Municipal Environmental Impact Assessment for EPCOR WTP Flood Mitigation Barriers

June 30, 2023

Prepared for:

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MUNICIPAL ENVIRONMENTAL IMPACT ASSESSMENT
FOR EPCOR WTP FLOOD MITIGATION BARRIERS

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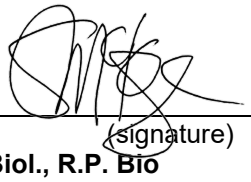
Prepared by  (signature)

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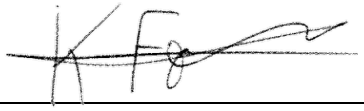
Reviewed by  (signature)

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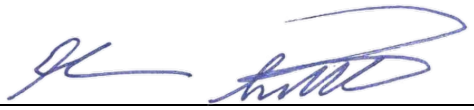
Approved by  (signature)

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Abbreviations

COE	City of Edmonton
EPCOR	EPCOR Water Services Inc.
FWIMT	Fish and Wildlife Internet Mapping Tool
KWBZ	Key Wildlife and Biodiversity Zone
LAA	Local Assessment Area
MEIA	Municipal Environmental Impact Assessment
NSR	North Saskatchewan River
PDA	Project Disturbance Area
SIRP	Stormwater Integrated Resource Plan
Stantec	Stantec Consulting Ltd.
USACE	United States Army Corps of Engineers
VC	Valued Component
WTP	Water Treatment Plant

1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by EPCOR Water Services Inc. (EPCOR) to complete a Municipal Environmental Impact Assessment (MEIA) for the Flood Mitigation Embankments project at the Rossdale and E.L. Smith Water Treatment Plants (WTPs) (the Project) (Figure 1.1, Appendix A). The Project will include the construction of flood mitigation works designed to mitigate the risk of overland flooding in a 1:500-year event. The Project is needed to protect critical infrastructure that provides drinking water to the City of Edmonton and more than 90 surrounding communities and counties.

A portion of the planned flood mitigation works and associated infrastructure at both the Rossdale and E.L. Smith WTPs would occur on land owned by the City of Edmonton (COE), within the *North Saskatchewan River Valley Area Redevelopment Plan* boundaries (Bylaw 7188). This Bylaw outlines the principles required to preserve the natural character and environment of the North Saskatchewan River Valley and Ravine System during future site development. Developments within the plan area are subject to an environmental assessment under the terms of this bylaw. This MEIA has been prepared by Stantec on behalf of EPCOR to satisfy Bylaw 7188 requirements for the Project. The purpose of the MEIA is to provide the environmental context of the Project, identify potential effects to the environment, and provide mitigation and monitoring techniques to limit adverse effects to the environment.

1.1 PROJECT BACKGROUND

EPCOR operates the E.L. Smith and Rossdale WTPs in the City of Edmonton. These plants collect and treat water from the North Saskatchewan River (NSR) and provide clean drinking water to over a million Albertans.

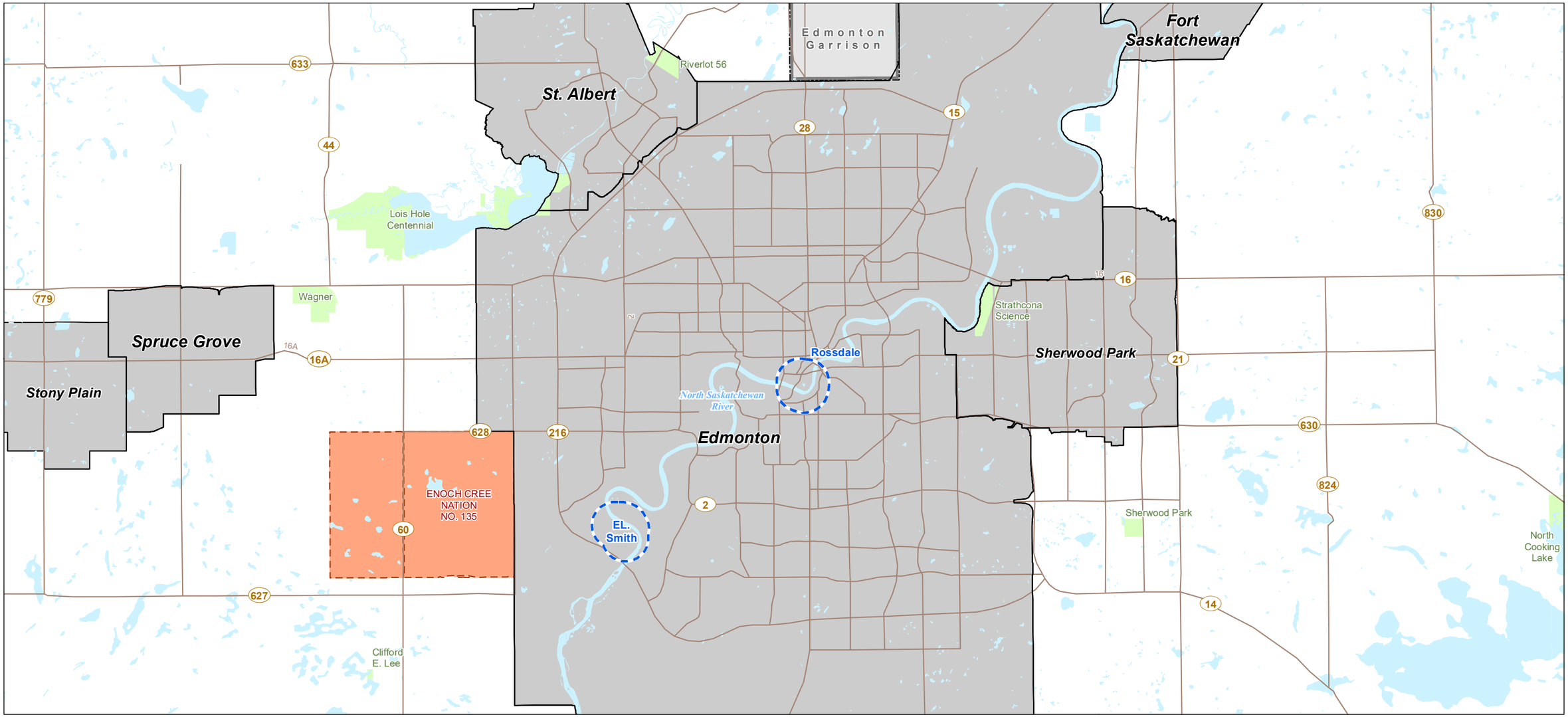
Both WTPs are located on the lower terrace of the NSR valley and may be vulnerable to overland flooding. In the context of climate change, the risk of urban flood damage in Canadian cities is increasing (Henstra and Thistlewaite 2017). The elevated risk is attributable to changes in snowmelt runoff caused by increasing temperatures, and increased likelihood of intense rainfall and severe storms (White and Etkin 1997; Loukas and Quick 1999; Cunderlik and Simonovic 2005 as cited in Henstra and Thistlewaite 2017). To manage the impact of these factors on residential and commercial customers in Edmonton, EPCOR has developed the Stormwater Integrated Resource Plan (SIRP). SIRP is a 20-year, $1.6-billion plan that includes a variety of actions to slow, move, secure, predict and respond to flooding in Edmonton neighbourhoods.

Due to major flooding across Alberta in 2013, EPCOR's insurance provider FM Global conducted an assessment of the Edmonton WTP's vulnerability to overland flooding from the NSR. Risk Reports were produced by FM Global for the Rossdale and E.L. Smith WTPs in 2017 and 2019 (FM Global, 2017; FM Global, 2019). The Risk Reports identified flood hazard concerns, site infrastructure requiring upgrades, and included recommendations for EPCOR to revise their Flood Emergency Response Plans.

EPCOR's SIRP has identified the E.L. Smith WTP as being situated in a medium-risk (E), and the Rossdale WTP as being situated in a high-risk (A) sub-basin zone (EPCOR 2018). EPCOR evaluated the submersion risk to critical equipment and structural damage that could potentially result from a major NSR flood at both the Rossdale WTP and E.L. Smith WTPs.

The COE has developed a Climate Change Adaptation Plan (COE 2018a) that outlines how the COE will plan and invest resources to increase our communities' climate resilience and minimize the exposure of people and assets to the impacts of climate change. The plan identifies river flooding as a result of changing precipitation as one of the climate variables that will impact the City of Edmonton, "Changing precipitation that leads to urban or river flooding can have a direct impact on facilities such as the water treatment system as well as residential or commercial buildings" (COE 2018a). The Climate Change Adaptation Plan includes the goal, "Edmonton's water supply is secure and safe for current and future Edmontonians", which aligns with the objectives of the Project (see Section 2.0).

Stantec undertook design studies including geotechnical and hydrotechnical analysis to determine the best course of action to address flood hazard concerns at the WTP sites (See Appendix B for detail).



- Local Assessment Area
- Road
- Aboriginal Reserve
- Military Base
- Park or Protected Area
- Urban Area
- Waterbody

0 2.5 5 Kilometres
(At original document size of 11x17)
1:175,000

N

Stantec

Project Location	Prepared by DS on 2022-10-05
Edmonton	TR by SM on 2022-10-05
Alberta	IR Review by SJ on 2022-10-17
Client/Project	110146440-005

EPCOR Water Services Inc.
EPCOR WTP Flood Mitigation

Figure No.
1-1

Title
Project Overview

Notes
1. Coordinate System: NAD 1983 3TM 114
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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2.0 PROJECT DESCRIPTION

EPCOR intends to protect the WTPs from overland flooding from the NSR through the construction of flood mitigation structures at both locations. Earthen embankments and concrete floodwalls were identified as the appropriate mitigation to reduce flood risk to the Edmonton WTPs.

- Increase protection to critical assets or relocate them to higher ground within the water treatment plants.
- Prevent river water from backing up into the plants through drainage pipes that discharge to the river.
- Develop flood barriers to protect equipment and storage facilities that cannot be moved.

The flood mitigation structures were designed with specific objectives to:

- Reduce the likelihood of damage to the WTPs during a NSR flood (1:500-year event)
- Mitigate the effects of flooding to allow EPCOR to resume potable water treatment as quickly as possible afterwards
- Protect and accommodate existing site infrastructure such as utilities, roads, swales, river valley trails, the E.L. Smith WTP Solar Farm project, and the Rossdale WTP treated water reservoirs
- Reduce the potential for flood water from the river to flow into the plant sites via the existing drainage pathways such as the waste streams and stormwater system
- Retain, as much as possible, the natural landscape around the WTPs between the facility and the NSR
- Project Location and Land Use

2.1.1 E.L. Smith Water Treatment Plant

The E.L. Smith WTP is located at 3900 E.L Smith Road NW, Edmonton Alberta. The Project is located within SE 9-52-25 W4M and SW 10-52-25 W4M, situated within the NSR valley, below the valley crest and top of bank, adjacent to the community of Cameron Heights. Henderson Estates is located to the east of the site on the east side of the NSR. The E.L. Smith Solar Farm lies directly adjacent to the E.L. Smith WTP, and these two areas combined comprise the E.L. Smith Lands. The majority of the Project is located on private (EPCOR owned) property, with portions of the Project encroaching on public (COE) land.

Recreational use of the NSR valley in proximity to the E.L. Smith Lands is common. Pedestrians and mountain bikers use an informal, unmaintained trail that follows the perimeter of the site above the NSR.

The NSR valley is a provincially significant natural area and regional biological corridor (COE 2008). The COE's Draft Ribbon of Green document classified the E.L. Smith WTP site as Urban Services under the broader category of "Active/Working Landscapes" (COE 2018b). According to this document, Active/Working Landscapes are located throughout the NSR valley, have lower levels of ecological sensitivity, and accommodate the highest intensity of uses while limiting ecological impact, when possible. Developments that improve the sustainability of existing operations, or expansions of power, water and wastewater utilities, are among the appropriate uses listed. COE (2018) also identifies the E.L. Smith Lands as a wildlife corridor as part of the Cameron-Oleskiw River Valley Reach-Ecological Guidance.

The E.L. Smith WTP lands are zoned as PU (Public Utility). The adjacent lands associated with the E.L. Smith Solar Farm are zoned as DC1 (Direct Development Control), and there is an A zone (Metropolitan Recreational Zone) to the south and west.

2.1.2 Rossdale Water Treatment Plant

The Rossdale Site is located within SE 32-52-24 W4M and is approximately 14.7 hectares (ha) in size and is owned by EPCOR. Within the Rossdale Site, the Rossdale WTP is located at 9469 Rossdale Road NW, Edmonton. The Rossdale Site includes various buildings including the Rossdale Power Plant, the Rossdale and Bellamy Substations, the Rossdale WTP, and the guardhouse.

The Rossdale WTP has been in operation for more than 100 years. The original plant was replaced by the current plant in 1947 and was expanded in 1956. A historical aerial photo review of the site from 1978 to 2009 was conducted by Tetra Tech (2019). The aerial photographs showed multiple site developments between 1980s to 2000s, such as the construction of the Fire Station, Low Lift Pumphouse, the removal of former reactivator site and the construction of reservoir cells.

The community of Rossdale lies to the east of the Rossdale Site. The COE-owned Fire Rescue Service Edmonton Fire Station #21 is located to the east of the Rossdale Site at 9315-101 Street NW. John Ducey Park is situated to the north of the Rossdale Site and is also owned by the COE. There is a multi-use trail that extends along the length of the Rossdale site on the southside above the NSR, and steeply sloped green space between the path and the edge of the NSR. There are two pumphouses associated with the Rossdale WTP that occur on the NSR-side of the multi-use trail.

The Rossdale Site is zoned as PU. Adjacent lands are zoned as AN (River Valley Activity Node Zone) and AP (Public Parks Zone). Portions of the Rossdale Site lie within the Flood Protection Overlay, and the site lies entirely within the NSR valley and Ravine System Overlay (COE 2022).

The COE is in the process of developing the proposed Touch the Water Promenade Project which consists of creating a park intended to improve and enhance access to the river valley. The Touch the Water Promenade Project is at the preliminary design phase, and the park space concept includes various decks, plazas, and pathways that link the Alberta Legislature grounds west of the Walterdale Bridge and extend along the NSR along the southern extent of the Rossdale Site.

2.2 PROJECT COMPONENTS AND ACTIVITIES

The Project will consist of the construction and installation of flood barriers at both the Rossdale and E.L. Smith WTPs. The following text is adapted from *EPCOR WTP Flood Mitigation Embankments—Issued for Regulatory Application* (Appendix B). Geotechnical and Hydrotechnical analysis conducted by Stantec informed design selection. All flood barriers will be constructed on land above the 1:35-year flood elevation and will therefore not interact with surface water within the NSR or fish habitat.

2.2.1 Project Components

2.2.1.1 Flood Mitigation Structures

Earthen Embankments

Standard earthen embankments will be constructed at both sites. The design of the earthen embankments follows the principles described in *Design and Construction of Levees* (USACE 2000). This design was selected for constructability, maintenance, operational access, and slope stability. The geometry of the embankments will consist of 3:1 slopes and a top width of 3.0 metres (m) (See IFRA drawings in Appendix A for further detail).

The standard embankment will consist of compacted clay fill and will be vegetated with grass. The embankment will be keyed into the existing ground surface. Following United States Army Corps of Engineers (USACE) standards, a 4.6 m vegetation setback and root free zone will be maintained on both sides of the embankment (USACE 2014) (See IFRA drawings in Appendix A for further detail).

The geometry of the earthen embankments may be modified in selected areas during detailed design to incorporate stakeholder feedback, avoid conflicts with utilities, and meet landscape objectives.

Floodwalls

There are two types of floodwalls that will be constructed for this Project:

1. Inverted T-type cantilever concrete floodwall (Rossdale WTP site)
2. Cantilever I-type concrete floodwall on concrete friction piles (E.L. Smith WTP site)

Inverted T-type

The inverted T-type floodwall consists of concrete wall extending to a depth of approximately 1.0 m below grade that is connected to the horizontal wall base with a shear key on one end. The width of the base and the height of the wall have been designed for 1:500-year flood levels plus 1.0 m of freeboard. The actual width of the base and the height of the wall will range based on detailed design and local topography (see IFRA drawings in Appendix A).

Cantilever I-type

The cantilever I-type floodwall consists of concrete wall projecting above grade to a height of the service level. The cantilever I-type floodwall is supported by a continuous concrete pile cap to the depth of 2.2 m below grade which in turn is founded on 750 mm diameter concrete friction piles spaced at 2.5 m. The cantilever I-type floodwalls to be constructed for this Project were designed to meet standard stability criteria (USACE Manual 1110-2-2502 “Retaining and Floodwalls”). These criteria have informed the design of the wall geometry at all locations along the length of the floodwall (see IFRA drawings in Appendix A).

Demountable Barriers

The Project will use a demountable barrier at the Rossdale WTP in association with the barrier opening between South Flood Wall #1 and South Flood Wall #2 (see IFRA drawings in Appendix A). This opening has been included to maintain an existing vehicular access route. Demountable barriers can be deployed when temporary flood emergencies arise. They are considered an alternative to sandbags. Demountable barriers consist of a series of flexible tubes that can be stacked, joined end to end, and filled with water. They form a flexible impervious barrier to mitigate flooding that can be quickly deployed as needed. Deployment of temporary flood control measures is contingent upon flood forecast monitoring, timing, and operations, and will follow procedures as laid out in the Operations and Maintenance Manual (Appendix B). All emergency response materials will be stored by EPCOR within sea cans on the WTP sites. These sea cans are positioned on areas of maintained lawn and have no notable environmental impact.

Embankment Arrangement

E.L. Smith WTP

The embankment arrangement at E.L. Smith WTP consists of earthen embankments and concrete floodwall. The earthen embankments will span the extent of the facility along the NSR, and a cast-in-place concrete floodwall will surround the Low Lift Pump Houses. A rip rap apron will be installed on the riverside of the curved portion of the floodwall to reduce erosion potential in the event of a flood up to a 1:500-year level. The riprap section will be covered with topsoil and vegetated to reduce potential impingements on wildlife movements between the floodwall and the NSR.

An additional section of earthen embankment will be constructed at the southeast corner of the property to mitigate potential overland flooding and a portion of the adjacent existing access road will be raised. The arrangement is shown in IFRA drawings in Appendix A.

Additional detail on the embankment and floodwall layout and design can be found in the IFRA Drawings included in Appendix A.

Rossdale WTP

The alignment of the proposed flood mitigation infrastructure at the Rossdale WTP consists of a series of earthen embankments and floodwalls along the north, south and east sides of the Rossdale Lands. These are shown in IFRA drawings in Appendix A as:

- the north earth embankments and north floodwall (north earth embankment #1 and #2; north floodwall)
- the south floodwalls #1, #2, and #3

The north earth embankments (#1 and #2) and north floodwall extend along the north side and northeast corner of the Rossdale lands. In the northwest corner of the Rossdale Lands, the north earthen embankment #1 ties into the raised entranceway, which will be re-graded as part of the Project. The north earth embankment connects to the north floodwall approximately midway along the north boundary and extends to the eastern extent of the Rossdale lands, rounds the corner, and extends south to connect to

north earth embankment #2. These earthen embankments and floodwalls will be constructed to accommodate existing infrastructure, pathways, and utilities, while maintaining public access and reducing the number of trees to be removed, as practicable.

The south floodwalls #1 and # 2 extend from the tie-in to the Rossdale Power Plant in the southwest corner of the Rossdale Lands adjacent to the multi-use trail and around the Low Lift Pumphouse to the demountable barrier location. South Floodwall #3 extends from the Tiger Dam to the Clarifier building. Additional detail on embankment/floodwall layout can be found in the IFRA Drawings included in Appendix A, and details on the design can be found in Appendix B. Note, the layouts shown in Appendix A have been updated from the older designs present in the Appendix B drawings. Should discrepancies exist, the layouts in Appendix A should be considered the current design at the time of writing.

Waste Stream Infrastructure

E.L. Smith WTP

The E.L. Smith WTP has three waste streams that discharge stormwater and process waste into the NSR. To prevent floodwater from entering these pipes during a flood event, the Project will include the installation of slide gates and the re-lining of pipes at several locations. The objective of re-lining the pipes is to reduce the groundwater infiltration associated with old pipes. Manholes will be installed to facilitate the installation of slide gates. See Appendices A and B for further detail.

Rossdale WTP

The Rossdale WTP has eight waste streams which discharge stormwater and process waste into the NSR. To prevent floodwater from entering these pipes during a flood event, the Project will include the installation of slide gates and the re-lining of pipes at several locations. Re-lining pipes is completed in order to reduce groundwater infiltration into old pipes. Manholes will be installed to facilitate the installation of slide gates. See Appendix A for further detail.

Stormwater Management System

E.L. Smith WTP

The location of the E.L. Smith WTP site is on the floodplain of the NSR, downslope from residential development. Runoff from the neighbourhood and the forested hillsides flows to the NSR through two ditches within the E.L. Smith WTP site. The earthen embankment arrangement for the E.L. Smith WTP site will cover the existing ditches. Therefore, two culverts will be installed to convey runoff flow through the embankments and maintain the existing drainage pattern. A gated opening in the floodwall will be installed near the Low Lift Pumphouse to allow for site drainage. Slide gates will be installed on the culverts and opening to prevent backflow from the river. Ditches will be located along the outer extent of the floodwalls to intercept runoff and direct it towards the culverts and gated opening.

There are two existing outfalls fed by two storm sewers that discharge water from the site to the NSR. These storm sewers will be retained, and flow control valves will be installed to prevent backflow from the NSR. See Appendices A and B for further detail.

Rossdale WTP

The Rossdale WTP is located above the NSR and is surrounded by urban development. The sewer system at the Rossdale Lands is a combined sewer (a type of gravity sewer that transports sewage and urban runoff together to a sewage treatment plant or an outfall) that runs along the north and east boundaries of the site. The south catchments of the Rossdale WTP site directly discharge to the NSR through underground storm sewers and four outfalls. The existing drainage system will be maintained after the construction of the embankments and the storm sewers will be fitted with flow control valves.

The presence of the south embankment will result in two low spots near the Water Excellence building and the Low Lift Pumphouse. Swales will direct flow from these low spots to nearby catch basins. See Appendices A and B for further detail.

2.2.2 Project Activities

The construction of flood mitigation at the E.L. Smith WTP is scheduled to commence in 2024 and will occur over 12 months. Construction at the Rossdale WTP is scheduled to commence in 2025 and will be 15 months in duration. Table 2.1 details construction and operations activities.

Table 2-1 Construction and Operation Activities

Project Phase	Activity	Description of Activity
Construction	Site Preparation and Construction Mobilization	• Temporary closure of multi-use trail at Rossdale and unofficial single-track trail at E.L. Smith • Temporary removal of existing security fencing (progressive with construction, with replacement occurring as soon as possible after construction is complete). • Permanent removal of security fencing in certain areas where concrete floodwalls will be tall enough to provide adequate security. • Mobilize equipment to site using public and existing access roads. Equipment will include: excavators, dump trucks, skid steers or other loaders • Install temporary fencing and signage for public safety and security • Install temporary erosion and sediment control measures • Clear and grub vegetation within the limits of construction except laydown areas; limited stumping and pruning within 5 m of the limits of construction • Strip soils down to clay • Strip topsoil and store soils following best management practices • Compaction of clay substrate with heavy equipment

Table 2-1 Construction and Operation Activities

Project Phase	Activity	Description of Activity
Construction	Laydown Areas	• Establish laydown areas and fueling stations with spill containment mitigation in place • Locate within existing disturbance at WTP sites • The temporary and/or permanent laydown footprints within the PDAs will be used for Project staging and laydown
Construction	Utility Relocates and Upgrades	• Relocate utility infrastructure as determined through detailed design • If infrastructure abandonment is required: remove, or cap and grout abandoned infrastructure • Install manholes and re-line existing pipe • Install backflow prevention mitigation on existing water infrastructure (slide gates and flow control valves) • Move power pole at entrance of Rossdale • Install culverts and swales for stormwater management
Construction	Regrade Entrance at Rossdale WTP	• Remove existing asphalt using milling machines, sweeper, dump trucks, pavers, and rollers • Raise grade with appropriate fill materials to detailed design specifications • Pave raised grade
Construction	Earthen Embankment Construction	• Bring clay fill to site store on laydown areas or place directly in construction footprint using loaders (backhoe/skid steers) • Placement of clay fill materials to construct embankments • Stabilize earthen embankment slopes through compaction • Grade and shape earthen embankment slopes to design specifications • Construct access ramp to outfall at E.L. Smith
Construction	Floodwall Construction	• Excavate soils within the concrete floodwall foundations footprints • Drill holes for cast in place concrete piles, place casings (if using) • Construct/Assemble cast-in-place concrete forms • Pour concrete • Construct riprap apron at curved section of E.L. Smith floodwall
Construction	Site Restoration and Revegetation	• Remove temporary fencing • Place topsoil on graded slopes, finalize grade • Hydroseed slopes with approved native grass seed mix • Construct security fences along berms and concrete floodwalls. Security fences will be replaced immediately (where applicable) following construction in position close to current location (generally on the public-facing side of the embankments) • At E.L. Smith, the outer security fence will not be replaced along the approximately 125 m portion at the southeastern extent of the WTP around the Low Lift Pumphouses. This removal is intended to reduce existing impingements to terrestrial wildlife movements between the WTP and the NSR

Table 2-1 Construction and Operation Activities

Project Phase	Activity	Description of Activity
		• Enhancement plantings of native shrubs and trees are proposed at E.L. Smith within the area between the WTP and the NSR. along the southeastern extent of the E.L. Smith WTP, around the Low Lift Pumphouses. A preliminary planting plan has been included within Appendix A. The species within this plan may be revised to incorporate feedback from indigenous consultation during the detailed design phase.
Operation	Maintenance activity	• Operate and maintain the embankments and floodwalls, and backflow prevention measures • On the earthen embankments and root free zones: – Promote growth of native grass including fertilizing and reseeding (See Appendix B) – Routine mowing and weed management 3 or 4 times per growing season – Inspect and repair erosion damage – Maintain access road and ramps – Discourage small mammal burrowing in earthen berms – Remove trash and refuse from embankment crown and slopes

2.3 APPLICABLE LEGISLATION

2.3.1 Bylaw 7188

The proposed locations for the Project occur within the NSR valley and is subject to the North Saskatchewan River Valley Area Redevelopment Plan (NSRVARP, Bylaw 7188, COE 2017).

In consultation with the COE administration, it was determined that the Project triggers the requirement for a MEIA. The scope of the MEIA is to:

- To identify the potential effects on the physical and biological environment resulting from the Project
- To evaluate the feasibility of mitigating or preventing adverse impacts, and to predict the potential residual effects (if any) associated with the Project after mitigation
- To develop mitigation strategies to avoid or reduce the potential of significant adverse effects to the environment from the construction and operation of the Project

2.3.2 Other Applicable Legislation

Table 2.2 details legislation and policy from all levels of jurisdiction as it applies to the Project.

Table 2-2 Applicable Legislation and Policy Guidance

Legislation or Policy	Requirements or Guidance Provided
Federal	
Impact Assessment Act	The Project does not meet the criteria of a Designated Project under the *Impact Assessment Act*. The Project is not an activity listed in the Physical Activities Regulations.
Species at Risk Act (SARA)	Protects species listed as extirpated, endangered, and threatened on federally regulated land or designated critical habitat. Species regulated under the *Species at Risk Act* may occur within the vicinity of the Project however, no critical habitat or federally regulated lands were identified near the Project.
Migratory Birds Convention Act (*MBCA*), and Migratory Bird Regulations	Protects and conserves migratory bird populations and individuals and their nests and eggs in Canada. The Migratory Bird Regulations were updated in July 2022. The nests of all migratory bird species are protected when they contain a live bird or a viable egg. Some nests are protected when not in use such as great blue heron and pileated woodpeckers. Authorizations to allow construction-related effects on migratory birds and their nests do not exist.
Provincial	
Environmental Protection and Enhancement Act (*EPEA*)	EPCOR consulted with AEP and it was determined approval under *EPEA* was not required for the Project.
Public Lands Act	Governs activities occurring on public land to ensure they occur in a safe, sustainable, orderly, and environmentally responsible manner. No public land is crossed by the Project.
Soil Conservation Act	In Alberta, the *Soil Conservation Act* requires landowners or occupants to prevent soil loss or deterioration from taking place, and to stop any identified the loss or deterioration from continuing.
Weed Control Act	In Alberta, the *Weed Control Act* requires landowners or occupants to: • Destroy plants listed as *prohibited noxious* upon discovery • Control populations of plants listed as *noxious* to prevent their spread
Water Act	In Alberta, works in and around watercourses are regulated under the *Water Act*. Alberta's *Water Act* requires that an approval, notice or licence be obtained by any person or company planning to undertake an activity that may affect the land or vegetation under or around a water body, or may affect the location, flow or quality of the water or aquatic environment. A portion of the flood mitigation measures for the E.L. Smith WTP will be constructed within the floodway and therefore require *Water Act* approval. The Project has received the *Water Act* approval for the E.L. Smith WTP. No portions of the flood mitigation measures for the Rossdale WTP will be constructed within the floodway and no changes to surface elevations within the NSR are expected. However, the implementation of flood mitigation measures (i.e., the berms or walls) at Rossdale WTP could interact with NSR surface flow velocity during major flood events (1:500). As such, an application for a *Water Act* approval was also made for the Rossdale WTP flood mitigation measures. The *Water Act* approval application is in review at the time of writing.
Wildlife Act and the Alberta Wildlife Regulation	The *Wildlife Act* protects species listed as endangered or threatened and the Wildlife Regulation provides a list of species considered endangered or threatened. Additionally, the Act prohibits the disturbance or destruction of the house, nest, or den of some wildlife.

Table 2-2 Applicable Legislation and Policy Guidance

Legislation or Policy	Requirements or Guidance Provided
Historical Resources Act	Historical resources in Alberta are protected under the *Historical Resources Act* and include archaeological, historic and paleontological sites, artifacts, and fossils. Under the Act, no historical resources site can be disturbed without approval of the Minister of Culture and the Status of Women (ACSW). ACSW determines and issues the requirements for Historical Resources Impact Assessment (HRIA) studies (if deemed required) and for mitigation measures for each archaeological and paleontological resource site. ACSW issues *Historical Resources Act* (HRA) approval for projects to proceed. The Project is situated on lands with known historical, archaeological, and paleontological values. ACSW issued HRA requirements for the Project and conditional approvals for construction at both WTPs. Construction activities will follow HRA approval requirements.
Land Stewardship Act	In Alberta, land-use planning is guided by the Land-Use Framework. The Land-Use Framework established seven land use regions and called for the development of a regional plan for each. The Project is within the boundaries of the North Saskatchewan Region. The North Saskatchewan Regional Plan is currently under development; it has not yet been finalized or approved by AEP.
Municipal	
Zoning Bylaw (Bylaw 12800)	Changes to zoning are not anticipated for either WTP location.
Community Standards Bylaw (Bylaw C14600)	The COE Community Standards Bylaw regulates the conduct and activities of people on privately owned property and immediately adjacent areas in order to promote the safe, enjoyable and reasonable use of such property for the benefit of all citizens of the City. The bylaw defines the allowable times for construction on private property and BMPs will be followed to comply with these requirements.
Drainage Bylaw (Bylaw 18093)	The COE Drainage Bylaw regulates the surface drainage on public and private land. Drainage within the Project area will be managed through the completion of a drainage assessment and the development of a storm water management plan which will identify Project specific drainage features designed to meet the requirements within this bylaw.
Development Setbacks from River Valley/Ravine Crests (Policy C542)	This policy outlines the development setback areas required within the NSR valley and Ravine System. This policy does not apply to existing river valley communities where development has already occurred on the slope or the floodplain of the river valley and ravine system therefore this policy does not apply to the Project.
Corporate Tree Management Policy (Policy C456A)	The purpose of the Corporate Tree Management Policy is to ensure that all trees on City owned property are adequately protected from destruction, loss or damage. There are no City owned trees within the PDA therefore this policy does not apply.
Public Tree Bylaw 18825	The Public Tree Bylaw mandates to the protection and preservation of City trees. A Tree Permit is required when work is conducted within 5 metres of any Boulevard and Open Space trees, or within 10 metres of Natural Stand. Ground excavation and grading activities within these areas require a Tree Preservation Plan. The Project will require a Tree Preservation Plan for both WTPs.
Other Guidance	
Terrain and Soils	• City of Edmonton Erosion and Sedimentation Control Guidelines (COE 2005a) • City of Edmonton Erosion and Sedimentation Control Field Manual (COE 2005b)

2.4 PROJECT ALTERNATIVES

The overall scope of the Project is to protect existing critical infrastructure from overland flooding at two locations within the COE. Because the scope and location of the Project is fixed, the consideration of project alternatives is limited to a review of alternative in situ design concepts that achieve flood mitigation objectives.

Various combinations of flood mitigation berms and floodwall-types were considered. Embankment and/or wall arrangements were reviewed. For example, berm placement both inside and outside of the existing security fences was considered. The Project team considered environmental and regulatory constraints and designed a Project that is intended to balance the need to protect critical infrastructure and limit the potential adverse effects to valued biophysical components and public enjoyment of the NSR valley.

Appendix B reviews the rationale for the design selections and provides the overall rationale for the Project design.

2.5 INDIGENOUS AND COMMUNITY ENGAGEMENT

EPCOR commenced with consultation and engagement with Indigenous Nations and communities, stakeholders, and the public for the Project. Engagement activities focussed on discussions on how the flood barriers around the water treatment plants will look and be experienced by those who live, work and recreate in the areas around the facility, as well as rights-holders and Indigenous Nations and communities with an interest in the areas around the facility.

EPCOR's engagement process is a phased approach that is intended to incorporate the input of Indigenous Nations and community members to improve the quality of the Project's design (Table 2.3).

Table 2-3 Indigenous and Community Engagement Phases and Timelines

Preliminary Design		
Shared Outcomes	November 2020 – March 2021	Community and Indigenous engagement about shared outcomes to guide future work at the Edmonton water treatment plants.
Phase One	May – September 2021	Community and Indigenous engagement about early concepts to understand what should be considered in the design process for the flood barriers.
Phase Two	October 2021 – June 2022	Community and Indigenous engagement about refined options for the flood barriers, including further conversations about potential community amenities to include in the flood barrier area.
Phase Three	Planned for fall 2022	Community and Indigenous engagement about the selected designs.

Table 2-3 Indigenous and Community Engagement Phases and Timelines

Detailed Design		
Phase Four	2023	Community and Indigenous engagement on the detailed design of the flood barriers. This will include discussions about the specific barrier treatments, landscaping plans and any potential amenities.
Construction		
Phase Five	2024-2027	Ongoing communication with the community and ongoing communication and engagement with Indigenous Nations and communities about construction plans, impacts and timing.
Complete	2027	Community event to celebrate completion of the water treatment plant flood barriers.

Phase 1 and 2 of Indigenous and community engagement have included the following activities:

- Online surveys
- Self-guided walking tours
- Indigenous walking tours
- Community workshops (in person and online)
- Archaeological and Indigenous Monitoring
- Discussions (phone, meetings)
- Indigenous ceremony

Phase three of engagement will focus on confirming that EPCOR appropriately understood feedback, and will be initiated in fall 2022, with formal engagement opportunities to be scheduled.

2.5.1 Indigenous Engagement

EPCOR recognizes the archaeological and historical significance of the sites of the plants; the importance of these areas in fostering communities predates the City of Edmonton itself. It was important to EPCOR to seek out, hear, and include the perspectives of the 32 Indigenous Nations and communities with an interest in these lands and will continue these conversations throughout this Project.

Feedback and responses were gathered from Indigenous Nations and community representatives during in-person walking tours, virtual information sharing and guidance-seeking workshops, monitoring activities and one-on-one conversations.

The following themes emerged through Indigenous engagement:

- The importance of Water
- Consideration for the Environment, tree removal, replanting
- Allow for interaction with the land, maintain harvesting opportunities
- The many histories and stories of the areas
- The importance of Treaty

EPCOR will continue to work with Nations to address these key themes throughout the life of the Project. EPCOR will prioritize reconciliation: working collaboratively with Indigenous Peoples to reconnect with their historic lands, by creating opportunities for monitoring archaeological work, shared learning, conducting ceremony, and traditional plant harvesting.

Indigenous engagement also provided feedback on a number of design considerations. This feedback and how it has or will influence Project design is detailed in Table 2.4.

Table 2-4 Design Considerations from Engagement and Influence on the Project at both WTP sites derived from Indigenous Engagement

Design Considerations from Engagement	How EPCOR intends to incorporate feedback into Project
Diverse perspectives on Project fencing, walls, berms and wall/berm combination.	• Incorporate feedback on fencing, floodwall, berms, and wall/berm combinations in detailed design
Stone was the preferred treatment on floodwalls, as brick can be a reminder of residential schools.	• Incorporate feedback on specific barrier treatments during detailed design
Amenities including plaques and benches that speak to Treaty and Stories.	• Incorporate feedback on amenities and interpretative educational signage throughout project lifecycle during detailed design
Storytelling plaques and artwork to adorn or be displayed along walls.	• Incorporate feedback on amenities and interpretative signage during detailed design
Recognition of the use of the land by many diverse peoples throughout history.	• Incorporate feedback on amenities and interpretative signage during detailed design
Emphasis on the importance of Ceremony before and throughout the project.	• Coordinate with Indigenous Nations and communities to include Ceremony prior to and during the development of the Project
Continuous Indigenous Monitoring of ground disturbances.	• Coordinate with Indigenous Nations and communities to include Indigenous Monitors during ground disturbance
Employment opportunities for Indigenous people.	• Provide Project-related employment opportunities for Indigenous people

2.5.2 Community Engagement

EPCOR heard from a number of community members who shared their perspectives on which design considerations are important for EPCOR to consider while building the flood barriers.

Community members engaged include:

- Property owners
- Residents
- Members of the public
- Community leagues
- Elected officials
- Government agencies
- EPCOR employees
- Other interested parties

EPCOR is committed to demonstrating how engagement is reflected in the Project's design and sharing how the input influenced the final design. Table 2.5 and 2.6 detail community feedback on design considerations and how that feedback has or will influence Project design and implementation.

Table 2-5 Design Considerations from Engagement and Influence on the Project at E.L. Smith WTP derived from Community Engagement

Design Considerations from Engagement	How EPCOR intends to incorporate feedback into Project
Prioritize maintaining and enhancing existing environment	• Selected floodwalls rather than earthen embankments along the north portions of the Project to reduce incursion on existing wildlife corridor between the Project and the NSR • Reduce vegetation loss by siting infrastructure on existing disturbance where possible
Support existing recreational use through minimal amenities	• Incorporate feedback on amenities during detailed design
Include educational features that include Indigenous representation.	• Incorporate feedback on amenities and interpretative signage during detailed design
Align with City, EPCOR, and Community priorities	• Coordinate with COE plans for the area (e.g., Ribbon of Green)

Table 2.6 details community feedback on design considerations and how that feedback has or will influence Project design and implementation at the Rossdale WTP.

Table 2-6 Design Considerations from Engagement and Influence on the Project at Rossdale WTP derived from Community Engagement

Design Considerations from Engagement	How EPCOR intends to incorporate feedback into Project
Create space for recreation and transportation	• Select floodwalls rather than earthen embankments along the south portions of the Project to reduce incursion on existing recreation and transportation associated with the multi-use trail

Table 2-6 Design Considerations from Engagement and Influence on the Project at Rossdale WTP derived from Community Engagement

Design Considerations from Engagement	How EPCOR intends to incorporate feedback into Project
Blend into existing surroundings	• Incorporate feedback on specific barrier treatments, landscaping plans during detailed design
Discourage vandalism	• Incorporate feedback on specific barrier treatments during detailed design
Improve institutional look or feel of the WTP	• Incorporate feedback on specific barrier treatments, landscaping plans during detailed design • Reduce vegetation loss by siting infrastructure on existing disturbance where possible
Celebrate history of area	• Incorporate feedback on amenities and interpretative signage during detailed design • Coordinate with COE plans for the area (proposed Touch the Water Promenade Project)
Align with City, EPCOR, and Community priorities	• Coordinate with COE plans for the area (proposed Touch the Water Promenade Project)

3.0 ENVIRONMENTAL EVALUATION APPROACH

3.1 SCOPE OF ASSESSMENT

This MEIA considers the potential effects on Valued Components (VCs) resulting from the construction and operation of the Project. Sections 3.1 through 3.5 outline the methods used to identify, evaluate, and determine the significance of potential environmental effects.

VCs are defined as an "environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historic, archaeological or aesthetic importance" (GOA 2010). The importance of a VC may be determined on the basis of cultural ideals or scientific concern (GOA 2010). VCs for the Project were selected with the objective of scoping the effects assessment to Project interactions that are of interest to the COE, the public, and the scientific community. The selection criteria for VCs include consideration of legislative or policy drivers, presence in the Project vicinity, and likelihood of interactions with the Project.

While not all biophysical components were selected as VCs, some aspects of the physical environment may be discussed under other VCs (e.g., noise may occur under sensory disturbance for wildlife). VCs were not carried forward in the effects assessment if Project interactions were considered negligible or if they were not expected to result in a measurable change to the VC with the application of Best Management Practices (BMPs) or standard practices. Items that are not considered VCs are scoped out of the effects assessment and are only discussed in the context of baseline conditions. Details regarding selected and scoped out VCs are provided in Section 3.5.

3.2 SPATIAL AND TEMPORAL BOUNDARIES

The spatial boundaries reflect the geographic area over which the Project's potential environmental effects may occur. The temporal boundaries identify when a potential environmental effect may occur in relation to specific Project components and/or activities. Spatial and temporal boundaries are developed in consideration of:

- timing/scheduling of Project activities
- understanding natural variations of each VC
- the time required for recovery from a potential environmental effect

3.2.1 Temporal Boundaries

The temporal boundaries for the Project encompass all Project activities.

Construction at E.L. Smith WTP is anticipated to begin in 2024 and is expected to take approximately 12 months.

Construction at Rossdale WTP is anticipated to commence in 2025 and is expected to take approximately 15 months.

Operations and maintenance will commence when construction is complete.

3.2.2 E.L. Smith Water Treatment Plant Spatial Boundaries

The spatial boundaries at E.L. Smith WTP are defined below with respect to Project components and activities:

- The E.L. Smith Project Development Area (PDA): The PDA is defined as the area in which Project activities and components may occur, and as such represents the area within which direct physical disturbance may occur as a result of the Project, both temporary and permanent. The PDA is approximately 3.79 ha.
- The E.L. Smith Local Assessment Area (LAA): The LAA is a one kilometre (km) buffer surrounding the PDA. The LAA represents the area in which potential environmental effects from Project activities and components can be predicted or measured with a reasonable degree of accuracy and confidence. The LAA is the same for all VCs and covers approximately 512.34 ha.

3.2.3 Rossdale Water Treatment Plant Spatial Boundaries

The spatial boundaries at Rossdale WTP are defined below with respect to Project components and activities:

- The Rossdale Project Development Area (PDA): The PDA is defined as the area in which Project activities and components may occur, and as such represents the area within which direct physical disturbance may occur as a result of the Project, both temporary and permanent. Laydown areas will be located on previously disturbed areas within the existing facility site and are included in the PDA's total area. The PDA is approximately 1.15 ha.
- The Rossdale Local Assessment Area (LAA): The LAA is a 1 km buffer surrounding the PDA. The LAA represents the area in which potential environmental effects from Project activities and components can be predicted or measured with a reasonable degree of accuracy and confidence. The LAA is the same for all VCs and covers approximately 446.31 ha.

3.3 MITIGATION OF POTENTIAL PROJECT EFFECTS

Mitigation is the implementation of preventative, corrective or alternative measures to avoid, reduce or control a potential undesirable Project-related effect on a VC. Mitigation measures are derived from industry standard practices, legislative requirements, or corporate practices.

3.4 EVALUATION OF POTENTIAL RESIDUAL EFFECTS

Potential residual effects are defined as "an effect that remains after mitigation has been applied" (GOA 2010). Residual effects are described for each potential negative effect on a VC after the implementation of the recommended mitigation measures. Potential residual effects have been characterized by direction, magnitude, geographic extent, frequency, duration, reversibility, and ecological and social context.

Environmental effect characterization definitions are based upon generally accepted knowledge and professional judgment and are defined in Table 3.1.

Table 3-1 Residual Effects Characterization Definitions

Characterization	Definition of Qualitative Categories	
Direction	**Positive**—an effect that moves measurable parameters in a direction beneficial to the VC relative to baseline **Adverse**—an effect that moves measurable parameters in a direction detrimental to the VC relative to baseline **Neutral**—no net change in measurable parameters relative to baseline	
Geographic extent	**PDA**—residual effect is restricted to the PDA **LAA**—residual effect extends into the LAA **Regional**—residual effect extends beyond the LAA into the surrounding region	
Magnitude	**Surface Water and Hydrology**	**Negligible**—no measurable change to hydrological and hydrogeological flow pattern, water quantity and/or quality **Minor**—a measurable change to hydrological flow pattern and hydrogeological flow pattern, water quantity and/or quality that is within normal variability of baseline conditions **Moderate**— a measurable change to hydrological flow pattern and hydrogeological flow pattern, water quantity and/or quality that is that is outside of the normal variability of baseline conditions, but is within regulatory limits and goals **Major**— a measurable change to hydrological and hydrogeological flow pattern, water quantity and/or quality such that federal and/or provincial authorizations may be required
	Geology, geomorphology, and Soil	**Negligible**—no measurable change in soil quantity or quality, or no change in topography affecting slope stability **Minor**—a measurable change in soil quantity or quality, or a measurable change in topography with no measurable change in slope stability **Moderate**—a measurable change in soil quantity or quality, or a measurable change in topography which is likely to affect slope stability **Major**—a measurable change in soil parameters which results in a change in soil capability, or a measurable change in slope stability which results in slope failure
	Vegetation	**Negligible**—no measurable change to native vegetation communities or species of management concern **Minor**—a measurable change to native vegetation communities or species of management concern such that distribution and abundance of native plant communities is affected within normal variability of existing conditions **Moderate**—a measurable change to native vegetation communities or species of management concern such that distribution and abundance of native plant communities is affected beyond normal variability of existing conditions **Major**—a measurable change to native vegetation communities or species of management concern such that distribution and abundance of native plant communities is affected beyond normal variability of existing conditions leading to changes in regional plant diversity

Table 3-1 Residual Effects Characterization Definitions

Characterization	Definition of Qualitative Categories	
	Wildlife and Wildlife Habitat	**Negligible**—no measurable change to wildlife habitat, wildlife movement or mortality risk **Minor**—a measurable change to wildlife habitat, wildlife movement or mortality risk such that species diversity is affected within normal variability of existing conditions and local individuals are affected **Moderate**—a measurable change to wildlife habitat, wildlife movement or mortality risk such that species diversity is affected beyond normal variability of existing conditions and local populations are affected **Major**—a measurable change to wildlife habitat, wildlife movement or mortality risk such that regional populations are affected
	Viewscape	**Negligible**—no measurable change to key elements, features or characteristic of views within the visual context of the surrounding area **Minor**—a change to key elements, features or characteristic of views that fits within the visual context of other elements, features or characteristic in the surrounding area **Moderate**—a change to key elements, features or characteristic of views that does not fit within the visual context of other elements, features or characteristic in the surrounding area **Major**—a change to key elements, features or characteristic of views that is novel and competes with the visual context of other elements, features or characteristic in the surrounding Area
	Historical Resources	**Negligible**—no potential to disturb archaeological or paleontological sites or sites with archaeological or paleontological potential **Minor**—some potential to disturb archaeological or paleontological sites or sites with archaeological or paleontological potential **Moderate**—medium potential to disturb archaeological or paleontological sites or sites with archaeological or paleontological potential **Major**—substantial potential to disturb archaeological or paleontological sites or sites with archaeological or paleontological potential
Duration	**Short-term**—residual effect is restricted to the construction stage **Medium-term**—residual effect is measurable for 1-5 years following construction **Long-term**—residual effect extends beyond 5 years following construction	
Reversibility	**Reversible**—the effect may be reversed after activity completion and reclamation **Irreversible**—the effect is unlikely to be reversed	
Frequency	**Single event**—occurs once **Multiple irregular event**—occurs on no set schedule **Multiple regular event**—occurs at regular intervals **Continuous**—occurs continuously	

3.5 SELECTION OF VALUED ECOSYSTEM COMPONENTS

Table 3-2 Selection of Valued Ecosystem Components

Valued Ecosystem Component	Potential Project Interaction	Included in Assessment	Rationale for Inclusion/Exclusion
Surface water and Hydrology	✓	• Baseline Conditions in Sections 4.1.1 and 5.1.1 • Effects Assessment in Sections 4.2.1 and 5.2.1	Construction activities related to changes in stormwater drainage at both WTPs will interact with surface water flow. There are no wetlands at either WTP and interactions with wetlands are excluded from the assessment. Construction works will occur within the floodway and flood fringe at the E.L. Smith WTP (at 1:100-year return elevation). Construction works at Rossdale are above the floodway and flood fringe and instream interactions are not anticipated.
Geology, Geomorphology, and Soils	✓	• Baseline Conditions in Sections 4.1.2 and 5.1.2 • Effects Assessment in Sections 4.2.2 and 5.2.2	Both sites were subject to geotechnical studies to support Project design (See Appendix B). The geotechnical studies did not find evidence of geological or geomorphological constraints that cannot be addressed through Project design. The presence of existing slope failure, river erosion, and slip-off slope were not noted at either location during geotechnical and hydrotechnical studies (Appendix B). Excavations and piles required for the construction of floodwall are not anticipated to interact with ground water based on previous groundwater monitoring results at both sites. Dewatering is not expected. Minor infiltration may occur and will be collected and pumped out if needed and will be done using industry standard best practices (Appendix B-see Geotechnical Report [*EPCOR WTP Flood Mitigation Embankments – Issued for Regulatory Application*, Appendix C]). Soils at both sites include modified soils (fill) with native soil components. Soils are included because the Project may result in an environmental effect on soil quality and quantity during construction. Compaction, rutting, erosion, and admixing of soils are possible wherever vehicles and equipment are used. Direct disturbance of soils will result from the construction of earthen embankments, floodwalls, and waste streams.
Fish and Fish Habitat	-	-	The Project is not anticipated to interact with fish and fish habitat with the implementation of erosion and sediment control measures per COE 2005a and 2005b. Construction activities will occur above the high-level mark of 1:35-year flood return elevation.
Vegetation Species and Communities	✓	• Baseline Conditions in Sections 4.1.3 and 5.1.3 • Effects Assessment in Sections 4.2.3 and 5.2.3	Project activities require clearing of trees and plant communities within the PDA. Vegetation species and communities have been included because vegetation clearing and ground disturbance will result in the loss of vegetation species and may affect community diversity. Maintenance of the floodwalls and embankments will include a root free zone where only grass will be seeded or allowed to persist.

Table 3-2 Selection of Valued Ecosystem Components

Valued Ecosystem Component	Potential Project Interaction	Included in Assessment	Rationale for Inclusion/Exclusion
Wildlife and Wildlife Habitat	✓	• Baseline Conditions in Sections 4.1.4 and 5.1.4 • Effects Assessment in Sections 4.2.4 and 5.2.4	The Project will result in changes to wildlife habitat during construction and potential change in mortality risk during construction and operation (maintenance –vehicle use, mowing, trimming). Project components are located adjacent to the NSR and may change wildlife movements during construction and operation at both locations.
Viewscape	✓	• Baseline Conditions in Sections 4.1.5and 5.1.5 • Effects Assessment in Sections 4.2.5and 5.2.5	The Project will result in temporary and permanent changes to the viewscape from adjacent communities (Cameron Heights, Henderson Estates, Rossdale), and the Walterdale Hill lookout. Temporary construction-related change is anticipated for trail users at both locations. As a result of these changes, viewscape has been included in the assessment.
Historical Resources	✓	• Baseline Conditions in Sections 4.1.6 and 5.1.6 • Effects Assessment in Sections 4.2.6 and 5.2.6	The Project is located on land with known Historical Resources, therefore interactions are possible and Historical Resources are included in the assessment.

Notes:
✓ = interaction is anticipated; "-" = no interaction or not applicable

4.0 E.L. SMITH WATER TREATMENT PLANT

This section summarizes baseline conditions for the E.L. Smith WTP (Section 4.1) and presents the assessment of potential environmental effects in Section 4.2. The baseline conditions and assessment of effects for the Rossdale WTP are presented in Section 5.0.

4.1 BASELINE CONDITIONS

4.1.1 Surface Water and Hydrology

A hydrotechnical assessment of the NSR was conducted in support of the Project (Appendix B). Hydraulic and hydrologic information informed Project design selections. Stantec's hydrotechnical assessment used AEP hydraulic models (HEC-21994-1995), and the AEP (2020) most recent draft flood model (HEC-RAS). During a 1:500-year flood, the flood elevations the E.L. Smith WTP are modeled to be 630.12 m (upstream) and 630.02 m (downstream) (Table 4.1).

Figure 4.1 shows a screenshot of the AEP 2020 flood inundation map at E.L. Smith WTP including the cross sections referenced in Table 4.1. The E.L. Smith WTP is above 628.5 m in elevation at baseline. Prior to the implementation of mitigation, overland flooding would be anticipated to occur at the WTP during a 1:75-year flood year return period elevation (Table 4.1), and stormwater drainage backflows would be anticipated when 1:50-year flood elevations are exceeded by the NSR.

Table 4-1 Surface Water Elevations of the NSR at Various Return Periods near the E.L. Smith Water Treatment Plant (Tetra Tech 2020a)

Cross Section	River Station (m)	Flood Return Period and Discharge (m^3/s)												
		2-yr	5-yr	10-yr	20-yr	35-yr	50-yr	75-yr	100-yr	200-yr	350-yr	500-yr	750-yr	1000-yr
		1300	2220	2910	3580	4130	4470	4860	5130	5800	6340	6670	7060	7330
		Water Surface Elevation (m)												
E.L. Smith														
XS-192	86955.53	623.45	625.09	626.12	627.02	627.71	628.12	628.58	628.89	629.61	630.13	630.43	630.77	631.00
XS-191	86239.82	623.23	624.83	625.84	626.72	627.41	627.81	628.26	628.57	629.28	629.82	630.12	630.46	630.69
XS-190	85554.21	623.01	624.60	625.63	626.53	627.23	627.65	628.11	628.43	629.16	629.71	630.02	630.36	630.59

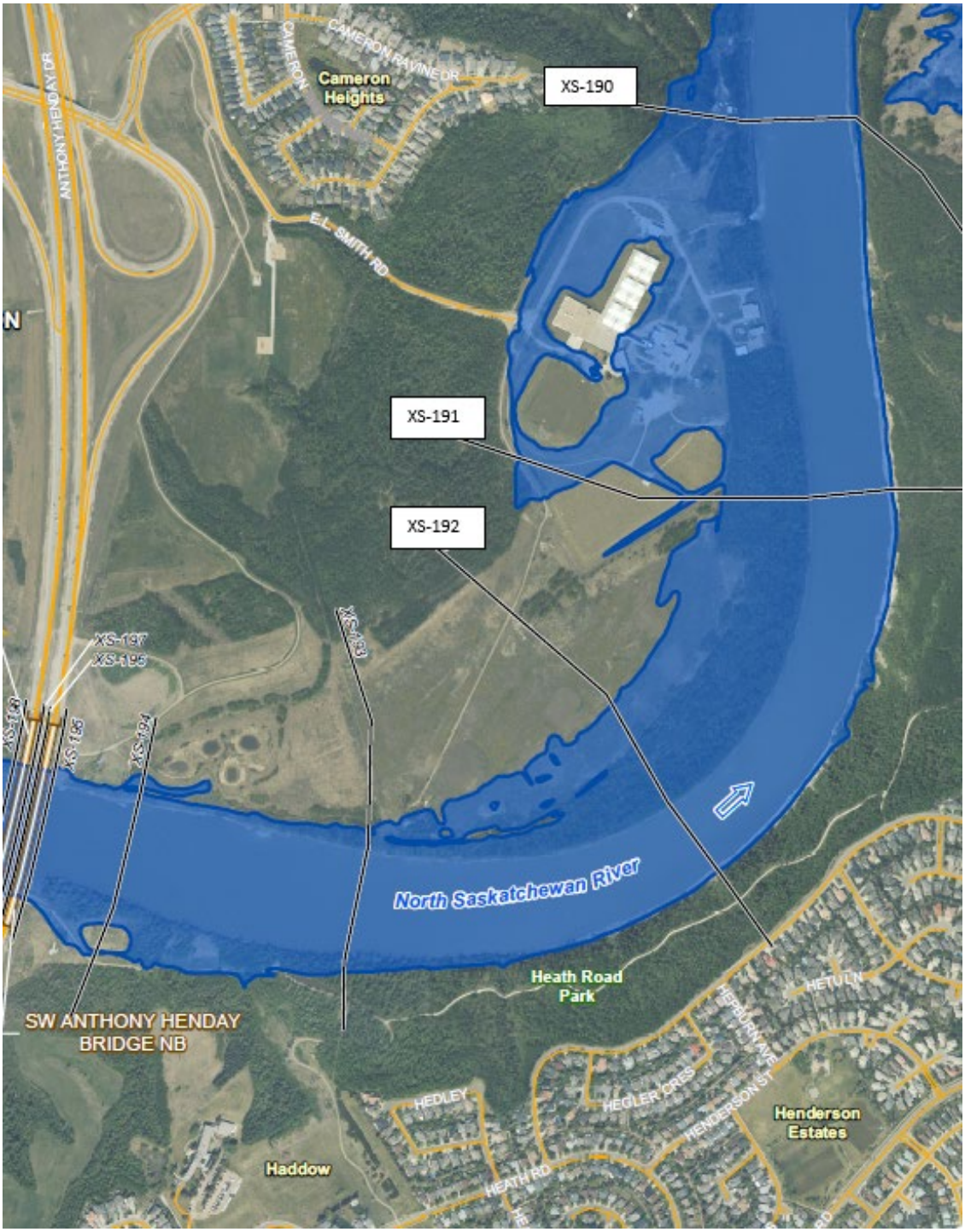


Figure 4-1 1:500-year Flood Extents at E.L. Smith WTP

The location of the E.L. Smith WTP site is on the floodplain of the NSR, approximately 50 m downslope from residential development. Runoff from the neighbourhood and the forested hillsides flow to the NSR through two ditches within the E.L. Smith WTP site. These two ditches are located east and west of the plant buildings. The E.L. Smith WTP site currently discharges to the NSR through storm sewers and two outfalls. Back flooding of the stormwater system at E.L. Smith does not occur until 1:50-year flood levels on the river are exceeded.

4.1.2 Geology, Geomorphology, and Soils

The E.L. Smith WTP site is located on a post-glacial floodplain of the NSR. The site is relatively flat with the majority of elevations between 629 m and 631 m, which is approximately 8 m to 10 m above the normal river level. A review of *Published Urban Geology of Edmonton* (Bayrock and Hughes 1962; Kathol and McPherson 1975) indicates the flood plain is underlain by alluvial deposits and by interbedded clay shale and sandstone bedrock of the Edmonton Formation. The alluvial deposits consist predominantly of fine to medium grained sand with some silt and clay. Coarse sand and gravel are present in many places, especially in or close to the river channel. See Appendix B for further detail.

Based on the historical borehole data, the general stratigraphy at the site consists of a 1 m to 2 m clay fill overlying 4 m to 7 m thick alluvial deposits over clay shale or sandstone bedrock (Appendix B). The upper alluvium was typically fine grained and consisted of predominately interbedded clay, silt and sand. Near the bedrock surface, the alluvium became coarse and consisted of mostly sand and gravel. Bedrock was encountered at approximately 8 m to10 m bgs (corresponding elevation of 620 m to 622 m) in most boreholes. See Appendix B for further detail.

Soils at the E.L. Smith WTP are disturbed and have been replaced with fill at most locations. Various fill types are present at surface or below a thin topsoil layer (Appendix B).

Previous field investigation results indicated that the groundwater level at the site was generally contained within the sand and gravel layer at about 3 m to 10 m below ground surface (bgs) (Appendix B). The recorded groundwater levels generally fluctuate with the river level. A recent study by Tetra Tech (2020b) showed shallow groundwater perched in the clay layer in localized areas on the E.L. Smith WTP site. See Appendix B for further detail.

The hydraulic and geomorphic characteristics of the NSR channel were reviewed in support of Project design (Appendix B). The E.L. Smith WTP is located at the inside of a bend, and slip-off bars are not prominent at this location. Significant bar growth is unlikely due to channel characteristics. See Appendix B for further detail.

A review of aerial imagery indicates no apparent riverbank erosion occurring at the E.L. Smith WTP. Site history based on aerial photo review does not indicate the presence of previous mining activity at the site See Appendix B for further detail on the aerial imagery review.

4.1.3 Vegetation Species and Communities

4.1.3.1 Methods

A desktop and field assessment were conducted to assess upland and wetland plant communities within the LAA and PDA, respectively. The desktop assessment included a search of the Alberta Conservation and Information Management System (ACIMS) for historical occurrences of rare plant and ecological communities within one kilometre of the PDA and review of recent and historical aerial imagery to map upland and wetland plant communities.

A one km radius was selected based in the ecology of species that have the potential to occur within the E.L. Smith PDA as well as the surrounding land use. Vegetation and wetland plant communities were classified using a Central Parkland Classification System derived from the following sources:

- A Preliminary Classification of Plant Communities in the Central Parkland Natural Subregion of Alberta (Wheatly and Bentz 2002) for uplands
- Alberta Wetland Classification System (Alberta Environment and Sustainable Resource Development 2015a) for wetlands
- Alberta Vegetation Inventory Standards Manual (Alberta Environmental Protection 1991) for agricultural, industrial and settled lands

Within the PDA, a total of 7 rare plant survey locations were assessed on August 31, 2021 (Figure 4.2). Field assessments included one survey interval of rare plant and rare ecological community surveys. During these surveys information was also gathered on *prohibited noxious* and *noxious* weed occurrences, if observed. See Appendix C for a list of species detected during rare plant surveys.

4.1.3.2 Regional Vegetation

The Project is located within the Central Parkland Natural Subregion of the Parkland Natural Region of Alberta (NRC 2006). The Central Parkland is a large subregion that forms a band across the central and west-central parts of the province and is a transitional zone between the Boreal Forest Natural Region to the north and the Grassland Natural Region to the south. Due to heavy pressure from agriculture and development, only a small portion of this subregion remains in a natural condition. The Central Parkland is dominated by undulating till plains and hummocky uplands, and the native remnants are a mosaic of aspen (*Populus tremuloides*) dominated forest stands on moist sites intermixed with prairie vegetation on drier sites. Stands of aspen dominated forest are found throughout the Central Parkland and have understories dominated by saskatoon (*Amelanchier alnifolia*), prickly rose (*Rosa acicularis*), and beaked hazelnut (*Corylus cornuta*). Stands dominated by balsam poplar (*Populus balsamifera*) occur on moist, nutrient rich sites, and often have aspen and white spruce (*Picea glauca*) intermixed within the stand (NRC 2006). The Project is also located within the NSR valley, which is a provincially significant natural area and regional biological corridor (COE 2008).

4.1.3.3 Local Assessment Area

The LAA comprises 50.0% anthropogenic land units (residential, green space, perennial pasture), 38.3% native plant communities and 11.6% open water (NSR) (Table 4.2).

Table 4-2 Plant Communities and Land Use within the LAA

Plant Community/Land Unit	Area (ha)	Percent of LAA
Anthropogenic	**256.38**	**50.0%**
Green Space	84.49	16.5%
Residential	76.05	14.8%
Industrial Development	48.92	9.5%
Perennial Pasture	25.76	5.0%
Transportation	16.29	3.2%
Constructed Waterbody	3.81	0.7%
Open Water	1.06	0.2%
Upland	**196.29**	**38.3%**
Aspen Poplar Woodland Alliance	131.37	25.6%
Aspen Woodland Alliance	23.58	4.6%
Balsam Poplar Woodland Alliance	2.95	0.6%
Mixed Deciduous and Evergreen Woodland Alliance	7.43	1.4%
Short Shrubland Alliance	6.38	1.2%
Tall Shrubland Alliance	21.08	4.1%
Wetland	0.95	0.2%
White Spruce Woodland Alliance	2.55	0.5%
Water	**59.67**	**11.6%**
Open Water	59.67	11.6%
Grand Total	**512.34**	**100.0%**

Most of the native plant community area within the LAA is Aspen Poplar Woodland Alliance (25.6%), which is consistent with plant communities along the NSR valley. Small amounts of Aspen, Balsam Poplar, Mixed Deciduous and Evergreen, and White Spruce Woodland Alliance exist in patches within the intact Aspen Poplar Woodland Alliance (Figure 4.2). Tall Shrubland and Short Shrubland Alliance mostly occur along the banks of the NSR. A general description of plant communities and land units in the LAA is provided in Appendix C.

4.1.3.4 Project Development Area

Plant Communities

Most of the PDA (3.48 ha, 91.7%) was classified as Industrial Development (Table 4.4, Figure 4.2). Aspen Poplar Woodland Alliance comprised 0.27 ha (7.2%) of the PDA followed by Aspen Woodland Alliance (0.03 ha, 0.8%), and Perennial Pasture (0.01 ha, 0.3%). The Aspen Poplar Woodland alliance was dominated by aspen and balsam poplar in the overstory, choke cherry (*Prunus virginiana*), prickly rose, snowberry (*Symphoricarpos albus*) and low-bush cranberry (*Viburnum edule*) in the shrub layer with bluejoint reedgrass (*Calamagrostis canadensis*), Lindley's aster (*Symphyotrichum ciliolatum*), slender wheatgrass (*Elymus trachycaulus ssp. subsecundus*) and wild lily-of-the-valley (*Maianthemum canadense*) in the herb layer.

Table 4-3 Plant Communities and Land Use within the PDA

Plant Community/Land Unit	Area (ha)	Percent of PDA
Industrial Development	3.48	91.7%
Aspen Poplar Woodland Alliance	0.27	7.2%
Aspen Woodland Alliance	0.03	0.8%
Perennial Pasture	0.01	0.3%
Grand Total	**3.79**	**100.0%**

The PDA includes both EPCOR property and COE-owned land. The total amount of mapped Woodland Alliance Plant Community occurring within the PDA is 0.30 ha. The areas mapped as Aspen Poplar Woodland Alliance and Aspen Woodland Alliance that contain trees based on imagery within Bylaw 7188 land, and will be affected by vegetation clearing are limited to approximately 0.04 ha (Table 4-4, Figure 4-3). A review of areas to be cleared within the PDA based on ownership indicates that 0.16 ha of mapped Woodland Alliance Plant Community on EPCOR property will be cleared to accommodate the Project (Table 4-4, Figure 4-3).

Within the mapped plant communities that fall within the PDA, it is estimated that Project construction will require the removal of approximately 496 trees. This estimate is based on the following:

- 14 primary mature balsam poplar trees within E.L. Smith fence line
- 103 trees on the Area NW (refer to Figure D-1, Appendix D) (approximately 47 are COE-owned)
- 255 trees on the EPCOR owned (approximately 0.09 ha) on Area NE (Figure D-1 of Appendix D)
- 28 trees on Area E (Figure D-1 of Appendix D)
- 96 trees on Area S (Figure D-1 of Appendix D) (of which 60% is COE-owned road allowance accounting for 58 trees).

Of the 103 trees on the west side of the PDA, approximately 47 would be on City property. The estimated COE-owned trees on the southern road allowance is 58 trees (total area 0.02 ha) for a total of

105 COE-owned trees. Tree estimations were based on field counts of all trees in the NW PDA and four 10 by 10 m transects for other estimations. They are also subject to some error due to boundary estimations which will be finalized during final design. A total of 220 trees and total area of 0.19 ha (63% of the forested areas) were surveyed in the four different forested areas where tree removal is proposed. All of the 3.48 ha area that forms the industrialized water treatment plant within the construction limit was also surveyed for trees bringing the total surveyed area of the construction limit to 97%.

Of the estimated 496 trees, 249 are considered saplings (< 10 cm in diameter) (see Photos 1 and 2 in Appendix D). Average DBH for all 220 surveyed trees was 13.7 cm. Species distribution was 3% balsam poplar; 76% trembling aspen; 1% birch; 19% white spruce; and 1% larch. Of the 179 aspen trees surveyed, there were 26 trees that were considered mature (>25 cm in diameter). Of the 35 white spruce trees 2 were above 25 cm in diameter.

In proximity to the Low Lift Pumphouses, the area between the security fence and the NSR has been identified as a proposed enhancement planting area (See Drawing E-0-0-L-0007 in Appendix A and Figure 4.3 and Photos 3 and 4 in Appendix D) to improve species composition and facilitate wildlife movements.

Table 4-4 Ownership of Mapped Plant Communities and Number of Trees within the PDA

Ownership of the Aspen Poplar Woodland and Aspen Woodland Alliance Mapped Units	Area (ha)	Number of trees estimated within PDA
EPCOR-Property	0.16	391
COE-owned Land	0.04	47
Government Road Allowance	0.02	58
Tree-free areas within polygons mapped as Woodland Alliance Plant Community[1]	0.07	-
Grand Total	**0.30**	**496***

Notes:
1. Due to mapping methods and minimum polygon size requirements some Woodland Alliance polygons included tree-free areas

4.1.3.5 Rare Plants

There are no historical occurrences of rare plant communities within the LAA (ACIMS 2022). A query of the ACIMS database resulted in four historical records of S3 tracked rare plant species (uncommon, known from between 21 and 100 locations in Alberta). There were two records of slender naiad, one record of smooth sweet cicely (*Osmorhiza longistylis*), and one record of flat-topped white aster within the LAA (Table 4.5; Figure 4.2) (ACIMS 2022). All of the ACIMS records are from the opposite side of the NSR from the E.L. Smith WTP.

Table 4-5 ACIMS Records for Rare Plants within the LAA at E.L. Smith WTP

Scientific Name	Common Name	S-RANK[1]
Osmorhiza longistylis	smooth sweet cicely	S3
Najas flexilis	slender naiad	S3
Doellingeria umbellata var. pubens	flat-topped white aster	S3

Notes:
[1]Standard Subnational Conservation Ranks (adapted from NatureServe)
S1 Known from five or fewer occurrences or especially vulnerable to extirpation because of other factor(s).
S2 Known from twenty or fewer occurrences or vulnerable to extirpation because of other factors.
S3 Known from 100 or fewer occurrences, or somewhat vulnerable due to other factors, such as restricted range, relatively small population sizes, or other factors.
S4 Apparently secure.
S5 Secure - taxon is common, widespread, and abundant.

Three rare plant species were observed during surveys of the LAA in August 2021 (Table 4.6, Figure 4.2). These included Geyer's onion (*Allium geyeri*), flat-topped white aster (*Doellingeria umbellata var. pubens*), and tall meadow rue (*Thalictrum dasycarpum*).

Table 4-6 Rare Plants Detected within the LAA at E.L. Smith WTP

Scientific Name	Common Name	S-Rank[1]	Plot Location	PDA or LAA
Allium geyeri	Geyer's onion	S2	RP06	LAA
Doellingeria umbellata var. pubens	flat-topped white aster	S3	RP04	PDA
			RP05	LAA
			RP06	LAA
Thalictrum dasycarpum	tall meadow rue	S3	RP01	PDA
			RP02	PDA
			RP04	PDA
			RP05	LAA
			RP06	LAA

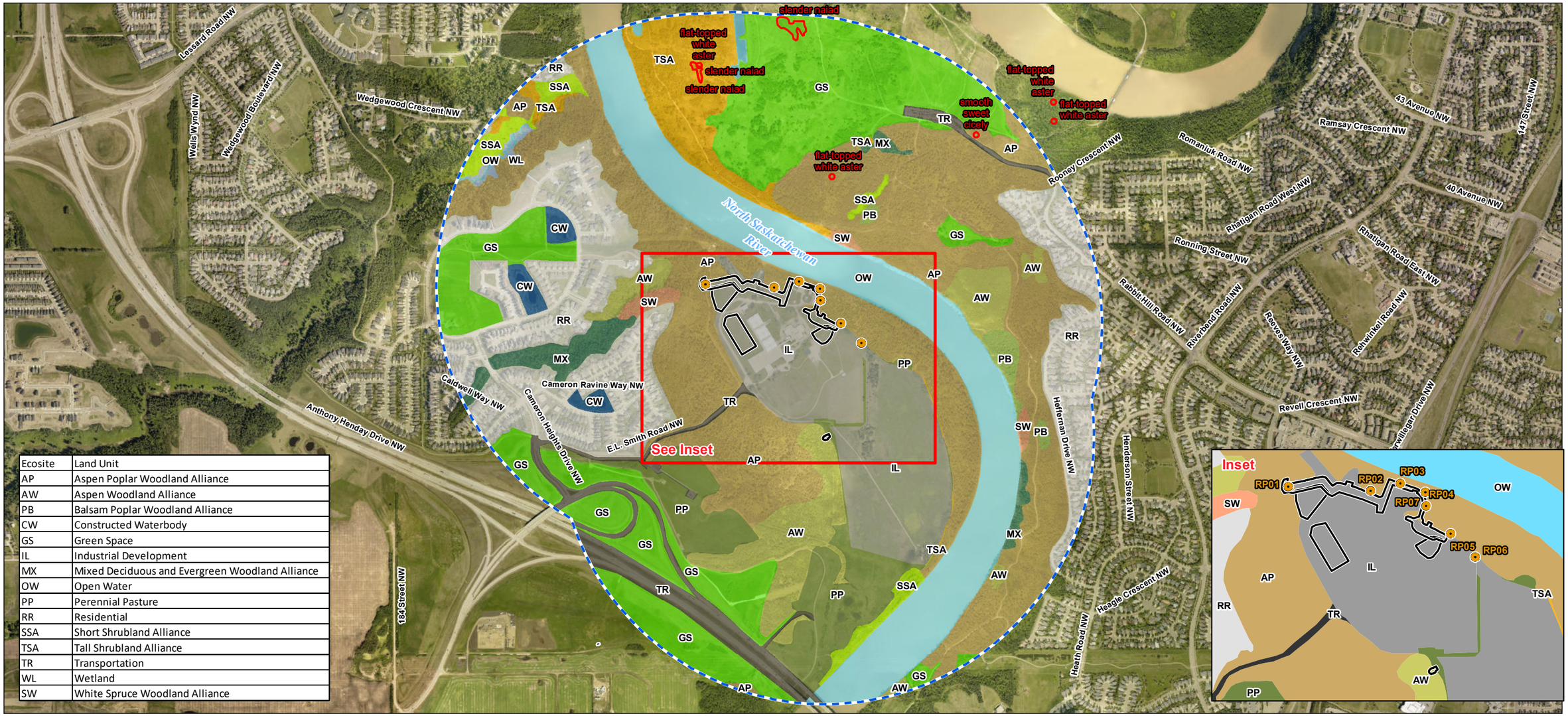
Notes:
[1]Standard Subnational Conservation Ranks (adapted from NatureServe)
S1 Known from five or fewer occurrences or especially vulnerable to extirpation because of other factor(s).
S2 Known from twenty or fewer occurrences or vulnerable to extirpation because of other factors.
S3 Known from 100 or fewer occurrences, or somewhat vulnerable due to other factors, such as restricted range, relatively small population sizes, or other factors.
S4 Apparently secure.
S5 Secure - taxon is common, widespread, and abundant.

4.1.3.6 Weeds

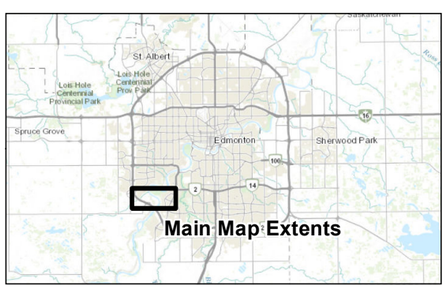
There were five species of *noxious* weeds observed at the E.L. Smith WTP during rare plant surveys. Species, weed class, and location is detailed in Table 4.7 and Figure 4.2. The proposed enhancement planting area shown on Figure 4.3 was primarily covered by common tansy (*Tanacetum vulgare*) at baseline (see Photos 3 and 4 in Appendix D)

Table 4-7 Weeds Observed at E.L. Smith WTP during Rare Plant Survey

Scientific Name	Common Name	Weed Class	Plot Locations
Tanacetum vulgare	common tansy	*Noxious*	RP03, RP06, RP07
Cirsium arvense	creeping thistle	*Noxious*	RP01, RP03, RP05
Convolvulus arvensis	field bindweed	*Noxious*	RP01
Euphorbia esula	leafy spurge	*Noxious*	RP07
Sonchus arvensis	perennial sow-thistle	*Noxious*	RP05



Ecosite	Land Unit
AP	Aspen Poplar Woodland Alliance
AW	Aspen Woodland Alliance
PB	Balsam Poplar Woodland Alliance
CW	Constructed Waterbody
GS	Green Space
IL	Industrial Development
MX	Mixed Deciduous and Evergreen Woodland Alliance
OW	Open Water
PP	Perennial Pasture
RR	Residential
SSA	Short Shrubland Alliance
TSA	Tall Shrubland Alliance
TR	Transportation
WL	Wetland
SW	White Spruce Woodland Alliance



Rare Plant Survey Location

ACIMS Observation

Land Unit

- Aspen Poplar Woodland Alliance
- Aspen Woodland Alliance
- Balsam Poplar Woodland Alliance
- Constructed Waterbody
- Green Space
- Industrial Development
- Mixed Deciduous and Evergreen Woodland Alliance
- Open Water
- Perennial Pasture
- Residential
- Short Shrubland Alliance
- Tall Shrubland Alliance
- Transportation
- Wetland
- White Spruce Woodland Alliance

Project Development Area

Local Assessment Area

0 250 500 metres

(At original document size of 11x17)
1:15,000

N

Notes

1. Coordinate System: NAD 1983 3TM 114

2. Data Sources:

3. Background: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Stantec

Project Location
Southwest Edmonton
Alberta

Prepared by DS on 2022-10-05
TR by SM on 2022-10-05
IR Review by SJ on 2022-10-17

Client/Project
110146440-001

EPCOR Water Services Inc.
EPCOR WTP Flood Mitigation

Figure No.
4-2

Title
Vegetation Species and Communities at E.L. Smith WTP

V:\1102\active\gis_clients\EPCOR\110146440_flood_mitigation\figures\110146440_001_ELSmith_Vegetation.mxd Revised: 2022-10-19 By: DCSpry

Stantec

- E. L. Smith Property Boundary
- Proposed Construction Limit
- Area for Tree Clearing
- Proposed Enhancement Planting Area

Owned by

- City
- Epcor
- Unknown

N

0 25 50 metres

(At original document size of 11x17)
1:2,750

Notes

1. Coordinate System: NAD 1983 3TM 114
2. Data Sources: Geogratis, ©Department of Natural Resources Canada, All rights reserved.
3. Background: City of Edmonton, 2022.

Project Location
Southwest Edmonton
Alberta

Prepared by MKuhl on 2023-04-06
TR by DRAFT on 2023-04-XX
IR by DRAFT on 2023-04-XX

Client/Project 110146440

EPCOR Water Services Inc.
Municipal Environmental Impact Assessment
for EPCOR WTP Flood Mitigation Barriers

Figure No.

4-3

Title

Mapped Communities within the PDA that require Vegetation Clearing by Ownership: EPCOR Property and COE-Owned Property

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4.1.4 Wildlife and Wildlife Habitat

Wildlife habitat in the LAA consists of approximately 38.3% native vegetation, comprised of primarily deciduous dominated woodland alliances. About half of the land cover within the LAA consists of anthropogenically modified land units (50.0%) including green space and residential (see Figure 4.2 and Table 4.8)

Table 4-8 Plant Communities and Land Use within the LAA

Plant Community/Land Unit	Area (ha)	Percent of LAA
Anthropogenic	**256.38**	**50.0%**
Green Space	84.49	16.5%
Residential	76.05	14.8%
Industrial Development	48.92	9.5%
Perennial Pasture	25.76	5.0%
Transportation	16.29	3.2%
Constructed Waterbody	3.81	0.7%
Open Water	1.06	0.2%
Upland	**196.29**	**38.3%**
Aspen Poplar Woodland Alliance	131.37	25.6%
Aspen Woodland Alliance	23.58	4.6%
Balsam Poplar Woodland Alliance	2.95	0.6%
Mixed Deciduous and Evergreen Woodland Alliance	7.43	1.4%
Short Shrubland Alliance	6.38	1.2%
Tall Shrubland Alliance	21.08	4.1%
Wetland	0.95	0.2%
White Spruce Woodland Alliance	2.55	0.5%
Water	**59.67**	**11.6%**
Open Water	59.67	11.6%
Grand Total	**512.34**	**100.0%**

PDA lies primarily within land units affected by industrial development (3.48 ha, 91.7%) and occurs largely within the existing E.L. Smith WTP lands (see Figure 4.2 and Table 4.4). The remainder of the PDA lies within Aspen Poplar Woodland Alliance (0.27 ha, 7.2%), with small areas of Aspen Woodland Alliance and Perennial Pasture. These vegetation communities generally provide habitat values for wildlife species that support life requisites such as breeding, foraging, security, and thermal cover.

Native vegetation communities along the NSR provide moderate to high suitability habitat for wildlife species and connect woodland vegetation communities to the north and south of the PDA along the NSR.

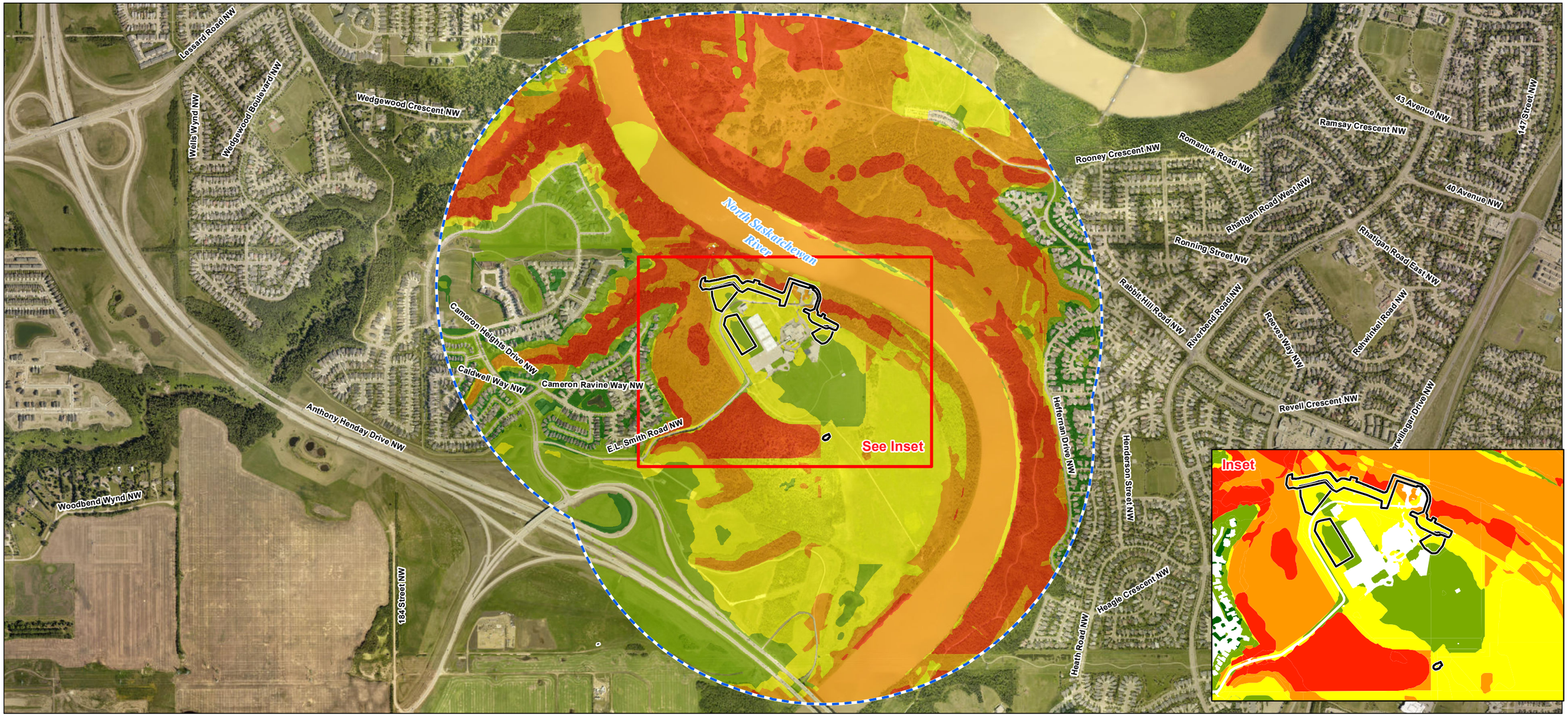
The NSR includes riparian and aquatic habitat for waterbirds and shorebirds and semi-aquatic mammals such as beaver (*Castor canadensis*).

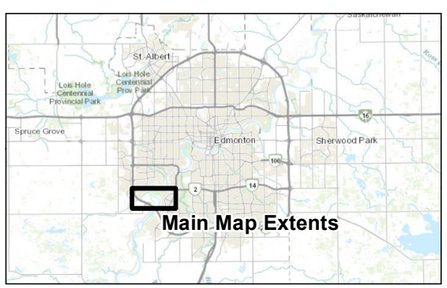
The COE lists 232 species that may reside in the NSR valley; the list comprises 178 birds, 47 mammals, and seven herptiles. Approximately 20% of these species are species of management concern federally and/or provincially (COE 2008).

Species of management concern are defined as species that are:

- listed provincially as *at risk*, *may be at risk*, or *sensitive* according to the General Status of Alberta Wild Species (GOA 2020)
- listed provincially as *endangered* or *threatened* under the Alberta *Wildlife Act* or *special concern* by the Alberta Endangered Species Conservation Committee (AESCC) (GOA 2017)
- listed federally as *endangered*, *threatened*, or *special concern* under Schedule 1 of the *Species At Risk Act* (GOC 2022)
- listed federally as *endangered*, *threatened*, or *special concern* by the Committee on the Status of Endangered Wildlife in Canada (GOC 2022)

A review of the COE's Environmental Sensitivity Project data (COE 2016) indicates there are areas within the LAA with high environmental sensitivity values. Over 70% of the LAA is ranked as either Extremely High, Very High, or High Value habitats (COE 2016) (Figure 4.3). The PDA is almost entirely (98%) ranked as Extremely High, Very High, or High Value habitats.





Environmental Sensitivity Value

- Extremely High Value
- Very High Value
- High Value
- Moderate Value
- Low Value
- Project Development Area
- Local Assessment Area

0 250 500 metres

(At original document size of 11x17)
1:15,000

N

Notes

1. Coordinate System: NAD 1983 3TM 114
2. Data Sources: Governments of Alberta and Canada; City of Edmonton
3. Background: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Stantec

Project Location
Southwest Edmonton
Alberta

Prepared by DS on 2022-10-05
TR by SM on 2022-10-05
IR Review by SJ on 2022-10-17

Client/Project 110146440-001

EPCOR Water Services Inc.
EPCOR WTP Flood Mitigation

Figure No.
4-4

Title
Environmental Sensitivity Project Overall Rank at E.L. Smith WTP

V:\1102\active\gis_clients\EPCOR\110146440_flood_mitigation\figures\110146440_003_ELSmith_Wildlife.mxd Revised: 2022-10-18 By: DCSpry

4.1.4.1 Wildlife Sensitivity Areas and Occurrence Records

The E.L. Smith LAA intersects key wildlife and key range areas identified by AEP (AEP 2022b), as follows:

- Sharp-Tailed Grouse Survey Area
- Sensitive Raptor Range for bald eagle
- Key Wildlife and Biodiversity Zone (KWBZ)

Based on the habitat present, it is unlikely that sharp-tailed grouse use the available habitat in the LAA. Sharp-tailed grouse are generally associated with native grasslands and agricultural settings (Connelly et al. 2020), which are largely absent in the LAA. Bald eagles could potentially nest in the LAA or elsewhere in the NSR valley. There are no known bald eagle nests within the E.L. Smith LAA.

The LAA intersects a KWBZ. KWBZs are areas identified by AEP as having high biodiversity potential and providing ungulate winter range. KWBZ are typically associated with major river valleys that provide the topographic variability and productivity to support high biodiversity and abundant winter browse for ungulates (ESRD 2015b).

4.1.4.2 Breeding Birds

Breeding bird surveys were conducted in support of the E.L. Smith Solar Farm Project in 2017 and 2019 (Stantec 2017, Stantec 2019). Surveys were conducted following provincial *Sensitive Species Inventory Guidelines* (GOA 2013).

Table 4.9 details the species detected during surveys in 2019. Twenty-three species were detected. One species of management concern was detected. Common yellowthroat (*Geothlypis trichas*) has a *sensitive* status in Alberta (GOA 2020).

Figure 4.10 details the species detected during breeding bird surveys conducted in 2017. Thirteen species were detected. Stantec (2017) indicated that three species of management concern were detected: Baltimore oriole (*Icterus galbula*), alder flycatcher (*Empidonax alnorum*), and least flycatcher (*Empidonax minimus*). These species were all considered *sensitive* at the time of writing but have since been re-evaluated as *secur*e. Baltimore oriole, red-eyed vireo (*Vireo olivaceus*), and ruby-crowned kinglet (*Regulus calendula*) were observed in the Aspen Poplar Woodland Alliance vegetation community adjacent to the NSR (Stantec 2017).

Table 4-9 Breeding Birds Detected in the E.L. Smith Solar Farm Project LAA in 2019

Common Name	Scientific Name	Alberta General Status 2020[1]	Wildlife Act or AESSC[2]	COSEWIC[3]	SARA Schedule and Status[3]
Red-tailed hawk	*Buteo jamaicensis*	Secure	-	Not at Risk	No schedule No Status
Northern flicker	*Colaptes auratus*	Secure	-	-	-
Least flycatcher	*Empidonax minimus*	Secure	-	-	-
Red-eyed Vireo	*Vireo olivaceus*	Secure	-	-	-
American crow	*Corvus brachyrhynchos*	Secure	-	-	-
Tree swallow	*Tachycineta bicolor*	Secure	-	-	-
Black-capped chickadee	*Poecile atricapillus*	Secure	-	-	-
Winter wren	*Troglodytes hiemalis*	-	-	-	-
American robin	*Turdus migratorius*	Secure	-	-	-
Gray catbird	*Dumetella carolinensis*	Secure	-	-	-
European starling	*Sturnus vulgaris*	Exotic/Alien	-	-	-
Cedar waxwing	*Bombycilla cedrorum*	Secure	-	-	-
Common yellowthroat	***Geothlypis trichas***	**Sensitive**	-	-	-
Yellow warbler	*Setophaga petechia*	Secure	-	-	-
Chipping sparrow	*Spizella passerina*	Secure	-	-	-
Clay-colored sparrow	*Spizella pallida*	Secure	-	-	-
Vesper sparrow	*Pooecetes gramineus*	Secure	-	-	-
Savannah sparrow	*Passerculus sandwichensis*	Secure	-	-	-
Song sparrow	*Melospiza melodia*	Secure	-	-	-
White-throated Sparrow	*Zonotrichia albicollis*	Secure	-	-	-
Dark-eyed Junco	*Junco hyemalis*	Secure	-	-	-
Brewer's blackbird	*Euphagus cyanocephalus*	Secure	-	-	-
American goldfinch	*Spinus tristis*	Secure	-	-	-

Notes:
"-" not assessed
[1] GOA 2020; [2] Wildlife Regulation, GOA 2017; [3] GOC 2022

Table 4-10 Breeding Birds Detected in the E.L. Smith Solar Farm Project LAA in 2017

Common Name	Scientific Name	Alberta General Status 2020[1]	Wildlife Act or AESSC[2]	COSEWIC[3]	SARA Schedule and Status[3]
Alder flycatcher	*Empidonax alnorum*	Secure	-	-	-
Least flycatcher	*Empidonax minimus*	Secure	-	-	-
Red-eyed vireo	*Vireo olivaceus*	Secure	-	-	-
Ruby-crowned kinglet	*Regulus calendula*	Secure	-	-	-
American robin	*Turdus migratorius*	Secure	-	-	-
Cedar waxwing	*Bombycilla cedrorum*	Secure	-	-	-
Yellow warbler	*Setophaga petechia*	Secure	-	-	-
Clay-colored sparrow	*Spizella pallida*	Secure	-	-	-
Vesper sparrow	*Pooecetes gramineus*	Secure	-	-	-
Savannah sparrow	*Passerculus sandwichensis*	Secure	-	-	-
White-throated sparrow	*Zonotrichia albicollis*	Secure	-	-	-
Baltimore oriole	*Icterus galbula*	Secure	-	-	-
American goldfinch	*Spinus tristis*	Secure	-	-	-

Notes:
"-" not assessed
[1] GOA 2020; [2] Wildlife Regulation, GOA 2017; [3] GOC 2022

4.1.4.3 Terrestrial Mammals

Eleven remote cameras were deployed in 2019 to monitor terrestrial mammal use of the E.L. Smith Solar Farm Project area as part the implementation of the *Wildlife Monitoring and Mitigation Plan* (Stantec 2020). Camera data collected during the summer and fall of 2019 (July through October) prior to construction indicates the E.L. Smith LAA is used by white-tailed deer (*Odocoileus virginianus*), coyotes (*Canis latrans*), elk (*Cervus canadensis*), moose (*Alces alces*), porcupine (*Erethizon dorsatum*), and snowshoe hare (*Lepus americanus*) (Table 4.11). Mule deer (*Odocoileus hemionus*) have also been observed incidentally while conducting camera maintenance. Human use of the LAA was also regularly observed.

Snow track surveys were also conducted in 2019 and 2020. Tracks from nine species or species groups were identified including deer, coyote, red fox, snowshoe hare, red squirrel (*Tamiasciurus hudsonicus*), short-tailed weasel (*Mustela erminea*) small rodents (mice, voles), porcupine, and human.

Deer and coyote tracks were observed between the NSR and the existing E.L. Smith WTP lower pump house demonstrating terrestrial wildlife movement through a corridor narrowed by the existing footprint of the WTP at baseline. No mammal species of management concern were observed during wildlife camera monitoring, snow track surveys, or incidentally.

Table 4-11 Mammal Species Observed in the E.L. Smith Solar Farm Project LAA

Common Name	Scientific Name	Alberta General Status 2020[1]	Wildlife Act or AESSC[2]	COSEWIC[3]	SARA Schedule and Status [3]
Beaver	*Castor canadensis*	Secure	-	-	-
White-tailed deer	*Odocoileus virginianus*	Secure	-	-	-
Mule deer	*Odocoileus hemionus*	Secure	-	-	-
Moose	*Alces alces*	Secure	-	-	-
Elk	*Cervus elaphus*	Secure	-	-	-
Red fox	*Vulpes vulpes*	Secure	-	-	-
Snowshoe hare	*Lepus americanus*	Secure	-	-	-
Red squirrel	*Tamiasciurus hudsonicus*	Secure	-	-	-
Porcupine	*Erethizon dorsatum*	Secure	-	-	-
Ermine	*Mustela erminea*	Secure	-	-	-

Notes:
"-" = not assessed
[1] GOA 2020; [2] Wildlife Regulation, GOA 2017; [3] GOC 2022

4.1.4.4 Species of Management Concern

A query of the FWIMT database resulted in four records of species of management concern (Table 4.12). Pileated woodpeckers have a status rank of Sensitive in Alberta and require large mature trees with decay characteristics for nesting and foraging. Pileated woodpecker nesting cavities are protected under the regulations of the *Migratory Birds Convention Act*. Bank swallows and barn swallows are insectivore species that have undergone dramatic population declines in recent decades. Bank swallows nest in near vertical banks often in association with rivers and watercourses. Barn swallows commonly construct nests on buildings or other infrastructure. Common yellowthroat are riparian nesters that commonly use shrubby areas near water for nesting. The LAA likely provides habitat for garter snakes, which are ranked as Sensitive species in Alberta.

Table 4-12 FWIMT Query Results for Species of Management Concern Records in the E.L. Smith LAA

Common Name	Scientific Name	Alberta General Status 2020[1]	Wildlife Act or AESSC[2]	COSEWIC[3]	SARA Schedule and Status [3]
Pileated woodpecker	*Dryocopus pileatus*	Sensitive	-	-	-
Bank swallow	*Riparia riparia*	Sensitive	-	Threatened	Schedule 1 Threatened
Barn swallow	*Hirundo rustica*	May Be at Risk	-	Special Concern	Schedule 1 Threatened
Common yellowthroat	*Geothlypis trichas*	Sensitive	-	-	-

Notes:
"-" = not assessed
[1] GOA 2020; [2] Wildlife Regulation, GOA 2017; [3] GOC 2022

4.1.4.5 Wildlife Habitat Connectivity

The Environmental Sensitivity Project model includes a binary ranking of terrestrial habitat connectivity for coyotes (COE 2016). According to this model, there are no impediments to terrestrial connectivity for medium-sized mammals associated with the PDA (COE 2016). The E.L. Smith Solar Farm has been developed since the publish date of COE (2016), because the solar facility is fenced, it is unlikely to provide habitat connectivity for terrestrial mammals.

The wildlife monitoring program for the E.L. Smith Solar Farm has two cameras positioned between the Low Lift Pumphouses and the NSR. Pre-construction data collection indicates that medium and large terrestrial mammals travel through this section of the LAA, including: coyote and white-tailed deer. Camera data also indicates that medium and large mammals travel through habitats to the south and west of the E.L. Smith WTP. The area between the existing fenceline around the Low Lift Pumphouses and the NSR is approximately 30 m wide and 120 m long. There is an existing pedestrian/cycling trail that follows the fenceline, and the area slopes downwards to the NSR below the trail. Human use of the trail may affect wildlife use of the corridor at baseline.

4.1.5 Viewscape

The viewscape is dominated by the NSR valley, Terwillegar Park on the adjacent bank of the river, the existing E.L. Smith Solar Farm, overhead transmission lines, and manicured areas and infrastructure associated with Anthony Henday Drive. The majority of the PDA (83%) is located within existing industrial development.

The Project is located along the edges of the E.L. Smith WTP within the NSR valley. There are two neighbourhoods (Cameron Heights and Henderson Estates) that have observation points with views of the PDA; however, most of these observation points are obstructed by existing vegetation.

Anthony Henday Drive is located to the south of the PDA and users of Anthony Henday Drive will have observation points with views of the LAA. The E.L. Smith Solar Farm is more immediately visible from the Anthony Henday than the PDA. Recreational users of the LAA, including formal and informal trails will also have observation points with views of the PDA. There is a recreational trail that lies between the PDA and the NSR that is frequently used by pedestrians and mountain bikers.

4.1.6 Historical Resources

The PDA intersects areas with a Historical Resource Value of 3a, which indicates a significant archaeological resource that likely requires avoidance (ACSW 2022). EPCOR has engaged in several archaeological and indigenous engagement programs over the past several years to further the knowledge of this site.

A Historical Resources Application (Application Number: 020595341) (HRA Number: 4956-21-0068-001), was submitted to ACSW on June 8, 2021. In response, ACSW issued HRA requirements on September 22, 2021 requiring an archaeological Historical Resources Impact Assessment (HRIA). These were completed under Archaeological Permit No. 21-216. The ACSW issued a conditional HRA clearance for the Project.

4.2 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

4.2.1 Surface Water and Hydrology

4.2.1.1 Potential Environmental Effects

The Project's potential interactions with surface water and hydrology could result in a change in water quality and quantity.

During construction, the removal of vegetation will occur at the same time as topsoil stripping. The installation of two culverts within the earthen embankments, along with a gated opening in the floodwall, and excavation for the stormwater ditches will require ground disturbance. Exposed soils due to site preparation and ground disturbance could increase the potential for Project activities to affect surface waters of the NSR through sedimentation and erosion.

Existing drainage patterns will be maintained at the WTP in the post-construction or operations phase. The presence of the floodwalls and earthen embankments will not increase the amount of impermeable surface in the LAA, as such the volumes of water discharged to the NSR and surrounding natural areas is not anticipated to change as a result of the Project (Appendix E). The earthen embankments and floodwall will naturally block existing overland stormwater drainage pathways. Culverts, equipped with gates, will be utilized to maintain these drainage pathways under normal conditions, while providing a mechanism to prevent water from flowing into the plant during a flood event. A PCSWMM hydrologic model was used to simulate storm events (1:100-year, 4 hour storm event) and size the culverts accordingly. Erosion protection measures at the culvert discharge locations will consist of riprap and will

follow Alberta Transportation standards. While ponding is expected to occur during this magnitude of storm event, it was concluded that there would be no impacts to existing plant infrastructure.

Under a 1:50-year river flooding event, the gates will be closed to protect the WTP. Stantec has considered the impacts of closing the gates within the WTP during a concurrent rainfall event and concluded that the ponding can be managed. For both the gates-open and gates-closed scenarios, the expectation is that EPCOR will be actively monitoring ponding elevations within the WTP and will deploy temporary mobile pumping systems to protect infrastructure. River velocities were modelled during 1:500-year flood levels along the toe of the proposed embankments to determine appropriate design elements for erosion control during major flood events (Appendix B). Modelled velocities ranged from 0.25m/s to 0.45 m/s. The earthen embankments require no additional erosion control measures beyond the establishment of grasses due to low flood velocities and water depths combined with distance from the main channel of the NSR. The floodwalls around the Low Lift Pumphouses will narrow the cross-sectional flow area by approximately 155 m during a 1:500-year flood event creating the potential for increased erosion upstream of the structure due to the reduced area of river conveyance. This reduction in conveyance area is modelled to result in a maximum water level increase of 0.02 m, and a left bank velocity increase of 0.16 m/s during the 1:500-year flood. As such, additional erosion control measures have been included in the Project's design at this location. At the curved portion of the floodwall, a riprap apron designed to protect to a net scour depth of 4 m below the existing ground height at the foot of the wall (See Appendix B for further detail). The presence of the Project components during a major flood are not anticipated to adversely affect upstream or downstream river elevations (relative to the Project) or instream velocities (other than a minor increase 0.16m/s) (Appendix B).

4.2.1.2 Mitigation Measures

Standard industry practices and avoidance measures, along with Project-specific mitigation measures will be implemented during construction of the Project to reduce or eliminate potential Project-related effects on water quality and quantity. See Table 4.13 for mitigation measures to reduce potential effects to surface water and hydrology.

Table 4-13 Mitigation Measures to Reduce Potential Project-Related Effects to Surface Water and Hydrology

Potential Effect	Effect Pathway	Proposed Mitigation
Change in water quality and quantity	• Increased erosion potential during construction	• Reduce the extent of disturbance to existing vegetation; phase construction to utilize existing vegetation as natural ESC where feasible • Limit the time of exposure of un-vegetated or exposed soils • Re-vegetate disturbed areas as soon as conditions allow • Develop and implement an ESC plan • Monitor ESC measures during construction and rectify deficiencies as soon as possible (COE 2005a)

Table 4-13 Mitigation Measures to Reduce Potential Project-Related Effects to Surface Water and Hydrology

Potential Effect	Effect Pathway	Proposed Mitigation
		• Implement construction recommendations outlined in the storm water management plan - install silt fences along the downstream side of the PDA - ecological design to include use of biodegradable ESC materials where feasible - Where extended lengths of silt fencing may be required, ecological design to include consideration for strategic openings or tiered installation to facilitate wildlife migration through PDA - provide construction entrance feature to minimize the transport of sediment on vehicles and equipment - direct runoff through swales and erosion control berms such that untreated runoff is not discharged from the PDA - install temporary rock check dams, straw swale barriers and/or filter cloth barriers in swales (where appropriate) - stabilize all disturbed areas not subject to construction activities within 30 days • Conduct semi-annual inspections for the first two years following construction (identifying and addressing bare soil, erosive gullies, isolated pooling and sediment build-up) • Complete inspection and maintenance leading up to and following large precipitation events to ensure ESC function • Remove ESC materials that are non-biodegradeable following remedial activities
	• Increased erosion potential during operation at point source flows due to surface water drainage	• A PCSWMM hydrologic model used to determine appropriate culvert size (1:100-year flood, 4-hour storm event). See Appendix B • Erosion protection measures at the culvert discharge locations will consist of riprap and will follow Alberta Transportation standards
	• Increased erosion potential due to increased surface water elevation and river velocities during a major flood event resulting from the presence of the flood mitigation structures	• Project design considerations (See Appendix B) • Riprap apron at curved location of floodwall (See Appendix B for details)

4.2.1.3 Potential Residual Effects

Project mitigation measures to control surface water runoff during construction include the implementation of both an ESC plan and stormwater management plan. Additionally, the implementation of construction and post-construction monitoring are expected to mitigate potential Project-related effects due to erosion. Re-vegetating exposed soils as soon as practical after construction is complete will reduce runoff volumes and velocities and allow the runoff to infiltrate into the underlying soil.

Residual effects resulting from Project activities include an increased surface water runoff volume and flow within the LAA during construction. Surface water quality is expected to be appropriately managed through the ESC and Stormwater Management Plans. With the implementation of mitigation measures, construction-related residual effects on surface water and hydrology will be adverse, limited to the LAA, minor in magnitude, occurring at multiple irregular events, long term in duration, and reversible.

Project design elements include appropriate culvert-sizing and the application of riprap at culvert discharge locations according to Alberta Transportation standards (See Appendix B for further discussion). The design measures are anticipated to reduce potential point source erosion during operation. Residual effects during the operation from point source flows are expected to be adverse in direction, minor in magnitude, occurring at multiple irregular events, long term in duration, and restricted to the LAA, and reversible.

Project design considerations during a 1:500-year flood elevation have resulted in the incorporation of a riprap apron on the floodwall near the Low Lift Pumphouses. Project-related impacts to water quality and quantity as a result of the presence of the flood mitigation structures during a major flood event are not anticipated.

4.2.2 Geology, Geomorphology, and Soils

4.2.2.1 Potential Environmental Effects

The Project's potential interactions with soils include a change in soil quality and quantity during construction resulting from soil loss through wind and/or water erosion following vegetation removal and soil stripping; compaction, rutting or loss of soil structure through vehicle or equipment movement; admixing during soil stripping activities; and contamination from fuel or chemical spills (COE 2005a).

The presence of the Project is not anticipated to result in geomorphological changes to surrounding areas in the event of a major flood event (1:500-year level). The Project is designed to withstand geomorphological changes related to a major flood event (Appendix B).

Project-related interactions with geology and geomorphology are not anticipated.

No interactions with soil are anticipated during operation after vegetation is re-established.

4.2.2.2 Mitigation Measures

Standard industry practices and avoidance measures, along with Project-specific mitigation measures will be implemented during construction of the Project to reduce or eliminate potential Project effects on soil quality and quantity. See Table 4.14 for mitigation measures to reduce potential Project-related effects to soils.

Table 4-14 Mitigation Measures to Reduce Potential Project-Related Effects to Soils

Potential Effect	Effect Pathway	Mitigation Measures

Change in soil quality and quantity	Soil loss and changes to soil quality through admixing during soil stripping/replacement, wind and/or water erosion following vegetation removal and soil stripping	• Develop and implement a stormwater management plan during construction
		  - install silt fences along the downstream side of the PDA
		  - Ecological design to include use of biodegradable ESC materials where feasible
		  - Where extended lengths of silt fencing may be required, ecological design to include consideration for strategic openings or tiered installation to facilitate wildlife migration through PDA
		  - provide construction entrance feature to minimize the transport of sediment on vehicles and equipment
		  - direct runoff through swales and erosion control berms such that untreated runoff is not discharged from the PDA
		  - install temporary rock check dams, straw swale barriers and/or filter cloth barriers in swales (where appropriate)
		  - stabilize all disturbed areas not subject to construction activities within 30 days
		• Limit disturbance to existing vegetation (COE 2005a)
		• Limit the time exposure of un-vegetated/exposed soils (COE 2005a)
		• Strip topsoil and subsoil separately, store topsoil and subsoil in separate stockpiles at least one metre apart
		• Re-vegetate disturbed areas as soon as conditions allow
		• Topsoil salvage and/or replacement will be avoided during heavy precipitation or extremely windy conditions
		• Develop and implement an ESC plan (COE 2005a)
		• Monitor ESC measures during construction and rectify deficiencies as soon as possible (COE 2005a)
		• Complete inspection and maintenance leading up to and following large precipitation events to ensure ESC function

	Compaction, rutting or loss of soil structure through vehicle and equipment movement	• In the event of adverse weather that could result in rutting and/or compaction, mitigation measures (i.e., limiting vehicle traffic, using tracked equipment or stripping topsoil) will be considered. If mitigation measures fail, Project activities may be suspended until adverse weather conditions abate • Traffic will be confined to workspace areas, access routes will be identified and marked by surveyors in order to reduce area of compaction • Working during and immediately after intense rainfall events or spring thaw when soils are wet will be avoided to the extent practical in order to reduce soil compaction • Installation of plywood sheets or rig matting (if required)
	Contamination from fuel or chemical spills	• Road vehicles will be refueled and maintained off site • Construction equipment will be inspected at the beginning and end of each shift, and any leaks noted will be repaired immediately upon detection or equipment will be removed from site • Drip trays will be placed under equipment overnight • Emergency response materials will be maintained on site and construction equipment will be equipped with a fire extinguisher, spill kits and will be operated by personnel trained in their use

4.2.2.3 Potential Residual Effects

The implementation of mitigation measures is expected to prevent measurable Project-related changes to soil quality and quantity. These measures include BMPs for soil handling procedures, supervision of ground disturbance, and the implementation of an ESC plan and a storm water management plan. Mitigation measures to limit risk of contamination from fuel or chemical spills are standard and known to be effective. In the event of an unplanned release of fuel or chemicals, all impacted areas will be remediated to applicable guidelines (e.g., Alberta Tier 1 Soil Remediation Guidelines, CCME Soil Quality Guidelines for the Protection of Environmental and Human Health).

With the implementation of mitigation measures, Project-related residual effects on soils will be neutral, limited to the PDA, negligible in magnitude, occurring at a continuous (compaction and erosion during construction) and/or a single event (potential spills or releases) frequency, short term in duration, and reversible following post-construction reclamation of the disturbance area.

4.2.3 Vegetation Species and Communities

4.2.3.1 Potential Environmental Effects

Site preparation activities (i.e., vegetation removal and soil stripping) will result in an environmental effect on vegetation through direct loss or alteration of plant communities or the potential introduction or spread of weeds listed in the *Weed Control Act*. The Project's interactions with vegetation species and communities include change in species composition and community diversity. Approximately 0.3 ha native vegetation composed of trees and shrubs will be lost and replaced with a native grass mix that will be maintained through mowing and weed control over the life of the Project. The native grass mix will be planted in the 4.6 m root free zones required in proximity to the earthen embankments and floodwalls. The root free zones are a design requirement per USACE (2000) standards and specifications to maintain the integrity of the structures (See Appendix B for further detail).

The Project was designed to reduce the loss of native vegetation. The earthen embankments are positioned within existing disturbance within the E.L. Smith WTP fenceline to the extent possible. Design considerations resulted in the selection of floodwalls around the Low Lift Pumphouses rather than earthen embankments to reduce the Project's footprint in native vegetation and maintain habitat in proximity to the NSR. The floodwall will be located within the plant site in existing disturbance, where possible, with some small incursions on native vegetation where existing buildings preclude siting on existing disturbance (See IFRA drawings in Appendix A). Vegetation clearing and grubbing will be limited to the construction limits. Some selective stumping and pruning, as determined by an arborist, will occur beyond the limits of construction. Stumping and pruning activity will be limited to within 5 m of the limits of construction. The purposed of stumping and pruning is to limit the potential for hazard tree blow down and to maintain some habitat values and soil stabilization.

4.2.3.2 Mitigation Measures

Standard industry practices and avoidance measures, along with Project-specific mitigation measures will be implemented during the construction of the Project to reduce or avoid potential effects to vegetation. See Table 4.15 as well as the preliminary planting plan (Drawing E-0-0-L-0007 in Appendix A) for mitigation measures to reduce potential Project-related effects to vegetation species and communities.

Table 4-15 Mitigation Measures to Reduce Potential Project-Related Effects to Vegetation Species and Communities

Potential Effect	Effect Pathway	Mitigation Measures
Change in species composition and community diversity	• Direct loss or alteration of plant communities and diversity • Introduction or spread of weeds listed in the *Weed Control Act* (i.e., exotic vegetation invasion)	• Reduce clearing of native plant communities through Project design • Reduce potential of accidental effects to native communities by fencing or flagging the limit of construction in forested areas • Ensure all equipment arrives on-site clean and free of soil or vegetative debris • Ensure all equipment remains within the PDA and designated travel lanes • Project related vehicles will not park on Parkland without prior approval or justification • Avoid grading except where required for safe construction of the Project • Reseed disturbed area using an approved native seed mix • Enhancement plantings comprising native shrub and tree species are proposed on EPCOR and COE-owned land between the WTP and the NSR in proximity to the Low Lift Pumphouses • Monitor topsoil piles for weed growth during construction and implement corrective measures (i.e., spraying, mowing or hand pulling) to avoid the spread of weeds, as required • Weed control will be conducted in accordance with the Alberta *Weed Control Act* and Regulations • If conducting herbicide weed control application within 100 m of the NSR, use hand application only

4.2.3.3 Potential Residual Effects

With the implementation of mitigation measures, the residual effects on vegetation and species communities are predicted to be adverse in direction and minor in magnitude. Residual effects will be limited to the PDA, will occur once, will be long term and are reversible. The use of an approved native seed mix in the root free zone within the limits of construction and the associated maintenance activities will result in approximately 0.3 ha of a woodland community being maintained at an earlier successional stage than baseline conditions.

To further mitigate the residual effects of the Project, EPCOR has begun the development of a vegetation management plan to improve overall ecological structure and function and to restore habitat at the WTPs. The plan will map current vegetation at each site and strive to understand shared values and Indigenous perspectives. Although still in the development phase, the preliminary priorities of the vegetation management plan are to naturalize and revegetate each site with a mixture of successional stages representative of Aspen Parkland Ecoregion vegetation.

4.2.4 Wildlife and Wildlife Habitat

4.2.4.1 Potential Environmental Effects

The Project's potential interactions with wildlife species and habitat include change in habitat, change in movement, and change in mortality risk.

Construction activities (e.g., vegetation removal, ground disturbance) will result in temporary loss of wildlife habitat. Areas within the construction footprint will not be available for wildlife during the construction period. A small area (approximately 0.3 ha) of native plant community will be changed from a woodland community to a native grass community in the long-term. Sensory disturbance associated with increased human presence and heavy equipment use will affect habitat use in proximity to the activities while they are occurring.

Wildlife movements in proximity to the PDA are affected by the presence of the fencing at baseline. The construction-related temporary fencing of the PDA is not anticipated to change medium and large wildlife species movements in the LAA during construction. Portions of the floodwall along the southeastern extent of the E.L. Smith WTP, around the Low Lift Pumphouses, will result in a reduction in the width of the corridor available for terrestrial wildlife movement during construction. This effect is likely to be most pronounced during active construction during non-frozen conditions when sensory disturbance and human presence may discourage terrestrial wildlife movements between the PDA and the NSR. There will be a temporary (construction period) reduction in the width of the corridor at this location (approximately 3.5 m to 4.5 m reduction). During the construction period, it is expected that some wildlife species could continue to use this corridor but may change their daily movement habits to avoid active construction (e.g., move through the corridor at night when construction has ceased for the day). Wildlife species could also avoid this corridor and use areas to the south and west of the E.L. Smith WTP during the construction period.

Approximately 125 m of the outer security fence line in proximity to the Low Lift Pumphouses will not be replaced post-construction. This will increase in the width of the corridor by approximately 3 m or 10% relative to baseline. During post-construction, after the establishment of native grass and enhancement plantings, wildlife movements are anticipated to return to conditions similar to or better than baseline. The change from woodland community to native grass community within the limits of construction (0.3 ha) may reduce security cover for some species travelling through the LAA in the long-term. This effect will be exacerbated by stumping and pruning in proximity (i.e., within 5 m) of the limits of construction (Appendix B).

During construction, vehicles and other equipment have the potential to result in an increased mortality risk for wildlife in the PDA. Vegetation removal may result in the physical destruction of key habitat features (e.g., nests, dens, roosts, hibernacula). Equipment may also result in the direct mortality of small, less mobile species or individuals (e.g., amphibians, juvenile birds).

4.2.4.2 Mitigation Measures

Standard industry practices and avoidance measures along with Project-specific mitigation measures will be implemented during construction of the Project to reduce or eliminate Project-related effects on wildlife habitat, wildlife movements, and mortality risk.

See Table 4.16 for mitigation measures to eliminate or reduce potential effects to wildlife habitat, wildlife movement, and risk of mortality.

Table 4-16 Mitigation Measures to Reduce Potential Project-Related Effects to Wildlife and Wildlife Habitat

Potential Effect	Effect Pathway	Proposed Mitigation
Change in wildlife habitat availability and suitability	• Direct loss or alteration of wildlife habitat due to vegetation removal and ground disturbance • Indirect loss or reduced effectiveness of wildlife habitat through sensory disturbance due to human activity and heavy equipment use	• Restrict all construction activities to the approved Project boundaries and do not clear vegetation beyond Project boundaries • Maintain noise abatement equipment on machinery in good working order to reduce potential sensory disturbance to wildlife • Adhere to all recommended setbacks and timing restrictions for identified wildlife habitat features (e.g., nests, dens) Restore vegetation to approved native seed mix as soon as practical
Change in wildlife movement	• Direct loss or alteration of wildlife corridor due to vegetation removal, ground disturbance, and fencing • Indirect loss or reduced effectiveness of wildlife corridor through sensory disturbance due to human activity and vehicle traffic	• Restrict all construction activities to the approved Project boundaries and do not clear vegetation beyond Project boundaries • Schedule construction activities outside of the RAP for KWBZs (Jan 15 – April 30) or discuss mitigation strategies with a regional AEP biologist • Maintain noise abatement equipment on machinery in good working order to reduce potential sensory disturbance to wildlife • Adhere to all recommended setbacks and timing restrictions for wildlife habitat features (e.g., nests, dens) • Reduce the extent of the outer security fence line by approximately 125 m in proximity to the Low Lift Pumphouses • EPCOR will work with COE and/or GOA to implement enhancement plantings of native shrubs and trees to improve values within the area between the WTP and the NSR outside the root free zone during Site Restoration and Revegetation (see preliminary planting plan in Appendix A).

Table 4-16 Mitigation Measures to Reduce Potential Project-Related Effects to Wildlife and Wildlife Habitat

Potential Effect	Effect Pathway	Proposed Mitigation
Change in wildlife mortality risk	• Direct mortality from ground disturbance and vegetation removal (e.g., destruction of nests or dens) • Direct mortality from collisions with Project vehicles and equipment	• Schedule the commencement of construction activities outside of the RAP for nesting migratory birds for Nesting Zone B4 (April 10 – August 31; GOC 2018), the general raptor nesting period (March 15 to July 15) (GOA 2021). If avoidance of the RAP is not possible, conduct nest searches and implement appropriate setbacks and/or mitigation measures to reduce the risk of incidental take and implement bird management plans, as required. If nest sweeps are required due to Project timing, results will be documented. • If tree removals are scheduled between February 1 and March 15, conduct owl nest searches to reduce potential destruction of wildlife features. • All construction personnel will receive environmental orientation at project start up, including education on avoiding the harassment and feeding of wildlife, mitigations to reduce potential for wildlife mortality, and other key environmental concerns. • Prior to construction at any time of year, nest surveys for bald eagles will be conducted within 1 km of the PDA. If nests are identified, a mitigation and management plan will be developed in consultation with a regional AEP biologist • Schedule construction activities outside of the RAP for KWBZs (Jan 15 – April 30) where this management zone overlaps the PDA, develop a mitigation plan to reduce effects to wildlife in the KWBZ in consultation with a regional AEP biologist • During construction vehicles and heavy equipment will be limited to established roadways within the WTP and the approved PDA and low speeds will be maintained • Monitor the construction area for trapped wildlife. Should any wildlife be identified, the Construction Manager will be contacted. In consultation with a professional wildlife biologist and AEP, appropriate corrective actions will be implemented • Keep construction site clear of garbage and food waste on a daily basis to reduce interactions with wildlife

4.2.4.3 Potential Residual Effects

Change in Wildlife Habitat

During construction, vegetation removal and ground disturbance will result in the direct and indirect loss of a small amount of native vegetation (approximately 0.3 ha). Project implementation will result in a change from native woodland habitat to native grasses in this area and some direct loss of habitat that provides security cover for some species. These changes will reduce the habitat values for nesting birds

and reduce thermal and security cover for some terrestrial mammals. The majority of the PDA lies within E.L. Smith WTP lands mapped as industrial development (approximately 83 % of the PDA). According to the COE Environmental Sensitivity Project mapping (COE 2016), 1.83 ha of Extremely High, Very High, and High value habitat will be affected by construction within the PDA.

Wildlife may avoid areas adjacent to the PDA during construction due to noise, light, human presence, and heavy equipment use associated with construction activities. The extent of potential avoidance outside of the PDA will vary by wildlife species, season, and construction activity.

Direct and indirect disturbance to wildlife habitat during construction activities will largely be avoided by siting the Project within the E.L. Smith WTP lands in areas of existing industrial development and scheduling construction activities to occur outside of sensitive wildlife periods (e.g., primary nesting periods for migratory birds and KWBZ RAPs). Wildlife may avoid areas adjacent to the PDA during construction due to noise, light, human presence, and heavy equipment use associated with construction activities. The extent of potential avoidance outside of the PDA will vary by wildlife species, season, and construction activity.

During construction, potential residual effects on wildlife habitat are predicted to be adverse as there will be direct loss of 0.3 ha of treed wildlife habitat within the construction limits. This habitat will be maintained as grass in the long-term, which represents a successional change in habitat. The magnitude of the potential effect is predicted to be minor because it is unlikely to have a measurable effect on wildlife abundance in the LAA. Although most changes in habitat will be limited to the PDA, sensory disturbance will extend into portions of the LAA, which may result in temporary local shifts in wildlife distribution. Potential effects on wildlife from direct habitat loss will occur from a single event (i.e., during vegetation removal and construction) and will extend beyond the operations phase. Potential indirect effects from sensory disturbance during construction will be short-term. Overall, the change in habitat is considered reversible because the residual loss or alteration of habitat can be reversed through habitat reclamation following decommissioning. Indeed, with the implementation of the preliminary planting plan (See Drawing E-0-0-L-0007 in Appendix A), some habitat within the LAA will be improved as a result of the Project.

Change in Wildlife Movement

During construction, noise, lights, and human activity may result in changes to movement around the PDA. There will be a small reduction in the width of the wildlife corridor between the Low Lift Pumphouses and the NSR during construction. The PDA extends 3.5 to 4.5 m past the existing fenceline in this section. This reduction will persist during the construction period but will be reclaimed and planted with an approved native seed mix during site restoration and revegetation. By not replacing the outer security fence line during site restoration, the wildlife corridor width will be increased by approximately 3 m or 10% relative to baseline. Approximately 0.3 ha of treed habitat will be lost and maintained as native grass cover over the life of the Project, however, this will be at least partially offset by the proposed enhancement plantings which are planned to cover approximately 0.27 ha. Overall, changes to vegetation will confer a reduction in security cover for some wildlife species moving through the LAA along the NSR.

Sensory disturbance in adjacent wildlife habitats may result in wildlife temporarily avoiding areas adjacent to the PDA during construction. Some species may avoid moving through the corridor between the PDA and the NSR and select routes to the south and west of the WTP. The extent of potential avoidance outside of the PDA will vary by wildlife species, season, and construction activity. Wildlife are anticipated to habituate to the change in habitat over time and baseline wildlife movements are anticipated to resume during operations as grassed areas become established along the limits of the construction. Project requirements for a root free zone as well as security fencing around the WTP limit the Project's ability to mitigate changes to wildlife movement through vegetation management and wildlife friendly fencing. Some species may avoid moving through the corridor between the PDA and the NSR during the operations phase and select routes to the south and west of the WTP. Large and medium-sized mammals are anticipated to resume use of the corridor between the PDA, but some species may reluctant to use corridor area due to reduced cover available in the root free zone during operations. The planting of trees and shrubs within the corridor area as part of the vegetation management plan (See Drawing E-0-0-L-0007 in Appendix A), is likely to facilitate movement for some species such as passerines and small mammals once weed removal activities are completed and plantings are established.

Although most changes in wildlife movement will be limited to the PDA, sensory disturbance will extend into the LAA, which may result in temporary local shifts in wildlife distribution. The effect is anticipated to adverse in direction and minor in magnitude. Potential effects on wildlife will occur from a single event (i.e., construction) and will extend beyond the operations phase. Potential indirect effects from sensory disturbance during construction will be short-term.

Change in Mortality Risk

Vegetation removal and site grading, as well as increased human activity (i.e., use of heavy equipment) could result in increased mortality risk to wildlife in the LAA. Wildlife mortality (e.g., for ground nesting birds or amphibians and reptiles) due to ground disturbance and vegetation clearing might occur during site preparation. All construction activities will be within the fenced PDA which will limit the potential for adverse effects to wildlife mortality risk for medium and large sized wildlife.

Adherence to migratory bird, owl, and raptor RAPs will reduce mortality risk to birds during construction. Where this is not possible, pre-construction surveys (i.e., nest searches) will be conducted to reduce mortality risk to birds.

The residual effect of construction-related change to mortality risk is considered minor because the Project is unlikely to have a measurable effect on wildlife abundance in the LAA. The increase in mortality is largely limited to the PDA and is short-term (i.e., construction phase only).

4.2.5 Viewscape

4.2.5.1 Potential Environmental Effects

The Project's potential interactions with the viewscape includes the change in visual quality for adjacent neighborhoods and other users of the LAA.

During construction, the visual quality of the LAA may be negatively affected by the loss of vegetation, presence of machinery and construction vehicles, presence of construction materials, and temporary construction fencing, which may be visible from unobstructed observation points within adjacent communities (Cameron Heights and Henderson Estates).

Upon completion of construction, some may consider the visual quality of the LAA to be negatively impacted by the change in vegetation and the flood mitigation structures themselves. With the implementation of the vegetation management plan, including the weed removal and the establishment of plantings as per the preliminary planting plan, some may view the change as neutral or positive. Renderings were developed based on observation points where the WTP may be visible and shared with the public for feedback. EPCOR will incorporate public feedback when selecting floodwall materials and finishes in detailed design.

4.2.5.2 Mitigation Measures

Standard industry practices and avoidance measures, along with Project-specific mitigation measures will be implemented during construction of the Project to reduce or eliminate potential Project effects on the alteration to the viewscape. See Table 4.17 for mitigation measures to reduce Project-related potential effects to the viewscape.

Table 4-17 Mitigation Measures to Reduce Potential Project-Related Effects to Viewscape

Potential Effect	Effect Pathway	Proposed Mitigation
Change in visual quality	Direct alteration to viewscape in the NSR valley	• Disturbances to the PDA will be limited as much as possible and will be delineated prior to construction to reduce the potential accidental removal of vegetation • Construction activities should be completed within the proposed timeframe and the impacted areas restored and revegetated as soon as possible • All temporary staging areas and fencing will be removed upon completion of construction • Floodwall textures and finishes will be considered during detailed design to enhance the Project aesthetics from observation points and incorporate feedback from consultation

4.2.5.3 Potential Residual Effects

In consideration of viewscapes from current observations points as well as those from potential future trails near the Project, EPCOR will enhance the aesthetics and overall viewscape through floodwall design and other landscaping during detailed design.

With the implementation of mitigation measures, potential effects on the viewscape are predicted to be adverse in direction, minor in magnitude, reversible, and limited to the LAA (or just outside of the LAA) in

geographic extent. The duration of the potential effects will persist during construction and operation and are considered long-term.

4.2.6 Historical Resources

4.2.6.1 Potential Environmental Effects

Because the PDA lies within an area designated with a HRV of 3a, there are confirmed archaeological resources present that could be affected by Project activities that involve surface or subsurface ground disturbance. Project activities have the potential to interact with historical resources which could result in the direct loss or damage to resources of cultural, archaeological, historical and/or paleontological significance.

4.2.6.2 Mitigation Measures

Standard industry practices and avoidance measures, along with Project-specific mitigation measures prescribed by Alberta Culture and Status of Women (ACSW) will be implemented during construction to reduce or eliminate potential Project-related effects related to the potential loss of historical resources. See Table 4.18 for proposed mitigation measures for reducing potential effects to heritage resources.

Table 4-18 Mitigation Measures to Reduce Potential Project-Related Effects to Heritage Resources

Potential Effect	Effect Pathway	Proposed Mitigation
Disturbance or destruction of part or all of a historic resource	Removal or disturbance of historical resource through vegetation removal or surface/subsurface disturbance	• HRA requirements for the Project, including the completion of an archaeological HRIA, and a paleontological HRIA • All construction works will comply with any conditions identified in the *Historic Resources Act* authorization • In the event that historical resources are encountered during construction, activities will be halted and ACSW will be notified

4.2.6.3 Potential Residual Effects

Project-related effects on heritage resources are mitigated to the standards set by the regulatory agency (ACSW). EPCOR will implement the mitigation measures prescribed by ACSW. Residual environmental effects are not anticipated.

5.0 ROSSDALE WATER TREATMENT PLANT

This section summarizes baseline conditions for the Rossdale WTP (Section 5.1) and presents the assessment of potential environmental effects in Section 5.2.

5.1 BASELINE CONDITIONS

5.1.1 Surface Water and Hydrology

The hydrotechnical assessment of the NSR was conducted in support of the Project at both WTP locations (Appendix B). As above in Section 4.1.1, Stantec used AEP's recent flood model to estimate flood elevations at the Rossdale WTP during a 1:500-year flood. Estimated flood elevations (1:500) at the Rossdale WTP are modeled to be 624.59 m (upstream) and 624.15 m (downstream) (Figure 5.1 shows a screenshot of the AEP 2020 flood inundation map at Rossdale WTP). The Rossdale WTP is above 623.5 m in elevation at baseline. Flooding from the NSR is anticipated to occur at the site during a 1:100-year flood (Table 5.1).

Table 5-1 Surface Water Elevations of the NSR at Various Return Periods near the Rossdale Water Treatment Plant (Tetra Tech 2020a)

Cross Section	River Station (m)	Flood Return Period and Discharge (m^3/s)												
		2-yr	5-yr	10-yr	20-yr	35-yr	50-yr	75-yr	100-yr	200-yr	350-yr	500-yr	750-yr	1000-yr
		1300	2220	2910	3580	4130	4470	4860	5130	5800	6340	6670	7060	7330
		Water Surface Elevation (m)												
XS-149	68725.8	616.89	618.74	619.90	620.90	621.67	622.12	622.62	622.95	623.72	624.31	624.65	625.06	625.32
XS-148	68538.8	616.84	618.70	619.85	620.85	621.61	622.06	622.56	622.89	623.67	624.25	624.59	624.99	625.25
XS-147	67911.6	616.62	618.43	619.55	620.52	621.26	621.69	622.18	622.5	623.25	623.82	624.15	624.55	624.81

The depth to groundwater was measured in many previously drilled boreholes and monitoring wells. Based on the historical borehole data, the groundwater level was at approximately 7 m to 10 m bgs (corresponding elevation of 616 m to 614 m). A higher ground water level was measured by Tetra Tech (2019) in the clay layer at 6.5 m bgs at the Low Lift Pumphouse location close to the NSR. See Appendix B for further detail.

The previous field investigation results indicated the ground water level was within the sand/gravel layer, although higher groundwater may be perched locally in the upper clay. Nichols (2015) developed a groundwater contour map which indicated that the groundwater generally flows in a southerly direction toward the river. See Appendix B for further detail.

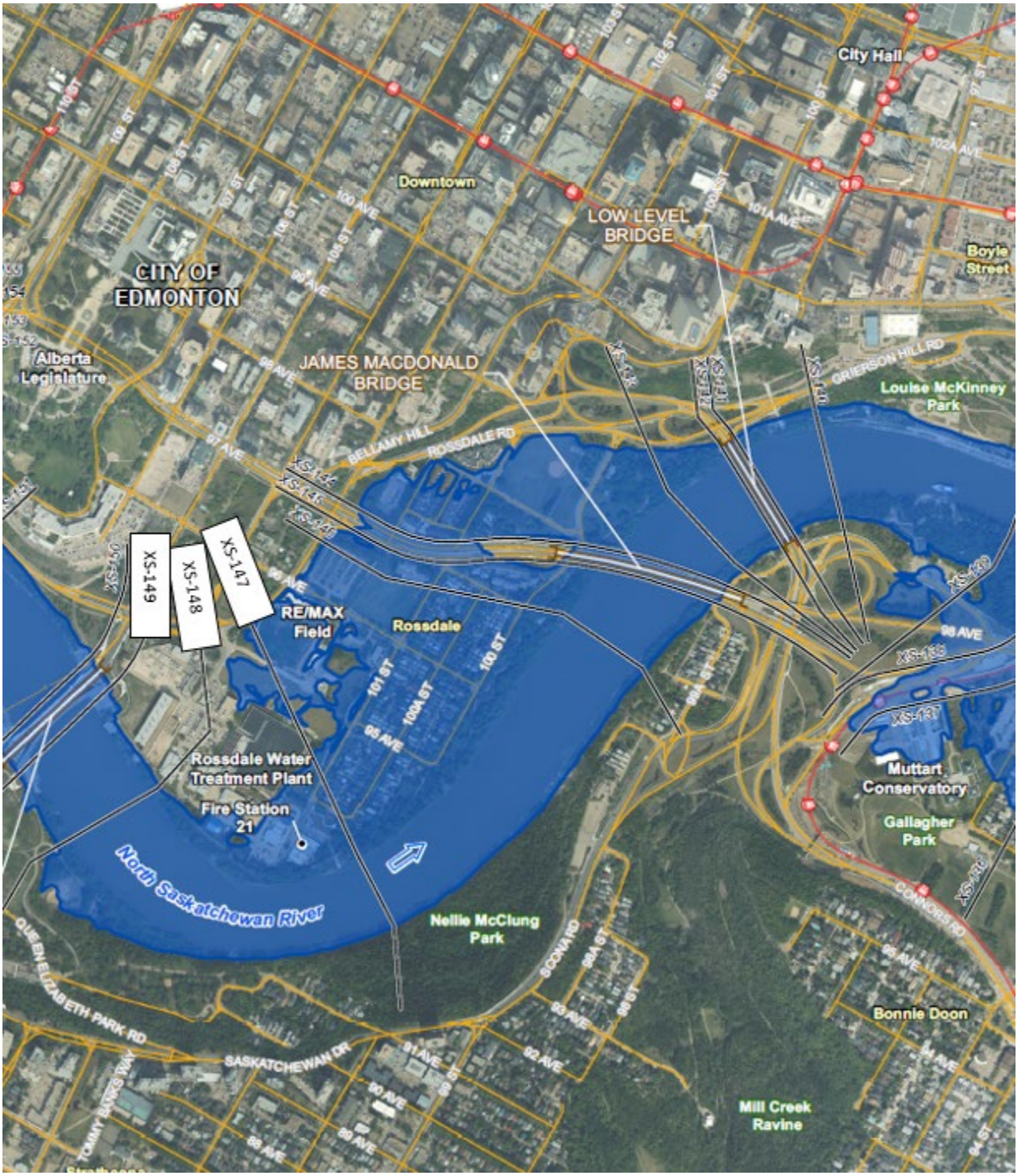


Figure 5-1 1:500-year Flood Inundation Maps at Rossdale WTP

The Rossdale WTP site is located on banks of the NSR and is surrounded by dense urban developments. Runoff at the site is captured in various sewer systems along north and east boundaries. Most south catchments of the Rossdale WTP site directly discharge to the NSR through underground storm sewers and four outfalls.

5.1.2 Geology, Geomorphology, and Soils

The Rossdale WTP site is located on post-glacial floodplain immediately to the east of Walterdale Bridge. The site is relatively level with a general slope south towards the NSR. The site is primarily situated at elevations between 623 m and 625 m, which is approximately 8 m to 10 m above the normal river level (Appendix B).

A review of *Published Urban Geology of Edmonton* (Bayrock and Hughes 1962, Kathol and McPherson 1975) indicates the flood plain is underlain by alluvial deposits, followed by interbedded clay shale and sandstone bedrock of the Edmonton Formation. The alluvial deposits consist predominately of fine to medium grained sand with some silt and clay. Coarse sand and gravel is present in many places, especially within or close to the river channel. See Appendix B for further detail.

Based on the historical borehole data, the general stratigraphy at the site consists of various fills overlying 4 to 7 m thick alluvial deposits overlying interbedded bentonitic shale bedrock. The alluvial deposits typically include silty clays and/or clayey silts, sands and gravel in descending order. Bedrock is expected to be encountered approximately 9 to 14 m below existing surface ground (at an approximate elevation of 612 m to 615 m).

Soils at the Rossdale WTP are disturbed and have been replaced with fill at most locations. Various fill types are present at surface or below a thin topsoil layer (Appendix B).

The hydraulic and geomorphic characteristics of the NSR channel were reviewed in support of Project design (Appendix B). The Rossdale WTP is located at the inside of a bend, and slip-off bars are not prominent at this location. Significant bar growth is unlikely due to channel characteristics. See Appendix B for further detail.

A review of aerial imagery indicates there was no significant change in the riverbank slope over the past 30 or more years except for minor localized riverbank erosions from some outfalls along the riverbank shoreline. Site history based on aerial photo review does not indicate the presence of previous mining activity at the site See Appendix B for further detail on the aerial imagery review.

5.1.3 Vegetation Species and Communities

The vegetation methods and regional vegetation setting described in Section 4.1.3 are also applicable to this section and are not re-iterated here.

Within the LAA, a total of 4 rare plant survey locations were assessed on August 31, 2021 (Figure 5.2). Field assessments included one survey interval of rare plant and rare ecological community surveys.

During these surveys information was also gathered on *prohibited noxious* and *noxious* weed occurrences, if observed. See Appendix C for the list of species detected during the rare plant survey.

5.1.3.1 Local Assessment Area

The LAA comprises 70.2% anthropogenic land units (residential, transportation, green space, industrial development.), 19.2 % native or modified plant communities and 10.6% open water (NSR) (Table 5.2). Most of the native plant community area is Aspen Poplar Woodland Alliance (49.61 ha), which is consistent with plant communities along the NSR valley. Within the Aspen Poplar Woodland Alliance on the north side of the NSR at the Rossdale WTP, the aspen component of the canopy is largely replaced by Manitoba maple (*Acer negundo*) and shining willow (*Salix lasiandra*) in the canopy, with young balsam poplar (*Populus balsamifera*), narrow-leaf willow (*Salix exigua*), and red-oiser dogwood (*Cornus stolonifera*) in the shrub layer. Weed species are dominant in the herbaceous layer including common burdock (*Arctium minus*), and creeping thistle (*Cirsium arvense*).

Tall Shrubland and Short Shrubland Alliance mostly occur along the banks of the NSR. A general description of plant communities and land units in the LAA are provided in Appendix C.

Table 5-2 Plant Communities and Land Use within the LAA

Plant Community/Land Unit	Area (ha)	Percent of LAA
Anthropogenic	**313.22**	**70.2%**
Residential	182.78	41.0%
Transportation	66.10	14.8%
Green Space	51.49	11.5%
Industrial Development	12.85	2.9%
Upland	**85.67**	**19.2%**
Aspen Poplar Woodland Alliance	49.61	11.1%
Mixed Deciduous and Evergreen Woodland Alliance	23.72	5.3%
Aspen Woodland Alliance	8.27	1.9%
Tall Shrubland Alliance	2.21	0.5%
Short Shrubland Alliance	1.13	0.3%
White Spruce Woodland Alliance	0.73	0.2%
Water	**47.42**	**10.6%**
Open Water	47.42	10.6%
Grand Total	**446.31**	**100.0%**

5.1.3.2 Project Development Area

The Rossdale WTP PDA is located almost entirely within Industrial Development (1.04 ha, 90.2%), with portions of the PDA in communities mapped as residential (0.09 ha, 7.8%) and green space (0.02 ha, 1.9%) (Table 5.3). The Rossdale WTP PDA intersects polygons with Environmental Sensitivity rankings of high and moderate (Figure 5.3).

Table 5-3 Plant Communities within the PDA at Rossdale WTP

Plant Community/Land Unit	Area (ha)	Percent of PDA
Industrial Development	1.04	90.2%
Residential	0.09	7.8%
Green Space	0.02	1.9%
Aspen Woodland Alliance	<0.001	0.05%
Transportation	<0.001	0.03%
Grand Total	**1.15**	**100%**

The PDA includes both EPCOR property and COE-owned land. The areas of mapped Aspen Woodland Alliance that contain trees based on imagery within COE-owned land that will be affected by vegetation clearing are limited to an area that shows as paved pathway based on aerial imagery (Figure 5-3). A review of the aerial imagery and a ground-truthing exercise shows a potential for the removal of up to 141 individual trees from the PDA.

The proposed vegetation clearing would include 12 City Owned and Maintained trees. These are 6 crabapple trees with diameters of 15 cm and 12 Swedish columnar aspen (DBHs of 22, 22, 25, 25, 25, 26 cm). In preliminary design 29 City of Edmonton owned trees were proposed to be removed and EPCOR did some reconfiguring to reduce that number. In addition, 28 EPCOR owned trees will be lost on Rossdale plant site (8 lodgepole pine, 19 white spruce, and one balsam poplar). Six balsam poplar (DBH 4.5, 28.8, 29.5, 31.0, 35.0, 53.5 cm), 12 lodgepole pine (mean DBH of 17.2 cm), and three white spruce (average DBH 23.2 cm). The tree loss total is expected to be 61 trees. This is a significant reduction from 141 trees in the preliminary design stage. See Figure D-2, Appendix D.

5.1.3.3 Rare Plants

There are no historical occurrences of rare plant communities within the LAA (ACIMS 2022). A query of the ACIMS database resulted in 5 historical records of rare plants with rankings of S1S2 (uncommon, known from 1-20 occurrences) or S3 (uncommon, known from between 21 and 100 locations in Alberta) within the LAA. There were two records of lime silk moss (*Entodon concinnus*) and three records of smooth sweet cicely (*Osmorhiza longistylis*). Record locations were from locations on the south side of the NSR within the LAA (Table 5.4, Figure 5.2).

Table 5-4 ACIMS Records for Rare Plants within the LAA at Rossdale WTP

Scientific Name	Common Name	S-RANK[1]
Entodon concinnus	lime silk moss	S1S2
Osmorhiza longistylis	smooth sweet cicely	S3

Notes:

[1]Standard Subnational Conservation Ranks (adapted from NatureServe)

S1 Known from five or fewer occurrences or especially vulnerable to extirpation because of other factor(s).

S2 Known from twenty or fewer occurrences or vulnerable to extirpation because of other factors.

S3 Known from 100 or fewer occurrences, or somewhat vulnerable due to other factors, such as restricted range, relatively small population sizes, or other factors.

S4 Apparently secure.

S5 Secure - taxon is common, widespread, and abundant.

One occurrence of smooth sweet cicely was observed during rare plant surveys outside of the PDA. This species was found within the Aspen Woodland Alliance, near RP02 and RP03 (Table 5.5, Figure 5.2). Other plant species detected during the rare plant survey included four species with an S-Rank of S3 or higher (Table 5.5). There were no rare plants detected within the PDA. None of these species in Table 5.5 are protected by the *Wildlife Act* or the *Species at Risk Act.* There are no legally required setbacks or other mitigation measures associated with these species.

Table 5-5 Rare Plants Detected within the LAA at Rossdale WTP

Scientific Name	Common Name	S-RANK[1]	Plot Location	PDA or LAA
Fraxinus pennsylvanica	green ash	S2	RP02, RP03	LAA
Apocynum cannabinum	Indian hemp	S3	RP02, RP03, RP04	LAA
Gnaphalium palustre	marsh cudweed	S3	RP02	LAA
Osmorhiza longistylis	smooth sweet cicely	S3	RP02, RP03	LAA

Notes:

[1]Standard Subnational Conservation Ranks (adapted from NatureServe)

S1 Known from five or fewer occurrences or especially vulnerable to extirpation because of other factor(s).

S2 Known from twenty or fewer occurrences or vulnerable to extirpation because of other factors.

S3 Known from 100 or fewer occurrences, or somewhat vulnerable due to other factors, such as restricted range, relatively small population sizes, or other factors.

S4 Apparently secure.

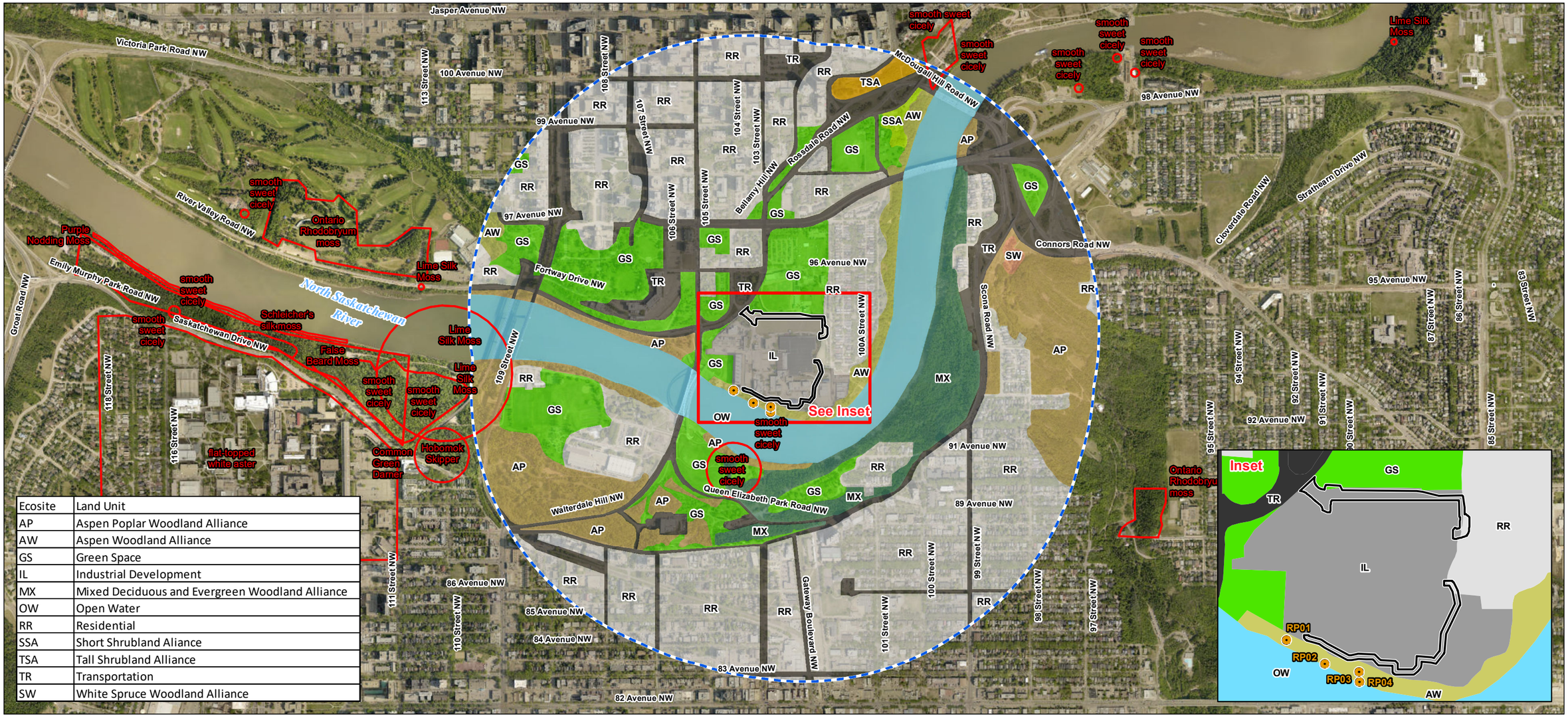
S5 Secure - taxon is common, widespread, and abundant.

5.1.3.4 Weeds

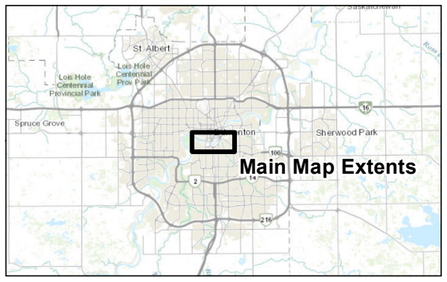
There were six species of *noxious* weeds observed at the Rossdale WTP during rare plant surveys. Species, weed class, and location is detailed in Table 5.6.

Table 5-6 Weeds Observed at Rossdale WTP during Rare Plant Survey

Scientific Name	Common Name	Weed Class	Plot Locations
Arctium minus	common burdock	*Noxious*	RP02, RP03
Tanacetum vulgare	common tansy	*Noxious*	RP02, RP03, RP04
Linaria vulgaris	common toadflax	*Noxious*	RP04
Cirsium arvense	creeping thistle	*Noxious*	RP02
Convolvulus arvensis	field bindweed	*Noxious*	RP01
Sonchus arvensis	perennial sow-thistle	*Noxious*	RP02, RP03, RP04



Ecosite	Land Unit
AP	Aspen Poplar Woodland Alliance
AW	Aspen Woodland Alliance
GS	Green Space
IL	Industrial Development
MX	Mixed Deciduous and Evergreen Woodland Alliance
OW	Open Water
RR	Residential
SSA	Short Shrubland Aliance
TSA	Tall Shrubland Aliance
TR	Transportation
SW	White Spruce Woodland Alliance



Notes
1. Coordinate System: NAD 1983 3TM 114
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Rare Plant Survey Location
ACIMS Observation
Land Unit
Aspen Poplar Woodland Alliance
Aspen Woodland Alliance
Green Space
Industrial Development
Mixed Deciduous and Evergreen Woodland Alliance
Open Water
Residential
Short Shrubland Alliance
Tall Shrubland Alliance
Transportation
White Spruce Woodland Alliance
Project Development Area
Local Assessment Area

0 250 500 metres
(At original document size of 11x17)
1:14,600

N

Stantec

Project Location
Southwest Edmonton
Alberta

Prepared by DS on 2022-10-05
TR by SM on 2022-10-05
IR Review by SJ on 2022-10-17

Client/Project 110146440-002

EPCOR Water Services Inc.
EPCOR WTP Flood Mitigation

Figure No.
5-2

Title
Vegetation Species and Communities at Rossdale WTP

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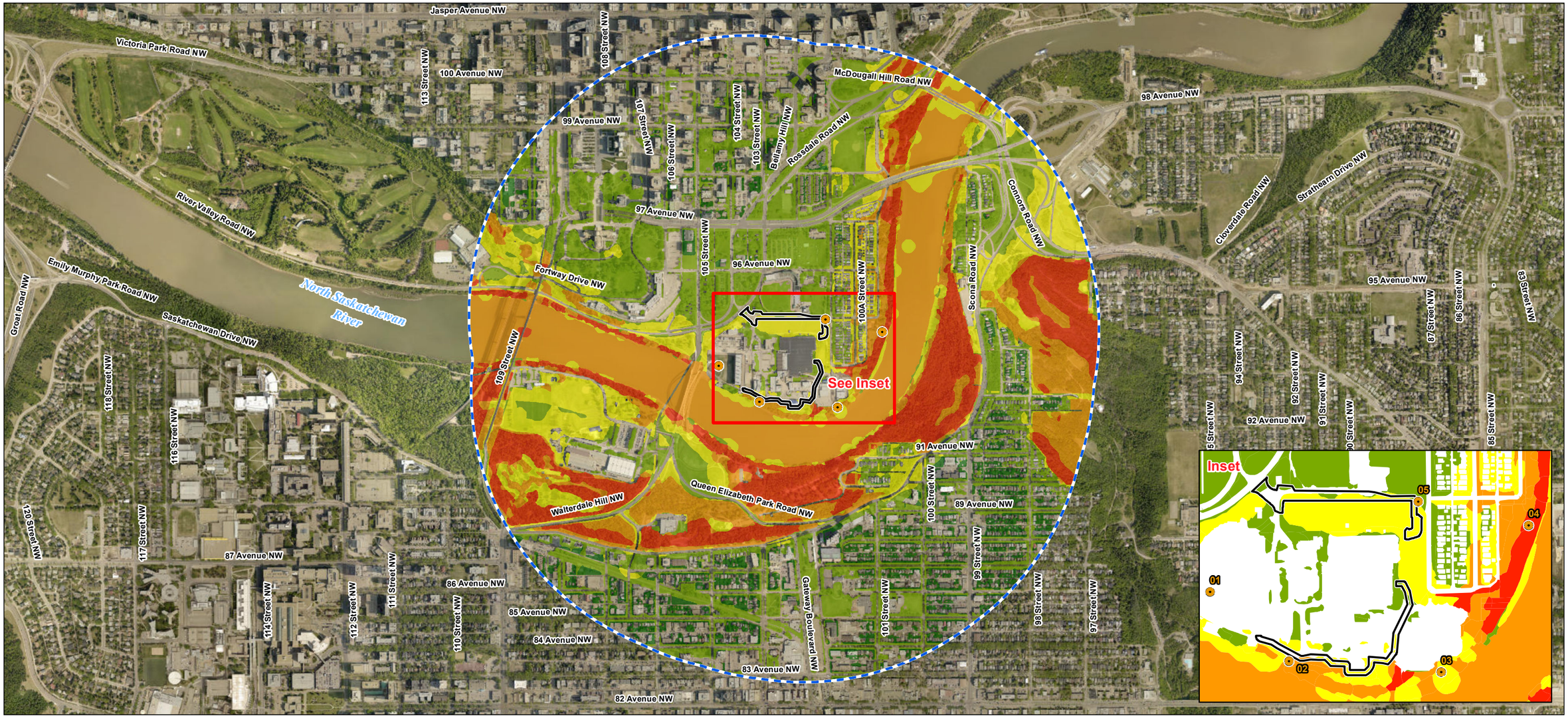

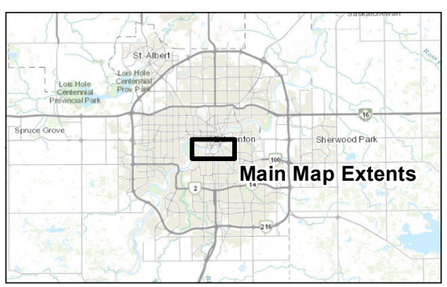

Breeding Bird Survey Location

Environmental Sensitivity Value

- Extremely High Value
- Very High Value
- High Value
- Moderate Value
- Low Value

Project Development Area

Local Assessment Area

0 250 500 metres

(At original document size of 11x17)
1:14,600

N

Notes

1. Coordinate System: NAD 1983 3TM 114
2. Data Sources: Governments of Alberta and Canada; City of Edmonton
3. Background: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Stantec

Project Location	Prepared by DS on 2022-10-05
Southwest Edmonton	TR by SM on 2022-10-05
Alberta	IR Review by SJ on 2022-10-17
Client/Project	110146440-002

EPCOR Water Services Inc.
EPCOR WTP Flood Mitigation

Figure No.
5-3

Title
Environmental Sensitivity Project Overall Rank at Rossdale WTP

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5.1.4 Wildlife and Wildlife Habitat

Wildlife habitat in the LAA is limited. Only 19% of the LAA is comprised of native vegetation, which occurs within the NSR valley. Native vegetation is mainly deciduous dominated woodland alliances. The majority of the land cover within the LAA, approximately 70%, consists of industrial land use, residential, and manicured parkland (Table 5.2, Figure 5.2).

The PDA is almost entirely situated on disturbed land units including industrial development, residential, and green space. These land units generally provide low suitability habitat for wildlife species. There is a small fringe of mature deciduous forested (Aspen Woodland Alliance) that lies between the NSR and below the multi-use trail along the southern portions of the Rossdale Lands. Wildlife values are higher in this vegetation community than in others on the north side of the NSR (Figure 5.3). Dominant species in the tree canopy in proximity to the PDA are largely non-native species such as Manitoba maple.

A review of the COE's Environmental Sensitivity Project data (COE 2016) indicates there are areas within the LAA with high sensitivity values. Over 39% of the LAA is ranked as either Extremely High, Very High, or High sensitivity values (COE 2016). About half of the PDA is ranked as Very High, or High Value.

5.1.4.1 Wildlife Sensitivity Areas and Occurrence Records

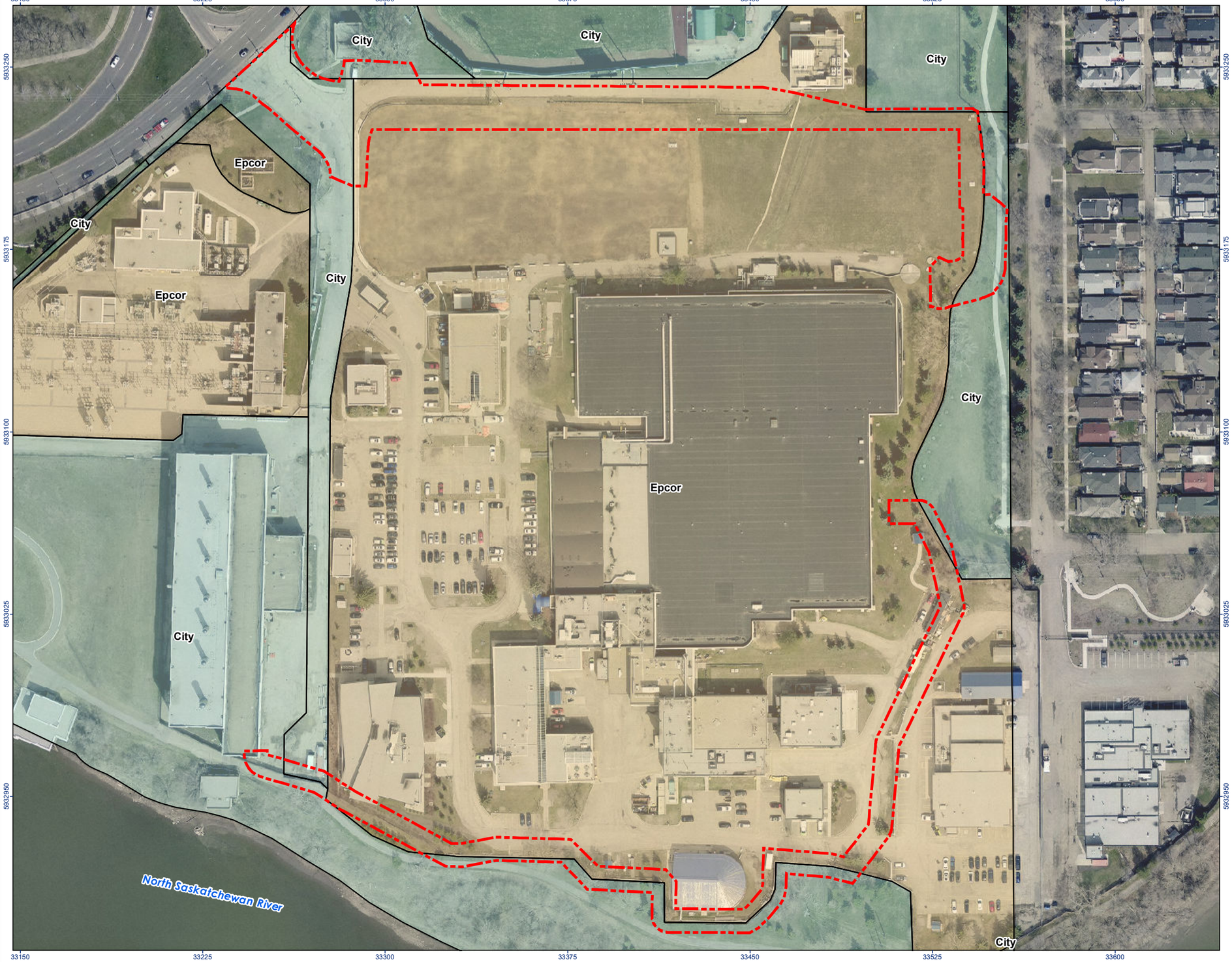
The Rossdale LAA is within key wildlife and key range areas identified by AEP (AEP 2022b), as follows:

- Sharp-Tailed Grouse Survey Area
- Sensitive Raptor Range for bald eagle
- Key Wildlife and Biodiversity Zone (KWBZ)

Based on the habitat present, it is unlikely that sharp-tailed grouse use the available habitat in the LAA. Sharp-tailed grouse are generally associated with native grasslands and agricultural settings (Connelly et al. 2020), which do not occur in the LAA. Bald eagle could nest in the LAA or elsewhere in the NSR valley. There are no known bald eagle nests within the Rossdale LAA.

The LAA and PDA intersects a KWBZ. The KWBZs are areas identified by AEP as having high biodiversity potential and providing ungulate winter range. KWBZ are typically associated with major river valleys that provide the topographic variability and productivity to support high biodiversity and abundant winter browse for ungulates (ESRD 2015).

A query of the FWIMT database search for the LAA returned records for three species: Canadian toad (*Anaxyrus hemiophrys*), peregrine falcon (*Falco peregrinus*), and cougar (Puma concolor) (AEP 2022a).



Stantec

Proposed Construction Limit

Owned by

City

Epcor

N

0 25 50 metres

(At original document size of 11x17)
1:1,600

Notes

1. Coordinate System: NAD 1983 3TM 114

2. Data Sources: Geogratis, ©Department of Natural Resources Canada, All rights reserved.

3. Background: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Project Location
Southwest Edmonton
Alberta

Prepared by MKuhl on 2023-04-06
TR by DRAFT on 2023-04-XX
IR by DRAFT on 2023-04-XX

Client/Project
EPCOR Water Services Inc.
Municipal Environmental Impact Assessment
for EPCOR WTP Flood Mitigation Barriers

110146440

Figure No.
5-4

Title
Mapped Communities within the PDA that require Vegetation Clearing by Ownership: EPCOR Property and COE-Owned Property

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5.1.4.2 Breeding Birds

Thirteen bird species were detected during two breeding bird surveys conducted in June 2022 following provincial *Sensitive Species Inventory Guidelines* (GOA 2013). Breeding bird surveys were completed at 5 stations distributed amongst representative habitats (Figure 5.3). All species detected are secure or exotic/alien species in Alberta (Table 5.7). The species detected are largely commonly-occurring, urban-adapted species that often occupy anthropogenically affected habitats. It is assumed that any of the species present could be using the LAA for breeding. Black-billed magpies were the most abundant species observed, followed by yellow warbler and chipping sparrow. All of the ring-billed gull observations were flyovers. Red-necked grebe (*Podiceps grisegena*) and solitary sandpiper (*Tringa solitaria*) were incidentally observed on the NSR.

Table 5-7 Breeding Birds Detected in the Local Study Area.

Common Name	Scientific Name	Alberta General Status 2020[1]	Wildlife Act or AESSC[2]	COSEWIC [3]	SARA Schedule and Status[3]
Mallard	*Anas platyrhynchos*	Secure	-	-	-
Ring-billed gull*	*Larus delawarensis*	Secure	-	-	-
Rock pigeon	*Columba livia*	Exotic/Alien	-	-	-
Red-eyed vireo	*Vireo olivaceus*	Secure	-	-	-
Black-billed magpie	*Pica hudsonia*	Secure	-	-	-
Black-capped chickadee	*Poecile atricapillus*	Secure	-	-	-
American robin	*Turdus migratorius*	Secure	-	-	-
Yellow warbler	*Setophaga petechia*	Secure	-	-	-
Chipping sparrow	*Spizella passerina*	Secure	-	-	-
Song sparrow	*Melospiza melodia*	Secure	-	-	-
White-throated sparrow	*Zonotrichia albicollis*	Secure	-	-	-
House finch	*Haemorhous mexicanus*	Secure	-	-	-
House sparrow	*Passer domesticus*	Exotic/Alien	-	-	-

Notes:
"-"=not assessed
[1] GOA 2020; [2] Wildlife Regulation or GOA 2017; [3] GOC 2022

5.1.4.3 Terrestrial Mammals

A search of the FWIMT database for the LAA returned a record for cougar (AEP 2022a). Cougars are not commonly observed in Edmonton, and the age and exact location of the sighting are not publicly available via the FWIMT database. However, the record does underscore that the NSR valley provides terrestrial habitat connectivity for medium and large-sized mammal species. Cougars are *Secure* provincially and have no schedule or status under SARA (GOA 2022, GOC 2022).

5.1.4.4 Species of Management Concern

A query of the FWIMT database resulted in two records of species of management concern (Table 5.8). Peregrine falcons are known to nest on buildings or other infrastructure in Edmonton, including the Bell Tower and are well-adapted to urban environments. Canadian toad may breed in the NSR or in wetlands proximate to the NSR valley. Garter snakes (*Thamnophis* spp.) have also been incidentally observed in the LAA near one of the outfall structures below the WTP. All three garter snake species in Alberta have a *Sensitive* status rank.

Table 5-8 FWIMT Query Results for Species of Management Concern Records in the LAA

Common Name	Scientific Name	Alberta General Status 2020[1]	AESSC[2]	Wildlife Act[2]	COSEWIC[3]	SARA Schedule and Status[3]
Canadian toad	*Anaxyrus hemiophrys*	May Be at Risk	Data Deficient	-	Not at Risk	No schedule No Status
Peregrine falcon	*Falco peregrinus*	At Risk	Threatened	Threatened	Not at Risk	Schedule 1 Special Concern

Notes:
"-"=not assessed
[1] GOA 2020; [2] Wildlife Regulation or GOA 2017; [3] GOC 2022

5.1.4.5 Wildlife Habitat Connectivity

The Environmental Sensitivity Project model includes a binary ranking of terrestrial habitat connectivity for coyotes. According to this model, there are identified impediments to terrestrial connectivity for medium-sized mammals associated with the LAA.

Coyotes have been observed within and near the Rossdale WTP. It is likely that coyotes use the multi-use trail to traverse along the NSR valley during non-frozen conditions. The bank slopes down to the NSR below the multi-use trail, and there are some impediments to movement for terrestrial mammals such as riprap on the east side of the Walterdale Bridge, and the two buildings below the multi-use trail.

5.1.5 Viewscape

The viewscape is dominated by the NSR valley, the Walterdale Bridge, and the Rossdale Powerplant on the adjacent bank of the river. There is a popular lookout on the south side of the Walterdale Bridge (The Hill at Walterdale Bridge), where views of the Walterdale Bridge and downtown are sought out and photographed.

The viewscape form the PDA looking towards on the opposite bank of the NSR is dominated by steep banks, coniferous forested stands, and a number of tall apartment buildings along Saskatchewan Drive.

5.1.6 Historical Resources

The LAA and PDA occur within SE-32-52-24 W4M which intersects areas with a Historical Resource Value of 1h, 3a, 4p, and 5a and 5p. These Historical Resource Values indicate various levels of significance reflected by the HRV notation and the suffix letters (Table 5.9). Suffix letters “a”, “c”, “gl”, “h”, and “p” are used following the numerical HRV value to indicate whether the notation refers to archaeological, cultural, geological, historical, or paleontological resources respectively.

Table 5-9 Historic Resource Value Definitions

Historical Resource Value Notation	Definition
1	World Heritage Sites and Historic Resources owned and Protected by the Government of Alberta
2	Municipal or Registered Resource
3	Significant historic resource that will likely require avoidance
4	A historic that will likely require avoidance
5	An area that is believed to contain a historic resource

Fort Edmonton was located on the Rossdale Flats from 1800-1839. It was a district headquarters for the North West Company / Hudson Bay Company for the North Saskatchewan region, and became a large and important post used as an administrative centre, warehouse and storage facility (HBC History Foundation 2016).

The EPCOR-owned portions of the Rossdale Flats are known to overlap Edmonton’s first-known cemetery. This area is believed to be the burial place of approximately 200 people of Cree, Blackfoot, Metis and non-aboriginal origin from 1801-1886 (Alberta Sweetgrass 2001).

The Rossdale Power Plant is recognized nationally as one of Canada’s Historic Places by the Heritage Canada Foundation. It is also designated a Provincial Historic Resource with an HRV of 1h.

The LAA is a known as a historical, archaeological, and paleontological site (ACSW 2022). EPCOR has engaged in several archaeological and indigenous engagement programs in the past to further the knowledge of this site.

A Historical Resources Application (Application Number # 020638918) (HRA Number: 4956-21-0069-001), was submitted to ACSW for the Project. In response, ACSW issued HRA Approval with Conditions on December 13, 2021 requiring an archaeological and paleontological Historical Resources Impact Assessment (HRIA) in the form of a monitoring program to be conducted during Project-related ground disturbance.

5.2 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

5.2.1 Surface Water and Hydrology

5.2.1.1 Potential Environmental Effects

The Project's potential interactions with surface water and hydrology could result in a change in water quality and quantity.

During construction, the removal of vegetation will occur at the same time as topsoil stripping. The temporary removal of vegetation could temporarily increase the volume of water discharged to the NSR, because the vegetation slows overland flows, absorbs water, and allows for more infiltration to the soil to occur. Two gated openings are proposed to be installed on the floodwall to the north of the reservoir cells to maintain the existing drainage pattern to the combined sewers. Another gated opening will be installed on the east side of the floodwall to maintain existing flows to the combined sewer on 101 Street. Slide gates will be installed on all openings to prevent backflow from the river in highwater events. These works will require ground disturbance. Exposed soils due to site preparation and ground disturbance could increase the potential for Project activities to affect surface waters of the NSR through sedimentation and erosion.

Existing drainage patterns will be maintained at the WTP in the post-construction or operations phase. At baseline, runoff at the site is captured in various sewer systems along north and east boundaries. Most south catchments of the Rossdale WTP site directly discharge to the NSR through underground storm sewers and four outfalls. The existing drainage system will be maintained after the construction of the embankments and the storm sewers will be fitted with flow control valves. Discharge to the NSR and surrounding vegetated areas are anticipated to constitute minimal changes to volumes in the operations phase (Appendix E).

The presence of the south embankment will result in two low spots near the Water Excellence building and the Low Lift Pumphouse (See Appendix A). Swales will direct flow from these low spots to nearby catch basins.

The presence of the floodwalls and earthen embankments will not increase the amount of impermeable surface in the LAA, as such the volumes of water discharged to the NSR is not anticipated to change as a result of the Project. The earthen embankments and floodwalls will naturally block existing overland stormwater drainage pathways. Overland flows will directed to the existing storm sewers throughout the WTP that discharge to the river via outfall structures. The existing storm sewers will be equipped with gates to maintain these drainage pathways under normal conditions, while providing a mechanism to prevent water from flowing into the plant during a flood event. A PCSWMM hydrologic model was utilized to simulate storm

events (1:100-year, 4-hour storm event) and assess impacts of those flows on existing site drainage. While ponding is expected to occur during this magnitude of storm event, it was concluded that there would be no impacts to existing plant infrastructure.

Under a 1:50-year river flooding event, the gates will be closed to protect the WTP. Stantec has considered the impacts of closing the gates within the WTP during a concurrent rainfall event and concluded that the ponding can be managed. For both the gates-open and gates-closed scenarios, the expectation is that EPCOR will be actively monitoring ponding elevations within the WTP and will deploy temporary mobile pumping systems to protect infrastructure.

River velocities were modelled during 1:500-year flood levels along the toe of the proposed embankments and floodwalls to determine appropriate design elements for erosion control during major flood events (Appendix B). Modelled velocities and elevations represented a negligible increase relative to baseline in a 1:500-year flood event. The earthen embankments and floodwalls require no additional erosion control measures beyond the establishment of grasses. Detailed design could include the use of Turf Reinforcement matting on the southside of the WTP to increase permissible shear stress resistance at that location.

In the event of a 1:500-year flood, the presence of the proposed flood mitigation earthen embankments and floodwalls are expected to result in negligible effects to water surface elevations, and a reduction in the left bank (Project-side) flow velocities in one section (See Appendix B for further detail). As such, the presence of the Project components during a major flood are not anticipated to adversely affect upstream or downstream river elevations (relative to the Project) or instream velocities (other than a minor reduction of 0.03 m/s at one modelled cross-section) (Appendix B).

Flood risk to the surrounding residential areas was addressed in an open house held with the Rossdale community. Flood flows are in a sub-critical hydraulic profile through this reach and therefore cannot increase flood risk in the Rossdale community, located downstream of the flood mitigation structure. Through this analysis, it was determined that no adverse effects on the Rossdale Community are expected.

5.2.1.2 Mitigation Measures

Standard industry practices and avoidance measures, along with Project-specific mitigation measures will be implemented during construction of the Project to reduce or eliminate potential Project-related effects on water quality. See Table 5.10 for mitigation measures to reduce potential effects to surface water and hydrology.

Table 5-10 Mitigation Measures to Reduce Potential Project-Related Effects to Surface Water and Hydrology

Potential Effect	Effect Pathway	Proposed Mitigation
Change in water quality and quantity	• Increased erosion potential during construction	• Reduce the extent of disturbance to existing vegetation • Limit the time of exposure of un-vegetated or exposed soils • Re-vegetate disturbed areas as soon as conditions allow • Develop and implement an ESC plan • Monitor ESC measures during construction and rectify deficiencies as soon as possible (COE 2005a)

Table 5-10 Mitigation Measures to Reduce Potential Project-Related Effects to Surface Water and Hydrology

Potential Effect	Effect Pathway	Proposed Mitigation
		• Implement construction recommendations outlined in the storm water management plan – install silt fences along the downstream side of the PDA – Ecological design to include use of biodegradable ESC materials where feasible – Where extended lengths of silt fencing may be required, ecological design to include consideration for strategic openings or tiered installation to facilitate wildlife movements through PDA – provide construction entrance feature to minimize the transport of sediment on vehicles and equipment – direct runoff through swales and erosion control berms such that untreated runoff is not discharged from the PDA – install temporary rock check dams, straw swale barriers and/or filter cloth barriers in swales (where appropriate) – stabilize all disturbed areas not subject to construction activities within 30 days • Conduct semi-annual inspections for the first two years following construction (identifying and addressing bare soil, erosive gullies, isolated pooling and sediment build-up) • Complete inspection and maintenance leading up to and following large precipitation events to ensure ESC function
	• Increased erosion potential during operation at point source flows due to surface water drainage	• A PCSWMM hydrologic model used to determine appropriate culvert size (1:100-year flood, 4-hour storm event). See Appendix B • Erosion protection measures at the culvert discharge locations will consist of riprap and will follow Alberta Transportation standards

5.2.1.3 Potential Residual Effects

Project mitigation measures to control surface water runoff during construction include the implementation of both an ESC plan and stormwater management plan. Additionally, the implementation of construction and post-construction monitoring are expected to mitigate potential Project-related effects due to erosion. Re-vegetating exposed soils as soon as practical after construction is complete will reduce runoff volumes and velocities and allow the runoff to infiltrate into the underlying soil.

Project design elements include appropriate culvert-sizing and the application of riprap at culvert discharge locations according to Alberta Transportation standards. The measures are anticipated to reduce potential point source erosion during operation (See Appendix B for further discussion). Erosion potential upstream and downstream of the Project due to the presence of the flood mitigation walls during a 1:500-year flood elevation was modelled to guide preliminary design choices. This modelling exercise indicates that the presence of the flood mitigation structure is unlikely to affect NSR water elevations or velocities during a major flood event (1:500-year elevation).

Residual effects resulting from Project activities include an increased surface water runoff volume and flow within the LAA. Surface water quality is expected to be appropriately managed through the ESC and Stormwater Management Plans. With the implementation of mitigation measures, potential residual effects on surface water and hydrology will be adverse, limited to the LAA, minor in magnitude, occurring at multiple irregular events, long term in duration, and reversible.

5.2.2 Geology, Geomorphology, and Soils

5.2.2.1 Potential Environmental Effects

The Project's potential interactions with soils include a change in soil quality and quantity during construction resulting from soil loss through wind and/or water erosion following vegetation removal and soil stripping; compaction, rutting or loss of soil structure through vehicle or equipment movement; admixing during soil stripping activities; and contamination from fuel or chemical spills (COE 2005a).

The presence of the Project is not anticipated to result in geomorphological changes to surrounding areas in the event of a major flood event (1:500-year level). See Appendix B for further detail.

Project-related interactions with geology and geomorphology are not anticipated.

No interactions with soils are anticipated during operations after vegetation is re-established.

5.2.2.2 Mitigation Measures

Standard industry practices and avoidance measures, along with Project-specific mitigation measures will be implemented during construction of the Project to reduce or eliminate potential Project effects on soil quality and quantity. See Table 5.11 for mitigation measures to reduce potential Project-related effects to soils.

Table 5-11 Mitigation Measures to Reduce Potential Project-Related Effects to Soils

Potential Effect	Effect Pathway	Mitigation Measures
Change in soil quality and quantity	Soil loss and changes to soil quality through admixing during soil stripping/replacement, wind and/or water erosion following vegetation removal and soil stripping	• Develop and implement a stormwater management plan during construction – install silt fences along the downstream side of the PDA – Ecological design to include use of biodegradable ESC materials where feasible – Where extended lengths of silt fence may be required, ecological design to include consideration for strategic openings or tiered installation to facilitate wildlife movements through the PDA – provide construction entrance feature to minimize the transport of sediment on vehicles and equipment – direct runoff through swales and erosion control berms such that untreated runoff is not discharged from the PDA – install temporary rock check dams, straw swale barriers and/or filter cloth barriers in swales (where appropriate) – stabilize all disturbed areas not subject to construction activities within 30 days

Table 5-11 Mitigation Measures to Reduce Potential Project-Related Effects to Soils

Potential Effect	Effect Pathway	Mitigation Measures
		• Limit disturbance to existing vegetation (COE 2005a) • Limit the time exposure of un-vegetated/exposed soils (COE 2005a) • Strip topsoil and subsoil separately, store topsoil and subsoil in separate stockpiles at least one metre apart • Re-vegetate disturbed areas as soon as conditions allow • Topsoil salvage and/or replacement will be avoided during heavy precipitation or extremely windy conditions • Develop and implement an ESC plan (COE 2005a) • Monitor ESC measures during construction and rectify deficiencies as soon as possible (COE 2005a) • Complete inspection and maintenance leading up to and following large precipitation events to ensure ESC function
	Compaction, rutting or loss of soil structure through vehicle and equipment movement	• In the event of adverse weather that could result in rutting and/or compaction, mitigation measures (i.e., limiting vehicle traffic, using tracked equipment or stripping topsoil) will be considered. If mitigation measures fail, Project activities may be suspended until adverse weather conditions abate • Traffic will be confined to workspace areas, access routes will be identified and marked by surveyors in order to reduce area of compaction • Working during and immediately after intense rainfall events or spring thaw when soils are wet will be avoided to the extent practical in order to reduce soil compaction • Installation of plywood sheets or rig matting (if required)
	Contamination from fuel or chemical spills	• Road vehicles will be refueled and maintained off site • Construction equipment will be inspected at the beginning and end of each shift, and any leaks noted will be repaired immediately upon detection or equipment will be removed from site • Drip trays will be placed under equipment overnight • Emergency response materials will be maintained on site and construction equipment will be equipped with a fire extinguisher, spill kits and will be operated by personnel trained in their use

5.2.2.3 Potential Residual Effects

The implementation of mitigation measures is expected to prevent measurable Project-related changes to soil quality and quantity. These measures include BMPs for soil handling procedures, supervision of ground disturbance, and the implementation of an ESC plan and a storm water management plan. Mitigation measures to limit risk of contamination from fuel or chemical spills are standard and known to be effective. In the event of an unplanned release of fuel or chemicals, all impacted areas will be remediated to applicable guidelines (e.g., Alberta Tier 1 Soil Remediation Guidelines, CCME Soil Quality Guidelines for the Protection of Environmental and Human Health).

With the implementation of mitigation measures, Project-related residual effects on soils will be neutral, limited to the PDA, negligible in magnitude, occurring at a continuous (compaction and erosion during construction) and/or a single event (potential spills or releases) frequency, short term in duration, and reversible following post-construction remediation of the workspace.

5.2.3 Vegetation Species and Communities

5.2.3.1 Potential Environmental Effects

Site preparation activities (i.e., vegetation removal and soil stripping) will result in adverse effects on vegetation through direct loss or alteration of plant communities or the potential introduction or spread of weeds listed in the *Weed Control Act*. The Project's interactions with vegetation species and communities include change in species composition and community diversity. Minor amounts of native vegetation communities be lost or altered as a result of the Project implementation (<0.001 ha of Aspen Woodland Alliance). Some tree removal may be required in land units mapped as green space, residential, or industrial development. Following restoration and revegetation manicured grass will be replaced with a native grass mix (see Appendix B) that will be maintained through mowing and weed control over the life of the Project.

The floodwall and earthen embankments will largely be located within the plant site in existing disturbance areas; however, due to space constraints the infrastructure will need to be constructed in COE-owned greenspace at certain locations where existing buildings preclude siting on existing disturbance (See IFRA drawings in Appendix A).

5.2.3.2 Mitigation Measures

Standard industry practices and avoidance measures, along with Project-specific mitigation measures will be implemented during the construction of the Project to reduce or avoid potential effects to vegetation. See Table 5.12 for mitigation measures to reduce potential Project-related effects to vegetation species and communities.

Table 5-12 Mitigation Measures to Reduce Potential Project-Related Effects to Vegetation Species and Communities

Potential Effect	Effect Pathway	Mitigation Measures
Change in species composition and community diversity	• Direct loss or alteration of plant communities and diversity • Introduction or spread of weeds listed in the *Weed Control Act* (i.e., exotic vegetation invasion)	• Reduce clearing of native plant communities, where possible • Ensure all equipment arrives on-site clean and free of soil or vegetative debris • Ensure all equipment remains within the PDA and designated travel lanes • Avoid grading except where required for safe construction of the Project • Reseed disturbed area using an approved native seed mix • Monitor topsoil piles for weed growth during construction and implement corrective measures

Table 5-12 Mitigation Measures to Reduce Potential Project-Related Effects to Vegetation Species and Communities

Potential Effect	Effect Pathway	Mitigation Measures
		(i.e., spraying, mowing or hand pulling) to avoid the spread of weeds, as required • Weed control will be conducted in accordance with the Alberta *Weed Control Act* and *Regulations* • If conducting herbicide weed control application within 100 m of the NSR, use hand application only • Use rig mats for equipment and laydown areas if going off trail within 10 m of a natural stand, or if equipment is wider than the current trail (3 m).

5.2.3.3 Potential Residual Effects

With the implementation of mitigation measures, the residual effects on vegetation and species communities are predicted to be adverse or neutral in direction, and minor in magnitude. Residual effects will be limited to the PDA, will occur once, will be long term and are reversible. The use of an approved native seed mix throughout the PDA may improve species composition.

To further mitigate the residual effects of the Project, EPCOR has begun the development of a vegetation management plan to improve overall ecological structure and function and to restore habitat at the WTPs. The plan will map current vegetation at each site and strive to understand shared values and Indigenous perspectives. Although still in the development phase, the preliminary priorities of the vegetation management plan are to naturalize and revegetate each site with a mixture of successional stages representative of Aspen Parkland Ecoregion vegetation.

5.2.4 Wildlife and Wildlife Habitat

5.2.4.1 Potential Environmental Effects

The Project's potential interactions with wildlife species and habitat include change in habitat, change in movement, and change in mortality risk.

Construction activities (e.g., vegetation removal, ground disturbance) will result in temporary loss wildlife habitat. Areas within the construction footprint will not be available for wildlife during the construction period. A small area (<0.001 ha) of native Aspen Woodland Alliance community will be permanently changed from a woodland community to a seeded native grass community. Sensory disturbance associated with increased human presence and heavy equipment use will affect habitat use in proximity to the activities while they are occurring.

The extent to which terrestrial wildlife move along the north-side areas of the NSR within the LAA is not quantified, but coyotes have been observed in the LAA and PDA, and it is likely that the multi-use trail and forested areas of the LAA provide movement corridors for medium-sized terrestrial mammals despite its narrow and fragmented condition at baseline. Construction activities will result in a temporary reduction in the width of the corridor available for terrestrial wildlife movement. This effect is likely to be most pronounced during active construction during non-frozen conditions when sensory disturbance and human presence may discourage terrestrial wildlife movements between the PDA and the NSR. The Project will result in a long-term reduction of security cover associated with the loss of some treed habitat and maintenance of the root free zone. Post-construction, after the establishment of native grasses, wildlife movements are anticipated to return to baseline conditions, because wildlife that use this corridor are likely habituated to a relatively narrow corridor that is affected by human presence.

During construction, vehicles and other equipment have the potential to result in an increased mortality risk for wildlife in the PDA. Vegetation removal may result in the physical destruction of key habitat features (e.g., nests, dens, roosts, hibernacula). Equipment may also result in the direct mortality of small, less mobile species or individuals (e.g., amphibians, juvenile birds).

5.2.4.2 Mitigation Measures

Standard industry practices and avoidance measures along with Project-specific mitigation measures will be implemented during construction of the Project to reduce or eliminate Project-related effects on wildlife habitat, wildlife movements, and mortality risk.

See Table 5.13 for mitigation measures to reduce potential Project-related effects to wildlife habitat, movement, and risk of mortality.

Table 5-13 Mitigation Measures to Reduce Potential Project-Related Effects to Wildlife and Wildlife Habitat

Potential Effect	Effect Pathway	Proposed Mitigation
Change in wildlife habitat availability and suitability	• Direct loss or alteration of wildlife habitat due to vegetation removal and ground disturbance • Indirect loss or reduced effectiveness of wildlife habitat through sensory disturbance due to human activity and heavy equipment use	• Restrict all construction activities to the approved Project boundaries and do not clear vegetation beyond Project boundaries • Maintain noise abatement equipment on machinery in good working order to reduce potential sensory disturbance to wildlife • Adhere to all recommended setbacks and timing restrictions for identified wildlife habitat features (e.g., nests, dens) • Restore vegetation to approved native seed mix as soon as practical
Change in wildlife movement	• Direct loss or alteration of wildlife corridor due to vegetation removal, ground disturbance, and fencing	• Restrict all construction activities to the approved Project boundaries and do not clear vegetation beyond Project boundaries • Schedule construction activities outside of the RAP for KWBZs (Jan 15 – April 30) or discuss mitigation strategies with a regional AEP biologist

Table 5-13 Mitigation Measures to Reduce Potential Project-Related Effects to Wildlife and Wildlife Habitat

Potential Effect	Effect Pathway	Proposed Mitigation
	• Indirect loss or reduced effectiveness of wildlife corridor through sensory disturbance due to human activity and vehicle traffic	• Maintain noise abatement equipment on machinery in good working order to reduce potential sensory disturbance to wildlife • Adhere to all recommended setbacks and timing restrictions for wildlife habitat features (e.g., nests, dens)
Change in wildlife mortality risk	• Direct mortality from ground disturbance and vegetation removal (e.g., destruction of nests or dens) • Direct mortality from collisions with Project vehicles and equipment	• Schedule the commencement of construction activities outside of the RAP for nesting migratory birds for Nesting Zone B4 (April 10 – August 31; GOC 2018), the general raptor nesting period (March 15 to July 15) (GOA 2021). If avoidance of the RAP is not possible, conduct nest searches and implement appropriate setbacks and/or mitigation measures to reduce the risk of incidental take and implement bird management plans, as required. If nest sweeps are required due to Project timing, results will be documented. • If tree removals are scheduled between February 1 and March 15, conduct owl nest searches to reduce potential destruction of wildlife features. • All construction personnel will receive environmental orientation at project start up, including education on avoiding the harassment and feeding of wildlife, mitigations to reduce potential for wildlife mortality, and other key environmental concerns. • Prior to construction at any time of year, nest surveys for bald eagles will be conducted within 1 km of the PDA. If nests are identified, a mitigation and management plan will be developed in consultation with a regional AEP biologist • Schedule construction activities outside of the RAP for KWBZs (Jan 15 – April 30) where this management zone overlaps the PDA, develop a mitigation plan to reduce effects to wildlife in the KWBZ in consultation with a regional AEP biologist • During construction vehicles and heavy equipment will be limited to established roadways within the WTP and the approved PDA and low speeds will be maintained • Monitor the construction area for trapped wildlife. Should any wildlife be identified, the Construction Manager will be contacted. In consultation with a professional wildlife biologist and AEP, appropriate corrective actions will be implemented • Keep construction site clear of garbage and food waste on a daily basis to reduce interactions with wildlife

5.2.4.3 Potential Residual Effects

Change in Wildlife Habitat

During construction, vegetation removal and ground disturbance will result in the direct and indirect loss of a small amount of low value wildlife habitat (i.e., green space and residential). Project implementation will result the loss of some mature trees and a change from non-native manicured grass to native grasses. Wildlife may avoid areas adjacent to the PDA during construction due to noise and light associated with construction activities. The extent of potential avoidance outside of the PDA will vary by wildlife species.

Disturbance to wildlife habitat during construction activities will largely be avoided by siting the Project within the Rossdale WTP lands in areas of existing industrial development and scheduling construction activities to occur outside of sensitive wildlife periods (e.g., primary nesting periods for migratory birds and KWBZ RAPs).

During construction, potential residual effects on wildlife habitat are predicted to be adverse as there will some alteration of habitat. The magnitude of the potential effect is predicted to be minor because it is unlikely to have a measurable effect on wildlife abundance in the LAA. Although most changes in habitat will be limited to the PDA, sensory disturbance will extend into portions of the LAA, which may result in temporary local shifts in wildlife distribution. Potential effects on wildlife from direct habitat loss will occur from a single event (i.e., during vegetation removal and construction) and will extend beyond the operations phase. Potential indirect effects from sensory disturbance during construction will be short-term. Overall, the change in habitat is considered reversible because the residual loss or alteration of habitat can be reversed through habitat reclamation following decommissioning. The use of an approved native seed mix throughout the PDA may improve species composition in the mapped green space polygons (Figure 5.2).

Mowing and weed management in the operations phase of the Project may result in sensory disturbance for local wildlife. This effect is expected to be unmeasurable and negligible.

Change in Wildlife Movement

During construction, noise, lights, and human activity may result in changes to movement around the PDA. There will be a small reduction in the width of the wildlife corridor along the multi-use trail on the NSR-side of the Rossdale WTP. The PDA extends onto the multi-use trail on two locations on the south side of the Project, near the Rossdale Power Plant and Water Excellence Building. This reduction will persist during the construction period but will be reclaimed and revegetated with an approved native seed mix during site restoration and revegetation.

Sensory disturbance in adjacent wildlife habitats may result in wildlife temporarily avoiding areas adjacent to the PDA during construction. The extent of potential avoidance outside of the PDA will vary by wildlife species. Wildlife are anticipated to habituate to the change in habitat over time and normal wildlife movement will resume during operations.

Although most changes in wildlife movement will be limited to the PDA, sensory disturbance will extend into the LAA, which may result in temporary local shifts in wildlife distribution. The effect is anticipated to adverse in direction and minor in magnitude. Potential effects on wildlife movement will occur from a single event (i.e., construction) and will extend beyond the operations phase. Potential indirect effects from sensory disturbance during construction will be short-term.

Change in Mortality Risk

Vegetation removal and site grading, as well as increased human activity (i.e., use of heavy equipment) could result in increased mortality risk to wildlife in the LAA. Wildlife mortality (e.g., for ground nesting birds or amphibians and reptiles) due to ground disturbance and vegetation clearing might occur during site preparation. All construction activities will be within the fenced PDA which will limit the potential for adverse effects to wildlife mortality risk for medium and large bodied wildlife.

Adherence to migratory bird, owl, and raptor RAPs will reduce mortality risk to birds during construction. Where this is not possible, pre-construction surveys (i.e., nest searches) will be conducted to reduce mortality risk to birds.

The residual effect of construction-related change to mortality risk is considered minor because the Project is unlikely to have a measurable effect on wildlife abundance in the LAA. The increase in mortality is largely limited to the PDA and is short-term (i.e., construction phase only).

With the implementation of mitigation measures, the residual effects on change in habitat are predicted to be adverse in direction, and minor in magnitude. Residual effects will be limited to the PDA, will occur once, will be short term and are reversible.

5.2.5 Viewscape

5.2.5.1 Potential Environmental Effects

The Project's potential interactions with the viewscape includes the change in visual quality for adjacent neighborhoods and other users of the LAA. The Project's earthen embankments and floodwalls will largely be low and unobtrusive. The use of demountable barriers was incorporated into Project design to reduce adverse visual effects of the Project at a key location near the Rossdale Power Plant.

During construction, the visual quality of the LAA may be negatively affected by the loss of vegetation, presence of machinery and construction vehicles, presence of construction materials, and temporary construction fencing, which may be visible from unobstructed observation points within adjacent communities (views from the Walterdale Bridge or Walterdale Hill Viewpoint).

Upon completion of construction, some may consider the visual quality of the LAA to be negatively impacted by the loss of vegetation and the flood mitigation structures themselves. Renderings were developed based on observation points where the flood mitigation at the WTP may be visible and shared with the public for feedback. EPCOR will incorporate public feedback when selecting floodwall materials and finishes in detailed design (See Appendix B for examples of finishes).

5.2.5.2 Mitigation Measures

Standard industry practices and avoidance measures, along with Project-specific mitigation measures will be implemented during construction of the Project to reduce or eliminate potential Project effects on the alteration to the viewscape. See Table 5.14 for mitigation measures to reduce Project-related potential effects to the viewscape.

Table 5-14 Mitigation Measures to Reduce Potential Project-Related Effects to Viewscape

Potential Effect	Effect Pathway	Proposed Mitigation
Change in visual quality	Direct alteration to viewscape in the NSR valley	• Disturbances to the PDA will be limited as much as possible and will be delineated prior to construction to reduce the potential accidental removal of vegetation • Construction activities should be completed within the proposed timeframe and the impacted areas restored and revegetated as soon as possible • All temporary staging areas and fencing will be removed upon completion of construction • Floodwall textures and finishes will be considered during detailed design to enhance the Project aesthetics from observation points and incorporate feedback from consultation

5.2.5.3 Potential Residual Effects

In consideration of viewscapes from current observations points as well as those from potential future trails near the Project, EPCOR will enhance the aesthetics and overall viewscape through floodwall design and other landscaping during detailed design.

With the implementation of mitigation measures, potential effects on the viewscape are predicted to be adverse in direction, minor in magnitude, reversible, and limited to the LAA (or just outside of the LAA) in geographic extent. The duration of the potential effects will persist during construction and operation and are considered long-term.

5.2.6 Historical Resources

5.2.6.1 Potential Environmental Effects

Project activities that involve surface or subsurface ground disturbance have the potential to interact with historical resources which could result in the direct loss or damage to resources of cultural, archaeological, historical and/or paleontological significance.

The Proposed South Floodwall #1 ties into the Rossdale Power Plant at the western extent of the PDA (Appendix A). Alterations to the existing buried utilities and waste stream and combined sewers have the potential to interact with historical resources.

5.2.6.2 Mitigation Measures

Standard industry practices and avoidance measures, along with Project-specific mitigation measures prescribed by Alberta Culture and Status of Women (ACSW) will be implemented during construction to reduce or eliminate potential Project-related effects related to the potential loss of historical resources. See Table 5.15 for proposed mitigation measures for reducing potential effects to heritage resources.

Table 5-15 Mitigation Measures to Reduce Potential Project-Related Effects to Heritage Resources

Potential Effect	Effect Pathway	Proposed Mitigation
Disturbance or destruction of part or all of a historic resource	Removal or disturbance of historical resource through vegetation removal or surface/subsurface disturbance	• Follow HRA requirements for the Project • All construction works will comply with any conditions identified in the *Historic Resources Act* authorization • In the event that historical resources are encountered during construction, activities will be halted and ACSW will be notified

5.2.6.3 Potential Residual Effects

Project-related effects on heritage resources are mitigated to the standards set by the regulatory agency (ACSW). EPCOR will implement the mitigation measures prescribed by ACSW. Residual environmental effects are not anticipated.

6.0 MONITORING

Monitoring during Project construction will be completed following the development of an ESC plan to determine if proposed mitigation measures outlined in this MEIA are followed and effective. Soil handling and temporary storage during the construction phase of the Project will also be monitored to assess the effectiveness of and adapt mitigation measures to protect soil quality and quantity. Additional construction monitoring will include monitoring for trapped wildlife within the fenced Project construction area.

HRA clearance requirements include the presence of qualified monitors during ground disturbance activities. EPCOR will engage Indigenous communities to determine if Indigenous monitors are appropriate during construction activities.

Semi-annual inspections will be conducted for the first two years following construction with a focus on identifying bare soil, vegetation establishment, the formation of erosive gullies, isolated pooling and sediment build-up.

7.0 SUMMARY AND CONCLUSION

The Project will include the construction of flood mitigation works designed to mitigate the risk of overland flooding in a 1:500-year event at the E.L. Smith and Rossdale WTPs. These WTPs provide clean drinking water to Edmonton and several other regional municipalities in Alberta. Both WTPs are critical infrastructure that are located on the lower terrace of the NSR valley and may be vulnerable to overland flooding.

The NSR valley is an important biophysical and cultural feature of the City of Edmonton. Bylaw 7188 requires an environmental assessment for development activities within the *North Saskatchewan River Valley Area Redevelopment Plan* boundaries.

The residual effects (i.e., the effects remaining after the implementation of mitigation measures) of the construction and operation of the flood mitigation structures at both WTP on VCs are summarized in Table 7.1 and Table 7.2.

Overall, the adverse residual effects associated with the Project are mostly limited to minor magnitude changes to vegetation and wildlife habitat and wildlife movements. These effects were reduced by Project design considerations including siting the majority of the flood mitigation structures on existing disturbance. The USACE (2000) requirements to maintain a root free zone will result in some areas of treed or shrub habitat being maintained as a native grass cover in the long-term. Within the existing corridors between the structures and the NSR, the implementation of the vegetation management plan and the preliminary planting plan is anticipated to reduce adverse Project-related effects to terrestrial wildlife movements once plantings are established depending on the species and time of year.

Construction activities will require ground disturbance and soil handling which will result in the potential for sedimentation and erosion. Standard practices and the implementation of an ESC plan and stormwater management plan are anticipated to adequately address this effect. Minor magnitude adverse residual effects are anticipated during the construction phase.

Table 7-1 Summary of Residual Effects Characterization for E.L. Smith WTP

Valued Component	Residual Effects	Effect Pathway	Direction	Magnitude	Duration	Frequency	Spatial Extent	Reversibility
Surface Water and Hydrology	Change in water quality and water quantity	Increased erosion potential during construction	Adverse	Minor	Short-term	Multiple Irregular-	PDA	Reversible
		Increased erosion potential during operation at point source flows due to surface water drainage	Adverse	Minor	Long-term	Multiple Irregular-	LAA	Reversible
		Increased erosion potential due to increased surface water elevation and river velocities during a major flood event caused by the presence of the flood mitigation structures	Neutral	Negligible	Long-term	Multiple Irregular-	LAA	Reversible
Geology, Geomorphology, and Soils	Change in soil quality and quantity	Soil loss and changes to soil quality through admixing during soil stripping/replacement, wind and/or water erosion following vegetation removal and soil stripping	Neutral	Negligible	Short-term	Continuous	PDA	Reversible
		Compaction, rutting or loss of soil structure through vehicle and equipment movement	Neutral	Negligible	Short-term	Continuous	PDA	Reversible
		Contamination from fuel or chemical spills	Neutral	Negligible	Short-term	Multiple Irregular-	PDA	Reversible
Vegetation Species and Communities	Change in species composition and community diversity	Direct loss or alteration of plant communities and diversity	Adverse	Minor	Long-term	Continuous	PDA	Reversible
		Introduction or spread of weeds listed in the *Weed Control Act* (i.e., exotic vegetation invasion)	Adverse	Minor	Long-term	Continuous	PDA	Reversible
Wildlife and Wildlife Habitat	Change in habitat	Direct loss or alteration of wildlife habitat due to vegetation removal and ground disturbance Indirect loss or reduced effectiveness of wildlife habitat through sensory disturbance due to human activity and heavy equipment use	Adverse	Minor	Long-term	Single Event	LAA	Reversible
	Change in wildlife movement	Direct loss or alteration of wildlife corridor due to vegetation removal, ground disturbance, and fencing Indirect loss or reduced effectiveness of wildlife corridor through sensory disturbance due to human activity and heavy equipment use	Adverse	Minor	Long-term	Continuous	LAA	Reversible

Table 7-1 Summary of Residual Effects Characterization for E.L. Smith WTP

Valued Component	Residual Effects	Effect Pathway	Direction	Magnitude	Duration	Frequency	Spatial Extent	Reversibility
	Change in wildlife mortality risk	Direct mortality from ground disturbance and vegetation removal (e.g., destruction of nests or dens Direct mortality from collisions with Project vehicles and equipment	Adverse	Minor	Short-term	Multiple Irregular	PDA	Reversible
Viewscape	Change in visual quality	Direct alteration to viewscape in the NSR valley	Adverse	Minor	Long-term	Continuous	LAA	Reversible
Historical Resources	Disturbance of destruction of part or all of a historic resource	Removal or disturbance of historical resource through vegetation removal or surface/subsurface disturbance	Neutral	Negligible	-	-	-	-

Table 7-2 Summary of Residual Effects Characterization for Rossdale WTP

Valued Component	Residual Effects	Effect Pathway	Direction	Magnitude	Duration	Frequency	Spatial Extent	Reversibility
Surface Water and Hydrology	Change in water quality and water quantity	Increased erosion potential during construction	Adverse	Minor	Short-term	Multiple Irregular-	PDA	Reversible
		Increased erosion potential during operation at point source flows due to surface water drainage	Adverse	Minor	Long-term	Multiple Irregular-	LAA	Reversible
		Increased erosion potential due to increased surface water elevation and river velocities during a major flood event caused by the presence of the flood mitigation structures	Neutral	Negligible	Long-term	Multiple Irregular-	LAA	Reversible
Geology, Geomorphology, and Soils	Change in soil quality and quantity	Soil loss and changes to soil quality through admixing during soil stripping/replacement, wind and/or water erosion following vegetation removal and soil stripping	Neutral	Negligible	Short-term	Continuous	PDA	Reversible
		Compaction, rutting or loss of soil structure through vehicle and equipment movement	Neutral	Negligible	Short-term	Continuous	PDA	Reversible
		Contamination from fuel or chemical spills	Neutral	Negligible	Short-term	Multiple Irregular-	PDA	Reversible

Table 7-2 Summary of Residual Effects Characterization for Rossdale WTP

Valued Component	Residual Effects	Effect Pathway	Direction	Magnitude	Duration	Frequency	Spatial Extent	Reversibility
Vegetation Species and Communities	Change in species composition and community diversity	Direct loss or alteration of plant communities and diversity	Adverse	Minor	Long-term	Continuous	PDA	Reversible
		Introduction or spread of weeds listed in the *Weed Control Act* (i.e., exotic vegetation invasion)	Adverse	Minor	Long-term	Continuous	PDA	Reversible
Wildlife and Wildlife Habitat	Change in habitat	Direct loss or alteration of wildlife habitat due to vegetation removal and ground disturbance Indirect loss or reduced effectiveness of wildlife habitat through sensory disturbance due to human activity and heavy equipment use	Adverse	Minor	Long-term	Single Event	LAA	Reversible
	Change in wildlife movement	Direct loss or alteration of wildlife corridor due to vegetation removal, ground disturbance, and fencing Indirect loss or reduced effectiveness of wildlife corridor through sensory disturbance due to human activity and heavy equipment use	Adverse	Minor	Long-term	Continuous	LAA	Reversible
	Change in wildlife mortality risk	Direct mortality from ground disturbance and vegetation removal (e.g., destruction of nests or dens) Direct mortality from collisions with Project vehicles and equipment	Adverse	Minor	Short-term	Multiple Irregular	PDA	Reversible
Viewscape	Change in visual quality	Direct alteration to viewscape in the NSR valley	Adverse	Minor	Long-term	Continuous	LAA	Reversible
Historical Resources	Disturbance of destruction of part or all of a historic resource	Removal or disturbance of historical resource through vegetation removal or surface/subsurface disturbance	Neutral	Negligible	-	-	-	-

8.0 LIMITATIONS AND QUALIFICATIONS

In conducting the investigation and rendering our conclusions, Stantec gives the benefit of its best judgment based on its experience and in accordance with generally accepted professional standards for this type of investigation. This report was submitted with the best information to date and on the information provided. The conclusions made within this report are a professional opinion, not a certification of the PDA's environmental condition, and no other warranty, expressed or implied, is made. This report has been prepared for the exclusive use of EPCOR for the purposes of assessing the potential environmental effects on the PDA of the proposed Project and recommending measures to mitigate potential effects. Stantec accepts no responsibility for damages, if any, suffered by any other third party as a result of decisions made or actions based on this report. Our conclusions are limited by the following:

- Vegetation and wildlife surveys were completed during the dates specified and conditions may vary outside those times
- Field surveys to verify the presence of species listed within ACIMS and/or FWMIS databases were conducted on the dates specified and presence or absence of said species outside of the survey dates cannot be verified
- Some of the information contained within this report was provided by agencies and organizations external to Stantec. While Stantec cannot guarantee the information provided by external parties, this information has been assumed to be correct
- The information contained within this report is based on the design available at the time of report preparation. Design drawings may continue to be modified and added as the detailed design process continues but are intended to not depart significantly from the information presented in this report. Should significant changes to the drawings be made in the future, an amendment to this report may be required
- The investigation was limited to those parameters specifically outlined in this report

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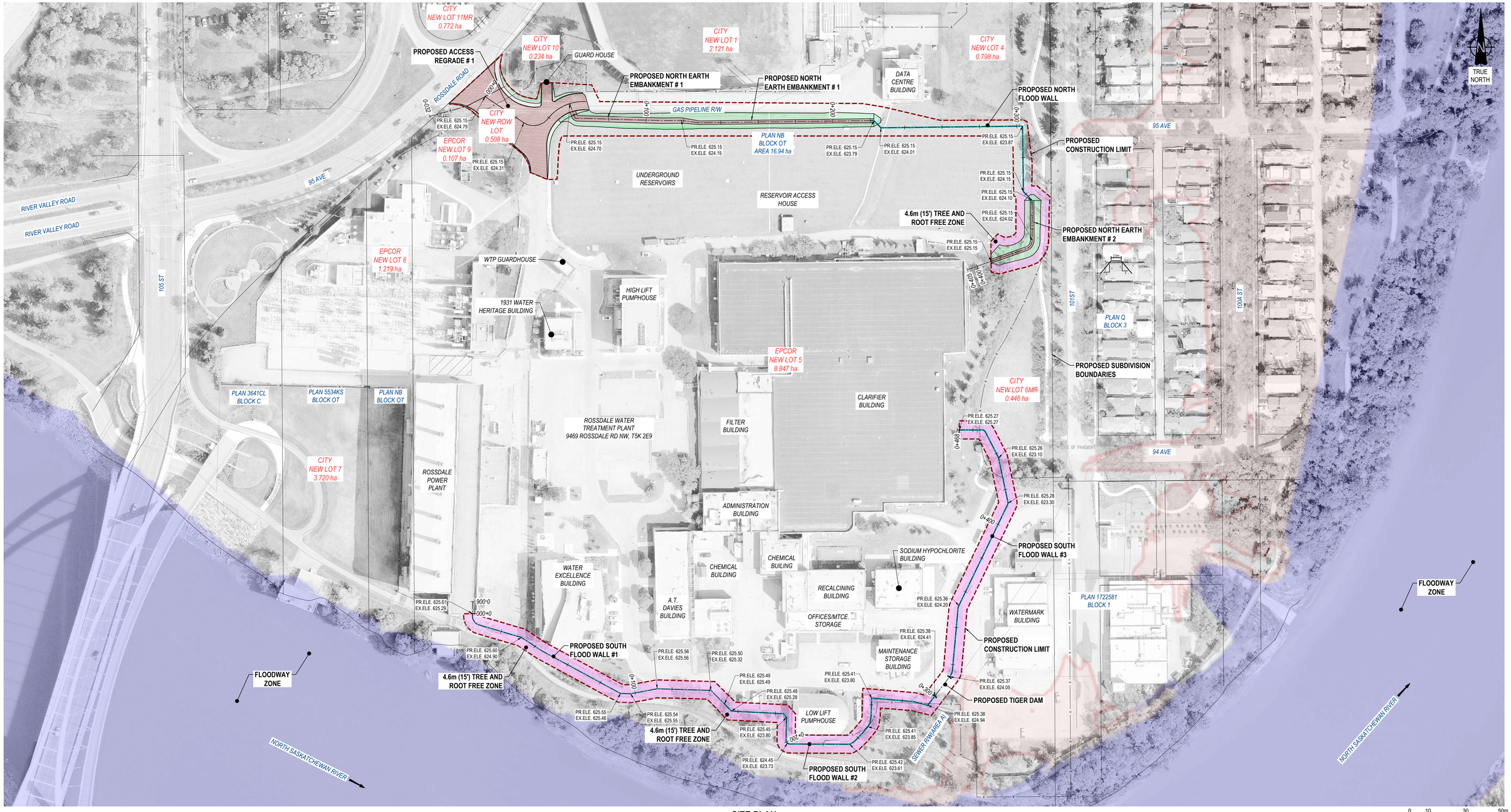
APPENDIX A

Figures and Drawings



SITE PLAN
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REFERENCE DRAWING DETAILS | **REVISION HISTORY**

PERMIT STAMP

NOT FOR CONSTRUCTION

ENGINEERING STAMP

CONSULTANT: Stantec

SCALE:	AS NOTED	DATE	
DRAWN BY:	BG	NOV/19	
DESIGNED BY:	BG	NOV/19	
CHECKED BY:	MB	NOV/19	
APPROVED BY:	HA	NOV/19	
ENGINEER:			
PROJECT MANAGER:			

SITE: ROSSDALE | FUNCTIONAL AREA: PLANT WIDE

PROJECT NAME: EPCOR WTP FLOOD MITIGATION EMBANKMENTS PROJECT

DRAWING TITLE: CIVIL
SITE PLAN
PROPOSED EMBANKMENT AND RETAINING WALL LOCATIONS
ROSSDALE

EPCOR DRAWING NO.	EPCOR PROJECT NO.	CONSULTANT DRAWING NO.	CONSULTANT PROJECT NO.	REV.	SHT.
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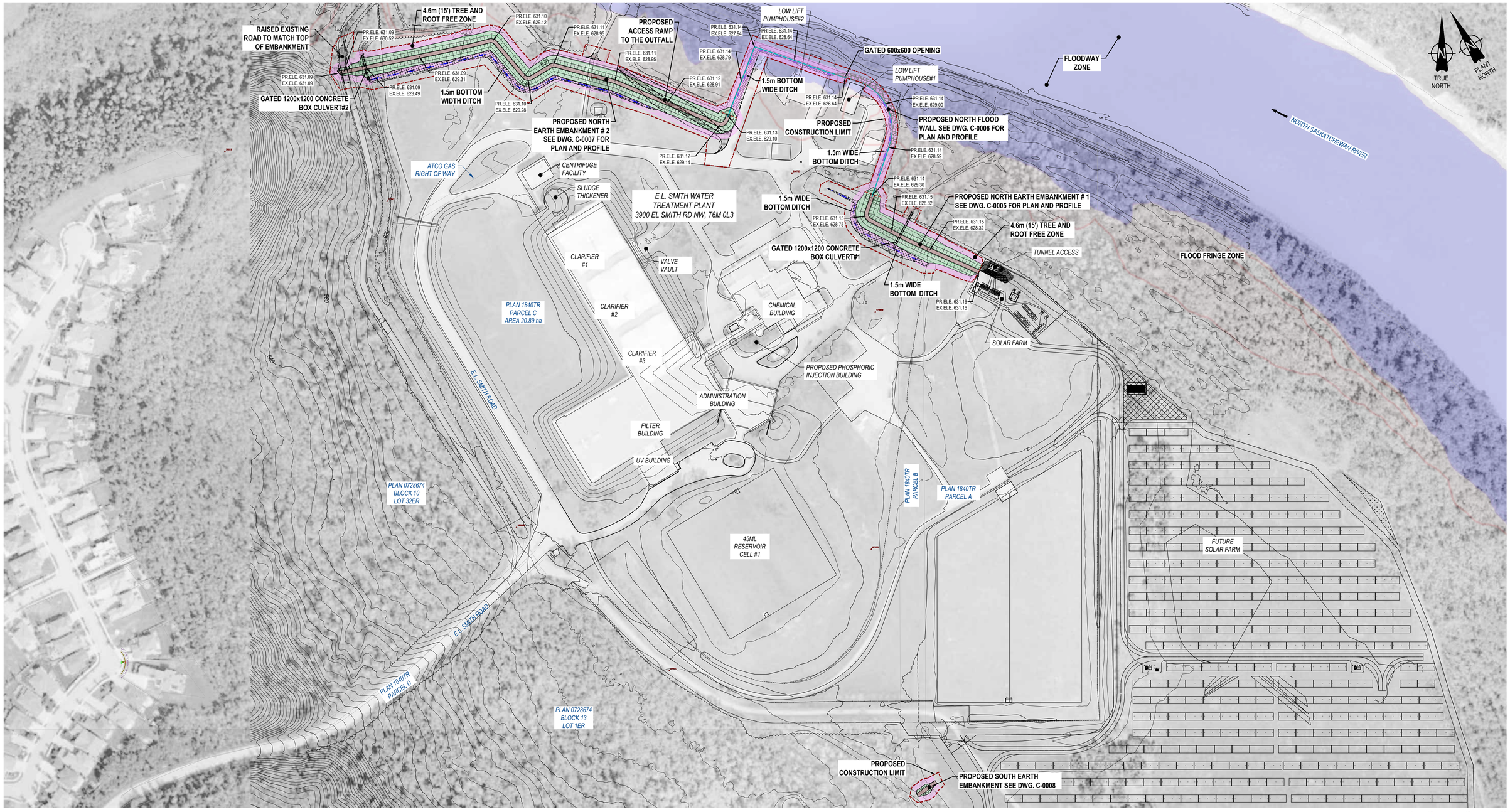

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1:1500

DRAWING No.	DRAWING TITLE
-	-

REFERENCE DRAWING DETAILS

No.	DESCRIPTION	DATE	BY
0B	ISSUED FOR REGULATORY APPLICATION	JUN/21	BG
0A	IFR - PRELIMINARY (PRJ #1004689)	APR/21	BG

REVISION HISTORY

PERMIT STAMP

ENGINEERING STAMP

EPCOR

CONSULTANT: Stantec

	AS NOTED	DATE
SCALE:		
DRAWN BY:	BG	FEB/21
DESIGNED BY:	BG	FEB/21
CHECKED BY:	MB	FEB/21
APPROVED BY:	MW	FEB/21
ENGINEER:		
PROJECT MANAGER:		

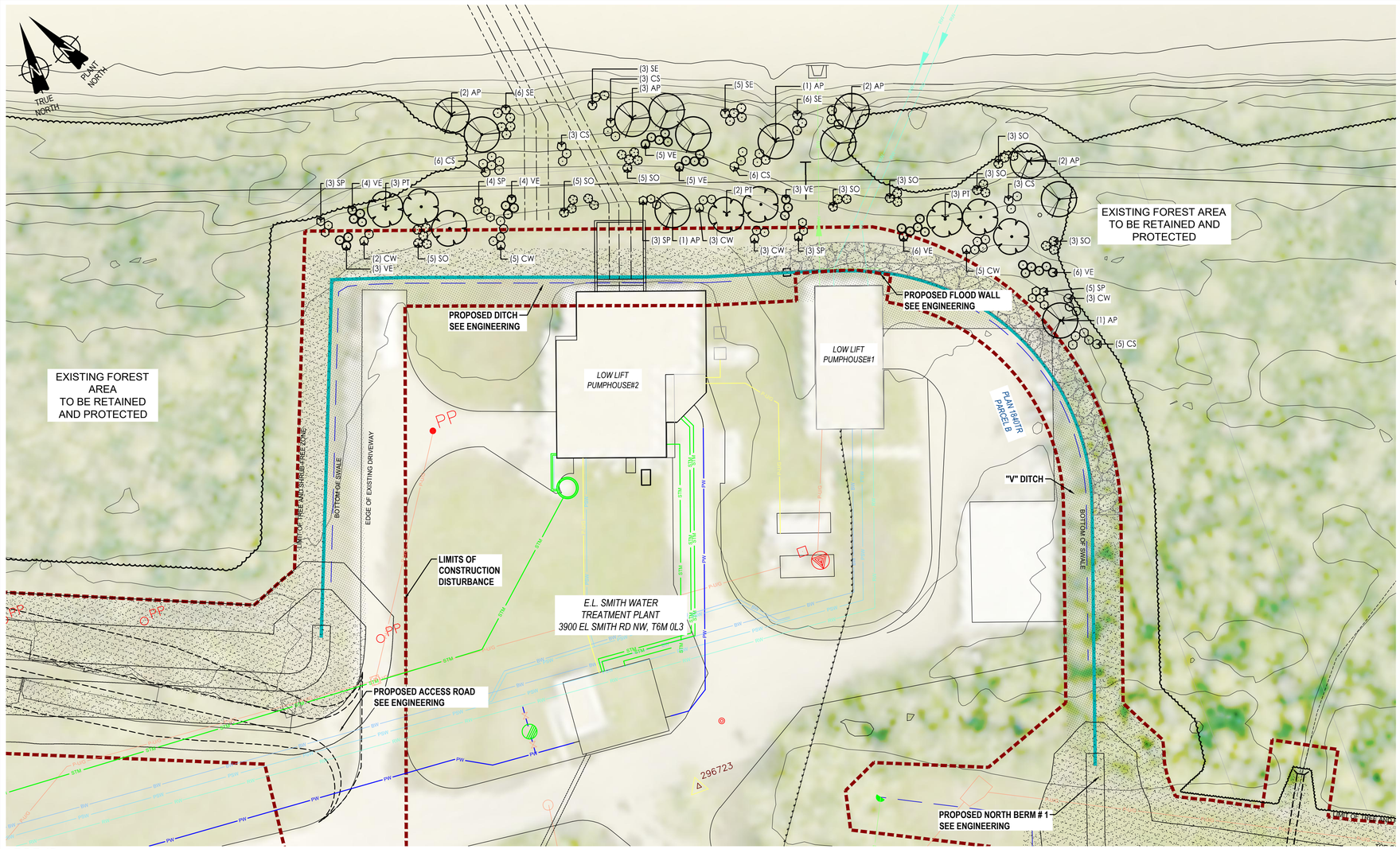
SITE: E.L. SMITH

FUNCTIONAL AREA: PLANT WIDE

PROJECT NAME: EPCOR WTP FLOOD MITIGATION EMBANKMENTS PROJECT

DRAWING TITLE: CIVIL
PROPOSED EMBANKMENT AND FLOOD WALL LOCATIONS
DETAIL, PLAN, SECTION
EL SMITH

EPCOR DRAWING NO.	EPCOR PROJECT NO.	CONSULTANT DRAWING NO.	CONSULTANT PROJECT NO.	REV.	SHT.
E-0-0-C-XXXX	1004689	C-0004	110146440	0B	-



LEGEND

- NATIVE SEED MIX CENTRAL PARKLAND
- PARKS MAINTENANANCE #1 SEED MIX

PLANT SCHEDULE

TREES	CODE	QTY	BOTANICAL / COMMON NAME	CAL/HT	SPACING	DETAIL
	AP	12	ALNUS CRISPA / GREEN ALDER	#10 POT.	6.0M O.C.	2/L008
	PT	8	POPULUS TREMULOIDES / QUAKING ASPEN	#15 POT.	6.0M O.C.	2/L008

SHRUBS	CODE	QTY	BOTANICAL / COMMON NAME	CONT	SPACING	DETAIL
	CS	26	CORNUS STOLONIFERA / RED OSIER DOGWOOD	#1 POT.	1.5M O.C.	1/L008
	CW	21	CORYLUS CORNUTA / BEAKED HAZELNUT	#1 POT.	1.5M O.C.	1/L008
	SP	18	SALIX DISCOLOR / PUSSY WILLOW	#1 POT.	1.5M O.C.	1/L008
	SE	20	SALIX EXIGUA / COYOTE WILLOW	#1 POT.	1.5M O.C.	1/L008
	SO	30	SYMPHORICARPOS OCCIDENTALIS / BUCKBRUSH	#1 POT.	1.5M O.C.	1/L008
	VE	36	VIBURNUM OPULUS / EUROPEAN CRANBERRYBUSH	#1 POT.	1.5M O.C.	1/L008

PLANTING NOTES

PLANTING NOTES ARE SUBJECT TO PROJECT SPECIFIC NOTES.

VERIFY PLANT QUANTITIES PRIOR TO BIDDING AND INSTALLATION. QUANTITIES ARE LISTED FOR CONVENIENCE ONLY. THE ACTUAL NUMBER OF SYMBOLS INDICATED ON THE PLANTING PLANS SHALL HAVE PRIORITY OVER QUANTITIES LISTED WITHIN THE LANDSCAPE MATERIAL SCHEDULE. THE CONTRACTOR SHALL FURNISH ALL PLANT MATERIAL NECESSARY TO COMPLETE THE PLANTINGS AS SHOWN ON THE PLANS.

CLARIFICATION OF DISCREPANCIES BETWEEN THE CONSTRUCTION DOCUMENTS AND THE SITE SHOULD BE BROUGHT TO THE ATTENTION OF THE LANDSCAPE ARCHITECT AND/OR OWNER'S AUTHORIZED REPRESENTATIVE IMMEDIATELY.

THE LANDSCAPE ARCHITECT AND/OR OWNER'S AUTHORIZED REPRESENTATIVE IS TO APPROVE ANY PLANT MATERIAL SUBSTITUTIONS.

UPON DELIVERY, ALL PLANT MATERIAL MUST MEET SPECIFICATIONS AS SET OUT IN THE LATEST GUIDE SPECS FOR NURSERY STOCK PREPARED BY THE CNTA AND ISA.

ALL PLANT MATERIAL MAY BE INSPECTED PRIOR TO ACCEPTANCE. THE LANDSCAPE ARCHITECT AND/OR OWNER'S REPRESENTATIVE RESERVES THE RIGHT TO REFUSE ANY PLANT MATERIAL DEEMED UNACCEPTABLE, EVEN AFTER DELIVERY TO SITE.

ALL TREES LOCATED WITHIN SIGHT DISTANCE AREAS MUST BE TRIMMED TO 1.8m CLEARANCE ABOVE FINISHED GRADE.

ALL TREES WITHIN TURF AREAS SHALL BE INSTALLED WITH TEMPORARY PVC ARBOR GUARDS.

ALL TURF AREAS SHALL BE GRADED SMOOTH AND APPROVED BY THE OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO INSTALLING SOD OR SEED. ALL AREAS TO RECEIVE TURF SHALL BE COMPLETELY FREE OF ANY RUTS, TRENCH SETTLING, OR ANY MATERIAL OVER 50mm IN DIAMETER PRIOR TO SOD OR SEED INSTALLATION.

TREES PLANTED 3.5m OR LESS FROM FENCE LINES SHALL BE BEDDED.

BEDS AND TREE WELLS TO BE MULCHED JUST PRIOR TO FAC.

PLANT MATERIAL SHALL BE MAINTAINED BY THE CONTRACTOR AS OUTLINED UNTIL THE DATE OF FINAL ACCEPTANCE CERTIFICATE (FAC).

PLANTING NOTES

CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO LANDSCAPED AREAS AND MUST MAKE ALL NECESSARY RESTORATIONS AND REPAIRS.

ALL ANCILLARY WORK NORMALLY ASSOCIATED WITH THIS TYPE OF CONSTRUCTION SHALL BE DEEMED TO BE PART OF THE CONTRACT.

ALL PLANT MATERIAL TO BE NURSERY GROWN STOCK AND SHALL MEET OR EXCEED THE SPECIFICATIONS OF THE CANADIAN NURSERY TRADES ASSOC. FOR SIZE, HEIGHT, SPREAD, GRADING, QUALITY, AND METHOD OF CULTIVATION.

NO SUBSTITUTIONS OF MATERIALS, PRODUCTS, OR QUANTITIES WITHOUT PRIOR CONSENT OF LANDSCAPE ARCHITECT.

PLANT SIZE NOTES

DECIDUOUS SHRUBS

200 mm HT. MIN. #1 CONTAINER	CONTAINER GROWN, OR BALLED & BURLAPPED 3 CANES OR MORE 200mm HT. WITH MIN ROOT SPREAD 150mm.

PERENNIALS/FORBS/GRASSES

100 mm POT	CONTAINER GROWN PLANTS AS PER CANADIAN NURSERY TRADES ASSOCIATION STANDARDS FOR BEDDING AND HERBACEOUS PERENNIAL PLANTS.

WHIPS & PLUGS

1 LITRE PLUG	300-450mm HT. WHIPS TO HAVE STRAIGHT, STURDY TRUNKS AND A WELL DEVELOPED ROOT SYSTEM.

SEED MIXES

CERTIFIED CANADA NO. 1 MIXTURE. MINIMUM GERMINATION OF 75%, MINIMUM PURITY OF 97%. ALL SEED MUST BE FROM A RECOGNIZED SEED FIRM, MEETING THE REQUIREMENTS FOR THE SEEDS ACT FOR CANADA NO. 1 SEED. SEED SHALL BE CERTIFIED NO. 1 GRADE. A GERMINATION TEST MAY BE REQUESTED AND ALL LAWN SEED MUST COMPLY WITH FEDERAL AND PROVINCIAL SEED LAWS.

CITY OF EDMONTON CENTRAL PARKLAND NATIVE SEED MIX

15% AWNED WHEATGRASS	15% SLENDER WHEATGRASS
15% WESTERN WHEATGRASS	5% SLOUGHGRASS
5% IDAHO FESCUE	5% ALKALI BLUEGRASS
5% JUNEGRASS	5% SANDBERG BLUEGRASS
20% GREEN NEEDLEGRASS	10% ROCKY MOUNTAIN FESCUE
WITH NURSE CROP (ANNUAL RYE GRASS)	

CITY OF EDMONTON PARK MAINTENANCE #1 MIX

30%	TOUCHDOWN KENTUCKY BLUEGRASS	20%	BANFF KENTUCKY BLUEGRASS
30%	CREEPING RED FESCUE	20%	FIESTA II PERENNIAL RYE GRASS

WITH NURSE CROP (ANNUAL RYE GRASS)

SEEDING RATE 240KG PER HECTARE

FLEXTERRA HYDROMULCH, TACKAFIER & HIGH QUALITY FERTILIZER (18-24-20) OR EQUIVALENT SLURRY TO BE APPLIED AFTER SEEDING. HYDROMULCH AND TACKAFIER TO BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS WITH CORRESPONDING APPLICATION AND LOADING CHARTS.

NOTES:

- NO PLANTING TO BE PLACED WITHIN 1.5m OF UTILITIES AND 3.0m OF OUTFALL
- DESIGN IS SUBJECT TO CHANGE BASED ON CITY OF EDMONTON REVIEW PROCESS AND INDIGENOUS GROUPS CONSULTATION ON PLANTING DESIGN

1:400 0 4 12 20m

DRAWING No.	DRAWING TITLE

REFERENCE DRAWING DETAILS

No.	DESCRIPTION	DATE	BY
0C	ISSUED FOR BYLAW 7188 APPLICATION	JUN/23	KP
0B	ISSUED FOR REGULATORY APPLICATION	JUN/21	BG
0A	IFR - PRELIMINARY (PRJ #1004689)	APR/21	BG

REVISION HISTORY

PERMIT STAMP

NOT FOR CONSTRUCTION

ENGINEERING STAMP

EPCOR

CONSULTANT: Stantec

SCALE:	AS NOTED	DATE
DRAWN BY:	KP	JUN/23
DESIGNED BY:	BT	JUN/23
CHECKED BY:	BT	JUN/23
APPROVED BY:	DO	JUN/23
ENGINEER:		
PROJECT MANAGER:		

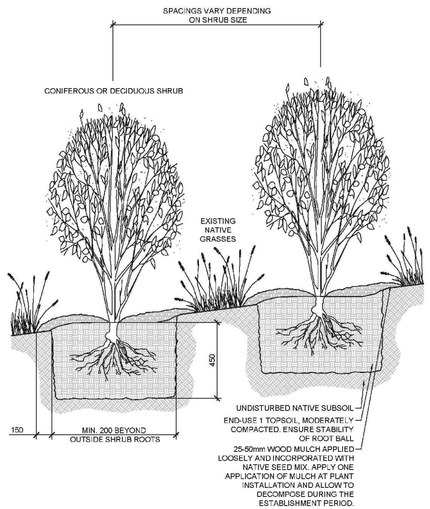
SITE: **E.L. SMITH** FUNCTIONAL AREA: **PLANT WIDE**

PROJECT NAME: **EPCOR WTP FLOOD MITIGATION EMBANKMENTS PROJECT**

DRAWING TITLE:
LANDSCAPE
PLANTING PLAN
LANDSCAPE - EIA RESTORATION PLAN
EL SMITH

EPCOR DRAWING NO.	EPCOR PROJECT NO.	CONSULTANT DRAWING NO.	CONSULTANT PROJECT NO.	REV.	SHT.
E-0-0-L-0007	1004689	L-0007	110146440	0C	-

NOTES:
- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02931 NATURALIZATION AS WELL AS THE RELATED SECTIONS.
- PRUNE ONLY DEAD, BROKEN OR DISEASED BRANCHES TO MAINTAIN PROPER SHRUB FORM (DECIDUOUS ONLY).
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.

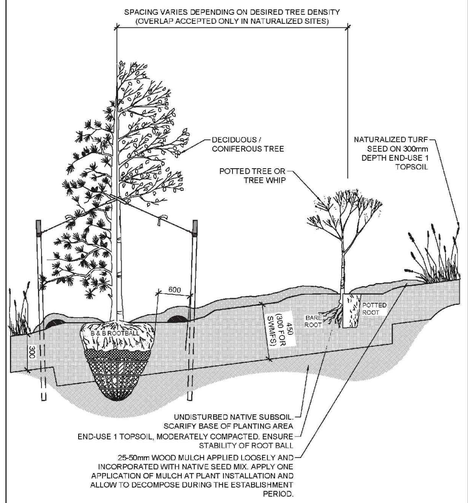


THE CITY OF Edmonton — NATURAL AREA SHRUB RESTORATION

Date Approved:	Drawn By:	Approved:	Revision:	Drawing No.
FEB 2021	DEDR	M.C.Stn		LA110A
Scale:	Checked By:			Old Drawing No.
N.T.S.	OPEN SPACE DESIGN			LA110

1 NATURAL AREA SHRUB RESTORATION - LA110A
SCALE: N.T.S.

NOTES:
- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02931 NATURALIZATION AS WELL AS THE RELATED SECTIONS.
- PRUNE ONLY DEAD, BROKEN OR DISEASED BRANCHES TO MAINTAIN PROPER SHRUB FORM (DECIDUOUS ONLY).
- ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
- IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS OR IF IN THE BOULEVARD THE STAKES SHOULD BE IN LINE WITH THE DIRECTION OF TRAFFIC.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.



THE CITY OF Edmonton — TYPICAL TREE NATURALIZATION

Date Approved:	Drawn By:	Approved:	Revision:	Drawing No.
FEB 2021	DEDR	M.C.Stn		LA111
Scale:	Checked By:			Old Drawing No.
N.T.S.	OPEN SPACE DESIGN			N/A

2 TYP. TREE NATURALIZATION - LA111
SCALE: N.T.S.

DRAWING No.	DRAWING TITLE
REFERENCE DRAWING DETAILS	

No.	DESCRIPTION	DATE	BY
0C	ISSUED FOR BYLAW 7188 APPLICATION	JUN/23	KP
0B	ISSUED FOR REGULATORY APPLICATION	JUN/21	BG
0A	IFR - PRELIMINARY (PRJ #1004689)	APR/21	BG
REVISION HISTORY			

PERMIT STAMP

NOT FOR CONSTRUCTION

ENGINEERING STAMP

EPCOR

CONSULTANT: Stantec

SCALE:	AS NOTED	DATE	
DRAWN BY:	KP	JUN/23	
DESIGNED BY:	BT	JUN/23	
CHECKED BY:	BT	JUN/23	
APPROVED BY:	DO	JUN/23	
ENGINEER:			
PROJECT MANAGER:			

SITE: **E.L. SMITH** | FUNCTIONAL AREA: **PLANT WIDE**

PROJECT NAME: **EPCOR WTP FLOOD MITIGATION EMBANKMENTS PROJECT**

DRAWING TITLE: **LANDSCAPE DETAILS LANDSCAPE - EIA RESTORATION DETAILS EL SMITH**

EPCOR DRAWING NO.	EPCOR PROJECT NO.	CONSULTANT DRAWING NO.	CONSULTANT PROJECT NO.	REV.	SHT
E-0-0-L-0008	1004689	L-0008	110146440	0C	. .

APPENDIX B

EPCOR WTP Flood Mitigation Embankments – Issued for Regulatory Application

Open Attachment (on the left) to view report

APPENDIX C

Vegetation Communities Table and Plant Species List

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Table 1 Plant Community / Land Unit Descriptions

Plant Community/Land Unit	Map Code	Description
Upland Plant Community		
Aspen Poplar Woodland Alliance	AP	This alliance also has a deciduous-dominated canopy, but is typically mixed with both aspen and balsam poplar (*Populus balsamifera*) species. Occasionally paper birch (*Betula papyrifera*) may be dominant or co-dominant in some stands. Minor components of spruce (*Picea* sp.) may also occur in the canopy. This plant community is characteristically found in lower slope positions along streams and riverbanks or lake margins, or in wet, depressional areas on moderately to imperfectly drained soils.
Aspen Woodland Alliance	AW	The canopy of this woodland alliance is composed primarily of aspen (*Populus tremuloides)*, but may have minor components of coniferous species (often spruce). This plant community is characteristic of a wide variety of sites from steep slopes to gradual to moderate (level) areas to depressions and low-lying areas, but these sites are typically are not very wet, occupying well to moderately well drained soils.
Balsam Poplar Woodland Alliance	PB	The canopy of this woodland alliance is composed primarily of balsam poplar, but can also have inclusions of aspen, paper birch and sometimes minor spruce components. Willow species (*Salix* sp.) can also form a major component of the shrub layer, as seen through openings in the forest crown, or even make up canopy level structure in some stands. These communities commonly occur on level areas adjacent to wetlands, lakes, rivers or in low-lying areas (link in between sand dunes) or wet and nutrient rich substrates. These sites are typically found on moderately well to imperfectly drained soils, and can be derived from a fluctuating water table or continuous water source (soil is wet for a longer portion of the growing season).
Mixed Deciduous and Evergreen Woodland Alliance	MX	This upland woodland alliance has a mixed forest canopy of both deciduous and coniferous species. The deciduous component is often dominated by aspen, balsam poplar, and paper birch, while the coniferous component is typically dominated by white spruce (*Picea glauca*). This alliance is typically found on well to moderately well drained upland soils with submesic to subhygric moisture conditions. However, some sites can be found in more low-lying areas or near water courses where they can receive nutrient rich seepage or flood waters for a portion of the growing season. As a result, slope and aspect are variable on these sites.
White Spruce Woodland Alliance	SW	This woodland alliance is dominated by white spruce, although minor components of balsam fir (*Abies balsamea*), aspen, balsam poplar, paper birch or even black spruce (*Picea mariana*) can occur in some stands. In this area, communities of this alliance are found in more middle to lower slope positions or in depressions where additional moisture and cooler temperatures prevail. It can sometimes be classified as a white spruce swamp but is still generally considered to be an upland community. This woodland alliance is perhaps more common further north into the Boreal Forest Natural Area, but in the Parkland Natural Region it is perhaps less common and, at times, can be considered locally rare.

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Table 1 Plant Community / Land Unit Descriptions

Plant Community/Land Unit	Map Code	Description
Tall Shrubland Alliance	TSA	This upland shrubby alliance typically includes aspen, choke cherry (*Prunus virginiana*), prickly rose (*Rosa acicularis*), wild red raspberry (*Rubus idaeus*) or willow. These communities are typically between 1.5 to 5 m in height and can represent younger, shrub-level successional stages of other upland woodland alliance communities, usually from some form of disturbance (either natural or anthropogenic). Some communities form when beavers, pathogens or insect outbreaks remove large portions of the forest canopy allowing the shrub layer to develop. These sites can be found in a variety of locations, from dry, steep, south facing slopes with rapid soil drainage to well to moderately well drained upland clearings and open (level) woodlands.
Short Shrubland Alliance	SS	This shrubby community type is similar to the Tall Shrubland Alliance described above; however, the shrub layer is typically shorter than 1.5 m in height. It often includes groves of snowberry (*Symphoricarpos albus*) or buckbrush (*Symphoricarpos occidentalis*) in addition to aspen, choke cherry, prickly rose, wild red raspberry and/or willow.
Water Land Unit		
Open Water	OW	This land unit is considered open water greater than 2 m deep, including ponds, lakes, rivers and flooded areas, which are not part of any natural ephemeral to semi-permanent wetland or anthropogenic dugout or reservoir.
Agricultural Land Unit		
Cultivated Land	CL	This unit includes all cultivated lands used for agronomic, annual crops, such as barley, wheat or oats, and hayfields used for bailing or silage in the fall. Narrow features such as windrows, roads and ditches may also be included within this agricultural land unit.
Green Space	GS	This unit includes areas created or maintained by man, currently used as green space. Some areas in this map unit include the following: parks, campgrounds, cemeteries, golf courses, ribbon development and recreational areas.
Industrial Development	IL	This unit includes all general industrial and/or oil & gas development, including plant sites, mine sites, well sites and other geophysical activities. It may or may not contain vegetated lands.
Perennial Pasture	PP	Perennial pasture includes land that is, or was, used for grazing livestock. It can include reclaimed lands or farmland planted with cultivated grasses and/or legumes that may be harvested at least once a year; however, these areas are typically rarely cultivated.
Residential	RR	This unit includes all settled areas. It also includes new subdivisions where land clearing has occurred (future residences).
Transportation	TR	This unit includes all roads, trails, highways, rail lines and rail yards that may or may not be vegetated. Areas cleared and/or maintained in association with transportation rights-of-way are also included.

Scientific Name	Common Name	S-Rank[1]	G-Rank[2]	Native or Exotic	ACIMS Track List
Acer negundo	Manitoba maple	SU	G5	Native	Do not track
Achillea alpina	siberian yarrow	S5	G5	Native	Do not track
Actaea rubra	red and white baneberry	S5	G5	Native	Do not track
Agastache foeniculum	blue giant hyssop	S4	G5	Native	Do not track
Agrostis scabra	rough bentgrass	S5	G5	Native	Do not track
Allium geyeri	Geyer's onion	S2	G4G5	Native	Track selected extant EOs (i.e., partial tracking)
Amelanchier alnifolia	saskatoon	S5	G5	Native	Do not track
Anemonastrum canadense	Canada anemone	S5	G5	Native	Do not track
Anemone cylindrica	long-fruited anemone	S5	G5	Native	Do not track
Apocynum androsaemifolium	spreading dogbane	S5	G5	Native	Do not track
Apocynum cannabinum	Indian hemp	S3	G5	Native	Do not track
Aralia nudicaulis	wild sarsaparilla	S5	G5	Native	Do not track
Arctium minus	common burdock	SNA	GNR	Exotic	Do not track
Artemisia campestris	plains wormwood	S5	G5	Native	Do not track
Betula papyrifera	white birch	S5?	G5	Native	Do not track
Bidens cernua	nodding beggarticks	S5	G5	Native	Do not track
Bromus inermis	smooth brome	SNA	G5T5	Exotic	Do not track
Calamagrostis canadensis	bluejoint reedgrass	S5	G5	Native	Do not track
Carex tenuiflora	thin-flowered sedge	S4	G5	Native	Do not track
Carex utriculata	small bottle sedge	S5	G5	Native	Do not track
Chamaenerion angustifolium	common fireweed	S5	G5	Native	Do not track
Cirsium arvense	creeping thistle	SNA	G5	Exotic	Do not track
Convolvulus arvensis	field bindweed	SNA	GNR	Exotic	Do not track
Cornus sericea	red-osier dogwood	S5	G5	Native	Do not track
Corylus cornuta	beaked hazelnut	S5	G5	Native	Do not track
Doellingeria umbellata var. pubens	flat-topped white aster	S3	G5T5	Native	Track all extant and selected historical EOs
Elaeagnus commutata	silverberry	S5	G5	Native	Do not track
Eleocharis palustris	creeping spike-rush	S5	G5	Native	Do not track
Elymus trachycaulus	slender wildrye	S5	G5	Native	Do not track

Scientific Name	Common Name	S-Rank[1]	G-Rank[2]	Native or Exotic	ACIMS Track List
Elymus trachycaulus ssp. subsecundus	slender wheatgrass	S4S5	G5T5	Native	Do not track
Epilobium palustre	marsh willowherb	S4	G5	Native	Do not track
Equisetum arvense	common horsetail	S5	G5	Native	Do not track
Equisetum scirpoides	dwarf scouring-rush	S5	G5	Native	Do not track
Erigeron canadensis	horseweed	S4	G5	Native	Do not track
Euphorbia virgata	Russian leafy spurge	SNA	GNRTNR	Exotic	Do not track
Eurybia conspicua	showy aster	S5	G5	Native	Do not track
Eurybia sibirica	Arctic aster	S5	G5	Native	Do not track
Euthamia graminifolia	flat-topped goldenrod	S4	G5	Native	Do not track
Festuca spp.	Festuca	-	-	-	-
Fragaria virginiana	wild strawberry	S5	G5	Native	Do not track
Fraxinus pennsylvanica	green ash	S2	G4	Native	Track selected extant EOs (i.e., partial tracking)
Galium boreale	northern bedstraw	S5	G5	Native	Do not track
Galium triflorum	sweet-scented bedstraw	S5	G5	Native	Do not track
Glycyrrhiza lepidota	wild licorice	S4	G5	Native	Do not track
Gnaphalium palustre	marsh cudweed	S3	G5	Native	Do not track
Heracleum maximum	cow parsnip	S5	G5	Native	Do not track
Hieracium umbellatum	narrow-leaved hawkweed	S5	G5	Native	Do not track
Hordeum jubatum	foxtail barley	S5	G5	Native	Do not track
Juncus balticus	wire rush	S5	G5	Native	Do not track
Juncus bufonius	toad rush	S5	G5	Native	Do not track
Juncus nodosus	knotted rush	S5	G5	Native	Do not track
Juncus tenuis	slender rush	S5	G5	Native	Do not track
Lactuca serriola	prickly lettuce	SNA	GNR	Exotic	Do not track
Lappula squarrosa	bluebur	SNA	GNR	Exotic	Do not track
Lathyrus spp.	Lathyrus	-	-	-	-
Linaria vulgaris	common toadflax	SNA	GNR	Exotic	Do not track
Lonicera dioica	twining honeysuckle	S5	G5	Native	Do not track
Lysimachia ciliata	fringed loosestrife	S4	G5	Native	Do not track
Maianthemum canadense	wild lily-of-the-valley	S5	G5	Native	Do not track

Scientific Name	Common Name	S-Rank[1]	G-Rank[2]	Native or Exotic	ACIMS Track List
Maianthemum stellatum	star-flowered Solomon's-seal	S5	G5	Native	Do not track
Tripleurospermum inodorum	scentless chamomile	SNA	GNR	Exotic	Do not track
Medicago spp.	Medicago	-	-	-	-
Medicago sativa ssp. falcata	yellow lucerne	SNA	GNRTNR	Exotic	Do not track
Medicago lupulina	black medick	SNA	GNR	Exotic	Do not track
Medicago sativa	alfalfa	SNA	GNR	Exotic	Do not track
Melilotus albus	white sweet-clover	SNA	G5	Exotic	Do not track
Oenothera spp.	Oenothera	-	-	-	-
Oenothera biennis	yellow evening-primrose	S5	G5	Native	Do not track
Orthilia secunda	one-sided wintergreen	S5	G5	Native	Do not track
Osmorhiza longistylis	smooth sweet cicely	S3	G5	Native	Track all extant and selected historical EOs
Ononis arvensis	common rest-harrow	SNA	GNR	Exotic	Do not track
Peltigera neopolydactyla	carpet pelt lichen	S3S4	GNR	Native	Do not track
Persicaria amphibia	water smartweed	S5	G5	Native	Do not track
Persicaria lapathifolia	pale persicaria	S5	G5	Native	Do not track
Petasites frigidus var. palmatus	palmate-leaved coltsfoot	S5	G5T5	Native	Do not track
Phalaris arundinacea	reed canary grass	S5	G5	Native	Do not track
Picea glauca	white spruce	S5	G5	Native	Do not track
Plantago major	common plantain	SNA	G5	Exotic	Do not track
Pleurozium schreberi	Schreber's moss	S5	G5	Native	Do not track
Poa palustris	fowl bluegrass	S5	G5	Native	Do not track
Poa pratensis	Kentucky bluegrass	S5	G5	Native	Track selected extant EOs (i.e., partial tracking)
Populus balsamifera	balsam poplar	S5	G5	Native	Do not track
Populus tremuloides	aspen	S5	G5	Native	Do not track
Potentilla norvegica	rough cinquefoil	S5	G5	Native	Do not track
Prunus pensylvanica	pin cherry	S5	G5	Native	Do not track
Prunus virginiana	choke cherry	S5	G5	Native	Do not track
Pyrola asarifolia	common pink wintergreen	S5	G5	Native	Do not track

Scientific Name	Common Name	S-Rank[1]	G-Rank[2]	Native or Exotic	ACIMS Track List
Ranunculus abortivus	small-flowered buttercup	S4	G5	Native	Do not track
Ranunculus cymbalaria	seaside buttercup	S5	G5	Native	Do not track
Rosa acicularis	prickly rose	S5	G5	Native	Do not track
Rubus pubescens	dewberry	S5	G5	Native	Do not track
Salix exigua	narrow-leaf willow	S3S4	G5	Native	Do not track
Salix lasiandra	shinning willow	S5	G5	Native	Do not track
Sanicula marilandica	snakeroot	S4S5	G5	Native	Do not track
Schoenoplectus pungens	three-square rush	S4	G5	Native	Do not track
Senecio spp.	Senecio	-	-	-	-
Senecio eremophilus	cut-leaved ragwort	S5	G5	Native	Do not track
Shepherdia canadensis	Canada buffaloberry	S5	G5	Native	Do not track
Sisymbrium loeselii	tall hedge mustard	SNA	GNR	Exotic	Do not track
Solidago spp.	Solidago	-	-	-	-
Solidago altissima	tall goldenrod	S5	G5	Native	Do not track
Sonchus arvensis	perennial sow-thistle	SNA	GNR	Exotic	Do not track
Sonchus asper	prickly annual sow-thistle	SNA	GNR	Exotic	Do not track
Sorbus aucuparia	European mountain-ash	SNA	G5	Exotic	Do not track
Sorbus scopulina	western mountain-ash	S5	G5	Native	Do not track
Symphoricarpos albus	snowberry	S5	G5	Native	Do not track
Symphoricarpos occidentalis	buckbrush	S5	G5	Native	Do not track
Symphyotrichum ciliatum	rayless aster	S4	G5	Native	Do not track
Symphyotrichum ciliolatum	Lindley's aster	S5	G5	Native	Do not track
Symphyotrichum lanceolatum var. hesperium	western willow aster	S5	G5T5	Native	Do not track
Tanacetum vulgare	common tansy	SNA	GNR	Exotic	Do not track
Taraxacum officinale	common dandelion	SNA	G5T5	Exotic	Do not track
Thalictrum dasycarpum	tall meadow rue	S3	G5	Native	Do not track
Thalictrum venulosum	veiny meadow rue	S5	G5	Native	Do not track

Scientific Name	Common Name	S-Rank[1]	G-Rank[2]	Native or Exotic	ACIMS Track List
Trifolium spp.	Trifolium	-	-	-	-
Trifolium pratense	red clover	SNA	GNR	Exotic	Do not track
Ulmus americana	American elm	SNA	G4	Exotic	Do not track
Viburnum edule	low-bush cranberry	S5	G5	Native	Do not track
Viburnum opulus	high-bush cranberry	S3S4	G5	Native	Do not track
Vicia americana	wild vetch	S5	G5	Native	Do not track
Vicia cracca	tufted vetch	SNA	GNR	Exotic	Do not track
Viola canadensis	western Canada violet	S5	G5	Native	Do not track

Notes:

[1]Standard Subnational Conservation Ranks:

SX Taxon is believed to be extirpated from the province.

SH Known from only historical records but still some hope of rediscovery.

S1 Known from five or fewer occurrences or especially vulnerable to extirpation because of other factor(s).

S2 Known from twenty or fewer occurrences or vulnerable to extirpation because of other factors.

S3 Known from 100 or fewer occurrences, or somewhat vulnerable due to other factors, such as restricted range, relatively small population sizes, or other factors.

S4 Apparently secure.

S5 Secure - taxon is common, widespread, and abundant.

SNA Not applicable- A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities. Example - introduced species.

APPENDIX D
EPCOR Figures, Photos and Tables

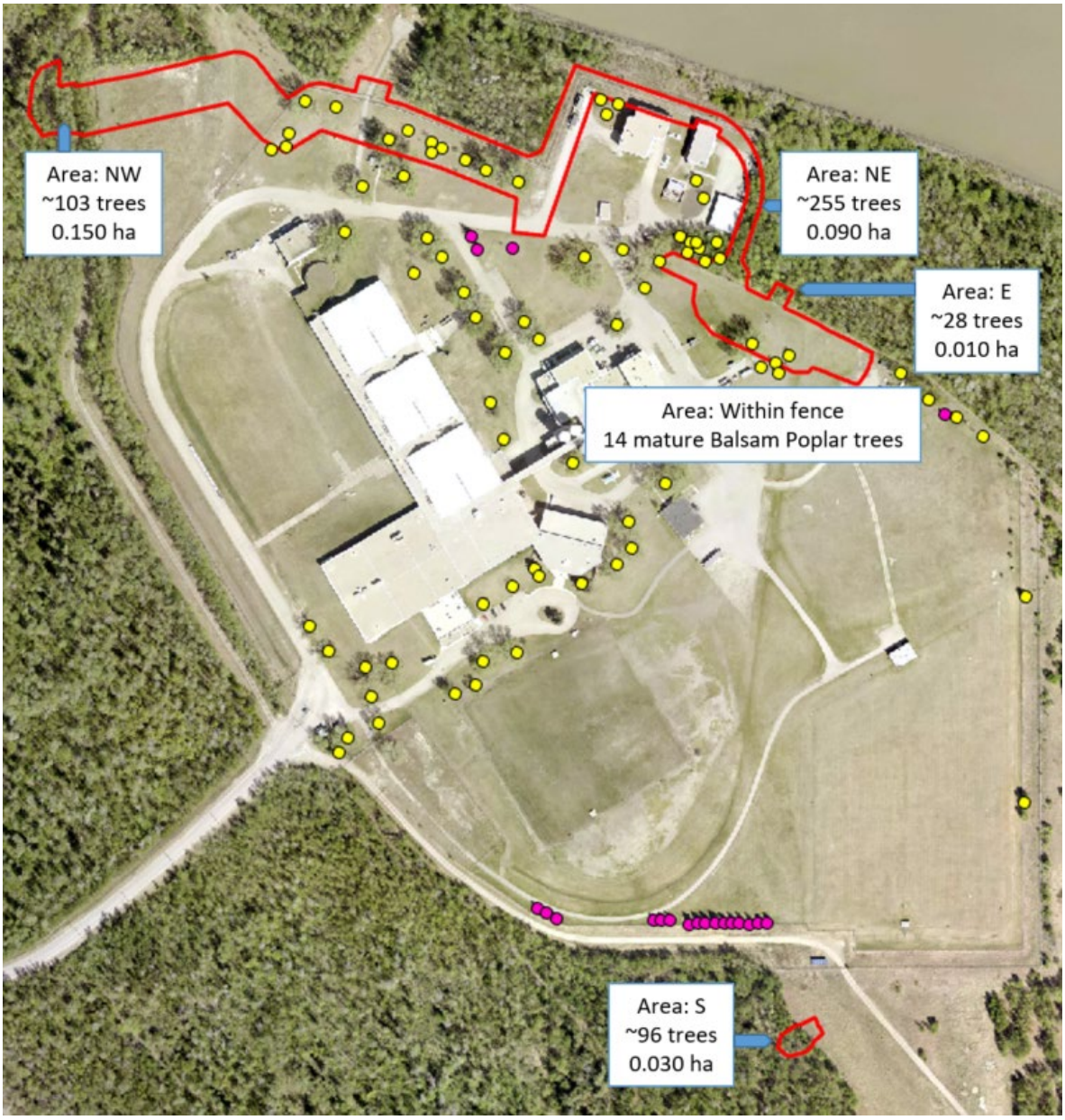

Figure D-1: E.L. Smith Tree Distribution

Note in Area: S 60% is on the Government Road Allowance and all of Area E is on the road allowance so a total of 86 trees are on the RA.

Figure D-2: Rossdale Tree Distribution

Table D-1: Tree Counts at E.L. Smith

Location	Total Trees	Area (m2)	Saplings	Poplar	Aspen	Birch	Spruce	Larch	Average DBH (cm)
NW	103	1500	33	0	93	1	9		16.2
NE	255	900	135	0	198	3	54		12.5
E	28	100	15	0	22	0	6		12.5
S	96	300	66	0	63	3	24	6	8.7
Within Fence	14	n/a	0	14	0	0	0	0	>20
TOTAL	496	2800	249	14	376	7	93	6	13.7

Photo 1: Picture of NW forest in PDA

Photo 2: Picture of forest PDA on EPCOR owned land between fence line and road allowance: Area NE

Photo 3: Proposed enhancement planting area at southeastern extent of the E.L. Smith WTP at the Low Lift Pumphouses between security fence and the NSR. Upstream view.

Photo 4: Proposed enhancement planting area at southeastern extent of the E.L. Smith WTP at the Low Lift Pumphouses between security fence and the NSR. Downstream view.

APPENDIX E
WTP Flood Mitigation Water Balance Memo

Stantec Consulting Ltd.
#400 – 10220 103 Avenue, Edmonton AB T5J 0K4

April 18, 2023
File: 1101-46440

Attention: Yolanda Casciaro, M.Sc., P.Eng.
EPCOR Water Services Inc.
E.L. Smith Water Treatment Plant
3900 E.L. Smith Road
Edmonton, AB T6M 0J2

Dear Yolanda,

Reference: PLT Flood Mitigation – Hydrologic Impact Assessment of Flood Embankment on Downstream Forested Areas

1 OBJECTIVE

Stantec completed preliminary flood wall and embankment system designs for the E.L. Smith and Rossdale Water Treatment Plant (WTP) sites located in Edmonton, Alberta. Both WTPs are located in the vicinity of the North Saskatchewan River (NSR) and runoff from the WTP sites discharges to the NSR through a combination of storm sewers and outfalls, existing channels in the river valley and as overland flows. The proposed flood walls and embankments will intercept some of the overland flows and runoff will be redirected to the existing piped drainage system or channels via proposed ditches or a piped system. This flow redirection will reduce flows to the forested areas in the river valley to some extent. The purpose of this memo is to estimate reduction of runoff entering the forested areas.

2 MODEL DESCRIPTION

Stantec used the model that was previously developed and used in the preliminary design. This model computes infiltration using the Green-Ampt method and infiltration parameters were set for clay-loam based soil. The hydrologic parameters used in the model are summarized below:

- Hydraulic Conductivity: 1 mm/hr
- Suction Head: 210 mm
- Initial Moisture Deficit: 0.15 (represents field capacity for clay-loam soil)
- Surface Roughness: 0.013 (paved areas), 0.24 (grassed areas), 0.4 (forested areas)
- Depression Storage: 1.3 mm (paved areas), 3.8 mm (grassed areas), 7.6 mm (forested areas)

3 E.L. SMITH WTP

Runoff from the E.L. Smith WTP site and offsite areas discharges to the NSR primarily through existing channels, storm sewers, and a culvert. The existing channels in the river valley were captured in LiDAR and shown in **Figure 1** using a hill shade view. A small portion of the catchment (0.81 ha) discharges runoff to the forested river valley as overland flow under existing conditions. These catchments will be

Reference: PLT Flood Mitigation – Hydrologic Impact Assessment of Flood Embankment on Downstream Forested Areas

redirected to the existing channels or culverts through proposed ditches. These catchments are shown in **Figure 2**. All remaining catchments discharge to the NSR through existing channels in the river valley, storm sewers and culverts and do not contribute runoff to the forests. The computed peak flow and runoff generation from the 0.81 ha catchment are 3 L/s and 80 m^3, respectively from a 2-year 24-hour rainfall event. The 0.81 ha catchment is comprised of approximately 25% impervious surfaces (roads and buildings), which are the primary contributor of runoff. These impervious areas cause increased runoff to the downstream forested area compared to the situation before development of the WTP.

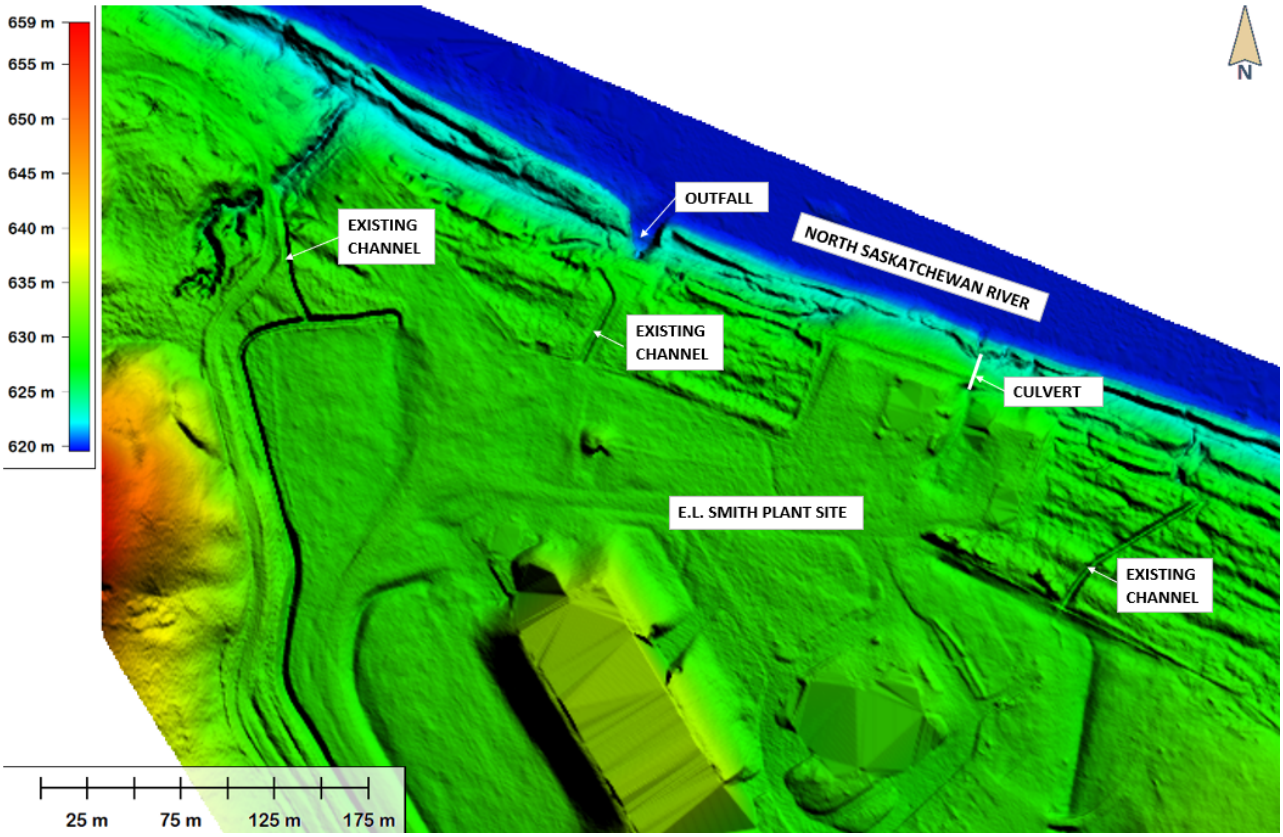

Figure 1: Existing Channels and Culvert on River Valley at E.L. Smith WTP Site

It is found that the 2-year 24-hour rainfall event does not generate runoff from the vegetated surfaces when initial moisture content is set at field capacity (in other words, the rainfall is absorbed into the soil). Field capacity is the amount of soil moisture that is retained by soil 2-3 days after a rainfall event or the portion of soil moisture that does not drain downward by gravity (https://www.fao.org/3/r4082e/r4082e03.htm). The 5-year 24-hour and higher intensity rainfall events do generate runoff given this initial moisture level, but these rainfall events are rather rare occurrences and should have minimum impact on long term water balances. Despite the fact that back-to-back rainfall events can elevate soil moisture levels and lower intensity rainfalls may generate runoff on vegetated surfaces, this occasional runoff will have minimal impact on long term water balances in Alberta's semi-arid climate system.

Reference: PLT Flood Mitigation – Hydrologic Impact Assessment of Flood Embankment on Downstream Forested Areas

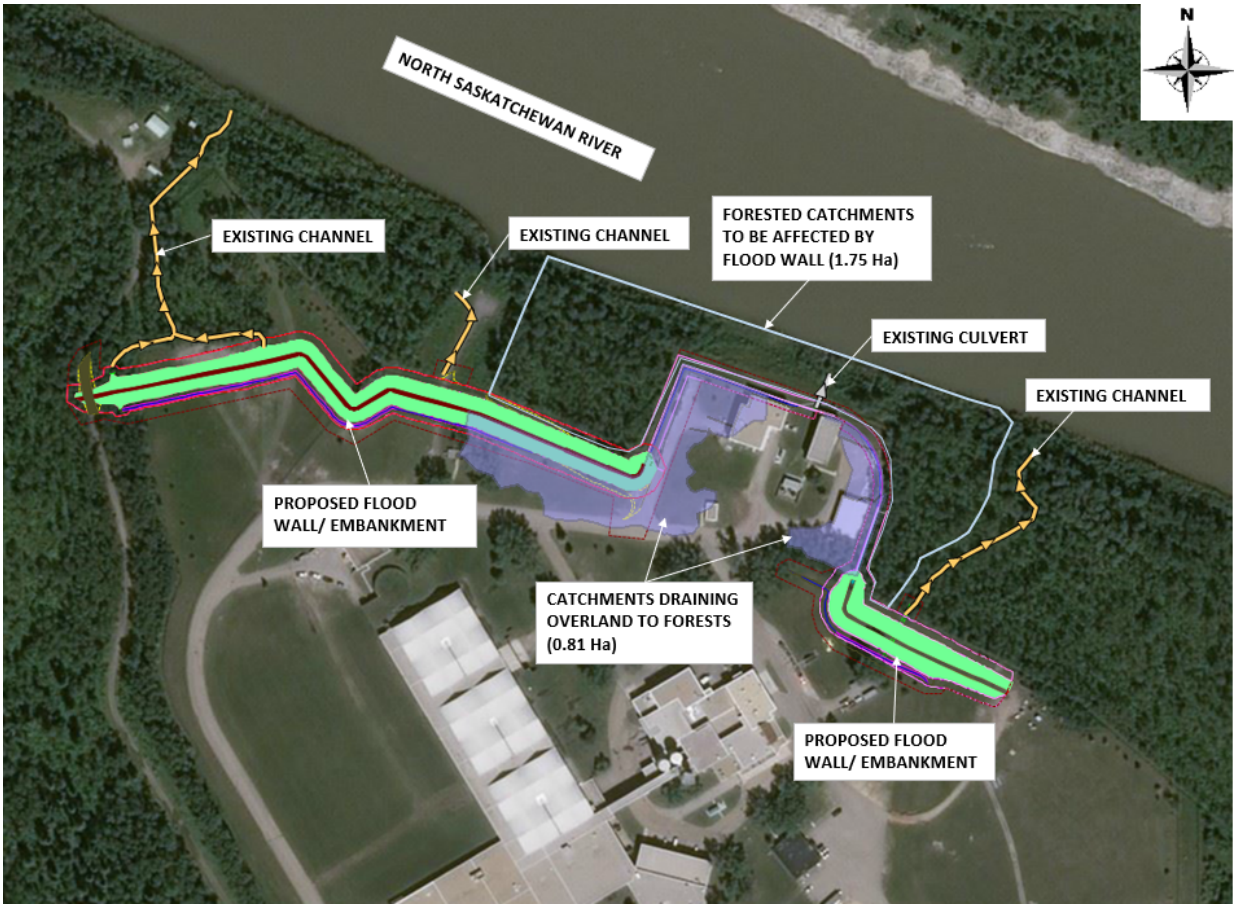

Figure 2: Catchments Draining Overland to Forests at E.L. Smith WTP Site

Examining the available rainfall records for Edmonton International Airport over the period between 1990 and 2007 reveals that the daily rainfall volume exceeded the 2-year rainfall volume only 21 times in this 17-year time period.

To assess the long-term water balance, a continuous model simulation was performed using the available rainfall record for Edmonton International Airport from 1961 to 2007). This continuous modeling exercise did not consider winter precipitation as winter runoff typically occurs on frozen ground and does not increase soil moisture content. The peak flow rates from the 0.81 ha catchment exceeded 0.01 m^3/s at only 72 occurrences during the 46-year time period, as shown in **Figure 3**.

The computed average annual runoff depth from the 0.81 ha catchment is 83.63 mm, resulting in a runoff coefficient of 0.28. Historical conditions (i.e., scenario before the WTP development) were also simulated assuming the area was naturally vegetated before the WTP was built. This scenario was modelled because the WTP increased runoff volumes to the forest compared to what it received before the WTP development. Therefore, a proper baseline condition for this assessment should be the condition before the WTP development when there was no imperviousness at the site. For this historical condition scenario, the continuous model simulation computed an average annual runoff depth of 30.3 mm resulting in runoff coefficient of 0.10 from the 0.81 ha onsite catchment.

As shown on **Figure 2**, the estimated forested area that will be affected by the flood wall construction is approximately 1.75 ha. Average annual runoff contributions from the 0.81 ha catchment area to the

forested area is 677 m^3 and 246 m^3 for the existing WTP and historical (before WTP) scenarios, respectively. Average annual rainfall volume to the 1.75 ha forested catchment area is 5,300 m^3. Therefore, reduction of water volumes to the forested areas after diversion of the 0.81 ha on site catchment will be 11.3% and 4.4% of the existing water volumes, respectively for the two scenarios mentioned above.

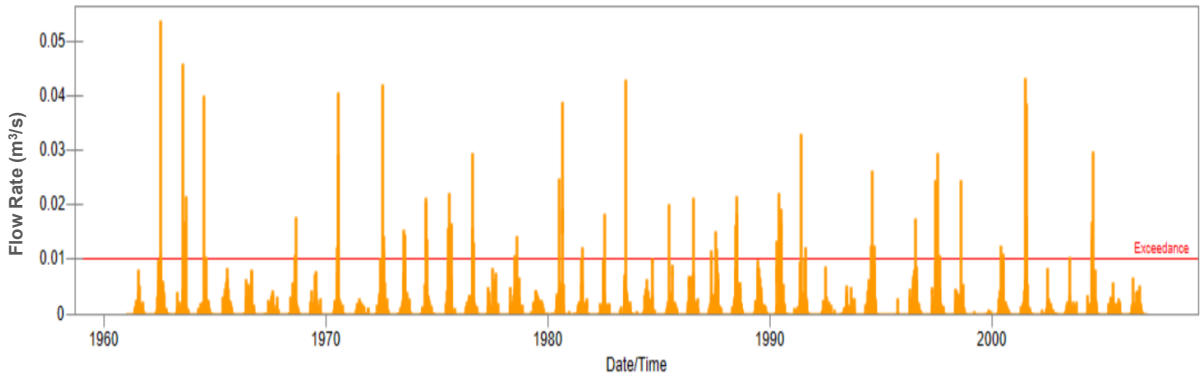

Figure 3: Flow Rate Exceedances between 1961 and 2007

4 ROSSDALE WTP

Rossdale WTP has an urban drainage system and three separate landscaped areas that discharge runoff as overland flow to the river valley or downstream lawn areas. These catchments are shown in **Figure 4** with total area of 0.22 ha. Because these catchments have no impervious areas, these catchments did not produce measurable runoff during a 2-year 24-hour rainfall event with initial moisture content set at field capacity. Despite the chance of back-to-back rainfall events that can elevate soil moisture levels and lower intensity rainfalls may generate runoff on the vegetated surfaces, these occasional runoff events will have minimal impact on long term water balances in Alberta's semi-arid climate system. Furthermore, there is an existing shared use path traversing between the Rossdale WTP site and the forested area, which disrupts the movement of overland flow (runoff).

Examining the available rainfall records for Edmonton International Airport over the period between 1990 and 2007 reveals that the daily rainfall volume exceeded the 2-year rainfall volume only 21 times in this 17-year time period.

To assess the long-term water balance, a continuous model simulation exercise was conducted using the available rainfall record in Edmonton International Airport from 1961 to 2007. This continuous modeling study did not consider winter precipitation as winter runoff typically occurs on frozen ground and does not increase soil moisture content. For the vegetated surfaces, the continuous model simulation computed an average annual runoff depth of 30.3 mm with a runoff coefficient of 0.10. Average annual runoff contributions from the 0.22 ha catchment area to the forested area is 67 m^3, not considering disruptions caused by the shared use path as noted above. The estimated forested area that would be affected by the flood wall construction is approximately 0.80 ha, which includes landscaped areas east of the WTP. Average annual rainfall volume to the 0.80 ha catchment area is 2,425 m^3. Therefore, reduction of water volume to the forested areas will be approximately 2.7% of the existing water volume.

Reference: PLT Flood Mitigation – Hydrologic Impact Assessment of Flood Embankment on Downstream Forested Areas

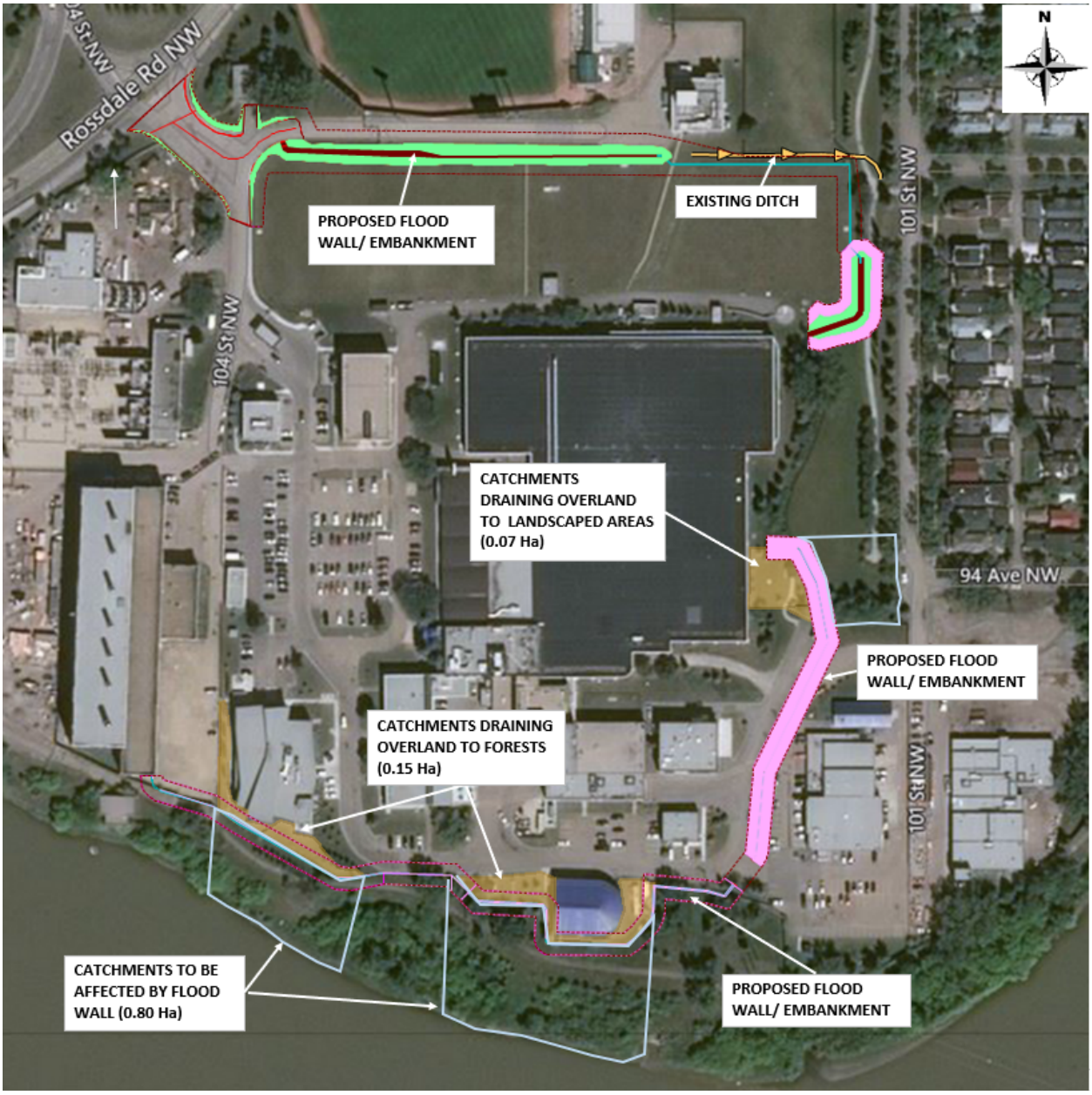

Figure 4: Catchments Draining Overland to Forests/Landscaped Areas at Rossdale WTP Site

5 CONCLUSIONS

Based on the estimated storm runoff quantities and discussions mentioned above, it can be concluded that the drainage system reconfigurations at both the E.L. Smith and Rossdale WTPs required to accommodate the proposed flood embankments and walls will have minimal impact on the long-term water balances. Compared to the conditions before the WTP, the estimated average annual reduction of water volume to the forested River Valley areas adjacent to the WTPs was calculated to be 4.4% and 2.7% of the existing water volume for the E.L. Smith and Rossdale WTP sites, respectively.

Reference: PLT Flood Mitigation – Hydrologic Impact Assessment of Flood Embankment on Downstream Forested Areas

In addition to the overland flow (storm runoff) pathway, it is also important to note that groundwater is another flow pathway to the forested areas. The groundwater pathway should not be disrupted by the proposed flood mitigation measures. EPCOR has been working to revegetate large portions of both WTP sites with natural Aspen Parkland species (treed canopy and natural grasslands on reservoirs) which will increase infiltration of storm runoff and increase groundwater recharge to adjacent forests. Low Impact Development features are also being added to both WTP sites that will store water and increase groundwater recharge to the downstream areas. These measures should at least partially offset the impacts of the redirection of overland flow.

It is recommended that the condition of the vegetation in the downstream catchments be monitored annually for five years after the construction of flood walls/embankments.

6 CLOSURE

Should you have any questions or concerns, feel free to contact the following undersigned at your convenience.

Regards,

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