

Environmental Assessment Worksheet

This most recent Environmental Assessment Worksheet (EAW) form and guidance documents are available at the Environmental Quality Board’s website at: <https://www.eqb.state.mn.us/> The EAW form provides information about a proposed project’s potential environmental effects, and also used as the basis for scoping an Environmental Impact Statement. Guidance documents provide additional detail and links to resources for completing the EAW form.

Cumulative potential effects can either be addressed under each applicable EAW Item or can be addressed collectively under EAW Item 21.

Note to reviewers: Comments must be submitted to the RGU during the 30-day comment period following notice of the EAW in the *EQB Monitor*. Comments should address the accuracy and completeness of information, potential impacts that warrant further investigation and the need for an EIS.

1. Project title: Big 39 and Little 39 Creek Mitigation, Beaver Bay Township, Lake County, Minnesota

2. Proposer: Northshore Mining Company

Contact person: Nathan Schroeder
Title: Environmental Engineer
Address: 10 Outer Drive
City, State, ZIP: Silver Bay, MN 55614
Phone: (218) 226-4125
Email: Nathaniel.Schroeder@clevelandcliffs.com

3. RGU: Minnesota DNR

Contact person: Sara Mielke
Title: EAW Project Manager
Address: 500 Lafayette Rd.
City, State, ZIP: St. Paul, MN 55155
Phone: (651) 259-5723
Email: sara.mielke@state.mn.us

4. Reason for EAW Preparation: Discretionary: Mandatory EAW

If EAW or EIS is mandatory give EQB rule category subpart number(s) and name(s):
MR 4410.4300, Subp. 26, Stream Diversion. For a diversion, realignment, or channelization of any designated trout stream, or affecting greater than 500 feet of natural watercourse with a total drainage area of ten or more square miles unless exempted by part 4410.4600, subpart 14, item E, or 17, the local government unit shall be the RGU.

5. Project Location:

- County: [Lake County](#)
- City/Township: [Beaver Bay](#)
- PLS Location (¼, ¼, Section, Township, Range):
[NW ¼](#) [SE ¼](#) [Section 30](#) [Township 56N](#) [Range 8W](#)
[NW ¼](#) [NW ¼](#) [Section 31](#) [Township 56N](#) [Range 8W](#)
- Watershed (81 major watershed scale): [Lake Superior](#)
- GPS Coordinates: [47.30792, -91.39903](#)
- Tax Parcel Number: [26-5608-30010](#)

At a minimum attach each of the following to the EAW:

- County map showing the general location of the project ([Figure 1](#))
- U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable) ([Figure 2](#))
- Site plans showing all significant project and natural features. Pre-construction site plan and post-construction site plan ([Appendix A](#))
- List of data sources, models, and other resources (from the Item-by-Item Guidance: *Climate Adaptation and Resilience* or other) used for information about current Minnesota climate trends and how climate change is anticipated to affect the general location of the project during the life of the project (as detailed below in item 7. Climate Adaptation and Resilience) ([Appendix D](#))
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 - Appendix A: Subset of Construction Plan Sheets
 - Appendix B: Big and Little Thirty-nine Creek Restoration Threatened and Endangered Species Review and Letter of Concurrence
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6. Project Description:

- a. Provide the brief project summary to be published in the *EQB Monitor*, (approximately 50 words).

The proposed project would restore 2,072 linear feet of historically degraded Big 39 Creek and 5,672 linear feet of Little 39 Creek. Once completed, the restoration would reestablish natural stream processes, improve floodplain connectivity, establish a meandered pattern, and provide additional habitat features such as wood and rock structures. The project, located in Beaver Bay Township in Lake County, is proposed by Northshore Mining Company and would mitigate and compensate for the partial loss of function these waterbodies experienced when they were straightened in the 1970s during construction of the Milepost 7 tailings basin.

- b. Give a complete description of the proposed project and related new construction, including infrastructure needs. If the project is an expansion include a description of the existing facility. Emphasize: 1) construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes, 2) modifications to existing equipment or industrial processes, 3) significant demolition, removal or remodeling of existing structures, and 4) timing and duration of construction activities

The proposer owns the proposed project parcel. During the 1970s construction of the Milepost 7 tailings basin, Big 39 and Little 39 Creeks were altered and modified through diversions by Reserve Mining Company. Flow of Little 39 Creek was altered by diverting the channel through a ditch system to Big 39 Creek. Big 39 Creek was further altered by diverting it to the main stem of the Beaver River through a diversion/ditch system. Figure 3 shows Big 39 and Little 39 in a 1939 historical aerial photograph. This mitigation project aims to improve stream function by increasing *functional feet* of the stream reach, thereby providing *functional lift* (as defined in the MNSQT User Manual v1.0¹) on the channelized reaches by creating bedform diversity and access to the floodplain. The design would generally follow the existing alignment and gravel riffles would be utilized to provide habitat, roughness and grade control. Toe wood structures and Log J-hooks would be utilized to replicate a natural streambank, protect the outer meander bends, and create woody habitat.

Existing channel vegetation would be temporarily removed. Existing alder would be excavated and used as transplants in critical areas. Native seed, trees, and shrubs would be planted along the stream banks and within the adjacent riparian corridor. Further back from the channel, a straw type erosion control blanket would be used to hold the soils until the vegetation is established. Plantings would include native forbs and grass seed, shrubs and trees.

Construction of 7,744 feet of stream channel would include grading and stabilizing new stream banks, installing in-stream structures for grade control and fish habitat, and stabilizing and vegetating disturbed areas.

The new stream channel would be excavated to the designed bankfull width as determined by the North Shore Regional Curve and existing stable cross-sections taken upstream and

¹ MNSQT User Manual v1.0
<https://bwsr.state.mn.us/minnesota-stream-quantification-tool-and-debit-calculator>

downstream from the project site.

Typically, an excavator and other associated heavy equipment would be used to construct the new channel. An excavator with a hydraulic thumb would be used to install the in-stream structures including toe-wood, boulders, logs and rocks.

The stream would be temporarily diverted around the active construction areas using a stream diversion plan (see SWPPP in Appendix A). Any stockpiles would have erosion and perimeter control and other best management practices implemented according to the Storm Water Pollution Prevention Plan, required by the MPCA administered NPDES/SDS permit to ensure that sediment does not enter the stream during construction.

Appendix A provides the engineering plan for the proposed stream mitigation project. The plan shows the existing and proposed channel alignments and dimensions, locations of riffles and pools, typical cross-sections, and typical plan and profile of riffle and pool features. In addition, the plans show erosion control details and access and vegetation restoration details.

Several general goals for the proposed stream mitigation plan would be defined in more detail during the detailed project design. The general goals include:

- Establish natural stream processes within the channelized reaches
- Establish appropriate pattern, profile, and channel dimensions for streams of this type
- Establish a floodplain appropriate for the channel type
- Improve aquatic and floodplain habitat
- Meet all the objectives to provide the maximum functional lift as determined by the MN Stream Quantification Tool (SQT).

Timing: The proposed timing of the project construction is May 2022 to September 2022 (construction would take approximately three months). The project would aim to be complete by September 15, before fall exclusion dates for the trout streams.

c. Project magnitude:

Table 1: Project Magnitude

Description	Value
Total Project Acreage	18.2 Acres
Linear project length	7,744 ft
Number and type of residential units	0
Residential building area (in square feet)	0
Commercial building area (in square feet)	0
Industrial building area (in square feet)	0
Institutional building area (in square feet)	0
Other uses – specify (in square feet)	0
Structure height(s)	NA

d. Explain the project purpose; if the project will be carried out by a governmental unit, explain the need for the project and identify its beneficiaries.

The proposed project would be completed as part of a larger project to mitigate the impacts associated with the progression of the tailings basin, as originally planned and permitted in the 1970s. The Big and Little 39 stream restoration project are being completed in order to meet the functional lift required by the SQT to meet the requirements of the stream debits as calculated by the SQT (see MNSQT Manual v1.0). The designs are intended to provide the maximum functional lift through the creation of a meandered channel appropriate for its channel type, addition of riffles and pools, and addition of both riparian and aquatic habitat.

- e. Are future stages of this development including development on any other property planned or likely to happen? ☐ Yes ☒ No

If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.

- f. Is this project a subsequent stage of an earlier project? ☐ Yes ☒ No

If yes, briefly describe the past development, timeline and any past environmental review.

7. Climate Adaptation and Resilience:

- a. Describe the climate trends in the general location of the project (see guidance: *Climate Adaptation and Resilience*) and how climate change is anticipated to affect that location during the life of the project.

The Minnesota Climate Explorer² projects the average temperature for Lake Superior – South to increase by approximately 5 degrees Fahrenheit by the Mid-Century and an additional 5- to 7-degree increase by the Late-Century. The model also projected recent and future annual precipitation values for this region and the model mean shows that from the present and Mid-Century (no change in precipitation between the present and Mid-Century) there will be an increase of 4.5 to 8 inches in the Late-Century.

Also, according to the FloodFactor³ the area has higher flood risk due to the projected increase and frequency in temperatures, evaporation, and precipitation, thus an increase in extreme rain and flood events.

- b. For each Resource Category in the table below: Describe how the project's proposed activities and how the project's design will interact with those climate trends. Describe proposed adaptations to address the project effects identified.

Table 2: Proposed Climate Adaptations

Resource Category	Climate Considerations (as identified above in 7a)	Project Information (what features of this resource category addresses vulnerabilities because of/due to climate the climate trend)	Adaptations (effect on that feature)
Project Design	More frequent and intense rain events	The project design would reconnect the floodplain and provide stabilization for banks.	Reduce shear stresses from flood flows. With more floodplain capacity, channel erosion would be reduced and the channel would remain resilient to more frequent flood flows.

² Minnesota Department of Natural Resources. *Minnesota Climate Explorer*. <https://arcgis.dnr.state.mn.us/climateexplorer>. Retrieved October 7, 2021

³ First Street Foundation. *Flood Factor for Silver Bay, MN*. <https://floodfactor.com>. Retrieved October 7, 2021 from: https://www.floodfactor.com/city/silver-bay-minnesota/2760250_fsid

Resource Category	Climate Considerations (as identified above in 7a)	Project Information (what features of this resource category addresses vulnerabilities because of/due to climate the climate trend)	Adaptations (effect on that feature)
Land Use	More frequent and intense rain events. Increased temperatures.	The land use change would be from grassland to forested land.	<p>Project grading would promote access to the floodplain, reducing any risk of localized flooding. The vegetation plan increases the Manning's "n"-factor in the floodplain (i.e., roughness), reducing the overland shear stresses.</p> <p>Once established, the trees would provide an overstory, maintaining cool water and air temperatures.</p>
Water Resources	Address in item 12	Address in item 12	Address in item 12
Contamination/ Hazardous Materials/Wastes	Not Applicable	Not Applicable	Not Applicable
Fish, wildlife, plant communities, and sensitive ecological resources (rare features)	Address in item 14.	Address in item 14.	Address in item 14.

8. **Cover types:** Estimate the acreage of the site with each of the following cover types before and after development:

Table 3: Existing and Proposed Cover Types

Cover Types	Before (acres)	After (acres)
Wetlands and shallow lakes (<2 meters deep)	13	13.0 ⁴
Deep lakes (>2 meters deep)	0	0
Wooded/forest	0	1.4
Rivers and streams	3.8	3.8
Brush/Grassland	1.4	0
Cropland	0	0
Livestock rangeland/pastureland	0	0
Lawn/landscaping	0	0
Green infrastructure TOTAL (from table below*)	0	0
Impervious surface	0	0
Stormwater Pond (wet sedimentation basin)	0	0
Other (describe)	0	0
TOTAL	18.2	18.2

Table 4: Existing and Proposed Green Infrastructure

Green Infrastructure*	Before (acreage)	After (acreage)
Constructed infiltration systems (infiltration basins/infiltration trenches/ rainwater gardens/bioretention areas without underdrains/swales with impermeable check dams)	0	0
Constructed tree trenches and tree boxes	0	0
Constructed wetlands	0	0
Constructed green roofs	0	0
Constructed permeable pavements	0	0
Other (describe)	0	0
TOTAL*	0	0

⁴ Improving floodplain access in Big 39 Creek will create or enhance up to 2.9 acres of wetland. Improving floodplain access in Little 39 Creek will create or enhance up to 4.9 acres of wetland.

Table 5: Proposed and Existing Trees

Trees	Percent	Number
Percent tree canopy removed or number of mature trees removed during development		
Number of new trees (proposed)		3,811

- 9. Permits and approvals required:** List all known local, state and federal permits, approvals, certifications and financial assistance for the project. Include modifications of any existing permits, governmental review of plans and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure. *All of these final decisions are prohibited until all appropriate environmental review has been completed. See Minnesota Rules, Chapter 4410.3100.*

Table 6: Summary of Required Permit Status

Unit of Government	Type of Application	Status
MN DNR	Public Waters Permit	Submitted, Permit #2021-3466
Lake County Minnesota ⁵	Land use Application for Grade/Fill	Contractor submittal
MPCA	Construction Stormwater Permit	Awaiting contractor decision following bid
US Army Corps of Engineers ⁶	Nationwide Permit (NWP) 27	Pre-construction Notification received. Pending as of 11/23/21.

Cumulative potential effects may be considered and addressed in response to individual EAW Item Nos.10-20, or the RGU can address all cumulative potential effects in response to EAW Item No.22. If addressing cumulative effect under individual items, make sure to include information requested in EAW Item No. 21.

⁵ Landuse Application for Grade and Fill

<https://www.co.lake.mn.us/environmental-services/planning-and-zoning/planning-and-zoning-documents/>

⁶ Nationwide Permit 27 Aquatic Habitat Restoration, Establishment and Enhancement Activities

<https://www.nww.usace.army.mil/Portals/28/docs/regulatory/NWPs/NWP27.pdf>

10. Land use:

a. Describe:

- i. Existing land use of the site as well as areas adjacent to and near the site, including parks and open space, cemeteries, trails, prime or unique farmlands.

The project is located on the proposer's property, upgradient of the tailings basin. The watersheds are primarily forested and in an undisturbed condition. The area surrounding the project is forest or shrubland and is not utilized for mining activities, nor would it be in the future. The project is directly adjacent to the tailings basin.

The Big 39 Diversion site is a 1700-foot-long excavated channel that redirects flow from the original remnant channel southwest to the Beaver River, as part of Reserve Mining Company's Mile Post 7 (MP7) tailings basin construction in the 1970s. The existing channel is an excavated ditch with the remnants of a weir that was used to temporarily divert flow back into the basin via a water supply culvert. The diversion lacks sinuosity, a connection to its floodplain at channel forming flow, large woody debris (LWD), bedform diversity, and habitat diversity. The riparian vegetation is mostly an invasive species (reed canary grass) with stretches of overhanging shrubs.

The Little 39 Diversion Ditch was also excavated during Reserve Mining Company's construction of the MP7 tailings basin. It was designed to redirect flow southwest to the Big 39 Creek, very near the point that the Big 39 Creek was diverted to the Beaver River, from its original course intersecting the footprint of the tailings basin. This 5700-foot-long diversion added approximately 6.5 square miles of new watershed area to the Beaver River main branch. The existing channel is an excavated ditch and downstream diversion berm designed to efficiently move water away from the MP7 tailings basin. The diversion lacks sinuosity, an appropriately sized floodplain, LWD, bedform diversity and habitat diversity. The riparian vegetation is mostly native and functioning.

- ii. Plans. Describe planned land use as identified in comprehensive plan (if available) and any other applicable plan for land use, water, or resources management by a local, regional, state, or federal agency.

The Lake County Comprehensive Plan⁷ identifies this area as a Forest-Recreational District. This stipulates larger lot sizes and authorizes uses such as Soil and Water Conservation programs, with which the stream restoration project proposed for Big and Little 39 Creeks comply. Aspects of other plans were considered and incorporated into the stream restoration design. The Final Lake Superior South WRAPS Report⁸ was referenced to identify appropriate restoration sites and strategies (see pages 55-57). The Lake Superior North One Watershed One Plan⁹ was considered, but primarily only to confirm alignment

⁷ Comprehensive Plan and Landuse Ordinance #12 Effective June 23, 2017

<https://www.co.lake.mn.us/environmental-services/planning-and-zoning/planning-and-zoning-documents/>

⁸ Final Lake Superior South Watershed Restoration and Protection Strategy Report August 2, 2018

<https://www.pca.state.mn.us/water/watersheds/lake-superior-south>

⁹ Lake Superior North One Watershed One Plan

<https://www.co.lake.mn.us/soil-and-water-conservation-district/lake-superior-north/>

with watershed plans.

- iii. Zoning, including special districts or overlays such as shoreland, floodplain, wild and scenic rivers, critical area, agricultural preserves, etc.

This project falls under the Shoreland Classification due to the restoration work proposed in the streams.

- iv. If any critical facilities (i.e. facilities necessary for public health and safety, those storing hazardous materials, or those with housing occupants who may be insufficiently mobile) are proposed in floodplain areas and other areas identified as at risk for localized flooding, describe the risk potential considering changing precipitation and event intensity.

Not Applicable

- b. Discuss the project's compatibility with nearby land uses, zoning, and plans listed in Item 9a above, concentrating on implications for environmental effects.

As a stream and riparian forest community restoration, the proposed project falls under section 9.02 of the Lake County Comprehensive Plan and Land Use Ordinance (Ordinance #12) as a permitted use for Soil and Water Conservation programs and Forest Management and Utilization, as such the project is compatible with the plan.

This project would include a land use change converting 1.4 acres of grassland to forested land.

- c. Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 10b above and any risk potential.

N/A. There are no incompatible uses identified.

11. Geology, soils and topography/land forms:

- a. Geology - Describe the geology underlying the project area and identify and map any susceptible geologic features such as sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions. Discuss any limitations of these features for the project and any effects the project could have on these features. Identify any project designs or mitigation measures to address effects to geologic features.

The area lies in the North Shore Volcanic Group, featuring igneous and metamorphic bedrock geology overlain by areas of glacial till. No sinkholes or karst geology are present in the project area. Unconfined or shallow aquifers would not likely be present as the region generally lacks sedimentary bedrock and aquifers, and instead water sources are often found in bedrock fractures.¹⁰ The project would not have any effect on the geology, and therefore no mitigation measures would be taken.

- b. Soils and topography - Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability or other soils limitations, such as steep slopes, highly permeable soils. Provide estimated volume and acreage of soil excavation and/or grading. Discuss impacts from project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after project construction to address soil limitations including stabilization, soil corrections or other measures. Erosion/sedimentation control related to stormwater runoff should be addressed in response to Item 12.b.ii.

A Custom Soil Resource Report provided by the NRCS identifies the soils in the project area as the following:

Table 7: Summary of NRCS Soil Resource Report

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
A1-40B	Normanna-Greysolon complex, 2 to 8 percent slopes, very rocky	3.4	7.0%
A3-11A	Twig-Tacoosh-Giese complex, 0 to 1 percent slopes, depressional	0.0	0.0%
A3-12A	Giese muck, depressional, 0 to 1 percent slopes	14.6	30.0%
A3-20A	Canosia loam, 0 to 2 percent slopes	10.4	21.3%
A3-21A	Hermantown silt loam,	0.4	0.8%

¹⁰ Minnesota Groundwater Provinces, 2021.

https://files.dnr.state.mn.us/waters/groundwater_section/provinces/2021-provinces.pdf

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
	1 to 3 percent slopes		
A3-30B	Normanna-Canosia-Hermantown complex, 0 to 8 percent slopes	0.7	1.4%
E1-9D	Ahmeek-Udifluvents, frequently flooded-Rock outcrop complex, 1 to 18 percent slopes	4.6	9.4%
F3-41D	Aldenlake-Ahmeek complex, 8 to 18 percent slopes	5.8	12.0%
K2-10A	Bowstring and Fluvaquents soils, 0 to 2 percent slopes, frequently flooded	8.8	18.1%
	Totals for Area Interest	48.7	100.0%

The soils described for the area in Table 7 are not especially erodible and consist primarily of rocky soils, mucky soils, loamy soils, and fluvial deposits of these soil types. The entirety of the project (aside from material staging) would occur within the existing stream valleys. Since the work is completed within a valley, the topography that would contribute to difficult erosion conditions is the valley slope. The valley slope of Little 39 ranges from 0.12-0.093 (FT/FT) and the valley slope of Big 39 is 0.0019 (FT/FT) – both of which are relatively flat. The soils and topography do not indicate an elevated risk of erosion during project operation. The soils and topography do not require any special considerations during construction, other than being in an area that will discharge to special waters. Approximately 58,000 cubic yards of excavated material would be removed from areas adjacent to current stream alignment in order to allow for the project goal of an accessible floodplain (where greater than bankfull flows can access the stream's floodplain). This allows for natural stream processes to occur, including both erosion and deposition. The excess cut material would be removed from the project area and placed within the permitted footprint of the tailings basin. BMPs will be used during construction to reduce risk of erosion of the temporarily exposed soil. Post-construction, the exact alignment of the streams is expected to adjust slightly due to natural stream processes, but the grade control and stabilization structures are designed to maintain the appropriate hydrology, hydraulics, geomorphology, physiochemical and biological conditions proposed.

12. Water resources:

a. Describe surface water and groundwater features on or near the site in a.i. and a.ii. below.

i. Surface water - lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, shoreland classification and floodway/floodplain, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include the presence of aquatic invasive species and the water quality impairments or special designations listed on the current MPCA 303d Impaired Waters List that are within 1 mile of the project. Include DNR Public Waters Inventory number(s), if any.

- o Little 39 Creek, Trout Stream, DNR PWI number, S-035-010-002
- o Big 39 Creek, Trout Stream, DNR PWI number, S-035-010

MPCA impaired waters list identifies the Beaver River, which is downstream from the project location, as impaired for Fish Bioassessments, Mercury, Turbidity and pH.

Little 39 Creek is a ditch that was excavated to divert the flow of the upper reaches of Little 39 Creek out of the tailings basin and into the Big 39 Creek watershed. The section is very straight and has a uniform slope of 0.12-0.093 (FT/FT). Both banks of the stream are armored in sections with rock. The stream setting is a mixed forest with shrubs within a ditched area. The downstream end of the Little 39 Creek restoration project has a watershed area of approximately 6.5 square miles.

Big 39 Creek section is a ditch that was excavated to divert the upper reaches of Big 39 flow out of the tailings basin and to the Beaver River. It also received the diverted Little 39 Creek watershed. This section is also very straight and has a uniform slope of 0.0019 (FT/FT). This section runs across a flat meadow of reed canary grass on the east side and has a slight valley slope on the west side that contains shrubs adjacent to the stream and transitions into mixed coniferous/deciduous forest. The watershed area contributing to the lower end of the project site is slightly less than 17.26 square miles (the entire Big 39 Creek watershed area).

There are no aquatic invasive species in Little 39 Creek, Big 39 Creek or the greater Beaver River watershed, according to the MN DNR List of Infested Waters.¹¹

ii. Groundwater – aquifers, springs, seeps. Include: 1) depth to groundwater; 2) if project is within a MDH wellhead protection area; 3) identification of any onsite and/or nearby wells, including unique numbers and well logs if available. If there are no wells known on site or nearby, explain the methodology used to determine this.

The project area is not within a wellhead protection area. The Minnesota Department of Health (MDH) Well Index (map feature) was consulted to confirm the absence of any nearby affected wells. There are wells related to landfill monitoring within the tailings basin

¹¹ DNR Infested Waters list. Published November 22, 2021.
<https://www.dnr.state.mn.us/invasives/ais/infested.html>

footprint, approximately 2800' to the SE of the nearest point of the project, but they are not in the same watershed as the project. The streams occur where the topography meets the elevation of the groundwater in the area, so depth to groundwater increases from zero at the stream's edges. Work would be conducted at or below the groundwater level/water table to restore the streams.

- b. Describe effects from project activities on water resources and measures to minimize or mitigate the effects in Item b.i. through Item b.iv. below.

iii. Wastewater - For each of the following, describe the sources, quantities and composition of all sanitary, municipal/domestic and industrial wastewater produced or treated at the site.

Not Applicable. No wastewater would be produced, treated or discharged during the duration of the project. The project would result in reduced peak flows and flooding conditions. This would reduce stress on bridge infrastructure and highway right-of-ways.

iv. Stormwater - Describe changes in surface hydrology resulting from change of land cover. Describe the routes and receiving water bodies for runoff from the project site (major downstream water bodies as well as the immediate receiving waters). Discuss environmental effects from stormwater discharges on receiving waters post construction including how the project will affect runoff volume, discharge rate and change in pollutants. Consider the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity and amount with this discussion. For projects requiring NPDES/SDS Construction Stormwater permit coverage, state the total number of acres that will be disturbed by the project and describe the stormwater pollution prevention plan (SWPPP), including specific best management practices to address soil erosion and sedimentation during and after project construction. Discuss permanent stormwater management plans, including methods of achieving volume reduction to restore or maintain the natural hydrology of the site using green infrastructure practices or other stormwater management practices. Identify any receiving waters that have construction-related water impairments or are classified as special as defined in the Construction Stormwater permit. Describe additional requirements for special and/or impaired waters.

The current site conditions rapidly remove water from the landscape, which exacerbates the downstream effects of more intense and frequent precipitation events. The project is designed to promote natural stream function that attenuates the impact of increased rainfall intensity and spring runoff events.

Construction

This 12.5-acre project would be completed under low-flow conditions. Best management practices would be used during construction to minimize soil erosion, including stabilization of constructed channels prior to the introduction of stream flow, use of erosion-control blankets and mulch, rapid re-vegetation of disturbed areas, and diversion of the streams during construction. Disturbed soils would be seeded with native vegetation and blanketed with erosion control fabric adjacent to the stream. Mulch would be placed in the upland areas to encourage quick re-vegetation and reduce erosion from disturbed areas. A stormwater pollution prevention plan (SWPPP), as regulated by the NPDES/SDS Construction

Stormwater program, has been prepared for the project (Appendix A).

Post-construction

The project's stream areas would retain more water due to the increased access to floodplains. The topography beyond that would be altered only to add sinuosity to the stream reaches. The route of water, runoff destination and receiving waters would not change. The nature of the project would increase the landscape's ability to absorb and reduce the downstream effects of climate change-driven increases in precipitation events. The peak runoff rate would be reduced by retaining water on the landscape, but the overall runoff volume should remain mostly unchanged. The makeup of the surface would include an increase in woody species cover but would not create any new pollutant sources. The quality and quantity of pre- and post-project stormwater runoff would be the same, since no impervious surfaces are created for the project. There are no soil limitations at the project site, so no increase in sedimentation from stormwater runoff would occur.

For further discussion on Minnesota climate trends, see comments in EAW Items 7 and 12.

v. Water appropriation - Describe if the project proposes to appropriate surface or groundwater (including dewatering). Describe the source, quantity, duration, use and purpose of the water use and if a DNR water appropriation permit is required. Describe any well abandonment. If connecting to an existing municipal water supply, identify the wells to be used as a water source and any effects on, or required expansion of, municipal water infrastructure. Discuss environmental effects from water appropriation, including an assessment of the water resources available for appropriation. Discuss how the proposed water use is resilient in the event of changes in total precipitation, large precipitation events, drought, increased temperatures, variable surface water flows and elevations, and longer growing seasons. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation. Describe contingency plans should the appropriation volume increase beyond infrastructure capacity or water supply for the project diminish in quantity or quality, such as reuse of water, connections with another water source, or emergency connections.

It is anticipated that work in both Little 39 and Big 39 Creeks would require temporary flow bypassing during construction. Depending on the magnitude of flow and the resultant bypass method, this would be expected to occur only during the construction workday. Longer bypasses could extend beyond 1 day. Longer bypasses would only occur on Big 39 where flows are higher and the landscape allows for a temporary channel realignment bypass. At no time would water be consumed or diverted from its valley course or watershed (basin of origin), only diverted around work area. The proposer would follow all applicable laws and apply for permits as needed.

vi. Surface Waters

Wetlands - Describe any anticipated physical effects or alterations to wetland features such as draining, filling, permanent inundation, dredging and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands, including the anticipated effects that any proposed wetland alterations may have to the host watershed,

taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Identify measures to avoid (e.g., available alternatives that were considered), minimize, or mitigate environmental effects to wetlands. Discuss whether any required compensatory wetland mitigation for unavoidable wetland impacts would occur in the same minor or major watershed and identify those probable locations.

Temporary impacts to wetlands during construction are anticipated. Post-construction, the project would have a very small impact of wetland conversion to open water, while enhancing and creating an estimated 7.8 acres of wetland in riparian areas. The net effect to wetland acreage would be positive. It is anticipated that per WCA no mitigation would be required for the project. The project would increase floodplain capacity (e.g., flood storage) which makes the post-construction project area more capable of mitigating the local climate trends that have projected an increase in frequency and intensity of precipitation events.

- c. Other surface waters- Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water Best Management Practices that are proposed to avoid or minimize turbidity/sedimentation while physically altering the water features. Discuss how the project will change the number or type of watercraft on any water body, including current and projected watercraft usage.

The project would establish a meandered stream pattern within a ditched stream system through excavation of a new channel. This channel is being designed to the appropriate bankfull width and cross-sectional area, as determined by reference cross-sections in stable riffles upstream of the project site. Riffle and pool morphology would be created along with habitat features such as toe wood and riffle rock and gravel structures. See details in the site plans (Appendix A). The project as described would be phased and stabilized as it is completed in 500-foot segments. The project would involve pumping and diverting the stream flow to complete the work out of the main flow of the channel. This would limit the turbidity created during the construction of the project, resulting in minor and temporary effects on the dewatered section. The streams are not navigable by typical watercraft, so this use would not be affected. The described work is designed to attenuate effects of increased intensity and frequency of flood flows. The existing condition is effective at moving water downstream and creating higher peak flows. The proposed condition would attenuate flood flows by retaining flows over bankfull in the floodplain and releasing those flows over a greater period of time, improving resilience to changing hydrology related to climate change.

13. Contamination/Hazardous Materials/Wastes:

- a. Pre-project site conditions - Describe existing contamination or potential environmental hazards on or in close proximity to the project site such as soil or ground water contamination, abandoned dumps, closed landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-project site conditions that would be caused or exacerbated by project construction and operation. Identify measures to avoid, minimize or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.
No such sites exist in close proximity of the project.
- b. Project related generation/storage of solid wastes - Describe solid wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from solid waste handling, storage and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of solid waste including source reduction and recycling.
No solid wastes would be generated or stored during this project.
- c. Project related use/storage of hazardous materials - Describe chemicals/hazardous materials used/stored during construction and/or operation of the project including method of storage. Indicate the number, location and size of any new above or below ground tanks to store petroleum or other materials. Indicate the number, location, size and age of existing tanks on the property that the project will use. Discuss potential environmental effects from accidental spill or release of hazardous materials. Identify measures to avoid, minimize or mitigate adverse effects from the use/storage of chemicals/hazardous materials including source reduction and recycling. Include development of a spill prevention plan.

It is likely that fuels, lubricants, diesel exhaust fluid (DEF) and hydraulic oil would be stored on site. It is up to the contractor to determine if tanks are required, although any such uses would be temporary in nature. The proposer maintains agreement with all contractors that they follow applicable federal and state rules regarding the storing of such materials, clean up and the reporting of spills. Contractors are required to acquire spill response materials and complete vehicle inspections. The proposer would also periodically inspect site and note spills or leaks if discovered. The proposer requires a copy of all spills reported on site. There are no existing tanks on the project site or in immediate vicinity. The project site falls within the purview of said plan and contractors are informed in preconstruction meetings of the applicable requirements they must follow. The operation of heavy equipment in and near lakes, streams and wetlands obligates the project proposers to develop a plan for managing fuels and lubricants, and the proposer has and maintains a Spill Prevention Control and Countermeasures Plan. The proposer and their contractors would be prepared to respond to spills and to recover and contain spilled material as quickly and thoroughly as possible. For petroleum spills that are five or more gallons, the proposer or their contractors are required to contact the State Duty Officer at (651) 649-5451 or (800) 422-0798. Information on reporting spills and leaks is available on the MCPA website.¹²

¹² MPCA: Incident Response webpage. <https://www.pca.state.mn.us/waste/incident-response>

- d. Project related generation/storage of hazardous wastes - Describe hazardous wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from hazardous waste handling, storage, and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of hazardous waste including source reduction and recycling

No hazardous wastes would be generated; therefore no generated hazardous waste would be stored.

14. Fish, wildlife, plant communities, and sensitive ecological resources (rare features):

- a. Describe fish and wildlife resources as well as habitats and vegetation on or in near the site. Native plant communities expected to be present in the area would be those typical of the North Shore Highlands Subsection of the Northern Superior Uplands Section in the Laurentian Mixed Forest Province. Existing riparian vegetation consists of majority of herbaceous plants and woody vegetation less than 20 feet tall, dominated by Speckled Alder, Birch, Reed Canary Grass and other species typical of a disturbed and ditched stream environment. Big 39 and Little 39 Creeks are classified as second and third order perennial streams in the Minnesota PWI and currently listed as Class 2A (cold water) streams. In 2011, the aquatic biota was sampled by the MPCA in both streams to determine fish and macroinvertebrate communities present.¹³ The fish community present upstream of the proposed restoration is detailed in Tables 8 and 9.

Table 8. Fish Species in Big 39 Creek

Visit Year	Species	Count	Min length (mm)	Max length (mm)
2011	Blacknose Dace	70	50	101
2011	Brook Stickleback	4	25	57
2011	Brook Trout	6	145	195
2011	Common Shiner	4	48	66
2011	Creek Chub	2	69	73
2011	Finescale Dace	1	53	53
2011	Johnny Darter	1	76	76
2011	Longnose Dace	17	54	111
2011	Mottled Sculpin	21	51	117
2011	Northern Redbelly Dace	1	39	39
2011	Pearl Dace	19	66	119
2011	White Sucker	1	165	165

¹³ MPCA Surface water data. Accessed February 2022. <https://webapp.pca.state.mn.us/surface-water/search>

Table 9: Fish Species in Little 39 Creek

Visit Year	Species	Count	Min length (mm)	Max length (mm)
2011	Blacknose Dace	227	45	78
2011	Brook Stickleback	5	50	52
2011	Brook Trout	1	59	59
2011	Central Mudminnow	1	79	79
2011	Common Shiner	17	34	109
2011	Creek Chub	66	60	164
2011	Finescale Dace	5	61	87
2011	Mottled Sculpin	6	25	89
2011	Northern Redbelly Dace	4	35	64
2011	Pearl Dace	30	27	110
2011	White Sucker	4	85	115

Invertebrates identified at the site include Alderflies, Balloon Flies, Black Flies, Caddisflies, Chiggers, Circular-Seamed Flies, Clubtails, Common Stoneflies, Darners, Finger-Net, Caddisflies, Fingernail Clam, Gastropods, Giant Stoneflies, Long-Horn Caddisflies, Long-Toe Water Beetles, Mayflies, Midges, Net-Spinning Caddisflies, Northern Caddisflies, Oligochaeta, Riffle Beetles, and Small Winter Stoneflies.

The project site is located in a larger complex of scrub-shrub wetlands, forested wetlands, and forested uplands. The area is likely used by commonly occurring species such as migratory songbirds; small mammals such as voles, mice, shrews; and medium to large mammals such as snowshoe hare, moose, white-tailed deer, bear, and gray wolves.

- b. Describe rare features such as state-listed (endangered, threatened or special concern) species, native plant communities, Minnesota County Biological Survey Sites of Biodiversity Significance, and other sensitive ecological resources on or within close proximity to the site. Provide the license agreement number (LA-____) and/or correspondence number (ERDB 20220067) from which the data were obtained and attach the Natural Heritage letter from the DNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.

See Appendix B for NHIS Review and concurrence.

An NHIS database review indicated that no endangered, threatened, or special concern species

have been previously identified within the restoration area. However, two state-listed special concern species have been identified within one mile of the project extents: the Twig rush (*Cladium mariscoides*) and the Neat spikerush (*Eleocharis nitida*).

Twig rush occurs mostly in fens, particularly prairie rich fens, northern rich fens, and calcareous fens¹⁴. Twig rush is found in two locations within one mile of the project extents. Both populations are found within former borrow sites where clay soils had been excavated for basin construction. One location has approximately 50 stems in a single patch covering about 12 square meters. The other nearby location has around 500 stems in a single patch covering about 15 square meters (Barr, 2016). No fen plant communities are located within the project extents. Suitable habitat for twig rush may be present within the creek restoration area. However, the species is listed as special concern and is not legally protected under state endangered species law.

Neat spikerush is a colonizer of small wet localized depressions, such as shallow ditches, pits, trails, and wheel ruts in sand, gravel, or clay¹⁵. One population of neat spikerush has been found within one mile of the project extents. This population of neat spikerush is located in a ditch next to the railroad, including about 100 stems within a small, less than one square meter patch¹⁶. Suitable habitat for neat spikerush may be present within the creek restoration area. However, the species is listed as special concern and is not legally protected under state endangered species law. No further action is required.

Review of endangered, threatened or special concern species using the USFWS Information for Planning and Consultation (IPaC) tool¹⁷ identified the following species that could potentially be affected by activities in this location: Canada lynx, Northern long-eared bat, Gray wolf, and Piping plover.

Canada lynx (*Lynx canadensis*), federally listed as threatened and state-listed as special concern, has been documented in the vicinity of the project. This species is found in large tracks of boreal and mixed conifer-hardwood forest where they are highly dependent on snowshoe hare for prey.

The Northern Long-eared bat (*Myotis septentrionalis*) is federally listed as threatened. The northern long-eared bat is found across much of the eastern and north central United States. The northern long-eared bat's habitat in the summer is the bark of both live and dead trees, caves and crevasses, and barns and sheds. During the winter, the bat hibernates in small crevasses in caves and mines.

¹⁴ Minnesota Department of Natural Resources. 2021. Rare Species Guide: *Cladium mariscoides*. Accessed November 24, 2021, at:

<https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PMCY04050>

¹⁵ Minnesota Department of Natural Resources. 2021. Rare Species Guide: *Eleocharis nitida*. Accessed November 24, 2021, at *Eleocharis nitida*:

<https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PMCY09180>

¹⁶ Barr Engineering. 2016. Endangered, Threatened, and Special Concern Plant Species Survey Report. October 2016.

¹⁷ United States Fish and Wildlife Service (2020) Information for Planning and Consultation tool. <https://ecos.fws.gov/ipac/location/index>

The Gray wolf (*Canis lupus*) is federally listed as threatened. Wolf packs usually live within a specific territory. Territories range in size from 50 square miles to more than 1,000 square miles depending on how much prey is available and seasonal prey movements. Packs use a traditional area and defend it from strange wolves. Their ability to travel over large areas to seek out vulnerable prey makes wolves good hunters. Wolves may travel as far as 30 miles in a day.

The Piping plover (*Charadrius melodus*) is federally listed as endangered. It is known to be along the north shore of Lake Superior but not as far north as the project area. Piping plovers use wide, flat, open, sandy beaches with very little grass or other vegetation. Nesting territories often include small creeks or wetlands.

In order to acquire the needed information for the MN SQT, a riparian vegetation Excel Workbook Field Form¹⁸ was completed. This form is brief and concerned primarily with areal cover by strata and wood stem basal area, but is survey work related to habitat and species. This survey was completed for both Big and Little 39 Creek sites.

- c. Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project including how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Include a discussion on introduction and spread of invasive species from the project construction and operation. Separately discuss effects to known threatened and endangered species.

The proposed project may have temporary minor impacts on the local wildlife and ecological communities during the construction period. Noise, dust, and construction activity during the project could temporarily dislocate a species sensitive to those activities.

Post construction, the site would be enhanced for fisheries and wildlife. Access trails and staging areas would be restored to a condition that is equal to or better than the existing conditions. The site's ability to resist impacts related to climate trends would be enhanced by the completion of this project. Increased floodplain access, roughness, and woody vegetation increases the streams' ability to handle greater frequency and intensity of storms by reducing peak flows and reducing erosive power of stream flow.

The project would not permanently damage or remove any habitat for Canada lynx, Northern long-eared bat, Gray wolf, or Piping plover. Habitat creation and enhancement are an integral part of the project design and would provide beneficial effects for these species, among others. For fish, pools would provide thermal refuge, cover, feeding and resting and nursery areas; riffles would provide oxygen to the water column and provide spawning areas; and root wads would provide woody cover and habitat and stabilize the stream banks.

- d. Identify measures that will be taken to avoid, minimize, or mitigate the adverse effects to fish, wildlife, plant communities, ecosystems, and sensitive ecological resources.

¹⁸ [Minnesota Stream Quantification Tool and Debit Calculator | MN Board of Water, Soil Resources \(state.mn.us\)](https://bwsr.state.mn.us/minnesota-stream-quantification-tool-and-debit-calculator)
<https://bwsr.state.mn.us/minnesota-stream-quantification-tool-and-debit-calculator>

The purpose of the proposed project is to restore the aquatic ecology and terrestrial environment to a condition better than what currently exists within the project area.

Stream restoration may cause some very temporary adverse impacts to fish, wildlife and plant communities. The proposer would take all reasonable measures to avoid impacts to the existing wildlife and ecology including the following:

- Construction would be conducted during non-spawning periods of trout and outside of the Northern long-eared bat hibernation period.
- The channel restoration work would be completed in phases instead of disturbing the entire area at once.
- If recommended by the MN DNR, the proposer would work with the local fisheries office to move fish out of the active construction area prior to diverting water.
- Access to the site would be limited to areas shown on the plans.
- Staging areas would be limited in size and would have perimeter control to reduce sediment runoff.
- Construction would be suspended during rain events at the discretion of the Engineer to limit rutting and excess erosion from the construction equipment.
- The construction timeline would be kept to a practical minimum, and the contractor would be dedicated to the project timing in order to minimize the amount of time that areas are disturbed. Contract timelines would be enforced.
- Only native species that are appropriate to the existing terrestrial ecology would be used to restore the disturbed areas.
- Erosion control blanket would be specified to be natural netting only to ensure that no wildlife is ensnared in the netting.
- Adherence to the erosion and sediment control plan.

All appropriate actions/BMPs to prevent the spread of invasive species would be utilized. Equipment used on the project would be required to be cleaned before entering the site to minimize any introduction of invasive species. Seeding and planting of native species would be completed once grading is finalized on each reach. Invasive species monitoring and prevention is part of the post-project monitoring required by the related 404 permit, 401 certifications and monitoring required to complete the MN SQT functional assessment. Monitoring would be conducted annually for 5 years post construction. Invasive species performance standards and adaptive management measures are included in permit conditions.

Existing channel vegetation would be temporarily removed during construction. Existing alder would be excavated and used as transplants in critical areas. Native seed, trees, and shrubs would be planted along the stream banks and within the adjacent riparian corridor. Further back from the channel, a straw type erosion control blanket would be used to hold the soils until the vegetation is established. Plantings would include native forbs and grass seed, shrubs and trees.

15. Historic properties:

Describe any historic structures, archeological sites, and/or traditional cultural properties on or in close proximity to the site. Include: 1) historic designations, 2) known artifact areas, and 3) architectural features. Attach letter received from the State Historic Preservation Office (SHPO). Discuss any anticipated effects to historic properties during project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to historic properties.

In October 2019, the 106 Group, acting as a consultant for the proposer, conducted background research of an area that includes the boundary of the proposed project. There were no previously recorded archaeological sites or historical properties within the construction limits, but three properties met the architectural history survey criteria and were recommended as potentially eligible for listing in the National Register of Historic Places (NRHP). On November 11th, 2019 the architectural history survey was conducted in the vicinity. These properties, LA-SVB-012, LA-XXX-003 and XX-RRD-047 consisted of the Milepost 7 Tailings Basin, Minnesota Power Transmission Line and Reserve Mining Company Mainline Railroad respectively. LA-SVB-012 and XX-RRD-047 were evaluated for significance and both were determined eligible under NRHP Criterion A (national significance within the area of Law). The proposed projects fall within the area "Recommended Individually Eligible," but there are no associated properties/buildings within the proposed project boundaries.

The identified properties and buildings would not be affected by the proposed project. No historic properties would be altered, directly or indirectly, as a result of the restoration of these two stream sites. The proposed action is limited to excavation, fill and installation of rock and wood features in a previously disturbed channel, and staging of material and equipment within a gravel pit in the immediate vicinity of the stream sites. As no disturbance would be made, no mitigation is planned for this site.

A review request was submitted to State Historic Preservation Office (SHPO) on 1/10/2022 and a review is in progress. If additional information or restrictions are made available during the EAW review period, they will be incorporated into the Record of Decision. The Section 106 process provides an ongoing public regulatory authority for these possibly historical resources.

16. Visual:

Describe any scenic views or vistas on or near the project site. Describe any project related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from the project. Identify any measures to avoid, minimize, or mitigate visual effects.

Little and Big 39 Creeks are in valleys. Visibility of the project sites would be limited to hilltops in the surrounding areas. All construction would be conducted during daylight hours, so no lights would be visible at any time. The sites are adjacent to an operating tailings basin with more and bigger equipment operating during daylight hours 7 days a week. The increase in equipment operation that could cause light, dust or noise pollution would be minimal. Most of the work related to this project would be done in the stream or adjacent riparian area. These areas are the lowest elevation within the valley and from many vantage points are hidden from view.

17. Air:

- a. Stationary source emissions - Describe the type, sources, quantities and compositions of any emissions from stationary sources such as boilers or exhaust stacks. Include any hazardous air pollutants, criteria pollutants. Discuss effects to air quality including any sensitive receptors, human health or applicable regulatory criteria. Include a discussion of any methods used assess the project's effect on air quality and the results of that assessment. Identify pollution control equipment and other measures that will be taken to avoid, minimize, or mitigate adverse effects from stationary source emissions.

No stationary source emissions would be created from this project.

- b. Vehicle emissions - Describe the effect of the project's traffic generation on air emissions. Discuss the project's vehicle-related emissions effect on air quality. Identify measures (e.g. traffic operational improvements, diesel idling minimization plan) that will be taken to minimize or mitigate vehicle-related emissions.

The construction equipment required to complete this project would be limited to the project area. This area is approximately 2.9 miles from the nearest residence and approximately 0.5 miles from the nearest public road. The area is remote and is adjacent to the much larger operation of the active tailings basin. The most effective tool to reduce emissions in this area is to limit construction time. Working in streams and using bypasses requires planned and efficient movements to complete tasks in the shortest amount of time possible. This aspect of the project would reduce emissions when compared to similarly sized project without the constraints of working in bypassed or temporarily blocked streams.

- c. Dust and odors - Describe sources, characteristics, duration, quantities, and intensity of dust and odors generated during project construction and operation. (Fugitive dust may be discussed under item 17a). Discuss the effect of dust and odors in the vicinity of the project including nearby sensitive receptors and quality of life. Identify measures that will be taken to minimize or mitigate the effects of dust and odors.

The construction equipment required to complete this project would be limited to the project area. This area is approximately 2.9 miles from the nearest residence and approximately 0.5 miles from the nearest public road. The area is remote and is adjacent to the much larger operation of the active tailings basin. The increase in equipment operation that could cause light, dust or noise pollution would be minimal. The potential for fugitive dust would be minimal due to work in wet conditions. Work in wet conditions, rapid re-vegetation and erosion/sediment control BMPs would minimize potential for lift off.

18. Greenhouse Gas (GHG) Emissions/Carbon Footprint

- a. GHG Quantification: For all proposed projects, provide quantification and discussion of project GHG emissions. Include additional rows in the tables as necessary to provide project-specific emission sources. Describe the methods used to quantify emissions. If calculation methods are not readily available to quantify GHG emissions for a source, describe the process used to come to that conclusion and any GHG emission sources not included in the total calculation.

Identified greenhouse gas emissions include direct emissions during the construction of the project. Emissions are from mobile equipment, light truck and construction equipment. There is also a small conversion of wetland to open-water and a creation (e.g., carbon sink) by grassland converted to forested land. Fuel use and vehicle miles were estimated from previous similar projects. Table 10 and Table 11 summarize the Mobile GHG Emissions and the source and sinks resultant of the project, respectively.

Table 10: Summary of Estimated Mobile GHG Emissions

Emission Source	Number of Units ⁴	Hours of Operation/year ²	Vehicle Type	Fuel Type	Fuel Amount (total gallons)	CO ₂ e (tons/year)
Operations - gasoline mobile sources On-Road	4	100	Passenger Cars	Gasoline	521	1.68
Construction - diesel mobile sources - On-Road	2	100	Medium- and Heavy-Duty Trucks	Diesel	274	2.05
Operations - diesel mobile sources - On-Road	2	100	Light Trucks	Diesel	511	1.92
Construction - diesel mobile sources - Nonroad	7	500	Construction Equipment ³	Diesel	4,375	16.43
					Total	22.08

Notes:

- 1 for Nonroad sources, fuel amount is calculated based on fuel usage estimates per horsepower-hour (0.05 gallons for diesel, 0.12 gallons for gasoline) from Table A9-3E in SCAQMD CEQA Air Quality Handbook (<https://www.cvw.org/ArchiveCenter/ViewFile/Item/608>).
- 2 Based on 10 hrs/day, 5 days/week for 16 weeks for construction and 2 hrs/day, 5 days/week for 16 weeks for operations
- 3 Includes equipment, such as dumpers, and excavators, as well as fuel consumption from trucks that are used off-road in construction.
- 4 Numbers are based on a hypothetical assessment and not from a specific source.

Table 11: Summary of GHG Sources and Sinks from Land Use Changes

Emission Source	Area (acres)	Net CO2 Flux for land use conversion (M metric tons CO2e) ^{1,2}	2019 Total US Land Use Change from Wetland to "other" (thousands of hectares) ³	2019 Total US Land Use Change from Grassland (thousands of hectares) ³	CO2e emission factor (metric tons CO2e/acre/year)	CO2e Emissions (tons/year)
Land Use Change - Conversion from wetlands to open water "other" ²	0.1	1.5	121	--	5.02	0.55
Land Use Change - Conversion from grassland to Forest Land ¹	1.4	(10.5)	--	992	(4.28)	(6.61)
					Total	(6.06)

Notes:

1 Table 6-24: Net CO2 Flux from Forest C Pools in Land Converted to Forest Land by Land Use Change Category, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2019. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019>

2 Table 6-66: Net CO2 Flux from C Stock Changes in Vegetated Coastal Wetlands Converted to Unvegetated Open Water Coastal Wetlands, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2019. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019>

3 Table 6-5: Land Use and Land-Use Change for the U.S. Managed Land Base for All 50 States, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2019. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019>

b. GHG Assessment

i. Describe any mitigation considered to reduce the project's GHG emissions.

This project would include converting grassland to forested land and would ultimately be creating a carbon sink. It was estimated that this land use conversion would result in a negative CO₂^e of 6.1 tons/year. Over the lifetime of this project (50 years), there would be a total carbon sink of 330 tons. Therefore, there would be no proposed CO₂^e mitigation considered for this project; however, adaptive mitigation for the construction site would be considered, including:

- Reduce any unnecessary clearing and grubbing
- Maintain tree canopy when feasible
- Practice vehicle and equipment maintenance

ii. Describe and quantify reductions from selected mitigation, if proposed to reduce the project's GHG emissions. Explain why the selected mitigation was preferred.

Not applicable

iii. Quantify the proposed project's predicted net lifetime GHG emissions (total tons/#of years) and how those predicted emissions may affect achievement of the Minnesota Next Generation Energy Act goals and/or other more stringent state or local GHG reduction goals.

Not applicable

19. Noise

- a. Describe sources, characteristics, duration, quantities, and intensity of noise generated during project construction and operation. Discuss the effect of noise in the vicinity of the project including 1) existing noise levels/sources in the area, 2) nearby sensitive receptors, 3) conformance to state noise standards, and 4) quality of life. Identify measures that will be taken to minimize or mitigate the effects of noise.

Additional heavy equipment would be added to the general area related to the construction of the project. Project work would be conducted during daylight hours Monday - Friday. This is approximately the same hours of the adjacent tailings basin equipment operation. At no time would the noise intensity from equipment related to this project exceed the noise intensity from equipment used in daily operation of the tailings basin. There are no sensitive receptors near the project area. This area is approximately 2.9 miles from the nearest residence and approximately 0.5 miles from the nearest public road. The effect of the added noise would be limited and temporary. The construction crew will be required to follow local noise ordinances and restrictions. Post construction, the operation of the project would produce no noise.

20. Transportation

- a. Describe traffic-related aspects of project construction and operation. Include: 1) existing and proposed additional parking spaces, 2) estimated total average daily traffic generated, 3) estimated maximum peak hour traffic generated and time of occurrence, 4) indicate source of trip generation rates used in the estimates, and 5) availability of transit and/or other alternative transportation modes.

Other than mobilizing equipment and personnel onsite, the majority of the materials would be obtained from onsite sources. Therefore, additional traffic on public roads would be minimal. No additional parking spaces would be needed. Equipment staging would occur in areas limited in size and would be restored to a condition that is equal to or better than the existing conditions. Daily traffic generated would be less than 10 vehicles per day. Due to the remote nature of the work, no alternative transportation modes would be applicable.

- b. Discuss the effect on traffic congestion on affected roads and describe any traffic improvements necessary. The analysis must discuss the project's impact on the regional transportation system. *If the peak hour traffic generated exceeds 250 vehicles or the total daily trips exceeds 2,500, a traffic impact study must be prepared as part of the EAW.* Use the format and procedures described in the Minnesota Department of Transportation's Access Management Manual, Chapter 5 (available at: <http://www.dot.state.mn.us/accessmanagement/resources.html>) or a similar local guidance,

A short period of mobilization would increase semi-truck traffic in area, but the area is an active industrial site that frequently has deliveries on semi-trucks. Increases would be negligible. During construction, crews would report daily during weekdays. This would be an addition of approximately 10 vehicles per day. Most materials required for the project would be acquired on-site, so there would not be many deliveries for the completion of this project. The site frequently sees increases due to maintenance, inspection and other work related to the operation of the tailings basin.

- c. Identify measures that will be taken to minimize or mitigate project related transportation effects.

None, due to the limited traffic effects of the project.

21. **Cumulative potential effects:** (Preparers can leave this item blank if cumulative potential effects are addressed under the applicable EAW Items)

- a. Describe the geographic scales and timeframes of the project related environmental effects that could combine with other environmental effects resulting in cumulative potential effects.

Potential for erosion

Soil exposed during construction would have the potential to erode by water or wind. This effect would be minor and temporary as the stream sections would only be dewatered during the work day. BMPs would be utilized to minimize erosion. The geographic extent of this effect would be up to 1 mile downstream.

Loss of wetland

Minimal impacts to wetlands during the digging of a new channel would be temporary during the construction period. Post-construction, the connection of the stream to the floodplain would provide conditions needed for the creation of an estimated 7.8 acres of wetland. This impact would be minor and limited to the project footprint.

Potential for spill of hazardous materials

Gasoline to power the construction equipment would be stored on site temporarily during the construction of the project. The potential for a spill would be minor and would be mitigated by a Spill Prevention Control and Countermeasures Plan and by following applicable federal and state rules regarding the storing of such materials, clean up and the reporting of spills. This effect would be limited to the project footprint.

Loss of stream habitat

The streamflow would be pumped around the project area during the workday for each 500-foot section of stream channel that undergoes reconstruction. This would create dry conditions and displace the species that normally occupy that reach. This effect would be temporary and would be mitigated by stopping pumping during the off-hours of construction and limiting the project to non-spawning periods. The geographic extent of this effect would be limited to the 500-foot reach.

Dispersal of wildlife

Wildlife would be temporarily affected by the noise and the presence of construction staff during the project. Some species would be dislocated during this period. This effect would be temporary and limited to a one-mile radius around the project site. The wildlife-friendly erosion control would allow for a safer space upon their return to the site.

Removal of plant communities/vegetative cover

The temporary removal of plant communities and vegetative cover while the stream channel is being relocated would cause temporary effects, limited to the project footprint. The sections would be replanted with native seeds and plantings, including the relocation of alder trees. Effects would be mitigated by performing construction in phases and invasive species monitoring that would continue for five years post-project.

Emissions/Greenhouse Gases

Emissions created by construction vehicles would produce a temporary effect during construction of the project. The magnitude of emissions will be limited and minimized by making intentionally efficient movements to complete tasks in the shortest possible time. Post-construction the project will produce no emissions and will instead be a carbon sink. See EAW item 18 for more details.

Creation of dust

Dust would be created during earth moving activities during the construction of the project. This effect would be limited to a half-mile radius around the project footprint and would be mitigated by working in wet conditions and the use of sediment BMPs. This effect would be minor and temporary.

Noise

Noise from construction activities would create a minor effect during the daylight hours while machines are running. The noise would be minimal with respect to background noise at the active tailings basin site adjacent to the project site. The noise would be limited to a one-mile radius and will comply with all local noise ordinances and restrictions.

- b. Describe any reasonably foreseeable future projects (for which a basis of expectation has been laid) that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.

No projects have been identified as reasonably foreseeable for which a basis of expectation has been laid. Below are descriptions of the projects identified, and details that evaluate why they do not fit the definition.

As of the publication of this document, several projects have been identified that are currently in the preliminary planning stages and do not meet the definition of reasonably foreseeable projects for which a basis of expectation has been laid, as is described in Rule 4410.0200 subp. 11a. These projects include:

- Beaver Bay water intake repair/replacement
- Housing development off Golf Course Road in Silver Bay.
- Housing development off Marks Drive in Silver Bay.
- Housing along Penn Avenue in Silver Bay.
- Multimodal trailhead center off Outer Drive in Silver Bay.
- Expansion of East Lakeview Drive in Silver Bay.
- Boathouse Bay Housing and Resort development in Silver Bay Business Park.
- New street between Outer Drive and Bank Boulevard in Silver Bay.
- Water treatment facility upgrades and booster station in Silver Bay.
- Renovation of William Kelley High School and bus garage in Silver Bay.
- Silver Bay City Street Improvement project. (Preliminary Engineering is completed but work has not been scheduled.)

Projects that have been permitted and/or scheduled include the following:

North Shore Camping Company Project

Leisure Hotels and Resorts plans to build the North Shore Camping Company Project, a 49-unit campground, within the city of Beaver Bay at 4595 Highway 61. The project will include the construction of camping sites, 3 staff park homes, a bath house, a maintenance shed, 2 rustic latrines, septic fields, a recreation area, a bike trail, granite paths, gravel parking areas, and drilling two water supply wells. An EAW was written for this project by the RGU, the City of Beaver Bay.¹⁹ Work expected during the summer and fall of 2022 include construction of the bath house. The geographic area of the effects described in the referenced EAW do not overlap with any effects described for the project.

Culvert Replacements on Hockamin Creek, Finland

Culverts will be replaced during the summer of 2022 on Hockamin Creek at Hefflefinger Road and at Breezy Lane. The Hefflefinger Road project will occur between July 1st and September 15th. The Breezy Lane culvert replacement has not yet been scheduled. These streams are about ten miles away and in the Baptism Watershed, so environmental effects would not overlap.

Mile Post 7 Railroad Relocation and Dam Construction

Notification has been given for future operations at the Mile Post 7 Tailings Facility to extend Dams 1 and 2, relocate the materials supply rail line, continue placement of fine tailings into the basin, and develop a new borrow site to supply clay suitable for dam construction. Extension of the dams and relocation of the rail line will allow the placement of tailings in portions of the basin previously inaccessible because of the existing rail line. The schedule presented by Northshore Mining indicates that this work would begin in 2026. This stated timeframe would not overlap with the timeframe for the project, thus no environmental effects would overlap.

MNDOT Bridgework at Silver Creek and Stewart River

Continuing work that began in 2021, road construction will occur on the Silver Creek and Stewart River bridges.²⁰ At Silver Creek, construction of a new bridge is replacing the box culvert, including a bike and pedestrian crossing on bridge. At the Stewart River Bridge, traffic on Hwy 61 will continue on the temporary bypass at Silver Creek through the fall of 2022. The bypass carries northbound and southbound traffic on 11-foot driving lanes. Because of the limited amount of traffic generated by the project, the environmental effects would not overlap.

- c. Discuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects.

Because no projects were identified as being reasonably foreseeable for which a basis of expectation has been laid and causing effects within an overlapping geographic area and/or timeframe, no potential cumulative effects are anticipated. Since no overlapping effects are

¹⁹ EAW for North Shore Camping Company. Published in the August 3, 2021 EQB Monitor.
https://www.beaverbaymn.com/vertical/Sites/%7B62AD44A4-CBA5-4F9A-A046-017EBA9D9274%7D/uploads/North_Shore_Camping_Co_EAW_2021-07-27.pdf

²⁰ MNDOT Webpage for Silver Creek and Stewart River Bridge Project.
<https://www.dot.state.mn.us/d1/projects/hwy61-bridges/index.html>

identified in regard to the identified projects, all cumulative effects will be as described in item 21a.

22. **Other potential environmental effects:** If the project may cause any additional environmental effects not addressed by items 1 to 19, describe the effects here, discuss the how the environment will be affected, and identify measures that will be taken to minimize and mitigate these effects.

No additional effects are anticipated.

RGU CERTIFICATION. *(The Environmental Quality Board will only accept **SIGNED** Environmental Assessment Worksheets for public notice in the EQB Monitor.)*

I hereby certify that:

- The information contained in this document is accurate and complete to the best of my knowledge.
- The EAW describes the complete project; there are no other projects, stages or components other than those described in this document, which are related to the project as connected actions or phased actions, as defined at Minnesota Rules, parts 4410.0200, subparts 9c and 60, respectively.
- Copies of this EAW are being sent to the entire EQB distribution list.

Signature_____

Date _____

Title EAW Project Manager

Figure 1, Project Location

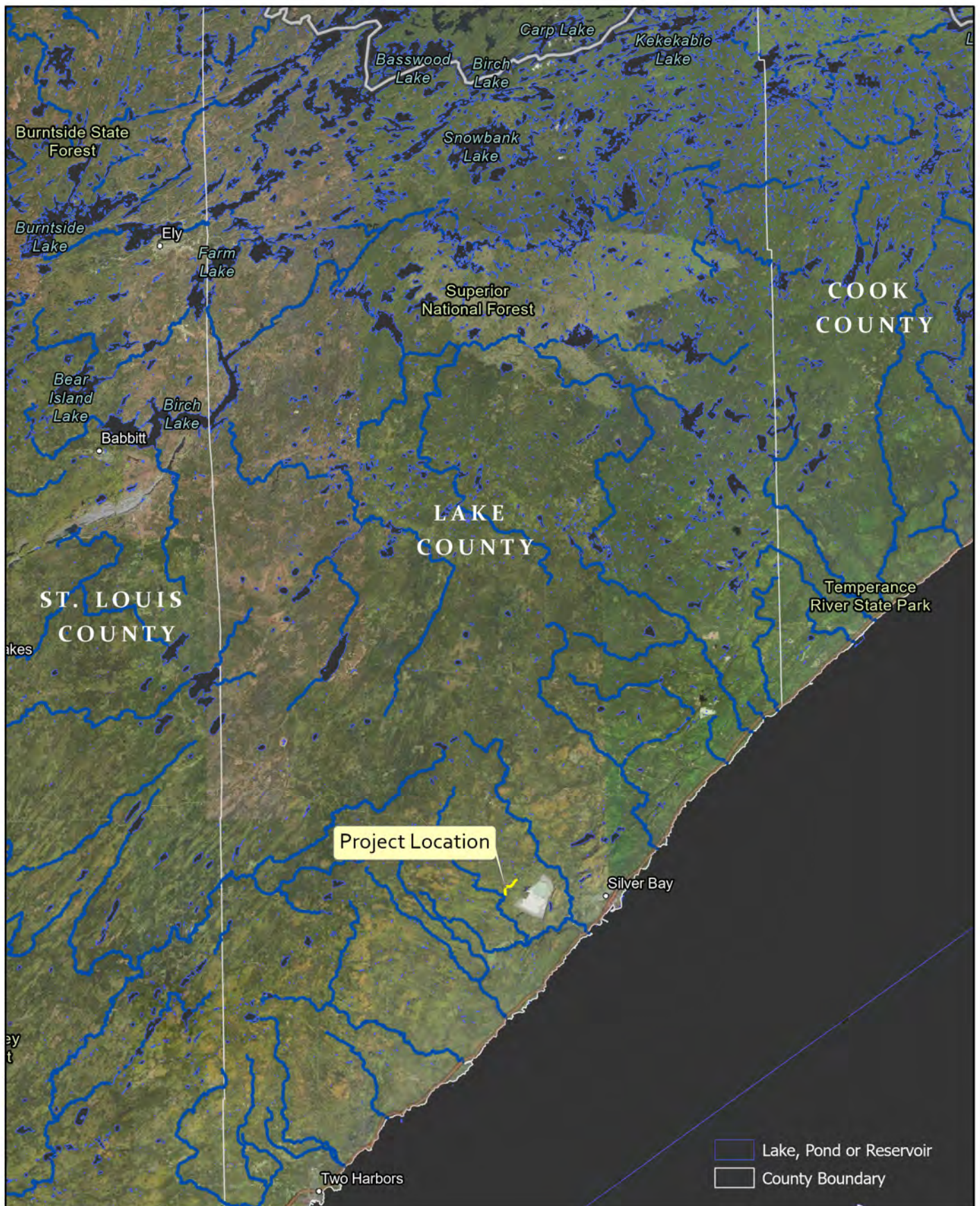


Figure 1
County Map
Northshore Mining Company
Big and Little 39 Mitigation
Lake County, MN

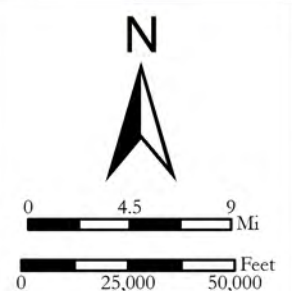


Figure 2, USGS Map of Project Boundaries

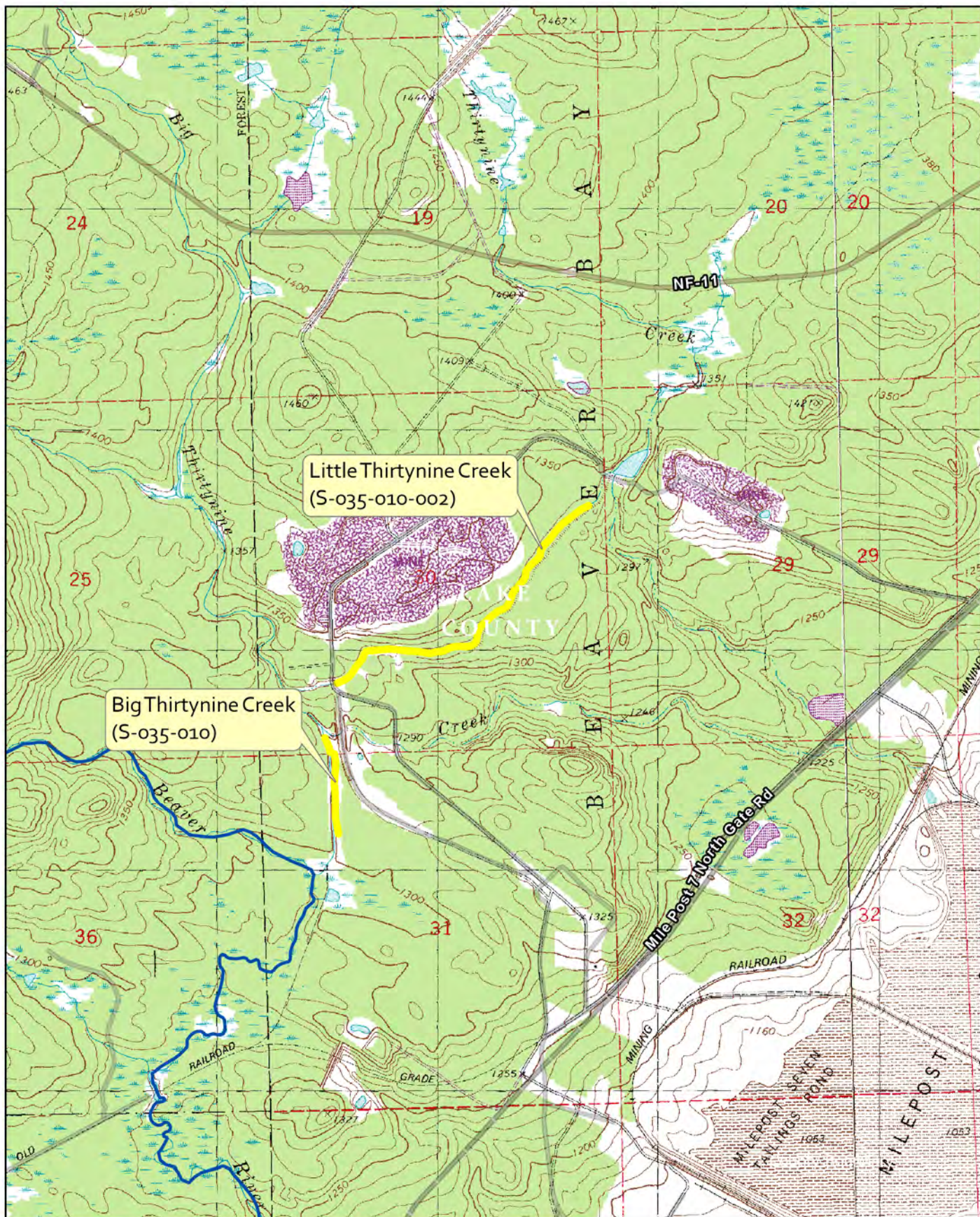


Figure 2
USGS Quadrangle Map
Northshore Mining Company
Big and Little 39 Mitigation
Lake County, MN

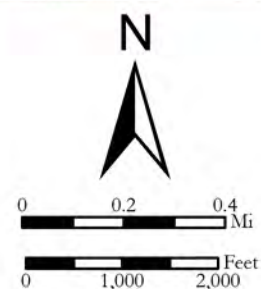
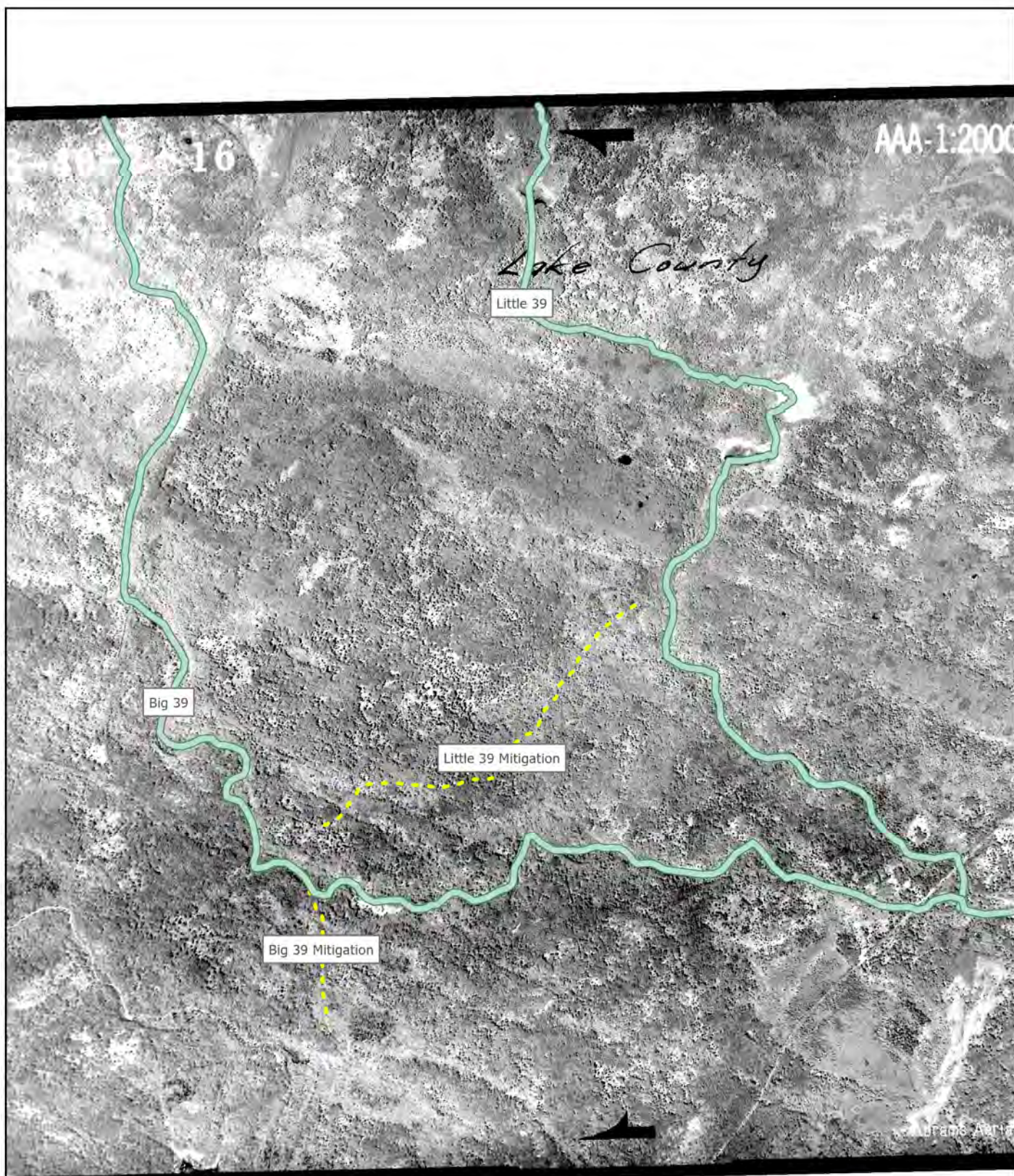


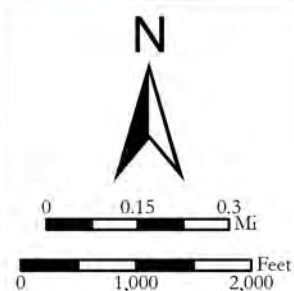
Figure 3, 1939 Historical Photograph



- - - Project Location
 — 1939 Historical Channel



Figure 3
 1939 Historical Photograph
 Northshore Mining Company
 Big and Little 39 Mitigation
 Lake County, MN

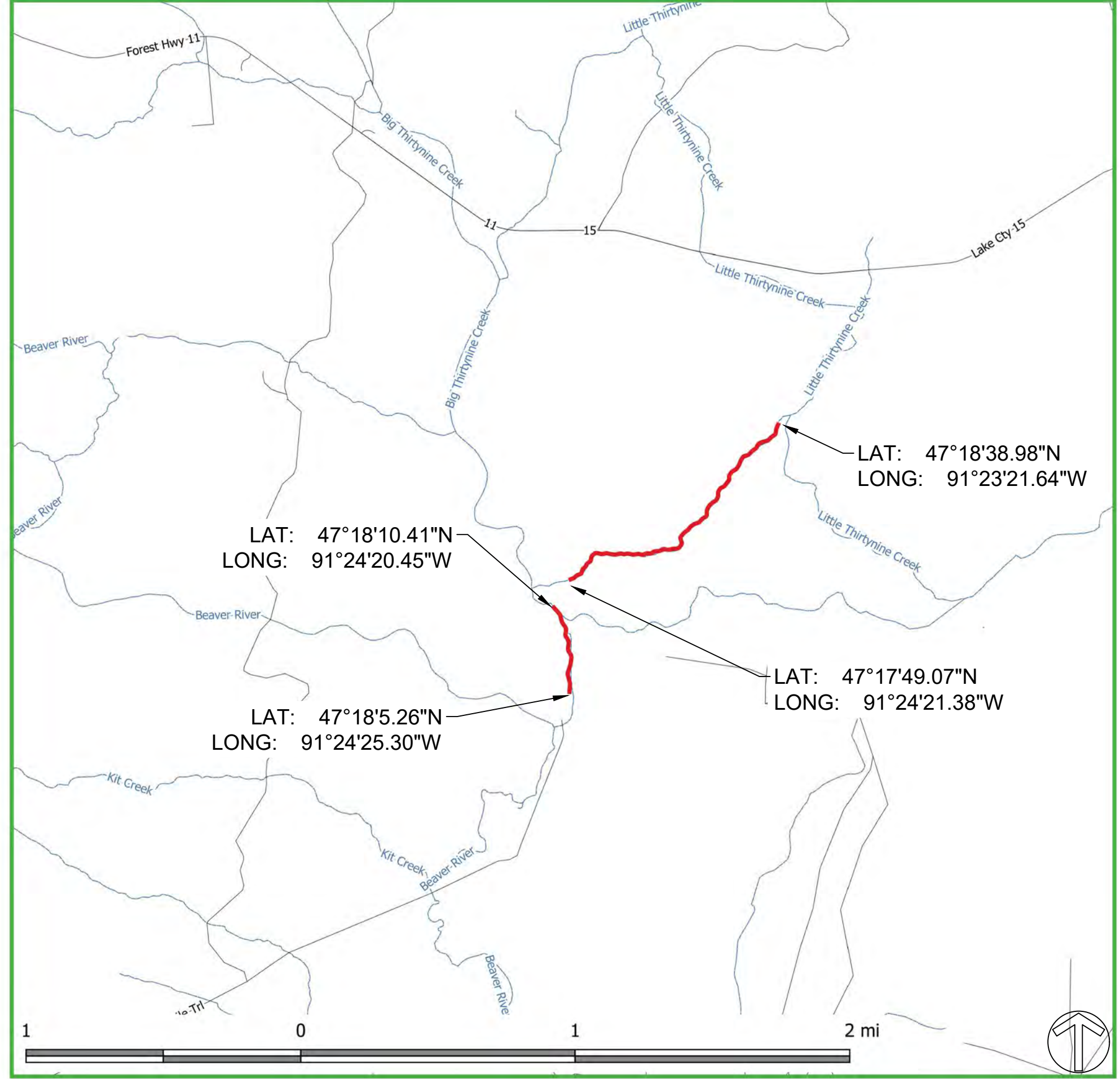
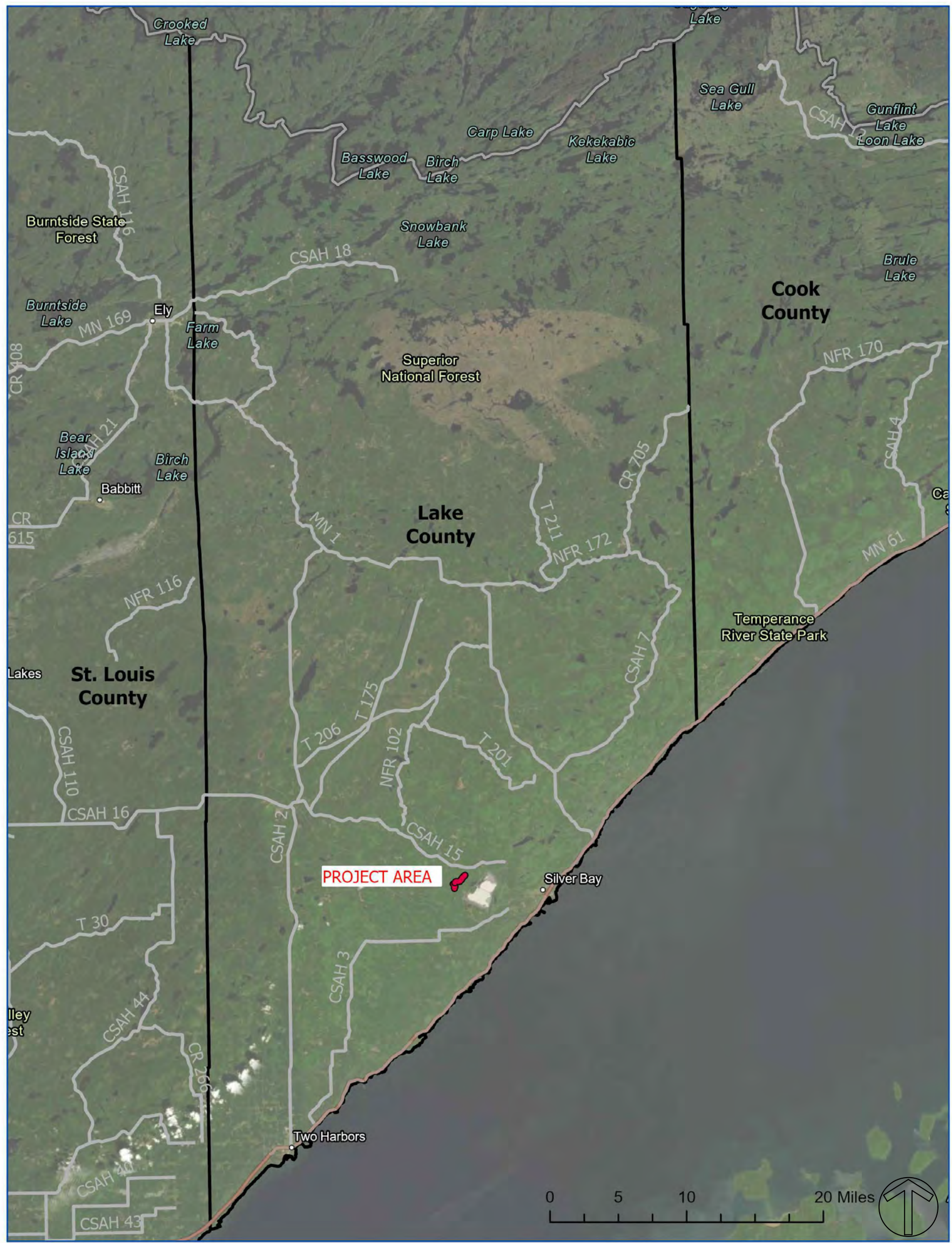
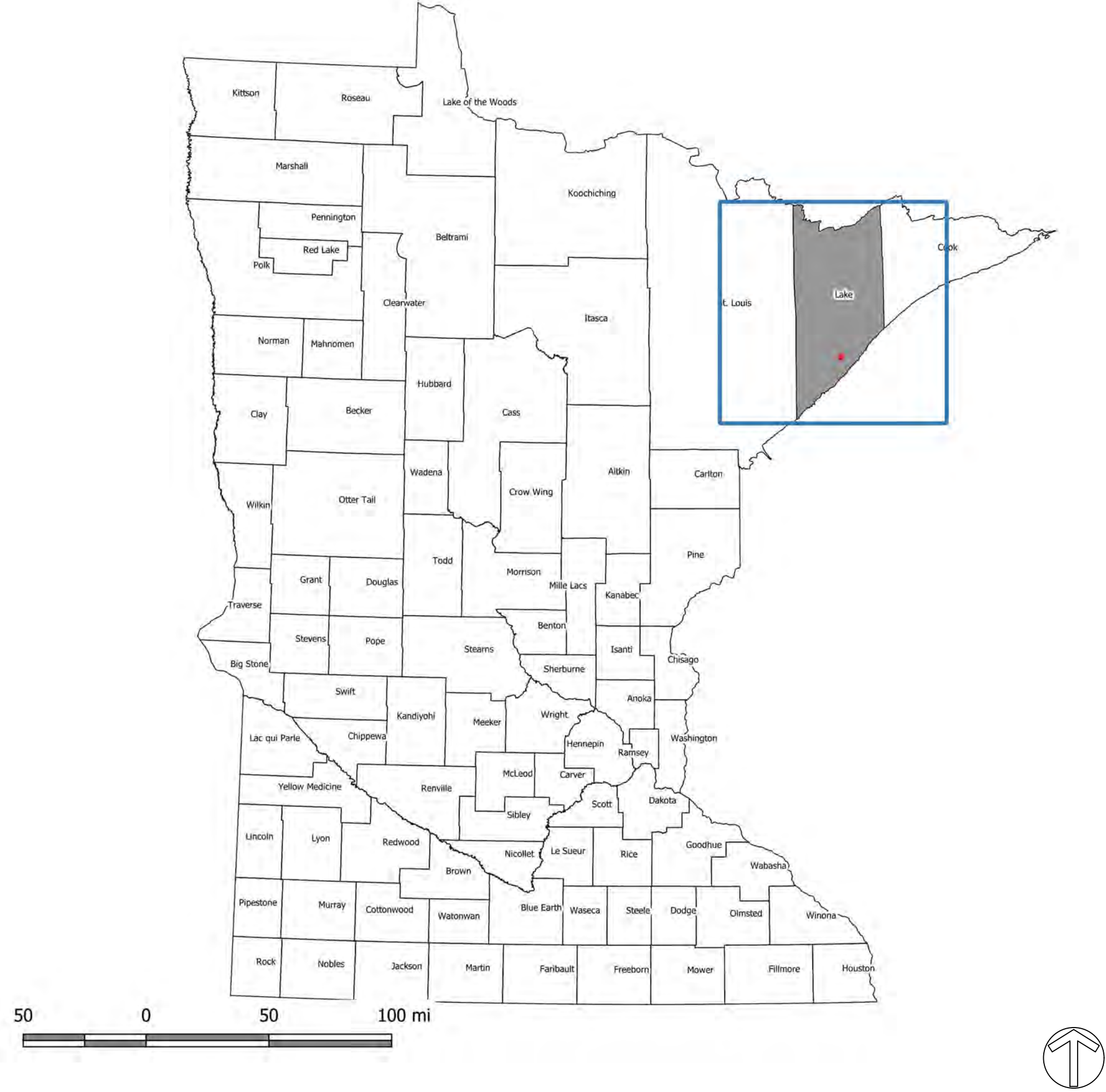


BID SET - NOT FOR CONSTRUCTION

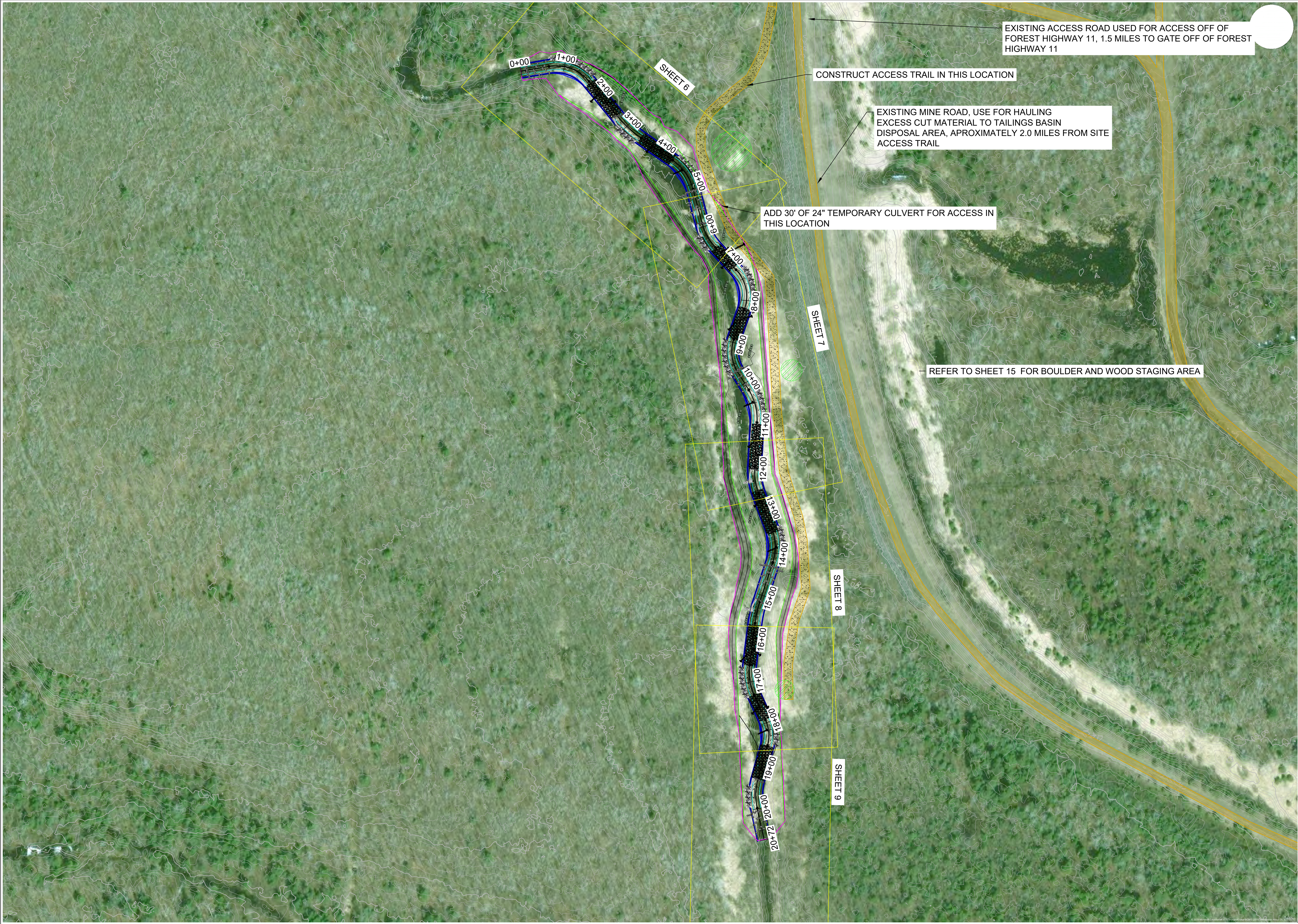
BIG AND LITTLE 39

STREAM RESTORATION

NEAR SILVER BAY
LAKE COUNTY, MN
10/15/2021



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				DRAFT 60%									
STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN		DRAFT 90%											
		BID SET											
		XX											
		XX											
		XX											
BIG 39 OVERVIEW		XX											
		XX											
		XX											
		XX											
		XX											

CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

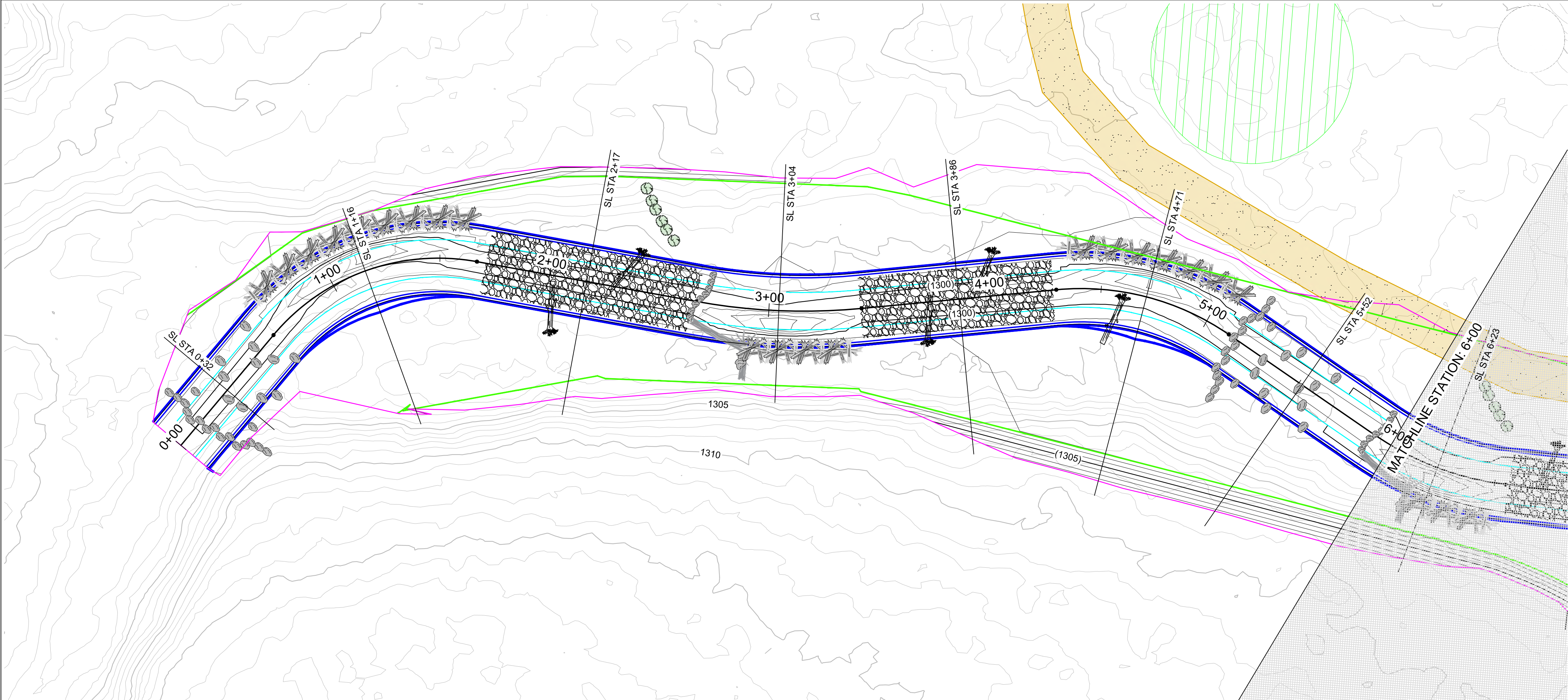
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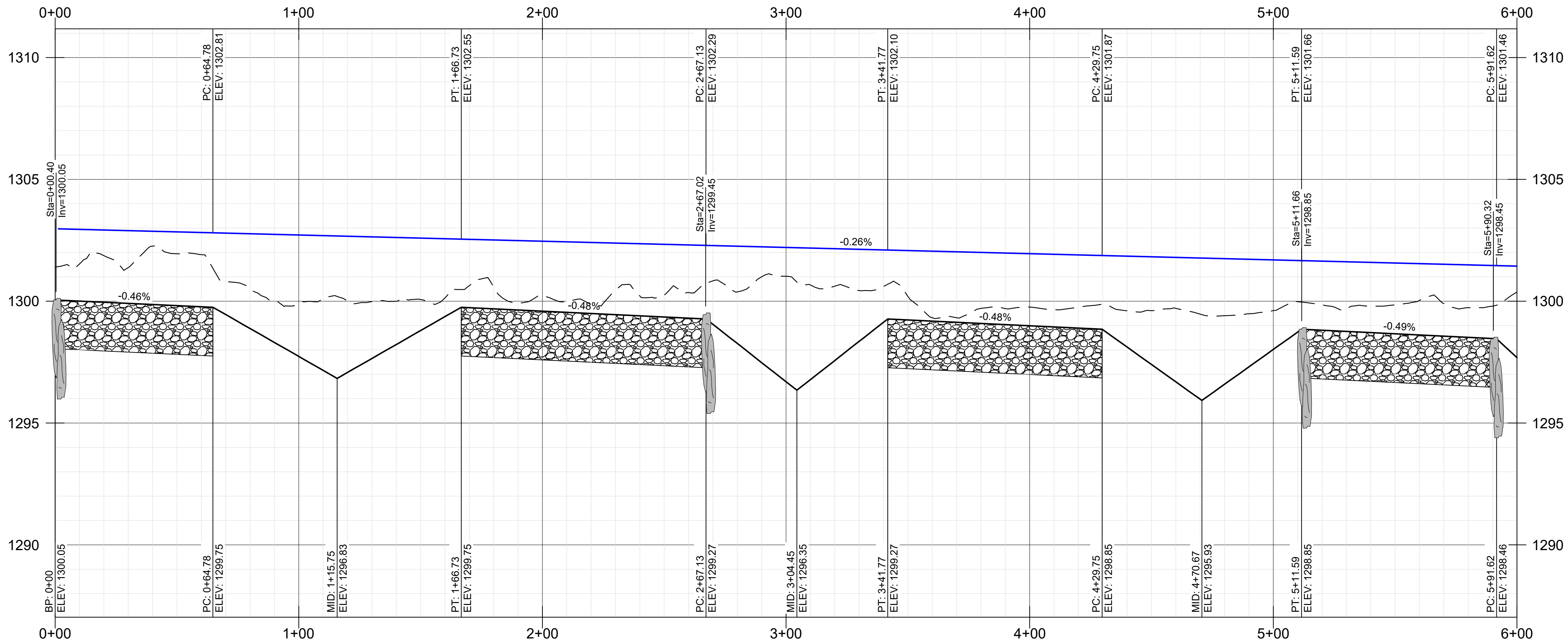
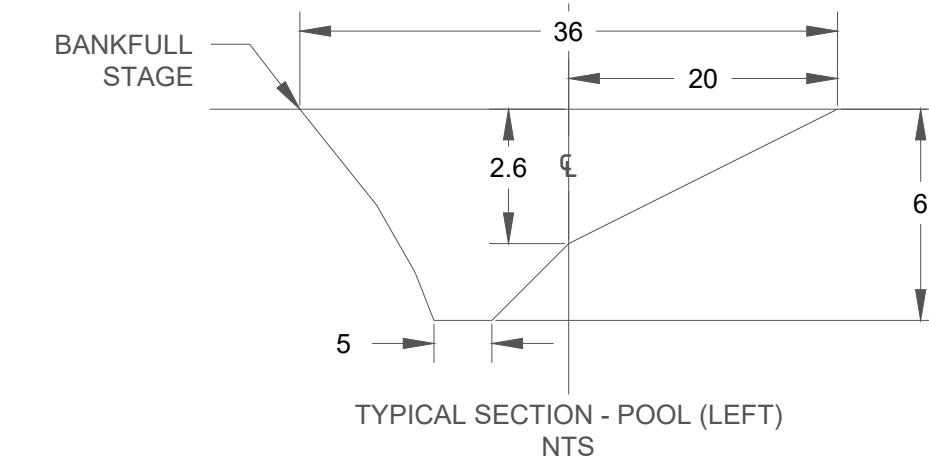
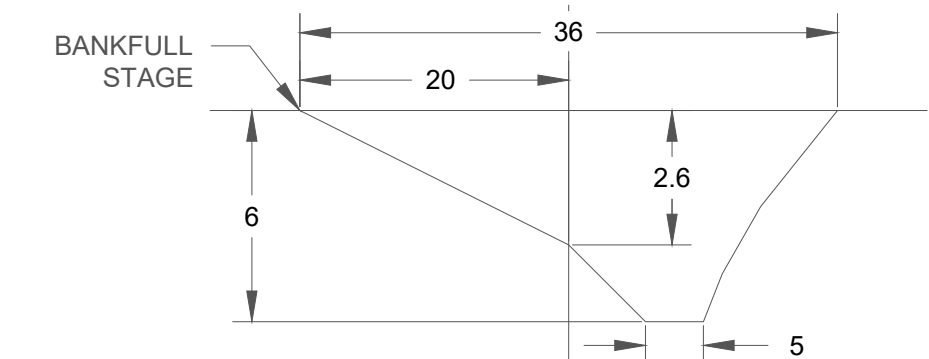
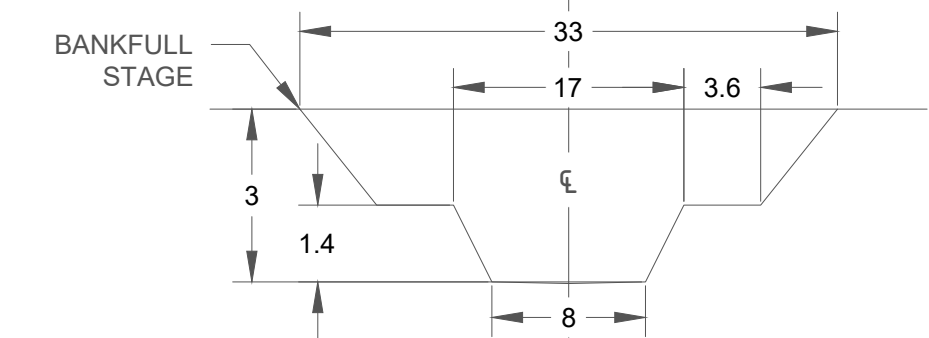
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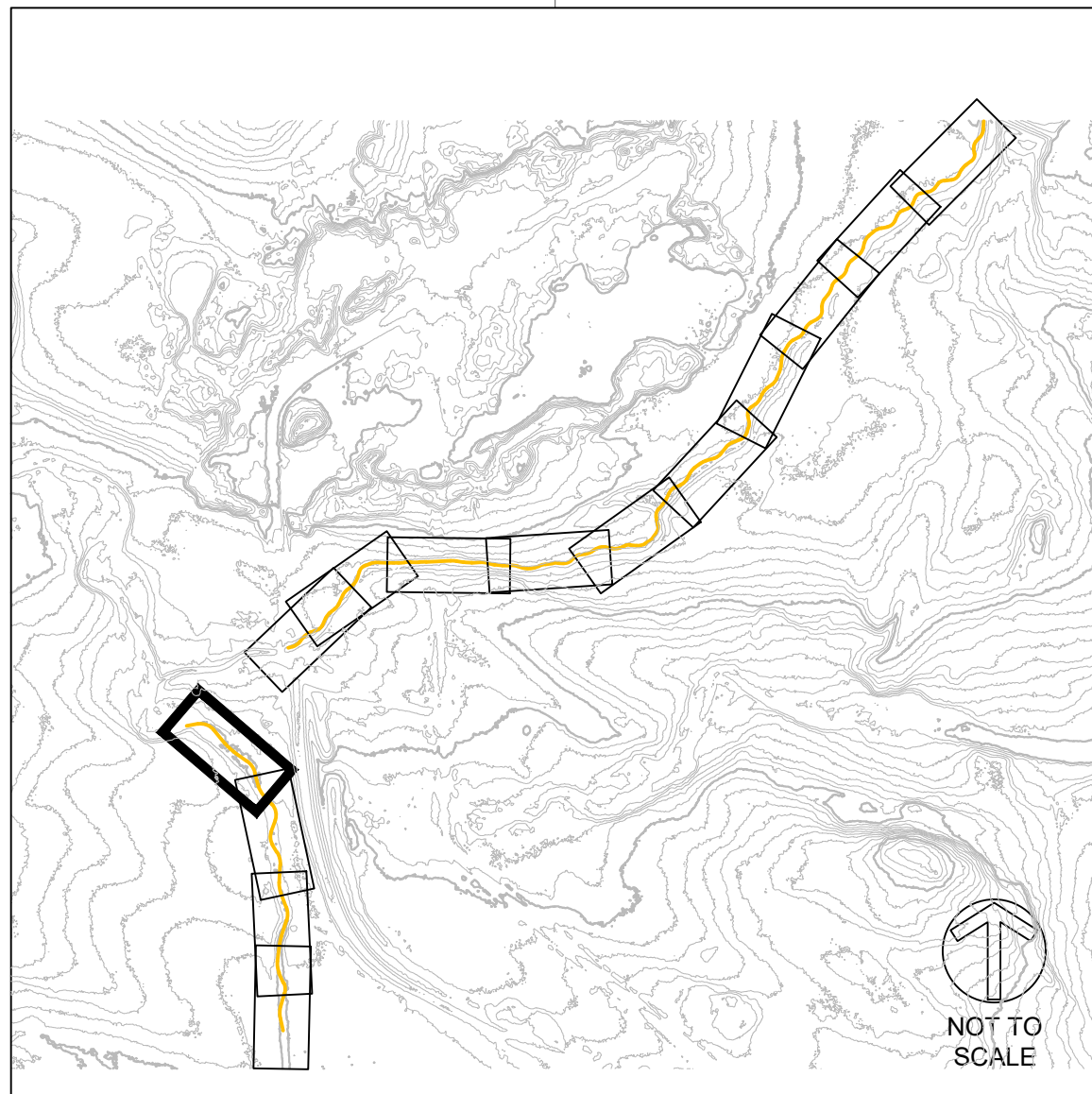


- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE SEE SHEET 38
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA SEE SHEET 49
 - LOG J-HOOK SEE SHEET 39
 - TOE WOOD SEE SHEET 41
 - TRANSPLANTS SEE SHEET 42
 - BOULDER CONSTRUCTED RIFFLE SEE SHEET 43
 - HABITAT LOG SEE SHEET 46
 - ROCK GLIDE RIFFLE SEE SHEET 44

- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - HEADER AND FOOTER BOULDER
 - AUGMENTED RIFFLE



SCALE: HOR 1" = 1'; VERT 1" = 0'



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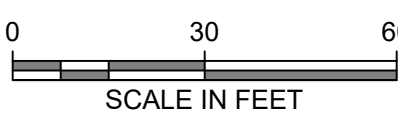
BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
BIG 39
PLAN AND PROFILE - (1)
STA 0+00 TO 6+00



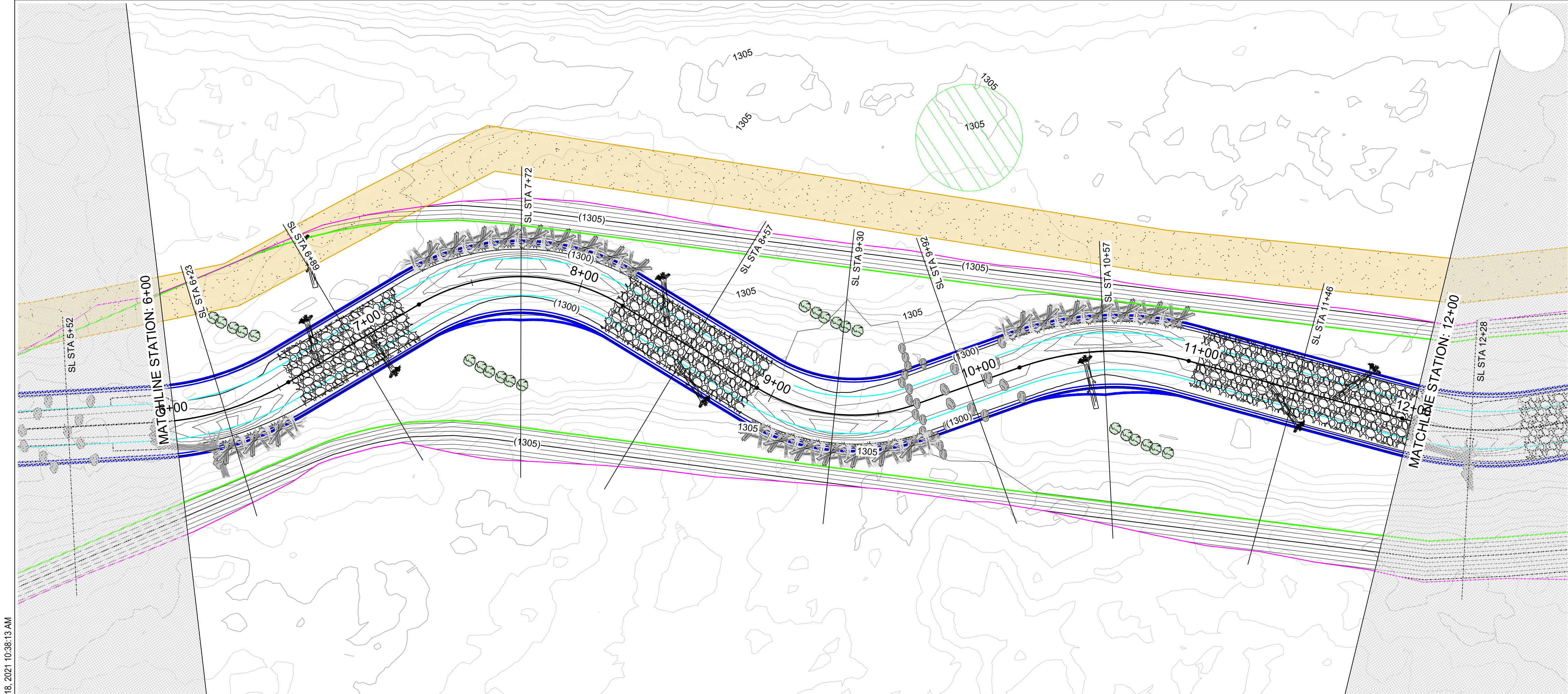
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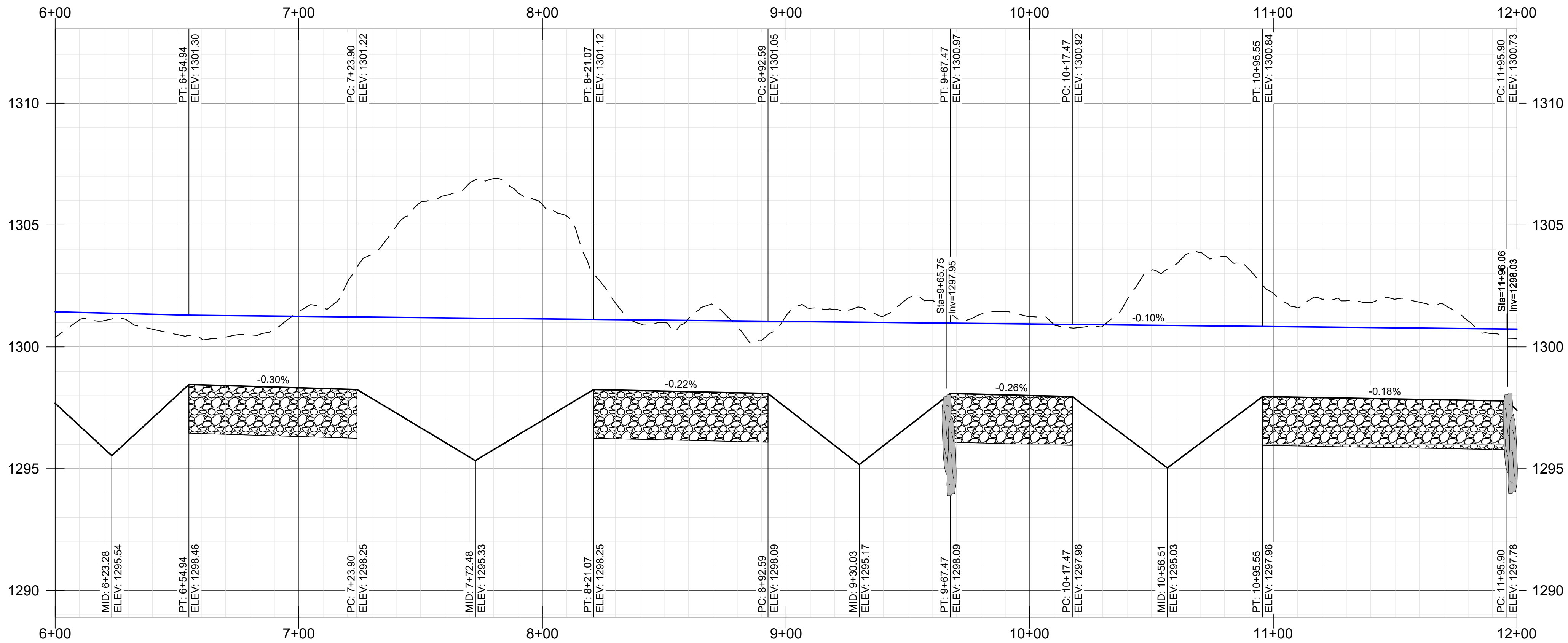
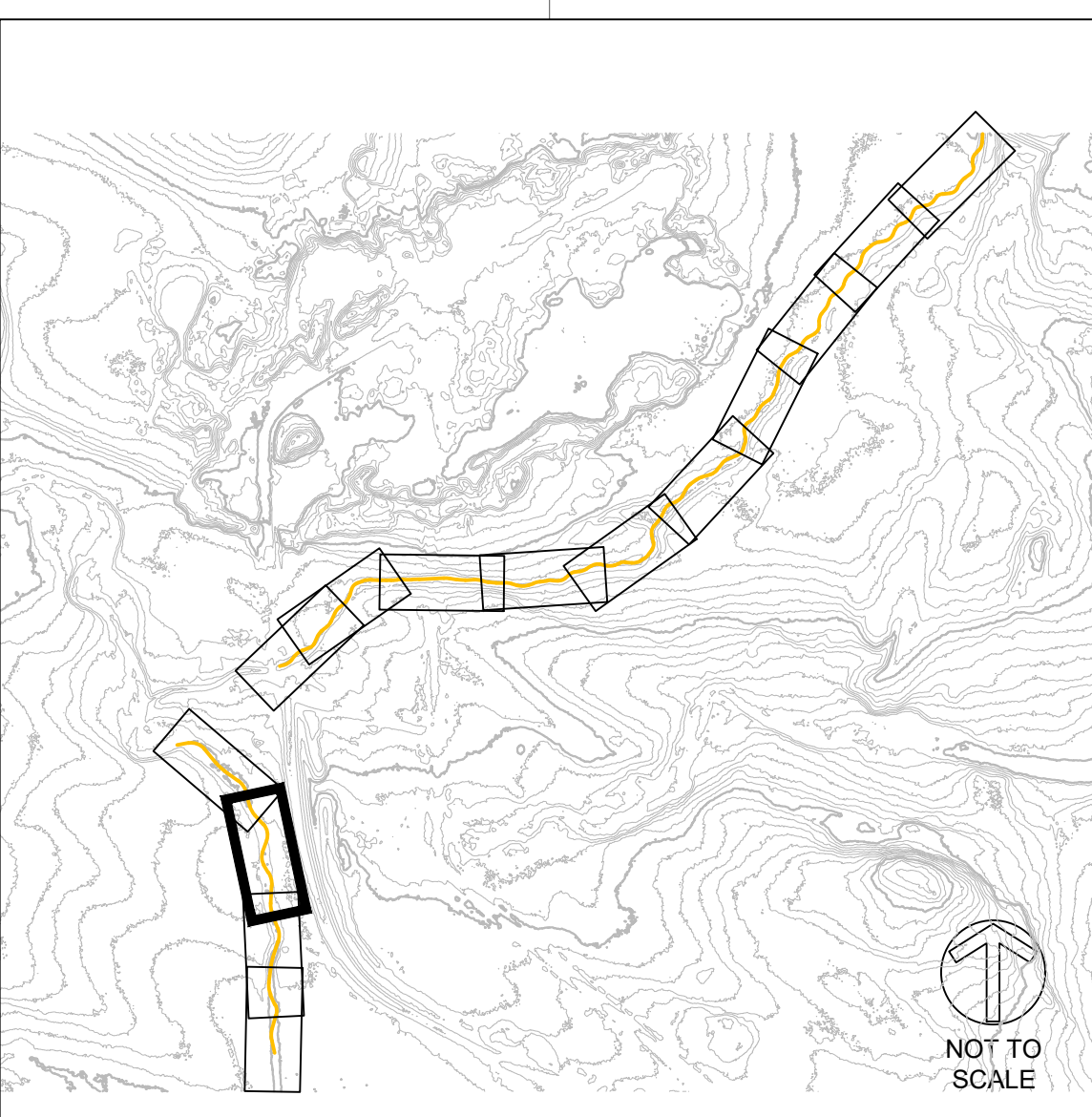
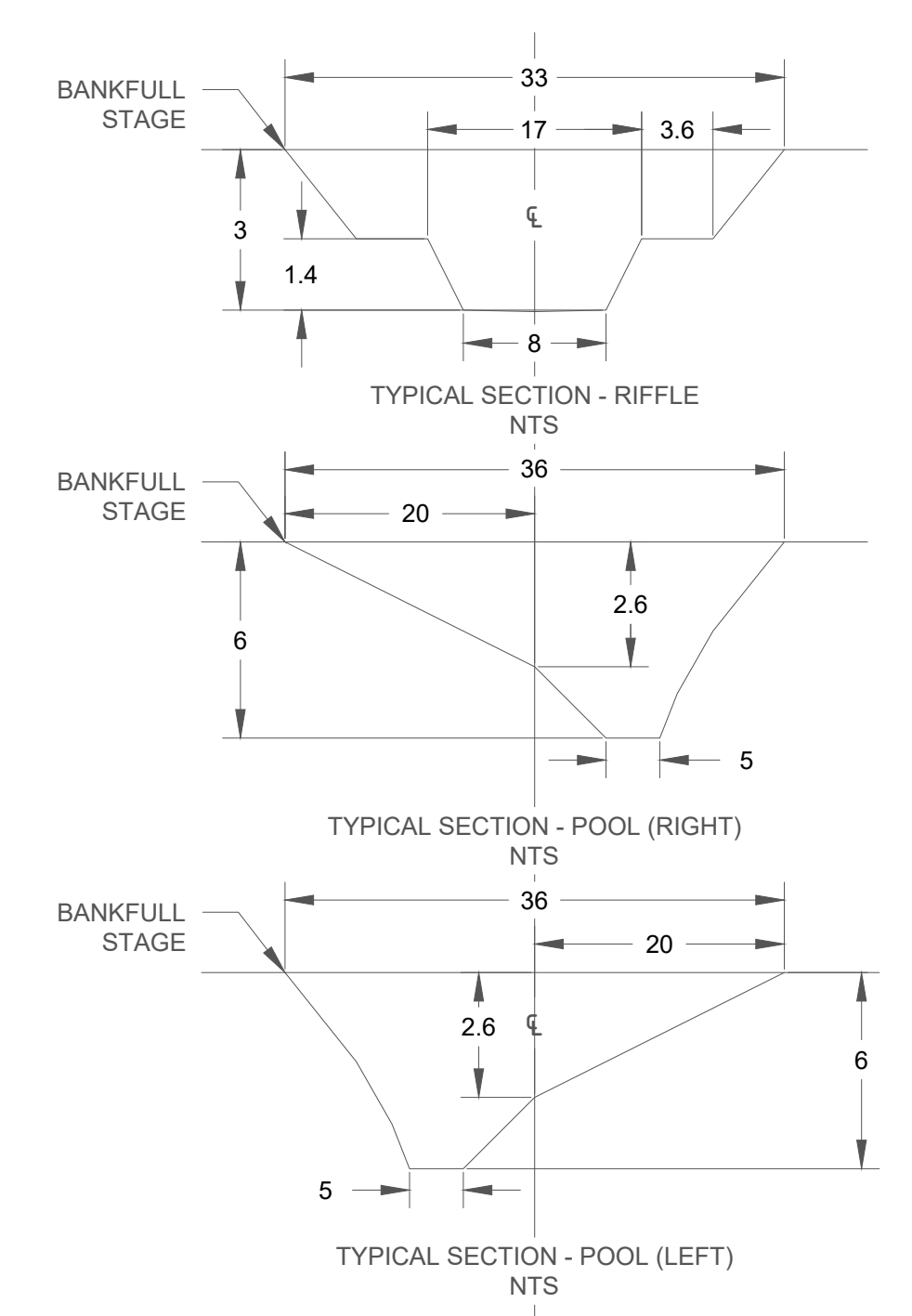
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6 OF 50

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- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE
SEE SHEET 38
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA
SEE SHEET 49
 - LOG J-HOOK
SEE SHEET 39
 - TOE WOOD
SEE SHEET 41
 - TRANSPLANTS
SEE SHEET 42
 - BOULDER CONSTRUCTED
RIFFLE
SEE SHEET 43
 - HABITAT LOG
SEE SHEET 46
 - ROCK GLIDE RIFFLE
SEE SHEET 44

- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - HEADER AND FOOTER BOULDER
 - AUGMENTED RIFFLE



SCALE: HOR 1" = 1'; VERT 1" = 0'

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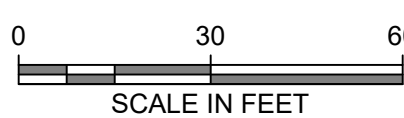
BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
BIG 39
PLAN AND PROFILE - (2)
STA 6+00 TO 12+00



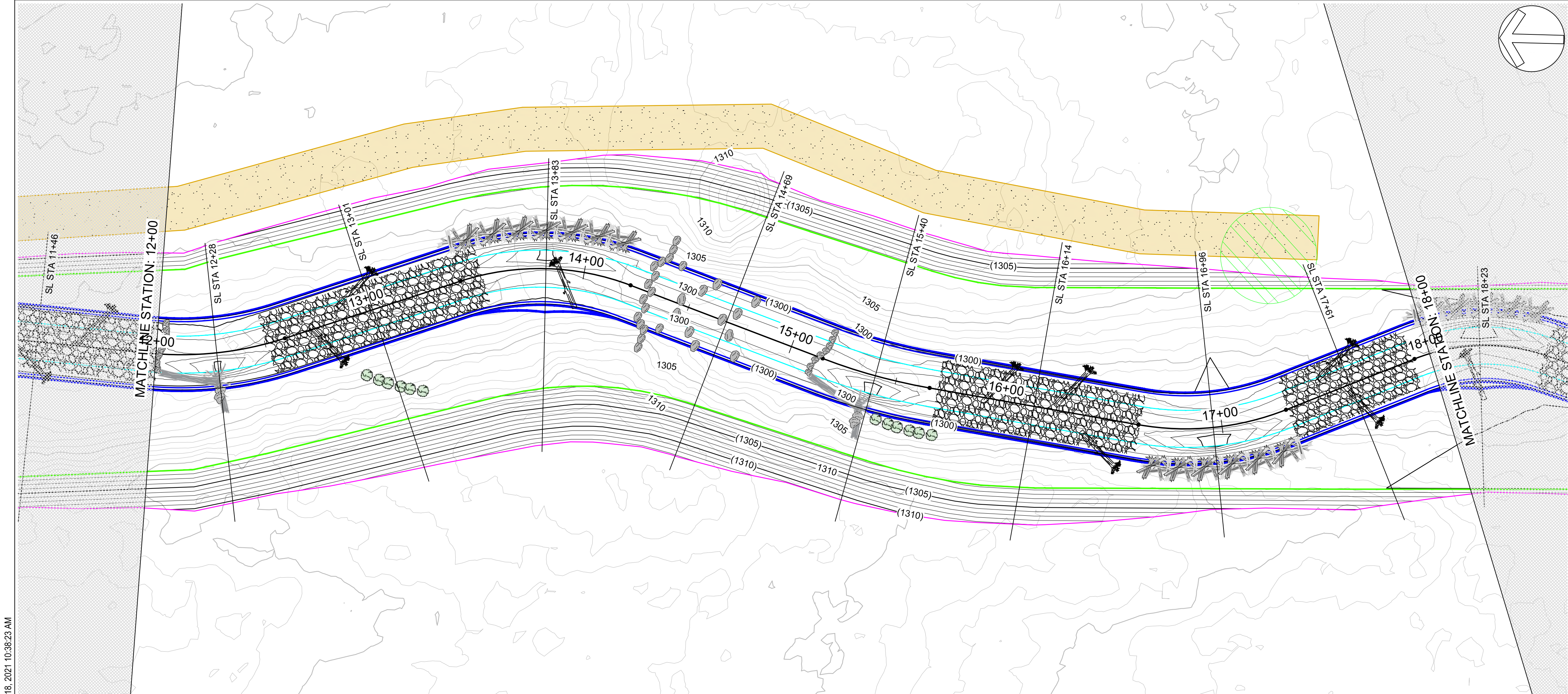
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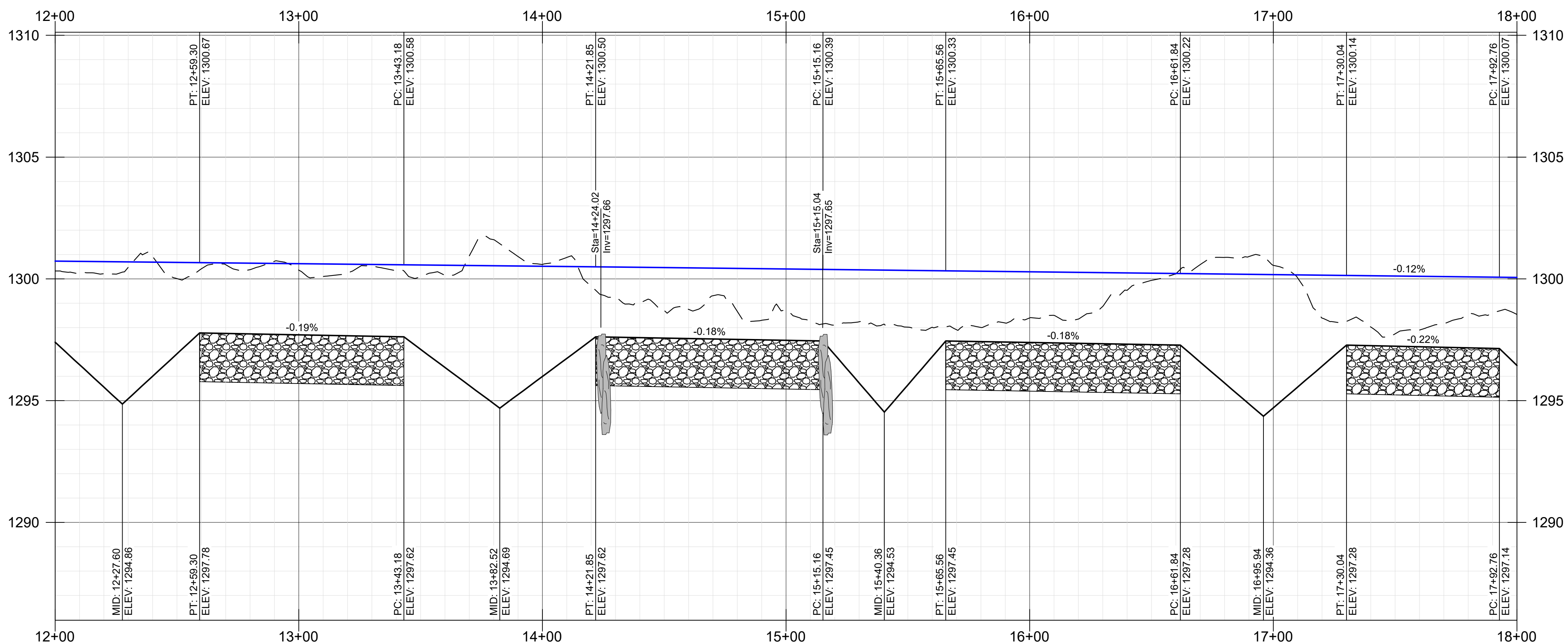
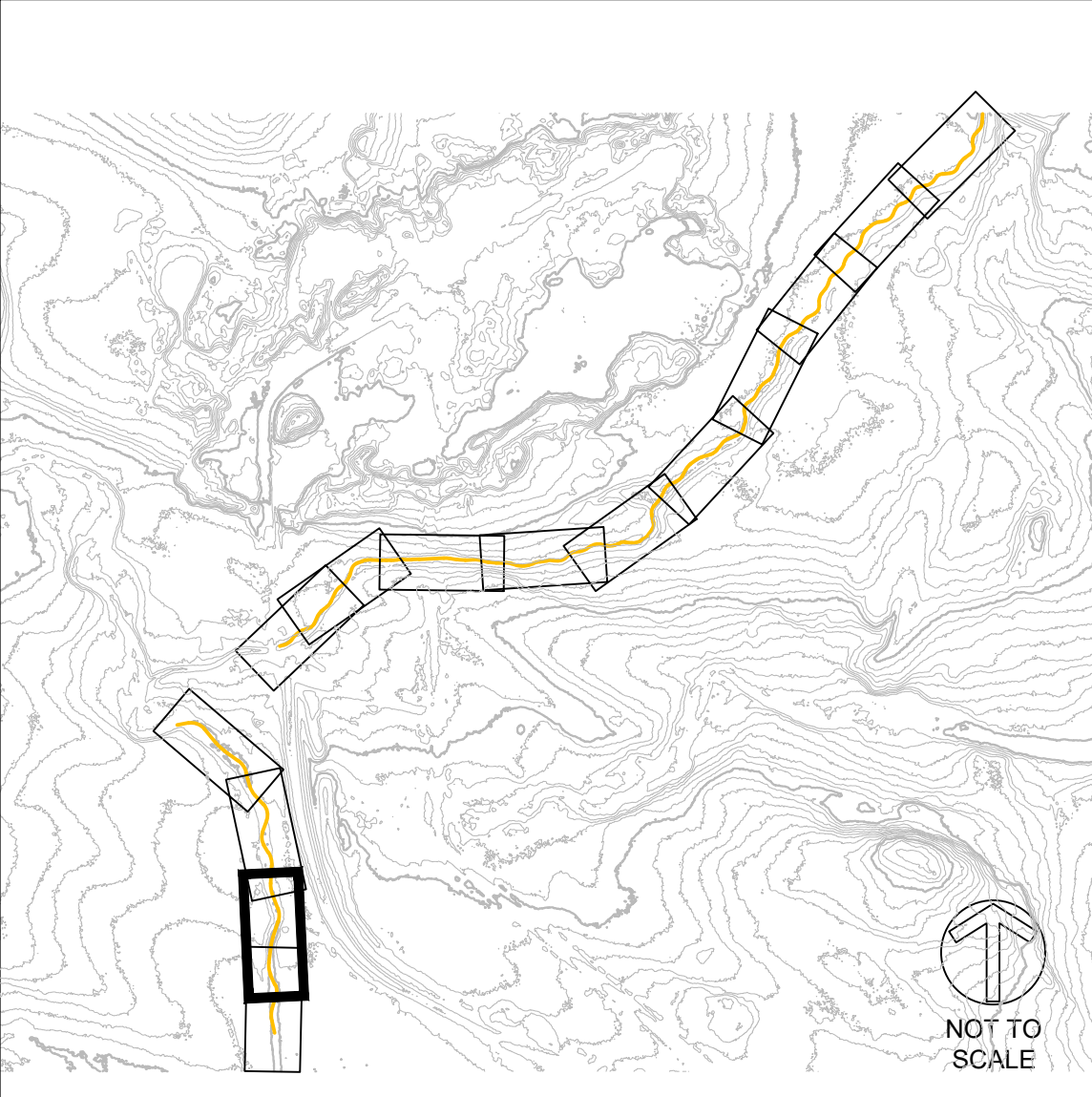
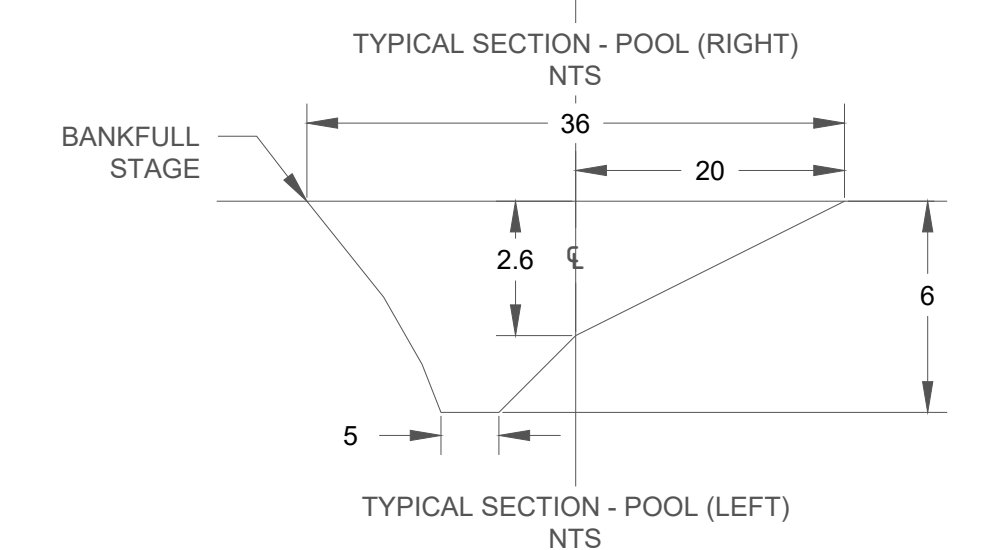
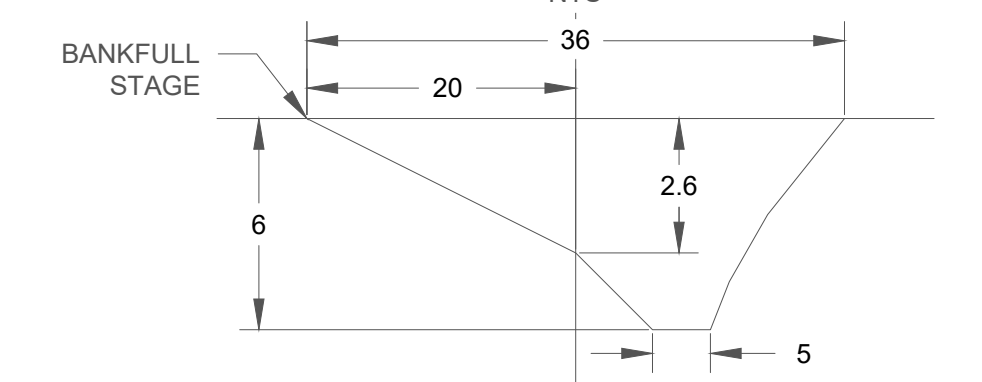
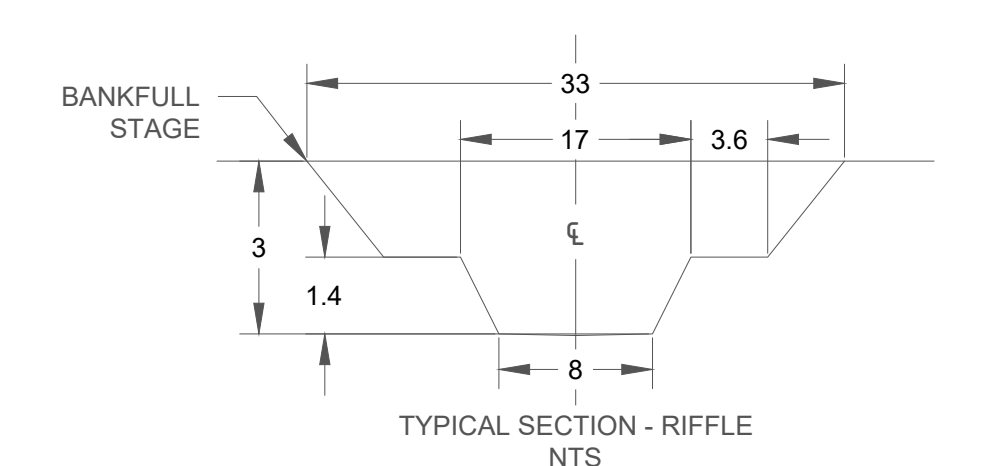
SHEET NUMBER
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- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
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SEE SHEET 42
 - BOULDER CONSTRUCTED RIFFLE
SEE SHEET 43
 - HABITAT LOG
SEE SHEET 46
 - ROCK GLIDE RIFFLE
SEE SHEET 44

- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - HEADER AND FOOTER BOULDER
 - AUGMENTED RIFFLE



SCALE: HOR 1" = 1'; VERT 1" = 0'

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	4	BID SET			KA
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	XX				XX
	XX				XX
	XX				XX

**BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN**

BID SET - NOT FOR CONSTRUCTION

**BIG 39
PLAN AND PROFILE - (3)
STA 12+00 TO 18+00**

CLIFFS

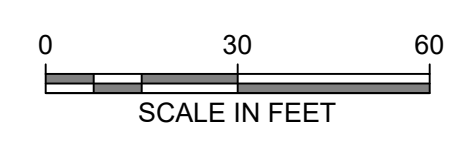
NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

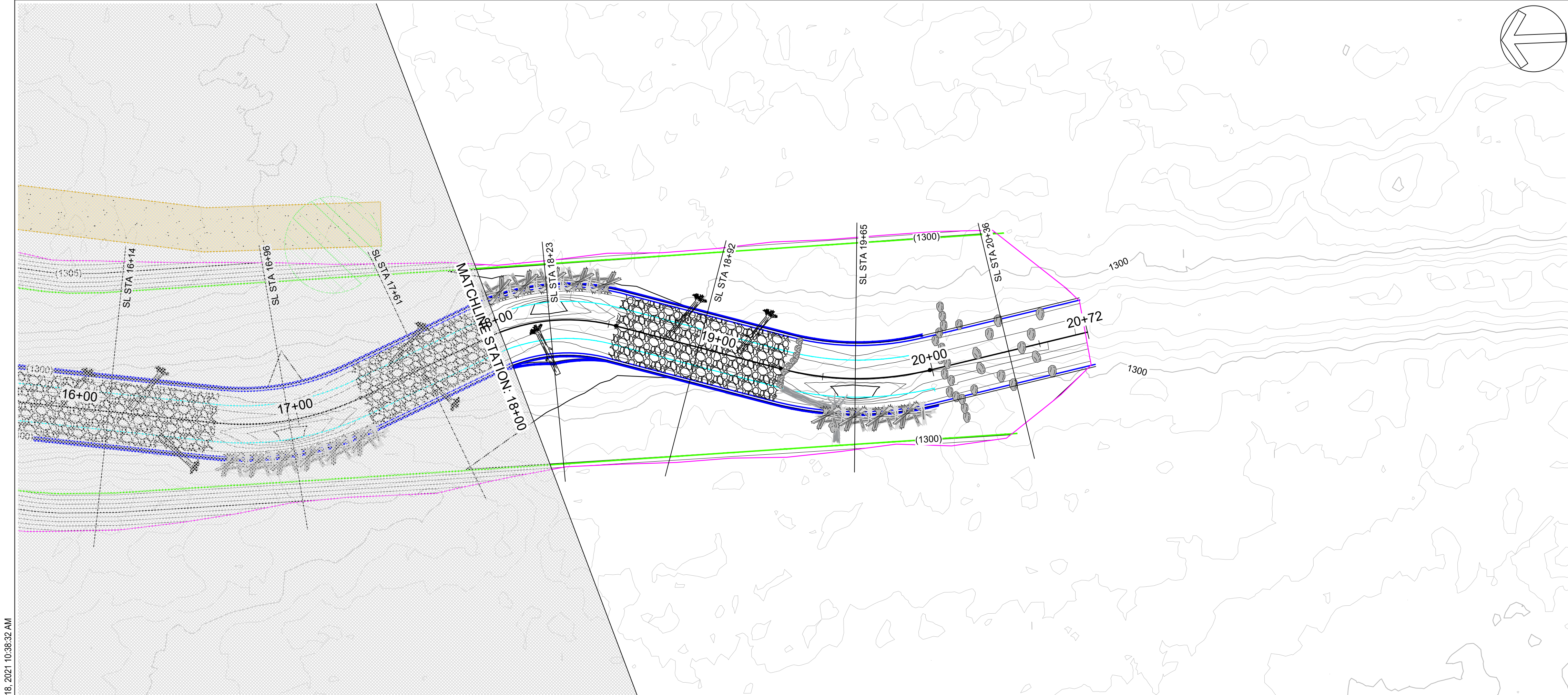
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CONSTRUCTION**

DATE: 10/15/2021
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SHEET NUMBER
8 OF 50

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PLAN LEGEND

PROPOSED STREAM CENTER LINE

PROPOSED INNER BERM

PROPOSED GEOMORPHIC CHANNEL TOB

PROPOSED FLOODPLAIN TOE

LIMITS OF DISTURBANCE

(483)

PROPOSED MAJOR CONTOUR

PROPOSED MINOR CONTOUR

479

EXISTING MAJOR CONTOUR

EXISTING MINOR CONTOUR

GRAVEL RIFFLE
SEE SHEET 38

CONSTRUCTION ACCESS

STOCKPILE AREA
SEE SHEET 49

LOG J-HOOK
SEE SHEET 39

TOE WOOD
SEE SHEET 41

TRANSPLANTS
SEE SHEET 42

BOULDER CONSTRUCTED
RIFFLE
SEE SHEET 43

HABITAT LOG
SEE SHEET 46

ROCK GLIDE RIFFLE
SEE SHEET 44

PROFILE LEGEND

PROPOSED STREAM CENTER LINE

PROPOSED BANKFULL TOB

EXISTING GROUND

STRUCTURE BOULDER

HEADER AND FOOTER BOULDER

AUGMENTED RIFFLE

BANKFULL STAGE

33

17

3.6

3

1.4

8

TYPICAL SECTION - RIFFLE

NTS

BANKFULL STAGE

36

20

2.6

6

5

TYPICAL SECTION - POOL (RIGHT)

NTS

BANKFULL STAGE

36

20

2.6

6

5

TYPICAL SECTION - POOL (LEFT)

NTS

18+00

19+00

20+00

20+72

18+00

19+00

20+00

20+72

1305

1300

1295

1290

1285

PT: 18+53.42
ELEV: 1300.00

PC: 19+30.63
ELEV: 1299.91

PT: 19+68.07
ELEV: 1299.83

PT: 18+23.09
ELEV: 1294.22

PT: 18+53.42
ELEV: 1297.14

PC: 19+30.63
ELEV: 1296.99

MID: 19+64.75
ELEV: 1294.07

PT: 19+68.07
ELEV: 1296.99

Sta=19+32.29
Inv=1297.20

Sta=19+59.46
Inv=1296.99

0.19%

0.15%

SCALE: HOR 1" = 1'; VERT 1" = 0'

APPROVED BY: KA

CHECKED BY: MJG

DRAWN BY: GET

REV

DESCRIPTION

APPRV

1

DRAFT 30% DESIGN

KA

2

DRAFT 60%

KA

3

DRAFT 90%

KA

4

BID SET

KA

XX

XX

XX

XX

XX

XX

XX

XX

BIG AND LITTLE 39

STREAM RESTORATION

NEAR SILVER BAY

LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION

BIG 39

PLAN AND PROFILE - (4)

STA 18+00 TO 20+72

CLIFFS

NORTHSHORE MINING CO

10 OUTER DR

SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC.

5752 EAGLE VIEW DRIVE

DULUTH, MN 55803

BID SET

NOT FOR

CONSTRUCTION

DATE:

10/15/2021

SCALE (34"x22"):

1" = 30'

SCALE (17"x11"):

1" = 60'

0

30

60

SCALE IN FEET

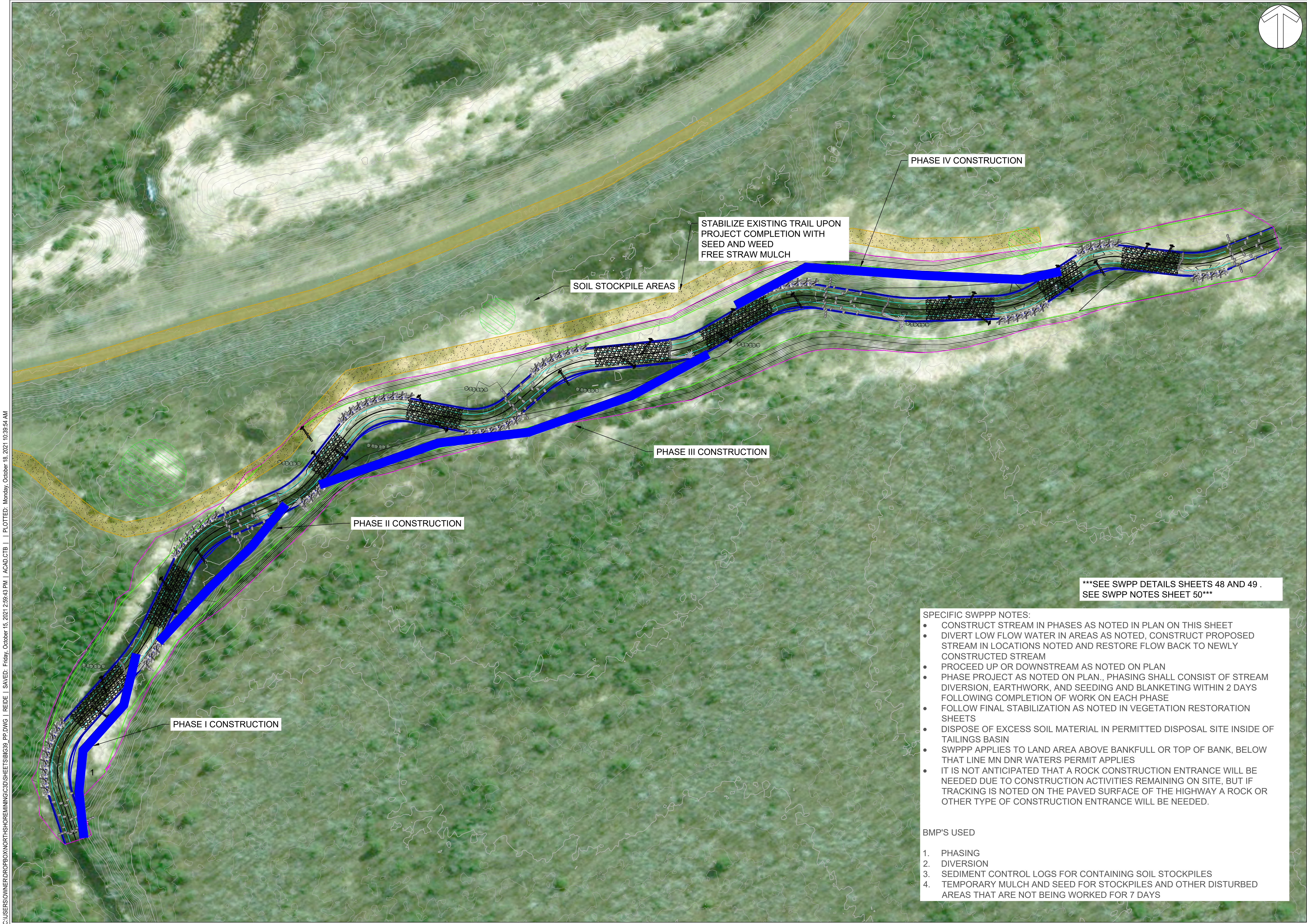
SHEET NUMBER

9

OF

50

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***SEE SWPP DETAILS SHEETS 48 AND 49 .
SEE SWPP NOTES SHEET 50***

SPECIFIC SWPPP NOTES:

- CONSTRUCT STREAM IN PHASES AS NOTED IN PLAN ON THIS SHEET
- DIVERT LOW FLOW WATER IN AREAS AS NOTED, CONSTRUCT PROPOSED STREAM IN LOCATIONS NOTED AND RESTORE FLOW BACK TO NEWLY CONSTRUCTED STREAM
- PROCEED UP OR DOWNSTREAM AS NOTED ON PLAN
- PHASE PROJECT AS NOTED ON PLAN., PHASING SHALL CONSIST OF STREAM DIVERSION, EARTHWORK, AND SEEDING AND BLANKETING WITHIN 2 DAYS FOLLOWING COMPLETION OF WORK ON EACH PHASE
- FOLLOW FINAL STABILIZATION AS NOTED IN VEGETATION RESTORATION SHEETS
- DISPOSE OF EXCESS SOIL MATERIAL IN PERMITTED DISPOSAL SITE INSIDE OF TAILINGS BASIN
- SWPPP APPLIES TO LAND AREA ABOVE BANKFULL OR TOP OF BANK, BELOW THAT LINE MN DNR WATERS PERMIT APPLIES
- IT IS NOT ANTICIPATED THAT A ROCK CONSTRUCTION ENTRANCE WILL BE NEEDED DUE TO CONSTRUCTION ACTIVITIES REMAINING ON SITE, BUT IF TRACKING IS NOTED ON THE PAVED SURFACE OF THE HIGHWAY A ROCK OR OTHER TYPE OF CONSTRUCTION ENTRANCE WILL BE NEEDED.

BMP'S USED

1. PHASING
2. DIVERSION
3. SEDIMENT CONTROL LOGS FOR CONTAINING SOIL STOCKPILES
4. TEMPORARY MULCH AND SEED FOR STOCKPILES AND OTHER DISTURBED AREAS THAT ARE NOT BEING WORKED FOR 7 DAYS

STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
BIG 39

OVERVIEW - SWPPP



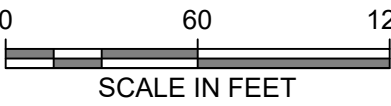
NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

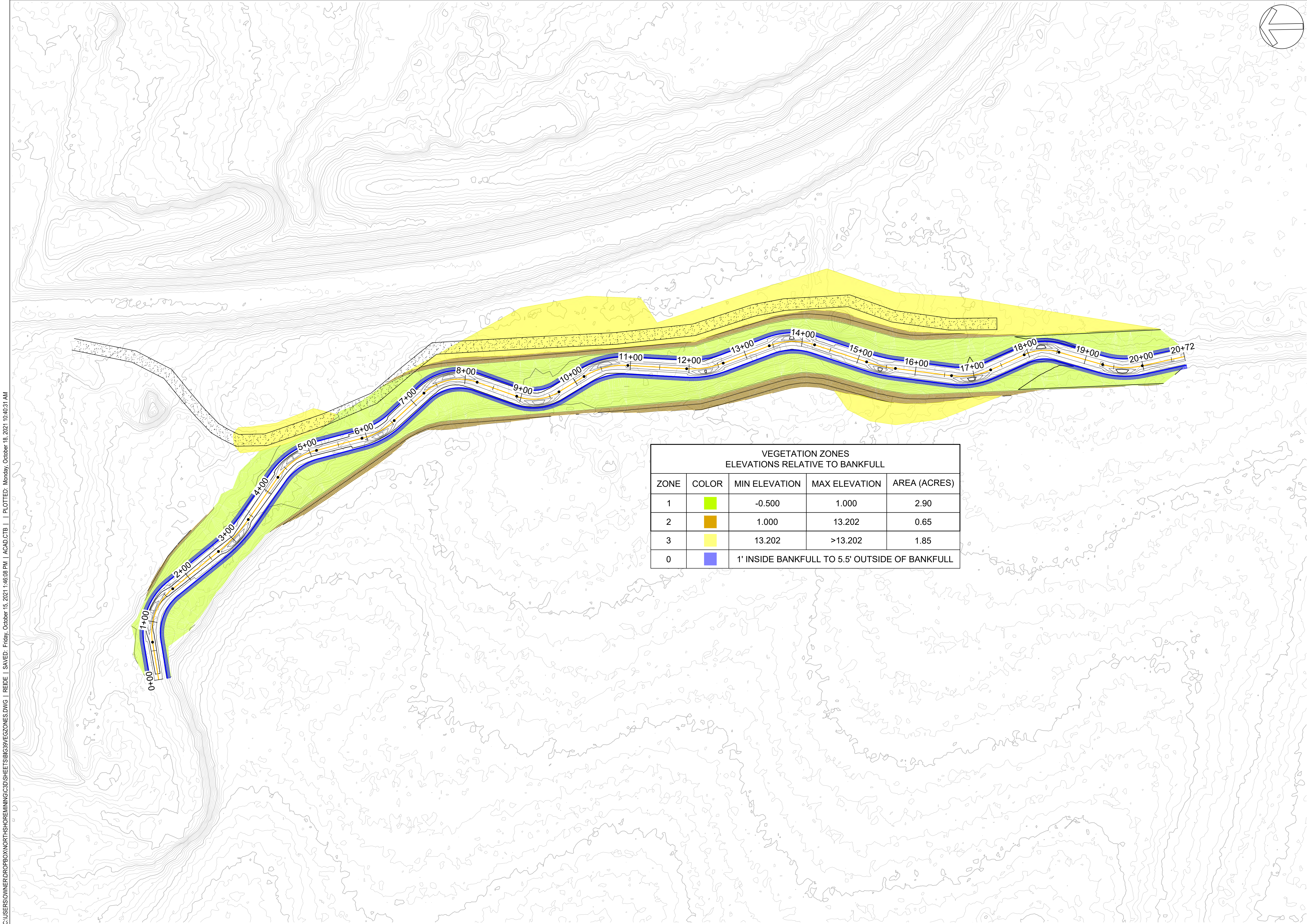
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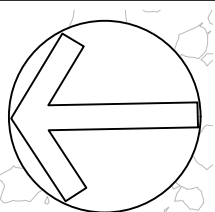
SHEET NUMBER
12 OF 50

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	XX			XX

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VEGETATION ZONES ELEVATIONS RELATIVE TO BANKFULL				
ZONE	COLOR	MIN ELEVATION	MAX ELEVATION	AREA (ACRES)
1	■	-0.500	1.000	2.90
2	■	1.000	13.202	0.65
3	■	13.202	>13.202	1.85
0	■	1' INSIDE BANKFULL TO 5.5' OUTSIDE OF BANKFULL		



APPROVED BY: KA

REV

CHECKED BY: KA

DESCRIPTION

DRAWN BY: GET

APPRV

DRAFT 30% DESIGN

DRAFT 60%

DRAFT 90%

BID SET

XX

XX

XX

XX

KA

KA

KA

KA

XX


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XX

BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
BIG 39
OVERVIEW - VEGETATION



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING
BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

DATE: 10/15/2021
SCALE (34"x22"): 1" = 75'
SCALE (17"x11"): 1" = 150'

075150

SCALE IN FEET

SHEET NUMBER
13 OF 50

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LEGEND

(483)

PROPOSED MAJOR CONTOUR (10')

479

PROPOSED MINOR CONTOUR (2')

EXISTING MAJOR CONTOUR (10')

EXISTING MINOR CONTOUR (2')

PROPOSED CHANNEL CENTERLINE

PROPOSED BANKFULL

LIMITS OF DISTURBANCE

FRESHWATER - FORESTED AND SHRUB WETLAND

FRESHWATER EMERGENT WETLAND

FRESHWATER POND

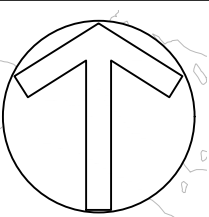
ESTUARINE AND MARINE WETLAND

RIVERINE

LAKES

ESTUARINE AND MARINE DEEPWATER

OTHER FRESHWATER WETLAND



APPROVED BY: KA

CHECKED BY: MJG

DRAWN BY: GET

REV

DESCRIPTION

APPROV

1

DRAFT 30% DESIGN

KA

2

DRAFT 60%

KA

3

DRAFT 90%

KA

4

BID SET

KA

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XX


BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION

OVERLAY - NATIONAL WETLAND INVENTORY



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



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BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

DATE: 10/15/2021
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SCALE (17"x11"): 1" = 200'

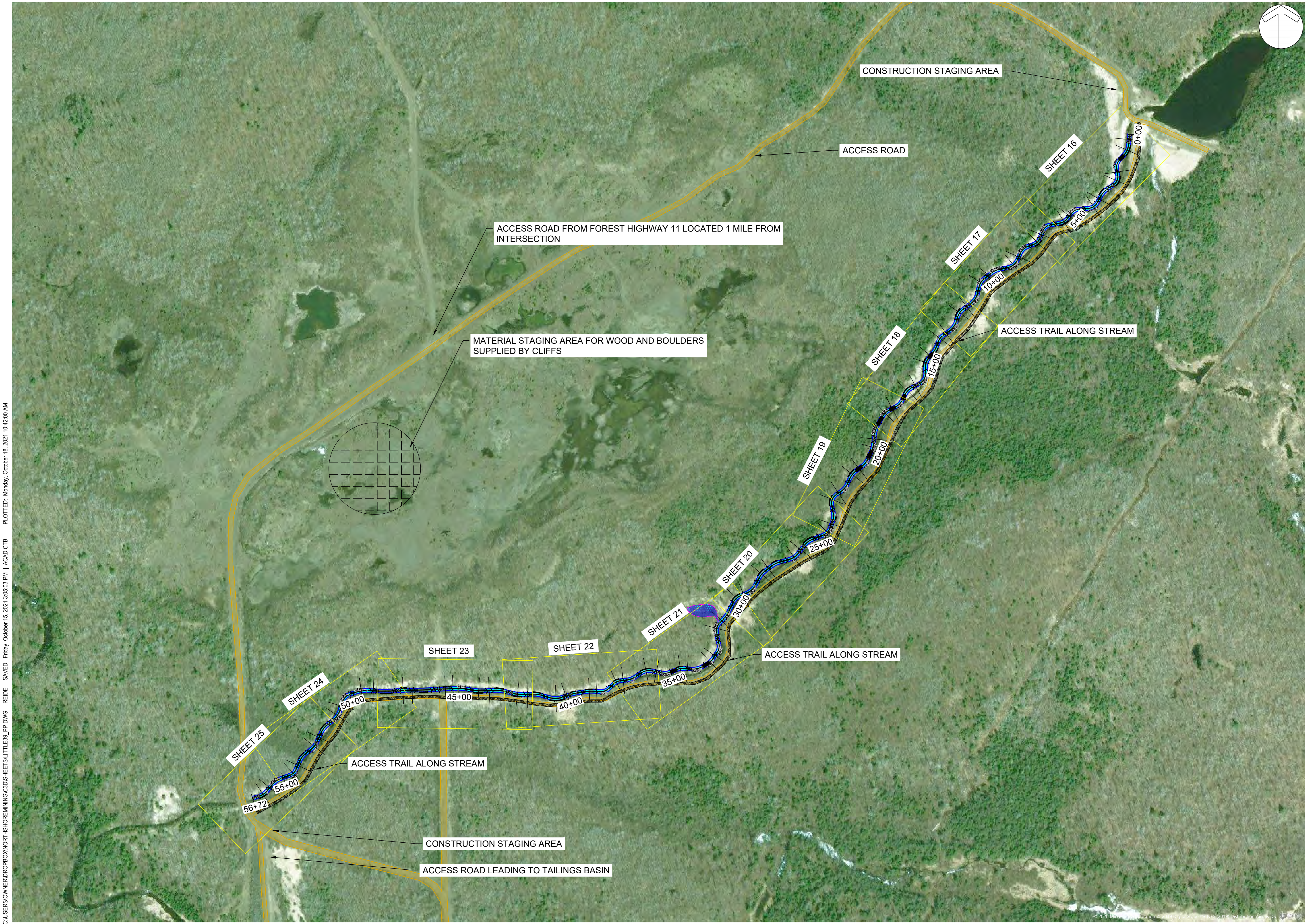
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SCALE IN FEET

SHEET NUMBER

14 OF 50

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REV
1
2
3
4
XX
XX
XX
XX

CHECKED BY: MUG
DESCRIPTION
DRAFT 30% DESIGN
DRAFT 60%
DRAFT 90%
BID SET
XX
XX
XX
XX

DRAWN BY: GET
APPRV
KA
KA
KA
KA
KA
XX
XX
XX
XX

STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION

LITTLE 39
OVERVIEW

CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING
BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

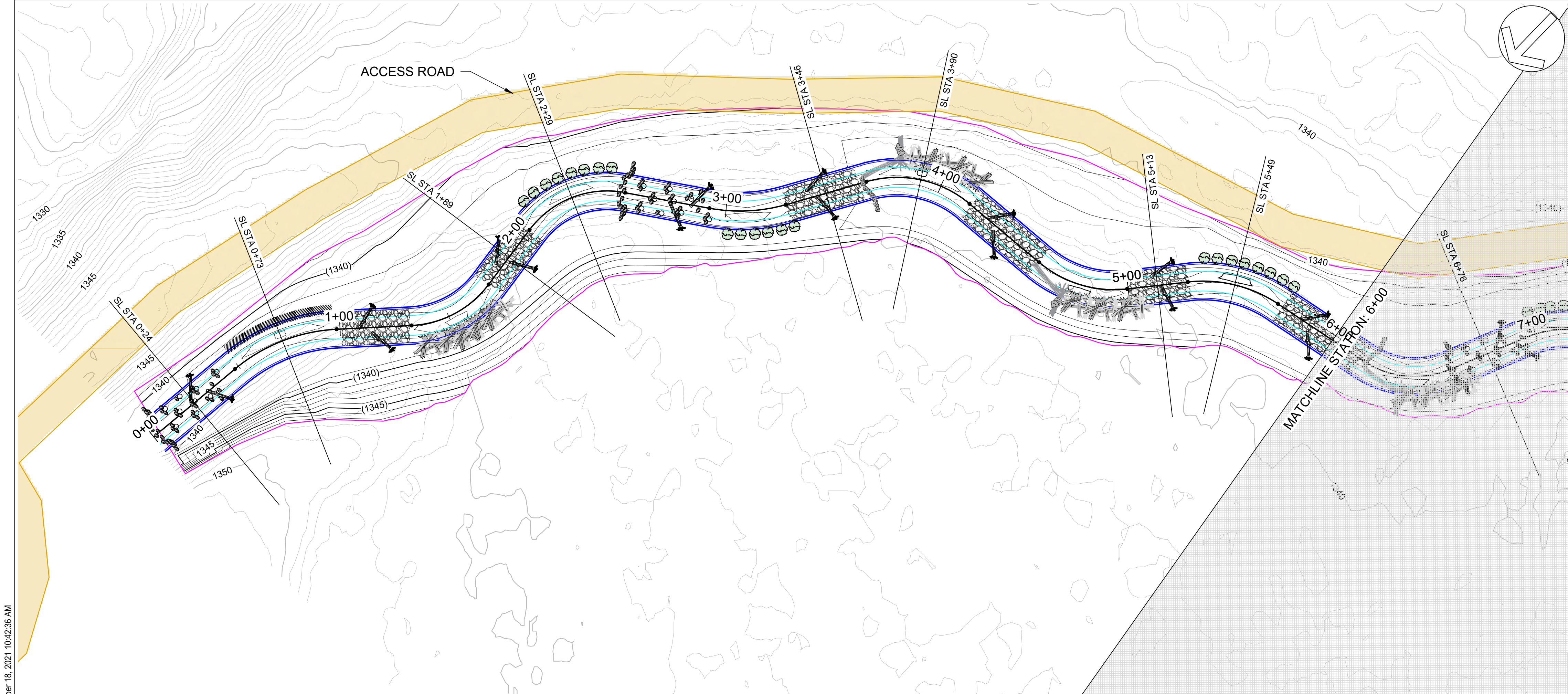
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CONSTRUCTION

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SHEET NUMBER
15 OF 50

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PLAN LEGEND

- PROPOSED STREAM CENTER LINE
- PROPOSED INNER BERM
- PROPOSED GEOMORPHIC CHANNEL TOB
- PROPOSED FLOODPLAIN TOE
- LIMITS OF DISTURBANCE
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR

PROFILE LEGEND

- PROPOSED STREAM CENTER LINE
- PROPOSED BANKFULL TOB
- EXISTING GROUND

STRUCTURE

- BOULDER
- AUGMENTED RIFFLE
- HEADER AND FOOTER BOULDER

TRANSPLANTS

- SEE SHEET 47

CONSTRUCTED RIFFLE

- SEE SHEET 43

HABITAT LOG

- SEE SHEET 46

ROCK GLIDE RIFFLE

- SEE SHEET 44

BOULDER J-HOOK

- SEE SHEET 45

LOG VANE

- SEE SHEET 40

GRAVEL RIFFLE

- SEE SHEET 38

CONSTRUCTION ACCESS

STOCKPILE AREA

- SEE SHEET 49

LOG J-HOOK

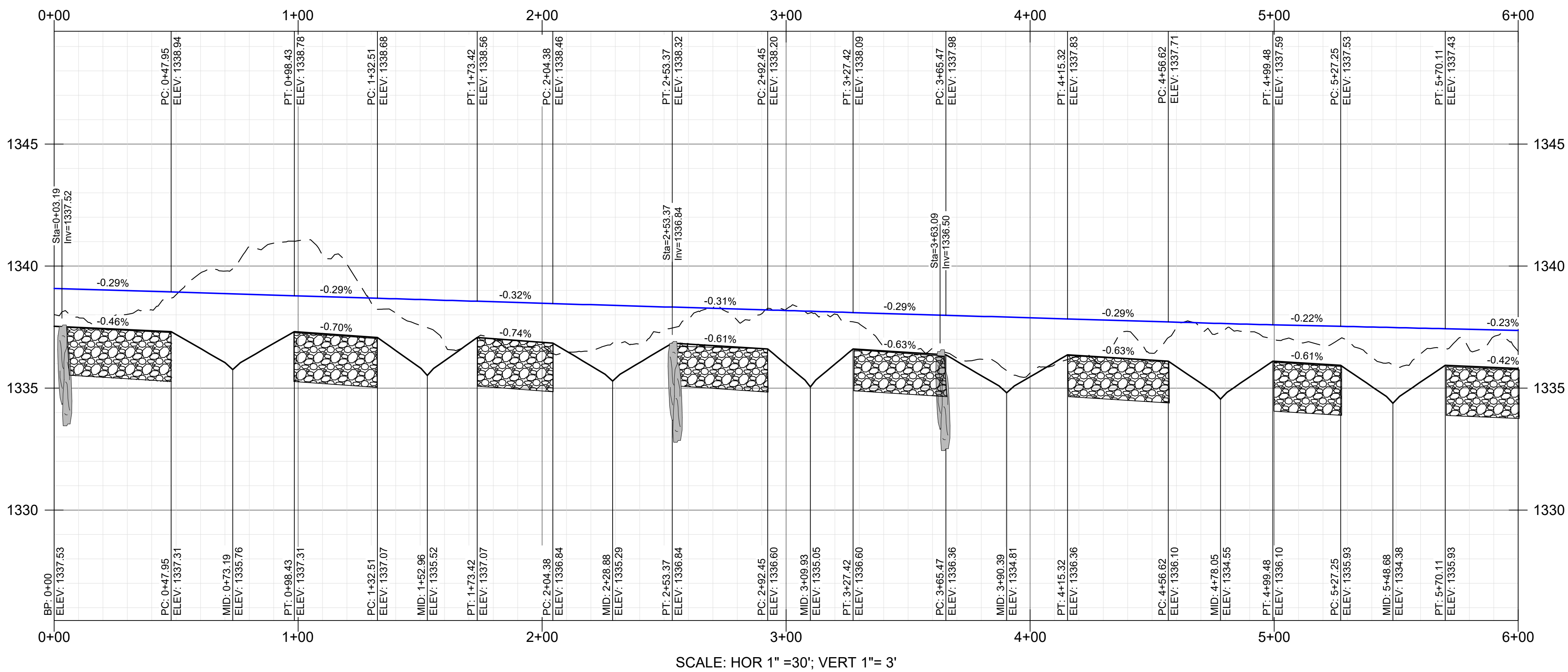
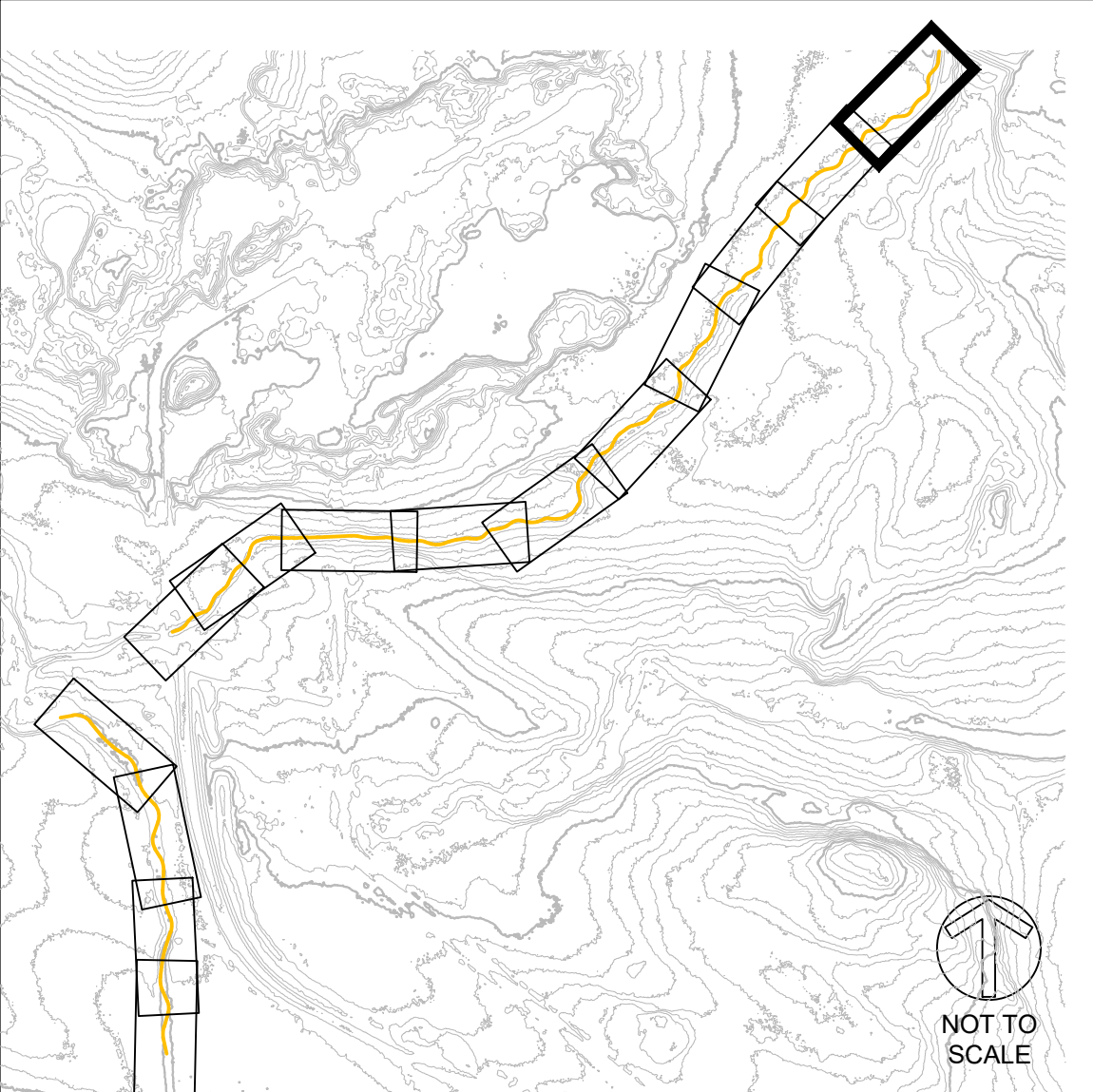
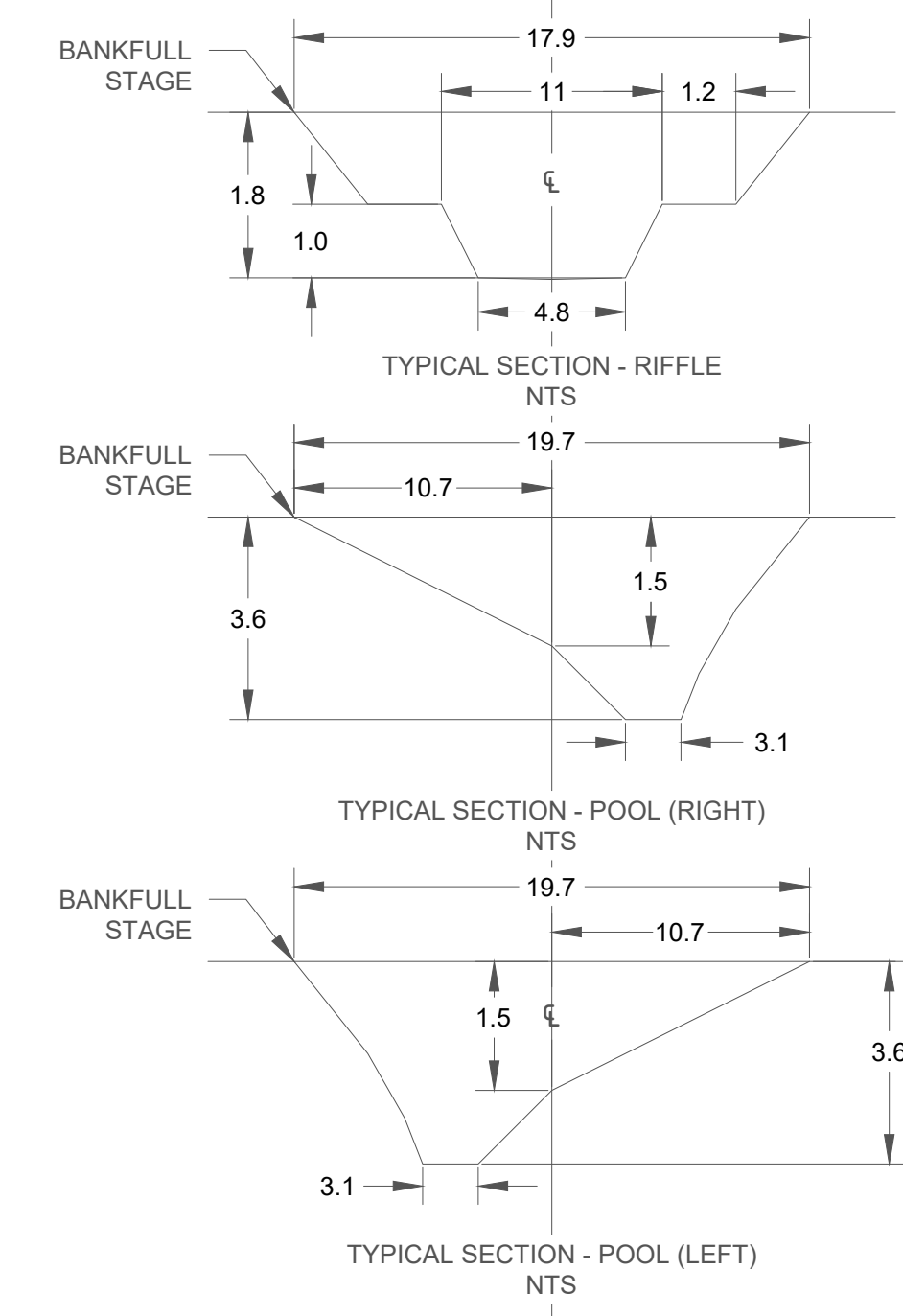
- SEE SHEET 39

TOE WOOD

- SEE SHEET 41

SOIL LIFT

- SEE SHEET 42



BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
LITTLE 39
PLAN AND PROFILE - (1)
STA 0+00 TO 6+00

CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

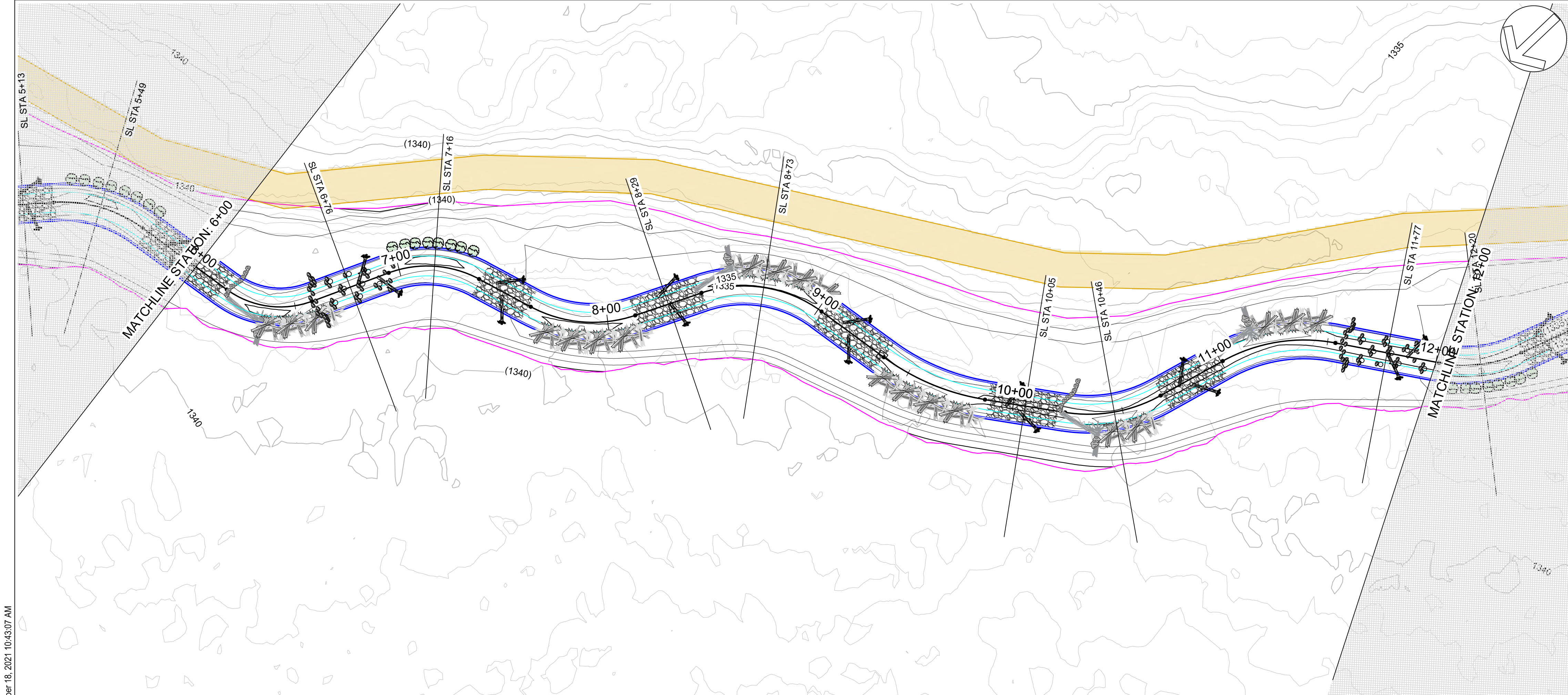
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SCALE (17"x11"): 1" = 60'

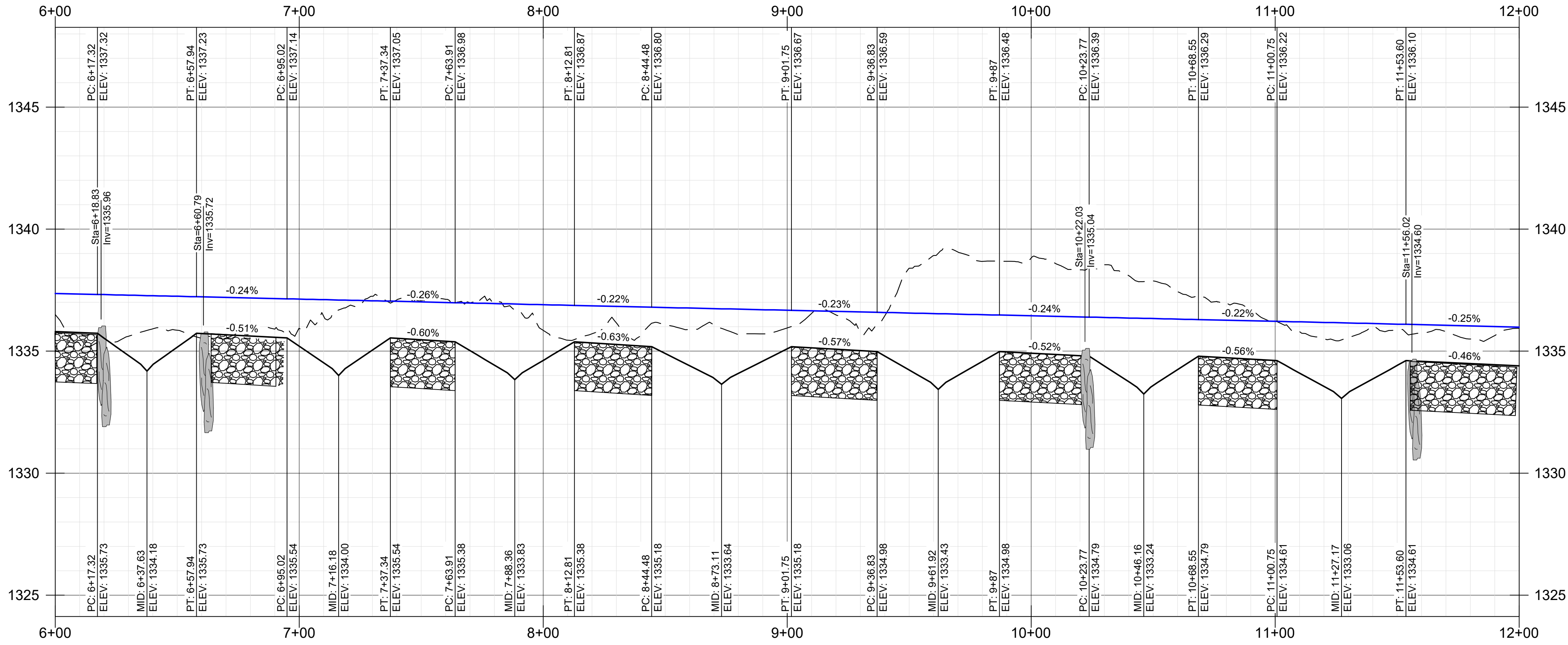
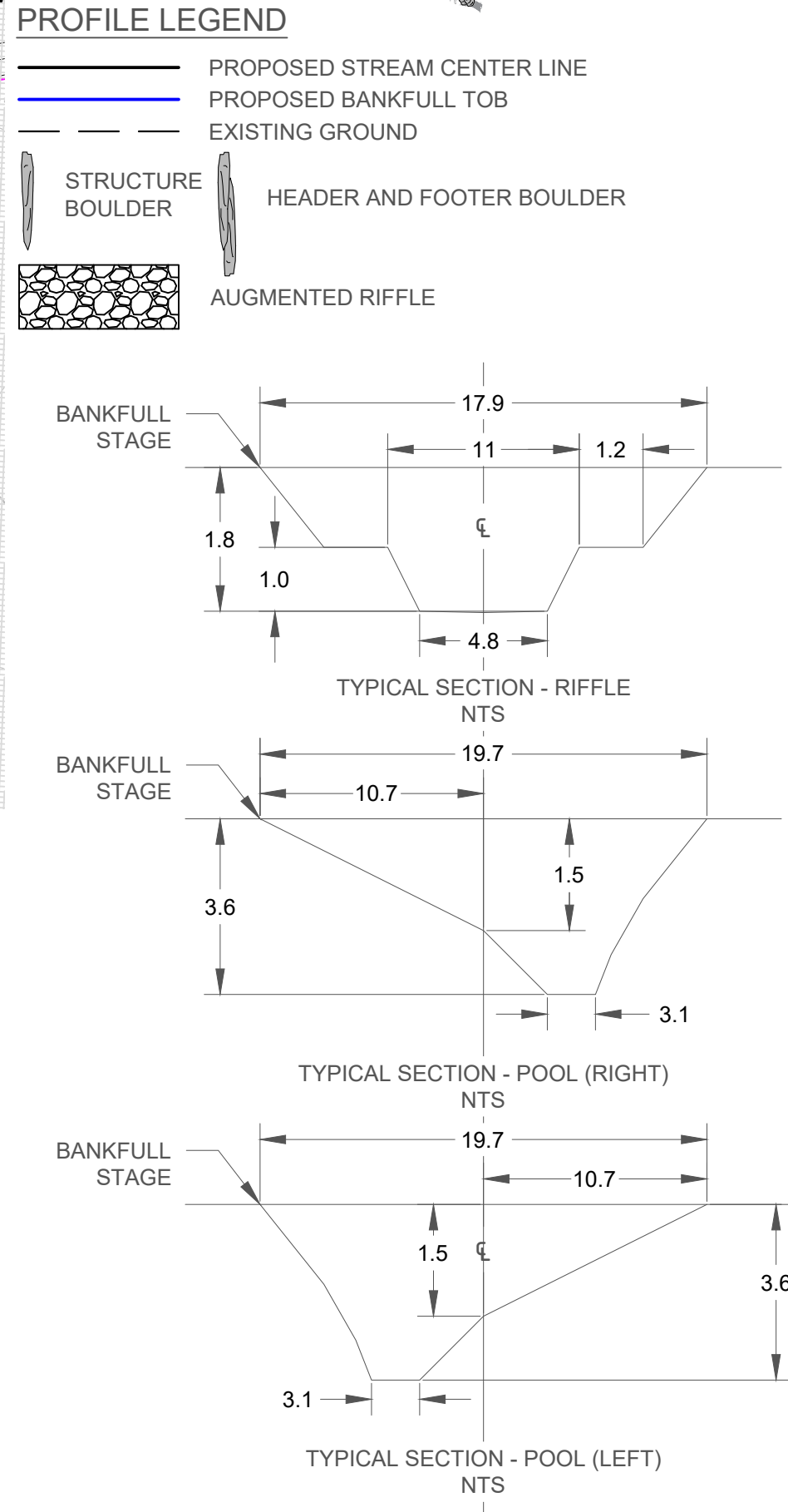
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SHEET NUMBER
16 OF 50

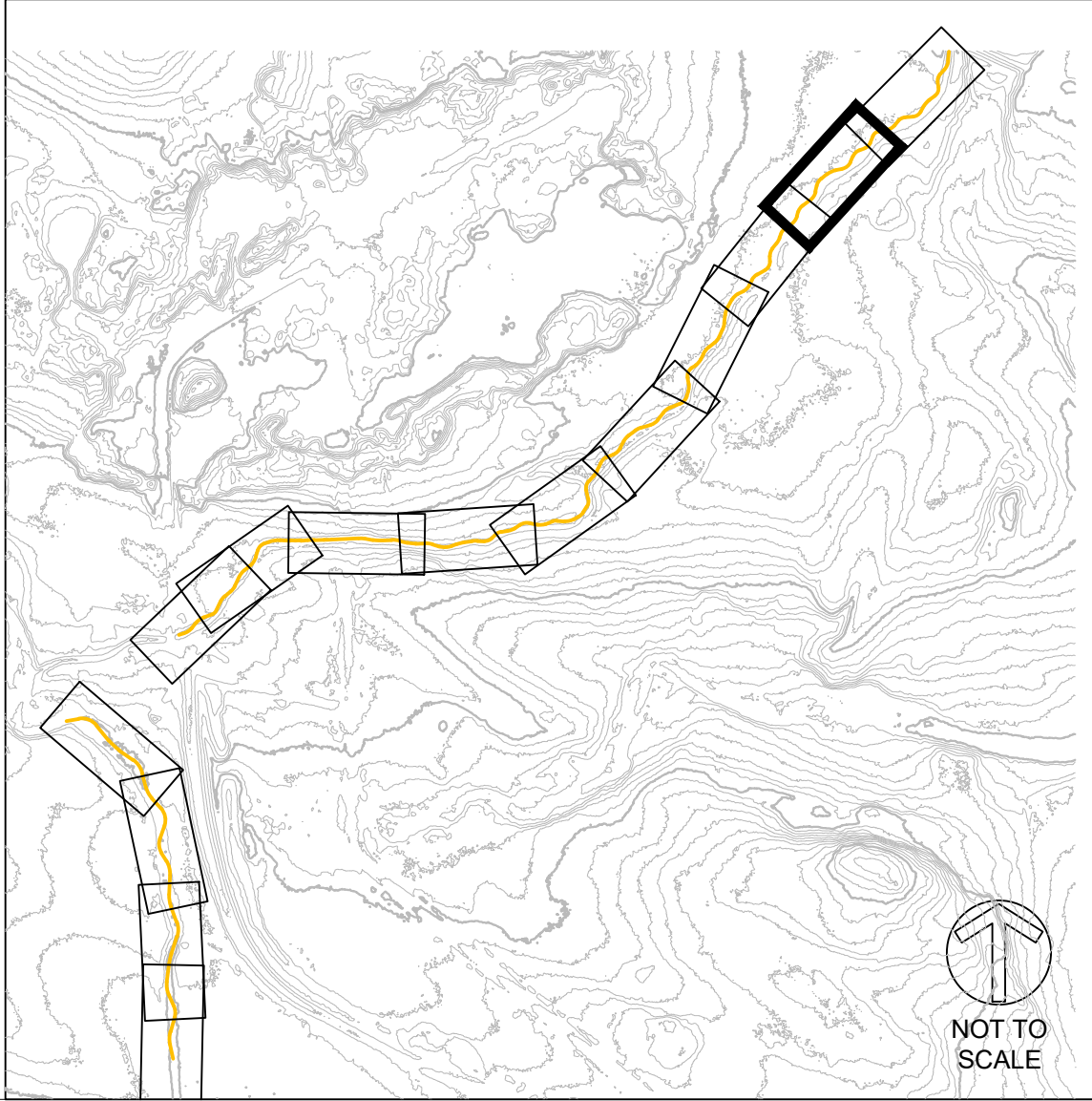
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- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE SEE SHEET 38
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA SEE SHEET 49
 - LOG J-HOOK SEE SHEET 39
 - TOE WOOD SEE SHEET 41
 - SOIL LIFT SEE SHEET 42
 - TRANSPLANTS SEE SHEET 47
 - CONSTRUCTED RIFFLE SEE SHEET 43
 - HABITAT LOG SEE SHEET 46
 - ROCK GLIDE RIFFLE SEE SHEET 44
 - BOULDER J-HOOK SEE SHEET 45
 - LOG VANE SEE SHEET 40
- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - AUGMENTED RIFFLE
 - HEADER AND FOOTER BOULDER



SCALE: HOR 1" = 30'; VERT 1" = 3'



APPROVED BY: KA

CHECKED BY: MAG

DRAWN BY: GET

REV	DESCRIPTION	APPROVED
1	DRAFT 30% DESIGN	KA
2	DRAFT 60%	KA
3	DRAFT 90%	KA
4	BID SET	KA
XX		XX
XX		XX
XX		XX
XX		XX

BIG AND LITTLE 39

STREAM RESTORATION

NEAR SILVER BAY

LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION

LITTLE 39

PLAN AND PROFILE - (2)

STA 6+00 TO 12+00

CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

DATE: 10/15/2021

SCALE (34"x22"): 1" = 30'

SCALE (17"x11"): 1" = 60'

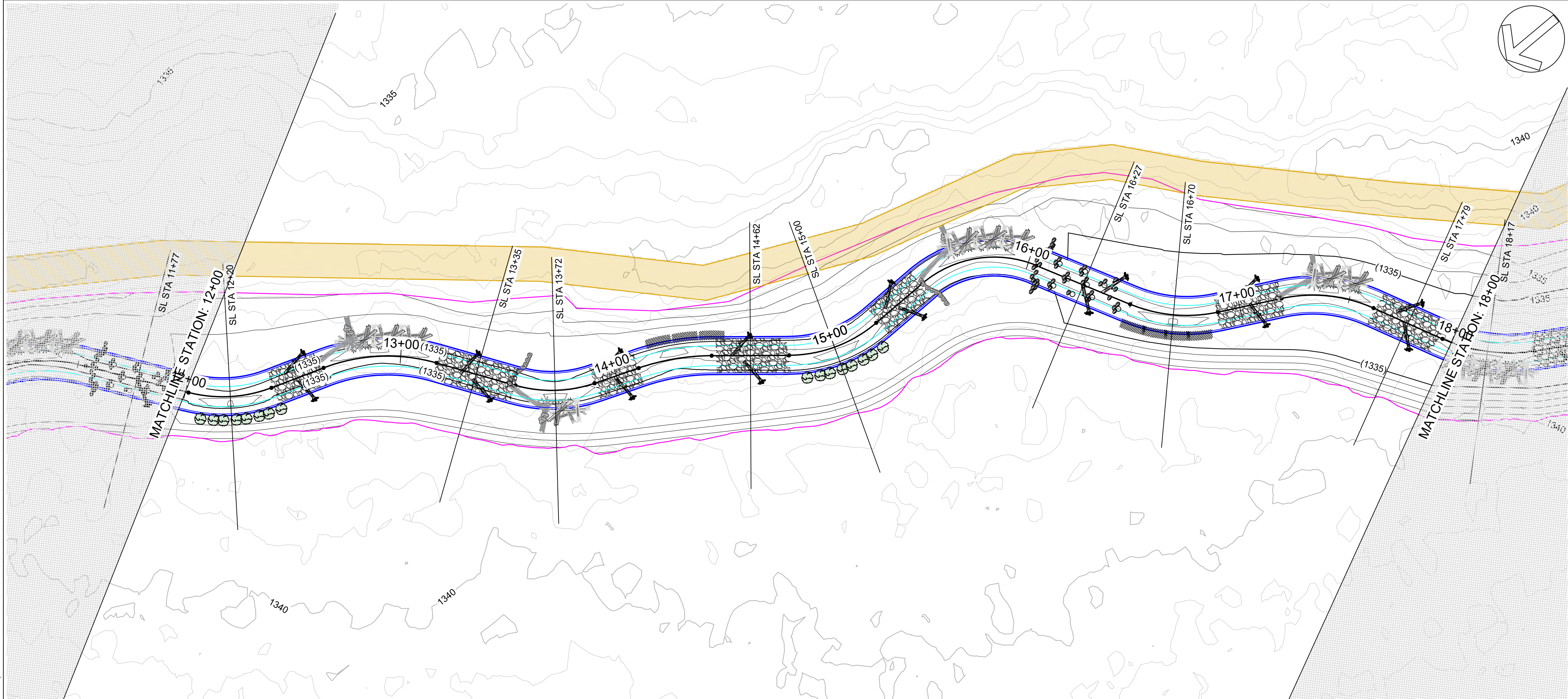
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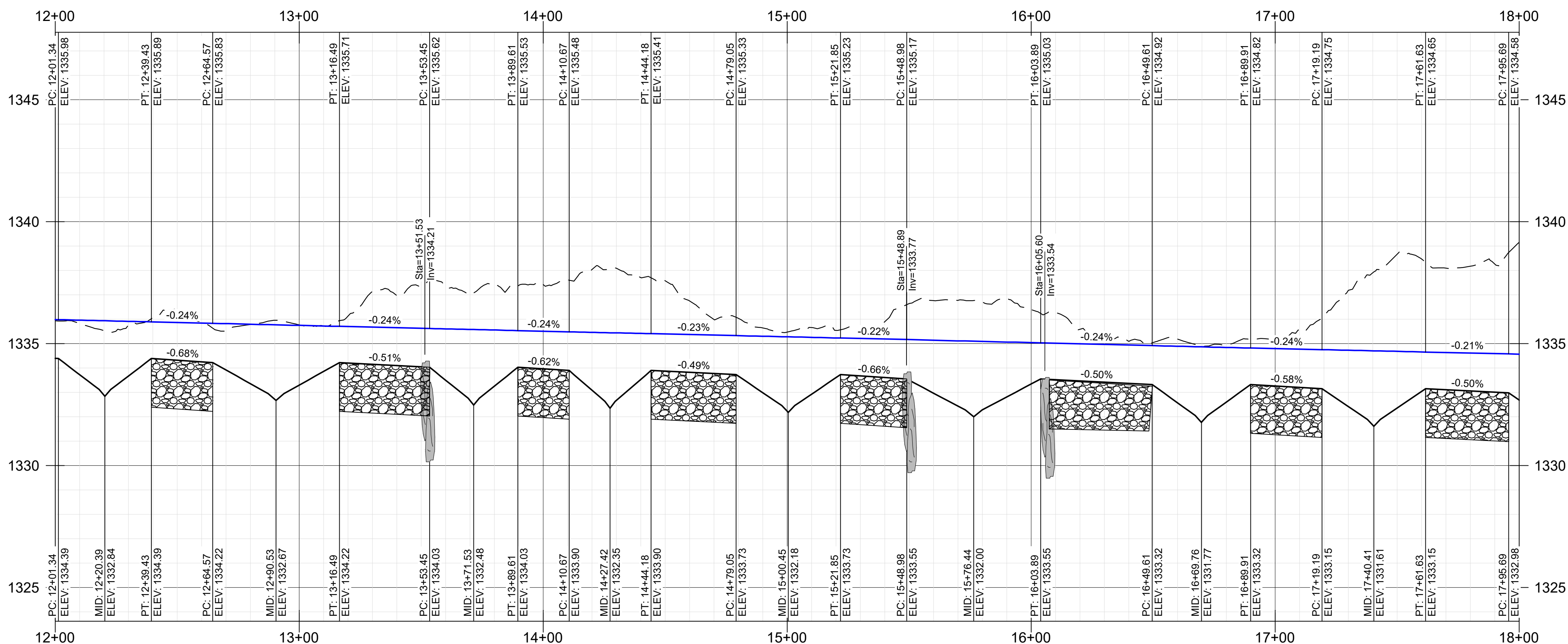
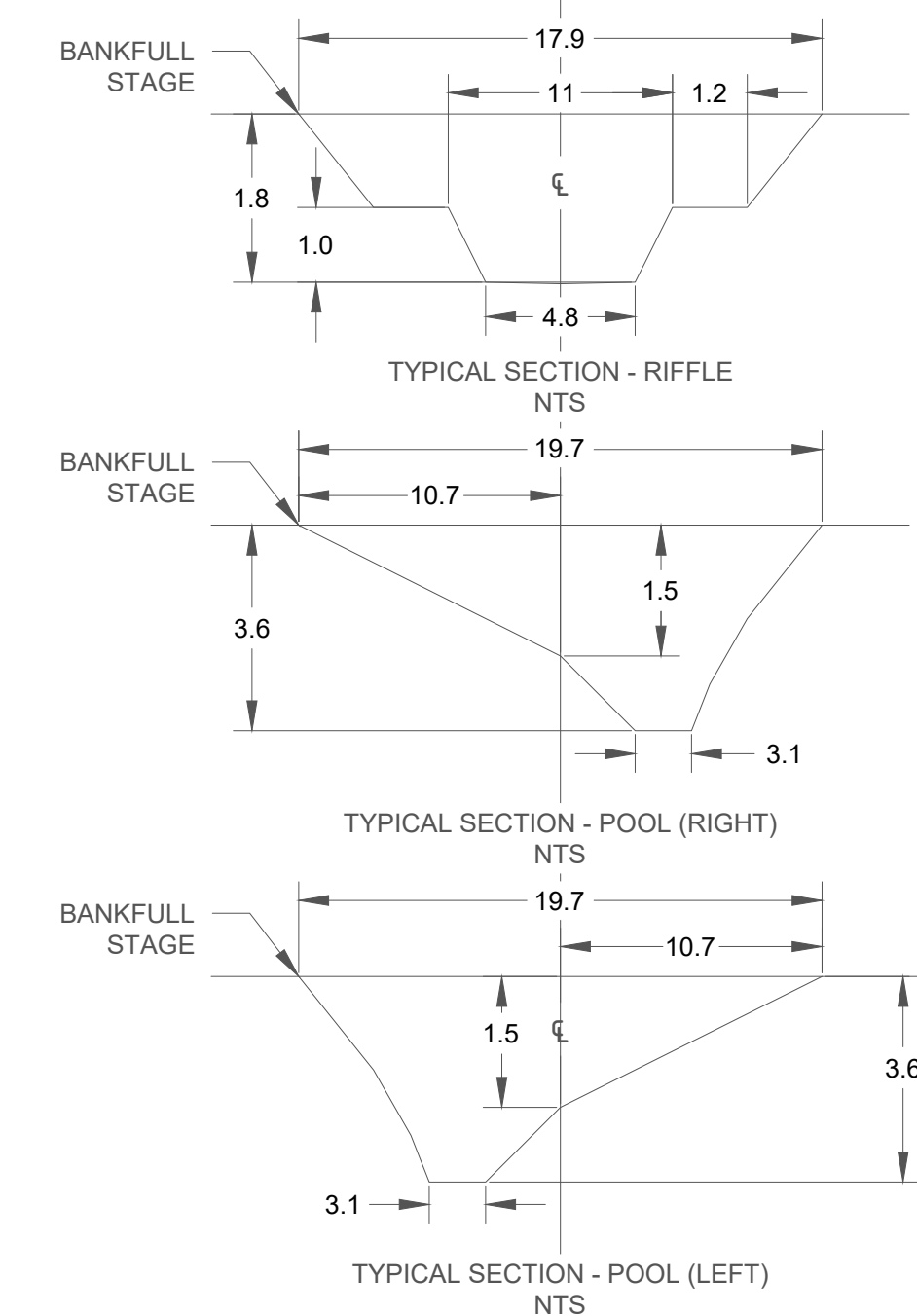
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17 OF 50

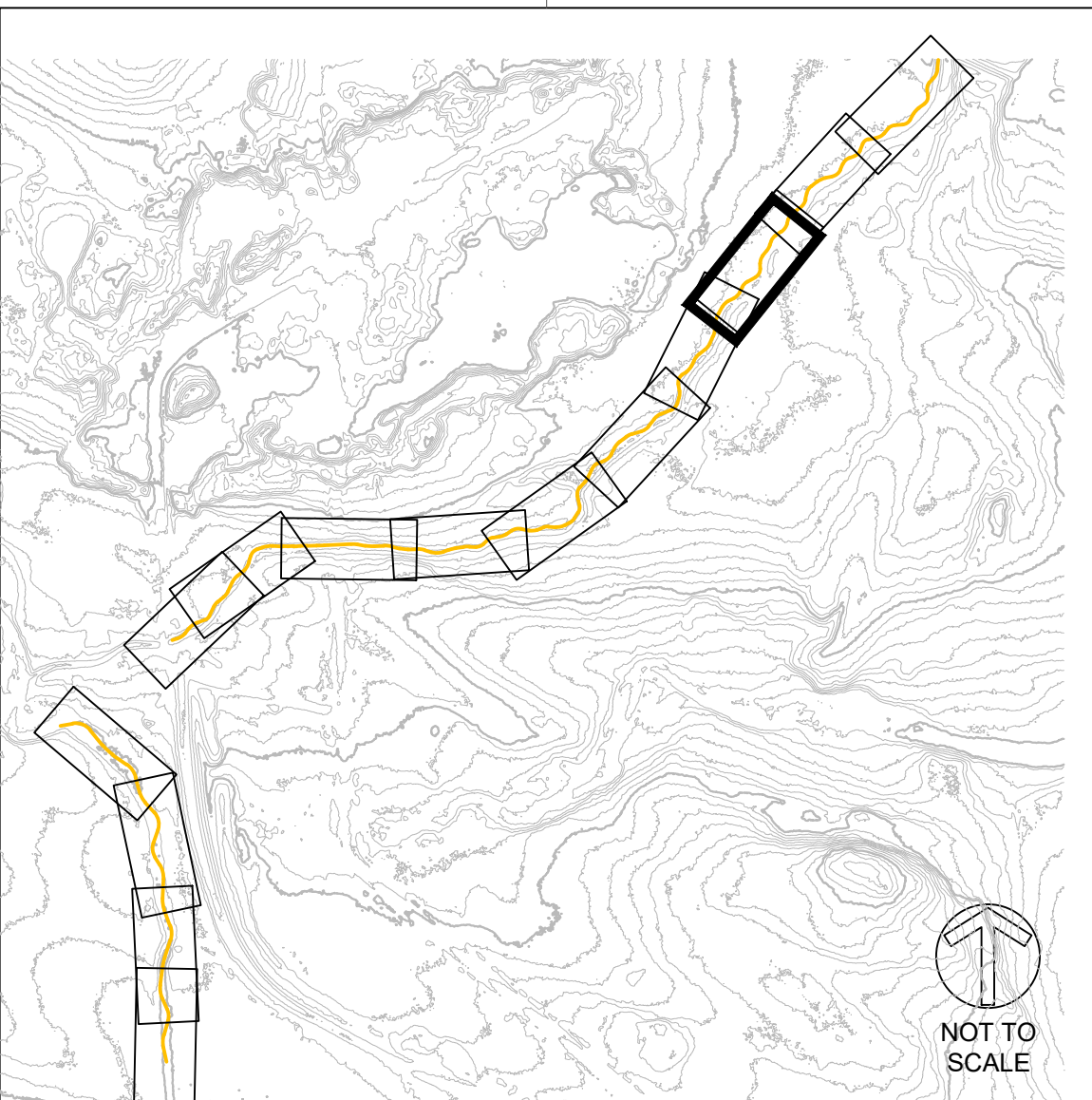
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- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE
SEE SHEET 38
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA
SEE SHEET 49
 - LOG J-HOOK
SEE SHEET 39
 - TOE WOOD
SEE SHEET 41
 - SOIL LIFT
SEE SHEET 42
 - TRANSPLANTS
SEE SHEET 47
 - CONSTRUCTED RIFFLE
SEE SHEET 43
 - HABITAT LOG
SEE SHEET 46
 - ROCK GLIDE RIFFLE
SEE SHEET 44
 - BOULDER J-HOOK
SEE SHEET 45
 - LOG VANE
SEE SHEET 40
- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - AUGMENTED RIFFLE
 - HEADER AND FOOTER BOULDER



SCALE: HOR 1" = 30'; VERT 1" = 3'



APPROVED BY: KA	CHECKED BY: MAG	DRAWN BY: GET
REV	DESCRIPTION	APPROV
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2	DRAFT 60%	KA
3	DRAFT 90%	KA
4	BID SET	KA
XX	XX	XX
XX	XX	XX
XX	XX	XX
XX	XX	XX

**BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN**

**BID SET - NOT FOR CONSTRUCTION
LITTLE 39
PLAN AND PROFILE - (3)
STA 12+00 TO 18+00**

CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

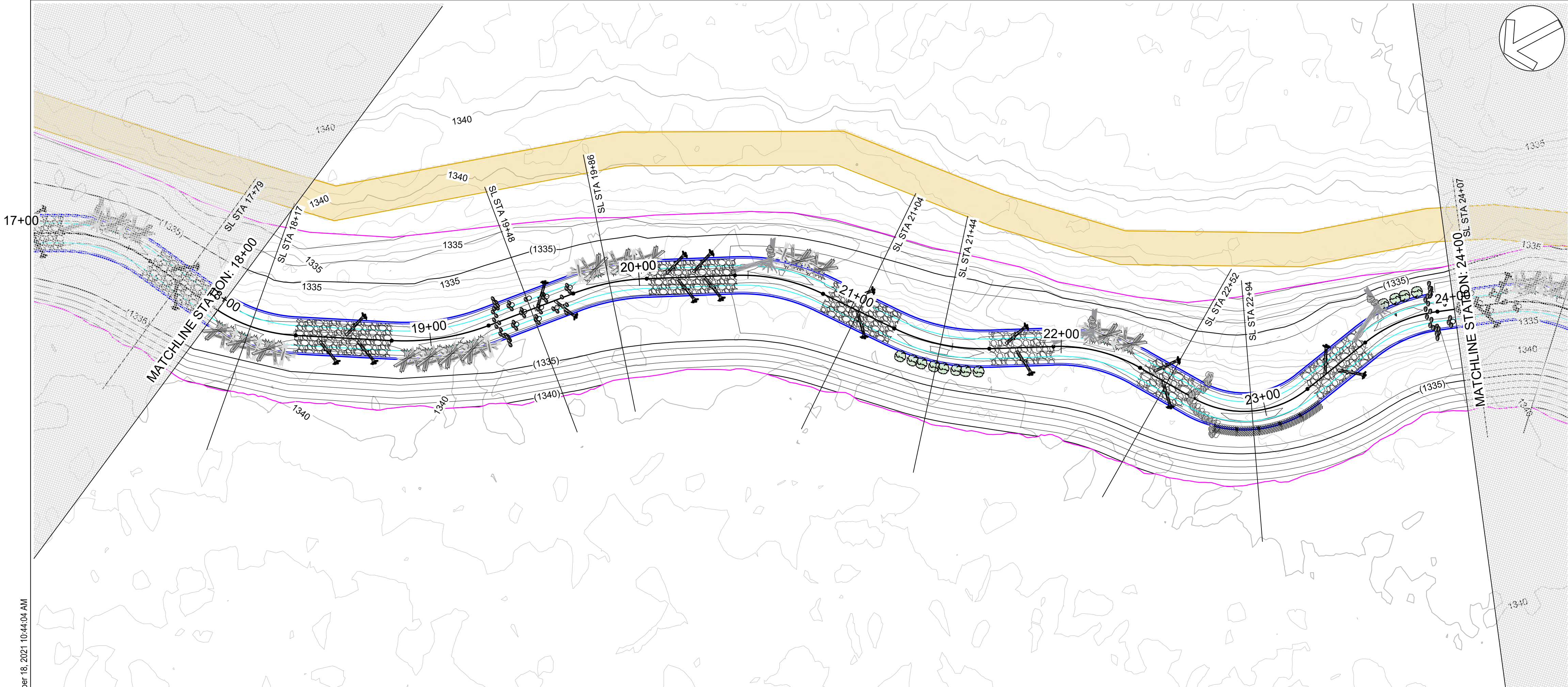
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NOT FOR
CONSTRUCTION**

DATE: 10/15/2021
SCALE (34"x22"): 1" = 30'
SCALE (17"x11"): 1" = 60'

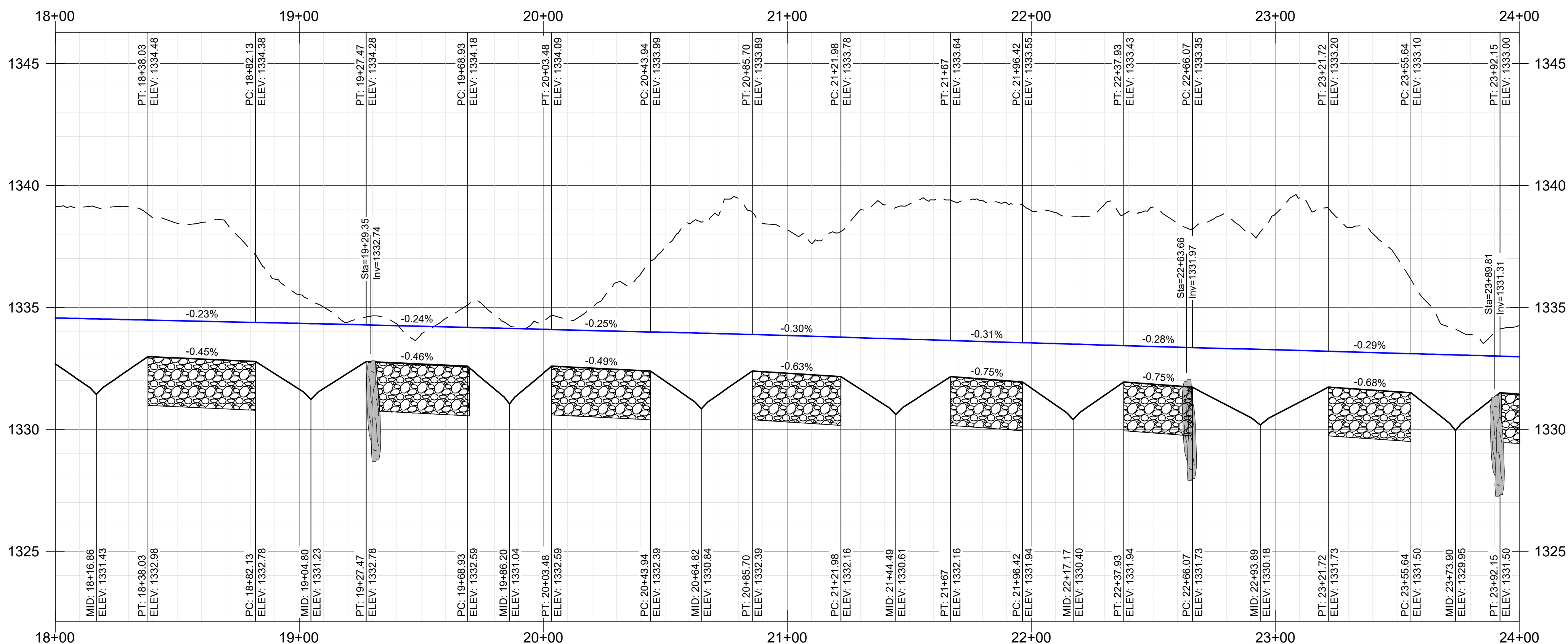
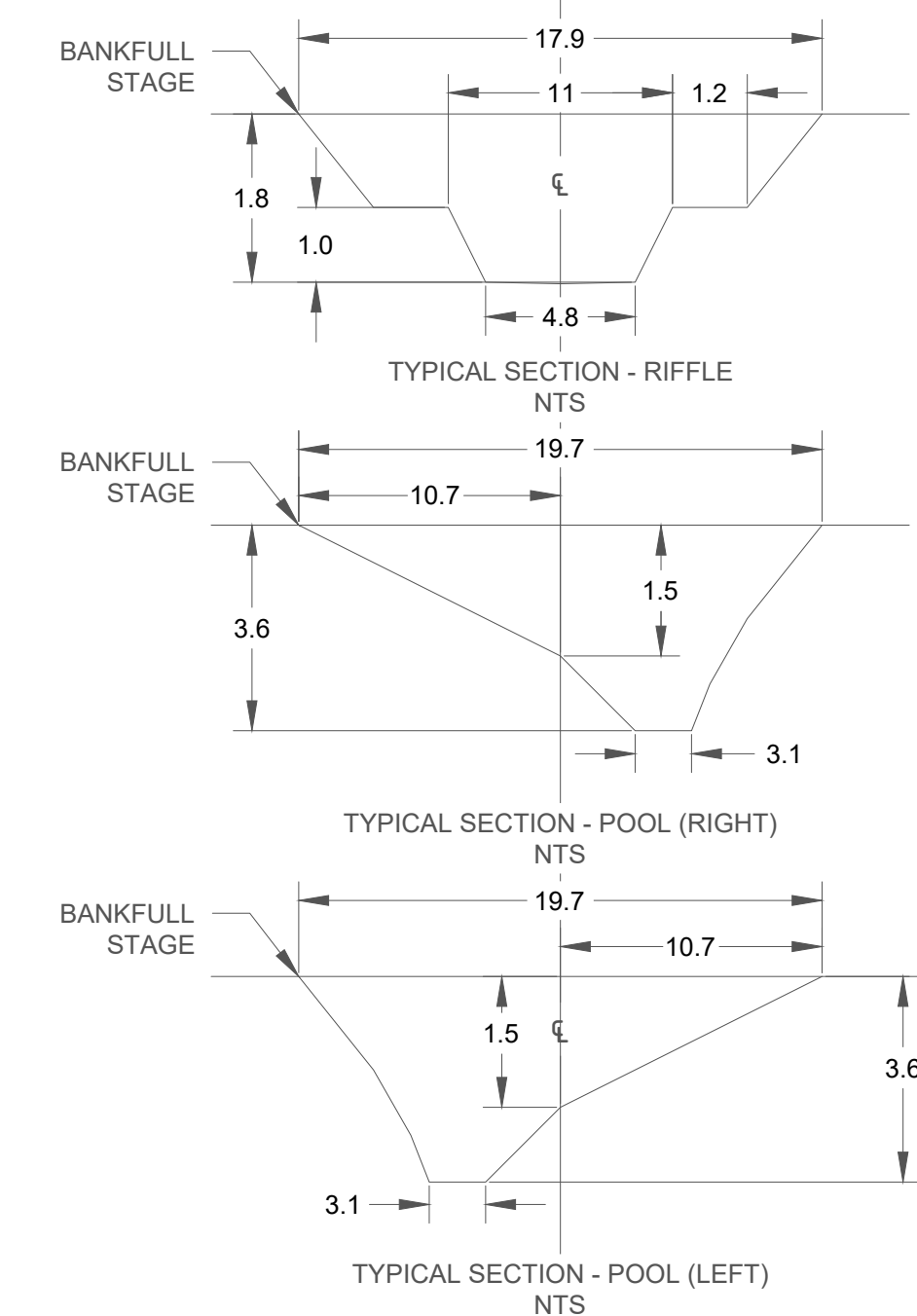
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SHEET NUMBER
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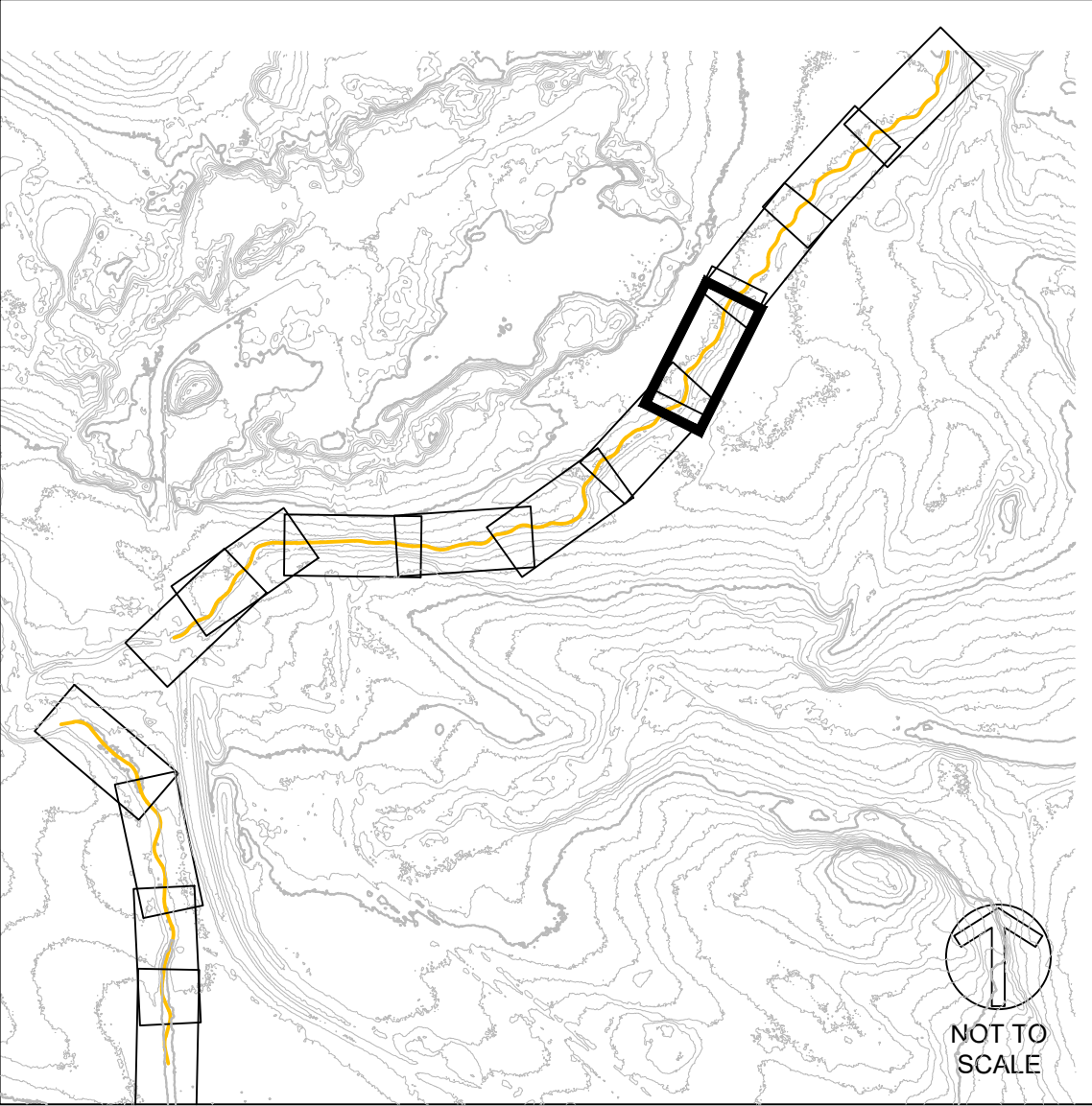
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- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE SEE SHEET 38
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA SEE SHEET 49
 - LOG J-HOOK SEE SHEET 39
 - TOE WOOD SEE SHEET 41
 - SOIL LIFT SEE SHEET 42
 - TRANSPLANTS SEE SHEET 47
 - CONSTRUCTED RIFFLE SEE SHEET 43
 - HABITAT LOG SEE SHEET 46
 - ROCK GLIDE RIFFLE SEE SHEET 44
 - BOULDER J-HOOK SEE SHEET 45
 - LOG VANE SEE SHEET 40
- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - AUGMENTED RIFFLE
 - HEADER AND FOOTER BOULDER



SCALE: HOR 1"=30'; VERT 1"= 3'



APPROVED BY: KA	REV	DESCRIPTION	CHECKED BY: MAG	DRAWN BY: GET	APPRV
	1	DRAFT 30% DESIGN			KA
	2	DRAFT 60%			KA
	3	DRAFT 90%			KA
	4	BID SET			KA
	XX				XX
	XX				XX
	XX				XX
	XX				XX

**BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN**

**BID SET - NOT FOR CONSTRUCTION
LITTLE 39
PLAN AND PROFILE - (4)
STA 18+00 TO 24+00**

CLIFFS

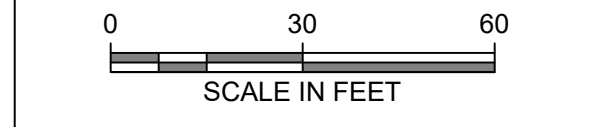
NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

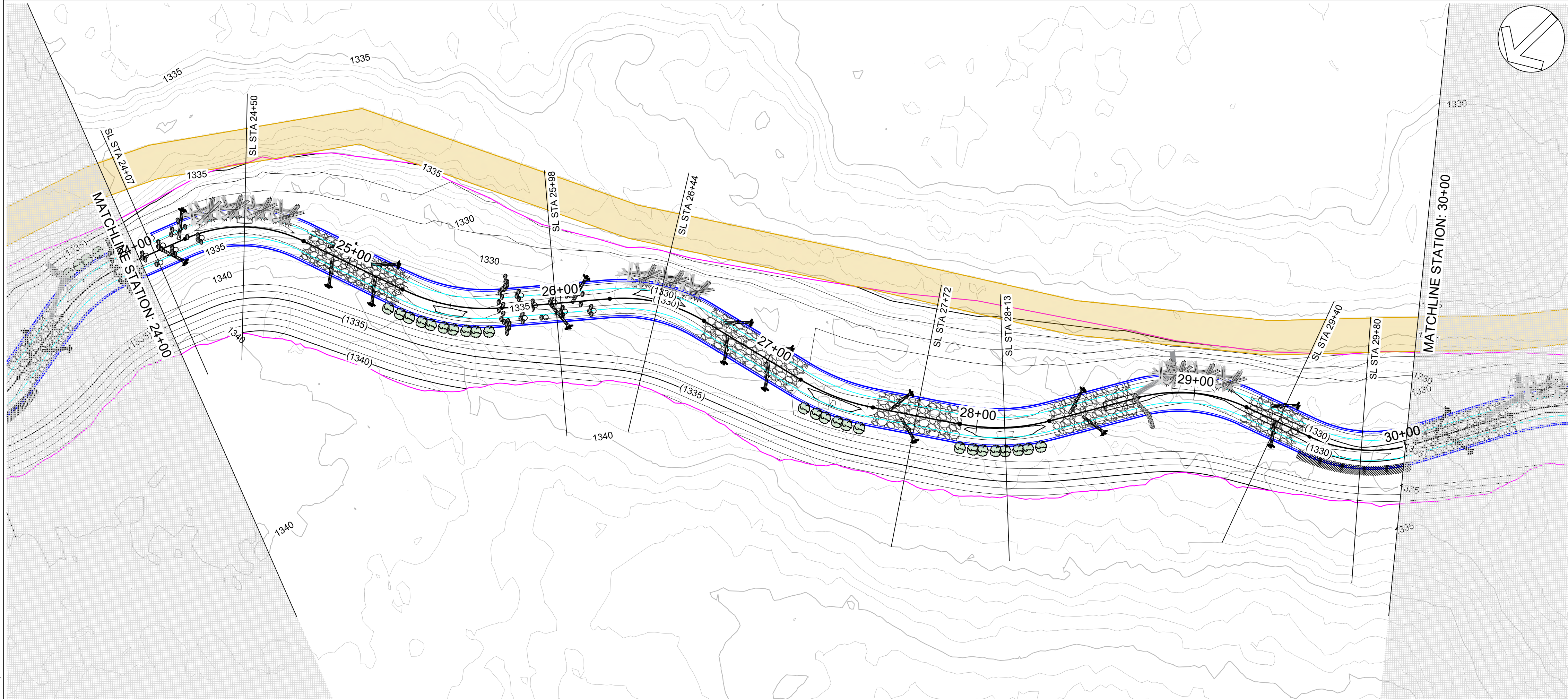
**BID SET
NOT FOR
CONSTRUCTION**

DATE: 10/15/2021
SCALE (34"x22"): 1" = 30'
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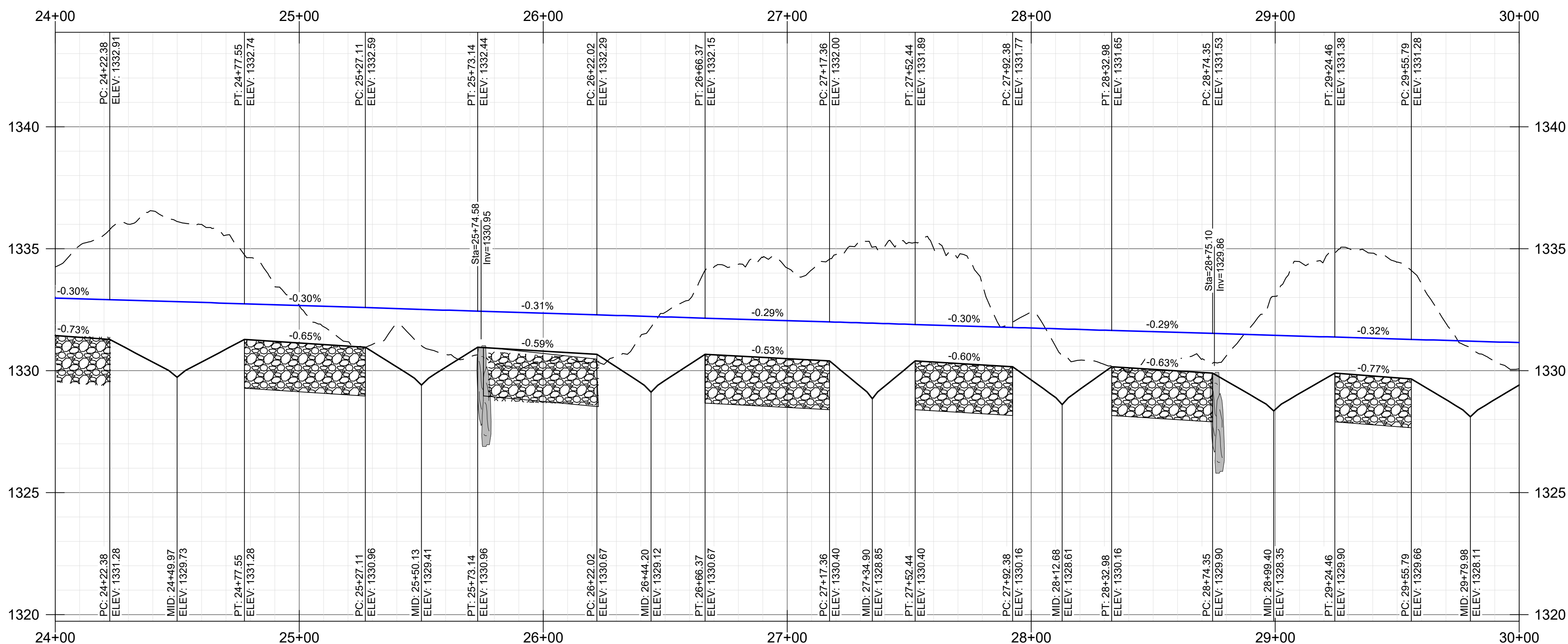
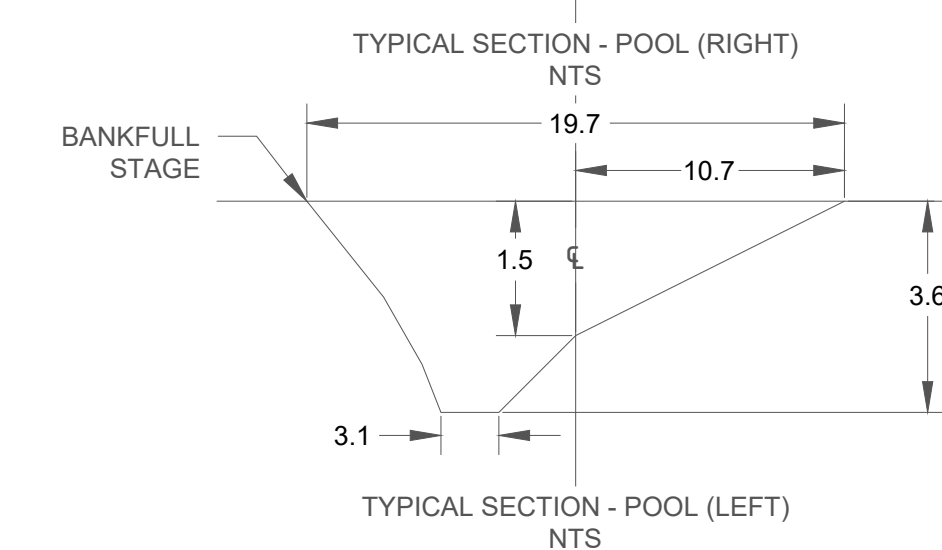
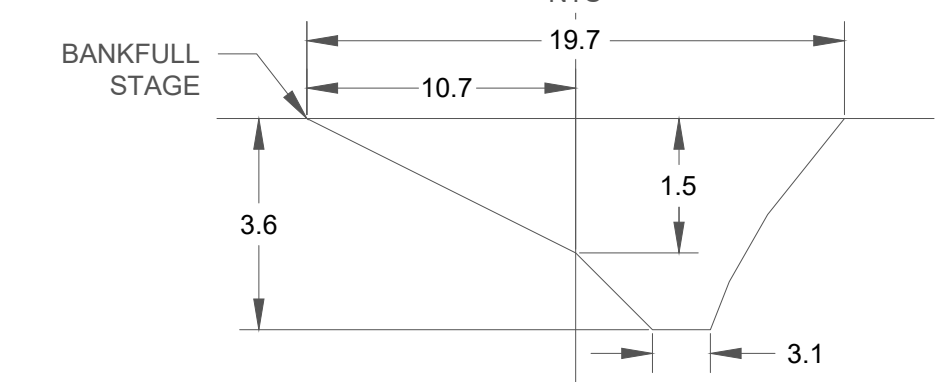
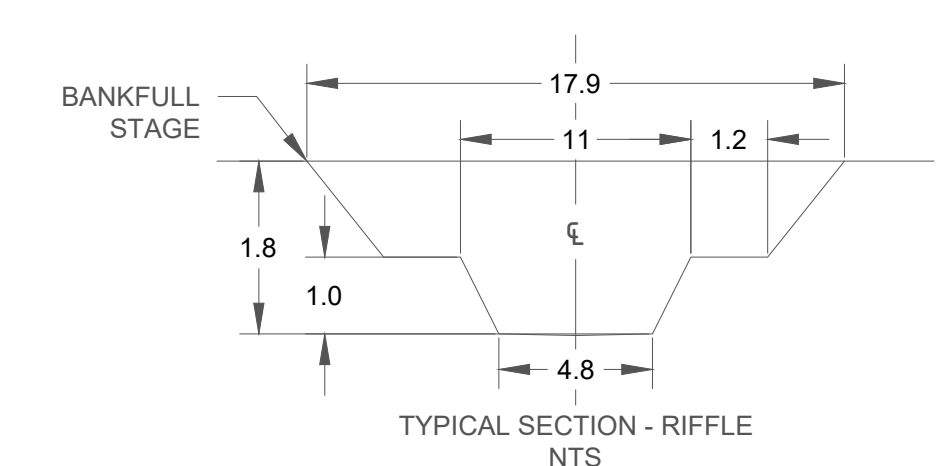
SHEET NUMBER
19 OF 50

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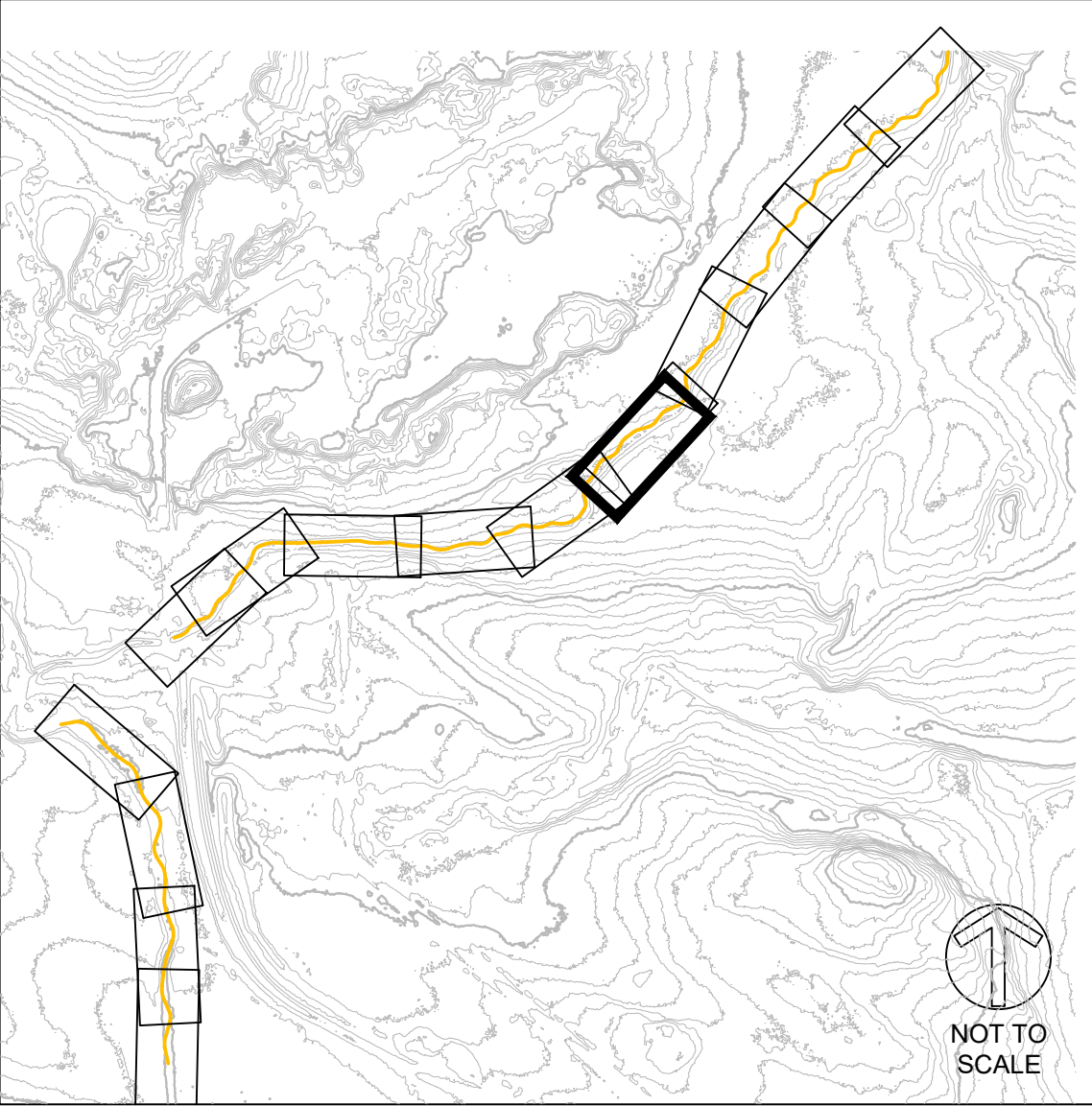


- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR (483)
 - PROPOSED MINOR CONTOUR (479)
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE SEE SHEET 38
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA SEE SHEET 49
 - LOG J-HOOK SEE SHEET 39
 - TOE WOOD SEE SHEET 41
 - SOIL LIFT SEE SHEET 42
 - TRANSPLANTS SEE SHEET 47
 - CONSTRUCTED RIFFLE SEE SHEET 43
 - HABITAT LOG SEE SHEET 46
 - ROCK GLIDE RIFFLE SEE SHEET 44
 - BOULDER J-HOOK SEE SHEET 45
 - LOG VANE SEE SHEET 40

- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - AUGMENTED RIFFLE
 - HEADER AND FOOTER BOULDER



SCALE: HOR 1"=30'; VERT 1"= 3'



APPROVED BY: KA	REV	DESCRIPTION	CHECKED BY: MJG	DRAWN BY: GET	APPRV
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	2	DRAFT 60%			KA
	3	DRAFT 90%			KA
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	XX				XX
	XX				XX
	XX				XX

**BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN**

**BID SET - NOT FOR CONSTRUCTION
LITTLE 39
PLAN AND PROFILE - (6)
STA 24+00 TO 30+00**

CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

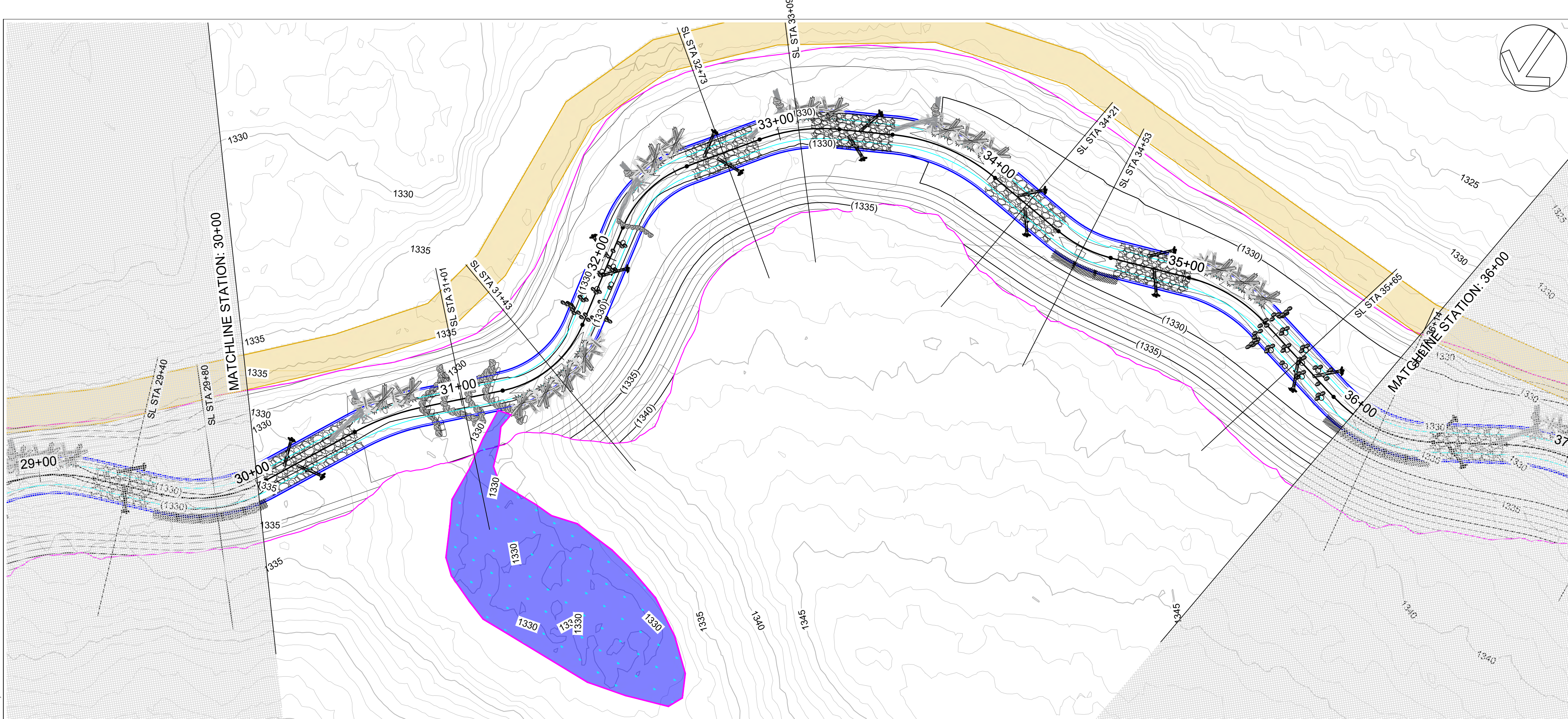
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NOT FOR
CONSTRUCTION**

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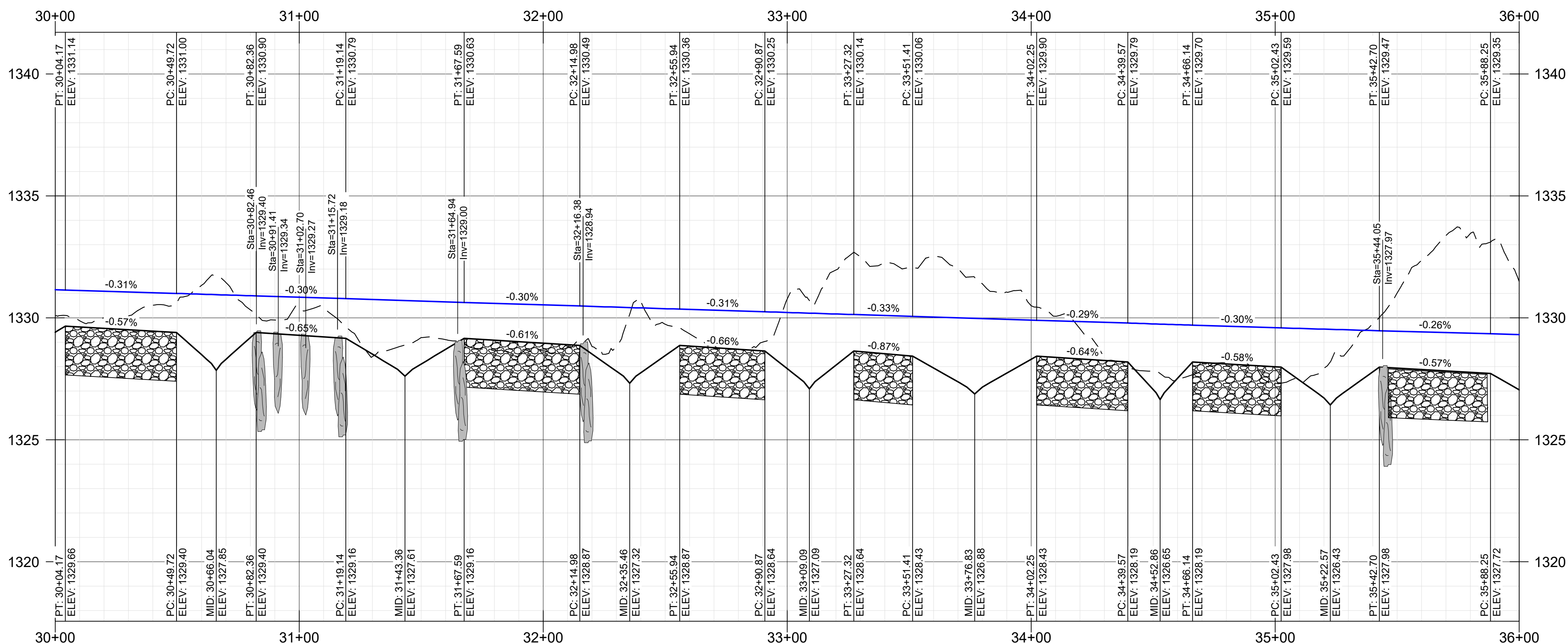
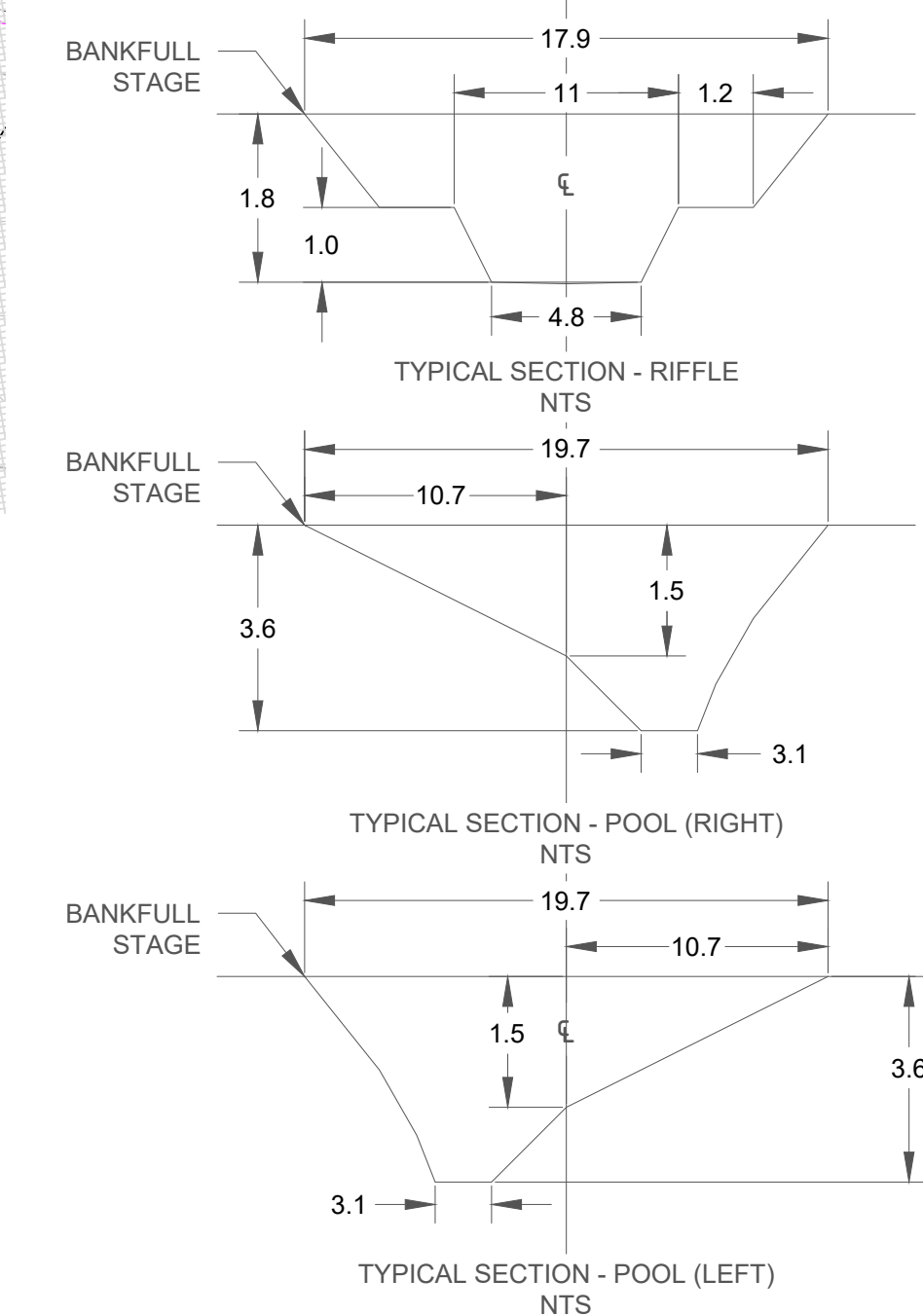
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SCALE IN FEET

SHEET NUMBER
20 OF 50

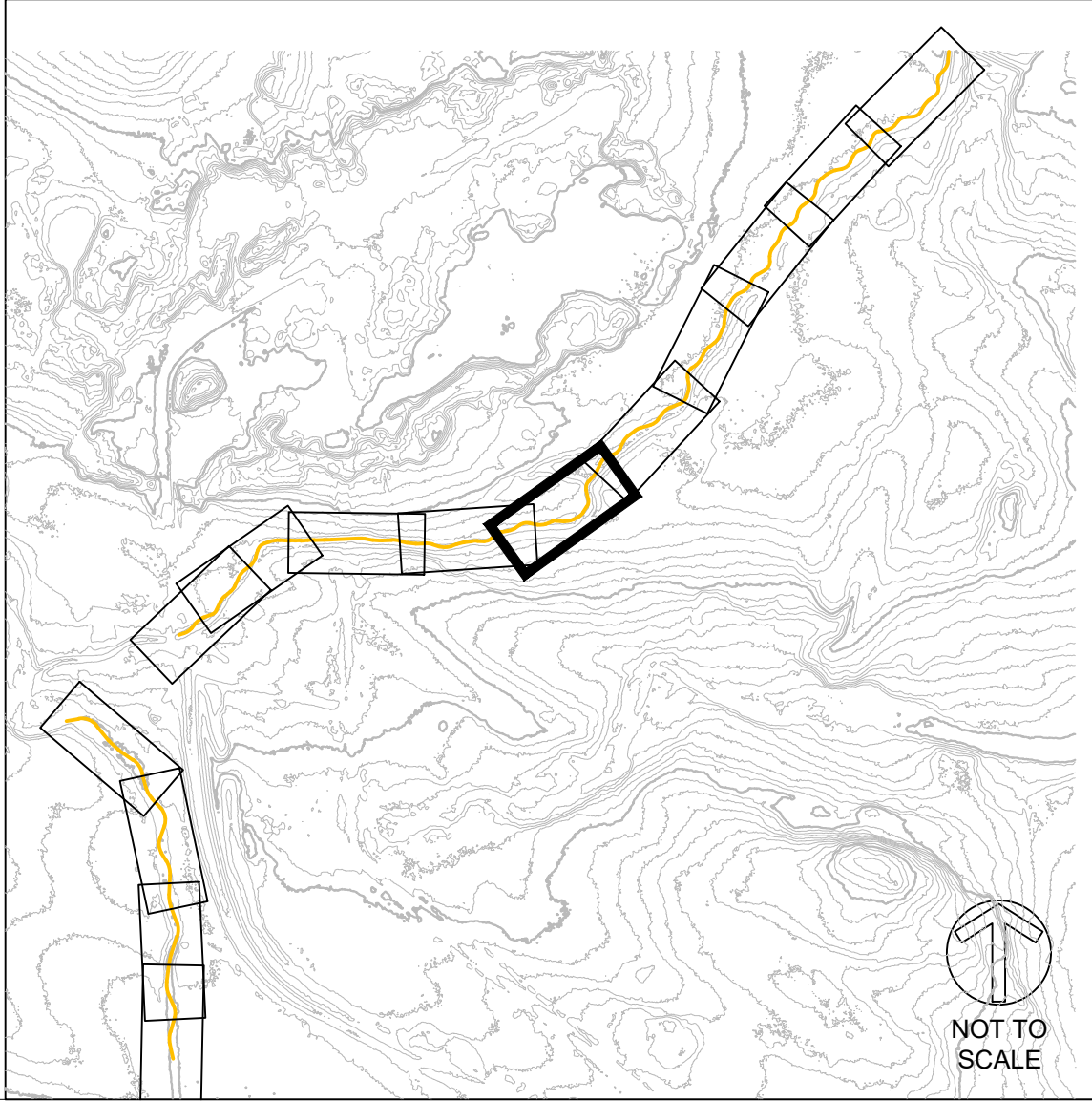
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- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE SEE SHEET 38
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA SEE SHEET 49
 - LOG J-HOOK SEE SHEET 39
 - TOE WOOD SEE SHEET 41
 - SOIL LIFT SEE SHEET 42
 - TRANSPLANTS SEE SHEET 47
 - CONSTRUCTED RIFFLE SEE SHEET 43
 - HABITAT LOG SEE SHEET 46
 - ROCK GLIDE RIFFLE SEE SHEET 44
 - BOULDER J-HOOK SEE SHEET 45
 - LOG VANE SEE SHEET 40
- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - AUGMENTED RIFFLE
 - HEADER AND FOOTER BOULDER

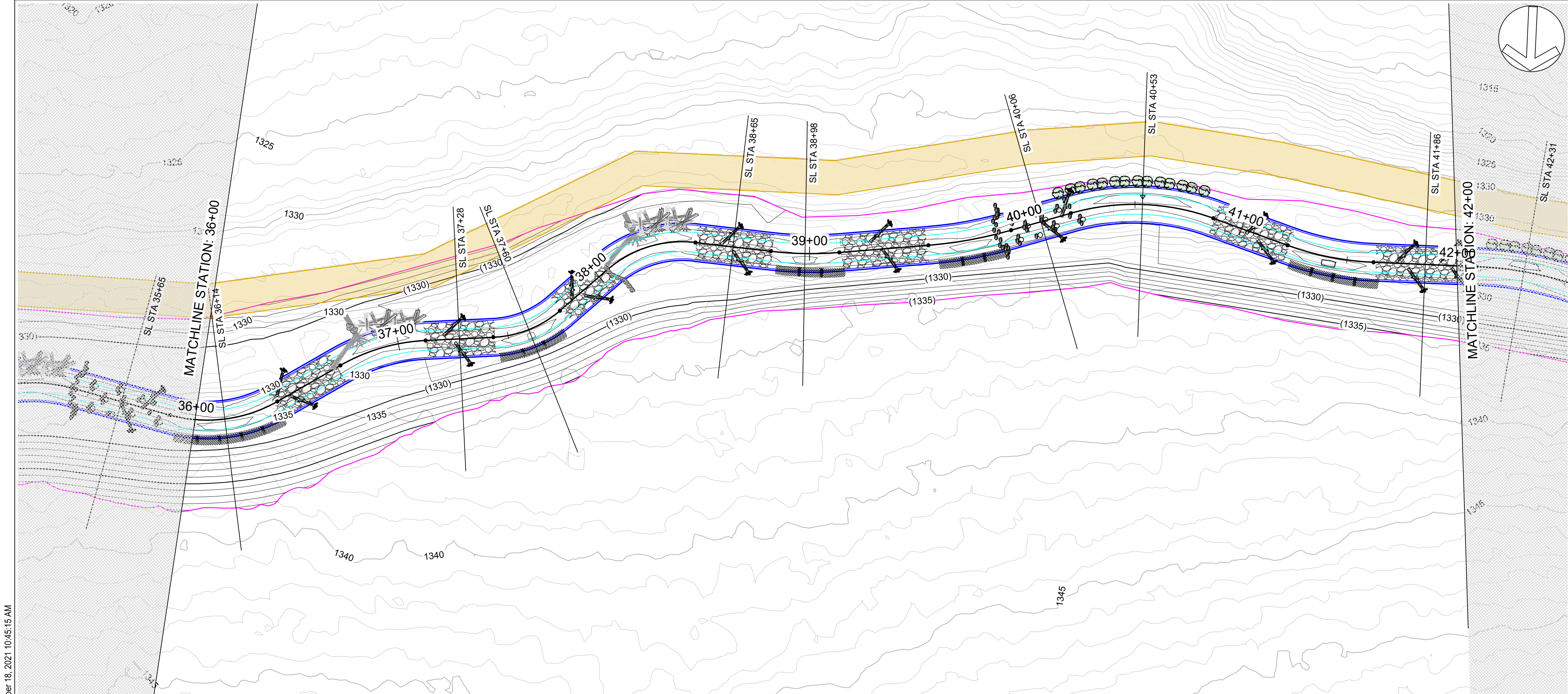


SCALE: HOR 1" = 30'; VERT 1" = 3'

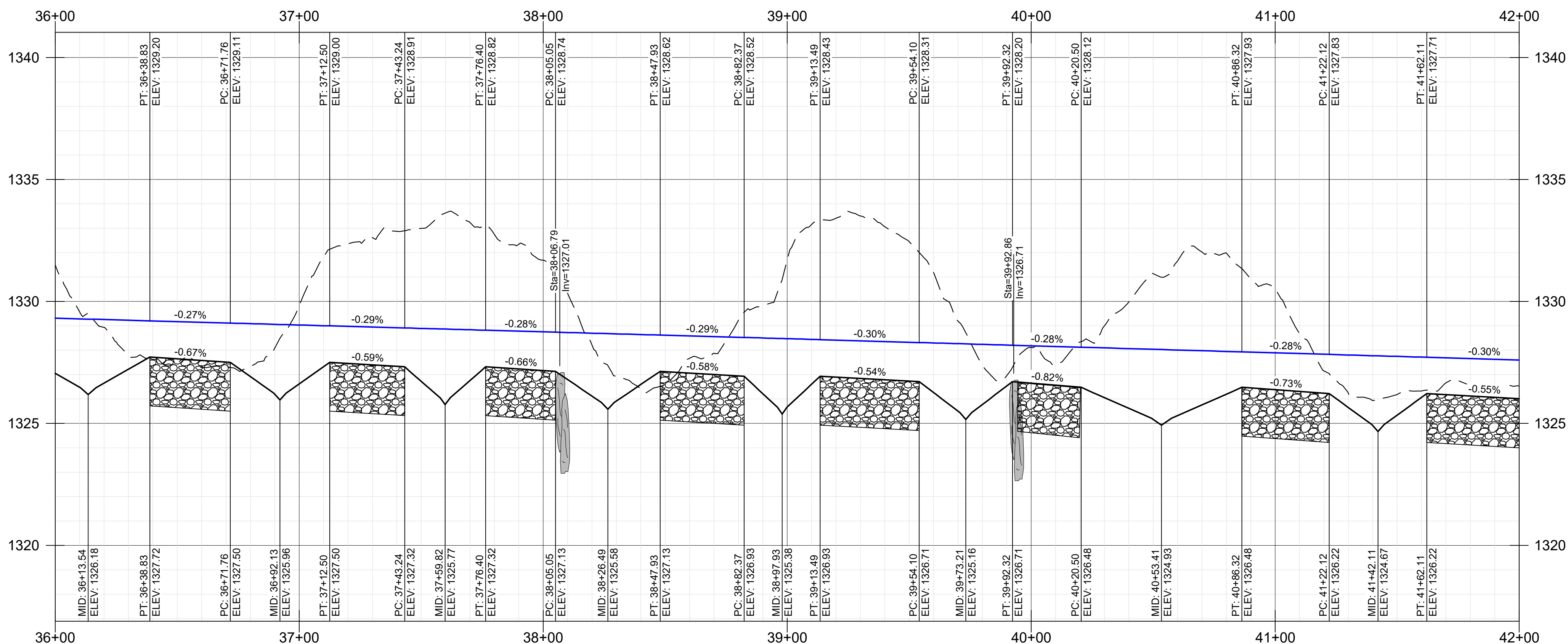
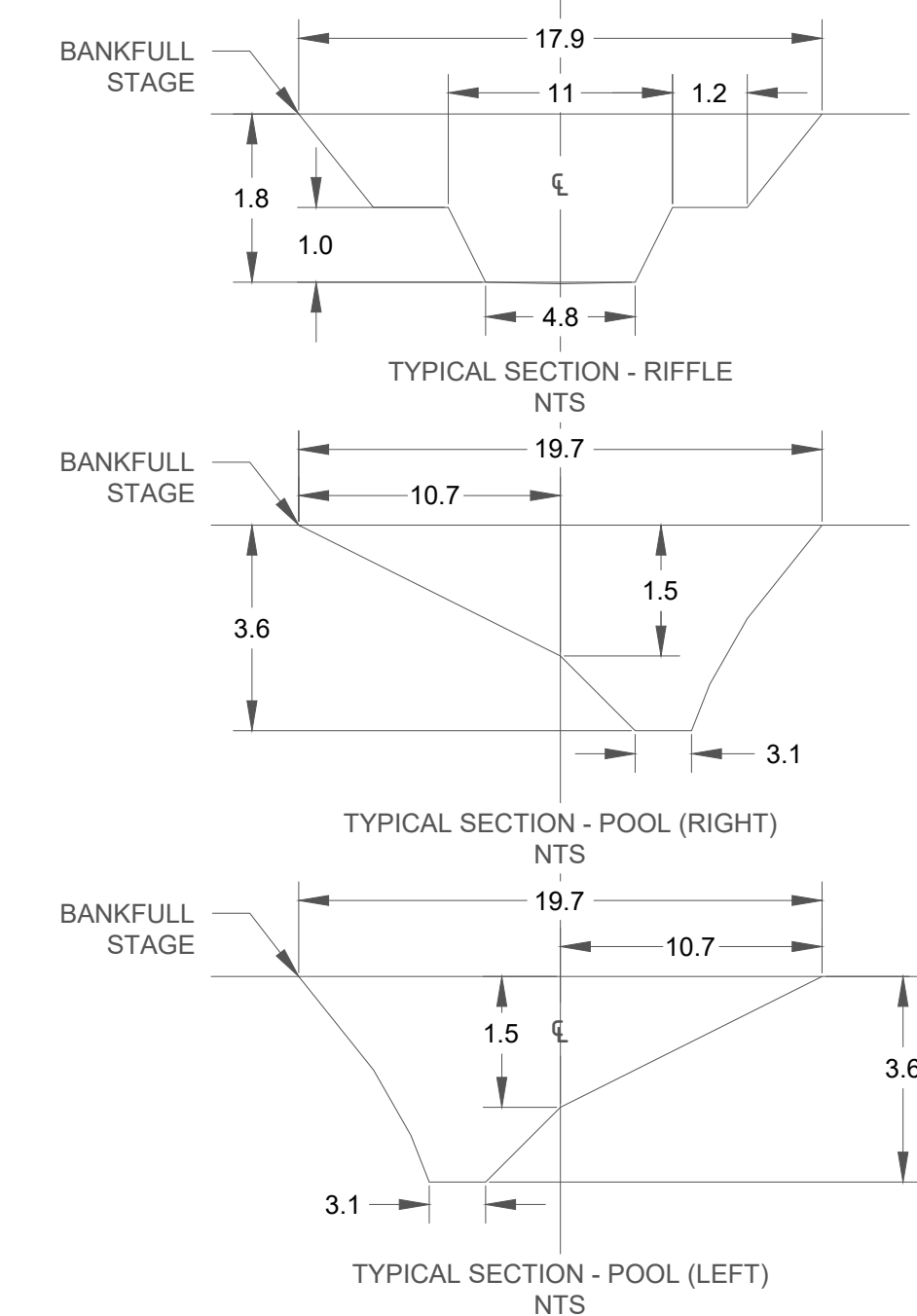


APPROVED BY: KA	REV	DESCRIPTION	CHECKED BY: MAG								DRAWN BY: GET
			APPRV								
			KA								
			KA								
BIG AND LITTLE 39 STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN			DRAFT 30% DESIGN								
			DRAFT 60%								
			DRAFT 90%								
			BID SET								
LITTLE 39 PLAN AND PROFILE - (6) STA 30+00 TO 36+00			XX								
			XX								
			XX								
			XX								
BID SET - NOT FOR CONSTRUCTION			XX								
			XX								
			XX								
			XX								
CLIFFS NORTHSHORE MINING CO 10 OUTER DR SILVER BAY, MN 55614 BEAVER RIVER CONSULTING BEAVER RIVER CONSULTING, LLC 5752 EAGLE VIEW DRIVE DULUTH, MN 55803			DATE: 10/15/2021								
			SCALE (34"x22"): 1" = 30'								
			SCALE (17"x11"): 1" = 60'								
			SHEET NUMBER 21 OF 50								

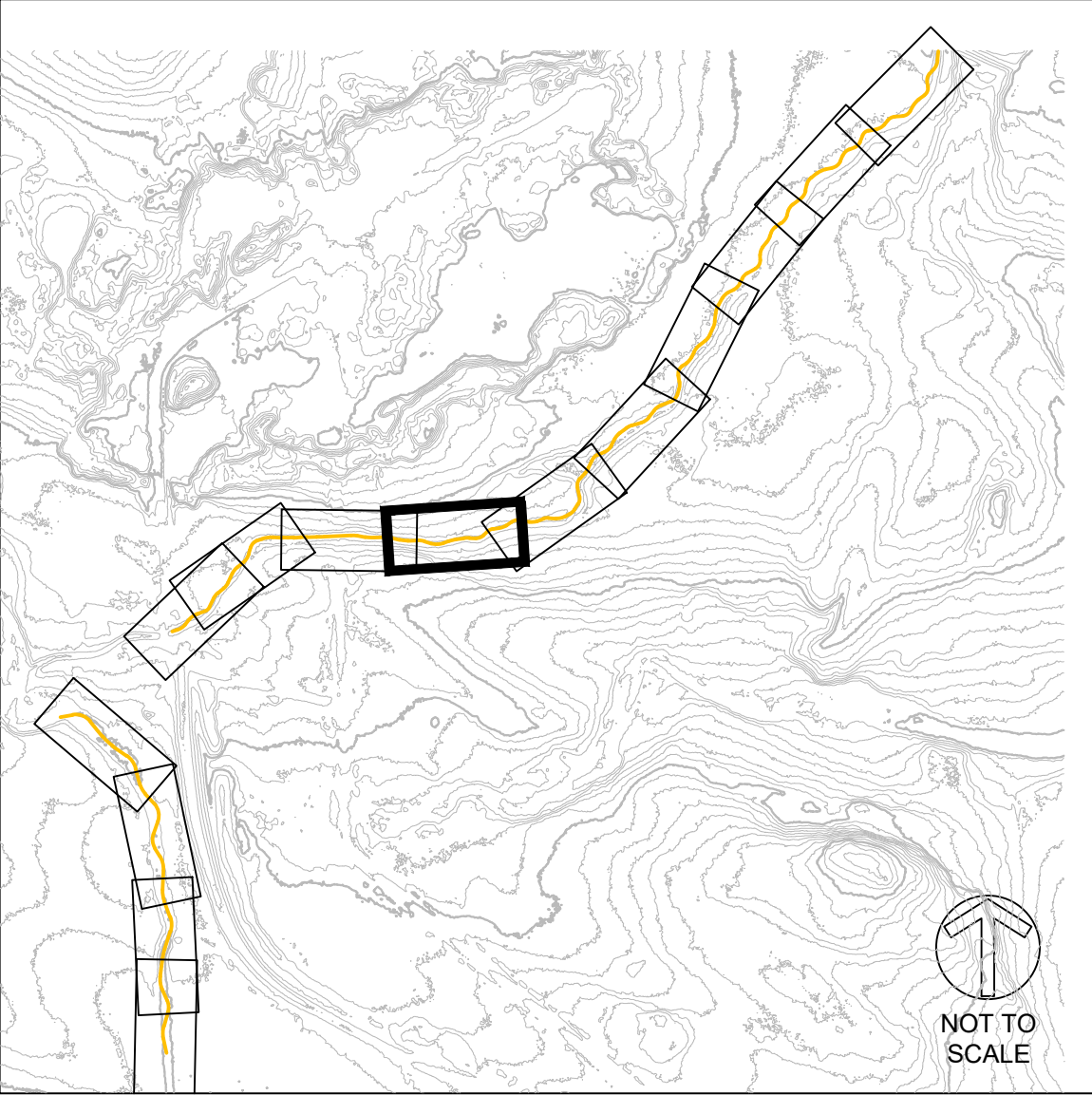
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- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE SEE SHEET 38
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA SEE SHEET 49
 - LOG J-HOOK SEE SHEET 39
 - TOE WOOD SEE SHEET 41
 - SOIL LIFT SEE SHEET 42
 - TRANSPLANTS SEE SHEET 47
 - CONSTRUCTED RIFFLE SEE SHEET 43
 - HABITAT LOG SEE SHEET 46
 - ROCK GLIDE RIFFLE SEE SHEET 44
 - BOULDER J-HOOK SEE SHEET 45
 - LOG VANE SEE SHEET 40
- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - AUGMENTED RIFFLE
 - HEADER AND FOOTER BOULDER



SCALE: HOR 1"=30'; VERT 1"= 3'



APPROVED BY: KA	REV	CHECKED BY: MJG	DESCRIPTION	DRAWN BY: GET	APPRV
	1		DRAFT 30% DESIGN		KA
	2		DRAFT 60%		KA
	3		DRAFT 90%		KA
	4		BID SET		KA
	XX		XX		XX
	XX		XX		XX
	XX		XX		XX
	XX		XX		XX

**BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN**

**BID SET - NOT FOR CONSTRUCTION
LITTLE 39
PLAN AND PROFILE - (7)
STA 36+00 TO 42+00**

CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

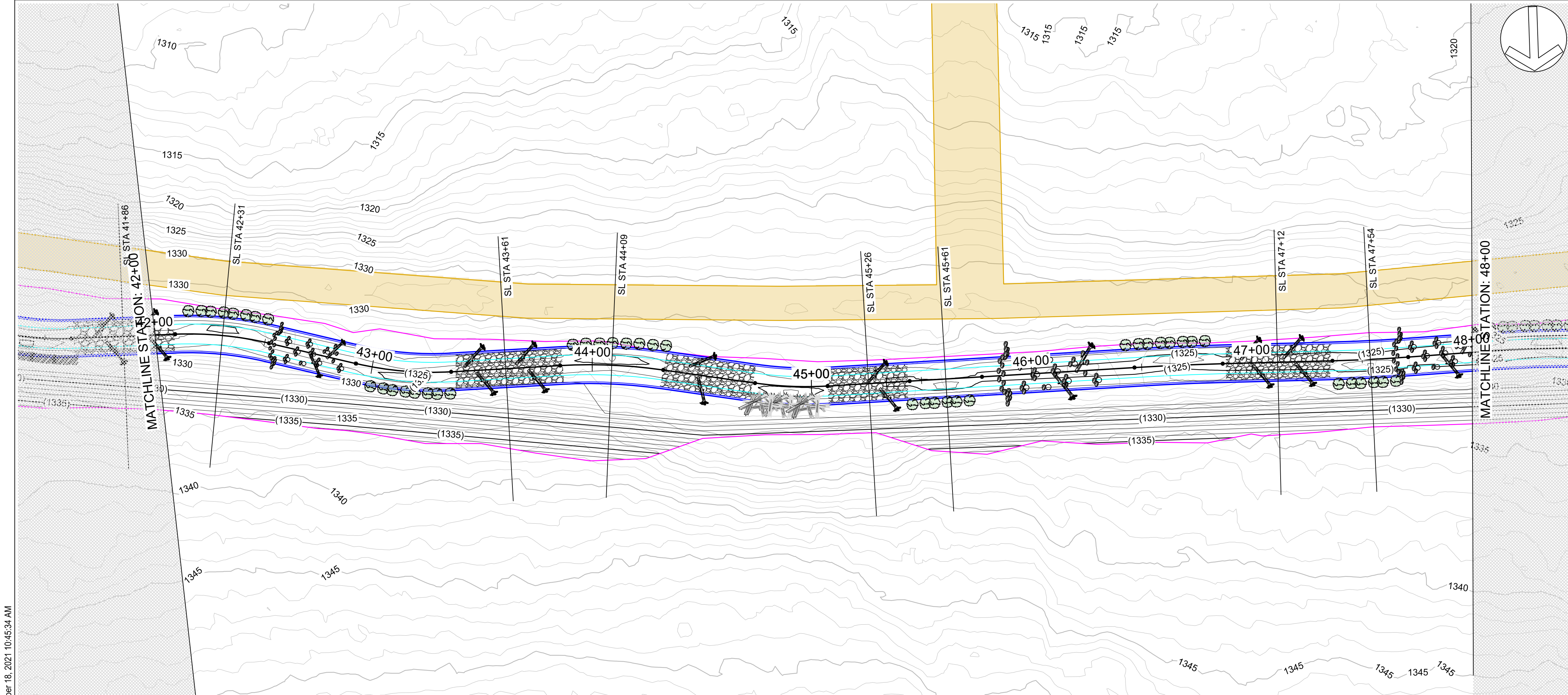
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NOT FOR
CONSTRUCTION**

DATE: 10/15/2021
SCALE (34"x22"): 1" = 30'
SCALE (17"x11"): 1" = 60'

0 30 60
SCALE IN FEET

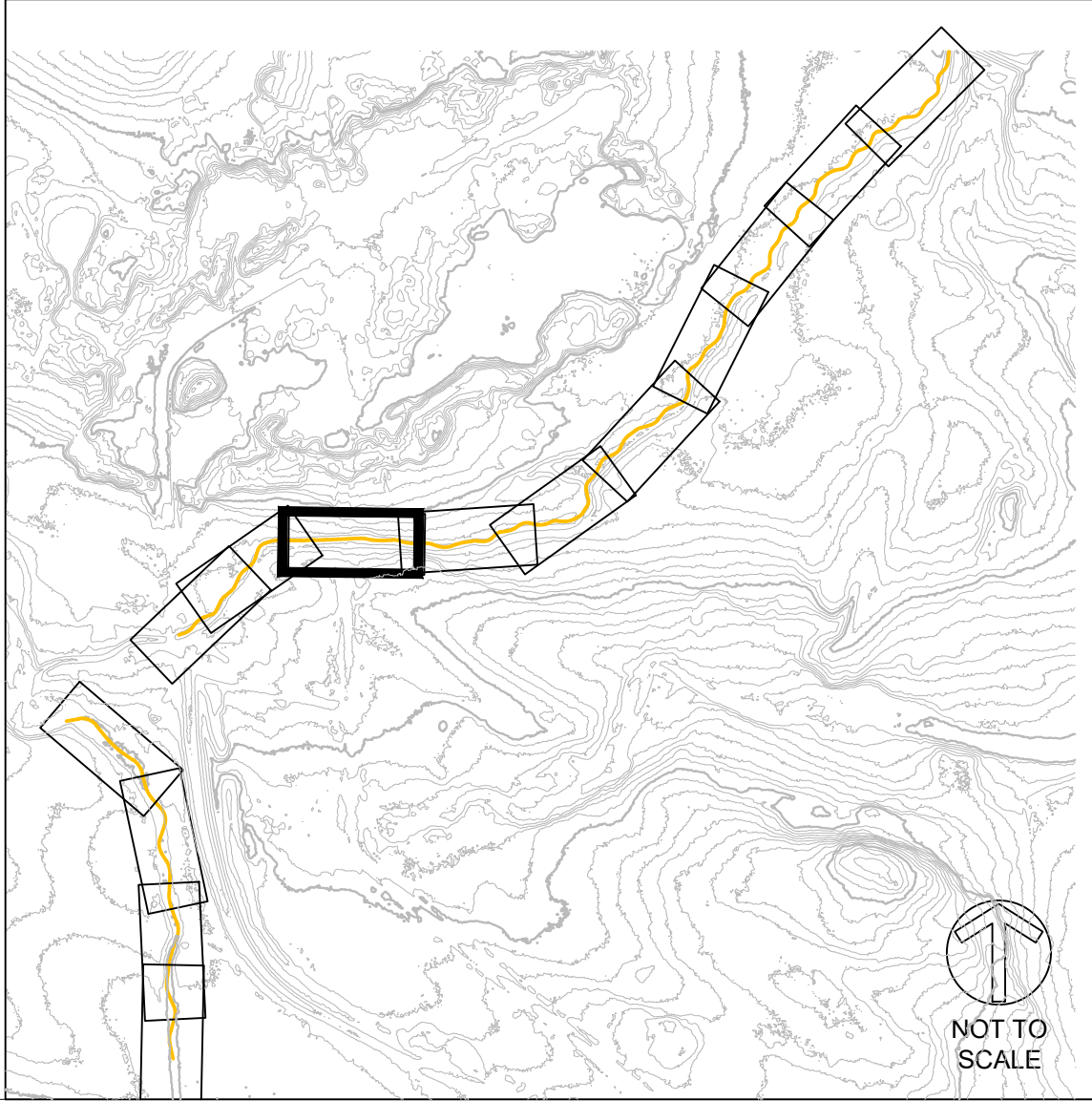
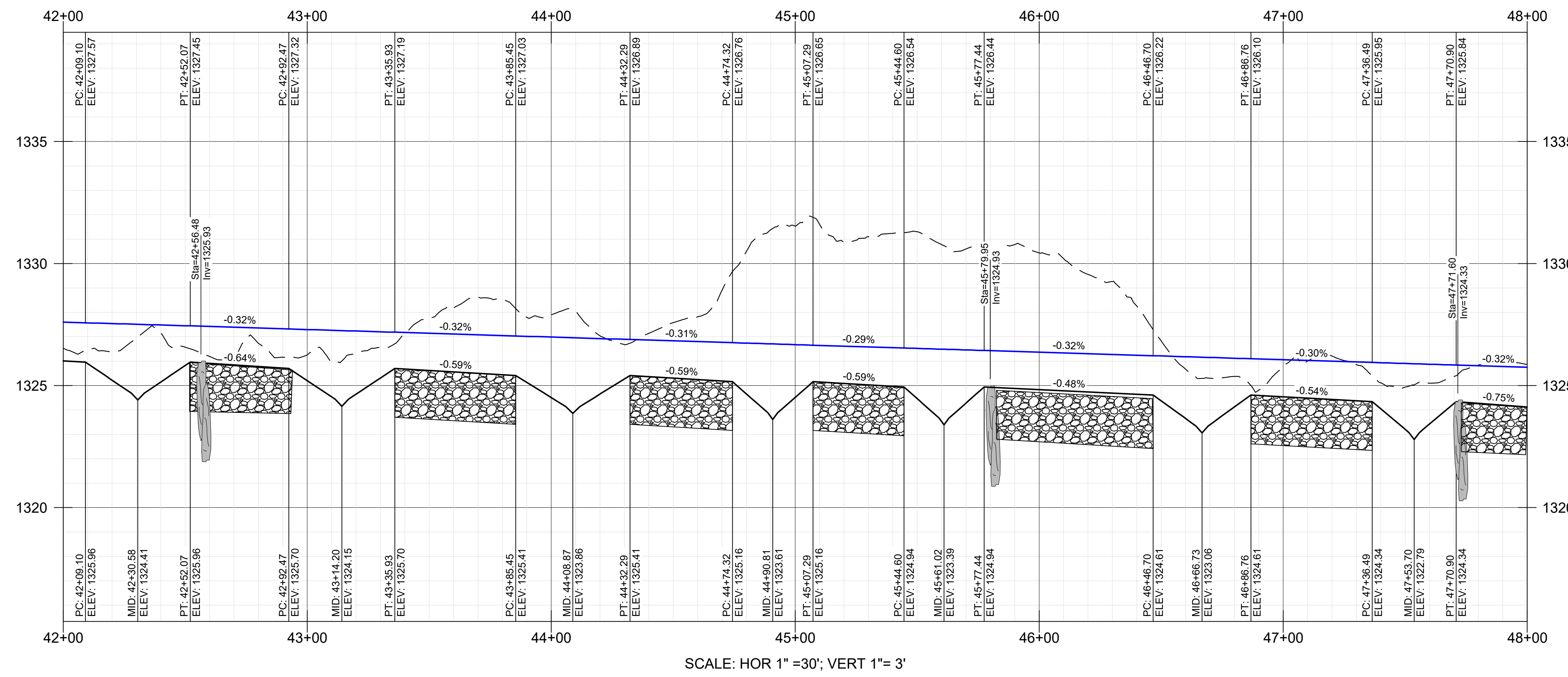
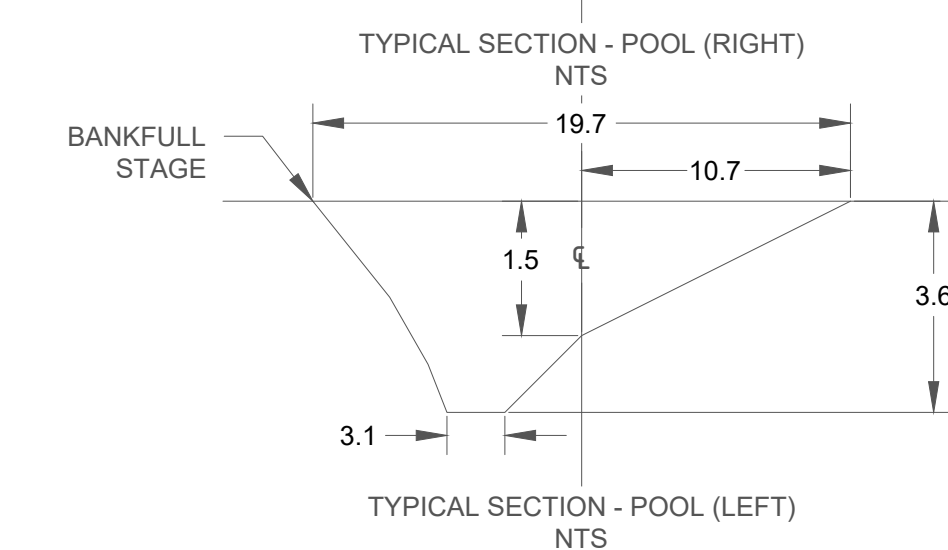
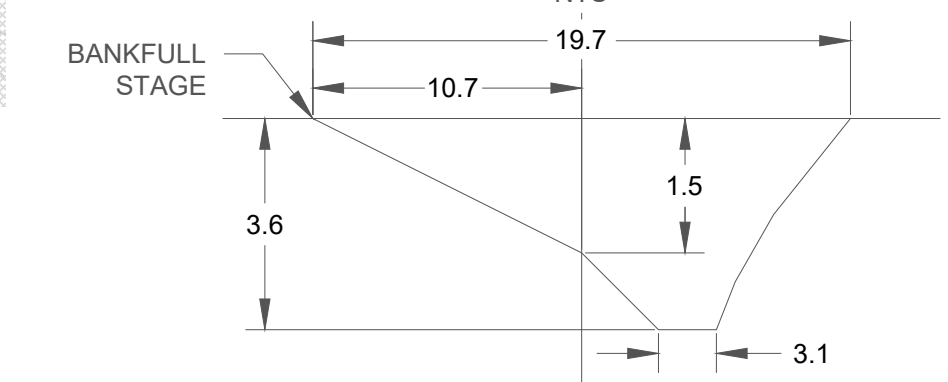
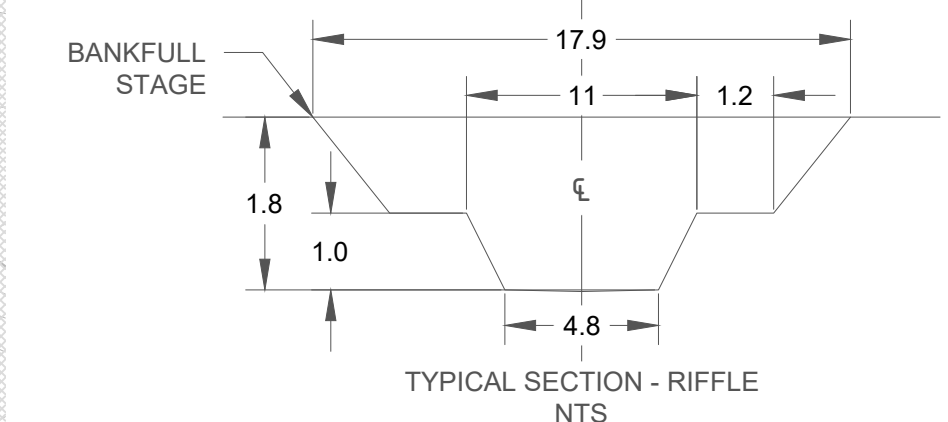
SHEET NUMBER
22 OF 50

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- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE SEE SHEET 38
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA SEE SHEET 49
 - LOG J-HOOK SEE SHEET 39
 - TOE WOOD SEE SHEET 41
 - SOIL LIFT SEE SHEET 42
 - TRANSPLANTS SEE SHEET 47
 - CONSTRUCTED RIFFLE SEE SHEET 43
 - HABITAT LOG SEE SHEET 46
 - ROCK GLIDE RIFFLE SEE SHEET 44
 - BOULDER J-HOOK SEE SHEET 45
 - LOG VANE SEE SHEET 40

- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - AUGMENTED RIFFLE
 - HEADER AND FOOTER BOULDER



APPROVED BY: KA	CHECKED BY: MJG	DRAWN BY: GET	APPRV
REV	DESCRIPTION		
1	DRAFT 30% DESIGN		KA
2	DRAFT 60%		KA
3	DRAFT 90%		KA
4	BID SET		KA
XX	XX		XX
XX	XX		XX
XX	XX		XX
XX	XX		XX

**BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN**

**BID SET - NOT FOR CONSTRUCTION
LITTLE 39
PLAN AND PROFILE - (8)
STA 42+00 TO 48+00**

CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

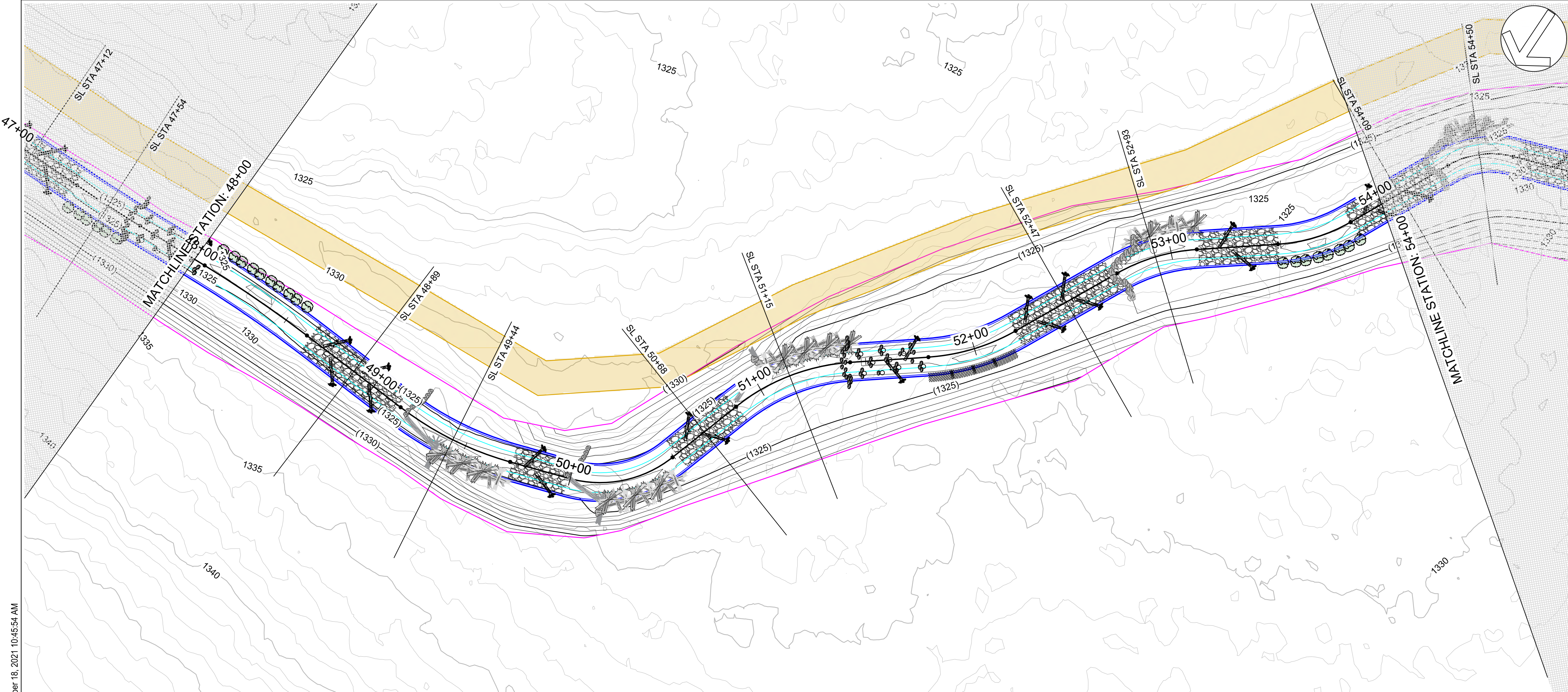
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NOT FOR
CONSTRUCTION**

DATE: 10/15/2021
SCALE (34"x22"): 1" = 30'
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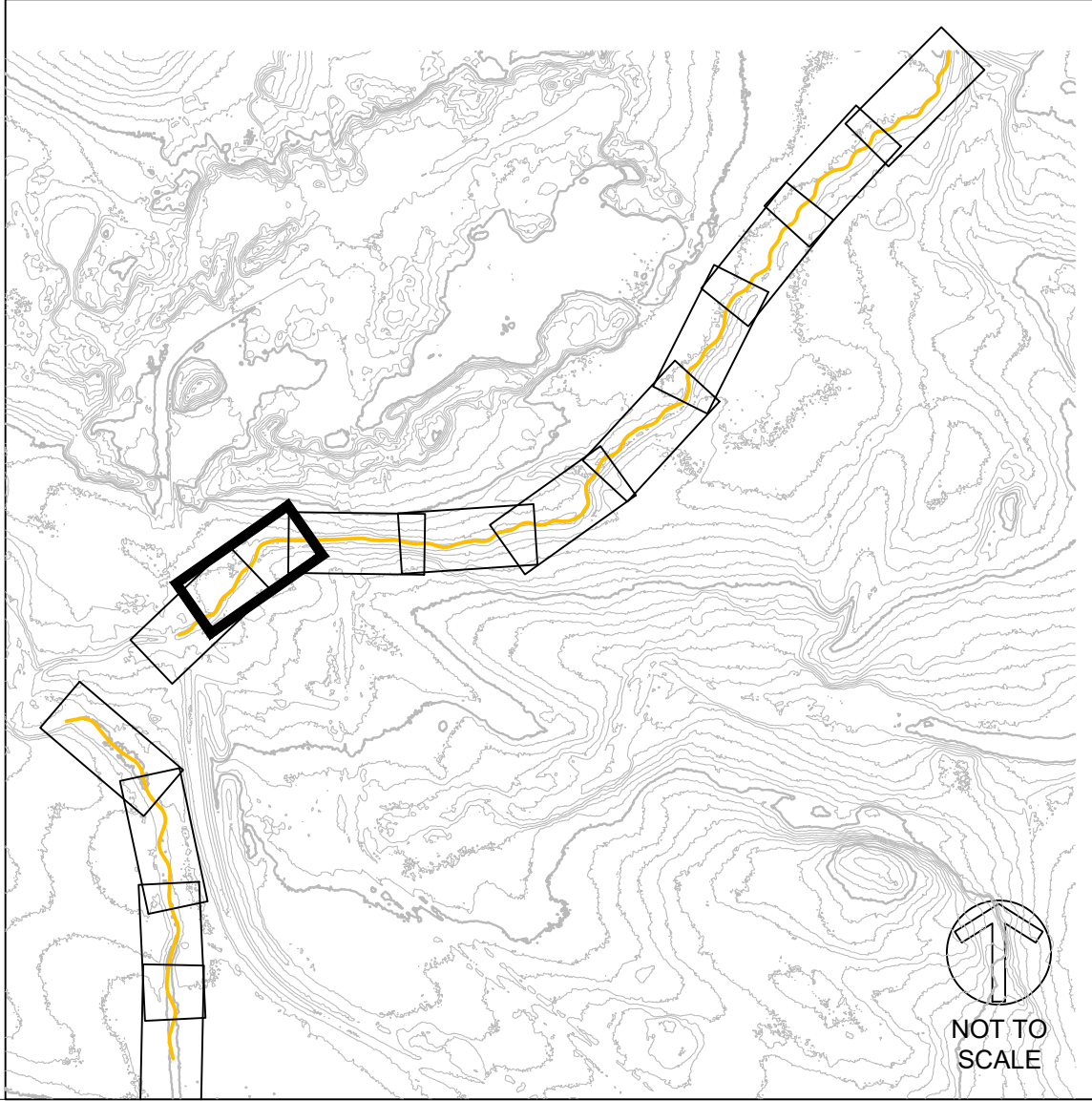
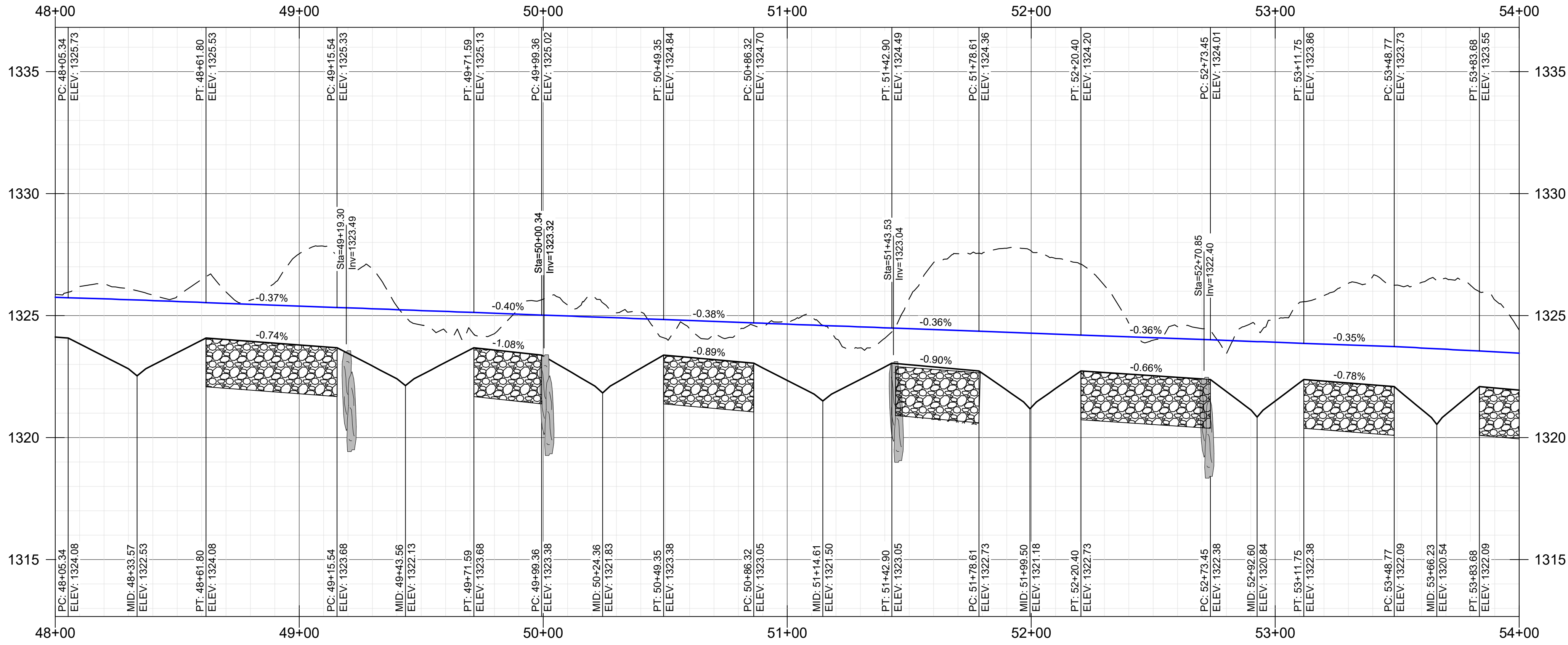
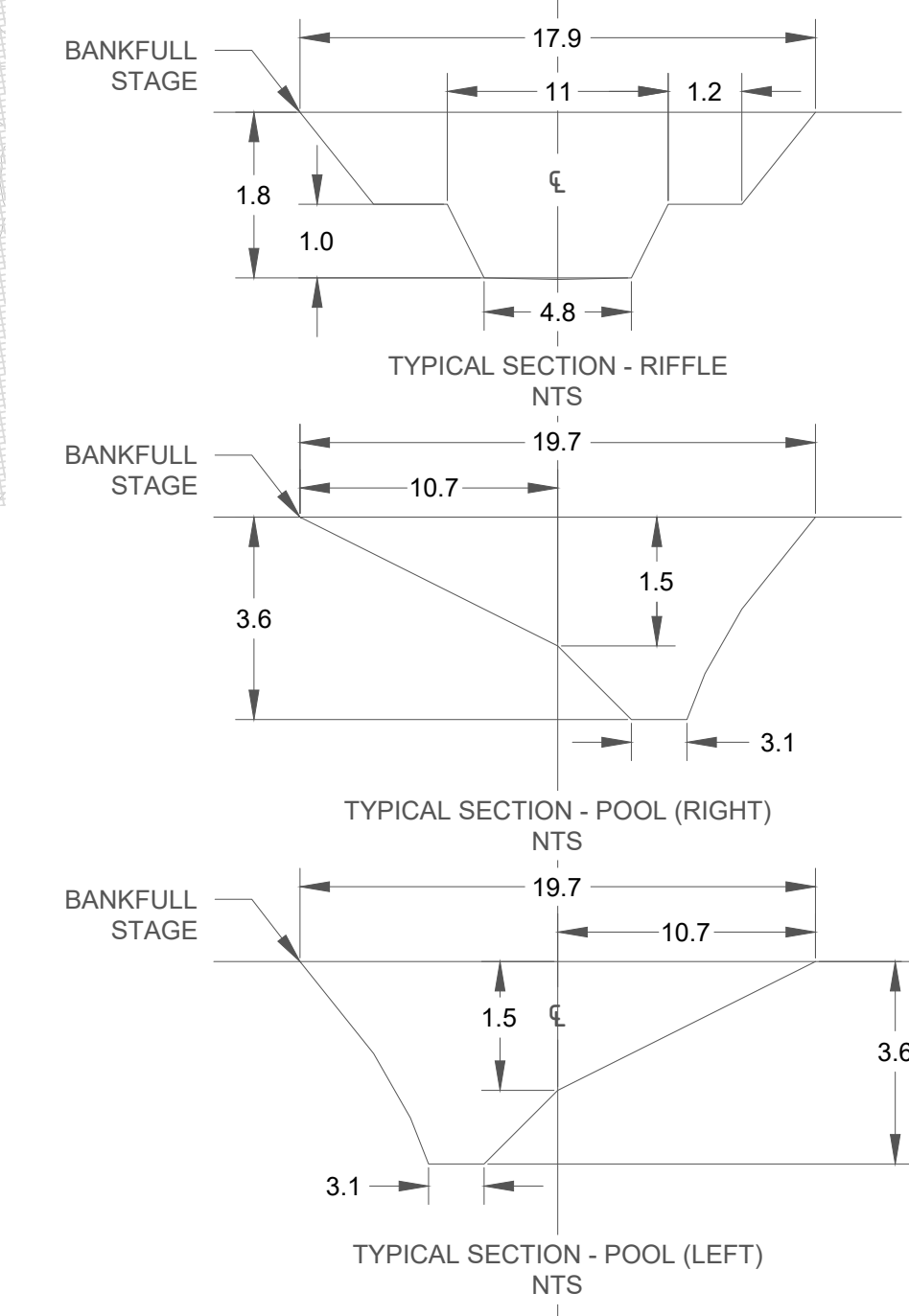
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SCALE IN FEET

SHEET NUMBER
23 OF 50

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- PLAN LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE (SEE SHEET 38)
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA (SEE SHEET 49)
 - LOG J-HOOK (SEE SHEET 39)
 - TOE WOOD (SEE SHEET 41)
 - SOIL LIFT (SEE SHEET 42)
 - TRANSPLANTS (SEE SHEET 47)
 - CONSTRUCTED RIFFLE (SEE SHEET 43)
 - HABITAT LOG (SEE SHEET 46)
 - ROCK GLIDE RIFFLE (SEE SHEET 44)
 - BOULDER J-HOOK (SEE SHEET 45)
 - LOG VANE (SEE SHEET 40)
- PROFILE LEGEND**
- PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - HEADER AND FOOTER BOULDER
 - AUGMENTED RIFFLE



APPROVED BY:	REV	DESCRIPTION	CHECKED BY:	DRAWN BY:	GET
BIG AND LITTLE 39 STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN	1	DRAFT 30% DESIGN	KA	KA	KA
	2	DRAFT 60%	KA	KA	KA
	3	DRAFT 90%	KA	KA	KA
	4	BID SET	KA	KA	KA
LITTLE 39 PLAN AND PROFILE - (9) STA 48+00 TO 54+00	XX		XX	XX	XX
	XX		XX	XX	XX
	XX		XX	XX	XX
	XX		XX	XX	XX

BID SET - NOT FOR CONSTRUCTION

CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

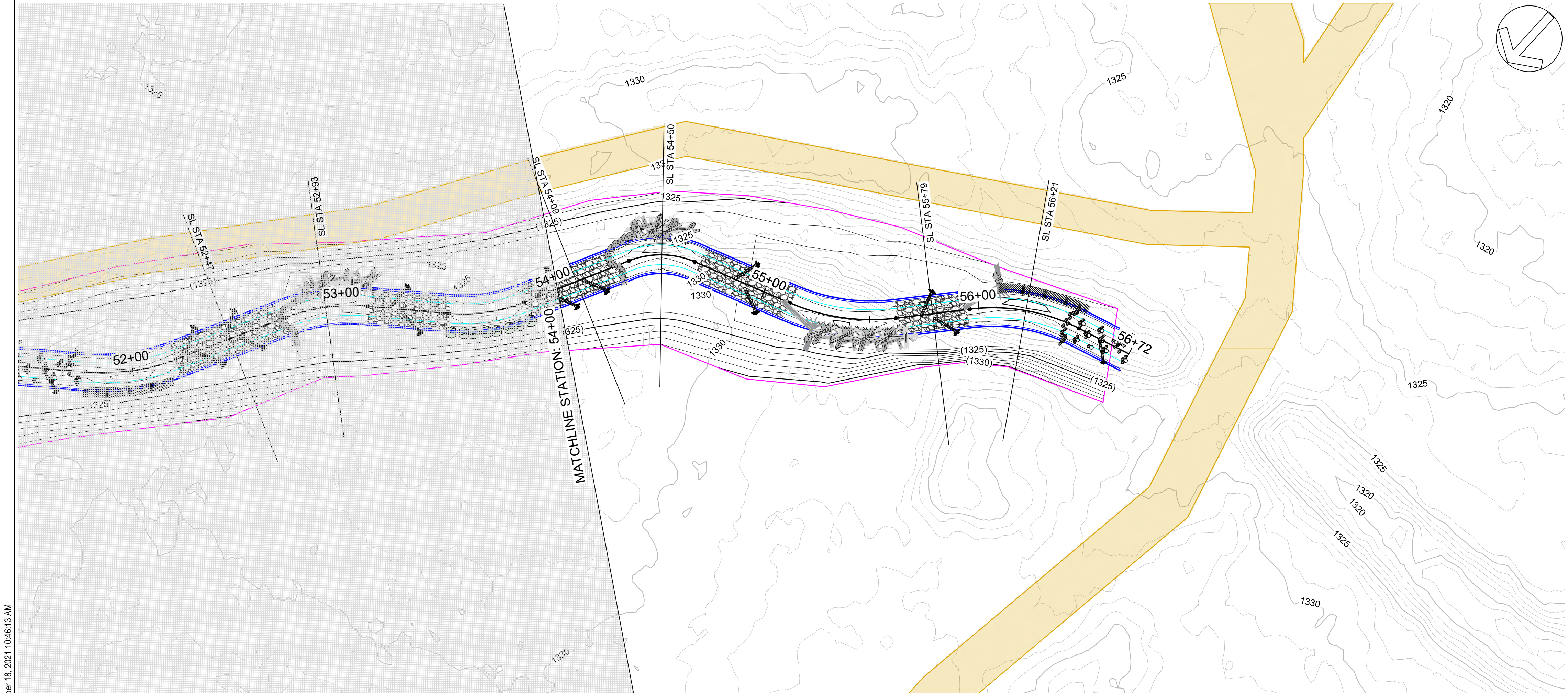
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DATE: 10/15/2021
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SCALE (17"x11"): 1" = 60'

0 30 60
SCALE IN FEET

SHEET NUMBER
24 OF 50

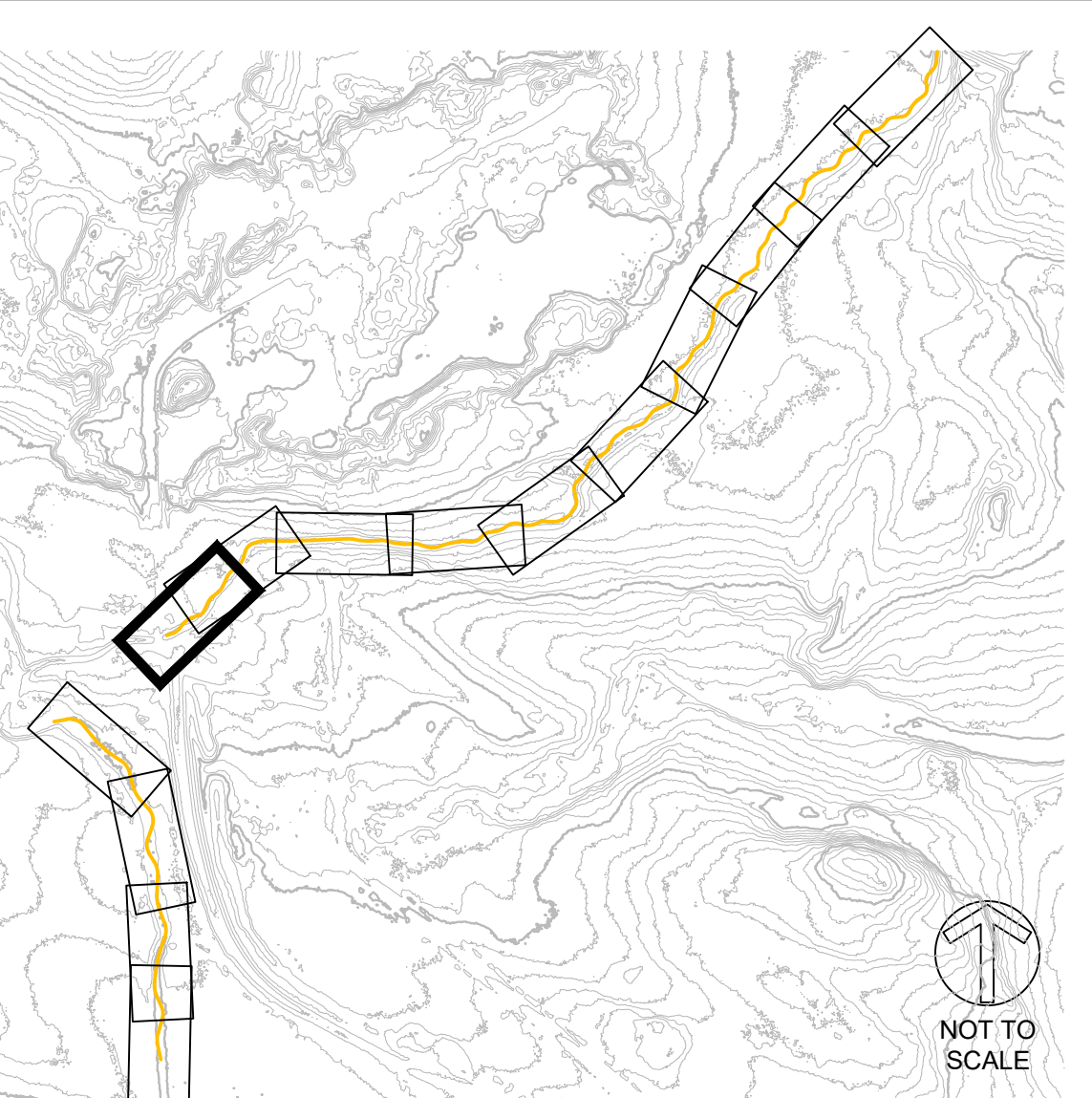
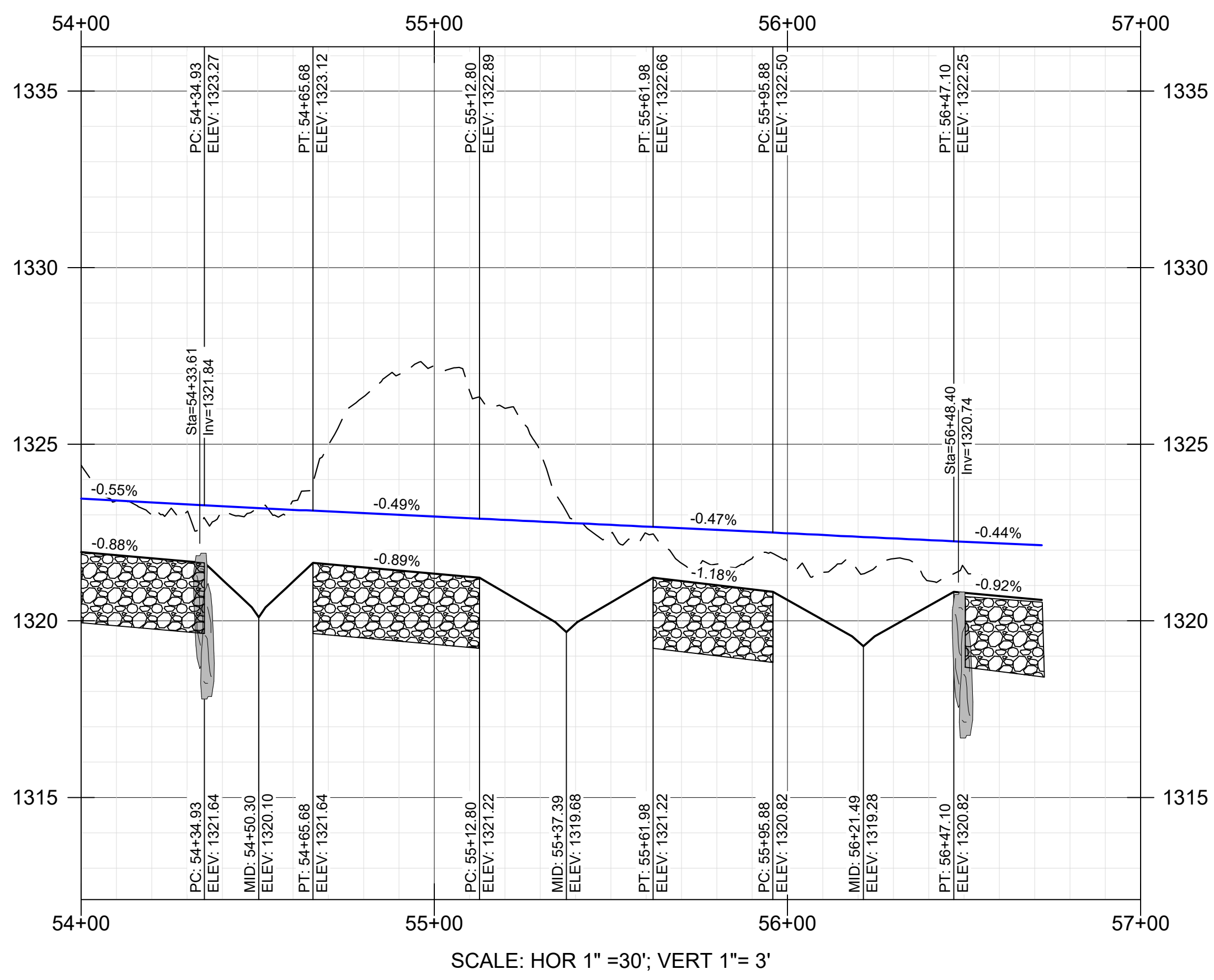
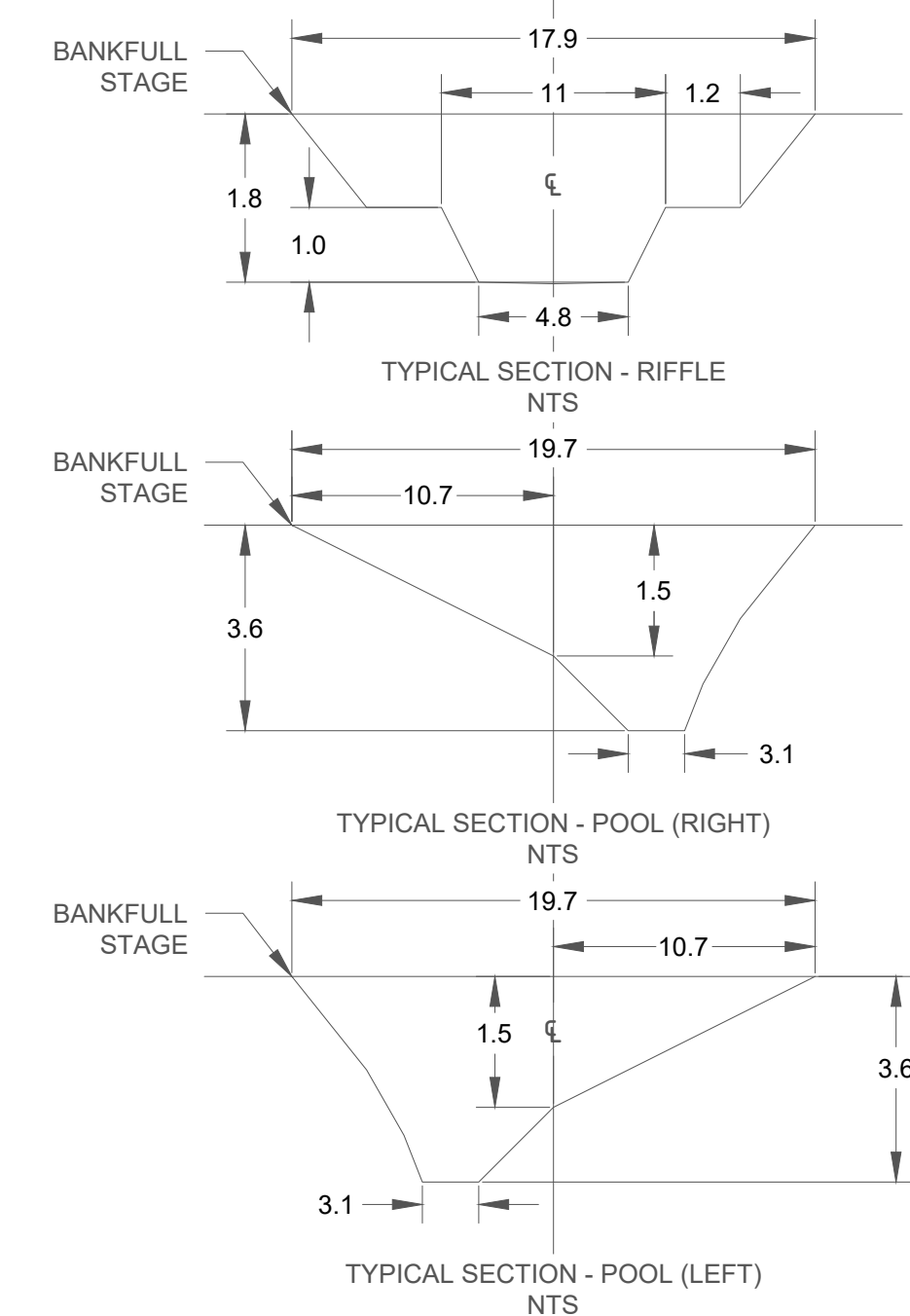
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- PLAN LEGEND**

 - PROPOSED STREAM CENTER LINE
 - PROPOSED INNER BERM
 - PROPOSED GEOMORPHIC CHANNEL TOB
 - PROPOSED FLOODPLAIN TOE
 - LIMITS OF DISTURBANCE
 - PROPOSED MAJOR CONTOUR (483)
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - GRAVEL RIFFLE SEE SHEET 38
 - CONSTRUCTION ACCESS
 - STOCKPILE AREA SEE SHEET 49
 - LOG J-HOOK SEE SHEET 39
 - TOE WOOD SEE SHEET 41
 - SOIL LIFT SEE SHEET 42
 - TRANSPLANTS SEE SHEET 47
 - CONSTRUCTED RIFFLE SEE SHEET 43
 - HABITAT LOG SEE SHEET 46
 - ROCK GLIDE RIFFLE SEE SHEET 44
 - BOULDER J-HOOK SEE SHEET 45
 - LOG VANE SEE SHEET 40
- PROFILE LEGEND**

 - PROPOSED STREAM CENTER LINE
 - PROPOSED BANKFULL TOB
 - EXISTING GROUND
 - STRUCTURE BOULDER
 - AUGMENTED RIFFLE
 - HEADER AND FOOTER BOULDER



APPROVED BY: KA

CHECKED BY: MAG

DRAWN BY: GET

APPRV

DESCRIPTION

REV

1

2

3

4

XX

XX

XX

XX

KA

KA

KA

KA

KA

XX

XX

XX

XX

KA

DRAFT 30% DESIGN

DRAFT 60%

DRAFT 90%

BID SET

XX

XX

XX

XX

XX

XX

XX

XX

STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
LITTLE 39
PLAN AND PROFILE - (10)
STA 54+00 TO 56+59

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

DATE: 10/15/2021
SCALE (34"x22"): 1" = 30'
SCALE (17"x11"): 1" = 60'

0 30 60
SCALE IN FEET

SHEET NUMBER
25 OF 50

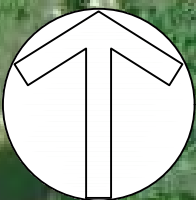
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***SEE SWPP DETAILS SHEETS 48 AND 49 .
SEE SWPP NOTES SHEET 50***

- SPECIFIC SWPPP NOTES:
- CONSTRUCT STREAM IN PHASES NOT EXCEEDING 500 FEET IN LENGTH
 - BYPASS PUMP LOW FLOW WATER IN UP TO 500 FOOT SEGMENTS, IT IS ANTICIPATED THAT THE LOW FLOW WILL NOT EXCEED 1 CUBIC FEET PER SECOND, (448 GALLONS PER MINUTE)
 - PROCEED UP OR DOWNSTREAM
 - PHASING SHALL CONSIST OF STREAM DIVERSION, EARTHWORK, AND SEEDING AND BLANKETING WITHIN 2 DAYS FOLLOWING COMPLETION OF WORK ON EACH PHASE
 - FOLLOW FINAL STABILIZATION SHALL BE COMPLETED AS NOTED IN VEGETATION RESTORATION SHEETS
 - DISPOSE OF EXCESS SOIL MATERIAL IN PERMITTED DISPOSAL SITE INSIDE OF TAILINGS BASIN
 - SWPPP APPLIES TO LAND AREA ABOVE BANKFULL OR TOP OF BANK, BELOW THAT LINE MN DNR WATERS PERMIT APPLIES
 - IT IS NOT ANTICIPATED THAT A ROCK CONSTRUCTION ENTRANCE WILL BE NEEDED DUE TO CONSTRUCTION ACTIVITIES REMAINING ON SITE, BUT IF TRACKING IS NOTED ON THE PAVED SURFACE OF THE HIGHWAY A ROCK OR OTHER TYPE OF CONSTRUCTION ENTRANCE SHALL BE EMPLOYED
 - UTILIZE SEDIMENT CONTROL LOGS FOR ALL SOIL STOCKPILES

BMP'S USED

1. PHASING
2. DIVERSION
3. SEDIMENT CONTROL LOGS FOR CONTAINING SOIL STOCKPILES
4. TEMPORARY MULCH AND SEED FOR STOCKPILES AND OTHER DISTURBED AREAS THAT ARE NOT BEING WORKED FOR 7 DAYS



56+72

ACCESS TRAIL

50+00

45+00

40+00

35+00

30+00

ACCESS TRAIL

25+00

20+00

15+00

10+00

ACCESS TRAIL

5+00

0+00

BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
LITTLE 39

OVERVIEW - SWPPP



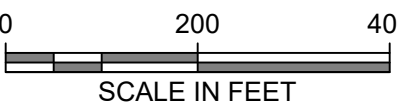
NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

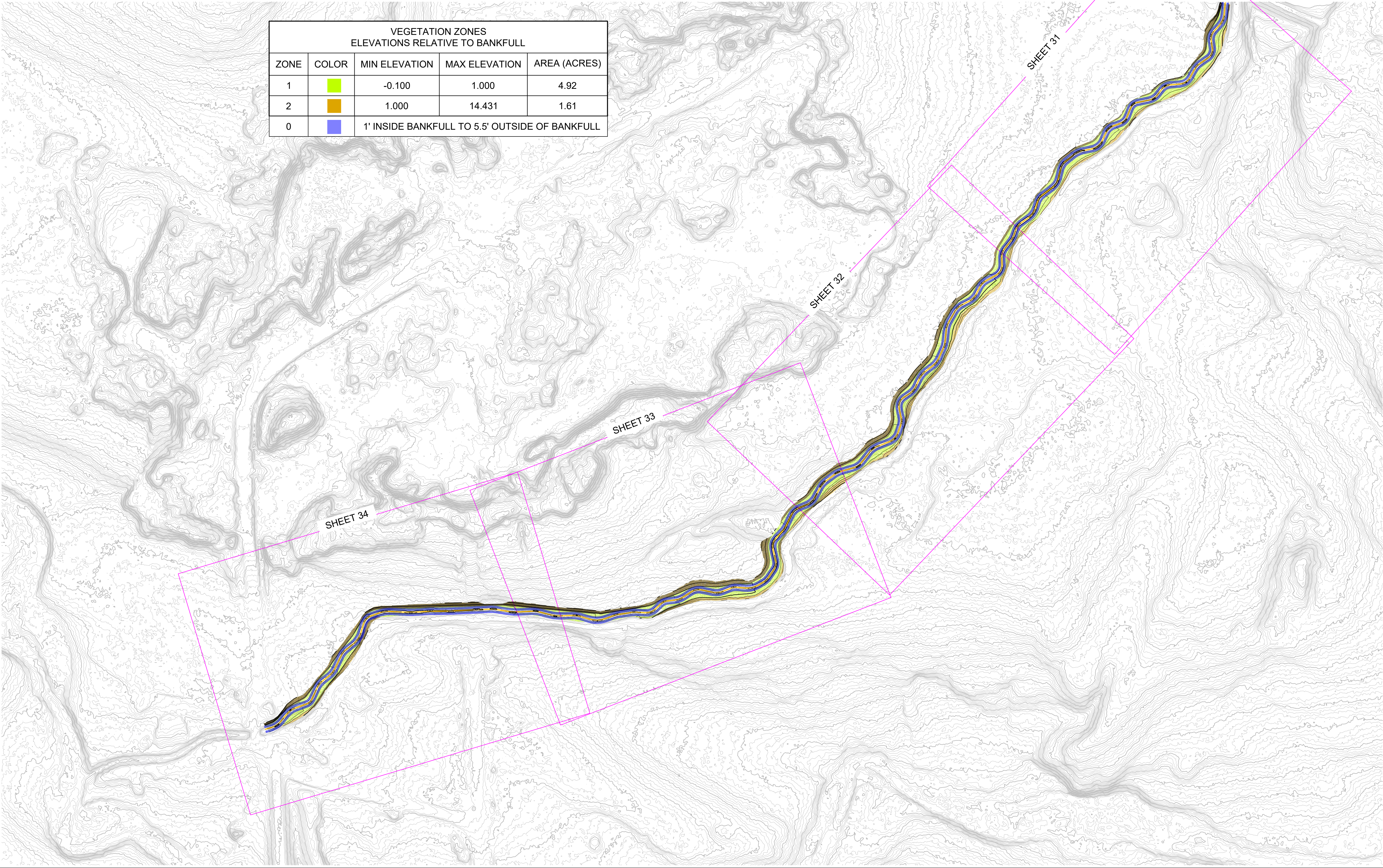
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CONSTRUCTION

DATE: 10/15/2021
SCALE (34"X22"): 1" = 200'
SCALE (17"X11"): 1" = 400'

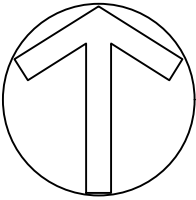


SHEET NUMBER
29 OF 50

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VEGETATION ZONES ELEVATIONS RELATIVE TO BANKFULL				
ZONE	COLOR	MIN ELEVATION	MAX ELEVATION	AREA (ACRES)
1	<div></div>	-0.100	1.000	4.92
2	<div></div>	1.000	14.431	1.61
0	<div></div>	1' INSIDE BANKFULL TO 5.5' OUTSIDE OF BANKFULL		



APPROVED BY: KA

REV

CHECKED BY: MUG

DESCRIPTION

DRAWN BY: GET

APPRV

1

KA

2

KA

3

KA

4

KA

XX

XX

XX

XX

XX

XX

XX

XX

DRAFT 30% DESIGN

DRAFT 60%

DRAFT 90%

BID SET

XX

XX

XX

XX

BIG AND LITTLE 39

STREAM RESTORATION

NEAR SILVER BAY

LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION

LITTLE 39

OVERVIEW - VEGETATION



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

DATE: 10/15/2021
SCALE (34"x22"): 1" = 200'
SCALE (17"x11"): 1" = 400'

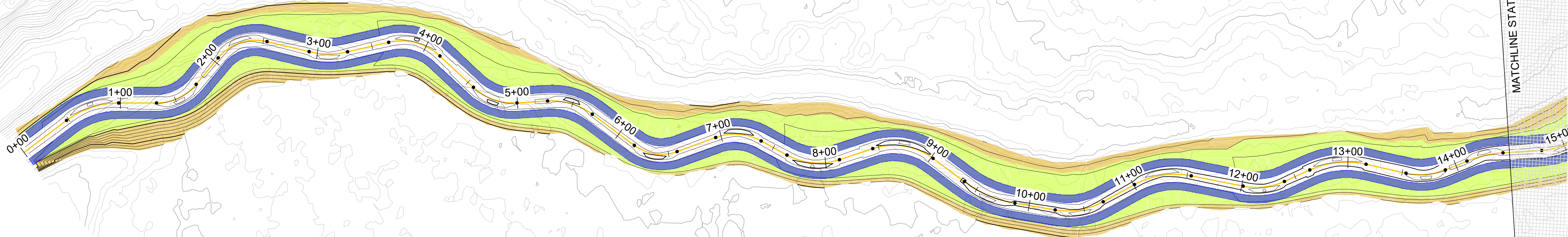
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SCALE IN FEET

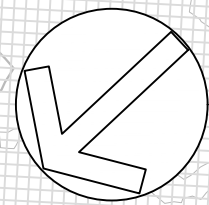
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30 OF 50

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VEGETATION ZONES ELEVATIONS RELATIVE TO BANKFULL				
ZONE	COLOR	MIN ELEVATION	MAX ELEVATION	AREA (ACRES)
1	■	-0.100	1.000	4.92
2	■	1.000	14.431	1.61
0	■	1' INSIDE BANKFULL TO 5.5' OUTSIDE OF BANKFULL		



APPROVED BY: KA

REV

1

CHECKED BY: MUG

DESCRIPTION

DRAFT 30% DESIGN

DRAWN BY: GET

APPROV

KA

APPROVED BY: KA

REV

2

CHECKED BY: MUG

DESCRIPTION

DRAFT 60%

DRAWN BY: GET

APPROV

KA

APPROVED BY: KA

REV

3

CHECKED BY: MUG

DESCRIPTION

DRAFT 90%

DRAWN BY: GET

APPROV

KA

APPROVED BY: KA

REV

4

CHECKED BY: MUG

DESCRIPTION

BID SET

DRAWN BY: GET

APPROV

XX

APPROVED BY: KA

REV

XX

CHECKED BY: MUG

DESCRIPTION

XX

DRAWN BY: GET

APPROV

XX

APPROVED BY: KA

REV

XX

CHECKED BY: MUG

DESCRIPTION

XX

DRAWN BY: GET

APPROV

XX

APPROVED BY: KA

REV

XX

CHECKED BY: MUG

DESCRIPTION

XX

DRAWN BY: GET

APPROV

XX

BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
LITTLE 39
VEGETATION - (1)
STA 0+00 TO 14+50



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

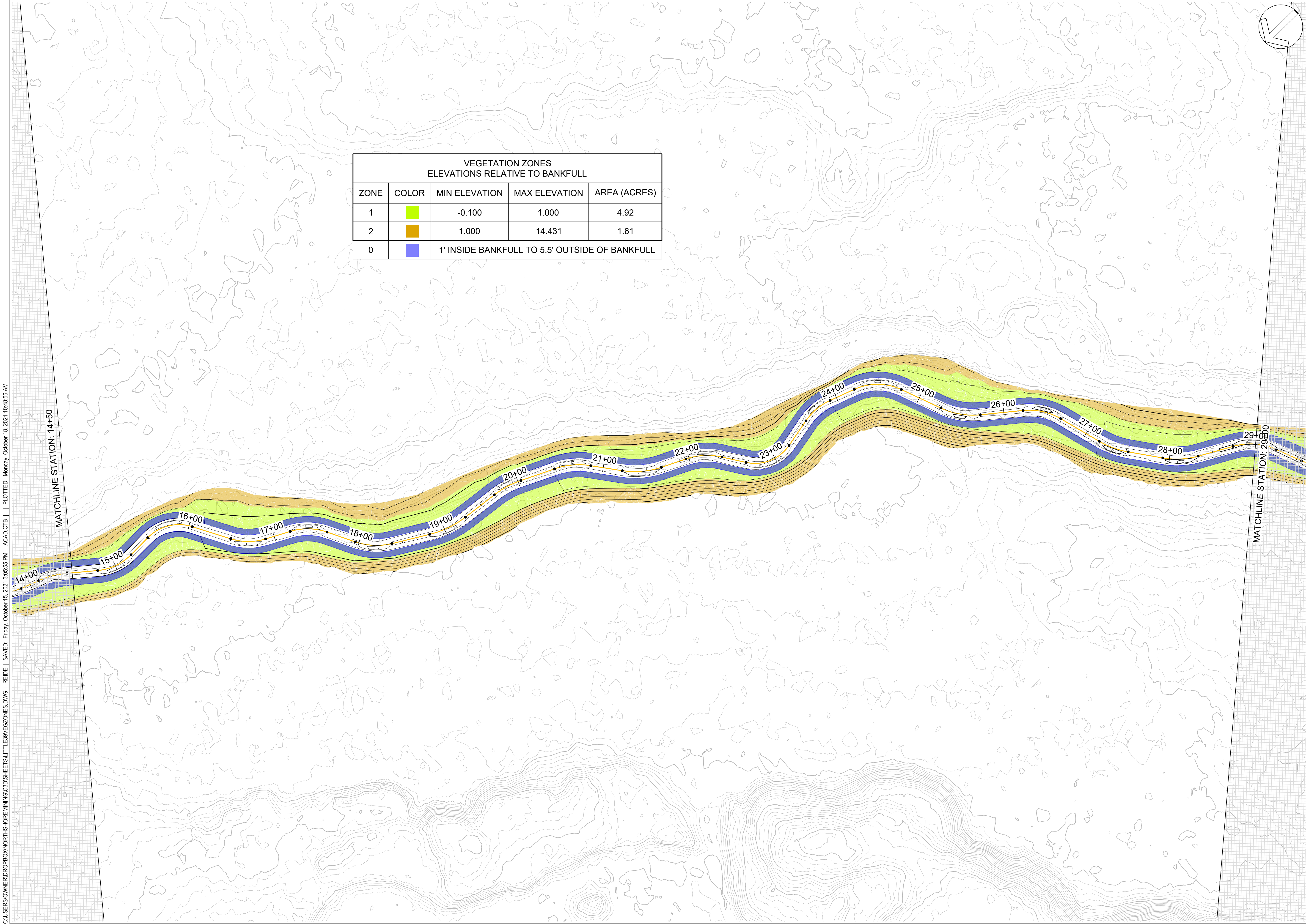
DATE: 10/15/2021
SCALE (34"x22"): 1" = 50'
SCALE (17"x11"): 1" = 100'

0 50 100

SCALE IN FEET

SHEET NUMBER
31 OF 50

C:\USERS\OWNER\PROPOX\NORTHSHOREMINING\CD\SHEETS\LITTLE39\VEGETATION\VEGETATION.DWG | REIDE | DATE: Friday, October 15, 2021 3:05:55 PM | ACAD.CTB | PLOTTED: Monday, October 18, 2021 10:48:56 AM



VEGETATION ZONES ELEVATIONS RELATIVE TO BANKFULL				
ZONE	COLOR	MIN ELEVATION	MAX ELEVATION	AREA (ACRES)
1	Light Green	-0.100	1.000	4.92
2	Orange	1.000	14.431	1.61
0	Blue	1' INSIDE BANKFULL TO 5.5' OUTSIDE OF BANKFULL		

STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
LITTLE 39
VEGETATION - (2)
STA 14+50 TO 29+00



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

DATE: 10/15/2021
SCALE (34"x22"): 1" = 50'
SCALE (17"x11"): 1" = 100'



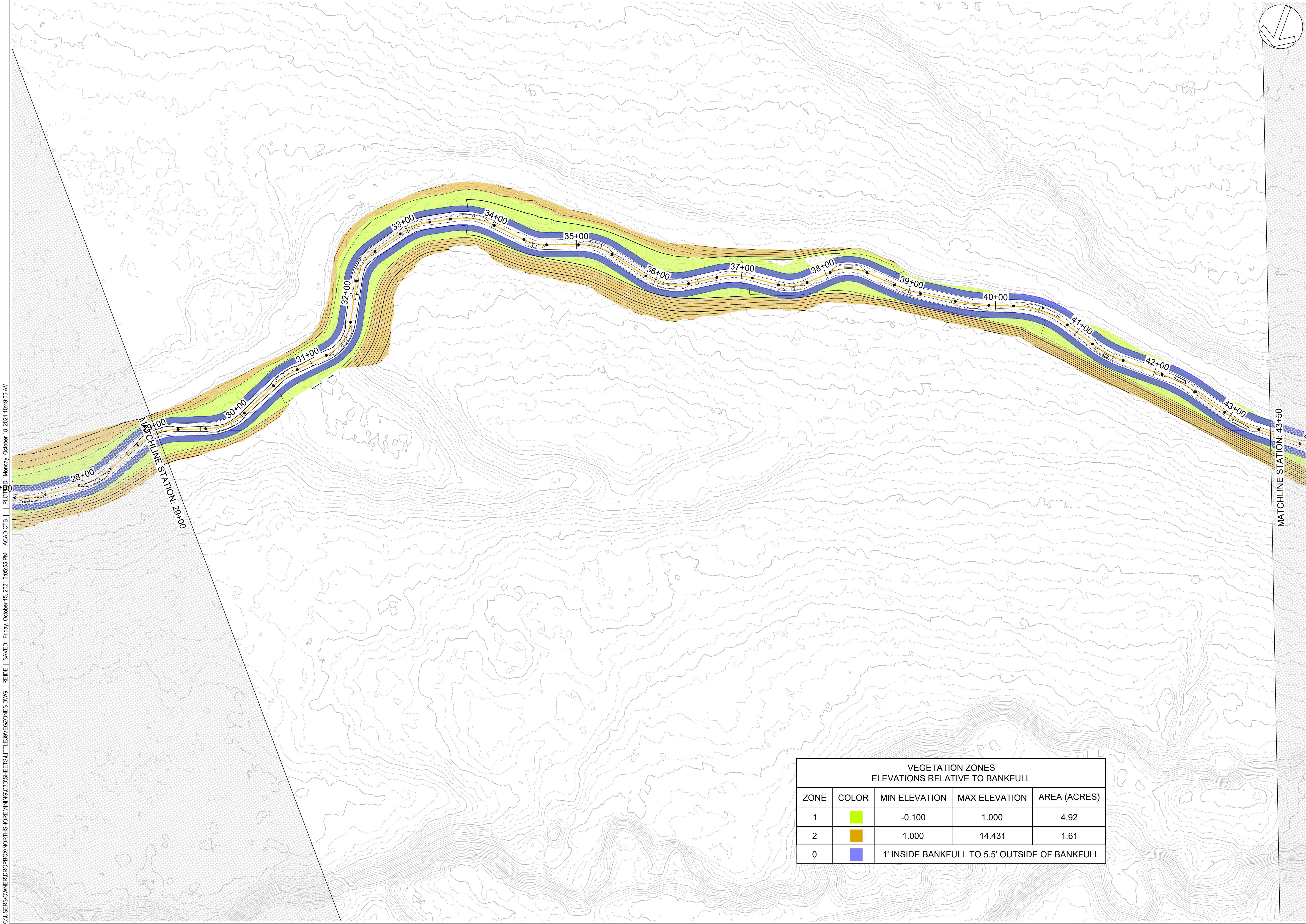
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SCALE IN FEET

SHEET NUMBER
32 OF 50

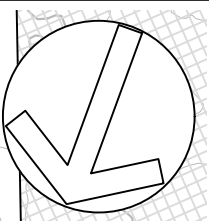
APPROVED BY: KA
CHECKED BY: MJG
DRAWN BY: GET

REV	DESCRIPTION	APPROV
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2	DRAFT 60%	KA
3	DRAFT 90%	KA
4	BID SET	KA
XX		XX
XX		XX
XX		XX
XX		XX

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VEGETATION ZONES ELEVATIONS RELATIVE TO BANKFULL				
ZONE	COLOR	MIN ELEVATION	MAX ELEVATION	AREA (ACRES)
1	<div></div>	-0.100	1.000	4.92
2	<div></div>	1.000	14.431	1.61
0	<div></div>	1' INSIDE BANKFULL TO 5.5' OUTSIDE OF BANKFULL		



APPROVED BY: KA

CHECKED BY: MUG

DRAWN BY: GET

REV


DESCRIPTION

APPRV


1	DRAFT 30% DESIGN	KA
2	DRAFT 60%	KA
3	DRAFT 90%	KA
4	BID SET	KA
XX	XX	XX
XX	XX	XX
XX	XX	XX
XX	XX	XX

BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
LITTLE 39
VEGETAION - (3)
STA 29+00 TO 43+50



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING
BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

DATE: 10/15/2021
SCALE (34"x22"): 1" = 50'
SCALE (17"x11"): 1" = 100'

050100

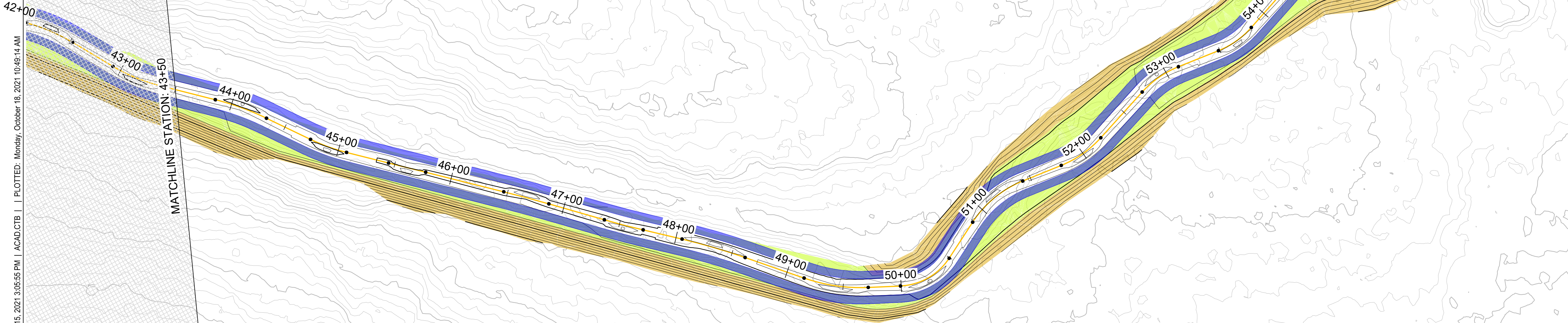
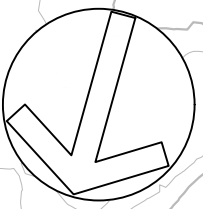
SCALE IN FEET

SHEET NUMBER
33 OF 50

C:\USERS\OWNER\PROPOX\NORTHSHOREMINING\CD\SHEETS\LITTLE39\VEGETATION\VEGETATION.dwg | REIDE | SAVER: Friday, October 15, 2021 3:05:55 PM | ACAD.CTB | PLOTTED: Monday, October 18, 2021 10:49:14 AM

MATCHLINE STATION: 43+50

VEGETATION ZONES ELEVATIONS RELATIVE TO BANKFULL				
ZONE	COLOR	MIN ELEVATION	MAX ELEVATION	AREA (ACRES)
1	Light Green	-0.100	1.000	4.92
2	Orange	1.000	14.431	1.61
0	Blue	1' INSIDE BANKFULL TO 5.5' OUTSIDE OF BANKFULL		



BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
LITTLE 39
VEGETATION - (4)
STA 43+50 TO 56+72



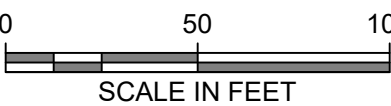
NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

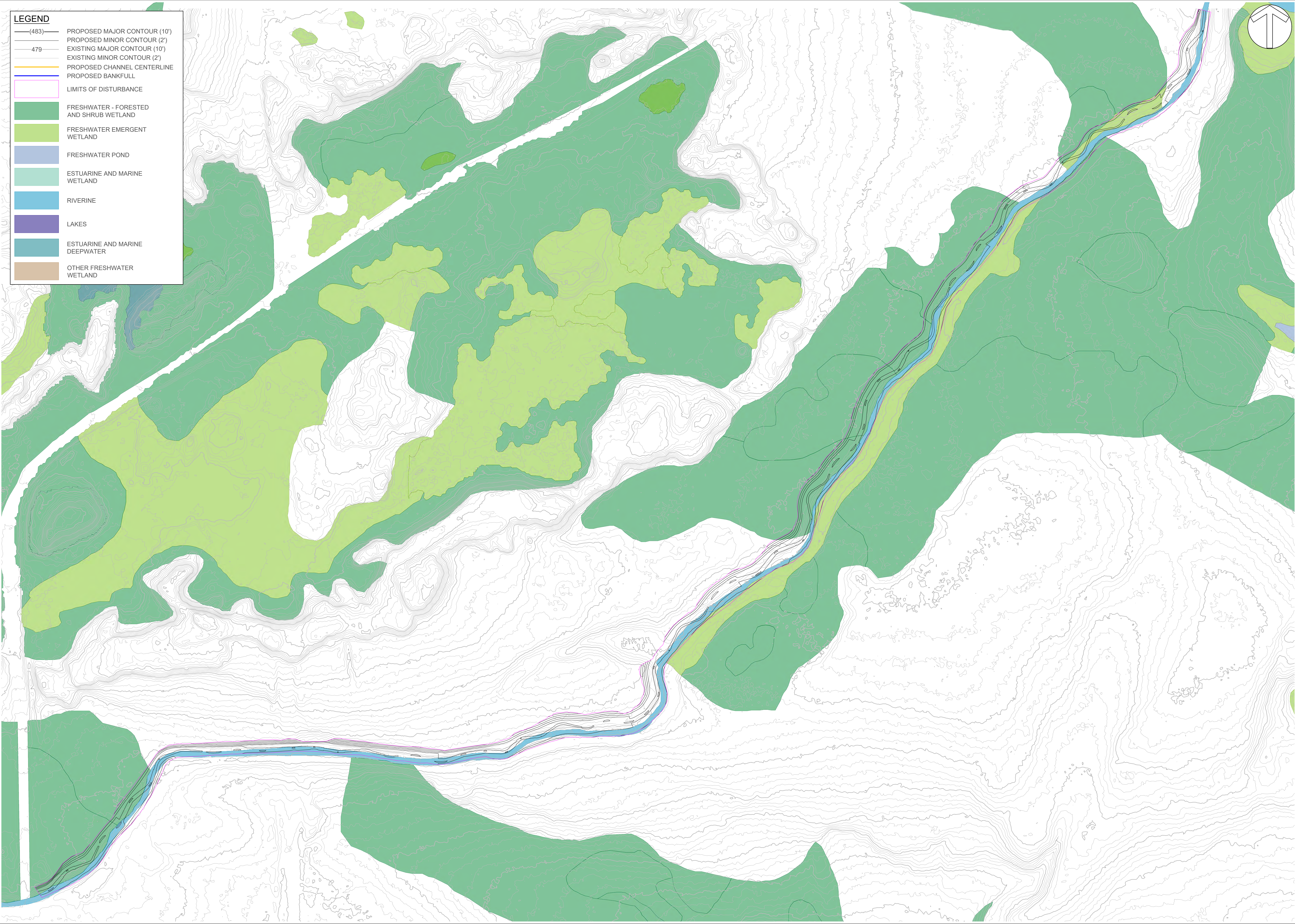
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SCALE (34"x22"): 1" = 50'
SCALE (17"x11"): 1" = 100'



SHEET NUMBER
34 OF 50

APPROVED BY: KA	REV	CHECKED BY: MUG		DRAWN BY: GET	
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	2	DRAFT 60%		KA	
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	4	BID SET		KA	
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	XX			XX	
	XX			XX	
	XX			XX	

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LEGEND

(483)

479

PROPOSED MAJOR CONTOUR (10')

PROPOSED MINOR CONTOUR (2')

EXISTING MAJOR CONTOUR (10')

EXISTING MINOR CONTOUR (2')

PROPOSED CHANNEL CENTERLINE

PROPOSED BANKFULL

LIMITS OF DISTURBANCE

FRESHWATER - FORESTED AND SHRUB WETLAND

FRESHWATER EMERGENT WETLAND

FRESHWATER POND

ESTUARINE AND MARINE WETLAND

RIVERINE

LAKES

ESTUARINE AND MARINE DEEPWATER

OTHER FRESHWATER WETLAND

STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION
LITTLE 39

OVERLAY - NATIONAL WETLAND INVENTORY

CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

BEAVER
RIVER
CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

DATE: 10/15/2021
SCALE (34"x22"): 1" = 150'
SCALE (17"x11"): 1" = 300'

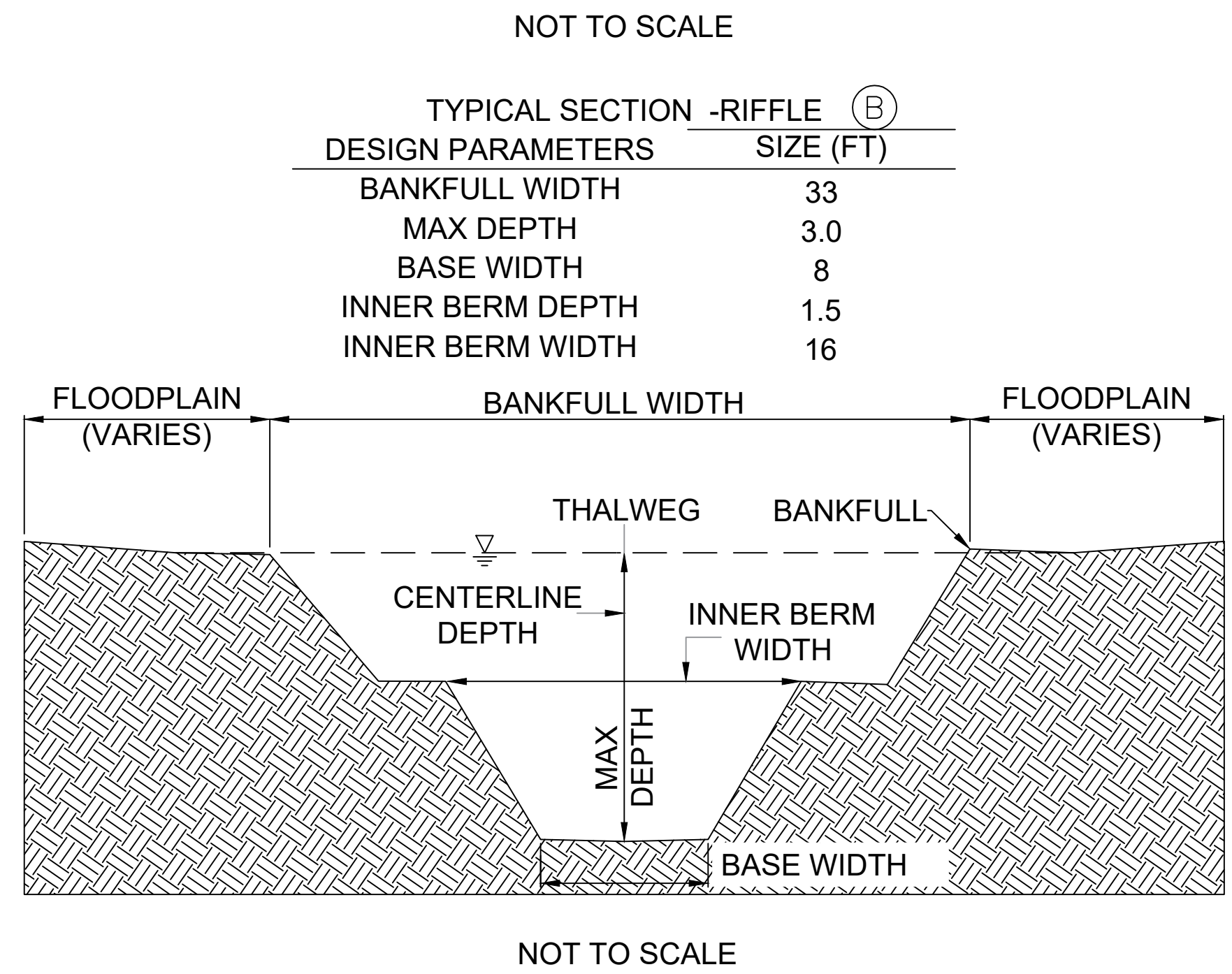
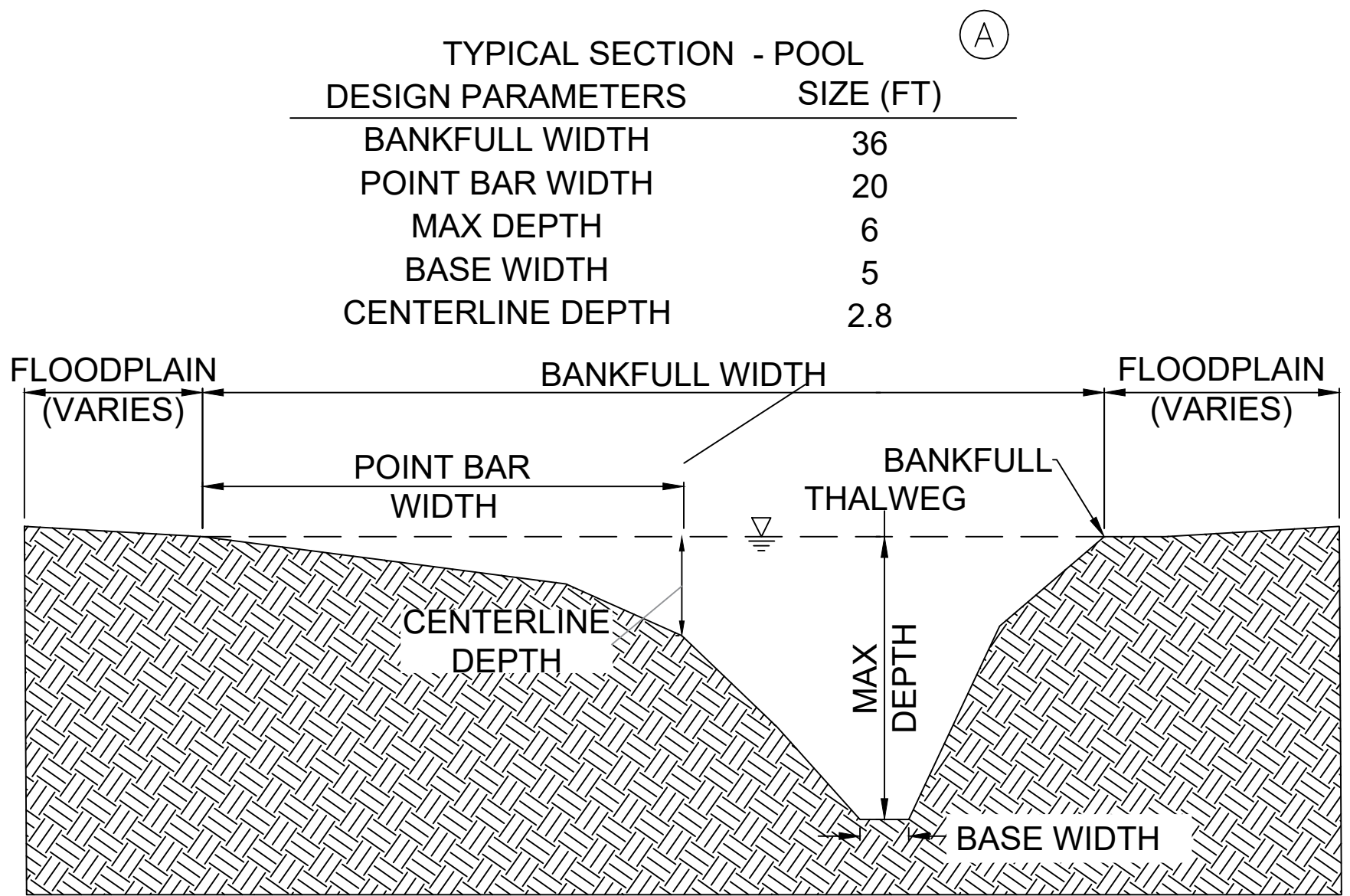
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SCALE IN FEET

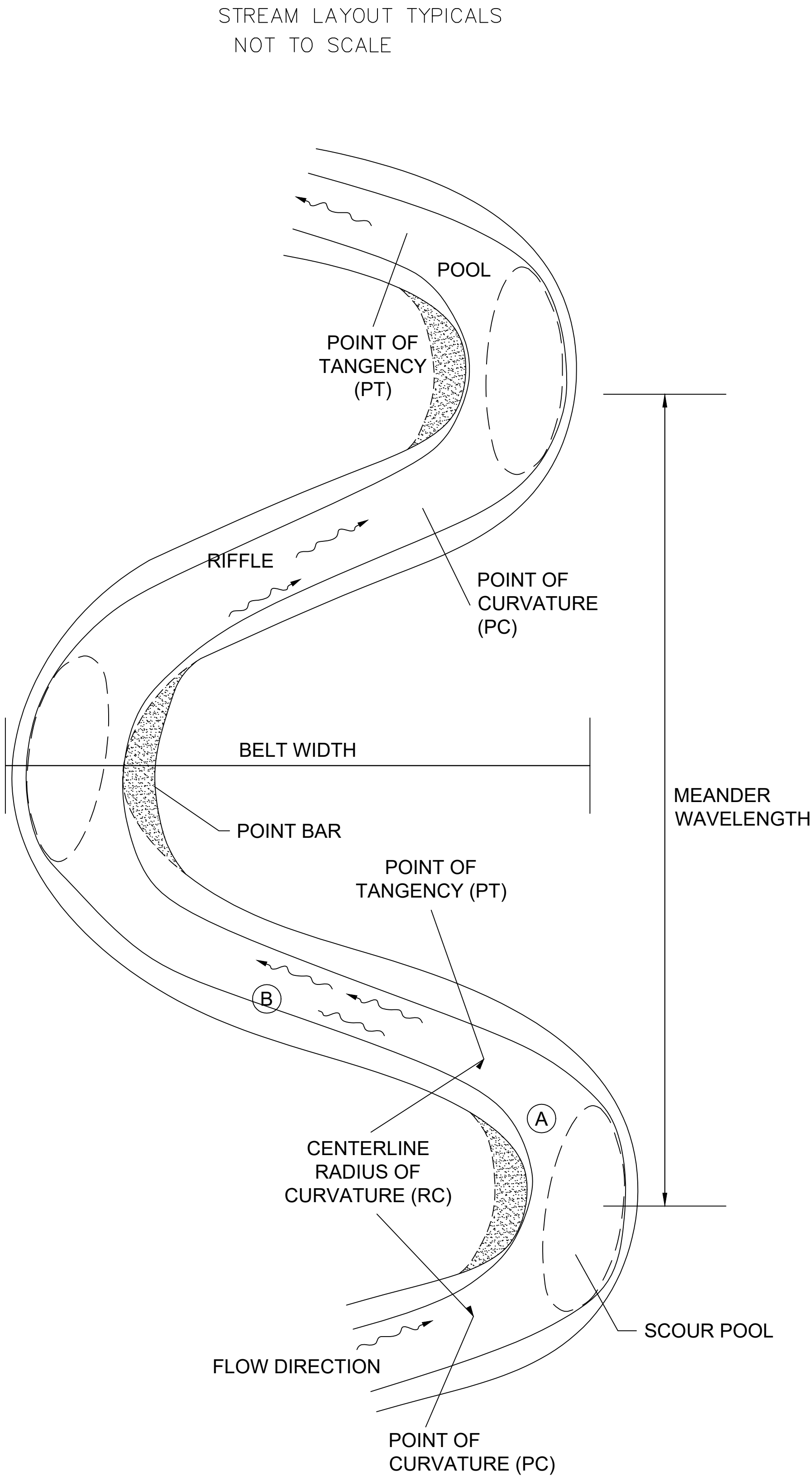
SHEET NUMBER
35 OF 50

APPROVED BY: KA	REV	CHECKED BY: MUG		DRAWN BY: GET	
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	3	DRAFT 90%		KA	
	4	BID SET		XX	
	XX	XX		XX	
	XX	XX		XX	
	XX	XX		XX	
	XX	XX		XX	



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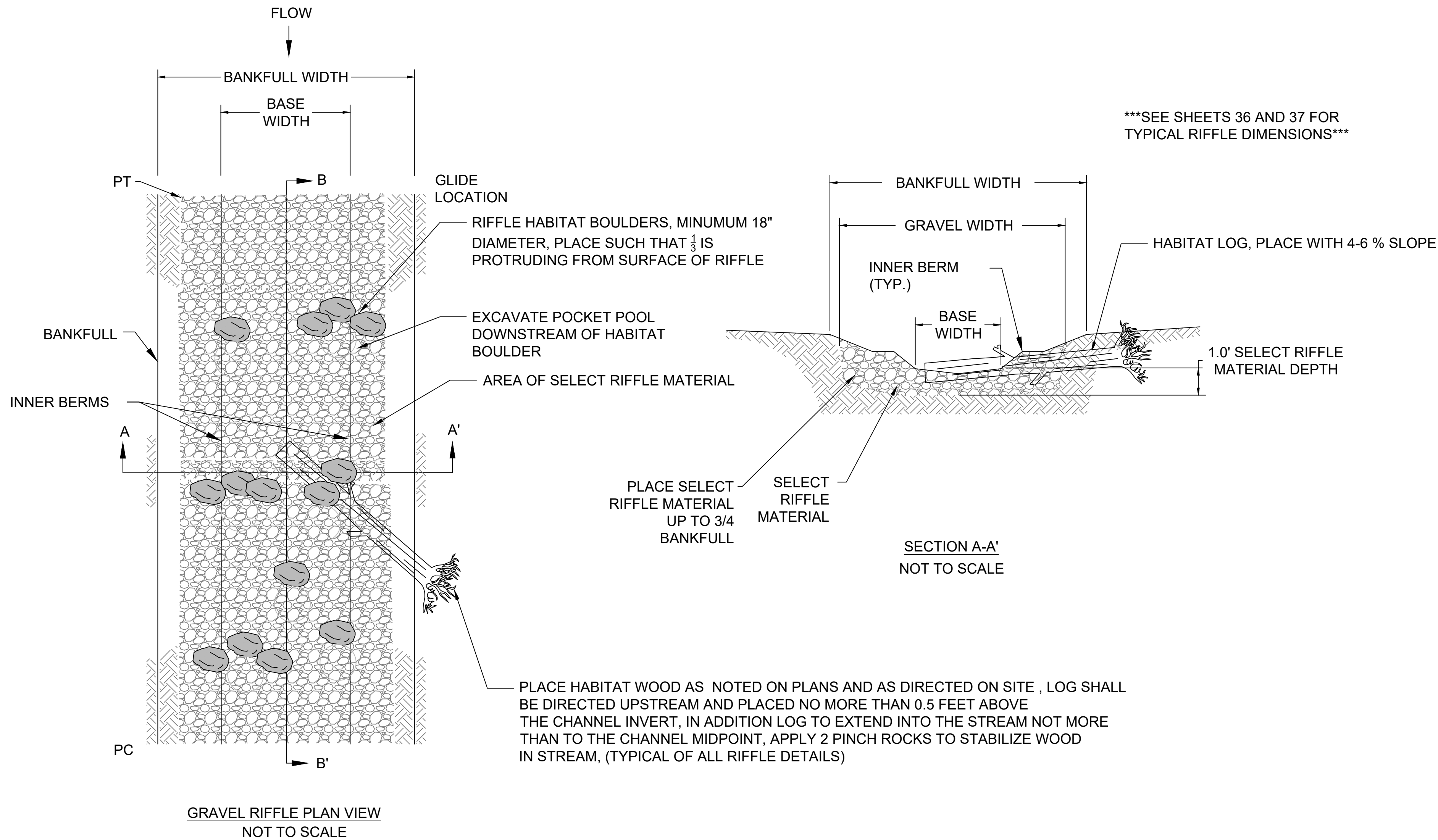
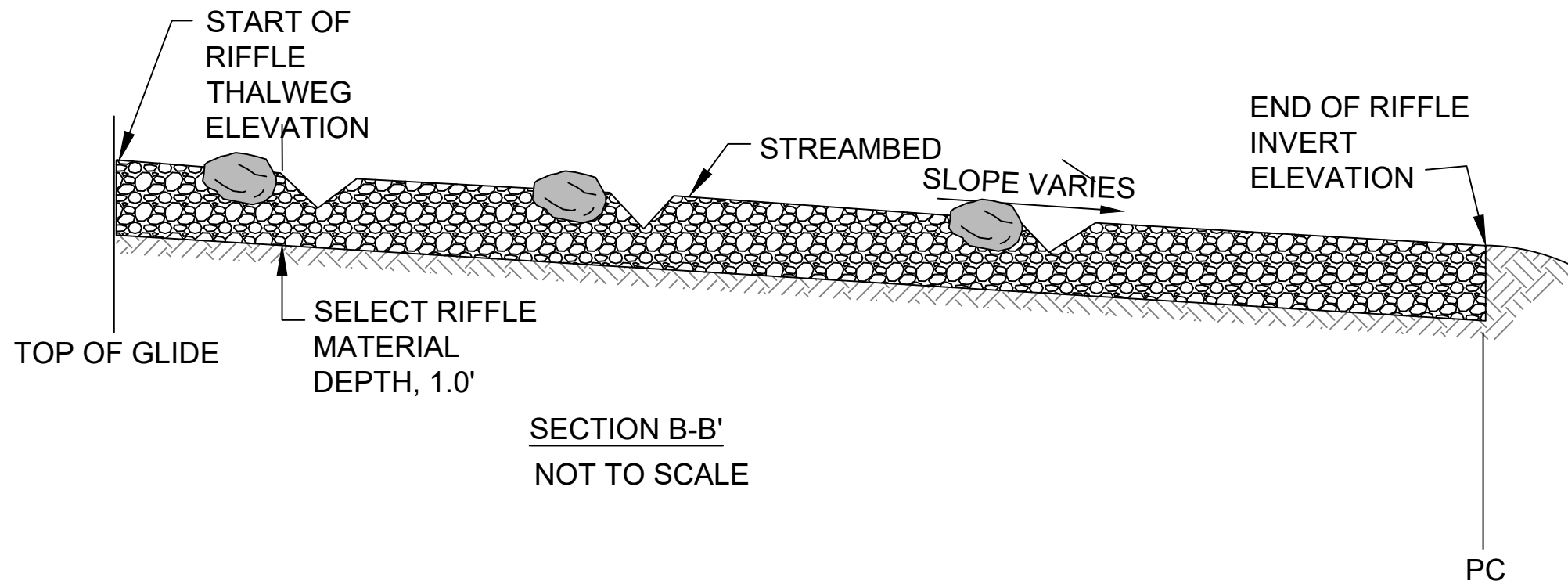
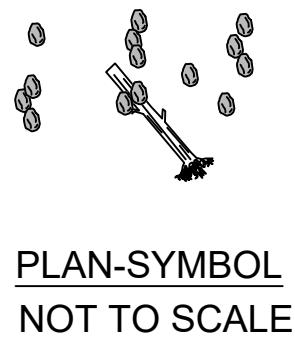
STREAM MORPHOLOGY
STREAM NAME: BIG 39



STREAM NAME	BIG 39		
STREAM TYPE	B4c		
DRAINAGE AREA, DA (SQ MI)	23		
DESIGN PARAMETERS	MINIMUM	MEDIAN	MAXIMUM
MEAN RIFFLE DEPTH, D_{BKF} (FT)		1.8	
RIFFLE WIDTH, W_{BKF} (FT)		33.0	
WIDTH-TO-DEPTH RATIO, $[W_{BKF}/D_{BKF}]$		18.0	
RIFFLE CROSS-SECTION AREA, A_{BKF} (SQ FT)		60.0	
MAX RIFFLE DEPTH, D_{MAX} (FT)		2.9	
POOL WIDTH, W_{BKFP} (FT)		36.0	
POOL CROSS-SECTION AREA, A_{BKFP} (SQ FT)		80.0	
MAX POOL DEPTH, D_{MAXP} (FT)		6.0	
RIFFLE LENGTH, L_{RIF} (FT)	1.4	3.0	4.3
POOL LENGTH, L_p (FT)	1.5	1.9	2.8
ENTRENCHMENT RATIO, ER $[W_{FPA}/W_{BKF}]$		2.2	
BELT WIDTH, W_{BLT} (FT)		80.0	
RADIUS OF CURVATURE, RC (FT)	3.0	4.4	9.0
POOL-TO-POOL SPACING, P-P (FT)	3.5		7.0
VALLEY SLOPE, VS (FT/FT)	0.0019		
WATER SURFACE SLOPE, WS (FT/FT)	0.0020		
SINUOSITY, $K = SL/VL$ (FT/FT)	1.0300		

BIG AND LITTLE 39 STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN	APPROVED BY: KA	CHECKED BY: MJG	DRAWN BY: GET
	REV	DESCRIPTION	APPRV
	1	DRAFT 30% DESIGN	KA
	2	DRAFT 60%	KA
	3	DRAFT 90%	KA
	4	BID SET	KA
	XX	XX	XX
	XX	XX	XX
	XX	XX	XX
	XX	XX	XX
BID SET - NOT FOR CONSTRUCTION BIG 39 ----- DETAIL - TYPICAL SECTIONS			
<div><div>NORTHSHORE MINING CO 10 OUTER DR SILVER BAY, MN 55614 ----</div><div><div>BEAVER RIVER CONSULTING BEAVER RIVER CONSULTING, LLC. 5752 EAGLE VIEW DRIVE DULUTH, MN 55803 ----</div></div></div>			
BID SET NOT FOR CONSTRUCTION			
DATE:		10/15/2021	
NOT TO SCALE			
SHEET NUMBER 36 OF 50			

C:\USERS\OWNER\PROBOX\NORTHSHOREMINING\C3D\SHEETS\NORTHSHORE38MASTERDETAIL.DWG | REIDE | SAVED: Friday, October 15, 2021 3:33:20 PM | ACAD.CTB | PLOTTED: Monday, October 18, 2021 10:50:25 AM



NOTES:


1. THE GRAVEL AND COBBLE SUBSTRATE USED FOR THIS FEATURE SHOULD BE PREFERENTIALLY HARVESTED FROM THE ARMOR LAYER OF THE EXISTING CHANNEL AND AMENDED OR SORTED AS NOTED BY THE REGION OF THE RIFFLE/GLIDE.
2. SORTING AND SIEVING OF THE HARVESTED RIFFLE SUBSTRATE IS INCIDENTAL TO THE CONSTRUCTION OF THIS STRUCTURE
3. SELECT RIFFLE MATERIAL SHALL HAVE A GRADATION OF 25 % BY VOLUME OF CLASS III RIP RAP, 25 PERCENT BY VOLUME CLASS II RIP RAP, AND 50 PERCENT BY VOLUME HARVESTED IN PLACE STREAM BED MATERIAL.
4. SELECT RIFFLE MATERIAL WILL BE PLACED AT A MINIMUM THICKNESS OF 1.5'.
5. THE SELECT RIFFLE MATERIAL WILL BE PLACED SUCH THAT, IN CROSS-SECTION, ITS LOWEST ELEVATION OCCURS IN THE CENTER OF THE CHANNEL AS PER THE DETAIL.
6. HABITAT BOULDERS SHALL BE PLACED IN THE RIFFLE SUCH THAT NOT MORE THAN $1/3 - \frac{1}{2}$ THE DIAMETER OF THE BOULDER PROTRUDES ABOVE THE STREAM BED. AS SHOWN SOME OF THE BOULDERS SHALL BE PLACED IN GROUPINGS OF 3 IN ORDER TO CREATE DOWNSTREAM SCOUR, THE BOULDERS SHALL BE 18-36" IN DIAMETER.
7. SELECT RIFFLE MATERIAL SHALL BE COMPACTED USING TRACK EQUIPMENT SUCH THAT FUTURE SETTLEMENT OF THE MATERIAL IS KEPT TO A MINIMUM.
8. RE-DRESSING OF CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF IN-STREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.

APPROVED BY: KA	REV	CHECKED BY: MJG	DESCRIPTION	DRAWN BY: GET	APPRV
	1		DRAFT 30% DESIGN		KA
	2		DRAFT 60%		KA
	3		DRAFT 90%		KA
	4		BID SET		KA
	XX		XX		XX
	XX		XX		XX
	XX		XX		XX
	XX		XX		XX


BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION

DETAIL - GRAVEL RIFFLE



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER
RIVER
CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

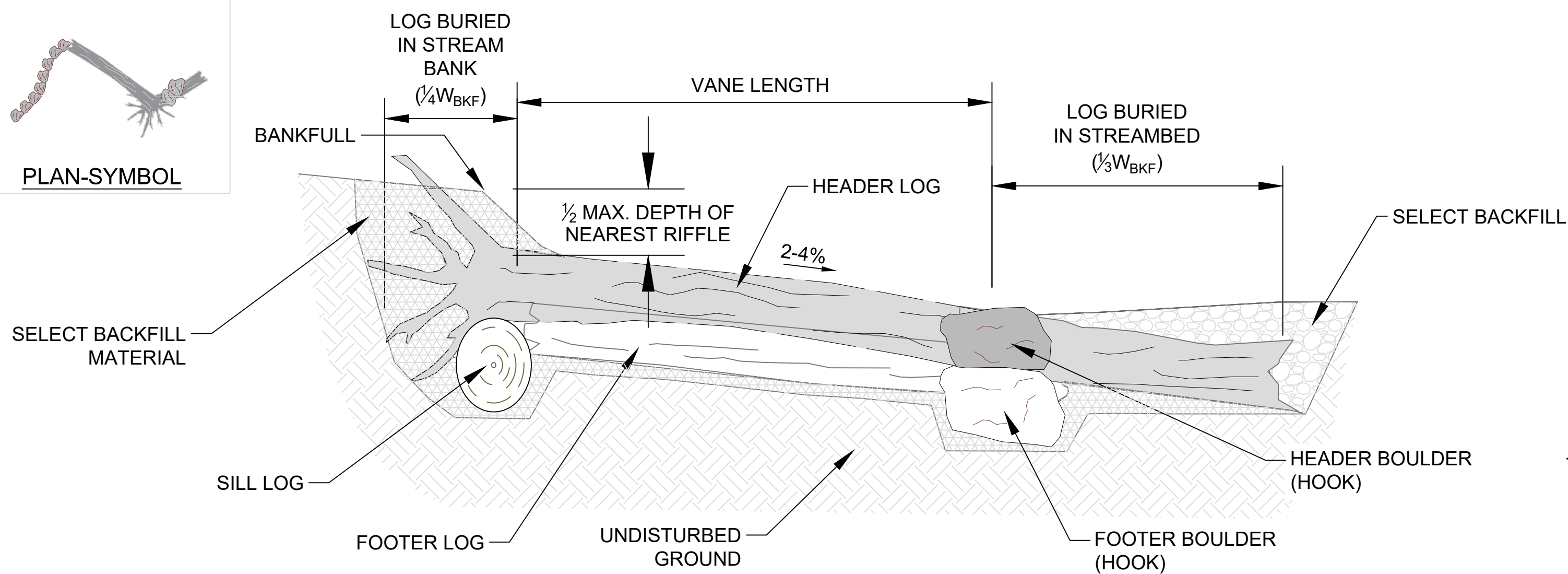
DATE:

10/15/2021

NOT TO SCALE

SHEET NUMBER

38 OF 50



A cross-sectional diagram of a boulder hook repair. The diagram shows a horizontal line representing the ground surface. Below this line, a hatched area represents the streambed. A vertical line on the left indicates the 'BOWLED OUT BANK'. A horizontal line across the middle is labeled 'BANKFULL'. A vertical line on the right is labeled 'END OF BOULDER HOOK'. The diagram shows a 'SELECT BACKFILL' area, a '700 GRAM COIR WITH CAT 3N 2S BACKER BLANKET' area, a 'FOOTER LOG', a 'HEADER LOG', and a 'STREAMBED' area. The 'UNDISTURBED GROUND' is shown on the right. The diagram is labeled 'SECTION C-C' at the bottom.

SECTION C-C'

1. THE LOG J-HOOK WITH ROOT WAD IS USED TO STABILIZE THE OUTSIDE BANK OF A STREAM CHANNEL IN A BEND BY PHYSICALLY PROTECTING THE BANK AND HELPING TURN THE WATER TOWARD THE CENTER OF THE CHANNEL. THE LOG J-HOOK CAN BE USED TO HELP STABILIZE AN EXISTING CHANNEL OR TO PROTECT THE BANK OF A NEWLY CONSTRUCTED CHANNEL.

2. THE STRUCTURE IS COMPRISED OF BOTH LOGS AND BOULDERS. LOGS SHALL HAVE A MINIMUM DIAMETER OF 14". THE LENGTH OF THE LOGS WILL BE DETERMINED BY THE SIZE AND SHAPE OF THE CHANNEL. ALL LOGS SHALL BE RELATIVELY STRAIGHT AND LIMBS SHALL BE TRIMMED FLUSH. THE SIZE OF THE BOULDERS VARIES WITH THE SIZE OF THE CHANNEL.

3. HEADER LOGS/BOULDERS SHALL BE UNDERLAIN BY FOOTER LOGS/BOULDERS UNLESS OTHERWISE DIRECTED BY THE ENGINEER. FOOTER LOGS PROVIDE SCOUR PROTECTION FOR HEADER LOGS. FOOTER BOULDERS PROVIDE SCOUR PROTECTION AND A FOUNDATION FOR THE HEADER BOULDERS.

4. THE SILL LOG WITH ROOT WAD IS GENERALLY INSTALLED FIRST. THE CONTRACTOR SHALL DIG A TRENCH PERPENDICULAR TO THE BANKFULL FLOW DIRECTION AND INSTALL THE SILL LOG. IT MAY BE NECESSARY TO CUT THE SILL LOG ROOTWAD TO PREVENT THE ROOTWAD FROM PROTRUDING ABOVE THE BANKFULL ELEVATION. A BOULDER OR HEADER SILL LOG SHALL BE PLACED ON THE SILL LOG TO EFFECTIVELY EXTEND THE SILL FURTHER INTO THE BANK.

5. THE HEADER LOG OF THE VANE ARM IS GENERALLY INSTALLED NEXT. THE CONTRACTOR SHALL DIG A TRENCH TO FACILITATE THE INSTALLATION OF THE VANE ARM. THE HEADER LOG SHALL TIE INTO THE STREAM BANK AT A MINIMUM ELEVATION OF 1/4 DMAX (MEASURED AT THE NEXT DOWNSTREAM RIFFLE) BELOW BANKFULL ELEVATION AND A MINIMUM ELEVATION OF 1/2 DMAX (MEASURED AT THE NEXT DOWNSTREAM RIFFLE) BELOW BANKFULL ELEVATION UNLESS OTHERWISE DIRECTED BY THE ENGINEER. THE HEADER LOG SHALL EXTEND FROM THE SILL LOG TO BEYOND THE HOOK PORTION OF THE STRUCTURE, GENERALLY AT A SLOPE OF 2 - 4%. THE VANE ARM FOOTER LOG SHALL BE CUT TO FIT BETWEEN SILL LOG AND THE BOULDER HOOK PORTION OF THE STRUCTURE. THE FOOTER LOG OF THE VANE ARM SHALL BE INSTALLED FROM UPSTREAM SIDE AND INSTALLED AGAINST THE LOWER HALF OF THE HEADER LOG RESULTING IN A STAGGER WITH THE HEADER LOG BEING SLIGHTLY MORE DOWNSTREAM THAN THE FOOTER LOG. ANY GAPS BETWEEN THE HEADER AND FOOTER LOGS WIDER THAN 1" SHALL BE CHINKED WITH BRANCHES AND/OR BRUSH FROM THE UPSTREAM SIDE. WHEN COMPLETE THE FOOTER LOG WILL NOT BE VISIBLE BUT THE HEADER LOG WILL BE VISIBLE DURING LOW FLOWS.

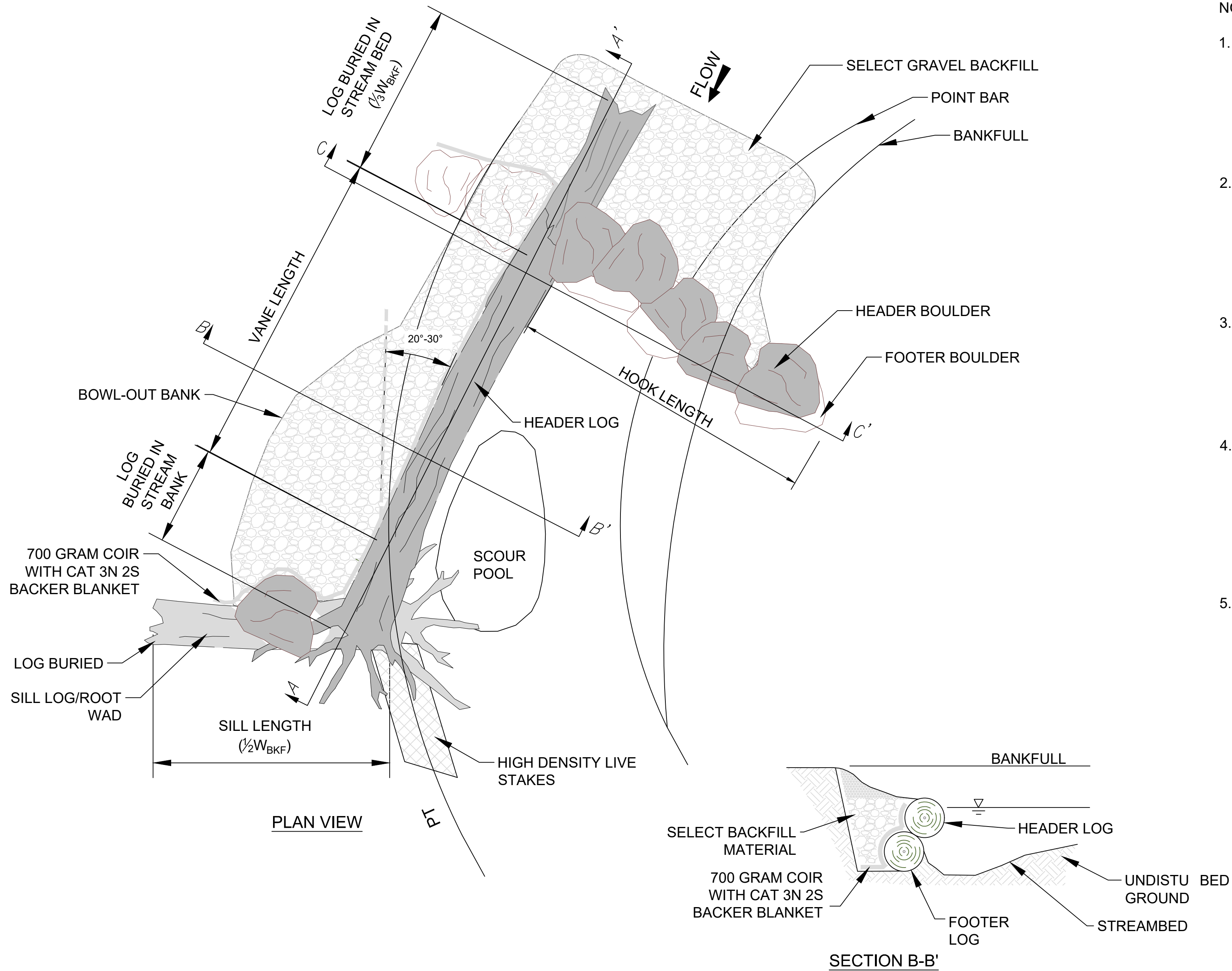
6. THE HOOK PORTION OF THE STRUCTURE CONSISTS OF BOULDERS. THE CONTRACTOR SHALL EXCAVATE A TRENCH TO FACILITATE THE INSTALLATION OF A ROW OF FOOTER BOULDERS THAT EXTEND FROM THE END OF THE FOOTER LOG OF THE VANE ARM ACROSS THE CHANNEL TO BEYOND BANKFULL ON THE OTHER SIDE OF THE CHANNEL CREATING A BURIED SILL. THE CONTRACTOR SHALL INSTALL HEADER BOULDERS ON TOP OF THE FOOTER BOULDERS. ALL BOULDERS SHALL BE FIT TIGHTLY TOGETHER AND ANY GAPS WIDER THAN 1" SHALL BE CHINKED WITH GRAVEL AND COBBLE FROM THE UPSTREAM SIDE WITH ROCKS. WHEN COMPLETE THE FOOTER BOULDERS WILL NOT BE VISIBLE BUT THE HEADER BOULDERS WILL BE VISIBLE DURING LOW FLOWS.

THE LOCATION AND ELEVATION OF THE SILL, VANE ARM AND THE BOULDER HOOK STRUCTURE MAY NOT VARY FROM THOSE SPECIFIED IN THE PLAN SHEETS UNLESS DIRECTED OTHERWISE BY THE ENGINEER. THE FOOTER DEPTH ON ALL STRUCTURES REQUIRING FOOTERS SHALL BE 6 TIMES GREATER THAN THE DROP BETWEEN THE STRUCTURE AND THE FOOTERED STRUCTURE DIRECTLY DOWNSTREAM.

8. ON THE UPSTREAM SIDE OF THE LOGS AND BOULDERS 700 GRAM COIR WITH CAT 3N 2S BACKER BLANKET SHALL BE PLACED AS SHOWN IN THE DETAIL PLANVIEW DRAWING. THE BACKER BLANKET SHALL BE NAILED TO UPSTREAM SIDE OF THE HEADER LOGS USING 3" 10D GALVANIZED COMMON NAILS ON 12" SPACING. THE BACKER BLANKET SHALL BE CAREFULLY PLACED AGAINST THE UPSTREAM SIDE OF THE BOULDERS AND HELD IN PLACE BY BACKFILL MATERIAL.

9. THE EXCAVATED AREAS UPSTREAM OF THE SILL, VANE ARM AND BOULDER HOOK SHOULD BE FILLED WITH SELECT BACKFILL MATERIAL AS SPECIFIED AND APPROVED BY THE ENGINEER. THE SELECT BACKFILL AND SOIL BACKFILL MATERIAL SHALL BE OVER COMPACTED USING EQUIPMENT SO THAT FUTURE SETTLEMENT IS KEPT TO A MINIMUM. THE STEAMBANK SHOULD BE BOWLED OUT BEHIND THE VANE ARM AT THE DOWNSTREAM END OF THE VANE ARM.

THE SURFACE OF THIS STRUCTURE SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS-SECTIONS OR ELEVATIONS SHOWN ON THE DRAWINGS . THE DEGREE OF FINISH FOR ELEVATIONS SHALL BE WITHIN 0.1' OF THE GRADES AND ELEVATIONS INDICATED. DRESSING OF THE CHANNEL, BANKFULL BENCH AND FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF THIS STRUCTURE AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.



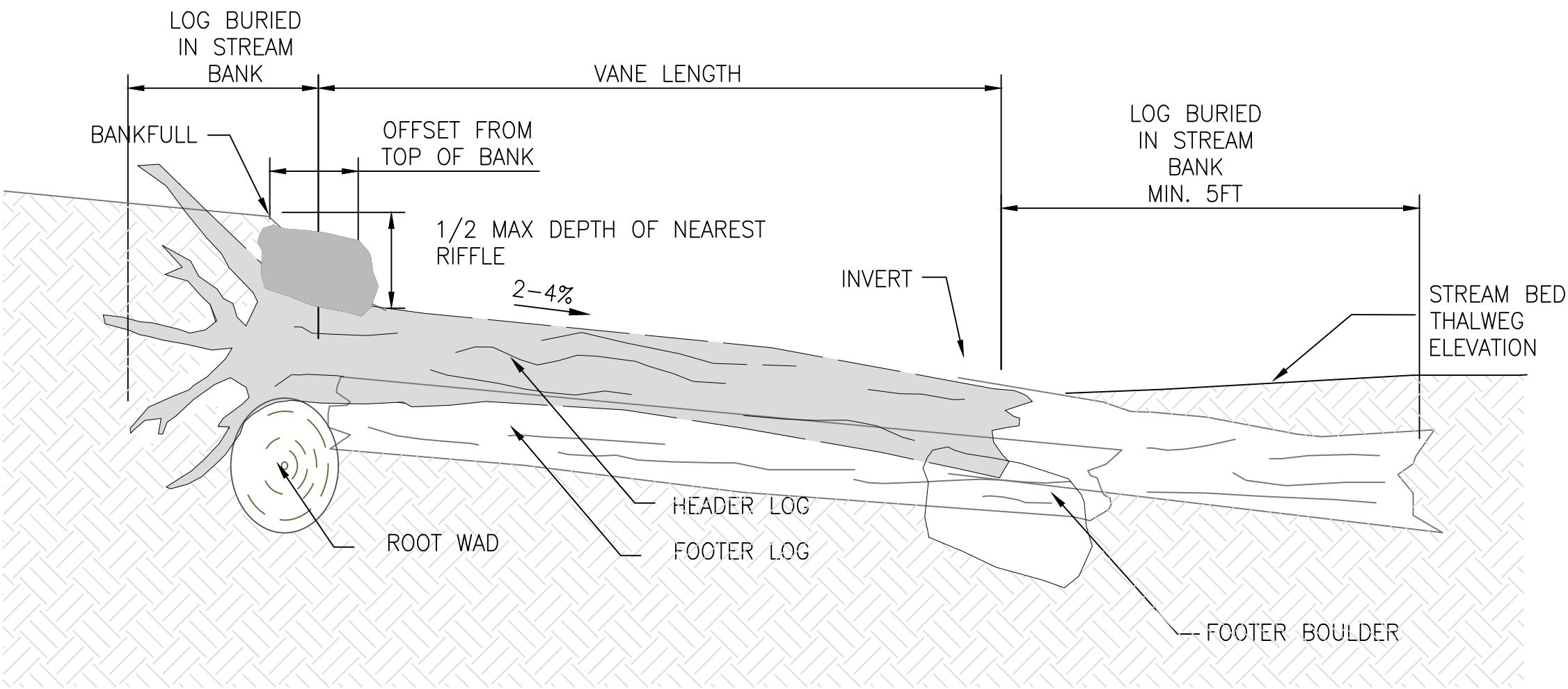
SECTION B-B'

DETAIL - LOG J-HOOK
NOT TO SCALE

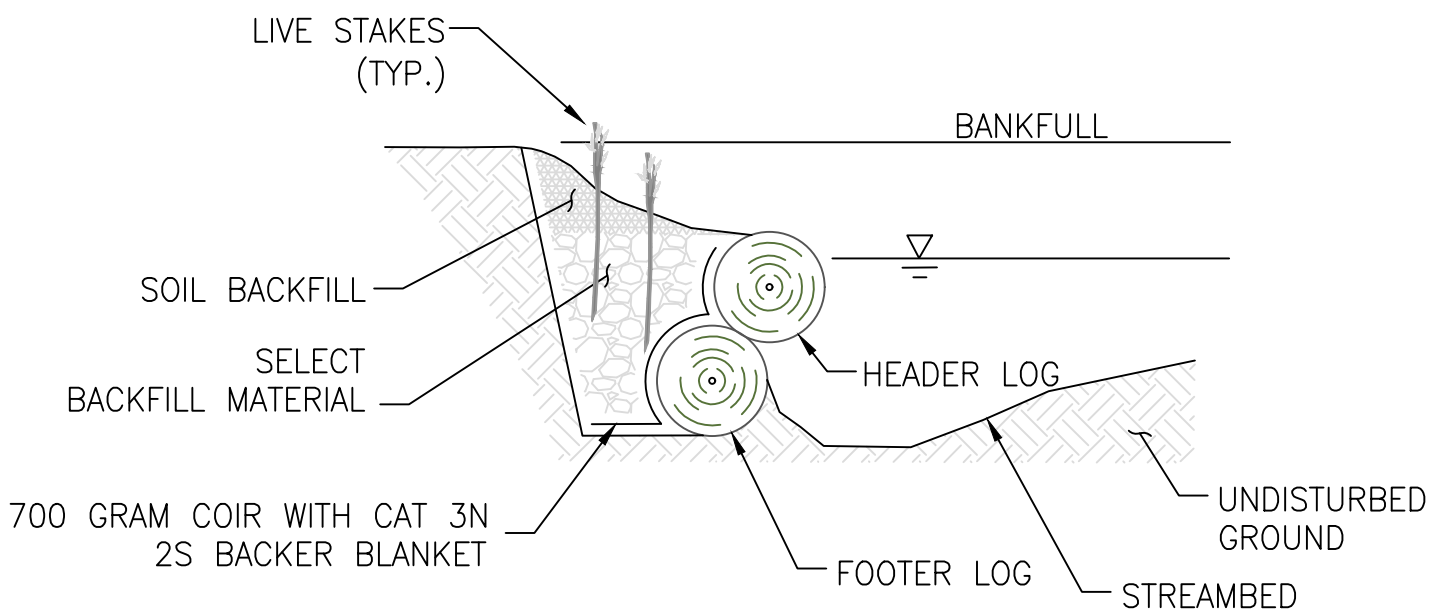
<p>BIG AND LITTLE 39 STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN</p> <p>BID SET - NOT FOR CONSTRUCTION</p> <p>-----</p> <p>DETAIL - LOG J-HOOK</p>	APPROVED BY: KA	CHECKED BY: NJG	DRAWN BY: GET
	REV	DESCRIPTION	APPROV
	1	DRAFT 30% DESIGN	KA
	2	DRAFT 60%	KA
	3	DRAFT 90%	KA
	4	BID SET	KA
	XX	XX	XX
	XX	XX	XX
	XX	XX	XX
	XX	XX	XX



PLAN-SYMBOL



SECTION A-A'



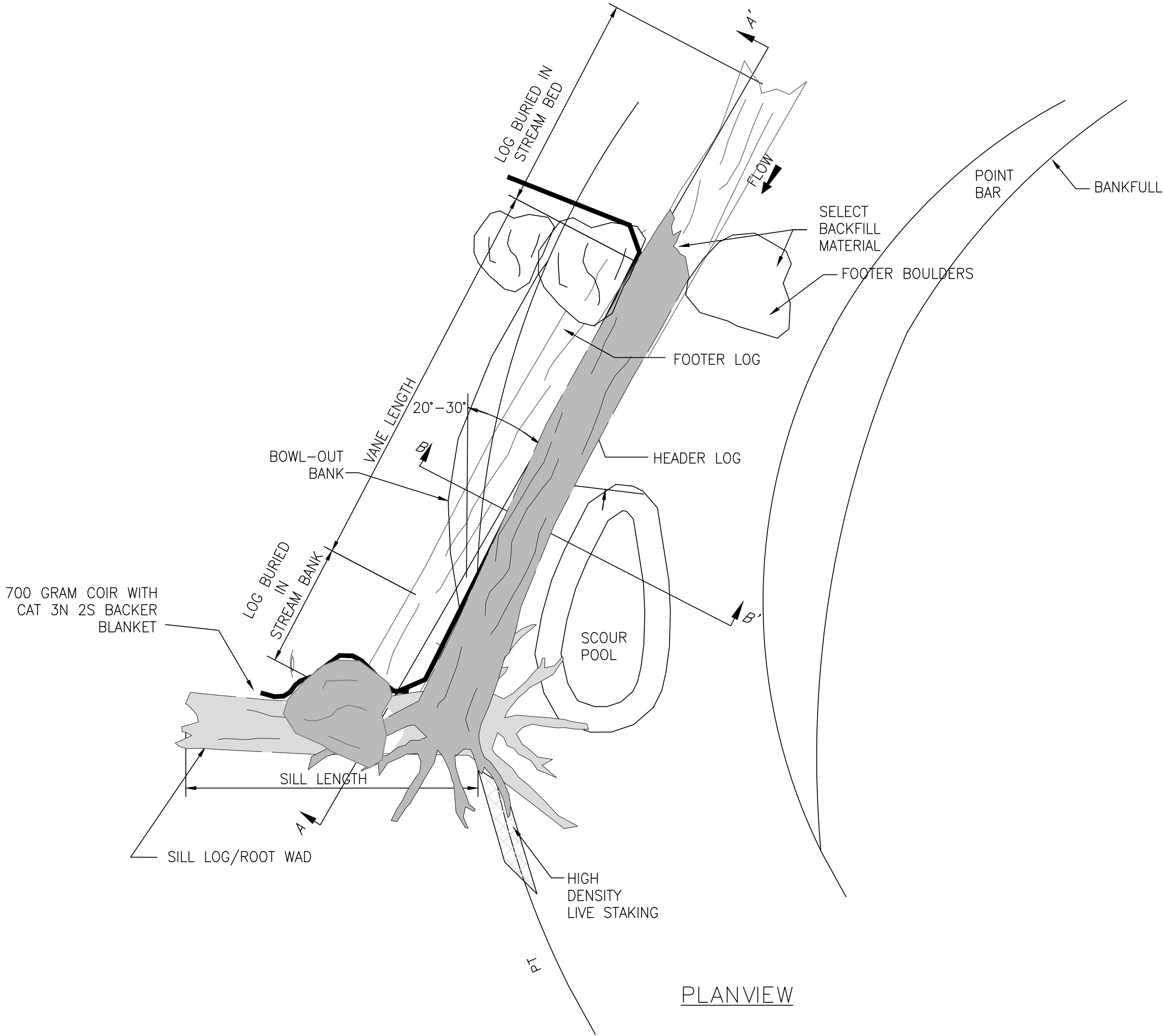
SECTION
B-B'

NOTE:

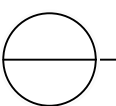
THE DEPARTURE ANGLE SHOWN ABOVE IS DEPICTED IN SUCH A WAY TO EMPHASIZE DETAIL. ACTUAL DEPARTURE ANGLE AND STRUCTURE LOCATION SHALL BE AS SHOWN ON THE PLAN AND PROFILE SHEETS AND WILL BE PROVIDED TO THE CONTRACTOR AS A 2004 FORMAT DWG FILE AND LN3 FILE.

NOTES:



1. LOGS SHALL HAVE MINIMUM DIAMETER OF 14" AND MINIMUM LENGTH OF 25 FEET.
2. ALL LOGS SHALL BE RELATIVELY STRAIGHT AND LIMBS SHALL BE TRIMMED FLUSH.
3. FOOTER LOGS/BOULDERS ARE LOGS/BOULDERS PLACED TO PROVIDE A FOUNDATION AND SCOUR PROTECTION FOR THE HEADER LOGS/BOULDERS.
4. HEADER LOGS/BOULDERS SHALL BE UNDERLAIN BY FOOTER LOGS/BOULDERS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
5. HEADER LOGS ARE THE TOP MOST LOGS USED IN EACH LOG STRUCTURE. ALL HEADER LOGS CAN BE SEEN PROTRUDING FROM THE WATER SURFACE DURING EXTREMELY LOW FLOWS.
6. HEADER LOGS SHALL BE OFFSET SLIGHTLY DOWNSTREAM OF THE FOOTING LOGS WHERE SCOUR POOLS ARE ANTICIPATED TO FORM AS SHOWN IN THE DETAIL.
7. SILL LOGS SHALL BE PLACED PERPENDICULAR TO THE BANKFULL FLOW DIRECTION.
8. THE FOOTER LOGS SHALL EXTEND FROM THE SILL LOG TO THE END OF THE HEADER LOG TOWARD THE BANK.
9. HOOK BOULDERS SHALL EXTEND FROM THE HEADER LOG TO BEYOND BANKFULL WIDTH.
10. SET INVERTS AT ELEVATION SHOWN ON THE PLAN AND PROFILE SHEETS. INVERTS AND ELEVATIONS WILL BE PROVIDED TO THE CONTRACTOR AS A 2004 FORMAT DWG FILE AND LN3 FILE. NO ELEVATIONS OF THE LOG DROPS STRUCTURE MAY VARY FROM THE PLAN LOCATIONS WITHOUT DIRECTIONS FROM ENGINEER.
11. HEADER LOG SHALL TIE INTO THE STREAM BANK AT A MAXIMUM ELEVATION OF 1/4 DMAX (MEASURED AT THE NEXT DOWNSTREAM RIFFLE) BELOW BANKFULL ELEVATION AND A MINIMUM ELEVATION OF 1/2 DMAX (MEASURED AT THE NEXT DOWNSTREAM RIFFLE) BELOW BANKFULL ELEVATION UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
12. CUTTING OF THE SILL LOG ROOTWAD MAY BE REQUIRED TO PREVENT THE ROOTWAD FROM PROTRUDING ABOVE THE BANKFULL ELEVATION.
13. ALL LOGS SHALL BE CHINKED WITH LIMBS AND/OR BRUSH ON THE UPSTREAM SIDE PRIOR TO PLACEMENT OF THE 700 GRAM COIR WITH CAT 3N 2S BACKER BLANKET.
14. ALL GAPS/VOIDS LARGER THAN 1 INCH BETWEEN THE HEADER AND FOOTING BOULDERS SHALL BE CHINKED WITH GRAVEL AND COBBLES.
15. ON THE STREAMBANK SIDE OF THE LOG AND/OR BOULDERS BACKER BLANKET SHALL BE PLACED AS SHOWN FOR THE ENTIRE LENGTH OF THE LOG.
16. SELECT BACKFILL AND SOIL BACKFILL MATERIAL SHALL BE COMPACTED SUCH THAT FUTURE SETTLEMENT OF THE MATERIAL IS KEPT TO A MINIMUM.
17. NAIL BACKER BLANKET TO EDGE OF HEADER LOG AND BACKFILL AS SHOWN IN THE PLANVIEW DETAIL.
18. THE SURFACE OF THIS STRUCTURE SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS-SECTIONS OR ELEVATIONS SHOWN ON THE DRAWINGS. THE DEGREE OF FINISH FOR INVERT ELEVATIONS SHALL BE WITHIN 0.1 FT OF THE GRADES AND ELEVATIONS INDICATED.
19. RE-DRESSING OF CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF IN-STREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.
20. SEE THE PLANTING DETAIL FOR HIGH DENSITY LIVE STAKING.
21. NO LIVE STAKES SHALL BE INSTALLED ON THE UPSTREAM SIDE OF THE LOG VANE AT OR BELOW THE TIE-IN ELEVATION OF THE HEADER LOG WITH THE STREAM BANK UNLESS OTHERWISE DIRECTED BY THE ENGINEER.



PLAN VIEW



DETAIL — LOG VANE
NOT TO SCALE

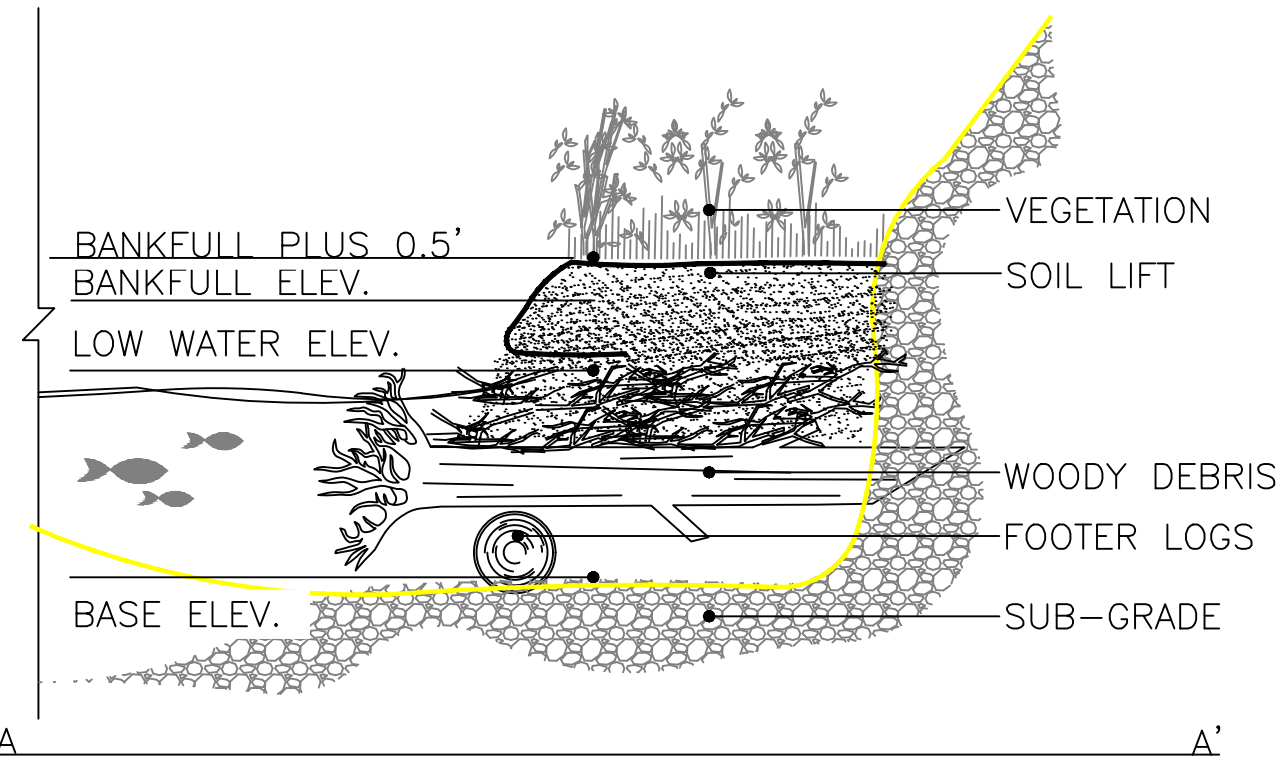
<p>BIG AND LITTLE 39 STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN</p>	APPROVED BY: KA	CHECKED BY: NJG	DRAWN BY: GET
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	1	DRAFT 30% DESIGN	KA
	2	DRAFT 60%	KA
	3	DRAFT 90%	KA
	4	BID SET	KA
	XX	XX	XX
	XX	XX	XX
	XX	XX	XX
	XX	XX	XX
<p>BID SET - NOT FOR CONSTRUCTION</p> <p>-----</p> <p>-----</p> <p>DETAIL - LOG VANE</p>			
 <p>CLIFFS</p> <p>NORTHSHORE MINING CO 10 OUTER DR SILVER BAY, MN 55614</p> <p>----</p>  <p>BEAVER RIVER CONSULTING</p> <p>BEAVER RIVER CONSULTING, LLC. 5752 EAGLE VIEW DRIVE DULUTH, MN 55803</p> <p>----</p> <p>BID SET NOT FOR CONSTRUCTION</p>			
<p>DATE: 10/15/2021</p>			
<p>NOT TO SCALE</p>			
<p>SHEET NUMBER 40 OF 50</p>			

1. INSTALLATION SUMMARY

TOEWOOD BENCH CONSTRUCTION WILL BE DONE IN DRY WEATHER
CONDITIONS AFTER STREAM HAS BEEN DIVERTED AND SITE DEWATERED.

ENGINEER OR SWCD REPRESENTATIVE MUST BE PRESENT FOR INSTALLATION
OF TOEWOOD BENCH.

THE DRAWINGS ON THIS PAGE ARE NOT TO SCALE.



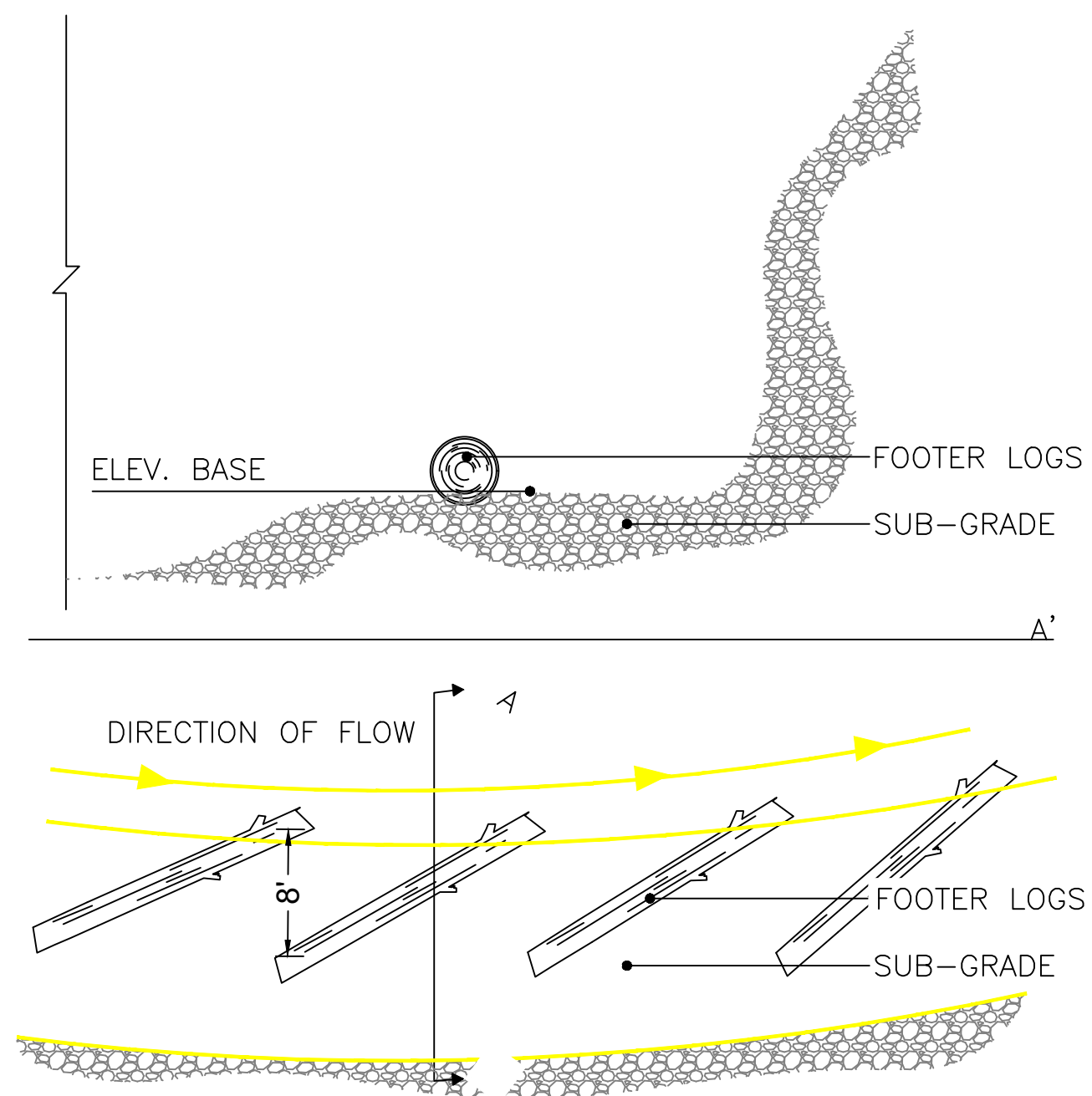
2. SUBGRADE AND FOOTER LOGS

SPECIFICATION:

- 10" MIN. DIAMETER
- LIMBS REMOVED
- 10' MIN. LENGTH

PLACEMENT:

- EXCAVATE TO BASE ELEVATION
- SPACE FOOTER LOGS ENDS X' APART, PERPENDICULAR TO STREAM



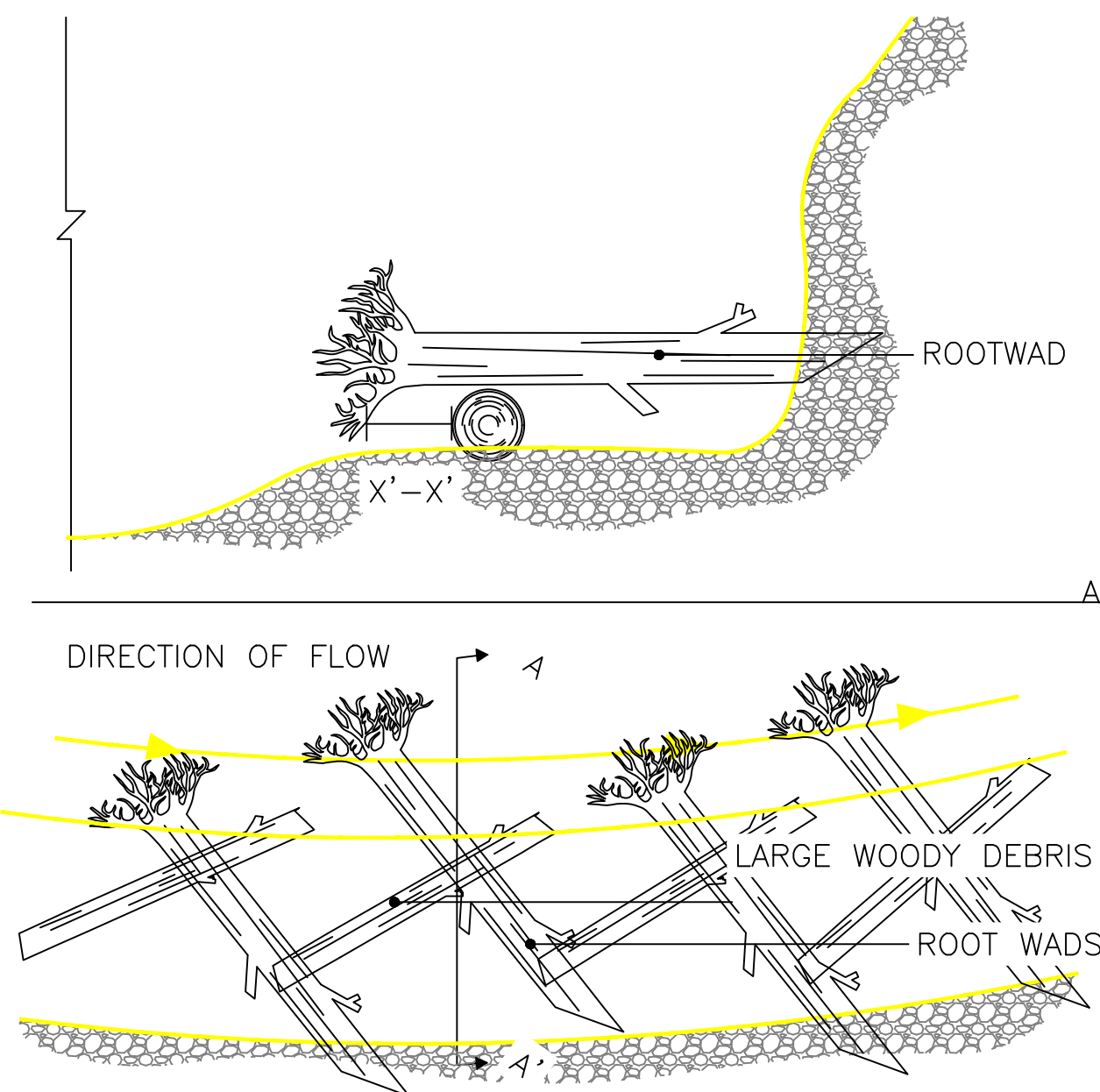
3. ROOTWAD PLACEMENT

ROOTWAD SPECIFICATION:

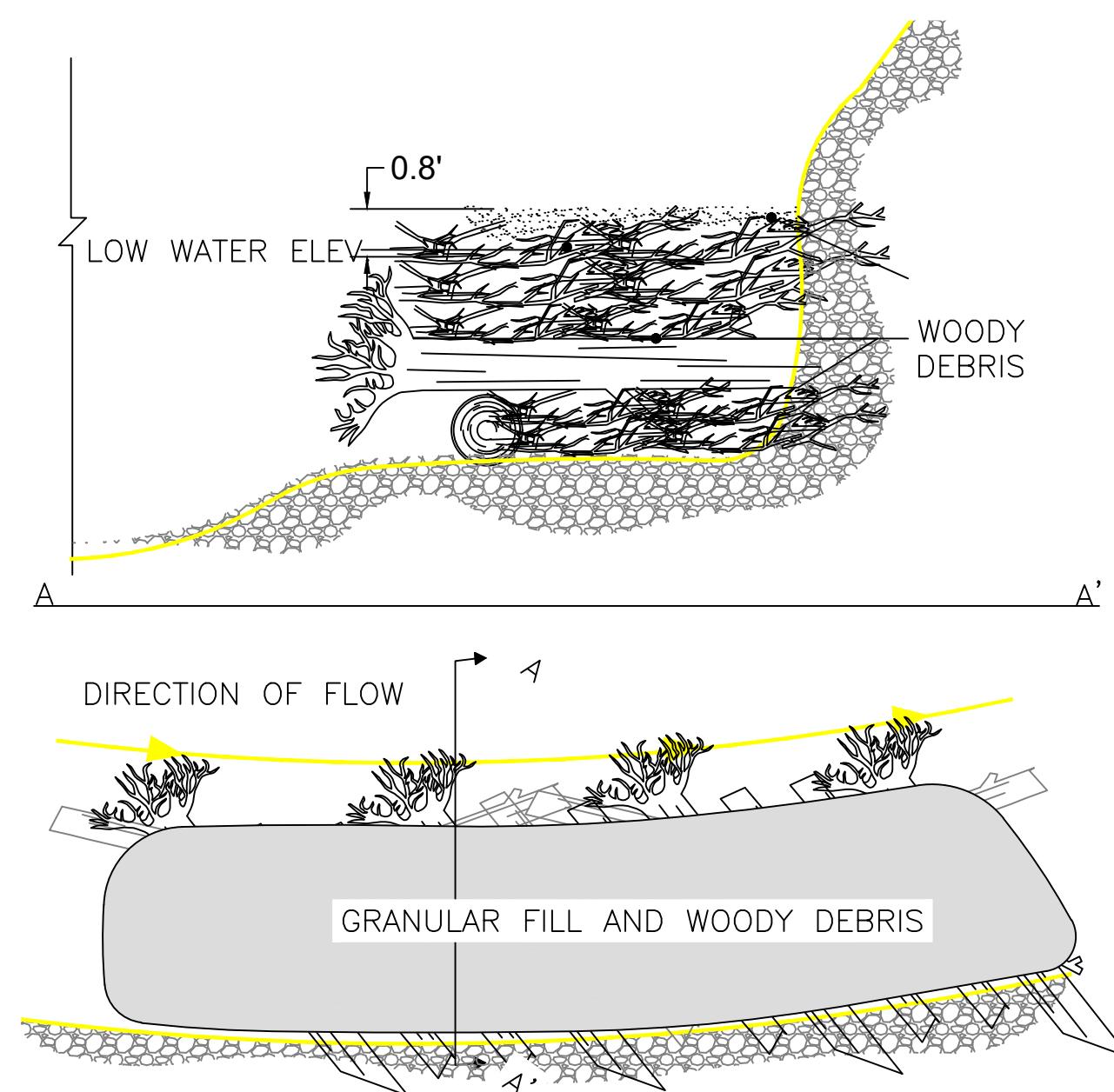
- 12" MIN DIAMETER, PROVIDED BY CLIFFS LOCATED IN STAGING AREA
- LOG LENGTH OF 10' MINIMUM
- LIMBS SHALL BE REMOVED
- ROOT WADS SHALL BE LEFT INTACT

PLACEMENT:

- PLACE ROOTWADS ON TOP OF FOOTER LOGS AS SHOWN, OVERHANG ROOT WAD LOGS 2'-5', VARY AS SHOWN SUCH THAT EVERY OTHER ROOT WAD IS PROTRUDING INTO STREAM 4-6 FEET FROM BANKFULL FEET
- ANGLE ROOTWADS UPSTREAM AS DIRECTED IN FIELD
- PLACE 1 ROOT WAD PER FOOTER LOG



4. WOODY DEBRIS PLACEMENT



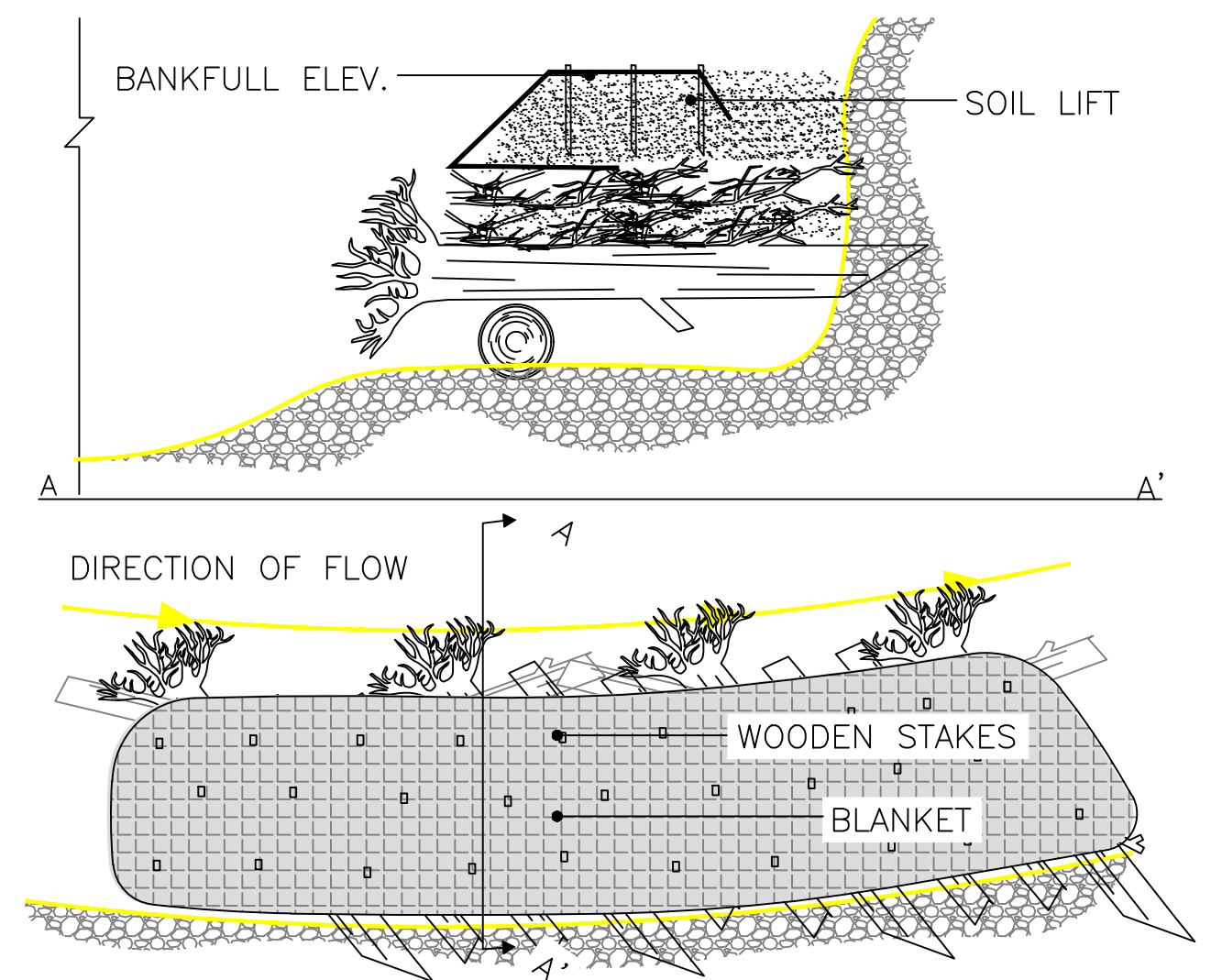
5. SOIL LIFT

MATERIAL SPECIFICATION:

- BLANKET SHALL BE: 9.8' WIDE ROLANKA BIOD-MAT 70, GEOCOIR 700, OR EQUAL BACKED WITH EROSION CONTROL BLANKET WITH NATURAL NETTING
- WOODEN STAKES: 18" WOODEN STAKES (2X4 CUT AT ANGLE OR EQUAL), PLACED AT MANUFACTURERS RECOMMENDED SPACING (3' MIN. TYP.) ALONG BLANKET.

PLACEMENT:

- LAY BLANKET ON TOP OF SOIL A MINIMUM OF 3 FEET BACK FROM FACE OF WOOD, ON TOP OF BENCH ENSURE THAT COIR BLANKET IS A MINIMUM OF 3 FEET BACK FROM TOP OF BENCH
- PLACE FILL ON TOP OF BLANKET SLOPE AT 2:1 (H:V).
- BEFORE WRAPPING UP BLANKET, SEED ALL AREAS ABOVE LOW FLOW ELEVATION WITH ZONE 1 SEED MIX.
- BUCKET COMPACT UNTIL BANKFULL PLUS 0.5' ELEVATION IS MET, GRADE TOP OF BENCH 2% TO EXISTING GROUND .
- TRENCH COCONUT BLANKET INTO GROUND 0.5' ALONG OUTSIDE OF BEND.




APPROVED BY: KA		CHECKED BY: MJG	DRAWN BY: GET
REV	DESCRIPTION	APPROV	
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2	DRAFT 60%	KA	
3	DRAFT 90%	KA	
4	BID SET	KA	
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**BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN**


BID SET - NOT FOR CONSTRUCTION

DETAIL - TOE WOOD



CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



**BEAVER
RIVER
CONSULTING**

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

**BID SET
NOT FOR
CONSTRUCTION**

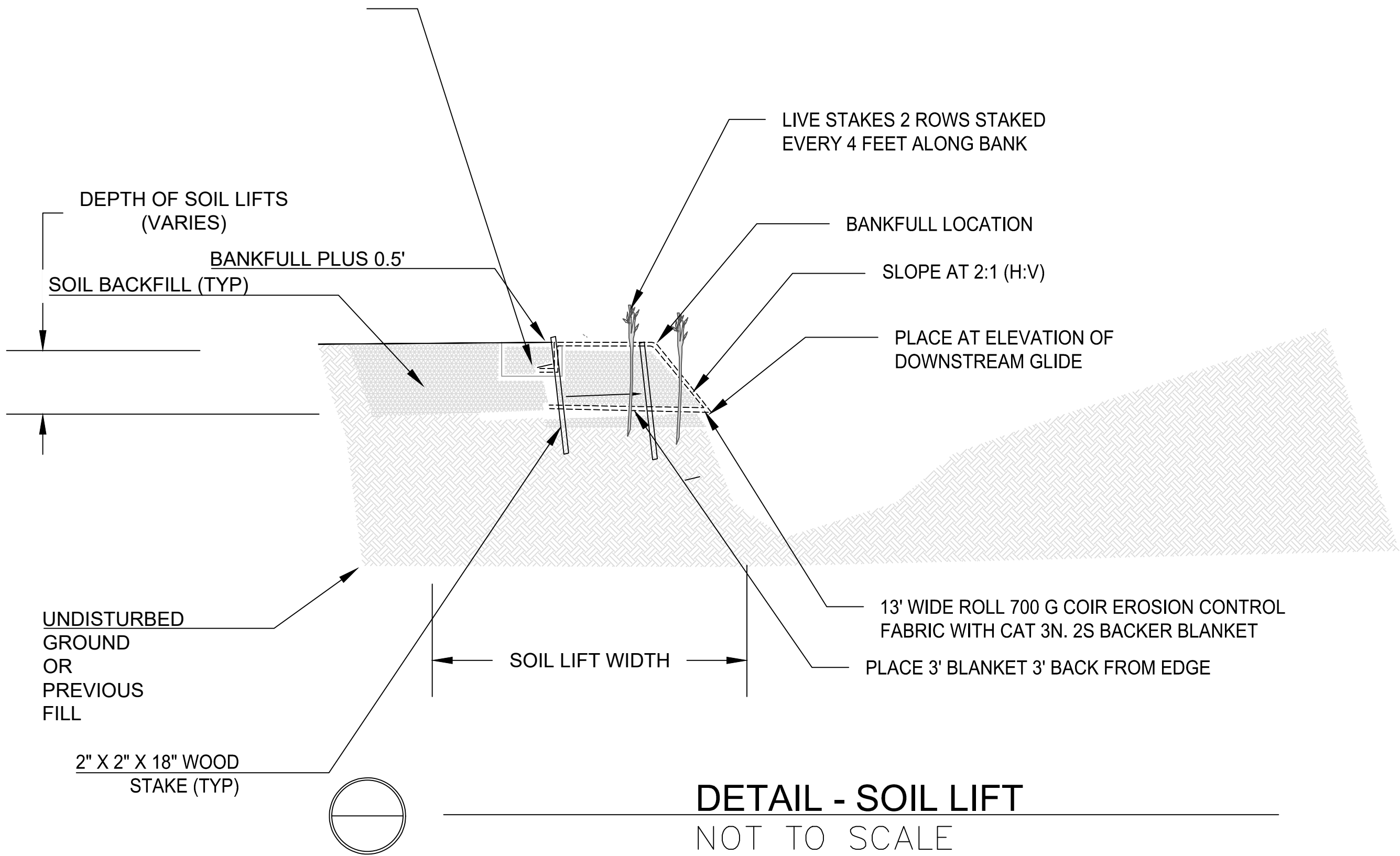
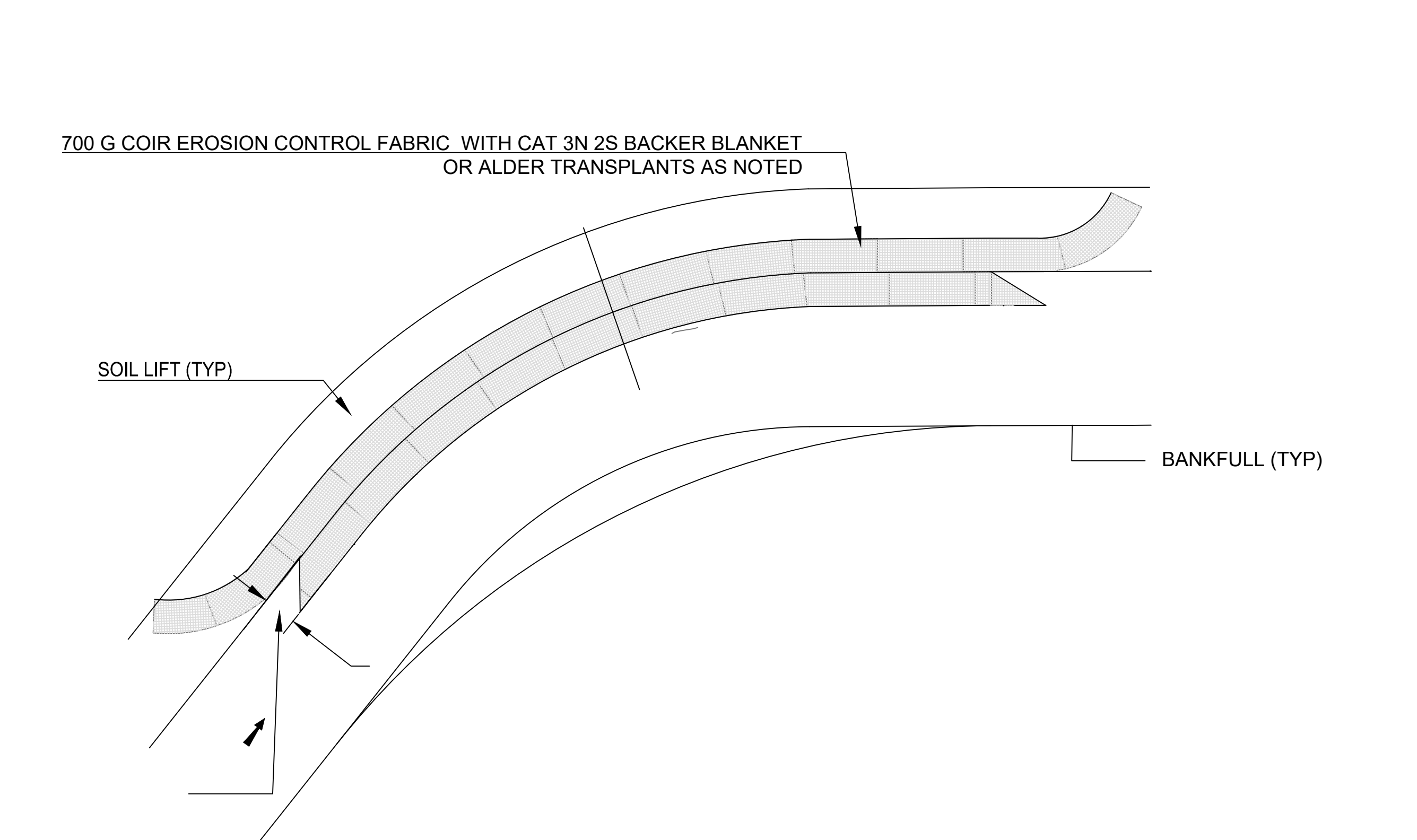
DATE: 10/15/2021

NOT TO SCALE

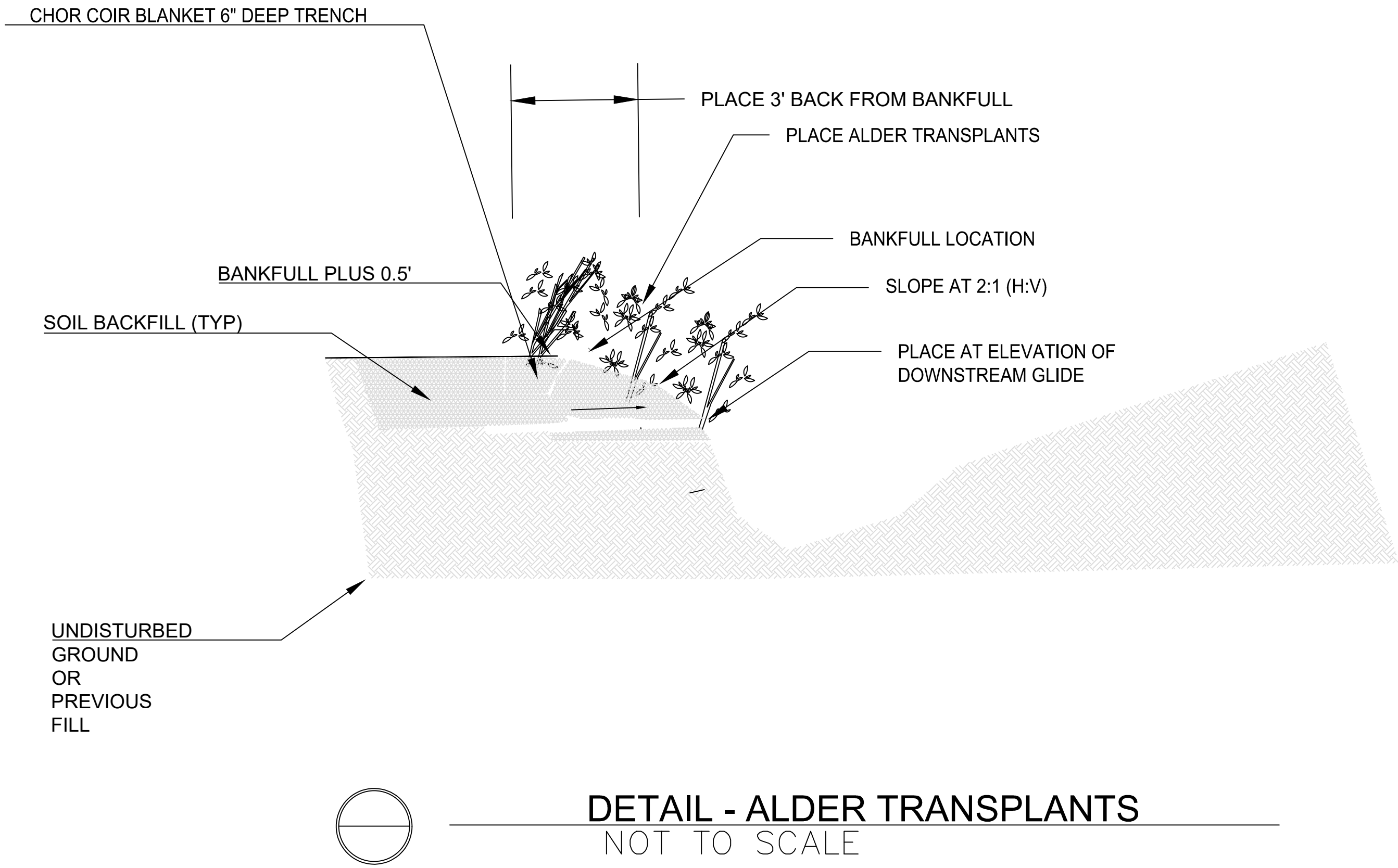
SHEET NUMBER

41 OF 50

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DETAIL - SOIL LIFT
NOT TO SCALE



DETAIL - ALDER TRANSPLANTS
NOT TO SCALE

NOTES SOIL LIFTS:

1. THE SOIL BACKFILL USED FOR LIFTS AND TOPSOIL USED FOR LAYERING WITH THE LIVE BRANCHES SHALL BE FREE OF ANY LARGE ROOTS OR WOODY DEBRIS AND SHALL GENERALLY BE FREE FROM ANY GRAVEL OR COBBLE MATERIAL.
2. SOIL BACKFILL SHALL BE COMPACTED SUCH THAT FUTURE SETTLING WILL BE KEPT TO A MINIMUM; YET, NOT SUCH THAT THE UNDERLYING SOIL LIFT IS DISPLACED OR DAMAGED.
3. THE TOP OF THE BACKFILL FOR THE FIRST LIFT SHALL BE SLOPED AT APPROXIMATELY 2% AWAY FROM THE STREAM.
4. PLACE SOIL BACKFILL UP TO THE LIFT HEIGHT SPECIFIED OF NO GREATER THAN 1.0 FT BEING CAREFUL NOT TO PUSH/PULL OR TEAR THE FABRIC PREVIOUSLY PLACED.
5. THE EROSION CONTROL BLANKET SHALL BE PULLED AS TIGHT AS POSSIBLE WITHOUT TEARING OR EXCESSIVELY DISTORTING THE FABRIC. THE COIR BLANKET USED FOR THE SOIL LIFT SHALL BE 13' WIDE AND PLACED AS SHOWN IN THE DETAIL.
6. SECURE THE EROSION CONTROL AND NON-WOVEN MATTING IN PLACE BY STAKING THE END OF THE EROSION CONTROL FABRIC WITH WOODEN STAKES ON 1.5-FOOT CENTERS.
7. THE SURFACE OF THIS STRUCTURE SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS-SECTIONS OR ELEVATIONS SHOWN ON THE DRAWINGS. THE DEGREE OF FINISH FOR ELEVATIONS SHALL BE WITHIN 0.1 FT OF THE GRADES AND ELEVATIONS INDICATED OR APPROVED BY THE ENGINEER.
8. RE-DRESSING OF CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF IN-STREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.

NOTES ON ALDER TRANSPLANTS:

1. ALL ALDER SHALL BE OBTAINED FROM ON SITE SOURCES
2. CUT ALDER TO 2 FEET ABOVE ROOT BALL
3. EXCAVATE TRANSPLANTS FROM SOURCE AND STORE FOR NO MORE THAN 48 HOURS BEFORE PLACEMENT ON SITE
4. REMOVE A MINIMUM OF 1 FOOT OF ROOT MATERIAL BELOW THE SURFACE OF THE ALDER
5. PLACE ON THE BANK AS SHOWN CONTINUOUSLY ALONG THE BANKS AS NOTED IN THE PLAN SHEETS
6. PLACE ALDER TRANSPLANTS A MINIMUM OF 3 FEET BACK FROM THE STREAM BANKFULL EDGE

APPROVED BY: KA	REV	DESCRIPTION	CHECKED BY: MUG	DRAWN BY: GET
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	2	DRAFT 60%	KA	KA
	3	DRAFT 90%	XX	XX
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	XX	XX	XX	XX
	XX	XX	XX	XX

BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION

DETAIL - SOIL LIFT AND ALDER TRANSPLANTS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614

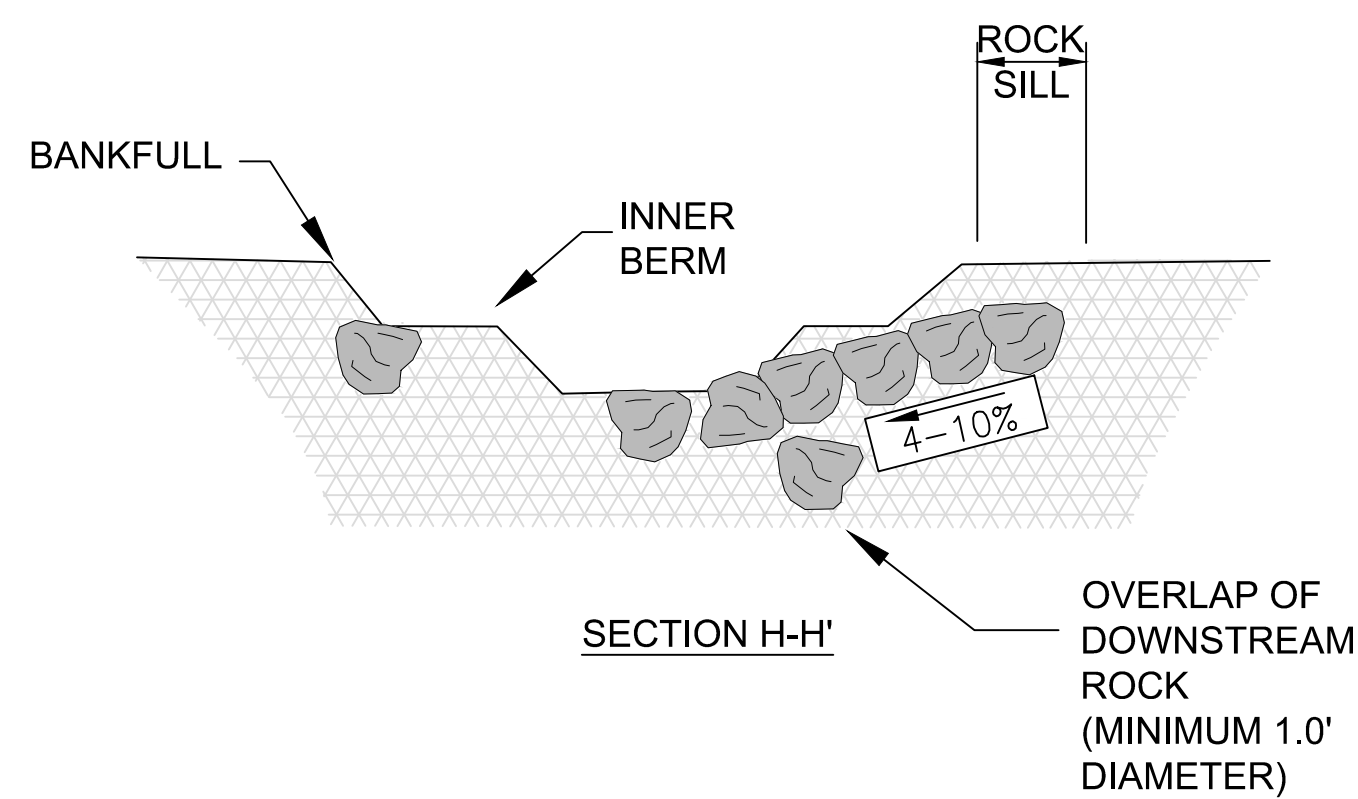
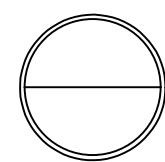
BEAVER RIVER CONSULTING
BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

DATE: 4/19/2021

NOT TO SCALE

SHEET NUMBER
42 OF 50



<p>BIG AND LITTLE 39 STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN</p>	REV	DESCRIPTION	CHECKED BY: KA	DRAWN BY: GET
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	3	DRAFT 90%		KA
	4	BID SET		KA
<p>BID SET - NOT FOR CONSTRUCTION</p> <p>-----</p> <p>-----</p>				
<p>DETAIL - BOULDER CONSTRUCTED RIFFLE</p>				



CLIFFS

NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

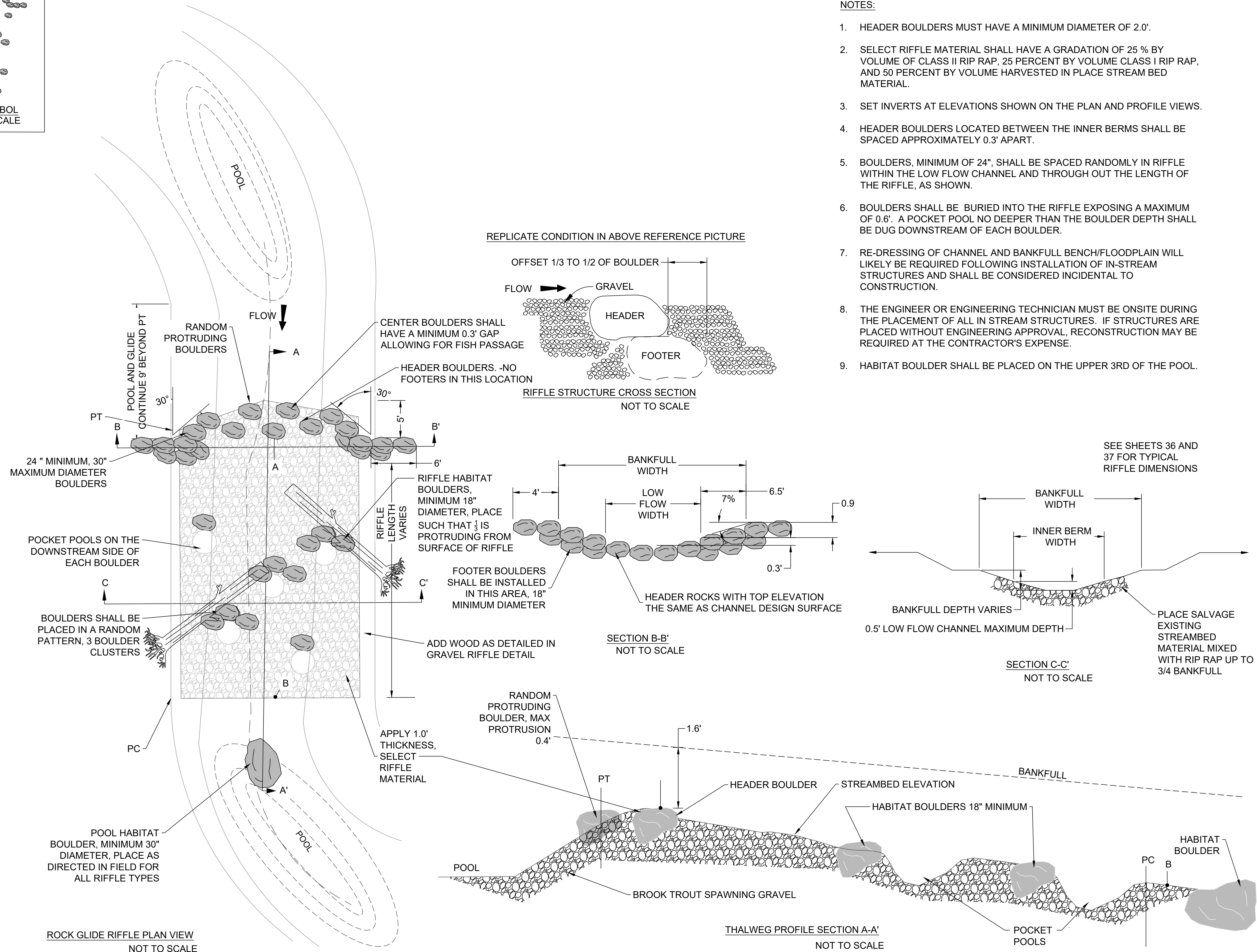
**BID SET
NOT FOR
CONSTRUCTION**

DATE: 10/15/2021



NOT TO SCALE

SHEET NUMBER

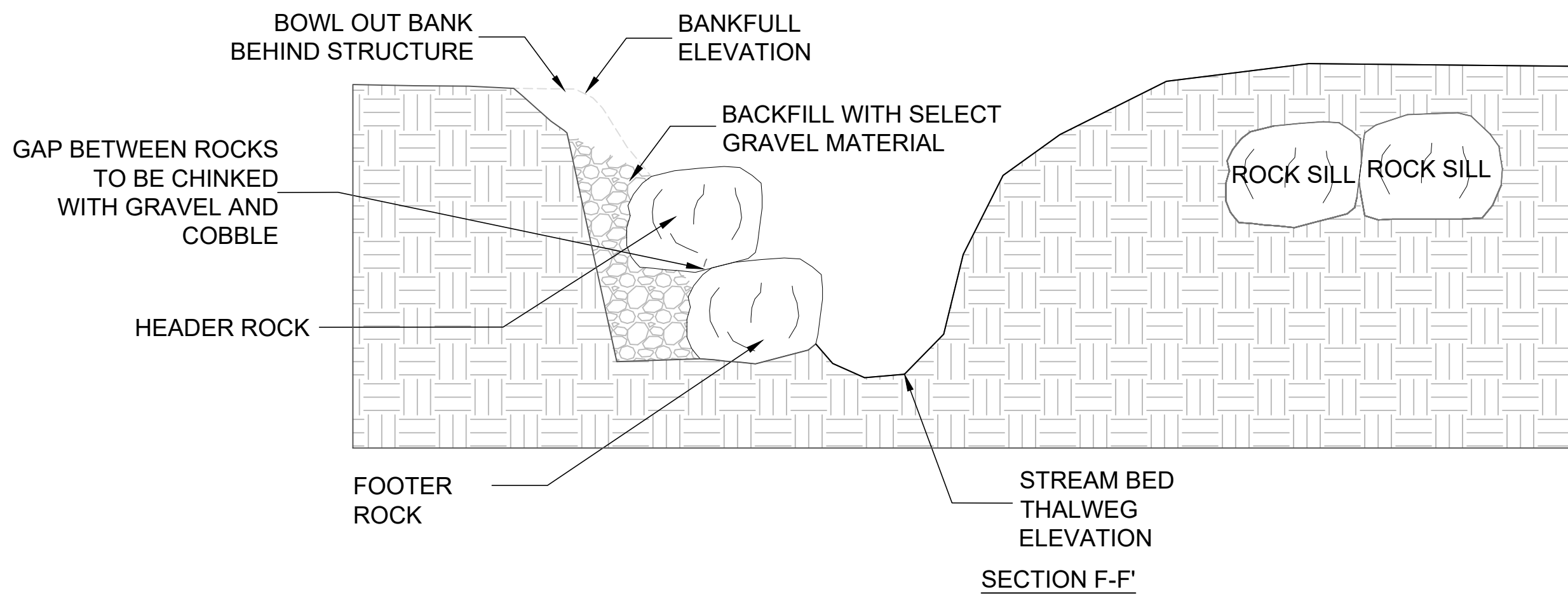
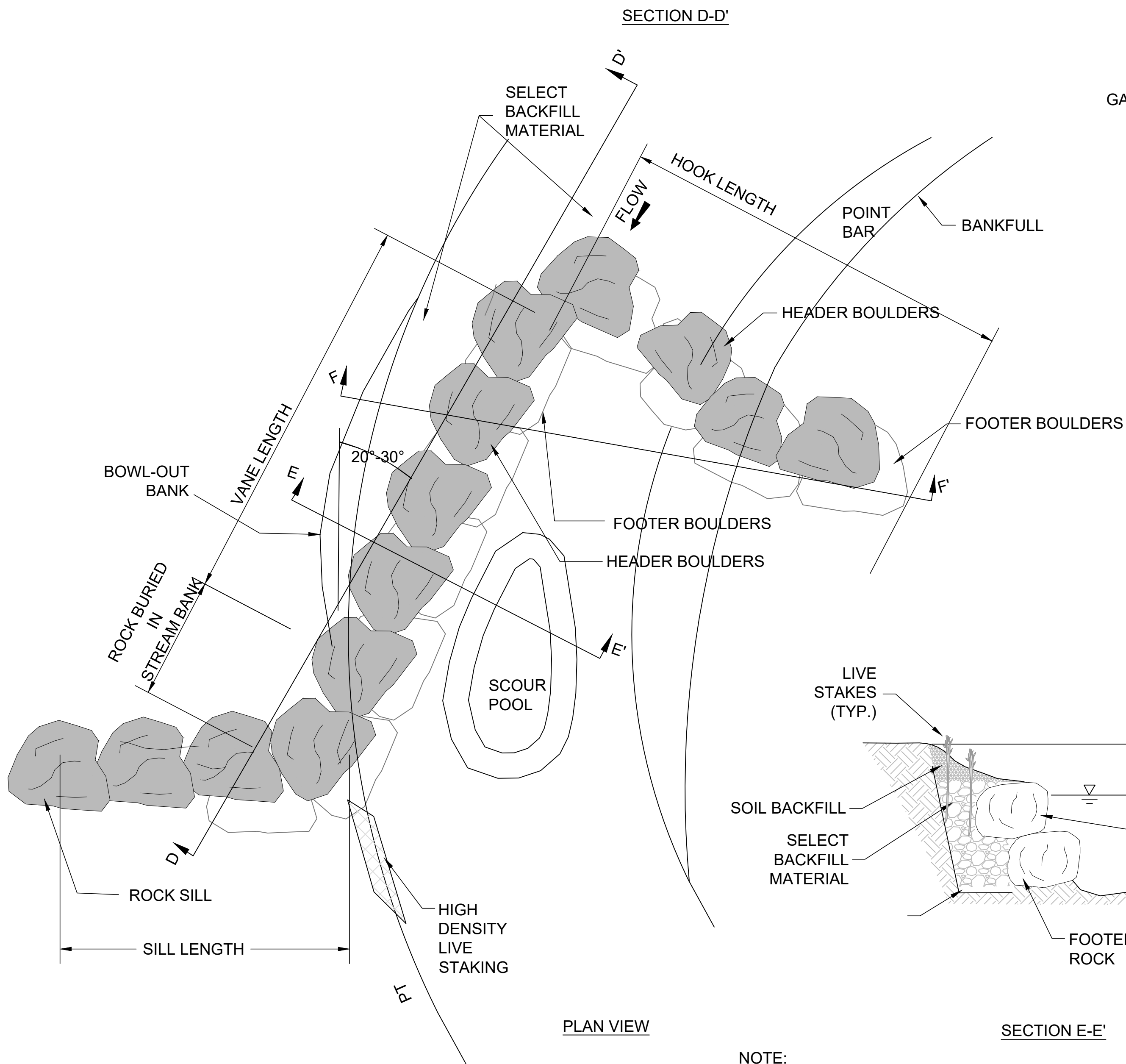
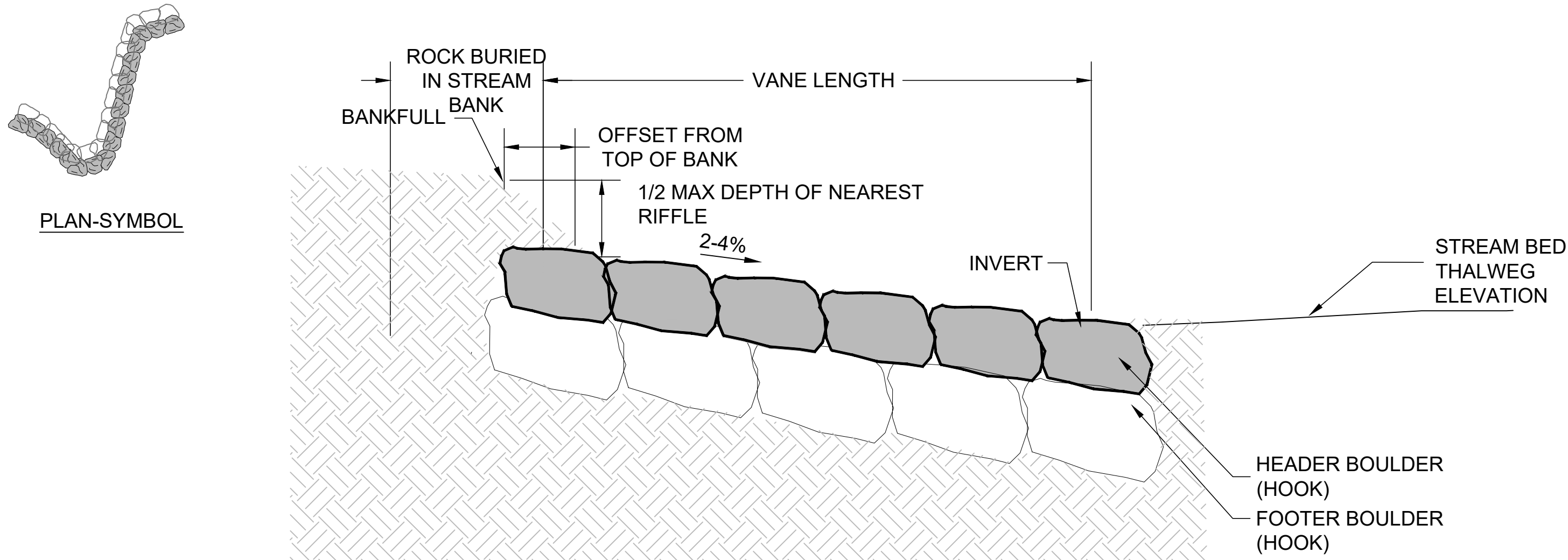
43 OF 50



- NOTES:**
1. HEADER BOULDERS MUST HAVE A MINIMUM DIAMETER OF 2.0'.
 2. SELECT RIFFLE MATERIAL SHALL HAVE A GRADATION OF 25 % BY VOLUME OF CLASS II RIP RAP, 25 PERCENT BY VOLUME CLASS I RIP RAP, AND 50 PERCENT BY VOLUME HARVESTED IN PLACE STREAM BED MATERIAL.
 3. SET INVERTS AT ELEVATIONS SHOWN ON THE PLAN AND PROFILE VIEWS.
 4. HEADER BOULDERS LOCATED BETWEEN THE INNER BERMS SHALL BE SPACED APPROXIMATELY 0.3' APART.
 5. BOULDERS, MINIMUM OF 24", SHALL BE SPACED RANDOMLY IN RIFFLE WITHIN THE LOW FLOW CHANNEL AND THROUGH OUT THE LENGTH OF THE RIFFLE, AS SHOWN.
 6. BOULDERS SHALL BE BURIED INTO THE RIFFLE EXPOSING A MAXIMUM OF 0.6'. A POCKET POOL NO DEEPER THAN THE BOULDER DEPTH SHALL BE DUG DOWNSTREAM OF EACH BOULDER.
 7. RE-DRESSING OF CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF IN-STREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.
 8. THE ENGINEER OR ENGINEERING TECHNICIAN MUST BE ONSITE DURING THE PLACEMENT OF ALL IN STREAM STRUCTURES. IF STRUCTURES ARE PLACED WITHOUT ENGINEERING APPROVAL, RECONSTRUCTION MAY BE REQUIRED AT THE CONTRACTOR'S EXPENSE.
 9. HABITAT BOULDER SHALL BE PLACED ON THE UPPER 3RD OF THE POOL.

<p>BIG AND LITTLE 39 STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN</p>	REV	DESCRIPTION	CHECKED BY: MJG	DRAWN BY: GET
	1	DRAFT 30% DESIGN		KA
	2	DRAFT 60%		KA
	3	DRAFT 90%		KA
	4	BID SET		KA
<p>BID SET - NOT FOR CONSTRUCTION</p>		XX		XX
		XX		XX
		XX		XX
		XX		XX
		XX		XX
<p>DETAIL - ROCK GLIDE RIFFLE</p>				
 <p>CLIFFS</p> <p>NORTHSHORE MINING CO 10 OUTER DR SILVER BAY, MN 55614</p> <p>----</p>  <p>BEAVER RIVER CONSULTING</p> <p>BEAVER RIVER CONSULTING, LLC. 5752 EAGLE VIEW DRIVE DULUTH, MN 55803</p> <p>-----</p>				
<p>BID SET NOT FOR CONSTRUCTION</p>				
DATE:		10/15/2021		
NOT TO SCALE				
SHEET NUMBER				
44		OF		50

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NOTES:

1. BOULDERS FOR THE CONSTRUCTED RIFFLE MUST BE A MINIMUM OF 1-2 TN BOULDER WITH A MIN. DIAMETER OF 2-3FT.
2. FOOTER BOULDERS ARE BOULDERS PLACED TO PROVIDE A FOUNDATION AND SCOUR PROTECTION FOR THE HEADER BOULDERS.
3. HEADER BOULDERS SHALL BE UNDERLAIN BY FOOTER BOULDERS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
4. HEADER BOULDERS ARE THE TOP MOST BOULDER USED IN EACH STRUCTURE. ALL HEADER BULDERS CAN BE SEEN PARTIALLY PROTRUDING FROM THE WATER SURFACE DURING EXTREMELY LOW FLOWS.
5. HEADER BOULDERS SHALL BE OFFSET SLIGHTLY DOWNSTREAM OF THE FOOTING BOULDERS WHERE SCOUR POOLS ARE ANTICIPATED TO FORM AS SHOWN IN THE DETAIL.
6. SILL BOULDERS SHALL BE PLACED PERPENDICULAR TO THE BANKFULL FLOW DIRECTION.
7. THE FOOTER BOULDERS SHALL EXTEND FROM THE SILL BOULDER TO THE END OF THE HEADER BOULDER TOWARD THE BANK.
8. HOOK BOULDERS SHALL EXTEND FROM THE HEADER BOULDER TO BEYOND BANKFULL WIDTH.
9. SET INVERTS AT ELEVATION SHOWN ON THE PLAN AND PROFILE SHEETS. INVERTS AND ELEVATIONS WILL BE PROVIDED TO THE CONTRACTOR AS A 2004 FORMAT DWG FILE. NO ELEVATIONS OF THE BOULDER DROPS STRUCTURE MAY VARY FROM THE PLAN LOCATIONS WITHOUT DIRECTIONS FROM THE ENGINEER.
10. HEADER BOULDER SHALL TIE INTO THE STREAM BANK AT A MINIMUM ELEVATION OF 1/4 DMAX (MEASURED AT THE NEXT DOWNSTREAM RIFFLE) BELOW BANKFULL ELEVATION AND A MINIMUM ELEVATION OF 1/2 DMAX (MEASURED AT THE NEXT DOWNSTREAM RIFFLE) BELOW BANKFULL ELEVATION UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
11. ALL GAPS/VOIDS LARGER THAN 1 INCH BETWEEN THE HEADER AND FOOTING BOULDERS SHALL BE CHINKED WITH GRAVEL AND COBBLES.
12. ON THE UPSTREAM SIDE OF THE BOULDERS SELECT BACKFILL SHALL BE PLACED FOR THE ENTIRE LENGTH OF THE BOULDER HOOK AS SHOWN.
13. SELECT BACKFILL AND SOIL BACKFILL MATERIAL SHALL BE COMPACTED SUCH THAT FUTURE SETTLEMENT OF THE MATERIAL IS KEPT TO A MINIMUM.
14. THE SURFACE OF THIS STRUCTURE SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS-SECTIONS OR ELEVATIONS SHOWN ON THE DRAWINGS. THE DEGREE OF FINISH FOR INVERT ELEVATIONS SHALL BE WITHIN 0.1 FT OF THE GRADES AND ELEVATIONS INDICATED.
15. RE-DRESSING OF CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF IN-STREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.
16. SEE THE PLANTING TABLE FOR DETAILS ON HIGH DENSITY LIVE STAKING.
17. NO LIVE STAKES SHALL BE INSTALLED ON THE UPSTREAM SIDE OF THE VANE AT OR BELOW THE TIE-IN ELEVATION OF THE HEADER LOG WITH THE STREAM BANK UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
18. FOOTER DEPTH ON ALL STRUCTURES REQUIRING FOOTERS SHALL BE 6 TIMES GREATER THAN THE DROP BETWEEN THE STRUCTURE AND THE FOOTERED STRUCTURE DIRECTLY UPSTREAM.

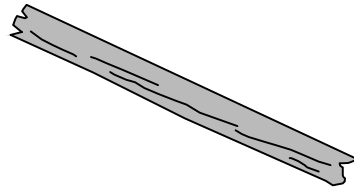
NOTE:

THE DEPARTURE ANGLE SHOWN ABOVE IS DEPICTED IN SUCH A WAY TO EMPHASIZE DETAIL. ACTUAL DEPARTURE ANGLE AND STRUCTURE LOCATION SHALL BE AS SHOWN ON THE PLAN AND PROFILE SHEETS AND WILL BE PROVIDED TO THE CONTRACTOR AS A 2004 FORMAT DWG FILE AND LN3 FILE.

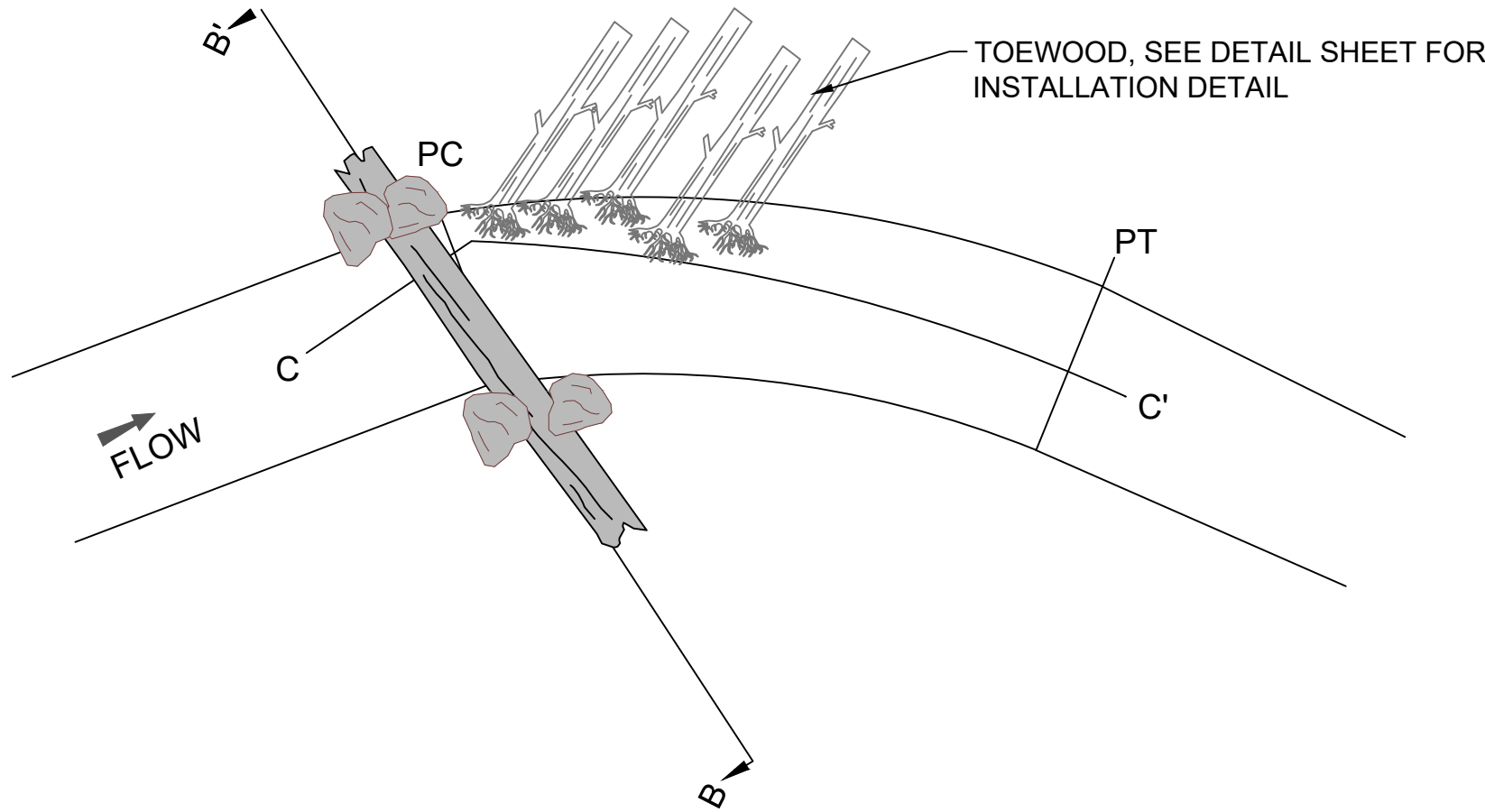


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<div>BIG AND LITTLE 39 STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN</div> <div>BID SET - NOT FOR CONSTRUCTION</div> <div>DETAIL - BOULDER J-HOOK</div>			
<div><div>NORTHSHORE MINING CO 10 OUTER DR SILVER BAY, MN 55614</div><div>----</div><div><div>BEAVER RIVER CONSULTING</div><div>BEAVER RIVER CONSULTING, LLC. 5752 EAGLE VIEW DRIVE DULUTH, MN 55803</div><div>----</div></div></div>			
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DATE:		10/15/2021	
NOT TO SCALE			
SHEET NUMBER			
45		OF	50

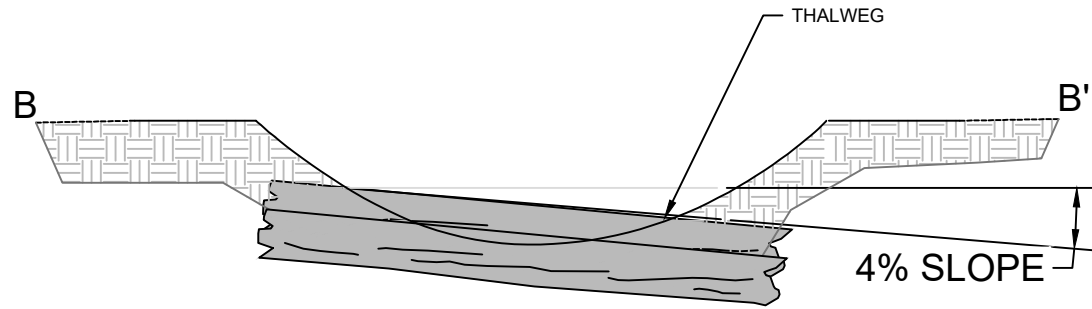
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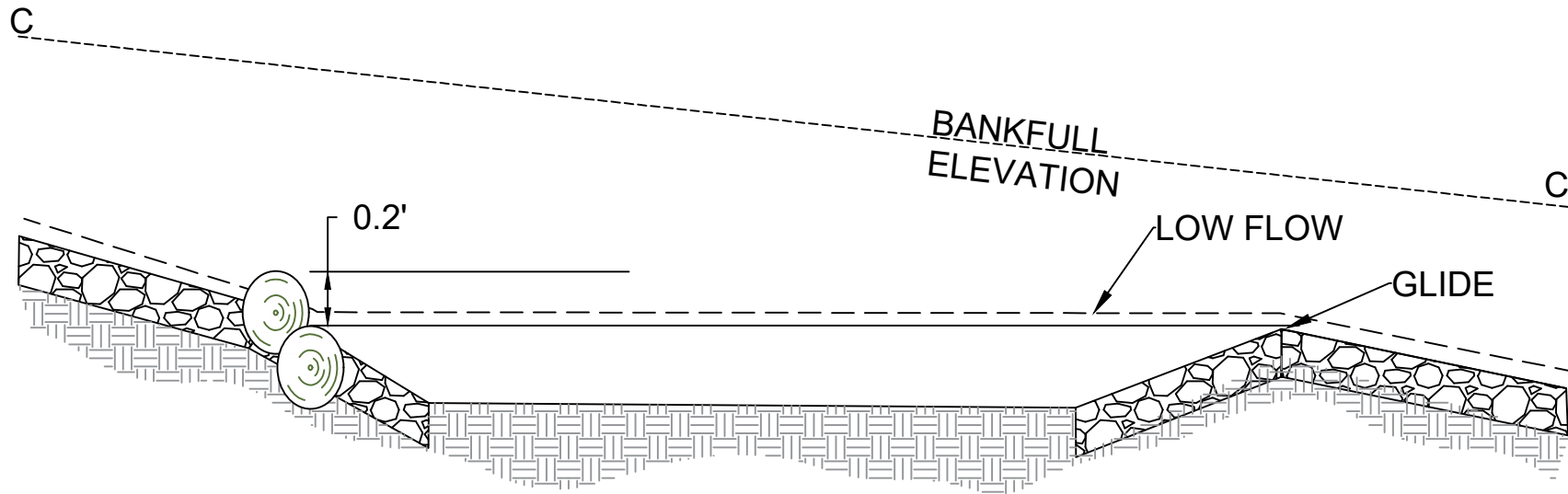
PLAN-SYMBOL



RUN LOG PLAN VIEW
NOT TO SCALE



RUN LOG CROSS SECTION B-B'
NOT TO SCALE

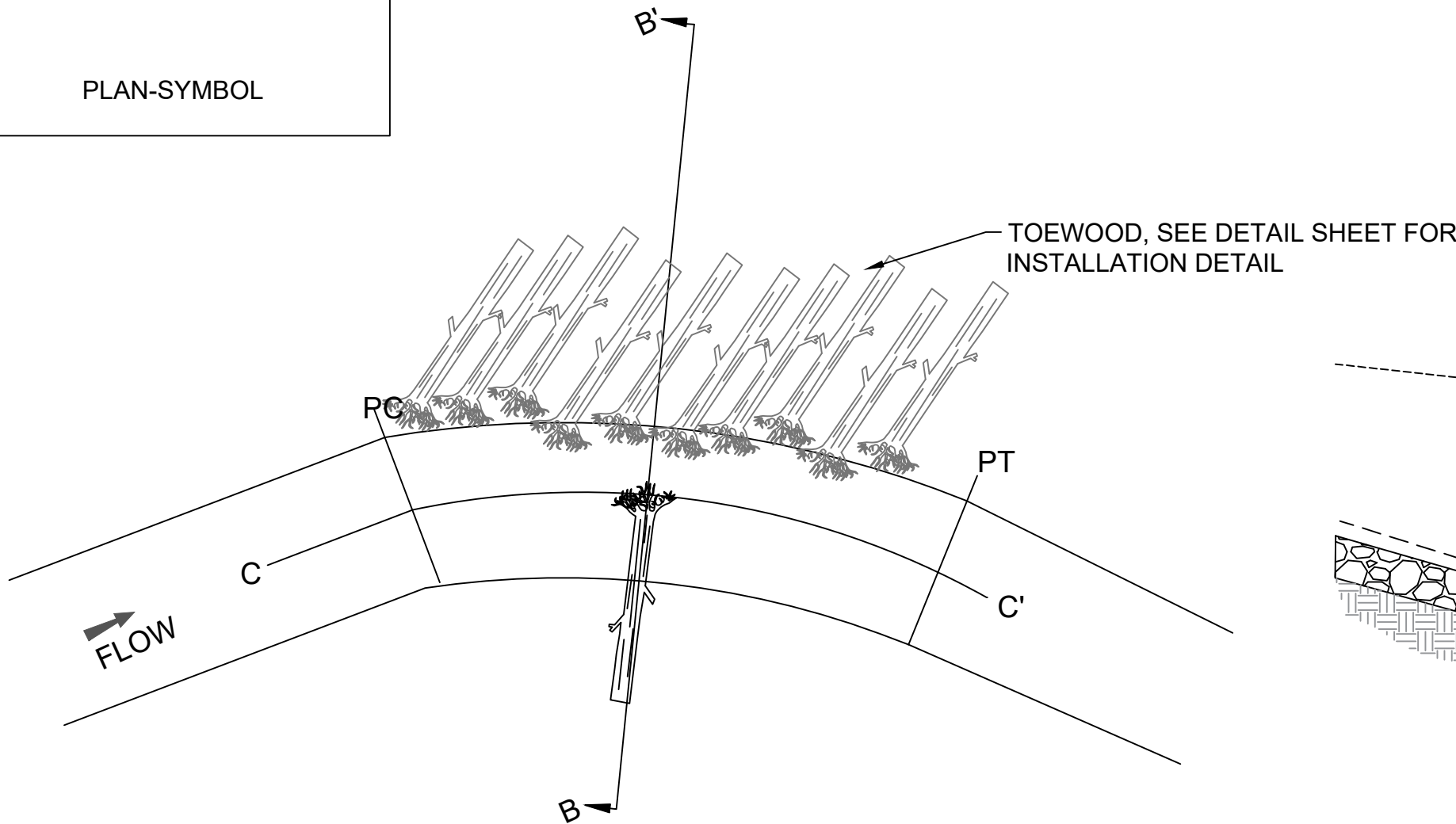


RUN LOG PROFILE C-C'
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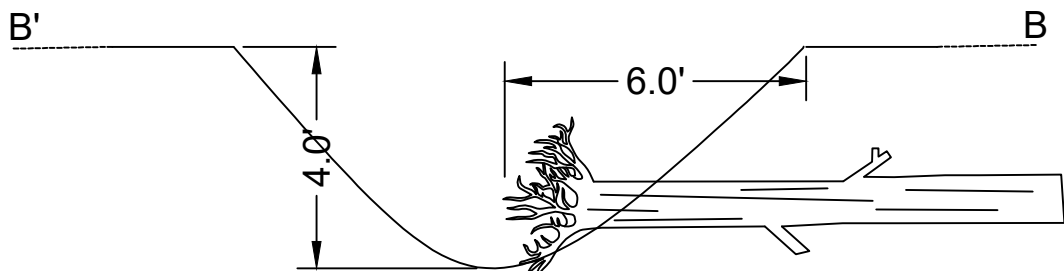
RUN LOG DETAIL



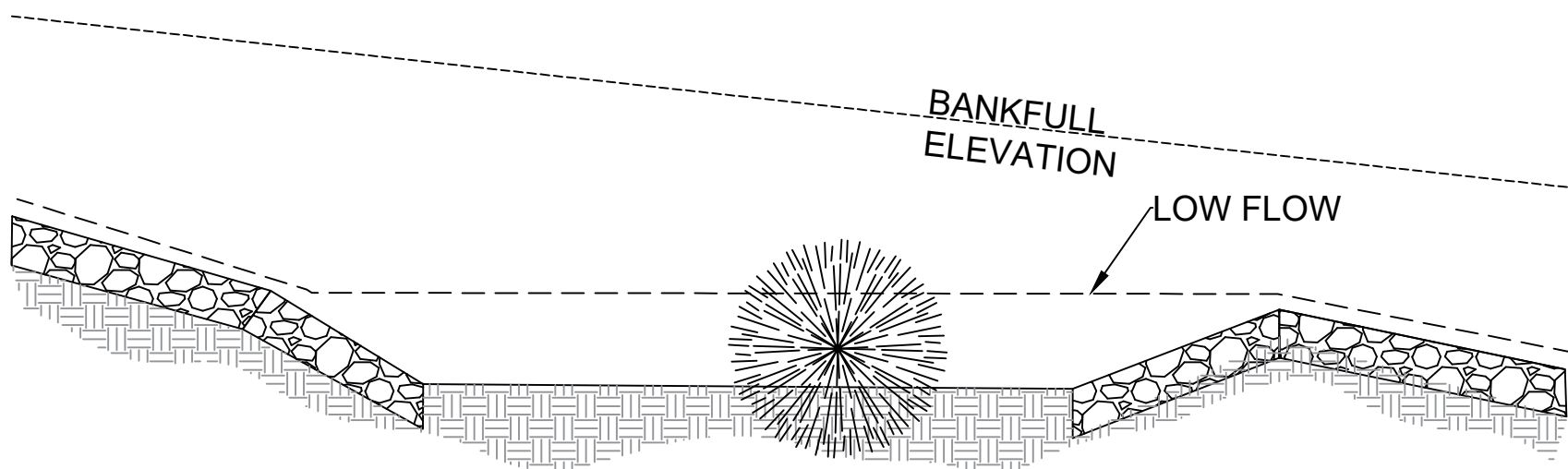
PLAN-SYMBOL



POINT BAR LOG PLAN VIEW
NOT TO SCALE

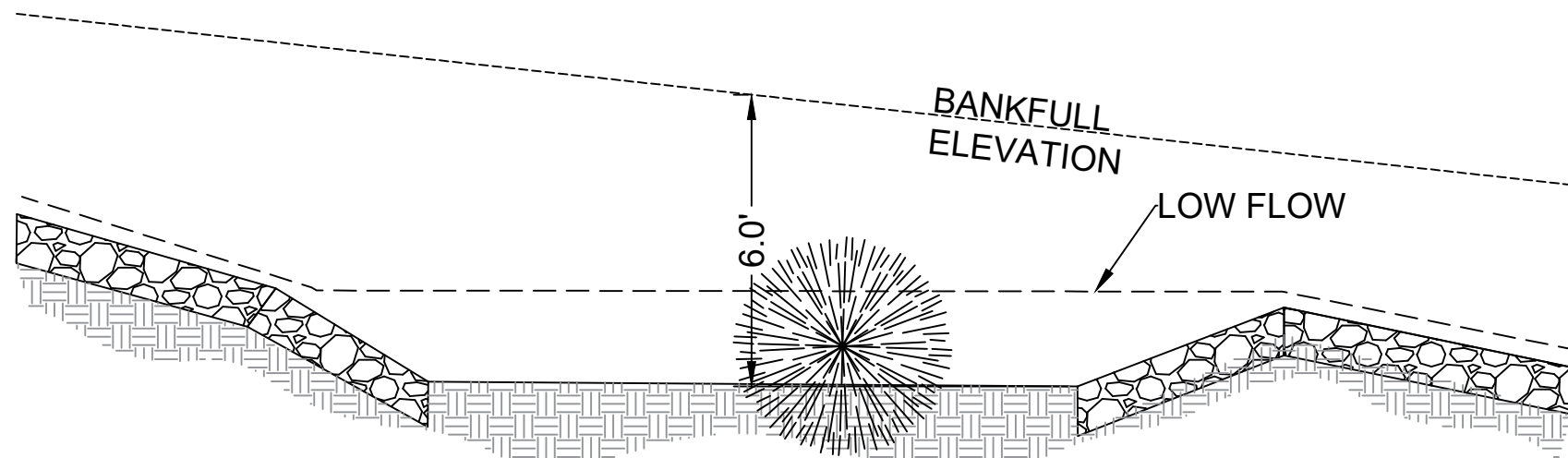


POINT BAR LOG CROSS SECTION B-B'
NOT TO SCALE



POINT BAR LOGS PROFILE C-C'
NOT TO SCALE

POINT BAR LOG DETAIL



HABITAT LOGS PROFILE C-C'
NOT TO SCALE

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			REV	DESCRIPTION
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	2	KA	KA	DRAFT 60%
	3	KA	KA	DRAFT 90%
	4	KA	KA	BID SET
	XX		XX	
	XX		XX	
	XX		XX	
	XX		XX	

BIG AND LITTLE 39 STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN	
BID SET - NOT FOR CONSTRUCTION	
DETAIL - HABITAT LOG	



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET NOT FOR CONSTRUCTION	
DATE:	10/15/2021

NOT TO SCALE	
SHEET NUMBER 46 OF 50	

SEED MIX ZONE 0 AND 1

GRASS SEED 15 LBS./ACRE

Big bluestem (<i>Andropogon gerardii</i>)	20%
Fringed brome (<i>Bromus ciliatus</i>)	8%
Blue-joint grass (<i>Calamagrostis canadensis</i>)	2%
Caterpillar Sedge (<i>Carex crinita</i>)	5%
Poverty oats (<i>Danthonia spicata</i>)	10%
Slender Wheatgrass (<i>Elymus trachycalum</i>)	12%
Virginia wild rye (<i>Elymus virginicus</i>)	13%
American manna (<i>Glyceria grandis</i>)	10%
Fowl bluegrass (<i>Poa palustris</i>)	5%
Cord grass (<i>Spartina pectinata</i>)	15%

Wildflower Seed 32oz. /acre

Yarrow (<i>Achillea millefolium</i>)	2%
Fragrant giant hyssop (<i>Agastache foeniculum</i>)	10%
Swamp milkweed (<i>Asclepias incarnata</i>)	10%
Common milkweed (<i>Asclepias syriaca</i>)	10%
Fireweed (<i>Epilobium angustifolium</i>)	2%
Boneset (<i>Eupatorium perfoliatum</i>)	8%
Joe-Pye weed (<i>Eutrochium maculatum</i>)	5%
Common ox-eye (<i>Heliopsis helianthoides</i>)	5%
Wild bergamot (<i>Monarda fistulosa</i>)	10%
Black-eyed Susan (<i>Rudbeckia hirta</i>)	5%
Stiff goldenrod (<i>Solidago rigida</i>)	7%
Blue vervain (<i>Verbena hastata</i>)	20%
Golden alexanders (<i>Zizia aurea</i>)	6%

ZONE 0

PLANTING AREA-

6.5' WIDE NEAR CREEK AREA MINUS TOE WOOD
CANOPY-

THE FOLLOWING CANOPY PLANTS SHALL BE 1.5' HEIGHT CONTAINERIZED STOCK. PLANT AT 8 FOOT SPACING ABOVE BANKFULL ELEVATION:

- WHITE SPRUCE (PICEA GLAUCA)-90%
- *WHITE CEDAR (*THUJA OCCIDENTALIS*)-10%

SUB-CANOPY-

THE FOLLOWING SUB-CANOPY PLANTS SHALL BE 1.5' HEIGHT CONTAINERIZED STOCK. PLANT THE FOLLOWING EVERY 10 FOOT SPACING, AT OR ABOVE BANKFULL ELEVATION.

- SPECKLED ALDER (ALNUS INCANA)-50%
- RED-OSIER DOGWOOD (CORNUS SERICEA)-50%

TRANSPLANTS:

TRANSPLANT WILLOW AND DOGWOOD SHRUBS FROM THE EXCAVATED AREA AS NOTED ON PLAN SHEETS

SEED AND COIR AND BACKER BLANKET

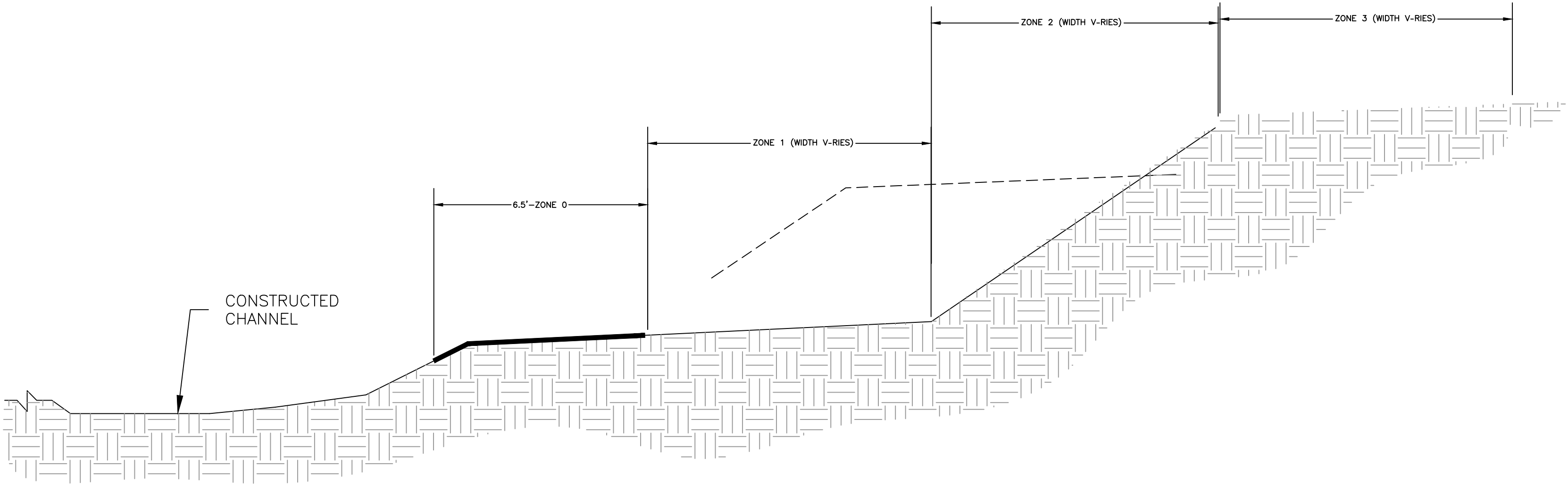
- BLANKET MAIN CHANNEL WITH 6.5' WIDE 700 GRAM COIR BLANKET AND BACKED WITH MN DOT CATEGORY 3N, 2S, EROSION CONTROL BLANKET. INSTALL 2' LONG, 2"X2" WOOD STAKES WITH A ROOFING NAIL AT THE TOP TO SECURE THE BLANKET, INSTALL STAKES EVERY 5' ALONG BLANKET EDGES AND EVERY 5' DOWN THE CENTERLINE OF THE BLANKET. SEED WITH MIX NOTED ON THIS DETAIL SHEET WITH 25 LBS/ACRE OF COVER CROP AS APPROVED BY ENGINEER.

ZONE 2 AND 3 SEED MIX, PLUS ACCESS TRAILS

Grasses 15 lbs/ac
Forbs 32 oz/ac

Grasses	Mix %
Big bluestem (<i>Andropogon gerardii</i>)	10%
Fringed brome (<i>Bromus ciliatus</i>)	8%
Poverty oats (<i>Danthonia spicata</i>)	30%
Canada wild rye (<i>Elymus canadensis</i>)	18%
Slender Wheatgrass (<i>Elymus trachycalum</i>)	24%
Little Bluestem (<i>Schizachrium scoparium</i>)	10%

Forbs	Mix %
Yarrow (<i>Achillea millefolium</i>)	1%
Fragrant giant hyssop (<i>Agastache foeniculum</i>)	12%
Canada anemone (<i>Anemone canadensis</i>)	2%
Common milkweed (<i>Asclepias syriaca</i>)	10%
Fireweed (<i>Epilobium angustifolium</i>)	3%
Large-leaved aster (<i>Eurybia macrophylla</i>)	1%
Grass-leaved goldenrod (<i>Euthamia graminifolia</i>)	2%
Stiff sunflower (<i>Helianthus pauciflorus</i>)	5%
Common ox-eye (<i>Heliopsis helianthoides</i>)	12%
Wild bergamot (<i>Monarda fistulosa</i>)	5%
Meadow rose (<i>Rosa blanda</i>)	3%
Black-eyed Susan (<i>Rudbeckia hirta</i>)	8%
Gray goldenrod (<i>Solidago nemoralis</i>)	4%
Upland goldenrod (<i>Solidago ptarmicoides</i>)	5%
Stiff goldenrod (<i>Solidago rigida</i>)	5%
Lindleys aster (<i>Symphotrichum ciliolatum</i>)	9%
Blue vervain (<i>Verbena hastata</i>)	5%
Golden alexanders (<i>Zizia aurea</i>)	8%



ZONE PLANTING
TYPICAL CROSS SECTION DETAIL

ZONE 1

SEEDING AND PLANTING AREA-

FLOODPLAIN AREA NOTED ON PLAN SHEET

CANOPY

THE FOLLOWING CANOPY PLANTS SHALL BE 1.5' HEIGHT CONTAINERIZED STOCK. PLANT AT 8 FOOT SPACING:

- WHITE SPRUCE (PICEA GLAUCA) -50%
- YELLOW BIRCH (BETULA ALLEGHANIENSIS)-10%
- *WHITE PINE (PINUS STROBUS) -40%

SUB-CANOPY

THE FOLLOWING SUB-CANOPY PLANTS SHALL BE 1.5' HEIGHT CONTAINERIZED STOCK. PLANT THE FOLLOWING AT 10 FOOT SPACING,

- CHOKE CHERRY (PRUNIS VIRGINIANA)-20%
- NANNYBERRY (VIBURNUM LENTAGO)-20%
- JUNE BERRIES (AMELANCHIER SPP.)-30%
- BUSH HONEYSUCKLE (DIERVILLA LONICERA)-30%

SEED AND APPLY EROSION CONTROL BLANKET

- APPLY TYPE CAT 3N2S EROSION CONTROL BLANKET, APPLY STAPLES AND BLANKET AS PER DETAIL ON SHEET??
- SEED WITH MIX NOTED ON THIS DETAIL SHEET WITH 25 LBS/ACRE OF COVER CROP.
- SCARIFY SOIL PRIOR TO SEEDING

TREE PROTECTION:

* SPECIES THAT REQUIRE 6' HIGH X 3.0' DIAMETER FENCING WITH 2 T-POSTS PLACED ON THE UPSTREAM SIDE OF THE TREE CAGE

ACCESS ROADS AND TRAILS
THIS AREA APPLIES TO GRASSED TRAILS NEAR STREAMS NOT EXISTING GRAVEL ROADS

SEED, MULCH, SOIL

- APPLY WEED FREE STRAW MULCH
- SEED AT 60LBS PER ACRE WITH MIX NOTED ON THIS DETAIL SHEET WITH 25 LBS/ACRE OF COVER CROP AS APPROVED BY ENGINEER.
- SCARIFY SOIL PRIOR TO SEEDING

ZONE 2

SEEDING AND PLANTING AREA-

SLOPE AREA FROM NEW FLOODPLAIN TO EXISTING GROUND

CANOPY

THE FOLLOWING CANOPY PLANTS SHALL BE 1.5' HEIGHT CONTAINERIZED STOCK. PLANT AT 8 FOOT SPACING:

- WHITE SPRUCE (PICEA GLAUCA) -30%
- RED PINE (*PINUS RESINOSA*)-40%
- JACK PINE (*PINUS BANKSIANA*)- 20%
- *WHITE PINE (PINUS STROBUS) -10%

SUB-CANOPY

THE FOLLOWING SUB-CANOPY PLANTS SHALL BE 1.5' HEIGHT CONTAINERIZED STOCK. PLANT THE FOLLOWING AT 10 FOOT SPACING,

- CHOKE CHERRY (PRUNIS VIRGINIANA)-20%
- NANNYBERRY (VIBURNUM LENTAGO)-20%
- JUNE BERRIES (AMELANCHIER SPP.)-20%
- BUSH HONEYSUCKLE (DIERVILLA LONICERA)-20%

SEED AND BLANKET

- APPLY CATEGORY 3N, 2S EROSION CONTROL BLANKET
- SEED AT 60LBS PER ACRE WITH MIX NOTED ON THIS DETAIL SHEET WITH 25 LBS/ACRE OF COVER CROP AS APPROVED BY ENGINEER.
- SCARIFY SOIL PRIOR TO SEEDING

ZONE 3

SEEDING AND PLANTING AREA-

HIGH GROUND AREAS WHERE REED CANARY GRASS IS PRESENT ON BIG 39 PROJECT


TREES AND SHRUBS

- TREE AND SHRUB SPECIES AND DENSITY SHALL BE THE SAME AS ZONE 3.

SEED, MULCH, SOIL

- APPLY WEED FREE STRAW MULCH
- REMOVE TOP 10" OF SOIL WITH REED CANARY GRASS PRESENT AND DISPOSE OF AT SITE APPROVED BY ENGINEER.
- SEED AT 60LBS PER ACRE WITH MIX NOTED ON THIS DETAIL SHEET WITH 25 LBS/ACRE OF COVER CROP AS APPROVED BY ENGINEER.
- SCARIFY SOIL PRIOR TO SEEDING


APPROVED BY: KA		CHECKED BY: MJG	DRAWN BY: GET
REV	DESCRIPTION	APPRV	
1	DRAFT 30% DESIGN	KA	BIG AND LITTLE 39 STREAM RESTORATION NEAR SILVER BAY LAKE COUNTY, MN
2	DRAFT 60%	KA	
3	DRAFT 90%	KA	
4	BID SET	KA	BID SET - NOT FOR CONSTRUCTION ----- -----
XX	XX	XX	
XX	XX	XX	
XX	XX	XX	
XX	XX	XX	DETAIL - PLANTING
XX	XX	XX	
XX	XX	XX	
XX	XX	XX	



NORTHSHORE MINING CO

10 OUTER DR

SILVER BAY, MN 55614



BEAVER RIVER CONSULTING

BEAVER RIVER CONSULTING, LLC.

5752 EAGLE VIEW DRIVE

DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

DATE:

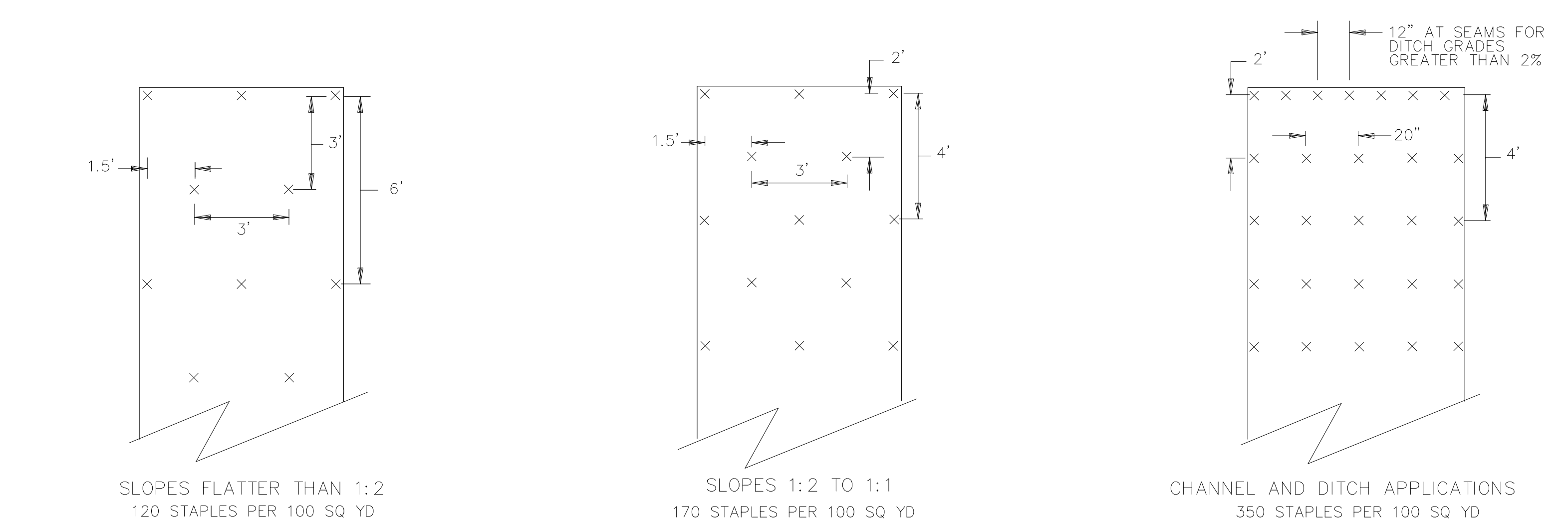
10/15/2021

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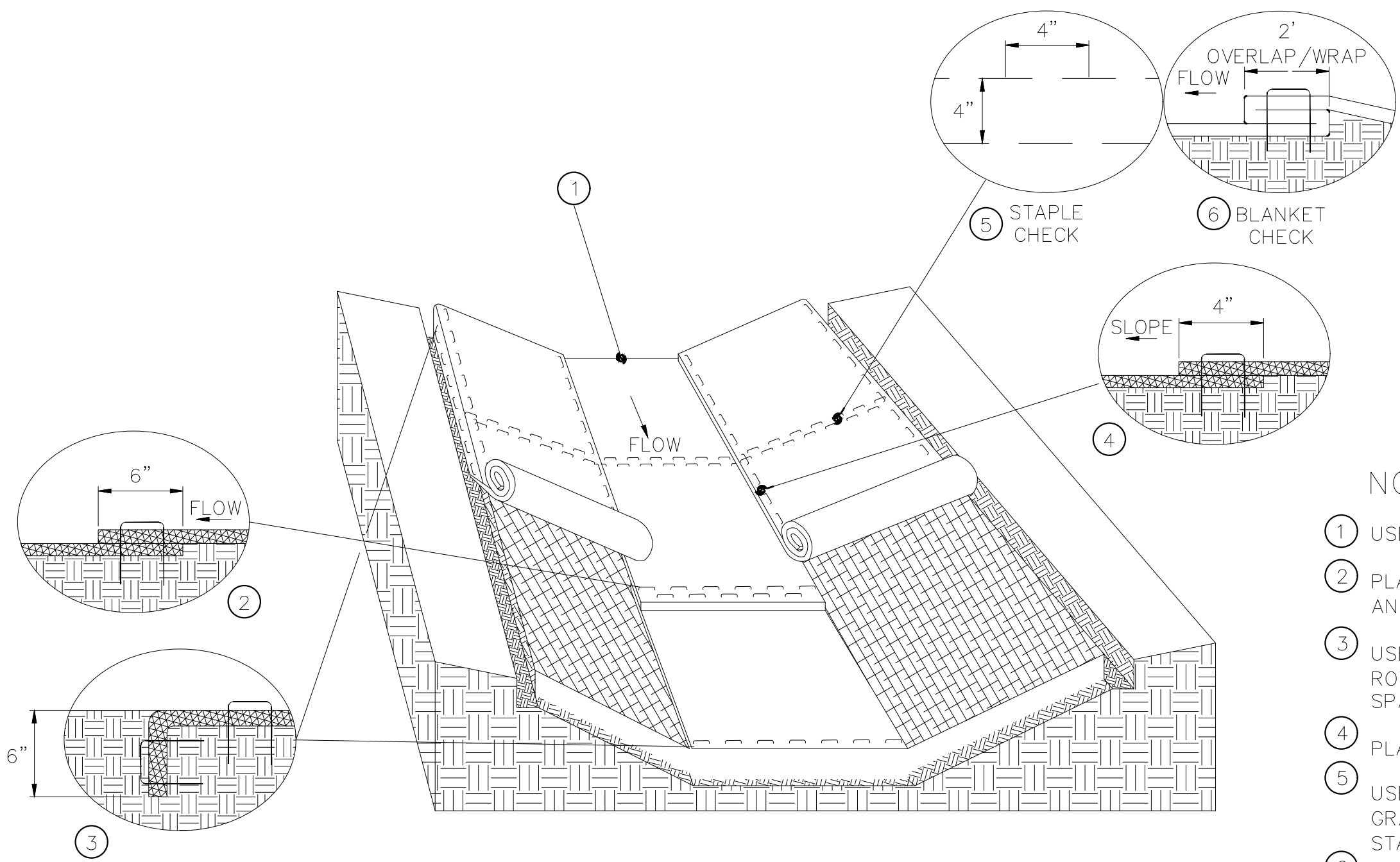
SHEET NUMBER

47 OF 50

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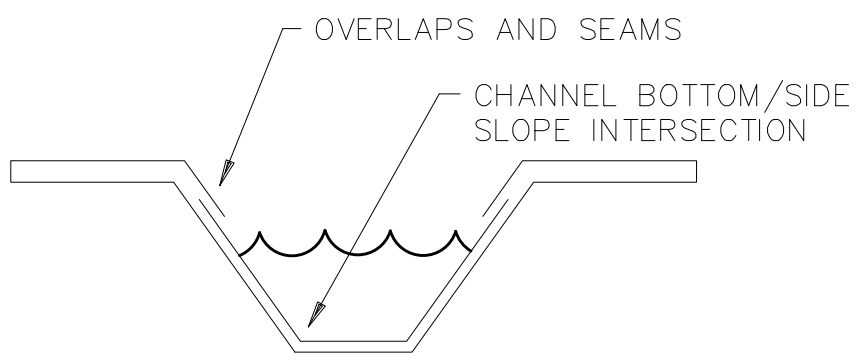
BLANKET STAPLE PATTERN



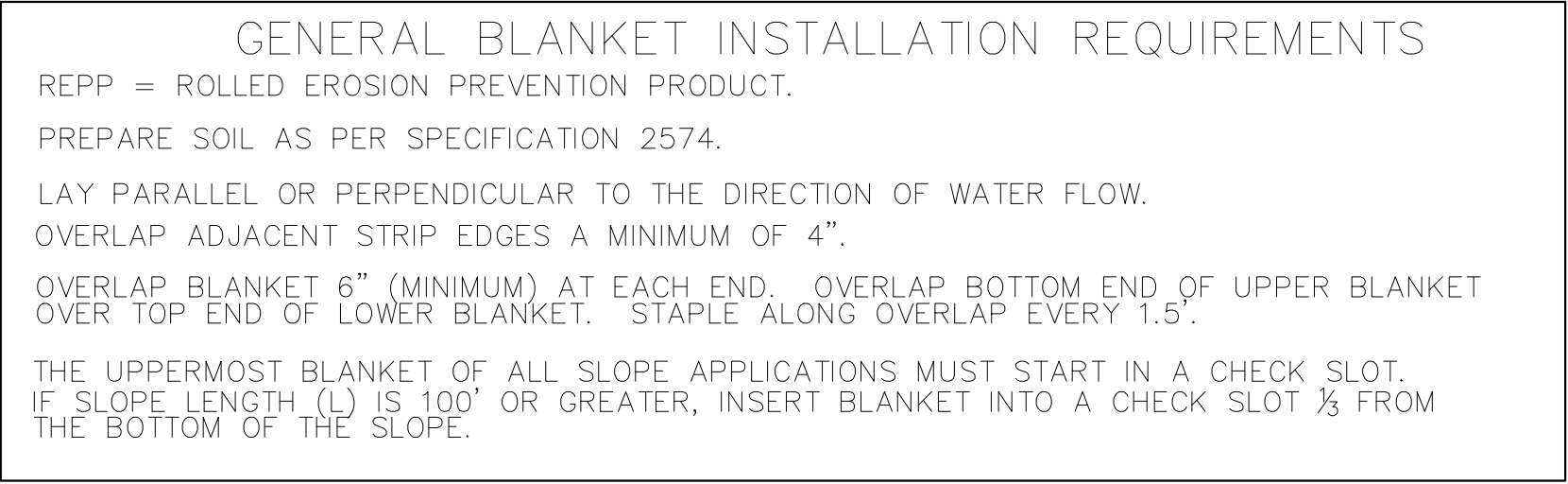
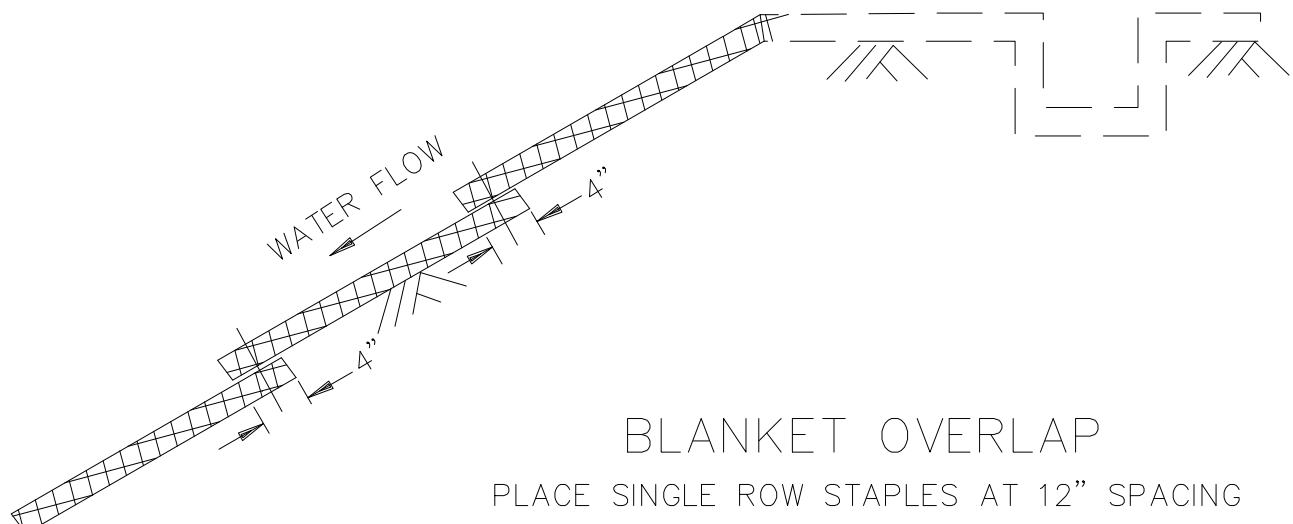
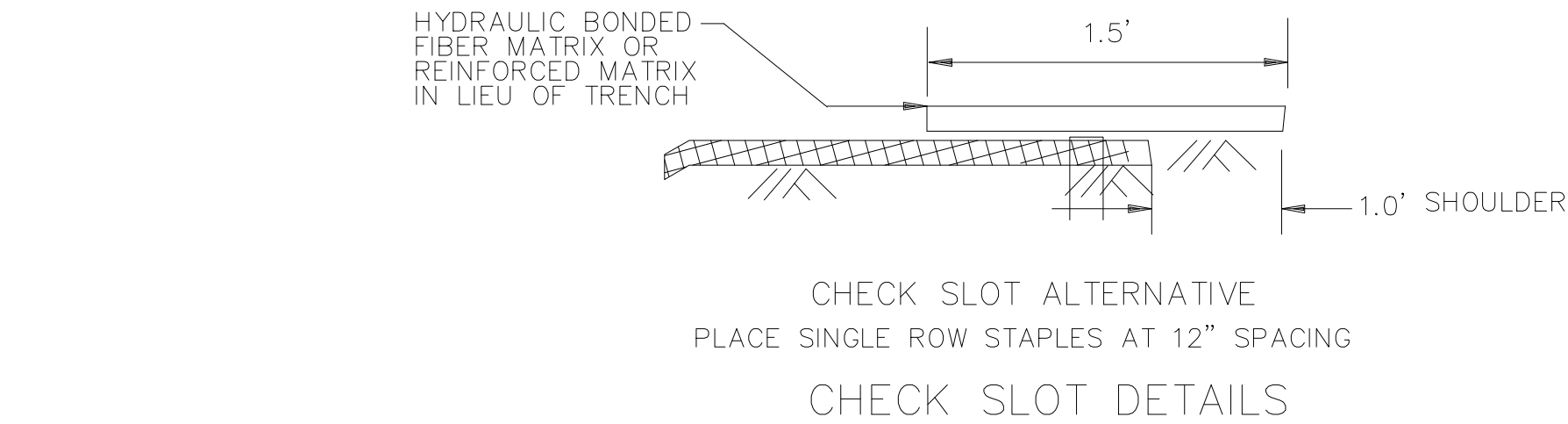
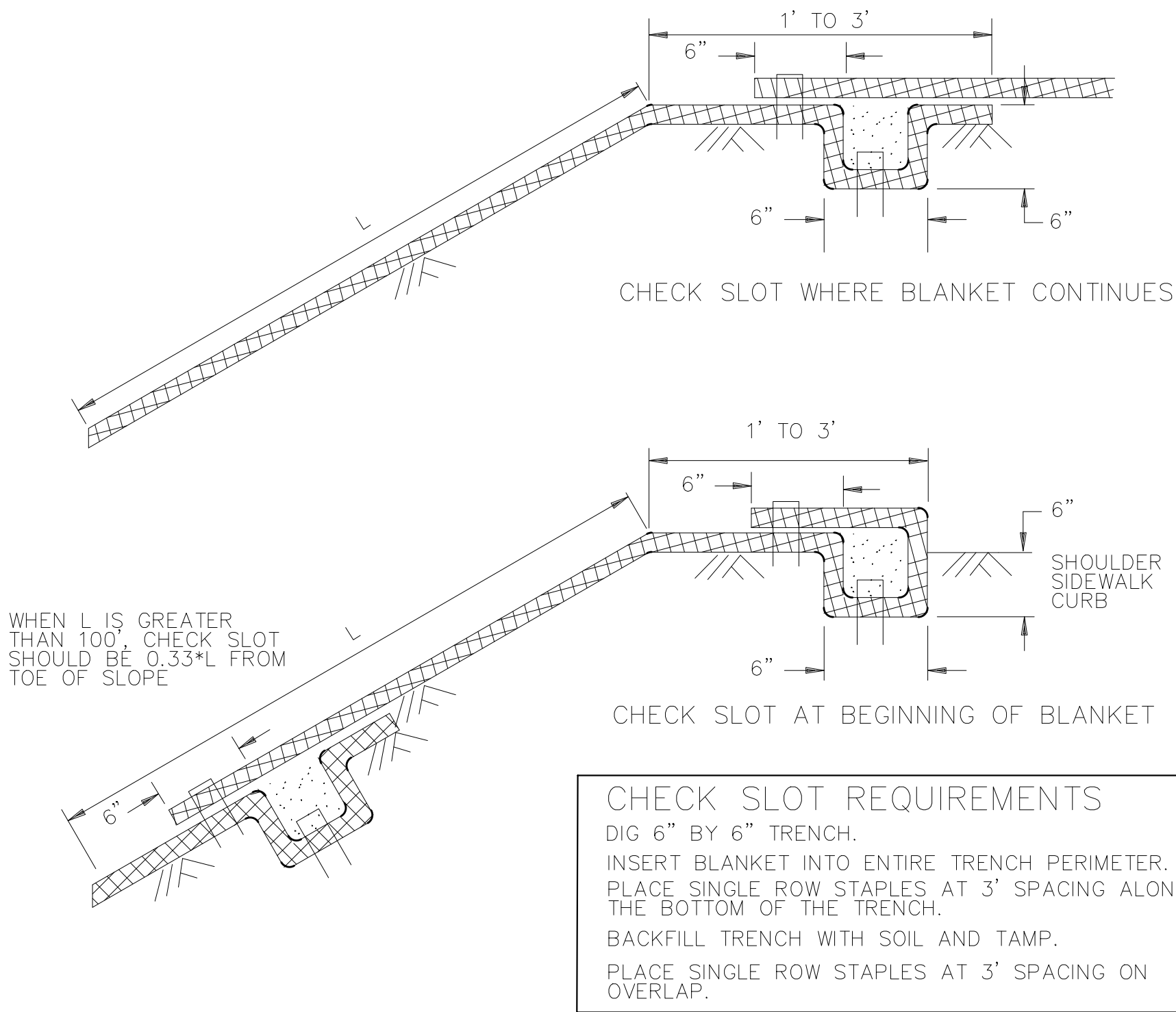
DITCH BLANKET STAPLE DETAIL

NOTES:

- 1 USE CHECK SLOT DETAIL (NO ALTERNATES).
- 2 PLACE DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER.
- 3 USE 6" X 6" TRENCH TO PLACE BLANKET. PLACE SINGLE ROW OF STAPLES ON TOP AND TRENCH SIDES AT 12" SPACING. BACKFILL TRENCH WITH SOIL AND TAMP.
- 4 PLACE SINGLE ROW OF STAPLES AT 12" SPACING.
- 5 USE STAPLE CHECK FOR CHANNEL SLOPES LESS THAN 2.5% GRADE AT 100' INTERVALS. PLACE DOUBLE ROW OF STAPLES STAGGERED 4" APART AND AT 4" SPACING.
- 6 USE BLANKET CHECKS FOR THE FOLLOWING SLOPES:
2.5%-3% 100' INTERVALS
3%-5% 50' INTERVALS
5%-7% 25' INTERVALS
- 7 CRITICAL POINTS SHALL BE SECURED WITH PROPER STAPLE PATTERNS.



DITCH BLANKET CRITICAL POINTS ⑦



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REV	DESCRIPTION			
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2	DRAFT 60%			KA
3	DRAFT 90%			KA
4	BID SET			KA
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XX	XX			XX
XX	XX			XX
XX	XX			XX

BIG AND LITTLE 39


STREAM RESTORATION

NEAR SILVER BAY


LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION

DETAIL - EROSION CONTROL BLANKET



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



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DULUTH, MN 55803

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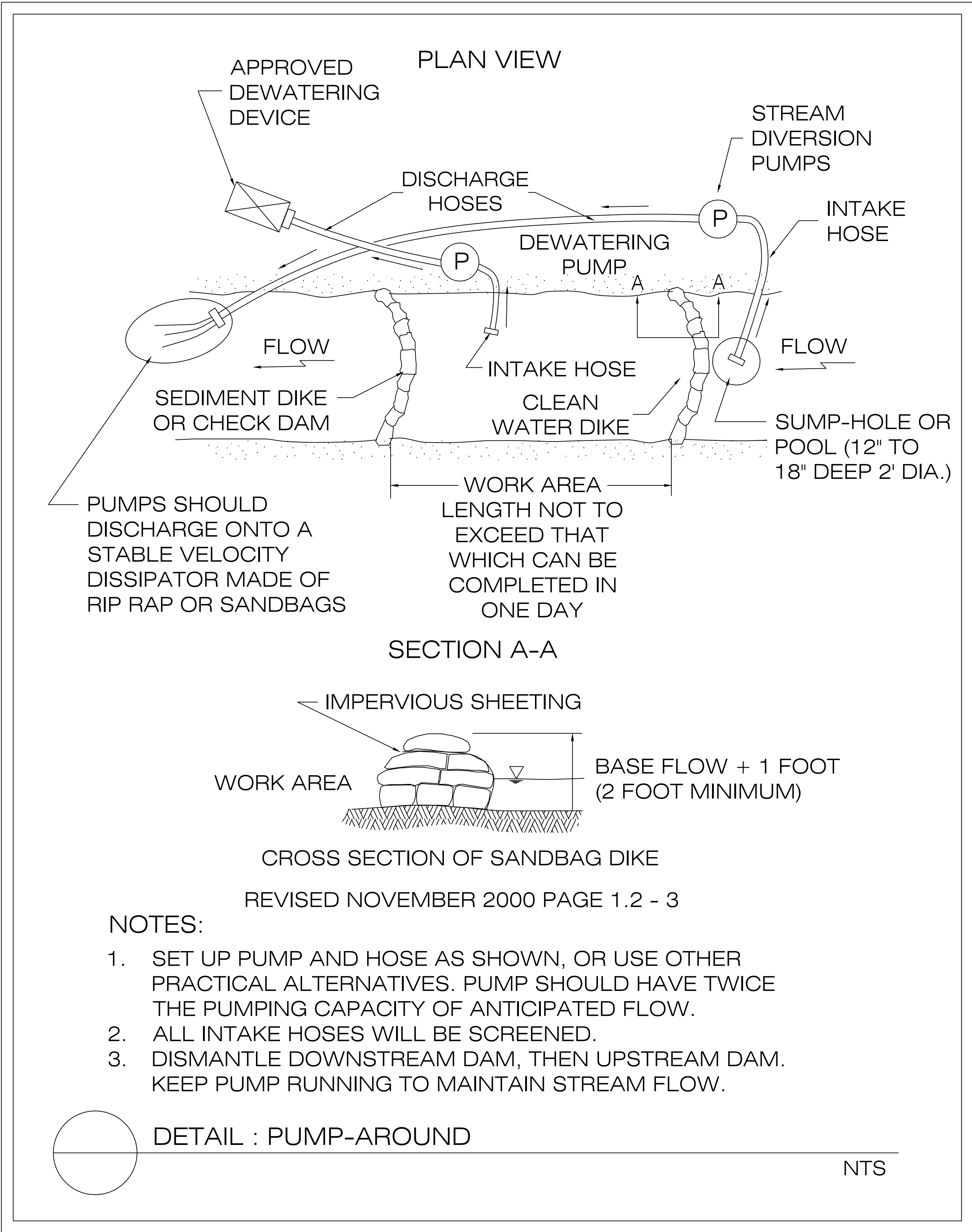
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	2		DRAFT 60%		KA
	3		DRAFT 90%		KA
	4		BID SET		KA
	XX		XX		XX
	XX		XX		XX
	XX		XX		XX
	XX		XX		XX

STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION

DETAIL - SWPP



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER RIVER CONSULTING
BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

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49 OF 50

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BIG/LITTLE 39 CREEKS STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

SWPPP PREPARATION DATE: 10/14/2021

SWPPP CONTACT

KEITH ANDERSON, BEAVER RIVER CONSULTING

5752 EAGLE VIEW DRIVE

DULUTH,MN 55803

218-626-7450

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMIT NUMBER:

CHAIN OF RESPONSIBILITY:

BY SIGNING BELOW, ALL PARTIES AGREE TO FOLLOWING THE SWPPP SETFORTH.

OWNER:

PHONE#:

OPERATOR:

PHONE#:

SWPPP DESIGNER: KEITH ANDERSON, KEITH@BEAVERRIVERCONSULTING.COM

PHONE#: CELL 218-626-7450

SWPPP INSPECTOR/MANAGER:

PHONE#:

CONSTRUCTION SWPPP DESIGNATE:

PHONE#:

ESTIMATED PROJECT DATES:

PROJECT START DATE: / /

PROJECT END DATE: / /

WATER BODY: BIG AND LITTLE 39 CREEKS, LAKE COUNTY MN

DNR WORK RESTRICTIONS: JULY 1-SEPTEMBER 15TH WITHOUT AMENDMENT

MN DNR SPECIAL WATERS, ENSURE ANY EQUIPMENT WORKING IN THE WATER HAS BEEN WASHED AND IS FREE OF EXOTIC SPECIES

ASSOCIATED DOCUMENTS:

CERTIFICATION OF TRAINING(S)

PROJECT PLANS

PROJECT DETAILS

SWPPP AMENDMENTS

CONTRACTOR SHOP DRAWING OF BMPS LOCATIONS AND TIMING: TO BE ATTACHED AT PRECONSTRUCTION MEETING

DIVERSION PLANS: TO BE ATTACHED AT PRECONSTRUCTION MEETING

DEWATERING PLANS: TO BE ATTACHED AT PRECONSTRUCTION MEETING

STAGING PLANS: TO BE ATTACHED AT PRECONSTRUCTION MEETING

NPDES PERMIT

PUBLIC WATERS WORK PERMIT

INSPECTION REPORTS

STORMWATER POLLUTION PREVENTION PLAN FOR THE BIG/LITTLE 39 STREAM RESTORATION PROJECTS

PROJECT INFORMATION:

THE PROJECT INVOLVES THE RESTORATION OF TWO REACHES OF STREAM IN THE BIG AND LITTLE 39 WATERSHED AREA. FLOODPLAIN EXCAVATION AND CHANNEL REALIGNMENT WILL BE PERFORMED TO ALLOW THE STREAMS TO BE IMPROVED TO A NATURAL CONDITION.

PROJECT DESCRIPTION:

THIS PROJECT INVOLVES RESTORING HABITAT AND FLOODPLAINS TO PREVIOUSLY DITCHED CHANNELS USING FLUVIAL GEOMORPHOLOGY TECHNIQUES THAT WILL ADD FLOODPLAIN PROCESSES AND REESTABLISH RIFFLE AND POOL MORPHOLOGY THUS ENHANCING FISH HABITAT. THE RESTORATION WILL INCLUDE TOEWOOD BANK STABILIZATION AND COARSE RIFFLE STRUCTURES TO CONTROL THE DESIGN STREAM GRADE. EACH REACH WILL BE COMPLETED ON A PHASING SCHEDULE THAT WILL BE DEVELOPED AT THE PRE-CONSTRUCTION MEETING AND ALONG WITH CORRESPONDING SWPPP AMENDMENTS.

THE TOTAL DISTURBED ARE FOR THE PROJECT IS 12.5 ACRES.
THE TOTAL AREA OF IMPERVIOUS SURFACE PRE PROJECT 0 ACRES
THE TOTAL AREA OF IMPERVIOUS SURFACE POST PROJECT, 0 ACRES

SEE INDEX FOR PLANS, DETAILS, SPECIFICATIONS, PHASING PLAN

REGULATORY CONTEXT:

SPECIAL OR IMPAIRED WATERS: THIS PROJECT DOES DISCHARGE TO SPECIAL WATERS, BIG AND LITTLE 39 CREEK. IN ADDITION TO THE MAIN STEM OF THE BEAVER RIVER WHICH IS AN MPCA IMPAIRED WATER.

THIS PROJECTS STORM WATER DISCHARGE IS NOT ANTICIPATED TO IMPACT ANY OF THE FOLLOWING: OUTSTANDING RESOURCE VALUE WATERS, CALCAREOUS FENS, PROPERTIES LISTED BY THE NATIONAL REGISTER OF HISTORIC PLACES OR ARCHAEOLOGICAL SITES AND IS NOT SUBJECT TO ADDITIONAL REGULATIONS DUE TO ANY FORMAL ENVIRONMENTAL REVIEW, ENDANGERED OR THREATENED SPECIES, WETLANDS DELINEATED AND IMPACT IS COORDINATED WITH ARMY CORPS OF ENGINEERS ALONG WITH THE WETLAND CONSERVATION ACT PANEL.

DEPARTMENT OF NATURAL RESOURCES HAS AUTHORITY OF WORK BELOW ORDINARY HIGH WATER LEVEL. PUBLIC WATERS WORK PERMIT SHALL BE OBTAINED AND ADHERED TO.

STORMWATER POLLUTION PREVENTION PLAN (SWPPP) IMPLEMENTATION RESPONSIBILITIES:

1. THE OWNER AND CONTRACTOR ARE IDENTIFIED BY THE BID DOCUMENTS.
2. CONTRACTOR SHALL VERIFY THAT ALL PERMITS HAVE BEEN OBTAINED.
3. CONTRACTOR SHALL PERFORM SITE INSPECTIONS, RECORD KEEPING AND RECORD RETENTION IN ACCORDANCE WITH ALL PERMITS.
4. CONTRACTOR SHALL INSTALL ALL SEDIMENT CONTROL BEST-MANAGEMENT-PRACTICES (BMP) AND CONSTRUCTION ENTRANCES PRIOR TO SITE GRADING, EXCAVATION, STOCKPILING OR DISTURBING EXISTING VEGETATIVE COVER.
5. CONTRACTOR SHALL PERFORM SITE GRADING, EXCAVATION, STOCKPILING WORK IN ACCORDANCE WITH SWPPP.
6. CONTRACTOR SHALL INSTALL, INSPECT, MONITOR AND MAINTAIN TEMPORARY AND PERMANENT EROSION CONTROL BMP AS SHOWN ON PLANS, CONTINUOUSLY DURING DURATION OF WORK.
7. CONTRACTOR SHALL INITIATE SOIL STABILIZATION IMMEDIATELY AND STABILIZE ALL EXPOSED SOILS WITHIN 7 DAYS AFTER CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED.
8. CONTRACTOR SHALL REPLACE OR REPAIR EROSION CONTROL AND SEDIMENT CONTROL BMPS IMMEDIATELY IF IT IS FOUND THAT THEY ARE NOT FUNCTIONING PROPERLY.
9. CONTRACTOR SHALL PERFORM SITE RESTORATION ACTIVITIES FOR PERMANENT VEGETATION ESTABLISHMENT.
10. CERTIFIED SWPPP INPECTOR/MANAGER IDENTIFIED AT THE PRECONSTRUCTION MEETING SHALL INSPECT THE ENTIRE PROJECT AT LEAST ONCE EVERY SEVEN (7) DAYS DURING ACTIVE CONSTRUCTION AND WITHIN 24 HOURS AFTER A RAINFALL EVENT GREATER THAN 0.5 INCHES IN 24 HOURS.
11. INSPECTIONS SHALL BE CONDUCTED WITH THE PROVIDED SWPPP INSPECTION WORKSHEET.
12. REDUNDANT BMP SHALL BE INSTALLED IF FREQUENT FAILURE OR EXCESSIVE MAINTENANCE IS NOTED AND SWPPP WILL BE AMENDED TO THAT EFFECT.
13. CONTRACTOR SHALL REMOVE SEDIMENT CONTROL DEVICES AT COMPLETION OF PROJECT AND SUBMIT A NOTICE OF TERMINATION TO MINNESOTA POLLUTION CONTROL AGENCY.
14. CONTRACTOR SHALL ENSURE THAT THE PUBLIC WATERS PERMIT STIPULATIONS ARE FOLLOWED.

RECORD RETENTION

1. SWPPP RECORDS SHOULD BE MAINTAINED BY OWNER FOR THREE YEARS AFTER FINAL STABILIZATION.
2. CHANGES MADE TO SWPPP PLAN IMPLEMENTATION SHALL BE RECORDED AS SWPPP AMENDMENTS WITH 24 HOURS.
3. SWPPP AMENDMENTS SHALL BE ACCOMPANIED BY NOTIFICATION OF CHANGES TO SWPPP INSPECTOR/MANAGER.
3. A COPY OF SWPPP PLAN SHALL BE MAINTAINED ON SITE OR IN CONSTRUCTION VEHICLE DURING ACTIVE CONSTRUCTION.
4. INSPECTIONS WILL BE RECORDED WITH 24 HOURS IN WRITING AND RETAINED WITH SWPPP RECORD IN A DESIGNATED LOCATION.

CONSTRUCTION ACTIVITY FIELD REQUIREMENTS:

A. ALL FIELD REQUIREMENTS SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE SWPPP.
1. THE CONTRACTOR MUST IMPLEMENT SWPPP AND PROVIDE BMPS IDENTIFIED IN THE SWPPP IN A APPROPRIATE AND FUNCTIONAL MANNER.
2. THE CONTRACTOR SHALL RESPOND TO CHANGING SITE CONDITIONS AND IMPLEMENT/SUPPLEMENT EROSION PREVENTION AND SEDIMENT CONTROL MEASURES UTILIZED TO PROVIDE ADEQUATE PROTECTION OF DISTURBED SOILS AND ADEQUATE PREVENTION OF SEDIMENT TRANSPORT OFF-SITE. AT A MINIMUM, THE FOLLOWING STORM WATER POLLUTION PREVENTION CONSTRUCTION FIELD REQUIREMENTS SHALL BE FURNISHED BY THE CONTRACTOR.

B. EROSION PREVENTION PRACTICES

1. THE CONTRACTOR SHALL ATTEMPT TO PHASE ALL WORK TO MINIMIZE EROSION AND MAINTAIN VEGETATION COVER TO THE EXTENT POSSIBLE.
2. ALL EXPOSED SOILS WITH PERIMETER CONTROL BMPS MUST BE STABILIZED NO LATER THAN 7 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED, INCLUDING STOCKPILES WITH SIGNIFICANT SILT, CLAY OR ORGANIC COMPONENTS.
3. TEMPORARY OR PERMANENT ENERGY DISSIPATION AT PIPE OUTLETS MUST BE PROVIDED WITHIN 24 HOURS OF CONNECTING TO A SURFACE WATER.
5. TOPSOIL WILL BE SALVAGED AND STOCKPILED FOR REAPPLICATION SO AS TO ENSURE MAXIMUM GROWTH POTENTIAL.

C. SEDIMENT CONTROL PRACTICES

CONTRACTOR SHALL BE RESPONSIBLE FOR THE FOLLOWING SEDIMENT CONTROL PRACTICES:
1. DUE TO THE LOCATION AND UNIQUE NATURE OF THE PROJECT WORKING IN THE STREAMS, DOWNGRAIDENT SEDIMENT CONTROL IS NOT FEASIBLE, ALL EFFORTS WILL BE MADE TO CONTROL SEDIMENT BY PHASING THE STREAM PROJECT AS NOTED IN THE PLANS AND STABILIZING AND DIVERTING THE WATER DURING CONSTRUCTION.
2. TIMING AND INSTALLATION OF SEDIMENT CONTROL DEVICES CAN BE ADJUSTED BY CONTRACTOR TO ACCOMMODATE SHORT-TERM ACTIVITIES SUCH AS CLEARING AND GRUBBING OR VEHICLE PASSAGE. ANY SHORT TERM ACTIVITY MUST BE COMPLETED AS QUICKLY AS POSSIBLE AND THE SEDIMENT CONTROL PRACTICES MUST BE INSTALLED IMMEDIATELY AFTER THE ACTIVITY IS COMPLETED AND IN ALL CASES PRIOR TO THE NEXT PRECIPITATION EVENT.
3. TEMPORARY SOIL STOCKPILES MUST HAVE SILT FENCE/TOP SOIL BERMS OR OTHER EFFECTIVE SEDIMENT CONTROL. SOIL STOCKPILES SHALL NOT BE PLACED WITH IN SURFACE WATERS OR STORMWATER CONVEYANCES. ALL STOCKPILES THAT WILL NOT BE DISTURBED FOR ONE MONTH OR LONGER SHALL BE PROTECTED FROM EROSION BY CONTRACTOR USING A COVER OF MULCH, EROSION CONTROL MATS OR PLASTIC SHEETING.
4. CONTRACTOR SHALL IMPLEMENT MEASURES TO CONTROL VEHICLE TRACKING OFFSITE IF NECESSARY.

D. DEWATERING AND BASIN DRAINING (IF APPLICABLE)

1. CONTRACTOR'S DEWATERING ACTIVITIES THAT HAVE SEDIMENT-LADEN DISCHARGE MUST DISCHARGE INTO A TEMPORARY OR PERMANENT SEDIMENTATION BASIN OR THROUGH SOME FORM OF BMP, SUCH AS A FILTER BAG, BY CONTRACTOR TO LIMIT SEDIMENT FROM LEAVING THE SITE TO ENSURE EFFLUENT WATER IS FREE OF SEDIMENT.

I. DEWATERING PLANS SHALL BE FURNISHED TO SWPPP PERSONNEL AT TIME OF CONSTRUCTION.
II. DEWATERING DISCHARGE POINTS MUST BE DISPERSED OVER PLYWOOD, NATURAL RIPRAP, SANDBAGS, PLASTIC SHEETING, OR OTHER ACCEPTED ENERGY DISSIPATING MEASURES IN A NON-EROSIVE MANNER.
III. DEWATERING BMPS SHALL BE INSPECTED BY THE CONTRACTOR PERIODICALLY DAILY AND IMMEDIATELY MAINTAINED OR REPAIRED IF SEDIMENT-LADEN WATER IS BEING DISCHARGED.

E. SWPPP PERSONNEL SHALL BE RESPONSIBLE FOR PERFORMING THE FOLLOWING INSPECTIONS AND MAINTENANCE:

1. ALL NONFUNCTIONAL BMPS SHALL BE REPAIRED, REPLACED WITHIN 24 HOURS AFTER DISCOVERY. CONTRACTOR SHALL PLACE ANY ADDITIONAL EROSION CONTROL MEASURES DEEMED NECESSARY BY THE ENGINEER WITH 24 HOURS OF NOTICE.
2. THE SWPPP INSPECTOR MUST ROUTINELY INSPECT THE SITE ONCE EVERY 7 DAYS DURING ACTIVE CONSTRUCTION AND WITH 24 HOURS AFTER A RAINFALL EVENT GREATER THAN 0.5 INCHES IN 24 HOURS.
3. ALL SILT MUST BE REMOVED FROM SILT FENCE BY CONTRACTOR WHEN IT REACHES A HEIGHT EQUAL TO ONE-THIRD OF THE HEIGHT OF THE SILT FENCE. CONTRACTOR SHALL REPAIR SILT FENCE THAT IS NONFUNCTIONAL WITH 24 HOURS OF DISCOVERY.
4. INSPECTIONS CAN BE SUSPENDED DUE TO FROZEN GROUND CONDITIONS UNTIL FIRST RUNOFF OCCURS OR CONSTRUCTION ACTIVITIES RESUME.

F. POLLUTION PREVENTION MEASURES

CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING THE FOLLOWING POLLUTION MANAGEMENT MEASURES ON THE SITE:
1. SOLID WASTE: COLLECTED SEDIMENT, ASPHALT, CONCRETE MILLINGS, FLOATING DEBRIS, PAPER, PLASTIC, FABRIC, CONSTRUCTION AND DEMOLITION DEBRIS AND OTHER WASTES MUST BE DISPOSED OF PROPERLY AND MUST COMPLY WITH MPCA DISPOSAL REQUIREMENTS.
2. HAZARDOUS MATERIAL: HAZARDOUS SUBSTANCES MUST BE STORED IN APPROPRIATE CONTAINERS AND STEPS IMPLEMENTED TO PREVENT SPILLS, LEAKS, AND VANDALISM.
3. ADEQUATE SUPPLIES TO CLEAN UP SPILLS MUST BE AVAILABLE ON SITE.
4. NO VEHICLE DEGREASING ON SITE.

G. DIVERSION

1. CONTRACTORS MUST PROVIDE DETAILS ON STREAM DIVERSION AT THE PRECONSTRUCTION MEETING. THIS INCLUDES BUT NOT LIMITED TO: PIPE SIZES, PUMP SIZES, DIVERSION CHANNEL SIZE, DIVERSION CHANNEL LOCATIONS, WITH ASSOCIATED DEWATERING PLANS IF APPLICABLE.
2. DIVERSION CAN BE ACHIEVED USING BERMS, ABANDONED CHANNELS, JERSEY BARRIERS, PIPES, SANDBAG DAMS, PLYWOOD DAMS, OR OTHER METHODS THAT ARE DEEMED APPROPRIATE FOR THE SITE.

FINAL STABILIZATION

1. ALL DISTURBED AREAS SHALL BE STABILIZED BY USING COIR MAT, EROSION CONTROL BLANKETS, MULCH, OR HYDROSEEDDED AS PER VEGETATIVE DETAILS SHEETS
2. ALL DISTURBED AREAS SHALL BE PERMANENTLY STABILIZED BY SEED, SHRUBS, AND TREES AS SPECIFIED IN PLANS.
3. TEMPORARY SEDIMENT EROSION CONTROL BMPS SHALL BE REMOVED AT PROJECT CLOSEOUT.

APPROVED BY: KA

REV

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XX

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XX

CHECKED BY: MAG

DESCRIPTION

DRAFT 30% DESIGN

DRAFT 60%

DRAFT 90%

BID SET

XX

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XX

XX

DRAWN BY: GET

APPRV

KA

KA

KA

KA

XX

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XX


BIG AND LITTLE 39
STREAM RESTORATION
NEAR SILVER BAY
LAKE COUNTY, MN

BID SET - NOT FOR CONSTRUCTION

DETAIL - SWPP NOTES



NORTHSHORE MINING CO
10 OUTER DR
SILVER BAY, MN 55614



BEAVER
RIVER
CONSULTING

BEAVER RIVER CONSULTING, LLC.
5752 EAGLE VIEW DRIVE
DULUTH, MN 55803

BID SET
NOT FOR
CONSTRUCTION

DATE:

10/15/2021

NOT TO SCALE

SHEET NUMBER

50 OF 50

Memorandum

To: MNDNR Environmental Policy & Review Unit
From: Tyler Conley, Mark Jacobson – Barr Engineering
Subject: Big and Little Thirtynine Creek Restoration Threatened and Endangered Species Review
Date: December 1, 2021
Project: 23381049
c: Nate Schroeder – Northshore Mining Company

Northshore Mining Company (Northshore) is in the process of permitting two stream mitigation projects related to the West Ridge Railroad and Tailings Basin Progression Project. The stream mitigation projects include the Big Thirtynine Creek and Little Thirtynine Creek Sites. The stream restoration locations are shown on **Figure 1**. This technical memorandum summarizes the results of the desktop review for the presence of endangered, threatened, and special concern (ETSC) species within the creek restoration extent **Figure 2**. The purpose of this memorandum is to identify the potential for ETSC species to be impacted by the proposed projects. On behalf of Northshore, Barr requests that the MDNR consider the documentation and conclusions of this review and provide a written determination addressing the sufficiency of this memo to fulfill the endangered and threatened species component of the Wetland Conservation Act (Minnesota Rule 8420.0515, subparts 1 and 2).

1.1 MNDNR NHIS Database Query

In November 2021, Barr queried the current NHIS database to identify any ETSC species that have been previously recorded within one mile of the stream restoration project extents. The database review indicated that no ETSC species have been previously identified within the restoration area. However, two state-listed special concern species have been identified within one mile of the project extents (**Table 1**).

Table 1 Rare Species Documented within One Mile of Big Thirtynine Creek and Little Thirtynine Creek Site According to MNDNR NHIS

Scientific Name	Common Name	Federal Status	State Status	Suitable Habitat Present?	Further Action Required?
<i>Cladium mariscoides</i>	Twig rush	None	Special Concern	Yes	No
<i>Eleocharis nitida</i>	Neat spikerush	None	Special Concern	Yes	No

1.1.1 Twig Rush (*Cladium mariscoides*)

Twig rush occurs mostly in fens, particularly prairie rich fens, northern rich fens, and calcareous fens (MDNR, 2021a). Twig rush is found in two locations within one mile of the project extents. Both

populations are found within former borrow sites where clay soils had been excavated for basin construction. One location has approximately 50 stems in a single patch covering about 12 square meters. The other nearby location has around 500 stems in a single patch covering about 15 square meters (Barr, 2016). No fen plant communities are located within the project extents. Suitable habitat for twig rush may be present within the creek restoration area. However, the species is listed as special concern and is not legally protected under state endangered species law. No further action is required.

1.1.2 Neat Spikerush (*Eleocharis nitida*)

Neat spikerush is a colonizer of small wet localized depressions, such as shallow ditches, pits, trails, and wheel ruts in sand, gravel, or clay (MDNR, 2021b). One population of neat spikerush has been found within one mile of the project extents. This population of neat spikerush is located in a ditch next to the railroad, including about 100 stems within a small, less than one square meter patch (Barr, 2016). Suitable habitat for neat spikerush may be present within the creek restoration area. However, the species is listed as special concern and is not legally protected under state endangered species law. No further action is required.

2.0 References

Barr Engineering. 2016. Endangered, Threatened, and Special Concern Plant Species Survey Report. October 2016.

Minnesota Department of Natural Resources. 2021a. Rare Species Guide: *Cladium mariscoides*. Accessed November 24, 2021, at:
<https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PMCYP04050>

Minnesota Department of Natural Resources. 2021b. Rare Species Guide: *Eleocharis nitida*. Accessed November 24, 2021, at *Eleocharis nitida*:
<https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PMCYP09180>

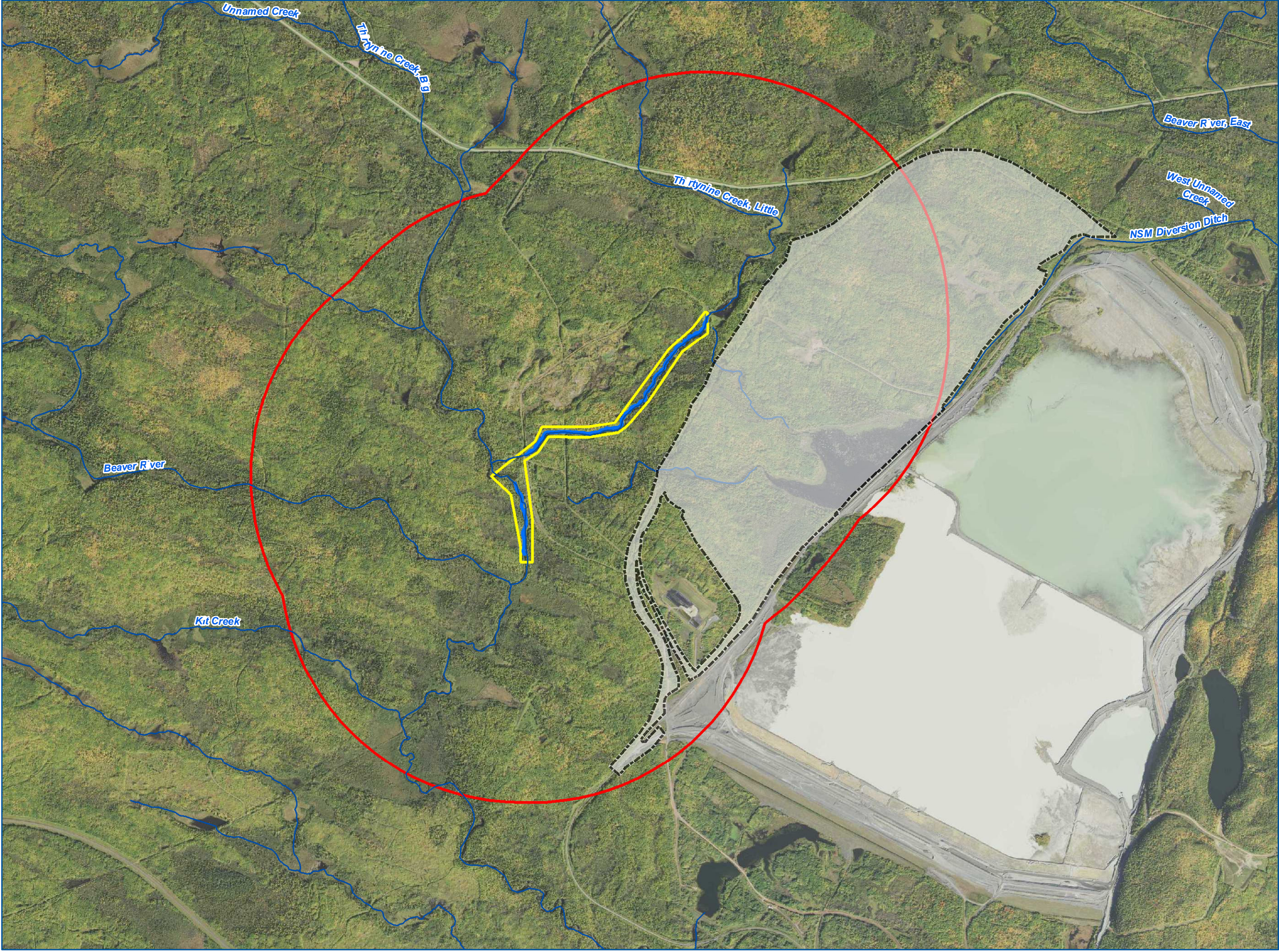
Figures

Figure 1 – Project Location Map

Figure 2 – Thirtynine Creek Restoration Area

Figures

Barr Footer: ArcGIS 10.8.1, 2021-11-23 11:38 File: I:\Client\NorthShoreMining\Work_Orders\DS14_2014_RR_Design\Maps\Other\Stream Mitigation\2021 Big Little 39 NHS Review\Figure 1 - Stream Restoration NHS Big Little 39.mxd User: maj



Legend

- Tailings Basin Project Area
- Stream Restoration Sites
- Streams
- Review Area
- Stream Restoration Project Extent

Feet

PROJECT LOCATION
BIG AND LITTLE 39 CREEKS
STREAM RESTORATION
Northshore Mining Co.
Lake County, Minnesota

FIGURE 1



Good morning,

We had Barr complete the Threatened and Endangered Species review for us. I have attached this review. I looked to see who to send this to and it looks like "Regional Program staff" where the project is proposed would be the normal path forward. Since you are the reviewers, does NSM send directly to you for concurrence? I worried that if I send it directly to the Region 2 reviewer it may not be properly applied to the project.

I have attached the review, but if I should send it to someone else please let me know. I hope to have the EAW and spreadsheet responses complete today.

Please advise,



Nate Schroeder
Environmental Engineer
P 218.226.6083 M 218.226.8567
Nathaniel.Schroeder@clevelandcliffs.com

CLEVELAND-CLIFFS INC.
Northshore Mining Company
10 Outer Drive
Silver Bay, MN 55614
clevelandcliffs.com

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Appendix C, Climate Trend Analysis and Carbon Footprint Estimation Data Sources and Output

Summary of Estimated Mobile GHG Emissions

1 gram =	1.1023E-06	short ton
Life of Project =	50	years
Time of construction =	3	months

Source Type ID	Emission Source	Number of Units ¹⁰	Hours of Operation/year ⁷	Vehicle Type	Estimated Vehicle Year ⁸	Fuel Type	MPG	VMT/day	horsepower if applicable	hp-hr if applicable	Fuel Amount		CO ₂ Emission Factors ¹		CH ₄ Emission Factors		N ₂ O Emission Factors		CO ₂ (tons/year)	CH ₄ (tons/year)	N ₂ O (tons/year)	CO ₂ e (tons/year)
											Value ⁶	Unit	Value	Unit	Value	Unit	Value	Unit				
DE-3	Construction - gasoline mobile sources On-Road	4	100	Passenger Cars	2007	Gasoline	20	14	N/A	N/A	521	total gallons	8.78	kg CO ₂ /gallon	0.0072	g CH ₄ /mile ³	0.0052	g N ₂ O/mile ³	1.68	0.000000	0.000000	1.68
DE-3	Construction - diesel mobile sources - On-Road	2	100	Medium- and Heavy-Duty Trucks	2007-2018	Diesel	15	5	N/A	N/A	548	total gallons	10.21	kg CO ₂ /gallon	0.0095	g CH ₄ /mile ⁴	0.0431	g N ₂ O/mile ⁴	2.05	0.000000	0.000001	2.05
DE-3	Construction - diesel mobile sources - On-Road	2	100	Light Trucks	2007-2018	Diesel	14	5	N/A	N/A	511	total gallons	10.21	kg CO ₂ /gallon	0.029	g CH ₄ /mile ⁴	0.0214	g N ₂ O/mile ⁴	1.92	0.000000	0.000000	1.92
DE-3	Construction - diesel mobile sources - Nonroad	7	500	Construction Equipment ⁹	N/A	Diesel	N/A	N/A	100	350000	4,375	total gallons	10.21	kg CO ₂ /gallon	0.2	g CH ₄ /gallon ²	0.47	g N ₂ O/gallon ²	16.41	0.000019	0.000045	16.43
TOTAL																			16.41	0.000019	0.000045	22.08

Notes:
(2) Table 5, Mobile Combustion CH₄ and N₂O for Non-Road Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL April, 2021. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>
(3) Table 3, Mobile Combustion CH₄ and N₂O for On-Road Gasoline Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL April, 2021. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>
(4) Table 4, Mobile Combustion CH₄ and N₂O for On-Road Diesel and Alternative Fuel Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL April, 2021. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>
(5) Includes equipment, such as excavators, haul trucks, skid steers
(6) for Nonroad sources, fuel amount is calculated based on fuel usage estimates per horsepower-hour (0.05 gallons for diesel, 0.12 gallons for gasoline) from Table A9-3E in SCAQMD CEQA Air Quality Handbook (<https://www.cvw.org/ArchiveCenter/ViewFile/Item/608>).
(7) Based on 10 hrs/day, 5 days/week for 16 weeks for construction
(8) Values based off of the most conservative year (2007) for the most recent year average for medium- and heavy-duty trucks and light trucks (2007-2018). <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>
(9) Includes equipment, such as dumpers, and excavators, as well as fuel consumption from trucks that are used off-road in construction.
(10) Numbers are based on a hypothetical assessment and not from a specific source.

Summary of GHG Sources and Sinks From Land Use Changes

Source Type ID	Emission Source	Area (acres)	Net CO ₂ Flux for land use conversion (M metric tons CO ₂ e) ^{1,2}	2019 Total US Land Use Change from Wetland to "other" (thousands of hectares) ³	2019 Total US Land Use Change from Grassland (thousands of hectares) ³	CO ₂ e emission factor (metric tons CO ₂ e/acre/year)	CO ₂ e Emissions (tons/year)
DE-4	Land Use Change - Conversion from wetlands to open water "other" ²	0.1	1.5	121	--	5.02	0.55
DE-4	Land Use Change - Conversion from grassland to Forest Land ¹	1.4	-10.5	--	992	(4.28)	(6.61)
						Total	(6.06)

Notes:

(1) Table 6-24: Net CO₂ Flux from Forest C Pools in Land Converted to Forest Land by Land Use Change Category, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2019. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019>

(2) Table 6-66: Net CO₂ Flux from C Stock Changes in Vegetated Coastal Wetlands Converted to Unvegetated Open Water Coastal Wetlands, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2019. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019>

(3) Table 6-5: Land Use and Land-Use Change for the U.S. Managed Land Base for All 50 States, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2019. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019>