Environmental Impact Assessment

Mill Creek Ravine Pedestrian Bridge #278
Rehabilitation and Trail Upgrades
Project: EB213002

Prepared for:

City of Edmonton, Integrated Infrastructure Service

Edmonton, Alberta

February 2022

Environmental Impact Assessment

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Prepared for:
City of Edmonton, Integrated Infrastructure Services
Edmonton, AB

Prepared by:
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25 February 2022
Wood Project: EB213002

City of Edmonton
Integrated Infrastructure Services, Infrastructure Planning & Design
12th Floor Edmonton Tower
10111 104 Avenue NW
Edmonton AB T5J 0J4

Attention: **Integrated Infrastructure Services, Infrastructure Planning & Design**

Reference: **Environmental Impact Assessment**
Mill Creek Ravine Pedestrian Bridge #278

On behalf of the City of Edmonton Integrated Infrastructure Services, Wood Environment & Infrastructure Solutions (Wood) is pleased to provide this Environmental Impact Assessment for proposed rehabilitation and trail upgrade for Mill Creek Pedestrian Bridge #278. The report was prepared to meet the information requirements for an Environmental Impact Assessment pursuant to City of Edmonton *Bylaw 7188: North Saskatchewan River Valley Area Redevelopment Plan*. The City of Edmonton completed their review and signed-off on the proposed Mill Creek B278 project under the *North Saskatchewan River Valley Area Redevelopment Plan (NSRV ARP)* in the letter dated January 4, 2022.

This Environmental Impact Assessment report outlines the assessment of potential effects of the proposed Project, as well as recommendations to minimize or address potential adverse environmental effects. Based on review by the City of Edmonton, with implementation of conditions and advisements provided by the reviewers during circulation of the EIA, including adherence to standard construction and operation BMPs and recommended mitigation measures described in this EIA, the objectives and policies relating to environmental protection and land use planning goals in the *NSRV ARP* can be achieved.

Please contact the undersigned at (780) 720-7825 if you have any questions about this report. We thank you for the opportunity to have been of service to you.

Sincerely,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Paul Kalashnikoff, RPBio, PBiol
Associate Environmental Biologist

Executive Summary

Introduction

The City of Edmonton proposes the bridge replacement and upgrade of approach trails of the Mill Creek Pedestrian Bridge B278. The Project is located in Mill Creek Ravine within the boundaries of City of Edmonton *Bylaw 7188: North Saskatchewan River Valley Area Redevelopment Plan*. Wood Environment & Infrastructure Solutions (Wood) was retained to prepare the engineering design and Environmental Impact Assessment pursuant to the City of Edmonton *Bylaw 7188: North Saskatchewan River Valley Area Redevelopment Plan ('Bylaw 7188')*.

Environmental review of development activities within the North Saskatchewan River valley is undertaken pursuant to the *Bylaw 7188*. The purpose of Bylaw 7188 is to protect the North Saskatchewan River valley and ravine system as part of Edmonton's valuable open space heritage. Policy requires an environmental review of developments in the *North Saskatchewan River Valley Area Redevelopment Plan* (NSRV ARP)[1].

The Projects team consisting of the Wood engineering team and the City of Edmonton Project proponent Transportation Planning and Design, Integrated Infrastructure Services, and Urban Growth and Open Spaces, Planning and Environment Services conducted an initial project review (IPR) meeting on July 7, 2021. The purpose of the IPR was to review of the proposed Project and level of environmental review pursuant to the NSRV ARP. Bylaw 7188 requires that all proposals for the development of a major facility that is publicly owned or is developed on public lands are subject to an Environmental Impact Assessment (EIA). Based on the Project description it was determined that an EIA was the appropriate level of environmental review under the NSRV ARP (A. Adhikari pers. comm). This EIA was prepared in accordance with the EIA Terms of Reference approved by City of Edmonton. A summary of the consultation process and EIA signoff under the NSRV ARP is provided in Section 8.0 of this report.

Project Overview

The Project will involve replacement of the existing two-span timber bridge with a new 3.0 m wide by 12m length single span steel truss with bridge abutments outside or above the active channel defined by the ordinary high-water level (OHW[2]). Headslopes will be constructed at 2H:1V slope and armoured with Class 2 rock riprap extending over the full width of the channel for a depth of 800 mm underlain by non-woven geotextile fabric. The streambed and banks will be reconstructed with riprap extending upstream for 8 m along the north (right) bank and 5 m along the south (left) bank to arrest lateral bank erosion and scour. Riprap will also extend for a 5 m length downstream of the bridge. The channel armouring will transition smoothly into the upstream and downstream natural channel of Mill Creek.

The existing pedestrian trails will be reconstructed for a length of approximately 80 m east and 90 m west of B278. Retaining walls will be constructed at the bridge/trail interface and approach trails for a 21 m length north of B278 and 12 m length south of the bridge to limit fill encroachment and reduce impacts on wooded areas and loss of trees. The retaining walls will be constructed of timber post and lagging. The existing trail will be reconstructed to a 2.4 m wide granular path, with 2:1 embankment side slopes and will be raised between 0.9 and 1.6 m higher than the current grade. Class 1M riprap or better will be installed over a 30 m length of the trail embankment from station 1+145 to 1+175. The new granular trail

1 City of Edmonton (COE). 2000. A Guide to Environmental Review Requirements in the North Saskatchewan River Valley and Ravine System. Edmonton, Alberta.

2 Ordinary high water mark (OHW) – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/ bank-full level" which is often the 1:2 year flood flow return level.

will meet City of Edmonton standards per the requirements shown on City standard drawing 5170 and other relevant City specifications. The trail reconstruction will involve installation of two 600 mm diameter cross-drainage culverts at Station 1+040 and 1+145, respectively, as per drawing MICR-P211-G02 (Appendix A.2). Class 1 or 2 riprap will be installed at the culvert invert ends for erosion control.

All disturbed areas will be revegetated as soon as possible following construction with the objective of permanently stabilizing disturbed areas within one growing season of construction completion. A site-specific replanting plan will be developed during the detailed design phase to include topsoiling, native shrub potted stock plantings, seeding and erosion and sediment control measures. In accordance with the City of Edmonton (2020) *Natural Stand Valuation Guidelines and/or* (2016a) *Guidelines for the Evaluation of Trees*, equitable compensation will be made for the loss of City trees resulting from new disturbed area along the trail reconstruction.

Environmental Assessment Methods

Baseline information for the Project study areas was compiled by reviewing existing reports (including existing environmental studies completed in the Project area), maps and satellite imagery, available provincial and federal environmental databases, and a field reconnaissance of the Site in July 2021. This information was used to gather site-specific information relevant to the Project and identify potential environmental issues of the Project on biophysical resources within the principal disturbance area (PDA), local study area (LSA), and regional study area (RSA), where applicable.

The assessment was based on review of the Project description, background information review, and field reconnaissance. This information was used to identify and assess potential effects of the proposed Project on the environment. Residual effects were assessed following the implementation of mitigation measures developed to address or minimize adverse environmental effects. The assessment also considered any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out in the RSA.

Potential Environmental Impacts and Residual Effects

The Project may affect **soil quality** from admixing, compaction, erosion, or contamination due to spills or leaks. These effects can be successfully mitigated with recommended mitigation measures and standard construction BMPs, including soil salvage and handling, erosion and sediment control measures, and reclamation and revegetation. A spill prevention and response plan will be implemented as part of the Contractor's Environmental Operation Construction (ECO) Plan. Mitigation measures identified to address potential effects on geology, geomorphology and soils within the study area are anticipated to fully mitigate potential negative environmental effects.

The Project will result in a new proposed disturbance footprint of 328 m^2, which includes previously undisturbed native **vegetation**. In accordance with the *Corporate Tree Management Policy C456C,* tree loss will be determined and equitable compensation for the loss and/or damages to City trees will be recovered in accordance with the City of Edmonton Natural Stand Valuation Guidelines and/or the City of the Edmonton Guidelines for the Evaluation of Trees. There is also potential for damage to trees adjacent construction access and laydown areas. A tree protection plan will be developed with the Contractor for existing trees within the Project footprint and 5 m of any construction. The potential for rare plants or unique plant communities of the LSA was considered to be low due to absence of rare plants during the spring and summer surveys. Indirect effects on vegetation resources may include the spread of non-native/invasive vegetation species and dust impacts. With implementation of recommended mitigation measures, including revegetation as soon as possible following construction and implementation of a site-

specific replanting plan residual effects on vegetation are considered to be low, limited to the PDA and reversible.

The project will result in the loss of localized native **Wildlife** habitat that is well represented in Mill Creek ravine. Mill Creek Ravine at the project site is a Biodiversity Core Area and Key Wildlife and Biodiversity Zone. Residual effects for direct habitat loss was considered to be low in magnitude, long-term and irreversible. Residual effect of direct habitat loss was considered to be low, limited to the PDA, and irreversible. Common wildlife urban-generalist species would be habituated to noise and activity disturbance and were expected to avoid construction activities and habitats in the immediate vicinity during the day and return during periods of inactivity (e.g., overnight). Wildlife mortality risk during construction and operation was assessed as low. Residual effects identified for sensory disturbance, habitat avoidance, and direct mortality were considered to be low, limited to the PDA and reversible. The project was expected to accommodate wildlife passage in accordance with City of Edmonton *Wildlife Passage Engineering Design Guidelines*.

With respect to the **fish and fish habitat**, Project works will result in the alteration of approximately 160 m^2 channel area below the OHW. The proposed works are expected to ehance fish habitat productivity for the expected warm water fish community of simple forage fish. Effects to **surface water quality** and the aquatic environment of the creek during the construction and operation phases of the Project will be mitigated through Project design and implementation of mitigation measures outlined in the Contractor's ECO Plan. The combination of riprap and revegetation was expected to stabilize the newly reconstructed channel bed and banks and reduce/eliminate future erosion and sediment transport. With implementation of recommended mitigation measures, including revegetation and temporary erosion and sediment control measures outlined in the Contractor's ECO Plan residual effects related to sediment and contaminant inputs were considered reversible. The new bridge and trail upgrades were designed to prevent flooding for a Q1:25 and Q1:10 year event, respectively. Future flood events at or below the Q1:25 year event were expected to be mitigated where debris removal at the new bridge and EPCOR inlet structure are carried out regularly (at less than 33% blockage) and after major flood events to maintain the hydraulic opening of the structures. Where recommended mitigation measures are implemented, residual effects are considered to be low, limited to the PDA and reversible.

Based on review of the project there are no Domestic Use Aquifers near the LSA, and there are no water wells listed in the Alberta Water Well Database that could be considered potentially vulnerable to the proposed work. No mitigation measures are required during the work program to protect or conserve **groundwater** resources in the LSA.

Project effects on **air quality** are attributed to an increase in air emissions from traffic, equipment, and activities during the construction phase. With the implementation of recommended mitigation measures, including dust abatement, residual effects on air quality are anticipated to be low and reversible. **Noise** impacts are only anticipated during construction, during daytime hours in accordance with the City of Edmonton Community Standards Bylaw and are considered to be negligible.

Effects to **socio-economic** resources include potential interruption of public trail and park open area use, or potential for injury to recreational users from construction equipment, particularly in staging areas. With fencing of equipment and staging areas, and signage to direct the public around the site during construction, effects are anticipated to be negligible. Improved pedestrian connectivity due to bridge and trail reconstruction is anticipated to provide positive long-term effects to lands applicable to *Bylaw 7188*.

Where the project results in disturbance of undisturbed land along the watercourse terraces, including surface and deep deposits, there is the potential for impacts to **historic resources.** Residual effect of the Project resulting from impacts to historic resources was predicted to be not significant. Impacts to historic resources are irreversible however mitigation measures required under the issued Historical Resources Act (HRA) approval will be implemented.

Cumulative Environmental Effects
Residual effects of the Project, such as loss of vegetation and wildlife habitat, changes in soils, fish habitat, noise and air quality, and socio-economics were identified for the Project as low in magnitude, and considered to be not significant.

Stakeholder Communication
Transportation Planning and Design and Transportation Infrastructure conducted a Public Engagement Decision Mapping Exercise for the Project. It was determined that due to the technical nature of the existing bridge replacement at the existing B278 bridge location, the Project did not have a meaningful opportunity for public engagement. The project will follow public advisory communication channels (Project website), request the Neighborhood Resource Coordinators to inform their contact within impacted community leagues, install signage and "letter drops" prior to construction.

The Project Team also help public information session for select stakeholders to communicate details of the Project. Stakeholders included community leagues, environmental organizations, and river valley user groups who would be affected by the Project. As a result of these stakeholder meetings, the Project team was provided with valuable feedback, to be taken into consideration during the next stages of the Project.

Follow-up
At the time of writing, detailed design was not completed. As such, some environmental effects or constraints cannot be confirmed, primarily due to ongoing design detail and pending construction plans to be determined in conjunction with the selected Contractor. However, based on past experience with similar Projects and good understanding of Project related effects, scientific confidence in the residual effects was considered high.

Conclusion
The EIA was based on existing baseline information as well as field surveys that were undertaken as part of this Project to identify and evaluate the environmental effects of the proposed Project on environmental and socio-economic resources. Residual effects ratings were based on an assessment of effects following mitigation measures identified to eliminate or minimize potential adverse impacts. Overall, potential adverse effects can be effectively mitigated through technically and economically feasible construction and operation BMPs and mitigation measures. Adverse residual effects are predicted to be not significant for construction and operation phases of the Project for all environmental components. This environmental assessment of the Project supports the conclusion that the Project will be developed to minimize disturbance to the natural environment and land uses occurring at the Project, and in a manner that protects the environment. The City of Edmonton Urban Planning and Economy, Planning and Environment Services coordinated inter-departmental review and sign-off on this Mill Creek B278 EIA, confirming Administration had no further concerns with the proposed development under the North Saskatchewan River Valley Area Redevelopment Plan with implementation of conditions and advisements outlined in this EIA report.

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List of Appendices

Acronyms

ACO	Aboriginal Consultation Office
AEP	Alberta Environment and Parks
ARP	North Saskatchewan River Valley Area Redevelopment Plan
B278	Pedestrian Bridge B278
BMP	Best Management Practices
Bylaw 7188	*Bylaw 7188: North Saskatchewan River Valley Area Redevelopment Plan*
COE	City of Edmonton
CSW	Alberta Culture and Status of Women
DFO	Department of Fisheries and Oceans Canada
DLO	Department License of Occupation
ECO Plan	Environmental Construction Operations (ECO) Plan
EDS	Electronic Disposition System
EIA	Environmental Impact Assessment
FWIMT	AEP Fish and Wildlife Internet Mapping Tool
IPR	Initial Project Review
NSRV ARP	North Saskatchewan River Valley Area Redevelopment Plan
QAES	Qualified Aquatic Environment Specialist
SIR	Supplemental Information Request

1.0 Introduction

The City of Edmonton (COE) proposes the bridge replacement and upgrade of approach trails of the Mill Creek Pedestrian Bridge B278. The Project is located in Mill Creek Ravine within the boundaries of City of Edmonton *Bylaw 7188: North Saskatchewan River Valley Area Redevelopment Plan*. Wood Environment & Infrastructure Solutions (Wood) was retained to prepare the engineering design and Environmental Impact Assessment pursuant to the City of Edmonton *Bylaw 7188*.

1.1 EIA Objectives

Environmental review of development activities within the North Saskatchewan River valley is undertaken pursuant to the *Bylaw 7188: North Saskatchewan River Valley Area Redevelopment Plan ('Bylaw 7188')*. The purpose of Bylaw 7188 is to protect the North Saskatchewan River valley and ravine system as part of Edmonton's valuable open space heritage. Policy requires an environmental review of developments occurring in the *North Saskatchewan River Valley Area Redevelopment Plan* (ARP)[3].

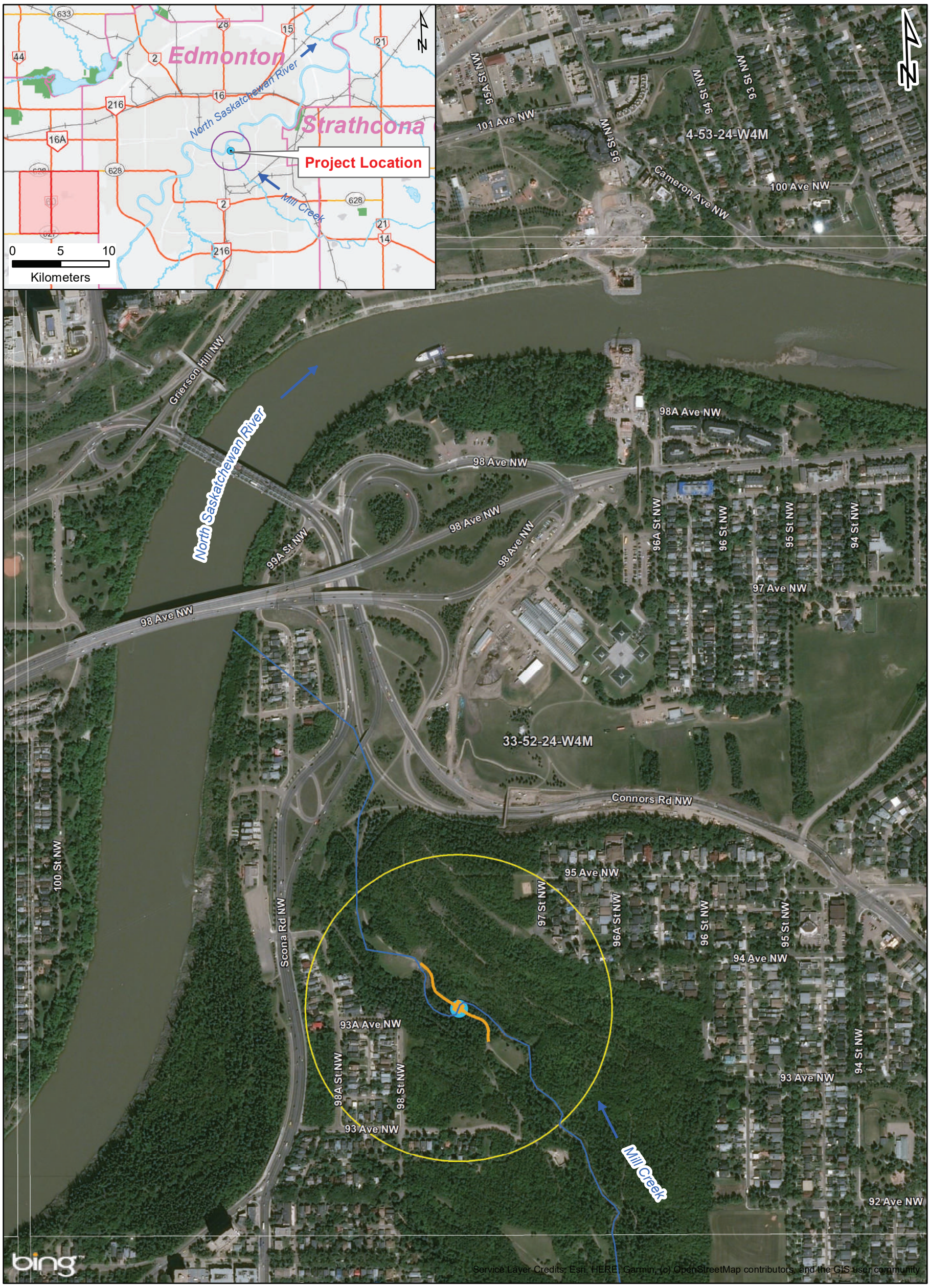
The Projects team consisting of the Wood engineering team, the Project proponent Transportation Planning and Design, Integrated Infrastructure Services, and Urban Growth and Open Spaces, Planning and Environment Services, City of Edmonton conducted an initial project review (IPR) meeting on July 7, 2021. The purpose of the IPR was to review of the proposed Pedestrian Bridge B278 Project and level of environmental review pursuant to the ARP. Section 3.5.3 of Bylaw 7188 requires that all proposals for the development of a major facility that is publicly owned or is developed on public lands is subject to an Environmental Impact Assessment (EIA). Based on the IPR it was determined that an EIA was the appropriate level of environmental review under the ARP (A. Adhikari pers. comm). This EIA has been prepared in accordance with the EIA Terms of Reference approved by City of Edmonton. A Site Location Study was not required as the Project activities will occur within the existing facility location.

2.0 Project Description

2.1 The Property

The Project site is located in Mill Creek ravine at Pedestrian Bridge B278 in SW33-52-24-W4M, as shown in Figure 1. Mill Creek is a tributary of the North Saskatchewan River; the drainage area at the site is approximately 125 km^2. The bed and banks of the creek at the Project site are owned by the Crown, and the upland area is owned by the City of Edmonton and within the ARP. The Project site is located in Mill Creek Ravine Park and zoned as (A) Metropolitan Recreation (COE 2021a). Mill Creek Ravine is considered a Protected Natural Area and a Biodiversity Core Area, that represents a large natural area and habitat patch of suitable size and quality to provide environmental conditions that support populations of animals and plants and associated ecological functions at a municipal scale (CoE 2008a, 2008b, and 2010).

[3] City of Edmonton (COE). 2000. A Guide to Environmental Review Requirements in the North Saskatchewan River Valley and Ravine System. Edmonton, Alberta.



CLIENT: Edmonton

PROJECT: **Mill Creek Ravine Pedestrian Bridge B278 Rehabilitation & Trail Upgrades**

TITLE: Location Plan

DATE: 20-Oct-2021

FILE NAME: Figure 1

PROJECT NO.: EB213002

FIGURE NO.: Figure 1

wood.

PREPARED BY: JP

DATUM: NAD_1983

QA/QC BY: PK

PROJECTION: UTM 12N

Legend:

- Regional Study Area (2 km)
- Local Study Area (250 m)
- Project Limits
- Mill Creek
- Project Site: B278
- Municipal District/County
- Parks & Protected Areas
- First Nations Land

0 150 300

Meters

1:6,300

Document Path: C:\Users\jessica.parker\OneDrive - Wood PLC\Edmonton GIS\EB213002 - Mill Creek Ravine Pedestrian Bridge\Fig1_EIA_LocationPlan.mxd

The existing Mill Creek Pedestrian Bridge (B278) occurs in a short, depressed section of the Mill Creek along a straight section of channel between two tight radius meander bends causing the outside of the bend to actively erode and prone to debris accumulation at the bridge. The toe of the west (left)[4] valley wall downstream of the bridge is protected with rock filled gabion baskets for a streambank length of approximately 35 m. The existing disposition (DLO 054638) for occupation of bed and shore of Mill Creek was originally prepared for the gabion erosion control work. Approximately 100 m downstream of the bridge, the water from the creek flows into a large pipe tunnel via the EPCOR intake structure and passing through the angled grating that is continually partially blocked by silt and debris (Wood 2021a).

The existing bridge B278 is a 2.6 m wide, two-span timber (glulam girders) structure (12.3 m – 12.3 m) that is over 30 years old, supported on piles of unknown depth, either steel or steel capped timber (Wood 2021a). Railings consist of timber posts and top rails with painted steel pickets, although the top rails have been retrofitted with a galvanized steel protective cap. Extensive evidence of wood rot was observed on the existing bridge structure. Maintenance work has included painting, staining and/or sealing of the timber, repainting of the steel pickets, trimming of encroaching trees, replacement of deck planks, maintenance to unstable gabion baskets, and occasional removal of upstream debris.

The B278 approach trails are part of the Mill Creek Ravine lower trail system and connect with a multi-use trail located higher up the slope of the ravine; the approach trails descend through an existing forested area and across the B278 crossing of Mill Creek in a north/south direction. The approach trails are unpaved with a natural clay surface and vary in width up to 4 m wide. The trail is not improved and typically at natural ground elevation, and ends of the bridge deck height difference varies up between 900 and 1500 mm.

B278 and trail approaches have been identified to be eligible for assessment for rehabilitation / replacement and the City of Edmonton values the importance of the bridge crossing providing connectivity within the Mill Creek Ravine. As such, the City of Edmonton has retained Wood Environment & Infrastructure Solutions (Wood) to assess and design the B278 bridge replacement and trail upgrade.

2.2 Project Design Process

2.2.1 Alternative Evaluation

Wood (2021b; Appendix A.1) evaluated alternatives up to a preliminary design stage for B278 rehabilitation or replacement with the objective to mitigate flooding while maintaining pedestrian connectivity on the approach trails. Four strategies for bridge rehabilitation were considered including: 1) do nothing and annual maintenance inspections; 2) minor rehabilitation and patching; 3) major rehabilitation; and 4) full replacement. For trail upgrades, the options evaluated were raising the trail to mitigate flooding, use of retaining walls, and a paved vs unpaved surface. Wood (2021b) further evaluated options to mitigate flooding for 1in 5 year flood (Q1:5), 1 in 10 year flood (Q1:10), and 1 in 25 year flood (Q1:25) events. The evaluation also took into consideration back flooding from drift accumulation for 10%, 20%, 33%, and 50% blockage of the EPCOR inlet structure grating, located approximately 120 m downstream of B278.

[4] Throughout this report, left and right banks refer to their orientation when looking in the downstream direction along the creek.

Preferred Option: Based on the comparison of flooding mitigation, pedestrian connectivity, constructability, cost, and environmental considerations, the COE proposes to proceed to detailed design for full replacement of B278 with retaining walls to accommodate a Q1:25 flood event, and trail upgrades for the Q1:10 flood event. Preliminary design plans are provided in Appendix A.2.

Full replacement was the preferred option as the cost was comparable to major rehabilitation and addresses concerns about the condition and challenges of repairing the rotten timber comprising the girders (Wood 2021b). Bridge design for a Q1:25 year flood was chosen as it offers the best protection against flooding of all options and the use of retaining walls reduces the area impacted by the bridge approach embankment slopes on the adjacent natural areas for a Q1:10 year flood. The design considered the EPCOR inlet structure grating, where 33% blockage was considered a conservative but representative basis for modeling water surface levels for the purpose of detailed design. A standard 2.4 m unpaved trail at a higher elevation was considered to be a more durable option, easier to maintain, and improves drainage (Wood 2021b). A paved trail was not chosen as the subgrade would be prone to washout during flooding or disturbance that may result in damage and the increased maintenance of a paving layer.

2.3 Project Description

2.3.1 Design Components

The Project will involve replacement of the existing two-span timber bridge with a new 3.0 m wide by 12m length single span steel truss with bridge abutments outside or above the active channel defined by the ordinary high-water level (OHW[5]). Headslopes will be constructed at 2H:1V slope and armoured with Class 2 rock riprap extending over the full width of the channel for a depth of 800 mm underlain by non-woven geotextile fabric. The streambed and banks will be reconstructed with riprap extending upstream for 8 m along the north (right) bank and 5 m along the south (left) bank to arrest lateral bank erosion and scour. Riprap will also extend for a 5 m length downstream of the bridge. The channel armouring will transition smoothly into the upstream and downstream natural channel bed and profile elevations and channel widths, as per drawing MICR-P211-S01 (Appendix A.2).

The existing pedestrian trails will be reconstructed for a length of approximately 80 m east and 90 m west of B278. Retaining walls will be constructed at the bridge/trail interface and approach trails for a 21 m length north of B278 and 12 m length south of the bridge to limit fill encroachment and reduce impacts on wooded areas and loss of trees. The retaining walls will be constructed of timber post and lagging as the preferred option. The existing trail will be reconstructed to a 2.4 m wide granular path, with 2:1 embankment side slopes and will be raised between 0.9 and 1.6 m higher than the current grade. Class 1M riprap or better will be installed over a 30 m length of the trail embankment from station 1+145 to 1+175. The new granular trail will meet City of Edmonton standards per the requirements shown on City standard drawing 5170 and other relevant City specifications. The trail reconstruction will involve installation of two 600 mm diameter cross-drainage culverts at Station 1+040 and 1+145, respectively, as per drawing MICR-P211-G02 (Appendix A.2). Class 1 or 2 riprap will be installed at the culvert invert ends for erosion control.

[5] Ordinary high water mark (OHW) – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/ bank-full level" which is often the 1:2 year flood flow return level.

All disturbed areas will be revegetated as soon as possible following construction with the objective of permanently stabilizing disturbed areas within one growing season of construction completion. A site-specific replanting plan will be developed during the detailed design phase to include topsoiling, native shrub potted stock plantings, seeding and erosion and sediment control measures. In accordance with the City of Edmonton (2020) *Natural Stand Valuation Guidelines and/or* (2016a) *Guidelines for the Evaluation of Trees*, equitable compensation will be made for the loss of City trees resulting from new disturbed area along the trail reconstruction.

A Facility Proximity Agreement is required for construction of the new bridge within 5 m of the existing EPCOR 600 m sewer line located west of the crossing; a consent letter is required for any retaining wall crossing the path of the existing sewer.

2.3.2 Construction, Access and Laydown

At the time of writing construction, access, and laydown locations were not determined. Site access into the ravine is available at the north end of the Project site from the ravine pedestrian trail or from south of the Project site via 93 Avenue and the ravine pedestrian trail system. Hard-surface access routes are preferred for large equipment, and will be used where feasible.

All laydown/staging areas will be fenced, meet safety standards, and the Contractor will be responsible for protecting all surfaces from permanent damage during construction and will return all surfaces to pre-construction condition upon completion. A trail detour will be established by the COE prior to and during construction. The public will be notified of the project of all trail cautions and closures such that interested residents and public can be kept informed of the construction and applicable trail detour routes. Trail closures will adhere to the City's Trail Closure Procedures and will be approved through River Valley Operations prior to construction and closure of trails. The selected Contractor will ensure that flaggers are used to provide safe passage of trail users, as required.

A construction review meeting of the access route and work areas will be conducted with COE Urban Forestry at least four weeks prior to the start of construction, access preparation or site clearing. Construction signage will be posted a minimum of five days prior to site mobilization and will be removed within one day of construction completion. Temporary trail closures will be coordinated with COE Community Services Parks Division, and anticipated trail disruption/closure dates will be posted to the City of Edmonton "Trail/Park Cautions & Closures" website a minimum of 14 days prior to site mobilization.

A spill prevention and response plan will be implemented as part of the Contractor's ECO Plan during construction in the event of accidental contamination to immediately respond and mitigate the contamination. Signage will be posted indicating a project contact person and phone number for inquiries.

2.3.3 Construction Environmental Management

Detailed construction methods and equipment will be outlined in the Contractors scope of work and Environmental Construction Operations (ECO) Plan. Standard requirements of the contract that are considered as part of the environmental impact review include the following:

- Laydowns/staging areas will be fenced, signed and limited in size. Restoration of the site after construction completion to the satisfaction of COE will be the responsibility of the Contractor.
- The waste management and disposal program will follow COE procedures as outlined in the Enviso Contractor's Environmental Responsibilities Package (COE 2018). This also includes retaining large trees on site and along trail margins (no removal unless approved by the COE).
- All activities will adhere to contract specifications and will be performed in accordance with established practices. All activities will be conducted in compliance with the appropriate approvals, permits, authorizations and/or dispositions and within the framework of the recommendations outlined in this EIA.
- Upon award of the contract, the Contractor's work will include a construction ECO Plan, Enviso compliance, and the implementation of erosion and sedimentation control best management measures. Suitable environmental protection practices will be imposed to prevent and contain potential spills of fuels, oils, lubricants, and other hazardous materials arising from construction activities. Adequate spill containment kits will be retained on site during construction.

2.3.4 Construction Schedule

A detailed Project schedule was not available at the time of writing; however, the proposed works are anticipated to occur from August to October 2022.

3.0 Regulatory Review

The following sections describe the key legislation, policies and regulations that are considered applicable to the proposed Project and related permitting, consultation or other requirements, as summarized below in Table 1.

Table 1. Summary of Key Anticipated Regulatory Requirements

Legislation or Policy	Responsible Authority	Purpose or Intent	Anticipated Requirement
Federal			
Fisheries Act	Fisheries and Oceans Canada	Protection of fish and fish habitat, including avoiding any death of fish or the harmful alteration, disruption or destruction of fish habitat (HADD) that must be authorized by Fisheries and Oceans Canada (DFO). To minimize any adverse effects that result or may reasonably be expected to result from the unlawful deposit of a deleterious substance.	The Request for Review pursuant to the federal *Fisheries Act* was submitted. The DFO Letter of Advice 22-HCAA-00328 and applicable conditions were obtained. A copy of the DFO Letter of Advice is provided in Appendix B.1. Section 36(3) prohibits any person from depositing or permitting the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance may enter such water
Migratory Birds Convention Act	Environment and Climate Change Canada	Protection of migratory birds, their nests and habitat	Timing constraint for vegetation clearing or other work that is potentially harmful to breeding birds, their nests and young may be carried out during the timing constraint of April 25 to August 15. Where activities are proposed during the timing constraints, site inspection by a qualified Wildlife Specialist will be required to determine the presence of nesting birds and, where appropriate, applicable mitigation measures. Permit for nesting survey may be required from AEP.
Species at Risk Act	Environment and Climate Change Canada	Prohibits harming, killing, or harassing of listed species or damaging or destroying their residence on federal lands, and for aquatic species and migratory birds under the *Migratory Birds Convention Act* regardless of where they are located.	No agreements, permits and or licenses under SARA are anticipated.
Canadian Navigable Waters Act	Transport Canada	Protecting the public right of navigation on all navigable waters in Canada	Approval and or public notification not a Project requirement.
Provincial			
Water Act and Code of Practice for Watercourse Crossings	Alberta Environment and Parks (AEP)	*Water (Ministerial) Regulation* outlines approval exemptions subject to the *Code of Practice for Watercourse Crossings*, under Part 1, 3(2) The placing, constructing, installing, maintaining, replacing or removing of a watercourse crossing is designated as an activity that does not require an approval if, and only if, the activity is carried out in accordance with *the Code of Practice for Watercourse Crossings,* as amended. Section 1(2)(ff) of the *Code of Practice for Watercourse Crossings* defines "watercourse crossing" as a crossing, and any associated structures that are or will be constructed to provide access over or through a water body, including but not limited to: (i) structures and measures to isolate the location of the works, (ii) erosion protection structures, and (iii) sedimentation management structures. The watercourse crossing does not include the realignment of the channel of a water body beyond a distance of 20 metres upstream and downstream from the watercourse crossing, or the diversion of water from the site of a watercourse crossing, including associated structures, which would require an authorization under the *Water Act*.	The *Code of Practice for Watercourse Crossings*, Section 7(1) requires an owner prepare and completed a plan for the works (2), (i) that are prepared by either a professional engineer or an engineering technical specialist, whichever is considered appropriate by the owner, and that contain the stamp, certification and signature of either the professional engineer or the certification and signature of the engineering technical specialist, as required under section 12(2)(a) and (b). Under Section 9(2), the proposed watercourse crossing works must be constructed in accordance with the applicable parts of Section 11 and Schedules 2 and 3, and the written specifications and recommendations of a qualified aquatic environment specialist (QAES), provided in the Wood (2022) Fish and Fish Habitat Assessment Report. Under Section 3(1) of the CoP, written notice of intended works must be provided to AEP at least 14 days in advance of the proposed start date to be submitted using AEP's Digital Regulatory Assurance System (DRAS).
Public Lands Act		Administers public crown land. Applies to the bed and shores of rivers, streams, watercourses, lakes, or other bodies. Prohibits disturbance that results or is likely to result in injury of the bed and shores of water bodies.	Department Licence of Occupation (DLO) of Crown land will be required from AEP for the bridge structure occurring within the bed and shores of Mill Creek Surface Disposition application was submitted on September 24, 2021 under file number DLO210149. At the time of writing, the DLO application was under review.
Environment Protection and Enhancement Act		Prohibition to (1) knowingly release or permit the release, or (2) release or permit the release of a substance into the environment in an amount, concentration or level or rate of release that is in excess of an approval or a regulation; or causes or may cause a significant adverse effect.	No agreements, permits and or licenses under EPEA are anticipated.
Wildlife Act		Prohibits the harassment, destruction, or damage of wildlife or beaver dams on public land without approval from the minister. Provides protection for individual endangered or threatened and non-game animals, as well as their house, nest or den.	Timing constraint for vegetation clearing or other work of February 15 to April 30. A field-based pre-disturbance wildlife sweep will be conducted by a qualified Wildlife Specialist to determine the presence of wildlife, important wildlife features and nesting birds that must be avoided, or that require mitigation measures to avoid or reduce adverse effects of the project, where applicable. Permit for nesting survey may be required from AEP.

Legislation or Policy	Responsible Authority	Purpose or Intent	Anticipated Requirement
Fisheries Act		Serves to facilitate and enhance the detection, suppression, elimination, and prevention of the spread of invasive organisms in Alberta	Decontamination of equipment working in or near water.
Historical Resources Act (HRA)	Alberta Culture and Status of Women	Provides a framework for the Protection of Historical Resources in Alberta. Projects that affect a historic resource must seek HRA approval.	*Historic Resource Act* (HRA) approval is required for Projects that involve ground disturbance within Listed Lands. HRA approval no. 4725-21-0056-001 dated November 01, 2021 is provided in Appendix B.2. Historical Resources Impact Assessment (HRIA) may be required by Alberta Culture and Status of Women (CSW) where the Project involves ground disturbance that has the potential to affect a historic resource.
Soil Conservation Act	Agriculture, Food and Rural Development	Requires owner to take reasonable measures to prevent soil loss or deterioration, or to employ measure to cease soil loss or deterioration that is taking place.	Erosion and Sediment Control
Weed Control Act	Alberta Agriculture and Forestry	Regulation of the spread of noxious weeds, prohibited noxious weeds and regulated weed seeds	Monitoring for the presence and immediate removal of any prohibited noxious weeds and control the spread of noxious weeds.
Agriculture Pest Act		Regulation of pests causing harm to agricultural land, livestock or property, including regulation of Clubroot.	Sanitation of equipment, footwear and materials involved with handling of soil related activities is recommended. Contact with Agricultural Service Board annually for a status update of Clubroot infestations and other pests.
Municipal			
Bylaw 7188 – The North Saskatchewan River Valley Area Redevelopment Plan	City of Edmonton Sustainable Development	Ensures the application of Bylaw 7188 to all proposed public development and development of public land in the river valley.	Environmental Impact Assessment (EIA) with Public Engagement. Circulation to City departments, and final review and approval from City Council.
Top of Bank Policy C542		Ensures that design of development in all new or redeveloping areas abutting the River Valley and Ravine System provide for the separation of development from the river valley or ravine.	Although this Project does not directly involve development of top-of-bank areas, Wood will consider this policy as applicable during design.
Change to Parkland Process	City of Edmonton Parks Planning	Ensures changes to any Parkland within the COE follow Parks Planning guidelines and policies.	Project review by City of Edmonton Parks during EIA circulation.
Parkland Bylaw 2202	City of Edmonton Parks Planning	Regulates the conduct and activities of people on parkland and protection of the environment in all COE parks.	It is anticipated that an exemption or clearance under the Bylaw will be prepared by the COE and the Parks Department.
Bylaw 18093 *Drainage Bylaw*	City of Edmonton	Regulates surface drainage on private and public land and protects the environment by regulating releases into the sewer system and natural watercourses, including grading changes and management of surface drainage.	Compliance will be evaluated during circulation of Environmental Impact Assessment report, and/or detailed design, where requested by the City of Edmonton Drainage Services.
Drainage Services Bylaw 18100	City of Edmonton EPCOR Drainage Services	Regulates drainage services provided by EPCOR for the collection, storage, pumping and monitoring of sanitary, storm and combined wastewater streams.	A Facility Proximity Agreement is required for construction of the new bridge within 5 m of the existing EPCOR 600 m sewer line located west of the crossing; a consent letter is required for any retaining wall crossing the path of the existing sewer.
Corporate Tree Management Policy C456	City of Edmonton	Applies to all City land and to all circumstances where City trees are to be removed or relocated.	Compensation required if live ornamental and natural treed areas on City property are removed. CoE Urban Forestry contacted a minimum of 4 weeks prior to start of construction to review construction and tree protection plans.
Integrated Pest Management Policy C501A		Pest Management Strategy based on integrated pest management principles based first on prevention and, when necessary, control.	Integrated Pest Management
Bylaw 14600 *Community Standards*		Sets noise limits for construction activities	Works must comply with bylaw noise limits
EnvISO Program		Instructs Contractors of their environmental-related responsibilities on COE projects.	To be included in construction Contract

3.1 Federal

Fisheries Act

The federal *Fisheries Act* includes provisions for the protection of fish and fish habitat. Any death of fish or the harmful alteration, disruption or destruction of fish habitat (HADD) must be authorized by Fisheries and Oceans Canada to avoid the contravention of Section 35(1) of the federal *Fisheries Act*. Based on results of the assessment completed herein, sportfish are absent from Mill Creek. Fish species in Mill Creek are limited to a community of simple forage fish. As the Project involves new permanent alteration on Mill Creek below the OHW, referral to the Department Fisheries and Oceans Canada (DFO) was submitted. The DFO Letter of Advice 22-HCAA-00328 and applicable conditions were obtained on February 18, 2022 indicating that with incorporation of applicable mitigation measures into the Project, Authorization under the *Fisheries Act*, the *Aquatic Invasive Species Regulations* or the *Species at Risk Act was not required*. A copy of the DFO Letter of Advice is provided in Appendix B.1.

Section 36(3) of the *Fisheries Act* also prohibits any person from depositing or permitting the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance may enter such water. "Deleterious substance" means any substance that degrades or alters the water and makes it harmful to fish or fish habitat (s. 34(1)). Common types are silt, hydrocarbons, and other chemical, physical and biological agents. Section 38(6) imposes a duty to minimize any adverse effects that result or may reasonably be expected to result from the unlawful deposit of a deleterious substance. Under Section 38(5) every person shall notify an inspector of the unlawful deposit of a deleterious substance, without delay.

Migratory Birds Convention Act

The federal *Migratory Birds Convention Act* serves to protect migratory birds under Section 12.1(h), which prohibits the killing, capturing, injuring, taking or disturbing of migratory birds or the damaging, destroying, removing or disturbing of nests. To exercise compliance with the *Act*, the implementation of a April 25 to August 15 timing constraint for vegetation clearing to protect migratory birds and their nests is recommended.

Where activities are proposed during the timing constraints, site inspection by a qualified Wildlife Specialist will be required to determine the presence of nesting birds and, where appropriate, applicable mitigation measures. It is the proponent's responsibility to ascertain whether surveys are required until approximately September 30th, based on species range, number of broods and available habitat. A permit for wildlife survey may be required from AEP.

Species at Risk Act

An issue for consideration is the federal *Species at Risk Act* (SARA) and the implications of habitat disruption of the species listed as extirpated, endangered or threatened under Schedule 1 of the *Act*, which triggers protection and recovery of the species at risk and its habitat. Under Clauses 34 and 35, prohibitions against killing species and damaging residences of listed species generally would not apply within lands under provincial jurisdiction, and is only applicable on federal lands, and where there are aquatic species protected under the *Fisheries Act* and migratory birds protected under the *Migratory Birds Convention Act,* wherever they are found. As the project does not occur on federal lands and there is low potential for listed species to occur at the Project site the SARA does not apply to the current Project.

Canadian Navigable Waters Act

Under the *Canadian Navigable Waters Act* (CNWA), Mill Creek is not a scheduled navigable waterway. Further, the watercourse was not classified as a navigated stream in accordance with the Alberta Transportation (2014) *Navigated Waters in Alberta* and Alberta Government (2014) *Drainage Basins and Navigated Stream Map*. As such, notification and/or approval under the CNWA is not required.

3.2 Provincial

Water Act and Code of Practice for Watercourse Crossings

The proposed works are subject to the *Code of Practice for Watercourse Crossings* and are exempt from *Water Act* approval under Schedules 1 and 2 of the *Water (Ministerial) Regulation*. The proposed works are subject *Code of Practice for Watercourse Crossings,* where Section 1(2)(ff) defines "watercourse crossing" as a crossing, and any associated structures that are or will be constructed to provide access over or through a water body, including but not limited to:

(i) structures and measures to isolate the location of the works;
(ii) erosion protection structures;
(iii) sedimentation management structures; and
(v) realignment of the channel of a water body within a distance of 20 metres upstream and downstream from the watercourse crossing is exempt from *Water Act* approval.

Further, the watercourse crossing does not include the realignment of the channel of a water body beyond a distance of 20 metres upstream and downstream from the watercourse crossing, or the diversion of water from the site of a watercourse crossing, including associated structures, and is exempt from authorization under the *Water Act*.

Pursuant to the *Code of Practice for Watercourse Crossings,* the following would apply:

- The *Code of Practice for Watercourse Crossings*, Section 7(1) requires an owner prepare and completed a plan for the works (2), (i) that are prepared by either a professional engineer or an engineering technical specialist, whichever is considered appropriate by the owner, and that contain the stamp, certification and signature of either the professional engineer or the certification and signature of the engineering technical specialist, as required under section 12(2)(a) and (b).
- Under Section 9(2), the proposed watercourse crossing works must be constructed in accordance with the applicable parts of Section 11 and Schedules 2 and 3, and the written specifications and recommendations of a qualified aquatic environment specialist (QAES), as provided in the Wood (2022) *Fish and Fish Habitat Assessment Report*.
- Under Section 3(1) of the CoP, written notice of intended works must be provided to AEP at least 14 days in advance of the proposed start date to be submitted using AEP's Digital Regulatory Assurance System (DRAS).

Public Lands Act

The Alberta *Public Lands Act* administers Crown lands in Alberta. The proposed development will occupy provincial Crown land of the bed and shores of the Mill Creek, which requires that a surface land use disposition under the *Public Lands Act*.

The original Department License of Occupation (DLO 054638) approved a disposition for the existing erosion control work (e.g., gabion baskets) at B278, and does not sufficiently cover the area required for

the new bridge and bank armoring. Further, the current alignment of the creek is different than DLO 065638 drawing (Abacus Datagraphics Ltd 2021; Wood 2021a). The B278 bridge replacement and riprap protection works will require a DLO.

The new application for Surface Disposition was submitted to AEP through the Electronic Disposition System (EDS) on September 24, 2021 under file number DLO210149. As part of the application, the Aboriginal Consultation Office (ACO) reviewed the DLO application (First nations Consultation number FNC202106177-001) and determined no Indigenous consultation is required as per the Alberta's First Nations and Metis Settlements policies and guidelines (http://indigenous.alberta.ca/1.cfm). At the time of writing, the DLO application was under review by AEP.

Environment Protection and Enhancement Act

In general, the provincial *Environment Protection and Enhancement Act* (EPEA) applies to activities that take place adjacent to a watercourse. The EPEA under Section 108 and 109, it is prohibited to: (i) release or permit the release, or (ii) knowingly release or permit the release, of a substance into the environment in an amount concentration or level or at a rate of release that is in excess of an approval or a regulation, or that causes or may cause a significant adverse effect on the environment.

Wildlife Act

Section 36(1) of the Alberta *Wildlife Act* provides protection for individual endangered or threatened and non-game animals, as well as their house, nest or den. Mitigation measures, specifically adherence to timing restrictions for clearing and vegetation removal will be required to ensure the Project is in compliance with the *Act*. AEP recommends that clearing should not be conducted between February 15 and April 30 of any year to ensure the protection of non-migratory bird species and required mitigation.

A field-based pre-disturbance wildlife sweep will be conducted by a qualified Wildlife Specialist to determine the presence of wildlife, important wildlife features and nesting birds that must be avoided, or that require mitigation measures to avoid or reduce adverse effects of the project, where applicable.

Fisheries Act

The provincial *Fisheries Act* Section 1(4) serves to facilitate and enhance the detection, suppression, elimination and prevention of the spread of invasive organisms in Alberta. Under Section 11.01 of the *Act* no person shall place or keep an invasive organism in or allow an invasive organism to enter water of any kind.

Historical Resources Act

Historical resources in Alberta are classified into three categories: historic buildings or other structures, archaeological sites (e.g., buried artifacts) and palaeontological sites (e.g., fossilized remains of plants and animals). The *Historical Resources Act* (HRA) under section 37(2) provides a framework for Historical Resources HRA approval in Alberta. Activities that may result in the alteration, damage or destruction of historic resources may require a Historical Resources Impact Assessment (HRIA) prior to development, as determined by Alberta Culture and Status of Women (CSW). The Project is located within lands on the "Listing of Historic Resources" and HRA approval is a project requirement. HRA approval no. 4725-21-0056-001 dated November 01, 2021 is provided in Appendix B.2.

Soil Conservation Act

The *Soil Conservation Act* under Section 3 requires owners to take appropriate measures to prevent soil loss or deterioration, or to employ measure to cease soil loss or deterioration that is taking place.

Weed Control Act

The *Weed Control Act* regulates noxious weeds, prohibited noxious weeds, and weed seeds through various control measures, including inspection and enforcement, together with provisions for recovery of expenses in cases of non-compliance. The *Weed Control Act* specifies that the owner or occupant of the land is accountable and responsible for controlling any noxious weed and destroying a prohibited noxious weed. In Part 1: Section 4(1) precaution must also be taken to prevent and restrict the spread of any classified weed through the use of, or movement of, any equipment or materials (e.g. soil/gravel movement, application of seed mixes). Invasive vegetation management is also conducted by the City of Edmonton Natural Areas Operations, River Valley Parks and Facilities pursuant to the *Integrated Pest Management Policy C501A*.

Agricultural Pest Act

The *Agricultural Pest Act* under Section 5(2) requires the owner to take active measures to prevent the establishment of any listed pests, including clubroot, present on or in land, property or livestock unless otherwise authorized.

3.3 Municipal

***Bylaw 7188* – The North Saskatchewan River Valley Area Redevelopment Plan**

Environmental reviews of development activities within the North Saskatchewan River valley are undertaken pursuant to the City of Edmonton *Bylaw 7188* – The *North Saskatchewan River Valley Area Redevelopment Plan* (COE 1985). The policy of the *Bylaw 7188* requires an environmental review of the proposed Project within the ARP. City of Edmonton conducted an initial project review (IPR) meeting on July 7, 2021. The purpose of the IPR was to review of the proposed Pedestrian Bridge B278 Project and level of environmental review pursuant to the ARP. Bylaw 7188 Section 3.5.3 requires that all proposals for the development of a major facility that is publicly owned or is developed on public lands is subject to an Environmental Impact Assessment (EIA). Based on the Project description it was determined that an EIA was the appropriate level of environmental review under the ARP (A. Adhikari pers. comm). This EIA has been prepared in accordance with the EIA Terms of Reference approved by City of Edmonton. A Site Location Study was not required as the Project activities will occur within the existing facility location.

***Bylaw 2202* - Parkland Bylaw**

The Parkland Bylaw 2202 regulates the conduct and activities of people on parkland and protection of the environment in all COE parks. Pursuant to the Bylaw, disturbance to natural areas, utilization of construction laydown areas, interference with other park users and motor vehicle access are restricted. It is anticipated an exemption or clearance under the Bylaw will be prepared by the COE and Parks Department, contingent on development of an approved detailed Staging Area Agreement prior to construction.

***Bylaw 18093* – Drainage Bylaw**

The purpose of the Bylaw 18093 is to: a) regulate connections between private and public drainage systems and the sewerage system; b) regulate the use of the sewerage system, including the release of matter into the sewerage system; c) prevent damage or misuse of the sewerage system; d) regulate surface drainage on public and private land; and e) prescribe fees related to the use of the sewerage system. In particular, the bylaw controls surface drainage including grading changes and management of surface drainage. Compliance will be evaluated, where requested by the City of Edmonton EPCOR Drainage Services.

Bylaw 18100 – EPCOR Drainage Services

The *EPCOR Drainage Services Bylaw 18100 r*egulates drainage services provided by EPCOR for the collection, storage, pumping and monitoring of sanitary, storm and combined wastewater streams.

Corporate Tree Management Policy C456

The Corporate Tree Policy applies to all COE land and to all circumstances where COE trees are to be removed or relocated. Under the Policy, equitable compensation will be recovered for the loss and/or damages to City trees in accordance with the *City of Edmonton Natural Stand Valuation Guidelines* and/or *the City of Edmonton Guidelines for the Evaluation of Trees*. The COE applies this policy consistently across all COE and community partner projects.

The City of Edmonton Urban Forestry will be contacted a minimum four weeks in advance of the construction start date to review construction plans and tree protection for existing trees within the Project footprint and 5 m of any construction. Forestry will schedule and carry out all required tree work involved with this project.

***Bylaw 14600* – Community Standards Bylaw**

The City of Edmonton's *Community Standards Bylaw 14600* establishes construction working periods (0700-2100 hours Monday to Saturday; 0900-1900 Sundays and holidays) and acceptable noise levels (not to exceed 65 dBA). Exemptions requested by a Contractor may be granted upon request but are done so on a case-by-case basis.

City of Edmonton Enviso

In 2004, Edmonton City Council approved COE Policy *C505* (Edmonton's Environmental Management System) committing the COE to establishing an environmental management system (now known as Enviso) based on the international standard ISO 14001 Enviso provides the COE with a systematic method of managing and improving its environmental performance and provides a framework for a strong environmental management system, aimed at legal/regulatory compliance. Review packages for both design teams and contractors must be acknowledged and accepted prior to working on any City of Edmonton project (COE 2018).

4.0 Methodology

4.1 Spatial Boundaries

For the purpose of the EIA, the principal disturbance area (PDA) was defined as the physical footprint of the proposed disturbance consisting of the channel bed and banks within 8 m upstream and 5 m downstream of B278, the pedestrian trail extending 80 m east and 90 m west of B278, and upland areas within varying widths of the proposed pedestrian trail upgrade.

The local study area (LSA) was defined a 250 m buffer width of lands surrounding the PDA. A regional study area (RSA) up to 2 km surrounding the PDA was used to identify and evaluate potential regional effects of the Project.

4.2 Background Information Review

A review of existing information in reference to the environment of the Project area was conducted. Information on fish and wildlife distribution and management, and objectives and issues pertaining to regional sustainable development from municipal, provincial and federal authorities were reviewed. The information sources reviewed included:

- Project description, design and construction information from the COE and Wood;
- Satellite imagery and maps; and
- Environmental databases: Agricultural Region of Alberta Soil Inventory Database online soil viewer and Alberta Soil Names File, Alberta Conservation Information Management System (ACIMS) element tracking lists, Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Species at Risk Public Registry, AEP Fish and Wildlife Internet Mapping Tool (FWIMT), and the Listing of Historic Resources maintained by Alberta Culture and Status of Women (CSW).

A historical resources review was undertaken for lands within the study area for the purpose of identifying potential for archaeological, historical, or palaeontological sites to occur on lands affected by the proposed Project. The historical resources review included the following:

- Examination of site data files maintained by CSW for archaeological and historic sites;
- Summary description and evaluation of known sites within the development zone with a particular focus on site location and function variables;
- Model of historical resources potential for the LSA based on known data, topographical potential, models of land use and site distribution; and
- Recommendation for no further historical resources work in the LSA.

4.3 Field Reconnaissance

Wood conducted a field reconnaissance of the study area on July 27, 2021. The field reconnaissance focused on verifying biophysical features identified during background information review. A vegetation inventory and fish and fish habitat assessment of the creek extending 100 m upstream to 120 m downstream of B278 were conducted concurrently (Wood 2022). Spring and summer rare plant surveys were conducted on June 17, 2021 and August 12, 2021, respectively. The rare plant survey involved a meandering survey technique following the guidelines of the Alberta Native Plant Council (ANPC 2012). The LSA was accessed on foot and representative site photos were taken.

Incidental observations of wildlife and wildlife signs and habitat were recorded, however formal wildlife surveys were not conducted. A wildlife sweep was conducted for the entire PDA during the July 2021 field reconnaissance as per the *Wildlife Sweep Protocols Sensitive Species Inventory Guidelines* (GoA 2020a).

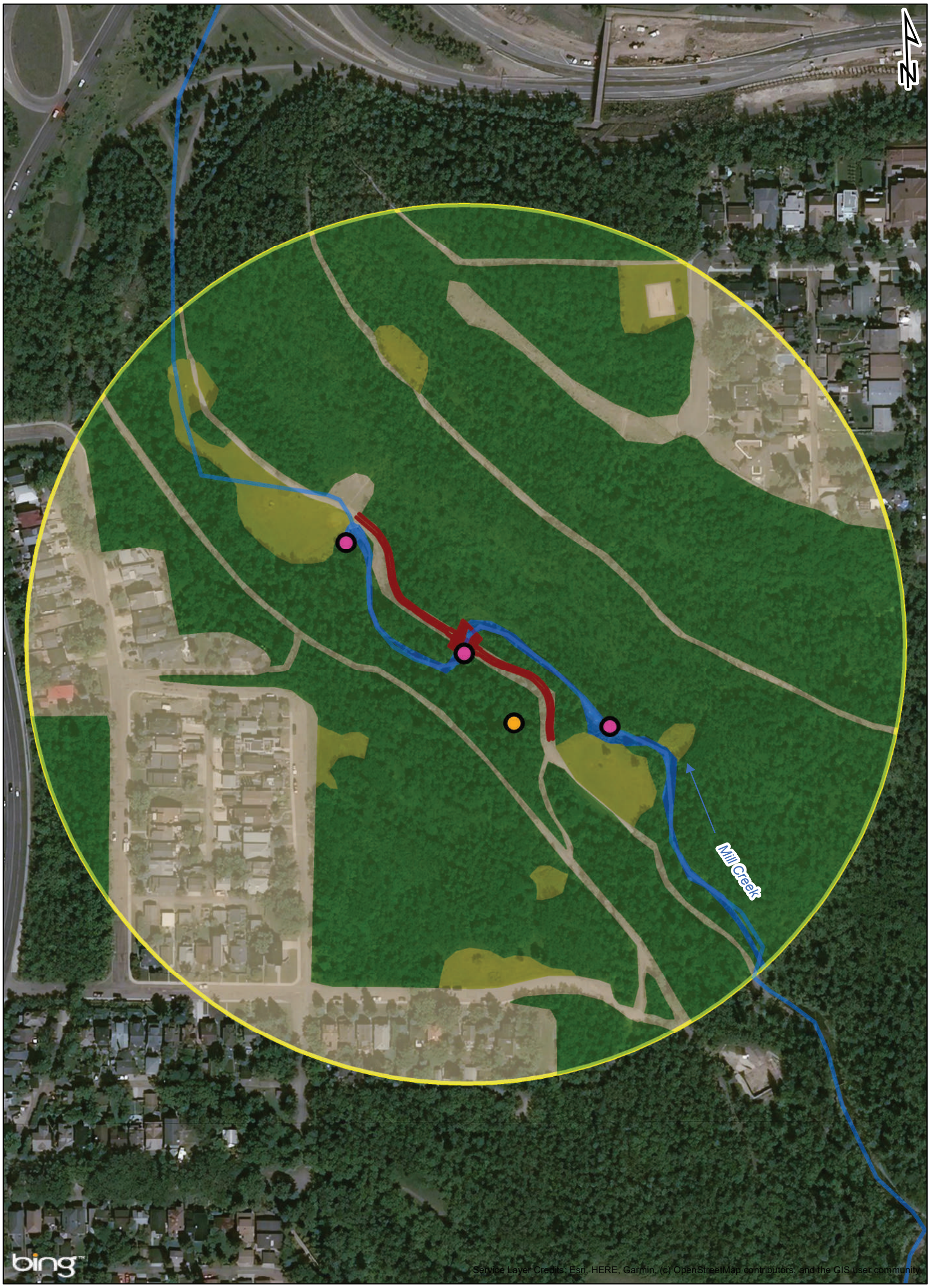
Photo documentation of the July 27 reconnaissance was provided in Appendix C. Detailed methodology for the rare plant surveys was provided in Appendix D. Environmental sensitivities, including vegetation communities, incidental wildlife signs, and invasive species locations were presented in Figure 2.

4.4 Environmental Effects Assessment

Assessment of the anticipated residual effects of the project-related activities on environmental components was based on professional judgment and qualitative/quantitative evaluation based on Project-specific activities and their potential interactions with the environment during the construction and operation/maintenance phases. Residual effects were assessed by considering the potential effectiveness of proposed mitigation measures, followed by assessing any remaining post-mitigation effects. Assessment criteria used to rate potential residual effects and determine significance is provided in Table E1, Appendix E. Underlying assumptions included:

- Proposed works will be designed, constructed and operated with due care for safety and the environment, using current and technically feasible engineering and construction Best Management Practices (BMPs), EIA recommendations, Contractor's ECO Plan, and COE Enviso requirements; and
- For residual effects, baseline condition includes effects of past and existing activities.

Assessment of cumulative environmental effects that are likely to result from the project follows directly from assessment of residual effects. If the project is anticipated to have measurable incremental effect on a given environmental component, and where these effects could act in an additive or cumulative manner with impacts from other projects or activities in the study area, then a cumulative effects assessment (CEA) was completed for the environmental component.



CLIENT: Edmonton	PROJECT: **Mill Creek Ravine Pedestrian Bridge B278 Rehabilitation & Trail Upgrades**	DATE: 15-Oct-2021	FILE NAME: Figure 2
	TITLE: Environmental Sensitivities Map	PROJECT NO.: EB213002	FIGURE NO.: Figure 2

wood.

PREPARED BY: JP	DATUM: NAD_1983
QA/QC BY: PK	PROJECTION: UTM 12N

Legend:

- Local Study Area
- Project Limits
- Mill Creek
- Himalayan balsam
- Woodpecker cavity

Vegetation Community

- Disturbed
- Grassland
- Treed
- Watercourse

0 20 40 80

Meters

1:2,200

Document Path: C:\Users\jessica.parker\OneDrive - Wood PLC\Edmonton GIS\EB213002 - Mill Creek Ravine Pedestrian Bridge\Fig2_EIA_Sensitivities Map.mxd

5.0 Existing Conditions

5.1 Geology and Geomorphology and Soils

Subsurface conditions of the LSA were inferred from published geology reports and maps (Shetsen 1987, Bibby 1974, Kathol and MacPherson, 1975, Andriashek 1988). Bedrock in the LSA is the upper Cretaceous Horseshoe Canyon Formation of the Edmonton Group and typically consists of interbedded mudstones (bentonitic shales), sandstone and coal seams. The sediments were deposited in a shallow inland sea. As these sediments were accumulating, volcanic ash was also being deposited over the Edmonton area which created bentonite seams within the bedrock.

The Project site is underlain by Quaternary deposits consisting mainly of coarse-grained sediments consisting of fine to coarse-grained sand, with minor silt beds to a depth of approximately 20 m. Surficial geology in the LSA generally consists of coarse sediments; mainly till but locally includes stratified glaciolacustrine or glaciofluvial sediments. Exposed till along the slopes of the creek ravine are expected.

Geotechnical drill logs show clay soil (0 - 3.8 m) and extremely weathered clay shale bedrock (3.1 - ≥10.4 m) is present below the surface at the Site (Wood 2021a). The soils in the Project area are also classified as disturbed according the AGRASID provincial soil mapping database. Ongoing erosion is occurring along the toe of the east valley wall upstream of B278, and the bank is showing signs of instability (Plate C1). At this location the streambank slope ranges from 1H:1V to near vertical (Wood 2021a). The west valley wall, downstream of the bridge is protected by a rock filled gabion basket with some signs of slumping above (Wood 2021a).

5.2 Vegetation and Rare Plants

Vegetation Communities

According to the City of Edmonton's (2015) Urban Primary Land and Vegetation Inventory (uPLVI) interactive map, land cover at the Mill Creek Ravine Project site is mapped as naturally wooded, and primary and secondary site type is a forested natural stand of trembling aspen and balsam poplar, with 30%-40% coverage. General vegetation communities observed in the LSA are described below and delineated in Figure 2.

Treed areas in the LSA were dominated by mature mid-late-seral stands of trembling aspen (*Populus tremuloides*) and subdominant species included balsam poplar (*Populus balsamifera*) and white spruce (*Picea glauca*), and less common white birch (*Betula papyrifera*). The understory consisted of a mixture of shrub and tree seedlings including American elm (*Ulmus americana*), burr oak (*Quercus macrocarpa*), western mountain ash (Sorbus scopulina), beaked hazelnut (*Corylus cornuta*), Canada buffaloberry (*Shepherdia canadensis*), chokecherry (*Prunus virginiana*), northern gooseberry (*Ribes oxyacanthoides*), prickly rose (*Rosa acicularis*), red-osier dogwood (*Cornus stolonifera*), saskatoon (*Amelanchier alnifolia*), snowberry (*Symphoricarpos albus*), wild black current (*Ribes americanum*), various moss, grasses and forbs including feathermoss, fowl bluegrass (*Poa palustris*), aster (*Aster* spp.), goldenrod (*Solidago* spp.), common horsetail (*Equisetum* arvense), northern bedstraw (*Galium* boreale), and red and white baneberry (*Actaea rubra*), and western Canada violet (*Viola canadensis*), and invasive species including common caragana *Caragana arborescens*), dandelion (*Taraxacum officinale*), fireweed (*Chamerion angustifolium*),

Vegetation along the existing pedestrian trails along the ravine consisted of balsam poplar, burr oak, and Manitoba maple (*Acer negundo*), with an understory of Canada buffaloberry, chokecherry, alpine willowherb (*Epilobiam anagallidifolium*), creeping bellflower (*Campanula rapunculoides*), common

horsetail, cow parsnip (*Heracleum maximum*), golden currant (*Ribes aureum*), gypsywort (*Lycopus europaeus*), narrow-leaved dock (*Rumex triangulivalvis*), northern gooseberry, prickly rose, red-osier dogwood, raspberry (*Rubus idaeus*), star-flowered Solomon's-seal (*Maianthemum stellatum*), saskatoon, star-flowered Solomon's-seal (*Maianthemum stellatum*), tall lungwort (*Mertensia paniculata*), vetch (*Vicia* spp.), western mountain ash, wild red raspberry (*Rubus idaeus*), and wild sarsparilla (*Aralia nudicaulis*), and invasive species alfalfa (*Medicago sativa*).

Open park and grassland areas were dominated by unmaintained and manicured grasses including smooth brome (*Bromus inermis*), and fescue (*Festuca spp.*), and various invasive species including smooth brome, Canada thistle (*Cirsium arvense*), common tansy (*Tanacetum vulgare*), lamb's quarters (*Chenopodium album*), sow thistle (*Sonchus* spp.), vetch, and wild mustard (*Sinapis arvensis*).

At the Project site upland vegetation along the creek and trail was dominated by Manitoba maple, followed by American elm (*Ulnus americana*), and balsam poplar, with an understory of grasses, current, green alder (*Alnus crispa*), feathermoss, red-osier dogwood, snowberry, star-flowered Solomon's-seal, prickly rose, and western mountain ash. Riparian vegetation was comprised of grasses, common caragana, current, common horsetail, northern gooseberry, red-osier dogwood, and sandbar willow (*Salix exigua*). Invasive species identified at the Project site included Canada thistle, Himalayan balsam (*Impatiens glandulifera*), lamb's quarters, sow thistle, and stinkweed (*Thlaspi arvense*).

Rare Plants

A query of the Alberta Conservation Information Management System (ACIMS) indicated two occurrences of one rare non-sensitive vegetation species (GoA 2017): smooth sweet cicely (*Osmorhiza longistylis*) (S3; see ranking definitions in Table D1), located within Mill Creek ravine between 540 and 770 m southeast of B278.

The spring and summer 2021 rare plant surveys at the Project site did not identify the presence of any tracked rare species (including Species at Risk), nor tracked ecological communities (Allen 2014). Results of the June 17 and August 12, 2021 rare plant surveys are presented in Appendix D, Table D2. It should be noted that the majority of the project was subject to recent flooding and regeneration of understory vegetation was ongoing throughout the 2021 growing season (Plate C2). As a result, no mosses or ground lichens were observed, nor collected for identification purposes and various forb and grass vegetation species commonly present may have been buried by the latest deposit of silt, clay and woody debris.

Weeds and Invasive Species

One prohibited noxious weed (Himalayan balsam) was observed during the June and August rare plant survey on the west side of the EPCOR inlet structure and the left[6] bank of the creek downstream of B278 (Plates C3-C5), and during the July field reconnaissance on the right[1] bank of the creek 100 m upstream of B278 (Plate C6), respectively (as shown in Figure 3). Himalayan balsam is listed as a prohibited noxious weed in the *Weed Control Act* and the *Fisheries (Alberta) Act*, due to the prolific seed producing capacity.

Five noxious weeds were also observed were observed throughout the LSA,: Canada thistle (*Cirsium arvense*), common tansy (*Tanacetum vulgare*), common toadflax (*Linaria vulgaris*), common burdock *(Arctium minus*), great burdock (*Arctium lappa*), perennial sow-thistle (*Sonchus arvensis*), and scentless chamomile (*Tripleurospermum inodorum*) were observed throughout the LSA (Plate C7).

6 Left and right bank designation defined for an observer facing downstream

Other non-native (exotic; non-regulated), invasive species observed throughout the LSA included: alfalfa, common caragana, common dandelion, common groundsel (*Senecio vulgaris*), common plantain (*Plantago major*), curled dock (*Rumex crispus*), bird's rape (*Brassica rapa*), lamb's quarters, pineappleweed (*Matricaria discoidea*), prickly lettuce (*Lactuca serriola*purslane (*Portulaca oleracea*), smooth brome, stinkweed, white clover (*Trifolium repens*), and wild mustard.

5.3 Wildlife

Wildlife Habitat

Mill Creek Ravine in the LSA is a Biodiversity Core Area, that represents a large natural area and habitat patch of suitable size and quality to provide environmental conditions that support populations of animals and plants and associated ecological functions at a municipal scale (CoE 2008a, 2008b, and 2010). Mill Creek ravine is expected to be utilized for one or more life functions (overwintering, foraging, breeding) by wildlife species expected to occur of the Project site.

Mill Creek Ravine at the Project site is also designated provincially as a Key Wildlife and Biodiversity Zone (KWBZ; AEP 2021a). KWBZs play a disproportionately large role in supporting regional wildlife populations and acting as a source of biodiversity contrary to their localized size and distribution. The North Saskatchewan River valley is considered a regional biological corridor (City of Edmonton 2010). As the project site is located on COE-owned land, timing constraints that AEP typically recommends for a KWBZ are not applicable (C. Nahirniak, pers. comm.).

Mill Creek Ravine contains topographic variation, increased biological productivity, due to proximity to Mill Creek, forest and topographic cover, and has higher habitat potential for biodiversity at the local level. These interior or core habitat areas maintain important thermal and security cover for both local resident and transitional wildlife. The ravine would also serve as a habitat refuge or habitat linkage that facilitates species movement from one habitat patch to the other at the municipal level.

Wildlife Species

Mill Creek ravine supports a variety of urban-generalist wildlife species. Wildlife that may occur in the Mill Creek Ravine include: moose (*Alces alces*), deer (*Odocoileus spp*.) coyote (*Canis latrans*), fox (*Vulpes vulpes*), skunk (*Mephitis mephitis*), beaver (*Castor canadensis*), snowshoe hare (*Lepus americanus*), red squirrel (*Tamiasciurus hudsonicus*), crow (*Corvus brachyrhynchos*), magpie (*Pica hudsonia*), little brown bats (*Myotis lucifugus*), Canadian toad (*Bufo hemiophyrus*), boreal chorus frog (*Pseudacris triseriata*), wood frog (*Rana sylvatica*), tiger salamander (*Ambystoma tigrinum*), red-sided garter snake (*Thamnophis sirtalis*), and a variety of songbirds, woodpeckers and raptors. Species reported in FWIMT within a 2 km radius of the Project site included: brown creeper (*Certhia americana*), Canadian toad (*Anaxyrus hemiophrys*), cougar (*Puma concolor*), northern goshawk (*Accipiter gentilis*), peregrine falcon (*Falco peregrinus*), short-eared owl (*Asio flammeus*) (AEP 2021a)

A wildlife sweep of the LSA was conducted on July 27, 2021, in accordance with *Wildlife Sweep Protocols Sensitive Species Inventory Guidelines* (GoA 2020a). Observations of wildlife habitats, movement habitat linkages and ecological connectivity within the LSA were presented in Table 3. Observed wildlife included squirrels (*Tamiasciurus hudsonicus*), chipmunk (*Tamias minimus*), red-eyed vireo (*Vireo olivaceus*), black capped chickadee (*Poecile atricapillus*), and wildlife signs including chipped bark and cavities in trees from woodpeckers (as shown in Figure 3), and beaver masticated logs. No sensitive or significant wildlife habitat features were observed in the LSA.

Species of Conservation Concern

A query of the FWIMT indicated the LSA occurs within sensitive sharp-tailed grouse (*Pedioecetes phasianellus*) survey area and bald eagle (*Haliaeetus leucocephalus*) ranges (AEP 2021a). Neither species were reported within 2 km of the Project site (AEP 2021a). Sensitive raptor range for bald eagle would be largely associated with the North Saskatchewan River and adjacent mature forest corridor.

Federal and provincial status of wildlife species reported within 2 km of the Project is presented below in Table 2.

Habitat Suitability

Habitat suitability refers to the ability of the habitat classes within the landscape to provide life requisites for a particular species or species group such as food, water, cover and reproductive requirements. Habitat suitability was also influenced by edge effect, where indirect disturbances may adversely affect available interior habitat.

Treed areas in the LSA were bordered by residential neighborhoods to the northeast and southwest, and roadway infrastructure and interchanges of Scona Road, Connors Road and 98 Ave resulting in fragmentation of habitat connectivity of the Mill Creek ravine and the North Saskatchewan River. Forest habitat in the LSA may provide woody browse and cover habitat for uncommon ungulates (i.e., deer *Odocoileus* spp. and moose *Alces alces*). However, more common medium-sized mammals would be coyote, fox, beaver, skunk, snowshoe hare and red squirrel. These urban-adapted species rely on upland woody vegetation cover for shelter and protection. Wildlife may also utilize forest canopy and tree trunks as security cover and shelter from wind, snow, rain, sun and outward radiation loss of heat at night.

The deciduous dominated overstory and shrubby understory may also support communities of resident and migratory bird species during the growing season. Live timber and standing deadwood (snags) may provide good nest sites for cavity nesting bird species such as woodpeckers and tree swallow (*Tachycineta bicolor*) or mammals such as little brown bats. A diversity and abundance of insects and other invertebrates were also expected to occur in forest habitats, which provide an important food source for songbirds, bats, and amphibians.

The LSA overlaps the watercourse of Mill Creek. This fluvial channel landform contains topographic variation and site productivity conditions that provide increased levels of biodiversity, and also likely serve as habitat linkages for wildlife species to move between local habitat patches. Waterfowl preference for certain surface waterbodies has been shown to correlate strongly with increased surface water area, shoreline length, density of surrounding wetlands and distance to large impoundments (Leschisin et al. 1992). Mill Creek in the LSA generally lack suitable shoreline and was rated as poor for waterfowl suitability. The watercourse was considered ecologically important due to the capability to provide habitat to amphibians and various other wildlife species. Due to their proximity to known frog habitats, it is likely that the watercourses provide seasonal refuge and forage opportunities for frogs.

Open park and grasslands in the LSA were dominated by unmaintained and manicured monoculture of planted grasses which are regularly mowed during the growing season to maintain a uniform height. These areas generally provide poor cover habitat for most wildlife species due to maintenance of grass height at levels too short to offer adequate cover from predators.

Table 2. Status of Wildlife Species Reported within 2 km of the Project Area

Common Name	Scientific Name	Federal Status[1]		Provincial Status		Expected Residency Status and Site Use[4]	Habitat[5]	Habitat Suitability Rating in LSA[6]
		COSEWIC	SARA	Wildlife Act	General Status Listing[3]			
Mammals								
Cougar	*Puma concolor*	Not Listed	Not Listed	No status	Secure	Very rarely as a movement corridor or for foraging,	Require large home range and will utilize a wide range of habitats to meet different life requirements (i.e. hunting vs dens). Generally, utilize more remote forested and rocky outcrop areas, however will utilize open pasture and crop lands for hunting were adequate forested corridor are available.	Low
Amphibians								
Canadian toad	*Anaxyrus hemiophrys*	Not at Risk	Not Listed	No status	May Be At Risk	Year-round residence for all life history functions, where species are present	Found in river valleys or along lakes with sandy borders. Prefers aspen parkland habitats including grassland, open parkland and boreal forest. Breed in and around ponds and wetlands but may be found far from water. Loose sandy soils important for hibernation.	Moderate
Birds								
Brown creeper	*Certhia americana*	Not Listed	Not Listed	No status	Sensitive	Periodically for foraging	Prefer sizable stands of large trees in mature woods. Prefer breeding in old growth and mature coniferous or mixed coniferous-deciduous forests. Nest under loose bark.	Low
Northern goshawk	*Accipiter gentilis*	Not at Risk	Not Listed	No status	Sensitive	Very rarely for foraging	Most common in mature to old deciduous-dominated mixedwood forests with a closed canopy. Foraging habitat contains dense canopy of early- to mid-seral forest with open understory. Post-fledging habitat contains mature/old forest, nest stands, snags, downed logs, and a well-developed understory	Low
Peregrine falcon	*Falco peregrinus*	Not at Risk	Special Concern, Schedule 1	Endangered	At Risk	Periodically for foraging	Typical nesting habitat for the species is characterized by cliffs close to riparian or marsh habitats in rural areas, or on buildings and other man-made structures in urban areas.	Low
Short-eared owl	*Asio flammeus*	Threatened	Special Concern, Schedule 1	No status	May Be at Risk	Rarely for foraging	Found in open habitat such as marshes, fields, prairies, or tundra. Breed in wet shrublands, dry marshes, grasslands, long-grass agricultural fields and open power line corridors. In migration and winter are found in alpine mountain meadows, sagebrush grasslands, marshes, agricultural fields, log-littered shores, and rangelands	Low

1. GoC 2021; COSEWIC – Committee on the Status of Endangered Species in Canada; SARA – *Species at Risk Act*; **Not at Risk** – a species that has been evaluated and found to be not at risk; **Not Listed** – the species may not have been assessed but may be a candidate species for future assessments; **Special Concern** - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats; 2. **Endangered** – species facing imminent extirpation or extinction; **No status** – species is not listed or protected under the *Wildlife Act*; 3. AEP 2017: **May Be At Risk** – any species that 'May be at Risk' of extirpation or extinction and is therefore a candidate for detailed risk assessment; **Secure** – a species that is not 'At Risk', 'May Be At Risk' or 'Sensitive'; **At Risk** - Any species known to be "At Risk" after formal detailed status assessment and legal designation as "Endangered" or "Threatened" in Alberta; 4. Residency status – expected frequency of the species to occur at the site (e.g., year-round, seasonally, periodically, rarely); Site Use – expected life history function/site use for the species at the Project site (i.e., migration, overwintering, foraging, breeding); 5. ACA and ASRD 2002, Cornell University 2015; Hoar et al 2010; Russell and Bauer 2000; Semenchuk 1992; Sibley 2000.

Table 3. Wildlife Sweep Observations within the LSA

Species Name		Detection Type
Common	Scientific	
Mammals		
Red Squirrel	*Tamiasciurus hudsonicus*	Visual
Chipmunk	*Tamias minimus*	Visual
American Beaver	*Castor canadensis*	Masticated logs
Birds		
Red-eyed vireo	*Vireo olivaceus*	Vocalizations
Black-capped chickadee	*Poecile atricapillus*	Vocalizations
Woodpecker	Unknown species	Chipped tree bark, Tree cavity: 53.529629°, -113.480894°

5.4 Fish and Fish Habitat

The following was based on the Wood (2022) *Fish and Fish Habitat Assessment, Mill Creek Ravine Pedestrian Bridge #278* report dated 14 February 2022 prepared for the City of Edmonton.

Watercourse Classification

In accordance with the *Code of Practice for Watercourse Crossings – St. Paul Management Area Map* Mill Creek is a mapped uncoded Class D water body (ESRD 2012). Pursuant to the *Alberta Code of Practice for Watercourse Crossings*, Section 8(3)(b) where an uncoded water body enters a mapped water body that is a Class […] C water body, the portion of the uncoded water body for a distance of 2 kilometres upstream from the mouth of the uncoded water body is the same class as the mapped water body that is entered. Therefore, Mill Creek in the vicinity of B278 will be default Class C waters as a tributary to the North Saskatchewan River with a restricted activity period of September 16 to July 31.

Fish Community

A query of Alberta Environment and Parks (AEP) Fish and Wildlife Management Information System (FWMIS) reported the fish species within Mill Creek are limited to a simple community of warm water forage fish including brook stickleback (*Culaea inconstans*) and fathead minnow (*Pimephales promelas*) (AEP 2021a). Two sportfish species, rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*) were historically stocked (1965 and 1948, respectively) within Mill Creek, however, no current records of either species exists and absence in Mill Creek is expected (AEP 2021).

Upstream fish passage/migration into Mill Creek is obstructed from the downstream receiving waters of the North Saskatchewan River. Approximately 120 m downstream of B278, the creek channel drains subsurface through an intake structure and tunnel to the North Saskatchewan River discharging through a permanent outfall structure located several meters above the river, which is located approximately 700 m downstream of B278 (COE 2016; Tetra Tech 2020). In addition, Mill Creek is suspected of lacking overwintering, spawning and rearing habitat capable of supporting resident large-bodied fish species.

Mill Creek Channel Characteristics

Wood conducted the field assessment on July 27, 2021 (Wood 2022). The recorded surface water flow water depth in the natural channel (outside the footprint of existing B278 bridge) in the study reach extending 100 m upstream to 120 m downstream averaged 0.11 m and recorded bankfull depth averaged 0.89 m. Average recorded channel and wetted widths were 6.63 m and 2.59 m, respectively. In the study reach, channel bed substrates were composed primarily of fine-textured sediments (86%), and a mixture of small gravel (12%), large gravel (2%), and trace amounts (<1%) of small and large cobble. Instream habitat was dominantly comprised of run habitat (80%), with some areas of flat (14%), and pool (6%) habitat (Plates C8-C9). Maximum recorded flow depth of 0.25 m located 100 m upstream of the B278 structure.

The creek bank heights (as measured between the bankfull depth and terrestrial vegetation) had an average of 1.41 m for the left bank and 0.72 m for the right bank (left and right bank designations defined for an observer facing downstream). Bank slopes averaged 39° and ranged from 20 to 75°. The left bank 100 m upstream of B278 was high (3.09 m), steeply eroded, slumping and near vertical bank, and between approximately 20 and 75 m downstream of B278 was armored with rock filled gabion baskets (Plates C19-C10). At the time of the assessment woody debris accumulation was observed at the EPCOR inlet structure, located 120 m downstream of B278 (Plate C11). Side- and braided-channel bars were common throughout the study reach (Plates C8-C10).

At the B278 structure, the channel was comprised entirely of pool habitat with fine textured substrate likely due to flow scour and downcutting through the existing constricted bridge opening (Plate C12). Maximum recorded flow depth under B278 was 0.95 m. Bank heights at B278 averaged 1.41, with slopes averaging 42.5°. At the Project site the right bank upstream of B278 was high (4 – 6 m) and steeply eroded and slumping (Plate C1). The channel thalweg was positioned along the right bank at a 90° meander bend occurring 8 m upstream of the bridge and was expected to flow primary along the right bank under B278 (Plate C1). Woody debris accumulation at the time of the assessment prevented observation of the location of the thalweg under B278 (Plates C1 and C12). Downstream of B278 flows were directed toward the left bank and 90° meander bend occurring 16 m downstream of B278. Total cover available was estimated to be 5% of the channel area. Cover was provided primarily by large woody debris (60%), with contributions from small woody debris (30%), and undercut banks (10%).

Fish Habitat Evaluation

Mill Creek was characterized as a small, permanent, warm water watercourse. Upstream fish passage/migration into Mill Creek is inhibited from the downstream receiving waters of the North Saskatchewan River due to the permanent outfall structure located several meters above the river (COE 2016; Tetra Tech 2020, Wood 2022). In addition, Mill Creek is suspected of lacking overwintering, spawning and rearing habitat capable of supporting resident large-bodied fish species. Productive capacity of available fish habitat is considered to be low and sportfish absence is suspected in the vicinity and upstream of B278. The study reach is primarily suitable for the forage fish species historically reported in Mill Creek, which have a greater tolerance to temperature variation and poor water quality. In general, these fish communities are less sensitive to disturbances.

Species of Conservation Concern

A review of the Department of Fisheries and Oceans (DFO) *Aquatic Species at Risk Map* did not identify Mill Creek as containing / potentially containing a species at risk or their critical habitat (DFO 2021). Brook stickleback and fathead minnow are provincially listed as 'secure' (AEP 2017), and not federally listed by COSEWIC or under the *Species at Risk Act* (SARA; GoC 2021). A query of the Alberta Conservation Information Management System (ACIMS) indicated one occurrence a non-sensitive mollusk species creeping ancylid (*Ferrissia rivularis*) (SU; see ranking definitions in Table D1), located within Mill Creek ravine between 540 and 770 m southeast of B278.

Aquatic Invasive Species

Mill Creek occurs in a mapped Yellow Zone within the hydrologic unit code for Cooking/Beaverhill Lake (HUC 6 Number 110301; AEP 2021a). The Yellow Zone represents high risk waters for the introduction or spread of aquatic invasive species (AIS) and fish disease, including whirling disease and Prussian carp. There are currently 52 prohibited fish, plant and invertebrate AIS species listed in the Alberta *Fisheries Act*. AIS species impacts are considered a threat to the environment, economy and human health, and are considered one of the greatest threats to freshwater resources and leading causes of loss of biodiversity (AEP 2018). A query of FWIMT reported the aquatic invasive plant species Purple loosestrife (*Lythrum salicaria*) within the floodplain of Mill Creek in 2020, approximately 2.5 km upstream (AEP 2021a). Further, Himalayan balsam (*Impatiends glandulifera*) was observed during the July 2021 field reconnaissance along the east bank 100 m upstream of B278 (Plate C6), and during the June and August 2021 rare plant surveys on the west side of the EPCOR inlet structure and the left[7] bank of the creek downstream of B278, respectively (Plates C3-C5).

[7] Left and right bank designation defined for an observer facing downstream

5.5 Surface Water / Water Quality

Surface Water Characteristics

The Project occurs in the Beaverhill Subwatershed of the North Saskatchewan River Watershed (NSWA 2005). Mill Creek originates in wetland areas east of Edmonton and flows northward and ultimately to an outfall to the North Saskatchewan River (approximately 0.8 km downstream of the Project Site) in Edmonton, Alberta (AEP 2021a). Mill Creek has been historically modified in the 1960s and 1970s to facilitate city development, including industrial areas and transportation corridors (CoE 2016b).

From its origin, Mill Creek flows northward through the community of Mill Woods and the Jackie Parker Recreation Area, and then is diverted through pipes under Edmonton's Davies/Coronet Industrial areas. Surface flows remerge north of Argyll Road, and continue on through Mill Creek Ravine Park (AEP 2021a, Google Earth Pro 2021). At the Project site drainage area of the creek is approximately 125 km^2, with 40% consisting of developed/developing lands and 60% undeveloped (Wood 2021a). Downstream from approximately 120 m downstream of B278 Mill Creek is diverted underground beneath the Connors Road freeway system via a pipe and concrete outfall structure operated by EPCOR (CoE 2016b). The outfall discharges into the North Saskatchewan River from the south/east side of the bank (CoE 2016b).

Surface water within the LSA is limited to Mill Creek and storm water runoff from adjacent urban and natural areas is directed to Mill Creek. The project site is located outside of the City of Edmonton Floodplain Protection Overlay and floodway and flood fringe of the North Saskatchewan River defined by the Province of Alberta (COE 2021a, AEP 2021b). Average annual precipitation in the region is approximately 441 mm with maximum precipitation in the months May through September (NRC 2006).

In urban areas, impervious surfaces alter flow patterns from natural conditions. The Mill Creek catchment has largely been urbanized, resulting in increased 'flashiness' in the flow regime which includes very rapid increase and decrease in flows and higher peak flow (Tetra Tech 2020). Although there are no Water Survey of Canada gauges on Mill Creek, reports of extreme flows associated with peak runoff conditions (snowmelt and heavy storms) and resulting erosion are well documented (Tetra Tech 2020).

Stream flows / creek hydrology in the vicinity of B278 have been altered as a result of accumulated woody debris at the B278 opening, which considerably restricts the bridge's hydraulic capacity (Wood 2021a). Further, water level elevations have been impacted by back flooding from woody debris accumulation at the EPCOR pipe structure (located 120 m downstream of B278) (Wood 2021a). Ongoing erosion and sedimentation of the creek is occurring, particularly as a result of tight meander bends in the immediate vicinity of B278 and back flooding from woody debris accumulation at the EPCOR pipe structure (Wood 2021b). Further, signs of slumping have been noted above the rock filled gabion baskets along west creek bank downstream of the bridge (Wood 2021b).

Hydrotechnical analysis completed by Wood (2021b) estimated the 2020 flood, which overtopped the existing B278 bridge deck and a portion of the adjacent trail to be in the order of Q1:25 year event. Water levels during the 2020 flood were in the order of 0.8 m above the existing bridge deck, primarily as a result of backwater from the woody debris accumulation on the inlet screen of the EPCOR structure, located 120 m downstream of B278.

Water Quality

Selected water quality parameters measured in representative flowing water at the crossing on July 27, 2021. Turbidity was rated low. Water temperature was 19.6°C and specific conductance was 2513 µS/cm. The water was alkaline (pH of 8.48) and dissolved oxygen measured 9.09 mg/L. The pH value recorded is slightly higher than maximum pH 9.0 provided by the CCME Water Quality Guideline for the Protection of Aquatic Life (CCME 2021). Toxicity of other chemicals may be affected by this pH level. According to the *Canadian Water Quality Guidelines*, the value recorded for dissolved oxygen met CCME guidelines for the *Protection of Aquatic Life* for freshwater ecosystems (CCME 1999).

5.6 Groundwater

Hydrogeology

The LSA is located on Mill Creek approximately 400 m east from the nearest approach of the North Saskatchewan River. To the west of the Project site, the ground elevation increases until an elevation of approximately 650 m near Scona Road at which point the ground slopes steeply toward the river which is at an elevation of approximately 615 m.

Based on the ground elevations near the LSA, the elevation of the river and Mill Creek, and the soil types in the area, no potential Domestic Use Aquifer (DUA) as defined in AEP's (2016) Alberta Tier 1 Soil and Groundwater Remediation Guidelines will be encountered within the proposed work area.

Groundwater Wells

The desktop review of the site hydrogeology was primarily based on the Alberta Water Well Database (AEP 2021c), and hydrogeology reports for the Edmonton area by W. Ceroici (1979) and Bibby (1974).

Potable water is supplied by the City of Edmonton, and there are essentially no groundwater wells within 1,000 m of the LSA. As shown on Figure 3, there are two water well records in the database for locations within 1 km (1,000 m) of the project site. These wells are recorded as being drilled in 1928 (Well ID 79277) and 1977 (Well ID 79275), and copies of these borehole logs are included in Appendix F. Both of these wells are relatively deep (i.e. 61 m and 90 m deep) and screened in fractured shale bedrock. Based on the age of these wells, and their locations within the City of Edmonton, it is considered unlikely that these wells are still in use.

The water well records summarized in the Reconnaissance Report (Appendix F) show that neither borehole log indicates the use of water wells near the LSA, nor the presence of a domestic use aquifer (DUA) as defined in AEP's (2016) Alberta Tier 1 Soil and Groundwater Remediation Guidelines.

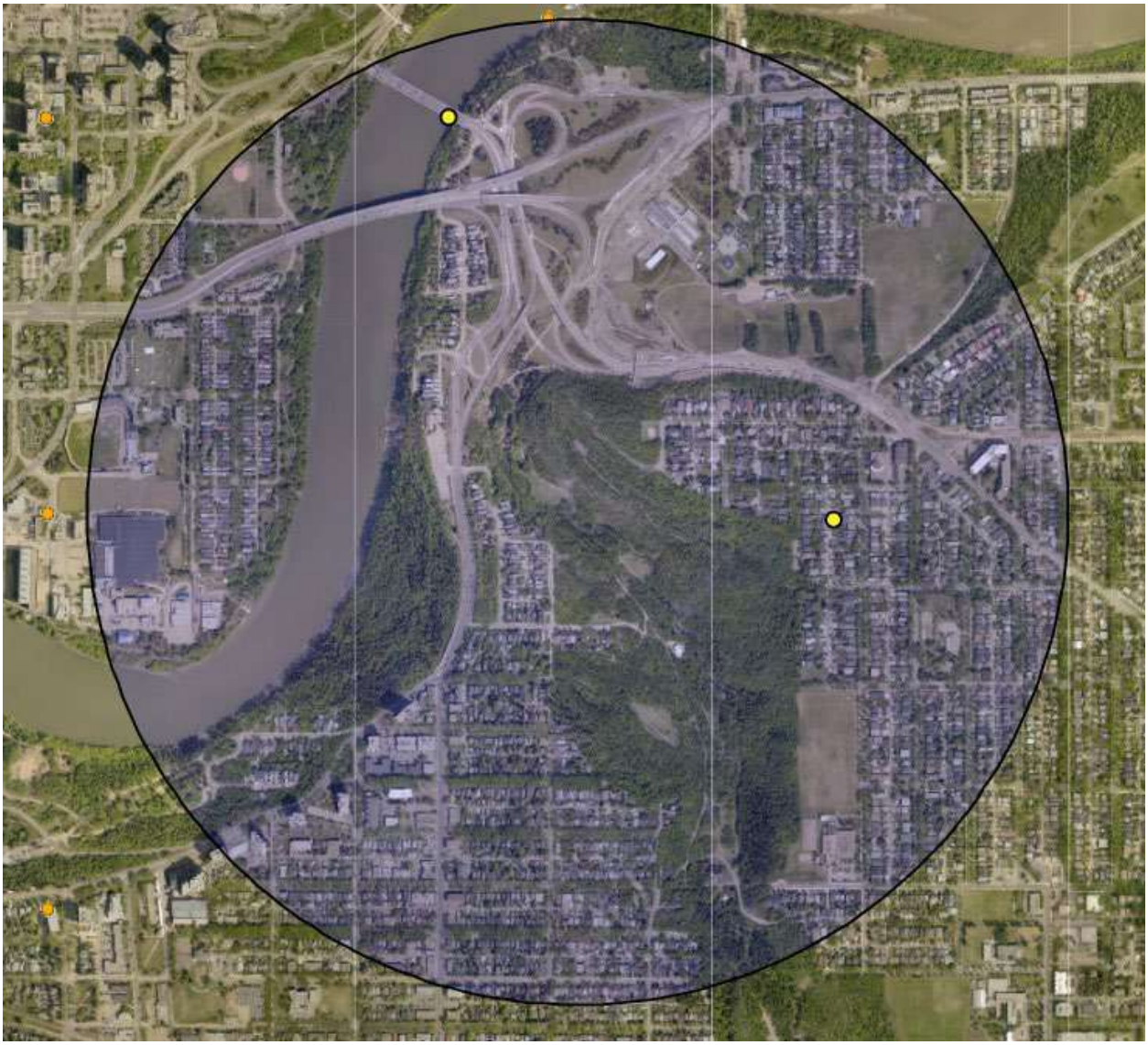


Figure 3. Alberta Water Well Database Image Showing Water Wells Within a 1,000 m Radius of the Project Site

5.7 Air and Noise

Noise pollution relevant to the project would primarily relate to the operation of construction equipment. The COE Bylaw 14600 Community Standards sets guidelines for construction noise within residential sites that would apply to this project. Air quality impacts relevant to this project would relate to dust and airborne particulate matter generated by construction. Background data that describes air quality in terms of those parameters are not measured by Edmonton's air quality monitoring programs, such as Clean Air Strategic Alliance (2019), therefore, no description of existing conditions was provided.

5.8 Socio-Economic

5.8.1 Land use

The Project site is located within Mill Creek Ravine Park and is bordered by residential property near the top of the ravine. The Project site occurs with neighborhood of Mill Creek Ravine North and surrounding Community leagues include Bonnie Doon to the east and Strathcona Centre to the west (CoE 2021a). The Project site is zoned as (A) Metropolitan Recreation (COE 2021a). Mill Creek Ravine at the Project site is considered a Protected Natural Area and a Biodiversity Core Area, that represents a large natural area and habitat patch of suitable size and quality to provide environmental conditions that support entire populations of animals and plants and associated ecological functions at a municipal scale (CoE 2008a, 2008b, and 2010).

The COE initiated the Environmental Sensitivity Project in 2015 to identify areas of significant ecological value (assets), threats to those valued resources and physical and cultural constraints to development. The City's Environmental Sensitivity - Score Map summarizes these factors into an environmental sensitivity score and classification system to identify areas that should be considered for protection, conservation or restoration, and zones where development poses low risk to ecological network. A review of the Environmental Sensitivity - Score Map rated Environmental Sensitivity of the Project site as Very High to Extremely High Value (COE 2021a).

An Alberta OneCall report site identified EPCOR and ATCO gas facilities at the Project site (Wood 2021b). A 600 mm combined sewer pipe runs along the length of the Project, under the trail at three locations and the creek downstream of B278, as shown in the design drawings in Appendix A.2.

According to the Atlas of Coal Mine Workings in Edmonton a now abandoned mine had previously operated below the Project site (Wood 2021b). Two seams with some longwall mining were mined. However, no information was provided regarding the depth of production or quantity (Wood 2021b).

5.8.2 Provincial Crown lands

The proposed development will occupy provincial Crown land of the bed and shores of the Mill Creek, which requires that a surface land use disposition application under the *Public Lands Act*. The existing disposition (DLO 054638) for bed and shore on Mill Creek was originally prepared for erosion control work but does not approve the area required for a new bridge and riprap armoring. Further, the alignment of the creek shown in the DLO 065638 does not accurately reflect current channel conditions (Abacus Datagraphics Ltd 2021; Wood 2021a). For the purpose of the bridge and riprap protection works, a new Department License of Occupation (DLO) application is required. A new application for Surface Disposition was submitted to AEP through the Electronic Disposition System (EDS) on September 24, 2021 under file number DLO210149. At the time of writing, the DLO application was under review.

5.8.3 Navigable Waters

Under the *Canadian Navigable Waters Act* (CNWA), Mill Creek is not a scheduled navigable waterway. Further, the watercourse was not classified as a navigated stream in accordance with the Alberta Transportation (2014) *Navigated Waters in Alberta* and Alberta Government (2014) *Drainage Basins and Navigated Stream Map*.

5.8.4 Site Contamination

As part of the Bylaw 7188 review process, the Environmental Overview (Phase 1 Environmental Site Assessment) was prepared in accordance with the COE (2016c) *Environmental Site Assessment Guidebook*, and based on the Canadian Standards Association (CSA), *Phase I ESA Standard* guideline *(CAN/CSA Z768-01)*. The objective of an Environmental Overview is to identify areas of potential environmental concern ('APECs') and associated contaminants of potential concern ('COPCs') that could be associated with current and past activities on the Site, and to determine if additional investigations are recommended. No concerns with current and past contamination in the LSA were identified

The Environmental Overview document (see Appendix A.1) was submitted to the City of Edmonton Planning Coordination Group, and Urban Growth and Open Spaces, Planning and Environment Services on July 24, 2021. The objective was to confirm any supplemental requirements beyond the Environmental Overview Report, as it pertains to contaminated site investigations and applicability to the EIA. No additional requirements were identified.

5.9 Historical Resources

The RSA includes lands that are on the Provincial Listing of Historic Resources ("Listing"). These lands have the Historic Resource Value of HRV5a and 5p and are High Archaeological Resource Sensitivity and High Palaeontological Resource Sensitivity Zones (CSW 2021a, 2021b; GoA 2020b).

There are numerous archaeological sites recorded within Mill Creek Ravine and the nearby North Saskatchewan River Valley. The lower reaches of Mill Creek Ravine were the focus of historic industrial activity within the City of Edmonton and was also the location of an extensive squatter community in the early 20th century. Historic documents report that Mill Creek was also the location for the encampment of indigenous peoples from southern Alberta when trading at Fort Edmonton (Edmonton House and Fort Augustus IV and V) in the 19th century. Mill Creek Ravine therefore has high potential to include unrecorded archaeological sites and ground disturbance associated with project development has the potential to affect a historic resource. Although Mill Creek Ravine has been subject to significant disturbance previous studies have shown that there remains the potential for intact historical resources to be present.

Historical Resources Act (HRA) Section 31 approval was issued for the project on 1 November 2021. HRA approval no. 4725-21-0056-001 is provided in Appendix B.2. The Heritage Division of Alberta Culture and Status of Women must be contacted immediately in the event that a historical or palaeontological resource is encountered during land disturbance activities. It may then be necessary for further instructions to be issued regarding the documentation of these resources, where required.

6.0 Effects Assessment and Mitigation Measures

An important consideration when assessing effects of the proposed development is the existing level of public use and activities that have already affected the biophysical resources in the study area. For example, current effects include the existing recreation trail, vegetation alterations and 'edge' habitat, and wildlife behavioural changes, such as habituation to noise disturbance and human activity. Standard practices by the Contractor for the proposed works that are assumed in the environmental review include:

- Contractor's understanding and acceptance of the City of Edmonton's:
  - Environmental Policy C512;
  - Edmonton's Environmental Management System Policy C505;
  - Enviso Contractor's Environmental Responsibilities Package, and
  - Contractor's Release Reporting.
- Contractor implementation of an Environmental Construction Operations (ECO) Plan in accordance to the COE (2020 or latest) Environmental Construction Operations (ECO) Plan Framework; and
- Contractor's understanding and implementation of the City of Edmonton Erosion and Sedimentation Guidelines (COE 2005a) and City of Edmonton Erosion and Sedimentation Field Manual (COE 2005b).

The terms used to define construction and operational residual effects are discussed in Appendix E, and the following sections present the results of the environmental assessment of the Project site.

6.1 Geology and Geomorphology and Soils

6.1.1 Potential Effects

Potential effects to geology, geomorphology and soils occur during construction related activities. These activities include site clearing, topsoil and subsoil salvage and handling, excavation, grading and reclamation of the land surface. Potential effects of the Project on soil quality may include:

- Admixing, which results in a loss of soil profile integrity, dilution of organic matter and reduction of nutrient status, and possibly changes in water holding capacity (i.e., a reduction in soil quality);
- Compaction, which degrades soil structure, thus reducing permeability and aeration;
- Erosion, which results in loss of soil volume and reduction in nutrient status; and
- Contamination by spills or leaks.

These effects may lead to reduction, and in some cases improvement, of soil suitability after restoration. Installation of riprap along the newly armoured channel bed and banks at B278 will stabilize the stream bed and banks and reduce/eliminate future erosion and sediment transport and protect the bridge abutments.

6.1.2 Mitigation Measures

M1. Construction activities should be scheduled to avoid periods of rapidly changing weather, including heavy rains or rapid snow melt, which could lead to surface run off and soil erosion.

M2. Construction area boundaries and areas of concern will be marked with barriers to ensure that construction personnel know they are working in or near sensitive areas that cannot be disturbed and to limit the area of disturbance to the required PDA.

M3. Soil salvage operations will be conducted with qualified supervision and in a manner to maximize the quality of the soil for future use in reclamation. In particular, topsoil and subsoil (i.e., A and B horizons) will be conserved and measures will be implemented to reduce admixing (e.g., scheduling of topsoil stripping activities during daylight hours).

M4. Topsoil will be salvaged and stored separately from underlying subsoil. Although color change between topsoil and subsoil is a good indicator of the soil profiles, care will be exercised to ensure proper topsoil salvage.

M5. During the construction, stabilization of topsoil stockpiles, and management of surface run-off (snow melt, rainfall) will reduce the erosion potential of runoff. Erosion and sediment control (ESC) measures will be used to reduce soil surface exposure, as required, in order to minimize both water and wind erosion. Applicable standard erosion and sediment control measures will be implemented as presented in the City of Edmonton *Erosion and Sedimentation Guidelines* (COE 2005a) and *Erosion and Sedimentation Field Manual* (COE 2005b).

M6. To minimize soil compaction, to the extent possible, the following will be implemented:
- schedule construction activities to avoid work on wet soils;
- minimize the number of repeated passes over areas prone to compaction;
- use tracked vehicles rather than conventional tires when warranted by soil moisture conditions; and
- use amelioration procedures (deep ripping, discing, revegetation) and incorporation of organic matter (compost, peat) during reclamation to alleviate residual compaction.

M7. Temporary ESC measures during construction will be the responsibility of the construction Contractor. ESC measures will be implemented to prevent loss of soils and sedimentation of through erosion.

M8. Following construction all disturbed soil areas will be topsoiled and seeded as soon as possible with the objective of permanently stabilizing disturbed areas within one growing season of construction completion.

M9. A spill prevention and response plan will be designed and implemented as part of the Contractor's ECO Plan during construction to prevent contamination of any soil system, including soils stored for later use, and in the event of accidental contamination during operation, to immediately respond and mitigate the contamination.

6.1.3 Residual Effects

Most potential effects on soil quality due to admixing, compaction or erosion, can be successfully mitigated with the recommended mitigation measures and BMPs, including soil salvage and handling, implementation of ESC measures, and reclamation and revegetation. Mitigation measures identified to address potential effects on geology, geomorphology and soils within the study area are anticipated to fully mitigate potential negative environmental effects.

The primary mitigation for potential effects related to accidental spills and releases is prevention through BMPs for fuel storage, re-fueling and spill response. Accidental releases are anticipated to be localized and will be handled immediately as outlined in the spill response plan as part of the Contractor's ECO Plan during construction.

Overall, the residual effects resulting from the Project related to admixing, compaction/rutting, contamination and/or soil erosion, are all considered to be negative, low in magnitude, limited to the PDA in extent, long-term in duration, and reversible.

6.1.4 Regulatory Requirements

Implementation of the recommended BMPs and mitigation measures, including pre-and post-disturbance assessments and reclamation of disturbed areas, is intended to comply with the provincial *Soil Conservation Act* and the provincial *Environmental Protection and Enhancement Act* as they apply to soil loss, disturbance or deterioration.

6.2 Vegetation

6.2.1 Potential Effects

Potential effects construction of the Project may have on vegetation include:

- Loss of native and non-native vegetation (including loss of trees);
- Introduction of weedy or invasive species; and
- Loss of rare plants or unique vegetation communities.

Construction activities will result in a new proposed disturbance footprint of 328 m^2 area. There is also potential for damage to trees adjacent construction access and laydown areas. To ensure compliance with the *Corporate Tree Management Policy* C456C the City of Edmonton Urban Forestry will be contacted a minimum four weeks in advance of the construction start date to review construction plans and tree protection for existing trees within the Project footprint and 5 m of any construction.

Other negative effects can be associated with non-native or introduced plant species that are often strong competitors with native species in disturbed environments. Non-native or invasive plant species (i.e., weeds) often colonize disturbed areas through the dispersal of seeds by wind, water, wildlife or human-related activity. Invasive plants can move into adjacent areas and displace or otherwise affect the post-disturbance recovery of native vegetation. Given the nature of the Project, there will be opportunities for weeds to invade disturbed areas. The spread of weeds into disturbed areas typically occurs over a medium time period (1-5 years). However, if native vegetation cover in can be re-established in a timely manner, weed spread is predominantly eliminated.

Based on the spring and summer 2021 surveys, no tracked rare species (including Species at Risk) or tracked ecological communities were observed in the PDA. The potential for loss of rare plants or unique plant communities is considered low, based on the absence of rare plants during the spring and summer surveys and the estimated 328 m^2 footprint of the PDA.

Dust may impact plants by reducing light availability on leaves, damaging leaves, introducing pathogens to leaves, and affecting leaf stomata and respiration. Areas affected by dust are typically confined to the first 5-20 metres of natural vegetation cover. Dust emissions (i.e., dust picked up by wind or moving vehicles from the ground) often vary substantially from day to day, depending on the level of activity, the specific operations, soil moisture conditions, and the prevailing meteorological conditions. In addition to the onsite activities, a secondary source is fugitive dust deposited on existing access roads/trails that may be re-suspended by moving vehicles. This secondary source of dust may be more important than all the dust sources related to the Project. Dust effects can be mitigated with high success with appropriate dust control measures, traffic management, and prompt implementation of ESC and revegetation of disturbed areas.

6.2.2 Mitigation Measures

The following measures will be implemented to address potential effects of the Project on the vegetation.

M10. The removal of vegetation will be restricted to the minimal acceptable requirements to avoid potential disturbance to native vegetation communities outside the PDA. All tree clearing will be conducted in accordance with the COE's Corporate Tree Policy.
M11. A site meeting with Urban Forestry to review construction plans and tree protection for existing trees within the Project footprint and 5 m of any construction and access will be scheduled a minimum 4 weeks in advance of the construction start date. Tree clearing will be completed by the City prior to construction.
M12. Where construction access or laydown areas are situated near boulevard trees, tree protection will be incorporated as per the COE Tree Protection Detail for Boulevard Tree Protection Zone (COE 2017). However, a minimum 2 m protection barrier surrounding each tree is required, as per the request from the COE provided in Appendix G.3.
M13. A revegetation plan will be developed to include native shrub potted stock plantings, to include integration of natural vegetation to enhance habitat and bank stability, where appropriate.
M14. All disturbed and newly constructed slopes will be seeded with a Native Seed mix – Central Parkland seed mix in accordance with the City of Edmonton (2021b) construction specifications Section 02920 Seed and Sod, 2.1.3.
M15. Mitigation measures for dust management will be implemented, including:
- Dust abatement measures will be applied when necessary to suppress dust generation. The Contractor will control dust on all disturbed areas in the Project site using water or other approved dust abatement materials.
- Cover or use of dust suppressants will be required for the haul/dump trucks when hauling fine-grained materials.

In order to control weed spread and colonization, the following is recommended:

M16. All construction and maintenance equipment will be cleaned prior to moving from one working area to another to ensure it is free of weeds and other foreign material.
M17. Weed control methods will be implemented during the construction, reclamation and maintenance phases of the Project in areas where weed problems are identified. The use of herbicides is not recommended within the Project site due to potential runoff into Mill Creek.
M18. Weed control measures, such as mowing, hand picking, seeding of a temporary vegetation cover (annuals) may be required on site until the desired vegetation becomes established. If herbicides will be used, this must be done in accordance with the *Environmental Code of Practice for Pesticides*, and only be applied by a certified herbicide applicator with the presence of a *Special Use Approval* in accordance with Section 9 of the EPEA *Pesticide (Ministerial) Regulation* for herbicide applications applied within 30 metres of a water body.

M19. Monitoring will be required to ensure that weeds are not spread and/or permitted to establish on disturbed or reclaimed areas. Monitoring activities related to weed control will include the following:
- Inspection of vehicles as they arrive on-site to ensure that they have been cleaned and are free of dirt, mud, weeds and invasive species.
- Periodic monitoring during construction for weed establishment throughout disturbed areas and any stockpiles. Further follow-up (e.g., implementing weed control measures) may be required if and where monitoring identifies problem areas (e.g., infestations of weeds designated as prohibited noxious or noxious are identified).
- Post-construction monitoring of reclaimed areas, including staging areas and access routes to identify occurrences of weed establishment.

6.2.3 Residual Effects

The Project will require vegetation clearing and alteration, primarily consisting of trees and shrubs. In accordance with the *Corporate Tree Management Policy C456C* administered by COE Urban Forestry Department, *tree loss will be determined and equitable compensation for the loss and/or damages to City trees will be recovered in accordance with the City of Edmonton* (2020) *Natural Stand Valuation Guidelines and/or* (2016a) *Guidelines for the Evaluation of Trees*. The COE applies this policy consistently across all COE and community partner projects.

All disturbed areas will be revegetated as soon as possible following construction with the objective of permanently stabilizing disturbed areas within one growing season of construction completion. A site-specific replanting plan will be developed during the detailed design phase to include topsoiling, native shrub potted stock plantings, seeding and erosion and sediment control measures.

There is expected to be a low potential for the Project to have an effect on tracked rare species or tracked ecological communities. The magnitude of the spread of non-native plants/invasive weeds is considered moderate but reversible.

With implementation of recommended mitigation measures, residual effects on vegetation related to direct effects (vegetation clearing) and indirect effects (weeds/invasive species) are predicted to be negative, low in magnitude, limited to the PDA in extent, long-term in duration, and reversible.

6.2.4 Regulatory Requirements

Implementation of mitigation and monitoring measures will address requirements under the *Weed Control Act* as it applies to the Project.

6.3 Wildlife and Wildlife Habitat

6.3.1 Potential Effects

Most wildlife species in the vicinity of the Project are urban-generalist species that are habituated to noise and activity disturbance. Sensory disturbance related to the Project is associated with vegetation clearing and construction activities. Most wildlife will avoid available habitats in the immediate vicinity of the active construction site during the day and return during periods of inactivity (e.g., overnight). Wildlife more tolerant of human disturbance (e.g., coyote, deer, squirrel, some bird species) have likely habituated to the current level of anthropogenic disturbance in the area and wildlife displacement may be temporary for these species. Most bird species, including some raptors, are highly susceptible to noise disturbance and will generally avoid nesting and staging in areas of high human activity. Following construction, these species are expected to return to adjacent and reclaimed habitats over time. No sensitive or significant wildlife habitat features were observed in the LSA.

The proposed works will result in the loss of habitat, primarily consisting of localized forest and shrub vegetation within the PDA. Impacts of direct habitat loss will vary depending on species, mobility, and home range size (Saunders *et al.* 1991). Direct mortality of wildlife may occur during clearing, particularly during the breeding period when eggs/young of birds and amphibians may be lost. Timing construction and or establishing setbacks to avoid sensitive breeding/nesting and denning periods will reduce the potential for wildlife mortality. Minimizing the duration over which clearing occurs will also reduce the sensory disturbance to wildlife. However, clearing is anticipated to be localized in nature and with appropriate mitigation, is anticipated to affect relatively few individuals. Dust and noise from construction may indirectly affect the composition and growth of vegetative adjacent the PDA, and may reduce primary and secondary productivity, thus affecting food resources for wildlife.

The movement patterns of animals, particularly mammals and ungulates, may be temporarily disrupted by construction activities. Construction activities are expected to occur during daylight hours, and animal movements may occur during periods of inactivity. Overall, substantial barriers to movement from construction activity are not expected to differ from current levels. As birds are highly mobile, construction and recreational activity not anticipated to cause significant barriers to movement. As suitable habitat for amphibian species of concern is limited within the study area, adverse effects on these species are not expected.

The City of Edmonton (2010) *Wildlife Passage Engineering Design Guidelines* categorizes species with similar habitat and wildlife passage requirements into Ecological Design Groups (EDGs) [8]. The Project LSA consisting of the Project trails and adjacent natural forested uplands of Mill Creek Ravine provide uninhibited passage and can be successfully crossed by all wildlife groups. For the purposes of addressing wildlife passage under the proposed B278 structure, it is important to identify the movement of the medium and small terrestrial mammal EDGs that are dependent on the low relief, riparian environments and associated floodplains of Mill Creek for travel (e.g., where movement is confined to riparian and/or aquatic environments). The proposed bridge structure with an Openness of 12.8 (Openness = [3.2 m height x 12.0 m width] / 3.0 length) will provide adequate passage for the anticipated medium and small terrestrial mammals, such as coyote, porcupine, muskrat, beaver, mink, and water vole.

[8] Ecological design groups are diversity of species grouped into categories for which connectivity planning and design should be considered and include large-medium-small terrestrial, amphibians, aquatic species, aerial mammals, scavengers birds, birds or prey, water birds, ground dwelling and other birds (CoE 2010).

Important considerations in designing wildlife crossings include proper location of ancillary structures, consistent ground cover, and maintenance of screening vegetation and security cover nearby (COE 2010). Ground and tree cover should be maintained in their natural condition wherever possible, in conjunction with other mitigation techniques such as revegetation of all disturbed areas as soon as possible following construction.

6.3.2 Mitigation Measures

M20. Clearly delineate by staking or flagging any construction access routes, temporary workspaces and environmentally sensitive areas prior to disturbance to minimize clearing necessary for construction workspaces;

M21. A field-based pre-disturbance wildlife sweep will be conducted by a qualified Wildlife Specialist to determine the presence of wildlife, important wildlife features and nesting birds that must be avoided, or that require mitigation measures to avoid or reduce adverse effects of the project, where applicable. Permit for nesting survey may be required from AEP.

M22. Vegetation clearing or other work that is potentially harmful to breeding birds, their nests and young should avoid the timing constraint of February 15 and April 30 to avoid the non-migratory bird breeding season (e.g., owls, hawks, some passerines), and between April 25 and August 15 to avoid the migratory bird breeding season. Adhering to this constraint for vegetation clearing will include the maternal period of bats of May 1 to August 15 and amphibian breeding periods;

M23. Where activities are proposed during the timing constraints, site inspection by a qualified Wildlife Specialist will be required to determine the presence of nesting birds and, where appropriate, applicable mitigation measures. Permit for nesting survey may be required from AEP.

M24. Limit construction to daylight hours to allow animals to move through the valley overnight;

M25. Use noise reduction equipment to muffle or control noise levels and reduce sensory disturbance to wildlife; and

M26. Ensure waste management plans are adhered to at all times to prevent attraction of wildlife to work site. Waste storage and accidental spill sites should be fenced to prevent wildlife access.

6.3.3 Residual Effects

The proposed development will result in loss of localized native habitat, which will alter the availability and suitability of wildlife habitat at the local level. Residual habitat losses are associated with existing habitat that is well-represented in Mill Creek ravine. The overall residual effect of direct habitat loss is considered negative in direction, local in extent, low in magnitude, long-term and irreversible.

Construction activities are anticipated to result in an increased amount of noise and traffic and will likely result in increased sensory disturbance. Due to the overall small scale of the Project and anticipated short construction timeframe, the residual effect related to sensory disturbance is considered to be negative in direction, local in extent, low in magnitude, short-term, and reversible.

6.3.4 Regulatory Requirements

The federal *Migratory Birds Convention Act* (MBCA) serves to protect migratory birds under Section 12.1(h), which prohibits the killing, capturing, injuring, taking or disturbing of migratory birds or the damaging, destroying, removing or disturbing of nests.

In Alberta, the *Wildlife Act* Section 36(1) provides protection for individual endangered or threatened and non-game animals, as well as their house, nest or den.

Vegetation clearing or other work which may result in the disruption of actively nesting birds should not be carried out during the timing constraints specified (see Section 6.3.2). Where clearing or other work is proposed during these timing constraints, site inspection by a qualified Professional Biologist will be required to determine the presence of nesting birds and, where appropriate, applicable mitigation measures. In the event that any wildlife is encountered during construction, AEP Fish and Wildlife officials will be contacted to determine if additional mitigation measures are required.

6.4 Fish and Fish Habitat, Water Quality and Surface Water

6.4.1 Potential Effects

Fish Habitat and Channel Area Affected

Mill Creek is characterized as a small, permanent, warm water watercourse. Sportfish absence was reported due to flow connectivity to the receiving fish bearing waters of North Saskatchewan River and suspected lack of overwintering habitat to support resident large-bodied fish species. The study reach is primarily suitable for the forage fish species historically reported in Mill Creek, which have a greater tolerance to temperature variation and poor water quality.

The proposed works will involve alterations to the existing channel. Any fish habitat alterations will be associated with low -moderate velocity pool and run habitat, with primarily fine textured substrates; an area anticipated to be utilized by a simple forage fish community. Reconstruction of the channel bed and banks through the new crossing will result in the alteration of approximately 160 m^2 of fish habitat below of the ordinary high-water level.

The proposed works are expected to ehance fish habitat productivity for the expected warm water fish community of simple forage fish. As such, alterations to the channel from the placement of Class 2 riprap armouring are expected to enhance substrate complexity and instream habitat diversity for fish, as well as protect the streambank from erosion and subsequent sedimentation. No additional habitat offsetting is proposed.

Fish Passage
The accommodation of fish passage was not a project requirement based on upstream fish migration being inhibited from the receiving fish-bearing waters of North Saskatchewan River. However, the proposed replacement bridge will provide a wider channel opening with improvements to flow conveyance capacity. As such, the design of the proposed replacement structure is considered appropriate, based on the site conditions, to meet the requirement for safe fish passage as required under Schedule 2, Part 1(g) of the *Code of Practice* and Section 29(1) of the fish passage provisions of the federal *Fisheries Act*.

Release of Deleterious Substance
Surface run-off, as a result of normal snowmelt or rainfall events can transport sediment and contaminants from the construction site, particularly exposed or improperly protected areas (e.g., graded areas, soils stockpiles), which could result in indirect effect to Mill Creek. Contaminants can be released by accidental spills and releases directly from construction equipment (e.g., leaks) or through improper storage and handling of fuels, oils and other potential contaminants. Similar to sedimentation, contaminants can have indirect effects on the aquatic environment (e.g., mortality of fish may occur if concentrations are sufficiently high). Placement of riprap is expected to stabilize the newly armoured channel bed and banks at B278 and reduce/eliminate future erosion and sediment transport.

Flooding
The new bridge and trail upgrades were designed to prevent flooding for a Q1:25 and Q1:10 year event, respectively. Future flood events at or below the Q1:25 year event are expected to be mitigated where debris removal at the new bridge and EPCOR inlet structure are carried out regularly (less than 33% blockage) and after major flood events to maintain the hydraulic opening of the structures.

Temporary Effect During Instream Worksite Isolation

Instream works are proposed to occur outside of the default Class C restricted activity period of September 16 to July 31. The study reach is primarily suitable for the forage fish species historically reported in Mill Creek. In general, these fish communities are less sensitive to disturbances. Potential effects would be temporary and low in magnitude with implementation of appropriate mitigation.

Construction of crossing structure within flowing water will require isolation of the instream work area from flows and/or flow bypass (e.g., diversion or pumping) from upstream to downstream of the worksite. Where isolation is required to facilitate construction, this can result in temporary disruption or alteration of stream flows.

6.4.2 Mitigation Measures

M27. According to the *Code of Practice for Watercourse Crossings*, Mill Creek is a mapped, uncoded Class D watercourse where fish as defined under the Code are not present. Under Section 8(3)(b) Mill Creek at B278 will be default Class C waters with a restricted activity period of Sept 16 to July 31. In accordance with Section 11(7) of the *Code of Practice for Watercourse Crossings,* where determined by a QAES works can be carried out within a RAP and still meet the requirements of Part 1 of Schedule 2, the works may be carried out within that restricted activity period in accordance with the written specifications and recommendations of the QAES.

M28. All efforts will be made by the contractor to minimize the duration of instream activities and complete the works as expediently as possible
M29. Equipment travel and operation will be suspended or modified (i.e., swamp mats) in areas where rutting problems on wet ground are jeopardizing topsoil structure and integrity at the work site.
M30. All work will be conducted from the existing trail or above the streambanks, wherever possible, to avoid disturbance to riparian vegetation and natural wooded areas.
M31. All debris from construction will be removed from the site and properly disposed of above the high-water mark such that they do not enter any water body.
M32. The contractor will minimize any disturbance to aquatic resources during construction.
M33. Construction will be halted during periods of heavy precipitation.
M34. Machinery will be operated in a manner that minimizes disturbance to the banks. Banks will be restored to original condition if any disturbance occurs.
M35. Effective ESC measures will be in place prior to disturbance, during and after construction to prevent sediment from entering the watercourse. All ESC measures will be inspected regularly to ensure that they are functioning properly and are maintained, cleaned and/or upgraded as required until complete re-vegetation of all disturbed areas is achieved.
M36. Temporary or permanent installation of erosion and sediment control measures will meet the following conditions:
    - Clean and free of fine materials;
    - Non-toxic to fish; and
    - Will not introduce silt and/or clay into the watercourses.
M37. All equipment and machinery will be assembled, cleaned and checked for proper mechanical operation prior to entering the work site. Regular inspections will be completed to ensure that hydraulic, fuel, and lubrication systems are in good condition and equipment is free of leaks.
M38. All equipment-servicing activities with the potential for accidental spills (e.g., oil changes, hydraulic repair) will be completed over an impervious tarp.
M39. The servicing and fueling of mobile equipment and storage of fuel, oil or other hazardous material will be prohibited within 100 m of watercourses.
M40. Where immobile equipment is required to operate within 100 m of watercourse, the following measures will be employed:
    - equipment is to be stationed in an impervious containment area;
    - all containers, hoses and nozzles are to be maintained free of leaks; and
    - operators are to be stationed at both ends of the hose during fueling, unless the nozzle ends are visible and readily accessible by one operator.
M41. Washing, refuelling and servicing machinery will be conducted in a manner to prevent any deleterious substance from entering the water and a minimum of 100 m away from the watercourse.
M42. Biodegradable oils and lubricants (e.g., white lithium greases and vegetable oil hydraulic fluid) will be used in equipment that will be working within the watercourse. Used oil, filter and grease cartridges, lubrication containers, and other products of equipment maintenance will be contained and disposed of at the nearest industrial waste facility.
M43. All equipment utilized in the watercourse will be free of aquatic invasive species and be decontaminated based on AEP's *Decontamination Protocol for Work in or near Water* available on-line at: https://open.alberta.ca/publications/9781460148204.
M44. Appropriate precautions will be taken to ensure that deleterious substances will not be placed in any location where the materials may enter a watercourse.
M45. All spoil materials and debris from construction will be removed from the site and properly disposed of above the ordinary high water mark such that they do not enter any water body.

M46. An emergency spill response plan will be developed, and implemented, if required. An emergency spill kit will be kept on site in case of fluid leaks or spills from machinery. Spill response materials and equipment will be readily available. Fuel and service vehicles will carry an adequate number of sorbent pads (in a spill kit) in addition to a poly tarp and fire extinguisher.
M47. Revegetation will be undertaken as soon as possible after disturbance, with the objective of permanently stabilizing disturbed areas within one growing season of the completion of construction.

Measures relating to the isolated instream worksite:

M48. Any instream works in flowing water conditions will be isolated during construction. 100% of downstream flow should be maintained at all times. Where the watercourse is dry or frozen to the channel bottom at the time of work the requirement to isolate does not apply.
M49. Where ice is present, the diverted water will be returned to the watercourse under the ice. All diverted or discharged water will meet the requirements of the federal and provincial water quality guidelines (CCME 2002, GOA 2018).
M50. Any bypass pumping or water withdrawal must pass through a screen with openings that are no larger than 2.54 mm and at a velocity that does not result in the entrainment and entrapment of fish or fish fry. The outlet will have a diffuser or be placed in a location that is not subject to erosion from the outflow.
M51. Materials in isolation facilities will be made of non-erodible materials and not introduce clay or silt into any watercourse. Instream works will be confined to the isolated channel section. Accumulations of deposited sediment will be removed from within the isolated area prior to removing the isolation barrier.
M52. Should the need for dewatering arise, water will be released into a well vegetated area or settling basin and not directly into any water body. Water returning to the watercourse will be of equal or better quality than the water in the watercourse.
M53. If water, standing or flowing, is present in the isolated work zone at the time of construction, a fish rescue program will be completed prior to the start of instream work to ensure all fish are protected.
M54. Any fish will be rescued from the isolated area prior to construction and be relocated, unharmed, into an area containing sufficient flow and cover. Fish rescue may require a provincial permit. Rescue operations employing effective methods (e.g., electrofishing, seine netting, minnow trapping) carried out as stipulated in the Provincial Fish Research License.

During removal of the isolation facility the following measures will be taken:

M55. Remove any deposited sediment from within isolated worksite and ensure any disturbed instream areas have been stabilized prior to removal.
M56. Where possible, maintain sediment control measures during removal and re-watering of isolated worksite.
M57. Gradually remove the downstream end of the isolation facility first.

Measures relating to environmental monitoring:

M58. The Contractor's activities will be subject to the maximum allowable limits of TSS (mg/L) as specified in Canadian water quality guidelines for the protection of aquatic life: Total particulate matter (CCME 2002). Removal of the existing structure and installation of new structure will be conducted in a methodical and careful manner to localize disturbance of channel bed sediments.

M59. To minimize sediment transport during instream works all equipment will be run at a reduced idle and or rate of installation, and or undertake a temporary shutdown as directed by an QAES monitor based on concurrent TSS and turbidity (NTU) water quality sampling. A temporary shutdown will be required for any exceedance of TSS limits.

6.4.3 Residual Effects

The proposed works will result in the alteration of approximately 160 m^2 channel area below the OHW, which has historically been disturbed by the existing bridge structure. The combination of riprap and revegetation are anticipated to provide long-term slope stability and decreased inputs of sediment to the watercourse. It is anticipated that residual effects will be offset through the implementation of seeding and revegetation. Residual effects on fish habitat and channel area are considered to be positive.

Effects to surface water quality during the construction and operations phases of the Project can, for the most part, be mitigated through implementation of mitigation measures described in this report and Project design including revegetation and temporary ESC measures outlined in the contractor's ECO Plan. Residual effects related to deleterious substances are considered to be negative in direction, low in magnitude, short-term and local in geographic extent. Effects related to sediment and contaminant inputs are considered to be reversible.

Where recommended mitigation measures are implemented, the potential for the Project to interrupt flows within the creek during construction is considered negative, low in magnitude, short-term, local in geographic extent, and reversible.

6.4.4 Regulatory Requirements

Any death of fish or the Harmful Alteration, Disruption or Destruction of fish habitat (HADD) must be authorized by Fisheries and Oceans Canada (DFO) to avoid the contravention of Section 35(1) of the federal *Fisheries Act*. Based on the results of the assessment conducted by Wood, including baseline information review and field investigation, sportfish absence is suspected. As the Project will likely result in work below the OHW, and not covered under DFO *Codes of Practice*, a Request for Review pursuant to the federal *Fisheries Act* was submitted. The DFO Letter of Advice 22-HCAA-00328 and applicable conditions were obtained. A copy of the DFO Letter of Advice is provided in Attachment B.1.

It is expected that the temporary and permanent works will meet the requirements for fish passage under Schedule 2, Part 1(g) of the *Code of Practice* and Section 29(1) of the fish passage provisions of the federal *Fisheries Act.*

Section 36(3) of the federal *Fisheries Act* prohibits any person from depositing or permitting the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance may enter such water. Section 38(6) imposes a duty to minimize any adverse effects that result or may reasonably be expected to result from the unlawful deposit of a deleterious substance. Under Section 38(5) every person shall notify an inspector of the unlawful deposit of a deleterious substance, without delay.

Water (Ministerial) Regulation outlines approval exemptions subject to the *Code of Practice for Watercourse Crossings*, under Part 1, 3(2), The Project was designated as an activity that does not require a *Water Act* approval where the activity is carried out in accordance with the *Code of Practice for Watercourse Crossings,* as amended. Under Section 8(5) of the *Code of Practice for Watercourse Crossings*, the Wood (2022) *Fish and Fish Habitat Assessment, Mill Creek Ravine Pedestrian Bridge #278* provides the written specification and recommendations of a QAES for the proposed bridge replacement works. Under Section 3(1) of the *Code of Practice for Watercourse Crossings*, written notice of intended works must be provided to AEP at least 14 days in advance of the proposed construction commencement.

The provincial *Fisheries Act* Section 1(4) serves to facilitate and enhance the detection, suppression, elimination and prevention of the spread of invasive organisms in Alberta. Under Section 11.01 of the *Act* no person shall place or keep an invasive organism in or allow an invasive organism to enter water of any kind.

Under Section 108 and 109 of the *Environment Protection and Enhancement Act*, it is prohibited to: (i) release or permit the release, or (ii) knowingly release or permit the release, of a substance into the environment in an amount concentration or level or at a rate of release that is in excess of an approval or a regulation, or that causes or may cause a significant adverse effect.

6.5 Groundwater

6.5.1 Potential Effects

There is no Domestic Use Aquifer (DUA) near the LSA, and there are no water wells listed in the Alberta Water Well Database that could be considered potentially vulnerable to the proposed work.

6.5.2 Mitigation Measures

No mitigation measures will be required during the work program to protect or conserve groundwater resources in the LSA.

6.5.3 Residual Effects

No potential residual effects to groundwater are identified.

6.6 Air and Noise Quality

6.6.1 Potential Effects

Project effects on air and noise quality are attributed to an increase in air emissions and noise from construction traffic, equipment, and activities during the construction phase. Air and noise impacts during Project operation are not anticipated and are not assessed further.

Equipment and activities responsible for air pollution during construction include heavy-duty diesel vehicles involved in earth-moving operations, and equipment traffic on access roads at the construction site. The most significant air pollutants are fugitive dust, and gasoline and diesel engine exhaust.

Dust emissions often vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. The temporary nature of construction differentiates it from other fugitive dust sources as to estimation and control of emissions. Emissions from the construction site can be expected to have a definable beginning and an end. Dust would not generally be expected to carry far under most working conditions due to vegetation in the ravine.

Diesel exhaust will be emitted from heavy-duty diesel vehicles during construction. Exhaust pollutants are dispersed into the surrounding air while the vehicle is in motion and therefore do not create air pollution problems. Usually, the public object to smoke and odorous exhausts from the diesel engines near slow-moving vehicles and stationary equipment; these can be severe at a construction site. However, emission effects normally do not extend throughout neighbouring communities located near the top of the ravine, as exhaust will typically be rapidly dispersed into the surrounding air.

Construction noise impacts would result largely from the noise generated by mechanized equipment such as loaders, bulldozers, and trucks. The noise emissions of various alternatives would likely differ somewhat depending on the types and number of pieces of mechanized equipment in use at a given time. The impacting construction equipment typically includes heavy equipment, piling rigs, and small hand-held pneumatically, hydraulically, or electrically powered tools. The primary noise source for conventional pile drivers is the impact of the hammer striking the pile. Engine-related noise sources, such as combustion explosion or release of steam at the head of some equipment, are usually secondary.

6.6.2 Mitigation Measures

Recommended mitigation measures for fugitive dust, and gasoline and diesel engine exhaust include:

M60. Dust abatement measures will be applied when necessary to suppress dust generation. The Contractor will control dust on all disturbed areas within the work area using water or other dust abatement materials approved by the COE or their Consultant.
M61. The Contractor will implement measures to reduce mud-tracking onto adjacent public roadways (e.g., stabilized construction entrances, wash stations), and clean-up measures for any mud that tracked off-site.

The following mitigation measures will be implemented to address identified impacts associated with increases in noise levels during site preparation and construction:

M62. Construction working periods will follow the City of Edmonton Community Standards Bylaw of 0700-2100 hours Monday to Saturday and 0900-1900 Sundays and holidays and meet acceptable noise levels (not to exceed 65 dB[A]).
M63. Regular inspection and maintenance of construction vehicles and equipment will be conducted to ensure that they have quality mufflers installed and worn parts are replaced.

6.6.3 Residual Effects

Air quality in the LSA will deteriorate during construction. However, due to the relatively small scope of the Project and following the implementation of mitigation measures, high concentrations of identified pollutants are not expected. With the implementation of recommended mitigation measures, residual effects are anticipated to be negative in direction, low in magnitude, local, short-term, and reversible.

All noise effects will be completely reversible and will cease immediately on construction completion. Given application of mitigation measures, construction will make only a small contribution to ambient noise levels within the LSA. The overall noise and vibration effect will be negative in direction, low in magnitude, local, short-term and primarily intermittent, and reversible.

6.6.4 Regulatory Requirements

Construction working periods will follow the City of Edmonton Community Standards Bylaw of 0700-2100 hours Monday to Saturday and 0900-1900 Sundays and holidays and meet acceptable noise levels (not to exceed 65 dB[A]).

6.7 Socio-Economic

6.7.1 Potential Effects

The main construction effect will be the potential interruption of public trail and park open area use. Implementation of appropriate measures to ensure public safety and to limit access to staging areas and construction sites will minimize effects. The relatively short (weeks) construction duration will keep interruption of public trail use to a minimum.

Construction activities in public areas present potential for injury to recreational users from construction equipment, particularly in staging areas. Stockpiling of material and trail surface material will be located within short hauling distances for Contractors and be conducted over short–term periods. This will reduce the potential conflicts with public access and community effects during the construction period.

6.7.2 Mitigation Measures

M64. City of Edmonton Parks Division will be contacted by the Contractor to determine appropriate signage and detour measures for anticipated trail disruptions or closures.

M65. Where required, a separate trail detour outside of the project access routes will be provided for recreational users. Where required, use of trails should be limited to short-term periods when equipment or materials must be moved to site. At these times, to ensure that trail users are kept a safe distance, a clearly visible flag person should be stationed at each end of the equipment.

M66. Construction activities in public areas present potential for injury to recreational users from construction equipment, particularly in staging areas. Stockpiling materials will be fenced and located within short hauling distances for Contractors and be conducted over short–term periods. This will reduce potential conflicts with public access and community effects during the construction period.

M67. Any laydown/staging area must be fenced and meet site safety standards, with no vehicular or project activity outside of the fenced area.

M68. Public access control measures should be in place and maintained post construction to prevent the public from accessing areas that have been newly landscaped (along the sides of trails, bridge, etc.) and discourage disturbance of the area by the public.

6.7.3 Residual Effects

With fencing of equipment and staging areas, and signage to direct the public around the construction sites, effects are anticipated to be negligible to public use.

With the anticipated improved pedestrian connectivity due to bridge and trail reconstruction, long-term effects to lands applicable to *Bylaw 7188* are considered to be positive in direction, low in magnitude, local in extent, long-term in duration and reversible.

6.8 Historical Resources

6.8.1 Potential Effects

Where the final design includes undisturbed land along watercourse terraces with archaeological potential, including surface and deep deposits, there is the potential for impacts to historic resources.

6.8.2 Mitigation Measures

Avoidance of historic resources is the primary mitigation strategy. Where avoidance cannot be undertaken, limiting the amount of new disturbance within areas of archaeological potential will reduce the level of effort required for *Historical Resources Act* (HRA) clearance. The Project is located in an area identified as having historic resource concerns and the project development has potential to affect an archaeological historic resource. Approval under the *Historic Resources Act* is required prior to the initiation of any land surface disturbance activities and conditions of approval will be applicable to the Project. Where the Project involves ground disturbance it is likely that Alberta Culture and Status of Women (CSM) will require additional mitigation in the form of a Historic Resources Impact Assessment (HRIA). It is assumed that the project development will not affect deep sediments likely to affect a palaeontological resource such as fluvial gravels and silts or bedrock and CSW will not require a HRIA for palaeontology.

6.8.3 Residual Effects

Residual effect of the Project resulting from impacts to historic resources is not predicted to be significant. Impacts to historic resources are irreversible however sufficient mitigation measures for HRA approval will be implemented. Residual effects are considered to be low in magnitude, local in extent and short-term in duration.

6.8.4 Regulatory Requirements

Historic Resource Act (HRA) approval is required for Projects that involve ground disturbance within Listed Lands. HRA approval no. 4725-21-0056-001 dated 01 November 2021 is provided in Appendix B.2.

Pursuant to Section 31 of the *Historical Resources Act*, should any historic resources be encountered during the conduct of any excavation activity, CSW (or said representative) is to be contacted for direction prior to proceeding with construction activities.

7.0 Cumulative Effects Assessment

The cumulative effects assessment predicts the effects of the proposed Project plus existing, approved and planned developments with the RSA. The RSA has already been partially impacted by clearing of native vegetation for urban construction.

The proposed Project will result in only local changes to soils, vegetation, wildlife, noise and air quality, and socio-economics in the area. In addition, anticipated effects resulting from the Project can be effectively mitigated. As a result, residual effects are expected to be negative, in direction, low in magnitude, local, short-term, reversible and are considered not to have a significant cumulative effect.

8.0 Stakeholder Communication

8.1 City of Edmonton Internal Review

The City of Edmonton was consulted through the development of the draft and finalization of this EIA which was coordinated by Urban Planning and Economy, Planning and Environment Services. A summary of the consultation process and EIA signoff under *North Saskatchewan River Valley Area Redevelopment Plan (NSRV ARP)* as follows.

- Draft EIA report was submitted to City of Edmonton on 22 October 2021.
- Initial circulation review responses was received from Christine Mahlmann, City of Edmonton Planning and Environment Services on 18 November 2021. A revised EIA and response prepared in consultation with the Project team was submitted for re-circulation to City of Edmonton Administration on 13 December 2021 (see Appendix G.1).
- The City of Edmonton completed their review and signed-off on the Mill Creek B278 EIA under the Bylaw 7188, confirming Administration had no further concerns with the proposed development under the NSRV ARP with implementation of conditions and advisements provided by the reviewers in the letter dated 4 January 2022 (see Appendix G.2).

8.2 Public Engagement Decision Mapping Exercise

Transportation Planning and Design and Transportation Infrastructure conducted a Public Engagement Decision Mapping Exercise (Appendix G.3), which concluded:

- Due to the technical nature of the bridge replacement, and due to the fact the bridge alignment and location are remaining the same, the project will not have a meaningful opportunity for public engagement; and
- The project will follow a similar public advisory level as the "Mill Creek Pedestrian Bridge Replacement Program (2020)" and will utilize the existing communication channels (project website), request the Neighborhood Resource Coordinators inform their contact within impacted community leagues, install signage prior to construction, and perform "letter drops" informing residents of construction impacts.

The public will be notified of the project through signage at the site and trail heads in the vicinity, posting on the City of Edmonton "Trail/Park Cautions & Closures" website and 3-1-1 telephone service a minimum of 14 days prior to site mobilization. Updates will be provided to River Valley Parks and Facilities such that they can update their Trail Closure website, the 311 website, as well as 311 scripting at the start of construction such that interested residents can be kept informed of the construction.

The public notification program will also involve utilizing the City of Edmonton Roads and Bridge Projects, Mill Creek Pedestrian Bridges website (https://www.edmonton.ca/projects_plans/roads/mill-creek-pedestrian-bridges) to communicate the Project and Trail Closure status.

Trail closures will adhere to the COE's Trail Closure Procedures and will be approved through River Valley Operations prior to construction and closure of trails.

8.3 Stakeholder Engagement and Communication

A public information session for interested stakeholders was undertaken with select stakeholders in the form of a presentation to communicate details of the Project. The select group of stakeholders was intended to help the Project team in notifying their members with upcoming project information through their respective channels. The main themes of discussion during the meetings are summarized below and outlined in the "What We Heard" document provided in Appendix G.4.

Stakeholders included community leagues, environmental organizations, and river valley user groups who would be affected by the Project. In total five stakeholders were identified for engagement during the Detailed Design Phase. Subsequently a Stakeholder Information presentation was developed, and invitations were sent out via email on January 28, 2022. Of the five stakeholder groups invited, four accepted and one-on-one information sessions were conducted between February 8-11, 2022 with the following stakeholder groups:

- Paths for People (February 8, 2022);
- Edmonton River Valley Conservation Coalition (February 11, 2022);
- Strathcona Community League – (February 11, 2022); and
- Cloverdale Community League – (February 11, 2022).

As a result of these stakeholder meetings, the project team was provided with valuable feedback, which will be taken into consideration during the next stages of the Project.

- Ensure trail users and the public had adequate information regarding, construction dates, trail closures, and detours, well in advance of the construction.
- Improving the overall esthetic of the area by minimizing the environmental impact is important to the project team and stakeholders.
- Some stakeholders expressed concern regarding the moving of equipment and possible damage to the access routes, 93 Avenue especially and that any damage to existing trails, sidewalks, curbs, or road space is repaired promptly.

From these meetings, the Project team has committed to the following:

- To share public project information (website, construction bulletins, etc.) once available.
- Public access areas will be assessed. If required, repairs will be made to the same or better condition.

9.0 Environmental Protection Plan

The Environmental Protection Plan (EPP) outlines environmental protection measures that should be implemented prior to and during Project construction in order to mitigate adverse environmental effects. Components of the EPP are the responsibility of either the City of Edmonton (or their Consultant) or the construction Contractor. The components of the EPP will include:

1. Regulatory Requirement Compliance: Conditions and requirements of Project regulatory approvals and authorizations should be incorporated into the contract documents and the Contractor's ECO Plan.
2. EIA Mitigation Compliance: Mitigation measures outlined in Section 6.0 of the EIA should be incorporated either into the contract documents and the Contractor's ECO Plan.
3. Environmental Construction Operations (ECO) Plan: The Contractor shall prepare an ECO Plan for their operations prior to Project start-up, which will be reviewed for completeness by the COE or their Consultant. The ECO Plan will prepared in accordance with the most recent ECO Plan Framework document (City of Calgary and City of Edmonton 2020), to include an Bridge Demolition Plan, Environmental Monitoring Plan, Erosion and Sediment Control Plan, Weed Management Plan, and a Spill Response Plan, and prepared in accordance with the most recent ECO Plan Framework document (City of Calgary and City of Edmonton 2020).
4. Compliance Auditing and Monitoring: An environmental compliance auditing program should be developed by the COE or their Consultant to review the Contractor's compliance with their ECO Plan and applicable regulatory requirements.

10.0 Conclusion, Recommendations, and Bylaw 7188 Decision

10.1 Outstanding Information

At the time of writing, some effects remain unknown, primarily due to undeveloped design detail and unknown construction methodologies. However, with based on past experience with similar Projects and good understanding Project related effects scientific confidence in the residual effects is considered high. The following are unresolved to some degree and will be addressed during the subsequent detailed design phase:

- Finalization of the bridge design.
- Determination of construction access and laydown locations.
- Equitable compensation for loss of trees.
- Detailed revegetation/landscaping plan including bioengineering, where appropriate.

10.2 Recommendations and Bylaw 7188 Decision

The environmental review process for the Mill Creek Pedestrian Bridge 278 Project identified a number of potential environmental effects resulting from the proposed works, as well as recommendations to mitigate these effects. Based on review by the City of Edmonton, with implementation of conditions and advisements provided by the reviewers during circulation of the EIA, including adherence to standard construction and operation BMPs and recommended mitigation measures described in this EIA, the objectives and policies relating to environmental protection and land use planning goals in the *North Saskatchewan River Valley Area Redevelopment Plan* can be achieved. Key mitigation measures include equitable compensation for trees lost and the implementation of an environmental protection plan, erosion and sediment control plan, weed monitoring and control, timing restrictions for vegetation clearing, instream worksite isolation and turbidity monitoring, and revegetation and bioengineering of areas disturbed during construction. Long-term effects to the study area, including lands applicable to *Bylaw 7188*, will be positive, with anticipated improvements being improved pedestrian connectivity, flood mitigation and protection of upland property. Adverse residual impacts therefore are predicted to be not significant for all environmental components.

The City of Edmonton completed their review and signed-off on the Mill Creek B278 project under the Bylaw 7188, confirming Administration had no further concerns with the proposed development under the NSRV ARP with implementation of conditions and advisements provided by the reviewers in the letter dated 4 January 2022 (see Appendix G.2).

11.0 Closing

This report is based on and limited by the interpretation of data, circumstances, and conditions available at the time of completion of the work as referenced throughout the report. Wood has performed its services in a manner consistent with the standard of care and skill ordinarily exercised by members of the profession practicing under similar conditions in the geographic vicinity and at the time the services were performed. Wood believes that this information is accurate but cannot guarantee or warrant its accuracy or completeness including information provided by third parties.

This report has been prepared for the exclusive use of the City of Edmonton and their agents for specific application to this project site. The work was conducted in accordance with the scope of work prepared

for this project, verbal and written requests from the City of Edmonton, and generally accepted biological work practices. No other warranty, expressed or implied, is made.

Wood does not accept any responsibility for the use of this report, in whole or in part, for any purpose other than that intended or to any third party for any use whatsoever. Wood requires that third parties wishing to rely on this report agree to the terms, conditions and limitations stipulated in Woods' Standard Contract and in the report.

We trust that the information contained within this report satisfies your requirements. Should you have any questions, please contact the undersigned at your earliest convenience.

Respectfully submitted,

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Appendix A

Preliminary Engineering Report, Design Drawings, and Phase 1 Environmental Site Assessment (Environmental Overview)

Appendix A.1

Preliminary Engineering Report

Preliminary Engineering Report

Mill Creek Ravine Pedestrian Bridge (B278) Rehabilitation & Trail Upgrades
Project # EB213002 City of Edmonton

Prepared for:

City of Edmonton
Edmonton, Alberta

September 24, 2021

Preliminary Engineering Report

Mill Creek Ravine Pedestrian Bridge (B278) Rehabilitation & Trail Upgrades
Project # EB213002 City of Edmonton

Prepared for:

City of Edmonton
Edmonton, Alberta

Prepared by:

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September 24, 2021

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Executive Summary

During Phase 2 Preliminary Engineering, we have carried out detailed hydrotechnical analysis of flooding based on arbitrary options for partial blockage of the EPCOR intake structure and evaluated flood levels relative to the existing profile of the bridge and of the trail sections north and south. We have developed design alternatives for bridge and trail elevations for three options based on that evaluation to mitigate flooding of the bridge and of the trails and to maintain pedestrian connectivity; these options are accompanied by estimated costs.

We have carried on with environmental work, including a Phase I Environmental Site Assessment (see Appendix E), rare plant surveys (spring and fall), fish habitat field investigations and habitat assessment and confirmed terms of reference for an EIA and public communications. We have carried out a geotechnical investigation and provided comparison of foundation types with design recommendations for favourable options, including driven steel pipe piles and micropiling, and with that, a preliminary design of the bridge substructure and foundations.

We have also confirmed the outline for DLO land acquisition based on the extent of rock riprap bank armoring and ordinary high water levels in the creek with a recommendation to proceed with application to AEP. We have confirmed the location of EPCOR's sewer asset and have initiated the process to acquire a proximity agreement with the utility.

Please refer to Table 1-1 in Section 1.2 for a detailed summary and description of our recommendations for design criteria and for other issues at this stage, which are compared to those from Phase 1. The table below presents a summary of the principal recommendations for detailed design.

Design Option/Criteria	Recommendation
Drift accumulation EPCOR grating	Current drift accumulation represents 33% blockage and is recommended for design purposes (not to be exceeded)
Bank/bed armoring	Class II angular rock riprap as shown in Appendix C.
Bridge Structure/Foundations	Weathering steel twin truss with a timber deck; micropiling or driven steel pipe piles; bridge railings integral with truss girders; girder height: 1.4 m (min) for cycling use – reference Minchau bridges
Span Configuration	Single span – 12 m (approx.)
Bridge Width/Loading	3.0 m (clear width); 80 kN maintenance vehicle (max)
Bridge Elevation	1:25 year flood – current soffit elevation = 626.78 m (approx. Proposed soffit (underside) = 628.47 m (includes 200 mm freeboard) **
Trail/Path Width	2.4 m (max)
Trail Construction/Surface and Slopes	Embankment fill, granular subgrade and surfacing layers (min 7% fines); 2H:1V embankments slopes (min)
Trail Gradients	Longitudinal 5% (max); 0.35% (min); Crossfall 2% (min)
Trail Elevation	1:5 year flood (north and south of the bridge) with retaining walls at bridge interfaces

**For comparison, high water elevation at the bridge for a 1:25 year flood with 33% blockage is matched for a 1:100 year flood but only with no blockage of the EPCOR grating

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1.0 Design Summary

1.1 Phase 1 Concept Design and Assessments - Overview

1.1.1 Existing Conditions and Assessments

Preliminary engineering forms Phase 2 of the project to rehabilitate or replace the existing pedestrian bridge over Mill Creek and any associated trail upgrades. Phase 1 was carried out between the start of April and early June 2021 and is captured in the technical memo entitled Mill Creek Ravine Pedestrian Bridge (B278) Rehabilitation & Trail Upgrades Concepts & Assessments, dated June 7, 2021, and which should be read in conjunction with this report.

The Concepts and Assessments memo was prepared to provide and discuss concepts for the rehabilitation or replacement of the existing bridge, including work to the existing creek, and for upgrades to the existing trails pursuant to the stated objective of the project to mitigate flooding of the bridge while maintaining pedestrian connectivity on the approach trails. Concepts were based on the results of initial assessments of the existing bridge and trails, initial hydrotechnical assessment of Mill Creek with reference to existing reports and detailed site inspections, and an environmental overview of the site that is located within Edmonton's River Valley.

The memo described the existing bridge and trail approaches in detail, which lie in a short, depressed section of the Mill Creek ravine. Slopes at both access points to the lower section are short and steep (>8%) bringing users down to the level of the forest floor. The trail is unpaved and of indeterminate width, sitting minimally above the creek bank elevation with the water elevation in the creek just below the top of bank. Detailed site survey in Phase 2 will confirm the relative profiles of streambed and trails north and south of the bridge to be compared to flood water levels at those locations.

The memo further described the existing channel of the creek, including its meandering profile and the presence of existing gabion protection of the left bank downstream and of large wood debris that has accumulated immediately upstream of the bridge, and which continues to restrict the bridge's hydraulic opening. Critical to the evaluation of flood conditions in this section, approximately 100 m downstream of the bridge, the water from the creek flows into a large pipe tunnel via the EPCOR intake structure, passing through the angled grating that is continually partially blocked by silt and debris.

Observations during our site visits indicated that the EPCOR inlet structure is causing water to backup along the channel, and the modeling of flooding has been a key focus of our efforts in Phase 2. High-water marks were observed upstream and downstream of the bridge, which were likely deposited during the 2020 flood event, estimated to be in the order of a 1:25 year event.

A 600 mm diameter combined sewer pipe was identified during Phase 1 within the area of the lower section of the trail and at the time did not appear to have any direct impact on the project except to be avoided during the geotechnical investigation for the bridge and trail design. This was further investigated during Phase 2.

The existing disposition (DLO 054638) for bed and shore on Mill Creek was originally prepared for erosion control work but does not adequately cover what would be required for a new bridge and bank armoring, and the alignment of the creek shown on the DLO drawing is not correct.

1.1.2 Bridge and Trails

1.1.2.1 Bridge

Timber elements of the bridge are showing a significant extent of brown rot, and evidence of more serious 'white' rot. The timber has suffered from being too close to the creek and to the existing ground on the south span. The girders do not appear to have been overloaded but the width of the bridge is narrow and heavier City maintenance vehicles cannot use it and there are no longitudinal structural members other than the main girders; the deck is therefore unlikely to support maintenance vehicle loading without remedial action/strengthening. Most of the existing rail is in varying stages of rot and all the posts are rotting to some degree. The deck has areas of advanced rot at plank ends and there are areas of white rot through the deck so that if rot continues beyond the supports it would become dangerous; wholesale replacement of deck timber is necessary. The existing piled foundations appear to be in fair condition but there are no records of the design depth. Girders were inspected for debonding, horizontal shear, vertical shear, bending issues and material degradation due to rot. The existing condition of two girders is poor and the other two are marginal. There is rot infection throughout all secondary timber elements although not as severe as in the main girders.

Of four strategies for the existing bridge -doing nothing and maintaining annual inspections, minor rehabilitation and patching, major rehabilitation, and full replacement, we recommended replacement of the bridge using a 2.4 m wide, single span, weathering steel truss superstructure. The cost of major rehab versus replacement was comparable and the choice of replacement removed any lingering concerns about the condition of the girders given that identification and repair of all the rotten timber would be very challenging. Context for the choice of a replacement structure in the form of twin weathering steel trusses was provided by the City's choice of the same type of structure for replacement of a dozen other bridges crossing Mill Creek - B206 and the 11 truss bridges crossing the creek in the park ravine section just north of 34th Avenue. The choice of material is highly durable, and the structural type has the distinct advantage of minimal structural depth below deck level to maximize the hydraulic opening, while still raising the bridge above flood levels and mitigating the impact on trail elevations, if any. Other superstructure options considered included Alberta Transportation standard precast SLC girders, weathering steel plate girders, and a single trapezoidal weathering steel box girder, all of which have significantly greater structural depth. The option of a prefabricated steel truss built in sections makes for easier delivery and handling for straightforward assembly on site, access to which is restricted.

1.1.2.2 Trail

The space the route of the existing trail occupies varies in width up to 4 m wide and has an unpaved, natural clay surface. The trail is typically at natural ground elevation through the wooded areas and has been built up to the ends of the existing bridge. The trail is not improved and is at the natural ground elevation of the surrounding wooded areas. It was in very poor condition and in wet conditions the saturated high plastic clay surface is hard to walk on; in fact, a channel is being eroded across the trail to the south of the bridge. There may also be weak, wet subgrade which can be addressed using geotextile products and engineered granular fill. For context, the entire length of the existing lower trail between the EPCOR intake structure and 76th Avenue is unpaved, uneven, of varying width generally between 1.5 and 2.4m approximately, and is very steep in sections, over both short and longer lengths; it generally does not conform to any design standard or specification. Key objectives were identified as raising trail levels for given water levels associated with flood events of increasing severity to mitigate flooding, using existing unobstructed space to construct a trail (no greater than 2.4m wide) to limit the impact on the existing wooded areas, and design vertical alignment and crossfall to mitigate steeper trail gradients while minimizing fill volumes where possible. In keeping with the current trail construction, we therefore

recommended that any new trail will be unpaved with a width no greater than 2.4 m, constructed to meet City of Edmonton standards. Options for building the trail at different elevations were discussed, including trail embankments and use of retaining walls. To raise the trail over 300 mm via embankments alone would potentially require clearing a wider zone, potentially impacting treed areas. Impact on the existing wooded areas could be reduced by retaining one or both sides of the trail but this will be more expensive. New wing walls from the bridge would tie into the approach trails and trail gradients would vary depending on the bridge option and flooding design criteria. Building a new trail at higher elevation was judged to be a more durable option, easier to maintain and which will drain better after all flooding events. Depending on the design criteria, a higher trail is less subject to flooding although backwater effects had yet to be determined; importantly, any damage should be minimal and can be quickly fixed with some stripping and bringing in new gravel. Installing culverts will allow low lying areas to drain to the creek without disrupting the trail surface.

1.1.2.3 Recommendations – bridge and trail

Balancing or offsetting the flood design criteria for the trails and the bridge following modeling of the backwater effects on flood levels was judged to be a practicable and cost effective choice. Combining options to raise the bridge and the trails by similar amounts would eliminate seasonal flooding of the trail and mitigate flooding for more severe events. Trails and the bridge will be designed and constructed to be robust under conditions of flooding for more severe events, including suitable longitudinal and transverse gradients; the bridge design will also account for buoyancy uplift during the most severe events when it may be partially submerged.

1.1.3 City Review

Several City departments were engaged and were involved in the review of the Concepts and Assessments memo, the outcome of which was receiving direction as follows:

- full bridge replacement while maintaining the existing alignment
- 3.0m (clear width) wide, single span structure
- review increase of channel width to allow for additional clearance of driftwood to pass through
- bridge superstructure design (weathering steel, twin half-through truss) like 11 other Mill Creek pedestrian bridges in the Minchau area being built in 2021 – those bridges were procured as a design/build contract from a specialist supplier (in that case Eagle Bridge); in this case, Wood would design the foundations and substructure with an outline design and a performance specification for the design and supply of a prefabricated superstructure as part of the contract, which will be the most cost-effective method of design and procurement.
- determination of water surface levels for flood events incorporating backwater effects caused by the EPCOR intake structure to provide clarity and aid in determining suitable bridge deck (and trail) elevations by the end of the Preliminary Design phase; high water elevations would be evaluated for events ranging from 1:2 year to 1:100 year floods and for select values of blockage of the intake structure.

1.2 Phase 2 Preliminary Engineering - Summary

The key objectives of Phase 2 are as follows:

- Provide detailed hydrotechnical analysis of flooding of the lower section of Mill Creek over the length of trail and the length of the reach of the watercourse based on arbitrary options for partial blockage of the EPCOR intake structure

- Based on the results of the model, provide an evaluation of the flood levels relative to the existing profile of the bridge and of the trail sections north and south, which are different from each other;
- Develop design alternatives for bridge and trail elevations based on that evaluation to mitigate flooding of the bridge and of the trails and to maintain pedestrian connectivity and access and calculate associated first-order estimated costs;
- Present and describe completed and ongoing environmental work associated with the project, including a Phase I Environmental Site Assessment (see Appendix E), rare plant surveys, fish habitat field investigations and habitat assessment; discuss and agree Terms of Reference for environmental reporting and any associated public consultation;
- Present and discuss foundation options and make recommendations from the geotechnical investigation for foundation design; determine preliminary design for bridge substructure and foundations based on prescribed maintenance vehicle loading
- Confirm outline for DLO land acquisition based on recommended design alternative for the proposed bridge configuration and elevation; this is largely determined by the extent of rock riprap bank armoring and ordinary high water levels
- Determine proximity of EPCOR sewer asset to the proposed construction and initiate process to acquire a proximity agreement with the utility, if required.

Details of hydrology and of the hydrotechnical analysis are contained in Section 2. The preliminary results and design parameters from the geotechnical investigation are in Section 3. The status of the environmental assessments and regulatory approval work is described in Section 4. Description of progress on utility related issues and of details of the proposed extents of land acquisition are described in Section 5. Description of the bridge and trail design options is in Section 6 together with discussion of the options and preliminary design recommendations.

The scheduled geotechnical investigation and site survey were carried out, and as described in Section 3, geotechnical parameters have been determined for preliminary and detailed design of bridge foundations with the option of either smaller diameter micro-piles or of driven steel pipe piles in pre-bored holes, which are the two types for which site conditions are most favourable. Drawing MICR-P211-S01 in Appendix C illustrates the configuration of the single span truss design for the recommended flood design criteria with the micro-piles option. For driven steel pipe piles, consideration will need to be given to the use of equipment given access constraints. Further description of piling options and constructability is included in Section 3. We have confirmed that several local contractors are equipped to undertake micropiling; driven steel pipe piles are common practice.

In Phase 2, we developed a detailed hydrotechnical model that has allowed us to determine flood water levels for the backwater effects caused principally by blockage of the grating at the EPCOR intake structure. Blockage of flow of the creek into the EPCOR intake structure consists of two elements: semi-permanent blockage of the lower part of the grating with fine silt and sediment to a height of approximately 2 m, and seasonal blockage of the grating with smaller and larger drift debris that is occasionally removed by EPCOR maintenance crews. At the time of issue of this report, the height of such debris rises approx. 1.5 m above the top of the silt deposits, which for all intents and purposes forms the current streambed for the purposes of modeling flow in the creek and to determine the flood levels. As is demonstrated, flood water elevations for any given flood event are sensitive to the amount of blockage to flow in the creek.

The effects are significantly reduced if the amount of intake structure grating is regularly kept clean and free of growth and debris, including below the surface of the creek. However, in recognition that such regular maintenance is impracticable, the choice of a design flood event and therefore of flood water

elevation to be considered when determining bridge and trail elevations to meet the project objectives, will take account of some amount of blockage.

Proposed horizontal and vertical profiles and cross sections for the new trail embankments north and south of the bridge are included in Appendix C – Drawing Nos MICR-P211-G01 to G04. The profiles have been developed based on mitigating flooding of the new trails for Q5, Q10, and Q25 flood events. The plans and cross sections show the degree of encroachment of trail embankments beyond the unobstructed space (edge of trail boundaries) available; trail gradients are limited to 5% for accessibility for all users. A comparison of options and discussion and recommendation of flood events upon which detailed design of the bridge and of the trails should be based are included in Section 6.

The location and proximity of the EPCOR sewer to the bridge could not be determined in Phase 1. During preparation of Phase 2 geotechnical investigation work, EPCOR identified the presence of the sewer and the potential need for a proximity agreement. Efforts to locate the sewer via existing manholes has proceeded during Phase 2; three manholes were located to effectively confirm the horizontal alignment of the sewer and this is shown on the drawings included in Appendix C, specifically MICR-P211-S01, and this is discussed further in Section 5. A proximity agreement is required as work for the new bridge, in the form of new foundations, will be more than 2 m in depth and within 5 m of the EPCOR utility. If new retaining walls are designed for the bridge trail interfaces to limit fill encroachment, a crossing agreement with EPCOR may also be required.

During Phase 2 we directed queries to Alberta Environment and Parks (AEP) to determine if we can apply for an extended disposition or if application for a new disposition is the only option once a footprint for a preferred option has been identified in Phase 2 Preliminary Engineering, which is now shown on drawing MICR-P211-S01. No response to those queries has been received at the time of writing and we are now proceeding, per the City's direction, to prepare a drawing for the proposed new disposition, which is applicable to all options so as not to delay acquisition of the bed and shore land required. Detailed survey of the project area has established the current creek alignment.

During Phase 2, the City revisited the Public Engagement mapping exercise, which showed that the project simply merits providing information to the public and interested external stakeholders via a project website, among other options, although a public information session remains part of the scope of the project. Further action on public engagement is included in the Terms of Reference issued to Wood by the City's Planning and Environment Services Section under the context of the River Valley Bylaw following review of the draft report and drawings; a separate Site Location Study is not required since we are not proposing to realign the bridge or the trail, but an Environmental Impact Assessment and the associated level of public engagement has been confirmed. Council approval is required, a process that may take 3 to 6 months.

1.3 Comparison of Recommendations – Phase 1 and 2

The following table presents the list of the recommendations that were presented in the Phase 1 technical memo recognizing that a greater understanding of the effects of backwater was required during preliminary engineering. These recommendations are revised and updated based on Phase 2 preliminary engineering for comparison.

Table 1-1. Recommendations

Design Criteria / Other Issue	Recommendation (Conceptual Design Memo)	Recommendation (Preliminary Engineering Report)
EPCOR structure grating	Clear grating to its full height (including sub-surface) without delay	Clear grating of debris to the 'streambed', i.e., top of silt deposits, without delay
EPCOR debris clearance	Continual clearance of grating on an as-needed basis	No Change
EPCOR 600 mm sewer	None	Obtain proximity agreement with EPCOR prior to tender; construction may require daylighting of the pipe to assure EPCOR that their utility will not be impacted Obtain crossing agreement for any retaining walls that cross the alignment of the sewer
Trail Sign	Remove/store or obscure the sign that warns that the trail is closed due to flooding	No Change; the presence of the sign is confusing and when it is necessary it will likely be ignored
Natural Areas clearance	It is assumed that Natural Areas will not change its policy. Absence of backwater effects relies on continual clearance of debris/drift by EPCOR and the City. No option will mitigate buildup on the EPCOR structure; generally, the amount of drift/debris will increase.	No Change; the proposed design options have taken into consideration the blockage of the EPCOR intake and detailed design recommendations allow for a maximum height of debris
Drift accumulation	The current accumulation at the bridge should be removed without delay	No Change – the restriction to the current and future hydraulic bridge opening needs to be removed pending seasonal run off flows prior to construction
Bank/bed armoring	Typical rock rip armoring to the banks as illustrated on Sketch INFO S-1 in Appendix C – this extends across the bed of the creek to form a fully armored creek bed as shown Alternative: Cut up accumulated drift and lay down with creek sediment in layers to form natural bank armoring	Rock rip rap Class 2 as shown on drawing MICR-P211-S01 in Appendix C. Velocities and other parameters are satisfied by the option of Class 1 riprap but to provide reassurance that the material will not be dispersed by any flood conditions, the City prefers the option to go with the larger and more angular Class2 rock; extent of armoring is further defined – refer to preliminary drawings in Appendix C
Bridge Structure	Weathering steel twin truss with a timber deck Bridge railings integral with truss girders Girder heights to match B206 (precedent) or else be 1.4 m (min) for cycling use	Cross-section details including clear width of 3 m, and including girder and railing heights will match similar type bridges (Minchau) for shared use Specification of weathering steel for superstructure design Design loading to match Minchau bridges for 80 kN maintenance vehicle

Span Configuration	Single span – 12 m (approx.)	Single span – refer to preliminary drawing MICR-P211-S01 (Appx C) for span configuration
Bridge Width	2.4 m (max)	3 m (clear width) as Minchau bridges for maintenance vehicle access
Bridge Elevation	Pending detailed hydrotechnical assessment in Phase 2	See Section 2 and preliminary engineering plans Bridge elevation is set for 200 mm freeboard for the flood elevation based on 1:25 year flood and 33% partial blockage of the EPCOR intake structure (approx. 1.5m above stream bed)
Trail/Path Width and Gradients	2.4 m (max)	No change in width recommendation Minimum longitudinal gradient= 0.35% Minimum crossfall = 2%
Trail Construction/Surface Embankment slopes	Embankment fill, granular subgrade and surfacing layers as described in Section 4 (Concept Design Memo)	No change – except to note that embankment fill will be largely clay under granular sub-base and surfacing layers to maintain integrity in the event of flooding Embankment slope: 2H:1V – may be reinforced at greater heights Paved surface is not recommended Refer to City Drawing 5170 for details of granular path construction
Trail Gradients	Longitudinal 8% (max); Crossfall 2% (min)	Reduce max gradients for longer sections and tie ins to bridge to 5%; 1% longitudinal gradient for the bridge (falling to the south); min longitudinal/transverse gradients as noted
Trail Elevation	For any given flood return period - 300 mm (min) or to a maximum height (800 mm approx.) within the existing unrestricted space (4 m); includes small diameter drainage culverts Note: In the most severe events it may be impracticable to design the trail to not be flooded	Based on the detailed hydrotechnical analysis for 33% blockage of the EPCOR intake structure, and tying into the proposed elevation of the new bridge PREFERRED/RECOMMENDED: raise trail 1.3 m (maximum) north of the bridge and 0.9m south of the bridge to maintain connectivity in the event of 1:5 year flooding ALTERNATIVE: for 1:10 year flooding, raise the trail by 1.6m and by 1.0 m to the north and south of the new bridge

2.0 Hydrotechnical Analysis

2.1 Data Collection, Information Review and Site Reconnaissance

Several sources of data were collected and reviewed as part of the assessment conducted in Phase 1 of the project including but not limited to the following.

- Mill Creek Erosion Study report[1]
- Daylighting the Downstream Reach of Mill Creek Technical Feasibility Study[2]
- Whitemud Creek Erosion Study[3]
- Water Survey of Canada (WSC) Whitemud Creek near Ellerslie gauge (Station ID 05DF006) hydrometric data
- Alberta Transportation (AT) Hydrotechnical Information System (HIS)
- Google Earth imagery.

Wood visited the site on January 5 and April 19, 2021, to assess Mill Creek at the location of the bridge and the trail approaches to the north and south of the crossing; site photos are provided in Appendix B. Upstream from the bridge, the creek flows along the toe of the east (right) valley wall, then enters a 90-degree meander bend prior to reaching the bridge, before flowing squarely under the bridge within approximately a 20 m straight reach. Throughout this report, left and right banks refer to their orientation when looking in the downstream direction along the creek. Downstream of the bridge crossing, the creek enters another 90-degree meander bend to flow along the toe of the west (left) valley wall; the approximate distance between the toe of the east valley wall to the toe of the west valley wall is 35 to 40 m. Due to ongoing erosion along the toe of the east (right) valley wall upstream of the bridge, the bank is showing signs of instability. At this location, the upper part of the east (right) bank is near vertical while the bottom part has approximately 1H:1V slope (see Photo 3). The toe of the west (left) valley wall downstream of the bridge is protected with rock filled gabion baskets for a reach of approximately 35 m. Above the gabion baskets, some signs of the west valley wall slope slumping were observed.

Wood debris, some of it substantial in size and length compared to the bridge opening, is accumulated immediately upstream of the bridge, which considerably restricts the bridge's hydraulic opening (see Photos 1, 2 and 3). Rock filled gabion baskets were located along the toe of the north (right) bank at the bridge site (see Photo 4).

Approximately 100 m downstream of the bridge, Mill Creek flows into a structural plate corrugated steel pipe (SPCSP) with an approximate diameter of 4.3 m, which is operated by EPCOR (see Photo 6). The reinforced concrete inlet structure has an angled grating (screen) to block debris from entering the culvert; debris was accumulated at the base of the grating during the site visit (see Photo 7).

EPCOR record drawings show details of the intake structure and of the tunnel as shown in Appendix D.

Although the creek was frozen during the winter site visit, the sound of water flowing into the SPCSP could be heard. The dimensions of the inlet structure and grating are shown in the drawing extracts in Appendix D, and it appears that about 50% of the grating was visible above the surface of the creek during our spring visit, although some of that area was blocked by debris. The angled grating extends the full height of the inlet structure and the invert of the SPCSP culvert is set slightly above the inlet structure

[1] Associated Engineering. 2016, February 2016.

[2] ISL Engineering and Land Services, March 2017.

[3] Golder Associates Ltd. 2006, May 2006.

base slab. What was evident is that there was a significant difference between the water level on the creek side of the grating and the water level on the other side. Therefore, blockage to the grating below the water level in the creek appears to be significantly impeding flow; as water levels in the creek have continued to drop, this was confirmed during further site visits.

During the winter site visit, the creek upstream of the EPCOR inlet structure was approximately 5 m wide and was frozen. The ice elevation of the creek was approximately 0.3 m below the trail top upstream of the EPCOR inlet structure. There were several H piles installed upstream of the EPCOR structure to catch flowing debris although it is unclear how effective those are since none was trapped there, nor how debris, if trapped on the piles, would be removed.

There is a semi-permanent sign at the EPCOR inlet structure saying that the trail is closed due to flooding. Several pedestrians and City of Edmonton police officers were observed using the bridge during the site visits.

Further evidence that the EPCOR inlet structure is causing water to backup along the channel is that there was no snow on top of the ice and the ice surface was relatively smooth. In contrast, a different ice texture was observed approximately 200 m upstream of the Bridge B278. The backwater is caused by ice and debris blockage on the screen of the inlet structure, with the potential for ice to build up on top of the trail upstream as a result.

High-water marks, in the form of loose material caught on tree branches, were observed upstream and downstream of the bridge. These high-water marks were likely deposited during the 2020 flood event. On average, these high-water marks were approximately 0.8 m above the bridge deck and 1.5 to 1.8 m above the trail in the vicinity of the bridge. Based on the detailed site survey carried out during this phase, the estimated high water mark elevation for the 2020 flood event is 628.5. The survey captured the existing bridge top of deck elevation as approximately 627.7 (627.68), which confirms that the bridge and all the approach trails were under water. The site visit observations further show that the water level elevations are greatly impacted by backwater from the EPCOR intake structure blockage, which has been taken into consideration in our hydraulic modeling.

Based on the spring site visit, the existing bridge vertical hydraulic opening from streambed to bottom of the superstructure is in the order of 1.6 m with a top of water width of 3.9 m. The average stream depth at that time was estimated to be 0.3 m. The water level was 1.3 m below the bottom of the superstructure and 2.1 m to the top of deck. Based on the winter and spring site visits, the top of ice was 0.7 m below the bottom of the superstructure resulting in the top of ice to streambed being in the order of 0.9 m.

Water depth and ice levels will vary from year to year and from season to season. The values noted above are a snapshot of these parameters at the times of our site visits. The results of the detailed site survey confirmed the relevant parameters for the hydrotechnical analysis

2.2 EPCOR Flow Data

Through contact with EPCOR, Wood received flow and water level data from two monitoring stations, including one station (#44) in the storm pipe downstream of the intake structure that captures the creek to eventual outfall into the North Saskatchewan River – see Fig. 2-1. The other station (#50) measures depth and flow in an upstream culvert where the creek comes out of a skimmer – see Fig 2-2. The data for station #44 dates from 2002 and for station #50 from 2009. This data was reviewed to finalize hydrology of Mill Creek in study reach.

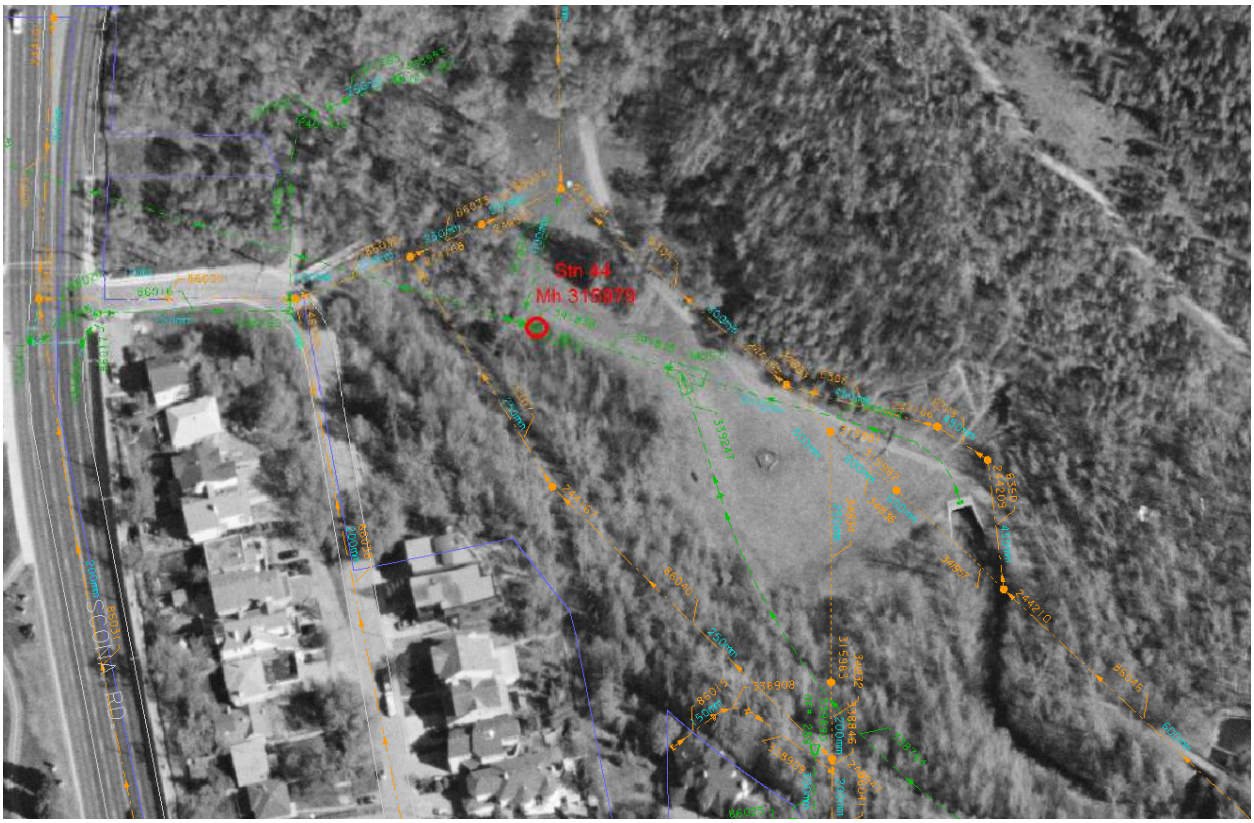


Figure 2-1 Location of Station #44 in 3800 mm pipe downstream of the confluence of 3600 mm STM pipe with 4270 mm pipe coming from the intake structure

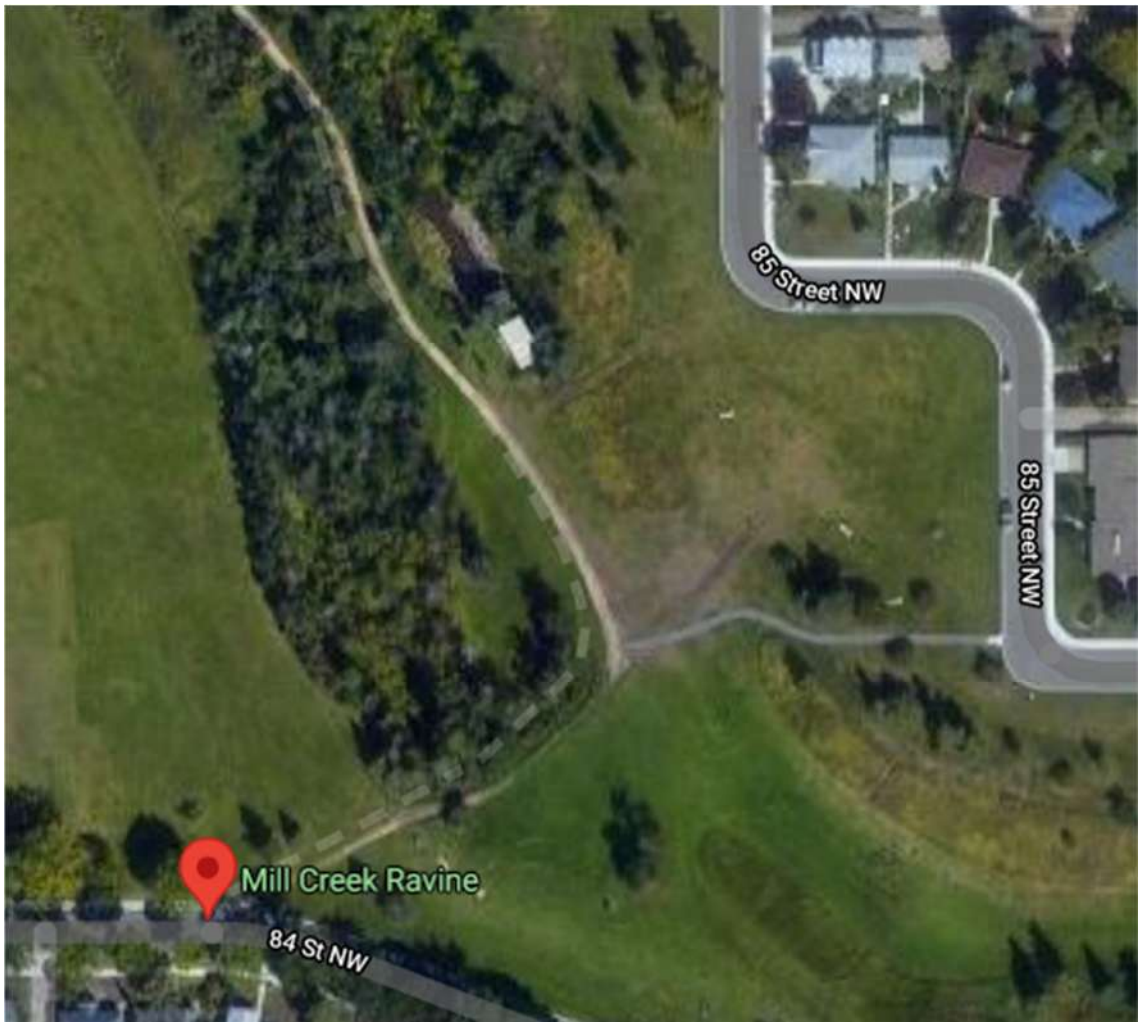


Figure 2-2: Location of Station #50

2.3 Channel

Mill Creek has an irregular meandering pattern with tight radius meander bends in the order of 90 degrees. Bridge B278 is located on a straight reach of the creek between two such tight bends, which make this site more prone to debris accumulation at the bridge, as is evidenced by the current situation. Erosion and sediment deposit upstream and downstream of the bridge, particularly due to the tight double bends, has happened over time to the detriment of some existing trees and with risk to others. Debris that is more easily trapped at the tight bend just before the bridge, as well as from the EPCOR structure, back up water for longer periods in the event of flooding that puts more trees at risk, which in turn will cause more deadfall.

2.4 Hydrology

Mill Creek is a tributary of the North Saskatchewan River; the drainage area of the creek at the study site is approximately 125 km^2 (HIS) of which 40% consists of developed or developing lands within the city boundaries, and approximately 60% of consists of undeveloped area within Strathcona County (Associated Engineering, 2016). The only major tributary of Mill Creek is Fulton Creek, which has a drainage area of approximately 32 km^2 (Associated Engineering, 2016).

There is no WSC gauge on Mill Creek. Several studies have been conducted on Whitemud Creek which has several WSC gauges within its drainage basin. Golder's 2006 report estimated the maximum instantaneous discharge for several return periods for Whitemud Creek near Ellerslie gauge (Station ID 05DF006), which has similar watershed characteristics as Mill Creek. Therefore, regional analysis was used to estimate maximum instantaneous discharge for several return periods at Mill Creek based on Golder's 2006 report. These values were compared to peak discharges provided in Associated Engineering's 2016 report. **Table 2-1** provides the estimated maximum instantaneous discharge for several return periods that we have used in our hydrotechnical analysis of flooding that affects the bridge and the approach trails on either side.

Table 2-1: Estimated Floods for Mill Creek Pedestrian Bridge B278

Return Period (Years)	Max Instantaneous Discharge[a] (m^3/s)
Q1:100	50
Q1:50	36
Q1:25	25
Q1:20	23
Q1:10	16
Q1:5	11
Q1:2	5

Note: - [a] Max instantaneous discharges estimated based on Golder's 2006 report and Associated Engineering's 2016 report

As mentioned previously, high-water marks were most likely deposited during the 2020 runoff flood which was estimated to be in the order of Q1:25 year event based on provisional data from the Whitemud Creek near Ellerslie gauge (Station ID 05DF006) and adjusted based on the Associated Engineering's 2016 report. As per the high-water marks surveyed/observed, the water level was in the order of 0.8 m above the existing bridge deck during the 2020 flood event. This high-water level is mostly caused by backwater from the EPCOR inlet structure due to debris caught on the screen, above and below water, which would have restricted the channel flow. Surveyed existing top of debris elevation at EPCOR inlet screen was 626.5, which was used to model channel flows for several return periods. Debris removal at the bridge and EPCOR inlet structure should be carried out regularly and after major flood events to maintain the hydraulic opening at the structures.

2.5 Hydraulic Modeling using HEC-RAS Model

2.5.1 Hydraulic Model of Options

A hydraulic model was developed to estimate the design flood elevation and associated flow velocity. The US Army Corps HEC-RAS model was constructed using cross sections from survey data. Survey was completed for the main channel of the creek, floodplain, and bottom section of the valley slope. Survey was also conducted for the existing bridge and trail. Plan and surveyed cross-sections are shown on Drawing SK-1 in Appendix A2. To determine the water levels for several return periods within the study site, a total of 9 surveyed cross sections (cross-sections 1 through 10, excluding cross-section 9) were incorporated in the HEC-RAS model; the EPCOR intake structure was also modelled, comprising 79.21 m of 4270 mm dia

SPCSP culvert followed by 300 m of 3800 mm dia concrete lined tunnel ending at the outfall to the North Saskatchewan River (See EPCOR Drawings in Appendix D). As mentioned previously, the study site is prone to backwater effects due to blockage at the EPCOR water intake structure (See Figure 2-1).

In Phase 1, for the Concepts and Assessments, simplistic analysis was carried out to estimate water surface levels without considering backwater effects since those could not be accurately estimated without a good model. However, it was recognized in discussing those results with the City, that the reality of the situation is that EPCOR will not remove debris from the grating sufficiently frequently to assume a basis of zero blockage for the analysis in Phase 2., f

Therefore, for the HEC-RAS model, further to discussion with the City during this phase, five blockage scenarios were selected to evaluate water surface elevations at nine surveyed cross-sections (1 through 10, 9 was not used in the model) for the flow discharges for each return period. Trail/bridge elevations at these cross-sections were also presented to provide a sense of whether the trail is under water or above water for the considered return periods. The blockage scenarios are as follow;

1- EPCOR inlet structure with zero blockage (a datum elevation of the surveyed creek bed of 625.0 was used, which shows that sediment and silt accumulation on the face of the grating is in the order of 2m deep)
2- Blockage of 10% of the area of the grating above the datum elevation up to elevation 625.8
3- Blockage of 20% of the grating up to elevation 626.1
4- Blockage of 33% of the grating up to elevation 626.5, which represents the existing surveyed debris blockage. This inlet blockage was also used to calibrate or validate the HEC-RAS model with the surveyed 2020 flood high water marks (elevation of 628.5).
5- At the request of the City, blockage up to 50% of the grating to an elevation of 627.1 (which would represent over 2 m (almost 7') of accumulated debris.

Figure 2-1: Looking at EPCOR Inlet Structure (Note; Debris catcher in channel and debris blockage at inlet screen (April 19, 2021 site visit photo)

For the purposes of the modeling, pertinent elevations at the EPCOR structure are as follows;

- Invert elevation of EPCOR intake structure 4270mm SPCSP outlet pipe based on information provided by EPCOR = 623.0
- Surveyed top of EPCOR intake structure = 628.73
- As noted previously, surveyed streambed elevation (top of silt) = 625.0
- Surveyed top of debris on the angled grating in front of EPCOR intake structure = 626.5

2.5.1.1 Hydraulic Modeling Results

The results of modelled flow water level elevations with and without these blockages are graphically presented as water surface profiles for the flows for each return period along with streambed, trail, and existing bridge profiles on drawings SK-2 through SK-5 in Appendix A2; the results are also presented in Tables A-1 to A-4 in Appendix A1.

Each table shows the calculated water surface elevations for zero blockage and for one of the four other scenarios and calculates the difference in elevation between the trail or bridge elevation at each cross section for each flood event.

Tables 2-2, 2-3 and 2-4 present the results for the critical trail section north and south of the bridge and for the bridge for the current level of blockage.

Table 2-2: HEC-RAS Flow Modeling Results at Mill Creek Pedestrian Bridge B278 with 33% Blockage at EPCOR Intake Structure (Cross Section #5)

Return Period (Years)	Max Instantaneous Discharge[a] (m^3/s)	Water Level Elevation at Bridge[b] (m)	Flow Velocity (m/s)	Compare to Existing Bridge Deck[c,d] (m)
Q1:100	50	629.28	0.9	-1.60
Q1:50	36	628.74	0.8	-1.06
Q1:25[d]	25	628.27	0.7	-0.59
Q1:10	16	627.82	0.6	-0.14
Q1:5	11	627.54	0.6	0.14
Q1:2	5	627.12	0.5	0.56

Table 2-3: HEC-RAS Flow Modeling Results at Cross Section #3 South of Bridge B278 with 33% Blockage at EPCOR Intake Structure

Return Period (Years)	Max Instantaneous Discharge[a] (m^3/s)	Water Level Elevation[c] (m)	Flow Velocity (m/s)	Compare to Existing Trail[e] (m)
Q1:100	50	629.31	0.9	-2.48
Q1:50	36	628.77	0.8	-1.94
Q1:25	25	628.30	0.7	-1.47
Q1:10[e]	16	627.85	0.6	-1.02
Q1:5[e]	11	627.56	0.6	-0.73
Q1:2	5	627.14	0.5	-0.31

Table 2-4: HEC-RAS Flow Modeling Results at Cross Section #8 North of Bridge B278 with 33% Blockage at EPCOR Intake Structure

Return Period (Years)	Max Instantaneous Discharge[a] (m^3/s)	Water Level Elevation[c] (m)	Flow Velocity (m/s)	Compare to Existing Trail[e] (m)
Q1:100	50	629.27	0.9	-3.02
Q1:50	36	628.73	0.8	-2.48
Q1:25	25	628.26	0.7	-2.01
Q1:10[e]	16	627.81	0.6	-1.56
Q1:5[e]	11	627.52	0.6	-1.27
Q1:2	5	627.11	0.5	-0.86

Tables Notes:

a. Max instantaneous discharges estimated based on Golder's 2006 report and Associated Engineering's 2016 report

b. Water level elevations based on Wood HEC-RAS Flow Modeling (blockage as noted)

c. Trail elevation is surveyed ground; bridge deck elevation refers to the level of the top of the timber deck planks; the value of the water level above the existing bridge deck/trail is based on Wood survey data and the existing bridge deck elevation = 627.68. A negative value in the last column shows that the bridge/trail is under water at that location during that flood event.

d. Highlighted as a reference since modelled water surface levels are similar to the height of water for the 2020 flood event based on site observations – considered as a basis for design (Q25/33%) – see 2.6

e. Highlighted to compare with values at bridge (see Note d.) for Q25/33%, which requires the deck level to be raised by 1.2 m (allowing for 200 mm freeboard below soffit of truss).

2.6 Sensitivity Analysis and Discussion

As an example of the sensitivity of the water surface levels to blockage (relative to the base case of 33% that represents the current situation), please refer to the values in the following three tables for the 10, 20, and 50% blockage scenarios (at the bridge).

Table 2-5: HEC-RAS Flow Modeling Results at Mill Creek Pedestrian Bridge B278 with 10% Blockage at EPCOR Intake Structure

Return Period (Years)	Max Instantaneous Discharge[a] (m^3/s)	Water Level Elevation at Bridge[b] (m)	Compare to Bridge Deck[c] (m)	Magnitude of Sensitivity[f] (m)
Q1:100	50	628.63	-0.95	-0.65
Q1:50	36	628.11	-0.43	-0.63
Q1:25	25	627.67	0.01	-0.60
Q1:10	16	626.91	0.77	-0.91
Q1:5	11	626.98	0.70	-0.56
Q1:2	5	626.75	0.93	-0.37

Table 2-6: HEC-RAS Flow Modeling Results at Mill Creek Pedestrian Bridge B278 with 20% Blockage at EPCOR Intake Structure

Return Period (Years)	Max Instantaneous Discharge[a] (m^3/s)	Water Level Elevation at Bridge[b] (m)	Compare to Bridge Deck[c] (m)	Magnitude of Sensitivity[f] (m)
Q1:100	50	628.90	-1.22	-0.38
Q1:50	36	628.37	-0.69	-0.37
Q1:25	25	627.91	-0.23	-0.36
Q1:10	16	627.13	0.55	-0.69
Q1:5	11	627.20	0.48	-0.34
Q1:2	5	626.75	0.93	-0.37

Table 2-7: HEC-RAS Flow Modeling Results at Mill Creek Pedestrian Bridge B278 with 50% Blockage at EPCOR Intake Structure

Return Period (Years)	Max Instantaneous Discharge[a] (m^3/s)	Water Level Elevation at Bridge[b] (m)	Compare to Bridge Deck[c] (m)	Magnitude of Sensitivity[f] (m)
Q1:100	50	629.86	-2.18	0.58
Q1:50	36	629.32	-1.64	0.58
Q1:25	25	628.84	-1.16	0.57
Q1:10	16	628.05	-0.37	0.23
Q1:5	11	628.11	-0.43	0.57
Q1:2	5	627.70	-0.02	0.58

Note:

f. A positive value means that the water surface level associated with the change in blockage has increased relative to the current level (33%).

The hydrotechnical model assumes the bridge hydraulic opening to be unblocked but in fact the size of the opening and the presence of any debris at the bridge (as it is now) nor any in the future, does not affect the water surface levels.

Taking Q25 results, and comparing results for the current level of blockage (33%), the model shows that the existing deck will be overtopped by approximately 600 mm. By removing approx. 1000 mm of that debris and keeping it at that level means that in the event of another flood like that of last year, the model indicated that the water surface level will only rise to the existing deck level, a difference of 600 mm. The commensurate saving by not having to raise either the bridge or particularly the trails to deal with the current amount of blockage is significant in terms of the cost of construction and the reduced impact due to less encroachment into treed and vegetated areas beside the existing trail that would be affected otherwise.

The results show that while it is practicable to base a design for elevating the trails and the bridge to mitigate flooding and maintain connectivity for a certain amount of blockage, it is essential to maintain communication with EPCOR regarding the frequency of debris removal, and certainly essential to agree that debris is not allowed to rise above a certain level, such as it is at the time of writing.

The trail north of the bridge is lower lying, as is illustrated on SK1 in Appendix A2, and thus the water surface levels for more frequent flood events such as Q5 and Q10 are significantly higher, in relative terms, in that section, which will require higher and wider trail embankments to elevate those sections to mitigate flooding; that causes greater impact as those embankments will cause greater encroachment.

Given the current evidence that routine maintenance of the EPCOR grating, i.e., clearing debris and any depth of silt is not frequent, we recommend that the current level of blockage, 33% of the grating area, is a conservative but representative basis for modeling water surface levels for the purpose of detailed design. The results of the model for 50% blockage are judged to be overly onerous. EPCOR maintenance crews are enjoying the benefit of the accumulated debris upstream of the bridge preventing significant amounts of drift material reaching the grating, which might force EPCOR to clear more frequently.

With that assumption, we suggest that the surface water levels for both Q50 and Q100 would require raising the bridge and the trails to mitigate flooding to an elevation that is not warranted and not reasonably practicable; the purpose of the project is primarily to mitigate the seasonal flooding that is routinely reported in this area.

2.6.1 Bridge Hydraulic Opening

Flood water levels are principally affected impacted by blockage at the EPCOR intake structure, and the hydraulic opening at the bridge does not significantly impact water levels in the study reach; a wider bridge opening provides no benefit and no value for the additional cost. Based on the average channel surveyed/observed streambed width, a design streambed width of 4 m at elevation 625.4 with 2H:1V head slopes is recommended. Allowing 200 mm freeboard and assuming 400 mm super-structure depth for the truss, the top of deck elevation of a new bridge is 628.87.

Drawing INFO-S1 in Appendix C illustrates a plan and elevation for a truss bridge to accommodate the water levels based on the recommended blockage flow discharge values.

2.6.2 Proposed Bank Protection

It is standard practice is to protect the bridge head slopes from erosion and scour with rock riprap. For this site, we currently envisage protecting the riverbank upstream of the new structure over a length of 8 m along the north (right) bank and 5 m along the south (left) bank upstream to arrest lateral bank erosion and scour. Downstream of the proposed structure, the riverbank would be protected over a length of 5 m on both banks. Flood conditions at this site are primarily caused by backwater effects from the EPCOR structure and therefore less subject to high flow conditions and other effects (e.g., ice shoving and debris perhaps) that collectively would raise the risk of mobility of the rock armoring. The water velocities are also low enough to warrant the selection of Class I rock riprap in this case, but based on discussion with the City, and evidence from their field experience of instream erosion of protection at several sites in Mill Creek, and their preference for use of a single larger Class size from a constructability and cost effectiveness perspective, the recommendation is to use Class II angular rock riprap for armoring of the bed and shore as shown on drawing MICR-P211-S01 in Appendix C.

The drawing shows plan and section views with the envisaged riverbank protection works at the bridge site. The width of the channel at this site is such that protection works will converge across the width of the stream bed; this is not uncommon for narrower creeks and has been implemented successfully on other projects. In such cases, the depth of rock for both the bed and shore armoring is the same.

The option of a bioengineering solution was identified in Phase 1 to extend protection of the right bank upstream of the proposed rock riprap armoring shown on the drawings included in the Phase 1 technical memo. The accumulated drift would be cut up into approximately 2.5 m lengths and piled up against the upstream right bank. While it is being piled up, the channel would be dredged of deposits and placed on top of the drift to fill the holes and then repeated in layers. It is basically a beaver dam structure placed strategically to protect the bank, stabilize the channel, and clean up deposits at and under the bridge. As the drift slowly rots it gives time for vegetation to grab hold and provide natural protection. Environmentally, this solution would leave natural materials where they have been deposited already. Sediment disturbed would muddy the waters during the work, which could be countered with a silt fence across the channel immediately downstream.

To be clear, we are not recommending that section of the bank requires protection, whether by rock riprap or otherwise, and we have not explored if such a biotechnical solution has been employed elsewhere by the City or other jurisdictions; therefore, we have not shown the additional bank armoring in

the final preliminary drawing package with recommendation to proceed based on the armoring of the bed and shore as shown on drawing MICR P211-S01.

3.0 Geotechnical Investigation and Appraisal

3.1 Summary of Existing Foundations and Subsurface Conditions

Existing piles are of unknown depth and are likely either driven steel pipe piles or steel capped driven timber piles. Five (5) boreholes were drilled at the site on June 29 and 30, 2021; One of the five (BH21-01) was drilled deeper (to a depth of 10.4m) to determine soil conditions and design parameters for the new bridge; the other four (BH21-02 to 05) were shallower boreholes, drilled between 5.5 and 5.8 m deep alongside the trail route located north and south of the bridge to complement BH21-01 and determine conditions and parameters pertinent to the design of the bridge and any upgrades to those trails. .

On June 29 and 30, 2021, five boreholes (Boreholes BH21-01 to -05) were advanced at the site using hollow and solid stem augers. Based on the collected information, the general stratigraphy at the site consisted of:

1. Low to medium plastic clay of firm to very stiff consistency, with thickness varying between 3.2 m and 3.8 m underlain by
2. Medium to high plastic, extremely clay shale bedrock of hard consistency with coal inclusions, and trace to some bentonitic interbeds.
3. Drilling refusal was encountered in Borehole BH21-02 within the hard clay shale bedrock.
4. A review of available geologic information[4] indicates that the bedrock is of the Edmonton formation, which is composed of interbedded bentonitic shales and sandstones with numerous coal seams.
5. Groundwater was encountered during drilling at depths of between 1.6 m to 4.7 m. Although no standpipes were installed, it would be reasonable to assume that the groundwater elevation would correspond to the high-water level in the creek.

The position of the boreholes was finalized following location of the 600 mm diameter sewer by EPCOR on site. Locations of three of the boreholes are indicated on Drawing No. MICR P211-S01 in Appendix C. The borehole logs are contained in Appendix F.

3.2 Geotechnical Appraisal and Issues

Due to the presence of clayey soils of very soft to firm consistency at shallow depths overlying extremely weathered clay shale bedrock, the prevalent ground conditions are favorable for the use of deep foundations to support settlement sensitive structures such as the proposed new bridge. The ground conditions are considered favourable for the use of rock-socketed cast-in-place (CIP) concrete piles, continuous flight auger (CFA) or micro piles founded within the clay shale bedrock that is present at relatively shallow depths. The use of driven piles will likely require installation within pre-drilled under-sized pilot holes. Such type of pile installations will require the use of pipe piles.

Where any type of drilling is to be undertaken for pile installation, consideration will need to be given for sourcing drilling equipment that will be able to advance the drill hole through very stiff to hard clay shales

[4] Kathol, C.P. and McPherson, R.A., Urban Geology of Edmonton, Bulletin 32, Alberta Research Council, 1975

with potential sandstone or siltstone zones as commonly found in the Edmonton Formation Bedrock. As such, the use of smaller diameter piles will be preferable. Due to the presence of high groundwater, the use of casing may need to be a consideration during drilling operations.

Where CIP, CFA rock socketed piles or micropiles are used, consideration will need to be given to delivery of concrete or cement grout to the bridge site with difficult access. The volume of grout required for the micropiles will likely be lesser than the volume of concrete required for CFA or CIP piles.
As the clay shale bedrock is of very stiff to hard consistency, the ground conditions are considered unfavourable for the installation of screw pile foundations to depths sufficient to overcome frost-jacking loads. Shallow foundations would need to be founded on the bedrock (3 m to 4 m depth) or on engineered fill placed on the bedrock as the overlying clay is considered a compressible material and is not considered favourable to act as a bearing stratum. In addition, foundations would need to be below the frost penetration depth to limit potential for frost heave. Given the likely need for shored excavations due to site areal constraints and the potential need for active dewatering during such construction due to the high groundwater levels present, the site conditions are not considered favourable for the use of shallow foundations.

Due to the presence of tree-cover, access constraints for construction equipment and the need for drilling equipment capable of advancing drill holes through hard clay shales or sandstone bedrock, the site conditions are favourable for the use of smaller diameter piles such as micropiles (150 mm to 250 mm diameter) or driven steel pipe piles in pre-bored holes. Where driven piles in pre-bored holes are to be used, consideration will need to be given to the use of drop hammers due to the smaller equipment footprint and potential lower headroom requirements due to the existing tree cover.

Therefore, based on these considerations, the detailed geotechnical recommendations provided in this report are limited to micro-piles and driven piles. Recommendations provided herein for this preliminary engineering report are limited to those required for axial design including for frost resistance. Upon selection of the preferred foundation option and finalization of the design basis, comprehensive geotechnical recommendations will be provided towards finalizing the design. This appraisal has also been provided in table form herein.

Where raising of the trail grades is required (raised trail heights are understood to be in the range of 2 m above the existing grade), stable slope angles will be required for long-term stability. Where such stable slope angles result in a considerable expansion of the trail footprint, consideration will need to be given to the use of appropriate retaining structures. Based on the soil conditions encountered, the use of timber or steel posts/beams embedded to suitable depths together with timber lagging will likely meet site requirements. The type of post and lagging material utilized will need to be selected based on structural and aesthetic requirements in addition to cost considerations.

Table 3-1: Foundation Type Appraisal Summary

Consideration	Foundation Type					
	Shallow Foundations	Screw Piles	Driven Pipe Piles	Cast-in-place (CIP) Concrete Piles	Continuous Flight Auger (CFA) Piles	Micropiles
Overburden Soil above bedrock	Not favourable as foundation material due to the presence of lower consistency soils.	Not favourable for bearing support due to presence of lower consistency units.	Not favourable for provision of axial resistance due to the presence of lower consistency soils			
Relatively shallow clay shale bedrock with potential sandstone interbeds	Favourable as foundation material	Although favourable as a foundation material, depths are too shallow to attain sufficient foundation embedment depth prior to refusal to overcome frost uplift or to satisfy lateral load resistance requirements.	Not favourable and will require pre-boring with undersized pilot holes. Will also require pre-boring equipment capable of drilling to pile embedment depths through the hard clay shale and potential sandstone	Favourable, will require use of drilling equipment capable of drilling to pile embedment depths through the hard clay shale and potential sandstone	Not favourable due to the need for mobilizing higher capacity (i.e., larger) drilling equipment to advance augers through shallow bedrock.	Favourable. Typical micropiling drilling rigs can advance smaller diameter holes through hard/very dense soils and competent bedrock.
High Groundwater	Not favourable	Inconsequential	Not favourable for prebores. May require the use of casing.	Not favourable. Will require the use of casing and concrete placement by tremie.	Inconsequential	Not favourable. Will require the use of casing and concrete placement by tremie.
Frost Impact	Not favourable.	Not favourable due to the presence of bedrock at shallow elevations.	Inconsequential. Pile embedment can be designed to be sufficiently deep to overcome frost uplift.			
Access constraints and tree cover	Inconsequential	Inconsequential	Not favourable. Requires the use of smaller drill rigs such as used for micropiling for prebores as the prebore diameter will be smaller than CIP or CFA piles and smaller hammers such as drop hammers.	Not favourable	Not favourable	Inconsequential due to the availability of equipment.
Equipment Requirements	Excavators, loaders, concrete delivery system (concrete trucks)	Screw pile installation apparatus mounted on excavator or equivalent.	Drilling rig (auger and rock drills) capable of drilling pilot holes (150 mm to 300 mm) through clay shale and potential sandstone, pile driving apparatus, crane, or equivalent for positioning piles, fillcrete for infilling of pipe piles may need trucks for delivery.	Drilling rig (auger and rock drills) capable of drilling 500 mm diameter or greater piles through clay shale and potential sandstone, cranes, or equivalent for placement of the reinforcement cage, concrete trucks for delivery of concrete.	Drilling rig (auger and rock drills) capable of drilling 500 mm diameter or greater piles through clay shale and potential sandstone, cranes, or equivalent for placement of the reinforcement cage, concrete trucks for delivery of concrete.	Drilling rig (auger and rock drills) capable of drilling smaller diameter holes through clay shale and potential sandstone (150 mm to 250 mm), cranes or equivalent for placement of the reinforcement cage, concrete trucks for delivery of concrete.

3.3 Geotechnical Recommendations

3.3.1 Design For Axial Loads

3.3.1.1 Single Piles

The following design procedure should be followed for rock-socket micropile design:

- The exterior surface area of the pile in contact with the soil should be used in the calculation of the skin friction resistance and bond adhesion resistance to compressive and uplift loading.
- Unfactored compressive and uplift resistance of a pile should be determined by multiplying the exterior surface area of the pile shaft in contact with the soil or bedrock times the unit skin friction values given in Table 3-2.
- To determine the ULS factored compressive resistance of the pile, a resistance factor, Φ, of 0.4 should be applied to the unfactored geotechnical compressive resistance. To determine the ULS factored uplift resistance of a pile, a resistance factor, Φ, of 0.3 should be applied to the unfactored uplift resistance.
- The design of piles for external uplift loads should be separate from the design for resistance to upward frost jacking forces. The rationale for this is that at the ultimate limit state, the adfreeze bond over the frost penetration depth will also resist the external loads. Sustained uplift loads should be considered additive to frost jacking forces.
- The minimum center-to-center pile spacing should be 2 pile diameters for micro piles. If the center-to-center pile spacing is less than 5 pile diameters, group effects should be considered (see Subsections 3.3.1.2).
- The impact of negative skin friction may need to be considered in areas where new fill of heights greater than 1 m is placed.

Table 3-2: Unfactored Unit Shaft Friction Values for Rock-Socket Micropiles

Depth		Soil Type	Unfactored Unit Shaft Resistance (kPa)
From (m)	To (m)		
0	3.5	Clayey soils of very soft to firm consistency	0
3.5	6	Extremely weathered clay shale bedrock	55
Below 6 m		Lightly weathered clay shale bedrock	150

Reliance on end bearing resistance is not recommended in determining a micropile' s compressive resistance. The recommendations provided in the Micropile Design and Construction Manual[5] should also be referenced.

3.3.1.2 Group Effects for Axially Loaded Piles

The overlapping zones of influence between closely spaced piles results in the axial resistance of a pile group being to be less than the sum of the axial resistances of the individual grouped piles. The reduction in group capacity is dependent on the center-to-center pile spacing and is quantified by the group efficiency reduction factor (n_g). The efficiency of a pile group may be expressed in equation form as:

$$n_g = \frac{Q_{ug}}{nQ_u}$$

Where: n_g is the pile group efficiency
Q_{ug} is the ultimate capacity of pile group
n is the number of piles in the pile group
Q_u is the ultimate capacity of each individual pile in the pile group

A n_g of 0.55 should be used for piles groups with a centre-to-centre pile spacing of 2.0 times the pile diameter. If the pile group centre-to-centre pile spacing is 4.0 or greater, a n_g of 1.0 may be used (i.e., no reduction to axial pile group resistance). Linear interpolation between n_g of 0.55 and n_g of 1.0 should be used for intermediate center-to-center pile spacings.

3.3.2 Buckling Considerations for Micropiles

Due to the relatively weak soils overlying the clay shale bedrock and the high slenderness ratio of micropiles, the potential for buckling must be considered. A procedure to evaluate the potential for micropile buckling is detailed in Section 5.20 of the Federal Highways Administration Micropile Design and Construction manual[5]. This procedure only considers the contribution from the steel (casing and/or rebar reinforcement) to resist buckling, i.e., the resistance from the grout is neglected. The potential length of the micropile susceptible to buckling would be that portion of the micropile, below the pile cap, and above the bedrock, which could be in the range of 3 m to 4 m for this site, based on the bottom of the pile cap being at the existing surface grade. Where the base of the pile cap is higher or lower, this length will vary accordingly. An appropriate unsupported micropile length should be considered to model the depth of weak soil above the clay shale bedrock. An average initial soil modulus of 1,200 kPa should be used to represent the native soils above the clay shale bedrock.

3.3.3 Installation Of Micropiles

A typical rock-socket micropile installation consists of the following:

1. Drilling the pile shaft and installing a steel casing down to the design pile tip elevation. The casing should be installed in 1.5 m lengths through the overburden soils (soils above the clay shale bedrock).
2. Flushing the hole with air to remove cuttings during drilling.
3. Removal of the drill rods and installation of steel rebar reinforcement.

[5] Micropile Design and Construction Manual Reference Manual, U.S. Department of Transportation Federal Highway Administration publication number FHWA NHI-05-039, December 2005.

4. Placement of grout into the drill hole by tremie. Grout must be pumpable; typically, the water to cement ratio is in the range of 0.40 to 0.50 by weight.
5. Where required: installation of a separate steel casing over the upper 3 m of the micropile for increased lateral resistance and resistance to buckling. Where steel casing is installed, the axial resistance of the micropile shaft should be neglected over the length of the permanent casing.

3.3.4 Monitoring During Pile Installation

The installation of all piles should be monitored by qualified geotechnical personnel to verify that the piles have been installed in accordance with recommendations contained in this report, and that acceptable construction procedures have been followed. A detailed account of the construction procedures employed for each pile would also provide a documented record for future reference if ever reviews of pile performance or modifications to the proposed facilities are required. The inspection should also include identification of the pile embedment depth at which bedrock is encountered at each pile location and the competency of the bedrock based on drilling difficulty as well as competency of drill cuttings.

3.3.5 Driven Pile Foundations

3.3.5.1 Design for Axial Loads for Driven Steel Pipe Piles

As discussed above, the use of driven steel pipe piles will require that the piles be driven through pre-bored pilot holes with marginally smaller diameters than the pipe pile outside diameters. To allow pipe piles to be driven to the required minimum embedment depths, the pre-bored pilot holes should be advanced to the greater of the pile depth required to overcome frost adfreeze stresses (Subsection 3.5) and the pile depth required to satisfy lateral pile design requirements. Minimum pile embedment depths to overcome stream erosion should also be considered where appropriate. The piles should have sufficient embedment to attain the required frost uplift resistance and lateral pile resistance within the zone below the scour depth. The pipe piles should be driven to refusal using an appropriately sized pile driving hammer and driving energies at depths below the pre-bore depth.

Compressive Resistance

Based on the stratigraphy observed in the test borings, it is expected that driven steel pipe piles would achieve practical refusal in the bedrock at relatively short embedment depths below the bottoms of pre-bored pilot holes advanced to 6 m below ground surface, or deeper. Compressive resistance of driven pipe piles will include a combination of shaft resistance and end-bearing resistance. As piles are driven in pre-bored pilot holes, the embedment of the pile tip achieved below the pre-bore depth will likely be minor. To mitigate reductions in end-bearing resistance that may occur over time due to the long-term softening/weakening of the bedrock resulting from stress relief and exposure to groundwater, it is recommended that upon completion of driving, the lower ½ of the pipe pile interiors be filled with low strength concrete or controlled low strength cementitious fill material (CLSM – 1 MPa). For steel pipe piles driven to practical refusal below the pre-bore depth using a suitably sized pile driving hammer and appropriate driving energy, the design of the piles to resist compressive loads should be based on the following relationship that considers the strength properties of the steel pipe piles as opposed to those of the bearing medium:

Unfactored geotechnical compressive resistance, $R_U = 0.8\ f_y\ A_s$,

Where: f_y = yield stress of the pile steel and
A_s = Area of steel in the pile cross-section

As a preliminary guide, practical refusal may be assumed to have taken place when the pile tip has been driven to below the bottom of the pre-bored hole and the pile hammer blow count exceeds 10 blows per 25 mm of penetration using an applied hammer energy in the range of 450 to 600 J per blow for each square centimeter of steel in the pile cross section. The actual practical refusal criteria to be adopted should be rationally determined using the wave equation (*GRLWEAP* software) in which the following parameters are inputted: pile size and length, grade of steel, applied hammer energy, hammer, cushion and helmet specifications, and applicable soil properties. To minimize the likelihood of incurring structural damage to the driven piles, the practical refusal criteria to be adopted should be such that the driving stresses do not exceed 90 percent of the compressive strength of the steel piles.

Tensile Resistance

For tensile loads, only shaft resistance, for which values are given in Table 3-3, should be used in design.

Table 3-3: Unfactored Unit Shaft Friction Values for Driven Steel Pipe Piles

Depth		Soil Type	Unfactored Unit Shaft Resistance (kPa)
From (m)	To (m)		
0	3.5	Clayey soils of very soft to firm consistency	0
3.5	6	Extremely weathered clay shale bedrock	55
Below 6 m		Lightly weathered clay shale bedrock	100

The resistance of piles to uplift loads will be provided solely by shaft resistance. Only the exterior surface area of the pile in contact with the soil should be used in the calculation of the shaft resistance. Unfactored uplift resistance of a pile should be determined by multiplying the exterior surface area of the pile shaft in contact with the soil times the unit skin friction values given in Table 3-3. Shaft resistance developed in soils present above the bedrock should be neglected. The design of piles for external uplift loads should be separate from the design for resistance to upward frost jacking forces. The rationale for this is that at the ultimate limit state, the adfreeze bond over the frost penetration depth will also resist the external loads. Sustained uplift loads should be considered additive to frost jacking forces.

Design Procedure (compressive and tensile)

The following design procedure should be followed for driven piles design:

a) The design minimum embedment depths of driven pipe piles should be determined as the greater of the pile depth required to overcome frost adfreeze stresses, the pile depth required to satisfy lateral pile design requirements, the pile depth required to resist tension loads, or a minimum of 5 m embedment depth below the creek bed elevation.

b) To determine the ULS factored compressive resistance of the pile, a resistance factor,Φ, of 0.4 should be applied to the unfactored geotechnical compressive resistance.

c) To determine the ULS factored uplift resistance of a pile, a resistance factor,Φ of 0.3 should be applied to the unfactored geotechnical uplift resistance.

d) The minimum centre-to-centre pile spacing should be 3 pile diameters for driven steel piles. This recommended minimum spacing is given to minimize reductions in axial capacity due to group effects, and to reduce potential heave of a pile during the subsequent driving of adjacent piles.

e) To provide sufficient frictional resistance against potential adfreezing stresses along the pile shaft the recommendations provided in Subsection 3.5 should be followed in determining the required minimum embedment depths of the foundations. Additional recommendations for piles subjected to frost forces are given in Subsection 3.5.

The effect of corrosion and deterioration from environmental conditions shall be considered in the selection of the required cross-section for long term pile capacity. The potential for corrosion and anticipated corrosion rates should be evaluated by a corrosion expert.

3.3.6 Installation of Driven Steel Pipe Piles in Pre-Bored Pilot Holes

To achieve the pile embedment depths required to provide the required compressive, uplift, and lateral resistances, the pipe piles must be driven into undersized, pre-bored pilot holes. To achieve the required shaft resistance and resistance to lateral loads, it is recommended that the pre-bored pilot holes be constructed no larger than 98 percent of the outside diameter of the pipe piles for piles of diameter 400 mm or larger. For smaller piles, the diameter of the predrill hole should be limited to 95 percent of the pile diameter. The diameter of the pre-bores may potentially need to be adjusted based on observations made during construction; however, the pre-bore diameter must not be larger than the outside diameter of the pile. To limit frost penetration, stress relief, and softening/weakening of the bedrock, the pre-bored holes should be drilled no more than 48 hours in advance of the pile driving.

Prior to pile installation, the piles should be inspected to confirm that the appropriate material specifications are satisfied. The piles should be free from protrusions, which could create voids in the soil around the pile during driving.

All piles driven within five pile diameters of a previously driven pile should have the previously driven pile(s) monitored for heave. Where heave is observed, the piles should be re-driven to at least the original elevation.

For preliminary sizing of driving hammers, hammer energies should be in the range of 450 to 600 joules per blow for each square centimeter of steel in the pile cross section. In the case of hydraulic hammers, which are more efficient than diesel hammers, the minimum required energies should be two-thirds of the recommended values given for diesel hammers. Prior to a contractor mobilizing a pile driving hammer to the site, the suitability of the pile driving hammer should be assessed using wave equation (GRLWEAP) analysis, and pile driving/termination criteria established for the selected hammer/pile combinations. Piles should not be driven beyond practical refusal, which may be taken as 10 to 12 blows per 25 mm interval for the last 300 mm, for the recommended range of hammer energies. If absolute refusal to driving occurs, pile driving should be immediately terminated to limit potential of damage occurring to the pile or piling hammer.

If damage to a pile is observed during driving, driving should cease immediately, and the pile capacity and extent of damage assessed by a qualified geotechnical engineer and structural engineer. The assessments may include estimating the pile capacity and assessing damage by dynamic testing. Piles that have been damaged may need to be replaced pending results of the review.

After inspection and approval of the piles, the interior of each pile should be backfilled with controlled low strength cementitious fill material (CLSM) to a minimum of the creek bed elevation or half the pile length, whichever is higher. Such backfill with CLSM is carried out to limit potential for future weakening of the exposed bedrock at the base of the pile, thus potentially reducing the long-term end-bearing resistance of the pile.

As driven steel pile installations do not allow for direct confirmation of soil conditions during construction, and the piles cannot be visually inspected for damage following installation, construction monitoring will be important in quality control and to verify that the piles are installed in accordance with the design assumptions and driving criteria. For each pile, complete installation and driving records in terms of blows per 250 mm of penetration and the driving energy should be recorded by the geotechnical inspector and reviewed by the geotechnical engineering during pile installation.

3.4 Pile Settlement

The settlement of single piles would depend on the applied load, strength-deformation properties of the foundation soils, and on the relative proportions of the loads carried by shaft friction and end-bearing. Settlement of pile foundations embedded within the clay shale bedrock will be limited by the deformation characteristics of the clay shale. In estimating the settlement of a single pile, it was assumed that the service load on the piles would be 25 to 40 percent of the unfactored geotechnical compressive resistance of the pile. For these piles (driven or micropiles), the settlement would be 0.1 to 0.3 percent of the pile diameter plus elastic shortening. In addition to settlement caused by superstructure loading, settlement due to negative skin friction caused by fill self-weight settlement and settlement of weak soils overlying the bedrock should be considered may need to be considered if new fill depths exceed 1 m. These considerations will be finalized once final trail raise height has been determined.

3.5 Frost Design Considerations

3.5.1 Frost Effects for Piles

Piles will be subject to adfreezing stresses (frost jacking) acting along the pile shafts within the frost penetration zone. Resistance to adfreezing stresses on pile shafts will be provided by the skin friction below the depth of frost penetration (approximately 2 m based on a mean winter condition), weight of the piles and by sustained compressive loads.

The minimum embedment depths of lightly loaded piles should be checked assuming an unfactored frost adfreeze stress of 65 kPa acting on the interface between the in-situ soil and pile shaft over the frost penetration depth provided previously. The impact of frost heave pressures on the undersides of pile caps and grade beams and the impact of frost adhesion on the sides of the pile caps or grade beams should also be considered.

1. A load factor of α = 1.25 should applied to the calculated unfactored frost jacking force to determine the ULS factored frost jacking force.
2. A resistance factor of Φ = 0.7 was applied to the calculated unfactored frost resistance to determine the ULS factored frost uplift resistance.

For individual piles, not resisting significant frost uplift forces on the undersides of pile caps, planned pile embedment depths of a minimum of 7 m below the ground surface is sufficient to resist frost uplift.

3.5.2 Frost Effects on Pile Caps, Grade Beams, etc.

The impact of frost heave pressures beneath pile caps, etc. should be considered during design. Granular backfill will be used behind the backwalls and pile heads. Based on assumed properties for the granular fill, it is expected that the frost penetration depth (for a mean return period) will be approximately 2.0 m. To limit the occurrence of frost heave pressures caused by infiltration of water within the voids on the undersides of pile caps, pile caps should be either above the groundwater level or below the depth of the frost penetration zone. Where possible, the ground surface should be graded away from the structure at a minimum grade of 3 percent over 2 m to minimize the potential for the void to become infilled with water. Where the pile cap is constructed within the frost zone, a compressible medium may be used in lieu of void forming products. For this case, frost uplift forces on the undersides of pile caps, grade beams, etc. will need to be determined based on the crushing strength of the material used.

3.6 Slope Stability

The stability of embankment side slopes depends on several factors including the slope angle, embankment height, undrained and long-term strength of the foundation soils, fill type and properties, and groundwater/drainage conditions. Other factors, such as erosion by surface runoff, could also impact shallow-based stability. The side slopes beside abutment walls must be flattened to a slope no steeper than 2H:1V to satisfy stability requirements for overall slope heights up to 1.5 m. Where fill heights are to be raised as high as 2 m above existing grades, 2H:1V slopes could likely be maintained, but may require the use of geogrid reinforcement. Once the trail grades have been finalized, stability assessments will be undertaken to determine these requirements during detailed design.

4.0 Environmental Regulatory Permitting Requirements

4.1 Regulatory Scoping

The provincial Code of Practice – St. Paul Management Area Map classifies Mill Creek as a mapped and uncoded water body (ESRD 2013a). Due to the Project site's proximity to the fish-bearing waters of the North Saskatchewan River, Mill Creek at B278 defaults to a Class C water body with a restricted activity period for instream works from 16 September to 31 July (AEP 2019). However, Mill Creek is not expected to support upstream fish passage due to the permanent outfall structure on the North Saskatchewan River located several meters above the river, which is a barrier to upstream fish migration.

Under the Alberta Water Act and Water (Ministerial) Regulation, watercourse crossings works are exempt from approval in accordance with Code of Practice for Watercourse Crossings. Pursuant to the Code of Practice for Watercourse Crossings Section 1(2)(ff) defines "watercourse crossing" as a crossing, and any associated structures that are or will be constructed to provide access over or through a water body, but does not include the realignment of the channel of a water body beyond a distance of 20 metres upstream and downstream from the watercourse crossing, or the diversion of water from the site of a watercourse crossing, including associated structures, that require approval under the Water Act.

A review of Abacus Datagraphics Limited (2021) was conducted for the quarter section SW33-52-24 W4M for public land dispositions. The search identified one recorded activity, a Department Licence of Occupation (DLO 054638) for Erosion Protection Bank Stabilization Works along Mill Creek. Since works will occur within the bed and shores of the water body and outside of the existing DLO, and without direction from AEP otherwise at the time of writing, we recommend that application for a new DLO be submitted upon approval of an option by the City for detailed design based on the associated requirements for bed and shore occupation.

Any death of fish or the harmful alteration, disruption, or destruction of fish habitat (HADD) must be authorized by Fisheries and Oceans Canada (DFO) to avoid the contravention of Section 35(1) of the federal Fisheries *Act*. Mill Creek supports a simple warm water forage fish community and with the implementation of DFO *Measures to Protect Fish and Fish Habitat,* the proposed works are not anticipated to result in the HADD of fish habitat.

Under the Canadian Navigable Waters Act (CNWA), Mill Creek is not a scheduled navigable waterway. Further, the watercourse was not classified as a navigated stream in accordance with the Alberta Transportation (2014) Navigated Waters in Alberta and Alberta Government (2014) Drainage Basins and Navigated Stream Map. As such, notification and/or approval under the CNWA is not required.

Mill Creek falls within the boundaries of the City of Edmonton Bylaw 7188 – North Saskatchewan River Valley Area Redevelopment Plan (City of Edmonton 1985). The purpose of the plan is to protect the North Saskatchewan River valley and ravine system as part of Edmonton's valuable open space heritage. The policy of the Bylaw 7188 requires environmental review of projects occurring within the North Saskatchewan River valley and ravine system. Where works involve adding new infrastructure including bridge replacement and or trail realignment and tree clearing, Environmental Impact Assessment (EIA) with Public Consultation will be required[6].

The anticipated regulatory program applicable to the Project, including related permitting, notification, or other requirements, are summarized in Table 4-1.

4.2 Status of Environmental Assessment and Regulatory Program

The following have been completed and/or summarize the environment scope of work to-date.

1. Environmental Overview – Phase 1 Environmental Site Assessment was completed on May 27, 2021, and submitted to the City Planning Coordination Group on June 24, 2021 as part of the Bylaw 7188 review process. The Phase 1 ESA is attached in Appendix __.
2. Initial Project Review (IPR) with Achyut Adhikari, Ecological Planner, Planning and Environment Services, City of Edmonton was held on July 7, 2021. He confirmed that the B278 Mill Creek Pedestrian Bridge Replacement and Trail Upgrades project will be subject to an Environmental Impact Assessment (EIA) under Bylaw 7188. EIA Terms of Reference are to be provided by Achyut once preliminary design drawings are submitted for city review. As the bridge replacement and trail work will not alter the alignment of the trail (including the bridge crossing), Achyut confirmed that a Site Location Study (SLS) will not be required.
3. The Spring rare plant survey was completed on 17 June 2021; the Fall rare plant survey is scheduled for the week of August 9, 2021.
4. Field reconnaissance of the local study area to collect baseline environmental information including fisheries assessment as per the requirements of the *Code of Practice for Watercourse Crossings* and federal *Fisheries Act* was completed on July 27, 2021.
5. The Historical Resources Impact Assessment approval application (as shown in Table 5-1) will be submitted during the detailed design phase.

[6] Achyut Adhikari, Ecological Planner. City of Edmonton Email correspondence dated July 7, 2021.

Table 4-1: Summary of Anticipated Project Regulatory Requirements

Regulatory Requirement	Responsible Authority	Purpose or Intent	Anticipated Requirement	Timeline
Federal				
Fisheries Act	Fisheries and Oceans Canada	Among other requirements, provides for the protection of fish and fish habitat, and the prohibition on deposition of deleterious substances (including sediment) into fish-bearing waters.	Where works occur below the OHW mark (1:2 year flood flow return level) of a fish-bearing watercourse, referral is anticipated to be required. No Section 35(2) authorization under the *Fisheries Act* is anticipated.	Up to 90 days for DFO review of referral. Authorization can take up to an additional 150 days (up to 60 days for review of application completeness and up to an additional 90 days for issuance of authorization).
Migratory Birds Convention Act	Environment Canada	Protection of migratory birds, their nests and habitat	Timing constraint for vegetation clearing or other disturbance of April 15 to August 15. *see also Alberta *Wildlife Act* timing constraint of February 15 to April 30	Pre-construction wildlife sweep nesting surveys prior to vegetation clearing or other disturbance.
Species at Risk Act	Environment Canada	Prohibits harming or killing of listed species or damage or destroy their residence on federal lands, for all aquatic species, and migratory birds under the *Migratory Birds Convention Act*.	No agreements, permits and or licenses under SARA are anticipated.	N/A
Canadian Navigable Waters Act	Transport Canada	Protecting the public right of navigation on all navigable waters in Canada	Approval and or public notification not a Project requirement.	N/A
Provincial				
Water Act	Alberta Environment and Parks (AEP)	Water (Ministerial) Regulation outlines approval exemptions subject to the Code of Practice for Watercourse Crossings, under Part 1, 3(2) The placing, constructing, installing, maintaining, replacing, or removing of a watercourse crossing is designated as an activity that does not require an approval if, and only if, the activity is carried out in accordance with *the Code of Practice for Watercourse Crossings*, as amended.	Section 1(2)(ff) of the *Code of Practice for Watercourse Crossings* as the crossing, and any associated structures that are or will be constructed to provide access over or through a water body, including but not limited to: (i) structures and measures to isolate the location of the works, (ii) erosion protection structures, and (iii) sedimentation management structures. The watercourse crossing does not include the realignment of the channel of a water body beyond 20 metres upstream and downstream from the watercourse crossing, or the diversion of water from the site of a watercourse crossing, including associated structures, which would require an authorization under the *Water Act*.	Under Section 3(1) of the *Code of Practice for Watercourse Crossings*, written notice of intended works must be provided to AEP at least 14 days in advance of the proposed start date
Public Lands Act		Administers public crown land. Applies to the bed and shores of rivers, streams, watercourses, lakes, or other bodies. Prohibits disturbance that results or is likely to result in injury of the bed and shores of water bodies.	Department Licence of Occupation (DLO) for permanent occupation of public land will be required from AEP where works occur within the bed and shores of a water body.	Approximately 1-6 months to obtain DLO
Environment Protection and Enhancement Act		Prohibition to (1) knowingly release or permit the release, or (2) release or permit the release of a substance into the environment in an amount, concentration or level or rate of release that is more than an approval or a regulation; or causes or may cause a significant adverse effect.	No agreements, permits and or licenses under EPEA are anticipated.	N/A
Wildlife Act		Prohibits the harassment, destruction, or damage of wildlife or beaver dams on public land without approval from the minister. Provides protection for individual endangered or threatened and non-game animals, as well as their house, nest, or den.	Timing constraint for vegetation clearing of February 15 to April 30.	Pre-construction wildlife sweep nesting surveys prior to vegetation clearing or other disturbance.
Historical Resources Act	Alberta Culture Multiculturalism and the Status of Women	Provides a framework for the Protection of Historical Resources in Alberta. Proponents of projects with the potential to affect a historic resource must seek HRA approval.	The proposed activity is in an area identified as having historic resource concerns; therefore, approval under the *Historic Resources Act* is required prior to the initiation of any land surface disturbance activities. The applicant must submit a Historic Resources Application through the Online Permitting and Clearance (OPaC) system	Approximately 20 days to obtain approval.

Regulatory Requirement	Responsible Authority	Purpose or Intent	Anticipated Requirement	Timeline
Municipal				
Bylaw 7188 – The North Saskatchewan River Valley Area Redevelopment Plan	City of Edmonton Sustainable Development	Ensures the application of Bylaw 7188 to all proposed public development and development of public land in the river valley.	Where works involve adding new infrastructure including bridge replacement and or trail realignment and tree clearing, Environmental Impact Assessment (EIA) with Public Consultation will be required.	Circulation to City departments, and final review and approval from City Council. Estimated 6 weeks for department review, plus 3-6 months for Council review and approval. Public Consultation as part of the EIA can result in additional 3-6 months to EIA preparation.
City of Edmonton Corporate Tree Policy C456	City of Edmonton	Applies to all City land and to all circumstances where City trees are to be removed or relocated.	Compensation required if live ornamental and natural treed areas on City property are removed.	CoE Urban Forestry contacted a minimum of 4 weeks prior to start of construction to review construction and tree protection plans.
Bylaw 14600 Community Standards	City of Edmonton	Sets noise limits for construction activities	Works must comply with bylaw noise limits	N/A
Bylaw 16200 Drainage Bylaw	City of Edmonton Drainage Services	Controls surface drainage including grading changes and management of surface drainage.	Compliance will be evaluated during circulation of Environmental Impact Assessment Report, and/or detailed design, where requested by the City of Edmonton Drainage Services.	N/A
Change to Parkland Process	City of Edmonton Parks Planning	Ensures changes to any Parkland within the COE follow Parks Planning guidelines and policies.	Project review by City of Edmonton Parks during EIA circulation.	N/A
ENVISO Program	City of Edmonton	Instructs Contractors of their environmental-related responsibilities on COE projects.	To be included in Construction Contract	N/A

5.0 Utilities and Right of Way

5.1 EPCOR

5.1.1 Intake Structure

Record drawings received from EPCOR are in Appendix C. Hydrotechnical modeling incorporates details from those drawings, principally the diameter and type of pipe leading from the structure towards the North Saskatchewan River as described in more detail in Section 2. The invert of the outlet pipe from the intake structure was captured during the survey work.

Maintenance of the grating is the responsibility of EPCOR, and it is noted that maintenance crews from EPCOR have not visited the site to remove any debris since the start of the project and apparently not since the start of the year (2021); it is therefore not clear by what criteria EPCOR judges that the debris or any of the silt that is gathered on the face of the grating is worth removing. Currently the grating is blocked to an elevation approximately 1.5 m above the streambed (which is formed of deposited sediment) or approximately 1/3 of the available opening above the streambed.

5.1.2 Combined Sewer Proximity

Response from Alberta OneCall registered both EPCOR and ATCO within the area provided with the ticket request. The gas facilities are associated with the residential areas at the top of the easter slope that is well beyond our project extents; at the end of phase 1, EPCOR documents showed that a 600 mm diameter combined sewer pipe runs through the ravine, crossing under the creek and the trails in many locations. At the time, this pipe did not appear to have any direct impact on the project except to be avoided during the geotechnical investigation for the bridge and trail design.

However, in responding to the River Valley Bylaw Application, EPCOR's response included information on the sewer that suggested that the sewer may lie close to the NW corner of the bridge, which would place it close enough to the proposed foundations of the new bridge such that it would require a proximity agreement. The details from EPCOR showed several manholes that would help to locate the line of the sewer but two of these (either side of the bridge) could not be found during initial survey work in Phase 2. EPCOR provided surveyor support at our request to locate one of those two manholes. Based on an updated survey, the located manholes have allowed us to determine that the line of the sewer is further away from the bridge than initially suggested but still within 5 m, such that a proximity agreement may still be required. The EPCOR asset is shown on the drawings in Appendix C.

We have provided some preliminary details of the new construction (bridge location, foundation type, layout, and size) to EPCOR and they have requested that we submit current drawings with a description of work to be reviewed by EPCOR's internal Review Committee. We propose forwarding the preliminary engineering plans to update them on the proposed design for their consideration; we have already indicated to them that the pipe is over 3 m from any proposed construction work below 2 m depth. The process of review by the EPCOR review committee is expected to take at least 4 weeks.

5.2 Lands Acquisition (DLO)

The existing disposition (DLO 054638) for bed and shore on Mill Creek at the existing bridge location was prepared for erosion control work, presumably on one or more banks of the creek. However, the extent of the disposition does not adequately cover what is required for the new bridge and associated bank armoring, and the alignment of the creek shown on the DLO drawing is not correct. We submitted a query to Alberta Environment and Parks (AEP) early in the project to determine if we can apply for an

extended disposition or if application for a new disposition is the only option; a response from AEP is still outstanding currently.

Detailed survey of the project area was done to establish the true creek alignment and streambed profile for the detailed hydrotechnical assessment. The preliminary bridge layout drawing MICR P211-S01 in Appendix C shows the proposed extent of the disposition for bed and shore required based on the surveyed alignment of the creek and existing top of banks and ordinary high water level, while allowing a buffer for any amendments during detailed design.

At this stage, without a response from AEP, extending the existing DLO is no longer an option, and we have recommended to the City to apply for a new DLO for the area shown on drawing MICR P211-S01, a process which may take 6 months to complete. Per confirmation from the City, and to submit the application without further delay so that the disposition is in place prior to tender in Q1 of 2022, and therefore not affect construction commencing at the start of August 2022, we are proceeding with the production of a separate drawing to AEP requirements that shows the proposed DLO area; this follows review of the revised preliminary drawing package issued on August 27th, 2021, and discussion with the City on August 31st, 2021.

6.0 Options and Cost Estimates

6.1 Bridge Design Details – Single Span Steel Truss

Please refer to the Bridge Layout drawing MICR P211-S01 in Appendix C.

Per the direction provided by the City at the end of Phase 1, full replacement of the existing two-span bridge is preferred with a single span bridge of similar design and using similar materials as the bridges being replaced over Mill Creek in the Minchau area.

As such, design, supply, and installation of the steel truss pedestrian bridge superstructure shall be by the Contractor; the design will be submitted for detailed review by Wood following the award of contract. Design of the substructure and foundations shall be by Wood; the tender package will impose dimensional and elevation constraints upon the contractors to ensure that the superstructure design works in conjunction with the substructure design and meets the required hydrotechnical clearances.

We expect that the superstructure shall be designed with a fixed neoprene bearing at one abutment in both longitudinal and transverse direction and an expansion neoprene bearing at the second abutment with fixity in the transverse direction.

The superstructure elevation will be specified so that the soffit (underside) of the bridge shall be above the high water elevation at the bridge location by at least 200 mm, including freeboard, for 1:25 year storm event; this high water elevation includes the backwater effects of 33% blockage of the EPCOR intake structure grating. The trails and bridge are very low lying at the lowest point of the ravine and the EPCOR grating is continuously blocked to varying levels. Due to the latter constraint, the high water levels are exacerbated as shown in Section 2, and coupled with the effects of the former constraint, the amount by which the bridge and particularly the trails need to raise to mitigate flooding is limited to what is reasonably practicable. As such, there are still infrequent times when it is possible that the bridge superstructure will be submerged, and the bridge bearings will be designed to resist any buoyancy uplift forces that would tend to dislodge the structure otherwise.

Steel for the superstructure shall be atmospheric corrosion-resistant weldable steel like the specified structural steel for the Minchau bridges.

Foundations shall either comprise small diameter (150 to 250 mm) micro-piles drilled into the bedrock or steel pipe piles driven into prebored holes as described in Section 3; a preliminary layout of the foundations is shown on drawing MICR P211 S01 in Appendix C (250 mm dia micro piles shown). Preliminary design shows that the bridge abutments require 4 No micro piles each with one pile at the end of each wing wall for a total of 12 piles, each approximately 8.5 m deep, socketed into the bedrock. The design for driven steel pipe piles will be similar.

Abutments and armored head slopes, which are shown at 2H:1V, will be designed and checked to meet stability requirements. Potential loss of head slope toe support due to river erosion will be mitigated by the armoring of the bed and banks of the creek as shown on Drawing MICR P211-S01 in Appendix C. As noted, the bed and shore armoring comprise Class II rock riprap, extending over the full width of the creek bed at the same depth (800 mm).

Also, like the Minchau bridges, decking shall comprise timber planks from S45 Eastern Hemlock No.2 or equivalent or better. The planks shall be pressure treated.

Based on the proposed design high water level for the bridge we have confirmed the length of the bridge to be 12 m at this stage and we have estimated costs of the replacement structure accordingly with a clear width of 3.0 m between internal handrails; the cost includes superstructure (designed and supplied via the contractor), installation of the new prefabricated bridge, and construction of substructure and foundations as noted above.

To design for more severe storm events would require lifting and lengthening the bridge considerably more than illustrated, e.g., for a 1 in 100 year flood event (with 33% blockage of the EPCOR grating), the length would increase from 12 m to between 16 and 18 m as the out-to-out fill dimension increases based on the current design bed width of 4 m and 2H:1V bank slopes to bring the bridge above the high water elevation in that case.

6.2 Proposed Trail Alternatives

Based on the hydrotechnical analysis and in conjunction with raising the bridge to an elevation for a 1:25 year storm event, plans, profiles, and cross sections are illustrated in Appendix C for 1 in 5 year (Q5), 1 in 10 year (Q10), and for 1 in 25 year (Q25) storm events on drawings MICR-P211-G01 to G04.

In each of those three alternatives, and away from the bridge approaches, the amount the trails are raised on each side of the bridge in the worst case is different - on the south side as follows:

Q5: 0.9 m at 1+020

Q10: 1.1 m at 1+040

Q25 1.6 m at 1+040

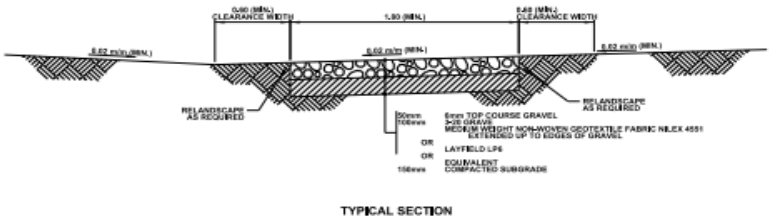
And on the north side as follows:

Q5: 1.3 m at 1+140

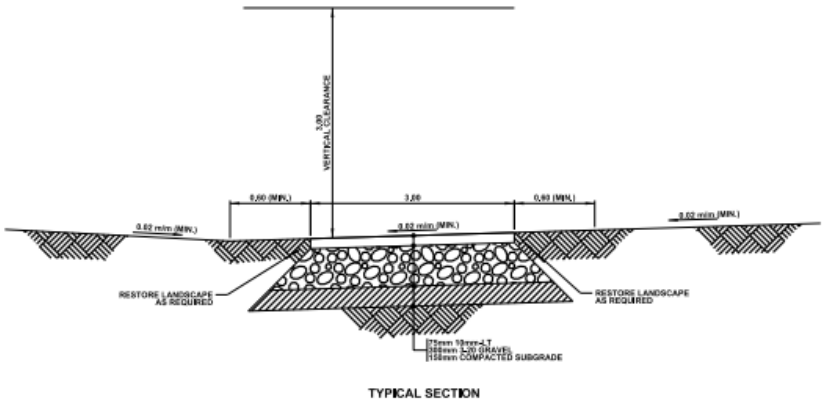
Q10: 1.6 m at 1+135

Q25: 2.0 m at 1+135

The new granular path shall meet City of Edmonton standards per the requirements shown on City standard drawing 5170 and other relevant City specifications; to ensure solid compaction of the path surfacing layers, gradation requires a minimum 7% fines.



Granular Path Construction



Shared Use Path Construction

Trail construction may be impacted by weak, wet subgrade based on the site being in a "bowl" and due to the prior flooding and continual sediment run off after rainfall. If competent subgrade material is not available, Wood will look at options such as using geotextile products and engineered granular fill to ensure a solid base and promote drainage during detailed design. In consultation with Wood's geotechnical group, we discussed the existing subgrade and the amount of removal of organic material and stripping, or cut, to allow for at this stage. As such, we have estimated cost based on an average depth of cut of the existing subgrade of 300 mm; we expect that this will effectively remove weak organic material to an exposed sound subgrade generally. We have allowed for this depth of cut over the whole area of the existing open 'corridor' and the areas beyond upon which embankments will encroach after clearing of vegetation and the removal of trees.

To construct a granular path (2.4 m wide) between 0.9 m and 2 m higher than the current grade to be at or above the related flood water elevations, requires:

- Embankments with 2:1 side slopes, which, for higher embankments may require geotextile reinforcement to maintain that slope angle (see Section 3); the width of the embankment will impact existing trees and vegetation over a considerable portion of the length to vary degrees for each option as shown making these more or less impactful without using retaining walls at all (at bridge trail interfaces); 600 dia culverts will be required for cross drainage. The encroachment extents are indicated on the plans and cross sections on the drawings in Appendix C.

Embankments can be extended all the way to the bridge before wrapping around the wing walls at or near the top of the banks of the creek. Because the bridge elevation is set for the 1 in 25 year flood event, the trails must rise to meet the bridge elevation for each option to varying relative degrees. To limit the flared extent of the embankments at the bridge/trail interface, which is similar for each option, the use of retaining walls is proposed as a sub-option for each flood profile. The walls would be designed to contain the fill and construction of the elevated granular path. Drainage pipes under the path and through these walls may be required in addition to the larger culverts shown on drawings MICR P211-G01 to G03.

An illustration of the proposed extent of walls of some type is shown on drawing MICR P211-S01; there are several options for short walls like these including:

- gabion/crib walls
- proprietary concrete block walls – most likely unreinforced (i.e., w/o geotextile layers)
- king post walls (timber or perhaps steel piles with timber infill)

Construction of the embankments will include:

- Clearance of trees and bush to provide sufficient space; coordinate with City Forestry staff regarding tree clearance as required and as agreed during design
- Clear subgrade of organic and saturated materials, between 150mm and 300 mm is expected, and we have allowed for 300 mm in our cost estimate
- Excavate to depth to suit path specification and per design elevations and compact 150mm subgrade
- Build embankment to the requisite elevation with clay that is properly moisture conditioned and install culverts north and south of the bridge to allow the wooded areas to drain back to the creek.
- Place Geotextile
- Place rip rap class 1 or 2 for erosion control for the culverts discharge
- Install 100mm to 250mm lift of 3-20mm minus gravel on the trail
- Install 50mm of 6mm top course gravel (pea gravel) on the trail; install paving if preferred
- Tie into the bridge wing walls while limiting gradients to 5% as shown on the drawings
- Topsoil and seeding of the embankment slopes and reinstate landscaping at edges of trail embankment construction

To include retaining walls at the bridge/trail interfaces only, and we would recommend the use of timber post and lagging as the preferred option to match other similar situations around City trails, including those in the ravine:

- Clear subgrade of organic and saturated materials, around 300mm expected
- Compact subgrade 150mm
- Install retaining walls – allow for drainage pipes if cross drainage is required
- Fill to depth, allowing for subgrade and surface layers, with gravel pit run, say 75mm minus; install drainage pipes
- Install 100mm to 250mm lift of 3-20mm minus gravel
- Install 50mm of 6mm top course gravel (pea gravel); install paving if preferred at additional cost

- Reinstate landscaping at edges of construction (base of walls)

Since we are proposing 1 in 5 year, 1 in 10 year, and 1 in 25 year options for the trail upgrades, in conjunction with raising the bridge to be above a 1 in 25 year event, it is possible and indeed more or less likely, in their lifespan, that the trails on either side of the bridge will be submerged; we therefore considered whether paving the surface of the trail would make the trails more robust to flood damage and thus require less reinstatement and quicker be returned to use in the wake of a severe flood.

We concluded that while the asphalt itself would not be prone to flood damage, the subgrade in the embankment below the paving may be prone to washout or disturbance, thus removing support for the paving, which would result in damage to the paving layer. In that event, then the reinstatement of a paved surface is not as straightforward as if it was just unpaved and formed of compacted granular material.

6.3 Cost Estimates

6.3.1 Overview and assumptions

Cost estimates were developed for the proposed options, which comprise the bridge design option to accommodate a 1:25 year flood event as previously described, and three trail options, for 1:5, 1:10, and 1:25 year floods. The cost of sub-options for each of those three trail profiles, which incorporate the use of retaining walls at the bridge/trail interface areas have also been included; these factor the cost of the walls set against savings in cut/fill, clearing and similar since the extent of the embankments will be reduced as shown on the drawings. These estimates include the following assumptions:

- Unit costs have been derived using Alberta Transportation (AT) Unit Price Averages and recent City of Edmonton project costs;
- As discussed in Section 2, it is assumed that Class II rock riprap will be used for bank armoring, underlain by non-woven geotextile fabric underlain by engineered fill (as req'd);
- Any potential subsurface drainage requirements have not been included in the estimate;
- Cost of the installation of bridge foundations has assumed the use of micro-piles as shown; the cost for supply and installation of driven steel pipe piles will be similar and within the contingency allowed;
- We have not allowed any additional cost related to the presence of the EPCOR sewer line; the separation of sewer and the proposed location of the bridge does not warrant apportioning significant additional cost pending any conditions in the forthcoming facility proximity or crossing agreements.
- A general contingency of 15% was added to account for project uncertainties at this level;
- The cost add-on for installing a paved surface is noted below Table 6-2.

6.3.2 Natural Area Value Assessment

For reference, an indicative tree count was carried out by Wood on August 26th, 2021. A total of 156 trees ≥ 60 mm caliper and 90 trees < 60 mm caliper were counted within the approximate area of the extent of embankments proposed for the 1:25 year flood – the 'worst-case' scenario. For comparison, the total number of trees counted within 2 m of the edge of the bare soil, and which would approximately represent the area for the 1:5 year flood embankment requirements, was as follows:

- 70 trees ≥ 60 mm caliper; and
- 66 trees < 60 mm caliper

Wood enquired with the City's Natural Areas Coordinator regarding valuation. As per the City document "Natural Stand Valuation Guidelines", a COE urban forester will need to be contacted to assess monetary value. A copy of the document is included in Appendix H.

In finalizing this report, the City Natural Areas group has assessed the Natural Area value for the worst case scenario per table 6-1 below

Table 6-1 Natural Area Value Assessment (Worst Case)

Item #	Description	Estimate
1	Natural Area Value Assessment (725m^2)	$30,000.00
2	Contractor Estimate (tree removal)	$ 5,000.00
3	Contractor Contingency (50%)	$ 2,500.00
Total		$37,500.00

Notes:

1. Contractor Estimate (Tree removal) & Contingency applies to all options
2. The Natural Area Value Assessment is pro-rated depending on the impacted area (see Table 6-3)

6.3.3 Summary of Costs

Table 6-2 Summary of Cost Estimates For 12 M Long Prefabricated Truss Bridge and Associated Trail Upgrade Options (inclusive of Natural Area Value)

Option	Bridge	Trail	Total
5 year flood (embankment only)	$924,600	$265,194	$1,189,794
5 year flood (embankment with extended walls at bridge)	$924,600	$308,050	$1,232,650
10 year flood (embankment only)	$924,600	$300,653	$1,225,253
10 year flood (embankment with extended walls at bridge)	$924,600	$343,688	$1,268,288
25 year flood (embankment only)	$924,600	$344,527	$1,269,127
25 year flood (embankment with extended walls at bridge)	$924,600	$394,798	$1,319,398

The additional cost to pave the trail is $37,500 plus 15%, but this is not recommended.

Please refer to Appendix G for more detailed breakdown of quantities and costs for the options.

6.4 Other Considerations

Based on, but not limited to typical construction best management practices and mitigation measures, general design and construction considerations are presented below:

- Public consultation is a task outlined in the document "A Guide to Environmental Review Requirements" from the City of Edmonton Planning and Development, 2000[7]. Public consultation requirements are detailed in the terms of reference provided by the City's Sustainable Development department following review of the draft of this report.
- An erosion and sediment control plan must be developed for work on site to comply with the City's Erosion and Sedimentation Control Guidelines[8].
- Coordination with the City to determine appropriate measures to ensure public safety and to limit access to staging areas and construction sites should be conducted.
- Potential removal of trees and clearance of natural vegetation is subject to control under applicable City policies and guidelines; plans for tree restoration and measures for tree conservation and protection may be required.
- All equipment should be cleared of mud, dirt, external grease, oil, and other fluids prior to the equipment entering the work area. Construction material, fuel, and the servicing and refueling of equipment should be done in a manner that prevents sawdust, preservative, fuel, and equipment fluids from entering the watercourse. All equipment used and cleaning requirements must comply with AEP Whirling Disease requirements.
- Works in the watercourse should not be completed during the Restricted Activity Period (RAP) to protect fish habitat during the critical life cycle stages in Mill Creek.
- Isolation of the work site during in-stream works will be confirmed. If required, flowing water should be excluded from the work zone in a manner that does not adversely affect the land and does not disturb sediments in the channel.
- Construction should take place during periods of low flow. This may minimize the need for care of water; however, experience on other projects has shown that care of water may necessitate a relatively high cost.
- Implement revegetation and seeding of disturbed areas as soon as possible after construction. All disturbed areas of the Project must be permanently stabilized within one growing season of the completion of construction.
- The proposed work may alter fish habitat, resulting in the requirement for approvals or authorizations as noted in **Table 4-1**.
- Direct and indirect transport of debris and sediment-laden runoff during construction may result in adverse effects to water quality and downstream aquatic resources (i.e., Mill Creek and the North Saskatchewan River). To address potential adverse impacts, in-stream construction should isolate the work site from active flow during construction.

[7] The City of Edmonton. 2000. *A guide to Environmental Review Requirements in the North Saskatchewan River Valley and Ravine System*, Edmonton, Alberta, December 2000.

[8] The City of Edmonton. 2005. Erosion and Sedimentation Control Guidelines, January 2005.

- Any disturbed ground should be revegetated with local shrub species
- There may be challenges mobilizing equipment and material to the site. Site access into the ravine is available at the north end of the upper ravine trail or via 93 Ave
- Construction equipment may damage the trail and off trail areas prior to reaching the construction site and rehabilitation may be required outside of the project area.
- For all options, room to work and tight areas for equipment to maneuver may drive up cost.

6.5 Option Comparison

Table 6-3 offers a comparison of the proposed options. From a cost perspective, the quantitative influence of tree asset value towards the cost of any potential tree compensation is not known at this time. Each of the options to incorporate retaining walls at the bridge/trail interfaces will, in addition to the savings in quantities for other items – clearing, stripping, subgrade preparation, fill, topsoil and seeding – also save on the number of trees to be removed. That value is approximately the same for each option that includes walls since the governing elevation is that of the bridge to which the trails need to rise.

Table 6-3 Option Comparison (Bridge designed for 1:25 year flood with 33% blockage of the EPCOR intake structure)

Option	5 year	5 year w/walls	10 year	10 year w/walls	25 year	25 year w/walls
Flood Mitigation	Offers the minimum protection against flooding although relatively infrequent		Offers better protection against flooding – less frequent		Offers best protection of the three options	
Pedestrian Connectivity*	Even, well compacted granular surface with standard longitudinal and transverse gradients - offers a significant improvement; each option avoids trail becoming covered in mud after every rainfall; loss of connectivity during poor weather and flooding is no longer seasonal and is relatively infrequent for all options					
Environmental factors – tree and vegetation clearance	Cleared area 512 m^2	Cleared area 224 m^2	Cleared area 612 m^2 20% increase over Q5	Cleared area 328 m^2	Cleared area 725 m^2 42% increase over Q5	Cleared area 442 m^2
Cost Rank** (Low to High with cost difference)	1	3 ($43k)	2 ($35k)	4 ($78k)	5 ($79k)	6 ($130k)
Constructability (Bridge)	The only differentiator with the bridge design option relates to the selection of foundation type – refer to Section 3 and elsewhere; the cost difference is not significant while micropiles offer a reliable and constructable option within the capabilities of local contractors; driven steel pipe piles are reliable and commonly used – depending on associated clearance requirements for trail, bridge and/or retaining wall construction, accessibility concerns for equipment to drive pipe piles may be less of a factor					
Constructability (Trail/Walls)	Lowest material quantities; shorter construction duration; lower average retained height of walls		Greater material quantities; longer construction duration; same average retained height of walls as 5 year option		Greatest amount of fill; longer construction duration; higher average retained height of walls	

*Pedestrian connectivity compares the effect of each of the options on the general condition of the current trail

**The cost includes the bridge but that does not affect the relative rank or the cost difference;

6.6 Discussion and Recommendation

In Phase 2, we have developed a detailed hydrotechnical model that has allowed us to determine flood water levels for the backwater effects caused principally by blockage of the grating at the EPCOR intake structure. Blockage of flow of the creek into the EPCOR intake structure consists of two elements: semi-permanent blockage of the lower part of the grating with fine silt and sediment to a depth of approximately 2 m, and seasonal blockage of the grating with smaller and larger drift debris that is only occasionally removed by EPCOR maintenance crews. At the time of issue of this report, the height of such debris rises approx. 1.5 m above the top of the silt deposits, which forms the current streambed and that is what has been assumed for the purposes of modeling flow in the creek and to determine the flood levels. As is demonstrated in our analysis, flood water elevations for any given flood event are sensitive to the amount of blockage to flow in the creek.

The effects are significantly reduced if the intake structure grating is regularly kept clean and free of growth and debris, including below the surface of the creek. However, in recognition that such regular maintenance may be impracticable, the choice of a design flood event and therefore of flood water elevation to be considered when determining bridge and trail elevations to meet the project objectives, must take account of some amount of blockage and we are recommending, based on the discussion in Sections 2.5 and 2.6, that **a design value for blockage height be more than 1.5m high or 33% (i.e., no greater accumulation than existing[9])**.

The trails and bridge are very low lying at the lowest point of the ravine and the EPCOR grating is continuously blocked to varying levels. Due to the latter constraint, the high water levels are exacerbated as shown in Section 2, and coupled with the effects of the former constraint, the amount by which the bridge and particularly the trails need to raise to mitigate flooding is limited to what is reasonably practicable. As such, **for the bridge design discharge flow, based on that blockage, we recommend a 1 in 25 year storm event to balance those constraints**, which requires raising the top of deck elevation of a truss bridge approximately 1.2 m above the existing bridge deck elevation, depending on freeboard requirements, and **we are recommending 200 mm freeboard**, which will also allow more debris to pass under the bridge.

To note for comparison, the same high water elevation at the bridge for a 1:25 year flood with 33% blockage is returned for a 1:100 year flood but only with no blockage of the grating whatsoever, and that is not a practicable design option.

Raising the bridge to accommodate either 1 in 50 or 1 in 100 year flood events, in conjunction with maintaining trail access to a bridge at those elevations would likely require a different approach entirely, possibly involving a multi-span elevated structure for both pedestrians and cyclists, which we do not judge to within the intent of the scope of the project and is not reasonably practicable set against the convenient alternative of the nearby paved upper trail in those very infrequent circumstances.

The prescribed elevation of the bridge therefore drives consideration of the three trail options as described. The greater hindrance to pedestrian connectivity on this section of trail appears to be the continual disruption caused by sediment being deposited routinely after any significant or prolonged rainfall, even in the absence of flooding of the creek. The surface of the trail becomes uneven and soft and at any time of year is difficult to pass either on foot or on a bicycle. In that sense, each of the three trail options offers equally significant improvement for the trail users and for maintenance access; the design of the trails in each case will ensure that sediment will not be deposited on the new trail surface.

[9] At site visit September 21, 2021, it was noted that the structure grating had been cleared of all debris.

Likewise, none of the trail options creates unduly steep slopes approaching the bridge and we have generally limited gradient to a maximum of 5% to promote greater accessibility and ease of use; any sections of the trail with gradients more than 5% have been limited in length, and it is anticipated that we can refine the vertical profile of the selected option during detailed design to limit gradients to 5% within the full extents of the project.

In any case of flooding of the trails, whether it is from a 1 in 5 or 1 in 25 year storm event, the time it will take waters to recede will be relatively short, and as noted previously, there are convenient alternative routes/paths on either side of the creek, of which the best option is the paved upper trail. It is possible that **flooding may require maintenance to the trails, such as gravel patching or drift removal** or similar but the path will be designed to be robust and as noted in section 2, flooding is caused by backwater effects from the EPCOR structure, which means that neither the bridge nor the trails ought to be subject to high velocity flows, which might place the trail and bridge infrastructure at more risk of damage.

Raising the trails to the Q25 flood profile would provide a consistent design philosophy for the project but it does come at additional cost; it is the costliest to build and the extent of the embankments create an area to be cleared that is over 40% greater than the extent of embankments for the Q5 option, so the commensurate greater natural area asset value for Q25 will further increase the cost difference between that option and either Q5 or Q10 alternatives. The Q10 option has embankments that extend the cleared area over that for Q5 by 20%.

The objective of the project is to mitigate flooding and maintain pedestrian connectivity. The significantly greater impact on trees and vegetation within this natural area to meet the Q25 flood profile for the trails is not warranted and not required to meet the objectives. We judge that both the Q5 and Q10 profile options meet the project objectives and are more sensitive to a desirable goal, which is to lessen the impact to the surrounding environment as much as possible.

Selection of the Q10 profile would offer greater reliability against lower level floods and would reduce the exposure of the trail to the potential for flood water damage, however minimal. However, selection of the Q5 profile does provide good reliability against lower level flood events, and with the paved upper trail so close by, overall connectivity is never lost and limits embankment extents to the least possible without including retaining walls.

The inclusion of retaining walls does save on clearing and tree loss, which is a significant factor in terms of the perception of trail users and the ability to retain existing vegetation and the natural tree canopy. Adding retaining walls to the 1 in 5 year option does rank it more expensive than the 1 in 10 year option (without walls) but the difference is small (< $10k) set against the overall value of reduced clearing and tree removal.

On that basis, we would recommend that the trails be designed for a Q5 flood event (with no more than 33% blockage of the EPCOR intake structure) in conjunction with design of the bridge for a Q25 event (same blockage) with the inclusion of retaining walls as shown on drawing MICR P211-S01.

This recommendation does also keep adjustments to both bridge and trail elevations within a similar range of each other, from 0.9 m south of the bridge, 1.2 m at the bridge, and 1.3 m north of the bridge at the lowest spot.

7.0 Closure

This report has been prepared for the exclusive use of the City of Edmonton. This report is based on, and limited by, the interpretation of data, circumstances, and conditions available at the time of completion of the work as referenced throughout the report. It has been prepared in accordance with generally accepted engineering practices. No other warranty, express or implied, is made.

Yours truly,

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PERMIT TO PRACTICE
WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS
RM SIGNATURE: _____
RM APEGA ID #: _____
DATE: _____
PERMIT NUMBER: P004546
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Appendix A1

Flood Frequency Tables

Table A-1

HEC RAS Water Surface Profile Modeling Results Comparison without Blockage (Elev 625.0) and with 10% Blockage (up to Elev 625.8) of EPCOR Surveyed Inlet Structure

Surveyed X-Section Number (Section 5 and 6 are the u/s and d/s ends of the bridge respectively; Section 10 is at the EPCOR intake)	Profile	Q Total	Min Channel Elev.	Surveyed Trail Elev (A)	W.S. Elev with no Blockage (Elev 625.0) at EPCOR Surveyed Inlet Structure (B)	W.S. Elev with 10% Blockage (up to Elev 625.8) at EPCOR Surveyed Inlet Structure (C)	Trail Height above Water Level with no Blockage (A-B)	Trail Height above Water Level with Blockage (A-C)
		(m^3/s)	(m)	(m)	(m)	(m)	(m)	(m)
1	Q100	50	625.72	629.17	628.30	628.66	0.87	0.51
1	Q50	36	625.72	629.17	627.89	628.17	1.28	1.00
1	Q25	25	625.72	629.17	627.60	627.76	1.57	1.41
1	Q10	16	625.72	629.17	627.35	627.17	1.82	2.00
1	Q5	11	625.72	629.17	627.21	627.21	1.96	1.96
1	Q2	5	625.72	629.17	626.95	626.95	2.22	2.22
2	Q100	50	625.59	627.08	628.34	628.70	-1.26	-1.62
2	Q50	36	625.59	627.08	627.90	628.19	-0.82	-1.11
2	Q25	25	625.59	627.08	627.57	627.76	-0.49	-0.68
2	Q10	16	625.59	627.08	627.28	627.11	-0.20	-0.03
2	Q5	11	625.59	627.08	627.15	627.15	-0.07	-0.07
2	Q2	5	625.59	627.08	626.91	626.91	0.17	0.17
3	Q100	50	625.68	626.83	628.34	628.69	-1.51	-1.86
3	Q50	36	625.68	626.83	627.90	628.19	-1.07	-1.36
3	Q25	25	625.68	626.83	627.56	627.76	-0.73	-0.93
3	Q10	16	625.68	626.83	627.28	627.11	-0.45	-0.28
3	Q5	11	625.68	626.83	627.14	627.15	-0.31	-0.32
3	Q2	5	625.68	626.83	626.91	626.91	-0.08	-0.08
4	Q100	50	625.61	627.68	628.31	628.68	-0.63	-1.00
4	Q50	36	625.61	627.68	627.86	628.17	-0.18	-0.49
4	Q25	25	625.61	627.68	627.52	627.73	0.16	-0.05
4	Q10	16	625.61	627.68	627.25	627.09	0.43	0.59
4	Q5	11	625.61	627.68	627.12	627.12	0.56	0.56
4	Q2	5	625.61	627.68	626.90	626.90	0.78	0.78
5	Q100	50	626.45	627.68	628.22	628.63	-0.54	-0.95
5	Q50	36	626.45	627.68	627.76	628.11	-0.08	-0.43
5	Q25	25	626.45	627.68	627.38	627.67	0.30	0.01
5	Q10	16	626.45	627.68	627.03	626.91	0.65	0.77
5	Q5	11	626.45	627.68	626.92	626.98	0.76	0.70
5	Q2	5	626.45	627.68	626.75	626.75	0.93	0.93
6	Q100	50	624.86	627.68	628.22	628.63	-0.54	-0.95
6	Q50	36	624.86	627.68	627.75	628.11	-0.07	-0.43
6	Q25	25	624.86	627.68	627.37	627.66	0.31	0.02
6	Q10	16	624.86	627.68	627.05	626.94	0.63	0.74
6	Q5	11	624.86	627.68	626.85	627.00	0.83	0.68
6	Q2	5	624.86	627.68	626.48	626.61	1.20	1.07
7	Q100	50	625.26	626.54	628.17	628.61	-1.63	-2.07
7	Q50	36	625.26	626.54	627.68	628.08	-1.14	-1.54
7	Q25	25	625.26	626.54	627.27	627.63	-0.73	-1.09
7	Q10	16	625.26	626.54	626.92	626.89	-0.38	-0.35
7	Q5	11	625.26	626.54	626.71	626.94	-0.17	-0.40
7	Q2	5	625.26	626.54	626.38	626.56	0.16	-0.02
8	Q100	50	625.21	626.25	628.16	628.60	-1.91	-2.35
8	Q50	36	625.21	626.25	627.66	628.08	-1.41	-1.83
8	Q25	25	625.21	626.25	627.24	627.62	-0.99	-1.37
8	Q10	16	625.21	626.25	626.87	626.87	-0.62	-0.62
8	Q5	11	625.21	626.25	626.65	626.93	-0.40	-0.68
8	Q2	5	625.21	626.25	626.30	626.53	-0.05	-0.28
10	Q100	50	625.08	626.54	627.07	627.56	-0.53	-1.02
10	Q50	36	625.08	626.54	626.73	627.21	-0.19	-0.67
10	Q25	25	625.08	626.54	626.42	626.91	0.12	-0.37
10	Q10	16	625.08	626.54	626.13	626.40	0.41	0.14
10	Q5	11	625.08	626.54	625.95	626.44	0.59	0.10
10	Q2	5	625.08	626.54	625.69	626.18	0.85	0.36

Note: Negative number means trail/bridge deck (Sections 5 and 6) are below water level.

Table A-2

HEC RAS Water Surface Profile Modeling Results Comparison without Blockage (Elev 625.0) and with 20% Blockage (up to Elev 626.1) of EPCOR Surveyed Inlet Structure

Surveyed X-Section Number (Section 5 and 6 are the u/s and d/s ends of the bridge respectively; Section 10 is at the EPCOR intake)	Profile	Q Total	Min Channel Elev.	Surveyed Trail Elev (A)	W.S. Elev with no Blockage (Elev 625.0) at EPCOR Surveyed Inlet Structure (B)	W.S. Elev with 20% Blockage (up to Elev 626.1) at EPCOR Surveyed Inlet Structure (C)	Trail Height above Water Level with no Blockage (A-B)	Trail Height above Water Level with Blockage (A-C)
		(m^3/s)	(m)	(m)	(m)	(m)	(m)	(m)
1	Q100	50	625.72	629.17	628.30	628.92	0.87	0.25
1	Q50	36	625.72	629.17	627.89	628.40	1.28	0.77
1	Q25	25	625.72	629.17	627.60	627.96	1.57	1.21
1	Q10	16	625.72	629.17	627.35	627.25	1.82	1.92
1	Q5	11	625.72	629.17	627.21	627.30	1.96	1.87
1	Q2	5	625.72	629.17	626.95	626.95	2.22	2.22
2	Q100	50	625.59	627.08	628.34	628.95	-1.26	-1.87
2	Q50	36	625.59	627.08	627.90	628.42	-0.82	-1.34
2	Q25	25	625.59	627.08	627.57	627.96	-0.49	-0.88
2	Q10	16	625.59	627.08	627.28	627.21	-0.20	-0.13
2	Q5	11	625.59	627.08	627.15	627.27	-0.07	-0.19
2	Q2	5	625.59	627.08	626.91	626.91	0.17	0.17
3	Q100	50	625.68	626.83	628.34	628.95	-1.51	-2.12
3	Q50	36	625.68	626.83	627.90	628.42	-1.07	-1.59
3	Q25	25	625.68	626.83	627.56	627.96	-0.73	-1.13
3	Q10	16	625.68	626.83	627.28	627.21	-0.45	-0.38
3	Q5	11	625.68	626.83	627.14	627.27	-0.31	-0.44
3	Q2	5	625.68	626.83	626.91	626.91	-0.08	-0.08
4	Q100	50	625.61	627.68	628.31	628.94	-0.63	-1.26
4	Q50	36	625.61	627.68	627.86	628.41	-0.18	-0.73
4	Q25	25	625.61	627.68	627.52	627.95	0.16	-0.27
4	Q10	16	625.61	627.68	627.25	627.19	0.43	0.49
4	Q5	11	625.61	627.68	627.12	627.25	0.56	0.43
4	Q2	5	625.61	627.68	626.90	626.90	0.78	0.78
5	Q100	50	626.45	627.68	628.22	628.90	-0.54	-1.22
5	Q50	36	626.45	627.68	627.76	628.37	-0.08	-0.69
5	Q25	25	626.45	627.68	627.38	627.91	0.30	-0.23
5	Q10	16	626.45	627.68	627.03	627.13	0.65	0.55
5	Q5	11	626.45	627.68	626.92	627.20	0.76	0.48
5	Q2	5	626.45	627.68	626.75	626.75	0.93	0.93
6	Q100	50	624.86	627.68	628.22	628.90	-0.54	-1.22
6	Q50	36	624.86	627.68	627.75	628.37	-0.07	-0.69
6	Q25	25	624.86	627.68	627.37	627.91	0.31	-0.23
6	Q10	16	624.86	627.68	627.05	627.13	0.63	0.55
6	Q5	11	624.86	627.68	626.85	627.19	0.83	0.49
6	Q2	5	624.86	627.68	626.48	626.78	1.20	0.90
7	Q100	50	625.26	626.54	628.17	628.88	-1.63	-2.34
7	Q50	36	625.26	626.54	627.68	628.35	-1.14	-1.81
7	Q25	25	625.26	626.54	627.27	627.89	-0.73	-1.35
7	Q10	16	625.26	626.54	626.92	627.11	-0.38	-0.57
7	Q5	11	625.26	626.54	626.71	627.17	-0.17	-0.63
7	Q2	5	625.26	626.54	626.38	626.76	0.16	-0.22
8	Q100	50	625.21	626.25	628.16	628.88	-1.91	-2.63
8	Q50	36	625.21	626.25	627.66	628.35	-1.41	-2.10
8	Q25	25	625.21	626.25	627.24	627.88	-0.99	-1.63
8	Q10	16	625.21	626.25	626.87	627.10	-0.62	-0.85
8	Q5	11	625.21	626.25	626.65	627.16	-0.40	-0.91
8	Q2	5	625.21	626.25	626.30	626.75	-0.05	-0.50
10	Q100	50	625.08	626.54	627.07	627.86	-0.53	-1.32
10	Q50	36	625.08	626.54	626.73	627.51	-0.19	-0.97
10	Q25	25	625.08	626.54	626.42	627.21	0.12	-0.67
10	Q10	16	625.08	626.54	626.13	626.70	0.41	-0.16
10	Q5	11	625.08	626.54	625.95	626.74	0.59	-0.20
10	Q2	5	625.08	626.54	625.69	626.48	0.85	0.06

Note: Negative number means trail/bridge deck (Sections 5 and 6) are below water level.

Table A-3

HEC RAS Water Surface Profile Modeling Results Comparison without Blockage (Elev 625.0) and with 33% Blockage (up to Elev 626.5) of EPCOR Surveyed Inlet Structure

Surveyed X-Section Number (Section 5 and 6 are the u/s and d/s ends of the bridge respectively; Section 10 is at the EPCOR intake)	Profile	Q Total	Min Channel Elev.	Surveyed Trail Elev (A)	W.S. Elev with no Blockage (Elev 625.0) at EPCOR Surveyed Inlet Structure (B)	W.S. Elev with 33% Blockage (up to Elev 626.5) at EPCOR Surveyed Inlet Structure (C)	Trail Height above Water Level with no Blockage (A-B)	Trail Height above Water Level with Blockage (A-C)
		(m^3/s)	(m)	(m)	(m)	(m)	(m)	(m)
1	Q100	50	625.72	629.17	628.30	629.29	0.87	-0.12
1	Q50	36	625.72	629.17	627.89	628.76	1.28	0.41
1	Q25	25	625.72	629.17	627.60	628.29	1.57	0.88
1	Q10	16	625.72	629.17	627.35	627.85	1.82	1.32
1	Q5	11	625.72	629.17	627.21	627.57	1.96	1.60
1	Q2	5	625.72	629.17	626.95	627.15	2.22	2.02
2	Q100	50	625.59	627.08	628.34	629.31	-1.26	-2.23
2	Q50	36	625.59	627.08	627.90	628.77	-0.82	-1.69
2	Q25	25	625.59	627.08	627.57	628.30	-0.49	-1.22
2	Q10	16	625.59	627.08	627.28	627.85	-0.20	-0.77
2	Q5	11	625.59	627.08	627.15	627.56	-0.07	-0.48
2	Q2	5	625.59	627.08	626.91	627.14	0.17	-0.06
3	Q100	50	625.68	626.83	628.34	629.31	-1.51	-2.48
3	Q50	36	625.68	626.83	627.90	628.77	-1.07	-1.94
3	Q25	25	625.68	626.83	627.56	628.30	-0.73	-1.47
3	Q10	16	625.68	626.83	627.28	627.85	-0.45	-1.02
3	Q5	11	625.68	626.83	627.14	627.56	-0.31	-0.73
3	Q2	5	625.68	626.83	626.91	627.14	-0.08	-0.31
4	Q100	50	625.61	627.68	628.31	629.30	-0.63	-1.62
4	Q50	36	625.61	627.68	627.86	628.76	-0.18	-1.08
4	Q25	25	625.61	627.68	627.52	628.29	0.16	-0.61
4	Q10	16	625.61	627.68	627.25	627.84	0.43	-0.16
4	Q5	11	625.61	627.68	627.12	627.55	0.56	0.13
4	Q2	5	625.61	627.68	626.90	627.13	0.78	0.55
5	Q100	50	626.45	627.68	628.22	629.28	-0.54	-1.60
5	Q50	36	626.45	627.68	627.76	628.74	-0.08	-1.06
5	Q25	25	626.45	627.68	627.38	628.27	0.30	-0.59
5	Q10	16	626.45	627.68	627.03	627.82	0.65	-0.14
5	Q5	11	626.45	627.68	626.92	627.54	0.76	0.14
5	Q2	5	626.45	627.68	626.75	627.12	0.93	0.56
6	Q100	50	624.86	627.68	628.22	629.28	-0.54	-1.60
6	Q50	36	624.86	627.68	627.75	628.74	-0.07	-1.06
6	Q25	25	624.86	627.68	627.37	628.27	0.31	-0.59
6	Q10	16	624.86	627.68	627.05	627.82	0.63	-0.14
6	Q5	11	624.86	627.68	626.85	627.53	0.83	0.15
6	Q2	5	624.86	627.68	626.48	627.12	1.20	0.56
7	Q100	50	625.26	626.54	628.17	629.27	-1.63	-2.73
7	Q50	36	625.26	626.54	627.68	628.73	-1.14	-2.19
7	Q25	25	625.26	626.54	627.27	628.26	-0.73	-1.72
7	Q10	16	625.26	626.54	626.92	627.81	-0.38	-1.27
7	Q5	11	625.26	626.54	626.71	627.53	-0.17	-0.99
7	Q2	5	625.26	626.54	626.38	627.11	0.16	-0.57
8	Q100	50	625.21	626.25	628.16	629.27	-1.91	-3.02
8	Q50	36	625.21	626.25	627.66	628.73	-1.41	-2.48
8	Q25	25	625.21	626.25	627.24	628.26	-0.99	-2.01
8	Q10	16	625.21	626.25	626.87	627.81	-0.62	-1.56
8	Q5	11	625.21	626.25	626.65	627.52	-0.40	-1.27
8	Q2	5	625.21	626.25	626.30	627.11	-0.05	-0.86
10	Q100	50	625.08	626.54	627.07	628.26	-0.53	-1.72
10	Q50	36	625.08	626.54	626.73	627.91	-0.19	-1.37
10	Q25	25	625.08	626.54	626.42	627.61	0.12	-1.07
10	Q10	16	625.08	626.54	626.13	627.32	0.41	-0.78
10	Q5	11	625.08	626.54	625.95	627.14	0.59	-0.60
10	Q2	5	625.08	626.54	625.69	626.88	0.85	-0.34

Note: Negative number means trail/bridge deck (Sections 5 and 6) are below water level.

Table A-4

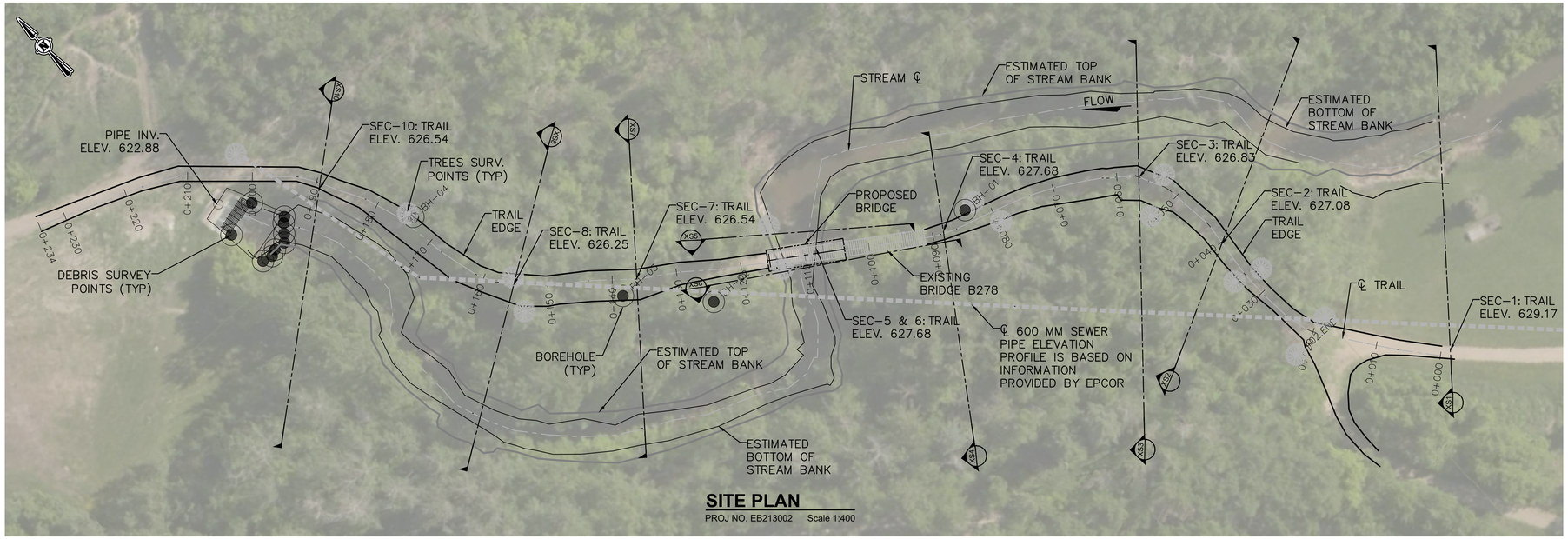
HEC RAS Water Surface Profile Modeling Results Comparison without Blockage (Elev 625.0) and with 50% Blockage (up to Elev 627.1) of EPCOR Surveyed Inlet Structure

Surveyed X-Section Number (Section 5 and 6 are the u/s and d/s ends of the bridge respectively; Section 10 is at the EPCOR intake)	Profile	Q Total	Min Channel Elev.	Surveyed Trail Elev (A)	W.S. Elev with no Blockage (Elev 625.0) at EPCOR Surveyed Inlet Structure (B)	W.S. Elev with 50% Blockage (up to Elev 627.1) at EPCOR Surveyed Inlet Structure (C)	Trail Height above Water Level with no Blockage (A-B)	Trail Height above Water Level with Blockage (A-C)
		(m^3/s)	(m)	(m)	(m)	(m)	(m)	(m)
1	Q100	50	625.72	629.17	628.30	629.87	0.87	-0.70
1	Q50	36	625.72	629.17	627.89	629.33	1.28	-0.16
1	Q25	25	625.72	629.17	627.60	628.85	1.57	0.32
1	Q10	16	625.72	629.17	627.35	628.05	1.82	1.12
1	Q5	11	625.72	629.17	627.21	628.12	1.96	1.05
1	Q2	5	625.72	629.17	626.95	627.70	2.22	1.47
2	Q100	50	625.59	627.08	628.34	629.88	-1.26	-2.80
2	Q50	36	625.59	627.08	627.90	629.34	-0.82	-2.26
2	Q25	25	625.59	627.08	627.57	628.86	-0.49	-1.78
2	Q10	16	625.59	627.08	627.28	628.05	-0.20	-0.97
2	Q5	11	625.59	627.08	627.15	628.12	-0.07	-1.04
2	Q2	5	625.59	627.08	626.91	627.70	0.17	-0.62
3	Q100	50	625.68	626.83	628.34	629.88	-1.51	-3.05
3	Q50	36	625.68	626.83	627.90	629.34	-1.07	-2.51
3	Q25	25	625.68	626.83	627.56	628.86	-0.73	-2.03
3	Q10	16	625.68	626.83	627.28	628.05	-0.45	-1.22
3	Q5	11	625.68	626.83	627.14	628.12	-0.31	-1.29
3	Q2	5	625.68	626.83	626.91	627.70	-0.08	-0.87
4	Q100	50	625.61	627.68	628.31	629.87	-0.63	-2.19
4	Q50	36	625.61	627.68	627.86	629.33	-0.18	-1.65
4	Q25	25	625.61	627.68	627.52	628.85	0.16	-1.17
4	Q10	16	625.61	627.68	627.25	628.05	0.43	-0.37
4	Q5	11	625.61	627.68	627.12	628.11	0.56	-0.43
4	Q2	5	625.61	627.68	626.90	627.70	0.78	-0.02
5	Q100	50	626.45	627.68	628.22	629.86	-0.54	-2.18
5	Q50	36	626.45	627.68	627.76	629.32	-0.08	-1.64
5	Q25	25	626.45	627.68	627.38	628.84	0.30	-1.16
5	Q10	16	626.45	627.68	627.03	628.05	0.65	-0.37
5	Q5	11	626.45	627.68	626.92	628.11	0.76	-0.43
5	Q2	5	626.45	627.68	626.75	627.70	0.93	-0.02
6	Q100	50	624.86	627.68	628.22	629.86	-0.54	-2.18
6	Q50	36	624.86	627.68	627.75	629.32	-0.07	-1.64
6	Q25	25	624.86	627.68	627.37	628.84	0.31	-1.16
6	Q10	16	624.86	627.68	627.05	628.05	0.63	-0.37
6	Q5	11	624.86	627.68	626.85	628.11	0.83	-0.43
6	Q2	5	624.86	627.68	626.48	627.70	1.20	-0.02
7	Q100	50	625.26	626.54	628.17	629.85	-1.63	-3.31
7	Q50	36	625.26	626.54	627.68	629.32	-1.14	-2.78
7	Q25	25	625.26	626.54	627.27	628.84	-0.73	-2.30
7	Q10	16	625.26	626.54	626.92	628.04	-0.38	-1.50
7	Q5	11	625.26	626.54	626.71	628.11	-0.17	-1.57
7	Q2	5	625.26	626.54	626.38	627.69	0.16	-1.15
8	Q100	50	625.21	626.25	628.16	629.85	-1.91	-3.60
8	Q50	36	625.21	626.25	627.66	629.31	-1.41	-3.06
8	Q25	25	625.21	626.25	627.24	628.84	-0.99	-2.59
8	Q10	16	625.21	626.25	626.87	628.04	-0.62	-1.79
8	Q5	11	625.21	626.25	626.65	628.11	-0.40	-1.86
8	Q2	5	625.21	626.25	626.30	627.69	-0.05	-1.44
10	Q100	50	625.08	626.54	627.07	628.86	-0.53	-2.32
10	Q50	36	625.08	626.54	626.73	628.51	-0.19	-1.97
10	Q25	25	625.08	626.54	626.42	628.21	0.12	-1.67
10	Q10	16	625.08	626.54	626.13	627.70	0.41	-1.16
10	Q5	11	625.08	626.54	625.95	627.74	0.59	-1.20
10	Q2	5	625.08	626.54	625.69	627.48	0.85	-0.94

Note: Negative number means trail/bridge deck (Sections 5 and 6) are below water level.

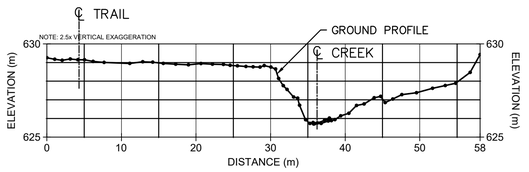
Appendix A2

Survey Plan, Cross Section and Flood Option Profiles



SITE PLAN

PROJ NO. EB213002 Scale 1:400



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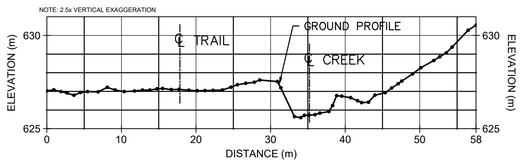

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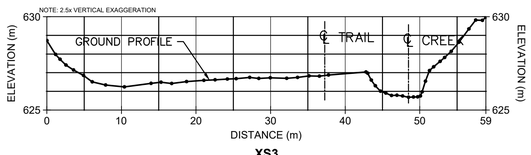

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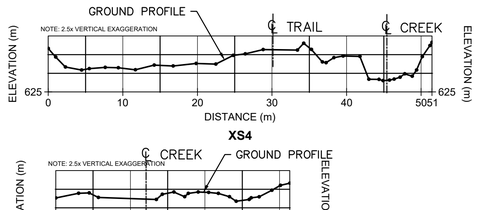

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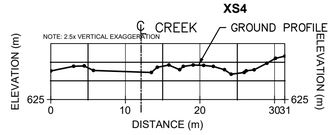
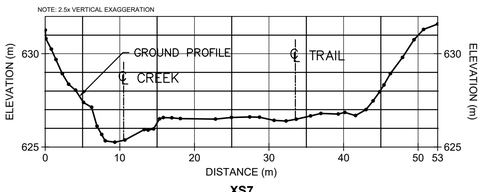


XS5

XS□



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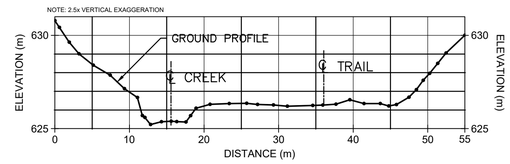

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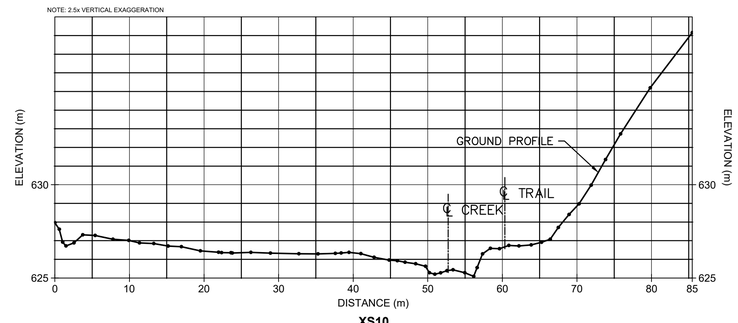

XS10

0 4 8 12 16 m

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wood.
Environment & Infrastructure Solutions
5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6
PHONE 780-436-2152, FAX 780-435-8425

PRELIMINARY
NOT FOR CONSTRUCTION

0□ AU□ 2021

NOTES:
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED.

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2				
1	ISSUED FOR REVIEW	-	-	-

NO.	ISSUE	BY	DATE
2	AS BUILT / TO GBIS		
1	TENDER AWARD DATE		

PROGRAM NO.

CONTRACT NO. -

CONSTRUCTION RETURN

CONTRACTOR

SURVEYOR

DATE

FILE NUMBER

CONSTRUCTION ENGINEER DATE

GENERAL SUPERVISOR DATE

APPROVED FOR CONSTRUCTION

DATE

DEPARTMENT / BRANCH	APPROVAL	DATE

DIRECTOR OF ENGINEERING SERVICES DATE

THE CITY OF Edmonton

INTEGRATED INFRASTRUCTURE SERVICES
ENGINEERING SERVICES

SURVEY

JOB NO.

SCALE

HOR.

VER.

DRAWN W.P. DATE 30 JUL 2021

DESIGNED - DATE 30 JUL 2021

CHECKED - DATE 03 AUG 2021

PROJECT

MILL CREEK RAVINE PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
PLAN AND SURVEYED CROSS SECTIONS

DRAWING

SK1

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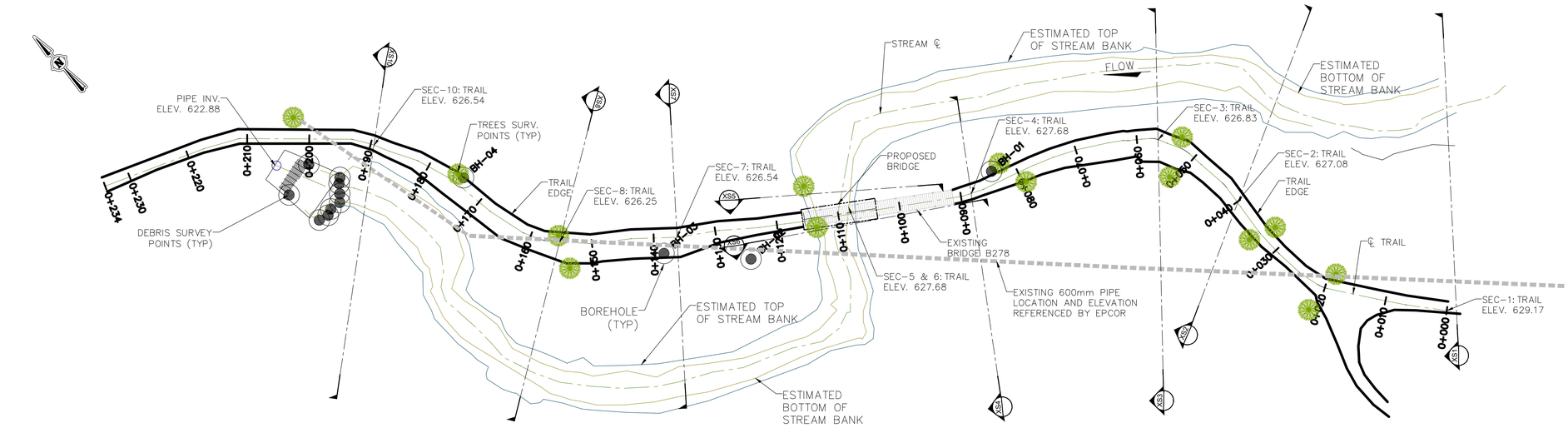
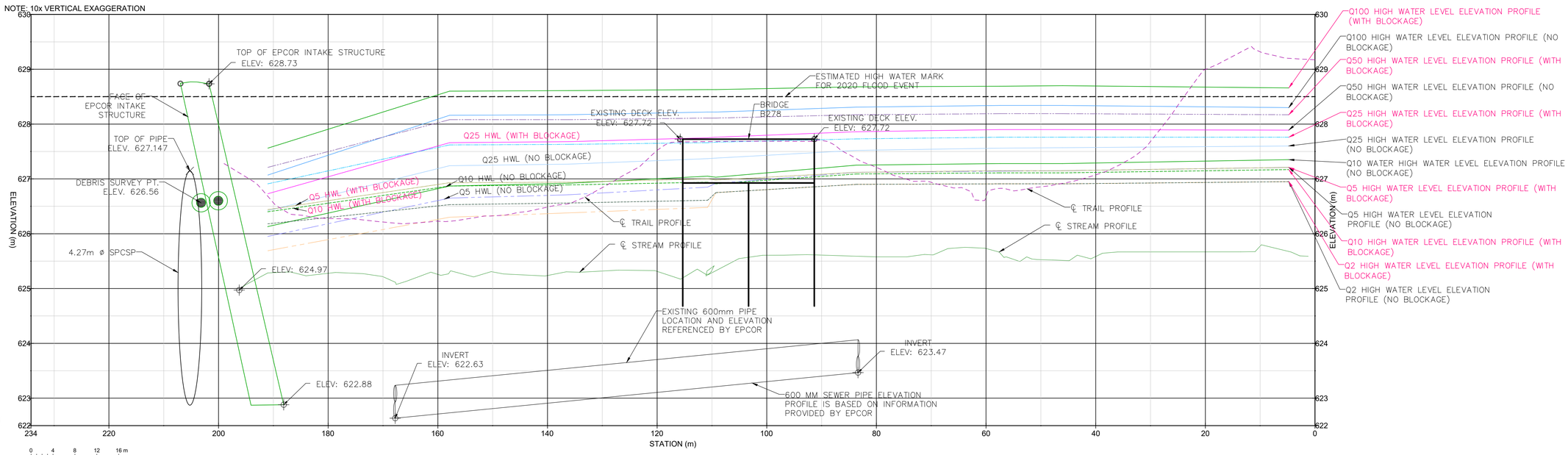


SITE PLAN

PROJ NO. EB213002 Scale 1:400

NOTE: 10x VERTICAL EXAGGERATION



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B278 BRID□E AND ASSOCIATED TRAIL PROFILE □ IT□ □ ATER LE□ELS □NO BLOC□A□E AND □ IT□ 10□ BLOC□A□E TO ELE□ATION □25 8□

PROJ NO. EB213002 SCALE HOR□ 1:400 VERT 1:40

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THE CITY OF Edmonton
INTEGRATED INFRASTRUCTURE SERVICES
ENGINEERING SERVICES

PROJECT
MILL CREEK RAVINE PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH/WITHOUT 10% BLOCKAGE

DRAWING
SK2

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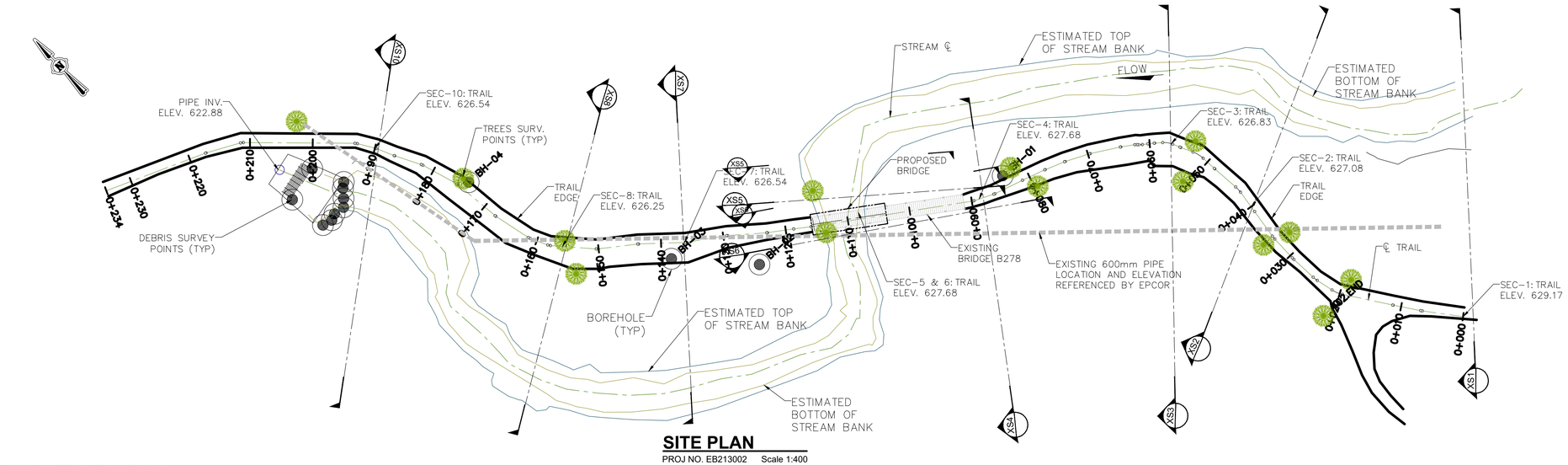
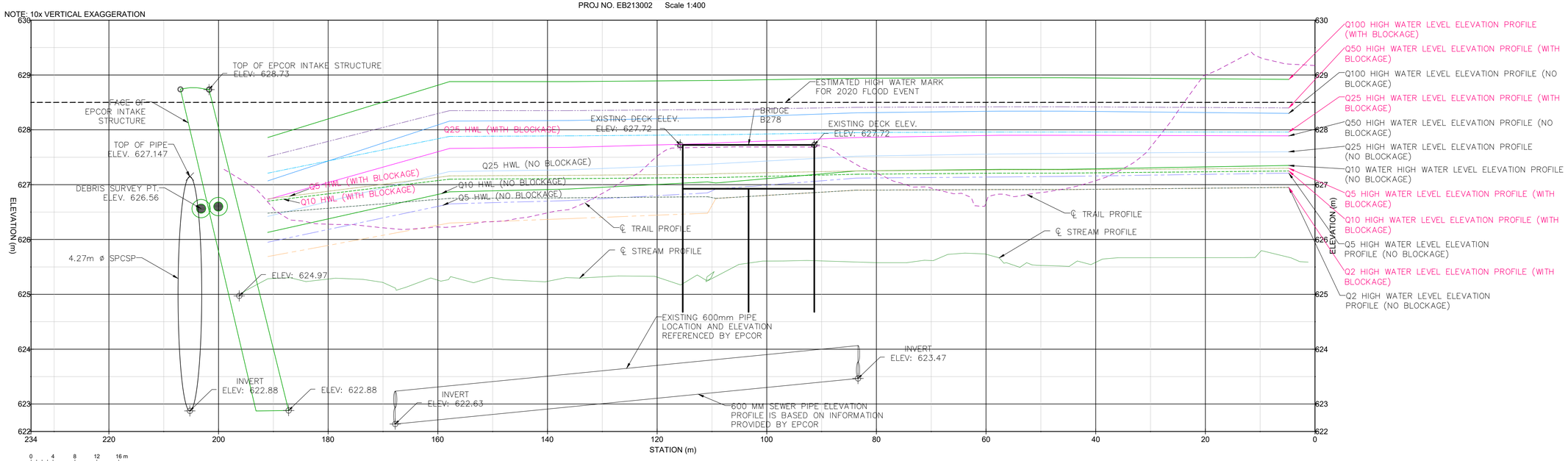


SITE PLAN

PROJ NO. EB213002 Scale 1:400

NOTE: 10x VERTICAL EXAGGERATION



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PROJECT
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REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH/WITHOUT 20% BLOCKAGE

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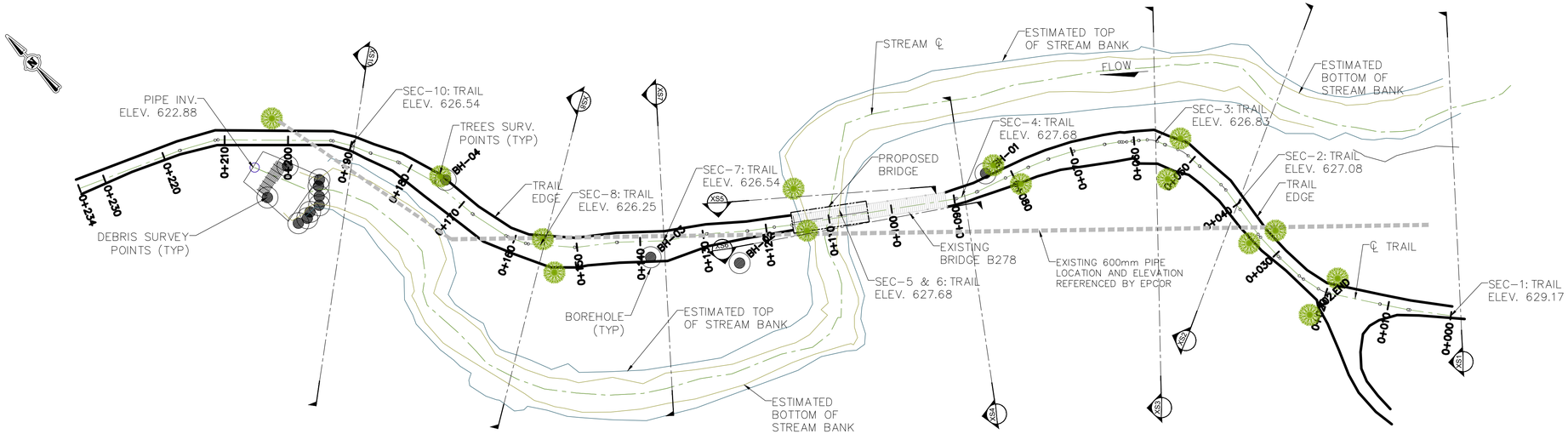
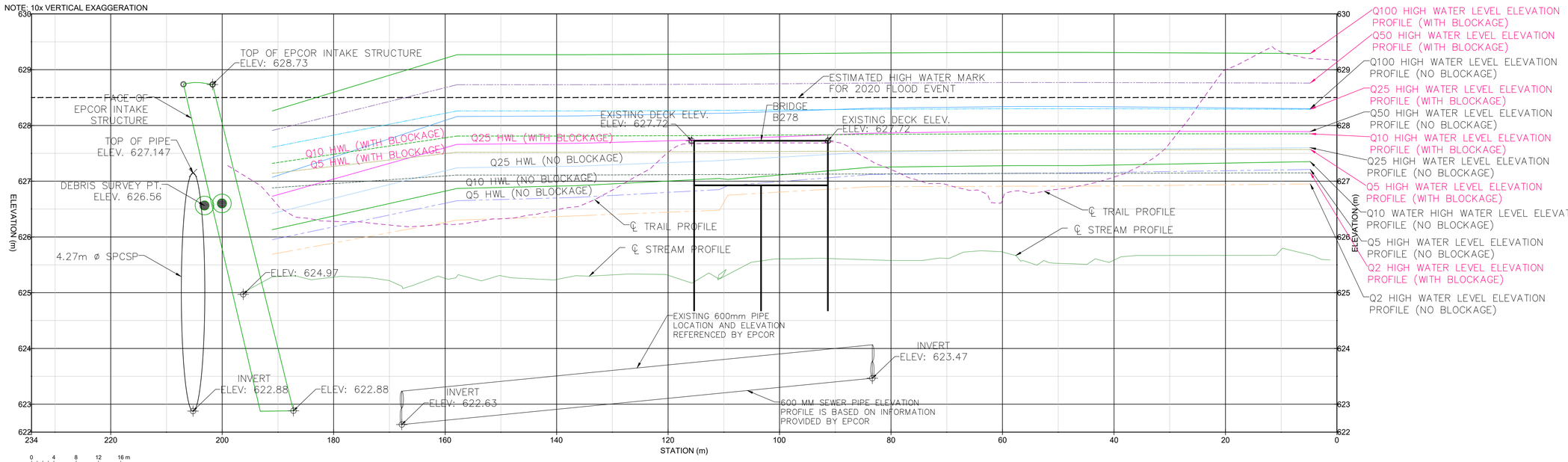


SITE PLAN

PROJ NO. EB213002 Scale 1:400

NOTE: 10x VERTICAL EXAGGERATION



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MILL CREEK RAVINE PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH/WITHOUT 33% BLOCKAGE

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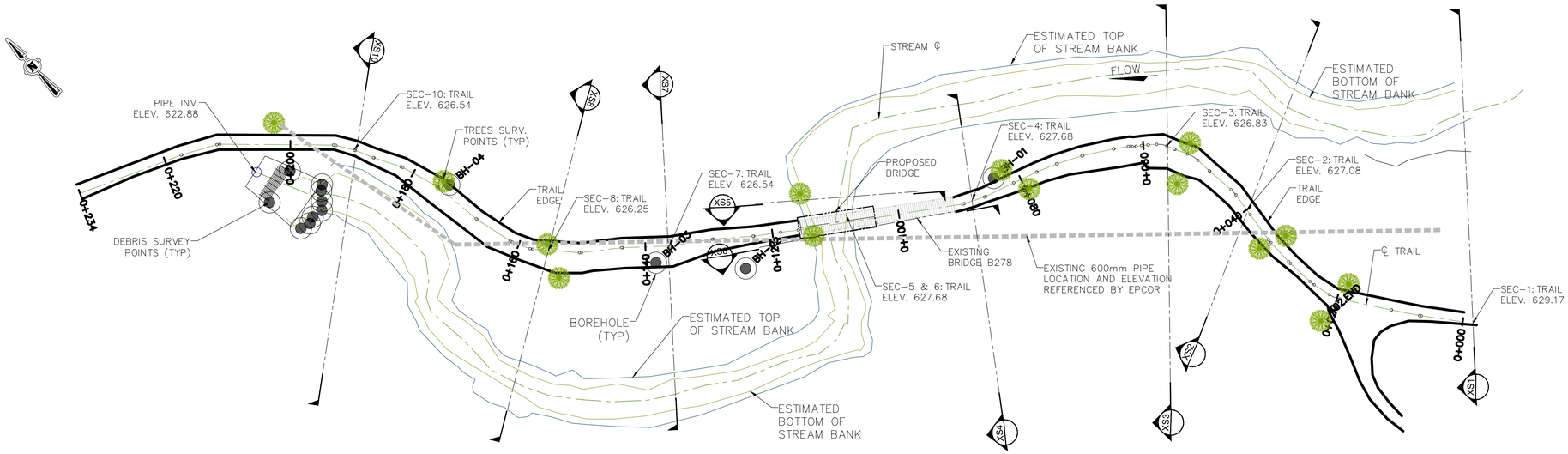
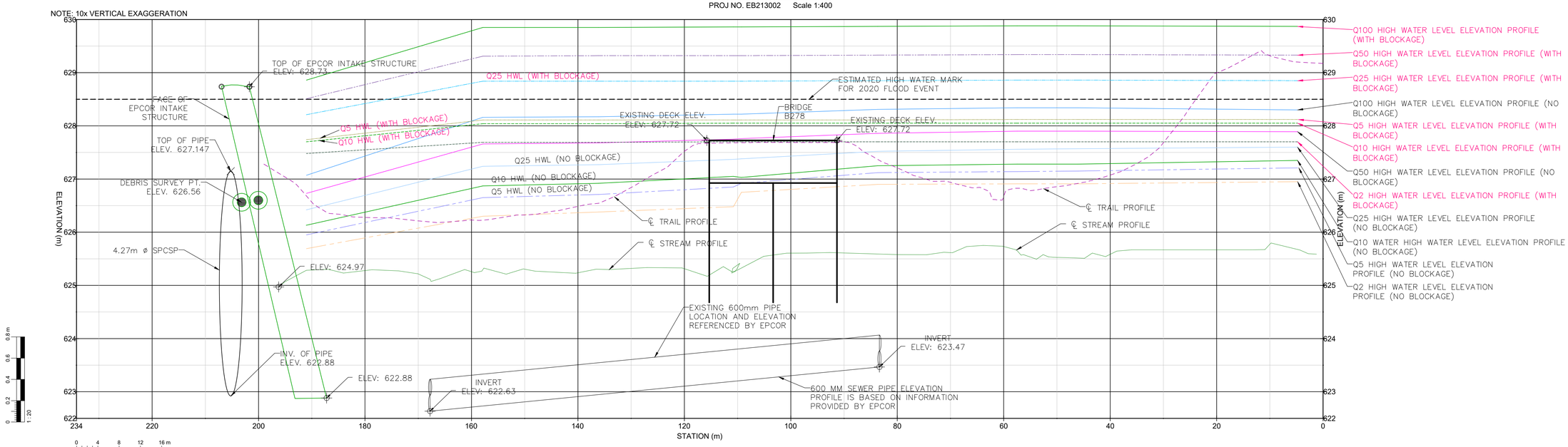


SITE PLAN

PROJ NO. EB213002 Scale 1:400

NOTE: 10x VERTICAL EXAGGERATION



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PROJECT
MILL CREEK RAVINE PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH/WITHOUT 50% BLOCKAGE

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Appendix B

Hydrotechnical Assessment Site Photos

Project Photos	Description
	**Photo 1** Looking downstream (southwest) at the west section of the bridge B278. Note the accumulated debris upstream of the bridge. Also note that Mill Creek main channel is only under the west bridge span. Photo taken April 19, 2021.
	**Photo 2** Looking downstream (southwest) at the east section of the bridge B278. Note the accumulated debris upstream of the bridge. Also note that the east bridge span is in the floodplain. Photo taken April 19, 2021.

Photo 3

Looking upstream (southeast) Note the accumulated debris upstream of the bridge. Also note the 90-degree meander bend and the steep east (right) bank. Photo taken April 19, 2021.

Photo 4

Looking northwest at the downstream end of bridge B278. Note rock filled gabion baskets along the northwest (right) bank. Photo taken April 19, 2021.

Photo 5
High water mark located in the floodplain northwest of bridge B278. Photo taken January 5, 2021.

Photo 6
Looking north at EPCOR SPCSP structure. Note debris on trash rack upstream of SPCSP structure. Also note debris caught between steel H piles in creek. Photo taken April 19, 2021.

Photo 7
Looking north at EPCOR SPCSP structure. Note debris on trash rack upstream of SPCSP structure. Photo taken May 5, 2021.

Appendix C

Bridge and Trail Preliminary Drawings

THE CITY OF Edmonton

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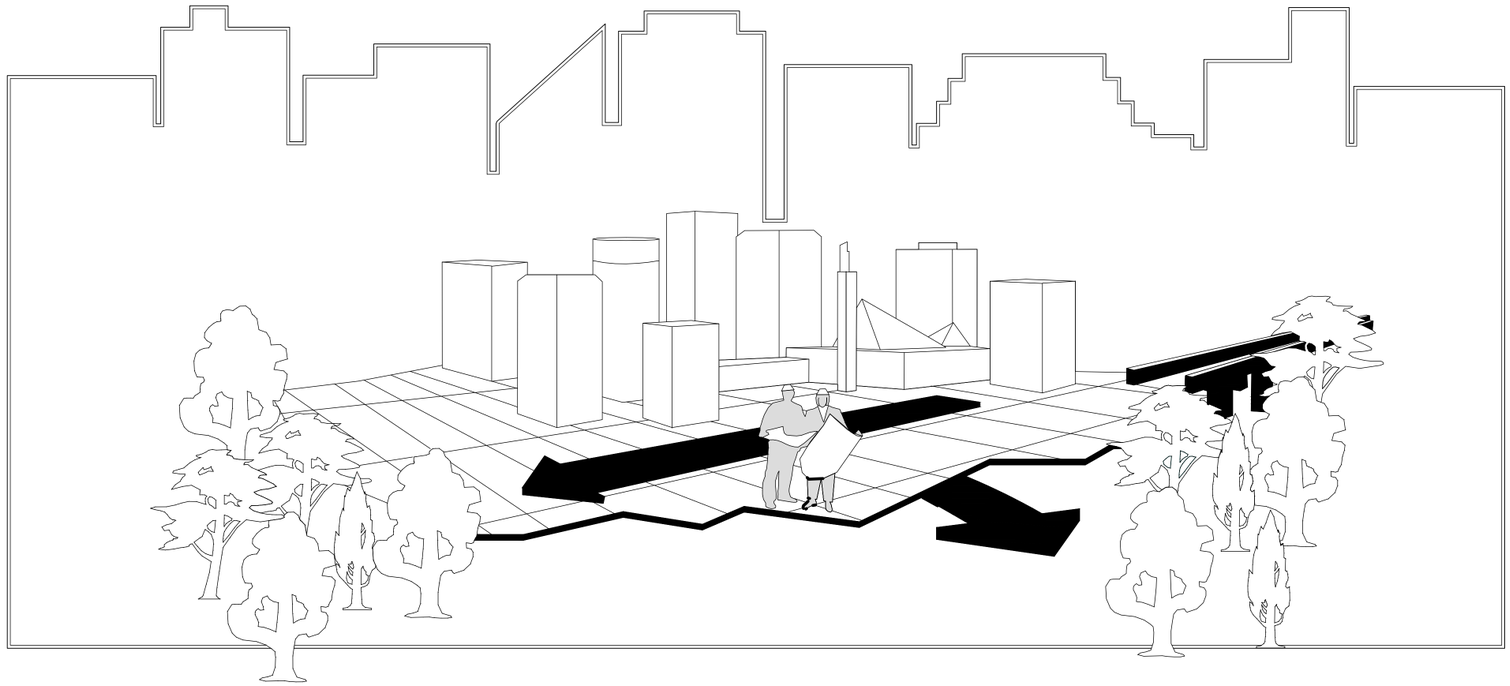
INFRASTRUCTURE PLANNING AND DESIGN BRANCH



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MILL CREE□ NORT□ PEDESTRIAN BRID□E □B278) REPLACEMENT AND TRAIL UP□RADES

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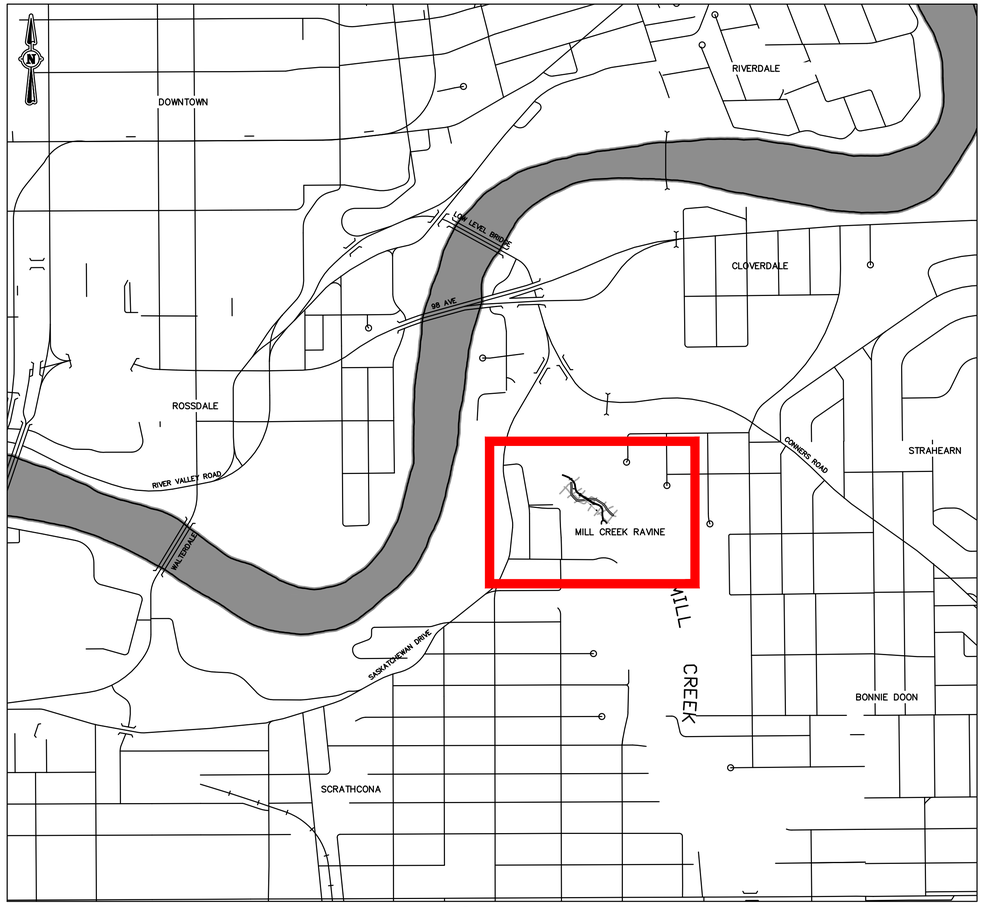

SITE MAP
Scale 1:10,000

SITE MAP
Scale 1:2,000

INDEX		
SHEET	DESCRIPTION	DRAWING NUMBER
0	COVER SHEET	MICR–P211–01
1	SITE PLAN AND DRAWING INDEX	MICR–P211–02
2	BRIDGE GENERAL LAYOUT	MICR–P211–S01
3	TRAIL PLAN AND PROFILE WITH 33% BLOCKAGE AT Q5 ELEVATION	MICR–P211–G01
4	TRAIL PLAN AND PROFILE WITH 33% BLOCKAGE AT Q10 ELEVATION	MICR–P211–G02
5	TRAIL PLAN AND PROFILE WITH 33% BLOCKAGE AT Q25 ELEVATION	MICR–P211–G03
6	SECTIONS AND DETAILS	MICR–P211–X01

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MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
SITE PLAN AND DRAWING INDEX

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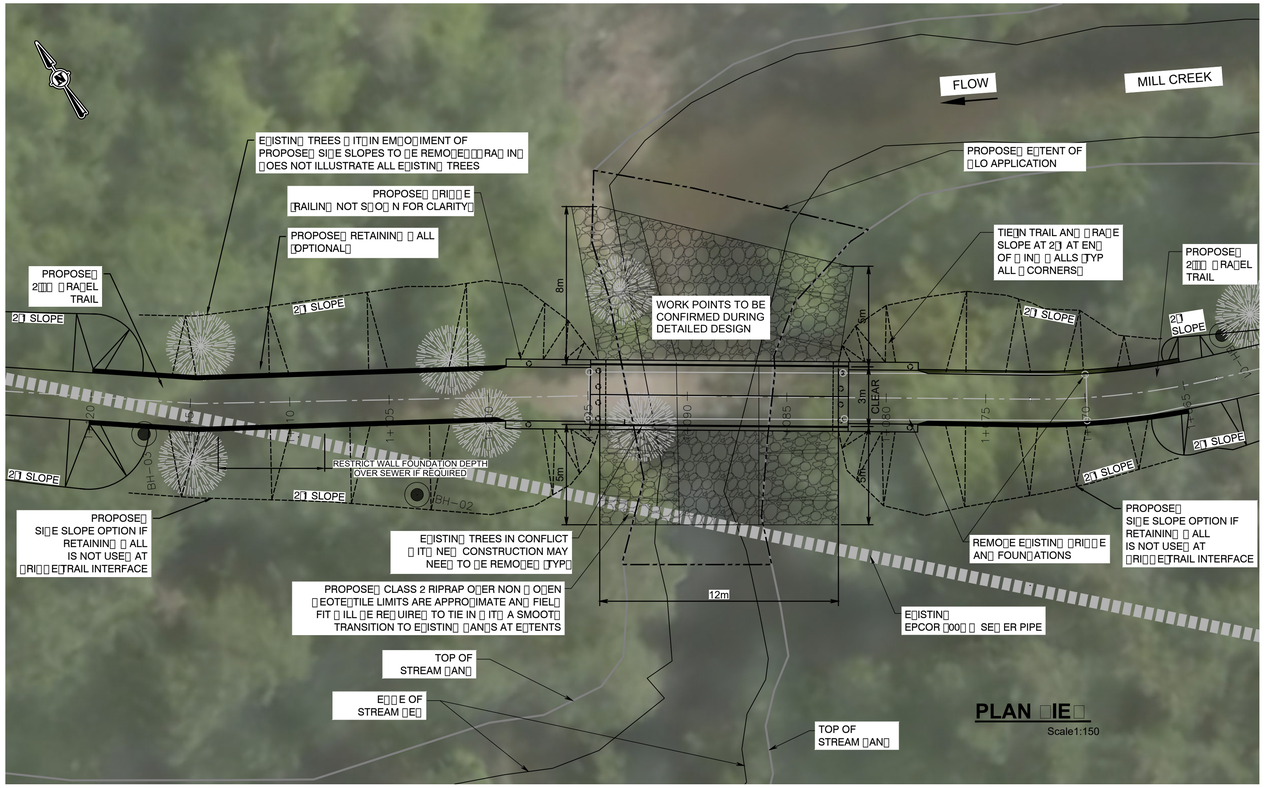
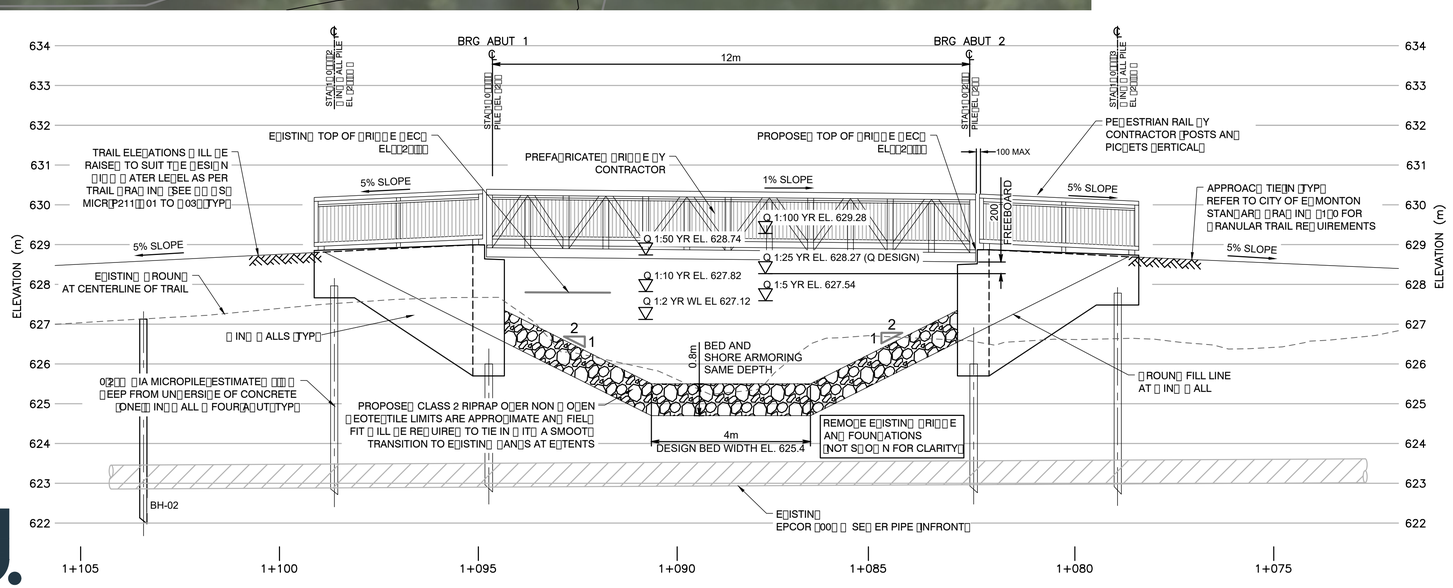


NOTES:

1. TOP OF BANK ELEVATION WAS ESTIMATED BY ALLOWING 300mm FREEBOARD ABOVE THE ESTIMATED 200 YEAR WATER LEVEL.
2. ALL ELEVATIONS ARE FROM THE CITY TECHNICAL MODEL BASED ON 3D LOCAL SURFACE OF THE EPCOR INTAKE STRUCTURE WITH RATING CURVE TO AN ELEVATION APPROX 1000mm ABOVE CURRENT STREAMBED PROFILE.
3. EXISTING LOD 0000 NOT SHOWN ON APPLICATION FOR NEW LOD PER OUTLINE SHOWN IN PENDING.

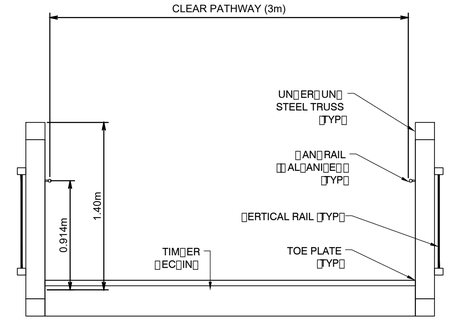
OR POINTS TO BE CONFIRMED IN DETAIL DESIGN.

RETURN PERIOD (YEARS)	MAX INSTANTANEOUS DISCHARGE (m^3/s)	WATER LEVEL ELEVATION (m) (See Note 2)	SOFFIT ELEVATION OF PROPOSED BRIDGE (m) (See Note 1)	TOP OF DECK ELEVATION FOR PROPOSED BRIDGE OPTION (m) (See Note 1)	COMPARE TO ELEVATION OF THE EXISTING BRIDGE DECK (m) (+/- ABOVE OR BELOW EXISTING)
100	50	629.28	629.48	629.78	2.10
50	36	628.74	628.94	629.24	1.56
25 - Q DESIGN	25	628.27	628.47	628.77	1.09
10	16	627.82	628.02	628.32	0.64
5	11	627.54	627.74	628.04	0.36
2	5	627.12	627.32	627.62	-0.16



BRIDGE ELEVATION

LOOKING NORTHEAST



BRIDGE SECTION

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MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
BRIDGE - GENERAL LAYOUT

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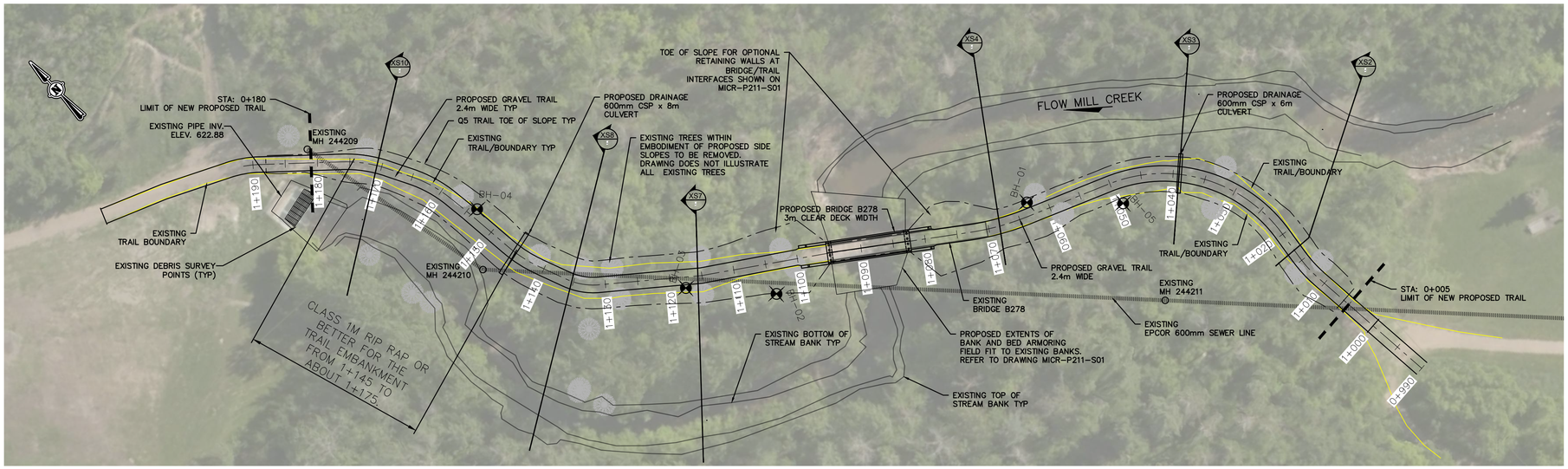

TRAIL PLAN

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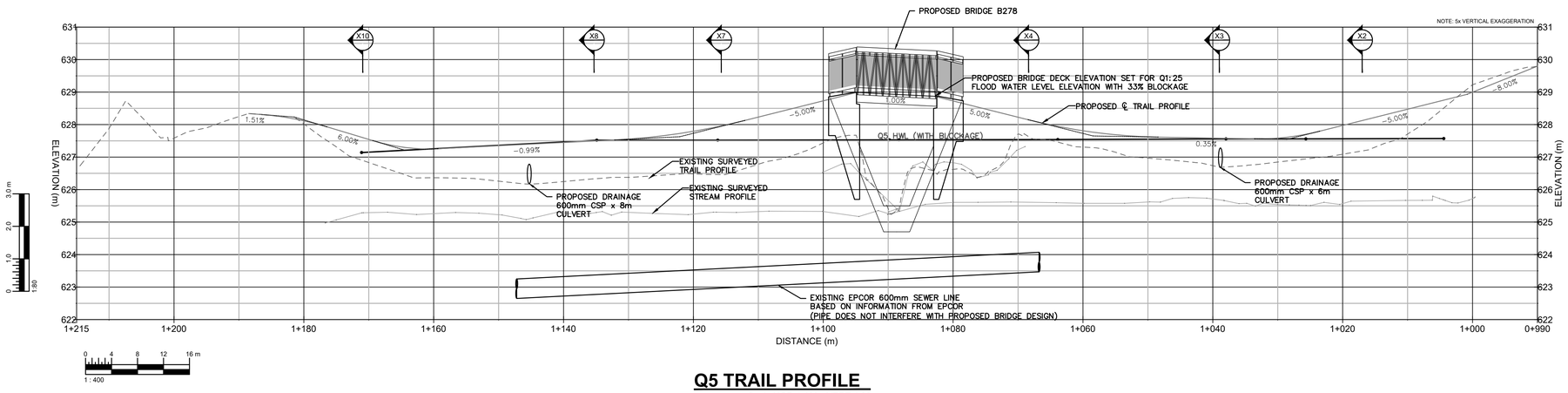

Q5 TRAIL PROFILE

Scale HOR 1:400 - VERT 1:80

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REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH 33% BLOCKAGE AT Q5 ELEV.

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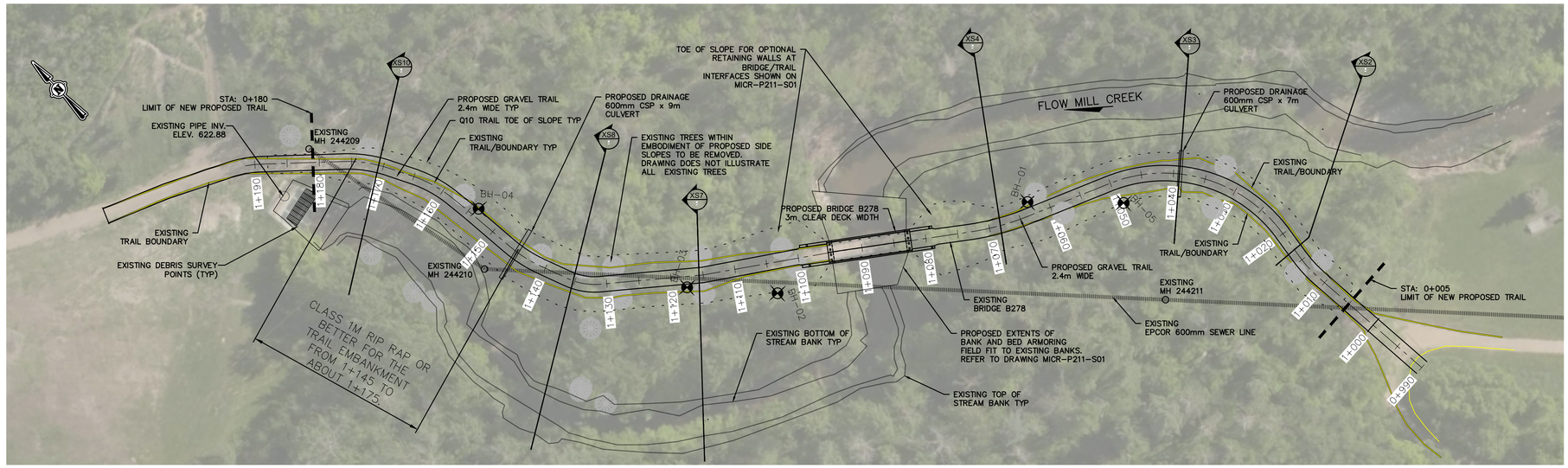

TRAIL PLAN

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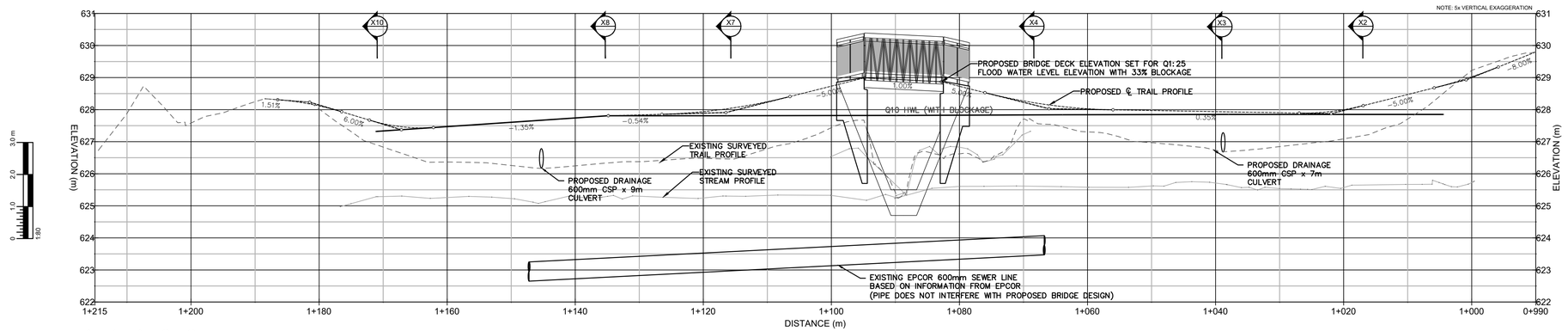

Q10 TRAIL PROFILE

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DESIGNED G.R.K. DATE 30 JUL 2021
CHECKED G.R.K. DATE 03 AUG 2021

THE CITY OF Edmonton
INTEGRATED INFRASTRUCTURE SERVICES
ENGINEERING SERVICES

PROJECT
MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH 33% BLOCKAGE AT Q10 ELEV.

DRAWING
MICR-P211-G02

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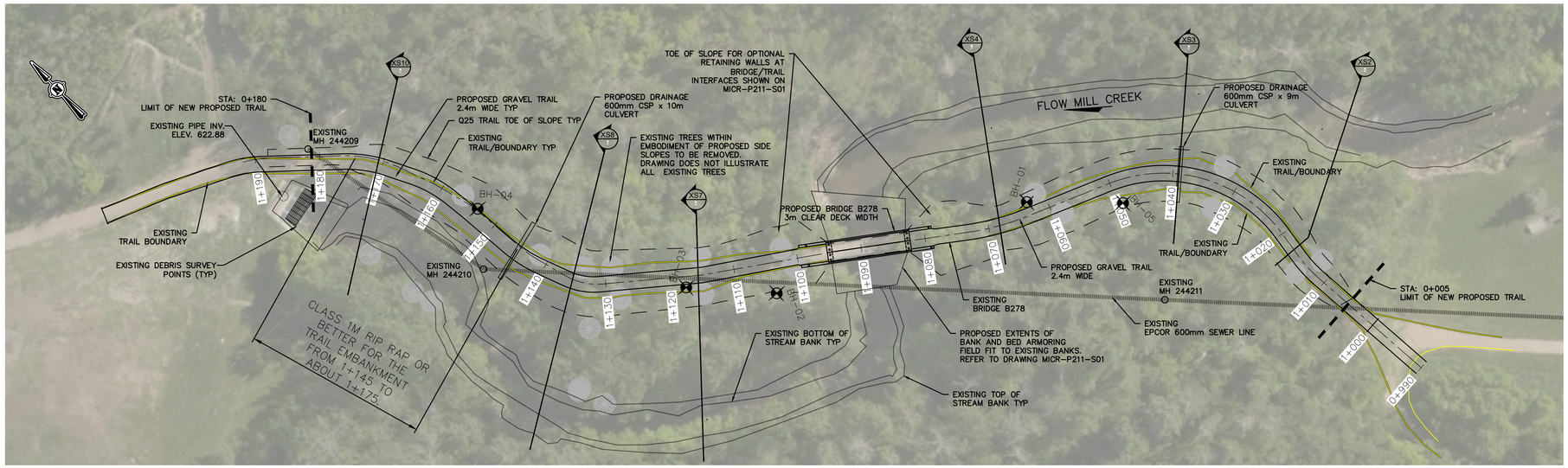

TRAIL PLAN

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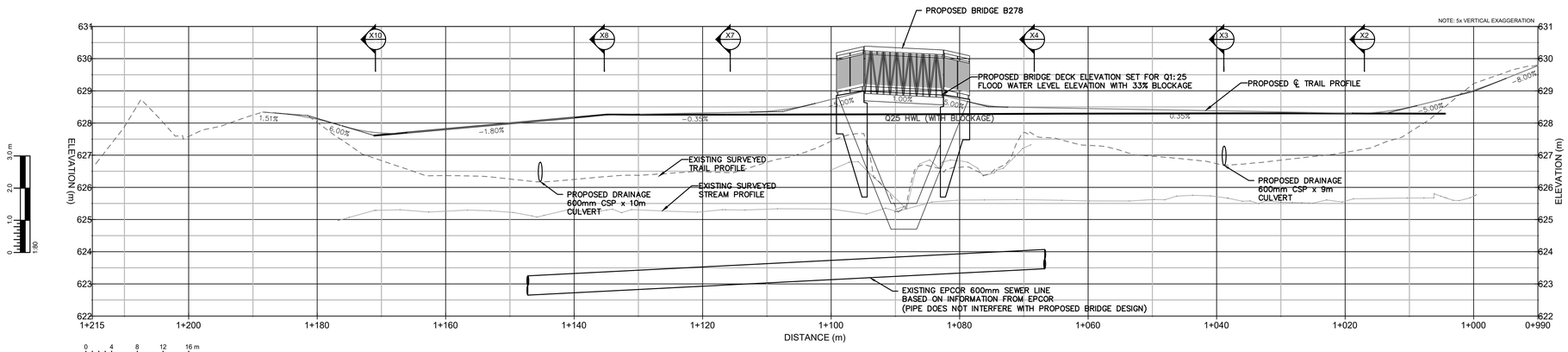

Q25 TRAIL PROFILE

Scale HOR 1:400 - VERT 1:80

PRELIMINARY
NOT FOR CONSTRUCTION

03 SEP 2021

wood.
Environment & Infrastructure Solutions
5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6
PHONE 780-436-2152, FAX 780-435-8425

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3	ISSUED FOR FINAL REVIEW	WP	21-SEP 03	GRK
2	ISSUED FOR 60% REVIEW	WP	21-AUG-27	GRK
1	ISSUED FOR 30% REVIEW	WP	21-AUG-13	GRK

NO.	ISSUE	BY	DATE
2	AS BUILT / TO GBIS		
1	TENDER AWARD DATE		

PROGRAM NO.
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

APPROVED FOR CONSTRUCTION
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE
TRANSPORTATION INFRASTRUCTURE DELIVERY - SUPERVISOR		
TRANSPORTATION PLANNING AND DESIGN - SUPERVISOR		

DIRECTOR OF TRASNPORTATION PLANNING AND DESIGN DATE

SURVEY
JOB NO.
SCALE
HOR
VER

DRAWN W.P. DATE 30 JUL 2021
DESIGNED G.R.K. DATE 30 JUL 2021
CHECKED G.R.K. DATE 03 AUG 2021

THE CITY OF Edmonton
INTEGRATED INFRASTRUCTURE SERVICES
ENGINEERING SERVICES

PROJECT
MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH 33% BLOCKAGE AT Q25 ELEV.

DRAWING
MICR-P211-G03

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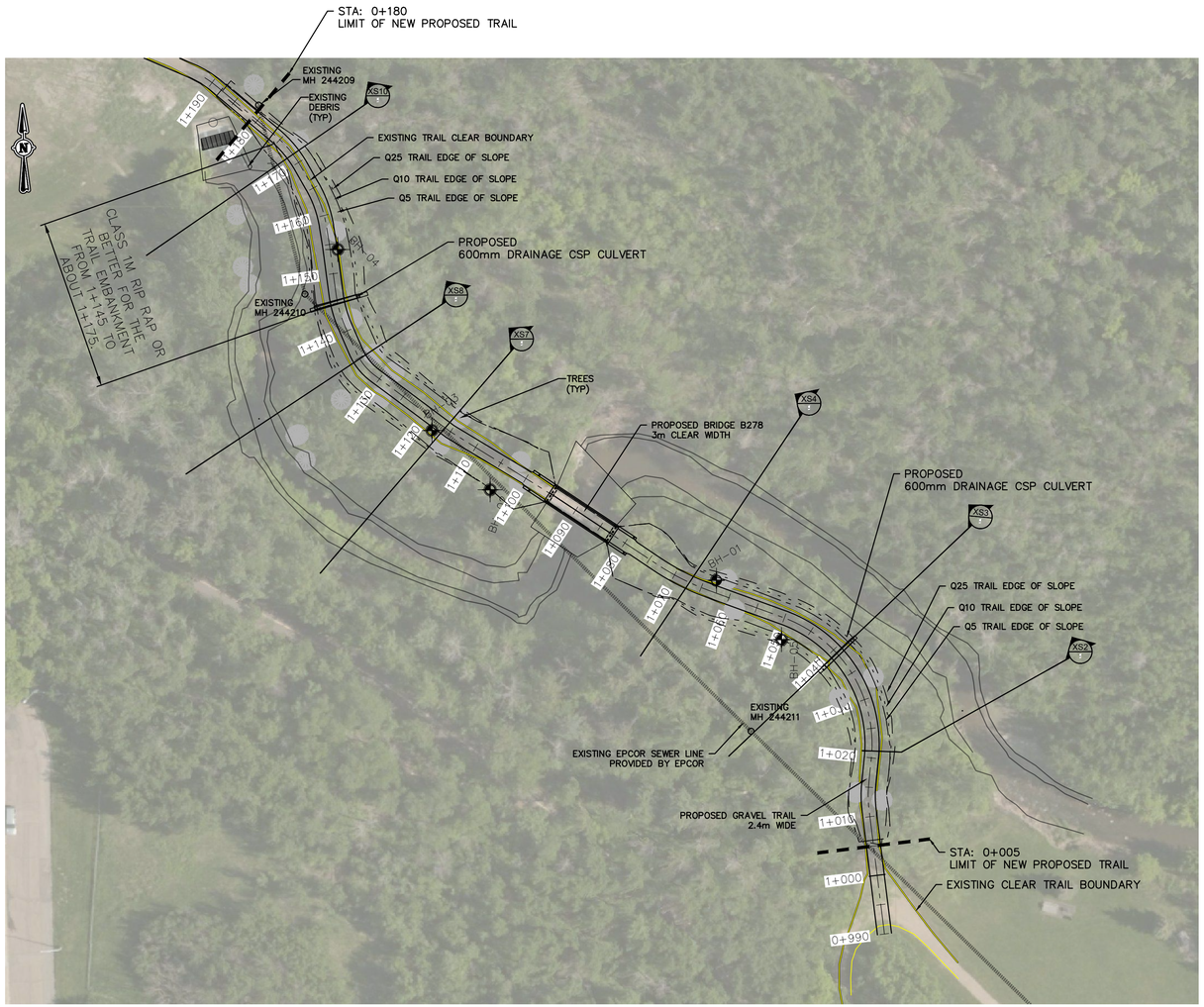
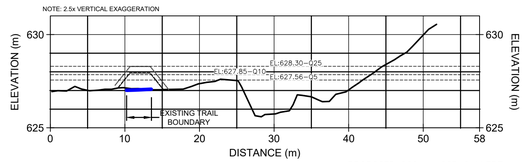


SITE PLAN



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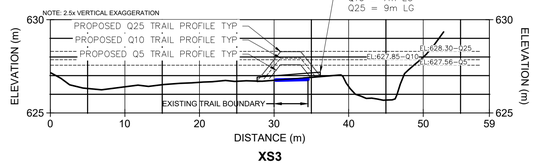

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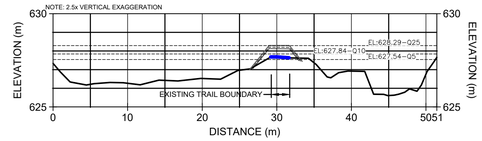

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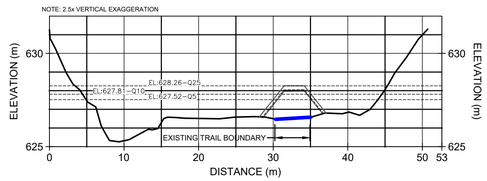

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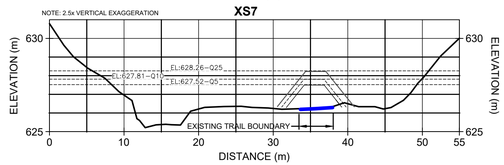

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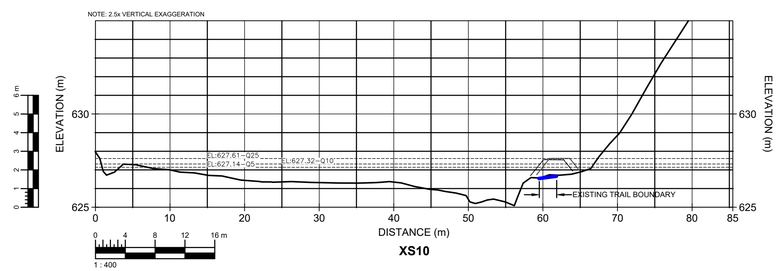

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PRELIMINARY
NOT FOR CONSTRUCTION

03 SEP 2021

wood.
Environment & Infrastructure Solutions
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PHONE 780-436-2152, FAX 780-435-8425

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TRANSPORTATION INFRASTRUCTURE DELIVERY - SUPERVISOR		
TRANSPORTATION PLANNING AND DESIGN - SUPERVISOR		

DIRECTOR OF TRASNPORTATION PLANNING AND DESIGN DATE

SURVEY
JOB NO.
SCALE
HOR.
VER.

DRAWN W.P. DATE 30 JUL 2021
DESIGNED G.R.K. DATE 30 JUL 2021
CHECKED G.R.K. DATE 03 AUG 2021

THE CITY OF Edmonton
INTEGRATED INFRASTRUCTURE SERVICES
ENGINEERING SERVICES

PROJECT
MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN / CROSS SECTIONS

DRAWING
MICR-P211-X01

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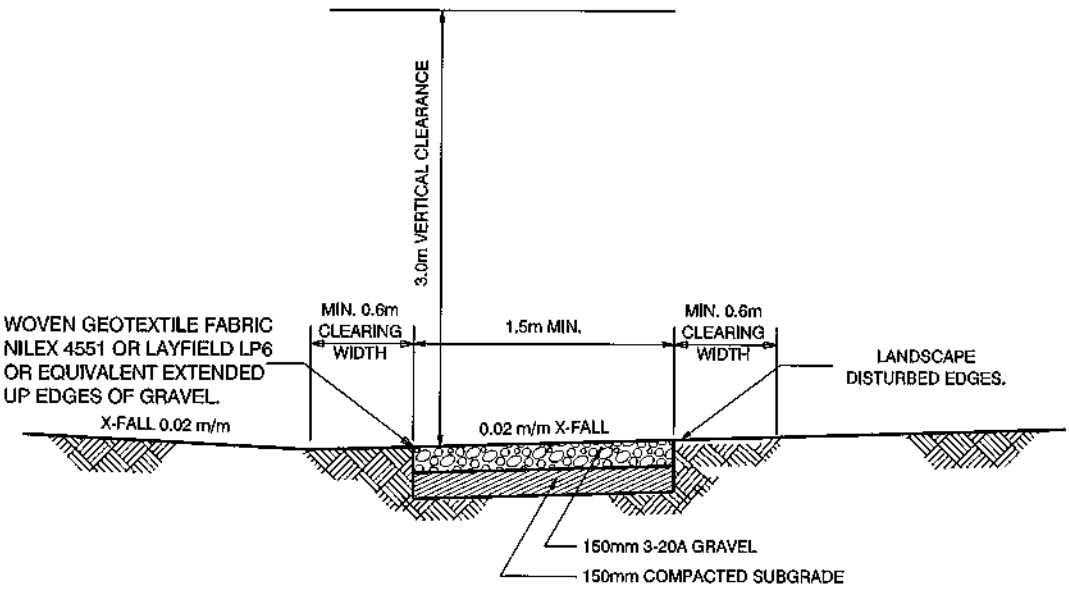


TYPICAL SECTION

ALTERNATE STRUCTURE: - 300mm 3-20A GRAVEL WITH GEOTEXTILE NILEX 4551 OR LAYFIELD LP6 OR EQUIVALENT ON NATIVE GROUND.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

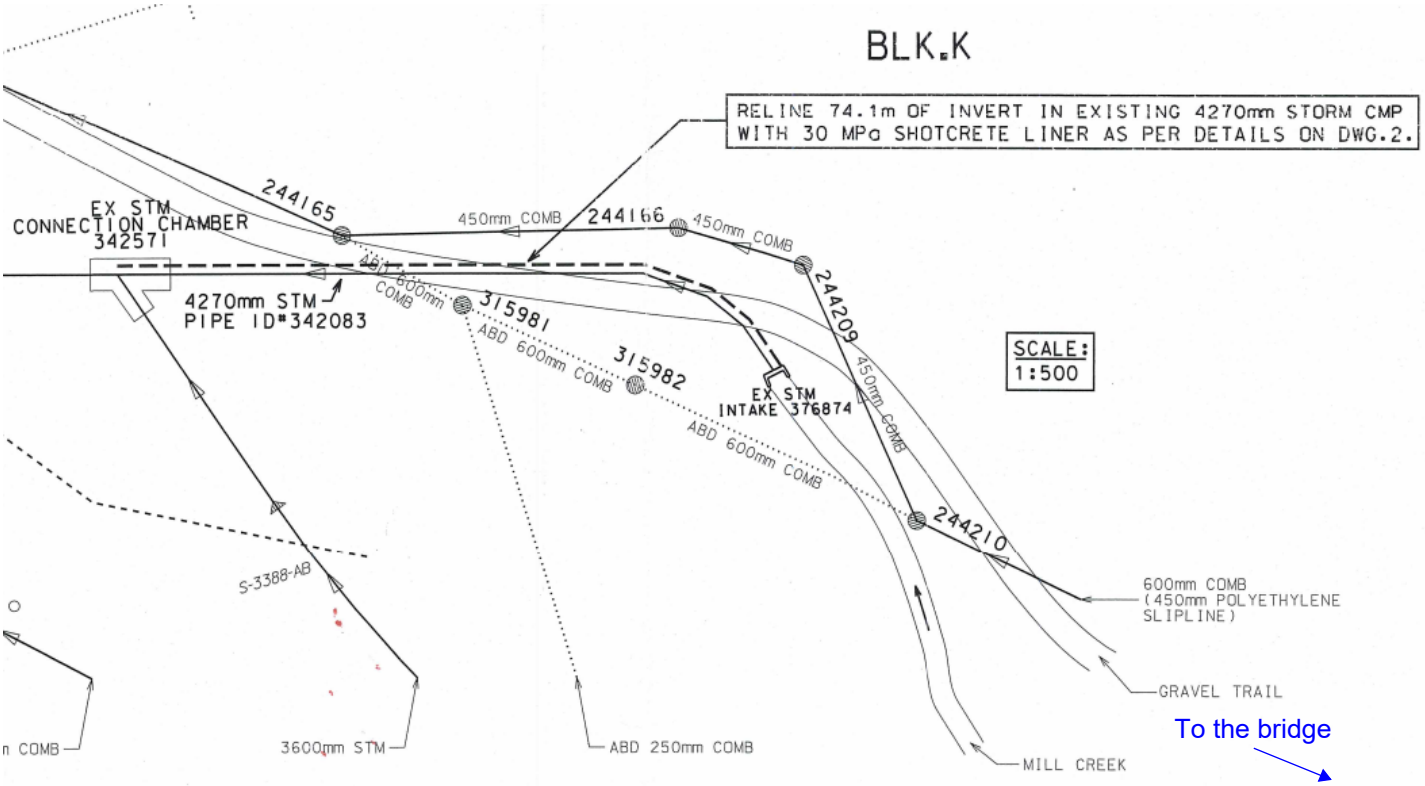
THE CITY OF Edmonton
STANDARD DRAWING

GRANULAR WALKWAY

Date Approved:	Drawn By:	Approved	Revision #	Drawing #
FEB., 2011	JW		—	5170
Scale: N.T.S.	Checked By:			

Appendix D

EPCOR Details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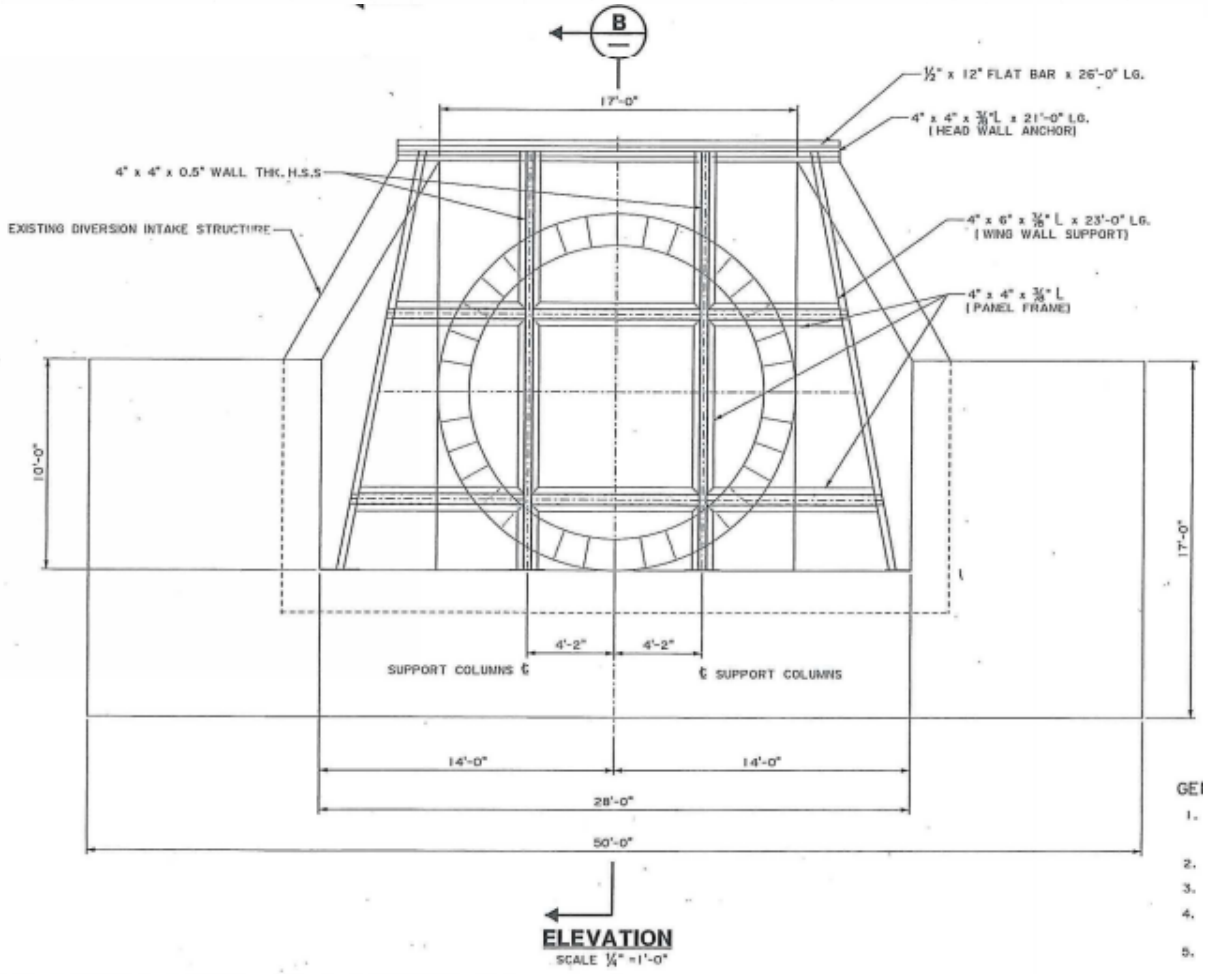
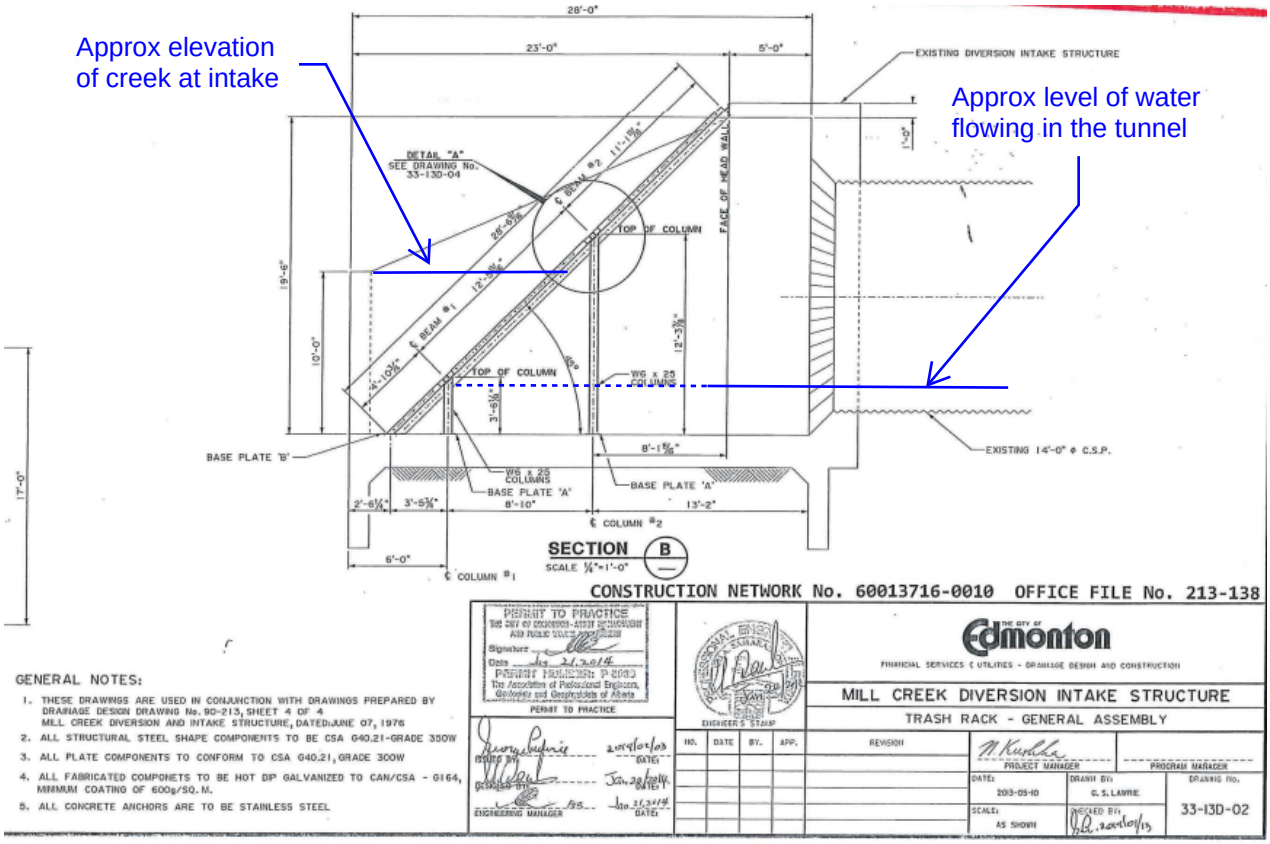
RELINE 74.1m OF INVERT IN EXISTING 4270mm STORM CMP WITH 30 MPa SHOTCRETE LINER AS PER DETAILS ON DWG.2.
EX STM CONNECTION CHAMBER 342571
244165
450mm COMB
244166
450mm COMB
244209
450mm COMB
4270mm STM PIPE ID#342083
ABD 600mm COMB
315981
ABD 600mm COMB
315982
EX STM INTAKE 376874
ABD 600mm COMB
SCALE: 1:500
244210
600mm COMB (450mm POLYETHYLENE SLIPLINE)
GRAVEL TRAIL
To the bridge
S-3388-AB
n COMB
3600mm STM
ABD 250mm COMB
MILL CREEK


B
17'-0"
½" x 12" FLAT BAR x 26'-0" LG.
4" x 4" x ¾"L x 21'-0" LG. (HEAD WALL ANCHOR)
4" x 4" x 0.5" WALL THK. H.S.S
EXISTING DIVERSION INTAKE STRUCTURE
4" x 6" x ⅜" L x 23'-0" LG. (WING WALL SUPPORT)
4" x 4" x ¾" L (PANEL FRAME)
10'-0"
17'-0"
4'-2"
4'-2"
SUPPORT COLUMNS ℄
℄ SUPPORT COLUMNS
14'-0"
14'-0"
28'-0"
50'-0"
ELEVATION
SCALE ¼" = 1'-0"



CONSTRUCTION NETWORK No. 60013716-0010 OFFICE FILE No. 213-138

GENERAL NOTES:

1. THESE DRAWINGS ARE USED IN CONJUNCTION WITH DRAWINGS PREPARED BY DRAINAGE DESIGN DRAWING No. 80-213, SHEET 4 OF 4 MILL CREEK DIVERSION AND INTAKE STRUCTURE, DATED: JUNE 07, 1976
2. ALL STRUCTURAL STEEL SHAPE COMPONENTS TO BE CSA G40.21-GRADE 350W
3. ALL PLATE COMPONENTS TO CONFORM TO CSA G40.21, GRADE 300W
4. ALL FABRICATED COMPONETS TO BE HOT DIP GALVANIZED TO CAN/CSA - G164, MINIMUM COATING OF 600g/SQ. M.
5. ALL CONCRETE ANCHORS ARE TO BE STAINLESS STEEL

PERMIT TO PRACTICE
PERMIT HOLDER: P 6083
The Association of Professional Engineers, Geologists and Geophysicists of Alberta
PERMIT TO PRACTICE

ENGINEER'S STAMP

ISSUED BY: 2014/01/03 DATE
CHECKED BY: Jan 28/2014 DATE
ENGINEERING MANAGER: Jan 31/2014 DATE

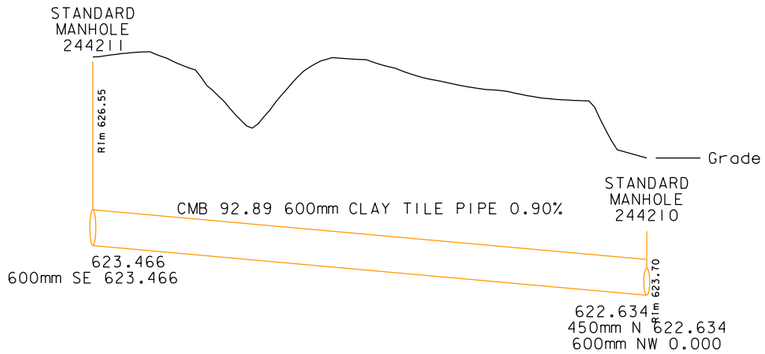
NO.	DATE	BY.	APP.	REVISION

THE CITY OF Edmonton
FINANCIAL SERVICES & UTILITIES - DRAINAGE DESIGN AND CONSTRUCTION

MILL CREEK DIVERSION INTAKE STRUCTURE
TRASH RACK - GENERAL ASSEMBLY

M Kupka — PROJECT MANAGER
PROGRAM MANAGER

DATE:	DRAWN BY:	DRAWING No.
2013-05-10	G. S. LAWRIE	33-13D-02
SCALE: AS SHOWN	CHECKED BY: 2014/01/13	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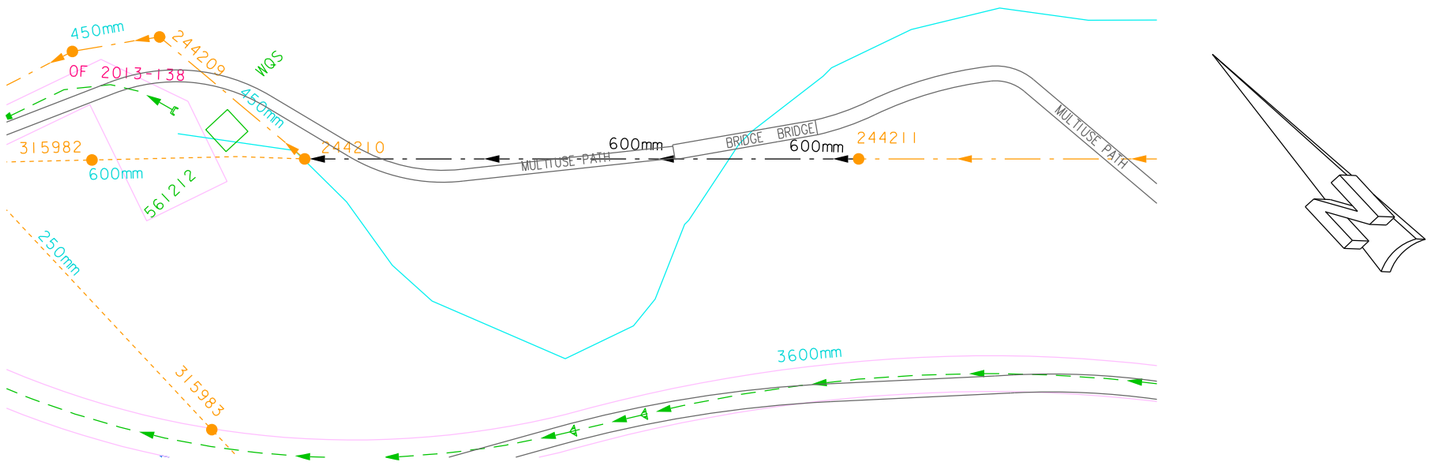
MANHOLE
244211
Rim 626.55
Grade
STANDARD
MANHOLE
244210
CMB 92.89 600mm CLAY TILE PIPE 0.90%
623.466
600mm SE 623.466
Rim 623.70
622.634
450mm N 622.634
600mm NW 0.000


450mm
244209
OF 2013-138
WQS
450mm
315982
600mm
244210
MULTIUSE PATH
600mm
BRIDGE
BRIDGE
600mm
244211
MULTIUSE PATH
561212
250mm
315983
3600mm

Appendix E

Phase 1 Environmental Site Assessment

Environmental Overview

Mill Creek Ravine Pedestrian Bridge B278
Edmonton, Alberta

Project: EB213002.0200.0600

Prepared for:
City of Edmonton
Edmonton, Alberta

May 2021

Distribution: City of Edmonton – 2 Bound Copies and 1 Electronic Copy on CD
Wood – 1 Bound File Copy

Environmental Overview

Mill Creek Ravine Pedestrian Bridge B278

Edmonton, Alberta

Project: EB213002.0200.0600

Prepared for:
City of Edmonton
11004 – 190 Street NW
Edmonton, AB T5S 0G9

Prepared by:
Wood Environment & Infrastructure Solutions
5681 – 70 Street
Edmonton, AB T6B 3P6
Canada
T: 780-436-2152

May 2021

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
5681 – 70 Street
Edmonton, AB T6B 3P6
Canada
T: 780-436-2152

27 May 2021
EB213002.0200.0600

City of Edmonton
11004 – 190 Street NW
Edmonton, AB T5S 0G9

Attention: **Ben Gibson**

Reference: **Environmental Overview**
Mill Creek Ravine Pedestrian Bridge B278
Edmonton, Alberta

Wood Environment & Infrastructure Solutions (Wood) is submitting this Environmental Overview report on the above-referenced property.

Should you have any questions regarding our findings, please call the undersigned at (780) 989-4580.

Yours truly,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Kristine Connor
Environmental Site Assessor

Executive Summary

Project:	Environmental Overview
Site Address:	Mill Creek Ravine Pedestrian Bridge B278
Legal Description:	Portion of Plan 2022463, Block 1, Lot 1B
Site Owner:	City of Edmonton of Edmonton, Alberta

The City of Edmonton retained Wood Environment & Infrastructure Solutions (Wood) to conduct an Environmental Overview of a portion of a property located within Mill Creek Ravine (the 'Site') in Edmonton, Alberta. The purpose of this overview was to identify actual or potential environmental contamination at the Site that may have resulted from previous land use, construction, management or operation of the property.

SCOPE OF WORK

The Environmental Overview methodology for this project consisted of:

- a review of historical and current documentation pertaining to the Site;
- development of an understanding of the Site in relation to its surrounding environment;
- visual inspection of the Site to identify practices or circumstances that may present potential environmental contamination; and
- preparation of this report summarizing the methodology and findings of the Environmental Overview.

SITE DESCRIPTION

The Site is located approximately 100 metres ('m') northeast of 98 Street within Mill Creek Ravine North neighbourhood in Edmonton, Alberta. The Site is zoned North Saskatchewan River Valley and Ravine System Protection and is currently undeveloped. There are no buildings on the Site. A paved trail crosses through the Site in a northwest to southeast direction along the Mill Creek Ravine. The Site has a pedestrian bridge with a total length of approximately 25 m and width of approximately 2.6 m.

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Glossary of Commonly Used Abbreviations

ACM	Asbestos containing material	HVAC	Heating, ventilating and air conditioning
AEC	Area of environmental concern	LCP	Lead containing paint
AEP	Alberta Environment and Parks	MDL	Method detection limit
AER	Alberta Energy Regulator	NORM	Naturally occurring radioactive material
APEC	Area of potential environmental concern	ODS	Ozone depleting substance
AST	Aboveground storage tank	PCB	Polychlorinated biphenyl
BTEX	Benzene, toluene, ethylbenzene, xylenes	PHC	Petroleum hydrocarbon
CFC	Chlorofluorocarbon	PTMAA	Petroleum Tank Management Association of Alberta
CSA	Canadian Standards Association	RMP	Risk management plan
ESA	Environmental site assessment	ROW	Right-of-way
ESAR	Environmental site assessment repository	SDS	Safety data sheet
FIP	Fire insurance plan	UFFI	Urea formaldehyde foam insulation
FOIP	Freedom of Information and Protection of Privacy	UST	Underground storage tank
H.E.L.P.	Help End Landfill Pollution	VOC	Volatile organic compound
HID	High intensity discharge	WHMIS	Workplace Hazardous Materials Information System

1.0 Introduction

1.1 Project Background

The City of Edmonton retained Wood Environment & Infrastructure Solutions (Wood) to conduct an Environmental Overview of a portion of a property located within Mill Creek Ravine (the 'Site') in Edmonton, Alberta. The area of focus is the Mill Creek Ravine Pedestrian Bridge B278. Authorization to proceed with the investigation of the Site was received on 29 March 2021.

The Mill Creek Ravine Pedestrian Bridge B278 currently serves as a pedestrian bridge crossing within the Mill Creek Ravine. Mill Creek Ravine is a major component of the Edmonton River Valley which neighbours Strathcona to the West and Bonnie Doon to the East. The ravine provides further access to Cloverdale to the North and to additional river valley pathways. Bridge B278 is a multi-spanned, mixed materials bridge with a total length of approximately 25 metres ('m') and width of approximately 2.6 m. The Site regularly floods during seasonal high-water events, causing erosion, and blocks access to the Bridge B278 and adjacent trails. The City of Edmonton intends to undertake a project to mitigate flooding of the bridge, and nearby trails, while maintaining pedestrian connectivity.

1.2 Objective

The objective of an Environmental Overview is to identify areas of potential environmental concern ('APECs') and associated contaminants of potential concern ('COPCs') that could be associated with current and past activities on the Site, and to determine if additional investigations are recommended.

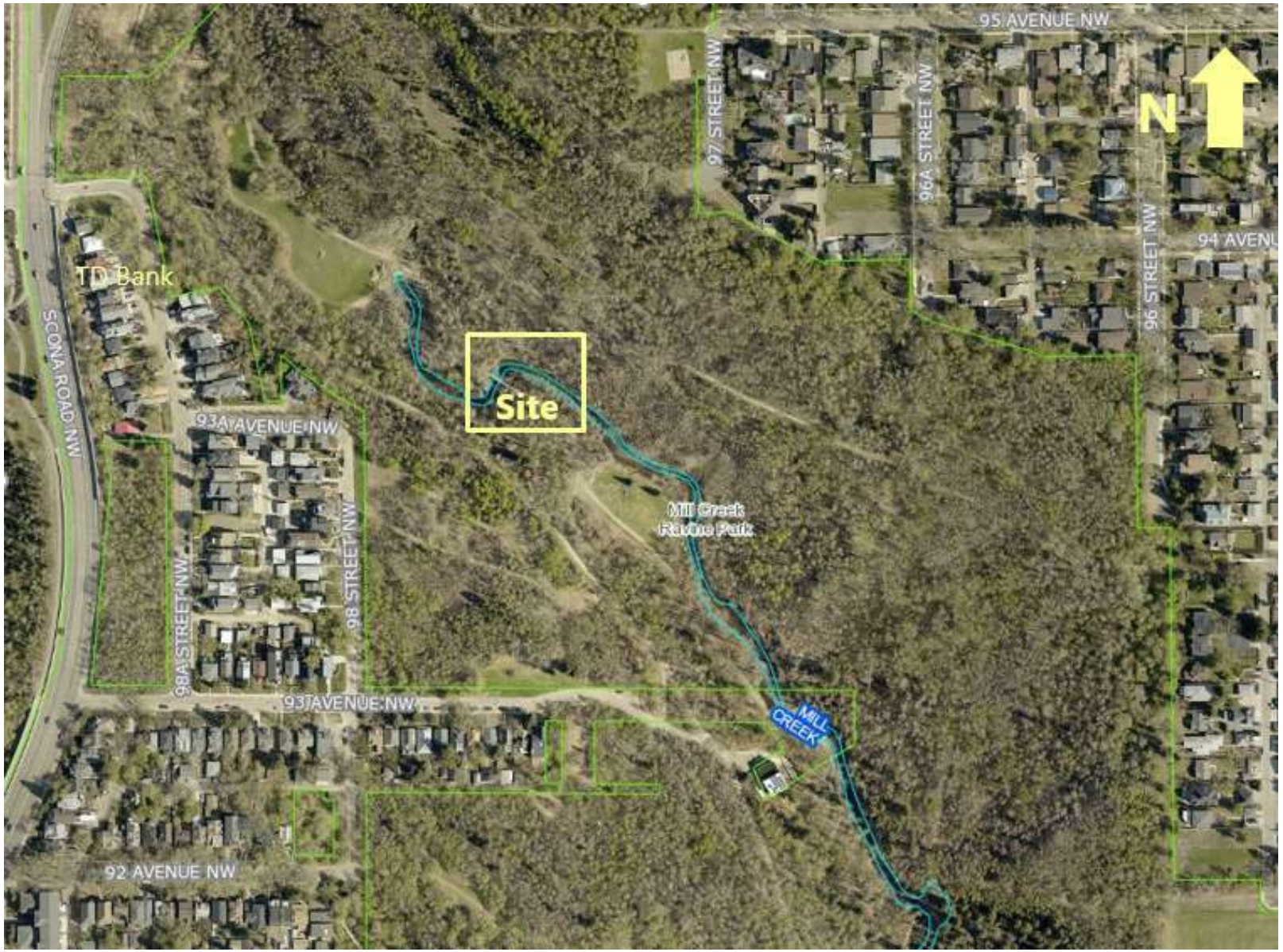
1.3 Scope of Work

The work performed as part of this Environmental Overview included the following components.

1. Performing a review of current information pertaining to the Site and adjacent properties.
2. Conducting a Site reconnaissance of the Site to identify potential environmental concerns.
3. Preparing a report summarizing the methodology and findings of the Review and Site Reconnaissance tasks and including recommendations for additional detailed investigation and assessment, if necessary.

The detailed methodology for these components is listed as follows.

1. Historical aerial photography of the Site and area was reviewed to record land use and development using available photographs obtained through the Alberta Environment and Parks ('AEP') Aerial Photograph Division for interpretation.
2. Alberta Safety Codes Authority ('ASCA') (formerly the Petroleum Tank Management Association of Alberta) was contacted to determine whether USTs and ASTs were recorded to be present in connection with current or previous Site occupancy.
3. The Abacus Datagraphics Limited database reviewed for Alberta Energy Regulator ('AER') information on oil and gas wells, facilities and batteries, and environmental spills for the Site.
4. The AEP Groundwater Information System database was reviewed to obtain information regarding water wells that may be present on the Site.
5. The City of Edmonton Transportation Infrastructure (Geo-Enviro) library was contacted for records of any environmental reports or documentation pertaining to the Site.
6. The Site and adjacent areas were visually inspected to identify evidence of contamination in the form of soil disturbance, waste storage/spillage, and staining or discolouration of soils. The visual inspection of the accessible areas of the Site also intended to determine the presence of hazardous materials such as asbestos, urea formaldehyde, PCBs or other chemicals or wastes as applicable.



Source: City of Edmonton SLIM Maps

wood.

2020 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

Scale: 1:2,000	Date: April 2021	Drawn: KC	Project No.: EB213002.0200.0600	Figure: 1

2.0 Review of Site Information

2.1 Topography and Soils

The Site and surrounding land generally slope northwest, towards Mill Creek. The Site has an elevation of approximately 636 metres above sea level ('masl'). At the time of the site inspection, soil erosion associated with seasonal flooding was observed along the creek and surrounding areas.

The surficial geology in the area of the Site generally consists of coarse sediments that resulted from the collapse and slumping of englacial and supraglacial debris due to the melting of buried stagnant ice at the glacier margin. The sediment is mainly till but locally includes stratified glaciolacustrine or glaciofluvial sediments. The landscape in the area of the Site is characterized by low- to high-relief hummocky topography[1,2,]. A review of published geology reports and maps[3,4,5,6] shows that the Site is underlain by Quaternary deposits consisting mainly of coarse-grained sediments consisting of fine to coarse-grained sand, with minor silt beds to a depth of approximately 20 m. Exposed till and bedrock along the slopes of the river valley are expected.

The bedrock in this area is the upper Cretaceous Horseshoe Canyon Formation of the Edmonton Group. It is mainly comprised of interbedded mudstones (bentonitic shales), sandstone and coal seams. The sediments were deposited in a shallow inland sea. As these sediments were accumulating, volcanic ash was also being deposited over the Edmonton area which created bentonite seams within the bedrock.

2.2 Hydrogeology

The lateral direction of shallow groundwater flow in this area is generally anticipated to be toward Mill Creek. Mill Creek flows northwards into the North Saskatchewan River via underground pipes and inlet chambers. Mill Creek experiences fluctuation in water levels during snowmelt/spring run off and during times of high rainfall.

2.3 Historical Air Photographs

Aerial photographs of the Site and surrounding area were obtained and reviewed to determine the historic land use and development. It should be noted that aerial photography does not provide a continuous record of Site development. It is possible that features of interest may have appeared and disappeared between the dates of coverage. In addition, photography quality and scale are variable and may make features difficult to identify or their purpose difficult to establish. Available photographs for the Site ranging from 1920 to 2020 were reviewed. A summary of the review is included in Table 1 and is augmented with information obtained from Fire Insurance Plans. Enlarged reproductions of aerial photographs for the years 1920, 1950, 1962, 1967, 1974, 1978, 1985, 1992, 2001, 2008 and 2014 are

1 Fenton, M.M., E.J. Waters, S.M. Pawley, N. Atkinson, D.J. Utting, and K. Mckay. 2013. Surficial Geology of Alberta; Alberta Energy Regulator/Alberta Geological Survey (AER/AGS), Map 601, scale 1:1 000 000.

2 Prior, G.J., B. Hathway, P.M. Glombick, D.I. Pana, C.J. Banks, D.C. Hay, C.L. Schneider, M. Grobe, R. Elgr, and J.A. Weiss (compilers). 2013. Bedrock Geology of Alberta, Alberta Geological Survey, Alberta Energy Regulator, Map No. 600, Scale 1:1 000 000. Edmonton, Alberta.

3 Shetsen, I. 1987. Quaternary Geology of Central Alberta. AEUB/AGS.

4 Bibby R., 1974. Hydrogeology of the Edmonton Area (Northwest Segment), Alberta, Report 74-10, Alberta Research Council

5 Kathol and MacPherson, 1975. Urban Geology of Edmonton. Bulletin 32, Alberta Research Council.

6 Andriashek, L.D. 1988. Quaternary Stratigraphy of the Edmonton Map Area, NTS 83H. Terrain Sciences Department, Natural Resources Division, Alberta Research Council. Open File Report #198804.

provided in Appendix A. A 2020 aerial photograph obtained from the City of Edmonton website was used to prepare Figure 1.

Table 1: Summary of Aerial Photograph Review

Year	Original Scale	Description
1920	1: 14,000	The Site and surrounding areas appeared to be forested natural areas. Residential properties are present approximately 100 m southwest of the Site. Structures are visible approximately 200 m southeast of the Site
1950	1:40,000	No significant changes were observed on the Site or adjacent properties. A trail is visible along the southwest of the Site. The structures southeast of the Site are no longer visible.
1962	1:31,680	No significant changes were observed on the Site or adjacent properties.
1967	1:31,680	No significant changes were observed on the Site or adjacent properties.
1974	1:12,000	No significant changes were observed on the Site or adjacent properties.
1978	1:20,000	No significant changes were observed on the Site or adjacent properties.
1985	1:25,000	No significant changes were observed on the Site or adjacent properties.
1992	1:20,000	No significant changes were observed on the Site or adjacent properties.
2001	1:20,000	No significant changes were observed on the Site or adjacent properties.
2008	1:20,000	No significant changes were observed on the Site or adjacent properties.
2014	1:20,000	No significant changes were observed on the Site or adjacent properties.

Based on the review of historical aerial photographs and available records, the Site has been undeveloped, natural land from prior to 1920 to present. Development of structures southeast of the Site occurred prior to 1920 and were removed by 1950. Residential development occurred to the southwest of the Site before 1920.

3.0 Review of Online Databases

3.1 Pipelines, Oil Wells and Spills/Releases

Searches through the Abacus Datagraphics Ltd. ('Abacus') database indicated that there are no Alberta Energy Regulator ('AER') records of oil/gas wells, facilities and batteries, pipelines, or environmental spills on the Site or adjacent properties. The reports are available in Appendix B.

3.2 Coal Mines

The Atlas of Coal Mine Workings in Edmonton[7] was reviewed and identified records of an abandoned mine that had previously operated beneath the Site as shown in Appendix C. According to the information provided, the mine named Twin City was mined using the room and pillar method and mined two (2) seams with some longwall mining. Twin City Coal Co. Ltd. was named as the mine owner, no information was provided regarding the depth of production quantity. No working or air shafts were identified on or beneath the Site.

[7] R.S. Taylor, 1971. Atlas: Coal Mine Workings in Edmonton.

3.3 Water Wells

Searches through the Alberta Environment and Water Groundwater Information System database identified records for three water wells in the section 33-52-24 W4M in which the Site is located as shown in Appendix D. No groundwater wells were observed at the time of the visual inspection. The wells included: a well drilled in 1920 for contamination investigation with no drilling depth was provided, an observation well with a drilling date of 01 September 1928 and a domestic well, drilled on 18 July 1977 to a depth of 60.96 m.

3.4 Publicly Available Reports and Information (ESAR) and City of Edmonton Transportation Infrastructure (Geo-Enviro) Library

The AEP Environmental Site Assessment Repository ('ESAR') database had no publicly available records for the Site. The City of Edmonton Geo-Environmental Information Services was contacted for records of reports. They had no additional records of reports the Site and adjacent lands.

3.5 Land Reclamation Certificates (ESAR)

The AEP Environmental Site Assessment Repository ('ESAR') database had no land reclamation records for the Site.

3.6 Alberta Safety Codes Authority (ASCA)

Correspondence received from the ASCA, and included in Appendix E, indicated that they have no records of petroleum storage tanks on the Site.

4.0 Site Inspection

Site Description / Silvan Zorzut of Wood conducted a visual inspection of the Site on 05 May 2021. The weather was sunny, windy with a temperature of approximately 12 ºC. The results of the visual inspection are presented in the following text and the completed checklists are included in Appendix G.

At the time of the visual inspection, signage on Site was observed indicating a trail closure due to flooding in the area as shown in Photograph 1 in Appendix F. Soil erosion was observed in the area around the pedestrian bridge as shown in Photograph 7 in Appendix F. Bridge 278 was viewed during the Site visit, as shown in Photographs 3 through 5 in Appendix F.

5.0 Areas of Potential Environmental Concern (APECs)

Wood has not identified any Areas of Potential Environmental Concern ('APECs') on the Site or surrounding area.

6.0 Summary

During the Environmental Overview, Wood has not identified any environmental concerns associated with current and past activities on the Site or surrounding area.

7.0 References

Abacus Datagraphics Ltd. 2018. *AbaData database*. Information retrieved 20 April 2021 Alberta Environment and Parks. 2018.

Alberta Water Wells Alberta Water Wells database. Information retrieved 20 April 2021.

Alberta Environment and Parks. 2018. ESAR database. Information retrieved 20 April 2021.

Fenton, M.M., E.J. Waters, S.M. Pawley, N. Atkinson, D.J. Utting, and K. Mckay. 2013. *Surficial Geology of Alberta*; Alberta Energy Regulator/Alberta Geological Survey (AER/AGS), Map 601, scale 1:1 000 000.

Natural Resources Canada, Centre for Topographic Information. 2001. *Camrose, Alberta, 83 H/2*, Edition 4, Scale 1:50 000.

Prior, G.J. 2013. *Notes to Accompany Map 600: Bedrock Geology of Alberta*; Alberta Energy Regulator / Alberta Geological Survey (AER/AGS), Open File Report 2013-02.

Prior, G.J., B. Hathway, P.M. Glombick, D.I. Pana, C.J. Banks, D.C. Hay, C.L. Schneider, M. Grobe, R. Elgr, and J.A. Weiss (compilers). 2013. *Bedrock Geology of Alberta, Alberta Geological Survey,* Alberta Energy Regulator, Map No. 600, Scale 1:1 000 000. Edmonton, Alberta.

8.0 Closure and Limitations

This report was prepared for the exclusive use of The City of Edmonton in accordance with the proposed work scope prepared for this site (20PROPTRNP.0384, EE26000-1747), and written requests from Ben Gibson and generally accepted assessment practices. It is intended to provide an Environmental Overview of the Site located in Mill Creek Ravine in Edmonton, Alberta, at the time of the Site inspection. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from Wood will be required. With respect to third parties, Wood has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

The report is based on data and information collected during the Environmental Overview of the property conducted by Wood. It is based solely on the conditions of the Site encountered at the time of the Site reconnaissance on 05 May 2021, supplemented by a review of historical information and data obtained by Wood as described in this report. Except as otherwise may be specified, Wood disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to Wood after the time during which Wood conducted the Environmental Overview.

In reviewing the Site, Wood has relied in good faith on information provided by the publicly available resources noted in this report. Wood has assumed that the information provided is factual and accurate Wood accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of managers of these resources.

Wood makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters discussed in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel. This report is also subject to the further Standard Limitations contained in Appendix H.

Respectfully submitted,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Kristine Connor
Environmental Site Assessor

Reviewed by:

PROFESSIONAL ENGINEER ALBERTA
Ian B. MacLeod

27MAY21

PERMIT TO PRACTICE
WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS
RM SIGNATURE: Ian B. MacLeod
RM APEGA ID #: 46997
DATE: 27 MAY 21
PERMIT NUMBER: P004546
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Ian B. MacLeod, P.Eng. APEGA I.D. No. 46997
Principal Environmental Engineer

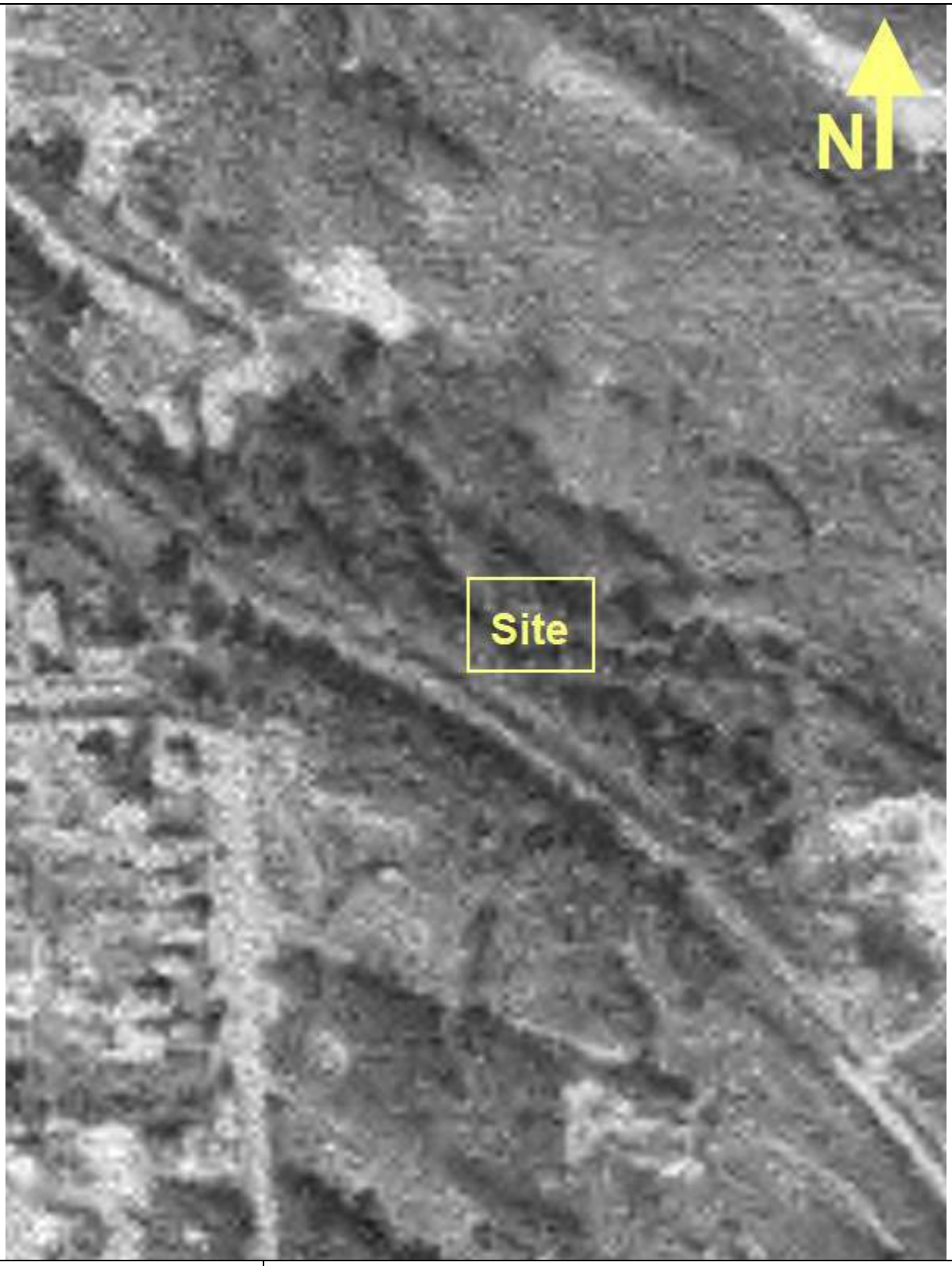
Appendix A

Aerial Photographs

wood.

1920 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:2,200



wood.

1950 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:1,700

wood.

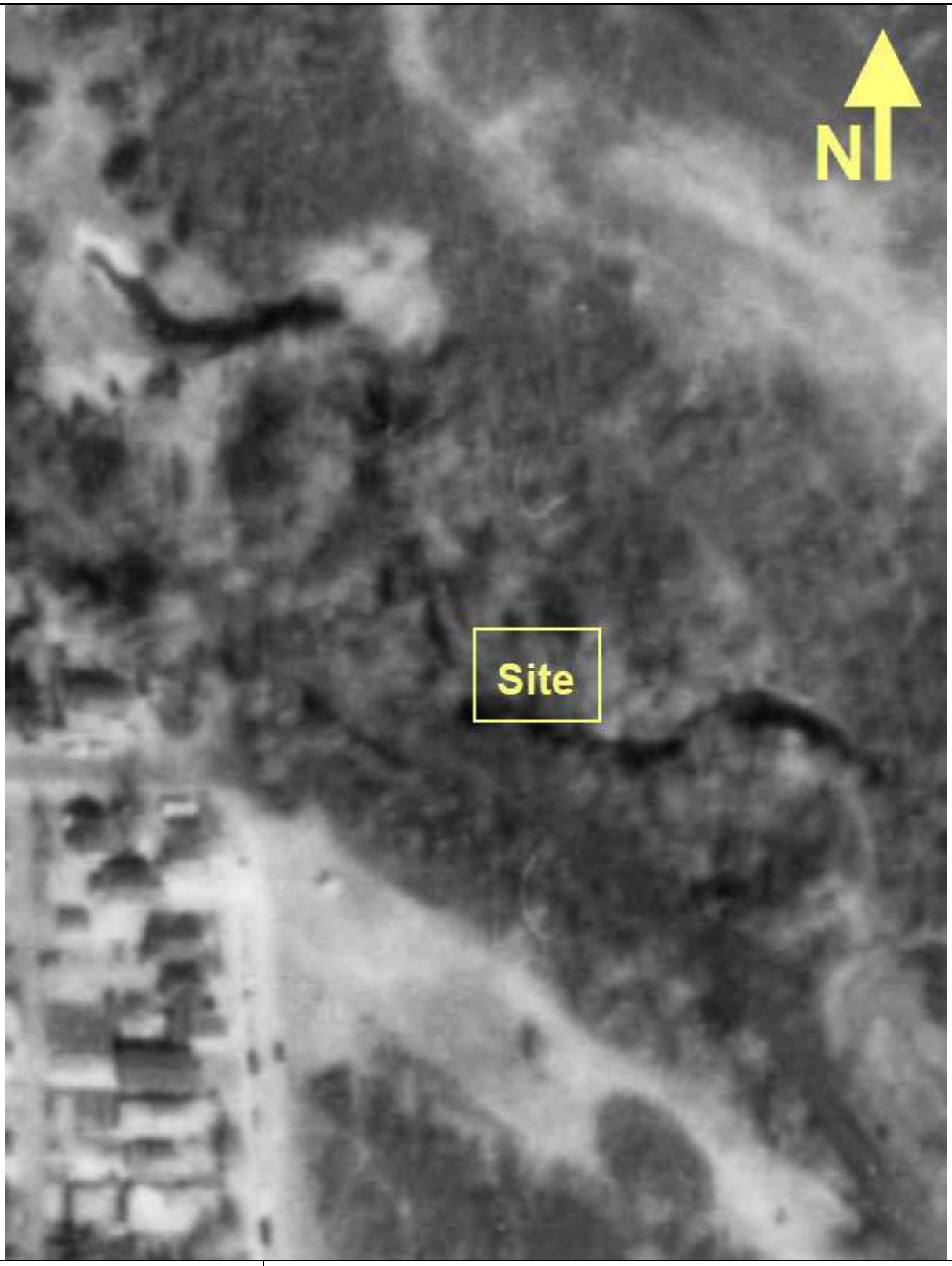
1962 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:1,700

wood.

1967 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:1,700



wood.

1974 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:1,700

wood.

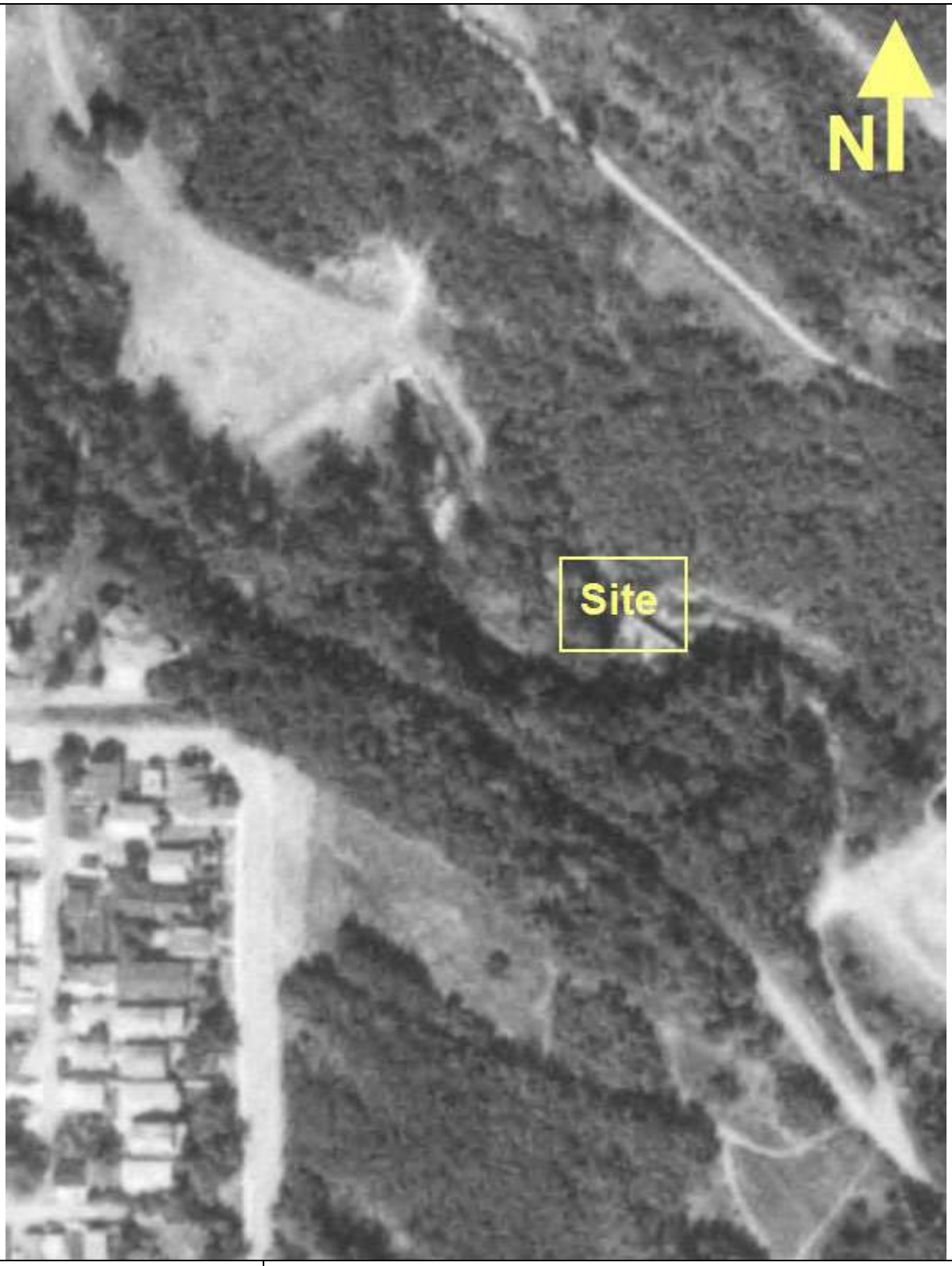
1978 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:1,700

wood.

1985 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

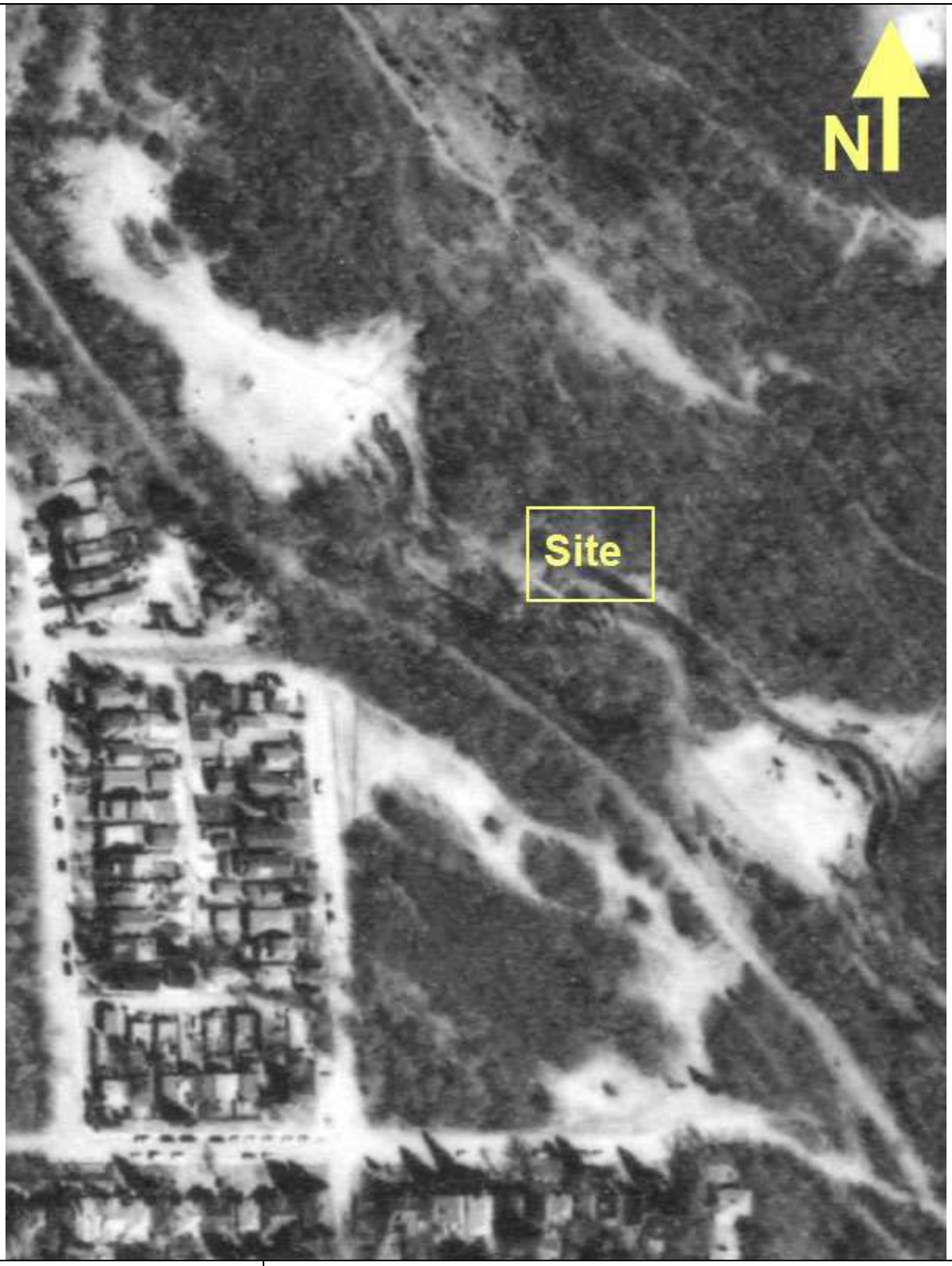
Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:1,700



wood.

1992 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

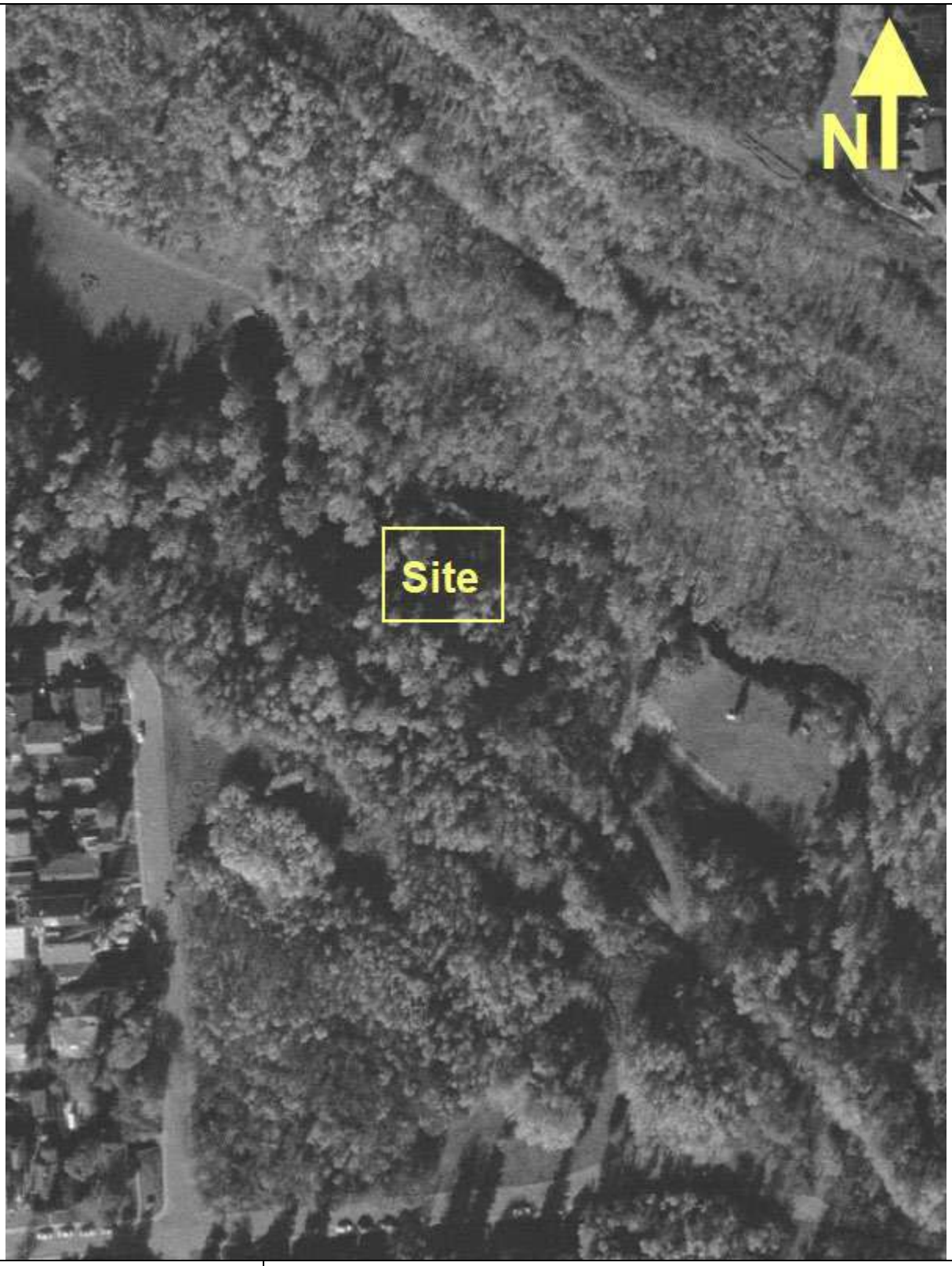
Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:1,700



wood.

2001 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:1,700



wood.

2008 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:1,800

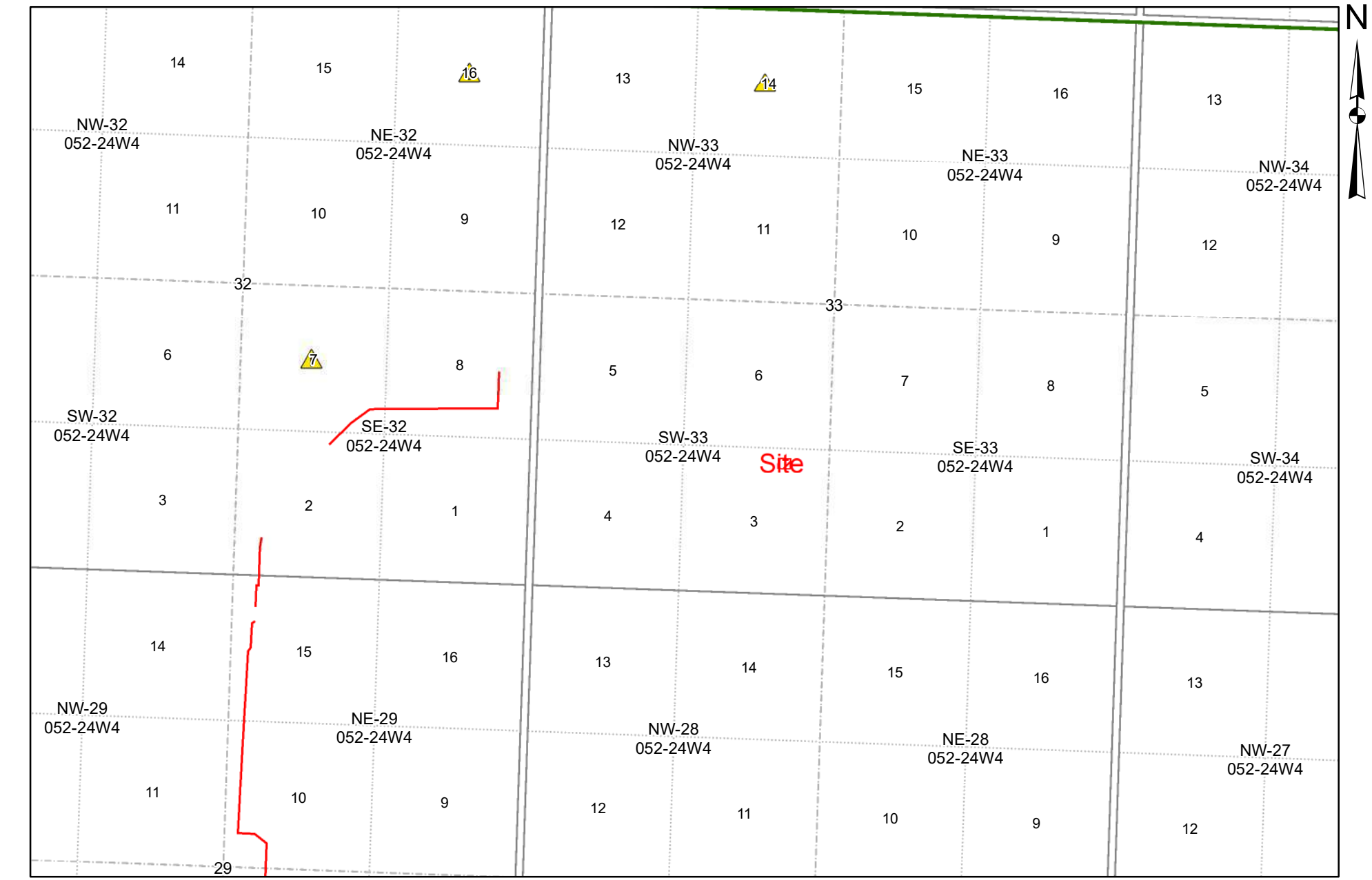
2014 Aerial Photograph Showing Site Location
Mill Creek Bridge
Edmonton, Alberta

Drawn: GK	Project No.: EB213002.0200.0600	Scale: ~1:1,500

Appendix B

Map - Pipelines and Oil Wells/Batteries

EB213002.0200.0600



Appendix C

Map - Coal Mines

Alberta Energy Regulator

Coal Mine Map Viewer

Search...

Getting Around | Annotate | Analysis

Tool Labels

Distance | Area | Edit | Erase | Clear

Measure

Coal Mine Number: 0177

Details

Coal Mine Number
0177

Coal Mine Name
Twin City

Owner
Twin City Coal Co. Ltd.

Coal Mine Type
Underground

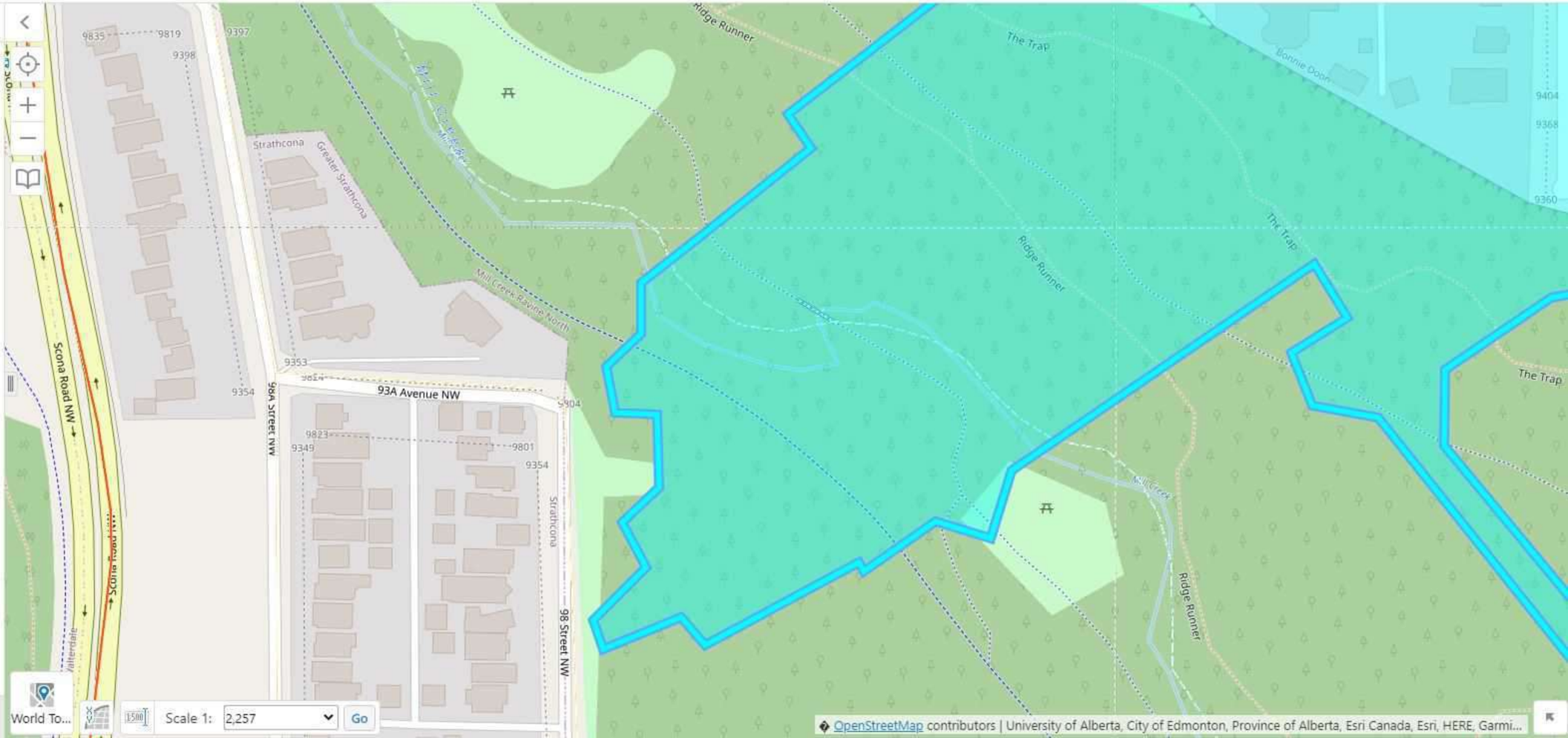
Status
Abandoned

Mining Method
Room and Pillar

Graphic Type
Polygon

Uncertain Location
No

Comments
Mined 2 seams. Some longwall mining took place.

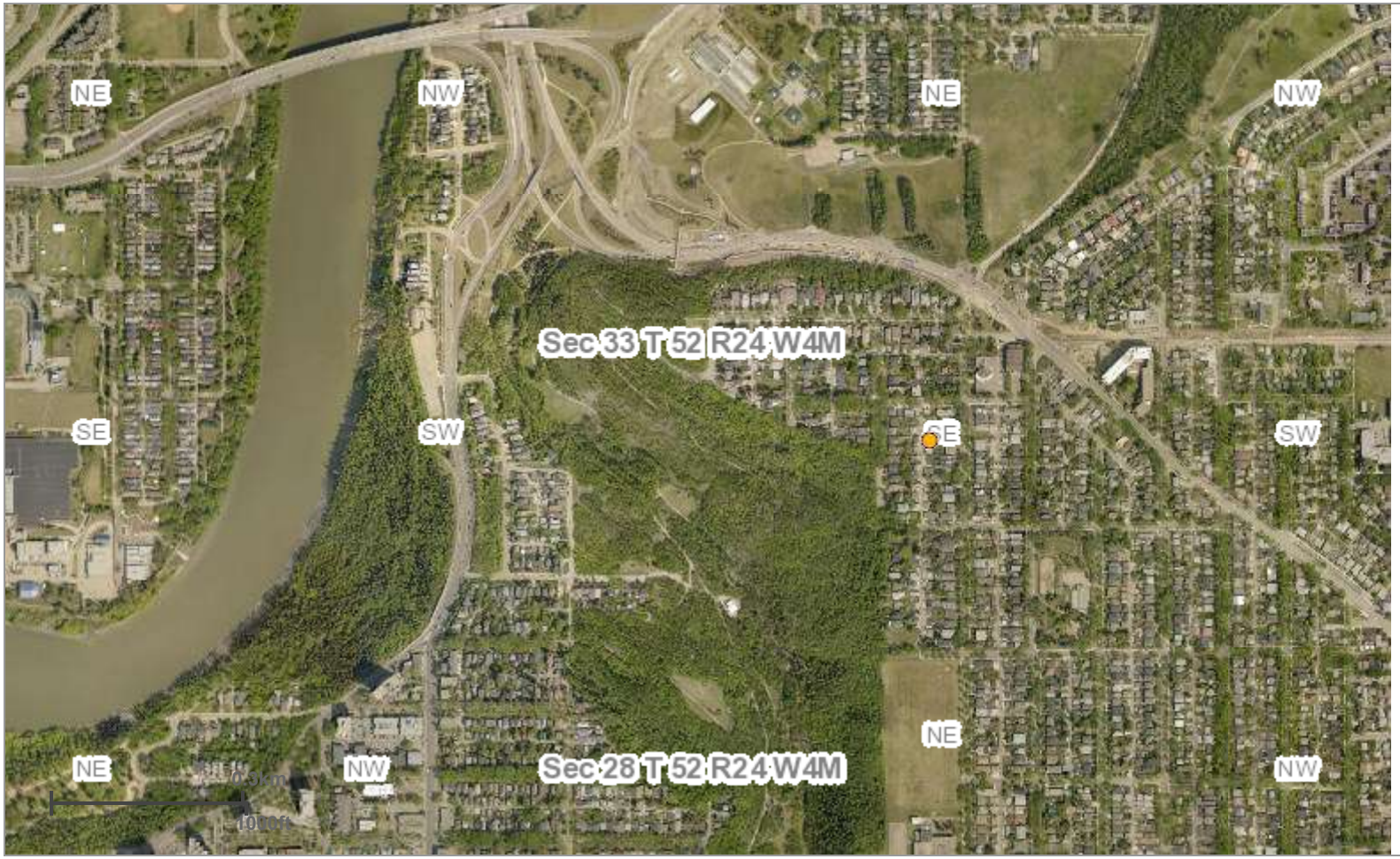


Welco... | Layers | Coal ... | Down...

World To... | Scale 1: 2,257 | Go

Appendix D

Map – Water Wells



Alberta Water Well Information Database Map

Projection
Web Mercator (Auxillary Sphere)

Datum
WGS 84

Date
4/20/2021, 1:56:53 PM

Legend
- Groundwater Drilling Report
- Baseline Water Well Report

http://groundwater.alberta.ca/WaterWells/d/

Reconnaissance Report

View in Metric

Export to Excel

Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

GIC Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)	SC_DIA (in)
79275	NW	33	52	24	4	ELLIOTT DRLG	1977-07-18	200.00	New Well	Domestic		11		ORAM, BILL	53.00	2.50	4.50
79276	14	33	52	24	4	UNKNOWN DRILLER	1920-01-01	0.00	Chemistry	Contamination Invest.	1			RESEARCH COUNCIL			0.00
79277	SE	33	52	24	4	UNKNOWN DRILLER	1928-09-01	294.00	New Well-Decommissioned	Observation		9		N.W. BREWING CO			0.00

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 79277
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1964/01/01

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
N.W. BREWING CO		EDMONTON	AB	CA	

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	33	52	24	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.530200 Longitude -113.474000
How Location Obtained
Not Verified

Elevation 665.38 m
How Elevation Obtained
Estimated

Drilling Information

Method of Drilling
Drilled

Proposed Well Use
Observation

Type of Work
New Well-Decommissioned
View Decommissioning Report

Plugged 1928/10/01
Plugged with Unknown
Amount

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
8.53		Blue Clayey Surficial
10.67		Sand
48.77		Clayey Shale & Coal
60.96		Shale
61.87		Coal
85.34		Shale & Coal
86.56		Soft Shale & Coal
89.00		Soft Shale
89.61		Sandstone

Yield Test Summary

Measurement in Metric

Recommended Pump Rate L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
89.61 m		1928/09/01	1928/09/01

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	89.61

Surface Casing (if applicable)
Unknown
Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Bottom at : 0.00 m

Well Casing/Liner
Unknown
Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Top at : 0.00 m
Bottom at : 0.00 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)

Perforated by Unknown

Annular Seal Unknown
Placed from 0.00 m to 0.00 m
Amount
Other Seals

Type	At (m)

Screen Type
Size OD : 0.00 cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings Bottom Fittings

Pack
Type Unknown Grain Size
Amount Unknown

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 79277
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1964/01/01

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
N.W. BREWING CO		EDMONTON	AB	CA	

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	33	52	24	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.530200 Longitude -113.474000
How Location Obtained: Not Verified

Elevation 665.38 m
How Elevation Obtained: Estimated

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level cm
Is Artesian Flow
Rate L/min
Is Flow Control Installed
Describe

Recommended Pump Rate L/min
Recommended Pump Intake Depth (From TOC) m
Pump Installed
Type
Depth m
Make
H.P.
Model (Output Rating)

Did you Encounter Saline Water (>4000 ppm TDS)
Depth m
Gas
Depth m
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to ESRD
Sample Collected for Potability
Submitted to ESRD

Additional Comments on Well

SALT WAS FOUND @ 294' SO WELL WAS ABANDONED. NO LOCATION IN SECTION GIVEN SO SE USED.

Yield Test

Taken From Ground Level | Measurement in Metric

Test Date	Start Time	Static Water Level
		m

Method of Water Removal

Type
Removal Rate L/min
Depth Withdrawn From m

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner

Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 79276
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
RESEARCH COUNCIL	DUMP SITE, BELOW MC HOTEL, EDMONTON				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	14	33	52	24	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.539338 Longitude -113.482820
How Location Obtained
Not Verified

Elevation 618.74 m
How Elevation Obtained
Estimated

Drilling Information

Method of Drilling
Drilled

Proposed Well Use
Contamination Invest.

Type of Work
Chemistry

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description

Yield Test Summary

Measurement in Metric

Recommended Pump Rate L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
0.00 m		1920/01/01	1920/01/01

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	0.00

Surface Casing (if applicable)

Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Bottom at : 0.00 m

Well Casing/Liner

Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Top at : 0.00 m
Bottom at : 0.00 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)

Perforated by

Annular Seal

Placed from 0.00 m to 0.00 m
Amount

Other Seals

Type	At (m)

Screen Type

Size OD : 0.00 cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings
Bottom Fittings

Pack

Type
Grain Size
Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner

Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 79275
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
ORAM, BILL		NAMAO			

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NW	33	52	24	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.537530 Longitude -113.485854
How Location Obtained: Not Verified

Elevation 647.70 m
How Elevation Obtained: Estimated

Drilling Information

Method of Drilling
Rotary

Proposed Well Use
Domestic

Type of Work
New Well

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
6.10		Brown Clay
9.75		Blue Clay
12.19		Coal
15.24		Shale
24.38		Hard Sand
25.91		Shale
27.13		Coal
36.58		Shale
54.86		Shale
57.91		Coal
60.96		Shale

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 0.00 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
1977/07/18	11.37	16.15

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
60.96 m		1977/07/16	1977/07/18

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	60.96

Surface Casing (if applicable)
Steel
Size OD : 11.43 cm
Wall Thickness : 0.396 cm
Bottom at : 60.96 m

Well Casing/Liner
Steel
Size OD : 8.89 cm
Wall Thickness : 0.635 cm
Top at : 0.00 m
Bottom at : 60.96 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
24.38	60.96	0.000		0.00

Perforated by Torch

Annular Seal
Placed from 0.00 m to 0.00 m
Amount

Other Seals

Type	At (m)

Screen Type
Size OD : 0.00 cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings
Bottom Fittings

Pack
Type
Grain Size
Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
ELLIOTT DRLG

Copy of Well report provided to owner

Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID 79275
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
ORAM, BILL		NAMAO			

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NW	33	52	24	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.537530 Longitude -113.485854
How Location Obtained: Not Verified

Elevation 647.70 m
How Elevation Obtained: Estimated

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level: cm
Is Artesian Flow:
Rate: L/min
Is Flow Control Installed:
Describe:

Recommended Pump Rate: 0.00 L/min
Recommended Pump Intake Depth (From TOC): 54.86 m
Pump Installed:
Depth: m
Type:
Make:
H.P.:
Model (Output Rating):

Did you Encounter Saline Water (>4000 ppm TDS):
Depth: m
Gas:
Depth: m
Well Disinfected Upon Completion:
Geophysical Log Taken:
Submitted to ESRD:

Sample Collected for Potability:
Submitted to ESRD:

Additional Comments on Well

Yield Test

Taken From Ground Level
Measurement in Metric

Test Date	Start Time	Static Water Level
1977/07/18	12:00 AM	16.15 m

Depth to water level

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)

Method of Water Removal

Type: Bailer
Removal Rate: 11.37 L/min
Depth Withdrawn From: 54.86 m

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well: UNKNOWN NA DRILLER
Certification No: 1
Company Name: ELLIOTT DRLG
Copy of Well report provided to owner
Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID 79276
GoA Well Tag No.
Drilling Company Well ID
Date Report Received
GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
RESEARCH COUNCIL	DUMP SITE, BELOW MC HOTEL, EDMONTON				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	14	33	52	24	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.539338 Longitude -113.482820
How Location Obtained: Not Verified

Elevation 618.74 m
How Elevation Obtained: Estimated

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level: cm
Is Artesian Flow:
Rate: L/min
Is Flow Control Installed:
Describe:

Recommended Pump Rate: L/min
Recommended Pump Intake Depth (From TOC): m
Pump Installed:
Depth: m
Type:
Make:
H.P.:
Model (Output Rating):

Did you Encounter Saline Water (>4000 ppm TDS):
Depth: m
Well Disinfected Upon Completion:
Gas:
Depth: m
Geophysical Log Taken:
Submitted to ESRD:
Sample Collected for Potability:
Submitted to ESRD: Yes

Additional Comments on Well

SAMPLE TAKEN FROM OLD DUMP SIGHT NEAR THE MCDONALD HOTEL. 3 MIN 20 SEC TO FILL 1L BOTTLE. SAMPLE TAKEN @ BEDROCK.

Yield Test

Taken From Ground Level | Measurement in Metric

Test Date	Start Time	Static Water Level
		m

Method of Water Removal

Type:
Removal Rate: L/min
Depth Withdrawn From: m

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner

Date approval holder signed

Appendix E

ESAR and ASCA Search

The ESA marker represents an approximate location of a site where the Government of Alberta has received scientific and/or technical information. The marker is an arbitrary, 40 meter diameter circle centered on the property for which this information is attached. For locations or other site information, see the document results table

Alberta Environment and Parks

Spatial Search provided by the Alberta Land Titles SPIN 2 System

Search Form | Map Search

A designated location identifies a site where Alberta Environment and Parks has received scientific or technical information for that site and does not imply anything regarding the current state or condition of the site. Please refer to the studies and reports to determine the condition of the site.

ATS

Meridian W -	4
Range	24
Township	52
Section	33
[Quarter]	

Search

- PBL
- Address
- Place Name
- Coordinate
- Help with Map

Map Views | Map Information | Map Navigation | Map Tools

Environmental Site Assessment Repository (ESAR)

- Search Form
- Map Search
- Download Complete ESA list (Updated Weekly)

ATS Search

► SHOW HELP

W 4 - 24 - 52 - 33 -[ ] -[ ] Search

Format: MER-RGE-TWP-SEC-[QTR]-[LSD]
[ ] denotes that the quarter section and legal subdivision are optional.

PBL Search

► SHOW HELP

Plan: Block: [ ] Lot: [ ] Search

Format: Plan - [Block] - [Lot]
[ ] denotes that the Block and/or Lot are optional.

Note:
An ESA document does not necessarily mean the site is, or ever was, contaminated. Please refer to the studies and reports to determine the condition of the site.
Place Name, **Street Address**, and **Coordinate Searches** are avaliable on the map page

-A marker identified as ESA is the location of a site where Alberta Environment and Parks has received scientific and/or technical information

-A marker identified as REC is the location of a site where Alberta Environment and Parks has received an application for a reclamation certificate.

Comments and questions can be directed to:
ESAR-Support@gov.ab.ca

Search Results

0 Result(s)

SHOW DETAILS

No results found for this ATS.

Document Results

SHOW DETAILS

Document Delivery

◉ Download ○ Email

Deliver Selected Documents

- Privacy
- Government Expense Disclosures

Alberta Safety Codes Authority

A Division of the Safety Codes Council

May 6, 2021

Ms. Kristine Connor
Wood PLC
5681 70 St
Edmonton AB T6B 3P6

EMAIL: kristine.connor@woodplc.com

Re: ASCA Storage Tank Search – Your File No. EB213002

Dear Ms. Connor,

As per your search request dated May 4, 2021, Alberta Safety Codes Authority (ASCA) has searched the storage tank database for existing and former installations of storage tank systems, as defined by the Fire Code, including those known to be inside structures at the following address:

1. Lot 1B, Block 1, Plan 2022463, Section 33, Township 54, Range 24, Meridian 4, Edmonton AB

The search of the storage tank database determined no records were available for the address requested.

The Freedom of Information and Protection of Privacy Act governs the information provided. Please note that the database is ***not*** complete. The main limitation of the database is that it only includes information reported through registration and permitting or a survey of abandoned sites completed in 1992 and should not be considered a comprehensive inventory of all past or present storage tank sites. ASCA's storage tank systems database is solely maintained based on information provided by owners and or operators of storage tank systems; therefore, the database may not reflect information related to all existing or former storage tank systems in Alberta. Further information on storage tank systems or investigations involving a spill/release or contamination may be filed with the local fire service or Alberta Environment.

Regards,

ASCA Associate
ascatanks@safetycodes.ab.ca

Appendix F

Site Photographs

Photograph 1: Signage on Site indicating trail closure due to flooding.

Photograph 2: Inlet structure connecting Mill Creek Ravine to the North Saskatchewan River.

Photograph 3: Bridge 278 as viewed from the southeast.

Photograph 4: Bridge 278 as viewed from the southwest.

Photograph 5: Bridge 278 as viewed from the south.

Photograph 6: A portion of Mill Creek Ravine as viewed from the bridge looking southwest.

Photograph 7: Erosion visible along the creek bank.

Appendix G

Site Inspection Checklists

PHASE I ENVIRONMENTAL SITE ASSESSMENT CHECKLISTS

GENERAL INFORMATION PROJECT # EG213002.020

Property Name: _____

Site Address: Portion of 9303-98 Street, Edmonton, Alberta

Telephone: (___) _____

Legal Description: Plan 2022463 Blk 1 Lot(s) 1B

Municipality/Township/County: City of Edmonton

Lsd. _____ Section _____ Township _____ Range _____ W _____ Meridian

Size of Property _____ HA/ACRES

Zoning: North Saskatchewan River Valley and Ravine System

Any Buildings / Structures on Property? ___ no ✓ yes: 1 how many?

Describe:

#1 Bridge
#2
#3
#4

Site Contact(s): _____

Manager: _____

Current Owner(s): City of Edmonton

Current Occupant(s): _____

Date current owner took title: _____

Prior **Occupants** of Property (name, business, dates)

none

What is the most recent business activity at the site?

parkland

Site utilities:

___ electricity: ___ aboveground ___ underground
___ telephone: ___ aboveground ___ underground
__/__ none ___ natural gas
___ sanitary sewer ___ storm sewer
___ municipal water supply
___ other: _____

Is the property, or any of the adjacent properties, on a federal, provincial or municipal list of hazardous waste or contaminated sites?

__/__ no ___ yes: _____

Is the property the subject of environmental litigation, regulatory citations, or enforcement action?

__/__ no ___ yes: _____

Are there any adverse press reports or complaints on file concerning the property?

__/__ no ___ yes: _____

If copy of site plan is available, please attach.

Completed By: _____ KC

Date: May 5, 2021 05May21

Temp = 12°C

SITE EXTERIOR **PROJECT #** EB 213002.020

Uses of property

What are/were the past and current uses of the property (c for current; p for past)

___ vacant, developed land
___ vacant, undeveloped land
___ industrial _____
___ commercial _____
___ recreational _____
___ agricultural: ___ cropland ___ pasture ___ hayland ___ irrigated
p/c natural: ___/___ forest ___ prairie ___ other Mill Creek
___ residential
___ other _____
___ unknown

Site Characteristics

Topography

___ flat land
___/___ hilly terrain
___ high elevation relative to adjacent lands
___ low elevation relative to adjacent lands
___ dry land
___ swampy land
___ rock outcrops
___ sloped: slope direction/drainage _____
___ evidence of fill

Storm Drainage

___ well-drained
___/___ naturally drained
___ controlled, piped drainage
___/___ controlled, open drainage
___ poorly drained: _____

Receiver:

___ municipal storm sewer
___ municipal sanitary sewer
___/___ general environment
___ collection pond
___/___ surface water body: Mill Creek

Locations of catch basins: On-Site _____
Adjacent Roads _____

Vegetation: ✓ Yes ___ No

Type
- ✓ Maintained lawn
- ✓ Forest
- ___ Invasive vegetation
- ___ Decorative shrubs/trees
- ___ other: _____

Quality of growth Not apparent due to seasonal conditions

Signs of stress or damage Stress associated with flooding was identified

Describe the ground keeping / vegetation management program. List herbicides and pesticides used and stored on site.

_____

_____

Surface Description

___ asphalt / concrete ___ sand ___ unknown
✓ clay ___ silt
✓ topsoil ___ rocks
___ gravel
___ other: _____

Groundwater

Depth to groundwater: <1 m ___ not known
Direction of groundwater flow NW ✓ estimated ___ not known
Quality of groundwater: _____

Surface Water (on the property) ___ no surface water
Describe: Mill Creek
Quality: _____
Is there standing water on the site? ___ no ✓ yes

Due to:
- ✓ impervious surfaces ___ subsidence
- ✓ plugged drainage systems ___ abnormal water table
- ✓ surface contours
- ___ other? _____

Drinking Water Source: none

___ Municipal system ___ Trucked in / cistern / bottled
___ Well - treated ___ Well - untreated
___ Surface water - treated ___ Surface water - untreated

Quality: _____

Environmental Risks

PROJECT # EG 21300 2.02 D

Describe any easements on the property (roadways, pipelines) with potential environmental implications.

✓ none known

Are there any obvious physical signs of contamination observed on or around the property?

- ✓ none observed
- ___ stained soil or concrete
- ___ vegetation damage
- ___ evidence of dumping
- ___ ash or blackened areas
- ___ oily sheens or discolouration of surface water
- ___ unnatural soil
- ___ foul or unusual odours
- ___ leachate seeps
- ___ trash / debris
- ___ other: _____

Describe: _____

Describe any historical spills that have occurred on the property. Describe any other reported contamination of the soil on the property. (Provide copies of available documentation.)

✓ none known

Have underground or aboveground storage tanks (USTs/ASTs) been removed from the property? If so, describe contents, location, construction, known contamination associated with these tanks, etc. (Provide copies of available documentation).

✓ none removed

Are wastes incinerated on-site? ✓ no ___ yes: Describe where, what, how.

Describe any compliance orders, enforcement actions, citations or suits (e.g. sewer-use infraction, remediation of groundwater or soil, etc.).

✓ none

Have any soil samples been analyzed for any contaminants? ___ unknown ✓ no ___ yes
Describe test results for contaminants:

Is there any evidence of soil erosion? ___ no ✓ yes; describe where, severity, controls:
Soil erosion associated with seasonal flooding was observed along the creek channel and surrounding lands

Provide, if available, copies of any company audits, internal company audits, previous environmental evaluations, or geotechnical (soils) reports.
None known

List storage pits, impoundments, lagoons, etc. Describe: size, location, materials of construction, purpose, contents, lining, general conditions, freeboard, leaks.
✓ none

Describe any excavations, quarries, mounds or pits on the site.
✓ none

Describe site housekeeping. ___ good ✓ fair ___ poor

Describe the uses of surface and groundwater on the property and by adjacent properties.
none

Describe any soil, air or water quality monitoring: Indicate which are required according to the operating licence or approval.
none

Completed By:
Date: May 5, 2021

ADJACENT PROPERTIES PROJECT # EAR213002.020

North

Land Use

___ vacant, developed land
___ vacant, undeveloped land
___ agricultural: ___ cropland ___ pasture ___ hayland
___ commercial
___ industrial
___ residential
/ natural: ___ forest ___ prairie ___ other: _____
___ other: _____
___ unknown

Adjacent roads Mill Creek Trail system
Topography hilly land
Surface water drainage direction northwest
Soil (disturbance/discolouration) none

Do the adjacent properties have any activities, chemical storage areas, above or underground storage tanks, waste dumps, or other conditions that could affect the subject property?

___ yes (give details) / no ___ unknown

Distance (metres) to nearest (within 500 m):

>500 service or bulk station	>500 chemical plant
>500 landfill or dump	>500 heavy manufacturing
>500 liquid storage terminal	>500 railway
_____ other: _____	

Names of neighbouring businesses:

South

Land Use

___ vacant, developed land
___ vacant, undeveloped land
___ agricultural: ___ cropland ___ pasture ___ hayland
___ commercial
___ industrial
___ residential
✓ natural: ✓ forest ___ prairie ___ other: _____
___ other: _____
___ unknown

Adjacent roads Mill Creek Trail system
Topography hilly terrain
Surface water drainage direction Northwest
Soil (disturbance/discolouration) none

Do the adjacent properties have any activities, chemical storage areas, above or underground storage tanks, waste dumps, or other conditions that could affect the subject property?

___ yes (give details) ✓ no ___ unknown

Distance (metres) to nearest (within 500 m):

>500 service or bulk station
>500 landfill or dump
>500 liquid storage terminal
_____ other: _____
>500 chemical plant
>500 heavy manufacturing
>500 railway

Names of neighbouring businesses:

East

Land Use

___ vacant, developed land
___ vacant undeveloped land
___ agricultural: ___ cropland ___ pasture ___ hayland
___ commercial
___ industrial
___ residential
✓ natural: ✓ forest ___ prairie ___ other: _____
___ other: _____
___ unknown

Adjacent roads Mill Creek Trail system
Topography hilly terrain
Surface water drainage direction Northwest
Soil (disturbance/discolouration) none

Do the adjacent properties have any activities, chemical storage areas, above or underground storage tanks, waste dumps, or other conditions that could affect the subject property?

___ yes (give details) ✓ no ___ unknown

Distance (metres) to nearest (within 500 m):

>500 service or bulk station
>500 landfill or dump
>500 liquid storage terminal
_____ other: _____
>500 chemical plant
>500 heavy manufacturing
>500 railway

Names of neighbouring businesses:

West

Land Use

___ vacant, developed land
___ vacant undeveloped land
___ agricultural: ___ cropland ___ pasture ___ hayland
___ commercial
___ industrial
___ residential
✓ natural: ✓ forest ___ prairie ___ other: _____
___ other: _____
___ unknown

Adjacent roads Mill Creek Trail system
Topography hilly terrain
Surface water drainage direction Northwest
Soil (disturbance/discolouration) none

Do the adjacent properties have any activities, chemical storage areas, above or underground storage tanks, waste dumps, or other conditions that could affect the subject property?

___ yes (give details) ✓ no ___ unknown

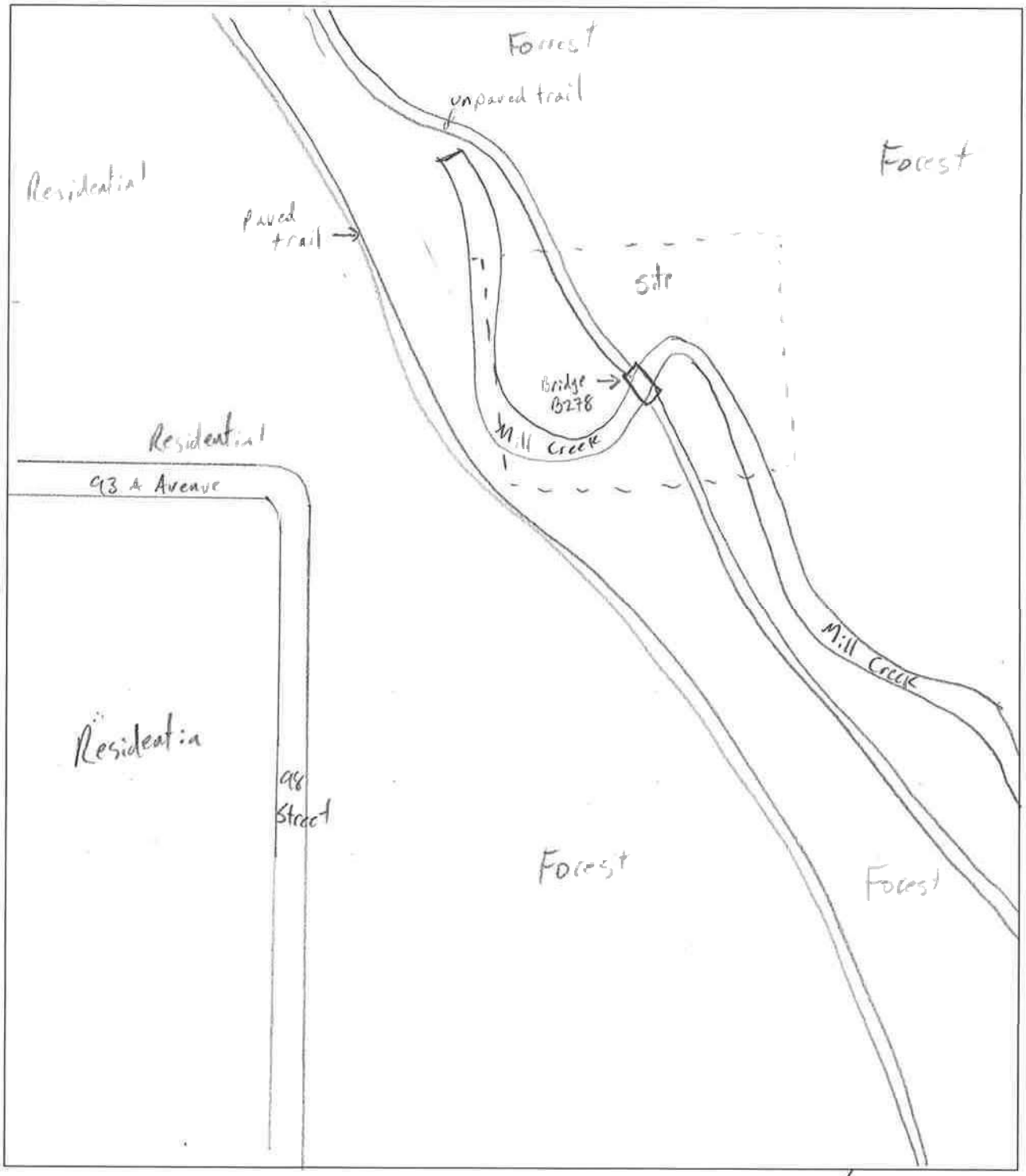
Distance (metres) to nearest (within 500 m):

>500 service or bulk station
>500 landfill or dump
>500 liquid storage terminal
_____ other: _____
>500 chemical plant
>500 heavy manufacturing
>500 railway

Names of neighbouring businesses:

Completed By _____
Date: May 5, 2021

Field sketch outlining site and surrounding properties PROJECT # EB213002.020



Completed By: [signature]
Date: May 5, 2021

Environmental Issues Master Inventory: PROJECT # EB 213002025

	Yes	No
1. Are there any air emissions other than those from heating appliances?		✓
2. Is asbestos suspected to be present in the building?		✓
3. Are there any chemical-using activities on the Site? Chemicals in containers or drums?		✓
4. Are chemicals, oils or fuels, or hazardous or bio-hazardous wastes stored:		
4a. in aboveground storage tanks?		✓
4b. in underground storage tanks?		✓
5. Are there air conditioners, large freezers or chillers, or Halon fire extinguishers on the Site which are known or suspected to contain ozone-depleting substances?		✓
6. Are there transformers, capacitors, gauges, switches or fluorescent light ballasts known or suspected to contain PCBs?		✓
7. Are solid wastes, other than domestic trash, generated?		✓
8. Are hazardous or bio-hazardous wastes generated?		✓
9. Does wastewater discharge locally (eg. septic tank, local treatment system)?		✓
Are liquid waste streams, other than domestic sewage, generated?		✓
10. Has there been reported or was there observed poor indoor human environment?		✓
11. Are there any areas of known or suspect mould or conditions conducive to mould?		✓
12. Are there any known or suspected dumps or landfills on the site?		✓
13. Are there any dry cleaning facilities currently on the site?		✓

Complete the supplemental checklist with the corresponding number for all "YES" answers above. Each item on the supplemental checklists must be rated as satisfactory (SAT), unsatisfactory (U/S) or not applicable (N/A).

Completed by: [signature]

Date: May 5, 2021

Appendix H

Limitations

STANDARD LIMITATIONS

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:

   (a) The Standard Terms and Conditions which form a part of our Professional Services Contract or which have been acknowledged;
   (b) The Scope of Services;
   (c) Time and Budgetary limitations as described in our Contract; and
   (d) The Limitations stated herein.

2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.

3. The conclusions presented in this report were based, in part, on visual observations of the site and attendant structures. Our conclusions cannot and are not extended to include those portions of the site or structures, which were not reasonably available, in Wood's opinion, for direct observation.

4. The environmental conditions at the site were assessed, within the limitations set out above, having due regard for applicable environmental regulations as of the date of the inspection. A review of compliance by past owners or occupants of the site with any applicable local, provincial or federal by-laws, orders-in-council, legislative enactments and regulations was not performed.

5. The site history research included obtaining information from third parties and employees or agents of the owner. No attempt has been made to verify the accuracy of any information provided, unless specifically noted in our report.

6. Where testing was performed, it was carried out in accordance with the terms of our contract providing for testing. Other substances, or different quantities of substances testing for, may be present on site and may be revealed by different or other testing not provided for in our contract.

7. Because of the limitations referred to above, different environmental conditions from those stated in our report may exist. Should such different conditions be encountered, Wood must be notified in order that it may determine if modifications to the conclusions in the report are necessary.

8. The utilization of Wood's services during the implementation of any remedial measures will allow Wood to observe compliance with the conclusions and recommendations contained in the report. Wood's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.

9. This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report, is the sole responsibility of such third party. Wood accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set our therein.

10. This report is not to be given over to any third party for any purpose whatsoever without the written permission of Wood.

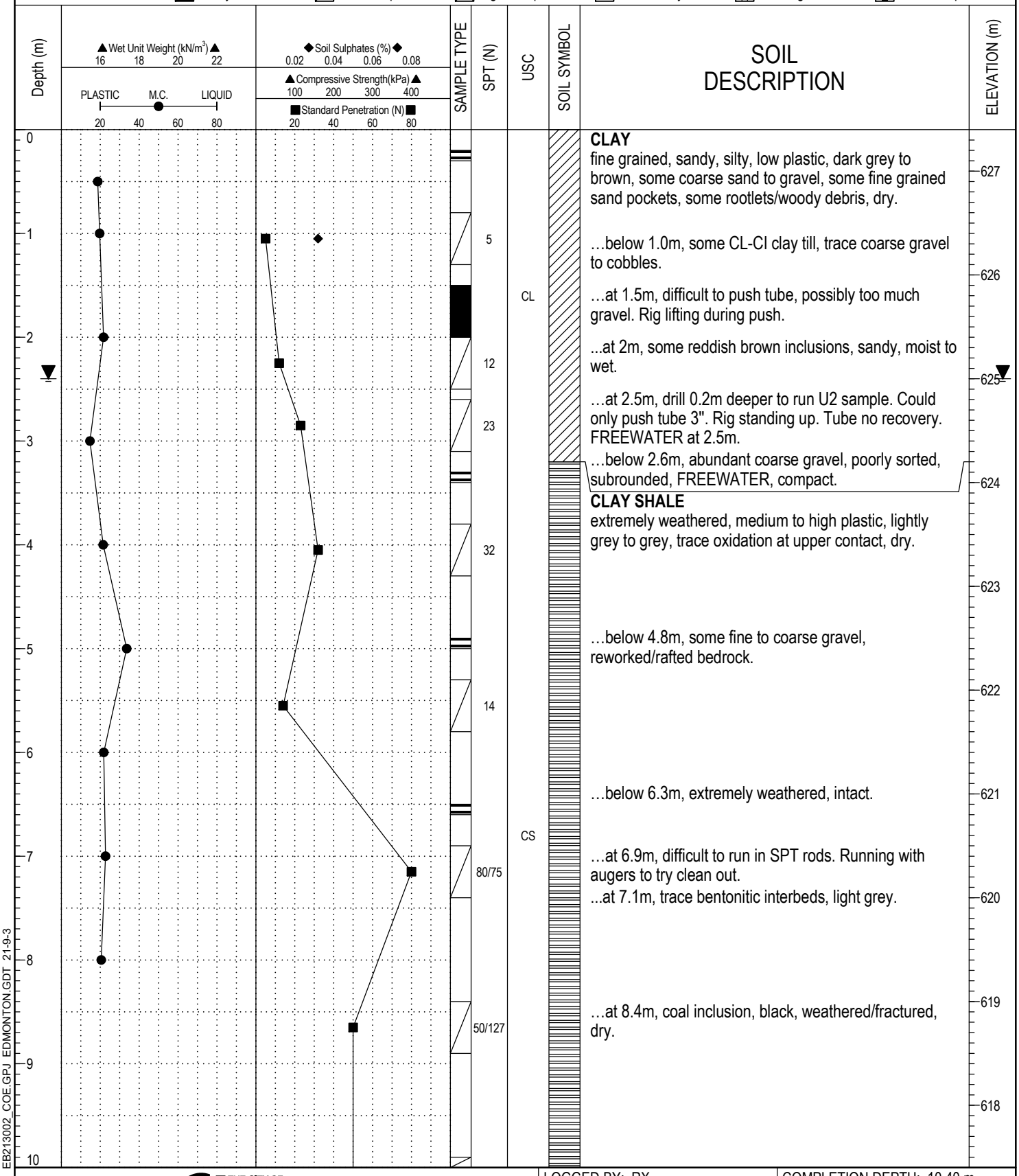
    Provided that the report is still reliable, and less than 12 months old, Wood will issue a third-party reliance letter to parties that the client identifies in writing, upon payment of the then current fee for such letters. All third parties relying on Wood's report, by such reliance agree to be bound by our proposal and Wood's standard reliance letter. Wood's standard reliance letter indicates that in no event shall Wood be liable for any damages, howsoever arising, relating to third-party reliance on Wood's report. No reliance by any party is permitted without such agreement.

Appendix F

Borehole Logs

Mill Creek Pedestrian Bridge Replacement Project	Mill Creek Ravine Trail	BOREHOLE NO: **BH21-01**
Integrated Infrastructure Services	UTM ZONE: - N5933130 E34414	PROJECT NO: EB213002
START DATE: 21-6-30	931+36+18/19	ELEVATION: 627.4 m

SAMPLE TYPE ■ Shelby Tube ⧄ Drive Sample ☒ Auger Sample ☰ No Recovery ▥ A-Casing ◧ Cored Sample



CLAY
fine grained, sandy, silty, low plastic, dark grey to brown, some coarse sand to gravel, some fine grained sand pockets, some rootlets/woody debris, dry.

…below 1.0m, some CL-CI clay till, trace coarse gravel to cobbles.

…at 1.5m, difficult to push tube, possibly too much gravel. Rig lifting during push.

...at 2m, some reddish brown inclusions, sandy, moist to wet.

…at 2.5m, drill 0.2m deeper to run U2 sample. Could only push tube 3". Rig standing up. Tube no recovery. FREEWATER at 2.5m.

…below 2.6m, abundant coarse gravel, poorly sorted, subrounded, FREEWATER, compact.

CLAY SHALE
extremely weathered, medium to high plastic, lightly grey to grey, trace oxidation at upper contact, dry.

…below 4.8m, some fine to coarse gravel, reworked/rafted bedrock.

…below 6.3m, extremely weathered, intact.

…at 6.9m, difficult to run in SPT rods. Running with augers to try clean out.

...at 7.1m, trace bentonitic interbeds, light grey.

…at 8.4m, coal inclusion, black, weathered/fractured, dry.

LOGGED BY: RX	COMPLETION DEPTH: 10.40 m
REVIEWED BY: SP	COMPLETION DATE: 21-6-30

GEOTECH EB213002_COE.GPJ EDMONTON.GDT 21-9-3

Mill Creek Pedestrian Bridge Replacement Project	Mill Creek Ravine Trail	BOREHOLE NO: **BH21-01**
Integrated Infrastructure Services	UTM ZONE: - N5933130 E34414	PROJECT NO: EB213002
START DATE: 21-6-30	931+36+18/19	ELEVATION: 627.4 m

SAMPLE TYPE ■ Shelby Tube ⊘ Drive Sample ⊠ Auger Sample ☰ No Recovery ▥ A-Casing ◧ Cored Sample

Depth (m)	▲Wet Unit Weight (kN/m³)▲ 16 18 20 22 / PLASTIC M.C. LIQUID 20 40 60 80	◆Soil Sulphates (%)◆ 0.02 0.04 0.06 0.08 / ▲Compressive Strength(kPa)▲ 100 200 300 400 / ■Standard Penetration (N)■ 20 40 60 80	SAMPLE TYPE	SPT (N)	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION (m)
10			⊘	50/127		☰		617
							End of Borehole at 10.4m Borehole sloughed to 9.7m, water level at 2.4m at completion.	
11								616
12								615
13								614
14								613
15								612
16								611
17								610
18								609
19								608
20								

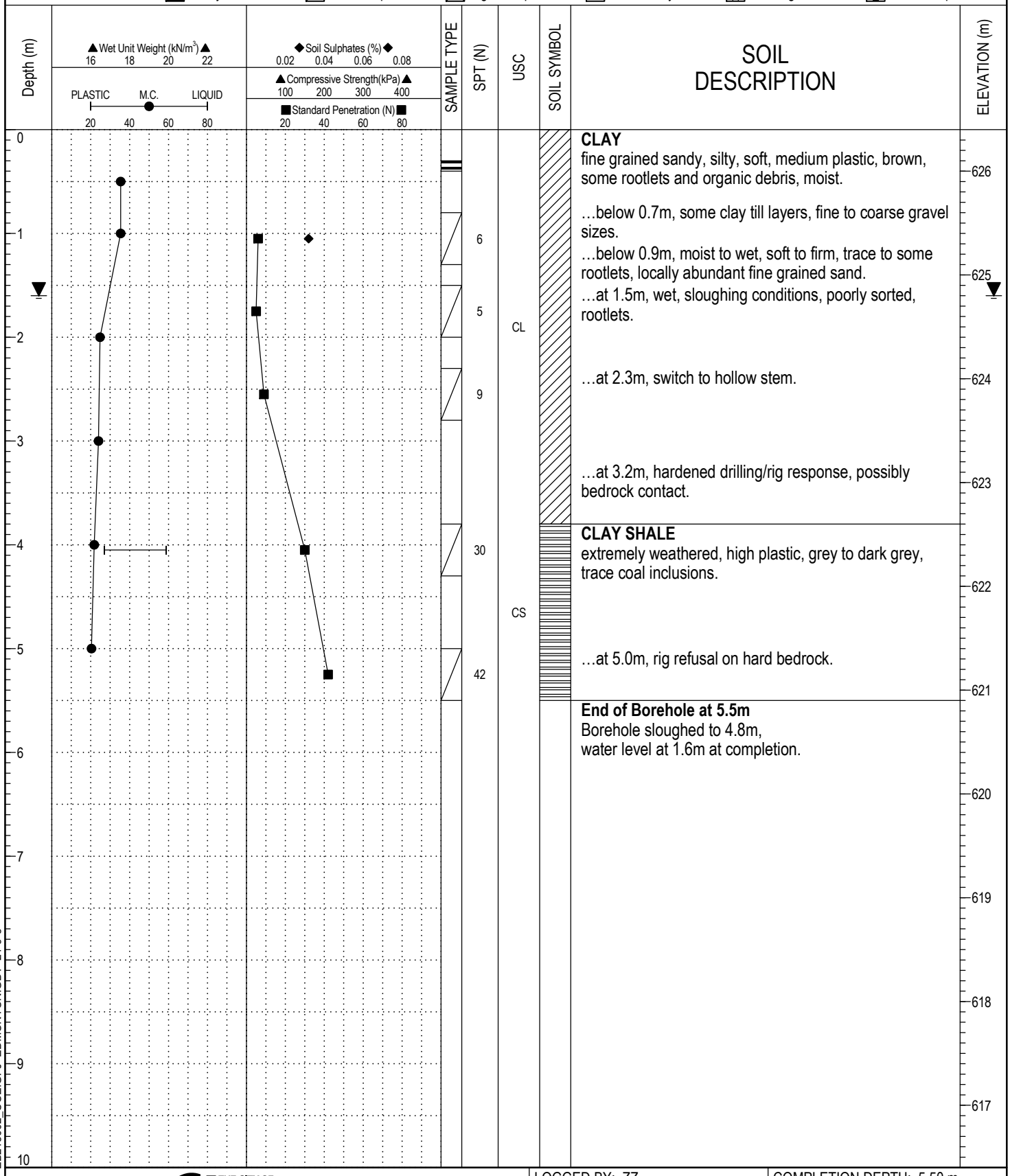
THE CITY OF Edmonton

LOGGED BY: RX	COMPLETION DEPTH: 10.40 m
REVIEWED BY: SP	COMPLETION DATE: 21-6-30
	Page 2 of 2

GEOTECH EB213002_COE.GPJ EDMONTON.GDT 21-9-3

Mill Creek Pedestrian Bridge Replacement Project	Mill Creek Ravine Trail	BOREHOLE NO: **BH21-02**
Integrated Infrastructure Services	UTM ZONE: - N5933145 E34376	PROJECT NO: EB213002
START DATE: 21-6-29	931+36+18/19	ELEVATION: 626.4 m

SAMPLE TYPE ■ Shelby Tube ▨ Drive Sample ☒ Auger Sample ▤ No Recovery ▥ A-Casing ◧ Cored Sample



SOIL DESCRIPTION

CLAY
fine grained sandy, silty, soft, medium plastic, brown, some rootlets and organic debris, moist.

…below 0.7m, some clay till layers, fine to coarse gravel sizes.

…below 0.9m, moist to wet, soft to firm, trace to some rootlets, locally abundant fine grained sand.

…at 1.5m, wet, sloughing conditions, poorly sorted, rootlets.

…at 2.3m, switch to hollow stem.

…at 3.2m, hardened drilling/rig response, possibly bedrock contact.

CLAY SHALE
extremely weathered, high plastic, grey to dark grey, trace coal inclusions.

…at 5.0m, rig refusal on hard bedrock.

End of Borehole at 5.5m
Borehole sloughed to 4.8m,
water level at 1.6m at completion.

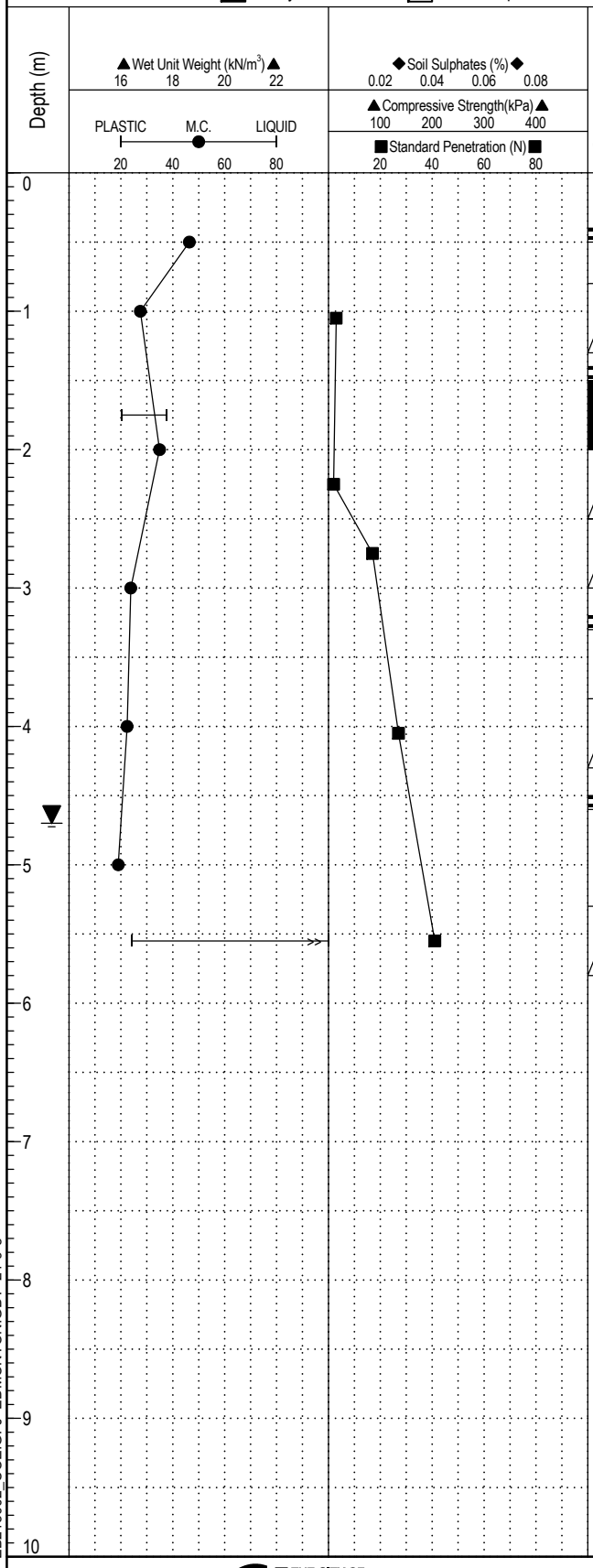
LOGGED BY: ZZ	COMPLETION DEPTH: 5.50 m
REVIEWED BY: SP	COMPLETION DATE: 21-6-29
	Page 1 of 1

THE CITY OF Edmonton

GEOTECH EB213002_COE.GPJ EDMONTON.GDT 21-9-3

Mill Creek Pedestrian Bridge Replacement Project	Mill Creek Ravine Trail	BOREHOLE NO: **BH21-03**
Integrated Infrastructure Services	UTM ZONE: - N5933155 E34366	PROJECT NO: EB213002
START DATE: 21-6-29	931+36+18/19	ELEVATION: 626.5 m

SAMPLE TYPE ■ Shelby Tube ⧄ Drive Sample ☒ Auger Sample ☰ No Recovery ▥ A-Casing ◧ Cored Sample



SAMPLE TYPE	SPT (N)	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION (m)
				CLAY fine grained sandy, silty, soft, medium plastic, brown, locally abundant coarse sand to gravel, moist. …at 0.2m, some reddish brown sand inclusions. …below 0.4m, some black organic inclusions. …below 0.6m, predominantly fine grained sand, brown, moist to wet. …below 1.3m, some clay till inclusions, some rootlets, moist to wet.	626 625
	3	CI			
	2			…below 2.4m, locally abundant coarse sand to gravel, poorly sorted, subrounded, wet.	624
	17				
				CLAY SHALE extremely weathered, medium to high plastic, grey to dark grey, some black organics (low graded coal) near upper contact.	623
	27	CS			622 ▼
	41			…below 5.3m, some bentonitic interbeds, high plastic, light grey.	621
				End of Borehole at 5.8m Borehole sloughed to 5.1m, water level at 4.7m at completion.	620 619 618 617

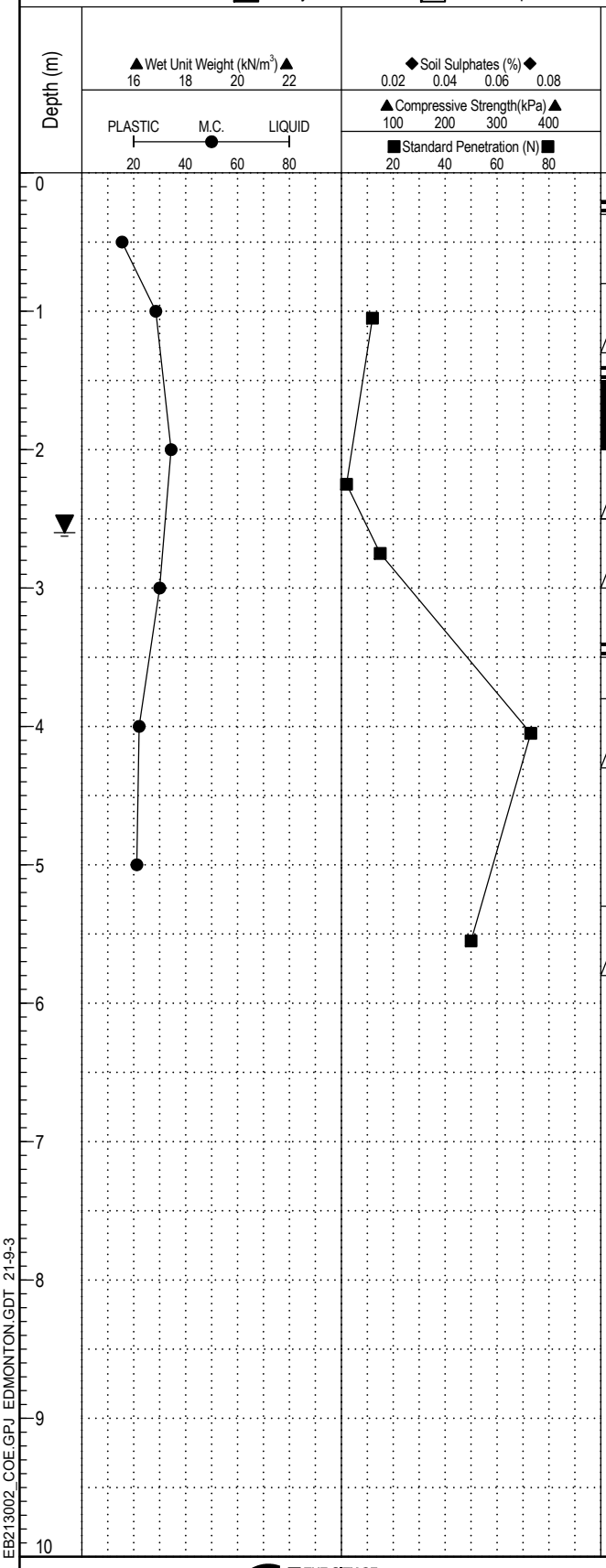
THE CITY OF Edmonton

LOGGED BY: ZZ	COMPLETION DEPTH: 5.80 m
REVIEWED BY: SP	COMPLETION DATE: 21-6-29
	Page 1 of 1

GEOTECH EB213002_COE.GPJ EDMONTON.GDT 21-9-3

Mill Creek Pedestrian Bridge Replacement Project	Mill Creek Ravine Trail	BOREHOLE NO: **BH21-04**
Integrated Infrastructure Services	UTM ZONE: - N5933186 E34350	PROJECT NO: EB213002
START DATE: 21-6-29	931+36+18/19	ELEVATION: 626.2 m

SAMPLE TYPE ■ Shelby Tube ⊘ Drive Sample ⊠ Auger Sample ▤ No Recovery ▥ A-Casing ◧ Cored Sample



SAMPLE TYPE	SPT (N)	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION (m)
				CLAY fine grained sandy, silty, stiff, low plastic, brown to grey, abundant coarse sand to coarse gravel, moist.	626
	12	CL			625
				...below 1.5m, soft, brown, some rust staining, moist to wet.	624
	2				
	15			…below 2.5m, increased fine to coarse gravel, subrounded, wet/SEEPAGE.	
				CLAY SHALE extremely weathered, medium to high plastic, grey to dark grey, dry.	623
	73	CS		…below 3.8m, some coal inclusions, dark grey to black, dry.	622
	50/127				621
				End of Borehole at 5.8m Borehole sloughed to 5.2m, water level at 2.6m at completion.	620
					619
					618
					617

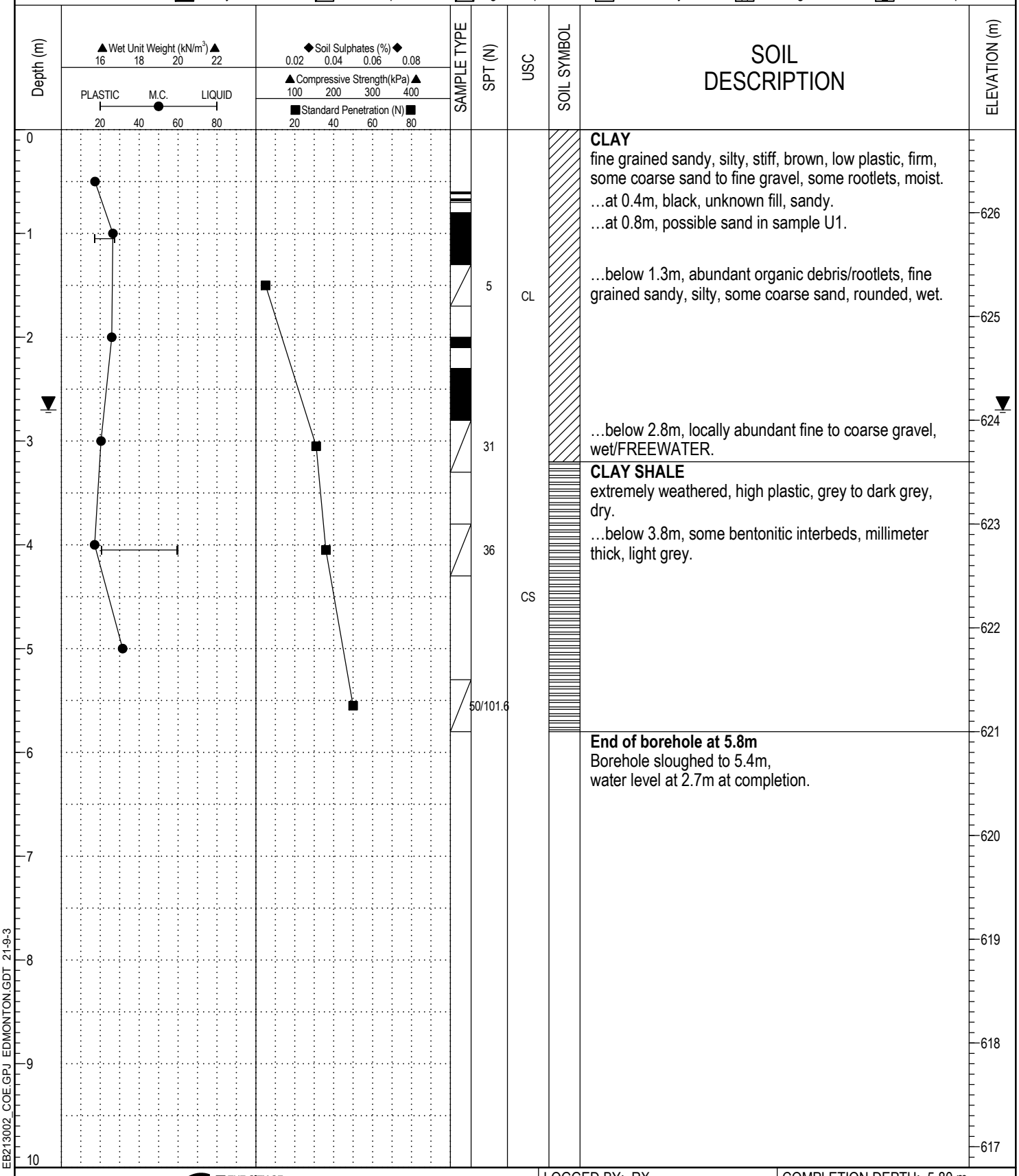
THE CITY OF Edmonton

LOGGED BY: RX	COMPLETION DEPTH: 5.80 m
REVIEWED BY: SP	COMPLETION DATE: 21-6-29
	Page 1 of 1

GEOTECH EB213002_COE.GPJ EDMONTON.GDT 21-9-3

Mill Creek Pedestrian Bridge Replacement Project	Mill Creek Ravine Trail	BOREHOLE NO: **BH21-05**
Integrated Infrastructure Services	UTM ZONE: - N5933120 E34425	PROJECT NO: EB213002
START DATE: 21-6-30	931+36+18/19	ELEVATION: 626.8 m

SAMPLE TYPE ■ Shelby Tube ⊘ Drive Sample ⊠ Auger Sample ☰ No Recovery ▥ A-Casing ◧ Cored Sample



CLAY
fine grained sandy, silty, stiff, brown, low plastic, firm, some coarse sand to fine gravel, some rootlets, moist.
…at 0.4m, black, unknown fill, sandy.
…at 0.8m, possible sand in sample U1.

…below 1.3m, abundant organic debris/rootlets, fine grained sandy, silty, some coarse sand, rounded, wet.

…below 2.8m, locally abundant fine to coarse gravel, wet/FREEWATER.

CLAY SHALE
extremely weathered, high plastic, grey to dark grey, dry.
…below 3.8m, some bentonitic interbeds, millimeter thick, light grey.

End of borehole at 5.8m
Borehole sloughed to 5.4m,
water level at 2.7m at completion.

LOGGED BY: RX	COMPLETION DEPTH: 5.80 m
REVIEWED BY: SP	COMPLETION DATE: 21-6-30
	Page 1 of 1

THE CITY OF Edmonton

GEOTECH EB213002_COE.GPJ EDMONTON.GDT 21-9-3

Appendix G

Cost Estimate Details

wood.

Bridge
24-Sep-21

Project: City Of Edmonton - Mill Creek Bridge B278 and Trail
Type of Work: Bridge Construction
Owner: City Of Edmonton
Contractor:

Wood Project Number: EB213002
Period Ending:
Certificate No.: 0
Contractor's G.S.T. No.:

Item	Description	Unit	Total	Unit Price	Cost
1	Mobilization	lump sum	1.00	$80,000.00	$80,000.00
2	Clearing	lump sum	1.00	$25,000.00	$25,000.00
3	Remove and Salvage Existing Timber bridge	lump sum	1.00	$50,000.00	$50,000.00
4	Excavation	lump sum	1.00	$40,000.00	$40,000.00
5	Granular Backfill	lump sum	1.00	$75,000.00	$75,000.00
6	Pre-fabricated truss type Steel bridge – Design & Supply	lump sum	1.00	$90,000.00	$90,000.00
7	Pre-fabricated truss type Steel bridge – Installation	lump sum	1.00	$40,000.00	$40,000.00
8	Abutment & Wingwall Construction	lump sum	1.00	$75,000.00	$75,000.00
9	Micro piles foundations (12 piles)	lump sum	1.00	$100,000.00	$100,000.00
10	Handrails at approaches	lump sum	1.00	$25,000.00	$25,000.00
11	Class 2 Heavy Rock Riprap	m3	180.00	$550.00	$99,000.00
12	Topsoil, Seeding, Matting	m2	100.00	$50.00	$5,000.00
13	Environmental Protection Works	lump sum	1.00	$50,000.00	$50,000.00
14	Care of Water	lump sum	1.00	$50,000.00	$50,000.00
15					
16					
17					

Notes: See report

	$804,000.00
	$804,000.00
Contingency 15%	**$120,600.00**
Sub Total Construction	**$924,600.00**
Engineering 15%	
TOTAL	**$924,600.00**
	$925,000.00

Certified By:

Riaz Abbas, P.Eng., Senior Bridge Engineer
Wood Environment & Infrastructure Solutions

wood.

Trail - Q5
24-Sep-21

Project:	**City Of Edmonton - Mill Creek Bridge B278 and Trail**	**Wood Project Number:**	**EB213002**
Type of Work:	**Trail Construction**	**Period Ending:**	
Owner:	**City Of Edmonton**	**Certificate No.:**	**0**
Contractor:		**Contractor's G.S.T. No.:**	

Item	Description	Unit	Total	Unit Price	Cost
1	Mobilization (add on)	lump sum	1	$10,000.00	$10,000.00
2	Natural Area Value (inc contractor tree removal and contingency)	lump sum	1	$28,686.21	$28,686.21
3	Environmental Protection Works	lump sum	1	$10,000.00	$10,000.00
4	Silt Fence Supply, Install and Maintain	m	330	$10.00	$3,300.00
5	Select Clearing	sq.m	512	$30.00	$15,360.00
6	Stripping (Cut)	cu.m	346	$20.00	$6,920.00
7	Common Excavation** (Fill)	cu.m	1,450	$50.00	$72,500.00
8	Surface Gravel (50mm -6mm minus and 100mm-20mm minus)*	tonne	200	$100.00	$20,000.00
9	Woven Geotextile (Nilex 4551 or Layfield LP6 or equivalent)*****	sq.m	620	$15.00	$9,300.00
10	Topsoil Replacement	sq.m	789	$30.00	$23,670.00
11	Broadcast Seeding	sq.m	789	$3.00	$2,367.00
12	Supply and Install 600 CSP Culverts***	m	14	$750.00	$10,500.00
13	Class 1M Rip Rap ****	sq.m	90	$200.00	$18,000.00
14	Timber Retaining Walls at bridge/trail interface	sq.m	0	$650.00	$0.00
					$230,603.21

Notes:

* Estimated cost for 5 year flood

** includes replacement of stripping material

*** Culverts to allow trapped water to drain to the creek

**** Includes for approximately 30m of Rip Rap 0+145 to 0+175

***** includes subgrade prep

To pave the trail 2.4m wide add $37,500, (includes add 150mm gravel) **$230,603.21**

Contingency 15%	**$34,590.48**
Sub Total Construction	**$265,193.69**
Engineering 15%	
TOTAL	**$265,193.69**
	$266,000.00

Certified By:

Gary R. Kerr, P.Eng., Senior Infrastructure Engineer
Wood Environment & Infrastructure Solutions

wood.

Trail - Q5 with walls
24-Sep-21

Project:	**City Of Edmonton - Mill Creek Bridge B278 and Trail**	**Wood Project Number:**	**EB213002**
Type of Work:	**Trail Construction**	**Period Ending:**	
Owner:	**City Of Edmonton**	**Certificate No.:**	**0**
Contractor:		**Contractor's G.S.T. No.:**	

Item	Description	Unit	Total	Unit Price	Cost
1	Mobilization (add on)	lump sum	1	$10,000.00	$10,000.00
2	Natural Area Value (inc contractor tree removal and contingency)	lump sum	1	$16,768.97	$16,768.97
3	Environmental Protection Works	lump sum	1	$10,000.00	$10,000.00
4	Silt Fence Supply, Install and Maintain	m	330	$10.00	$3,300.00
5	Select Clearing	sq.m	224	$30.00	$6,720.00
6	Stripping (Cut)	cu.m	259	$20.00	$5,180.00
7	Common Excavation** (Fill)	cu.m	1,092	$50.00	$54,600.00
8	Surface Gravel (50mm -6mm minus and 100mm-20mm minus)*	tonne	200	$100.00	$20,000.00
9	Woven Geotextile (Nilex 4551 or Layfield LP6 or equivalent)*****	sq.m	620	$15.00	$9,300.00
10	Topsoil Replacement	sq.m	497	$30.00	$14,910.00
11	Broadcast Seeding	sq.m	497	$3.00	$1,491.00
12	Supply and Install 600 CSP Culverts***	m	14	$750.00	$10,500.00
13	Class 1M Rip Rap ****	sq.m	90	$200.00	$18,000.00
14	Timber Retaining Walls at bridge/trail interface	sq.m	134	$650.00	$87,100.00

Notes:

* Estimated cost for 5 year flood
** includes replacement of stripping material
*** Culverts to allow trapped water to drain to the creek
**** Includes for approximately 30m of Rip Rap 0+145 to 0+175
***** includes subgrade prep
To pave the trail 2.4m wide add $37,500, (includes add 150mm gravel)

	$267,869.97
	$267,869.97
Contingency 15%	**$40,180.50**
Sub Total Construction	**$308,050.47**
Engineering 15%	
TOTAL	**$308,050.47**
	$309,000.00

Certified By:

Gary R. Kerr, P.Eng., Senior Infrastructure Engineer
Wood Environment & Infrastructure Solutions

wood.

Trail - Q10
24-Sep-21

Project:	**City Of Edmonton - Mill Creek Bridge B278 and Trail**	**Wood Project Number:**	**EB213002**
Type of Work:	**Trail Construction**	**Period Ending:**	
Owner:	**City Of Edmonton**	**Certificate No.:**	**0**
Contractor:		**Contractor's G.S.T. No.:**	

Item	Description	Unit	Total	Unit Price	Cost
1	Mobilization (add on)	lump sum	1	$10,000.00	$10,000.00
2	Natural Area Value (inc contractor tree removal and contingency)	lump sum	1	$32,824.14	$32,824.14
3	Environmental Protection Works	lump sum	1	$10,000.00	$10,000.00
4	Silt Fence Supply, Install and Maintain	m	330	$10.00	$3,300.00
5	Select Clearing	sq.m	612	$30.00	$18,360.00
6	Stripping (Cut)	cu.m	376	$20.00	$7,520.00
7	Common Excavation** (Fill)	cu.m	1,688	$50.00	$84,400.00
8	Surface Gravel (50mm -6mm minus and 100mm-20mm minus)*	tonne	200	$100.00	$20,000.00
9	Woven Geotextile (Nilex 4551 or Layfield LP6 or equivalent)*****	sq.m	620	$15.00	$9,300.00
10	Topsoil Replacement	sq.m	901	$30.00	$27,030.00
11	Broadcast Seeding	sq.m	901	$3.00	$2,703.00
12	Supply and Install 600 CSP Culverts***	m	16	$750.00	$12,000.00
13	Class 1M Rip Rap ****	sq.m	120	$200.00	$24,000.00
14	Timber Retaining Walls at bridge/trail interface	sq.m	0	$650.00	$0.00

Notes:

* Estimated cost for 10 year flood
** includes replacement of stripping
*** Culverts to allow trapped water to drain to the creek
**** Includes for approximately 30m of Rip Rap 0+145 to 0+175
***** includes subgrade prep
To pave the trail 2.4m wide add $37,500, (includes add 150mm gravel)

	$261,437.14
	$261,437.14
Contingency 15%	**$39,215.57**
Sub Total Construction	**$300,652.71**
Engineering 15%	
TOTAL	**$300,652.71**
	$301,000.00

Certified By:

Gary R. Kerr, P.Eng., Senior Infrastructure Engineer
Wood Environment & Infrastructure Solutions

wood.

Trail - Q10 with walls
24-Sep-21

Project: City Of Edmonton - Mill Creek Bridge B278 and Trail
Type of Work: Trail Construction
Owner: City Of Edmonton
Contractor:

Wood Project Number: EB213002
Period Ending:
Certificate No.: 0
Contractor's G.S.T. No.:

Item	Description	Unit	Total	Unit Price	Cost
1	Mobilization (add on)	lump sum	1	$10,000.00	$10,000.00
2	Natural Area Value (inc contractor tree removal and contingency)	lump sum	1	$21,072.41	$21,072.41
3	Environmental Protection Works	lump sum	1	$10,000.00	$10,000.00
4	Silt Fence Supply, Install and Maintain	m	330	$10.00	$3,300.00
5	Select Clearing	sq.m	328	$30.00	$9,840.00
6	Stripping (Cut)	cu.m	290	$20.00	$5,800.00
7	Common Excavation** (Fill)	cu.m	1,327	$50.00	$66,350.00
8	Surface Gravel (50mm -6mm minus and 100mm-20mm minus)*	tonne	200	$100.00	$20,000.00
9	Woven Geotextile (Nilex 4551 or Layfield LP6 or equivalent)*****	sq.m	620	$15.00	$9,300.00
10	Topsoil Replacement	sq.m	609	$30.00	$18,270.00
11	Broadcast Seeding	sq.m	609	$3.00	$1,827.00
12	Supply and Install 600 CSP Culverts***	m	16	$750.00	$12,000.00
13	Class 1M Rip Rap ****	sq.m	120	$200.00	$24,000.00
14	Timber Retaining Walls at bridge/trail interface	sq.m	134	$650.00	$87,100.00

Notes:
* Estimated cost for 10 year flood
** includes replacement of stripping
*** Culverts to allow trapped water to drain to the creek
**** Includes for approximately 30m of Rip Rap 0+145 to 0+175
***** includes subgrade prep
To pave the trail 2.4m wide add $37,500, (includes add 150mm gravel)

	$298,859.41
	$298,859.41
Contingency 15%	**$44,828.91**
Sub Total Construction	**$343,688.32**
Engineering 15%	
TOTAL	**$343,688.32**
	$344,000.00

Certified By:

Gary R. Kerr, P.Eng., Senior Infrastructure Engineer
Wood Environment & Infrastructure Solutions

wood.

Trail - Q25
24-Sep-21

Project: City Of Edmonton - Mill Creek Bridge B278 and Trail
Type of Work: Trail Construction
Owner: City Of Edmonton
Contractor:

Wood Project Number: EB213002
Period Ending:
Certificate No.: 0
Contractor's G.S.T. No.:

Item	Description	Unit	Total	Unit Price	Cost
1	Mobilization (add on)	lump sum	1	$15,000.00	$15,000.00
2	Natural Area Value (inc contractor tree removal and contingency)	lump sum	1	$37,500.00	$37,500.00
3	Environmental Protection Works	lump sum	1	$10,000.00	$10,000.00
4	Silt Fence Supply, Install and Maintain	m	330	$10.00	$3,300.00
5	Select Clearing	sq.m	725	$30.00	$21,750.00
6	Stripping (Cut)	cu.m	410	$20.00	$8,200.00
7	Common Excavation** (Fill)	cu.m	2,044	$50.00	$102,200.00
8	Surface Gravel (50mm -6mm minus and 100mm-20mm minus)*	tonne	200	$100.00	$20,000.00
9	Woven Geotextile (Nilex 4551 or Layfield LP6 or equivalent)*****	sq.m	620	$15.00	$9,300.00
10	Topsoil Replacement	sq.m	1,033	$30.00	$30,990.00
11	Broadcast Seeding	sq.m	1,033	$3.00	$3,099.00
12	Supply and Install 600 CSP Culverts***	m	19	$750.00	$14,250.00
13	Class 1M Rip Rap ****	sq.m	120	$200.00	$24,000.00
14	Timber Retaining Walls at bridge/trail interface	sq.m	0	$650.00	$0.00

Notes:
* Estimated cost for 25 year flood
** includes replacement of stripping
*** Culverts to allow trapped water to drain to the creek
**** Includes for approximately 30m of Rip Rap 0+145 to 0+175
***** includes subgrade prep
To pave the trail 2.4m wide add $37,500, (includes add 150mm gravel)

	$299,589.00
	$299,589.00
Contingency 15%	**$44,938.35**
Sub Total Construction	**$344,527.35**
Engineering 15%	
TOTAL	**$344,527.35**
	$345,000.00

Certified By:

Gary R. Kerr, P.Eng., Senior Infrastructure Engineer
Wood Environment & Infrastructure Solutions

wood.

Trail - Q25 with walls

24-Sep-21

Project: City Of Edmonton - Mill Creek Bridge B278 and Trail
Type of Work: Trail Construction
Owner: City Of Edmonton
Contractor:

Wood Project Number: EB213002
Period Ending:
Certificate No.: 0
Contractor's G.S.T. No.:

Item	Description	Unit	Total	Unit Price	Cost
1	Mobilization (add on)	lump sum	1	$15,000.00	$15,000.00
2	Natural Area Value (inc contractor tree removal and contingency)	lump sum	1	$25,789.66	$25,789.66
3	Environmental Protection Works	lump sum	1	$10,000.00	$10,000.00
4	Silt Fence Supply, Install and Maintain	m	330	$10.00	$3,300.00
5	Select Clearing	sq.m	442	$30.00	$13,260.00
6	Stripping (Cut)	cu.m	325	$20.00	$6,500.00
7	Common Excavation** (Fill)	cu.m	1,664	$50.00	$83,200.00
8	Surface Gravel (50mm -6mm minus and 100mm-20mm minus)*	tonne	200	$100.00	$20,000.00
9	Woven Geotextile (Nilex 4551 or Layfield LP6 or equivalent)*****	sq.m	620	$15.00	$9,300.00
10	Topsoil Replacement	sq.m	741	$30.00	$22,230.00
11	Broadcast Seeding	sq.m	741	$3.00	$2,223.00
12	Supply and Install 600 CSP Culverts***	m	19	$750.00	$14,250.00
13	Class 1M Rip Rap ****	sq.m	120	$200.00	$24,000.00
14	Timber Retaining Walls at bridge/trail interface	sq.m	145	$650.00	$94,250.00

Notes:

* Estimated cost for 25 year flood
** includes replacement of stripping
*** Culverts to allow trapped water to drain to the creek
**** Includes for approximately 30m of Rip Rap 0+145 to 0+175
***** includes subgrade prep
To pave the trail 2.4m wide add $37,500, (includes add 150mm gravel)

	$343,302.66
	$343,302.66
Contingency 15%	**$51,495.40**
Sub Total Construction	**$394,798.06**
Engineering 15%	
TOTAL	**$394,798.06**
	$395,000.00

Certified By:

Gary R. Kerr, P.Eng., Senior Infrastructure Engineer
Wood Environment & Infrastructure Solutions

Appendix H

Natural Stand Valuation Guidelines (CoE)

Natural Stand Valuation Guidelines

OPEN SPACE OPERATIONS - Last Update: March 2020

Equitable compensation may be pursued by the City from the civic or private entity where there is damage or loss to City trees, as explained in the City of Edmonton Corporate Tree Management Policy. These guidelines outline how equitable compensation for Natural Stands is determined using the Natural Stand Valuation Methodology (equitable compensation for trees in boulevard and open spaces is outlined in the *City of Edmonton Guidelines for Evaluation of Boulevard and Open Space Trees* and is not part of these guidelines). An equitable compensation value is calculated based on the concept of canopy replacement.

These guidelines were developed and adapted from *The Tree Evaluation Method for Natural Stands in Our Urban Environment,* which was developed from Alberta Agriculture publication, *A Guide to Determining Replacement Value of Trees and Shrubs in Alberta*, Section 3 (AGDEX 275/33-3). The methodology relies on unit rate costs to be updated annually by the City of Edmonton. As industry best-management practices and corporate processes evolve, there may be a need to review the equitable compensation methodology. This document is intended to be a working document and may be updated by the City of Edmonton at any time. Recovery of administrative costs and tree maintenance costs associated with project work is also outlined, but is not the primary function of this document.

When will the Natural Stand Valuation Guidelines apply?

Equitable Compensation may be pursued by the City from the civic or private entity causing partial loss (damage) or total loss of City tree(s) within a Natural Stand, as per the Corporate Tree Management Policy. Examples of situations where Equitable Compensation is sought for Natural Stands (but not limited to) are:

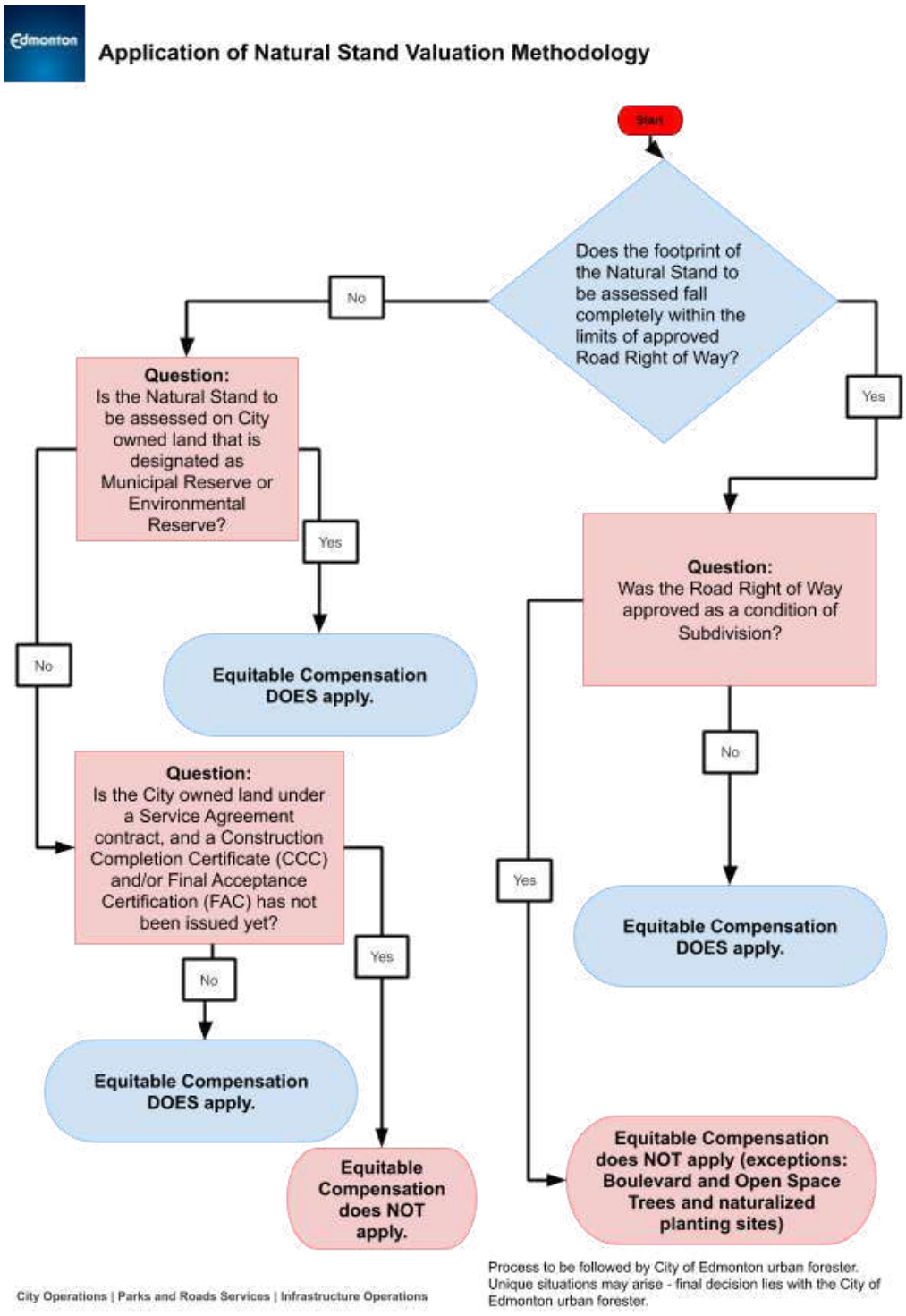
- As a result of not complying with Tree Preservation Guidelines, City bylaws or policies.
- As a result of vehicle accidents.
- As a result of natural stand removal requests.

How are the Natural Stand Valuation Guidelines applied?

The City of Edmonton Natural Areas urban forester (CoE urban forester) will assess the Natural Stand for monetary value. If you are requesting tree removal within a Natural Stand or are responsible for the loss of City tree(s) in a Natural Stand, the CoE urban forester will work with you and explain how the value will be determined and billed.

The CoE urban forester will follow these steps to assess the Natural Stand value:

1. Determine if equitable compensation should apply (based on the scenario):



Note: Unique situations may not meet the requirements of this decision tree. The City of Edmonton will make final decisions on when and how equitable compensation is sought.

2. Natural Stand valuation (CoE urban forester to complete assessment):
   Determine equitable compensation value: V = (Pt + PtFv + Mc + Lr)*Svf

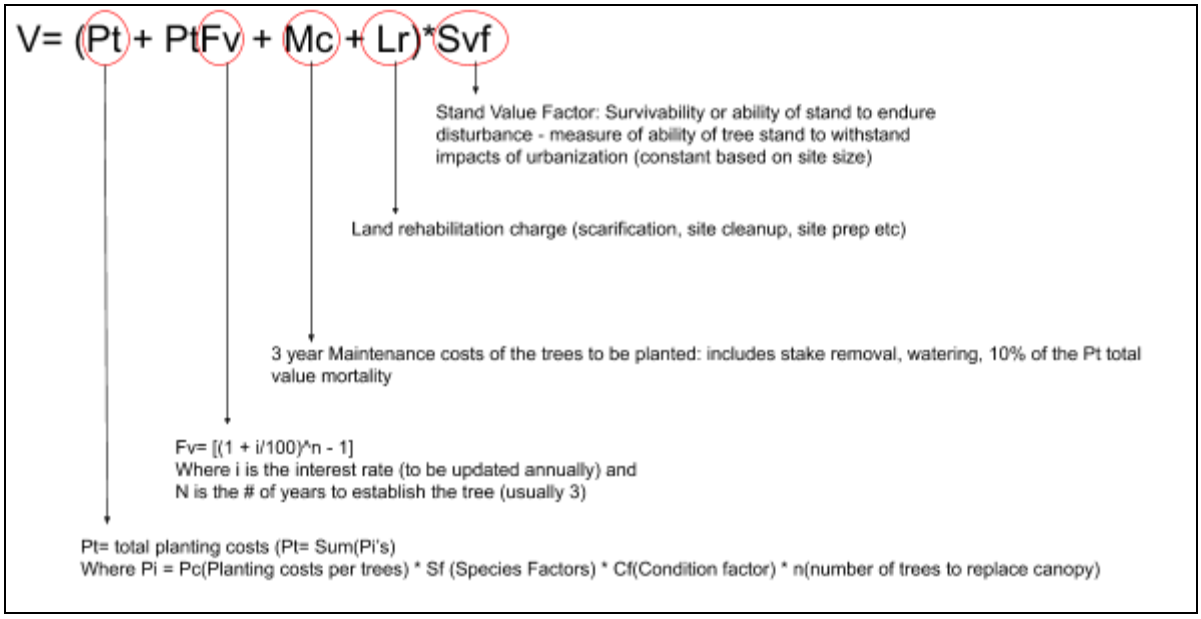


Figure 3: Formula for determining equitable compensation of Natural Stand.

A. Determine total planting costs (Pt)
   a. Pt= Sum(Pi's)
      Where Pi = Pc(Planting costs per trees) * Sf (Species Factors) * Cf(Condition factor) * n(number of trees to replace canopy)
   b. Pi must be calculated for each species in the assessment.
   c. Pc is a unit rate based on the previous years' operational unit rates for planting costs per tree or shrub
   d. Sf is a constant percentage value used as a species rating for each species being assessed (Table 1, Appendix 1).
   e. Cf, the condition factor, assessment value determined by the Forester based on the matrix in Table 2, Appendix 1.
   f. n is the number of trees required to replace the canopy:
      Total area being assessed x % canopy cover of the species / canopy area of coverage for the given species
      - Total area being assessed to be predetermined
      - Canopy cover (%) of stand: calculate all visible woody species from the bird's eye view perspective (total canopy cover to equal 100%, canopy cover(s) for individual species to be rounded to the nearest 5%).
      - Canopy area of coverage: each species has a theoretical canopy diameter and canopy area of coverage (Table 3, Appendix 1).

- Site should be staked out in the field by the entity responsible for the loss in tree canopy/damages prior to CoE urban forester's site visit.

B. Determine the future value (PtFv)
    a. Pt determined in 2A.
    b. Fv is the interest factor: $Fv = [(1 + i/100)^n - 1]$

    i = interest rate (%) usually a rate of inflation.
    n = number of years to establish the new trees (usually 3 years in an urban environment). For our purposes we use 3.
    Current Fv rate in Item 1, Appendix 1.

C. Determine the 3 year establishment costs of the trees to be planted.
    Mc = (establishment costs for 3 years + 10% mortality of the costs of planting a tree) x n
    Where: Establishment costs for 3 years = stake removal and watering costs for 3 years in addition to 10% of Pc value for mortality.
    n = number of trees to be planted as outlined in 2Af.

D. Determine land rehabilitation Charge (Lr).
    This would include costs associated with the clean-up, scarification and conditioning of the planting site if replanting to occur at site being assessed.

E. Determine the stand value factor (Svf).
    a. Accounts for the survivability or the ability of the tree stand to endure disturbance caused by both external and internal factors. It is a measure of the ability of the tree stand to withstand the impacts of urbanization.
    b. Value increases with the size of the site.
    c. Constant values included in Table 4, Appendix 1.

F. Determine equitable compensation V = (Pt + PtFv + Mc + Lr)*Svf

3. CoE urban forester will recover costs (as per the Corporate Tree Management Policy) from the civic or private entity responsible for the tree loss:
    A. The urban forester you are working with will provide additional details on information required to set up payments at time of project initiation (i.e. creation of Purchase Orders etc).
    B. Administrative costs for CoE urban forestry personnel time will be recovered.
    C. Costs associated with any required tree maintenance as a result of the Natural Stand tree loss will be recovered.
    D. The equitable compensation value of Natural Stand tree(s) that were assessed for total loss will be recovered. The value recovered will be based on the

methodology described in Step 2 (Step 2F would determine total equitable compensation value).

Definitions:

All definitions in the Corporate Tree Management and Tree Reserve Procedure apply to this guideline.

References:

1. City of Edmonton. *Guidelines for Evaluation of Trees*. https://www.edmonton.ca/residential_neighbourhoods/COE_Guidelines_for_Evaluation_of_Trees_20170424.pdf

2. Corns, I.G.W., Annas R.M. 1986. *Field guide to forest ecosystems of west-central Alberta*.
   Canadian Forest Service, Northern Forestry Centre, Edmonton, Alberta.

3. Davies, M., *The Tree Evaluation Method for Natural Stands in Our Urban Environment*, 4th edition.

4. Grainger, G., *Determining Replacement Value of Trees and Shrubs in Alberta*. Alberta Tree Nursery and Horticultural Centre

5. Prairie Chapter International Society of Arboriculture. 2003. *Alberta Tree Species Rating Guide.* http://www.isaprairie.com/docs/Alberta-Tree-Species-Rating-Guide.pdf

APPENDICES

Table 1: Tree Species Ratings Classes and Percentages for the City of Edmonton

BOTANICAL NAME	COMMON NAME
Class 1 – 110% (Special Class)	
Picea pungens 'Koster'	Kosters Blue Spruce
Picea spp. (Specialties)	All grafted types of Spruce
Pinus spp. (Specialties)	All grafted types of Pines
Quercus spp.	Oak species
Class 2 – 100%	
Abies spp.	All Firs
Aesculus glabra	Ohio buckeye
Aesculus hippocastanum	Chestnut/Horse Chestnut
Elaeagnus angustifolia	Russian olive
Betula pendula gracilis	Weeping birch
Fraxinus selections	Patmore/Summit/Fallgold/Manchurian
Larix sibirica	Siberian Larch
Larix spp.	Larch Species
Picea spp.	All types of Spruce
Pinus spp.	All types of Pines
Populus tremula 'Erecta'	Swedish Columnar Aspen
Pseudotsuga menziesii	Douglas fir
Syringa reticulata	Japanese lilac tree
Tilia americana	American basswood
Tilia cordata	Little Linden Leaf, Lime (Hybrids)

Ulmus americana ‘Brandon’	American elm “Brandon”
Ulmus americana	American elm
Class 3 – 80%	
Acer ginnala	Amur maple
Acer saccharinum	Silver maple
Betula spp.	All other types of Birch
Crataegus spp.	Hawthorns
Fraxinus spp.	Common Green Ash & Black Ash
Juniperus scopulorum	Rocky Mountain Juniper & Cultivars
Malus baccata	Siberian flowering crab
Malus “Rosybloom Hybrids”	Rosybloom Crabs
Malus spp. Hybrids	Hybrid Apple/Crab
Populus x canescens ‘Tower’	Tower Poplar
Populus x jackii ‘Northwest’	Northwest poplar - cultivar
Prunus padus commutata	Mayday tree
Prunus spp.	Plums and Cherries
Prunus spp. Hybrids	Hybrid Cherries & plums
Pyrus ussuriensis	Ussurian Pear
Sorbus spp.	Mountain Ash Species
Class 4 – 60%	
Acer negundo (upright var. or form)	Manitoba maple (specialty upright forms)
Alnus spp.	Alder
Caragana arborescens	Standard Pea tree
Caragana arborescens vars.	Standard Pea tree – forms

Populus Hybrids	Hybrid Poplars
Salix acutifolia	Sharp leaf willow
Salix pentandra	Laurel leaved willow
Ulmus pumila	Siberian/Manchurian elm
Class 5 – 40%	
Acer negundo	Manitoba maple
Populus X 'Brooks #6'	Brooks #6 Poplar
Populus X 'Griffin'	Griffin Poplar (Non-fluff)
Populus spp.	Native poplars
Salix spp.	Native Willows

*Taken from the *Guidelines for Evaluation of Trees.*
**Values adapted from *The Tree Evaluation Method for Natural Stands in Our Urban Environment* and *Alberta Tree Species Rating Guide*.

Table 2: Tree Condition Rating

Percent	**Description**
100%	Perfect tree or specimen quality
90%	Excellent tree
80%	Very Good tree
70%	Above Average tree
60%	Good or Average tree
50%	Below Average tree
40%	Fair tree
30%	Poor tree
20%	Very poor tree

Table 3: Canopy Area per Tree for Tree Species Commonly Used in Edmonton

Tree Species	Canopy Area / Tree (m^2)
Northwest Poplar	145
American Elm	145
Balsam Poplar	82
Manitoba Maple	89
Patmore Ash	65
Trembling Aspen	21
Willow / Birch	17
Black Ash	10
Common Caragana	9
Saskatoon / Cotoneaster / Alder	5
Dogwood	3
Scots Pine	22
White Spruce	18
Colorado Spruce	18
Larch	10
Lodgepole Pine	6
Jack Pine	10
Mugo Pine	3
Chokecherry / Honeysuckle	5
Mountain Ash	17
Currant / Gooseberry / Raspberry	3
Seabuckthorn	5

Roses	3

* Adapted from Table I in *The Tree Evaluation Method for Natural Stands in Our Urban Environment.* Canopy Area per Tree recorded in this table as median value in range.
**Additional species have been added to this table that are frequently observed in Edmonton's natural areas (canopy area adapted from original table using a value similar to listed species with a similar growing habit).
***Where additional species are observed in the natural area being assessed, use this table as a guide to determine the canopy area per tree based on a similar species and its growth habit and size characteristics.
****In the "calculation spreadsheet" a value of 7 is used for pine, as lodgepole pine most common in Edmonton (value 6) - increased value to 7 to account for some other pine species being planted.

Table 4: Stand Value Factors

Stand Value Factors	Area of the Site being Assessed
1.35	(> 5000m²)
1.25	(3000m² to 5000m²)
1.2	(1500m² to 3000m²)
1.15	(500m² to1500m²)
1.05	(< 500m²)

Adapted from *The Tree Evaluation Method for Natural Stands in Our Urban Environment.*

Item 1: Interest Factor

Formula: Fv = [(1 + i/100)^n - 1]
Current interest rate (i) = 2.7%* and n = 3
Fv = [(1 + 1.6/100)^3-1]
Fv = 0.083206683

*Rate as of January 2020. Taken from Consumer Price Index.

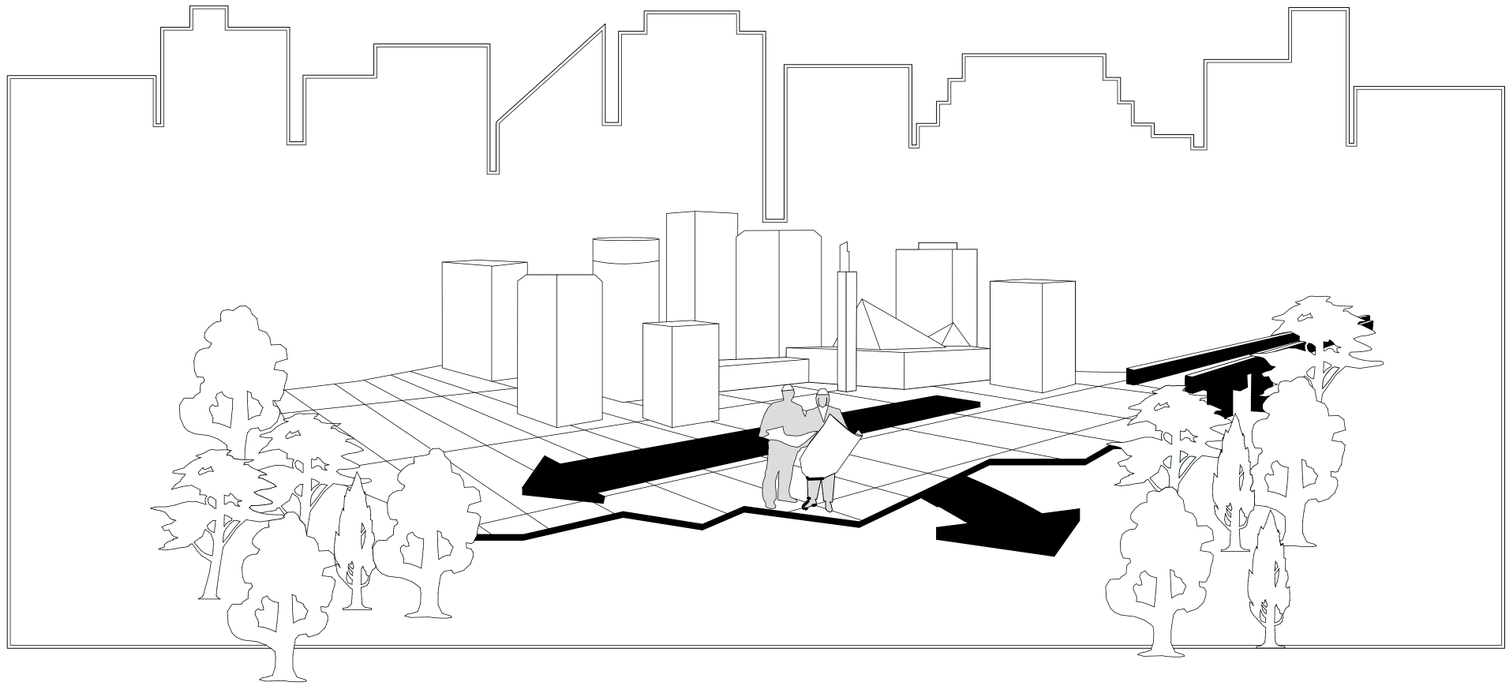
Appendix A.2

Preliminary Design Drawings

THE CITY OF Edmonton

INTEGRATED INFRASTRUCTURE SERVICES

INFRASTRUCTURE PLANNING AND DESIGN BRANCH



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03 SEP 2021

MILL CREE□ NORT□ PEDESTRIAN BRID□E □B278) REPLACEMENT AND TRAIL UP□RADES

____CON **TRA**C **T**_No.___

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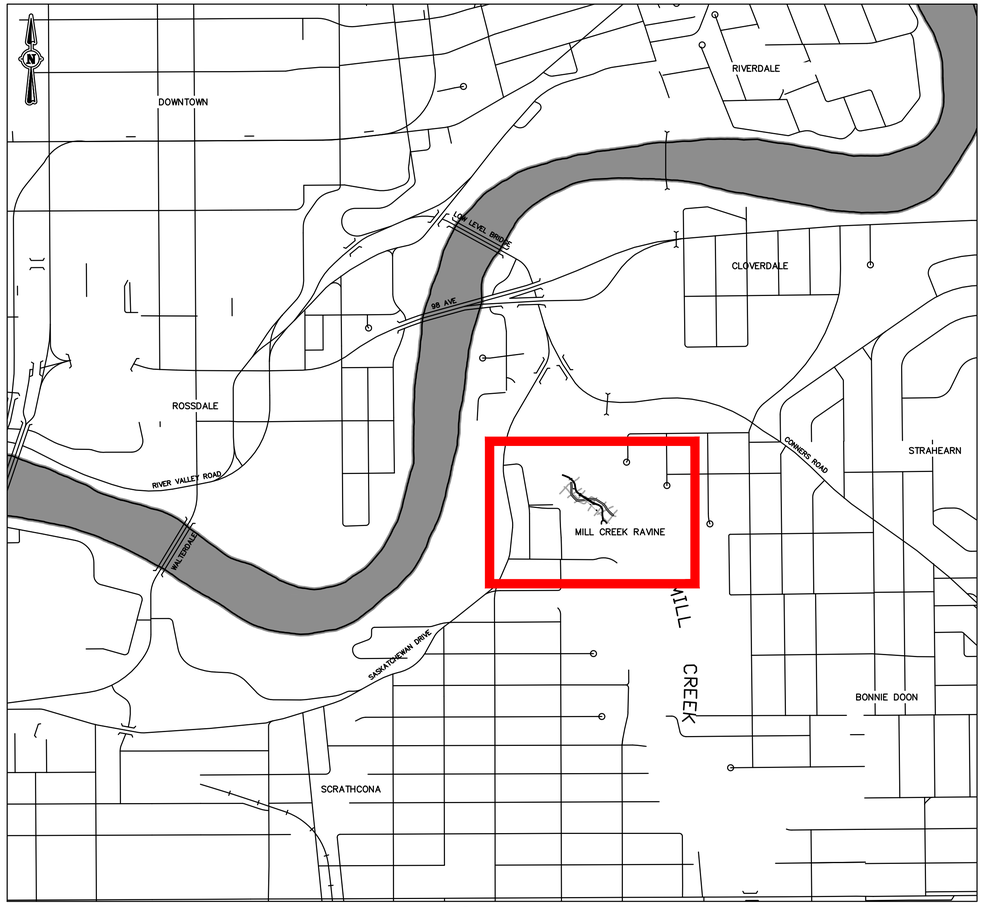
DIRECTOR OF TRANSPORTATION PLANNING AND DESIGN — DATE

DRAWING
MICR-P211-01

DRAWING NUMBER (STRUCTURAL DRAWINGS)



SITE MAP
Scale 1:10,000

SITE MAP
Scale 1:2,000

INDEX		
SHEET	DESCRIPTION	DRAWING NUMBER
0	COVER SHEET	MICR–P211–01
1	SITE PLAN AND DRAWING INDEX	MICR–P211–02
2	BRIDGE GENERAL LAYOUT	MICR–P211–S01
3	TRAIL PLAN AND PROFILE WITH 33% BLOCKAGE AT Q5 ELEVATION	MICR–P211–G01
4	TRAIL PLAN AND PROFILE WITH 33% BLOCKAGE AT Q10 ELEVATION	MICR–P211–G02
5	TRAIL PLAN AND PROFILE WITH 33% BLOCKAGE AT Q25 ELEVATION	MICR–P211–G03
6	SECTIONS AND DETAILS	MICR–P211–X01

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7				
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3	ISSUED FOR FINAL REVIEW	WP	21-SEP 03	B.G.
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THE CITY OF Edmonton
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PROJECT
MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
SITE PLAN AND DRAWING INDEX

DRAWING
MICR-P211-02

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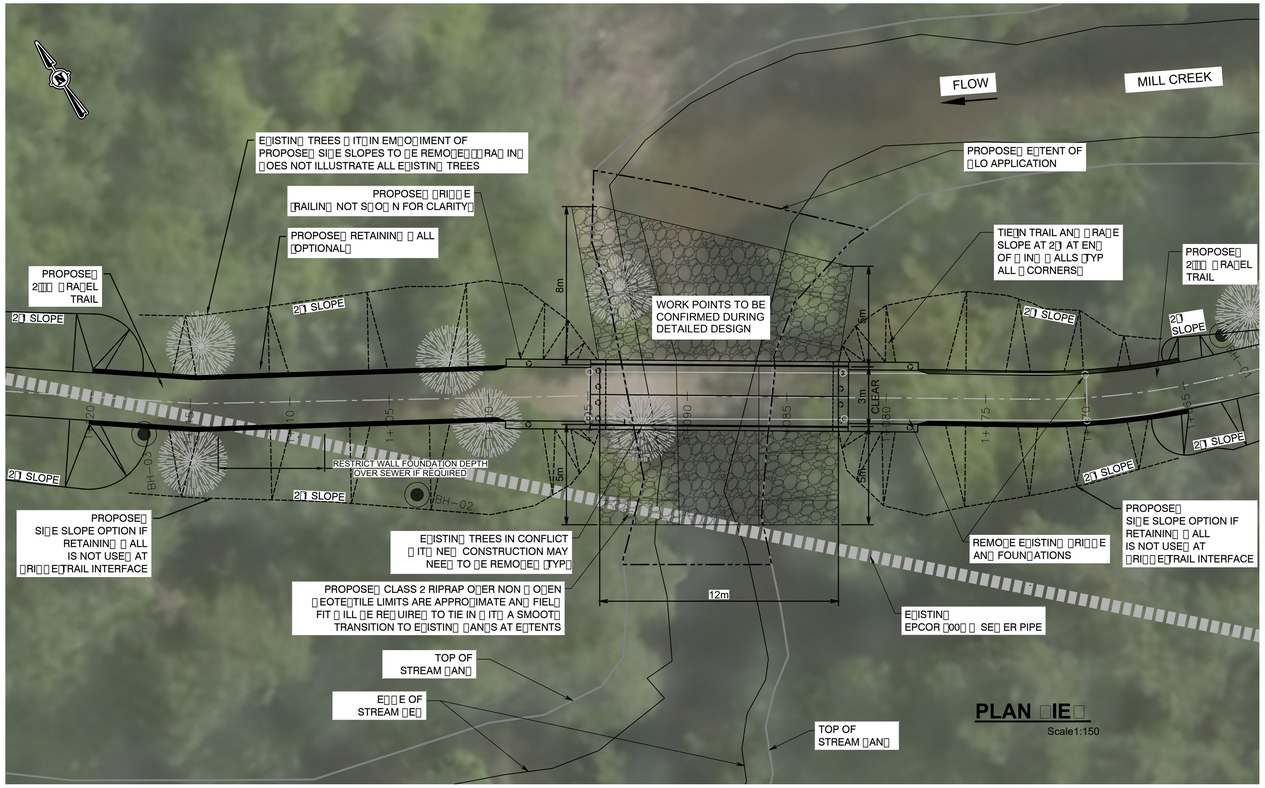
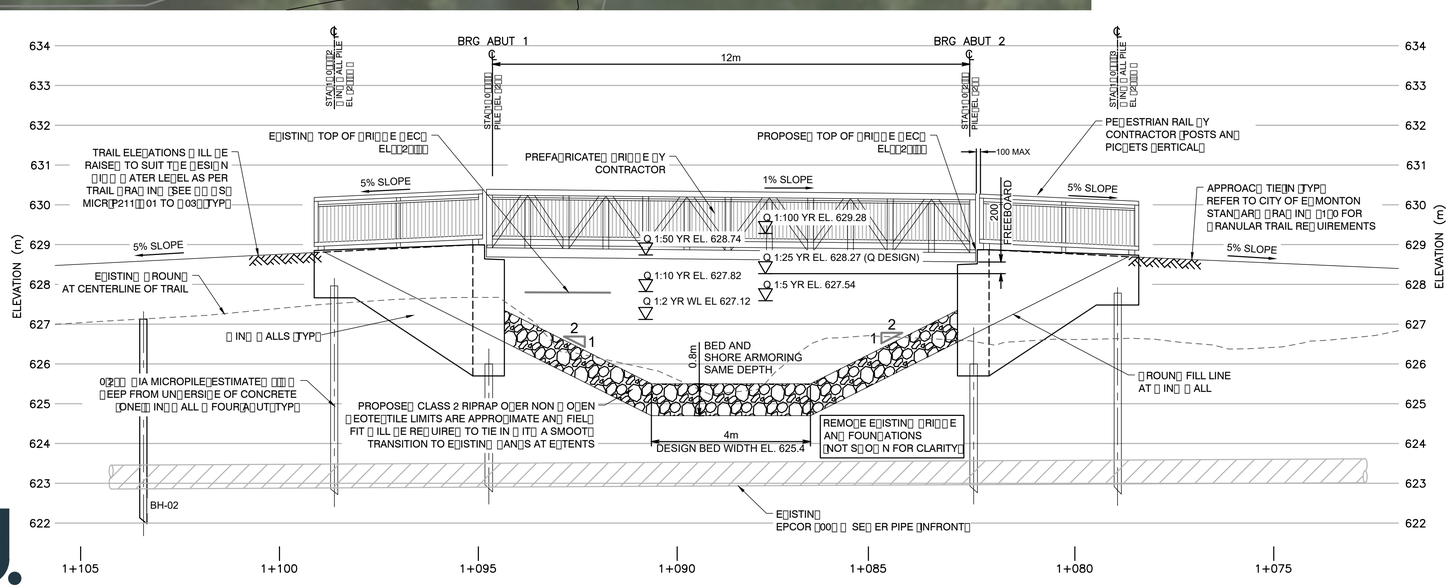


NOTES:

1. TOP OF BANK ELEVATION WAS ESTIMATED BY ALLOWING 300mm FREEBOARD ABOVE THE ESTIMATED 200 YEAR WATER LEVEL.
2. ALL ELEVATIONS ARE FROM THE CITY TECHNICAL MODEL BASED ON 3D LOCAL SURFACE OF THE EPCOR INTAKE STRUCTURE WITH RATING CURVE TO AN ELEVATION APPROX 1000mm ABOVE CURRENT STREAMBED PROFILE.
3. EXISTING LOD 0000 NOT SHOWN ON APPLICATION FOR NEW LOD PER OUTLINE SHOWN IN PENDING.

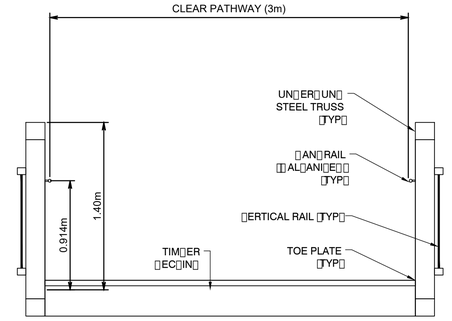
OR POINTS TO BE CONFIRMED IN DETAIL DESIGN.

RETURN PERIOD (YEARS)	MAX INSTANTANEOUS DISCHARGE (m^3/s)	WATER LEVEL ELEVATION (m) (See Note 2)	SOFFIT ELEVATION OF PROPOSED BRIDGE (m) (See Note 1)	TOP OF DECK ELEVATION FOR PROPOSED BRIDGE OPTION (m) (See Note 1)	COMPARE TO ELEVATION OF THE EXISTING BRIDGE DECK (m) (+/- ABOVE OR BELOW EXISTING)
100	50	629.28	629.48	629.78	2.10
50	36	628.74	628.94	629.24	1.56
25 - Q DESIGN	25	628.27	628.47	628.77	1.09
10	16	627.82	628.02	628.32	0.64
5	11	627.54	627.74	628.04	0.36
2	5	627.12	627.32	627.62	-0.16



BRIDGE ELEVATION

LOOKING NORTHEAST



BRIDGE SECTION

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6				
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4				
3	ISSUED FOR FINAL REVIEW	WP	21-SEP 03	B.G.
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1	ISSUED FOR REVIEW	W.P.	21-AU-05	B.G.

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THE CITY OF Edmonton
INTEGRATED INFRASTRUCTURE SERVICES
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PROJECT
MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
BRIDGE - GENERAL LAYOUT

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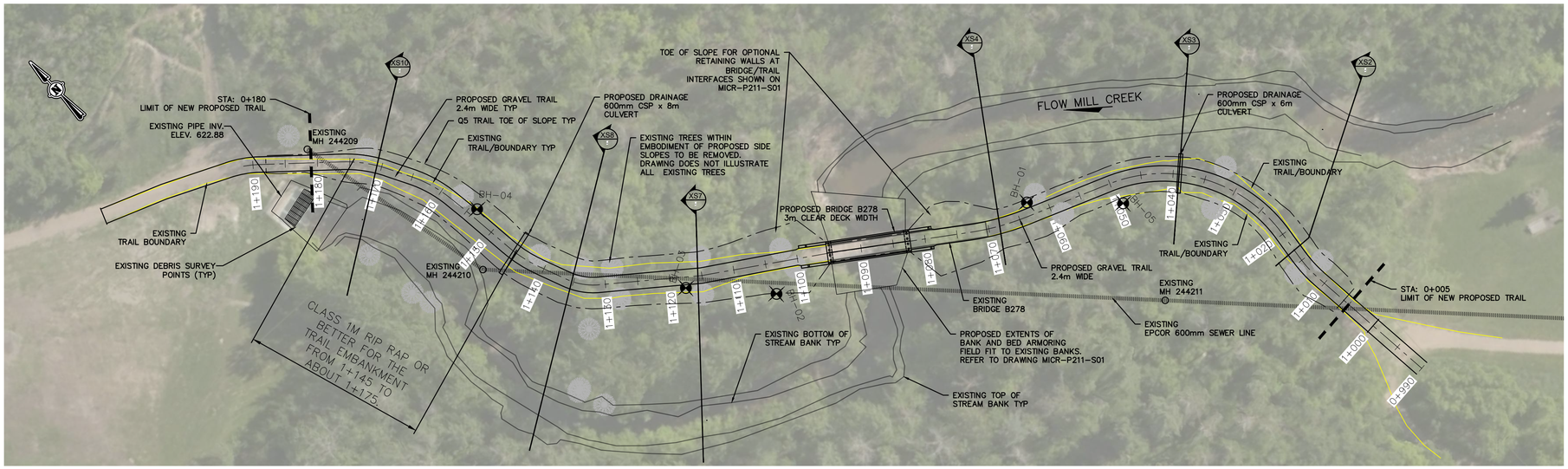

TRAIL PLAN

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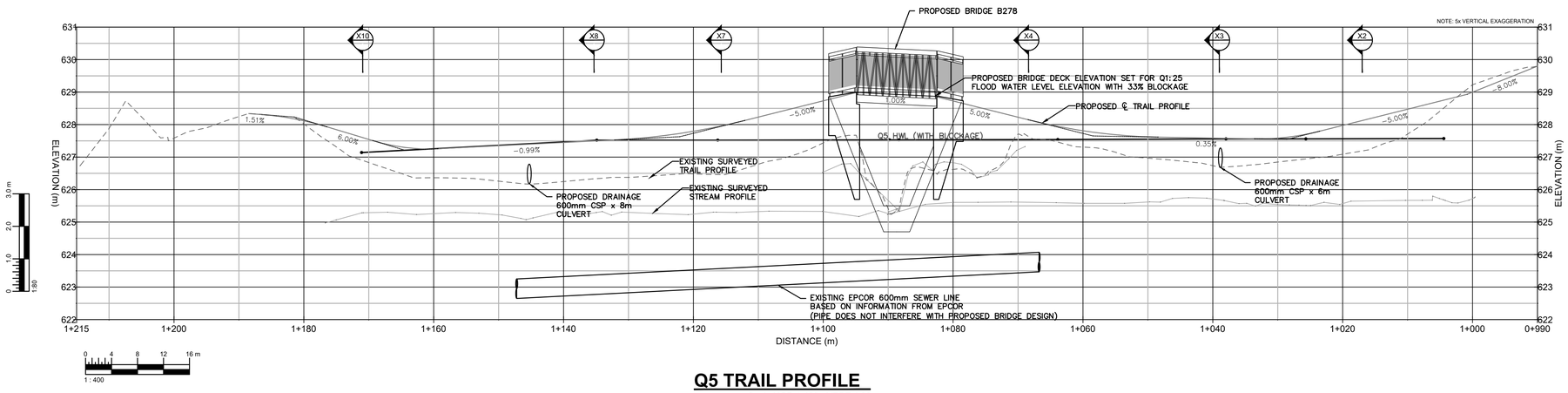

Q5 TRAIL PROFILE

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7				
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3	ISSUED FOR FINAL REVIEW	WP	21-SEP 03	GRK
2	ISSUED FOR 60% REVIEW	WP	21-AUG-27	GRK
1	ISSUED FOR 30% REVIEW	WP	21-AUG-13	GRK

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PROJECT
MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH 33% BLOCKAGE AT Q5 ELEV.

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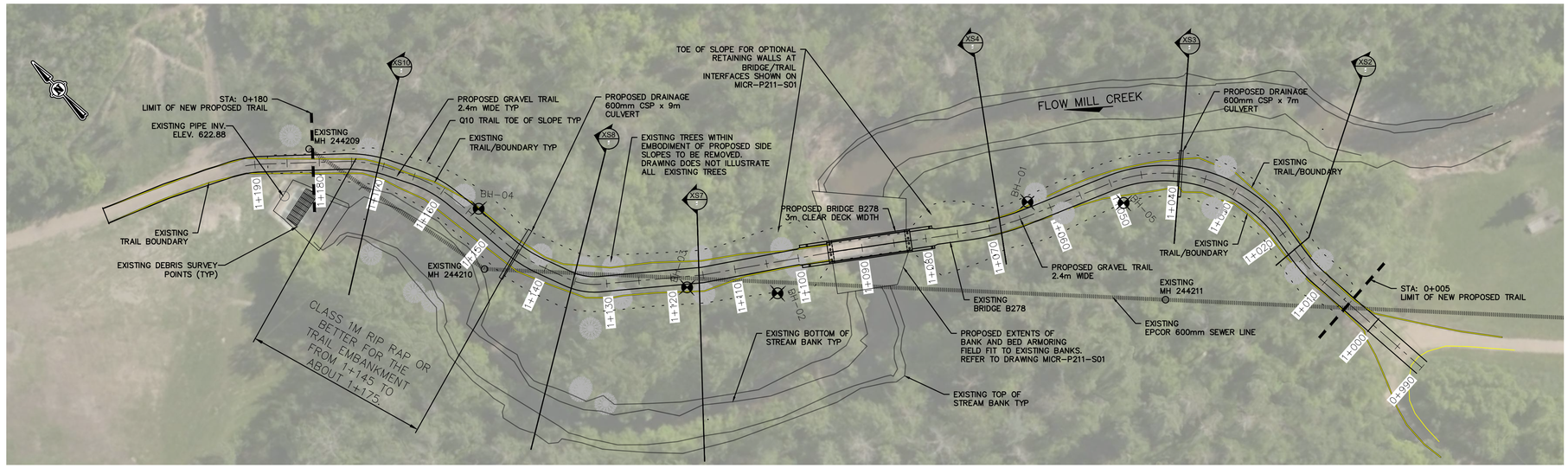

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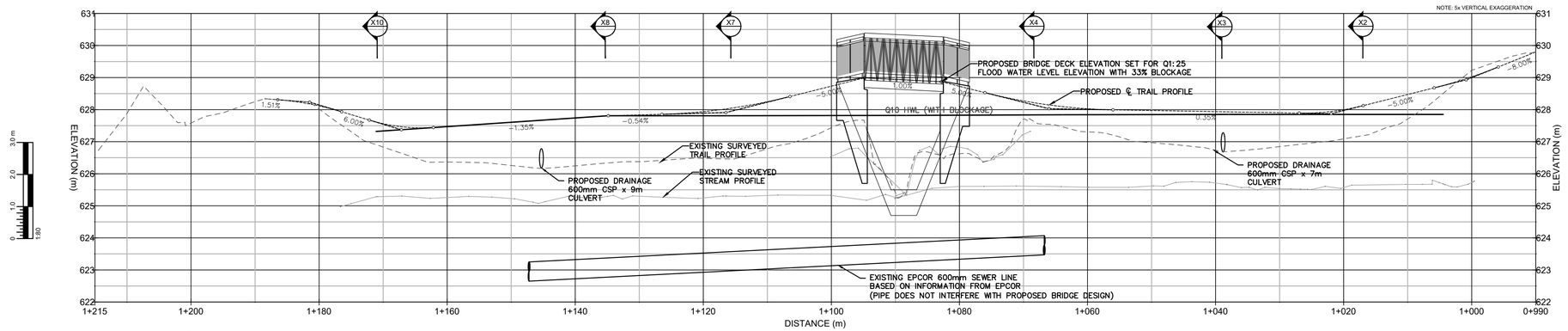

Q10 TRAIL PROFILE

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2	ISSUED FOR 60% REVIEW	WP	21-AUG-27	GRK
1	ISSUED FOR 30% REVIEW	WP	21-AUG-13	GRK

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PROJECT
MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH 33% BLOCKAGE AT Q10 ELEV.

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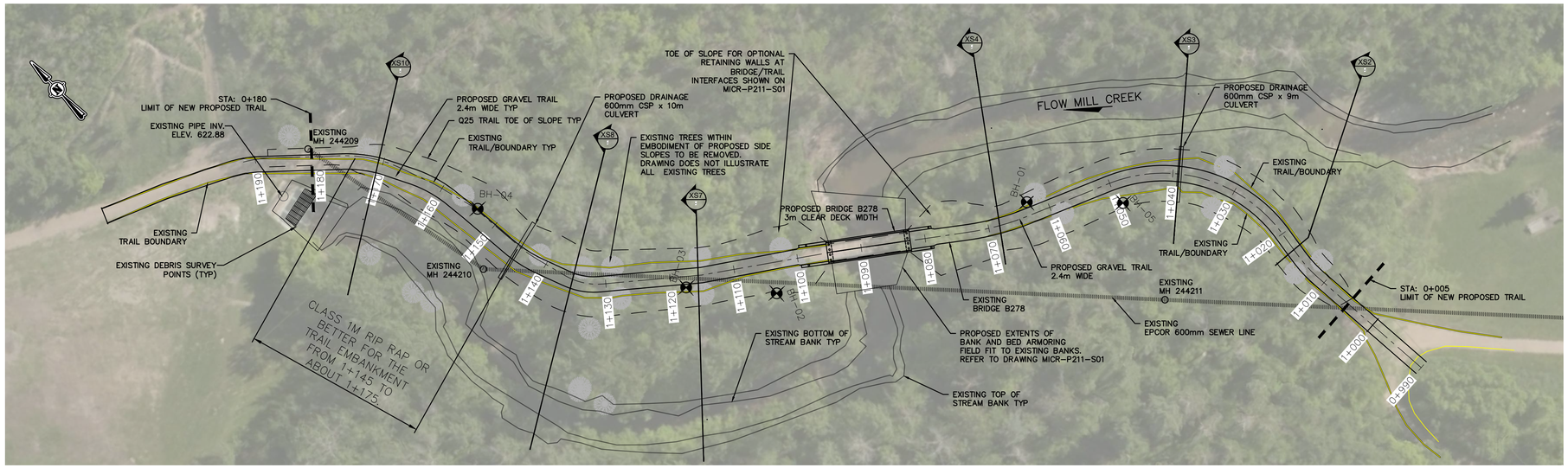

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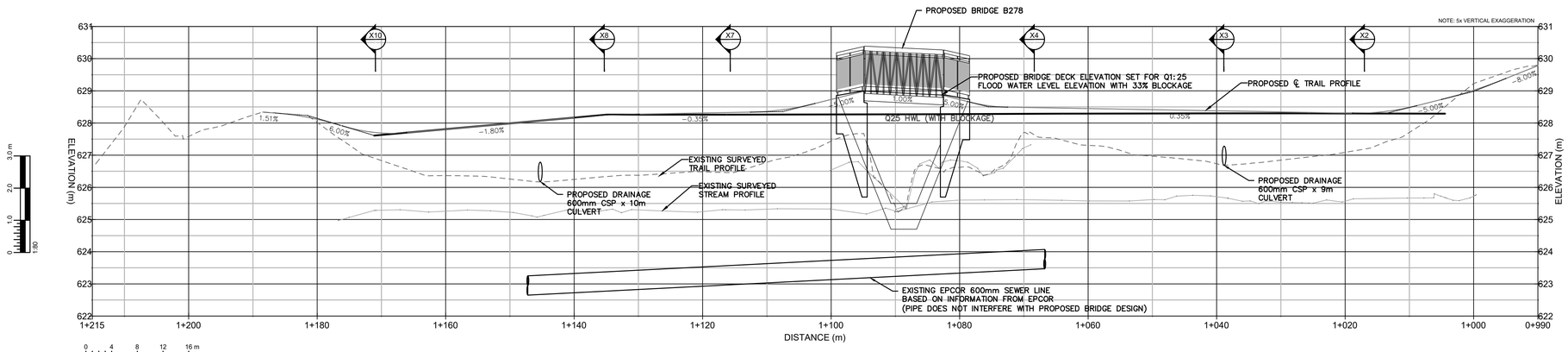

Q25 TRAIL PROFILE

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3	ISSUED FOR FINAL REVIEW	WP	21-SEP 03	GRK
2	ISSUED FOR 60% REVIEW	WP	21-AUG-27	GRK
1	ISSUED FOR 30% REVIEW	WP	21-AUG-13	GRK

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THE CITY OF Edmonton
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MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH 33% BLOCKAGE AT Q25 ELEV.

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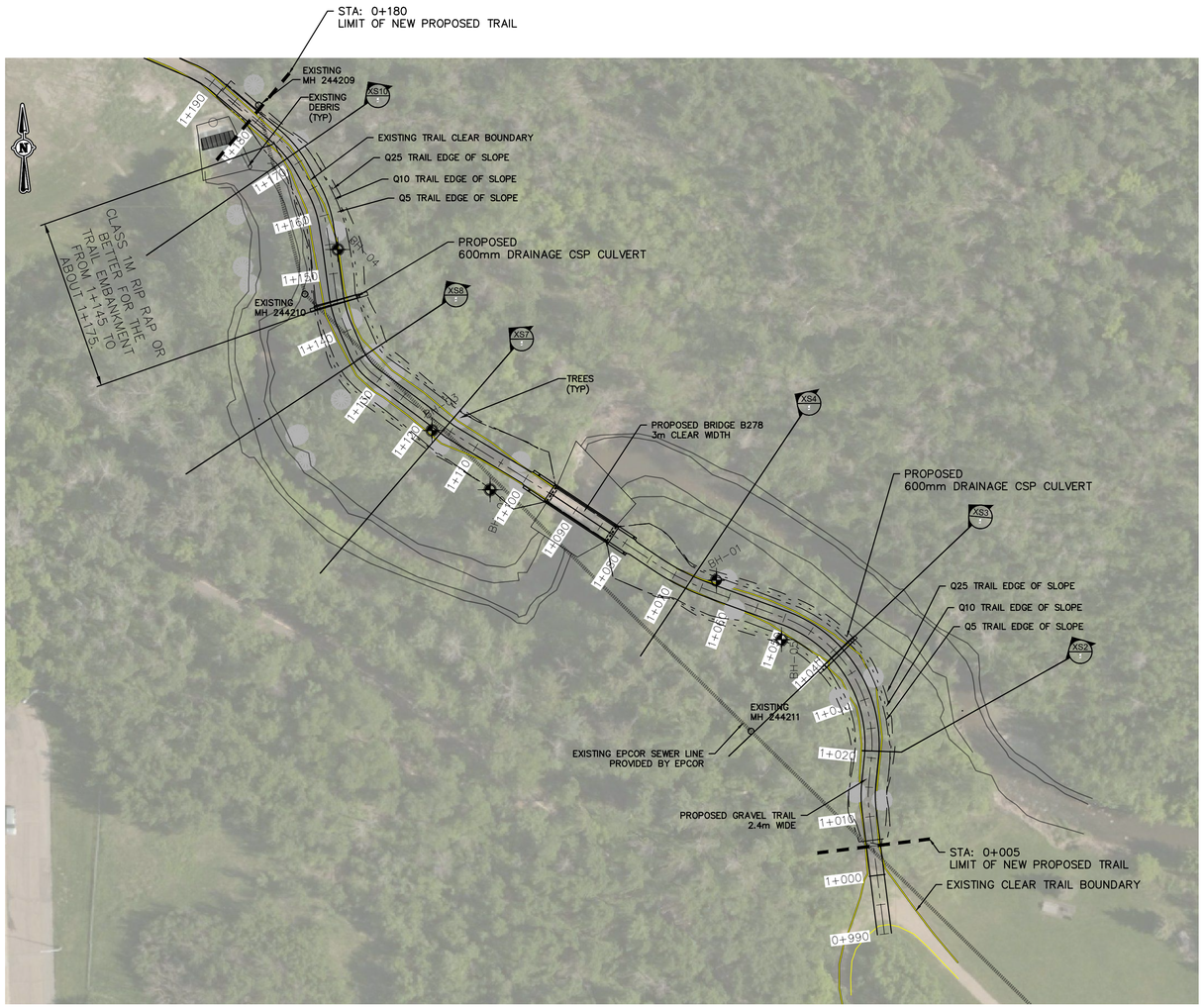
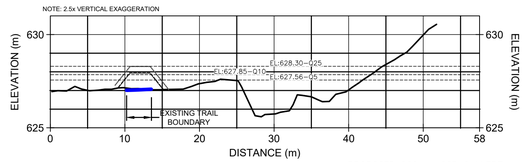


SITE PLAN



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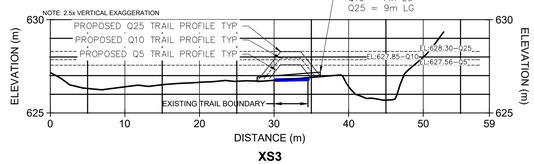

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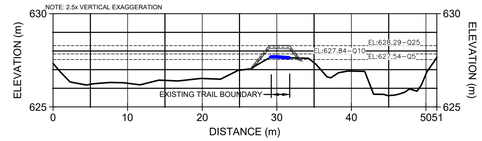

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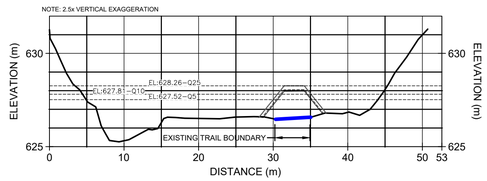

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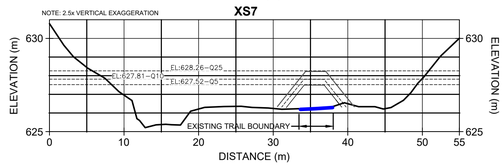

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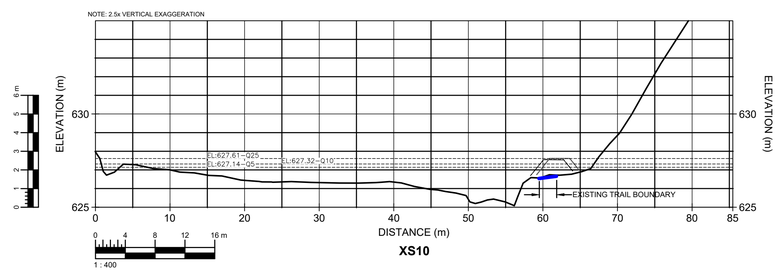

XS10

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1	ISSUED FOR 30% REVIEW	WP	21-AUG-13	GRK

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THE CITY OF Edmonton
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MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN / CROSS SECTIONS

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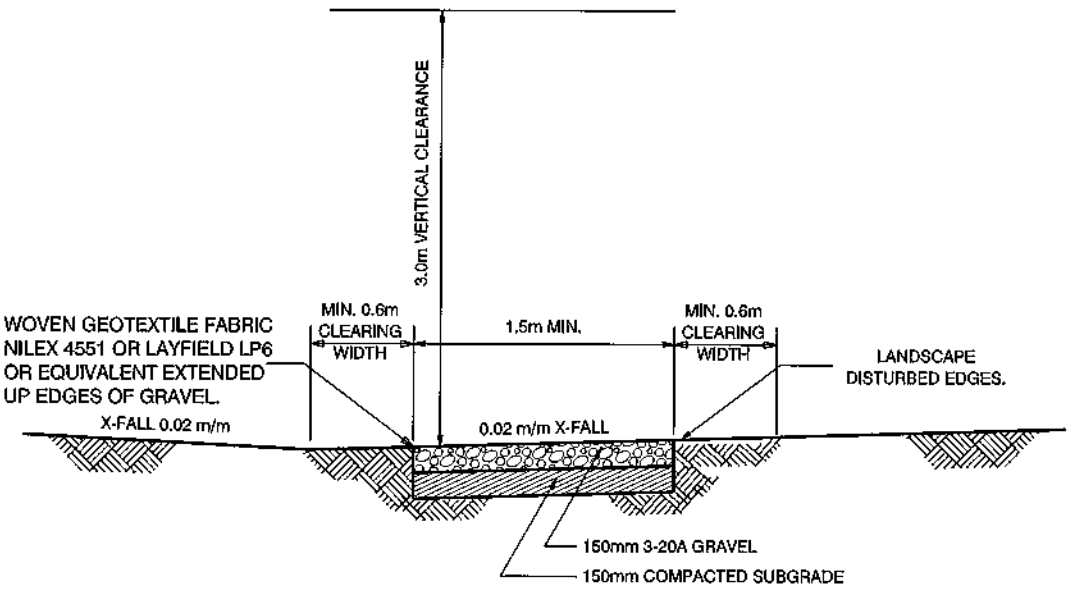


TYPICAL SECTION

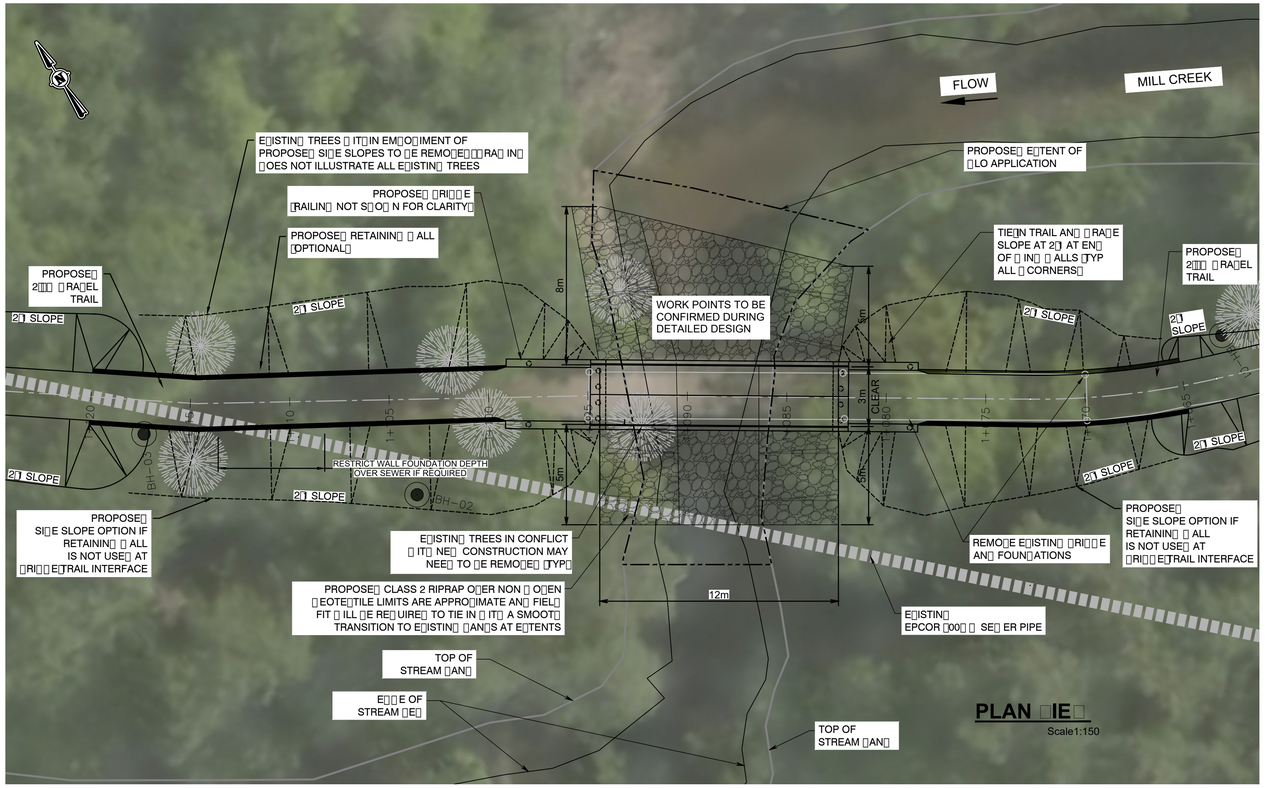
ALTERNATE STRUCTURE: - 300mm 3-20A GRAVEL WITH GEOTEXTILE NILEX 4551 OR LAYFIELD LP6 OR EQUIVALENT ON NATIVE GROUND.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

THE CITY OF Edmonton
STANDARD DRAWING

GRANULAR WALKWAY

Date Approved:	Drawn By:	Approved	Revision #	Drawing #
FEB., 2011	JW		—	5170
Scale: N.T.S.	Checked By:			

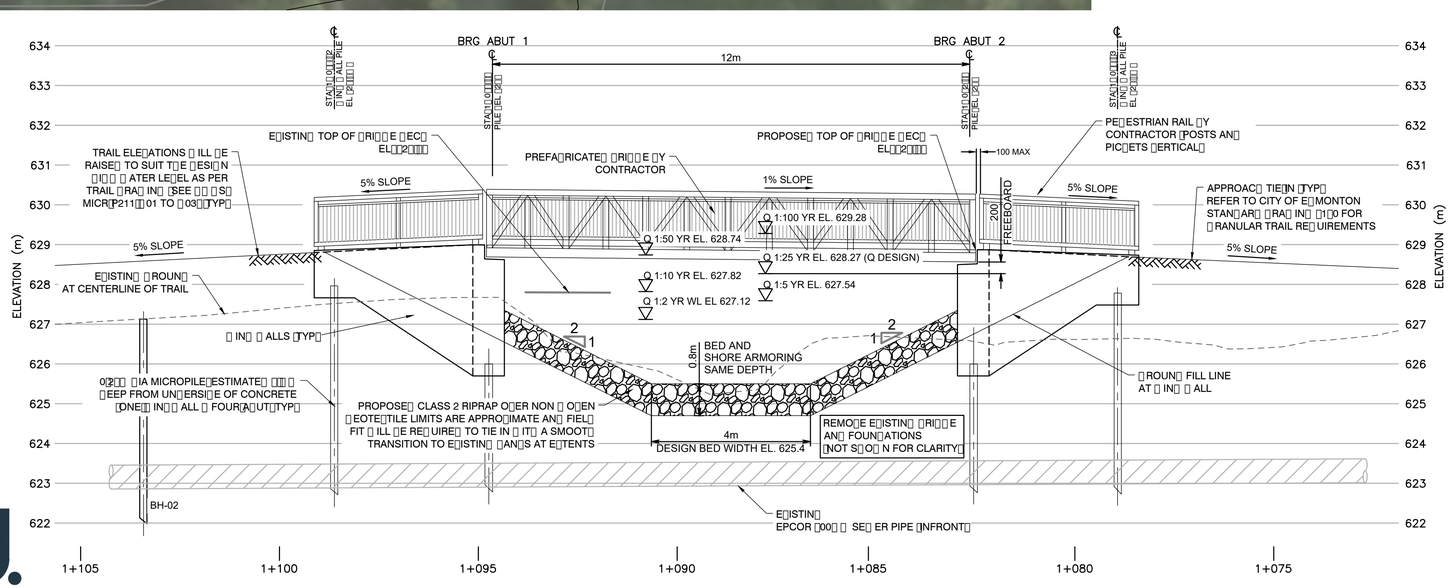


NOTES:

1. TOP OF BANK ELEVATION WAS ESTIMATED BY ALLOWING 300mm FREEBOARD ABOVE THE ESTIMATED 200 YEAR WATER LEVEL.
2. ALL ELEVATIONS ARE FROM THE CITY TECHNICAL MODEL BASED ON 3D LOCAL SURFACE OF THE EPCOR INTAKE STRUCTURE WITH RATING CURVE TO AN ELEVATION APPROX 1000mm ABOVE CURRENT STREAMBED PROFILE.
3. EXISTING LOD 0000 NOT SHOWN ON APPLICATION FOR NEW LOD PER OUTLINE SHOWN IN PENDING.

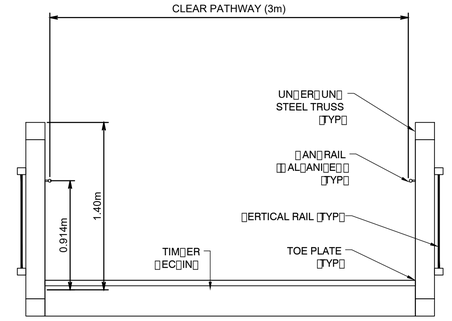
OR POINTS TO BE CONFIRMED IN DETAIL DESIGN.

RETURN PERIOD (YEARS)	MAX INSTANTANEOUS DISCHARGE (m^3/s)	WATER LEVEL ELEVATION (m) (See Note 2)	SOFFIT ELEVATION OF PROPOSED BRIDGE (m) (See Note 1)	TOP OF DECK ELEVATION FOR PROPOSED BRIDGE OPTION (m) (See Note 1)	COMPARE TO ELEVATION OF THE EXISTING BRIDGE DECK (m) (+/- ABOVE OR BELOW EXISTING)
100	50	629.28	629.48	629.78	2.10
50	36	628.74	628.94	629.24	1.56
25 - Q DESIGN	25	628.27	628.47	628.77	1.09
10	16	627.82	628.02	628.32	0.64
5	11	627.54	627.74	628.04	0.36
2	5	627.12	627.32	627.62	-0.16



BRIDGE ELEVATION

LOOKING NORTHEAST



BRIDGE SECTION

PRELIMINARY
NOT FOR CONSTRUCTION
03 SEP 2021

wood.
Environment & Infrastructure Solutions
5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6
PHONE 780-436-2152, FAX 780-435-8425

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3	ISSUED FOR FINAL REVIEW	WP	21-SEP 03	B.G.
2	ISSUED FOR REVIEW	W.P.	21-AU-27	B.G.
1	ISSUED FOR REVIEW	W.P.	21-AU-05	B.G.

NO.	ISSUE	BY	DATE
2	AS BUILT / TO GBIS		
1	TENDER AWARD DATE		

PROGRAM NO.
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

APPROVED FOR CONSTRUCTION
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE
TRANSPORTATION INFRASTRUCTURE DELIVERY - SUPERVISOR		
TRANSPORTATION PLANNING AND DESIGN - SUPERVISOR		

DIRECTOR OF TRASNPORTATION PLANNING AND DESIGN DATE

SURVEY
JOB NO.
SCALE
HOR
VER

DRAWN W.P. DATE 30 JUL 2021
DESIGNED A.M. DATE 30 JUL 2021
CHECKED B.G. DATE 03 AUG 2021

THE CITY OF Edmonton
INTEGRATED INFRASTRUCTURE SERVICES
ENGINEERING SERVICES

PROJECT
MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
BRIDGE - GENERAL LAYOUT

DRAWING
MICR-P211-S01

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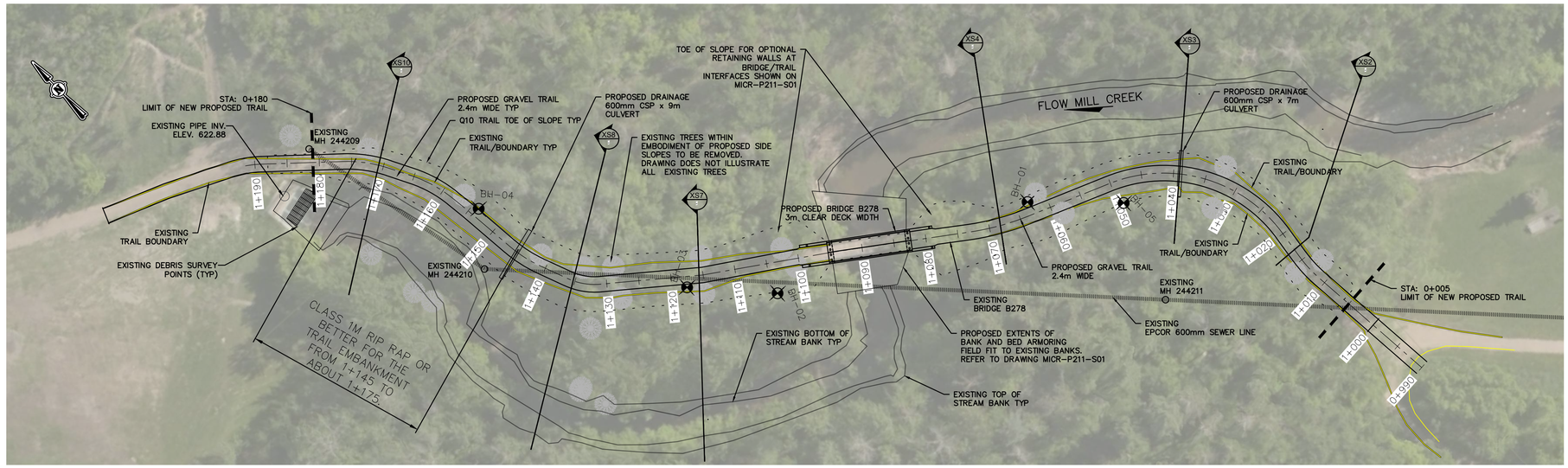
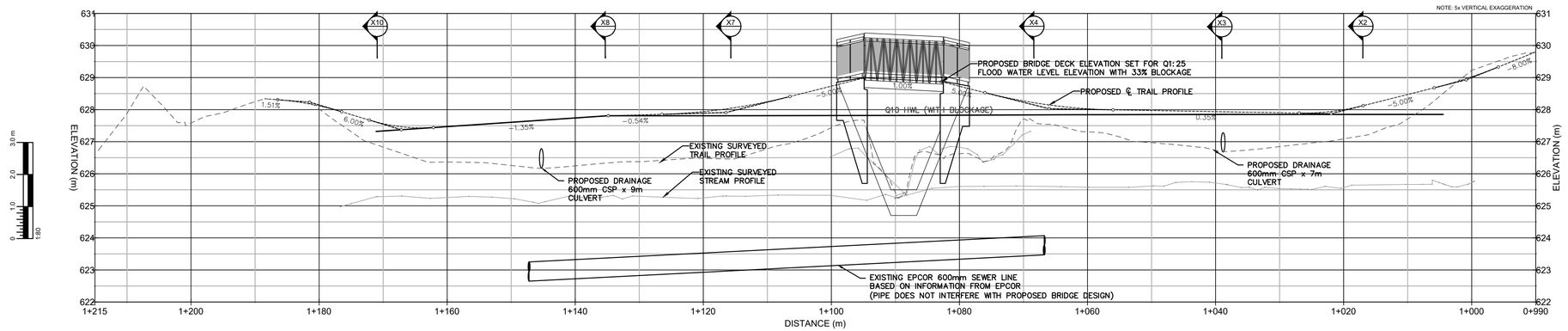


TRAIL PLAN

Scale 1:400



Q10 TRAIL PROFILE

Scale HOR 1:400 - VERT 1:80

wood.
Environment & Infrastructure Solutions
5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6
PHONE 780-436-2152, FAX 780-435-8425

PRELIMINARY
NOT FOR CONSTRUCTION

03 SEP 2021

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3	ISSUED FOR FINAL REVIEW	WP	21-SEP 03	GRK
2	ISSUED FOR 60% REVIEW	WP	21-AUG-27	GRK
1	ISSUED FOR 30% REVIEW	WP	21-AUG-13	GRK

NO.	ISSUE	BY	DATE
2	AS BUILT / TO GBIS		
1	TENDER AWARD DATE		

PROGRAM NO.
CONTRACT NO. -

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

APPROVED FOR CONSTRUCTION
DATE

DEPARTMENT / BRANCH	APPROVAL	DATE
TRANSPORTATION INFRASTRUCTURE DELIVERY - SUPERVISOR		
TRANSPORTATION PLANNING AND DESIGN - SUPERVISOR		

DIRECTOR OF TRASNPORTATION PLANNING AND DESIGN DATE

SURVEY
JOB NO.
SCALE
HOR
VER

DRAWN W.P. DATE 30 JUL 2021
DESIGNED G.R.K. DATE 30 JUL 2021
CHECKED G.R.K. DATE 03 AUG 2021

THE CITY OF Edmonton
INTEGRATED INFRASTRUCTURE SERVICES
ENGINEERING SERVICES

PROJECT
MILL CREEK NORTH PEDESTRIAN BRIDGE B278
REHABILITATION & TRAIL UPGRADES
TRAIL PLAN/PROFILE WITH 33% BLOCKAGE AT Q10 ELEV.

DRAWING
MICR-P211-G02

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Appendix B

Environmental Regulatory Program

Appendix B.1

DFO Fisheries Act Letter of Advice 22-HCAA-00328

Fisheries and Oceans Canada
Pêches et Océans Canada

Ontario and Prairie Region
Fish and Fish Habitat Protection Program
867 Lakeshore Rd.
Burlington, ON
L7S 1A1

Région de l'Ontario et des Prairies
Programme de protection du poisson et de son habitat
867 chemin Lakeshore
Burlington, ON
L7S 1A1

February 22nd, 2022

Our file *Notre référence*
22-HCAA-00328

Ryan Teplitsky
City of Edmonton
1300 Edmonton Tower, 10111 104 Avenues NW
Edmonton, Alberta
T5J 0J4

Subject: Bridge Replacement, Mill Creek, City of Edmonton (22-HCAA-00328) – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat

Dear Ryan Teplitsky:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on February 14th, 2022. We understand that you propose to:

- Replace an existing 2.6m wide timber bridge structure with a 3m wide x 13m long single span steel truss bridge with abutments above the High Water Mark resulting in 150m^2 footprint below the High Water Mark;
- Reconstruct headslopes, streambed and banks with riprap resulting in ~225m2 footprint below the High Water Mark;
    - Riprap to be embedded in the streambed to allow for fish passage under low flow conditions
- Reconstruct the pedestrian trails;
- Conduct all in-water works, undertakings or activities in isolation of open or flowing water, ensuring fish passage and flow maintained;
- Replace/restore all disturbed habitat features and remediate any areas impacted by the work, undertaking or activity
- Ensure appropriate erosion and sediment control measures

In addition, the following aquatic species are subject to the *Aquatic Invasive Species Regulations* and may be found in the vicinity of your proposed work, undertaking, or activity:

- Prussian Carp
- Phragmites
- Himalayan Balsam

Canada

- Flowering Rush

Our review considered the following information:

- Request for Review form and associated documents submitted on February 14th, 2022.

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*;
- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*; and
- the introduction of aquatic species into regions or bodies of water frequented by fish where they are not indigenous, which is prohibited under section 10 of the *Aquatic Invasive Species Regulations*.

The aforementioned impacts are prohibited unless authorized under their respective legislation and regulations.

To avoid and mitigate the potential for prohibited effects to fish and fish habitat (as listed above), we recommend implementing the measures listed below:

- Plan in-water works, undertakings and activities to respect timing windows to protect fish and fish habitat
    - No in-water work between September 16 to July 31
- Capture, relocate and monitor for fish trapped within isolated, enclosed, or dewatered areas
    - Dewater gradually to reduce the potential for stranding fish
- Screen intake pipes to prevent entrainment or impingement of fish
    - Use the code of practice for water intake screens
- Apply the interim code of practice for temporary cofferdams and diversion channels
- Limit impacts on riparian vegetation to those approved for the work, undertaking or activity
- Replace/restore any other disturbed habitat features and remediate any areas impacted by the work, undertaking or activity
- Develop and implement an Sediment Control Plan to minimize sedimentation of the waterbody during all phases of the work, undertaking or activity
    - Conduct all in-water works, undertakings or activities in isolation of open or flowing water to reduce the introduction of sediment into the watercourse
        - Maintain the natural flow regime for any diversion works
- Do not deposit any deleterious substances in the water course
- aquatic

    - Stop work, contain sediment-laden water and other deleterious substances and prevent their further migration into the watercourse
- All debris and vegetation removed from the site should be properly dispose of to reduce the risk of spreading invasive species
- Ensure that all in-water equipment is decontaminated following the "Decontamination Protocol for Watercraft & Equipment" guideline produced by Alberta Environment and Parks to ensure that aquatic plants and pests are not transferred to or out of the waterbody
- Report and photograph any non-native species found, including:
    - Approximate number and size class(es) of non-native fish removed
    - Sightings of Flowering Rush, with approximate number and location
    - Pictures would enhance the ability to report all items, and is encouraged as part of the report

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal will not require an authorization under the *Fisheries Act*, the *Aquatic Invasive Species Regulations* or the *Species at Risk Act*.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, the *Species at Risk Act* and the *Aquatic Invasive Species Regulations.*

Whirling disease, a disease of finfish, caused by infection with a microscopic parasite called *Myxobolus cerebralis,* has been identified in Alberta. There may be a requirement for you to apply for a permit from the Canadian Food Inspection Agency to move certain species of finfish, such as rainbow trout, and things, such as sediments, within or out of Alberta. Please visit http://www.inspection.gc.ca/animals/aquatic-animals/domestic-movements/eng/1450122972517/1450122973466 for more information.

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to (http://www.dfo-mpo.gc.ca/pnw-ppe/CONTACT-eng.html).

We recommend that you notify this office at least 10 days before starting your project and that a copy of this letter be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

If you have any questions with the content of this letter, please contact Carly White by email at Carly.White@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

.../4

Yours sincerely,

Carly White
Biologist, Triage and Planning
Fish and Fish Habitat Protection Program

Appendix B.2

Historical Resources Act Approval and Standard Requirements Under the Historical Resources Act

HRA Number: 4725-21-0056-001
November 01, 2021

Historical Resources Act Approval

Proponent: City of Edmonton
11004 190 Street NW, Edmonton, AB T5S 0G9
Contact: Mr. Mitchell Schutta

Agent: Wood Environment and Infrastructure Solutions
Contact: Aidan Burford

Project Name: **Mill Creek Bridge B278 and Trail Upgrades**

Project Components: Trail
Other - Trail bridge

Application Purpose: Requesting HRA Approval / Requirements

Historical Resources Act approval is granted for the activities described in this application and its attached plan(s)/sketch(es) subject to Section 31, "a person who discovers an historic resource in the course of making an excavation for a purpose other than for the purpose of seeking historic resources shall forthwith notify the Minister of the discovery." The chance discovery of historical resources is to be reported to the contacts identified within Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources.

Martina Purdon
Manager, Regulatory Approvals
and Information Management
Alberta Culture and Status of
Women

Lands Affected: All New Lands

Proposed Development Area:

MER	RGE	TWP	SEC	LSD List
4	24	52	33	3,6

Documents Attached:

Document Name	Document Type
Design drawings	Illustrative Material

Alberta

STANDARD REQUIREMENTS UNDER THE *HISTORICAL RESOURCES ACT*: REPORTING THE DISCOVERY OF HISTORIC RESOURCES

If development proponents and/or their agents become aware of historic resources during the course of development activities, they are required, under Section 31 of the *Historical Resources Act*, to report these discoveries to the Heritage Division of Alberta Culture and Status of Women. This requirement applies to all activities in the Province of Alberta.

1.0 REPORTING THE DISCOVERY OF ARCHAEOLOGICAL RESOURCES

The discovery of archaeological resources is to be reported to Darryl Bereziuk, Director, Archaeological Survey, at 780-431-2316 (toll-free by first dialing 310-0000) or darryl.bereziuk@gov.ab.ca.

2.0 REPORTING THE DISCOVERY OF PALAEONTOLOGICAL RESOURCES

The discovery of palaeontological resources is to be reported to Dan Spivak, Head, Resource Management, Royal Tyrrell Museum of Palaeontology, at 403-820-6210 (toll-free by first dialing 310-0000) or dan.spivak@gov.ab.ca.

3.0 REPORTING THE DISCOVERY OF HISTORIC PERIOD SITES

The discovery of historic structures to be reported to Rebecca Goodenough, Manager, Historic Places Research and Designation Program, at 780-431-2309 (toll-free by first dialing 310-0000) or rebecca.goodenough@gov.ab.ca. Please note that some historic structure sites may also be considered Aboriginal traditional use sites.

4.0 REPORTING THE DISCOVERY OF ABORIGINAL TRADITIONAL USE SITES

The discovery of any Aboriginal traditional use site that is of a type listed below is to be reported to Valerie Knaga, Director, Aboriginal Heritage Section, at 780-431-2371 (toll-free by first dialing 310-0000) or valerie.k.knaga@gov.ab.ca.

Aboriginal Traditional Use sites considered by Alberta Culture and Status of Women to be historic resources under the *Historical Resources Act* include:

Historic cabin remains;
Historic cabins (unoccupied);
Cultural or historical community camp sites;

Ceremonial sites/Spiritual sites;
Gravesites;
Historic settlements/Homesteads;
Historic sites;
Oral history sites;
Ceremonial plant or mineral gathering sites;
Historical Trail Features; and,
Sweat/Thirst/Fasting Lodge sites

5.0 FURTHER SALVAGE, PRESERVATIVE OR PROTECTIVE MEASURES

If previously unrecorded historic resources are discovered, proponents may be ordered to undertake further salvage, preservative or protective measures or take any other actions that the Minister of Culture considers necessary.

Appendix C

Photo Documentation

Plate C1: July 27, 2021. Facng upstream (east), from 2 m upstream of B278, showing steeply eroded and slumping right (east) bank. Note woody denris jam at B278 bridge opening.

Plate C2: June 17, 2021. Facing south from the west bank of Mill Creek, approximately 80 m downstream of B278, showing recovering understory vegetation covered with soil deposits from recent flooding. Understory vegetation was still recovering during the August rare plant survey.

Plate C3: June 17, 2021. Facing northeast, west of the EPCOR inlet structure located at the north extent of the Project trail, showing seedling sof prohibited noxious weed Himalayan balsam (*Impatiens glandulifera*).

Plate C4: June 17, 2021. Seedling Himalayan balsam in an area approximately 5 m x 5 m, on the west creek bank west of the EPCOR inlet structure.

Plate C5: 12 August 2021. Facing east, a single plant of Himalyan balsam was observed on east bank dow nstream of B278, which was removed and disposed of on 12 August 2021.

Plate C6: July 27, 2021. Facing northwest (downstream) from 100 m upstream of B278, showing Himalayan balsam on the right bank.

Wood Environment & Infrastructure Solutions 5681 - 70 STREET, EDMONTON, ALBERTA T6B 3P6 PHONE (780) 436-2152 FAX (780) 435-8425	wood.	PROJECT: **Mill Creek Ravine Pedestraine Bridge B278 Rehabilitation & Trail Upgrades Environmental Impact Assessment**	City of Edmonton
		TITLE: **Photo Documentation**	FIGURE C1

Plate C7: Plate B6: June 17, 2021. Showing noxious weeds including Canada thistle, common toadflax, great burdock, scentless chamomile and perennial sow-thistle around a soil stockpile north of the Project site

Plate C8: July 27, 2021. Facing downstream from 50 m upstream of B278, showing runhabitat in the upstream sub-reach. Note side channel bars composed of fine-tectured material.

Plate C9: July 27, 2021. Facing upstream (southeast) from 75 m downstream, showing run habitat in the downstream sub-reach. Note rock filled gabion baskets along the right (west) bank.

Plate C10: July 27, 2021. Facing southwest showing the high, steeply eroded and slumping left (west) bank, located 100 m upstream of B278. Note side channel bars composed of fine-tectured and gravel material.

Plate C11: July 27, 2021. Facing downstream (northwest) from the pedestrian trail approximately 55 m north of B278, showing woody denris jam at the EPCOR inlet structure.

Plate C12: July 27, 2021. Facing upstream (northeast) from downstream of B278, showing pool habitat with fine textured substrate matieral at the crossing. Note woody debris jam and rock filled gabion baskey on the right bank, at the crossing.

Wood Environment & Infrastructure Solutions 5681 - 70 STREET, EDMONTON, ALBERTA T6B 3P6 PHONE (780) 436-2152 FAX (780) 435-8425	wood.	PROJECT: **Mill Creek Ravine Pedestraine Bridge B278 Rehabilitation & Trail Upgrades Environmental Impact Assessment**	City of Edmonton
		TITLE: **Photo Documentation**	FIGURE C2

Appendix D

2021 Spring and Summer Rare Plant Survey Methodology and Results

D.0 SURVEY METHODOLOGY

The rare plant survey followed the general guidelines of the Alberta Native Plant Council (ANPC 2012), using a meandering survey technique. Three plots (RP01-RP03) were surveyed within the PDA at the location provided in Table D2. An inventory of all plant species observed within each plot was completed and recorded, see Table D2. Definitions for species conservation rank is provided in Table D1.

To ensure rare plant habitat for rare plants are identified and protected (where required) within the area, two rare plant surveys are typically completed during the active growing season; one in the early summer (between 15 June and 7 July), and the second in mid-summer (between 21 July and 31 August) in order to observe early and late season perennials and annuals (ANPC 2012). The early summer survey was conducted June 18, 2019 and the mid-summer survey was conducted on 12 August 2021.

A review of the ACIMS database was completed on both June 16, 2021 and October 8, 2021 to determine what rare plant species have previously been observed near the Project area, and to become familiar with their habitat. The tracked ecological communities list (Allen 2014) was also reviewed for potential plant communities that could occur within the Project area.

Rare plant species defined for the purposes of this assessment include:

- those species listed by Alberta Conservation Information Management System (ACIMS) (GoA 2017) on the tracking list and watch list for vascular, nonvascular plants and lichen species;
- those species provincially regulated as 'Extinct', 'Extirpated', 'Endangered', 'Threatened', or 'Special Concern' under the *Wildlife Act* and *Wildlife Regulation*; and
- those species listed as 'Special Concern', 'Threatened', 'Endangered', 'Extinct' or 'Extirpated', under the federal *Species at Risk Act* and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (GoC 2017).

Where field identification of plants was uncertain, a specimen and/or photographs were collected for later verification. Collections of non-vascular species was not completed, due to recent flooding events leaving the ground layer covered with (silty) soils deposits. A few moss samples not within the Mill Creek floodplain were collected, however all specimens observed were fairly common and not tracked rare specimens.

Table D1. Species Ranking Definitions[1]

Alberta Rank[2]	Global Rank	Global Rank	Rank Description
S1	N1	G1	5 or fewer occurrences or very few remaining hectares.
S2	N2	G2	6-20 occurrences or few remaining hectares.
S3	N3	G3	21-80 occurrences or may be rare and local throughout its range, or found locally, even abundantly, in a restricted range.
S4	N4	G4	Apparently secure province wide under present conditions, typically >100 occurrences but may be fewer with many large populations; may be rare in parts of its range, especially peripherally.
S5	N5	G5	Demonstrably secure globally province-wide under present conditions, >100 occurrences, may be rare in parts of its range, especially peripherally.
SNA	NNA	GNA	Not applicable because species is not a suitable target for conservation activities.
SNR	NNR	GNR	Element not yet ranked.
SU	NU	GU	Unrankable. Currently unrankable due to lack of information or substantially conflicting information about status or trends.
S#S#	N#N#	G#G#	Ranks can be combined to indicate a range. Example - S2S3 = may be between 6 to 80 occurrences throughout Alberta but the exact status is uncertain. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4). Combined ranks indicate a larger margin of error than ranks assigned a "?" qualifier[3].

1: Adapted from Alberta Parks 2018 and NatureServe 2019.
2: Some species are transitionally ranked, such as S1S2.
3: "?" – Inexact numeric rank.

Table D2. 2021 Rare Plant Survey Results - Vegetation Species List

Scientific Name	Common Name	Alberta Rank[1]	National Rank[1]	Global Rank[1]	Origin	Track Status	*Weed Control Act* Class.	Transect Location (12 U Easting Start/ End, Northing Start/ End)		
								12U 335610/ 335550, 59304043/ 5934104	12U 335547/ 335470, 5934098/ 5934151	12U 335547/ 335487, 5934098/ 5934173
Trees										
Acer negundo	Manitoba maple	SU	N5	G5	Native	Do not track	-	**RP01**	**RP02**	**RP03**
Malus spp.	Crab apple	-	-	-	-	-	-			RP03
Populus balsamifera	balsam poplar	S5	N5	G5	Native	Do not track	-	**RP01**	**RP02**	**RP03**
Populus tremuloides	trembling aspen	S5	N5	G5	Native	Do not track	-	**RP01**		**RP03**
Quercus macrocarpa	burr oak	SNA	N5	G5	Unknown / Undetermined	Do not track	-	RP01		
Ulmus americana	American elm	SNA	N5	G5	Exotic	Do not track	-	RP01	RP02	RP03
Shrubs										
Amelanchier alnifolia	Saskatoon	S5	N5	G5	Native	Do not track	-	RP01	RP02	
Caragana arborescens	common caragana	SNA	NNA	GNR	Exotic	Do not track	-		**RP02**	
Cornus stolonifera	red-osier dogwood	S5	N5	G5	Native	Do not track	-	**RP01**		**RP03**
Corylus cornuta	beaked hazelnut	S5	N5	G5	Native	Do not track	-	**RP01**	**RP02**	RP03
Cotoneaster acutifolius	hedge cotoneaster	-	-	-	-	-	-		RP02	
Prunus virginiana	choke cherry	S5	N5	G5	Native	Do not track	-	RP01	**RP02**	**RP03**
Ribes americanum	wild black currant	S4	N5	G5	Native	Do not track	-	RP01		
Ribes aureum	golden currant	S5	N5	G5	Native	Do not track	-	RP01		
Rosa acicularis	prickly rose	S5	N5	G5	Native	Do not track	-	**RP01**		**RP03**
Rubus idaeus	wild red raspberry	S5	N5	G5	Native	Do not track	-	RP01		
Salix spp.	willow spp.	-	-	-	-	-	-	**RP01**		RP03
Salix bebbiana	beaked willow	S5	N5	G5	Native	Do not track	-	RP01	RP02	
Salix discolor	pussy willow	S5	N5	G5	Native	Do not track	-	RP01		
Salix exigua	narrow-leaf willow	S3S4	N5	G5	Native	Do not track	-	RP01		
Salix pyrifolia	balsam willow	S5	N5	G5	Native	Do not track	-	RP01		RP03
Salix scouleriana	Scouler's willow	S5	N5	G5	Native	Do not track	-		RP02	
Symphoricarpos albus	snowberry	S5	N5	G5	Native	Do not track	-	RP01	**RP02**	**RP03**
Viburnum edule	low-bush cranberry	S5	N5	G5	Native	Do not track	-		RP02	
Forbs										
Actaea rubra	red and white baneberry	S5	N5	G5	Native	Do not track	-		RP02	RP03
Aralia nudicaulis	wild sarsaparilla	S5	N5	G5	Native	Do not track	-		RP02	
Artemisia spp.	sage	-	-	-	-	-	-			RP03
Brassica rapa	bird's rape	SNA	NNA	GNR	Exotic	Do not track	-			RP03
Chenopodium album	lamb's-quarters	SNA	NNA	G5	Exotic	Do not track	-	RP01		RP03
Chenopodium glaucum	oak-leaved goosefoot	-	-	-	-	-	-			RP03
Epilobium anagallidifolium	alpine willowherb	S3	N5	G5	Native	Do not track	-		RP02	
Equisetum arvense	common horsetail	S5	N5	G5	Native	Do not track	-	RP01	RP02	RP03
Erigeron canadensis	horseweed	S4	N5	G5	Native	Do not track	-			RP03
Galium boreale	northern bedstraw	S5	N5	G5	Native	Do not track	-			RP03
Impatiens capensis	spotted touch-me-not	S4	N5	G5	Native	Do not track	-		RP02	
Impatiens noli-tangere	western jewelweed	S4	N4	G4G5	Native	Do not track	-			RP03
Lactuca serriola	prickly lettuce	SNA	NNA	GNR	Exotic	Do not track	-		RP02	RP03
Lycopus europaeus	gypsywort	-	-	-	-	-	-	RP01	RP02	
Maianthemum stellatum	star-flowered Solomon's-seal	S5	N5	G5	Native	Do not track	-	RP01	RP02	RP03

Table D2. 2021 Rare Plant Survey Results - Vegetation Species List

Scientific Name	Common Name	Alberta Rank[1]	National Rank[1]	Global Rank[1]	Origin	Track Status	*Weed Control Act* Class.	Transect Location (12 U Easting Start/ End, Northing Start/ End)		
								12U 335610/ 335550, 59304043/ 5934104	12U 335547/ 335470, 5934098/ 5934151	12U 335547/ 335487, 5934098/ 5934173
Maianthemum trifolium	three-leaved Solomon's-seal	S5	N5	G5	Native	Do not track	-			RP03
Matricaria discoidea	pineappleweed	SNA	N5	G5	Exotic	Do not track	-			RP03
Medicago sativa	alfalfa	SNA	NNA	GNR	Exotic	Do not track	-	RP01		RP03
Mertensia paniculata	tall lungwort	S5	N5	G5	Native	Do not track	-		RP02	
Persicaria amphibia	water smartweed	S5	N5	G5	Native	Do not track	-	RP01		
Persicaria lapathifolia	pale persicaria	S5	N5	G5	Native	Do not track	-			RP03
Plantago major	common plantain	SNA	NNA	G5	Exotic	Do not track	-	RP01	RP02	RP03
Polygonum aviculare	prostrate knotweed	SNA	N5	G5	Unknown/ Undetermined	Do not track	-	RP01		
Potentilla norvegica	rough cinquefoil	S5	N5	G5	Native	Do not track	-	RP01		
Portulaca oleracea	purslane	SNA	NNA	GU	Exotic	Do not track	-			RP03
Senecio vulgaris	common groundsel	SNA	NNA	GNR	Exotic	Do not track	-			RP03
Solidago canadensis	Canada goldenrod	-	-	-	-	-	-	RP01		
Rumex crispus	curled dock	SNA	NNA	GNR	Exotic	Do not track	-		RP02	
Rumex triangulivalvis	narrow-leaved dock	S5	N5	G5	Native	Do not track	-		**RP02**	RP03
Taraxacum officinale	common dandelion	SNA	N5	G5	Exotic	Do not track	-	RP01	RP02	RP03
Thlaspi arvense	stinkweed	SNA	NNA	GNR	Exotic	Do not track	-	RP01	RP02	
Trifolium repens	white clover	SNA	NNA	GNR	Exotic	Do not track	-	RP01		
Urtica dioica	common nettle	S5	N5	G5	Native	Do not track	-	RP01		
Vicia americana	wild vetch	S5	N5	G5	Native	Do not track	-	RP01		RP03
Viola canadensis	western Canada violet	S5	N5	G5	Native	Do not track	-			RP03
Myosotis latifolia	broadleaf forget-me-not	-	-	-	-	-	-	RP01		
Grasses										
Alopecurus aequalis	short-awned foxtail	S5	N5	G5	Native	Do not track	-			RP03
Bromus inermis	smooth brome	SNA	NNA	G5	Exotic	Do not track	-	**RP01**		**RP03**
Calamagrostis canadensis	bluejoint	S5	N5	G5	Native	Do not track	-	RP01	**RP02**	
Phalaris arundinacea	reed canary grass	S5	N5	G5	Native	Do not track	-	RP01	**RP02**	**RP03**
Poa palustris	fowl bluegrass	S5	N5	G5	Native	Do not track	-	**RP01**		RP03
Scirpus microcarpus	small-fruited bulrush	S5	N5	G5	Native	Do not track	-		RP02	RP03
Sparganium angustifolium	narrow-leaved bur-reed	S4	N5	G5	Native	Do not track	-			RP03
Regulated Weeds										
Arctium lappa	great burdock	SNA	NNA	GNR	Exotic	Do not track	Noxious			RP03
Arctium minus	common burdock	SNA	NNA	GNR	Exotic	Do not track	Noxious			RP03
Cirsium arvense	creeping thistle	SNA	NNA	G5	Exotic	Do not track	Noxious	RP01	RP02	RP03
Impatiens glandulifera	Himalayan balsam	SNA	NNA	GNR	Exotic	Do not track	Prohibited Noxious		RP02	
Linaria vulgaris	common toadflax	SNA	NNA	GNR	Exotic	Do not track	Noxious			RP03
Sonchus arvensis	perennial sow-thistle	SNA	NNA	GNR	Exotic	Do not track	Noxious	RP01	RP02	RP03
Tanacetum vulgare	common tansy	SNA	NNA	GNR	Exotic	Do not track	Noxious	RP01		RP03
Tripleurospermum inodorum	scentless chamomile	SNA	NNA	GNR	Exotic	Do not track	Noxious	RP01	RP02	RP03

RP(black) = First Observation on June 17, 2021

RP(blue) =First Observation on August 12, 2021

**** Bold text indicates dominant species observed**

Appendix E

Terms Used to Define Construction and Operational Residual Effects

Table E1. Framework Used to Characterize Residual Effects

Criteria	Characteristics
Direction of Effect	
Negative (Adverse)	Net loss to the resource.
Positive	Net benefit to the resource.
Neutral	No net benefit or loss to the resource.
Geographical Extent of Effect	
PDA	Effects are limited to the PDA or project footprint.
Local	Effects are not likely to extend beyond the proposed project footprint and adjacent land base within the LSA.
Sub-regional	Effects extend beyond the LSA but are limited to approximately 1000 m from the Project activities or facilities.
Regional	Effects extend beyond the sub-regional boundaries.
Magnitude of Effect	
Negligible	Measured or estimated effect results in slight apparent change to the indicator (quality, quantity or other attribute), but too low to be meaningful, or within the range of natural variation and can be mitigated by implementing best management practices. Such effects are not further assessed.
Low	Disturbance predicted to be somewhat above typical baseline conditions or concentrations, but within established or accepted protective standards, or to cause no detectable change in biological, social or economic parameters.
Moderate	Disturbance predicted to be above baseline conditions or concentrations, but within established criteria or scientific effects thresholds, or to cause a detectable change in biological, social or economic parameters.
High	Disturbance predicted to exceed established criteria or scientific effects thresholds, or to cause a detectable change in biological, social or economic parameters beyond the range of natural variability or social tolerance.
Duration of Effect	
Short-term	Within the construction phase (i.e., < 1 year).
Medium-term	Encompasses construction phase and 1 year of reclamation/restoration phase (i.e. 1-2 years).
Long-term	Encompasses the reclamation/restoration phase and 5 years of the operations phase (i.e. >6 years).
Degree of Reversibility of Effect	
Reversible	Effect can be naturally returned to baseline conditions over a ten year period.
Irreversible	Effect is permanent and cannot be returned to baseline conditions.
Frequency of Effect	
Isolated	Effects confined to a specific time period and occurring only once (e.g., clearing).
Intermittent	Effects likely to occur periodically over the life of the Project.
Frequent	Effects likely to occur continuously over the life of the Project.
Accidental	Effects associated with unplanned, accidental events.
Seasonal	Effects likely to occur seasonally.
Scientific Confidence	
Low	Confidence in the effects rating is low as a result of incomplete baseline data or a poor understanding of cause-effect relationships.
Medium	Confidence in the effects rating is limited by either incomplete baseline data or an incomplete understanding of cause-effect relationships.
High	Confidence in the effects rating is high as a result of sufficient site specific baseline data and a good understanding of cause-effect relationships.

Appendix F

Water Well Drilling Reports and Groundwater Wells Reconnaissance Report

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 79277
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1964/01/01

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
N.W. BREWING CO		EDMONTON	AB	CA	

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	33	52	24	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.530200 Longitude -113.474000
How Location Obtained
Not Verified

Elevation 665.38 m
How Elevation Obtained
Estimated

Drilling Information

Method of Drilling
Drilled

Proposed Well Use
Observation

Type of Work
New Well-Decommissioned
View Decommissioning Report

Plugged 1928/10/01
Plugged with Unknown
Amount

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
8.53		Blue Clayey Surficial
10.67		Sand
48.77		Clayey Shale & Coal
60.96		Shale
61.87		Coal
85.34		Shale & Coal
86.56		Soft Shale & Coal
89.00		Soft Shale
89.61		Sandstone

Yield Test Summary

Measurement in Metric

Recommended Pump Rate L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
89.61 m		1928/09/01	1928/09/01

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	89.61

Surface Casing (if applicable)
Unknown
Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Bottom at : 0.00 m

Well Casing/Liner
Unknown
Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Top at : 0.00 m
Bottom at : 0.00 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)

Perforated by Unknown

Annular Seal Unknown
Placed from 0.00 m to 0.00 m
Amount

Other Seals

Type	At (m)

Screen Type
Size OD : 0.00 cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings
Bottom Fittings

Pack
Type Unknown
Grain Size
Amount Unknown

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner
Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 79277
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1964/01/01

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
N.W. BREWING CO		EDMONTON	AB	CA	

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	33	52	24	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.530200 Longitude -113.474000
How Location Obtained: Not Verified

Elevation 665.38 m
How Elevation Obtained: Estimated

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level: cm
Is Artesian Flow:
Rate: L/min
Is Flow Control Installed:
Describe:

Recommended Pump Rate: L/min
Recommended Pump Intake Depth (From TOC): m
Pump Installed:
Depth: m
Type:
Make:
H.P.:
Model (Output Rating):

Did you Encounter Saline Water (>4000 ppm TDS):
Depth: m
Gas:
Depth: m
Well Disinfected Upon Completion:
Geophysical Log Taken:
Submitted to ESRD:
Sample Collected for Potability:
Submitted to ESRD:

Additional Comments on Well

SALT WAS FOUND @ 294' SO WELL WAS ABANDONED. NO LOCATION IN SECTION GIVEN SO SE USED.

Yield Test

Taken From Ground Level | Measurement in Metric

Test Date	Start Time	Static Water Level
		m

Method of Water Removal

Type:
Removal Rate: L/min
Depth Withdrawn From: m

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner

Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 79275
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
ORAM, BILL		NAMAO			

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NW	33	52	24	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.537530 Longitude -113.485854
How Location Obtained: Not Verified

Elevation 647.70 m
How Elevation Obtained: Estimated

Drilling Information

Method of Drilling: Rotary

Proposed Well Use: Domestic

Type of Work: New Well

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
6.10		Brown Clay
9.75		Blue Clay
12.19		Coal
15.24		Shale
24.38		Hard Sand
25.91		Shale
27.13		Coal
36.58		Shale
54.86		Shale
57.91		Coal
60.96		Shale

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 0.00 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
1977/07/18	11.37	16.15

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
60.96 m		1977/07/16	1977/07/18

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	60.96

Surface Casing (if applicable)
Steel
Size OD : 11.43 cm
Wall Thickness : 0.396 cm
Bottom at : 60.96 m

Well Casing/Liner
Steel
Size OD : 8.89 cm
Wall Thickness : 0.635 cm
Top at : 0.00 m
Bottom at : 60.96 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
24.38	60.96	0.000		0.00

Perforated by Torch

Annular Seal
Placed from 0.00 m to 0.00 m
Amount

Other Seals

Type	At (m)

Screen Type
Size OD : 0.00 cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings
Bottom Fittings

Pack
Type
Grain Size
Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
ELLIOTT DRLG

Copy of Well report provided to owner | Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID 79275
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
ORAM, BILL		NAMAO			

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NW	33	52	24	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.537530 Longitude -113.485854
How Location Obtained: Not Verified

Elevation 647.70 m
How Elevation Obtained: Estimated

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level: cm
Is Artesian Flow:
Rate: L/min
Is Flow Control Installed:
Describe:

Recommended Pump Rate: 0.00 L/min
Recommended Pump Intake Depth (From TOC): 54.86 m
Pump Installed: Depth: m
Type: Make: H.P.:
Model (Output Rating):

Did you Encounter Saline Water (>4000 ppm TDS): Depth: m
Gas: Depth: m
Well Disinfected Upon Completion:
Geophysical Log Taken:
Submitted to ESRD:

Sample Collected for Potability: Submitted to ESRD:

Additional Comments on Well

Yield Test

Taken From Ground Level
Measurement in Metric

Test Date	Start Time	Static Water Level
1977/07/18	12:00 AM	16.15 m

Depth to water level

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)

Method of Water Removal

Type: Bailer
Removal Rate: 11.37 L/min
Depth Withdrawn From: 54.86 m

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well: UNKNOWN NA DRILLER
Certification No: 1
Company Name: ELLIOTT DRLG
Copy of Well report provided to owner
Date approval holder signed

Reconnaissance Report

View in Imperial

Export to Excel

Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

GIC Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (m)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (m)	TEST RATE (L/min)	SC_DIA (cm)
79275	NW	33	52	24	4	ELLIOTT DRLG	1977-07-18	60.96	New Well	Domestic		11		ORAM, BILL	16.15	11.37	11.43
79277	SE	33	52	24	4	UNKNOWN DRILLER	1928-09-01	89.61	New Well-Decommissioned	Observation		9		N.W. BREWING CO			0.00

Appendix G

Stakeholder Communications

Appendix G.1

City of Edmonton – Bylaw 7188 Draft EIA Supplementary Information Request

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
5681 – 70 Street
Edmonton, AB T6B 3P6
Canada
T: 780-436-2152

13 December 2021
Reference Number: 413078960-001

City of Edmonton
Urban Planning and Economy
Planning and Environment Services
7th Floor, 10111 – 104 Avenue
Edmonton, AB, T5J 0J4

Attention: **Christine Mahlmann**

Reference: **CM21 06 Mill Creek Pedestrian Bridge B278**
Response to Circulation of Bylaw 7188 Environmental Impact Assessment

1.0 Introduction

Wood Environment & Infrastructure Solutions (Wood) is pleased to provide the following responses to review comments regarding the Mill Creek Pedestrian Bridge B278 Rehabilitation and Trail Upgrades Environmental Impact Assessment (EIA) prepared pursuant to City of Edmonton *Bylaw 7188: North Saskatchewan River Valley Area Redevelopment Plan* ("*Bylaw 7188*").

The EIA report was submitted to the City of Edmonton for review and circulation to other City of Edmonton (COE) departments on 22 October 2021. Circulation review responses were received by Wood on 18 November 2021 and are provided in Attachment A. Responses to the circulation review comments are provided herein.

2.0 EIA Review Comment Responses

Review Comment	EIA / Design Reference	Response
Comments from Urban Growth and Open Space Strategy (Natural Areas Operations)		
Please ensure demolition plan is included such that all the mitigation measures identified in the report including debris material handling and proper disposal. The Contractor should be informed of potential best practices required to execute the demolition work. The Plan should provide location and timeline associated with site storage and proper mitigation or ESC measures if there is a short-term storage required on site.	EIA 2.3.3 and 9.0	To be addressed by the selected construction Contractor in their Environmental Construction Operations (ECO) Plan, which will provide the details on how the Project's work activities will meet environmental compliance obligations, municipal environmental requirements and reduce / control environmental impacts, including ESC measures. The Contractors ECO Plan will be prepared in accordance with the latest ECO Plan Framework and ENVISO requirements. The ECO Plan must be reviewed and accepted by the City prior to the start of construction. The City's ENVISO and Contractor's Environmental Responsibilities Package for construction, operation and maintenance will be part of the construction contract.
Restoration plans and detailed design will incorporate the recommendations outlined within the EIA report. Follow up with such plans and designs once available for review and approval. The landscaping and revegetation plan should address the creek bank slope stability concerns and opportunities to improve flood resilience through integration of natural vegetation supporting both habitat and bank stabilization functions.	EIA 2.3.3, 6.2.2 and 10.1	Applicable plans and designs will be incorporated into the detailed design plans. The revegetation/landscaping plan will incorporate recommendations in the EIA report and include integration of natural vegetation to enhance habitat and bank stability as part of the B278 Project, where appropriate. The City of Edmonton will be provided the detailed designs and revegetation/landscaping plan for review and approval prior to commencing works. As part of the construction contract, the Contractor will be required to restore the Project site, access and laydown areas to the satisfaction of City.
It appears that the preferred option with trail upgrades for 5 year and bridge for 25 years return period with embankment in place would be most favorable to reduce vegetation removal. We support this option but would like to see further initiatives during the detailed design stage to explore options to reduce the actual tree removal considering the worst case scenario was referenced with this reporting.	EIA 2.2.1 and 6.2.2	The COE proposes to proceed to detailed design for full replacement of B278 with retaining walls to accommodate a Q1:25 flood event, and trail upgrades for the Q1:10 flood event. During detailed design, opportunity to limit new footprint and therefore reduce the number of trees removed will be incorporated where possible.
There should be a vegetation removal plan, tree protection and conservation plan to minimize the impact on the natural vegetation prior to the construction and the project teams should ensure the key requirements to be included within those plans in reference to the EIA findings. Also, please identify applicable monitoring plans during and post construction stage.	EIA 3.3, 6.2.2, and 10.1	A site meeting with Urban Forestry to review construction plans and tree protection for existing trees within 5m of any construction and access will be scheduled a minimum 4 weeks in advance of the construction start date. Tree clearing will be completed by the City Forestry prior to construction. A revegetation/landscaping plan will be prepared during the detailed design phase. Vegetation monitoring plans are discussed in Section 6.2.2. The IFC drawings will clearly identify the Contractor's laydown area, Construction limits and tree removal limits. The Contractor will be required to avoid disturbance in any other area with prior approval from the City.
There are a number of limitations as outlined under an EIA report including the development of environmental controls by the construction Contractor. Please provide a clear mechanism on how the contractor will be able to replicate the mitigation measures and other plans developed from preliminary design to detailed design stage of the project. There is a greater risk of undermining the EIA. Outcomes will not be well represented at the various construction stages that may have changes progressing at the detailed design stage.	EIA 2.3.3 and 9.0	To be addressed by the selected construction Contractor in their ECO Plan, which will provide the details on how the Project's work activities will meet environmental compliance obligations, municipal environmental requirements under ENVISO and adherence to the EIA. The Contractors ECO Plan will be prepared in accordance with the latest ECO Plan Framework and ENVISO requirements.

Review Comment	EIA / Design Reference	Response
		The environmental controls set out in the EIA will be transferred to the construction Contract documents and the Contractor will be required to comply with the Contract requirements. Construction activities will be monitored to ensure any anomalies are addressed in a timely manner. The Contractors ECO Plan will be prepared in accordance with the latest ECO Plan Framework and must include review and incorporation of mitigation measures outlined in the EIA. The ECO Plan must be reviewed and accepted by the City prior to the start of construction.
The EIA did not identify the access routes and storage required for the overall demolition and construction. Please consider identifying such areas as it may have major impacts that need proper mitigation and restoration.	EIA 2.3.2	Site access into the ravine is available at the north end of the Project site from the ravine pedestrian trail or from south of the Project site via 93 Avenue and the ravine pedestrian trail system. Hard-surface access routes are preferred for large equipment. A construction review meeting of the laydown areas, access routes, construction and tree removal limits will be conducted with COE Urban Forestry at least four weeks prior to the start of construction, access preparation or site clearing. Construction signage will be posted a minimum of five days prior to site mobilization and will be removed within one day of construction completion. Temporary trail closures will be coordinated with COE Community Services Parks Division. All laydown/staging areas will be fenced, meet safety standards, and the Contractor will be responsible for protecting all surfaces from permanent damage during construction and will return all surfaces to pre-construction condition upon completion. In consultation with COE Urban Forestry and Parks and Open Spaces the laydown areas, access routes, construction and tree removal limits will be clearly identified. The IFC drawings will clearly identify these limits. The Contractor will be required to avoid disturbance in any other area with prior approval from the City.
Please ensure documentation of public engagement reports including the EIA impacts on vegetation such that the public are well informed of the consequences and were consulted properly prior to the construction stage.	EIA 8.0 and Appendix G	Transportation Planning and Design and Transportation Infrastructure conducted a Public Engagement Decision Mapping Exercise. The project will utilize the existing communication channels (Project website), request the Neighborhood Resource Coordinators inform their contact within impacted community leagues, install signage prior to construction, and perform “letter drops” informing residents of construction impacts.
Considering the major vegetation removal in completing this project, we would recommend the project team to prepare a restoration/landscaping plan compatible with the current design for our evaluation. The details could be revised and worked out at the detailed design stage but the EIA should provide clear guidelines for preparation for detailed landscaping/restoration plan to ensure the project will offset the impacts considering the EIA outcomes and the contractor will have clear guideline to prepare the detailed restoration and landscaping plans.	EIA 6.2.2 and 10.1	A revegetation/landscaping plan will be prepared during the detailed design phase based on the final facility disturbance footprint. City Urban Forestry will be consulted during preparation. The plan will also be provided Natural Areas Operations, River Valley Parks and Facilities for review and comment. Equitable compensation for the permanent loss of trees at the project site will be determined in consultation with City Urban Forestry in accordance with the City Corporate Tree Management Policy during detailed design.

Review Comment	EIA / Design Reference	Response
Comments from Parks and Roads Services (Natural Areas Operations)		
This project will require the removal of significant mature trees in an ecologically sensitive area. Therefore, it is recommended the restoration plan go above and beyond to ensure a return to a forested area where disturbance will occur. Please ensure the restoration plans are circulated and reviewed by naturalareaoperations@edmonton.ca prior to approval.	EIA 10.1	Equitable compensation for the permanent loss of trees at the project site will be determined in consultation with City Urban Forestry in accordance with the City Corporate Tree Management Policy during detailed design. The plan will be provided Natural Areas Operations for review and comment. The approved restoration plan will be included in the IFC drawings.
An approved Tree Preservation Plan will be required prior to construction.	EIA 3.3	A site meeting with Urban Forestry to review construction plans and tree protection for existing trees within 5m of any construction and access will be scheduled a minimum 4 weeks in advance of the construction start date. Tree clearing will be completed by the City Forestry prior to construction.
It is recommended that educational signage be used in the restoration areas to educate the public and minimize potential disturbance	EIA 8.0	Noted
Please provide a vegetation removal plan, including the squared meters of disturbance areas.	EIA 2.3.2	A construction review meeting of the laydown areas, access routes, construction and tree removal limits will be conducted with COE Urban Forestry at least four weeks prior to the start of construction, access preparation or site clearing. All laydown/staging areas will be fenced, meet safety standards, and the Contractor will be responsible for protecting all surfaces from permanent damage during construction and will return all surfaces to pre-construction condition upon completion. In consultation with COE Urban Forestry and Parks and Open Spaces the laydown areas, access routes, construction and tree removal limits will be clearly identified. The IFC drawings will clearly identify these limits. The Contractor will be required to avoid disturbance in any other area with prior approval from the City.
Please be advised, that the identified prohibited noxious plants and other noxious species that fall within the scope of this project are under the responsibility of the Proponent to mitigate to the satisfaction of the Weed Control Act. Given the speed and ability of Himalayan balsam populations to spread it is recommended that an invasive vegetation management plan for this site is developed so as to minimize the spread and potential seed contamination of equipment. Also, please note that in Section 5.2 of the submitted EIA that burdock is a regulated noxious species.	EIA 3.0, 3.2, 5.2, and 6.2.2	Common burdock has been re-categorized under noxious weeds in Section 5.2 of the EIA. Mitigation to control weed spread and colonization are outlined in Section 6.2.2 of the EIA, including weed control measures, cleaning of construction equipment, and construction and post-construction monitoring in order. These measures will be included in the construction contract, and it will be the responsibility of the contractor to ensure they are implemented. The construction PM in collaboration with the Resident Engineer will monitor the contractors control measures. Further, Municipal invasive vegetation management is conducted by the City of Edmonton pursuant to the *Integrated Pest Management Policy C501A*.
The public communication should include details on the tree removals required for the project.	EIA 8.0	The project will utilize the existing communication channels (Project website), request the Neighborhood Resource Coordinators inform their contact within impacted community leagues, install signage prior to construction, and perform “letter drops” informing residents of construction impacts.

Review Comment	EIA / Design Reference	Response
Vegetation Removal Conditions: 1. Upon approval of the plan, a site meeting with Natural Areas will be required to review construction plans and tree protection. This meeting will need to be scheduled a minimum of four weeks in advance of the construction start date. This is to review access points, placement of all permanent or temporary construction material required for this project, and to determine tree protection requirements for construction within 5 meters of any City tree or 10 meters from a natural stand. For any vegetation removal, please ensure the area has been clearly staked. Note the laydown area fencing must be installed outside the dripline of any adjacent trees. 2. Please be advised that all costs associated with pruning, removal, tree damage, or replacement shall be covered by the Proponent as per the Corporate Tree Management Policy. Natural Areas will schedule and carry out all required tree work involved with this project. Please contact naturalareaoperations@edmonton.ca to arrange this meeting. 3. Any soil damage or compaction compromising the tree's root system within the parkland space shall be corrected by and at a cost to the Proponent. Please be advised that all costs associated with soil remediation, watering, and tree protection shall be covered by the Proponent as per the Corporate Tree Management Policy. 4. Please note that the removal of vegetation has the potential to impact birds and bird habitat. Protection of migratory and non-migratory birds is legislated federally and provincially and enforceable regardless of whether or not individual environmental reviews conducted in accordance with the River Valley Bylaw include discussions of these topics. The onus is on the individual or company conducting habitat disturbance or construction activities to ensure that due diligence has been exercised to avoid harm to migratory and non-migratory birds. Individuals or companies that do not avoid harm to most wildlife species risk prosecution under the Wildlife Act and, in some cases, the Species at Risk Act. In the case of migratory birds, prosecution under the Migratory Birds Convention Act is also possible.	EIA 3.3 and 6.2.2 EIA 3.3 and 6.2.2 EIA 3.3 EIA 3.1, 3.2 and 6.3.2	1. A site meeting with Urban Forestry will be scheduled to review construction plans and tree protection during construction (within 5 m of any construction and access). This meeting will be scheduled a minimum 4 weeks in advance of the construction start date. 2. Tree clearing will be completed by the City prior to construction. naturalareaoperations@edmonton.ca will be contacted to schedule and carry out all required work. 3. Noted, addressed in EIA. 4. Wildlife mitigation including applicable timing constraints are outlined in the EIA Section 6.3.2 to ensure compliance with the *Wildlife Act* and *Migratory Bird Convention Act and Species at Risk Act*.
Comments from Infrastructure Planning & Design (Engineering Services)		
In general, this project will involve a number of engineering challenges and geotechnical risks that must be appropriately minimized and managed through proper engineering design and appropriate construction techniques and practices. Provided that good local construction techniques and practices are employed, with due adherence to the EIA recommendations, Construction Best Management Practices, the Contractor's ECO Plan and ENVISO requirements, I would anticipate that the work may be carried out without any significant adverse impacts to the river valley or surrounding lands.	EIA 2.3.3 and 9.0	To be addressed by the selected construction Contractor in their ECO Plan, which will provide the details on how the Project's work activities will meet environmental compliance obligations, municipal environmental requirements under ENVISO and adherence to the EIA. The Contractors ECO Plan will be prepared in accordance with the latest ECO Plan Framework and ENVISO requirements. The Contractors ECO Plan will be prepared in accordance with the latest ECO Plan Framework and must include review and incorporation of mitigation measures outlined in the EIA. The ECO Plan must be reviewed and accepted by the City prior to the start of construction.
Comments from Civic Events and Festivals		
It is expected that this project will affect some of the cross country runs that take place in this area in the fall. We have enough lead time to be able to work with impacted groups to amend their route if it is in this area. Please keep Cheryl Taylor on the distribution list for this project. Cheryl.Taylor@edmonton.ca	N/A	Cheryl Taylor will be kept on the distribution list for this project. Cheryl.Taylor@edmonton.ca
Flying Canoe Volant Festival occurs Jan 18 – Feb12, 2022 (including set up and take down time). Likely around the same time in 2023 as well. So long as the bridge construction dates are not rescheduled, I have no conflicts or impacted groups. Please keep	N/A	Michelle May will be kept on the distribution list for this project. Michelle.May@edmonton.ca In the event that the bridge construction schedule changes Civic Events and Festivals and/or Michelle May will be contacted.
Comments from Parks and Roads Services (Resource Planning and Land Development)		
A pre-construction inspection prior to accessing the site and a post-construction inspection once parkland restoration has occurred will be conducted by Land Development. Email: parkslandscapeinventory@edmonton.ca to request inspections.	N/A	As construction dates are determined, the design team will schedule pre-construction and post-construction inspections.
This project must follow all City Policies and Servicing Agreements	EIA 3.0	City Policies and Bylaws applicable to the Project will be followed.
The site is in compliance with the site's Natural Area Management Plan.	N/A	Noted. No further action required

Review Comment	EIA / Design Reference	Response
The Project must be reviewed and commented on by Natural Areas Operations, River Valley Parks and Facilities for possible impacts and landscaping material selection.	EIA 10.1	Natural Areas Operations reviewed the project as part of the EIA circulation. Natural Areas Operations, River Valley Parks and Facilities will be consulted during preparation of the revegetation/landscaping plan during detailed design.
A detailed landscape restoration design must be submitted to Natural Area Operations for comment and approval	EIA 10.1	Natural Areas Operations will be consulted during preparation and review of the revegetation/landscaping plan and review during the detailed design phase.
Impacts to vegetation may require biological surveys such as rare plant surveys, breeding bird surveys, etc. These surveys must be completed within the appropriate time frame and with consideration to seasonality and construction timelines.	EIA 5.2, 6.2, 5.3 and 6.3	Addressed in EIA
Erosion and Sedimentation Control Measures must be in place prior to any construction activity to prevent any contaminants from entering Infrastructure or Water Bodies.	EIA 6.4.2	Addressed in the EIA
Any damaged turf areas shall be re-sodded or repaired with approved natural grasses/vegetation as required and maintenance (watering, mowing and weed control) of restored turf areas will be the responsibility of the proponent until the turf is established. All damages to natural areas must be restored to pre-existing conditions with natural plantings as required and the maintenance (watering and weed control) of restored natural areas will be the responsibility of the proponent until the natural area planting material is established and accepted by PARS. All other damages to parkland inventory (hardscape, furniture, fixtures, trees, shrub beds, etc.) must be restored to pre-existing conditions and COE Construction Standards and PARS acceptance.	EIA 6.1.2 and 6.2.2	Applicable plans and designs will be incorporated into the detailed design plans. The revegetation/landscaping plan will incorporate recommendations in the EIA report and include integration of natural vegetation. The City of Edmonton will be provided the detailed designs and revegetation/landscaping plan for review and approval prior to commencing works. Restoration of the site after construction completion to the satisfaction of COE will be the responsibility of the Contractor.
Any lay down, staging or haul route area on Parkland must be approved and fenced, with no vehicular or project activity outside of the fenced area. There should be no access to the lay down, staging or haul route area to ensure public safety. The restoration of the entire area must be repaired to the existing conditions. Soil compaction protection, aeration and re-sodding; including the maintenance (e.g., watering, mowing and weed control) of restored turf areas will be the responsibility of the proponent until the sod is established and accepted by PARS.	EIA2.3.2, 6.1.2, and 6.2.2	To be addressed by the selected construction Contractor, in their ECO Plan, which will provide the details on how the Project's work activities will meet environmental compliance obligations, municipal environmental requirements under ENVISO and adherence to the EIA. The Contractors ECO Plan will be prepared in accordance with the latest ECO Plan Framework and ENVISO requirements. The Contractors ECO Plan will be prepared in accordance with the latest ECO Plan Framework and must include review and incorporation of mitigation measures outlined in the EIA. The ECO Plan must be reviewed and accepted by the COE prior to the start of construction.
Site drainage must not be affected by this project. Any overland drainage issue that is a result of this project will be corrected and repaired by the developer/contractor, not the City of Edmonton.	EIA 3.3	Overland drainage will be taken into consideration during detailed project design and construction phase.
Erosion Control Measures must be in place and maintained post construction to prevent overland drainage washout on areas that have been newly landscaped (along the sides of stairs, trails, etc.). The project should also consider the installation of fencing and informational signage around areas to discourage disturbance of the area by the public.	EIA 6.1.2 and 6.4.2	Addressed in EIA
Public access control measures should be in place and maintained post construction to prevent the public from accessing areas that have been newly landscaped (along the sides of trails, stairs, etc.). In order to ensure the success of the restoration areas, the project should also consider the installation of snow fencing and informational signage around areas to discourage disturbance of the area by the public. Please be aware that native species can take longer to establish than many ornamental landscaping species or traditional turf grasses. It is for this reason that considerations for protection of restoration areas are strongly recommended.	EIA 2.3.2 and 6.7.2	Public access control measures will be implemented as required.
Trail closures shall adhere to the City's Trail Closure Procedures. All trail closure activities must be approved through River Valley Operations prior to construction and closure of trails. This shall be done a minimum two weeks in advance of planned construction.	EIA 8.0	Trail closures will adhere to the City's trail Closure Procedures and will be approved through River Valley Operations prior to construction and closure of trails.
Any new trail construction or rehabilitation must meet current City of Edmonton trail construction standards and have a minimum 1m buffer zone, free of vegetation on either side of the trail.		Trail upgrades will meet current City of Edmonton trail construction standards.

Review Comment	EIA / Design Reference	Response
All damages to trails and paths must be restored to pre-existing trail surface type conditions and to COE Construction Standards and PARS final acceptance.	EIA 2.3.2	Restoration of the site after construction completion to the satisfaction of COE and current City of Edmonton trail construction standards will be the responsibility of the Contractor.
Any trail construction with steep side slopes (steeper than 3:1) must have a shoulder (minimum 600mm) built to current CoE trail/shared path construction standards. Please consider installing safety barriers (post and rail fence) on any trail sections that do not have a minimum 600mm shoulder before a steep (steeper than 3:1) decline off the trail surface edge.	N/A	Trail upgrades will meet current City of Edmonton trail construction standards. The configuration of the trails and side slopes, and potential use of safety barriers will be reviewed in detailed design. The City of Edmonton will be provided the detailed designs for review and approval prior to commencing works.
Please note that the disturbance areas will need to be weed free to pass the FAC inspection. Therefore, the contractor should ensure they have an adequate weed control plan in place and that it is adhered to throughout the warranty period.	EIA 6.2.2	Noted. The Contractor(s) will incorporate measures outlined in the EIA to control weed spread and colonization and prepare and implement a Weed Management Plan as part of their ECO Plan and ENVISO requirements.
If tree conflicts (work within 5m of a tree) are anticipated, or arise during construction, or a tree is within 3m of the haul route a site meeting with the City of Edmonton Urban and/or Natural Area Forester will be required. Please be advised that all costs associated with the removal, replacement or transplanting of trees shall be covered by the applicant as per the Corporate Tree Management Policy (C456C). The City of Edmonton will schedule and carry out all required tree work involved with this project.	EIA 2.3.2	A site meeting with Urban Forestry to review construction plans and tree protection for existing trees within 5m of any construction and access will be scheduled a minimum 4 weeks in advance of the construction start date. Tree clearing will be completed by the City Forestry prior to construction.
Tree protection is required around existing boulevard trees near the site access points. A minimum 2m protection barrier surrounding each tree is required.	EIA 3.3, and 6.2.2	Tree protection zone information has been added to EIA. A site meeting with Urban Forestry to review construction plans and tree protection for existing trees within 5 m of any construction and access will be scheduled a minimum 4 weeks in advance of the construction start date. Tree clearing will be completed by the City prior to construction. As part of the ECO Plan the Contractor will prepare a Tree Protection Plan.
There is no dumping or stockpiling on the site.	EIA 6.3.2	As part of the ECO Plan the Contractor will prepare a Waste Management Plan.
Use of this area must be managed carefully to prevent any spills or release of contaminants.	EIA 6.4.2 and 9.0	The Contractor will prepare and implement a Spill Response Plan as part of their ECO Plan
The developer/contractor is responsible for all weed control on the construction site, lay down or haul route areas during construction and until the site has been accepted by the City of Edmonton, PARS.	EIA 6.2.2 and 9.0	The Contractor will prepare and implement a Weed Management Plan as part of their ECO Plan
Hard-surface access routes are preferred for large equipment.	EIA 2.3.2	This has been added to the EIA. All laydown/staging areas will be fenced, meet safety standards, and the Contractor will be responsible for protecting all surfaces from permanent damage during construction and will return all surfaces to pre-construction condition upon completion.
All holes must be filled immediately to ensure public safety. This includes mitigating settlement that would create a future trip hazard.	N/A	Noted.
The site is left in an intended state that meets the City's satisfaction.	N/A	Restoration of the site after construction completion will be subject to COE review and approval, and subject to a warranty period to be fulfilled by the Contractor.
For projects longer than one day, signage must be posted with an active project contact person and phone number for inquiries.	EIA 8.0	The public will be notified of the project through signage at the site and trail heads in the vicinity, posting on the City of Edmonton "Trail/Park Cautions & Closures" website and 3-1-1 telephone service a minimum of 14 days prior to site mobilization. Updates will be provided to River Valley Parks and Facilities such that they can update their Trail Closure website, the 311 website, as well as 311 scripting at the start of construction such that interested residents can be kept informed of the construction.
Please follow the City of Edmonton Design and Construction Standards Volume 5 -Landscaping (2021).	N/A	The project will adhere to the City of Edmonton Design and Construction Standards Volume 5 -Landscaping (2021)
Contact Alberta One-Call (1-800-242-3447) to have all utility lines located at least 48 hours prior to any excavation.	N/A	Alberta One-Call (1-800-242-3447) will be contacted to have all utility lines located at least 48 hours prior to any excavation

Review Comment	EIA / Design Reference	Response
This location may require an OSCAM permit in order to facilitate crossing of the boulevard. The application for the OSCAM permit can be obtained on the City Web Site. https://www.edmonton.ca/business economy/licences permits/oscam-permit-request.aspx.	N/A	Once the construction laydown and access road has been confirmed, OSCAM permit requirements will be determined and obtained, if required.
Comments from Epcor Water and Sewer		
Drainage Bylaw 16200 was repealed in 2018 and the responsible authority in the documents are incorrect.	EIA 3.0	EIA has been updated to reflect the new Bylaw 18093 Drainage Bylaw and responsible authority. No further action required.
Our records indicate that no water and/or sewer services exist within the area of the proposal directly off EPCOR mains. Note: There is EPCOR sewer main infrastructure within the proposed bridge replacement area.	EIA 2.1, 2.3.1, and 5.8	Addressed in EIA.
The owner/developer must conform to the requirements of the City of Edmonton Erosion and Sedimentation Control Guidelines and Field Manual.	EIA 6.0 and 6.1.2	Addressed in EIA.

3.0 Closure

We trust that the information contained within this addendum satisfies your requirements.

Respectfully submitted,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Jessica Parker, PBiol, BSc.
Environmental Biologist

Paul Kalashnikoff, PBiol, RPBio
Senior Environmental Biologist

Reviewed by:

Ben Gibson, P.Eng.
Bridge Team Lead (Edmonton)
Project Manager

Tariq Aziz, P.Eng.
Project Manager
Transportation Infrastructure & Delivery
City of Edmonton

Attachment A: City Circulation Review SIR

Attachment A

City EIA Circulation Review

INTEGRATED INFRASTRUCTURE SERVICES
Infrastructure Planning & Design
Engineering Services Section

Memorandum

City of Edmonton
11004 - 190 Street NW
Edmonton, AB T5S 0G9
Tel.: 780.496.6770

edmonton.ca

Date: November 9, 2021

File: 508.001; CAD: 931+36-18 & 931+36-19;
Posse: 413078960-001

TO: Christine Mahlman, Ecological Planner
Planning and Environment Services, Urban Planning and Economy

FROM: Gordon Pauls, M.Sc., P.Eng., Geotechnical Engineering
Engineering Services, Integrated Infrastructure Services

SUBJECT: CM21-06 Mill Creek Pedestrian Bridge B278 Draft EIA
Geotechnical Review Comments

Engineering Services reviewed information provided for the proposed Mill Creek Pedestrian Bridge B278 Rehabilitation Project. This information comprised a draft Environmental Impact Assessment (EIA) report, prepared by Wood Environment & Infrastructure Solutions (Wood), dated October, 2021. In addition, the EIA included in the appendices, a Preliminary Engineering Report, also prepared by Wood, dated September 24, 2021.

Engineering Services initiated this project under the Open Space Environmental Renewal Composite Capital Profile. The Open Space Environmental Renewal Profile helps to ensure the viability and serviceability of infrastructure and public lands adversely impacted by environmental hazards and conditions.

Engineering Services has been working closely with Transportation Planning and Design on this project, also providing technical review of the geotechnical engineering aspects of this project from the preliminary site assessment through to detailed engineering design.

In general, this project will involve a number of engineering challenges and geotechnical risks that must be appropriately minimized and managed through proper engineering design and appropriate construction techniques and practices. Provided that good local construction techniques and practices are employed, with due adherence to the EIA recommendations, Construction Best Management Practices, the Contractor's ECO Plan and ENVISO requirements, I would anticipate that the work may be carried out without any significant adverse impacts to the river valley or surrounding lands.

Engineering Services - Geotechnical provides full support for this project and will continue to be involved throughout the project delivery.

If you have any questions regarding these comments, please contact me at (780) 868-3951.

GJP

URBAN PLANNING AND ECONOMY
PLANNING AND ENVIRONMENT SERVICES

City of Edmonton
7th Floor, 10111 - 104 Avenue NW
Edmonton, AB T5J 0J4

Email: sdrivervalleybylaw@edmonton.ca

November 18, 2021 Reference No.413078960-001

To:

From: Christine Mahlmann, Planning and Environment Services

Subject: CM21 06 - Mill Creek Ped Bridge B278 EIA Draft for Review - More Information Requested

---

We have completed our review of **CM21 06 - Mill Creek Ped Bridge B278 EIA Draft for Review**. This letter confirms that Administration has no further concerns with the proposed development under the North Saskatchewan River Valley Area Redevelopment Plan (NSRV ARP). Please adhere to the following conditions and advisements provided by reviewers.

Comments from Urban Growth and Open Space Strategy (Urban Planning and Environment):

We have reviewed the Draft Mill Creek Pedestrian Bridge 278 EIA prepared by Wood Environment & Infrastructure Solutions and have few items that need further clarification and follow up.

- The EIA report in general identified major impacts and required mitigation during construction. There are many actions or plans to be prepared and implemented by the contractor during the construction stages.
- Please ensure the demolition plan is included such that all the mitigation measures identified in the report including debris material handling and proper disposal. The contractor should be informed of potential best practices required to execute the demolition work. The plan should provide location and timeline associated with site storage and proper mitigation or ESC measures if there is a short-term storage required on site.
- Please ensure the restoration plan and detailed design will incorporate the recommendations outlined within this EIA report. Please follow up with such plans and designs once available for our review and approval. Moreover, the landscaping and revegetation plan should address the creek bank slope stability concerns and opportunities to improve flood resilience through integration of nature based solutions. We strongly recommend the project team to consider a bioengineering approach in developing a restoration plan that could complement both natural vegetation supporting both habitat and bank stabilization functions.
- It appears that the preferred option with trail upgrades for 5 year and bridge for 25 years return period with embankment in place would be most favorable to reduce vegetation removal. We support this option but would like to see further initiatives during the detailed design stage to explore options to reduce the actual tree removal considering the worst case scenario was referenced with this reporting.
- There should be a vegetation removal plan, tree protection and conservation plan to minimize the impact on the natural vegetation prior to the construction and the project team should ensure the key requirements to be included within those plans in reference to the EIA findings. Also, please identify applicable monitoring plans during and post

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construction stage.

- There are a number of limitations as outlined under an EIA report including the development of environmental controls by the construction contractor. Please provide a clear mechanism on how the contractor will be able to replicate the mitigation measures and other plans developed from preliminary design to detailed design stage of the project. There is a greater risk of undermining the EIA. Outcomes will not be well represented at the various construction stages that may have changes progressing at the detailed design stage.
- The EIA did not identify the access routes and storage required for the overall demolition and construction. Please consider identifying such areas as it may have major impacts that need proper mitigation and restoration.
- Please ensure documentation of public engagement reports including the EIA impacts on vegetation such that the public are well informed of the consequences and were consulted properly prior to the construction stage.

Considering the major vegetation removal in completing this project, we would recommend the project team to prepare a restoration/landscaping plan compatible with the current design for our evaluation. The details could be revised and worked out at the detailed design stage but the EIA should provide clear guidelines for preparation of detailed landscaping/restoration plan to ensure the project will offset the impacts considering the EIA outcomes and the contractor will have a clear guideline to prepare the detailed restoration and landscaping plans.

Let me know if the proponent or the consultant have any questions or need further clarification to the above mentioned comments.

Comments from Parks and Roads Services (Natural Areas Operations)

- This project will require the removal of significant mature trees in an ecologically sensitive area. Therefore, it is recommended the restoration plan go above and beyond to ensure a return to a forested area where disturbance will occur. Please ensure the restoration plans are circulated and reviewed by naturalareaoperations@edmonton.ca prior to approval.

- An approved Tree Preservation Plan will be required prior to construction.

- It is recommended that educational signage be used in the restoration areas to educate the public and minimize potential disturbance

- Please provide a vegetation removal plan, including the squared meters of disturbance areas.

- Please be advised, that the identified prohibited noxious plants and other noxious species that fall within the scope of this project are under the responsibility of the Proponent to mitigate to the satisfaction of the Weed Control Act. Given the speed and ability of Himalayan balsam populations to spread it is recommended that an invasive vegetation management plan for this site is developed so as to minimize the spread and potential seed contamination of equipment. Also, please note that in Section 5.2 of the submitted EIA that burdock is a regulated noxious species.

- The public communication should include details on the tree removals required for the project.

Vegetation Removal Conditions:

1. Upon approval of the plan, a site meeting with Natural Areas will be required to review

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construction plans and tree protection. This meeting will need to be scheduled a minimum of four weeks in advance of the construction start date. This is to review access points, placement of all permanent or temporary construction material required for this project, and to determine tree protection requirements for construction within 5 meters of any City tree or 10 meters from a natural stand. For any vegetation removal, please ensure the area has been clearly staked. Note the laydown area fencing must be installed outside the dripline of any adjacent trees.

2. Please be advised that all costs associated with pruning, removal, tree damage, or replacement shall be covered by the Proponent as per the Corporate Tree Management Policy. Natural Areas will schedule and carry out all required tree work involved with this project. Please contact naturalareaoperations@edmonton.ca to arrange this meeting.

3. Any soil damage or compaction compromising the tree's root system within the parkland space shall be corrected by and at a cost to the Proponent. Please be advised that all costs associated with soil remediation, watering, and tree protection shall be covered by the Proponent as per the Corporate Tree Management Policy.

4. Please note that the removal of vegetation has the potential to impact birds and bird habitat. Protection of migratory and non-migratory birds is legislated federally and provincially and enforceable regardless of whether or not individual environmental reviews conducted in accordance with the River Valley Bylaw include discussions of these topics. The onus is on the individual or company conducting habitat disturbance or construction activities to ensure that due diligence has been exercised to avoid harm to migratory and non-migratory birds. Individuals or companies that do not avoid harm to most wildlife species risk prosecution under the *Wildlife Act* and, in some cases, the *Species at Risk Act*. In the case of migratory birds, prosecution under the *Migratory Birds Convention Act* is also possible.

Comments from Infrastructure Planning & Design (Engineering Services):

Please see attached *Memo 1-CM21-026 Mill Creek Bridge B278 EIA Review.pdf* for comments.

Comments from Community and Recreation Facilities (River Valley Parks and Facilities):

No comments received during circulation period.

Comments from Civic Events and Festivals:

1. It is expected that this project will affect some of the cross country runs that take place in this area in the fall.

2. We have enough lead time to be able to work with impacted groups to amend their route if it is in this area. Please keep Cheryl Taylor on the distribution list for this project. Cheryl.Taylor@edmonton.ca

3. Flying Canoe Volant Festival occurs Jan 18 - Feb 12, 2022 (including set up and take down time). Likely around the same time in 2023 as well. So long as the bridge construction dates are not rescheduled, I have no conflicts or impacted groups. Please keep Michelle May on the distribution list for this project. Michelle.May@edmonton.ca

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Comments from Parks and Roads Services (Resource Planning and Land Development):

1. A pre-construction inspection prior to accessing the site and a post-construction inspection once parkland restoration has occurred will be conducted by Land Development. Email: parkslandscapeinventory@edmonton.ca to request inspections.
2. This project must follow all City Policies and Servicing Agreements
3. The site is in compliance with the site's Natural Area Management Plan.
4. The Project must be reviewed and commented on by Natural Areas Operations, River Valley Parks and Facilities for possible impacts and landscaping material selection.
5. A detailed landscape restoration design must be submitted to Natural Area Operations for comment and approval.
6. Impacts to vegetation may require biological surveys such as rare plant surveys, breeding bird surveys, etc. These surveys must be completed within the appropriate time frame and with consideration to seasonality and construction timelines.
7. Erosion and Sedimentation Control Measures must be in place prior to any construction activity to prevent any contaminants from entering Infrastructure or Water Bodies.
8. Any damaged turf areas shall be re-sodded or repaired with approved natural grasses/vegetation as required and maintenance (watering, mowing and weed control) of restored turf areas will be the responsibility of the proponent until the turf is established. All damages to natural areas must be restored to pre-existing conditions with natural plantings as required and the maintenance (watering and weed control) of restored natural areas will be the responsibility of the proponent until the natural area planting material is established and accepted by PARS. All other damages to parkland inventory (hardscape, furniture, fixtures, trees, shrub beds, etc) must be restored to pre-existing conditions and COE Construction Standards and PARS acceptance.
9. Any lay down, staging or haul route area on Parkland must be approved and fenced, with no vehicular or project activity outside of the fenced area. There should be no access to the lay down, staging or haul route area to ensure public safety. The restoration of the entire area must be repaired to the existing conditions. Soil compaction protection, aeration and re-sodding; including the maintenance (eg watering, mowing and weed control) of restored turf areas will be the responsibility of the proponent until the sod is established and accepted by PARS.
10. Site drainage must not be affected by this project. Any overland drainage issue that is a result of this project will be corrected and repaired by the developer/contractor, not the City of Edmonton.
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13. Trail closures shall adhere to the City's Trail Closure Procedures. All trail closure activities

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must be approved through River Valley Operations prior to construction and closure of trails. This shall be done a minimum two weeks in advance of planned construction.

14. Any new trail construction or rehabilitation must meet current City of Edmonton trail construction standards and have a minimum 1M buffer zone, free of vegetation on either side of the trail.
15. All damages to trails and paths must be restored to pre-existing trail surface type conditions and to COE Construction Standards and PARS final acceptance.
16. Any trail construction with steep side slopes (steeper than 3:1) must have a shoulder (minimum 600mm) built to current CoE trail/shared path construction standards. Please consider installing safety barriers (post and rail fence) on any trail sections that do not have a minimum 600mm shoulder before a steep (steeper than 3:1) decline off the trail surface edge.
17. Please note that the disturbance areas will need to be weed free to pass the FAC inspection. Therefore, the contractor should ensure they have an adequate weed control plan in place and that it is adhered to throughout the warranty period.
18. If tree conflicts (work within 5m of a tree) are anticipated, or arise during construction, or a tree is within 3m of the haul route a site meeting with the City of Edmonton Urban and/or Natural Area Forester will be required. Please be advised that all costs associated with the removal, replacement or transplanting of trees shall be covered by the applicant as per the Corporate Tree Management Policy (C456C). The City of Edmonton will schedule and carry out all required tree work involved with this project.
19. Tree protection is required around existing boulevard trees near the site access points. A minimum 2M protection barrier surrounding each tree is required.
20. There is no dumping or stockpiling on the site.
21. Use of this area must be managed carefully to prevent any spills or release of contaminants.
22. The developer/contractor is responsible for all weed control on the construction site, lay down or haul route areas during construction and until the site has been accepted by the City of Edmonton, PARS.
23. Hard-surface access routes are preferred for large equipment.
24. All holes must be filled immediately to ensure public safety. This includes mitigating settlement that would create a future trip hazard.
25. The site is left in an intended state that meets the City's satisfaction.
26. For projects longer than one day, signage must be posted with an active project contact person and phone number for inquiries.
27. Please follow the City of Edmonton Design and Construction Standards Volume 5 - Landscaping (2021).
28. Contact Alberta One-Call (1-800-242-3447) to have all utility lines located at least 48 hours prior to any excavation.
29. This location may require an OSCAM permit in order to facilitate crossing of the boulevard. The application for the OSCAM permit can be obtained on the City Web Site. https://www.edmonton.ca/business_economy/licences_permits/oscam-permit-request.aspx

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Comments from Epcor Water and Sewer:

Drainage Bylaw 16200 was repealed in 2018 and the responsible authority in the documents are incorrect.

Water & Sewer Comments:
Our records indicate that no water and/or sewer services exist within the area of the proposal directly off EPCOR mains.
Note: There is EPCOR sewer main infrastructure within the proposed bridge replacement area.
The owner/developer must conform to the requirements of the City of Edmonton Erosion and Sedimentation Control Guidelines and Field Manual.

Should you have any questions or concerns please contact me by e-mail, or by phone at 780-442-4844.

Regards,

Christine Mahlmann

URBAN PLANNING AND ECONOMY
PLANNING AND ENVIRONMENT SERVICES

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Email: sdrivervalleybylaw@edmonton.ca

November 18, 2021 Reference No.413078960-001

To:

From: Christine Mahlmann, Planning and Environment Services

Subject: CM21 06 - Mill Creek Ped Bridge B278 EIA Draft for Review - More Information Requested

---

We have completed our review of **CM21 06 - Mill Creek Ped Bridge B278 EIA Draft for Review**. This letter confirms that Administration has no further concerns with the proposed development under the North Saskatchewan River Valley Area Redevelopment Plan (NSRV ARP). Please adhere to the following conditions and advisements provided by reviewers.

Comments from Urban Growth and Open Space Strategy (Urban Planning and Environment):

We have reviewed the Draft Mill Creek Pedestrian Bridge 278 EIA prepared by Wood Environment & Infrastructure Solutions and have few items that need further clarification and follow up.

- The EIA report in general identified major impacts and required mitigation during construction. There are many actions or plans to be prepared and implemented by the contractor during the construction stages.
- Please ensure the demolition plan is included such that all the mitigation measures identified in the report including debris material handling and proper disposal. The contractor should be informed of potential best practices required to execute the demolition work. The plan should provide location and timeline associated with site storage and proper mitigation or ESC measures if there is a short-term storage required on site.
- Please ensure the restoration plan and detailed design will incorporate the recommendations outlined within this EIA report. Please follow up with such plans and designs once available for our review and approval. Moreover, the landscaping and revegetation plan should address the creek bank slope stability concerns and opportunities to improve flood resilience through integration of nature based solutions. We strongly recommend the project team to consider a bioengineering approach in developing a restoration plan that could complement both natural vegetation supporting both habitat and bank stabilization functions.
- It appears that the preferred option with trail upgrades for 5 year and bridge for 25 years return period with embankment in place would be most favorable to reduce vegetation removal. We support this option but would like to see further initiatives during the detailed design stage to explore options to reduce the actual tree removal considering the worst case scenario was referenced with this reporting.
- There should be a vegetation removal plan, tree protection and conservation plan to minimize the impact on the natural vegetation prior to the construction and the project team should ensure the key requirements to be included within those plans in reference to the EIA findings. Also, please identify applicable monitoring plans during and post

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construction stage.

- There are a number of limitations as outlined under an EIA report including the development of environmental controls by the construction contractor. Please provide a clear mechanism on how the contractor will be able to replicate the mitigation measures and other plans developed from preliminary design to detailed design stage of the project. There is a greater risk of undermining the EIA. Outcomes will not be well represented at the various construction stages that may have changes progressing at the detailed design stage.
- The EIA did not identify the access routes and storage required for the overall demolition and construction. Please consider identifying such areas as it may have major impacts that need proper mitigation and restoration.
- Please ensure documentation of public engagement reports including the EIA impacts on vegetation such that the public are well informed of the consequences and were consulted properly prior to the construction stage.

Considering the major vegetation removal in completing this project, we would recommend the project team to prepare a restoration/landscaping plan compatible with the current design for our evaluation. The details could be revised and worked out at the detailed design stage but the EIA should provide clear guidelines for preparation of detailed landscaping/restoration plan to ensure the project will offset the impacts considering the EIA outcomes and the contractor will have a clear guideline to prepare the detailed restoration and landscaping plans.

Let me know if the proponent or the consultant have any questions or need further clarification to the above mentioned comments.

Comments from Parks and Roads Services (Natural Areas Operations)

- This project will require the removal of significant mature trees in an ecologically sensitive area. Therefore, it is recommended the restoration plan go above and beyond to ensure a return to a forested area where disturbance will occur. Please ensure the restoration plans are circulated and reviewed by naturalareaoperations@edmonton.ca prior to approval.

- An approved Tree Preservation Plan will be required prior to construction.

- It is recommended that educational signage be used in the restoration areas to educate the public and minimize potential disturbance

- Please provide a vegetation removal plan, including the squared meters of disturbance areas.

- Please be advised, that the identified prohibited noxious plants and other noxious species that fall within the scope of this project are under the responsibility of the Proponent to mitigate to the satisfaction of the Weed Control Act. Given the speed and ability of Himalayan balsam populations to spread it is recommended that an invasive vegetation management plan for this site is developed so as to minimize the spread and potential seed contamination of equipment. Also, please note that in Section 5.2 of the submitted EIA that burdock is a regulated noxious species.

- The public communication should include details on the tree removals required for the project.

Vegetation Removal Conditions:

1. Upon approval of the plan, a site meeting with Natural Areas will be required to review

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construction plans and tree protection. This meeting will need to be scheduled a minimum of four weeks in advance of the construction start date. This is to review access points, placement of all permanent or temporary construction material required for this project, and to determine tree protection requirements for construction within 5 meters of any City tree or 10 meters from a natural stand. For any vegetation removal, please ensure the area has been clearly staked. Note the laydown area fencing must be installed outside the dripline of any adjacent trees.

2. Please be advised that all costs associated with pruning, removal, tree damage, or replacement shall be covered by the Proponent as per the Corporate Tree Management Policy. Natural Areas will schedule and carry out all required tree work involved with this project. Please contact naturalareaoperations@edmonton.ca to arrange this meeting.

3. Any soil damage or compaction compromising the tree's root system within the parkland space shall be corrected by and at a cost to the Proponent. Please be advised that all costs associated with soil remediation, watering, and tree protection shall be covered by the Proponent as per the Corporate Tree Management Policy.

4. Please note that the removal of vegetation has the potential to impact birds and bird habitat. Protection of migratory and non-migratory birds is legislated federally and provincially and enforceable regardless of whether or not individual environmental reviews conducted in accordance with the River Valley Bylaw include discussions of these topics. The onus is on the individual or company conducting habitat disturbance or construction activities to ensure that due diligence has been exercised to avoid harm to migratory and non-migratory birds. Individuals or companies that do not avoid harm to most wildlife species risk prosecution under the *Wildlife Act* and, in some cases, the *Species at Risk Act*. In the case of migratory birds, prosecution under the *Migratory Birds Convention Act* is also possible.

Comments from Infrastructure Planning & Design (Engineering Services):

Please see attached *Memo 1-CM21-026 Mill Creek Bridge B278 EIA Review.pdf* for comments.

Comments from Community and Recreation Facilities (River Valley Parks and Facilities):

No comments received during circulation period.

Comments from Civic Events and Festivals:

1. It is expected that this project will affect some of the cross country runs that take place in this area in the fall.

2. We have enough lead time to be able to work with impacted groups to amend their route if it is in this area. Please keep Cheryl Taylor on the distribution list for this project. Cheryl.Taylor@edmonton.ca

3. Flying Canoe Volant Festival occurs Jan 18 - Feb 12, 2022 (including set up and take down time). Likely around the same time in 2023 as well. So long as the bridge construction dates are not rescheduled, I have no conflicts or impacted groups. Please keep Michelle May on the distribution list for this project. Michelle.May@edmonton.ca

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Comments from Parks and Roads Services (Resource Planning and Land Development):

1. A pre-construction inspection prior to accessing the site and a post-construction inspection once parkland restoration has occurred will be conducted by Land Development. Email: parkslandscapeinventory@edmonton.ca to request inspections.
2. This project must follow all City Policies and Servicing Agreements
3. The site is in compliance with the site's Natural Area Management Plan.
4. The Project must be reviewed and commented on by Natural Areas Operations, River Valley Parks and Facilities for possible impacts and landscaping material selection.
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27. Please follow the City of Edmonton Design and Construction Standards Volume 5 - Landscaping (2021).
28. Contact Alberta One-Call (1-800-242-3447) to have all utility lines located at least 48 hours prior to any excavation.
29. This location may require an OSCAM permit in order to facilitate crossing of the boulevard. The application for the OSCAM permit can be obtained on the City Web Site. https://www.edmonton.ca/business_economy/licences_permits/oscam-permit-request.aspx

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Comments from Epcor Water and Sewer:

Drainage Bylaw 16200 was repealed in 2018 and the responsible authority in the documents are incorrect.

Water & Sewer Comments:
Our records indicate that no water and/or sewer services exist within the area of the proposal directly off EPCOR mains.
Note: There is EPCOR sewer main infrastructure within the proposed bridge replacement area.
The owner/developer must conform to the requirements of the City of Edmonton Erosion and Sedimentation Control Guidelines and Field Manual.

Should you have any questions or concerns please contact me by e-mail, or by phone at 780-442-4844.

Regards,

Christine Mahlmann

Appendix G.2

City of Edmonton Bylaw 7188 Sign off
Mill Creek Pedestrian Bridge B278 Draft EIA

URBAN PLANNING AND ECONOMY
PLANNING AND ENVIRONMENT SERVICES

City of Edmonton
7th Floor, 10111 - 104 Avenue NW
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Email: sdrivervalleybylaw@edmonton.ca

January 4, 2022 Reference No. 413078960-001

To: Tariq Aziz, City Operations

From: Christine Mahlmann, Planning and Environment Services

Subject: CM21 06 - Mill Creek Ped Bridge B278 EIA Draft for Review -Sign Off

---

We have completed our review of **CM21 06 - Mill Creek Ped Bridge B278 EIA Draft for Review**. This letter confirms that Administration has no further concerns with the proposed development under the North Saskatchewan River Valley Area Redevelopment Plan (NSRV ARP). Please adhere to the following conditions and advisements provided by reviewers.

Comments from Urban Growth and Open Space Strategy (Urban Planning and Environment):

1. Urban Growth and Open Space (Urban Planning and Environmental Services) reviewed the resubmission of the EIA and supplemental Appendix G "City of Edmonton - Bylaw 7188 Supplementary Information Request". We are in support of the project and have no further major concerns with the EIA Draft Submission at this time.
2. As a condition of approval, please submit the final copy of the EIA when available. Should changes in scope or design occur, please note that re-circulation to River Valley Bylaw will be required to review and update or amend the approval accordingly.

Comments from Infrastructure Planning & Design (Engineering Services):

1. See attached Memo: CM21-06 Mill Creek Pedestrian Bridge B278 Draft EIA - Geotechnical Review Comments

Comments from Community and Recreation Facilities (River Valley Parks and Facilities):

1. No comments or concerns from River Valley Parks and Facilities

Comments from Civic Events and Festivals:

1. I expect that this project will affect some of the cross country runs that take place in this area in the fall. We have enough lead time to be able to work with impacted groups to amend their route if it is in this area. Please keep me on the distribution list for this project. Cheryl.Taylor@edmonton.ca
2. Flying Canoe Volant Festival occurs Jan 18 - Feb 12, 2022 (including set up and take down time). Likely around the same time in 2023 as well. So long as the bridge construction dates are not rescheduled, I have no conflicts or impacted groups. Please keep me on the distribution list for this project. Michelle.May@edmonton.ca

Comments from Partnership and Event Attraction Strategy:

1. No concerns or comments

Comments from Parks and Roads Services (Natural Areas Operations):

NAO comments are as follows:

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- This project will require the removal of significant mature trees in an ecologically sensitive area. Therefore, it is recommended the restoration plan go above and beyond to ensure a return to a forested area where disturbance will occur. Please ensure the restoration plans are circulated and reviewed by naturalareaoperations@edmonton.ca prior to approval.
- An approved Tree Preservation Plan will be required prior to construction.
- It is recommended that educational signage be used in the restoration areas to educate the public and minimize potential disturbance
- Please provide a vegetation removal plan, including the squared meters of disturbance areas.
- Please be advised, that the identified prohibited noxious plants and other noxious species that fall within the scope of this project are under the responsibility of the Proponent to mitigate to the satisfaction of the Weed Control Act. Given the speed and ability of Himalayan balsam populations to spread it is recommended that an invasive vegetation management plan for this site is developed so as to minimize the spread and potential seed contamination of equipment. Also, please note that in Section 5.2 of the submitted EIA that burdock is a regulated noxious species.
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Vegetation Removal Conditions:

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29. This location may require an OSCAM permit in order to facilitate crossing of the boulevard. The application for the OSCAM permit can be obtained on the City Web Site. https://www.edmonton.ca/business_economy/licences_permits/oscam-permit-request.aspx

Comments from Epcor Drainage and Epcor Water & Sewer:

1. Drainage Bylaw 16200 was repealed in 2018 and the responsible authority in the documents are wrong.Was the design and option discussed and approved by EPCOR Drainage? If so, can you please forward me EPCOR Drainage's acceptance/approval for my records? Thanks, Amy Ling 780-964-6356

Water & Sewer Comments:

1. Our records indicate that no water and/or sewer services exist within the area of the proposal directly off EPCOR mains.Note: There is EPCOR sewer main infrastructure within the proposed bridge replacement area. The owner/developer must conform to the requirements of the City of Edmonton Erosion and Sedimentation Control Guidelines and Field Manual.

Comments from Environment and Risk:

1. No comments or concerns.

City of Edmonton
7th Floor, 10111 - 104 Avenue NW
Edmonton, AB T5J 0J4

Email: sdrivervalleybylaw@edmonton.ca

General Conditions:

1. All mitigation measures and commitments outlined by City reviewers must be incorporated into the construction work plan.
2. The proponent is responsible for seeking approval for any other regulatory permits from provincial and federal agencies.
3. Please contact the **Neighbourhood Resource Coordinator, Darrell Nordell (780-944-5424)** in the area to ensure appropriate community notification.
4. For potential impacts to City parks and facilities:
    a. Hard surface access/haul routes are preferred.
    b. Please ensure restoration of the site occurs and meets existing site conditions. All damages to parkland must be restored to City of Edmonton Construction Standards and City Operations' satisfaction.
    c. Noxious weeds shall be managed and controlled as required within any fenced area and should be the responsibility of the contractor/department during construction.
    d. Signage must be posted indicating a project contact person and phone number for inquiries.
5. All trail closures shall adhere to the City's Trail Closure Procedures. All trail closure activities must be approved through River Valley Operations prior to construction and closure of trails. Please contact **Braeden Holmstrom** (Team Leader, River Valley & Horticulture) at **587-986-2841** or braeden.holmstrom@edmonton.ca to obtain the necessary trail closure approvals. This shall be done a minimum of **two weeks** in advance of planned construction.
6. Please attach this letter for any further City of Edmonton approvals.

Should you have any questions or concerns please contact me by e-mail, or by phone at 780-442-4844.

Regards,

Christine Mahlmann

Appendix G.3

Public Engagement Decision Mapping Exercise

Transportation Planning and Design & Transportation Infrastructure Delivery

Approvals

- Kristi Bland, Communications Advisor AUTHOR
- Paul Hanlon, Integration Manager *must have*
- Jill Wheeler-Bryks, Account Director
- Mitchell Shutta, PM, Transportation Planning & Design, Integrated Infrastructure Services *must have*
- Tariq Aziz, PM, Transportation Infrastructure Delivery, Integrated Infrastructure Services *must have*
- Cy Balitat, Project Supervisor, Transportation Planning & Design, IIS *must have*
- Ryan Teplitsky, Program Supervisor, Transportation Infrastructure Delivery, IIS *must have*

Project Leads	Kristi Bland	Mitchell Schutta,Tariq Aziz	
Project Support	Paul Hanlon		*C&E Resources Needed:* • Research • Public Engagement • Creative • ~~Web / Digital~~ • Storytelling • ~~Social Media~~ • Media Relations • External Relations • Inside Information • ~~311~~
Estimated Hours	Xhours	*Project Start Date*	Oct 13, 2021
Estimated Budget	$	*Launch Date*	Apr 11, 2022
Workfront Project	Linked reference number		
ELT Priority (if any)			
Reference Files			

Table of Contents	Executive Summary *(one line of text for each row)*
Business Need	Rehabilitate bridge 278 in the Mill Creek Ravine and mitigate flood activity near the bridge
Audience	Bridge users, trail users, residents near the Mill Creek Ravine, nearby community leagues
Communication Needs	Prepare stakeholder and public communication prior to construction starting

Communication Objectives	To build awareness and understanding for why the bridge area will be closed and what work will be done.
Key Messages	The Mill Creek Ravine Pedestrian Bridge B278 and approaching trails will be rehabilitated for user safety. Construction is anticipated to begin in spring 2022 and will be complete by the end of 2022. Work will include rehabilitating the pedestrian bridge and flood mitigation for the bridge and the nearby trails.
Communication Tactics	Website updates, 311 script, review/approval of signs, construction bulletins in the area
Optimization / Evaluation	Social/website analytics, calls to 311, questions from residents

Research

BUSINESS NEED

The Mill Creek Pedestrian Bridge B278 is being rehabilitated for safety and user experience. Construction is anticipated to begin in spring 2022 and will be complete by the end of the year. While rehabilitating the bridge, other work in the area will include flood mitigation steps for the bridge and nearby trail.

Communication, before, during and after construction will be needed to inform trail users and nearby residents.

AUDIENCE

Primary Audience

- Trail users
- Nearby residents
- Nearby community league

Secondary Audiences

- General public

COMMUNICATION NEEDS & OBJECTIVE

To prepare and inform interested audiences of the bridge and trail rehabilitation, the project goals and impacts.

RESEARCH / ENGAGEMENT INSIGHTS

Public Engagement Decision Mapping Exercise

As of July 15, 2021, the project team (Mitchell Schutta, Tim Dykstra, Kristi Bland, Lyndsay Ward, and Braeden Holmstrom) has concluded that this project will follow a similar public advisory level as the "Mill Creek Pedestrian Bridge Replacement Program (2020)" and will utilize the existing communication channels (project website), request the Neighborhood Resource Coordinators inform their contact within impacted community leagues, install signage prior to construction, and perform "letter drops" informing residents of construction impacts.

Due to the technical nature of the bridge replacement, and due to the fact the bridge [illegible] location are remaining the same, the project team has concluded there is not a meaningful opportunity for public engagement.

Strategy

STRATEGIC APPROACH

Our strategic approach for the Mill Creek Ravine Bridge Rehabilitation (B278) will include informing residents and stakeholders of the rehabilitation before, during and after it is complete. It will be important that interested parties are aware of the changes prior to using the Ravine area and why the rehabilitation is needed.

Another important factor is to ensure our audiences know who to ask questions to, how they can get more information and that our information is timely and transparent. We will achieve this through information to stakeholders including community leagues, the City of Edmonton website, information to 311 operators and signage throughout the project area.

KEY MESSAGES

- The Mill Creek Ravine Pedestrian Bridge B278 Rehabilitation Projects aims to rehabilitate a pedestrian bridge in the ravine area, along with surrounding trail upgrades
- An additional component of this project will be flood mitigation efforts. This bridge regularly floods due to its location, causing erosions and blocks access for trail users
- Construction is anticipated to begin in summer 2022 and will be complete by the end of the year
- Information will be provided to area residents and stakeholders, including the community leagues, prior to construction starting
- Trail users will also be aware of the project with site signage
- During construction, the trail leading to this bridge will also be closed. The trail only leads to this bridge
- When in the area during construction, please be mindful of signage and crews on site
- For more information, please visit website
- Mill Creek Ravine is a major part of Edmonton's River Valley, stretching from Strathcona to Bonnie Doon, east to west, and connects to additional river valley pathways.
- Bridge B278 is behind Scona Road, near 93a Avenue, adjacent to the EPCOR inlet.

INTEGRATED TACTICS

Audience For each tactic	**Tactic** Link content, document, or final art	**Lead** Responsible	**Launch** Date	**Status** eg. Planning, In Progress, In Approvals, or Complete
EXTERNAL chronological order				
All audiences	*311 messaging*	*Communications Advisor with PM help*		
All audiences	*Web updates*	*Communications Advisor with PM help*		
All audiences	*Social Media*	*Communications Advisor*		
Area residents	*Construction bulletin*	*PM with Communications Advisor review/approval*		
Community League members	*Information to community league*	*PM with Communications Advisor help*		
Trail users	*Trail signage*	*PM & Communications*		
All audiences	*Building Edmonton website info*	*Communications*		
Area residents	*Building Edmonton signage?*	*Communications & PM*		

EVALUATION

- Social media analytics
- Website analytics
- Calls to 311/project team
- What worked best?
- What would we do differently next time?

Appendix G.4

Stakeholder Engagement and Communication

1.0 STAKEHOLDER ENGAGEMENT AND COMMUNICATION

The City of Edmonton conducted a Public Engagement Decision Mapping Exercise and concluded that the project will follow a similar public advisory level as the "Mill Creek Pedestrian Bridge Replacement Program (2020)". Public engagement was not expected, however a public information session for interested stakeholders was planned to communicate the project overview and impacts. The Environmental Impact Assessment identified the need for public engagement. Therefore, the Project Team decided to undertake limited engagement with select stakeholders in the form of a presentation to communicate details of the project design. The select group of stakeholders will help the project team in notifying their members with upcoming project information through their respective channels.

1.1 WHAT WE DID

The City of Edmonton identified directly and potentially affected stakeholders to exchange project information with. Stakeholders included community leagues, environmental organizations, and river valley user groups who would be affected by the project. In total five stakeholders were identified for engagement during the Detailed Design Phase. Subsequently a Stakeholder Information presentation was developed, and invitations were sent out via email on January 28, 2022. Of the five stakeholder groups invited, four accepted and one-on-one information sessions were conducted between February 8-11 with the following stakeholder groups:

- Paths for People (February 8, 2022)
- Edmonton River Valley Conservation Coalition (February 11, 2022)
- Strathcona Community League – (February 11, 2022)
- Cloverdale Community League – (February 11, 2022)

Due to COVID – 19 in-person gatherings and face to face stakeholder meetings were prohibited. Therefore, meetings occurred virtually through Google Meet. At each meeting, the project team presented information on the Mill Creek Ravine bridge project, including a project overview, potential impacts, bridge and approach trail design, timelines, and next steps. The presentation was formatted to encourage discussion and allowed multiple opportunities to collect stakeholder feedback and answer questions.

The presentation and meeting minutes are attached in Appendix A.

1.2 WHAT WE HEARD

As a result of these stakeholder meetings, the project team was provided with valuable feedback, which will be taken into consideration during the next stages of the project. The main themes of discussion during the meetings are outlined below.

1.2.1 Public Safety and Awareness

All stakeholders wanted to ensure trail users and the public had adequate information regarding, construction dates, trail closures, and detours, well in advance of the construction. All stakeholders agreed to share the project information with their respective members, once available, through existing communication channels.

1.2.2 Trees, Vegetation, and Overall Esthetic

Improving the overall esthetic of the area by minimizing the environmental impact is important to the project team and stakeholders. The River Valley Conservation Coalition voiced their concern about the impacts of the construction on the existing trees and vegetation, they would like to see as minimal impact on the area as possible. Paths for People shared that they would like to see a viewpoint area or a space for a bench so that trail users could enjoy the natural setting.

1.2.3 EPCOR Intake Structure

Paths for People expressed concern that the continued blockage of the EPCOR intake structure will lead to the same issues in the future. They want to ensure that the new bridge and upgraded trails will mitigate the flooding of the area.

1.2.4 Damage to Existing Infrastructures

Some stakeholders expressed concern regarding the moving of equipment and possible damage to the access routes, 93 Avenue especially. They would like to ensure that any damage to existing trails, sidewalks, curbs, or road space is repaired promptly as the community is very engaged and tend to raise concerns quickly.

1.2. COMMITMENTS

From these meetings, the project team has committed to the following:

- To share public project information (website, construction bulletins, etc.) once available.
- Public access areas will be assessed. If required, repairs will be made to the same or better condition.

1.3 NEXT STEPS

Stakeholders were informed that the next steps regarding the project included:

- Project Information will be made available on our website at a later date www.edmonton.ca/B278MillCreekReplacement
- As part of the Public Information phase, after the contract is awarded and prior to the start of construction, additional information will be provided that can be passed along to community members through the existing communication channels.
- The project team will strive to mitigate the construction impacts by replanting trees and shrubs, space permitting.

APPENDIX A

Stakeholder Engagement Meeting Minutes and Presentation

Meeting Notes

Date/Time:	February 8, 2022, 12:00 PM – 1:00 PM
Place:	Google Meet
Next Meeting:	
Attendees:	Michell Schutta, Tariq Aziz, Ben Gibson, Jaylene Perkins, Stephen Raitz
Absentees:	N/A

1. **Welcome & Territory Acknowledgement**

2. **Introductions**
   - Mitchell Schutta – City of Edmonton- Project PM of Planning and Design
   - Tariq Aziz – City of Edmonton Construction PM of Detailed Design and Delivery
   - Ben Gibson – Wood PLC - Consultant
   - Jaylene Perkins – Wood PLC - Consultant
   - Stephen Raitz – Paths for People

3. **Agenda Overview**
   - Project Overview
   - Mill Creek Ravine B278 Bridge Replacement & Approach Trail Upgrades
   - Timelines
   - Discussion
   - Next Steps

4. **Project Overview**
   - The project site is at existing Pedestrian Bridge B278 in Mill Creek Ravine Park between Strathcona and Bonnie Doon Communities, South of Connors Road NW. Bridge B278 is a multi-spanned, mixed materials bridge with a total length of approximately 25m and width of approximately 2.4m and allows for restrictive shared use. The site regularly floods during seasonal high-water events, causing erosion, and blocking access to the Bridge B278 and adjacent trails.
   - The City of Edmonton performed a condition assessment, and found that due to regular seasonal flooding, the low elevation of the bridge and proximity to the creek bank, wood debris and litter is trapped by the bridge and accumulates causing water backlog and additional flooding. Most of the bridge is in varying stages of rot and if left, it will become dangerous. The recommendation from the assessment was that Pedestrian Bridge B278 be demolished and fully replaced with retaining walls, and trail upgrades on either side of the bridge to maintain pedestrian connectivity and safety to trail users year-round.
   - EPCOR has a concrete and steel intake structure approximately 100 m downstream of the bridge that collects all waterflow from the catch basin and directs it toward the North Saskatchewan River. It is prone to blockage by silt and debris, creating flooding and backwater contributes to the condition of the bridge.

5. **Mill Creek B278 Bridge Replacement & Approach Trail Upgrades**
   - **Activities**
     - Demolish and remove existing structure
       - Existing structure is a 2 spanned, mixed materials bridge with a total length of approximately 25m and width of approximately 2.4m

    - Materials from the demolition will be separated and taken to the appropriate locations for recycling or proper disposal
  - Installation of new bridge and foundation
    - Replace with 3.0m wide, single span, weathering steel truss structure similar to 11 other Mill Creek pedestrian bridges in the Minchau area
      Bridge elevation will be raised based on 1:25 year flood approximately 1.25m above the existing bridge
    - Retaining walls on either end of the bridge
  - Armor and reinforce bed & shore and creek banks
    - Armor the head slopes and bed of the creek upstream over a length of 8m along the north bank and 5m along the south bank
    - Downstream the riverbank will be protected over a length of 5m on both banks
    - Rock riprap will be used for armoring of the bed and shore
  - Placement of fill materials to elevate approach trails
    - 2.4m max width of trail with a granular surface and 600mm wide shoulders
    - When analyzing what elevation would be suitable for the bridge, it was determined that the approach trails would need to be raised at either side of the bridge to mitigate flooding and to tie-in to the elevation of the new bridge
  - Vegetation restoration
    - Implement revegetation and seeding of disturbed areas as soon as possible as part of construction

- **Project Limits & Impact to Trails**
  - There will be 2 laydown areas north and south of the work site
  - Existing space will be utilized as much as possible to restore and elevate the trails.
  - There will be trail closures with a detour to maintain access for trail users. Signage will be posted at the site and trail heads in the vicinity. Trail closures will adhere to the COE's Trail Closure Procedures and will be approved through River Valley Operations prior to construction and closure of trails. Flag persons will be used if required when moving equipment to and from site.
  - A Trail Condition Assessment will be done prior to construction and again after, if required the trail and access locations will be repaired to existing or better condition.

- **Bridge & Approach Trail Design**
  - New bridge will be a single span 3m wide, concrete wing walls, steel structure design.
    - Structural steel truss, concrete foundations.
    - Abutments and wing walls are supported on small micropiles that limits the use of larger equipment and reduces impact to the environment
  - Retaining walls on either end of the bridge extending 15-20m, comprised of driven piles with 3 rail timber sections blending into steel railings. limiting the impact on the trees and vegetation of the embankment.
  - The current approach trails are not defined trails, unpaved, uneven, varying width, and very steep in sections.
    - Trails will be elevated between 0.9m – 1.6m higher than current trail to mitigate flooding.

6. Timelines

- Preliminary Engineering – Spring 2021

- Detailed Design – January-March 2022
    - Stakeholder Engagement
    - Public Information
        - Spread awareness of project and impact with the help of neighborhoods and community leagues using existing communication channels
        - Distribution of the project website, construction impacts, advising of detours
- Construction – Summer 2022
    - Late summer construction to limit the effects on trail users, and to follow provincial regulations for restricted activity periods.
- Bridge Operational – Late 2022

7. Discussion

- **Paths for People**
    - Thanks for reviewing the project and information with us
    - We recognize that this is a heavily used recreation area and we have heard from the community regarding the issues at this location.
    - Will EPCOR be involved in the project as their asset is a partial cause to these issues?
    - **Project Team**
        - The lack of maintenance at the EPCOR facility is definitely a contributing factor to the bridge and trail conditions however it is not the only cause.
        - This area is prone to flooding and debris accumulation in part due to the low-lying area and the position of the bridge, between two tight bends of the creek.
        - EPCOR has been involved in discussions and provided hydrologic date that played a role in designs
- **Paths for People**
    - Do you see EPCOR's lack of maintenance being a reoccurring problem in the future that might lead to the same issues?
    - **Project Team**
        - There were many factors that lead to the current condition. EPCOR is a factor, along with elevation.
        - As the bridge elevation was low and the creek bed width small it caused debris to be trapped contributing to the flooding. The elevation of the bridge will be raised to limit the debris.
        - We cannot change the circumstances causing the flooding, but we can upgrade the trails and bridge so they can still be used regardless of flooding.
- **Paths for People**
    - We recognize this is a smaller project and are wondering how projects are prioritized as it seems there may be larger concerns that should be prioritized higher? Maybe this project could have just been a trail closure?
    - **Project Team**
        - Does Paths for People have a list of future projects that they would like to see prioritized?
    - **Paths for People**
        - You can refer to the Missing Links Map found on our website
            - COE has used this list resource in the past
            - This project is not on the list

- **Paths for People**
    - Very happy with the proposed grading
    - This is not an all-mobility route, but this upgrade is moving it in the right direction.
  - **Project Team**
    - The City of Edmonton wanted to maintain pedestrian connectivity and safety to trail users year-round. These upgrades will mean less closures due to flooding at this site.
    - To clarify the trail will not be paved but will be a granular surface.
- **Paths for People**
    - Would like to see if there is room to add a space for a viewpoint area on the bridge if possible. Or a bench area or something along those lines.
    - Would allow trail users to have a spot to stop and enjoy the space more.
  - **Project Team**
    - As we are in the detailed design stage it might not be possible to make those changes.
- **Paths for People**
    - Would it be possible to add lighting in this area to make it safer for trail users?
  - **Project Team**
    - As there isn't any existing lighting infrastructure already in place it is very unlikely that it can be added at this point.
- **Paths for People**
    - A general note to keep in mind in the future is that we would like the opportunity to engage and comment earlier in the design process.
  - **Project Team**
    - Following public consultation guidelines and requirements of Bylaw 7188, the project team was not required to consult stakeholders during that stage of the project, as we are not altering the alignment of the bridge or trail.
    - Some aspects of the project are determined by different regulations and requirements and cannot be changed.
- **Paths for People**
    - We want to ensure impacts to 93 Avenue (equipment access, damage to curbs, sidewalks, road space) are addressed promptly as the community is very engaged and raise concerns quickly.
  - **Project Team**
    - The contractor will be moving equipment in and out mostly from the North. If 93 Avenue is utilized a Trail Condition Assessment will be done prior to construction and again after, if required the trail and access locations will be repaired to the same or better condition.
    - The contractor will use flag persons if required when moving equipment to and from site.
- **Paths for People**
    - It would be nice if this bridge could be given a name rather than an identification number?
  - **Project Team**
    - We really like that idea and that is something we will take into consideration and could possibly do.

8. Next Steps

- Paths for People would like to be notified once the Project Information is live

    - Project Information will be made available on our website at a later date www.edmonton.ca/B278MillCreekReplacement
- Paths for People would like to ensure the existing infrastructure is monitored for any damage and is repaired promptly
- Paths for People would like to ensure the trail users to be made aware of the construction, closures, and detours

Meeting Notes

Date/Time:	February 11, 2022, 9:00 AM – 10:00 AM
Place:	Google Meet
Next Meeting:	
Attendees:	Michell Schutta, Tariq Aziz, Cyril Balitbit, Ben Gibson, Jaylene Perkins, Eric Gormley
Absentees:	N/A

1. **Welcome & Territory Acknowledgement**

2. **Introductions**
   - Mitchell Schutta – City of Edmonton- Project PM of Planning and Design
   - Tariq Aziz – City of Edmonton Construction PM of Detailed Design and Delivery
   - Ben Gibson – Wood PLC - Consultant
   - Jaylene Perkins – Wood PLC - Consultant
   - Eric Gormley – ERVCC Representative
   - Cyril Balitbit – City of Edmonton – Additional Support

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   - The City of Edmonton performed a condition assessment, and found that due to regular seasonal flooding, the low elevation of the bridge and proximity to the creek bank, wood debris and litter is trapped by the bridge and accumulates causing water backlog and additional flooding. Most of the bridge is in varying stages of rot and if left, it will become dangerous. The recommendation from the assessment was that Pedestrian Bridge B278 be demolished and fully replaced with retaining walls, and trail upgrades on either side of the bridge to maintain pedestrian connectivity and safety to trail users year-round.
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    - Spread awareness of project and impact with the help of neighborhoods and community leagues using existing communication channels
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- Construction – Summer 2022
    - Late summer construction to limit the effects on trail users, and to follow provincial regulations for restricted activity periods.
- Bridge Operational – Late 2022

7. Discussion

- **ERVCC**
    - Thanks for sharing the presentation with us, it helps to see the big picture.
    - Do you know when the bridge was built? How old is the bridge?
    - **Project Team**
        - It is unclear but we estimate it to be 30-40 years old, there are no as-built drawings or any record of drawings for this structure. There are 5 or 6 very similar bridges in the area.
- **ERVCC**
    - Do you have a projected cost of the project? Could you give a rough estimate, $2m, $5m or $10m?
    - **Project Team**
        - We don't want to get into financials and as we are still in detailed design stage, and we haven't received any bids from contractors for the construction yet. But a rough estimate is it would be closer to $2m.
- **ERVCC**
    - What is the current width of the bridge?
    - **Project Team**
        - The bridge is currently 2.4m and will be upgraded to be 3m.
- **ERVCC**
    - Are the abutments the dark grey pieces perpendicular to the bridge shown on the Overall Bridge & Approach Trail Design slide?
    - **Project Team**
        - Yes. The darker gray is the vertical face of the concrete that the end of the bridge sits on
        - Lighter areas are showing the vegetation around the retaining walls
        - Adjacent to the walls is the extent of the working limits of the contractor
        - The vegetation restoration will remain within the working limits
- **ERVCC**
    - Are the abutments the same width of the path?
    - **Project Team**
        - Yes, not much wider than the path
- **ERVCC**
    - Are the abutments sunk into the ground?
    - **Project Team**
        - Yes, they are, and are supported on micropiles

    - Abutments and armored head slopes will be designed and checked to meet stability requirements. Potential loss of head slope toe support due to river erosion will be mitigated by the armoring of the bed and backs of the creek.
    - All armoring and rock installation will be done within the regulatory timelines for in-stream and water works.

- **ERVCC**
    - When do the trails start to rise?
    - **Project Team**
        - The grade rises at the shaded area on the right-hand side of the Overall Bridge & Approach Trail Design slide
        - The lighter lines represent the existing surface of the trail shape and the embankment that will exist at the end of construction
        - The embankments will have a 2:1 side slope which is a little steeper than normal to limit the encroachment into the existing naturalized area.
- **ERVCC**
    - How many meters will the retaining walls extend from the end of the bridge?
    - **Project Team**
        - The South side will extend 15-20m
        - The North side will extend 25m
        - 75m of trail from either end of the bridge will be raised
- **ERVCC**
    - The bridge crosses the river and then extends over the ground a little bit as well?
    - **Project Team**
        - Yes, the dotted line on the Profile Bridge & Approach Trail Design slide shows the existing creek profile and the proposed profile.
        - The channel will be wider to alleviate the issue of debris getting trapped
        - The depth of the structure below the deck will not be as low to help create space below the bridge to allow for debris to flow freely and not be affected by flooding.
- **ERVCC**
    - Yes, the bridge is quite low to the water. You can see how the debris can get jammed.
    - How much tree removal will be required? There are quite a few trees that are close to the site. How big will the equipment be? How much vegetation will be disturbed?
    - **Project Team**
        - Yes, there is a width of open area between the tree areas and the trail that varies as it is not really a trail, it has been affected by the flooding and has been eroded away. Total width of the existing open space varies between 2.5 and over 5m.
        - On the Overall Bridge & Approach Trail Design slide the area between the blue lines and the embankment will represent the width of clearance
        - We will require approximately between 4m and just over 9m of width for the construction of the bridge and trail
- **ERVCC**
    - How much vegetation will be lost for the construction?
    - **Project Team**
        - As the current open space varies in width and the space required for the new embankments at the same spot is not a fixed dimension beyond the open space, the amount of vegetation affected will vary.

    - Depending on the available space the vegetation will be replanted
    - Is there an opportunity to steepen those backslopes to make less of an impact or would it create a safety issue?
        - Overall context is what elevation of trail we want in order to mitigate flooding.
        - A 1:10 year event for the trail on either side in conjunction with the bridge at 1:25 year elevation with the use of retaining walls to mitigate impact.

- **ERVCC**
    - So, this is not just a bridge but a trail as well. Does the trail flood as well?
    - **Project Team**
        - During any rainfall, surface runoff from the slopes topography of the area causes erosion of the trail. Routinely after rainfall the trail is eroded and unpassable for most trail users.
        - To mitigate this the trails will be elevated, and drainage culverts will be installed through embankments to control water runoff.
        - The trail surface will be granular and profiled in a way to ensure mud and water will not collect.
- **ERVCC**
    - Would it be possible in the future for Mill Creek to be daylighted? Would this solve these problems?
    - **Project Team**
        - We don't know if it would alleviate the problems.
        - We looked at different trail elevations and different options to mitigate overall impact to the naturalized area. Chose the 1:10 year with retaining wall option for the trails, 1:25 would be too large of an impact.
- **ERVCC**
    - Are the retaining walls shown on the diagram? Where are they and what will they be made of?
    - **Project Team**
        - The retaining wall on either side of the Profile Bridge & Approach Trail Design Slide.
        - Piles are steel and driven in the ground; gaps between the piles are filled in with timber lagging or planks. Little space is required beyond the width of the retaining wall to install. Working within existing space the wall is built from the existing ground level to gradient of the new path.
- **ERVCC**
    - What will the impacts on other parts of the ravine be from moving the equipment in and out of the work site?
    - **Project Team**
        - There shouldn't be a large impact. The contractor will be using the existing trail for accessing the work site.
        - The trail may have some impact as it is dirt and gravel but nothing significant.
        - A Trail Condition Assessment will be done prior to construction and again after, if required the trail and access locations will be repaired.
- **ERVCC**
    - So, the equipment is not that large?
    - **Project Team**
        - It was a conscious design choice to allow for accessibility to the site. Smaller equipment will be used for installation to accommodate the available space.

- **ERVCC**
    - Are there biologists and other environmental specialists involved regarding the creek and natural areas? Will they be involved during construction?
    - **Project Team**
        - Yes. There are environmental teams who have been involved with various environmental requirements and yes, they will be available and involved during the construction phase to ensure regulations are followed
- **ERVCC**
    - Did this project have to be approved by City Council?
    - **Project Team**
        - Yes, this project, under bylaw 7188, requires an Environmental Impact Assessment to be completed and approved by City Council. The EIA will be going before council on April 14, 2022
        - Sometimes these dates change, would you like to be informed if there are any changes?
- **ERVCC**
    - Yes please
    - Who was all approached for consultation?
    - **Project Team**
        - We approached Strathcona Community League, Bonnie Doon Community League, Cloverdale Community League, and Paths for People
        - We were unable to connect with Bonnie Doon Community League
        - We met with Paths for People on Tuesday February 8, 2022
        - We have meetings scheduled for later today with Strathcona Community League and Cloverdale Community League
- **ERVCC**
    - Thanks for all the information

8. Next Steps

- ERVCC would like to be notified once the Project Information is live
    - Project Information will be made available on our website at a later date www.edmonton.ca/B278MillCreekReplacement
- ERVCC would like to ensure the trail users to be made aware of the construction, closures, and detours
- ERVCC would like to be updated if the date of the Environmental Impact Assessment (EIA) review with City Council is changed
- Project team to review if the side slopes can be steepened to mitigate proposed impact

Meeting Notes

Date/Time:	February 11, 2022, 10:00 AM – 10:30 AM
Place:	Google Meet
Next Meeting:	
Attendees:	Michell Schutta, Tariq Aziz, Ben Gibson, Jaylene Perkins, Derek Kaplan
Absentees:	N/A

1. **Welcome & Territory Acknowledgement**

2. **Introductions**
   - Mitchell Schutta – City of Edmonton- Project PM of Planning and Design
   - Tariq Aziz – City of Edmonton - Construction PM of Detailed Design and Delivery
   - Ben Gibson – Wood PLC - Consultant
   - Jaylene Perkins – Wood PLC - Consultant
   - Derek Kaplan – Strathcona Community League Representative

3. **Agenda Overview**
   - Project Overview
   - Mill Creek Ravine B278 Bridge Replacement & Approach Trail Upgrades
   - Timelines
   - Discussion
   - Next Steps

4. **Project Overview**
   - The project site is at existing Pedestrian Bridge B278 in Mill Creek Ravine Park between Strathcona and Bonnie Doon Communities, South of Connors Road NW. Bridge B278 is a multi-spanned, mixed materials bridge with a total length of approximately 25m and width of approximately 2.4m and allows for restrictive shared use. The site regularly floods during seasonal high-water events, causing erosion, and blocking access to the Bridge B278 and adjacent trails.
   - The City of Edmonton performed a condition assessment, and found that due to regular seasonal flooding, the low elevation of the bridge and proximity to the creek bank, wood debris and litter is trapped by the bridge and accumulates causing water backlog and additional flooding. Most of the bridge is in varying stages of rot and if left, it will become dangerous. The recommendation from the assessment was that Pedestrian Bridge B278 be demolished and fully replaced with retaining walls, and trail upgrades on either side of the bridge to maintain pedestrian connectivity and safety to trail users year-round.
   - EPCOR has a concrete and steel intake structure approximately 100 m downstream of the bridge that collects all waterflow from the catch basin and directs it toward the North Saskatchewan River. It is prone to blockage by silt and debris, creating flooding and backwater contributes to the condition of the bridge.

5. **Mill Creek B278 Bridge Replacement & Approach Trail Upgrades**
   - **Activities**
     - Demolish and remove existing structure
       - Existing structure is a 2 spanned, mixed materials bridge with a total length of approximately 25m and width of approximately 2.4m

        - Materials from the demolition will be separated and taken to the appropriate locations for recycling or proper disposal
    - Installation of new bridge and foundation
        - Replace with 3.0m wide, single span, weathering steel truss structure similar to 11 other Mill Creek pedestrian bridges in the Minchau area
          Bridge elevation will be raised based on 1:25 year flood approximately 1.25m above the existing bridge
        - Retaining walls on either end of the bridge
    - Armor and reinforce bed & shore and creek banks
        - Armor the head slopes and bed of the creek upstream over a length of 8m along the north bank and 5m along the south bank
        - Downstream the riverbank will be protected over a length of 5m on both banks
        - Rock riprap will be used for armoring of the bed and shore
    - Placement of fill materials to elevate approach trails
        - 2.4m max width of trail with a granular surface and 600mm wide shoulders
        - When analyzing what elevation would be suitable for the bridge, it was determined that the approach trails would need to be raised at either side of the bridge to mitigate flooding and to tie-in to the elevation of the new bridge
    - Vegetation restoration
        - Implement revegetation and seeding of disturbed areas as soon as possible as part of construction

- **Project Limits & Impact to Trails**
    - There will be 2 laydown areas north and south of the work site
    - Existing space will be utilized as much as possible to restore and elevate the trails.
    - There will be trail closures with a detour to maintain access for trail users. Signage will be posted at the site and trail heads in the vicinity. Trail closures will adhere to the COE's Trail Closure Procedures and will be approved through River Valley Operations prior to construction and closure of trails. Flag persons will be used if required when moving equipment to and from site.
    - A Trail Condition Assessment will be done prior to construction and again after, if required the trail and access locations will be repaired to existing or better condition.

- **Bridge & Approach Trail Design**
    - New bridge will be a single span 3m wide, concrete wing walls, steel structure design.
        - Structural steel truss, concrete foundations.
        - Abutments and wing walls are supported on small micropiles that limits the use of larger equipment and reduces impact to the environment
    - Retaining walls on either end of the bridge extending 15-20m, comprised of driven piles with 3 rail timber sections blending into steel railings. limiting the impact on the trees and vegetation of the embankment.
    - The current approach trails are not defined trails, unpaved, uneven, varying width, and very steep in sections.
        - Trails will be elevated between 0.9m – 1.6m higher than current trail to mitigate flooding.

6. Timelines

- Preliminary Engineering – Spring 2021

- Detailed Design – January-March 2022
    - Stakeholder Engagement
    - Public Information
        - Spread awareness of project and impact with the help of neighborhoods and community leagues using existing communication channels
        - Distribution of the project website, construction impacts, advising of detours
- Construction – Summer 2022
    - Late summer construction to limit the effects on trail users, and to follow provincial regulations for restricted activity periods.
- Bridge Operational – Late 2022

7. Discussion

- **Strathcona Community League**
    - Will the trails at the access locations need to be closed as well?
    - **Project Team**
        - The trails at the access locations (shown in green on Project Limits & Impact to Trails slide) will only need to close when moving equipment in and out of site.
        - The access to 93 Ave will be a controlled access rather than continuous
- **Strathcona Community League**
    - The project is not as much to mitigate the flooding but to raise the trail and bridge so it can still be used regardless of flooding?
    - **Project Team**
        - Yes, that is correct. We cannot change the circumstances causing the flooding, but we can upgrade the trails and bridge to handle the flooding better.
- **Strathcona Community League**
    - What will be used for the sides of the embankment?
    - **Project Team**
        - There will be planted and erosion sedimentation control measures, so the embankments won't erode. Rock riprap will be used at the bridge along with seeding, planting and erosion matting on the embankments.
        - Using rock riprap armoring for the creek bank, bed and shore will stabilize the bridge head slopes
- **Strathcona Community League**
    - Do you require anything from the League? I am not expecting any pushback from the other members. They may be interested in seeing a detail of what the embankment sides would look like, and what the final esthetic would look like.
    - **Project Team**
        - We don't require anything at the moment. About 90 days prior to construction, as part of the Public Information phase, we will provide some more information that can be passed along to your members through your existing communication channels.
            - Project Website
            - Physical Signs

8. Next Steps

- Strathcona Community League would like to be notified once the Project Information is live
    - Project Information will be made available on our website at a later date www.edmonton.ca/B278MillCreekReplacement
- Strathcona Community League would like to ensure the trail users to be made aware of the construction, closures, and detours

Meeting Notes

Date/Time:	February 11, 2022, 2:00 PM – 3:00 PM
Place:	Google Meet
Next Meeting:	
Attendees:	Michell Schutta, Tariq Aziz, Ben Gibson, Jaylene Perkins, Carly Toronchuk
Absentees:	N/A

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   - Jaylene Perkins – Wood PLC - Consultant
   - Carly Toronchuk – Cloverdale Community League - Civic Director

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- Bridge Operational – Late 2022

7. Discussion

- **Cloverdale Community League**
        - Do you have a more specific timeline for start and end dates?
    - **Project Team**
        - We are hoping to begin around mid-June 2022 so that we will be ready to do the in-stream work within the unrestricted time period between August 1-September 15.
- **Cloverdale Community League**
        - How long will it take to complete the construction?
    - **Project Team**
        - We anticipate the bridge to be operational by the end of October, with possibly some final restoration to be done after that.
- **Cloverdale Community League**
        - Looking at the Project Limits & Impact to Trails slide, the green path on the outside of the park area is an alternate path that will not be affected, and the inner path is the one where the work will be taking place?
    - **Project Team**
        - Yes, the green path is a paved path and will not be affected by the project.
- **Cloverdale Community League**
        - Is there a way for trail users to access the yellow portion of the path?
    - **Project Team**
        - No, the yellow and red paths shown on the slide will be closed to the public and used by the contractor for construction.
- **Cloverdale Community League**
        - What is a laydown area?
    - **Project Team**
        - It is an area that the contractor will use for their site office and to store equipment.
- **Cloverdale Community League**
        - Is it possible to have sort of number markers at either end of the closed trail so trail users can map out their routes accordingly?
    - **Project Team**
        - Part of the Public Information stage will be to update City of Edmonton trail maps, post physical signage and detour routes so that trail users will be informed of the closures.
- **Cloverdale Community League**

    - Will there be a way to access this information for the rest of the board? Could we publish a map in our semi-monthly flyer?
  - **Project Team**
    - There will be a project website up and running within 2-3 weeks that will be available to the public. We can advise you when it is live.
    - About a month prior to construction, we will be distributing bulletins to be circulated using the communities existing communication channels.
- **Cloverdale Community League**
    - If possible, we would like to send information out sooner and then update the community again closer to construction?
  - **Project Team**
    - It may be difficult to provide that information prior to having a contractor on board as some specifics will be determined by them and are likely to change.
    - Once we have a contractor on board the specifics will be clearer and more final. It would be better to wait to distribute that information to avoid changes.
- **Cloverdale Community League**
    - By raising the trails approaching the bridge, are the trails beyond this area ok from flooding?
  - **Project Team**
    - Yes, we have done various flood models that show these areas are above the flooding issues.
- **Cloverdale Community League**
    - If we have more questions is there someone we could email?
  - **Project Team**
    - Yes, you can contact Mitchell Schutta with the City of Edmonton
      - mitchell.schutta@edmonton.ca
- **Cloverdale Community League**
    - What are the next steps?
  - **Project Team**
    - In about 2-3 weeks the project website will be available, and we will send an email to all the stakeholders to advise when it is live.
    - You can use the information on the website to distribute to the community members using your flyers/newsletters. We are not sure if there will be a detour map included with this information as it may change.
    - We will do our best to communicate information as it becomes available while ensuring it is correct and current.

8. Next Steps

- Cloverdale Community League would like to be notified once the Project Information is live
  - Project Information will be made available on our website at a later date www.edmonton.ca/B278MillCreekReplacement
- Cloverdale Community League would like to ensure the trail users to be made aware of the construction, closures, and detours

Stakeholder Meeting

Mill Creek B278 Bridge Replacement & Approach Trail Upgrades

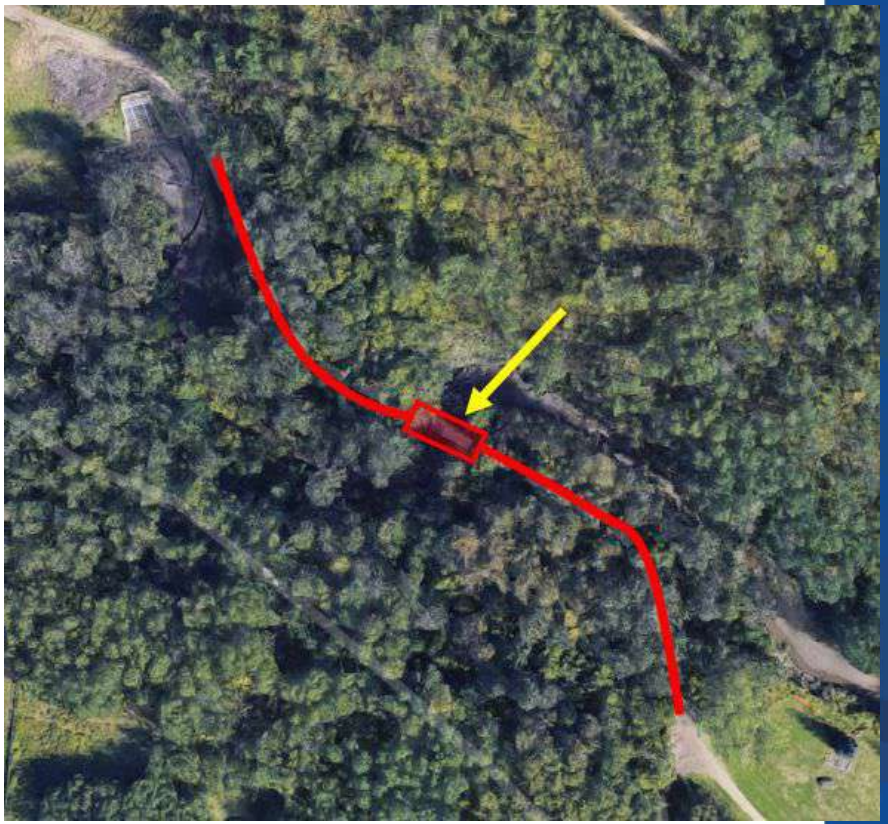
Transportation Planning and Design

Integrated Infrastructure Services
Infrastructure Planning and Design

Agenda

- Project Overview
- Project Impacts
- Timelines
- Discussion
- Next Steps

Project Overview

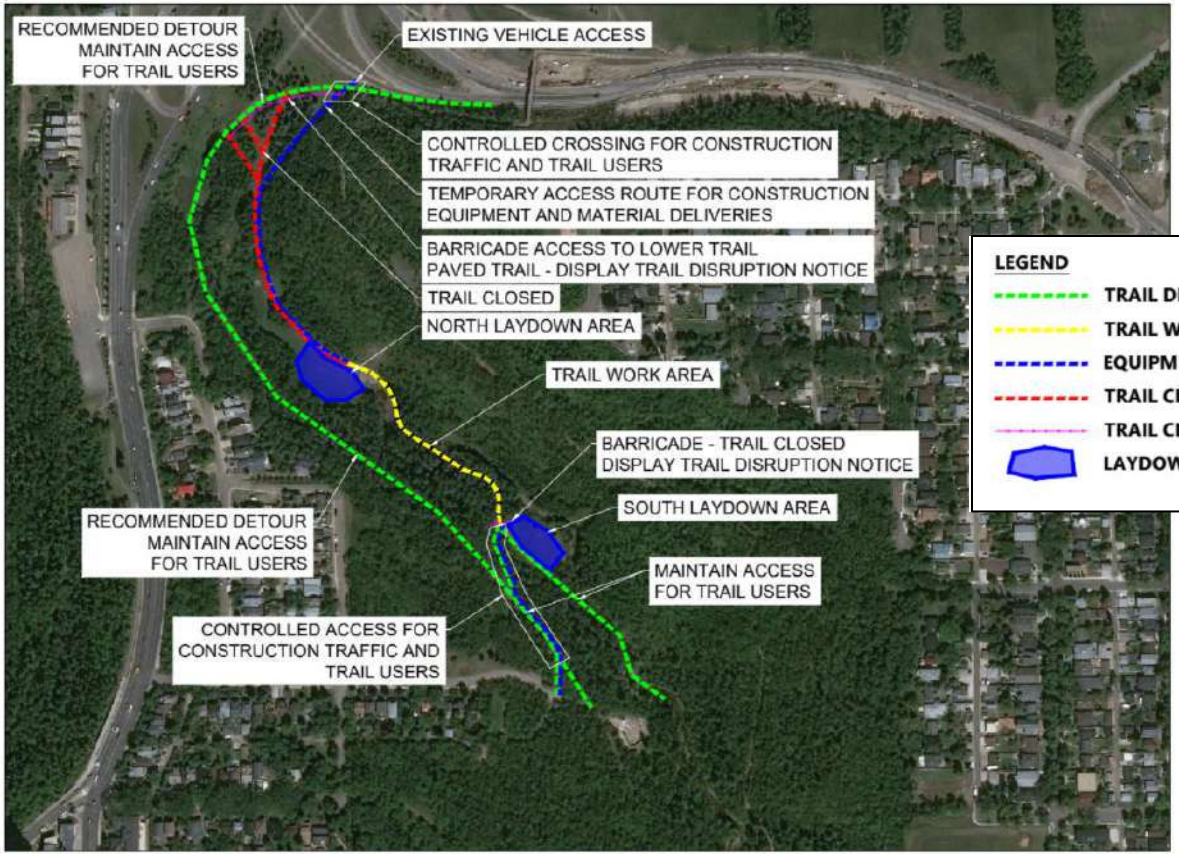


Mill Creek B278 Bridge Replacement & Approach Trail Upgrades

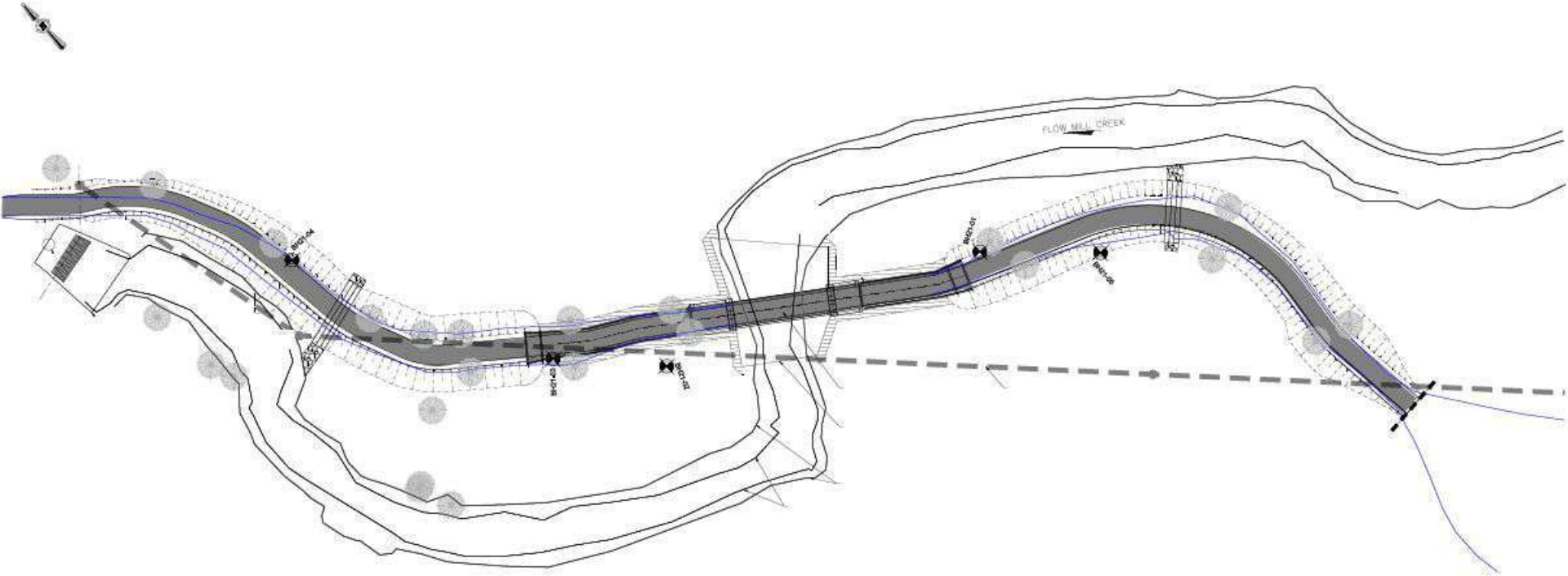
Activities:

- Demolish and remove existing structure
- Installation of new bridge and foundation
- Armoring of creek banks
- Placement of fill materials to elevate approach trails
- Vegetation restoration

Project Limits & Impact to Trails

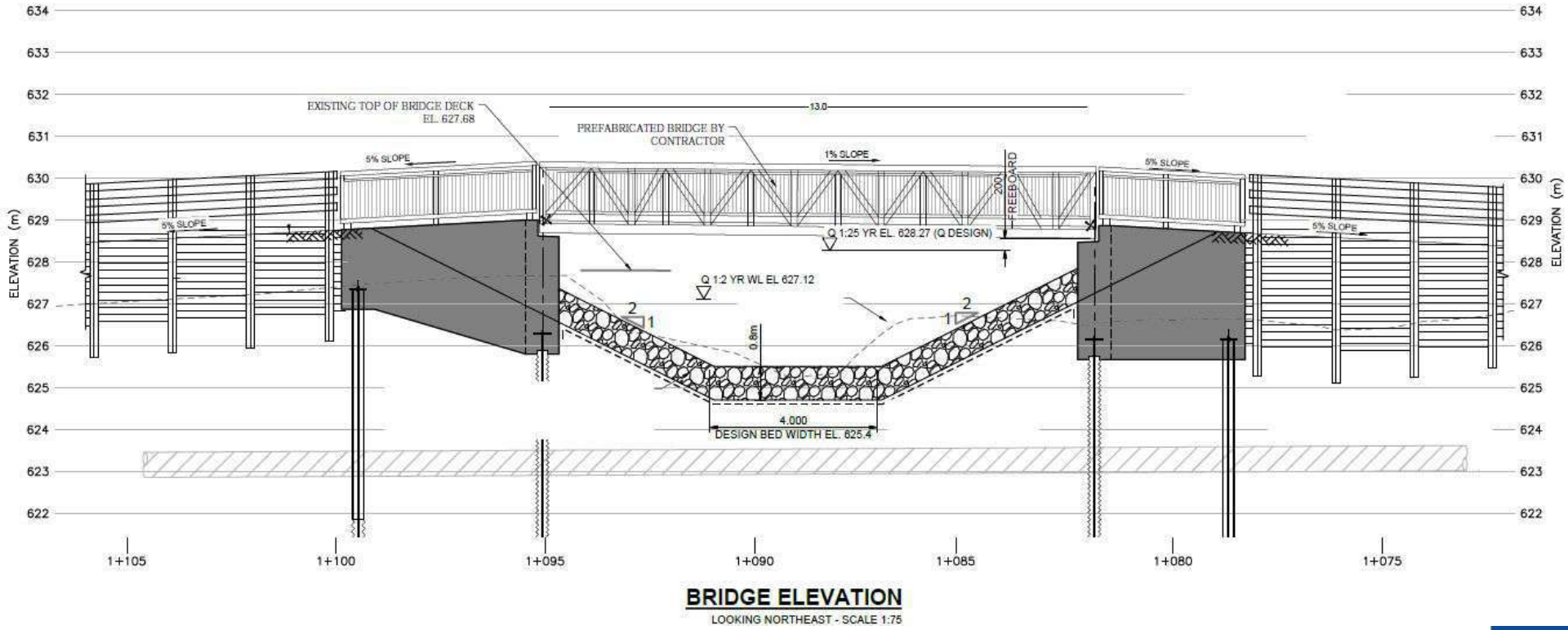


Bridge & Approach Trail Design



TRAIL PLAN

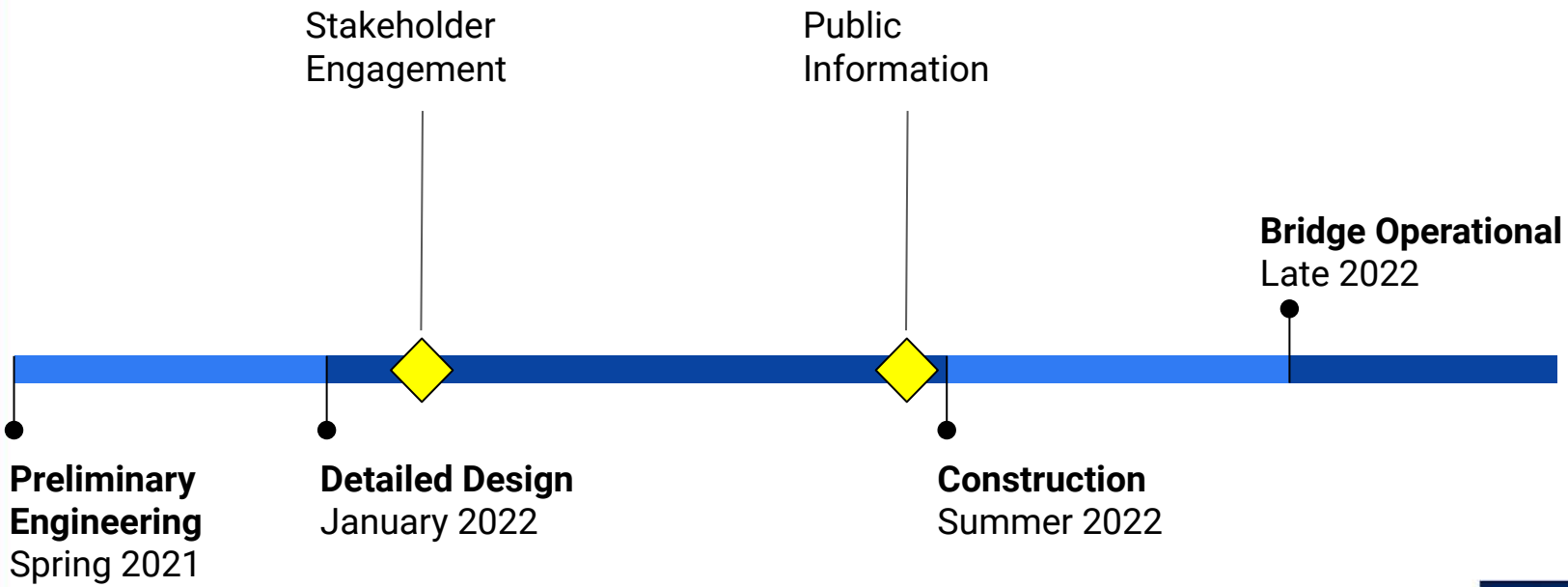
Bridge & Approach Trail Design



BRIDGE ELEVATION

LOOKING NORTHEAST - SCALE 1:75

Anticipated Timelines



Discussion

Next Steps

Project information will be made available on our website at a later date:

www.edmonton.ca/**B278MillCreekReplacement**

Thank you

Contact information:
Mitchell Schutta, Project Manager
transportationplanninganddesign@edmonton.ca