



# LOWER MINNESOTA RIVER WATERSHED DISTRICT

## Executive Summary for Action

Lower Minnesota River Watershed District Board of Managers

Meeting Wednesday, July 20, 2022

### **Agenda Item**

#### **Item 4. D. – Request for reimbursement – City of Chaska Seminary Fen C-2 Feasibility Study**

### **Prepared By**

Linda Loomis, Administrator

### **Summary**

The City of Chaska is studying various ravines that contribute sediment to Seminary Fen. The first ravine, C-1, was stabilized through a joint project between the City, the MN Department of Natural Resources, the Board of Water & Soil Resources, Carver County Water Management Organization and the LMRWD. In January 2020, the City kicked off its study of Ravine C-2 and approached the LMRWD to participate. The LMRWD Board of Managers authorized execution of a Cooperative Agreement between the City and the LMRWD. The feasibility study is complete and the City has requested payment.

The City has been asked for supporting documentation of its costs.

### **Attachments**

Invoice from the City of Chaska

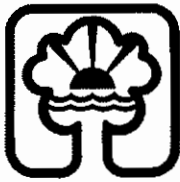
Excerpt of January 15, 2020 LMRWD Board of Managers meeting minutes

Cooperative Agreement between the City of Chaska and the LMRWD

C-2 Seminary Fen Ravine Feasibility Report

### **Recommended Action**

Motion to authorize payment of the invoice #3804 from the City of Chaska



City of Chaska  
 Accounts Receivable  
 One City Hall Plaza  
 Chaska, MN 55318

PHONE  
 (952) 448-9200  
 FAX  
 (952) 448-9300

**INVOICE**

CUSTOMER	INVOICE DATE	INVOICE NUMBER	DUE DATE	INVOICE TOTAL DUE
LOWER MN RIVER WATERSHED DISTRICT	06/20/2022	3804	07/20/2022	\$20,000.00

DESCRIPTION	QUANTITY	PRICE	UOM	ORIGINAL INVOICE	ADJUSTED	PAID	AMOUNT DUE
GRANT - FEN RAVINE STUDY	1.00	\$20,000.00	EACH	\$20,000.00	\$0.00	\$0.00	\$20,000.00
<b>Invoice Total:</b>							<b>\$20,000.00</b>

Grant Reimbursement for Seminary Fen Ravine C-2 Stabilization Feasibility Study

✂ DETACH AND RETURN THE PORTION BELOW WITH YOUR PAYMENT ✂

Promptly Send Payment To:



City of Chaska  
 Accounts Receivable  
 One City Hall Plaza  
 Chaska, MN 55318

**INVOICE**

Remit Portion

Invoice Date	06/20/2022
Invoice Number	3804
Customer Number	30562
Amount Paid	\$0.00
<b>Due Date</b>	<b>07/20/2022</b>
<b>Invoice Total Due</b>	<b>\$20,000.00</b>

LOWER MN RIVER WATERSHED DISTRICT  
 LINDA LOOMIS  
 6677 Olson Memorial Highway  
 Golden Valley, MN 55427

Please write your Invoice Number on your check and enclose this portion of the invoice with your payment.  
 Make checks payable to: City of Chaska

Rules. She said she is planning to attend those meetings, so she should be able to get a feel for the public sentiment regarding the rules.

**President Hartmann made a motion to revise the rules, prepare and distribute comments and call for a public hearing on February 19, 2020. The motion was seconded by Manager Frey. The motion carried unanimously.**

**D. 2020 Legislative Action**

Administrator Loomis reported on a meeting she and Lisa Frenette had with BWSR. She said that BWSR suggested that the LMRWD request legislation to allow the LMRWD to use money it had received for managing dredge material to replace the grant payment that was denied. The Board discussed the pros and cons of such action.

President Hartmann asked if this jeopardizes anything they ask for in the future. Administrator Loomis said she doesn't think it will, but that she would discuss it with Ms. Frenette. She said the legislators that they have spoken to about this issue might view it favorably that the LMRWD and BWSR were able to work out this situation without asking for an additional appropriation.

She noted once the dredge site work is complete the LMRWD would no longer need the entire appropriation that it has been receiving from the state. She noted that BWSR asked what the LMRWD intended in the future. She and Ms. Frenette told BWSR that the Board would likely recommend to the Board that the appropriation end or be reduced. BWSR suggested that they the LMRWD consider continuing to receive the current state appropriation and use the money to address sediment reduction within the Minnesota River Basin. She said BWSR indicated they would support this. She said that she and Ms. Frenette asked BWSR how it envisioned such a program would work .

The board discussed the dollars and possible sediment reducing projects. They also talked about erosion at the dredge site that the City of Savage has expressed concern over.

**E. Education and Outreach Plan**

No information to report since last update.

**F. LMRWD Projects**

***(only projects that require Board action will appear on the agenda. Informational updates will appear on the Administrator Report)***

**i. East Chaska Creek Restoration**

Administrator Loomis said they are hoping to get this project done this spring. Staff has been working with the contractor to get the contracts in order.

**ii. Seminary Fen Restoration Area C-2**

Administrator Loomis said the cooperative agreement was reviewed by legal counsel. She addressed the concern expressed by Manager Raby at the December meeting. She stated the only obligation of the LMRWD in this agreement is to contribute \$20,000. So if there are costs over runs or other funding becomes unavailable, there is no additional responsibility to the LMRWD.

**President Hartmann made a motion to authorize execution of the cooperative agreement. The motion was seconded by Manager Frey. The motion carried unanimously.**

**G. Project/Plan Reviews**

***(only projects that require Board action will appear on the agenda. Informational updates will appear on the Administrator Report)***

COOPERATIVE AGREEMENT  
BETWEEN THE CITY OF CHASKA AND  
THE LOWER MINNESOTA RIVER WATERSHED DISTRICT

**SEMINARY FEN C-2 RAVINE STUDY**

This cooperative agreement is made by and between the City of Chaska, a Minnesota municipal corporation (the City), and the Lower Minnesota River Watershed District, a watershed district pursuant to Minnesota Statutes chapters 103B and 103D (LMRWD), to implement the Seminary Fen C-2 Ravine Study (the Study) in Chaska, Carver County, Minnesota. The purpose of the Study is to determine the causes of erosion, estimate the sediment contributions from the ravine, develop stabilization options, and provide a cost range for the alternatives and a cost estimate for the chosen option.

**Recitals**

**WHEREAS**, LMRWD has an approved water resources management plan pursuant to Minnesota Statutes section 103B.231 (the Plan) that has a goals to protect, improve and restore surface water quality through the use of High Value Resources Areas and to protect and manage unique natural resources and wetlands;

**WHEREAS**, the Seminary Fen Wetland Complex is a 600 acre complex in Carver County that is one of only 500 calcareous fens in the world and is one of the highest quality calcareous fens in southern Minnesota;

**WHEREAS**, Seminary Fen is both a unique natural resource and a wetland whose unique hydrology, soils plants and habitats are highly sensitive to water quality and sediment stress;

**WHEREAS**, the bluffs located north of Seminary Fen are highly prone to erosion due to sandy soils, groundwater discharges, naturally steep slopes and surface water flows. As a result several ravines have eroded and caused sediment plumes to enter the fringe of the wetland;

**WHEREAS**, the LMRWD and the City completed a project that stabilized the longest ravine, labeled C1, which was estimated to contribute 1,680 tons per year of sediment to the Seminary Fen complex;

**WHEREAS**, the LMRWD and the City would like to stabilize the next largest ravine, labeled C-2

**WHEREAS**, the capital improvement program in the Plan includes the Seminary Fen Ravine Site C-2 and C-3 studies, which will conduct a study to estimate the sediment contribution to Seminary Fen and provide approaches and cost estimates for correcting the erosion problems;

**WHEREAS**, in September 2019 Stantec Consulting Services, Inc. provided the City with a scope of services (the Scope) for the Study, attached hereto and incorporated herein as Exhibit A, which details the scope of services which includes: data collection and investigation tasks, survey and analysis,

hydrologic modeling, concept design for grade control and erosion protection, and meeting, reporting and project management tasks; and

**WHEREAS**, the LMRWD and the City are authorized by Minnesota Statutes section 471.59 to enter into this cooperative agreement for the Study

### **Agreement**

NOW, THEREFORE, THE LMRWD AND THE CITY enter into this agreement to document their understanding as to the scope of the Study, reaffirm both parties commitment as to the general responsibilities for and tasks to be undertaken by the parties and facilitate communication and cooperation to successfully complete the Study.

1. **Study.** The Study elements are described in detail in and supported by the Scope (Exhibit A), which serves as the basis for the partner's agreement.
2. **Costs.** The Scope estimates the total cost for the study will be \$50,890, which includes reimbursable expenses, such as mileage, copying charges, etc.
  - 2.1 The City will be responsible for oversight and management of the Study.
  - 2.2 The LMRWD will be responsible for \$20,000 of the Study costs (to be paid to the City) and technical assistance and information to the city's consultant as requested.
  - 2.3 Upon completion and final acceptance of the Study and receipt of the accompanying documents, the LMRWD will reimburse the City within thirty (30) days.
  - 2.4 Each party will bear the internal, administrative and incidental costs of fulfilling its responsibilities and obligations under this agreement, as well as the costs incurred in providing and conducting public education, outreach and meetings for the Study.
3. **The City's Specific Rights and Duties**
  - 3.1 The City has contracted with Stantec Consulting Services (Stantec), Inc. provide the services detailed in Exhibit A. Notwithstanding the foregoing, the City makes no warranty to the LMRWD regarding Stantec's or a third party's performance.
  - 3.2 The City will contract for Stantec's services and oversee the Study. The City may adjust the scope of service in consultation with the LMRWD, as long as the adjustments do not exceed the scope of rights granted under this agreement or create obligations not anticipated hereunder. If the City, in its judgment, should decide that the Study is infeasible prior to the obligations of any funds for the Study, the City may at its option declare this agreement rescinded and annulled. If the City so declares, all obligations herein, performed or not, will be voided.

4. **LMRWD Specific Rights and Duties.** On receipt of documentation of costs incurred and paid, LMRWD will reimburse the City as described in Section 2 of this agreement.

5. **General Terms**

5.1 **INDEPENDENT RELATIONSHIP; LIABILITY.** This agreement does not create a joint powers board or organization within the meaning of Minnesota Statutes section 471.59, and no party agrees to be responsible for the acts or omission of another pursuant to subdivision 1(a) of the statute. Only contractual remedies are available for the failure of a party to fulfill the terms of this agreement. The City and LMRWD enter this agreement solely for the purposes of improving the ecological health and condition of Seminary Fen. Accordingly, with respect to any and all activity undertaken pursuant to this agreement, the City and LMRWD (each party as an Indemnitor Party) agree to hold each other harmless, and defend and indemnify each other, their officers, employees and agents (individually, an Indemnified Party) from and against any and all liability, loss, claim, damage or expense (including reasonable attorney fees, costs and disbursements) that an Indemnified Party may incur as a result of the Study due to any negligent or willful act or omission by the Indemnitor Party or the Indemnitor Party's breach of any specific contractual duty. Notwithstanding the foregoing or any other provision of this agreement, the City's and LMRWD obligations under this paragraph will survive the termination of the agreement.

This agreement creates no right in and waives no immunity, defense or liability limitation with respect to any third party. As between the parties, only contract remedies are available for a breach of this agreement.

5.2 **PUBLICITY AND ENDORSEMENT.** Any publicity regarding the Study must identify the City and LMRWD as the sponsoring entities. For purposes of this provision, publicity includes notices, information pamphlets, press releases, research, reports, signs and similar public notices prepared by or for the City or LMRWD individually or jointly with others. Each party at its own cost, may develop, produce and after approval of the other party, distribute educational, outreach and publicity materials related to the Study.

5.3 **DATA MANAGEMENT.** All designs, written materials, technical data, research or any other work-in-progress will be shared between the parties to this agreement on request, except as prohibited by law. As soon as is practicable, the party preparing plans, specifications, contractual documents, materials for public communication or education will provide them to the other party for recordkeeping and other necessary purposes.

5.4 **DATA PRACTICES.** All data created, collected, received, maintained or disseminated for any purpose in the course of this agreement is governed by the Data Practices Act, Minnesota Statutes chapter 13, any other applicable state statute, or any state rules adopted to implement the act, as well as federal regulations on data privacy.

- 5.5 ENTIRE AGREEMENT. This agreement contains the complete and entire agreement between the parties relating to the subject matter hereof and supersedes all prior negotiations, agreements, representations and understandings, if any, between the parties respecting such matters. The recitals stated at the outset are incorporated into and a part of the agreement.
- 5.6 AMENDMENT. This agreement, as it may be amended in writing, constitutes the entire agreement between the City and LMRWD. Any amendment to this agreement will not be effective until it has been executed and approved by the same parties executing and approving the original agreement or their successors in office.
- 5.7 WAIVERS. The Waiver by the City and LMRWD of any breach or failure to comply with any provision of this agreement by the other party will not be construed as nor will it constitute a continuing waiver of such provision or a waiver of any other breach of or failure to comply with any other provision of this agreement.
- 5.8 NOTICES, COORDINATION. The City and LMRWD designate the following authorized representatives, each to serve as liaison to the other party for purposes of communication regarding the Study as provided in this agreement. Any written communication required under this agreement will be addressed to the other party as follows, except that any party may change its address for notice by so notifying the other party in writing:

**City of Chaska**

Matt Clark  
City Engineer  
One City Hall Plaza  
Chaska, MN 55318  
Phone: (952)448-9200  
Email: MClark@chaskamn.com

**Lower Minnesota River Watershed District**

Linda Loomis  
Administrator  
112 East 5th Street, Suite 102  
Chaska, MN 55318

- 5.9 TERM; TERMINATION. This agreement is effective on execution by both parties and will terminate once the final report is received or on the written agreement of the City and LMRWD.

**IN WITNESS WHEREOF**, the parties have caused the agreement to be duly executed intending to be bounded thereby.

*(Signature page follows)*

CITY OF CHASKA

\_\_\_\_\_

By: \_\_\_\_\_

Its \_\_\_\_\_

Date: \_\_\_\_\_

\_\_\_\_\_

By: \_\_\_\_\_

Its \_\_\_\_\_

Date: \_\_\_\_\_

*Approved as to form & execution:*

\_\_\_\_\_

City Attorney

LOWER MINNESOTA RIVER  
WATERSHED DISTRICT

  
\_\_\_\_\_

By: Jesse Hartmann

Its President

Date: 1-15-2020

*Approved as to form & execution:*

\_\_\_\_\_

District Attorney



## C2 Seminary Fen Ravine Feasibility Report

Chaska, MN



Prepared for:

City of Chaska

Prepared by:

Kellie Schlegel, P.E., Project Engineer  
John Smyth, Project Manager

February 2022

## C2 Seminary Fen Ravine Feasibility Report

February 10, 2022

Prepared for:

City of Chaska

Prepared By:

Stantec Consulting Services Inc.

733 Marquette Avenue

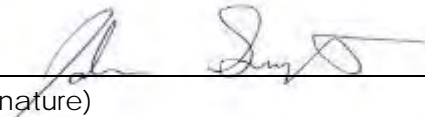
Suite 1000

Minneapolis, MN 55402


Project Number: 193805279

This document entitled C2 Seminary Fen Ravine Feasibility Report was prepared by Stantec Inc. for the account of City of Chaska. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Prepared by Kellie M. Schlegel  
(signature)

Prepared by   
(signature)

**John Smyth, Project Manager**

Reviewed by   
(signature)

**Dan Edgerton, P.E., Senior Associate**



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- Appendix C – Cost Estimates

## C2 SEMINARY FEN RAVINE FEASIBILITY REPORT

Project Summary and Cost Estimate  
February 11, 2022

### 1.0 PROJECT SUMMARY AND COST ESTIMATE

The proposed project involves stabilizing and providing protection to approximately 1,100 linear feet of the C2 Seminary Fen Ravine. The project location is shown in Figure 1. The proposed improvements will reduce the sediment discharge to the Seminary Fen wetland complex by an estimated 322 tons per year. Seminary Fen supports dozens of rare, threatened, and special concern animal and plant species that are sensitive to sedimentation stress, so a reduction of sediment is critical to maintaining the unique characteristics of this wetland.

Several grants and funding from organizations have been used to provide financial support to similar projects in the past, including:

- Clean Water Fund Grant (BWSR)
- MN Department of Natural Resources
- Lower MN Watershed District
- Carver County

The estimated funding required for this project is provided in the table below.

Alternative	Project Length	Estimated Sediment Removal	Estimated Project Cost
1 – Rock-Lined Channel with no Upstream Detention	1,140 LF	Not estimated (option not feasible)	
2 – Rock-Lined Channel	1,140 LF	322 tons/year	\$815,000
3 – Storm Sewer Pipe with Vegetated Channel	1,140 LF	322 tons/year	\$780,000

Detailed cost estimates for each alternative option are included in Appendix C.

## C2 SEMINARY FEN RAVINE FEASIBILITY REPORT

Introduction  
February 11, 2022

### 2.0 INTRODUCTION

Seminary Fen, a 600-acre complex in Carver County, supports one of only 500 calcareous fens in the world and is one of the highest quality calcareous fens in southern Minnesota. Given this fact, and the fact that it supports dozens of rare, threatened, and special concern plant and animal species, it has been characterized as one of the most significant natural areas in the Twin Cities Metropolitan Area and is part of the Minnesota Department of Natural Resources Scientific and Natural Areas program. The fen feeds Assumption Creek, one of the metro area's last known trout streams that supports naturally-reproducing native brook trout. Assumption Creek discharges to the nearby Minnesota River. The fen's unique hydrology, soils, plants, and habitats are highly sensitive to water quality and sedimentation stress.

The City of Chaska completed the C-1 Ravine Stabilization Project in 2016 with funding partners including the Board of Water and Soil Resources, Carver County Watershed Management Organization, Department of Natural Resources, and Lower Minnesota Watershed District (Figure 2). The C-1 Ravine project was estimated to reduce yearly sediment loads by 1,680 tons per year to Seminary Fen. The C-2 Ravine is the 2<sup>nd</sup> most severely eroded ravine along Seminary Fen, and the proposed improvements to C-2 are estimated to reduce sediment loads by 322 tons per year. The sediment plume from C-2 is estimated to have expanded into 2.0 acres of Seminary Fen at the end of the ravine with depths between 2 feet and 5 feet.

### 3.0 STUDY METHODS

The first step in this project involved a ravine analysis. The ravine analysis consisted of a site visit, in which we walked the ravine and documented the erosion locations and causes of erosion, and a hydraulic analysis.

A HydroCAD hydraulic analysis was completed for existing conditions on the entire ravine section below the upstream outlet (Station 10+00). To perform the analysis, existing conditions cross-sections (XSs) based on survey data were imported from AutoCAD, and hydraulic data was entered for each XS. Based on modeled flow velocities and XS analysis, a suite of recommended improvements was developed to address the varying levels and types of degradation found along the ravine. The 100-year storm event (NOAA Atlas 14) flows were determined using a HydroCAD model based on existing ponding conditions at the upstream end of the ravine and its contributing watershed. In the model, the ravine was split into two representative sections with unique slope and cross-section. The watershed's contributing flows to each section were modeled conservatively to enter at the upstream end of their respective reaches. The cumulative 100-year flow to the downstream end of the ravine (Station 0+00) that was used for the analysis was 60.4 cfs.

The sediment plume investigation was conducted to determine approximately how much sediment had encroached into the historical wetland, as well as to estimate the depth of sediment. A delineation done in 2015 for the C-1 and C-2 ravines is shown on Figure 2. Hand soil borings were taken to the depth of the original soil. Borings extended from the upland towards the wetlands until there was no sediment observed, indicating the limits of sediment. The soil boring locations are shown on Figure 4.

### 4.0 EXISTING CONDITIONS

The overall area draining to the C-2 ravine is 12.4 acres and is comprised of a mixture of residential, park, and heavily-wooded land covers. Soils draining to the ravine are generally hydrologic soil groups (HSG) B and C, which are silty loams and produce moderate amounts of runoff following rainfall. Drainage to the upstream end of the ravine first flows to a small depressional area along the east edge of Hazeltine Bluff Park, where it enters an existing catch basin with a 15" outlet pipe before discharging to the ravine (see photo, next page). Existing conditions HydroCAD modeling indicated that this catch basin is overwhelmed by stormwater runoff in 10-year and larger storm events, resulting in overland flows to the ravine without the benefit of the 15-inch pipe outlet that would provide some rate control.



## C2 SEMINARY FEN RAVINE FEASIBILITY REPORT

### EXISTING CONDITIONS

February 11, 2022



**Catch basin upstream of ravine can only handle the 10-year storm event before it discharges overland to the ravine**

The catch basin has an invert of 912.24 and drops the flows 30 feet in a pipe that discharges in the ravine with a 15-inch pipe at an invert of 882.49. The ravine's soils in the bluff areas, including C-2, are mapped by the NRCS soil survey as Lester Kilkenny (Figure 3). The soil survey describes this soil as having 20 inches of loam over 38 inches of clay loam over loam with 18% slopes. The erosion found in this ravine is a common symptom of concentrated flow, loss of herbaceous vegetation due to shading, and increased impervious surfaces in the watershed. This increased amount of runoff routed through the ravine overcomes the natural resistance of the soils and vegetation to erosion. There is no floodplain, so flow concentrates along the steep slope and causes toe erosion. Eroding of the toe of slope has resulted in massive slope failure along steep bluff slopes. In most areas, the slope failure has resulted in near-vertical slopes over 24 feet high (see photo, next page).



## C2 SEMINARY FEN RAVINE FEASIBILITY REPORT

### EXISTING CONDITIONS

February 11, 2022



Toe of slope erosion causing slope failure along ravine

In several locations, concentrated flows from adjacent runoff discharge down steep bluff slopes to the ravine bottom. These steep slopes of the ravine cannot handle these concentrated discharges, and therefore cause slope erosion. Two such locations occur near station 7+00 from flows east of the ravine and near station 4+50 from the discharge at an existing 15-inch CMP under an existing gravel trail. Refer to Figures 1 and 3 in Appendix B for station locations.



## C2 SEMINARY FEN RAVINE FEASIBILITY REPORT

### EXISTING CONDITIONS

February 11, 2022



**Concentrated discharges at top of slope causing slope erosion (STA 7+00)**

### **Sediment Plume**

The C-2 channel has dropped out sediment where it flattens near the downstream end and enters the Seminary Fen Wetland Complex. The sediments have been depositing in the wetland for over 85 years. There is evidence of discharge of sediments to the wetland even in the oldest aerial photographs dated 1937 and 1940 (Appendix A). In 1966, the sediment areas were vegetated, but sediment continues to be deposited further into the wetland today. Currently, ground cover is minimal due to the sandy soils and frequent sediment deposits. The site is predominantly trees and shrubs. The sediment plume continues to expand due to erosion from the ravine.

The sediment plume is approximately 2.0 acres in size. The fill soil is predominantly 24 inches thick but was observed to be as much as 70 inches thick. The estimated sediment plume boundary based on the 2015 wetland delineation and hand soil borings is provided on Figure 4.

### 5.0 DESIGN ALTERNATIVES

There were three design alternatives initially reviewed, but only two of the design alternatives were found to be practical and were taken to the point of a cost estimate. The three design alternatives include:

Alternative 1. Channel and slope stabilization with no upstream detention improvements

Alternative 2. Rock-lined channel and slope stabilization with upstream detention improvements

Alternative 3. Storm sewer pipe and slope stabilization with upstream detention improvements

#### ALTERNATIVE 1. CHANNEL AND SLOPE STABILIZATION WITH NO UPSTREAM DETENTION IMPROVEMENTS

Alternative 1 is the reestablishment of a stable channel bottom and slopes with no additional upstream improvements. With this option, the upstream catch basin would convey the 10-year storm event, but larger storm events would continue to flow overland, which results in the highest flows of any of the options for the channel. The channel flows under this option are 40.66 cfs with flows depths of 0.90 feet. With a safety factor of 1.5, these flows would require a rock-lined channel using Class V sized riprap. This is the largest rock sized by MNDOT and includes rock over 24 inches. Due to the large sized rock, this approach is considered cost-prohibitive and not practical, and was not analyzed further as part of this report.

#### UPSTREAM DETENTION IMPROVEMENTS

Upstream detention improvements are necessary for the both the piping and rock channel options. It provides the needed rate control to reduce the pipe size for the storm pipe option (Alternative 3), and to reduce the rock size for the rock-lined channel option (Alternative 2). Without the upstream detention improvements, the upstream catch basin in Hazeltine Bluff Park is overwhelmed by stormwater runoff in 10-year and larger storm events. In these events, flows are routed overland down to the ravine, resulting in high flows within the ravine (40.66 cfs) discussed in the previous section.

The detention improvements involve construction of a dry detention basin and new outlet replacing the existing catch basin upstream of the ravine. The improvements include excavation of the detention area west into the hillside along the existing park trail with a bottom elevation of 909.5 and a 15-inch pipe outlet at 909.5 that will tie into the existing pipe that discharges to the ravine. An embankment will be built on the downstream end to ensure flow discharges into the pipe rather than bypassing to the ravine. As proposed, the 100-year storm would be conveyed in the 15-inch pipe. A comparison of existing and proposed 100-year flows at the upstream end of the ravine is shown in the table below.

## C2 SEMINARY FEN RAVINE FEASIBILITY REPORT

design alternatives

February 11, 2022

	<b>Berm Elevation</b>	<b>HWL</b>	<b>Overtopping flow</b>	<b>Peak Outflow to Ravine</b>
<b>Scenario</b>	<b>(ft)</b>	<b>(ft)</b>	<b>(cfs)</b>	<b>(cfs)</b>
Existing	913.09	913.47	12.3	19.4
Recommended (Upstream Detention)	914.00	913.84	0.0	11.5

The proposed detention area grading and the 100-year HWL is contained almost entirely on the City's park property and the adjacent drainage and utility easements.

### ALTERNATIVE 2. ROCK-LINED CHANNEL AND SLOPE IMPROVEMENTS

The improvements for this option are provided on Figures 1 and 2 in Appendix B. The goal is to create a stable channel bottom and reestablish stable vegetated slopes. This will be accomplished by creating a rock-lined channel with rock weirs and select pool locations. The rock weirs and pools help to dissipate the flows, and the rock-lined channel will stabilize the channel bottom and protect the toe of slope from erosion (Figure 2). The new channel bottom will be raised approximately 3-4 feet to reestablish a channel bottom closer to the historical elevation and reduce the height of the vertical cut faces that currently exist. Given the steep ravine slopes and its history of erosion, it is recommended that the ravine be lined with angular rock with MNDOT Class IV gradation. Rock was sized using 100-year flows calculated in HydroCAD and the USDA NRCS Trapezoidal Riprap-Lined Waterway Design spreadsheet tool. Minimum riprap size was determined for each of the representative HydroCAD ravine sections. Based on 100-year storm flow depth (0.9 ft), the proposed channel is sized appropriately to convey the 100-year storm event without overtopping the rock. The proposed rock channel cross-sections will have a 6' channel bottom width and a 2' depth. The concept and details for this alternative are provided in Appendix B (Figures 1 and 2)

### ALTERNATIVE 3. STORM SEWER PIPE WITH VEGETATED CHANNEL AND SLOPE IMPROVEMENTS

An alternative to the channel improvements proposed above is to run storm sewer piping along the bottom of the existing ravine that would convey upstream detention flows and pick up intermediate ravine flows at storm structures placed at ravine bends. The pipe conveyance system will route direct discharges from offsite through a pipe to the bottom of the ravine. Over the pipe, a vegetated channel will be established to route localized flows. With this option, the velocities of flows are low enough so the channel bottom does not require rock throughout its length. A 6-foot-wide channel will be developed and stabilized with deep-rooted native vegetation and Turf Reinforcement Mat. Buried rock checks will be located along the ravine bottom to reduce the potential for head cutting. The concept and details for this alternative are provided in Appendix B (Figures 3 and 4).

The typical side slope improvements proposed for both Alternatives 2 and 3 are provided on Figure 5. The side slopes of the ravine will be graded to create a 2:1 or flatter slope in locations

## C2 SEMINARY FEN RAVINE FEASIBILITY REPORT

COST ESTIMATE  
February 11, 2022

where the 2:1 slope is exceeded. Trees will be removed in the graded area, and select tree removal will occur along the slopes and near the top of slope to open the canopy. The long slope length requires that 6-inch fiber biologs be placed parallel to the slope with approximately 8-foot spacing to break up the slope length and control erosion. Topsoil has eroded away along most of the slope. The slopes will be seeded with partial shade native state seed mix 36-211, which will provide a deep root structure to protect the ravine slopes. The seed will be covered with Earth Guard Fusion Extreme or a similar bonded fiber matrix product that provides nutrients and soil protection as the seeds develop.

### Side Channels

In several locations, concentrated flows carry surface runoff down steep bluff slopes to the ravine bottom. These steep slopes of the ravine cannot handle concentrated discharges, causing slope erosion in areas such as at station 7+00 from flows east of the ravine and near station 4+50 from the discharge at the existing 15-inch CMP under the trail. On the westerly side channel of the ravine, we propose to extend the 15-inch pipe down the ravine slope to the channel bottom to reduce slope discharge and erosion. The eastern location will have overland flow captured at the top of the slope in a catch basin and then routed down to the channel bottom in a pipe. The location of the discharges will need to be verified in the field prior to construction plans being completed. The concept and details for these proposed improvements are shown in Figures 1 and 3 in Appendix B.

## 6.0 COST ESTIMATE

Cost estimates have been prepared for both the channel and pipe alternatives. Cost estimates include a 15% construction contingency, as well as estimated indirect costs for engineering, legal, administrative, and other costs. The detailed cost estimates can be found in Appendix C. The estimated project costs are as follows:

	Alternative 2 (Rock-Lined Channel)	Alternative 3 (Storm Sewer Pipe with Vegetated Swale)
Estimated Construction Cost (Incl. 15% Contingencies)	\$615,000	\$580,00
Estimated Indirect Costs	\$200,000	\$200,000
Total Estimated Project Cost	\$815,000	\$780,000

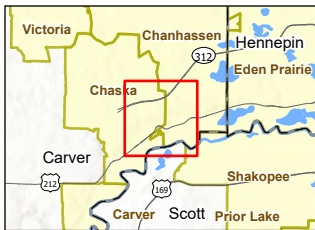
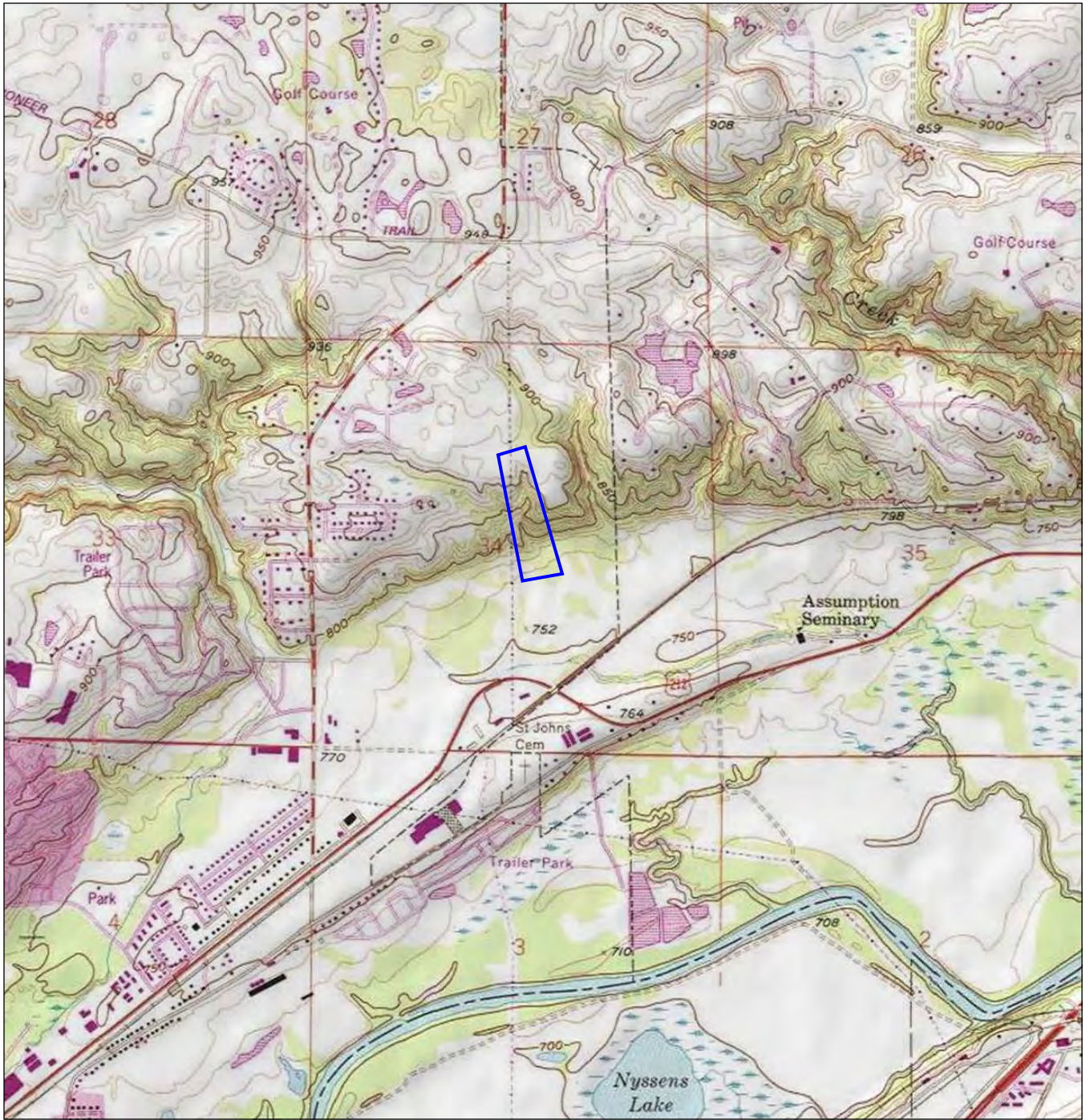
Conclusion  
February 11, 2022

### 7.0 CONCLUSION

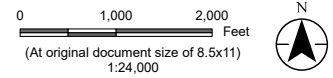
If completed, this project will reduce the sediment discharge to the Seminary Fen wetland complex by an estimated 322 tons per year. Seminary Fen supports dozens of rare, threatened, and special concern animal and plant species that are sensitive to sedimentation stress, so a reduction of sediment is critical to maintaining the unique characteristics of this wetland. This unique wetland community is valued by the State, County, local watershed, and City, so funding support from a variety of agencies is likely; however, the proposed storm sewer pipe alternative likely would not be funded by agencies such as the Board of Water and Soil Resources. Based on cost and funding support potential, we recommend the City move forward with the rock-lined channel option with upstream detention improvements (Alternative 2).

## FIGURES





**Legend**  
 Project Site C2 Ravine



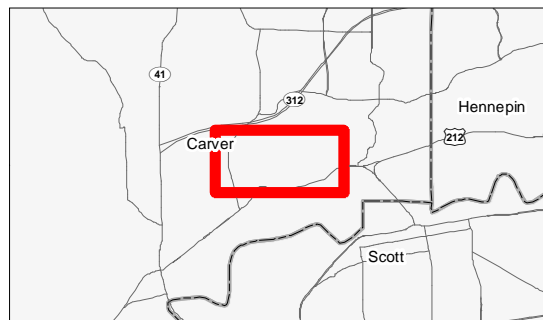
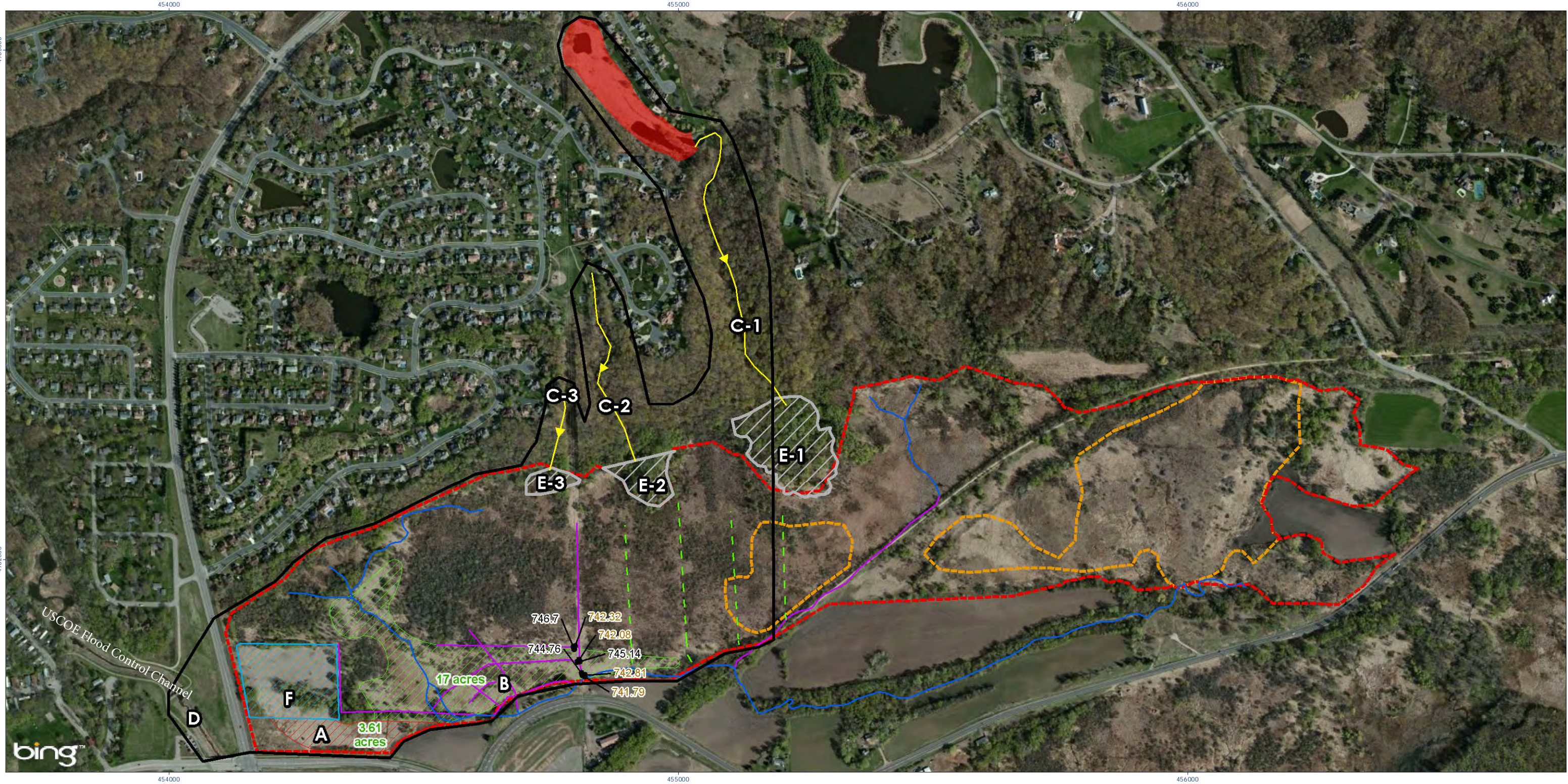
**Project Location** T116N, R23W, S34  
 C. of Chaska, Carver Co., MN  
**Client/Project** City of Chaska  
 Seminary Fen C2 Ravine

Prepared by SF on 2021-05-14  
 TR by MZ on 2022-01-26  
 IR by JS on 2022-01-26  
 193805279

**Figure No.**  
 1  
**Title**  
 Project Location and Topography

- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
  2. Data Sources: Stantec and USGS
  3. Background: USGS 7.5' Topographic Quadrangle





Legend

- Project Site
- Seminary Fen Wetland Complex (B)
- Calcareous Fen (Southeastern)
- Sedimentation Plumes (E-1, E-2, E-3)
- Natural Drainageway
- Potential Tile (No tile observed)
- Surface Ditch
- 745.14 Ditch Top Elevations
- 742.32 Ditch Bottom Elevations
- 2011 Wetland Restored (F)
- Potential Purchase and Wetland Restoration Area (A)
- Proposed Wetland Restoration Area (B)
- Hazeltine Bluff Wetland
- Ravines (C-1, C-2, C-3)



1:7,500 (At original document size of 11x17)



Notes  
 1. Coordinate System: NAD 1983 UTM Zone 15N  
 2. Data Sources Include: Stantec, USGS, and ESRI  
 3. Orthophotography: Microsoft Corporation, with permission

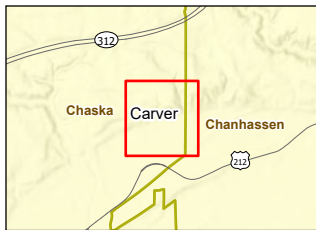
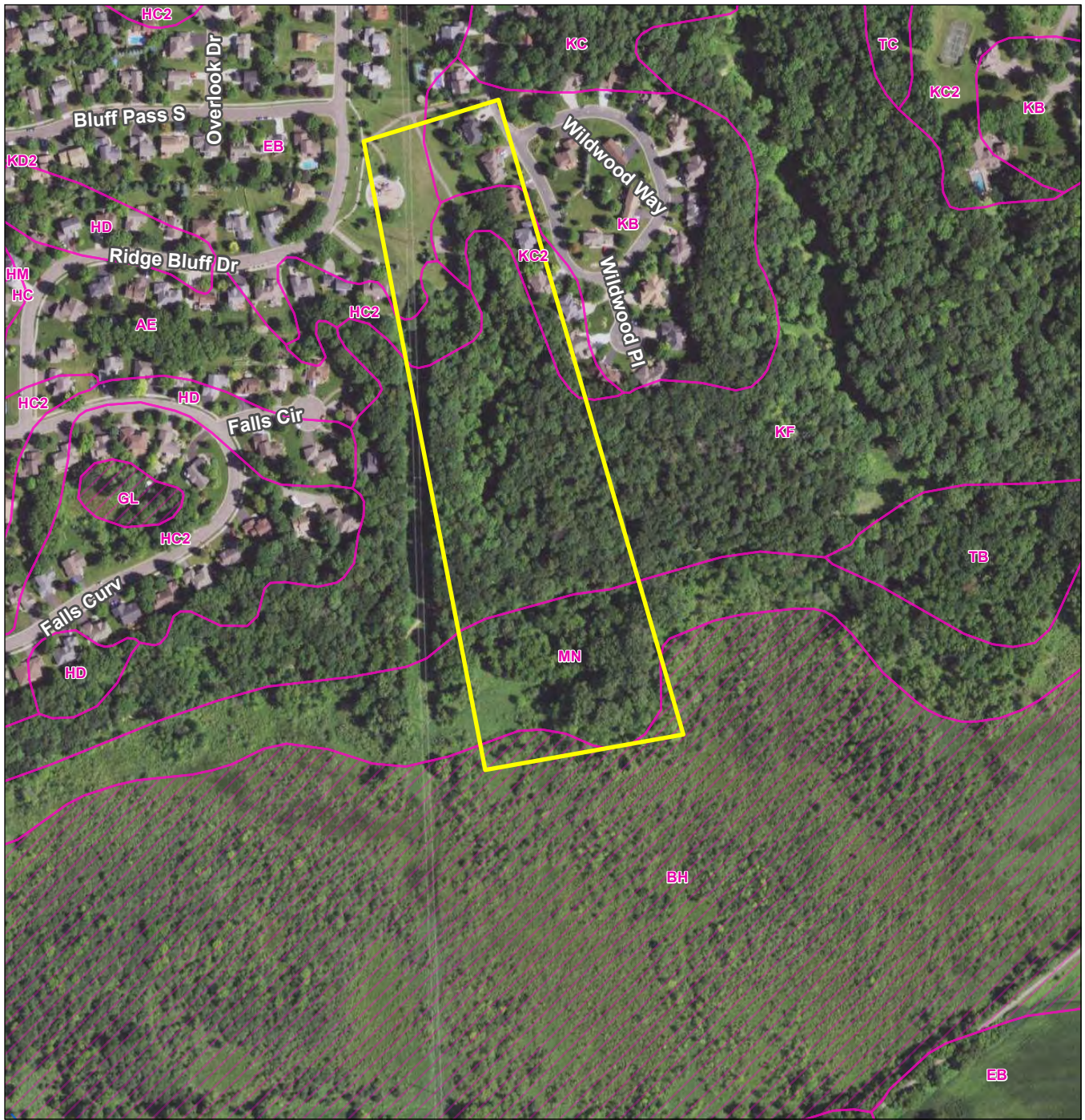
Figure No. **2**  
 Title **Ravines at Seminary Fen**

Client/Project  
 City of Chaska

Project Location 193702489  
 1116, R23, S34  
 C. of Chaska Prepared by CS on 2015-03-05  
 Carver Co., MN Technical Review by JS on 2015-09-18



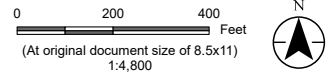




**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 15N  
 2. Data Sources: Stantec, USGS, NADS, NRCS  
 3. Background: 2019 NAIP

- Legend**
- Project Site C2 Ravine
  - NRCS Soil Survey Data**
  - Hydric Rating**
  - Predominantly Hydric Soil
  - Partially Hydric Soil
  - Non-Hydric Soil
  - National Hydrography Dataset**
  - Perennial Stream\*
  - Intermittent Stream
  - Waterbody\*

\*No Features Within Data Frame



**Project Location** T116N, R23W, S34  
 C. of Chaska, Carver Co., MN

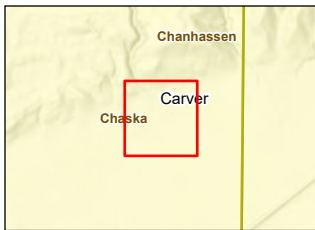
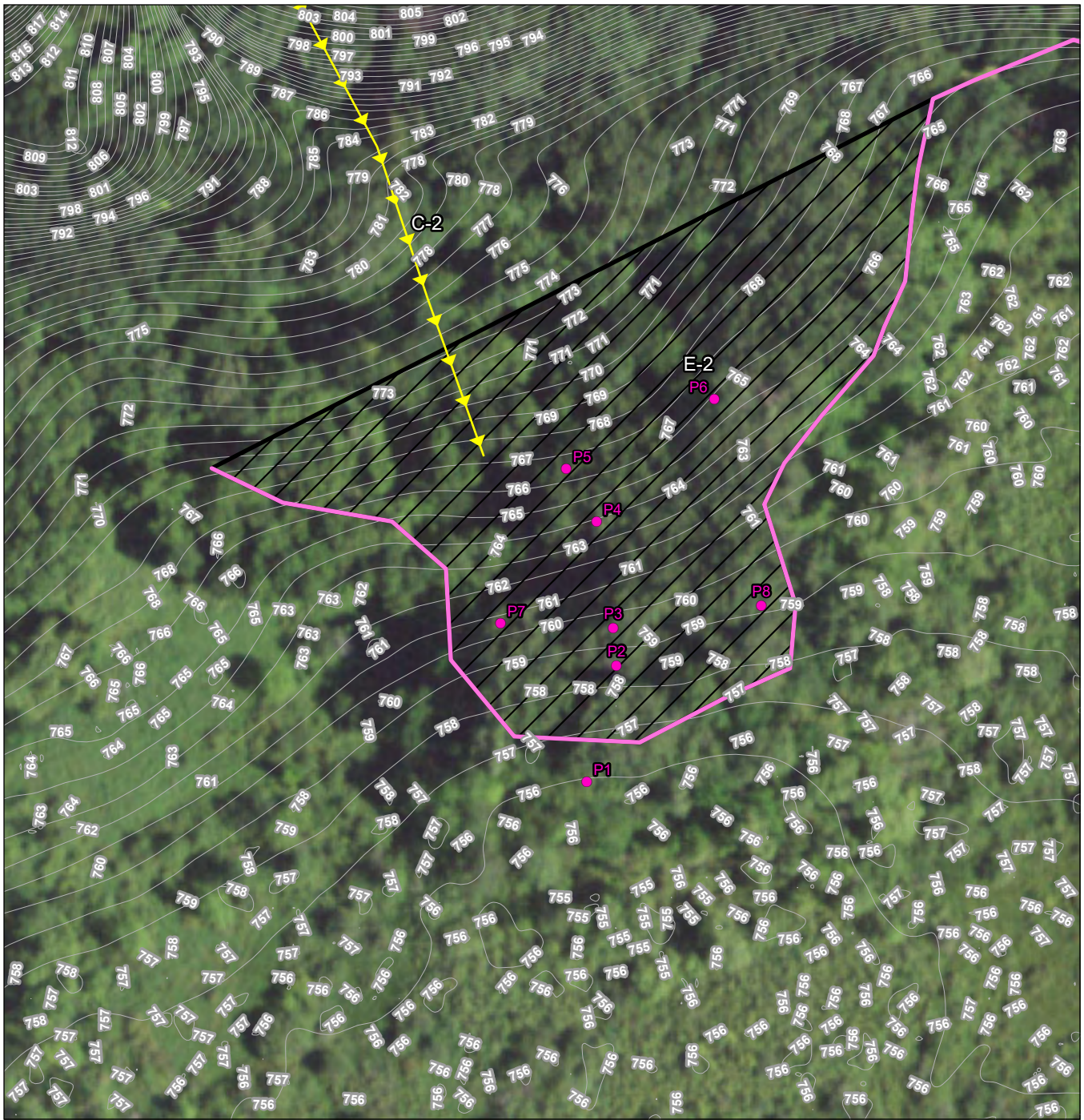
**Prepared by SF** on 2021-05-14  
**TR** by MZ on 2022-01-26  
**IR** by JS on 2022-01-26

**Client/Project** City of Chaska  
 Seminary Fen C2 Ravine

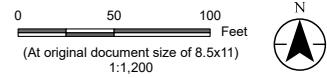
193805279

**Figure No.** 3  
**Title**  
**NRCS Soil Survey Data**





- Legend**
- Delineated Wetland Boundary
  - Sample Point
  - C2 Ravine
  - 1ft Lidar Elevation Contour
  - Approximate Sediment Plume Boundary 2.02 Ac.



**Project Location**  
 T116N, R23W, S34  
 C. of Chaska, Carver Co., MN

**Prepared by SF on 2021-05-14**  
**TR by MZ on 2022-01-26**  
**IR by JS on 2022-01-26**

**Client/Project**  
 City of Chaska  
 Seminary Fen C2 Ravine

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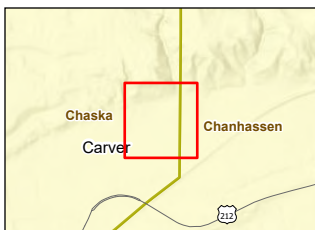
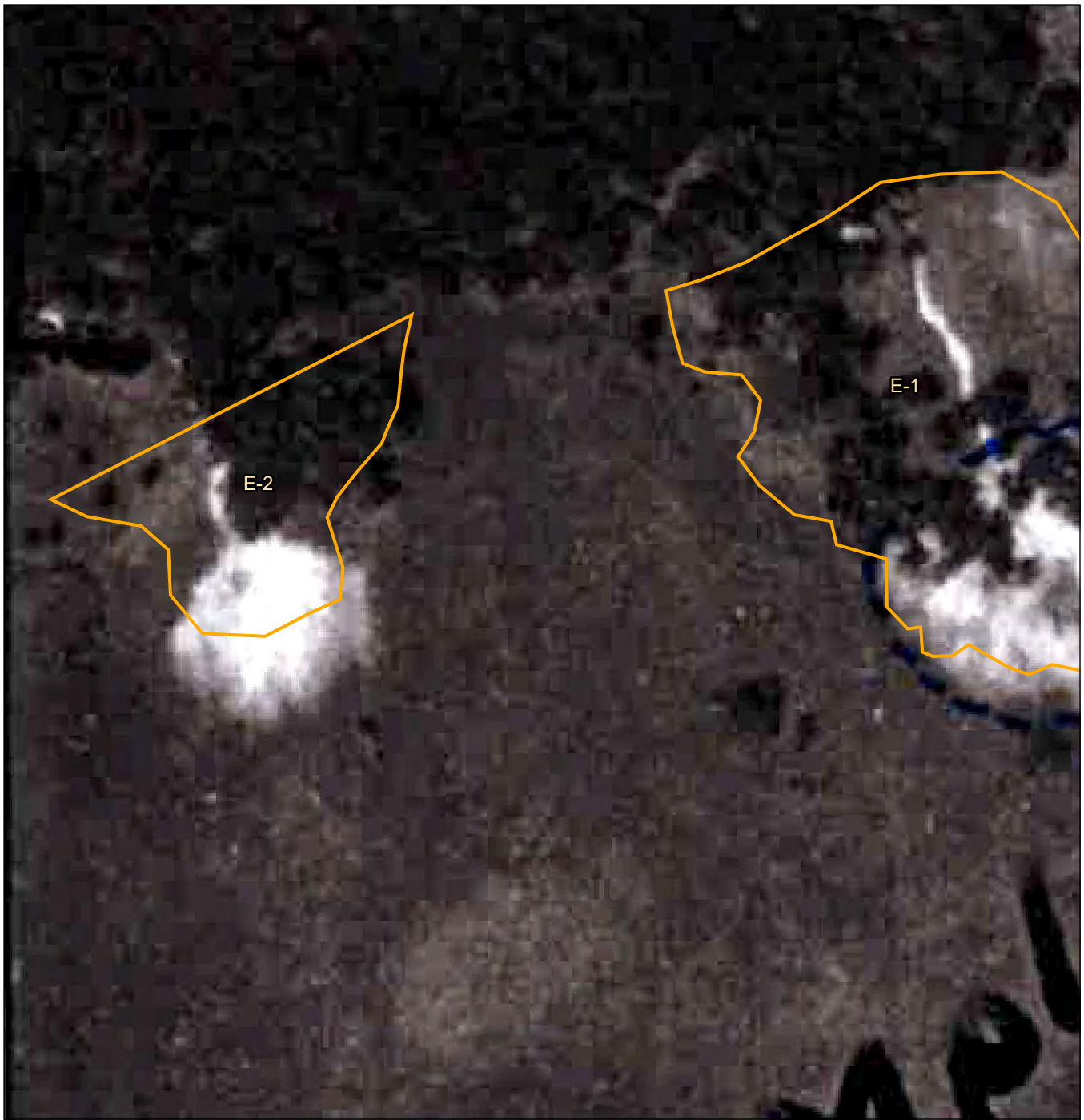
**Figure No.**  
**4**


**Title**  
**Sediment Plume Field Data**

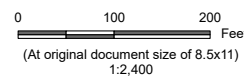
- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
  2. Data Sources: Stantec, USGS, NADS, MNGeo
  3. Background: 2019 NAIP

**APPENDIX A  
HISTORICAL IMAGERY**





**Legend**  
 Approximate Sediment Plume Boundary

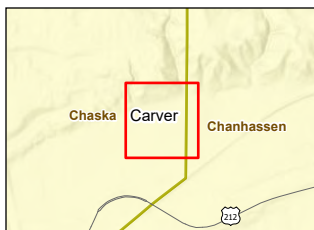
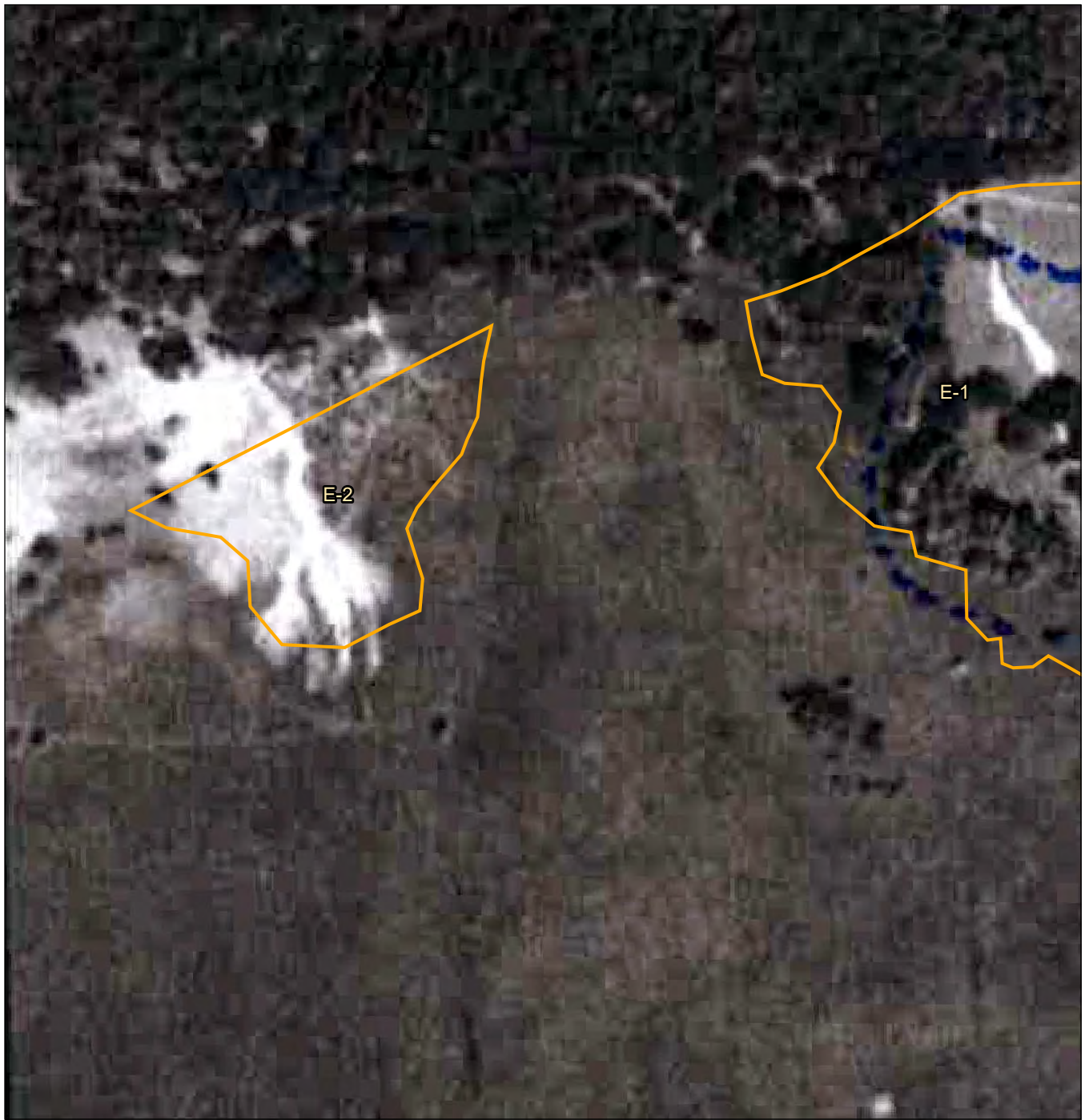



*Project Location* T116N, R23W, S34  
C. of Chaska, Carver Co., MN  
*Prepared by SF on 2021-05-14*  
*TR by MZ on 2022-01-26*  
*IR by JS on 2022-01-26*

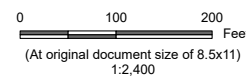
*Client/Project* City of Chaska  
Seminary Fen C2 Ravine  
193805279

*Figure No.* **Appendix A**

*Title*  
**Historic Imagery (1937)**  
**Approximate Sediment Plume**



**Legend**  
 Approximate Sediment Plume Boundary



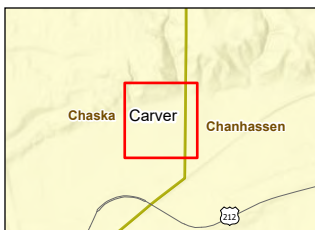
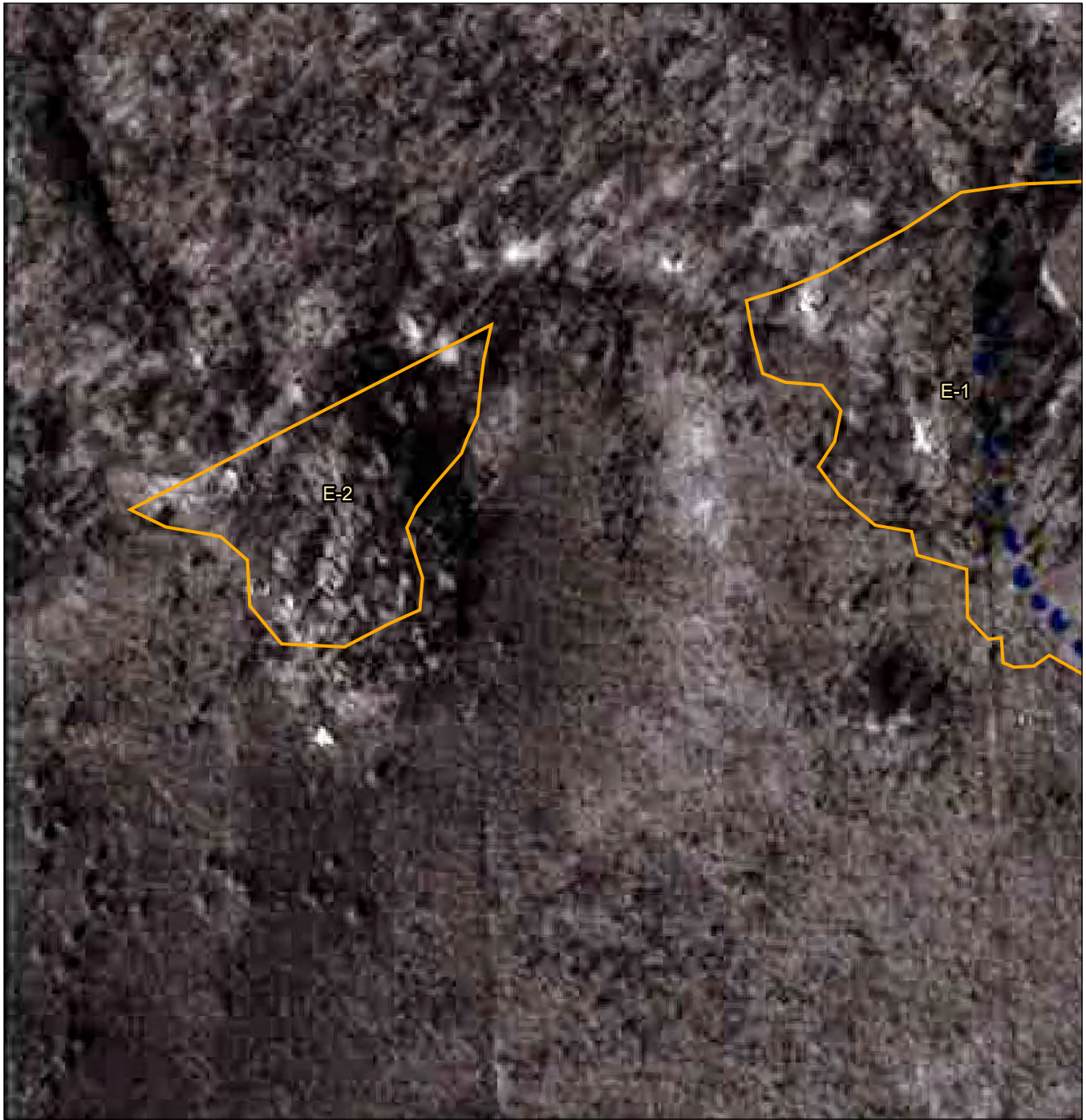
*Project Location* T116N, R23W, S34  
C. of Chaska, Carver Co., MN  
*Prepared by SF on 2021-05-14*  
*TR by MZ on 2022-01-26*  
*IR by JS on 2022-01-26*


*Client/Project* City of Chaska  
Seminary Fen C2 Ravine  
193805279

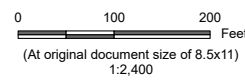
*Figure No.* Appendix A

*Title*  
**Historic Imagery (1940)  
Approximate Sediment Plume**





**Legend**  
 Approximate Sediment Plume Boundary



*Project Location* T116N, R23W, S34  
C. of Chaska, Carver Co., MN  
*Prepared by SF on 2021-05-14*  
*TR by MZ on 2022-01-26*  
*IR by JS on 2022-01-26*

*Client/Project* City of Chaska  
Seminary Fen C2 Ravine  
193805279

*Figure No.* Appendix A

*Title*  
**Historic Imagery (1966)  
Approximate Sediment Plume**

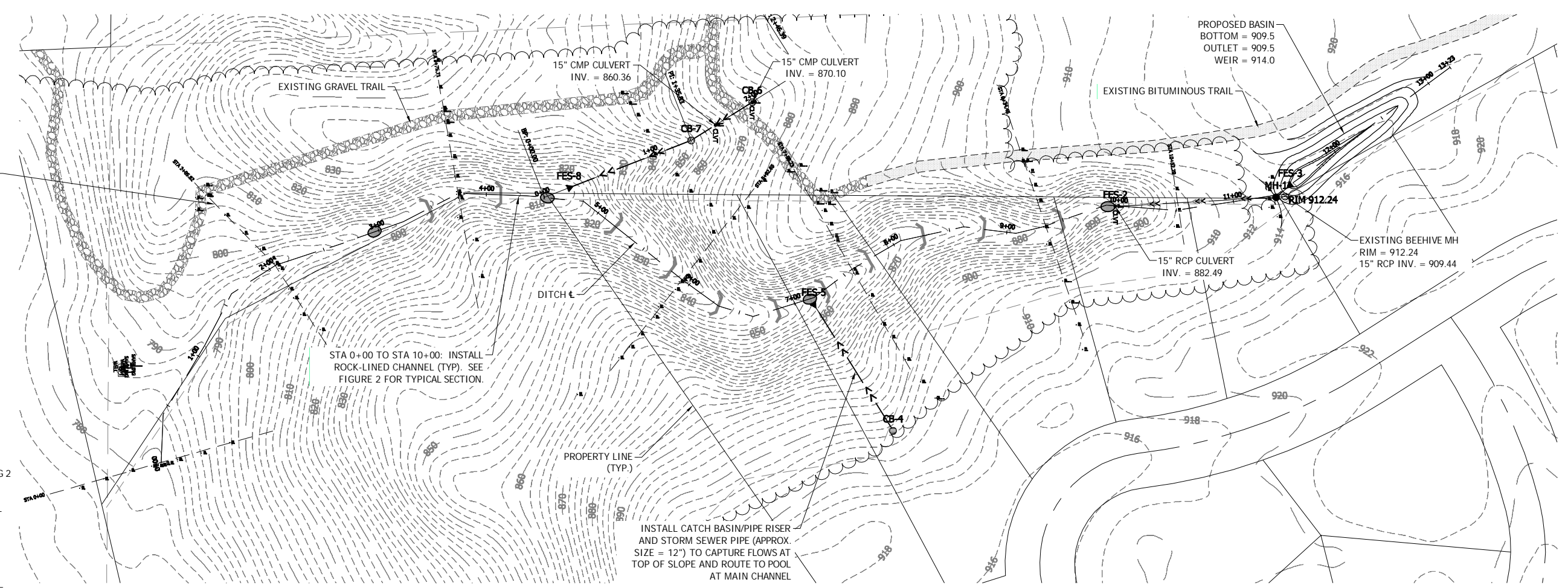
**APPENDIX B  
DESIGN ALTERNATIVES**

THE CONTRACTOR SHALL VERIFY AND BE RESPONSIBLE FOR ALL DIMENSIONS. DO NOT SCALE THE DRAWING. ANY ERRORS OR OMISSIONS SHALL BE REPORTED TO STANTEC WITHOUT DELAY. STANTEC SHALL BE RESPONSIBLE FOR ANY REPRODUCTION OF THIS DRAWING OR USE FOR ANY PURPOSE OTHER THAN THAT AUTHORIZED BY STANTEC'S PERMISSION.

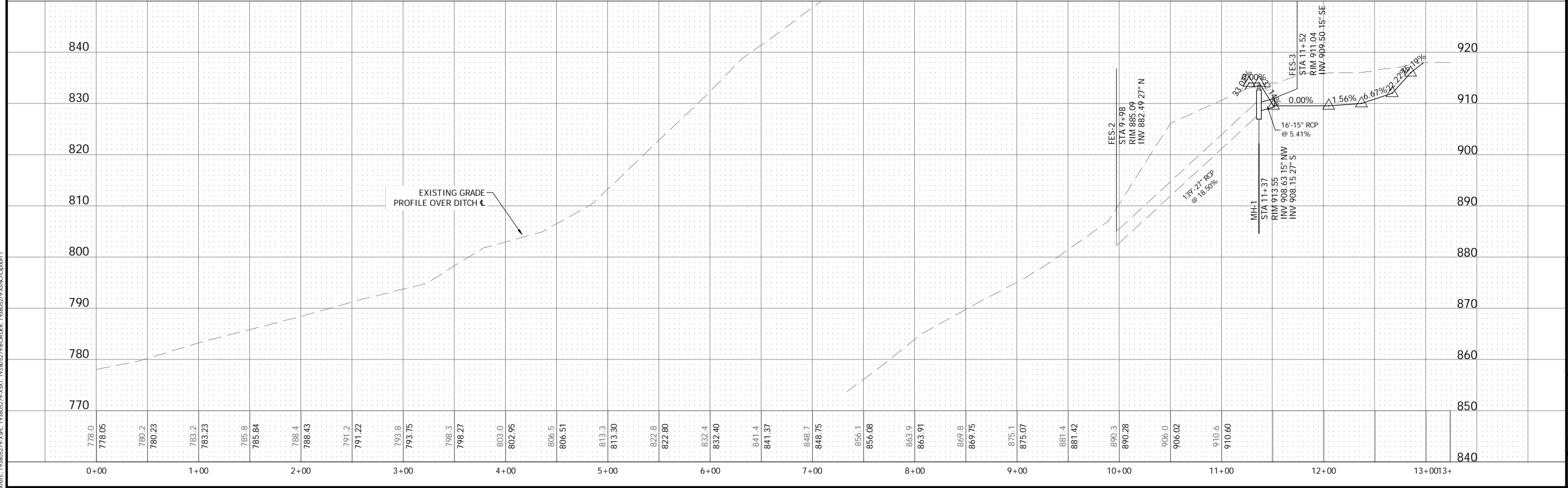
CROSS SECTIONS FROM PRELIM. SURVEY (TYP.)

LEGEND

- PROPOSED POOL - SEE DETAIL ON FIG 2
- PROPOSED ROCK WEIR - SEE DETAIL ON FIG 2
- PROPOSED STORM SEWER PIPE
- PROPOSED STORM SEWER STRUCTURE



MAIN CHANNEL



Plot Date: 02/07/2022 - 12:45pm  
 Drawing Name: \\193805279\193805279\CAD\Drawings\193805279\193805279-XSAP-Option 1.dwg  
 Xref: 193805279-XSAP-Option 1.dwg; 193805279-XSAP-Option 1.dwg



I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A LICENSED ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.  
 PRINT NAME: KELIE M. SCHEGEL  
 SIGNATURE: \_\_\_\_\_  
 DATE: \_\_\_\_\_ LIC. NO.: 4520

CITY OF CHASKA, MINNESOTA  
 C2 SEMINARY FEN RAVINE  
 ALTERNATIVE 2  
 PROPOSED ROCK-LINED CHANNEL

NO	REVISION	DATE

APPROVED: \_\_\_\_\_  
 PROJ. NO.: 193805279











**APPENDIX C  
COST ESTIMATES**

C2 Ravine Stabilization  
 Cost Estimate - Alternative 2: Rock-Lined Channel  
 2/9/2022

Ravine Stabilization Improvements - Rock-Lined Channel	Unit	Quantity	Unit Price	Total Price
Mobilization	LS	1	\$ 25,000.00	\$ 25,000.00
Traffic Control	LS	1	\$ 3,000.00	\$ 3,000.00
Storm Sewer Bypass	LS	1	\$ 5,000.00	\$ 5,000.00
Temporary Rock Construction Entrance	EA	1	\$ 1,500.00	\$ 1,500.00
Culvert Protection	EA	4	\$ 300.00	\$ 1,200.00
Street Sweeper with Pick-up Broom & Operator	HR	12	\$ 150.00	\$ 1,800.00
Clearing and Grubbing	LS	1	\$ 40,000.00	\$ 40,000.00
Grading Eroded Vertical Faces	LS	1	\$ 40,000.00	\$ 40,000.00
Granular Filter Material	CY	300	\$ 70.00	\$ 21,000.00
Geotextile Fabric	SY	1800	\$ 4.00	\$ 7,200.00
Class 2 Random Riprap	CY	262	\$ 110.00	\$ 28,824.89
Class 3 Random Riprap	CY	22	\$ 120.00	\$ 2,640.00
Class 4 Random Riprap	CY	1310	\$ 150.00	\$ 196,533.33
Class 5 Random Riprap	CY	73	\$ 170.00	\$ 12,466.67
12" RCP Storm Sewer	LF	140	\$ 80.00	\$ 11,200.00
15" RCP Storm Sewer	LF	200	\$ 90.00	\$ 18,000.00
27" Beehive Catch Basin	EA	1	\$ 2,000.00	\$ 2,000.00
4' Dia. Storm Sewer CBMH	EA	2	\$ 4,000.00	\$ 8,000.00
12" Flared End Section	EA	1	\$ 1,500.00	\$ 1,500.00
15" Flared End Section	EA	3	\$ 1,800.00	\$ 5,400.00
Connect to Existing Storm Sewer	EA	1	\$ 1,500.00	\$ 1,500.00
Restore Gravel Trail	SY	225	\$ 20.00	\$ 4,500.00
Restore Bituminous Trail	SY	120	\$ 35.00	\$ 4,200.00
Silt Fence, Machine Sliced	LF	1000	\$ 3.00	\$ 3,000.00
Fiber Biolog	LF	10000	\$ 3.00	\$ 30,000.00
Seeding Mix 34-261 & Erosion Control Blanket	SY	1700	\$ 4.00	\$ 6,800.00
Seeding Mix 36-211 & Bonded Fiber Matrix	SY	15000	\$ 3.50	\$ 52,500.00
Subtotal Construction				\$ 534,764.89
Construction Contingency (15%)				\$ 80,214.73
Estimated Construction Cost				\$ 614,979.62
Indirect Costs (Engineering, Legal, Admin.)				\$ 200,000.00
Estimated Project Cost				\$ 814,979.62

C2 Ravine Stabilization  
 Cost Estimate - Alternative 3: Storm Sewer Pipe with Vegetated Channel  
 2/9/2022

Ravine Stabilization Improvements - Storm Sewer Pipe	Unit	Quantity	Unit Price	Total Price
Mobilization	LS	1	\$ 25,000.00	\$ 25,000.00
Traffic Control	LS	1	\$ 3,000.00	\$ 3,000.00
Storm Sewer Bypass	LS	1	\$ 5,000.00	\$ 5,000.00
Temporary Rock Construction Entrance	EA	1	\$ 1,500.00	\$ 1,500.00
Culvert Protection	EA	4	\$ 300.00	\$ 1,200.00
Street Sweeper with Pick-up Broom & Operator	HR	12	\$ 150.00	\$ 1,800.00
Remove Storm Sewer Pipe	LF	12	\$ 150.00	\$ 1,800.00
Clearing and Grubbing	LS	1	\$ 40,000.00	\$ 40,000.00
Grading Eroded Vertical Faces	LS	1	\$ 40,000.00	\$ 40,000.00
Granular Filter Material	CY	100	\$ 70.00	\$ 7,000.00
Geotextile Fabric	SY	150	\$ 4.00	\$ 600.00
Class 3 Random Riprap	CY	110	\$ 120.00	\$ 13,200.00
12" RCP Storm Sewer	LF	140	\$ 80.00	\$ 11,200.00
15" RCP Storm Sewer	LF	356	\$ 90.00	\$ 32,040.00
24" RCP Storm Sewer	LF	280	\$ 120.00	\$ 33,600.00
30" RCP Storm Sewer	LF	342	\$ 130.00	\$ 44,460.00
36" RCP Storm Sewer	LF	189	\$ 140.00	\$ 26,460.00
48" RCP Storm Sewer	LF	180	\$ 150.00	\$ 27,000.00
27" Beehive Catch Basin	EA	1	\$ 2,000.00	\$ 2,000.00
4' Dia. Storm Sewer CBMH	EA	3	\$ 4,000.00	\$ 12,000.00
5' Dia. Storm Sewer CBMH	EA	4	\$ 5,000.00	\$ 20,000.00
6' Dia. Storm Sewer CBMH	EA	2	\$ 6,000.00	\$ 12,000.00
7' Dia. Storm Sewer CBMH	EA	3	\$ 8,000.00	\$ 24,000.00
12" Flared End Section	EA	1	\$ 1,500.00	\$ 1,500.00
15" Flared End Section	EA	2	\$ 1,800.00	\$ 3,600.00
48" Flared End Section	EA	1	\$ 5,000.00	\$ 5,000.00
Restore Gravel Trail	SY	225	\$ 20.00	\$ 4,500.00
Restore Bituminous Trail	SY	120	\$ 35.00	\$ 4,200.00
Silt Fence, Machine Sliced	LF	1000	\$ 3.00	\$ 3,000.00
Fiber Biolog	LF	10000	\$ 3.00	\$ 30,000.00
Seeding Mix 34-261 & Turf Reinforcement Mat	SY	3000	\$ 5.00	\$ 15,000.00
Seeding Mix 36-211 & Bonded Fiber Matrix	SY	15000	\$ 3.50	\$ 52,500.00
Subtotal Construction				\$ 504,160.00
Construction Contingency (15%)				\$ 75,624.00
Estimated Construction Cost				\$ 579,784.00
Indirect Costs (Engineering, Legal, Admin.)				\$ 200,000.00
Estimated Project Cost				\$ 779,784.00