ENVIRONMENTAL ASSESSMENT WORKSHEET

This Environmental Assessment Worksheet (EAW) form and EAW Guidelines are available at the Environmental Quality Board's website at: http://www.eqb.state.mn.us/EnvRevGuidanceDocuments.htm. The EAW form provides information about a project that may have the potential for significant environmental effects. The EAW Guidelines provide additional detail and resources for completing the EAW form.

Cumulative potential effects can either be addressed under each applicable EAW Item, or can be addresses collectively under EAW Item 19.

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: Mission Creek Restoration Project

2. Proposer: South St. Louis Soil & Water Conservation District
Contact person: Ann Thompson
Title: Conservation Specialist
Address: 215 N 1st Ave E. Rm. 301
City, State, ZIP: Duluth, MN 55803
Phone: 218-723-4867
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3.RGU: South St. Louis Soil & Water Conservation District
Contact person: Kate Kubiak
Title: Conservation Specialist
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Phone: 218-723-4946
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4. Reason for EAW Preparation: (check one)

Required:
☐ EIS Scoping
X Mandatory EAW

Discretionary:
☐ Citizen petition
☐ RGU discretion
☐ Proposer initiated

If EAW or EIS is mandatory give EQB rule category subpart number(s) and name(s): The proposed project will re-align approximately 2,800 feet of a designated trout stream so the EAW is mandatory under the following rule category: Subp. 26. **Stream diversion.** For a diversion, re-alignment, 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. The South St. Louis Soil & Water Conservation District is the Local Government Unit and will serve as the RGU.

5. Project Location:
County: St. Louis
City/Township: Duluth
PLS Location (¼, ¼, Section, Township, Range): T48 R15 Sec. 5
Watershed (81 major watershed scale): St. Louis River
GPS coordinates (decimal degrees): 46.668073, -92.274768
Tax Parcel Number: City of Duluth property, Parcel ID numbers: 010-2730-00700, 010-2730-00670, 010-2730-00680

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

- County map showing the general location of the project; *See Attachment 1*
- U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable); *See Attachment 2*
- Site plans showing all significant project and natural features. Pre-construction site plan and post-construction site plan; *See Attachment 3*

Additional Attachments:

- *Attachment 4: Well and Boring Report – Minnesota Department of Health*
- *Attachment 5: Custom Soil Resource Report – Natural Resources Conservation Service*
- *Attachment 6: Wetlands Information – National Wetlands Inventory*
- *Attachment 7: Natural Heritage Review – Minnesota Department of Natural Resources*

6. Project Description:

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

The Mission Creek Restoration project will stabilize a 2,800 foot long reach that was negatively impacted by the flood of 2012. The project includes the removal of a debris catcher that was originally installed to protect the Highway 23 Bridge from being blocked with logs and other materials. During the June 2012 Flood, the stream jumped around the debris catcher. Channel form will be restored, pool and riffle habitat will be created, the creek will be re-connected to the floodplain and native vegetation will be re-established in the riparian corridor. Removal of the debris catcher will result in a single thread, free-flowing channel where there are currently several. Restoring Mission Creek will have lasting beneficial effects on the health of this stream and on the greater watershed.

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 proposed project is a stream restoration project on Mission Creek, a designated trout stream that runs through the Fond du Lac neighborhood of Duluth, MN. Its 11 square mile watershed is mostly undeveloped except for the dense group of homes at the downstream end.

This restoration project is designed to improve the ecological/hydrological function of the stream channel and adjacent floodplain by creating a sinuous channel that is connected to the floodplain and has diverse in-stream habitat for trout and other cold-water species.

Construction of 2,800 feet of stream channel will include grading and stabilizing new stream banks, installing in-stream structures for grade control and fish habitat, removing the upstream debris catcher, and stabilizing and vegetating disturbed areas. Construction will also include the stabilization of 700 feet of a small tributary that is currently extremely incised and has vertical eroding banks.

The new stream channel will be excavated at the calculated bankfull width of 25 feet. Natural Channel Design methodology requires that a reference reach be used to inform the design of the new channel. Data from the Blackhoof River at Carlton County Highway 6 is being used as the reference reach for this restoration project. The channel will have a slope of approximately 2% and will have a sinuosity of >1.2 (a Rosgen “C” channel type). “C” channels have a riffle-pool sequence. Pools will provide thermal refuge, cover, feeding and resting areas for aquatic organisms. Riffles will provide oxygen to the water column and the gravel within the riffles will provide spawning areas. Root wads will be installed to provide woody cover and habitat and to stabilize the stream banks.

A bulldozer, excavator and dump truck will be used to dig and shape the new channel. An excavator with a hydraulic thumb will be used to install the in-stream structures including toewood, boulders, logs and rocks.

The riparian areas will be planted with native vegetation. The riparian area will be stabilized with erosion control mats and blankets to allow vegetation to become established. Plantings will include native flower and grass seed, shrubs and trees.

The stream will be temporarily diverted around the active construction areas using an engineer-approved stream diversion plan. All stockpiles will have erosion and perimeter control and other best management practices implemented according to the Storm Water Pollution Prevention Plan to ensure that sediment does not enter the stream during construction. A balance of fill and cut will occur so that excess material will not be hauled on or off site.

Timing: The proposed timing of the project is as follows:

Construction:
July-September 2019:

- Construction of the re-meandered channel, including grading and excavating.
- Placement of all stream structures and habitat features, including toe wood, stream vanes and j-hooks
- Stabilization of all disturbed areas (erosion control blanket in new channel).
- Construction and stabilization of the small tributary

September/October 2018:

- Planting of all disturbed areas with native forbs and grasses, shrubs and trees.
- Installation of erosion control matting to protect the newly seeded area.
- Restoration of any access trails and/or staging areas.

Construction limits, site access, the stream channel alignment and stockpile locations will be staked out prior to the start of the project. See Attachment 3 for design plans.

c. Project magnitude:

Total Project Acreage	9.5 ac.
Linear project length	2896 feet
Number and type of residential units	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)	N/A

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 project has three purposes:

1. Create fish habitat
2. Enhance floodplain connectivity and stream stability by restoring the channel to the correct form
3. Decrease water temperatures through the establishment of native vegetation

The purpose of the project is to restore the physical and ecological function of Mission Creek. Each of the five components of stream health will be addressed (geomophology, hydrology, connectivity, water quality, and biology). This includes restoring fish habitat; decreasing solar input to decrease water temperatures; removing the current debris catcher structure; and re-meandering the creek to a natural, stable pattern. Using Natural Channel Design methodology will allow us to meet our goals.

The project is being carried out by the South St. Louis Soil & Water Conservation District, which is the Local Government Unit. The beneficiaries for the project are aquatic species living in the creek, the residents of the Fond du Lac neighborhood, and the citizens of Duluth as healthy creeks and watersheds are a goal for the City and its residents (City of Duluth Comprehensive Plan, 2006). Visitors and residents in the watershed will also receive an improved area for recreation and will benefit from a decrease in sediment moving downstream.

e. Are future stages of this development including development on any other property planned or likely to happen?
☐ Yes X 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 X No
If yes, briefly describe the past development, timeline and any past environmental review.

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

	Before	After		Before	After
Wetlands	0	0	Lawn/landscaping	0	0
Deep water/streams	1.8	1.8	Impervious surface	0	0
Wooded/forest	0	6.0	Stormwater Pond	0	0
Brush/Grassland	7.7	1.7	Other	0	0
Cropland	0	0			
			TOTAL	**9.5**	**9.5**

8. 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.*

Unit of government	Type of application	Status
MN DNR	Public Waters Permit	Submitted
MN DNR	Natural Heritage Information System	Complete/attachment 7
State Historic Preservation Office	Cultural Resource Features	Currently coordinating
Army Corps of Engineers	CWA Section 404/401	Submitted
City of Duluth	Fill/Haul permit	To be submitted
City of Duluth	Shoreland Alteration	To be submitted
City of Duluth	Erosion/Sediment Control	To be submitted
City of Duluth	License Agreement	To be arranged
MPCA	NPDES Construction Stormwater	To be submitted

Cumulative potential effects may be considered and addressed in response to individual EAW Item Nos. 9-18, or the RGU can address all cumulative potential effects in response to EAW Item No. 19. If addressing cumulative effect under individual items, make sure to include information requested in EAW Item No. 19

9. Land use:

a. Describe:

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

The project is located on City of Duluth property. This site is currently forested on the riparian edges and is upstream of the Fond du Lac neighborhood. The area is used for recreation including hiking and biking.

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 City of Duluth's Comprehensive Plan (2006) identifies the project site as "Park, Cemetery, Recreation." The "Park, Cemetery, Recreation" category is defined in the Plan as "Public and private outdoor recreational areas including playgrounds, community gardens, picnic facilities, trails, golf courses, and natural areas."

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

The "park, cemetery, recreation" category is reserved for public lands and designated trails.

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

The restoration project at Mission Creek complies with the land uses and zoning areas described in the City of Duluth Comprehensive Plan. Restoration of the stream will not change the land use currently in place and will continue to allow park and recreation space.

c. Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 9b above.

The design will be reviewed by the City of Duluth to ensure that current and future recreation opportunities will continue.

10. 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.

We have not identified any sinkholes, shallow limestone, shallow aquifers or karst conditions. Due to the absence of any known special features, we have not provided for any mitigation measures in our design. Bedrock is present on site at varying depths.

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 11.b.ii.

The Custom Soil Resource Report provided by the NRCS (attachment 5) identifies the soils in the project area as the following:

1034A Udifluvents and Fluvaquents, Loamy,
0 to 2 percent slopes,
Rarely flooded, 6.9%

E12A Udifluvents Complex
0 to 3 percent slopes,
Flooded, 91.4%

F155G Udalfs – Eutrudepts Complex
25 to 70 percent slopes
1.7%

The National Wetland Inventory does not show wetlands in this area.

The nature of the project involves impacts to the topography and soils, however, since this is a stream restoration project, we expect that those impacts will be positive, not negative. Excavated soils will serve as needed fill for the project. The project will not alter the topography of the site.

11. 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, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include 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.

The MN DNR Public Waters Inventory lists Mission Creek (S-002-007). Mission Creek is a designated trout stream.

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.

A search of the Minnesota Department of Health's County Well Index online identified several domestic wells and monitoring wells in the area. The closest domestic well is approximately 870 feet east of the project site. This well is located at 136th Avenue West Duluth, MN. The boring report (updated 9/14/2018) indicates that water was encountered 18 feet from the surface. See attachment 4.

The project site is not in a MDH wellhead protection area.

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.

i. 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.

1) If the wastewater discharge is to a publicly owned treatment facility, identify any pretreatment measures and the ability of the facility to handle the added water and waste loadings, including any effects on, or required expansion of, municipal wastewater infrastructure.
2) If the wastewater discharge is to a subsurface sewage treatment systems (SSTS), describe the system used, the design flow, and suitability of site conditions for such a system.
3) If the wastewater discharge is to surface water, identify the wastewater treatment methods and identify discharge points and proposed effluent limitations to mitigate impacts. Discuss any effects to surface or groundwater from wastewater discharges.

No wastewater will be produced, treated or discharged during the project.

ii. Stormwater - Describe the quantity and quality of stormwater runoff at the site prior to and post construction. Include the routes and receiving water bodies for runoff from the site (major downstream water bodies as well as the immediate receiving waters). Discuss any environmental effects from stormwater discharges. Describe stormwater pollution prevention plans including temporary and permanent runoff controls and potential BMP site locations to manage or treat stormwater runoff. Identify specific erosion control, sedimentation control or stabilization measures to address soil limitations during and after project construction.

This project will be completed under dry channel conditions. The quality and quantity of pre- and post-project stormwater runoff will be the same. The proposed project is not a development project and will not be creating any additional impervious areas. Short-term stormwater runoff may occur during the construction of this project. No soil limitations occur at the site of the project that would increase sedimentation from stormwater runoff. Post-construction stormwater runoff should be similar to pre-construction conditions as no impervious surfaces will be constructed. A Stormwater Pollution Prevention Plan (SWPPP) will be developed and submitted to the Minnesota Pollution Control Agency (MPCA), as part of the National Pollutant Discharge Elimination System (NPDES) permit administered by the MPCA. The proposed SWPPP will include best management practices to minimize soil erosion, including stabilization of constructed channels prior to the introduction of stream flow, use of erosion control blanket and mulch, rapid re-vegetation of disturbed areas. Disturbed soils will be seeded with native vegetation and covered with erosion control fabric adjacent to the stream. Mulch will be placed in the upland areas to encourage quick re-vegetation and reduce erosion from disturbed areas. The project will reduce long–term erosion by redirecting the stream flow away from steep, eroding banks.

iii. 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. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation.

This project will not result in any water appropriation from Mission Creek, during construction or permanently.

iv. Surface Waters

a) 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. 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 will occur in the same minor or major watershed, and identify those probable locations.

No wetlands are present in the restoration area.

b) 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.

The nature of the project is to alter a surface water, however, the purpose of the alteration is environmentally positive. The project will re-establish a stable stream channel throughout the reach using Natural Channel Design methodology and will restore the dimension, pattern and profile of Mission Creek. Construction will occur between July and September.

Vegetation will be re-established at the project site. Only native plants will be planted in the riparian area and species will be identified in the restoration design plans. The South St. Louis Soil and Water Conservation District has extensive experience with stream restoration projects such as the proposed, and are familiar with riparian species that will not only thrive in NE Minnesota's environment, but also help ensure the integrity of the restored stream channel.

The environmental effects from altering (restoring) the creek will be wholly beneficial. Minimal, temporary turbidity may occur during construction, but it is expected to be less than the natural turbidity generated during spring runoff.

All direct and indirect environmental effects of restoring the creek are expected to be positive.

Mission Creek is not big enough to be used for watercraft.

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.

The Soil and Water Conservation District will work with the contractor to ensure that all appropriate measures are taken to minimize environmental impacts including turbidity and sedimentation.

Soil stockpiles will be stabilized with straw mulch and silt fencing or a similar best management practice, according to the Stormwater Pollution Prevention Plan to ensure that no soils migrate into the creek.

The primary way that impacts to the creek will be mitigated is by conducting the project during low-flow periods (summer). In addition, the work will be phased so that only short sections of the stream will be under construction. As each section is completed, it will be planted and stabilized. Finally, impacts will be mitigated by diverting water around the active construction area according to an engineer-approved stream diversion plan.

Discuss how the project will change the number or type of watercraft on any water body, including current and projected watercraft usage.

There is currently no watercraft usage in the existing stream channel and there will be none in the future.

12. 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 hazardous contamination conditions are known to exist within the project area.
No utilities run near the project site.

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 will 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 above or below ground tanks to store petroleum or other materials. 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.

During project construction and installation, activities fuels, oils, lubricants and other hazardous materials will be used during equipment operations. An accidental release or spill of any of these substances could occur. A spill could result in potentially adverse effects to on-site soils. However, the amounts of fuel and other lubricants and oils will be limited and the equipment needed to quickly limit any contamination will be located on site. To minimize the likelihood of potential spills and leaks of petroleum and hydraulic fluids during project construction, equipment will be inspected daily for leaks and petroleum contamination. Additionally, a spill prevention control and containment plan designed to reduce effects from spills (fuel, hydraulic fluid, etc.) will be prepared and implemented prior to the start of construction.

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 will be generated or stored during this project.

13. 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.

The site is undeveloped forestland. The riparian vegetation is limited due to sediment deposits from the June 2012 flood.

Fish species include a limited number of game and non-game species. These include dace, chubs, Johnny darter, blue gill, and bass. Fish habitat is limited due to filled in pools and little vegetative cover. Water temperatures in this reach have increased since the flood due to the lack of pools and vegetation. Trout habitat was also obliterated during the 2012 flood and has not fully recovered.

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 20180101) 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.

The Natural Heritage Information System database was consulted in September 2018 to determine if any rare plant or animal species are present within the project site (attachment 7). The Natural Heritage review determined that the project is partially within and adjacent to a site of *High Biodiversity significance*. This site is identified as harboring several high quality native plant communities. We will follow the recommendations listed in Attachment 7 to limit the disturbance to the project site. We will also concentrate our efforts on reducing the area of impact and will share this information with the contractor and anyone on-site.
Creek heelsplitter (*Lasmigona compressa)* and black sandshell (*Ligumia recta)*, mussel species of special concern, and lake sturgeon (*Acipenser fulvenscens*) have been documented in the St. Louis River – near the project site. To minimize disturbance to these organisms, we will work to reduce erosion and sediment input to Mission Creek and its receiving water, the St. Louis River, by actively following the Storm Water Pollution Prevention Plan, by working during low flow conditions (between July and September), and by pumping water around the active work areas.

c. Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project. 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 will have some temporary, negative impacts on the local wildlife and ecological communities, during the construction period. However these impacts will last no longer than 90 days and the sote will be greatly enhanced for wildlife once the project is complete. Access trails and staging areas will be restored to a condition that is equal to or better than the existing conditions.

Due to the nature of the project, there is always the possibility that some sediment will move off site, especially as the temporary stream diversion system is being installed.

The proposed project will also impact local communities and wildlife positively as the purpose of the project is to improve both aquatic and terrestrial habitat and reduce sediment impacts to the creek and downstream neighborhood. This will be accomplished by constructing a stable stream channel that can effectively carry sediment and flows without aggrading or degrading. Also, we are moving the creek away from existing eroding banks, which will reduce the amount of sediment sloughing off of these banks during high flows. Additionally, habitat creation and enhancement is an integral part of the project design - pools will provide thermal refuge, cover, feeding and resting and nursery areas for fish; riffles will provide oxygen to the water column and provide spawning areas; and root wads will provide woody cover and habitat and stabilize the stream banks.

Per the construction contract, contractors must take all appropriate and available measures to prevent the spread of invasive species. The contract language is as follows:

> *The Contractor shall prevent invasive species from entering into or spreading within a project site by cleaning equipment prior to arriving at the project site. If the equipment, vehicles, gear, or clothing arrives at the project site with soil aggregate material, mulch, vegetation (including seeds) or animals, it shall be cleaned by contractor furnished tool or equipment at the staging area. The contractor shall dispose of material cleaned from equipment and clothing at a suitable location. If the material cannot be disposed of onsite, Contractor shall secure the material prior to transport and legally dispose of offsite.*

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

The purpose of the proposed project is to restore the aquatic ecology and terrestrial environment within the project area to a condition equal to or better than it was before the project.

Stream restoration will cause some temporary adverse impacts to fish, wildlife and plant communities. We are taking all reasonable measures to avoid impacts to the existing wildlife and ecology including the following:

1. Construction is being conducted during non-spawning periods of trout and sturgeon.
2. The channel restoration work will be completed in phases instead of disturbing the entire area at once.
3. If recommended by the MN DNR, we will work with the local fisheries office to move fish out of the active construction area prior to diverting water.
4. Access to the site will be limited to only a couple of entrance points.
5. Staging areas will be limited in size and will have perimeter control to reduce sediment runoff.
6. Construction will be suspended during rain events at the discretion of the Engineer to limit rutting and excess erosion from the construction equipment.
7. The construction timeline will be kept tight, and the contractor will be expected to be dedicated to the project in order to minimize the amount of time that areas are disturbed. Contract timelines will be enforced.
8. Only native species that are appropriate to the existing terrestrial ecology will be used to restore the disturbed areas. In addition, we plan to have a three-year maintenance plan included in the contract in order to ensure the success of all seeding, trees, and shrubs.
9. Erosion control blanket is specified to be natural netting only to ensure disintegration. No plastic netting will be allowed on site.

14. 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.

The SWCD has completed a Phase 1 archeology survey of the project site in conjunction with the MN DNR. This report has been shared with the SHPO and with the Army Corps of Engineers. The SWCD is continuing to work with the SHPO as part of the ongoing review in accordance with the responsibilities of the Army Corps of Engineers under federal law.

15. 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.

No views and/or vistas will be impacted by this project. No vapor plumes or glare from lights will be present at the restoration site.

16. 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, and any greenhouse gases. 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 will 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 used for this project, including an excavator, skid-steer, bulldozer and dump truck, would have localized, minimal effects on air quality. The overall impact on air quality is expected to be negligible and temporary in nature.

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 16a). 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.

This stream restoration project will require the use of construction equipment such as an excavator, skid-steer and dump truck. Construction will involve the movement and grading of soils and rock materials in dry and wet soil conditions. Most materials handled are stone and wood and do not cause fugitive dust generation or offensive odors.

17. Noise

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.

Noise generated from the project will be temporary and will only occur during construction hours. Earth-moving equipment will generate noise such as engine noise, rock on metal and backup safety alarms. This equipment will generate noise during workday daytime hours and will occur for a time between July 1st and September 15th.

The project site is located on City of Duluth parkland. The noise area classification for the project site is "2" – Parks.

18. 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.

Limited hauling of construction materials (boulders and woody material) will occur. Hauling will only occur on weekday, during daytime hours. Trucks will access the site at the end of 131st Avenue West.

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,

No project-related traffic congestion is expected.

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

There are no anticipated project-related transportation effects.

19. 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 to environmental effects that could combine with other environmental effects resulting in cumulative potential effects.

The proposed project is 9.5 acres. Construction will occur over approximately six to eight weeks. Construction will occur between July 1st and September 15th. This is to ensure that construction is completed in low flow conditions. Planting will extend in to the fall to ensure conditions are correct for planting trees and shrubs.

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.

There are no projects known to any of the project partners within the same geographic area or timeframe that would interact with the proposed project in such a way as to cause cumulative effects.

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.

Increased turbidity or sedimentation from this project would be short-term and have no long-term consequences. A slight increase in downstream sedimentation due to in-channel construction should be expected. The expected increase in sedimentation is small and would not affect spawning areas for trout or aquatic invertebrates.

20. 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.

All potential environmental effects have been addressed.

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

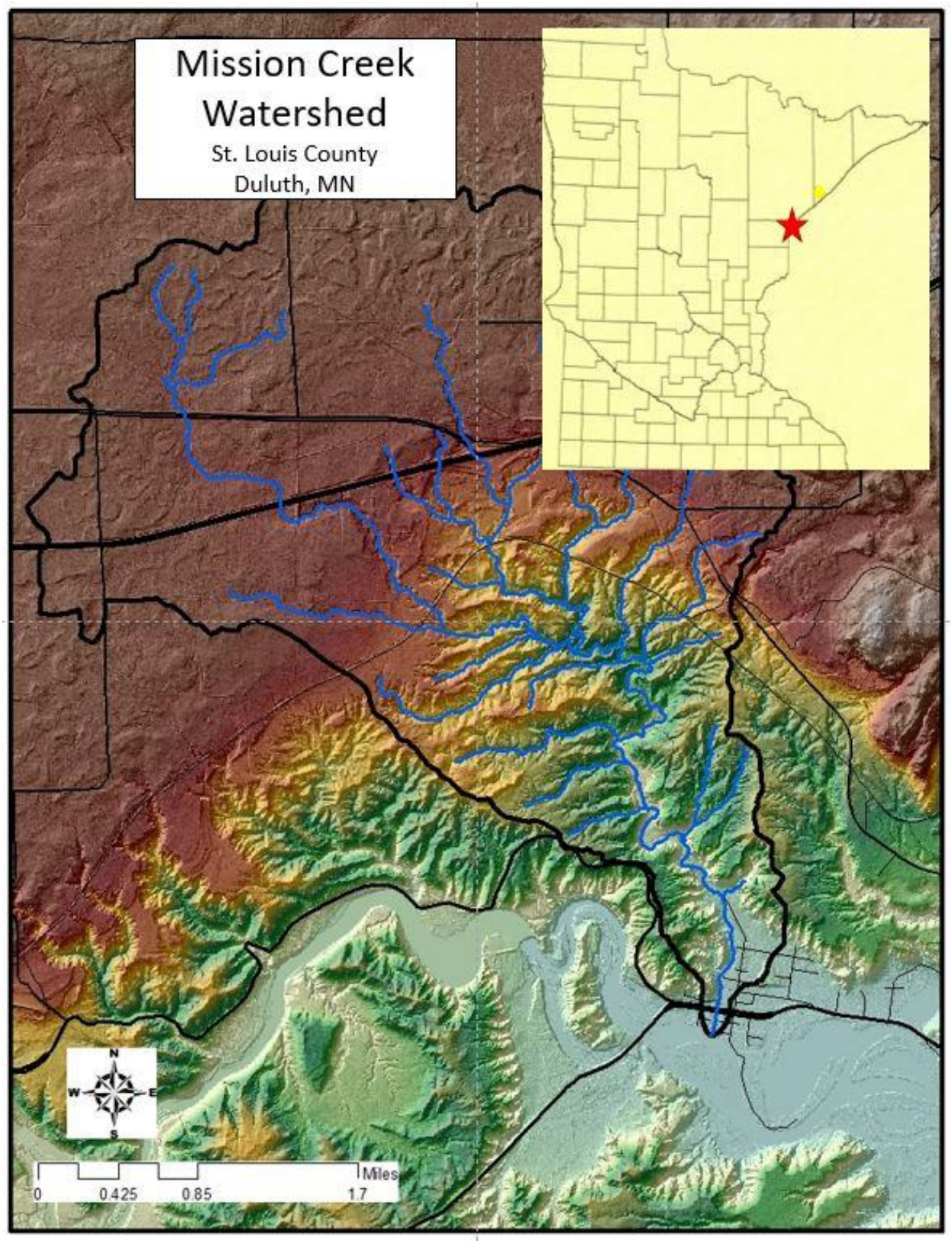
I hereby certify that:

- 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.

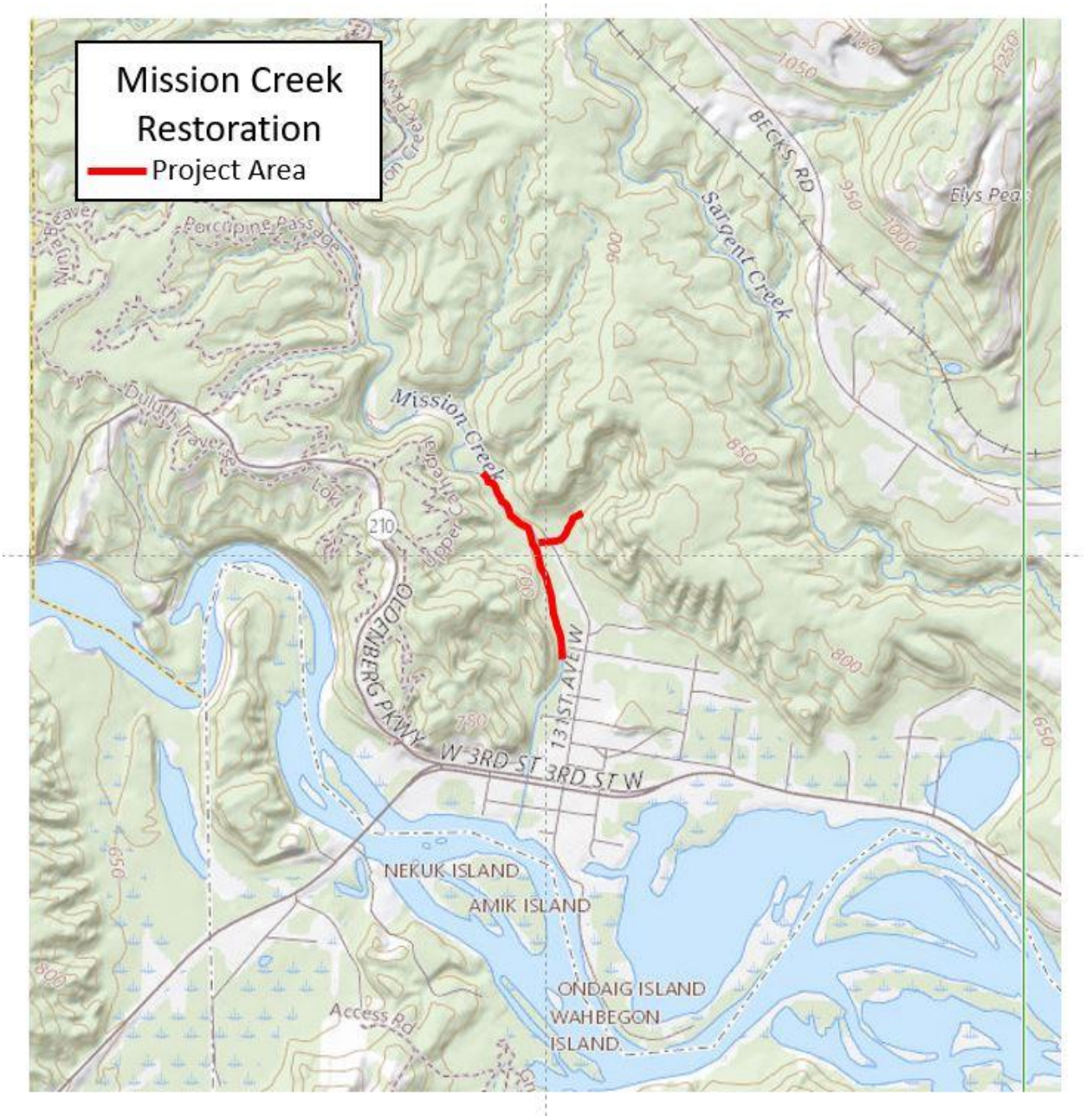
Signature _____ Date 17 - Dec - 2018

Title Conservation Specialist

Attachment 1.



Attachment 2.



APPLICABLE SPECIFICATIONS

IN ADDITION TO ANY SPECIFICATIONS IDENTIFIED IN THE PROJECT CONTRACT, THE FOLLOWING MN DOT STANDARD SPECIFICATIONS FOR CONSTRUCTION, 2016 EDITION, GOVERN THIS PROJECT

TECHNICAL SERVICE AREA III
IN COOPERATION WITH
SOUTH ST. LOUIS
SOIL AND WATER CONSERVATION DISTRICT
MISSION CREEK STREAM RESTORATION
ST LOUIS COUNTY, MINNESOTA

DRAWING NOTES

COORDINATES ARE IN UTM ZONE 15N COORDINATE SYSTEM, AND ELEVATIONS ARE IN NGVD 88 DATUM.

ALL EARTHWORK QUANTITIES ARE CALCULATED AS IN PLACE QUANTITIES, ANY CONSTRUCTION RELATED EXPANSION OR CONTRACTION IN EARTH WORK QUANTITIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

EXISTING UTILITIES SHOWN ON THE PLANS ARE UTILITY QUALITY LEVEL D.

BEFORE THE START OF CONSTRUCTION THE OWNERS OF ANY UTILITIES MUST BE NOTIFIED. THE EXCAVATOR IS RESPONSIBLE FOR GIVING THIS NOTICE BY CALLING "GOPHER STATE ONE CALL" AT (800) 252–1166 AT LEAST 48 HOURS PRIOR TO ANY EXCAVATION.

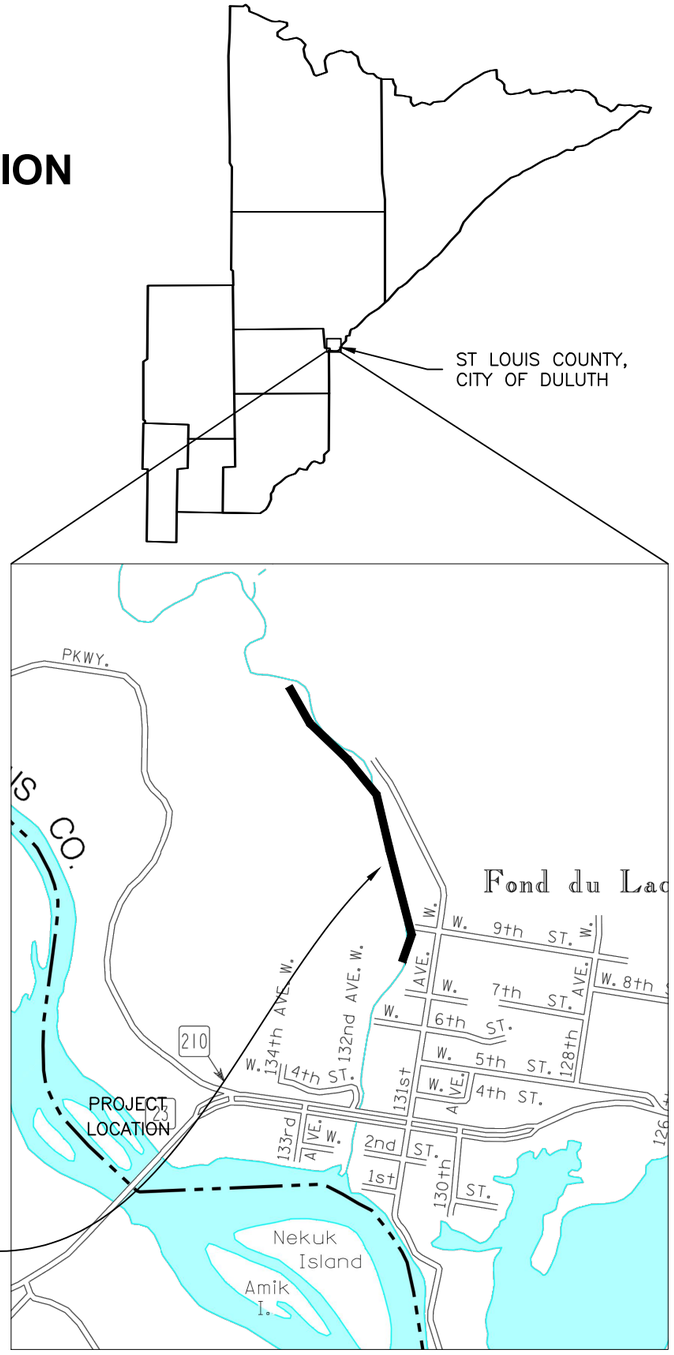
CHANGES IN THE DRAWINGS OR SPECIFICATIONS MUST BE AUTHORIZED BY THE ENGINEER.

THE CONTRACTOR IS RESPONSIBLE FOR ENSURING LOCAL, STATE, AND FEDERAL PERMITS OR OTHER PERMISSION NECESSARY TO PERFORM THE WORK HAVE BEEN OBTAINED.

ESTIMATED QUANTITIES

DRAWING INDEX

Sheet List Table	
Sheet Number	Sheet Title
1	TITLE
1a	PROJECT OVERVIEW
2	MAIN CHANNEL PLAN AND PROFILE
3	MAIN CHANNEL PLAN AND PROFILE
4	MAIN CHANNEL PLAN AND PROFILE
5	TRIBUTARY CHANNEL PLAN AND PROFILE
6	TRIBUTARY CHANNEL PLAN AND PROFILE
7	CHANNEL DIMENSIONS AND HABITAT LOG DETAIL
8	LOG RIFFLE DETAIL
9	ROCK GLIDE RIFFLE DETAIL
10	CROSS VANE DETAIL
11	TOE WOOD DETAIL
12	Section Sheet – (1)
13	Section Sheet – (2)
14	Section Sheet – (3)
15	Section Sheet – (4)
16	Section Sheet – (5)
17	Section Sheet – (6)
18	Section Sheet – (8)
19	Section Sheet – (13)
20	Section Sheet – (14)



PROJECT LOCATION

LOCATION MAP

NOT TO SCALE

TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK STREAM RESTORATION

LOCATION:

DISTRICT:

SOUTH ST. LOUIS SWCD

NOTES:

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINTED NAME: KEITH A. ANDERSON

SIGNATURE:

DATE: LIC. NO. 42827

NOT FOR CONSTRUCTION
PLANS ARE SUBJECT TO REVIEW AND CHANGE, NOT TO BE USED FOR CONSTRUCTION.

DESIGNED:		DATE:	
DRAWN:		DATE:	
CHECKED:		DATE:	

REVISION:	BY:	DATE:	APPROVED:
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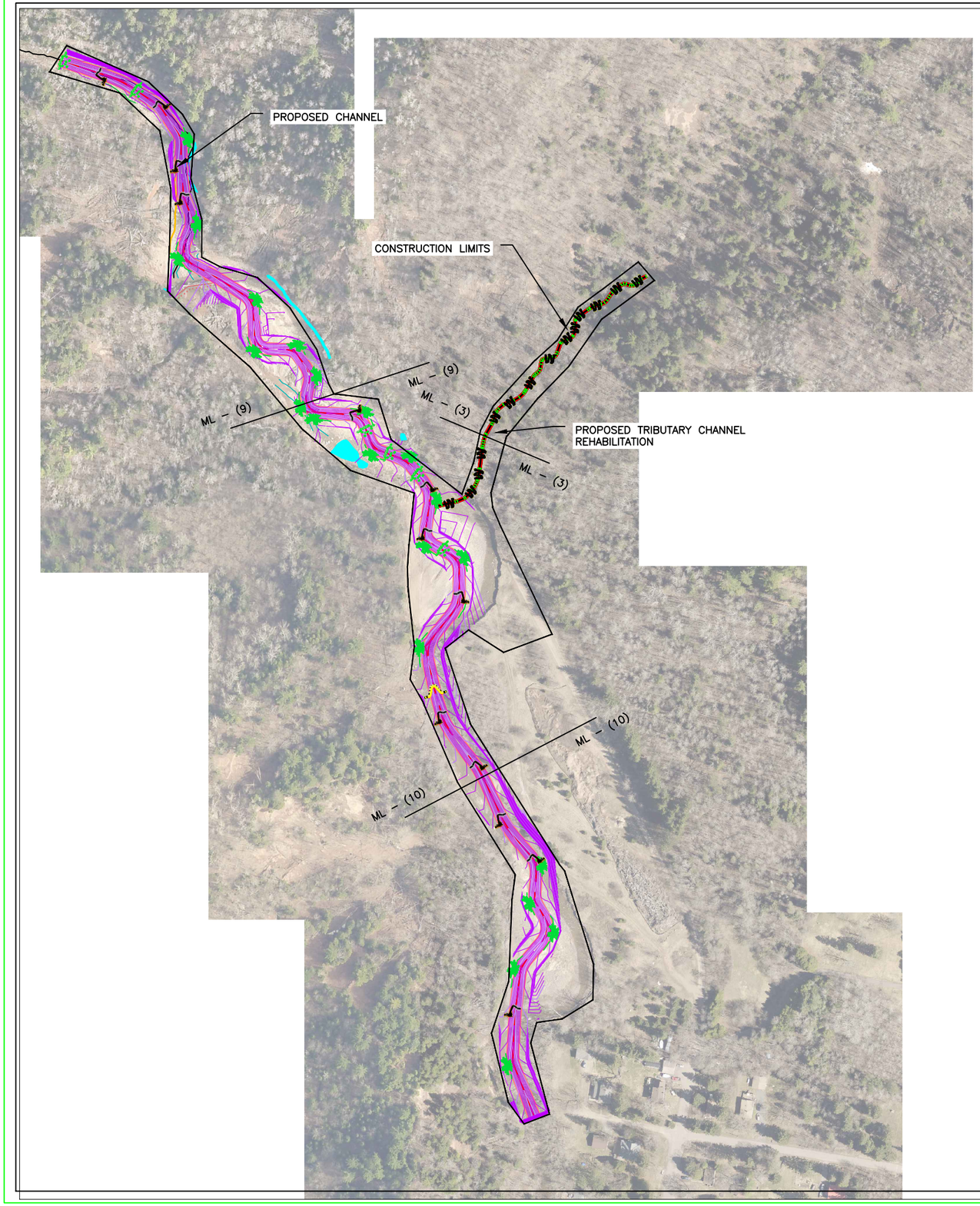
1- TITLE

FILE PATH:T:\ACTIVE PROJECTS\SouthStLouis\2015_MissionCreek\Plans\TITLE SHEET.dwg PLOT DATE: 10/1/2018



TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK RESTORATION

LOCATION:

(ADDRESS)

DISTRICT:

XXX

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PRINTED NAME: KEVIN A. ANDERSON

SIGNATURE:

DATE: LIC. NO. 42827

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CHECKED:		DATE:	

REVISION:	BY:	DATE:	APPROVED:
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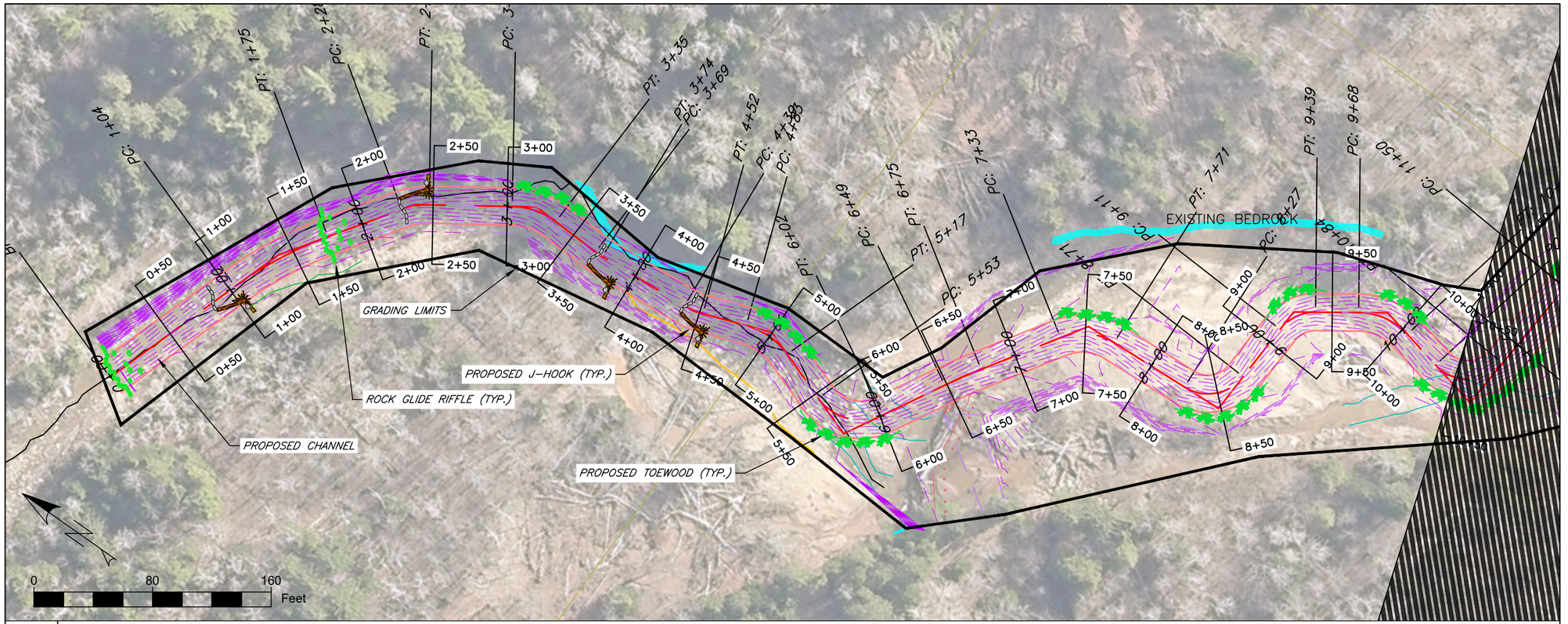
1a - PROJECT OVERVIEW



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TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK RESTORATION

LOCATION:

(ADDRESS)

DISTRICT:

XXX

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DRAWN:	DATE:
CHECKED:	DATE:

REVISION:	BY:	DATE:	APPROVED:
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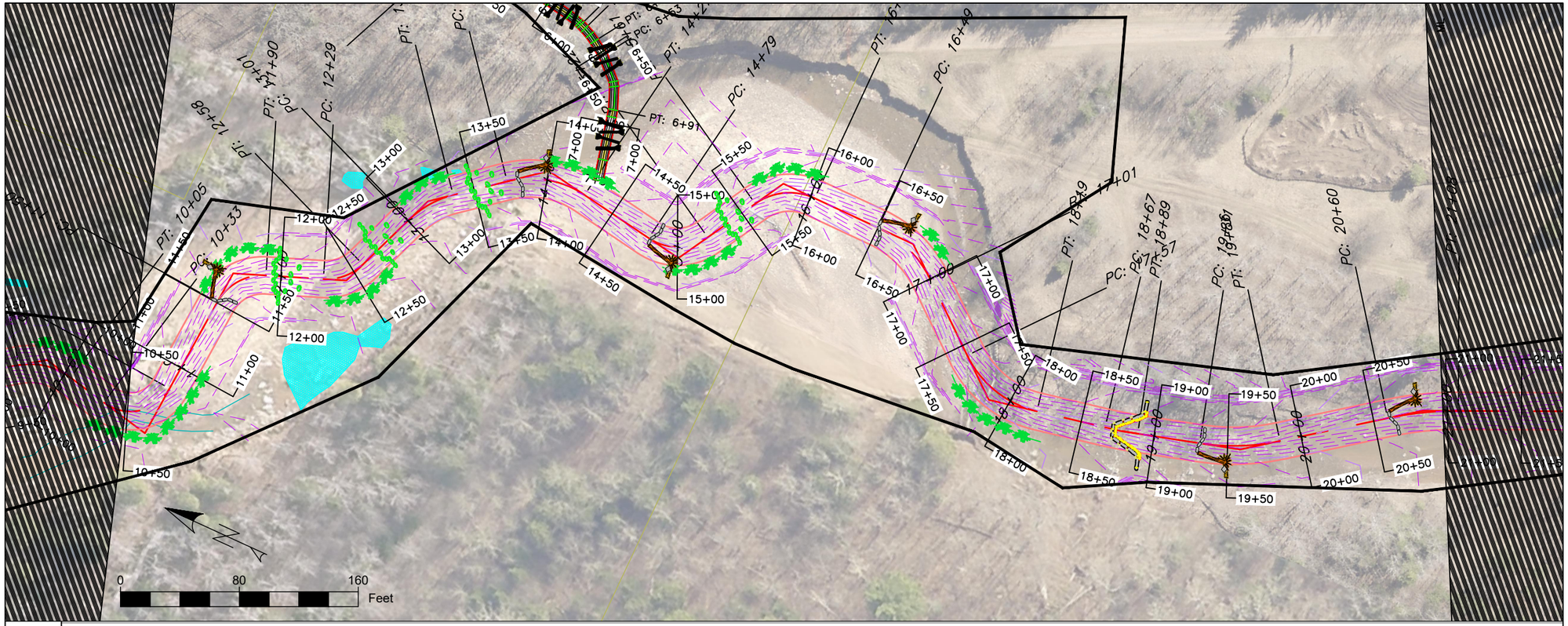
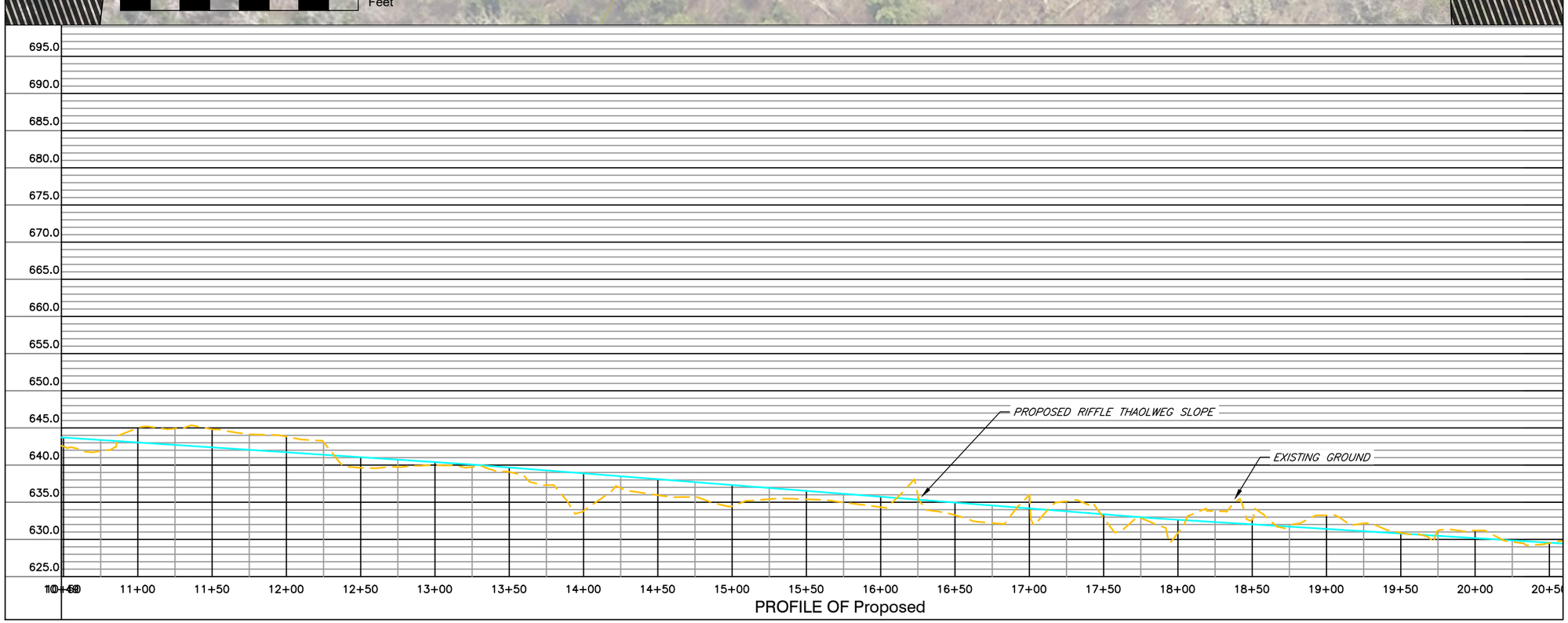
2 - MAIN CHANNEL PLAN AND PROFILE





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TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK RESTORATION

LOCATION:

(ADDRESS)

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PRINTED NAME: KELSEY A. ANDERSON

SIGNATURE:

DATE: LIC. NO. 42827

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DRAWN:	DATE:
CHECKED:	DATE:

REVISION:	BY:	DATE:	APPROVED:
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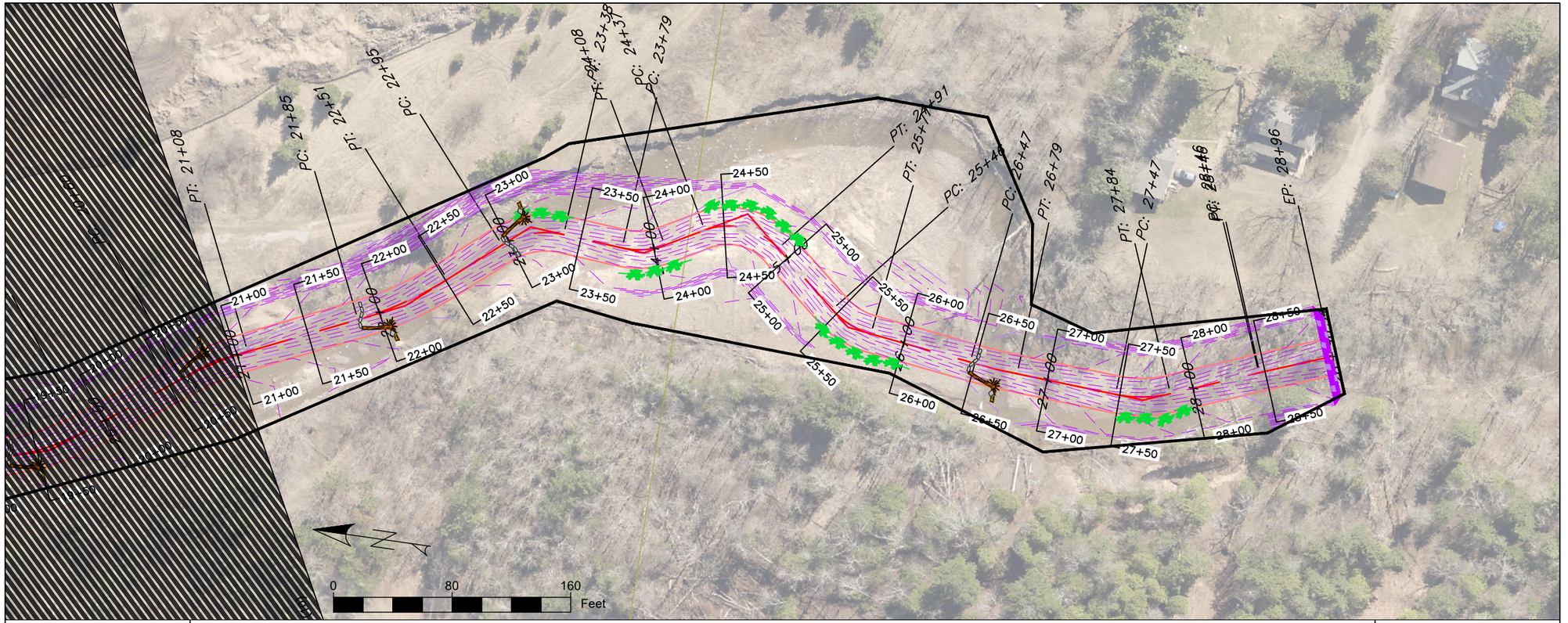
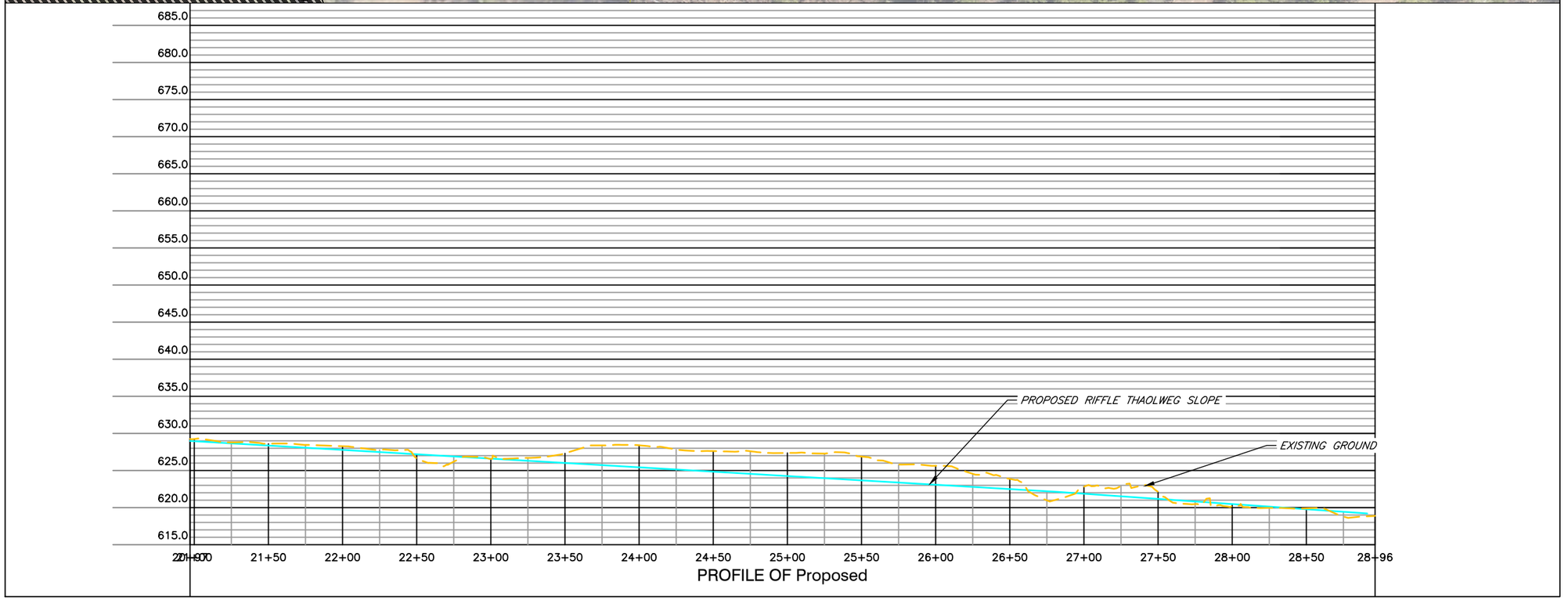
3 - MAIN CHANNEL PLAN AND PROFILE





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DRAWN:	DATE:
CHECKED:	DATE:

REVISION:	BY:	DATE:	APPROVED:
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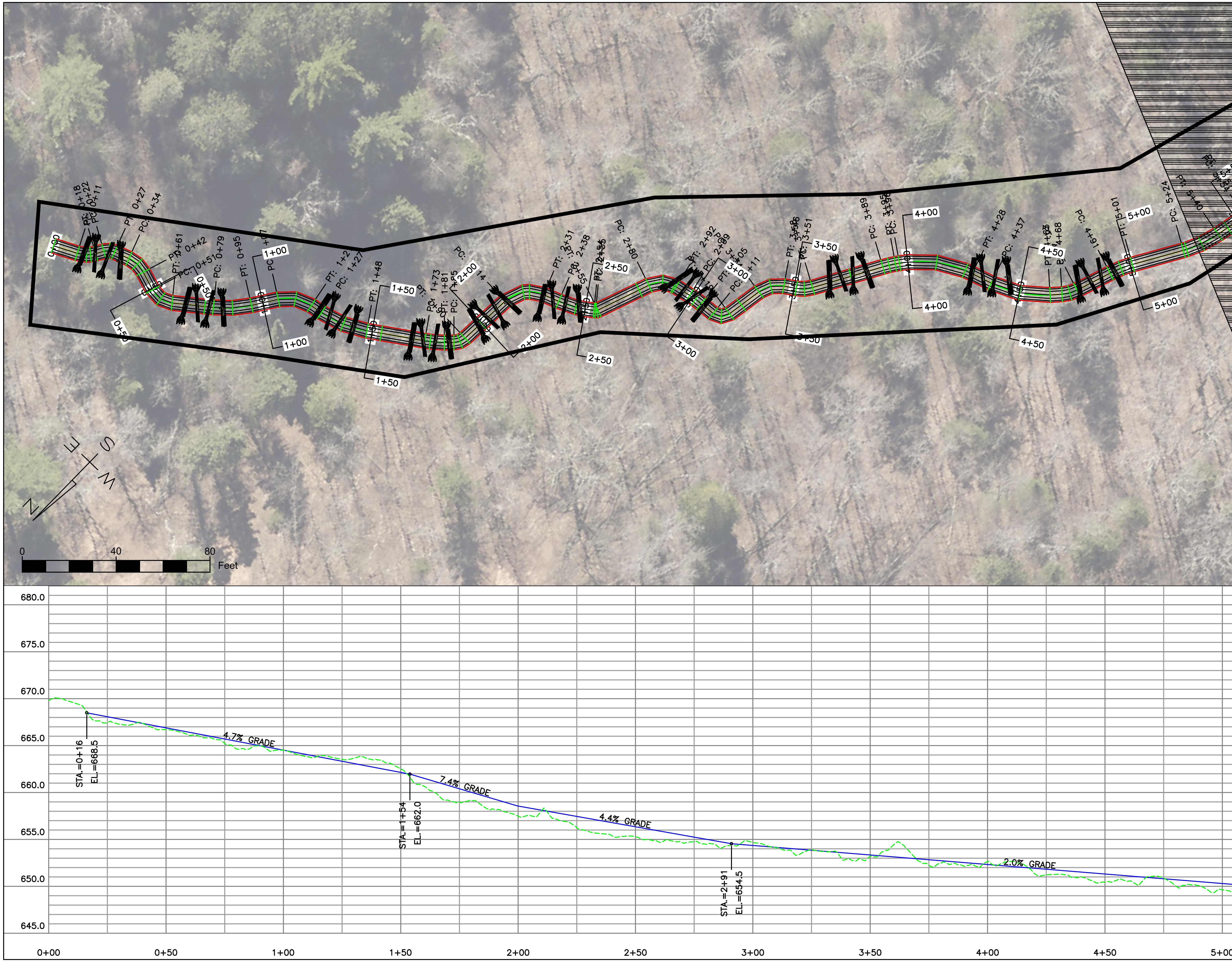
4 - MAIN CHANNEL PLAN AND PROFILE



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TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

SHEET SET TEMPLATE – PROJECT NAME

LOCATION:

(ADDRESS)

DISTRICT:

(COUNTY) SWCD

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DRAWN:	DATE:
CHECKED:	DATE:

REVISION:	BY:	DATE:	APPROVED:
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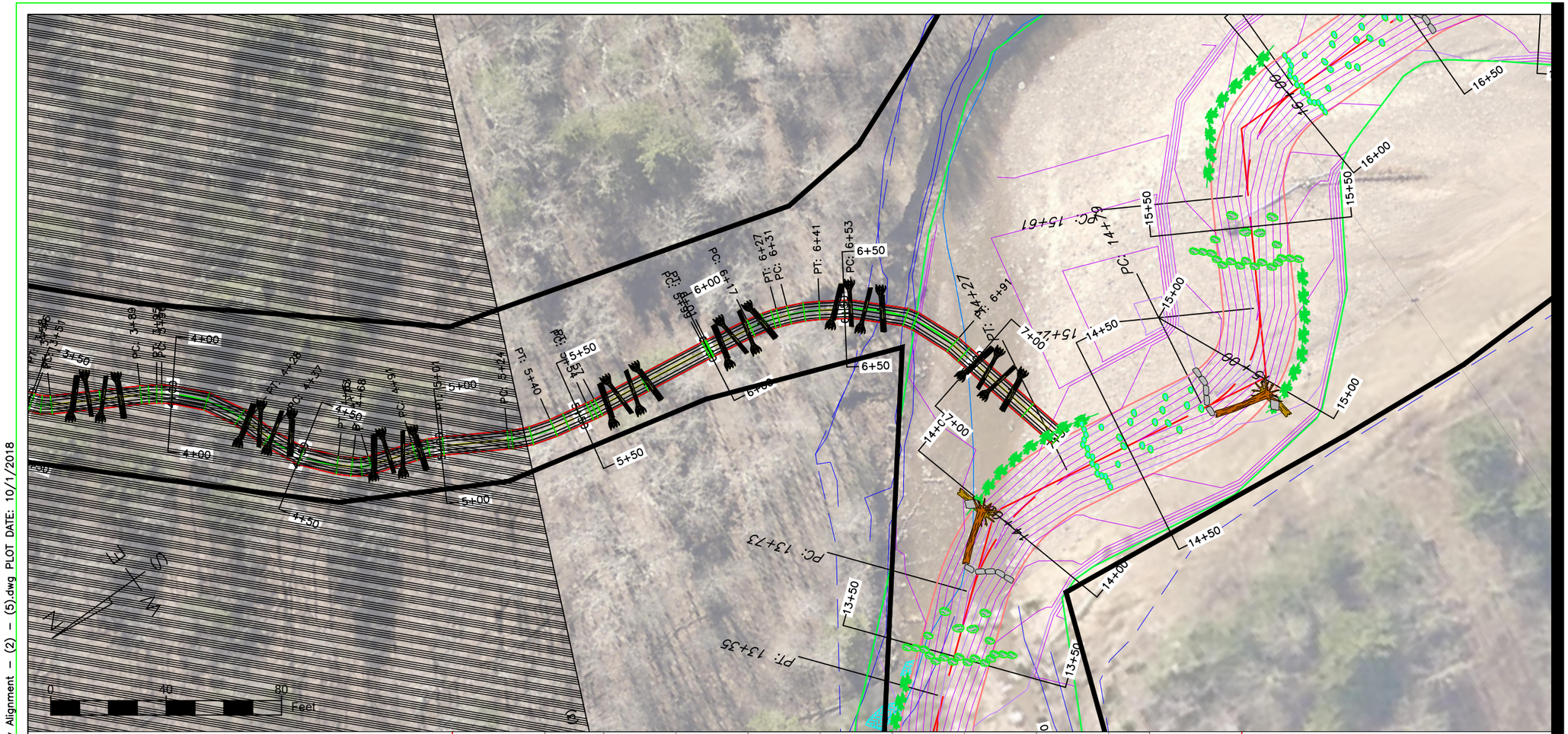
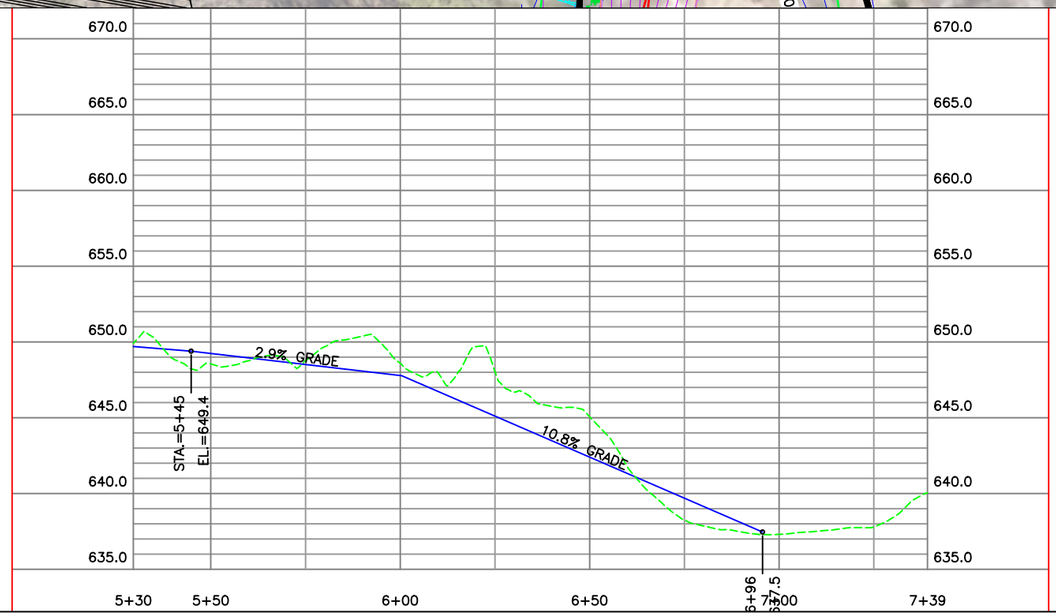
- SHEET NAME





TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK RESTORATION

LOCATION:

(ADDRESS)

DISTRICT:

XXX

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DRAWN:	DATE:
CHECKED:	DATE:

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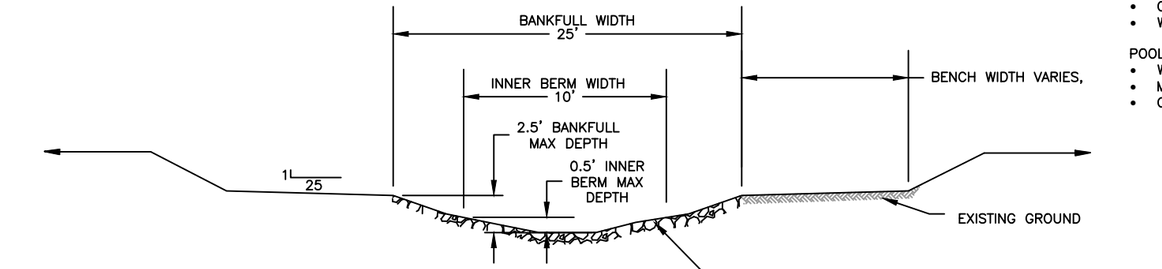
2 - Sheet - (5)

FILE PATH:T:\ACTIVE PROJECTS\SouthStLouis\2015_MissionCreek\Plans\VFG – Tributary Alignment – (2) – (5).dwg PLOT DATE: 10/1/2018

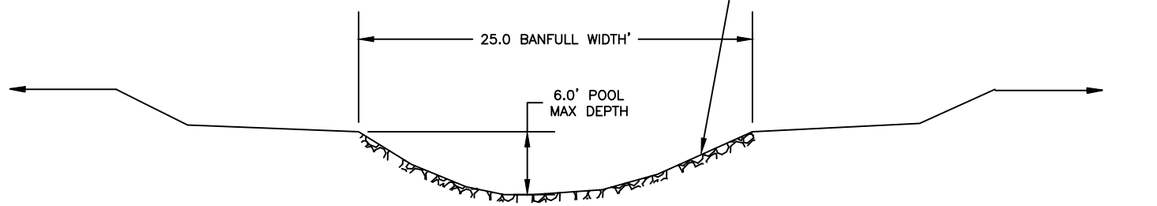
DESIGN CHANNEL DETAILS:
CHANNEL TYPE: C4
WATERSHED AREA: 11.8 MILE^2

RIFFLE DIMENSIONS:
- WIDTH– 25'
- MAX DEPTH– 2.5'
- CROSS SECTIONAL AREA– 44 SF
- WIDTH/DEPTH RATIO– 17

POOL DIMENSIONS:
- WIDTH– 25'
- MAX DEPTH– 6.0'
- CROSS SECTIONAL AREA– 72 SF

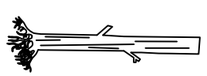


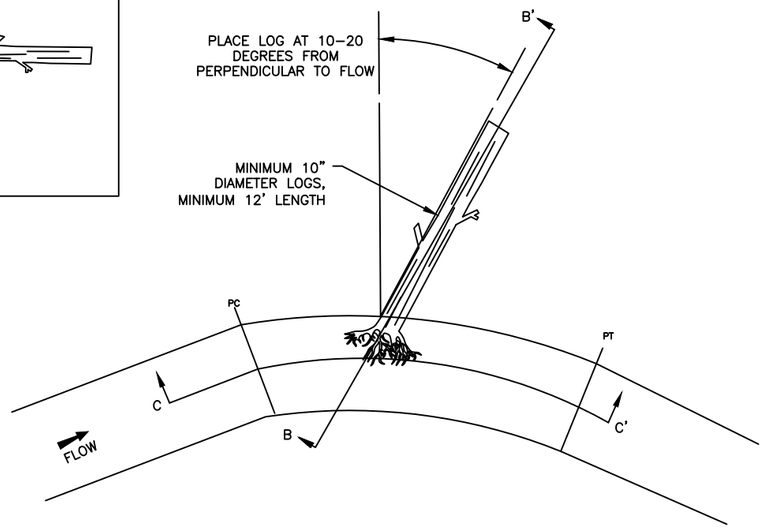
PROPOSED RIFFLE CROSS SECTION
NOT TO SCALE



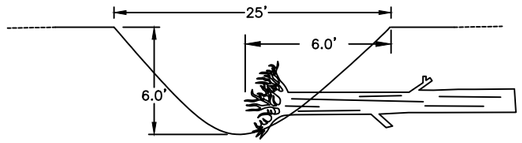
PROPOSED POOL CROSS SECTION
NOT TO SCALE

PLAN SYMBOL

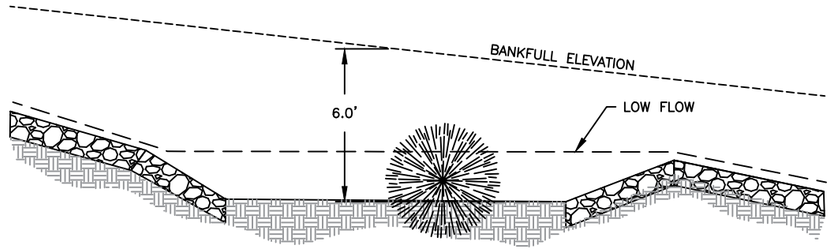




HABITAT LOG PLAN VIEW
NOT TO SCALE



LOG CROSS SECTION B–B'



HABITAT LOGS PROFILE C–C'

HABITAT LOG DETAIL

TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK RESTORATION

LOCATION:

(ADDRESS)

DISTRICT:

XXX

NOTES:

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PRINTED NAME: KEITH A. ANDERSON

SIGNATURE:

DATE: LIC. NO. 42827

DESIGNED:	DATE:
DRAWN:	DATE:
CHECKED:	DATE:

REVISION:	BY:	DATE:	APPROVED:
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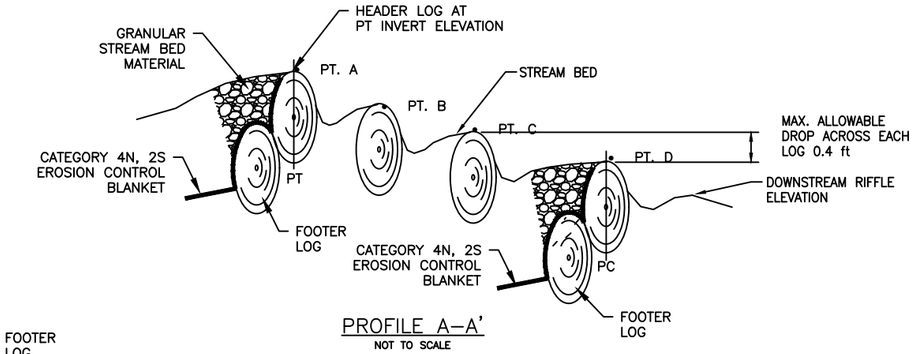
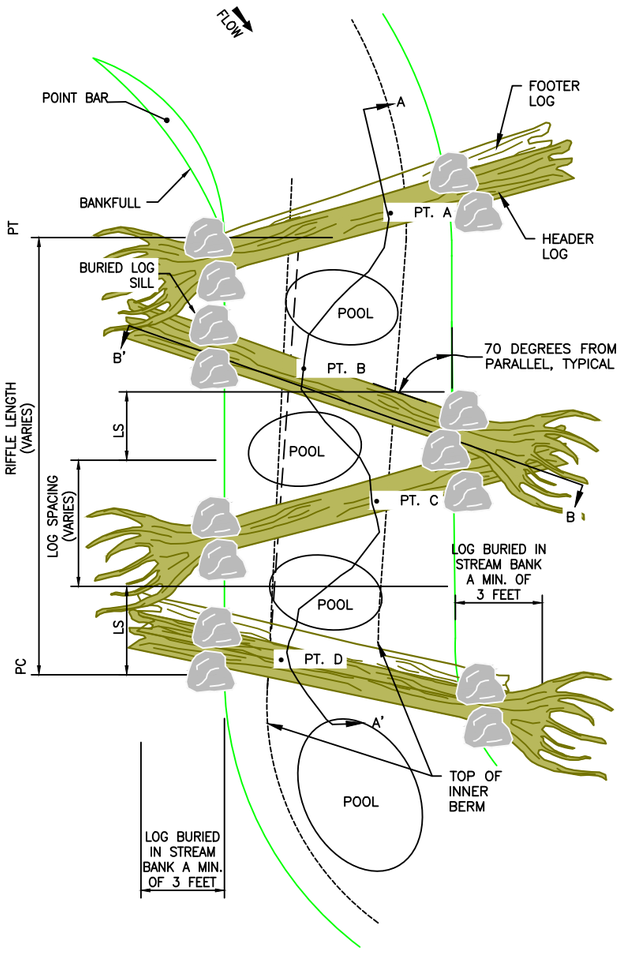
7 - CHANNEL DIMENSIONS AND HABITAT LOG DETAIL

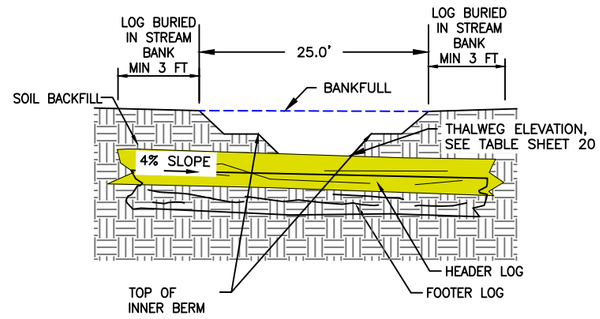
PLAN–SYMBOL
NOT TO SCALE



PROFILE A–A'
NOT TO SCALE



PLAN VIEW
NOT TO SCALE



SECTION B–B'
NOT TO SCALE

TYPICAL LOG RIFFLE, SUB STRUCTURE

NOTES:

1. LOGS SHALL HAVE MINIMUM DIAMETER OF 12 INCHES. LOGS SHALL HAVE A MINIMUM LENGTH OF 20 FEET.
2. ALL LOGS SHALL BE RELATIVELY STRAIGHT AND LIMBS SHALL BE TRIMMED FLUSH.
3. HEADER LOGS ARE THE TOP MOST LOGS USED IN EACH LOG STRUCTURE. HEADER LOGS FOR THIS STRUCTURE ARE ONLY VISIBLE BETWEEN THE INNER BERMS.
4. HEADER LOGS SHALL BE OFFSET SLIGHTLY DOWNSTREAM OF THE FOOTER LOGS. HEADER LOG SHALL BE INSTALLED BEFORE THE FOOTER LOG AND THEN THE FOOTER LOG WILL BE PLACED UPSTREAM AND AGAINST THE LOWER HALF OF THE HEADER LOG.
5. SET INVERTS AT ELEVATION SHOWN ON LOG RIFFLE TABLE SHEET 20.
6. ALL LOGS ARE PLACED SUCH THAT THEY OVERLAP THE NEXT DOWNSTREAM LOG; THEREFORE, IT IS RECOMMENDED THAT THIS STRUCTURE BE CONSTRUCTED FROM DOWNSTREAM TO UPSTREAM.
7. ALL GAPS/VOIDS LARGER THAN 1 INCHES BETWEEN THE HEADER AND FOOTER LOGS SHALL BE CHINKED WITH LIMBS AND/OR BRUSH ON THE UPSTREAM SIDE PRIOR TO PLACEMENT OF THE EROSION CONTROL BLANKET.
8. BACKFILL MATERIAL SHALL BE COMPACTED SUCH THAT FUTURE SETTLEMENT OF THE MATERIAL IS KEPT TO A MINIMUM.
9. 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, PROVIDED ANY HEIGHT DOES NOT EXCEED MAX. ALLOWABLE DROP OF 0.4 FT FOR EACH LOG.

TECHNICAL SERVICE AREA III

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DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

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DISTRICT:

XXX

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PRINTED NAME: KEITH ANDERSON

SIGNATURE

DATE: LIC. NO. 42827

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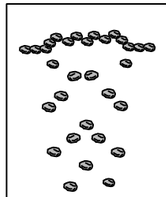
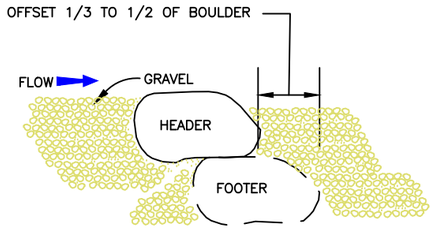
8 - LOG RIFFLE DETAIL



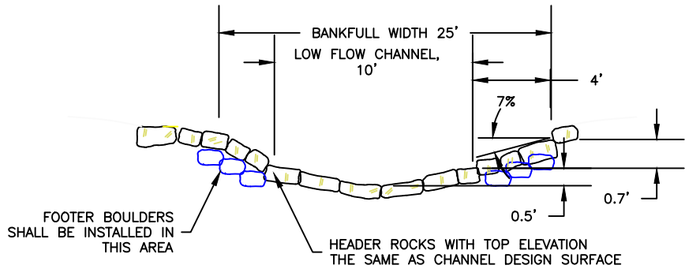
PLAN–SYMBOL

ROCK GLIDE RIFFLE PLAN VIEW
NOT TO SCALE

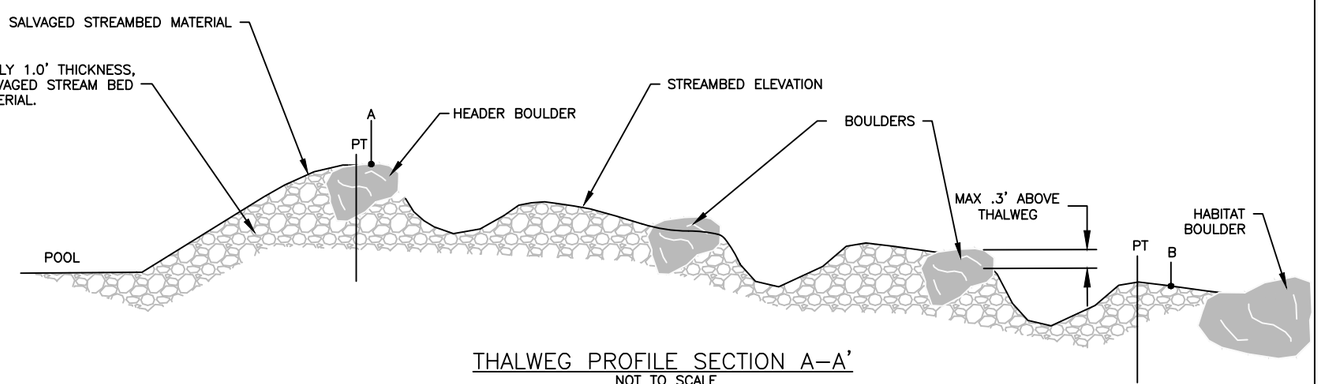
REPLICATE CONDITION IN ABOVE REFERENCE PICTURE



RIFFLE STRUCTURE CROSS SECTION
NOT TO SCALE



SECTION B–B'
NOT TO SCALE



THALWEG PROFILE SECTION A–A'
NOT TO SCALE

NOTES:

1. BOULDERS MUST HAVE A MINIMUM DIAMETER OF 2' AND A MAXIMUM DIAMETER OF 3' ON INTERMEDIATE AXIS.
2. EACH STRUCTURE SHALL HAVE 22 BOULDERS PER STRUCTURE, ASSUMING A BOULDER DIAMETER OF 24".
3. SALVAGED STREAM BED MATERIAL SHALL CONSIST OF A RANGE OF PARTICLES SIZES TYPICALLY SEEN IN EXISTING STREAM BED RIFFLES.
4. HEADER BOULDERS MUST NOT EXCEED 0.3' ABOVE THALWEG ELEVATIONS.
5. SET INVERTS AT ELEVATIONS SHOWN ON THE ROCK GLIDE RIFFLE TABLE ON SHEET 19. NO ELEVATIONS OF THE CONSTRUCTED RIFFLE ARMS MAY VARY FROM THE PLAN LOCATIONS WITHOUT DIRECTION FROM THE ENGINEER.
6. HEADER BOULDERS LOCATED BETWEEN THE INNER BERMS WILL BE SPACED APPROXIMATELY 0.3' APART.
7. BOULDERS SHALL BE SPACED RANDOMLY IN RIFFLE WITHIN THE INNER BERM AND THROUGH OUT THE LENGTH OF THE RIFFLE.
8. 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.
9. 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.
10. 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.
11. HABITAT BOULDER SHALL BE PLACED ON THE UPPER 3RD OF THE POOL SLOPING OUT OF THE WATER WITH THE THICKER PART OF THE BOULDER ON THE DOWNSTREAM SIDE.

TECHNICAL SERVICE AREA III

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DISTRICT:

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PRINTED NAME: KEITH A. ANDERSON

SIGNATURE:

DATE: 3/27/2018 LIC. NO. 42827

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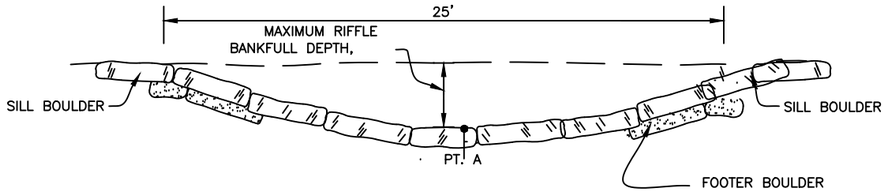
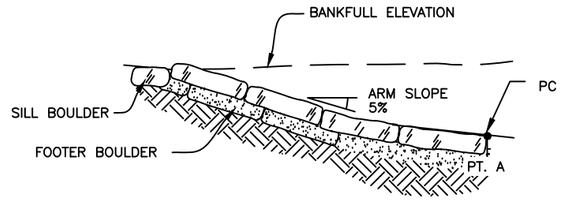
9 - ROCK GLIDE RIFFLE DETAIL

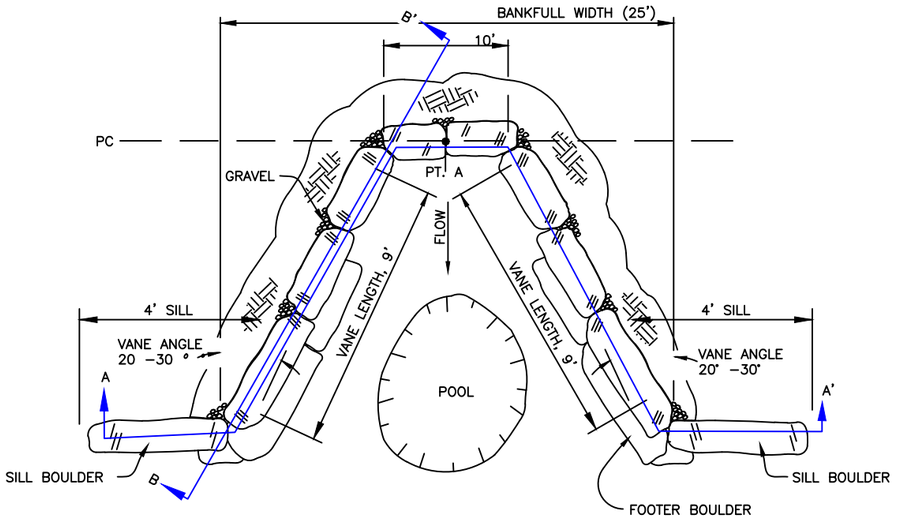
PLAN SYMBOL
NOT TO SCALE



CROSS VANE TYPICAL CROSS–SECTION A–A'
NOT TO SCALE



CROSS VANE LONGITUDINAL PROFILE B–B'
NOT TO SCALE



CROSS–VANE PLAN VIEW
NOT TO SCALE

NOTES:

1. BOULDERS PER STRUCTURE AT 24" MIN. DIAMETER.
2. CONTRACTOR SHALL USE AN EXCAVATOR WITH A HYDRAULIC THUMB TO CONSTRUCT STRUCTURE.

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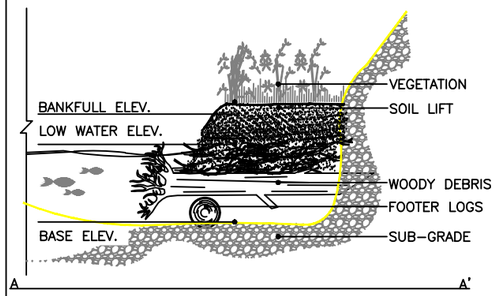
10 - CROSS VANE DETAIL

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.

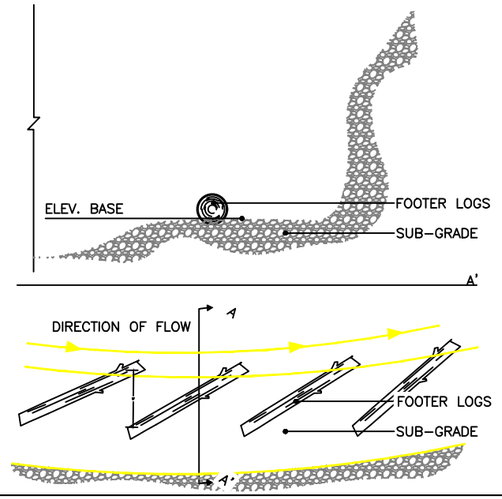
THE DRAWINGS ON THIS PAGE ARE NOT TO SCALE.



2. SUBGRADE AND FOOTER LOGS

SPECIFICATION:
- –10" MIN. DIAMETER
- –LIMBS REMOVED
- –10' MIN. LENGTH

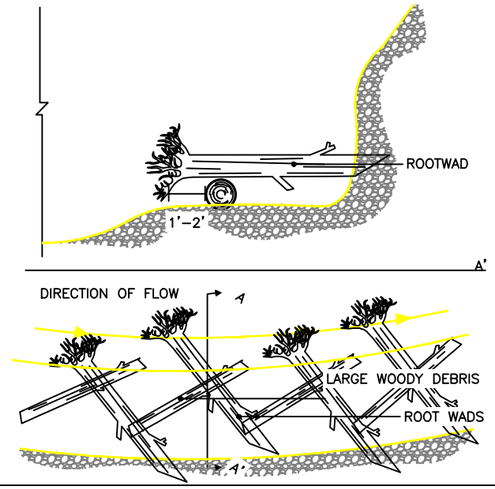
PLACEMENT:
- –EXCAVATE TO BASE ELEVATION
- –CONTRACTOR SHALL MAKE EFFORT TO SEPARATE GRANULAR AND FINE FILL NATIVE MATERIAL FOR USE IN STEPS 4 AND 5.
- –SPACE FOOTER LOGS ENDS 8' APART, PERPENDICULAR TO STREAM
- –KEY FOOTER LOGS 8' INTO BANK, 2' PROTRUDING INTO STREAM.



3. ROOTWAD PLACEMENT

ROOTWAD SPECIFICATION:
- –10" MIN DIAMETER
- –LOG LENGTH OF 10' MIN.
- –LIMBS SHALL BE REMOVED
- –ROOT WADS SHALL BE LEFT INTACT

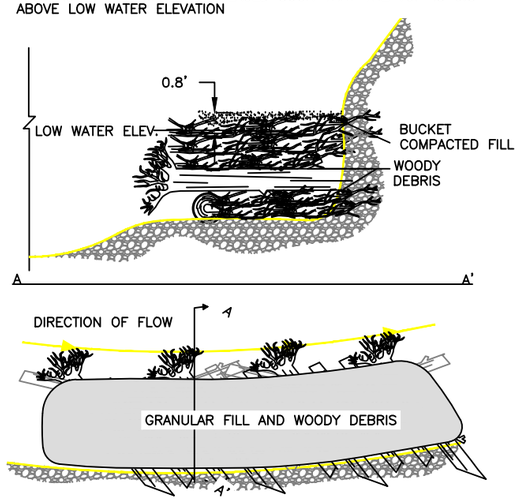
PLACEMENT:
- –PLACE ROOTWADS ON TOP OF FOOTER LOGS AS SHOWN, OVERHANG ROOT WAD LOGS 1–2', VARY AND SHOWN SUCH THAT EVERY OTHER ROOT WAD IS PROTRUDING INTO STREAM 2 FEET
- –ANGLE ROOTWADS UPSTREAM AS DIRECTED IN FIELD
- –PLACE 1 ROOT WAD PER FOOTER LOG



4. WOODY DEBRIS PLACEMENT

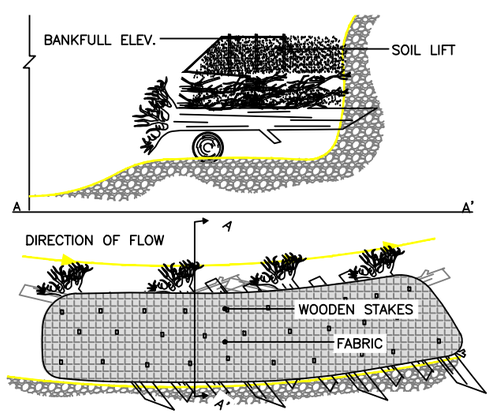
WOODY MATERIAL SPECIFICATION:
- –WOODY MATERIAL (COMPOSED OF 75 % SMALL LIMBS AND BRANCHES, 25% MEDIUM SIZED MATERIAL (3–6" LIMBS), AND LOGS UP TO 10" IN DIAMETER (ONE PER FIVE FEET),
- –ALL MATERIAL SHALL BE FRESHLY CUT (NO ROTTEN LOGS OR LIMBS)

PLACEMENT:
- –FILL BETWEEN FOOTER LOGS AND ROOTWADS WITH WOODY MATERIAL
- –PLACE WOODY MATERIAL TO 0.5' ABOVE LOW WATER ELEVATION
- –LAYER GRANULAR FILL ON TOP OF WOODY DEBRIS
- –COMPACTED FILL SHALL BE PLACED SUCH THAT THE TOP IS 0.8' ABOVE LOW WATER ELEVATION



5. SOIL LIFT

MATERIAL AND PLACEMENT SPECIFICATION:
- –BLANKET SHALL BE: MIN 9.8' WIDE ROLANKA BIOD–MAT 70, GEOCOIR 700, OR EQUAL BACKED WITH MNDOT CAT 3N 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.
- –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 MNDOT SEED MIX 34–361 RIPARIAN NORTHEAST @ 60 LBS/ACRE.
- –BUCKET COMPACT UNTIL BANKFULL ELEVATION IS MET, GRADE TOP OF BENCH 2% TO EXISTING GROUND .
- –TRENCH COCONUT BLANKET INTO GROUND 1.0' ALONG OUTSIDE OF BEND.



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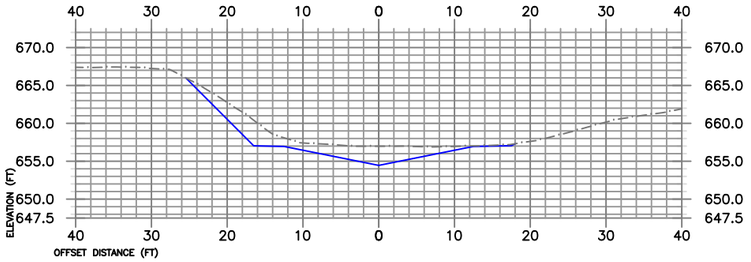
11 - TOE WOOD DETAIL



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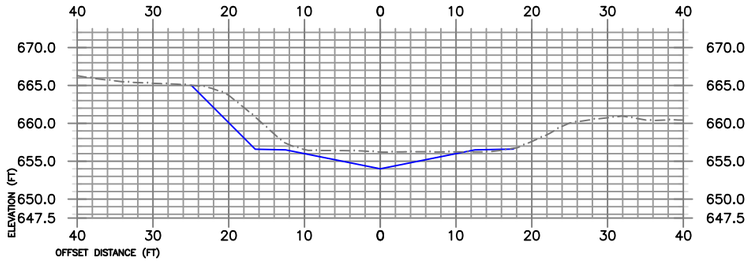

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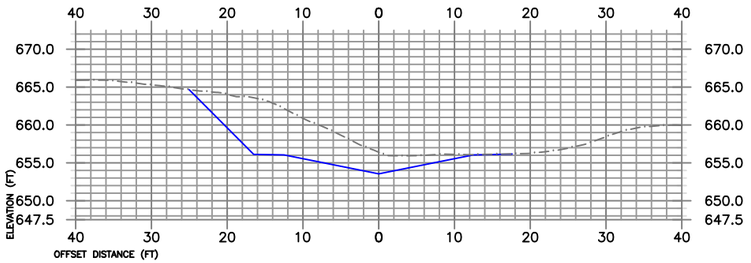

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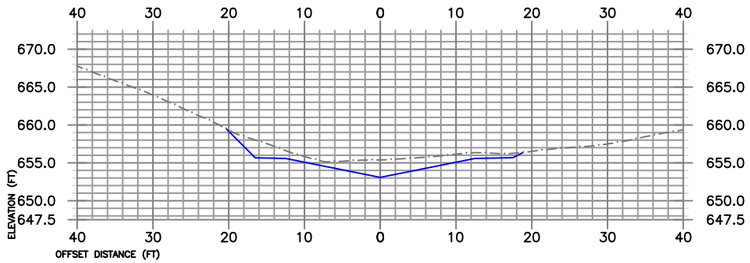

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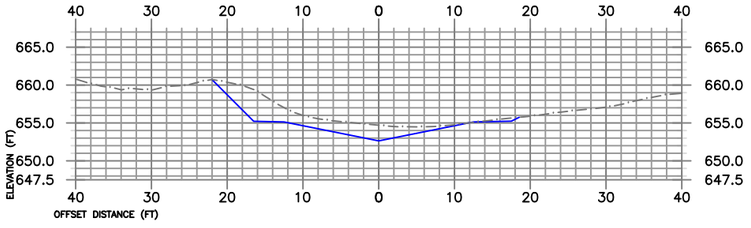

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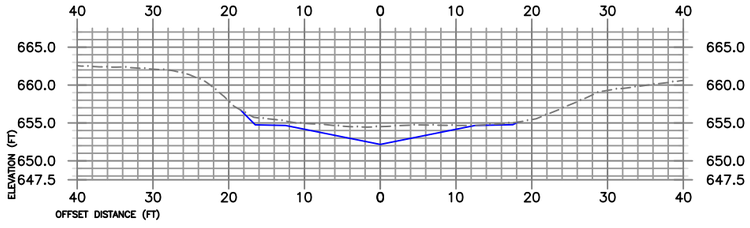

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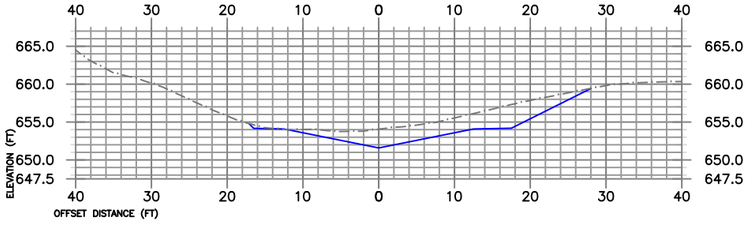

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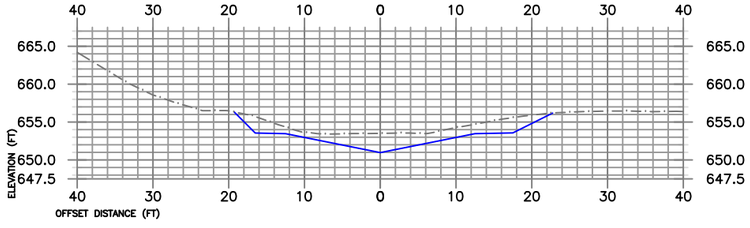

STA. 4+00 ALONG Proposed (Ft)

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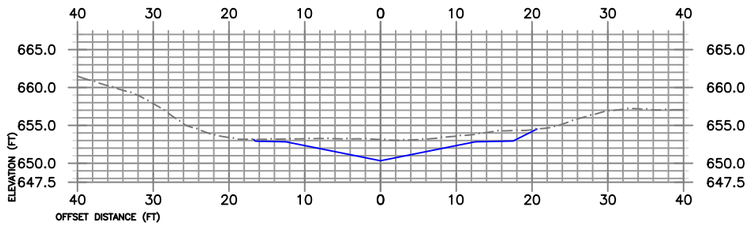
12 - Section Sheet - (1)



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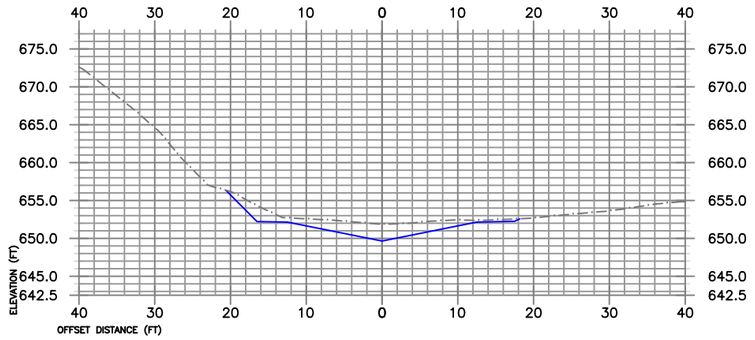

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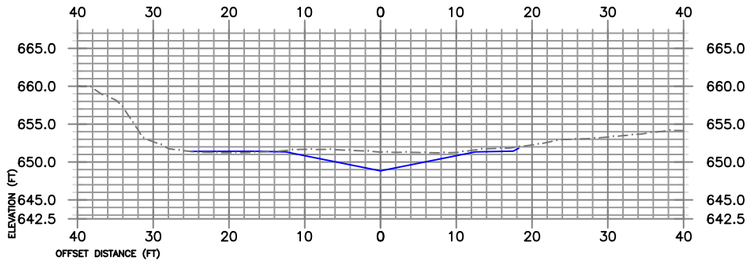

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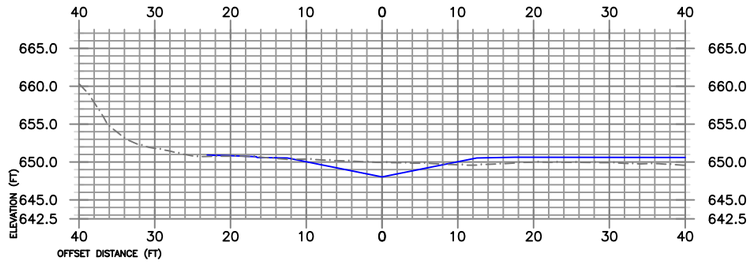

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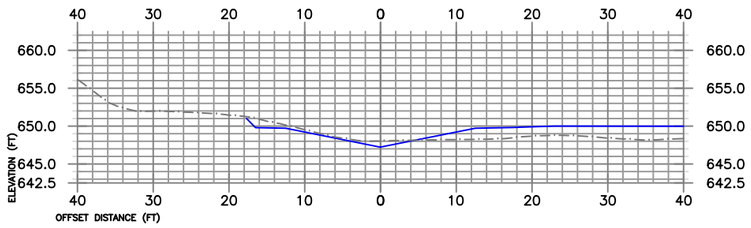

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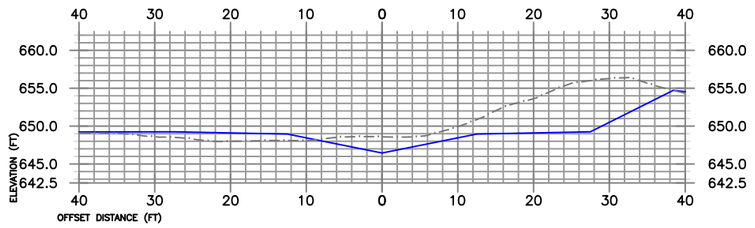

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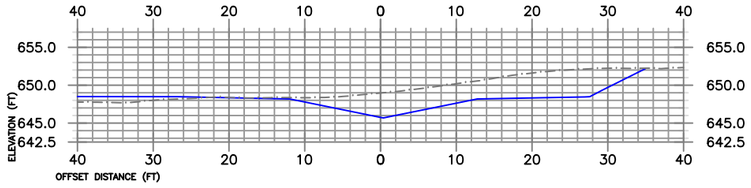

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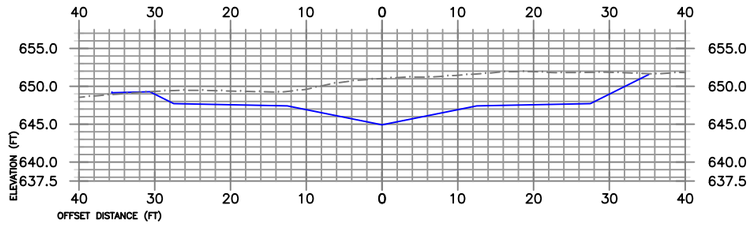

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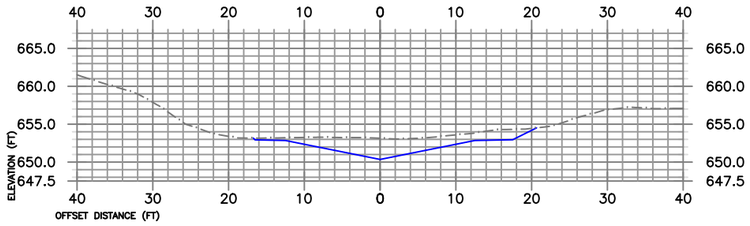
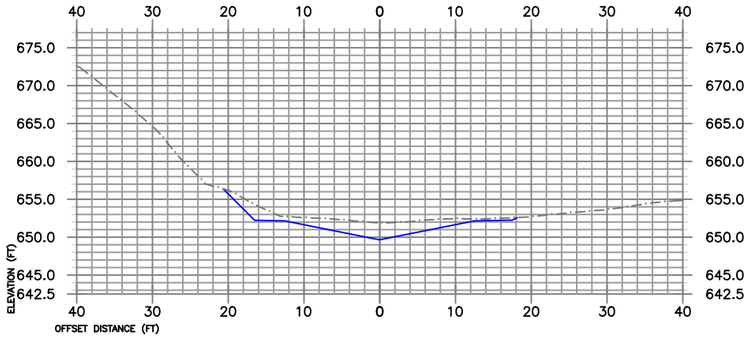
13 - Section Sheet - (2)



STA. 4+50 ALONG Proposed (Ft)



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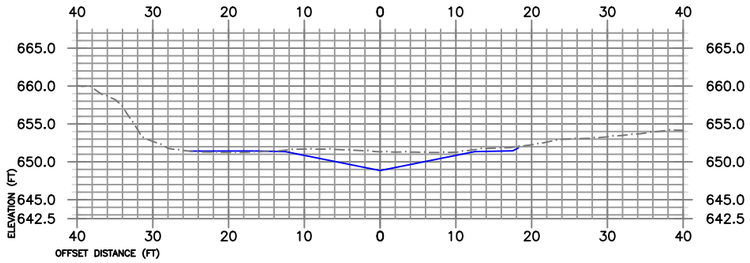

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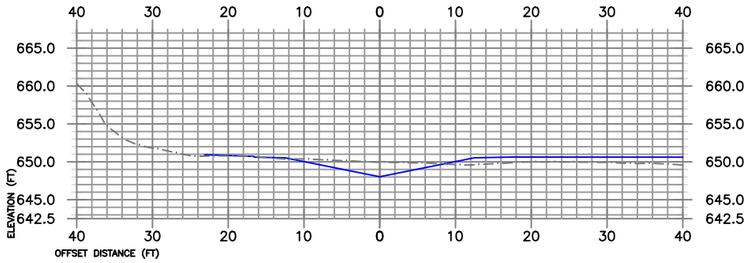

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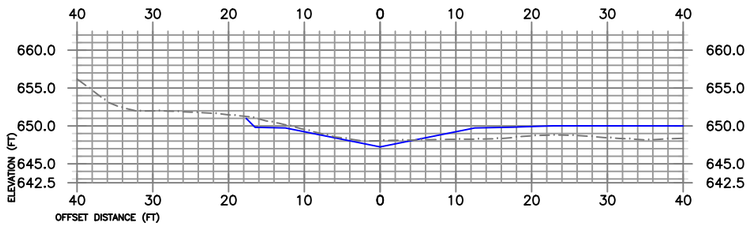

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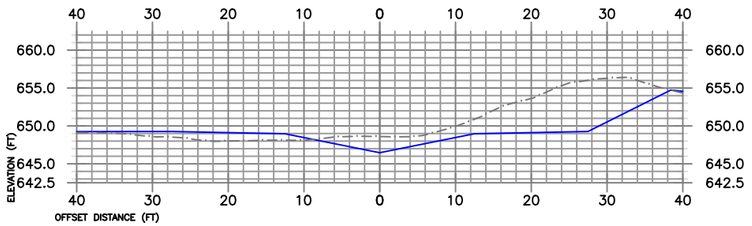
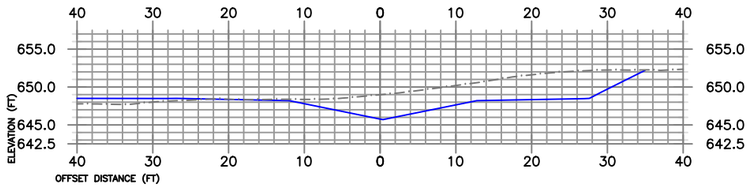
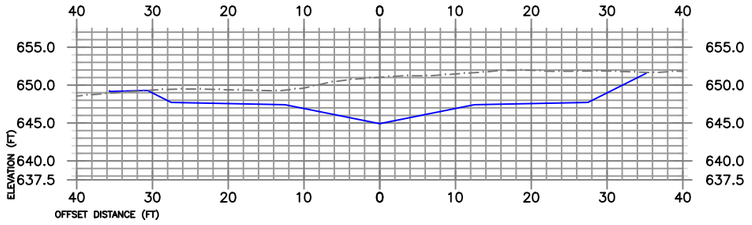


STA. 7+00 ALONG Proposed (Ft)



STA. 7+50 ALONG Proposed (Ft)



STA. 8+00 ALONG Proposed (Ft)

TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK RESTORATION

LOCATION:

(ADDRESS)

DISTRICT:

XXX

NOTES:

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PRINTED NAME: KEVIN A. ANDERSON

SIGNATURE:

DATE: LIC. NO. 42827

NOT FOR CONSTRUCTION
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DESIGNED:		DATE:
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CHECKED:		DATE:

REVISION:	BY:	DATE:	APPROVED:
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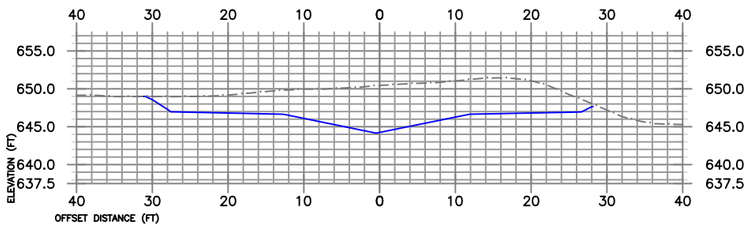
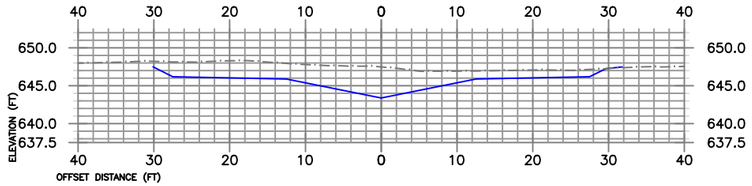
14 - Section Sheet - (3)



STA. 8+50 ALONG Proposed (Ft)



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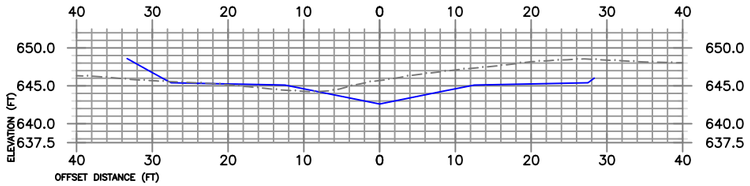

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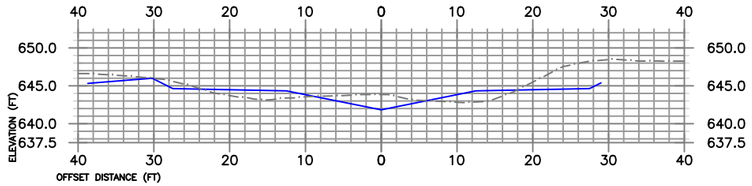

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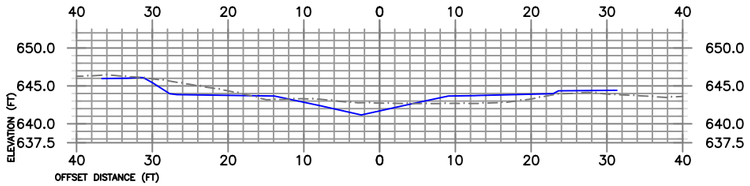

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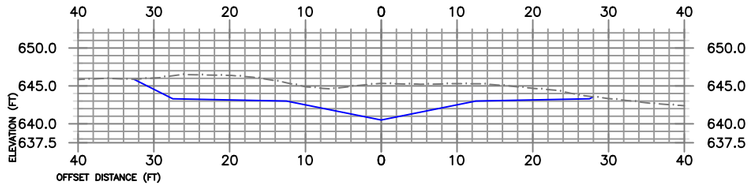

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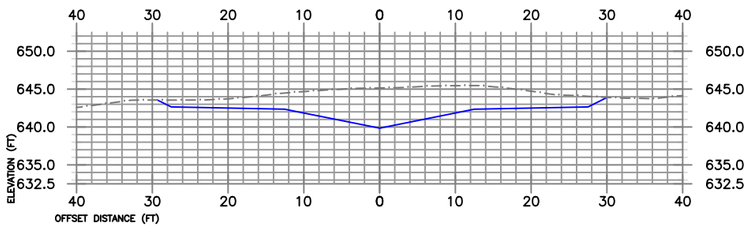

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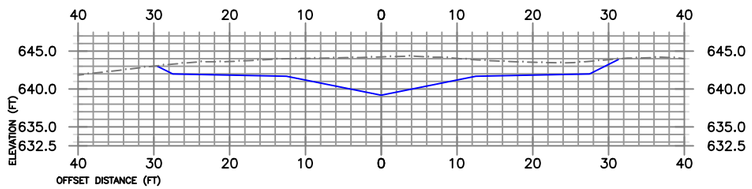

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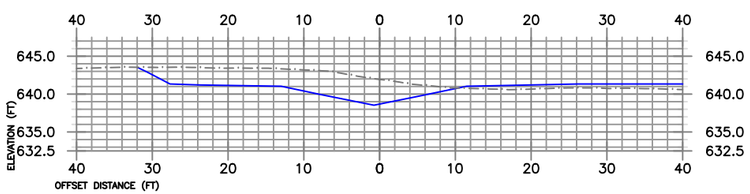
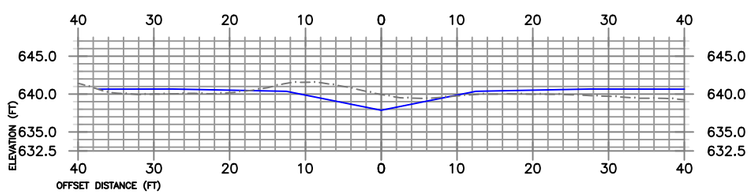


STA. 12+50 ALONG Proposed (Ft)



STA. 13+00 ALONG Proposed (Ft)

TECHNICAL SERVICE AREA III

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DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK RESTORATION

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DISTRICT:

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PRINTED NAME: KOLETA J. ANDERSON

SIGNATURE:

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REVISION:	BY:	DATE:	APPROVED:
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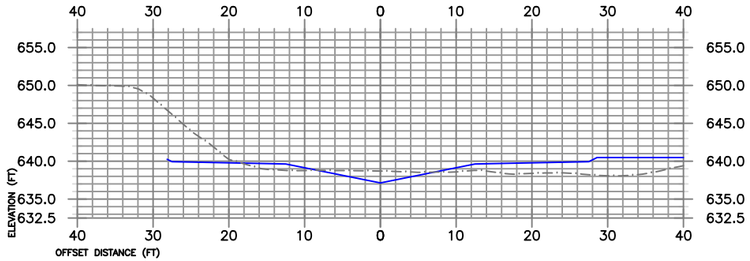
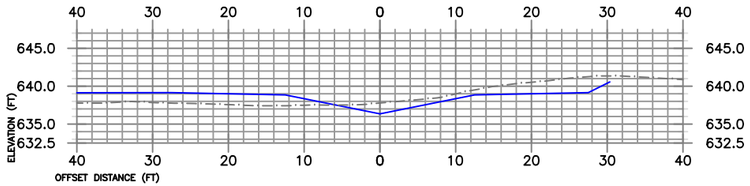
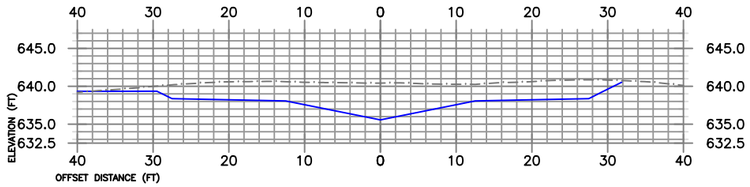
15 - Section Sheet - (4)



STA. 13+50 ALONG Proposed (Ft)



STA. 14+00 ALONG Proposed (Ft)



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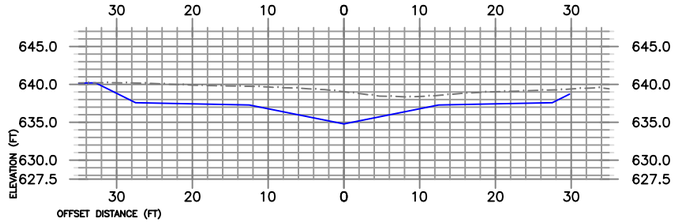

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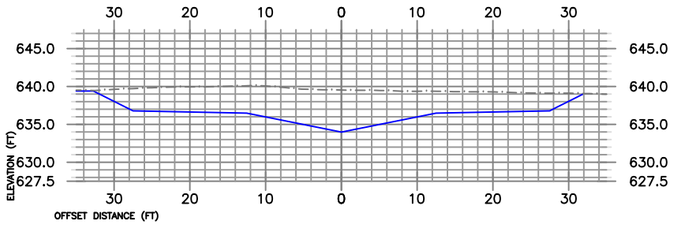

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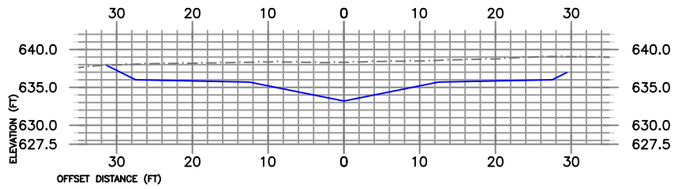
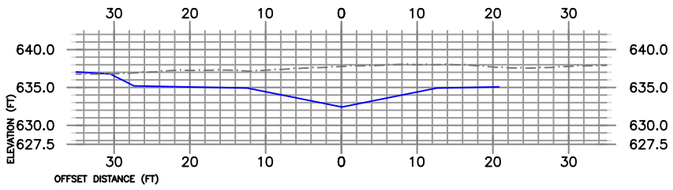


STA. 16+00 ALONG Proposed (Ft)



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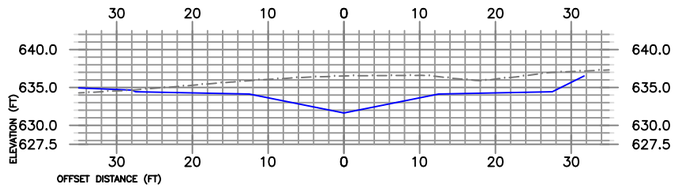

STA. 17+00 ALONG Proposed (Ft)

TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK RESTORATION

LOCATION:

(ADDRESS)

DISTRICT:

XXX

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PRINTED NAME: KEVIN A. ANDERSON

SIGNATURE:

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REVISION:	BY:	DATE:	APPROVED:
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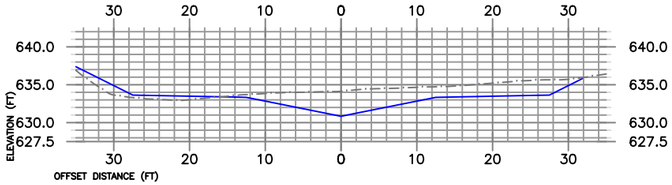
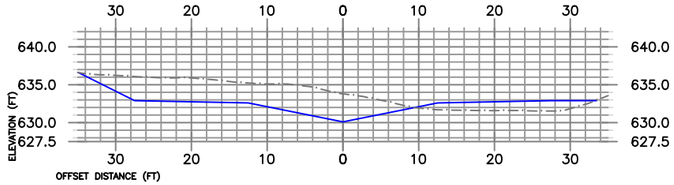
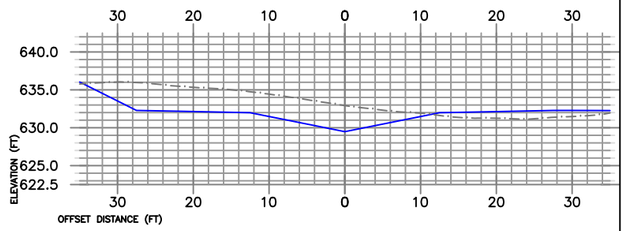
16 - Section Sheet - (5)



STA. 17+50 ALONG Proposed (Ft)



STA. 18+00 ALONG Proposed (Ft)



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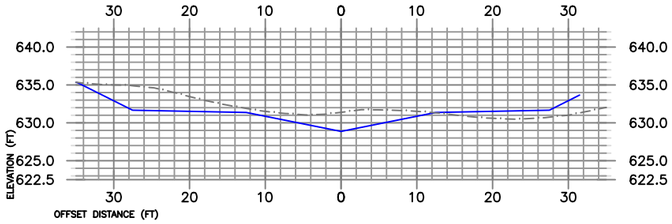

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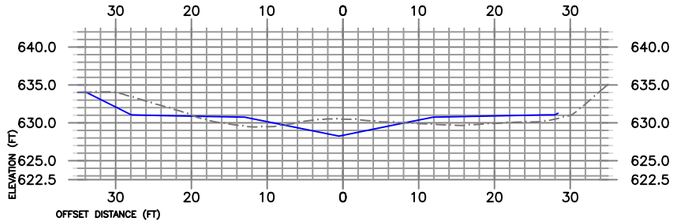
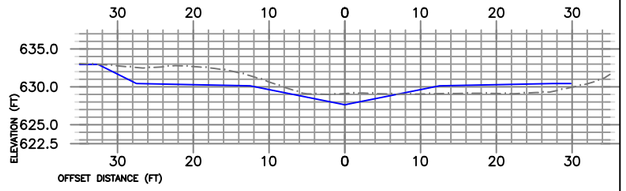
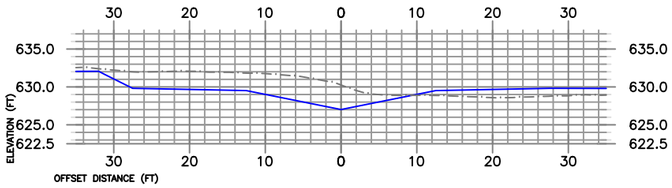


STA. 19+50 ALONG Proposed (Ft)



STA. 20+00 ALONG Proposed (Ft)



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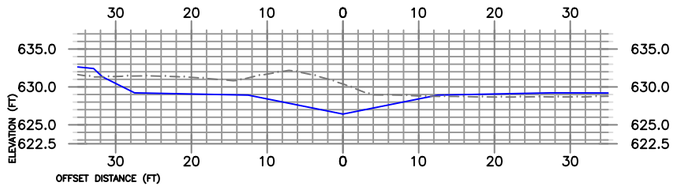

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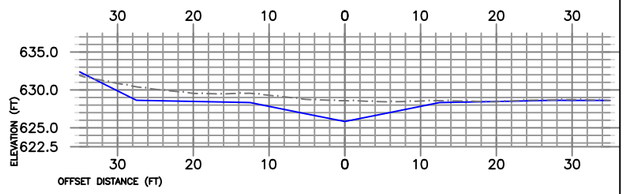
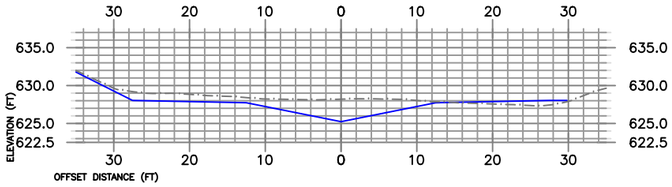
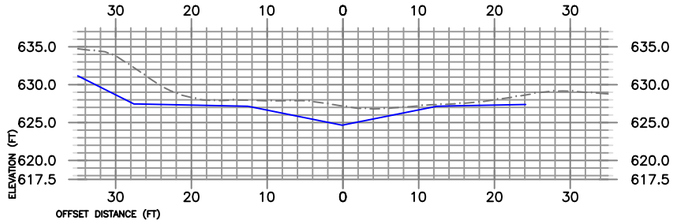


STA. 21+50 ALONG Proposed (Ft)



STA. 22+00 ALONG Proposed (Ft)



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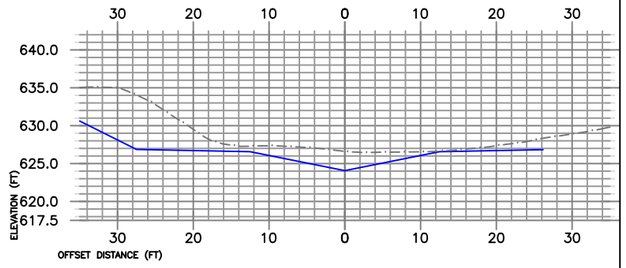

STA. 23+00 ALONG Proposed (Ft)

TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK RESTORATION

LOCATION:

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PRINTED NAME: KELLEA ANDERSON

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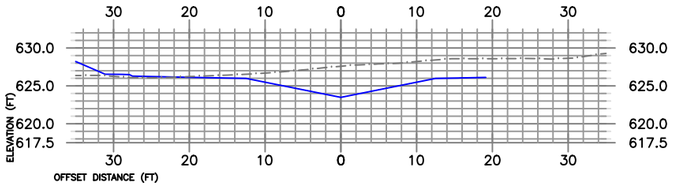
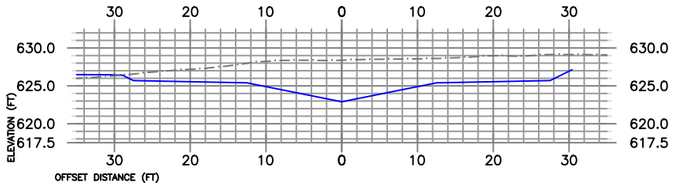
17 - Section Sheet - (6)



STA. 23+50 ALONG Proposed (Ft)



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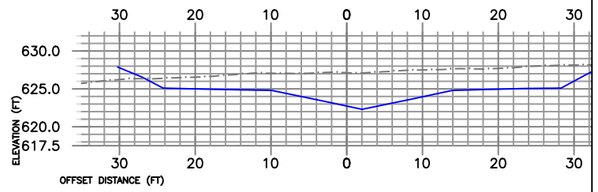

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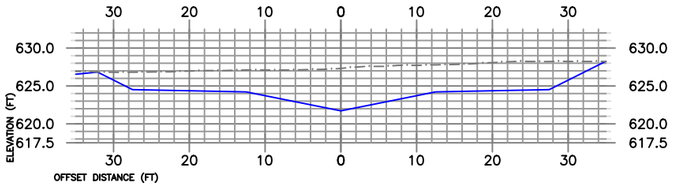
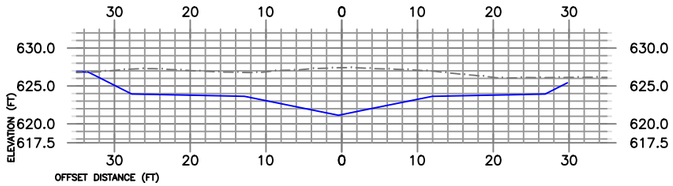


STA. 25+00 ALONG Proposed (Ft)



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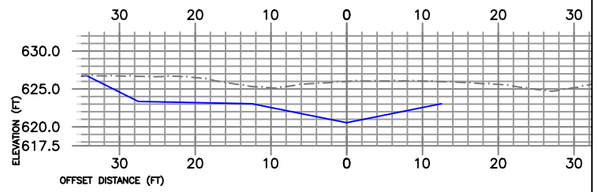

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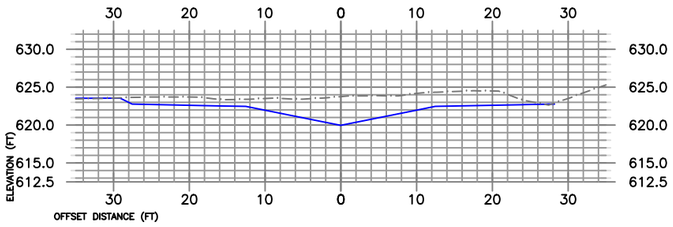
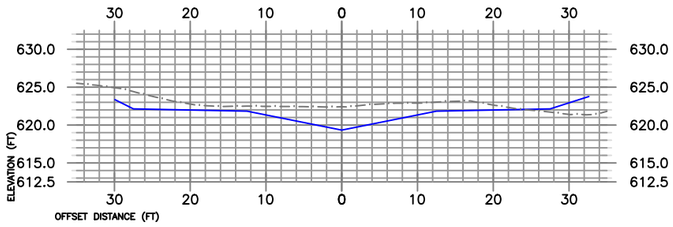
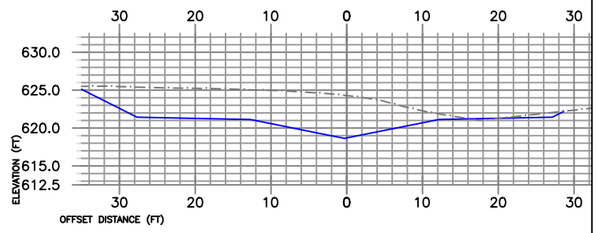


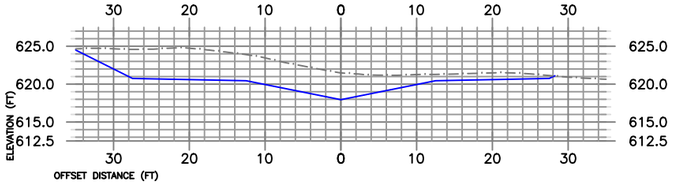
STA. 26+50 ALONG Proposed (Ft)



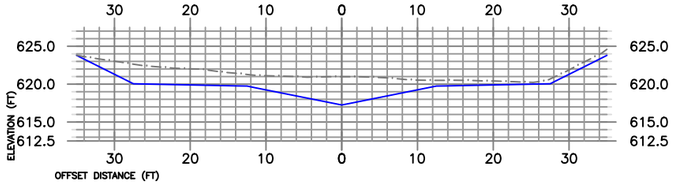
STA. 27+00 ALONG Proposed (Ft)



STA. 27+50 ALONG Proposed (Ft)



STA. 28+00 ALONG Proposed (Ft)



STA. 28+50 ALONG Proposed (Ft)

TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
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(218) 723 - 4865

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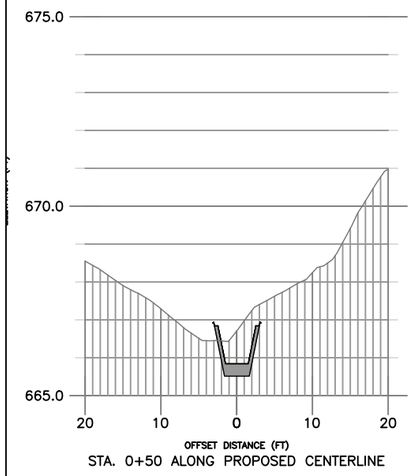
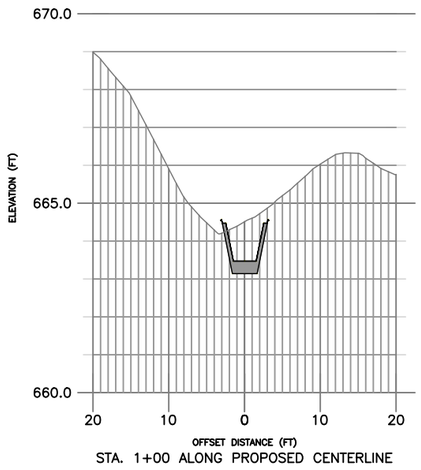
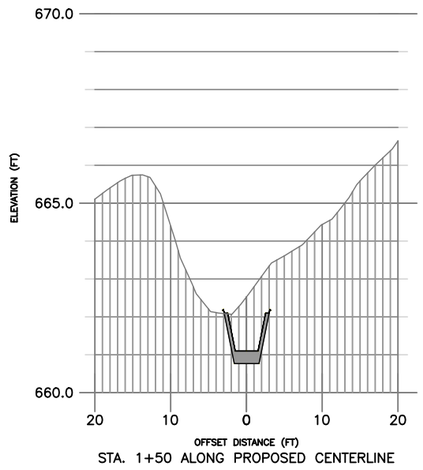


STA. 0+50 ALONG PROPOSED CENTERLINE



STA. 1+00 ALONG PROPOSED CENTERLINE



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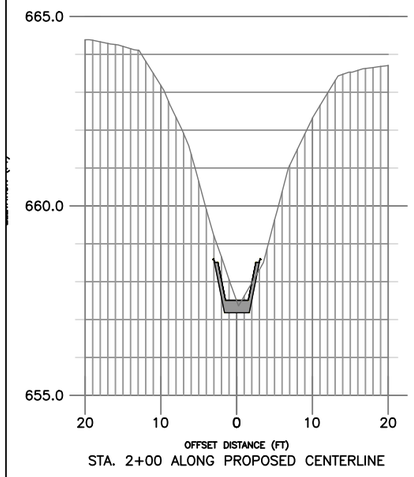

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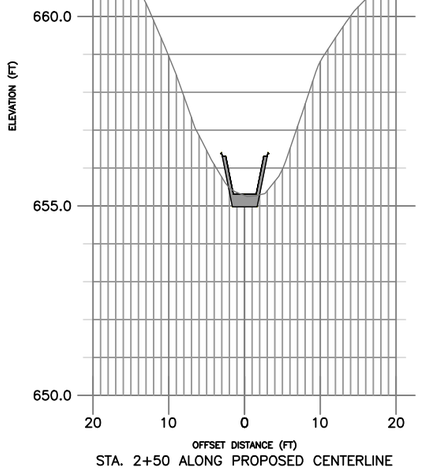

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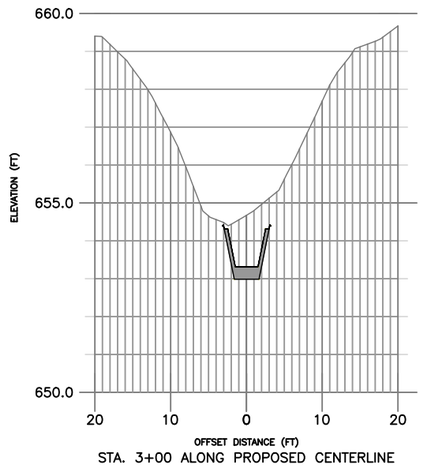

STA. 3+00 ALONG PROPOSED CENTERLINE

TECHNICAL SERVICE AREA III

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK RESTORATION

LOCATION:

(ADDRESS)

DISTRICT:

XXX

NOTES:

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINTED NAME: KELSEY A. ANDERSON

SIGNATURE:

DATE: LIC. NO. 42827

NOT FOR CONSTRUCTION
PLANS ARE SUBJECT TO REVIEW AND CHANGE, NOT TO BE USED FOR CONSTRUCTION.

DESIGNED:	DATE:
DRAWN:	DATE:
CHECKED:	DATE:

REVISION:	BY:	DATE:	APPROVED:
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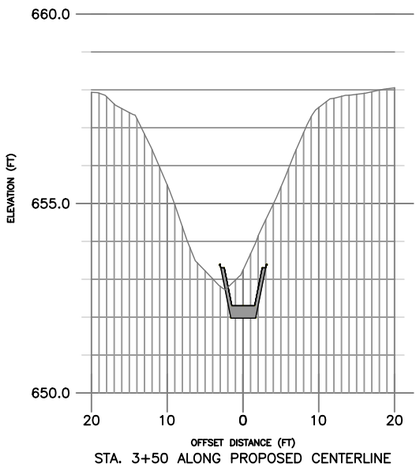
19 - Section Sheet - (13)



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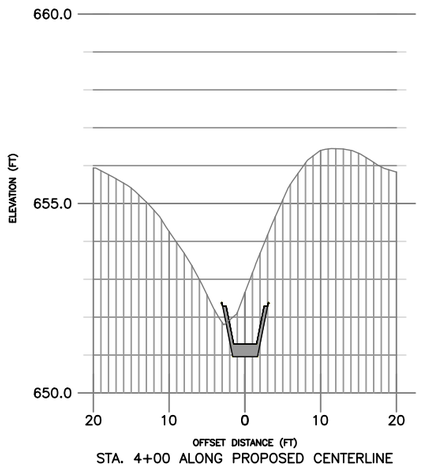

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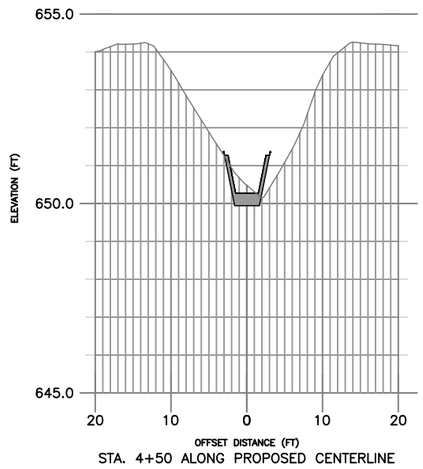

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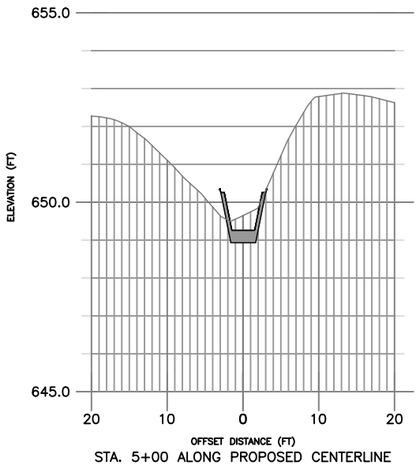

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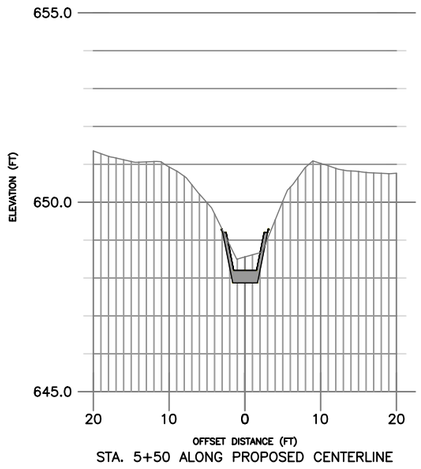

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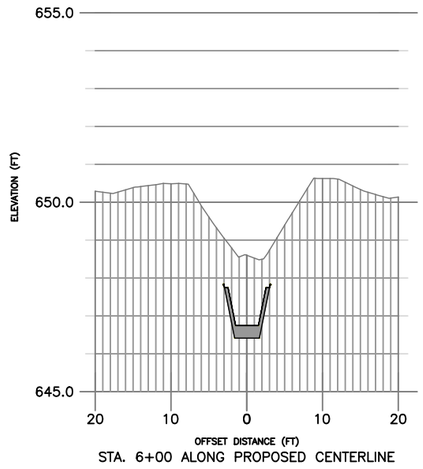

STA. 6+00 ALONG PROPOSED CENTERLINE

215 N 1ST AVE E, ROOM 301
DULUTH MN, 55802
(218) 723 - 4865

PROJECT:

MISSION CREEK
RESTORATION

LOCATION:

(ADDRESS)

DISTRICT:

XXX

NOTES:

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINTED NAME: KELLEA J. ANDERSON

SIGNATURE:

DATE: LIC. NO. 42827

NOT FOR CONSTRUCTION
PLANS ARE SUBJECT TO REVIEW AND CHANGE,
NOT TO BE USED FOR CONSTRUCTION.

DESIGNED:	DATE:	
DRAWN:	DATE:	
CHECKED:	DATE:	

REVISION:	BY:	DATE:	APPROVED:
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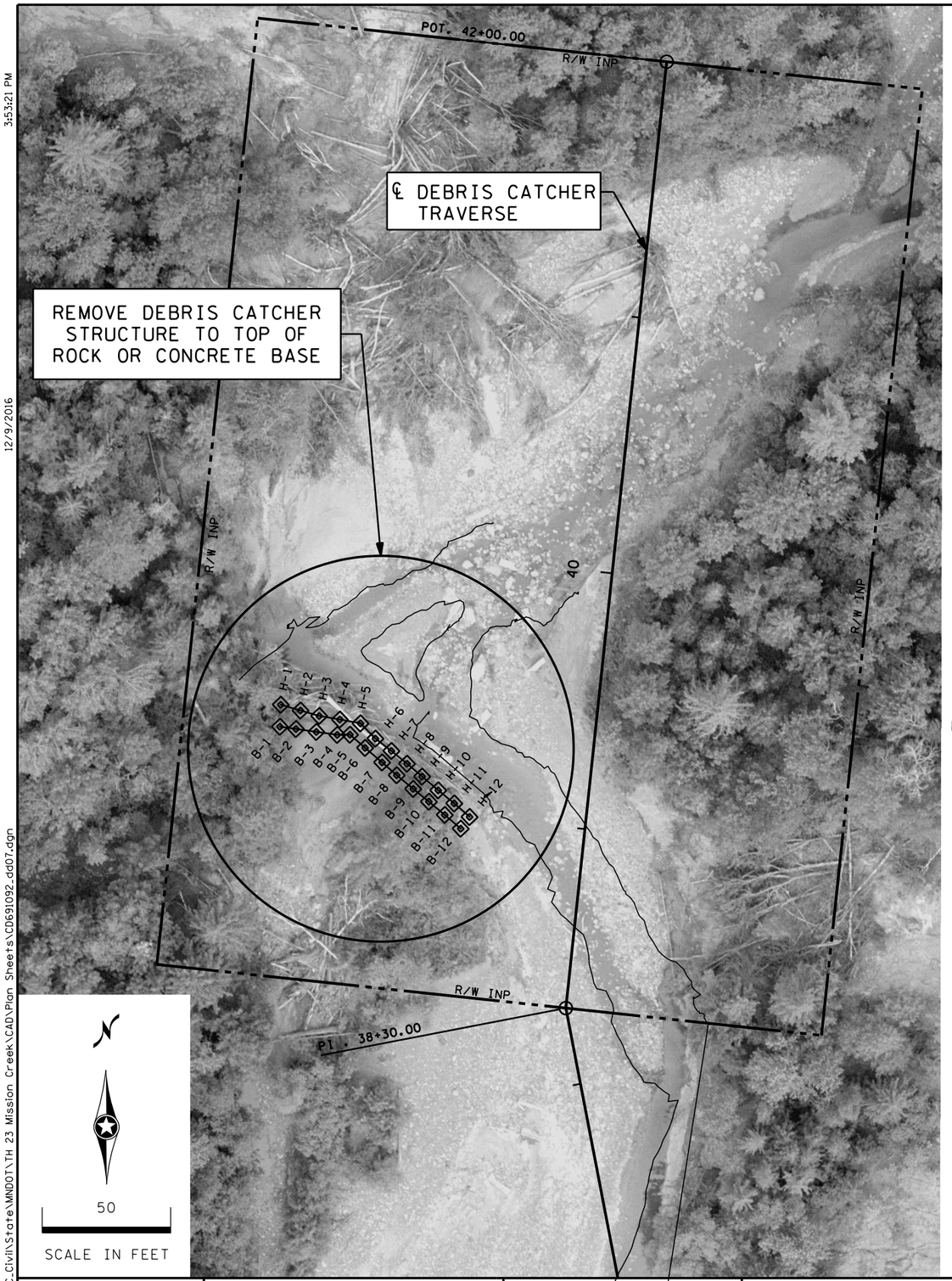
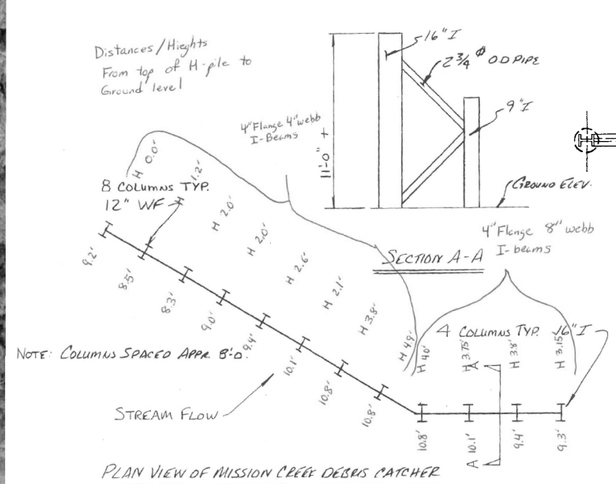
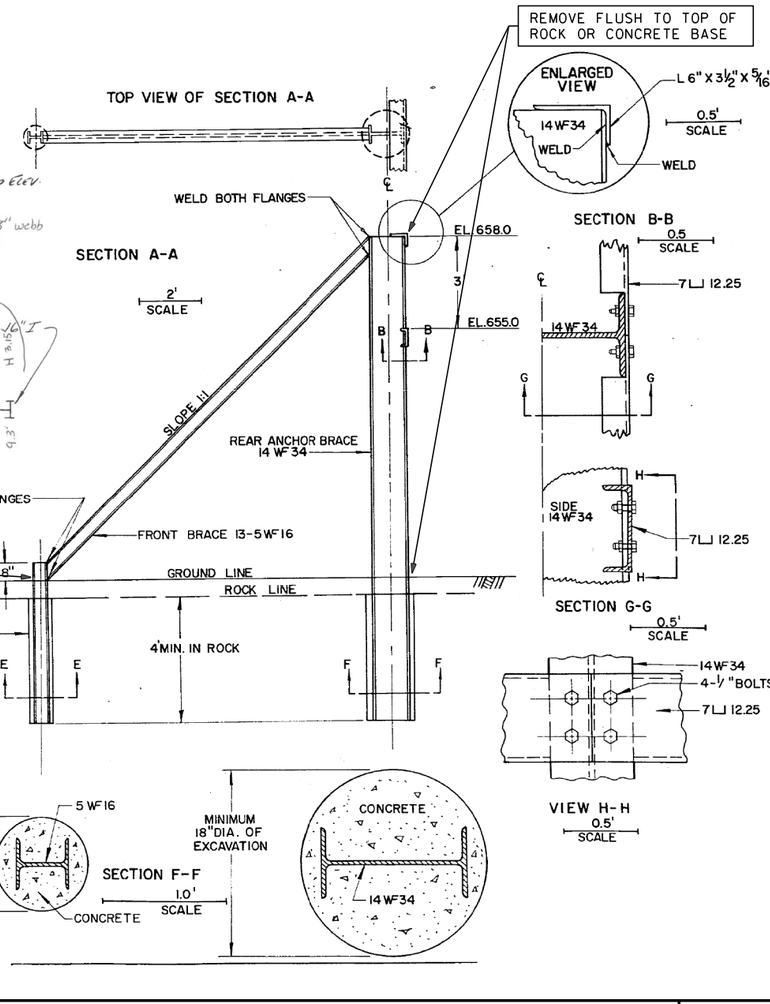
20 - Section Sheet - (14)



MISCELLANOUS REMOVALS						
BEAM NO.	I-BEAM 16"	I-BEAM 4X8	I-BEAM 4X4	WIDE FLANGE 12" WF	HEIGHT	NOTE
H-1	X				9.3	
H-2	X				9.4	
H-3	X				10.1	
H-4	X				10.8	
H-5				X	10.8	
H-6				X	10.8	
H-7				X	10.1	
H-8				X	9.4	
H-9				X	9.0	
H-10				X	8.3	
H-11				X	8.5	
H-12				X	9.1	

MISCELLANOUS REMOVALS						
BEAM NO.	I-BEAM 16"	I-BEAM 4X8	I-BEAM 4X4	WIDE FLANGE 12" WF	HEIGHT	NOTE
B-1		X			3.15	
B-2		X			3.8	
B-3		X			3.75	
B-4		X			4.0	
B-5			X		4.9	
B-6			X		3.8	
B-7			X		2.1	
B-8			X		2.6	
B-9			X		2.0	
B-10			X		2.0	
B-11			X		1.2	
B-12			X		0.0	





DESIGNED BY:	WDJ
DRAWN BY:	RJM
CHECKED BY:	NMG

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

CERTIFIED BY: Nicky Gulick Licensed Professional Engineer LIC NO. 45642

PRINTED NAME: NICOLE GULICK, P.E. DATE: 11/30/2016

Kimley»Horn
2550 UNIVERSITY AVENUE WEST, SUITE 238N
SAINT PAUL, MINNESOTA 55114
Ph: 651-645-4197 www.kimley-horn.com

MINNESOTA DEPARTMENT OF TRANSPORTATION
TH 23 MISSION CREEK

MISCELLANEOUS DETAILS
DEBRIS CATCHER TOPOGRAPHY AND REMOVAL PLAN

STATE PROJ. NO. 6910-92 (TH 23)

DD07 OF DD08

45 / 165

Minnesota Unique Well Number

161021

County St. Louis
Quad Esko
Quad ID 224A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 02/22/1988
Update Date 09/14/2018
Received Date

Well Name	Township	Range	Dir	Section	Subsection
KNIGHT, JIM	48	15	W	5	CDADCB

Elevation 624 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 136TH AV W DULUTH MN

Contact 12919 9TH ST W DULUTH MN

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
TOP SOIL	0	8	BLACK	SOFT
SANDY LOAM	8	32	BROWN	SOFT
COARSE SAND &	32	38	BROWN	SOFT

Remarks

Well Depth 38 ft. **Depth Completed** 38 ft. **Date Well Completed** 02/00/1980

Drill Method Air Rotary **Drill Fluid**

Use domestic **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint** Threaded

Drive Shoe? Yes ☒ No ☐ **Above/Below** 1.5 ft.

Casing Diameter	Weight	Hole Diameter
6 in. To 38 ft.	19.4 lbs./ft.	6 in. To 38 ft.

Open Hole From 38 ft. To 38 ft.

Screen? ☐ **Type** **Make**

Static Water Level

18 ft. land surface Measure 02/00/1980

Pumping Level (below land surface)

ft. hrs. Pumping at 6 g.p.m.

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☒ 12 in. above grade

☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☐ Yes ☐ No ☐ Not Specified

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☒ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock Aquifer Quat. buried

Last Strat sand +larger-brown Depth to Bedrock ft

Located by Minnesota Geological Survey

Locate Method GPS SA Off (averaged) (15 meters)

System UTM - NAD83, Zone 15, Meters X 555809 Y 5168187

Unique Number Verification Tax Records Input Date 09/13/2018

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Graves Well Co.	69090	KILPELA, P.

Minnesota Well Index Report | **161021** | Printed on 11/16/2018 HE-01205-15

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for St. Louis County, Minnesota, Duluth Part

November 16, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

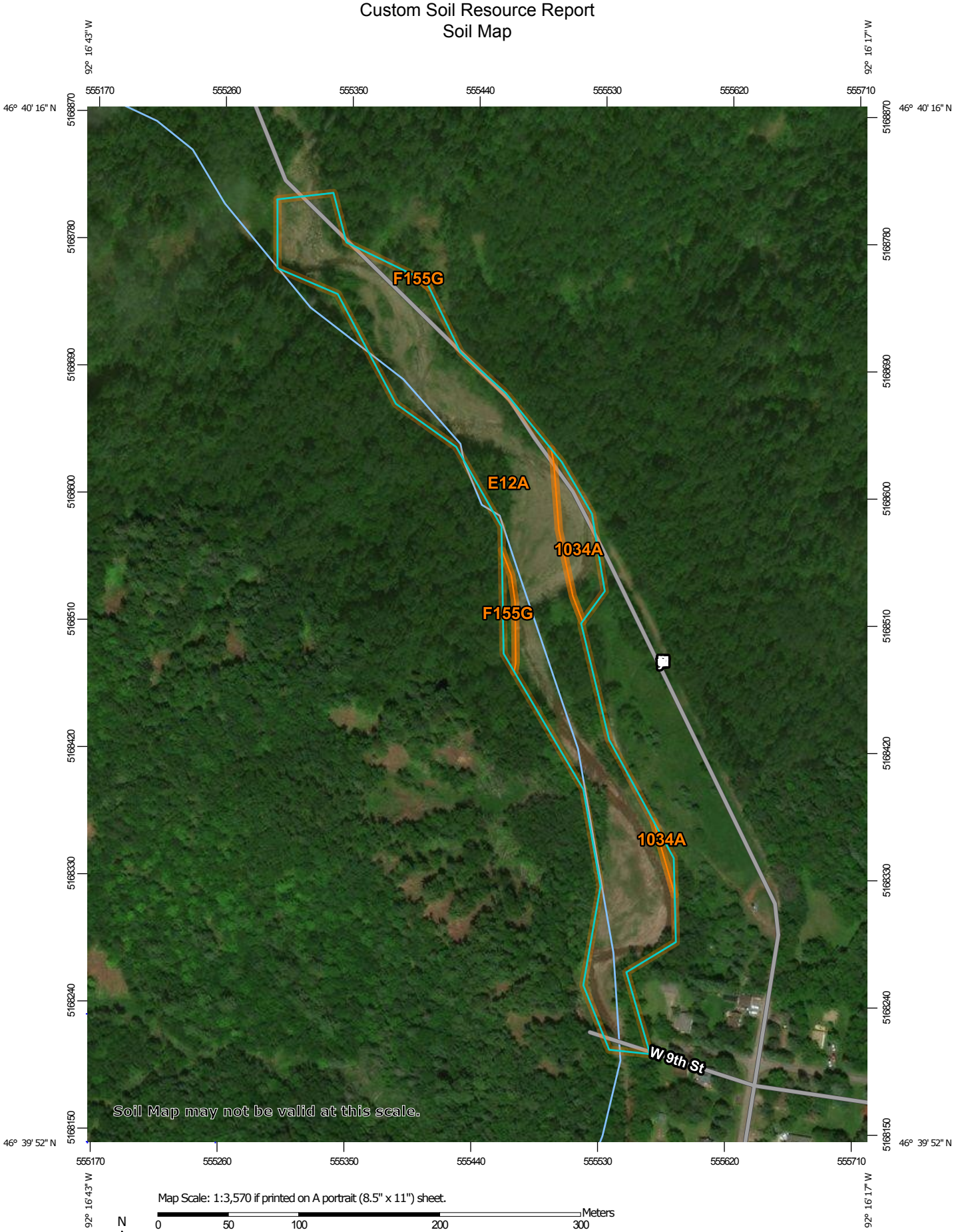
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,570 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: St. Louis County, Minnesota, Duluth Part
Survey Area Data: Version 16, Oct 9, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 27, 2014—Sep 8, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1034A	Udifluvents and Fluvaquents, loamy, 0 to 2 percent slopes, rarely flooded	0.6	6.9%
E12A	Udifluvents complex, 0 to 3 percent slopes, flooded	7.8	91.4%
F155G	Udalfs-Eutrudepts complex, 25 to 70 percent slopes	0.1	1.7%
Totals for Area of Interest		**8.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

St. Louis County, Minnesota, Duluth Part

1034A—Udifluvents and Fluvaquents, loamy, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: 1jtpd
Elevation: 610 to 2,100 feet
Mean annual precipitation: 23 to 34 inches
Mean annual air temperature: 36 to 46 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Udifluvents, rarely flooded, moderately well drained, and similar soils: 55 percent
Udifluvents, rarely flooded, somewhat poorly drained, and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udifluvents, Rarely Flooded, Moderately Well Drained

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 6 inches: silt loam
C - 6 to 80 inches: stratified silt loam to gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Forage suitability group: Sloping Upland, Acid (G093AN006MN)
Hydric soil rating: No

Description of Udifluvents, Rarely Flooded, Somewhat Poorly Drained

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 6 inches: silt loam
Cg - 6 to 80 inches: stratified silt loam to gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 18 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Forage suitability group: Level Swale, Low AWC, Acid (G093AN007MN)
Hydric soil rating: No

Minor Components

Fluvaquents, rarely flooded

Percent of map unit: 10 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

E12A—Udifluvents complex, 0 to 3 percent slopes, flooded

Map Unit Setting

National map unit symbol: p0gj
Elevation: 490 to 1,310 feet
Mean annual precipitation: 25 to 34 inches
Mean annual air temperature: 37 to 43 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Udifluvents, frequently flooded, and similar soils: 55 percent
Udifluvents, occasionally flooded, and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udifluvents, Frequently Flooded

Setting

Landform: Rises on flood plains, flats on flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 8 inches: sandy loam
C - 8 to 43 inches: stratified very gravelly coarse sandy loam to silt loam
Ab - 43 to 48 inches: sandy loam
Cb - 48 to 80 inches: stratified loamy sand to gravelly silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 13 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Forage suitability group: Frequently Flooded (G092XN016MN)
Hydric soil rating: Yes

Description of Udifluvents, Occasionally Flooded

Setting

Landform: Levees on flood plains
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 8 inches: extremely gravelly loam
C - 8 to 80 inches: stratified extremely gravelly loam to sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 30 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C
Forage suitability group: Wet Frequently Flooded (G092XN015MN)
Hydric soil rating: No

Minor Components

Fluvaquents, frequently flooded
Percent of map unit: 10 percent
Landform: Depressions on flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

F155G—Udalfs-Eutrudepts complex, 25 to 70 percent slopes

Map Unit Setting
National map unit symbol: 1jvy1
Elevation: 490 to 1,310 feet
Mean annual precipitation: 25 to 34 inches
Mean annual air temperature: 37 to 43 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition
Hapludalfs and similar soils: 35 percent
Eutrudepts and similar soils: 25 percent
Glossudalfs and similar soils: 15 percent
Glossudalfs, stratified substratum, and similar soils: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hapludalfs

Setting
Landform: Glacial lakes (relict)
Landform position (two-dimensional): Backslope, shoulder
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified lacustrine

Typical profile
A - 0 to 5 inches: very fine sandy loam
Bw - 5 to 25 inches: very fine sandy loam
E - 25 to 35 inches: very fine sandy loam
E&Bt,Bt&E - 35 to 50 inches: very fine sandy loam
BC - 50 to 60 inches: silt loam
2C - 60 to 80 inches: loamy very fine sand

Properties and qualities

Slope: 25 to 70 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Forage suitability group: Not Suited (G093AN024MN)
Hydric soil rating: No

Description of Eutrudepts

Setting

Landform: Glacial lakes (relict)
Landform position (two-dimensional): Backslope, shoulder
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified lacustrine

Typical profile

A - 0 to 5 inches: silt loam
Bw - 5 to 40 inches: silt loam
C - 40 to 80 inches: silt loam

Properties and qualities

Slope: 25 to 70 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.60 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Forage suitability group: Not Suited (G093AN024MN)
Hydric soil rating: No

Description of Glossudalfs

Setting

Landform: Glacial lakes (relict)
Landform position (two-dimensional): Backslope, shoulder
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Stratified lacustrine

Typical profile

A - 0 to 4 inches: very fine sandy loam
E - 4 to 10 inches: very fine sandy loam
B/E - 10 to 18 inches: very fine sandy loam
2Bt - 18 to 24 inches: clay loam
2C - 24 to 80 inches: clay

Properties and qualities

Slope: 12 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Forage suitability group: Not Suited (G093AN024MN)
Hydric soil rating: No

Description of Glossudalfs, Stratified Substratum

Setting

Landform: Glacial lakes (relict)
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified lacustrine

Typical profile

A - 0 to 3 inches: silt loam
E - 3 to 5 inches: silt loam
E/B - 5 to 12 inches: silt loam
Bt - 12 to 35 inches: silty clay loam
2C - 35 to 80 inches: stratified very fine sandy loam to silty clay

Properties and qualities

Slope: 12 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: About 32 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C
Forage suitability group: Not Suited (G093AN024MN)
Hydric soil rating: No

Minor Components

Udifluvents, frequently flooded
Percent of map unit: 5 percent
Landform: Alluvial flats on glacial lakes (relict)
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Udifluvents, occasionally flooded
Percent of map unit: 3 percent
Landform: Alluvial flats on glacial lakes (relict)
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Udorthents
Percent of map unit: 2 percent
Landform: Glacial lakes (relict)
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear

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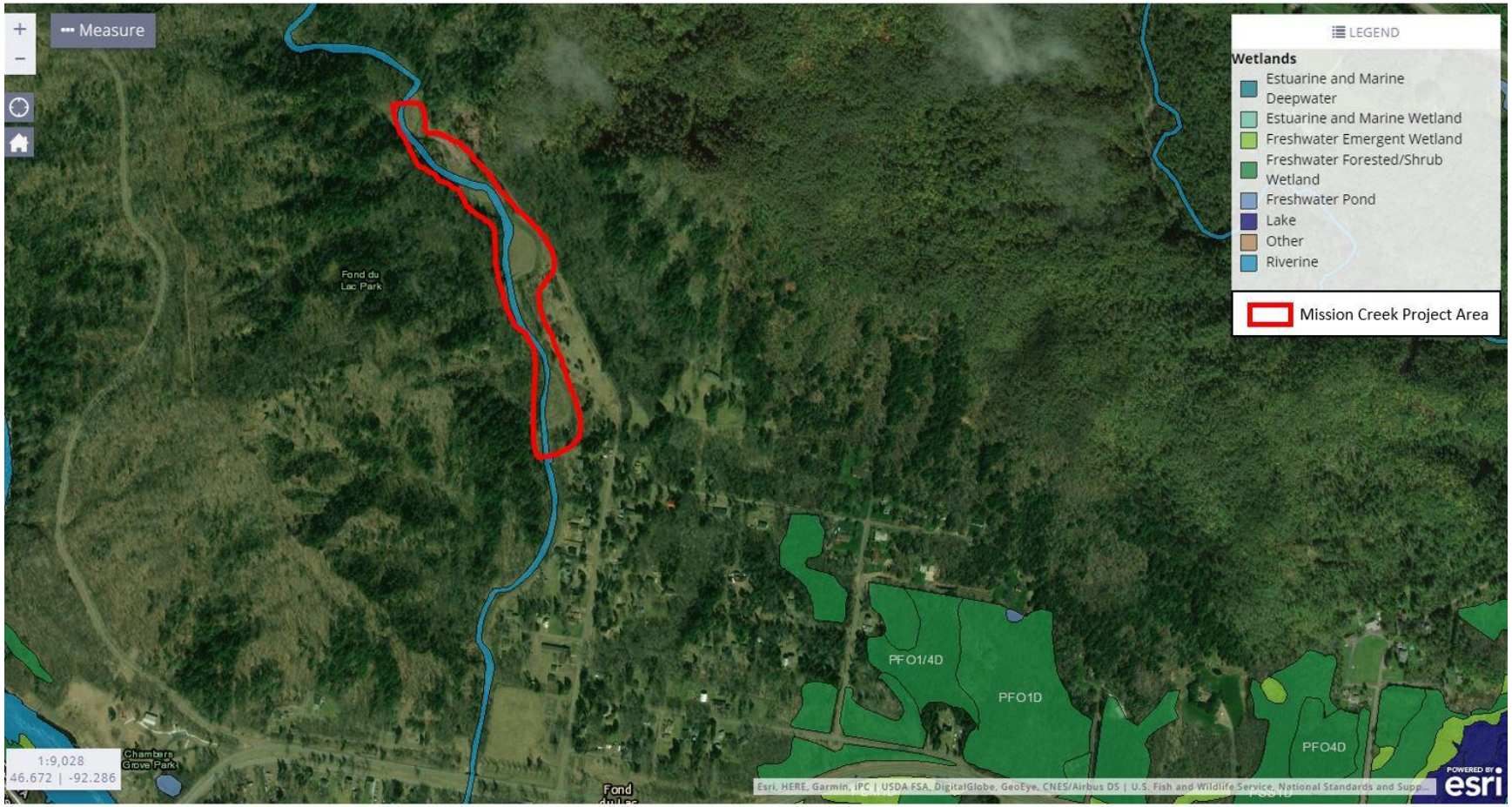
Attachment 6.



Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

September 12, 2018
Correspondence # ERDB 20190073

Mr. Karl Koller
MN DNR
1201 East Highway 2
Grand Rapids, MN 55744

RE: Natural Heritage Review of the proposed Mission Creek Stream Restoration,
T48N R15W Section 5; St. Louis County

Dear Mr. Koller,

As requested, the Minnesota Natural Heritage Information System has been queried to determine if any rare species or other significant natural features are known to occur within an approximate one-mile radius of the proposed project. Based on this query, rare features have been documented within the search area (for details, please visit the Rare Species Guide Website for more information on the biology, habitat use, and conservation measures of these rare species). Please note that the following rare features may be adversely affected by the proposed project:

Ecologically Significant Areas

- The proposed project is partially within and adjacent to an area the Minnesota Biological Survey (MBS) has identified a Site of *High* Biodiversity Significance. Sites of Biodiversity Significance have varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Sites ranked as *High* contain very good quality occurrences of the rarest species, high quality examples of the rare native plant communities, and/or important functional landscapes. This particular Site contains several high quality native plant communities.

  Given the ecological significance, we recommend minimizing disturbance in this area as much as possible. GIS shapefiles of MBS Sites of Biodiversity Significance and DNR Native Plant Communities can be downloaded from Quick Layers. Actions to minimize disturbance may include, but are not limited to, the following recommendations:

  - Minimize vehicular disturbance within the Site (allow only vehicles/equipment necessary for construction activities);
  - Do not park equipment or stockpile supplies in the Site;
  - Do not place spoil within the Sites or other sensitive areas;

- Use effective erosion prevention and sediment control measures;
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species;
- As much as possible, operate within already-disturbed areas;
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible; and
- Use only weed-free mulches, topsoils, and seed mixes.

- If the Wetland Conservation Act (WCA) is applicable to this project, please note that wetlands within *High* MBS Sites of Biodiversity Significance may qualify as "rare natural communities" under this Act. Minnesota Rules, part 8420.0515, subpart 3 states that a wetland replacement plan for activities that modify a rare natural community must be denied if the local government unit determines the proposed activities will permanently adversely affect the natural community.

State-listed Species

- The creek heelsplitter (*Lasmigona compressa*) and black sandshell (*Ligumia recta*), both state-listed mussel species of special concern, along with lake sturgeon (*Acipenser fulvescens*), a state-listed special concern fish species, have been documented in the St. Louis River in the vicinity of the proposed stream work. Please maintain effective erosion prevention and sediment control practices throughout the duration of the project to prevent adverse debris and material from entering the river.

Environmental Review and Permitting

- The Environmental Assessment Worksheet should address whether the proposed project has the potential to adversely affect the above rare features and, if so, it should identify specific measures that will be taken to avoid or minimize disturbance.

- Please include a copy of this letter in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location (noted above) and the project description provided on the NHIS Data Request Form. Please contact me if project details change or for an updated review if construction has not occurred within one year.

The Natural Heritage Review does not constitute review or approval by the Department of Natural Resources as a whole. Instead, it identifies issues regarding known occurrences of rare features and potential effects to these rare features. If needed, please contact your DNR Regional Environmental Assessment Ecologist to determine whether there are other natural resource concerns associated with the proposed project. Please be aware that additional site assessments or review may be required.

Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources. An invoice will be mailed to you under separate cover.

Sincerely,

Samantha Bump
Natural Heritage Review Specialist
Samantha.Bump@state.mn.us

Links: Rare Species Guide
http://www.dnr.state.mn.us/rsg/index.html
DNR Regional Environmental Assessment Ecologist Contact Info
http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html

Cc: Margi Coyle
Brooke Haworth
Doug Norris
Kim Boland