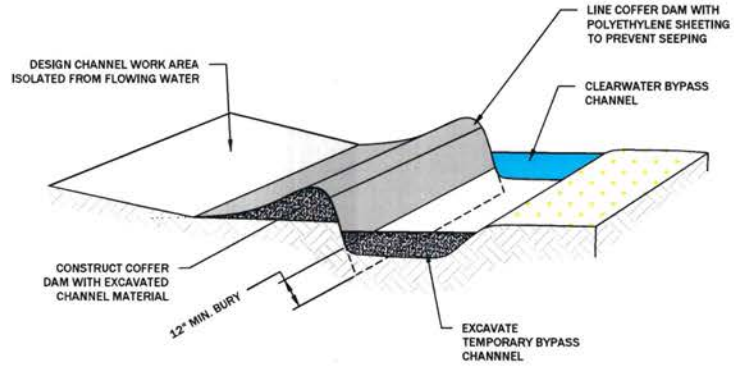
GENERAL NOTES:

1. WORK AREA TO BE ISOLATED USING COFFERDAMS CONSTRUCTED WITH BULK BAGS, SAND BAGS, OR APPROVED ALTERNATIVE. BULK BAGS ARE ALSO CALLED FLEXIBLE INTERMEDIATE BULK CONTAINERS (FIBC) THAT CAN BE CUSTOM MADE FROM VARIOUS FABRIC. THE FOLLOWING REQUIREMENTS ARE NECESSARY FOR THE RIVER ENVIRONMENT:
2. LARGE BULK BAGS SHALL BE CONSTRUCTED OF 8 oz WOVEN FABRIC, 1200 HOUR UV RESISTANT WITH SEWN LIFTING LOOPS. FILL MATERIAL SHALL BE COMPRISED OF SPAWNING GRAVEL AND MEET THE GRADATION SHOWN IN FILL GRADATION TABLE. THE BAGS ARE APPROXIMATELY 6' WIDE x 6' LONG x 4' HIGH WHEN FILLED.
3. SMALL BULK BAGS SHALL BE CONSTRUCTED OF 8 oz WOVEN FABRIC, 1200 HOUR UV RESISTANT WITH SEWN LIFTING LOOPS. FILL MATERIAL SHALL BE COMPRISED OF SPAWNING GRAVEL AND MEET THE GRADATION GIVEN BY THE CITY OF BOISE SPECIFICATIONS (SHOWN BELOW). THE BAGS ARE APPROXIMATELY 3' WIDE x 3' LONG x 2.5' HIGH WHEN FILLED.
4. BULK BAGS SHALL BE CAREFULLY PLACED TO ENSURE NO TEARING OR CUTTING OF THE BAGS OCCURS.
5. BULK BAGS SHALL BE PLACED USING A HYDRAULIC CRANE OR TRACKHOE USING LIFTING BARS AND STEEL CABLES TO EQUALIZE LOAD ON LIFTING LOOPS.

1 BULK BAG INSTALLATION DETAIL NTS

BMP'S SHALL BE INSTALLED AT THE DIRECTION OF THE CONSTRUCTION MANAGER





SECTION XS-1

1 TEMPORARY COFFER DAM WITH BYPASS CHANNEL DETAIL NTS

BMP'S SHALL BE INSTALLED AT THE DIRECTION OF THE CONSTRUCTION MANAGER

RDG RIVER DESIGN GROUP

BMP DETAILS
NEVADA CREEK PHASE 6
NEAR HELMVILLE

NO.	DATE	BY	DESCRIPTION	CHK
-	06-17-22	NW	DESIGN	JM

PROJECT NUMBER RDG-22-017

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