Riel Industrial Sector Plan Amendment

Natural Area Screening Desktop Study

City of Saskatoon

TRITON

Progressive Aboriginal RELATIONS SILVER LEVEL

Canadian Council for Aboriginal Business

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Executive Summary

Triton Environmental Consultants Ltd. was retained by the City of Saskatoon (the City) to complete a Natural Areas Screening (NAS) of the proposed Riel Industrial Sector Plan Study Area (Study Area). The Study Area included a 500m buffer from the boundaries of the Riel Industrial Sector for wildlife and rare plants. The NAS consists of a desktop review of publicly available data sources, previous studies that have been conducted in the area, and spatial data. Field studies were not conducted as part of this NAS. This NAS is intended to support the City of Saskatoon with planning and design of future development within the Riel Industrial Sector.

The Study Area is located in Northwest Saskatoon and is 1,908 hectares (4,715 acres) in size. The majority of the lands within the Study Area are previously disturbed by agriculture or development and several farmyards and homesteads are dispersed throughout the Study Area. Natural areas occurring within the Study Area include a multitude of wetlands, tree stands, and the South Saskatchewan River Valley. The most notable natural area within the Study Area is the Hudson Bay Swale Wetland Complex that occurs within the eastern portion (East block) of the Study Area.

Several important features are found within a 500m buffer of the Study Area. Wanuskewin Heritage Park is located along the northeast corner of the East block of the Study area. The native grassland within Wanuskewin, including Opimihaw Creek valley, creates a connection between the Hudson Bay Swale Wetland Complex and the South Saskatchewan River Valley.

The Study Area is located within the Saskatoon Plain landscape of the Moist Mixed Grassland Ecoregion. Dominant soil associations within the Study Area are the Bradwell-Weyburn, Weyburn-Biggar, and Sutherland-Bradwell. Overall, soils within the Study Area are classified as having moderately severe to severe limitations for use in agriculture or require special conservation practices.

Sources of potential contamination were found primarily associated with current industrial development and farmyards. These are predominantly located along 71st Street East at the perimeter of the Study Area. Several historic impacted sites were found within the Study Area through a search of the Ministry of Environment Geohub database.

Natural surface drainage in the Study Area is via the Hudson Bay Swale Wetland Complex and Opimihaw Creek, which ultimately drains into the South Saskatchewan River.

A total of 144 wetlands have been classified within the Study Area (Stantec, 2012), totalling approximately 461 hectares, including the Hudson Bay Swale Wetland Complex. Wetlands vary in permanency from Class 2 to Class 5. The Hudson Bay Swale Wetland Complex is comprised of 10 wetlands, including one Class 3, eight Class 4, and one Class 5 wetlands. Portions of the Hudson Bay Swale Wetland Complex are relatively undisturbed, though other areas have been impacted due to infilling, road developments, and drainage canals.

Vegetation within the Study Area is comprised of species that are generally common to the region. Two provincially tracked species, narrow-leaved water plantain (*Alisma gramineum*) and northern blue-eyed grass (*Sisyrinchium septentrionale*), were recorded

by Stantec (2012) within the Study Area. Twelve additional provincially tracked species were identified within 500 m of the Study Area (500m buffer). No federally listed plant species have been previously recorded within the Study Area or 500m buffer. Given the disturbed context of the Study Area, numerous weed species have been previously documented, including weeds listed as noxious and nuisance under *The Weed Control Act*.

The Hudson Bay Swale Wetland Complex and South Saskatchewan River valley provide the highest quality wildlife habitat in the Study Area. Multiple species of management concern have been documented during past field studies and by citizens, including Osprey (*Pandion haliaetus*), Common Nighthawk (*Chordeiles minor)*, Loggerhead Shrike (*Lanius ludovicianus*), and Whooping Crane (*Grus americana*). There is potential for amphibian breeding and overwintering to occur within the multitude of wetlands in the Study Area, though no species of management concern were detected during amphibian surveys conducted by Stantec (2012).

Based on available imagery, the Study Area appears to contain some areas of native grassland, including areas on the South Saskatchewan riverbank where archaeological potential is high. Two historic homesteads are known to exist within the Study Area, which include the Caswell and Valley Crest Homestead Sites. Additionally, a review of the Saskatchewan Developers' Online Screening Tool identified heritage sensitivities occurring at several legal land descriptions within the Study Area.

The remnant natural areas within the Study Area are heavily fragmented by agricultural practices, though agriculture does not necessarily provide a barrier to movement across the landscape. Physical barriers that may pose an impediment to movement include Highways 11 and 12, developments, and the CN rail line. Additionally, infilling of the Hudson Bay Swale Wetland Complex may restrict connectivity from south to north and may influence local hydrology and downstream water levels.

Results

The results of this NAS have identified that the Hudson Bay Swale Wetland Complex should be a key component within the Riel Industrial Sector Study Area planning. Conservation of this area aligns with the City's *Wetland Policy* and *Green Infrastructure Strategy,* as well as providing opportunities for mitigating impacts to groundwater and surface drainage. The Hudson Bay Swale Wetland Complex may play a large role in the mitigation of impacts to groundwater, through incorporating the Hudson Bay Swale Wetland Complex into a stormwater management plan for this sector.

Since the area is closely tied to the Upper Floral aquifer, and unlikely to be suitable for surface development, avoidance of excavation and development within the boundaries of the wetlands within the Hudson Bay Swale Wetland Complex is the recommended primary mitigation of impacts to groundwater. Considering the locations of piezometers with artesian flows (water rises higher than the top of the aquifer due to confining pressure) as described in Tetra Tech (2015) the recommendation is to restrict development to the top of the slopes leading into the Hudson Bay Swale Wetland Complex in order to maximize elevation above the aquifer.

In terms of wetland area conservation, previous reports have recommended a 20m development buffer for wetlands (Stantec, 2012, City of Saskatoon, 2015). Triton recommends that any development within 45m of the riparian edge of wetlands be evaluated to ensure that impacts to the wetlands are avoided or minimized. The buffer should be established from the edge of riparian vegetation primarily around the Hudson Bay Swale Wetland Complex as a minimum distance for unmitigated development. With appropriate mitigation, this distance could be reduced following an assessment of the proposed development risk to the wetland. Further to this, Triton recommends that any mitigated development is restricted, at a minimum, to 20m from the riparian boundary or the top of the nearest slope leading down to the wetland, whichever is further. For wetlands outside of the Hudson Bay Swale Wetland Complex, the standard minimum 20m development buffer (Appendix B), as recommended by Stantec (2012), is sufficient to conserve wetland habitats, as many of these wetlands have been surrounded by cultivation for many years.

From a natural area perspective, the Hudson Bay Swale Wetland Complex provides the dominant undeveloped habitat for vegetation and wildlife species. Updated functional assessments, as well as wildlife and rare plant species detection surveys, are recommended to provide the City with an updated understanding of habitat utilization of the Hudson Bay Swale Wetland Complex.

In terms of ecological network conservation, Triton recommends studying the role of the Hudson Bay Swale Wetland Complex in more detail to establish the value it provides to local species. Until such an assessment is completed, further development within the boundaries of the Hudson Bay Swale Wetland Complex should be restricted.

Given the results of the heritage screening, archaeological field investigations are recommended and should be completed prior to planning development on Heritage-sensitive lands.

Summary Table of Recommendations

Section	Component	Recommendation
4.2.2	Development Restrictions	1. Conduct a specific study on the potential impacts of developments within the Wanuskewin Heritage Park visual buffer and viewshed, including the lands leased to Wanuskewin Heritage Park that had been designated as To Be Determined within the 2015 *Riel Industrial Sector Plan*. This study should also consider any additional protections that may arise from a successful UNESCO World Heritage Site nomination.

Section	Component	Recommendation
4.3	Potentially Contaminated Sites	2. Sector and concept planning should consider in more detail the types of hazardous materials currently being stored within the Study Area and 500m buffer and if exclusion of any hazardous material storage is warranted, given the shallow groundwater within the Study Area. 3. The City should compare the results of the GeoHub database search with internal contaminated sites records to confirm the completeness of the information within this report. 4. Phase 1 Environmental Site Assessments should be completed on sites with potential contamination prior to development to determine the likelihood of contamination and evaluate the need for field sampling.
4.3.1	Hudson Bay Swale Wetland Complex Infill	5. Triton recommends monitoring this area and working with the landowner to ensure that proper planning and permitting are in place prior to any further modification of this area. 6. The City should explore legal and legitimate methods of reconnaissance to collect evidence with respect to modification of the Hudson Bay Swale Wetland Complex, industrial waste regulations, and the *Environmental Management and Protection Act, 2010*. 7. The City should explore its jurisdiction to halt further modification of the Hudson Bay Swale Wetland Complex by infilling and other modifications. 8. Field visits are recommended for any infill sites to document current in situ conditions.
4.4.1	Surface drainage	9. Triton recommends that the City monitor changes to the wetlands within the Hudson Bay Swale Wetland Complex. 10. Triton recommends the use of aerial imagery to monitor the margins of the wetlands against the historic margins to determine if infilling is causing those wetlands to hold more water, thus affecting downstream flows and potentially causing issues for stormwater management across the East block of the Study Area.

Section	Component	Recommendation
4.4.4	Groundwater	11. Additional groundwater monitoring by a qualified professional is recommended for the Study Area. 12. The City should explore what role the Hudson Bay Swale Wetland Complex may play in the mitigation of impacts to groundwater, through potential incorporation into a stormwater management plan for the Study Area. 13. Since the area is closely tied to the Upper Floral aquifer, avoidance of excavation and development within the boundaries of the wetlands within the Hudson Bay Swale Wetland Complex (Figure 5) is the recommended primary mitigation against impacts to groundwater. 14. In keeping with the 20m riparian buffer suggested by Stantec (2012) and within the 2015 *Riel Industrial Sector Plan,* Triton recommends considering a minimum 45m buffer from the riparian margin of the Hudson Bay Swale Wetland Complex for unmitigated development and minimum buffer of at least 20m from the riparian margin or the top of the nearest slope leading into the Hudson Bay Swale Wetland Complex, whichever is further, for developments that mitigate risks to the Hudson Bay Swale Wetland Complex. 15. The City should consult with professional engineers to assess and make specific recommendations on construction planning and practises in high groundwater areas to ensure safe excavations and minimize the risk of impacting water supply to rural properties that could be using the aquifers for water supply. 16. Triton recommends that the City consider restricting use of underground storage tanks (UST) within the East block of the Study Area.

4.5	Wetlands and Natural Areas	17. It is recommended to conserve the Hudson Bay Swale Wetland Complex as an important natural area within the City of Saskatoon. 18. It is recommended to implement the management and protection strategies proposed by Stantec for the Hudson Bay Swale Wetland Complex in the 2012 report *North/Northwest Natural Area Screening Study*. 19. The City, in consultation with Ministry of Environment and Ministry of Highways, should consider the effects of the proposed Saskatoon Freeway infrastructure on drainage patterns and habitat connectivity. 20. Updated functional assessments, as well as wildlife and rare plant species detection surveys, are recommended to provide the City with an updated understanding of habitat utilization of the Hudson Bay Swale Wetland Complex. 21. The City should consider rehabilitation of wetlands outside the 4km airport buffer and the establishment of a 20m development buffer around the boundary of those wetlands (Stantec, 2012). Buffers to be measured from the nearest margin of riparian vegetation to the boundary of the proposed development. 22. Triton recommends a minimum 45m buffer from the riparian margin of the Hudson Bay Swale Wetland Complex for unmitigated development and minimum buffer of at least 20m from the riparian margin or the top of the nearest slope leading into the Hudson Bay Swale Wetland Complex, whichever is further, for developments that mitigate risks to the Hudson Bay Swale Wetland Complex. Buffer is to be measured from the nearest margin of riparian vegetation to the boundary of the proposed development. 23. Triton recommends maintaining wetlands designated as "Preserve" under the City's Wetland Policy and seeding disturbed areas within the 20m buffer of the wetlands with a native seed mix. 24. The City should assess the effects of the infill actions across the Hudson Bay Swale Wetland Complex through monitoring of changes in drainage flow and vegetation. Assessing infill actions may suggest that

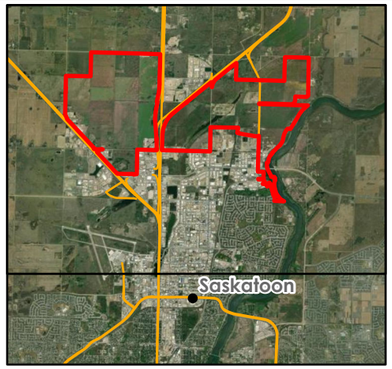
Section	Component	Recommendation
		the wetlands are expanding (or receding) as a result of the change in wetland connectivity along the Hudson Bay Swale Wetland Complex. 25. The City should consider bolstering the City's *Wetland Policy* and working with the Saskatoon North Partnership for Growth (P4G) to provide specific protections for large significant wetland assets, such as that within the Hudson Bay Swale Wetland Complex, in order to enhance conservation of important natural areas. 26. Further wetland investigations would benefit the planning of the Riel Industrial Sector. Updated wetland verifications and functional assessments within the Study Area are recommended to inform the selection of candidate wetlands for ecological enhancement, or for incorporation into stormwater management systems. 27. Portions of the Hudson Bay Swale Wetland Complex that are ranked "Manage 1" under the City's *Wetland Policy* could be used by the City as tools to facilitate linkage between "Preserve" wetland areas and for stormwater management within the Study Area.
4.6	Vegetation	28. Prior to development, it is recommended to complete rare plant surveys as per the *Species Detection Survey Protocol: 20.0 Vascular Plant* (Government of Saskatchewan, 2021) within natural areas to verify documented occurrences of rare plants and determine if mitigation measures should be implemented.

Section	Component	Recommendation
4.7	Wildlife	29. Wildlife field studies using provincial species detection protocols are recommended to characterize wildlife utilization of this area and determine what level of human interaction can be sustained while still conserving the habitat use and connectivity that currently exists along the Hudson Bay Swale Wetland Complex. 30. Minimizing natural area loss and degradation is recommended by incorporating green buffer zones around natural areas, particularly wetland complexes, such as the Hudson Bay Swale Wetland Complex, to align with the City's *Wetland Policy* and *Green Infrastructure Strategy*. Green buffer width should be based on the results of the recommended habitat utilization surveys for the Hudson Bay Swale Wetland Complex (Recommendation #26). Green buffer widths are recommended to be 30m from the riparian margins of the Hudson Bay Swale Wetland Complex in areas with low wildlife use and up to 100m for high wildlife use areas. Green buffers would include the wetland development buffers. 31. Conservation of the Hudson Bay Swale Wetland Complex should be prioritized as a consideration in the planning and development of the Riel Industrial Sector, with particular consideration given for the wetland areas that are ranked as "Preserve" under the City's *Wetland Policy* in order to facilitate habitat connectivity. 32. The City should consider including the portion of the Hudson Bay Swale Wetland Complex that is outside the Study Area and travels around the Wanuskewin Heritage Park as part of the *Green Infrastructure Strategy* (City of Saskatoon, 2020) in order to preserve a significant movement corridor for wildlife. 33. Triton recommends that the City explore dedicated wildlife crossing design options in consultation with Ministry of Environment and Ministry of Highways to facilitate wildlife movement through the area once the Saskatoon Freeway is built (Figure 9).

Section	Component	Recommendation
4.8	Heritage	34. Heritage referrals should be submitted to the Heritage Conservation Branch for review prior to initiation of any works on heritage sensitive lands. 35. The Wanuskewin Heritage Park visual buffer and viewshed should continue to be considered when planning for development in the northeast corner of the Study Area. Triton recommends working with Wanuskewin Heritage Park to create guidelines for development within these areas. 36. The City should continue to keep informed of the Wanuskewin Heritage Park UNESCO nomination process in order to be proactive in incorporating any additional protections or mitigations that may result from UNESCO World Heritage Site designation.
4.9	Ecological Connectivity	37. Triton recommends further investigation into the value of the Hudson Bay Swale Wetland Complex as an ecological corridor through further studies facilitating the collection of data related to seasonal habitat usage, species diversity, and density within the Hudson Bay Swale Wetland Complex, to provide the City with ability to target specific areas and core habitats/corridors for conservation (Hilty, et al., 2020). Field studies in all four seasons would ensure that seasonal migration and habitat utilization can be observed. 38. Triton recommends assigning the majority of dedicated municipal and environmental reserve parcels to the areas surrounding the Hudson Bay Swale Wetland Complex, as well as using those areas to conserve an ecological corridor along the Hudson Bay Swale Wetland Complex to Opimihaw Creek and ultimately along the SSR valley. 39. The City should consult with Ministry of Environment and Ministry of Highways to ensure that City goals with respect to the *Wetland Policy* and habitat connectivity are communicated and, to the extent possible, incorporated into the design and construction planning of the Saskatoon Freeway.

Riel Industrial Ammendment Natural Area Screening

Figure 12. Summary of Constraints and Recommendations



- Freeway Phase 1
- Airport 8km Buffer
- Airport Water Storage 4km Buffer
- Chemical Plant 1km Buffer
- Anticipated High Groundwater Table
- Recommended Monitoring
- Recommended Wildlife & Vegetation Survey
- Study Area
- Study Area 500m Buffer
- Wanuskewin Heritage Park
- Wetlands
- Trees
- Wanuskewin Heritage Park 1.8km Visual Buffer
- Wanuskewin Viewshed

Sources and Disclaimer
Base map Source: ESRI
Disclaimer: This map is a visual aid only to be used together with the accompanying report, including and incorporating any disclaimer contained therein. This map has been prepared to illustrate the results of our work, and is **not intended to be used for navigational purposes**. Information displayed on this map is based, in whole or in part, on geographic information that may have been provided by third parties, including government data. Triton Environmental Consultants Ltd. disclaims (without limiting the generality of the foregoing) all responsibility for the accuracy of any such third party information, regardless of the source.

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Scale 1:40,000

Projection: NAD 1983 UTM Zone 13N

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Disclaimer

This report is rendered solely for the use of the City of Saskatoon in connection with Riel Industrial Sector Plan's Natural Area Screening, and no person may rely on it for any other purpose without Triton Environmental Consultants Ltd.'s prior written approval. Should a third party use this report without Triton's approval, they may not rely upon it. Triton accepts no responsibility for loss or damages suffered by any third party as a result of decisions made or actions taken based on this report.

This report is based on facts and opinions contained within the referenced documents, including the results of any data collection programs carried out in relation to this report. We have attempted to identify and consider facts and documents relevant to the scope of work, accurate as of the time period during which we conducted this analysis. However, the results, our opinions, or recommendations may change if new information becomes available or if information we have relied on is altered.

We applied accepted professional practices and standards in developing and interpreting data. While we used accepted professional practices in interpreting data provided by the City of Saskatoon or third-party sources, we did not verify the accuracy of any such data.

This report must be considered as a whole; selecting only portions of this report may result in a misleading view of the results, our opinions, or recommendations.

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1.0 Introduction

The City of Saskatoon (the City) is exploring further development of the Riel Industrial Sector along the north side of Saskatoon. Under the City's *Official Community Plan Bylaw, 2020* (OCP) (Bylaw No. 9700), a Natural Area Screening (NAS) study (the Project) is to be undertaken to evaluate natural areas, assets, and features as identified within the Section E2.5 of the OCP. Triton Environmental Consulting (Triton) was retained by the City to conduct an NAS for amendment to the Riel Industrial Sector Plan. The NAS will inform the City's Planning and Development Department on the area's natural and historical features and make recommendations on development planning within the Project.

1.1 Project Scope

The scope of work for the Project is to complete a NAS of the Riel Industrial Sector Study Area. An outline of the Study Area can be seen in Figure 1.

This project consists of the following objectives:

- Desktop biophysical assessment using historical and recent studies, documents, and data relevant to the Study Area to provide a thorough biophysical inventory and provide recommendations on further studies, ground truthing, or feature delineation that would increase the City's understanding of the landscape within the Project.
- Review of the Saskatchewan Heritage Conservation Branch (HCB) Developers' Online Screening Tool (HCB 2021) to determine any Heritage Resources Impact Assessment (HRIA) requirements and provide recommendations of any further studies that should be undertaken by the City.

In past years, various natural area screening studies have been conducted on portions of the Riel Industrial Sector (AMEC, 2002; Stantec, 2006; and Stantec, 2012). Findings from these studies were reviewed and integrated into this final report as applicable.

2.0 Study Area

The Riel Industrial Sector Study Area (the Study Area) is approximately 1,908 hectares (4,715 acres) in size, located along the north boundary of the City of Saskatoon (Figure 1). The Study Area is divided into two separate sections (herein referred to as the West block and East block) by Highways 11 and 12.

The West block extends west from Highway 12 to Range Road 3060 along Highway 16, and south from Township Road 380 to the current development limits at 71st Street West and Marquis Drive.

The East block extends east from Highway 11 to the west boundary of Wanuskewin Heritage Park (WHP) and the top of the bank of South Saskatchewan River (SSR), south from Penner Road to the current city development limits approximately 800 metres (m) north of 71st Street East, and south along the SSR along the Silverwood Golf Course into a small portion of land along the SSR.

Riel Industrial Amendment
Natural Area Screening

Figure 1.
Riel Industrial Study Area

Opimihaw Creek

Meewasin Valley Natural Area

Riel Industrial Sector Boundary

Silverwood Golf Course

Study Area

Study Area 500m Buffer

Wanuskewin Heritage Park

Sources and Disclaimer
Base map Source: ESRI
Disclaimer: This map is a visual aid only to be used together with the accompanying report, including and incorporating any disclaimer contained therein. This map has been prepared to illustrate the results of our work, and is **not intended to be used for navigational purposes**. Information displayed on this map is based, in whole or in part, on geographic information that may have been provided by third parties, including government data. Triton Environmental Consultants Ltd. disclaims (without limiting the generality of the foregoing) all responsibility for the accuracy of any such third party information, regardless of the source.

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3.0 Methods

3.1 Literature Review

The NAS for the Riel Industrial Sector was completed by desktop review. To understand past and present conditions of the Study Area, previous studies and publicly available data sources were used to gather information.

Multiple field studies have occurred within the area to document existing conditions. Most recently in 2022, X-terra conducted biophysical surveys to support a biosolids pipeline application that occurs along the eastern edge of the Study Area. Stantec conducted field investigations in 2012 to support the North/Northwest NAS, which has significant overlap with the current Study Area, including the Hudson Bay Swale Wetland Complex. These studies, among others, aided in providing context to the results and recommendations of this NAS.

The City of Saskatoon provided several documents relevant to completing the NAS review. The following documents were reviewed:

- *Environmental Screening Report, Marquis/Silverwood Industrial Area* (AMEC, 2002)
- *North Industrial Sector Plan Natural Area Screening - Resource Overview Report* (Stantec, 2006)
- Wetland Inventory Shapefiles (Stantec, 2012)
- *North/Northwest Natural Area Screening Study* (Stantec, 2012)
- *Wetland Policy* (City of Saskatoon, 2013)
- *Riel Industrial Sector Plan* (City of Saskatoon, 2015)
- *North Sector Swale Hydrogeological, Geotechnical, and Wetland Evaluation, Saskatoon, Saskatchewan* (Tetra Tech EBA, 2015)
- *Saskatoon North Partnership for Growth – Green Network Refinement Stage 1: Natural Areas Screening (Desktop)* (Saskatoon North Partnership for Growth, 2020)
- *Desktop review and Biological & Wildlife Surveys for the WWTP Biosolids Transfer System - Conceptual Design Services: Preliminary Route(s) Screening* (X-terra, 2022)

3.2 Data Sources

In conjunction with the multitude of resources provided by the City of Saskatoon, a desktop assessment of biophysical features (land use, wetlands, wildlife, plants, etc.) was completed using a number of publicly available data sources.

3.2.1 Soils Classification

The following data sources were used to review and classify existing soil conditions within the Study Area:

- Canada Land Inventory Soil Class Rating System
- Saskatchewan Soil Information System SKSIS
- *Saskatchewan Soil Survey Reports* (Acton & Ellis, 1978)
- *Ecoregions of Saskatchewan* (Acton, Padbury, & Stushnoff, 1998)
- *North/Northwest Natural Area Screening Study, City of Saskatoon* (Stantec, 2012)

3.2.2 Potential Contamination

The following data sources were used to complete a review of locations with possible contamination:

- Hazardous Substance Storage Facility Search (Government of Saskatchewan, 2023a)
- Discharge Cases (Spills) Historic Database (Government of Saskatchewan, 2023b)
- Discharge Cases (Spills) Database (Post January 1, 2015) (Government of Saskatchewan, 2023c)

3.2.3 Wetlands and Natural Areas

The following data sources and resources were used to identify wetlands and natural areas within the Study Area:

- LiDAR Data (acquired in 2007) provided by the City of Saskatoon.
- 2021 Aerial Imagery provided by the City of Saskatoon.
- Aerial and satellite imagery, such as Google Earth Pro (Google Earth Pro, 2023)
- Hunting, Angling and Biodiversity Information of Saskatchewan (HABISask) (SKCDC, 2023)

3.2.4 Vegetation and Wildlife

The following data sources were reviewed to identify the presence of and potential for wildlife and wildlife habitat within the Study Area, including Species of Management Concern:

- HABISask (SKCDC, 2023)
- eBird Saskatoon- Millar Ave Swale (N of 71st St) Sightings (eBird, 2023)
- iMap Invasives (Naturserve, 2023)
- *The Wildlife Act* (Government of Saskatchewan, 1998)
- *Wildlife Regulations (Government of Saskatchewan, 1981)*
- *The Weed Control Act* (Government of Saskatchewan, 2010)

3.2.5 Heritage Resource Sensitivity

The following data sources were reviewed to determine if lands within the Study Area possess heritage resource sensitivities.

- Heritage Conservation Branch (HCB) Online Screening Tool (Government of Saskatchewan, 2023)

4.0 RESULTS

4.1 Soils Classification

The Study Area lies in the Moist Mixed Grassland Ecoregion compromised of level to gently undulating glaciolacustrine and glacial till plains with Dark Brown Chernozemic soils throughout the region (Acton, Padbury, & Stushnoff, 1998).

Area soils vary highly in textures from clay loam soils occurring on the southeast portion, sandy loam in the central and fine loam in the western portion. The Hudson Bay Swale Wetland Complex occurs on Carbonated and/or Saline Rego Humic Gleysols with clay loam textured soil, surrounded by sandy loam on the northside and clay loam on the south (Acton & Ellis, 1978). Eight soil associations and nine soil map units were identified within the Study Area (Acton & Ellis, 1978). The dominant soil association is Bradwell-Weyburn, followed by Weyburn-Biggar and Sutherland-Bradwell.

According to the Canada Land Inventory, Class 1 and 2 are the most desired soil classes for crop production. The Land Capability for Agriculture within the Study Area is dominated by Class 3 soils, with the northern portion of the West block and a small portion of the East block, classified as Class 4 soils. Therefore, the soils have moderately severe to severe limitations that restrict their use to a limited range of crops or require special conservation practices (Government of Canada, 2013; Stantec, 2012). The soils within the Hudson Bay Swale Wetland Complex have a Class 5 Capability for Agriculture, meaning that the soils have very severe limitations restricting their use to the production of native or tame species of perennial forage crops (Stantec, 2012).

Table 1. Summary of soil map unit descriptions identified within the Riel Industrial Study Area and 500m buffer (Acton & Ellis, 1978), (SKSIS Working Group, 2023).

Soil Map Unit	Soil Association	Texture	Slope Description	Surface Expression	Soil Classification	Erosion Capability		Agriculture Capability
						Wind	Water	
A1	Asquith	Sandy loam	Gently sloping	Undulating	Orthic Dark Brown Chernozem	Low	Very Low	4(10)M
Rw	Runway	N/A*	Moderately sloping	Undulating	Miscellaneous	High	Low	5(10)TP
Su2E1	Sutherland-Elstow	Clay-Clay loam	Gently sloping	Undulating	Orthic Dark Brown Chernozem	Low	Low	3(8)M 2(2)C
Av6	Alluvium	Clay loam	Nearly level	Level	Saline Rego Humic Gleysol	Very low	Very low	5(10)WN
Br3W4	Bradwell-Weyburn	Loam	Very gently sloping	Undulating	Orthic Dark Brown Regosol	Low	Very low	3(10)M
W1Bg1	Weyburn-Biggar	Sandy-loam	Very gently sloping	Undulating	Orthic Dark Brown Chernozem	Low	Low	3(6)M 4(4)M
Bg3	Biggar	Gravelly loam	Very gently sloping	Undulating	Orthic Dark Brown Chernozem	High	Low	4(10)MN
Bg1W12	Biggar-Weyburn	Sandy loam	Very gently sloping	Undulating	Orthic Dark Brown Regosol	Moder ate	Low	4(10)M
Br3W4	Bradwell Weyburn	Fine sandy loam	Very gently sloping	Gently undulating	Dak brown Calcareous	Low	Low	3(10)M

*Soils in this soil zone are composed of coarse sediment deposited by aeolian processes and lack a dominant soil texture.

4.2 Current Land Cover

The Study Area is located in the Eastern section of the Saskatoon Plain landscape area of the Moist Mixed Grassland ecoregion of Saskatchewan (Acton et al., 1998). The Saskatoon Plain landscape area is a level glacial till plain with limited surface drainage associated around the SSR (Acton et al., 1998). The landscape is comprised of gently undulating, silty glaciolacustrine landscapes within the southern portion, and thinner deposits of discontinuous cover on an eroded, stony, and gravely glacial till surface towards the north. At the northern margin of the area, the eroded till plain has a large amount of gravel and is covered with a very thin, sandy deposit (Acton et.al., 1998).

Agricultural land comprises a large portion of the land cover within the Study Area, predominantly cultivated lands in the West block. Also noted within the West block is the Red Pheasant Cree Nation Urban Reserve parcel. Industrial development within the West block of the Study Area includes an RV Park (AMEC, 2002) and several commercial properties.

Land cover within the 500m buffer of the Study Area is predominantly agricultural use along the north and west boundaries. Provincial Highway 12 runs along the east boundary, bordering agricultural land with and considerable commercial and industrial development along Marquis Drive and Highway 12 within the southeast corner of the study area (Figure 2).

The East block of the Study Area is predominantly undeveloped and contains the natural area known as the Hudson Bay Swale Wetland Complex (Stantec, 2012), a large developed commercial property in the centre of the Hudson Bay Swale Wetland Complex, and several farmyards. There has been some commercial development along 71st Street East along the south boundary of the Study Area. Two chemical plants are located north of the intersection of Marquis Drive and Wanuskewin Road.

Within the 500m buffer of the Study Area, WHP is located along the northeast corner. In the west, there is Bridge City Speedway, along with significant industrial development. Within the 500m buffer along the south boundary is extensive commercial and industrial development along 71St Street East and Marquis Drive, extending southward to the residential neighbourhood of Silverwood Heights, including Silverwood Golf Course.

The 500m buffer along the east boundary of the East block also includes the SSR and portions of the Meewasin natural areas along the riverbanks. This area includes a Conservation Easement that was created in 1986 between Meewasin and the owner of the ERCO Worldwide chemical plant at the time. This was done to restrict public access to the riverbank adjacent to the chemical plant, in keeping with Ministry of Environment safety buffer for chemical storage vessels at the plant sites, while allowing Meewasin to conserve the riverbank area. Thus, construction and development of multi-use trails within this area will not take place to reduce the potential of exposure to the public in the unlikely event of a chemical release (City of Saskatoon, 2015).

4.2.1 Hudson Bay Swale Wetland Complex

The Hudson Bay Swale Wetland Complex is a large, post glacial meltwater channel that historically was much bigger, branching off from the SSR around the King George neighbourhood. The channel is documented in *The Meewasin Valley Project* report (Moriyama 1978) as originally travelling through the areas that are now developed as the Westmount and Hudson Bay neighbourhoods. The Hudson Bay Swale Wetland Complex then connects through the Hudson Bay Industrial Area, through the East block of the Study Area, and into the RM of Corman Park, then intersecting Opimihaw Creek which runs through WHP and eventually drains into the SSR (Saskatoon, 2015).

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387800
390300
5787900
5785400
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S

Riel Industrial Amendment
Natural Area Screening

Figure 2.
Existing Land Cover

Study Area 500m Buffer

Study Area

Land Cover

- Agricultural Land
- Canadian National Railway
- Disturbed
- Farm Yard
- Industrial Area
- RV Park
- Red Pheasant Cree Nation Urban Reserve
- Residential
- Road
- Wanuskewin
- Natural Areas (Wetlands, Naturalised Areas)
- Grassland

Sources and Disclaimer
Base map Source: ESRI
Disclaimer: This map is a visual aid only to be used together with the accompanying report, including and incorporating any disclaimer contained therein. This map has been prepared to illustrate the results of our work, and is **not intended to be used for navigational purposes**. Information displayed on this map is based, in whole or in part, on geographic information that may have been provided by third parties, including government data. Triton Environmental Consultants Ltd. disclaims (without limiting the generality of the foregoing) all responsibility for the accuracy of any such third party information, regardless of the source.

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Scale 1:30,000

Projection: NAD 1983 UTM Zone 13N

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4.2.2 Development Restrictions

4.2.2.1 Airport Buffer

The Saskatoon *Airport Zoning Regulations* require that no owner or occupier of lands within 4km of the airport is permitted to allow any portion of those lands be used as a sewage lagoon or open water storage reservoir unless the application provides for a bird deterrent program to be in place to minimize birds being attracted to the area. Further, no landfills are permitted within 8km of the airport (City of Saskatoon, 2015). See Figure 3 for details on the buffers associated with the Saskatoon Airport.

4.2.2.2 Chemical Storage Buffer

As outlined in the 2015 *Riel Industrial Sector Plan*, there are two chemical plants (ERCO Worldwide and Nouryon Chemical) east of Wanuskewin Road and north of 71st Street East, which are both located within the current Study Area. Both of these plants store hazardous chemicals on site. The Saskatchewan Ministry of Environment regulates the storage of hazardous chemicals and has placed a one-kilometre precautionary buffer for each plant separating storage vessels from any place of public assembly or any residential area. As shown on Figure 2, the one-kilometre buffers collectively cover 124 hectares (306 acres) of the Riel Industrial Sector lands (City of Saskatoon, 2015).

In 1986, Meewasin and the owner of the ERCO Worldwide chemical plant agreed to the protection of the riverbank area by establishing a Conservation Easement. According to *The Meewasin Valley Authority Act*, the Conservation Easement is outside the Meewasin jurisdiction; however, Meewasin retains the rights to the riverbank area (land within 92 metres of the shoreline of the South Saskatchewan River or on any part of the slope leading down to said shoreline where the gradient is in excess of 20%, plus 10 metres, whichever extends the greatest distance measured horizontally from the shoreline). As a result, no public access or river multi-use trails shall be constructed within the Conservation Easement due to the proximity of the chemical storage vessels in the unlikely event of a major accident involving the release of airborne chemicals (City of Saskatoon, 2015).

4.2.2.3 Wanuskewin Heritage Park

As outlined within the 2015 Riel Industrial Sector Plan, a 1.8-kilometre radial visual buffer around WHP (Figure 3) was identified as an area of further study and would allow growth around the park to be managed. Further study and discussions must be held between the adjacent landowners and WHP Administration to clarify the types of development that could be appropriate within the buffer, and any development standards, such as berms and landscaping, that might enable development in the vicinity of WHP while conserving the unique character of the park (City of Saskatoon, 2015).

While WHP lies outside the Study Area, it is immediately adjacent to its eastern boundary. The natural, cultural, and historic resources found at the site are identified in the *P4G District Official Community Plan* (P4G DOCP) (Saskatoon North Partnership for Growth,

2023) as being inherently valuable to the region and shall be protected. The P4G DOCP identifies a viewshed around WHP as part of the *Green Network Study Area* (GNSA) (City of Saskatoon, 2019). This viewshed comprises important natural views from key WHP features. Through the development of the P4G DOCP, the P4G municipalities committed to work with WHP to ensure plans and policies are complementary, and that any development within the viewshed protects important natural views.

The lands within the Riel Industrial Sector Study Area, in NE, SE and SW-35-37-05 W3M east of Wanuskewin Road, have been shown as To Be Determined in the *Riel Industrial Sector Plan* (2015) due to the future land use being under review by civic Administration. The City is currently involved in leasing these lands to WHP to use for pasturing their bison herd and development restrictions are specified in the lease agreement. A separate study may be created for this area and an amendment to this Sector Plan may be required (City of Saskatoon, 2015).

4.2.2.4 Saskatoon Freeway (Phase 1)

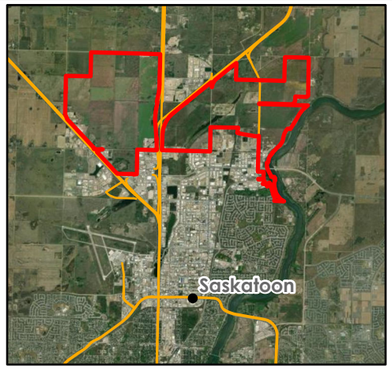
Saskatchewan Ministry of Highways has completed the functional design for Phase 1 of the Saskatoon Freeway that will encompass the north side of Saskatoon via new bridge crossing the South Saskatchewan River and new interchange configurations for Highway 11, Wanuskewin Road, Penner Road, Highway 12, and Highway 16 (Saskatchewan Ministry of HIghways, 2023). Phase 1 will be crossing through the northern portion of the Riel Industrial Sector Study Area and will have a significant impact on planning and habitat continuity within the Study Area. The Highway 11 interchange may require considerable construction and operational right-of-ways, bordering the WHP visual buffer and crossing the Hudson Bay Swale Wetland Complex.

4.2.2.5 Silverwood Off Leash Area

The Silverwood Off Leash Area is located within the southeast corner of the Study Area. This area provides dog owners with access to an area of the riverbank in which their pets can be off leash as per *The Animal Control Bylaw, 1999* (Bylaw No. 7860).

Riel Industrial Amendment
Natural Area Screening

Figure 3.
Development Buffers in the Riel Industrial Study Area



- Freeway Phase 1
- Airport Water Storage 4km Buffer
- Chemical Plant 1km Buffer
- Study Area
- Airport Landfill 8km Buffer
- Study Area 500m Buffer
- Wanuskewin Heritage Park 1.8km Visual Buffer
- Wanuskewin Viewshed

Sources and Disclaimer
Base map Source: ESRI
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Scale 1:50,000

Projection: NAD 1983 UTM Zone 13N

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4.3 Potential Contaminated Sites

A desktop review of aerial imagery, past relevant reports, and the Government of Saskatchewan's Geohub database, including environmentally impacted sites and current and historical spills, was searched for possible areas of soil contamination and areas with potential waste dumping locations. Most of the sections of land within the Study Area are undeveloped which is considered to be low potential for environmental concerns. These sections are considered agricultural, recreational, and natural undeveloped lands.

A total of 53 historical impacted sites were found within the Ministry of Environment GeoHub database (Table 2). Seventeen operating hazardous materials storage sites were also found within the provincial GIS database (Table 3). The search of the Provincial spill reporting databases indicated that there have been 63 spills reported within the Study Area and 500m buffer (Table 4). A summary of the GeoHub searches is illustrated in Figure 4 with details in Tables 2, 3, and 4.

Table 2. Summary of Impacted Sites within the Study Area and 500m Buffer.

Map ID #	Status	Confirmed Substance	Location[1]
IS1	Closure	Petroleum Hydrocarbons (PHCs)	Buffer
IS2	Notice of Site Condition	Contaminated soil	OB
IS3	Corrective Action Plan	Contaminated soil	OB
IS4	Closure	Contaminated soil	Buffer
IS5	Assessment	Organochlorine Pesticide, Liquid, Toxic	OB
IS6	Notification	Hydraulic Oil	Buffer
IS7	Closure	Nitrites, Inorganic, Aqueous Solution, N.O.S	Buffer
IS8	Closure	Petroleum Hydrocarbons (PHCs)	Buffer
IS9	Assessment	Petroleum Hydrocarbons (PHCs)	OB
IS10	Closure	Petroleum Hydrocarbons (PHCs)	OB
IS11	Notification	Chromium	Study Area
IS12	Notification	Mercury	Study Area
IS13	Corrective Action Plan	Chromium	OB
IS14	Corrective Action Plan	Copper	OB
IS15	Corrective Action Plan	Molybdenum	OB
IS16	Corrective Action Plan	Petroleum Hydrocarbons (PHCs)	OB
IS17	Notification	Petroleum Hydrocarbons (PHCs)	OB
IS18	Notification	Chromium	OB
IS19	Notification	Nickel	OB
IS20	Assessment	Arsenic	OB

Map ID #	Status	Confirmed Substance	Location[1]
IS21	Assessment	Articles containing Polychlorinated Biphenyls (PCB) greater than 50 ppm	OB
IS22	Assessment	Manganese	OB
IS23	Assessment	Petroleum Hydrocarbons (PHCs)	OB
IS24	Assessment	Polycyclic Aromatic Hydrocarbon (PAHs)	OB
IS25	Assessment	Sodium	OB
IS26	Assessment	Uranium	OB
IS27	Assessment	Petroleum Hydrocarbons (PHCs)	Buffer
IS28	Notification	Tetrachloroethylene	OB
IS29	Notification	Lead	Study Area
IS30	Notification	Lithium	Study Area
IS31	Notification	Manganese	Study Area
IS32	Notification	Nitrates, Inorganic, N.O.S	Study Area
IS33	Notification	Selenium	Study Area
IS34	Notification	Silver	Study Area
IS35	Notification	Sodium	Study Area
IS36	Notification	Uranium	Study Area
IS37	Notification	Zinc	Study Area
IS38	Closure	Petroleum Hydrocarbons (PHCs)	OB
IS39	Assessment	Copper	Study Area
IS40	Assessment	Selenium	Study Area
IS41	Assessment	Petroleum Hydrocarbons (PHCs)	OB
IS42	Corrective Action Plan	Contaminated soil	Study Area
IS43	Assessment	Copper	Study Area
IS44	Assessment	Zinc	Study Area
IS45	Corrective Action Plan	Arsenic	Buffer
IS46	Corrective Action Plan	Chlorate and Magnesium Chloride mixture	Buffer
IS47	Corrective Action Plan	Chloroform	Buffer
IS48	Corrective Action Plan	Nickel	Buffer
IS49	Corrective Action Plan	Nitrates, Inorganic, N.O.S	Buffer
IS50	Assessment	Copper	Buffer
IS51	Closure	Petroleum Hydrocarbons (PHCs)	Buffer
IS52	Closure	Ethylbenzene	Buffer
IS53	Closure	Petroleum Hydrocarbons (PHCs)	Buffer

[1] Location column designates location within Study Area, 500m Buffer (Buffer) and Outside Study Area Buffer (OB).

Table 3. Summary of operating hazardous materials storage locations within the Study Area and 500m buffer.

Map ID #	Operator	Address	Location[1]
H1	Grow Tec Ltd. Storage Site	117 Wakooma St., Saskatoon	OB
H2	Nouryon Chemical Storage Site (Formerly Akzo Nobel Chemicals Ltd.)	3910 Wanuskewin Rd, Saskatoon	Study Area
H3	CNH Canada Ltd., Saskatoon Storage Site	1000 71st St. E., Saskatoon	OB
H4	Saputo Dairy Producers Canada G.p., Wakooma Street, Saskatoon, Storage Site	122 Wakooma St., Saskatoon	Buffer
H5	Rosler Construction Limited Storage Site	106 71st St. W., Saskatoon	Study Area
H6	Mobil Gas Bar(#3861),	2815 Wanuskewin Rd., Saskatoon	OB
H7	Flying J Travel Plaza Inc. Storage Site	Corner Of Marquis Drive And Siemens Avenue, Saskatoon	OB
H8	Kap Equipment Inc. Storage Site	3715b Thatcher Ave., Saskatoon	Buffer
H9	Saskatchewan Place Assoc. Inc. Storage Site	3515 Thatcher Ave., Saskatoon	OB
H10	Blueline Truck Wash And Lube Storage Site	102 Neepawa St., Saskatoon	Buffer
H11	Costco Wholesale Storage Facility	115 Marquis Dr. Saskatoon	Buffer
H12	BASF Agricultural Specialties Ltd Warehouse	3835 Thatcher Avenue, Saskatoon	Buffer
H13	Hertz Equipment Rental Facility Approval To Construct	3611 Arthur Rose Ave, Saskatoon	Buffer
H14	SaskTel Storage Site	745 - 66th Street East, Saskatoon	OB
H15	The Hertz Corporation Storage Site	3911 Burron Ave, Saskatoon	OB
H16	Cover Building Systems Storage Site	3815 Wanuskewin Road Saskatoon	Buffer
H17	Wajax, Saskatoon Storage Site	205 Marquis Drive West, Saskatoon	Buffer

[1] Location column designates location within Study Area, 500m Buffer (Buffer) and Outside Study Area Buffer (OB).

Table 4. Summary of Provincial spill database search within the Study Area and 500m buffer.

Map ID #	Year	Substance	Amount	Unit of Measure (UOM)	Status	Location[2]
S1	2023	Municipal sewage sludges	3	Cubic meters (m3)	Transferred to Water Security	OB
S2	2023	Municipal sewage sludges	50	Gallons (US Gal)	Transferred to Water Security	OB
S3	2023	Amine	40	Kilograms (kg)	Notification	Study Area
S4	2023	Sodium Hydroxide Solution	4000	Litres (L)	Notification	OB
S5	2023	Sodium Hydroxide Solution	4000	Litres (L)	Notification	OB
S6	2022	Chromium	1127	Litres (L)	Closure	OB
S7	2022	Armeen	5	Kilograms (kg)	Closure	Study Area
S8	2022	Diesel Fuel; Fuel Oil; Gas Oil; of Heating Oil Light	2000	Litres (L)	Closure	Study Area
S9	2022	Ammonia Solution	150	Other	Closure	OB
S10	2022	Anhydrous Ammonia	112	Other	Closure	Buffer
S11	2022	Nitrogen, Refrigerated Liquid	489	Litres (L)	Closure	Buffer
S12	2022	Nitrogen, Refrigerated Liquid	489	Litres (L)	Closure	Buffer
S13	2021	Municipal sewage sludges	3000	Litres (L)	Closure	OB
S14	2021	Sulfuric Acid, Spent	100	Litres (L)	Transferred to Water Security	OB
S15	2021	Chlorine	0	Kilograms (kg)	Notification	OB
S16	2020	Glycol Solution	15000	Litres (L)	Closure	OB
S17	2020	Hydraulic Oil	114	Litres (L)	Closure	OB
S18	2020	Hydrocarbons, Liquid NOS	1	Other	Closure	OB
S19	2020	Glycol Solution	48	Cubic meters (m3)	Closure	OB
S20	2020	Air emissions, burning landfill	1	Other	Notification	OB
S21	2019	Glycol Solution	20000	Litres (L)	Notification	OB
S22	2019	Armeen	2250	Kilograms (kg)	Completed	Study Area
S23	2018	Corrosive liquid, Acidic, Organic, N.O.S	100	Litres (L)	Completed	Buffer
S24	2018	Transformer Oil	450	Litres (L)	Closure	OB
S25	2018	Petroleum distillates, N.O.S; or Petroleum products, N.O.S	1000	Litres (L)	Closure	OB
S26	2018	Sodium Hydroxide Solution	150	Litres (L)	Completed	OB
S27	2017	Propane	0.5	Litres (L)	Closure	Buffer
S28	2017	Petroleum Hydrocarbons (PHCs)	0	Other	Notification	Buffer
S29	2017	Armeen	400	Kilograms (kg)	Closure	Study Area
S30	2017	Hydrochloric Acid	500	Litres (L)	Closure	Study Area
S31	2017	Amine	45	Kilograms (kg)	Closure	Study Area
S32	2017	Glycol Solution	123	Litres (L)	Closure	OB

S33	2016	Cream	1500	Litres (L)	Completed	Buffer
S34	2016	Municipal sewage sludges	250	Gallons (Imp Gal)	Assessment	OB
S35	2016	Sediment	0	Other	Closure	OB
S36	2016	Sediment	0	Other	Closure	Study Area
S37	2016	Sediment	0	Other	Completed	
S38	2016	Barium compound, N.O.S. other than barium sulphate	500	Kilograms (kg)	Completed	Buffer
S39	2016	Hydraulic Oil	225	Litres (L)	Closure	OB
S40	2016	Crankcase Oils and Lubricants	100	Litres (L)	Completed	OB
S41	2015	Diethyl Ether; or Ethyl Ether	8	Litres (L)	Closure	OB
S42	2015	Hydrochloric Acid	0	Other	Closure	OB
S43	2015	Brines, Sludges	2500	Litres (L)	Completed	OB
S44	2015	Chlorodifluoromethane; or Refrigerant Gas R22	15	Pounds (lb)	Closure	Buffer
S45	2002	A/C De-Icing Fluid	405	Litres (L)	N/A[1]	OB
S46	2002	Anhydrous Ammonia vapor	Unknown	Unknown	N/A[1]	OB
S47	2002	Redi-Coat C2914	1818	Kilograms (kg)	N/A[1]	OB
S48	2000	Chlorine Gas	10	Kilograms (kg)	N/A[1]	OB
S49	2000	Diesel	200	Litres (L)	N/A[1]	Study Area
S50	2000	Diesel	2700	Litres (L)	N/A[1]	OB
S51	2000	Base - Caustic Soda and Sulphuric Acid	Unknown	Unknown	N/A[1]	OB
S52	1999	Chlorine	Unknown	Unknown	N/A[1]	OB
S53	1999	Diesel	4500	Litres (L)	N/A[1]	OB
S54	1998	Calcium Hydroxide	1400	Kilograms (kg)	N/A[1]	OB
S55	1998	Waste Oil	1000	Kilograms (kg)	N/A[1]	OB
S56	1998	Diesel	150	Litres (L)	N/A[1]	OB
S57	1998	Acid	110	Litres (L)	N/A[1]	OB
S58	1998	Chlorine Gas	Unknown	Unknown	N/A[1]	OB
S59	1998	Hydraulic Oil	30	Litres (L)	N/A[1]	OB
S60	N/A*	Chlorine Gas	100	Grams (g)	N/A[1]	Study Area
S61	N/A*	Sulfuric Acid	0	Litres (L)	N/A[1]	Study Area
S62	N/A*	Lean Brine	1	Cubic meters (m3)	N/A[1]	Study Area
S63	N/A*	Diesel Fuel Liquid	200	Litres (L)	N/A[1]	OB

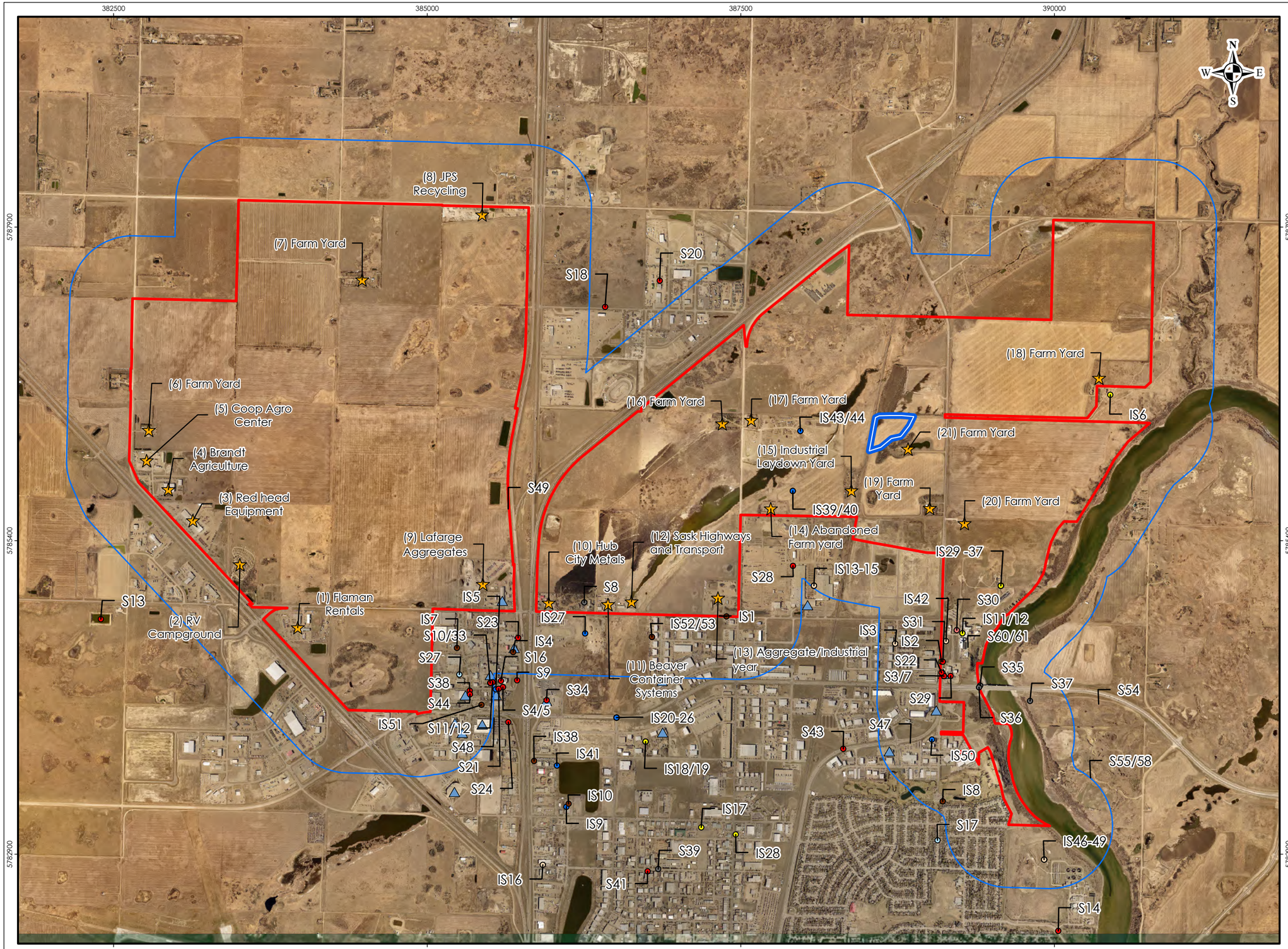
*Date was not entered into Provincial Database.

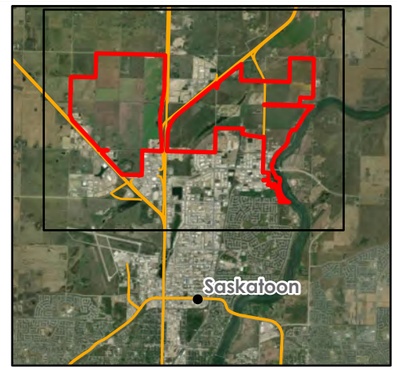
[1]Status was not available for spills prior to 2015.

[2] Location column designates location within Study Area, 500m Buffer (Buffer) and Outside Study Area Buffer (OB).

Riel Industrial Amendment
Natural Area Screening

Figure 4.
Potential Soil Contamination Areas





- Snow Dump
- Study Area
- Study Area 500m Buffer

Discharge Cases Spills
- Fixed Facility
- Pipelines
- Transportation
- Other

Environmentally Impacted Sites
- Assessment
- Closure
- Corrective Action Plan
- Notice of Site Condition
- Notification

- Potential Contamination Facilities
- Riel NAS Hazardous Materials Storage

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Scale 1:30,000

Projection: NAD 1983 UTM Zone 13N

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4.3.1 City of Saskatoon Snow Dump

The City uses an area along the CN Rail line in NE-27-37-05 W3M as a snow dump. This area is likely subject to impact from the road salt, litter, or other contaminants that are hauled in with the snow. This is an area that should have a Phase I Environmental Site Assessment completed prior to development. Of concern is the proximity to the Hudson Bay Swale Wetland Complex and the potential effects of snow melt and stormwater (Stantec, 2012).

4.3.2 Hudson Bay Swale Wetland Complex Infill

Through review of aerial and satellite imagery, an area of infill was observed within the Hudson Bay Swale Wetland Complex. Upon review of historic aerial imagery (Appendix A) there is evidence of infill operations continuing to expand from 1997 through 2021. The land base has been progressively expanded into the wetland within the Hudson Bay Swale Wetland Complex to construct what appears to be a construction lay-down yard. Figure 5 below shows the boundaries of the infill from the 2012 Stantec assessment, as well as the current boundaries as of 2021 (the acquisition year of the imagery). As of 2021, it appears only a small channel remains connecting the wetlands within the Hudson Bay Swale Wetland Complex across the property.

Two records of environmentally impacted sites were found within the Ministry of Environment Impacted Sites Database (Figure 4) within the infill that has taken place within the Hudson Bay Swale Wetland Complex. Both are classified as historical, one being recorded for impacts from zinc and the other for copper. A second pair of sites was recorded within the agricultural land on the east side of the Hudson Bay Swale Wetland Complex, southeast of the infill, with impacts from selenium and copper, respectively (Figure 4).

4.3.3 Recommendations

4.3.3.1 Potentially Contaminated Sites

Development planning should consider in more detail the types of hazardous materials being stored within the Study Area and 500m buffer. Phase 1 Environmental Site Assessments (ESA) should be completed on areas with potential contamination in the proposed development area prior to development to determine the likelihood of contamination and evaluate the need for field sampling.

The City should also compare the results of the GeoHub database search with internal contaminated sites records to confirm the completeness of the information within this report.

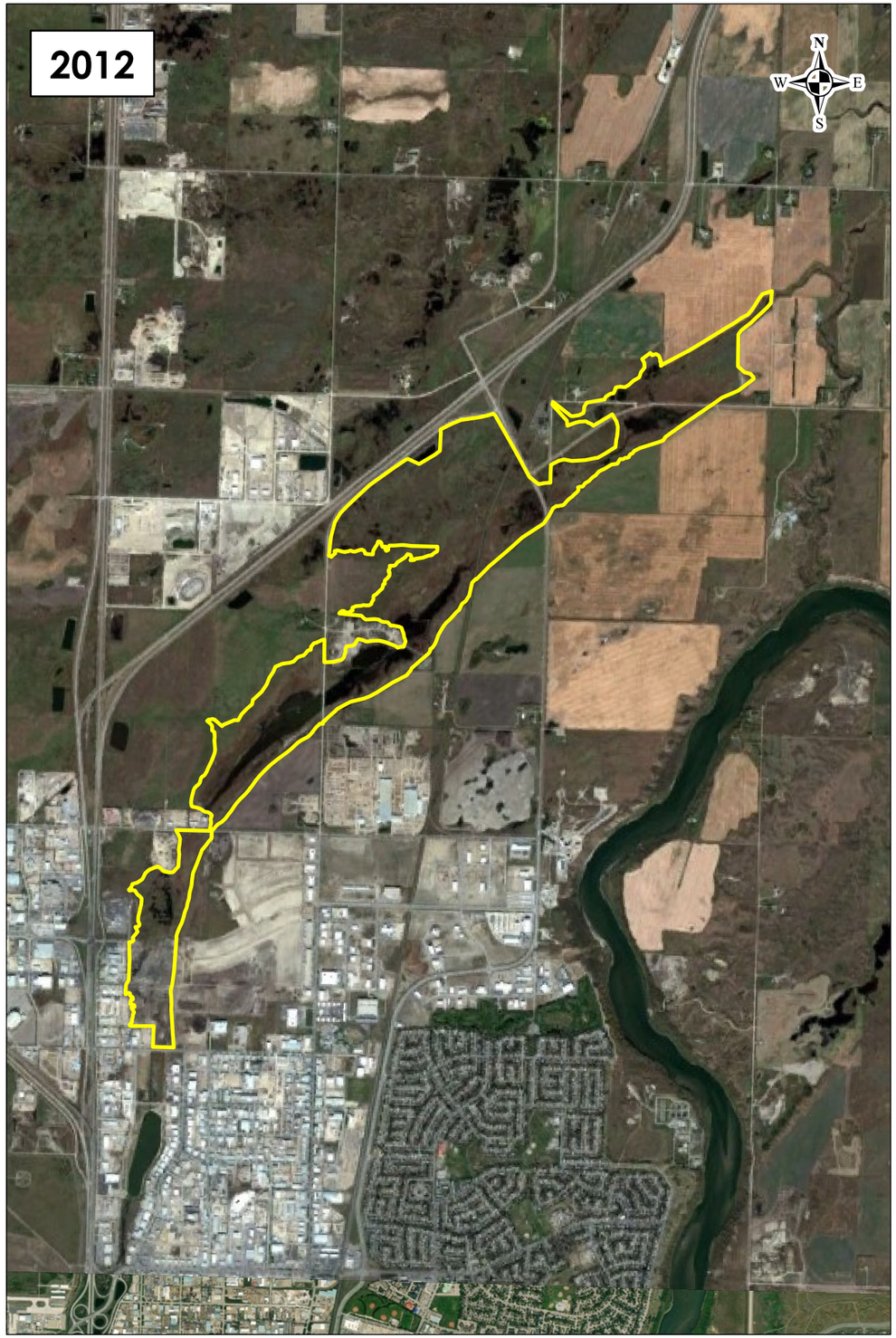
4.3.3.2 Hudson Bay Swale Wetland Complex

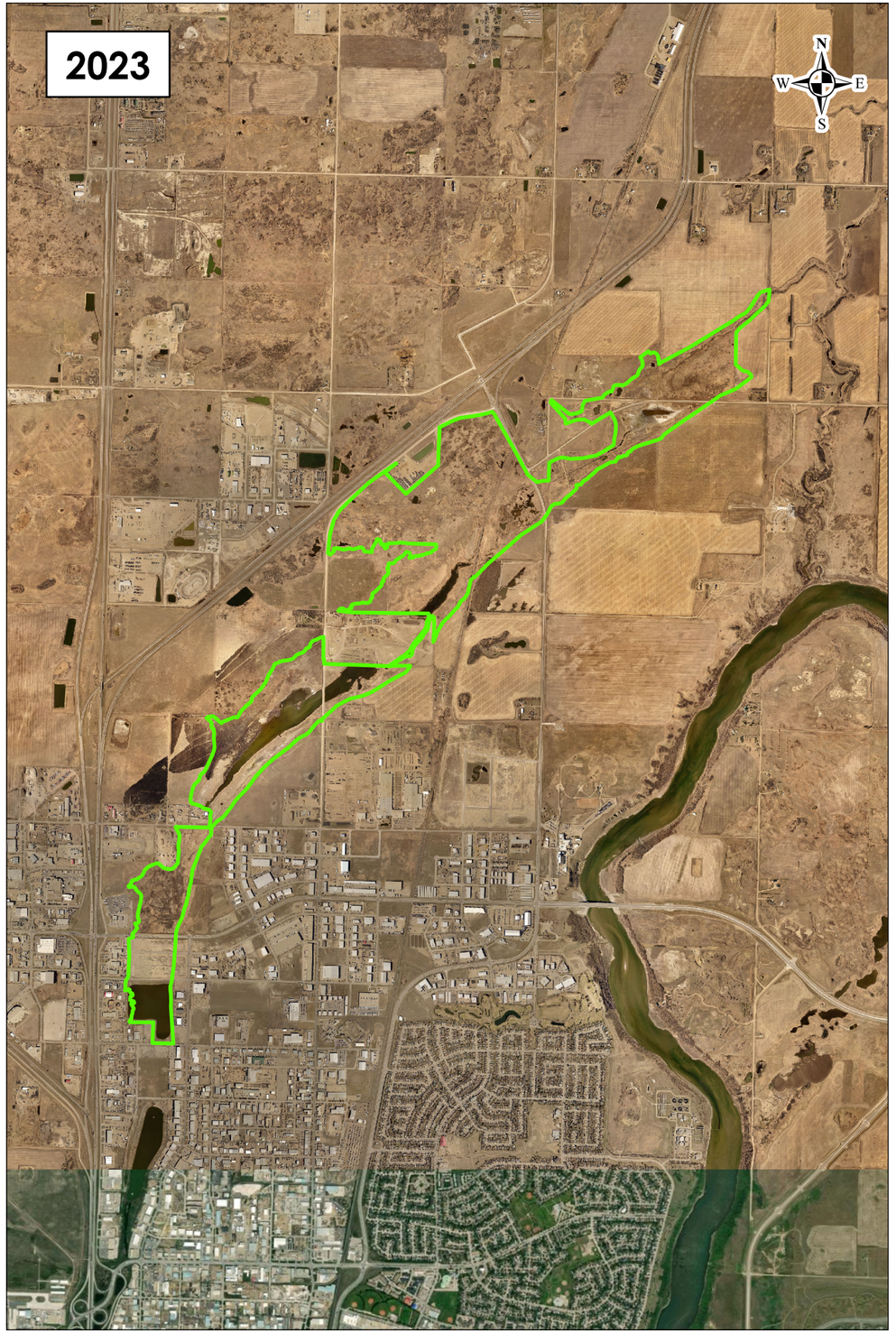
The modification (infill) of the wetlands within the Hudson Bay Swale Wetland Complex is impacting a significant natural feature within the Study Area. There are two documented impacted sites within the infill area, and the assessment of aerial imagery is that there is

a risk of contamination of the Hudson Bay Swale Wetland Complex, and potentially groundwater, as discussed in Section 4.4.2. Further, the contents stored in the presumed construction lay-down yard appear to consist of metals and other materials that could be subject to leaching into the ground and contaminating the site over time. The historic aerial photo sequence in Appendix A provides a timeline of impacts to this area of the Hudson Bay Swale Wetland Complex.

As these parcels and activities were inherited by the City through annexation, Triton recommends that the City explore legal and legitimate methods of reconnaissance to collect evidence with respect to modification of the Hudson Bay Swale Wetland Complex, industrial waste regulations, and the *Environmental Management and Protection Act, 2010*. The City should explore its jurisdiction to halt further impact to the Hudson Bay Swale Wetland Complex by infilling and other modifications. The 2015 *Riel Industrial Sector Plan* notes that the landowner at the time did not allow assessment of the Hudson Bay Swale Wetland Complex across the aforementioned parcels at time of field study in 2012. Further, the 2015 *Riel Industrial Sector Plan* affirms that the developer (landowner) proposing to develop one of these parcels will be required to provide a site-specific Natural Area Screening study, at the landowner's expense, to civic Administration's satisfaction, prior to development occurring on the site or prior to preparing an industrial area concept plan for the parcel (City of Saskatoon, 2015).

Field visits are recommended for any infill sites to document current in situ conditions.

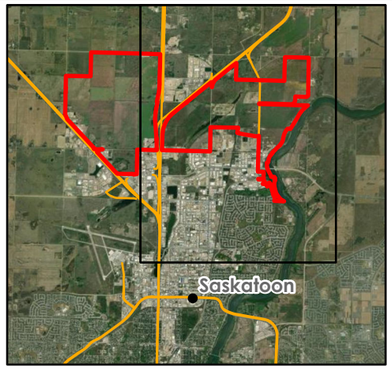




Riel Industrial Amendment
Natural Area Screening

Figure 5.

Hudson Bay Swale Infill



2012 Swale Boundary

2023 Swale Boundary

Sources and Disclaimer

Base map Source: ESRI Imagery 2022 / Google Earth

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Projection: NAD 1983 UTM Zone 13N

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4.4 Hydrology and Hydrogeology

4.4.1 Surface Drainage

As reported in (AMEC, 2002), surface drainage is either directly to the South Saskatchewan River Valley to the east, or to the chain of wetlands within the Hudson Bay Swale Wetland Complex near the east side of the Study Area that links to Opimihaw Creek via northward flow during high-water levels. Opimihaw Creek, in turn, empties into the SSR near the east boundary of the Study Area. Evaluation of current aerial imagery indicated that wetlands and bluffs of trees are evident within the valley and other low-lying areas resulting from increased groundwater conditions and during the spring freshet (AMEC 2002).

4.4.2 Groundwater

Groundwater movement is restricted within a sand/silt layer below the surface, by the underlying glacial till at about 20 to 25 meters depth (AMEC 2002). Flow of groundwater within this shallow aquifer is heavily influenced by topographic features of the area. Movement flows horizontally above the till layer, where it passes through the Opimihaw Creek valley towards wetlands and depressions, to collect in springs located above the bank of the river, on a regional scale (Tetra Tech EBA, 2015). Tetra Tech concluded that the flow direction of shallow groundwater was towards the Hudson Bay Swale Wetland Complex above the glacial layer with an upward hydraulic gradient of 0.002 to 0.007 m/m (Tetra Tech EBA, 2015).

A hydrogeological investigation was undertaken by Tetra Tech EBA in 2015, which included a literature review and installation of piezometers. Groundwater levels were observed at thirteen piezometers and measured between April 16 and October 15, 2015. A summary of measurements is provided in Table 5 (Tetra Tech EBA, 2015). As a result of the literature review and interpretation of borehole data, there are nine major mappable horizons above the Lea Park Formation which could contain aquifer sediments (Tetra Tech EBA, 2015). AMEC (2002) reported that deep groundwater flow exists about 75 meters below the surface through the Tyner Valley Aquifer, from the northwest to the north. This aquifer exists in a stream valley created pre-glacial activity.

Table 5. Summary of groundwater levels observed at 13 piezometers between April 16 and October 15, 2015 (Tetra Tech EBA, 2015).

Piezometer ID	Horizon	Measured Water Level (m below ground surface)			
		April 16	May 12	June 10	October 15
15BH001	Upper Floral Aquifer (sand)	-0.950	-0.950	-0.950	-0.950
15BH003	Upper Floral Aquifer (below interbedded till)	0.589	0.502	0.495	0.389
15BH004	Upper Floral Aquifer (sand)	-0.217	-0.435	-0.285	-0.239
15BH005	Upper Floral Aquifer (sand)	-0.170	-0.345	-0.222	-0.199
15BH006	Floral Till (silty, some sand)	2.873	1.151	1.892	1.999
15BH007*	Upper Floral Aquifer (silty)	2.422	2.032	2.120	-
15BH008	Upper Floral Aquifer (sand)	0.152	-0.035	0.055	0.091
15BH009	Upper Floral Aquifer (sand)	-0.054	-0.054	0.095	0.060
15BH010	Floral Till (silty, sandy)	0.609	0.175	0.685	0.235
15BH011	Floral Till (silty, some sand)	4.954	1.081	1.035	0.951
15BH012	Floral Till (sandy)	1.787	1.141	1.071	0.975
15BH013	Floral Till (silty)	Dry	Dry	Dry	Dry
15BH014	Floral Till (sandy)	1.970	1.065	1.210	1.865
15BH015	Floral Till (sandy)	3.180	2.185	2.235	3.081

* 15BH007 did not exist during 15-Oct-15 water level monitoring. It was destroyed by construction activities on an unknown date.

* Negative water levels indicate the water level above ground level.

The maximum depth of any of the piezometers installed by Tetra Tech EBA was 21.7m. Sediments related to the Upper Floral and Lower Floral aquifers from the Saskatoon Group Aquifers were encountered by seven piezometers, with four piezometers within the Hudson Bay Swale Wetland Complex showing artesian flows. Artesian flows refer to aquifers or wells within aquifers where water rises higher than the top of the aquifer due to confining pressure (Government of Canada, 2023). At times, artesian flows will exceed the surface of the ground and flows freely unless contained. Tetra Tech EBA (2015) concluded that within their study area, groundwater levels are shallow (less than 1.5m), with a horizontal hydraulic gradient flowing toward the Hudson Bay Swale Wetland Complex.

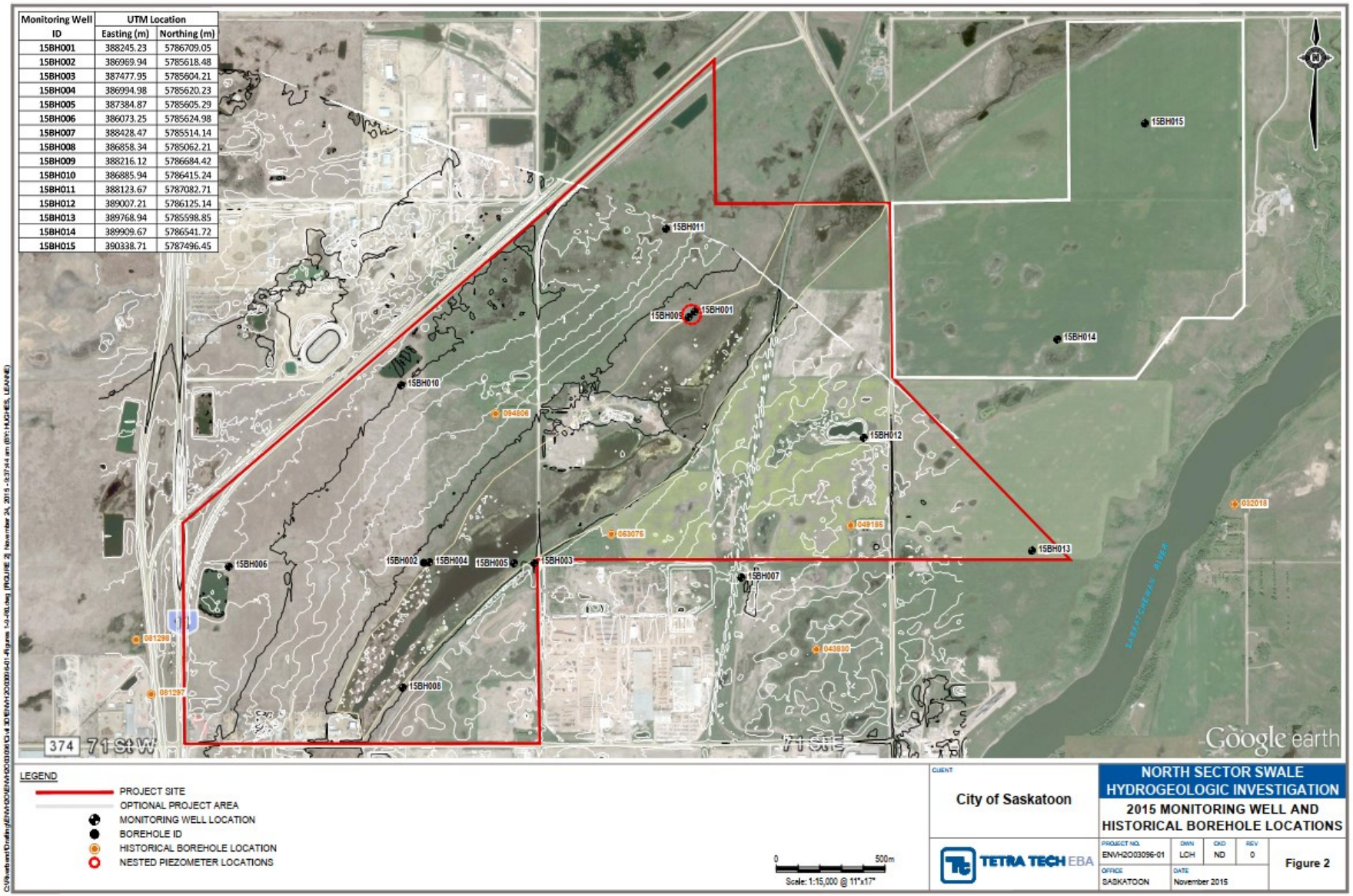

Figure 6. Locations of existing boreholes and piezometers installed during the 2015 North Sector Swale Hydrogeologic Investigation (as presented in Tetra Tech EBA, 2015).

4.4.3 Recommendations

The infill of the wetland within the Hudson Bay Swale Wetland Complex (Figure 5) has narrowed the connection of wetlands across the property significantly and is likely to be impacting natural surface drainage along the Hudson Bay Swale Wetland Complex. Triton recommends the City monitor changes to the wetlands within the Hudson Bay Swale Wetland Complex. Triton suggests using air imagery to monitor the margins of the wetlands within the Hudson Bay Swale Wetland Complex against the historic margins, to determine if the infill is causing those wetlands to hold more water, thus affecting downstream flows and potentially causing issues for stormwater management across the East block of the Study Area.

Predominantly shallow groundwater levels are likely to affect or be affected by development of the Riel Industrial Sector, including City utility corridors, sanitary sewers, and stormwater management infrastructure, as well as other construction-related excavation. The data collected by Tetra Tech EBA during their 2015 *North Sector Swale Hydrogeological, Geotechnical and Wetland Evaluation* indicated that groundwater levels are shallow, particularly around the Hudson Bay Swale Wetland Complex where piezometers demonstrated artesian flows.

The Hudson Bay Swale Wetland Complex may play a large role in the mitigation of impacts to groundwater through incorporation of these wetlands into a stormwater management plan for the Study Area. Since the area is closely tied to the Upper Floral aquifer, and unlikely to be suitable for surface development, avoidance of excavation and development within the boundaries of the wetlands within the Hudson Bay Swale Wetland Complex (Figure 5) is the recommended primary mitigation of impacts to groundwater. Considering the locations of piezometers with artesian flows as described in the Tetra Tech 2015 groundwater study, the recommendation is to restrict development to the top of the slopes leading into the Hudson Bay Swale Wetland Complex in order to maximize elevation above the aquifer.

Given the degree to which the City has investigated into the hydrogeology of the Study Area, Triton recommends that prior to planning development within the East block of the Study Area, that the City consult with professional engineers to assess and make specific recommendations on construction planning and practises. This may ensure safe excavations and minimize the risk of impacting water supply to rural properties that could be using the aquifers for water supply. Triton also recommends that the City consider restricting the use of underground storage tanks (UST), particularly within the East block of the Study Area, given the proximity of contact with the aquifers and risk of direct contamination. As was recommended for the University Heights No.3 neighborhood where shallow groundwater was also present, Triton also recommends that the Hudson Bay Swale Wetland Complex be used as a tool to manage stormwater drainage (EDI Environmental Dynamics, 2021).

4.5 Wetlands and Natural Areas

The Riel Industrial Sector Study Area is dominated by disturbed lands (e.g., agricultural lands, developed lands); however, remnant natural areas remain, particularly wetlands and few tree stands.

The City of Saskatoon's *Wetland Policy* (City of Saskatoon, 2013) defines a wetland as:

"[L]ands having water at, near, or above the land surface or land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, aquatic vegetation, and various kinds of biological activity which are adapted to a wet environment. Wetlands can hold water temporarily or permanently, with water levels fluctuating over the course of a single year and over many years with climactic cycles."

The *Wetland Policy* dictates that the City will maintain an inventory of wetland resources that includes classification and functional assessment of wetlands, and identification of significant wetland complexes. The policy establishes that wetland classification will be completed according to the Stewart and Kantrud Wetland Classification system. The policy also requires wetland mitigation planning as part of any concept plan or amendment thereof that has the potential to impact wetlands identified as Preserve, Manage 1, and Manage 2 within the City's wetland inventory.

In the eastern portion of the Study Area, the Hudson Bay Swale Wetland Complex occupies a significant area (Table 6 and Figure 7) (Stantec, 2012). There are ten wetlands that comprise the Hudson Bay Swale Wetland Complex, including one Class 5 wetland, eight Class 4 wetlands and one Class 3 wetland (Stantec, 2012). Portions of the Hudson Bay Swale Wetland Complex have little disturbance, though other areas have been impacted by infilling, road developments, and drainage canals (Stantec, 2012).

Disturbance of the Hudson Bay Swale Wetland Complex over time has divided the water into multiple wetlands. The size and permanence, along with high diversity of the wildlife that utilize the area, makes this area a candidate for conservation within the northern portion of the City of Saskatoon (Stantec, 2006). Stantec (2006), Jonker and Gollop (1992), and Weichel (1992) note the significance of the Hudson Bay Swale Wetland Complex and its associated wetlands, being known for its variety of bird life and importance as a nature viewing location. Weichel (1992) identifies the Hudson Bay Swale Wetland Complex as one of ten sites around Saskatoon having priority for conservation. The *Green Infrastructure Strategy* (City of Saskatoon, 2020) identifies the Hudson Bay Swale Wetland Complex as a significant natural area, as well as area of interest for Meewasin.

Table 6. Wetlands Comprising the Hudson Bay Swale (Stantec, 2012)

Stewart and Kantrud Classification			Area (ha)
Class	Cover	Phase	
4	3	Open water	21.54
4	2	Open water	4.08
5	3	Open water	57.12
4	3	Open water	23.23
4	3	Open water	50.24
4	2	Normal emergent and open water	33.84
4	2	Open water	26.48
3	2	Open water	4.67
4	2	Open water	20.75
4	2	Normal emergent	46.33
Total Area			**311.05**

A total of 144 wetlands were classified within the Study Area by Stantec (2012) (Table 7 and Figure 7), including 41 wetlands that were field verified. Additionally, four tree bluffs were identified and field verified by Stantec during their 2012 field investigations. Natural areas identified within the Study Area are presented in Figure 7.

Table 7. Natural Areas Within the Study Area (Stantec, 2012)

Natural Area Type	Total Number of Areas	Number of Areas Field Verified	Total Area (ha)
Class 2 wetland	69	10	78
Class 3 wetland	58	19	77
Class 4 wetland	15	6	100
Class 5 wetland	2	2	58
Tree Bluff	4	4	20
Total (wetlands)	144	41	461
Total (wetlands + tree bluffs)	**148**	**45**	**481**

Within the 500m buffer, a total of 102 wetlands were classified by Stantec (2012) (Table 8), including 42 that were verified in the field. A summary of the natural areas within the 500m buffer is shown in Figure 7.

Table 8. Natural Areas within the 500m buffer of the Study Area.

Natural Area Type	Total Number of Areas	Number of Area Field Verified	Total Area (ha)
Class 2 wetland	29	4	32
Class 3 wetland	58	26	54
Class 4 wetland	15	12	201
Class 5 wetland	0	0	0
Tree Bluff	4	0	38
Total (wetlands + tree bluffs)	**106**	**42**	**325**

There is potential that data collected in the past, including field verified natural areas, is outdated and inaccurate. There is also potential that natural areas have since been altered, degraded, or lost due to agricultural practices, modification, or natural processes. Since 2012, the Hudson Bay Swale Wetland Complex has experienced infilling at NW 27-37-5 W3M (Appendix A), which may have an effect on local hydrology. Additionally, wetlands with a low permanency class (i.e., Class 2) are particularly at risk of infilling through regular agricultural practices.

4.5.1 Recommendations

It is recommended to conserve the Hudson Bay Swale Wetland Complex as an important natural area within the City of Saskatoon. It is recommended to implement the management and protection strategies proposed by Stantec for the Hudson Bay Swale Wetland Complex in the 2012 report *North/Northwest Natural Area Screening Study* (Appendix B). The City should consider the effects of the proposed perimeter road and civic infrastructure on drainage patterns and habitat connectivity.

The Hudson Bay Swale Wetland Complex should be a key component within Riel Industrial Sector planning, future concept planning, and future development. Protection and enhancement of this area aligns with the City's *Wetland Policy* and *Green Infrastructure Strategy,* as well as provides opportunities for mitigating impacts to ground water and surface drainage.

The Hudson Bay Swale Wetland Complex provides the dominant undeveloped habitat for vegetation and wildlife species. Updated functional assessments, as well as wildlife and rare plant species detection surveys are recommended to provide the City with an updated understanding of habitat utilization of the Hudson Bay Swale Wetland Complex.

Stantec also makes recommendations to consider rehabilitation of wetlands outside the 4km airport buffer and the establishment of a 20m activity restriction buffer around the riparian boundary of the wetlands within the Hudson Bay Swale Wetland Complex (Stantec, 2012). Other Stantec recommendations include maintaining wetlands designated as "Preserve" under the City's Wetland Policy and native seeding disturbed areas within the 20m buffer of the wetlands. Following those recommendations, the City

provisioned for a minimum 20m riparian area buffer between the Hudson Bay Swale Wetland Complex boundary (as mapped in Stantec 2012) and adjacent developments within the *Riel Industrial Sector Plan* (City of Saskatoon, 2015).

Triton recommends that any development within 45m of the riparian edge of wetlands be evaluated to ensure that impacts to the wetlands are avoided or minimized. The buffer should be established from the edge of riparian vegetation primarily around the Hudson Bay Swale Wetland Complex as a minimum distance for unmitigated development. With appropriate mitigation, this distance could be reduced following an assessment of the proposed development risk to the wetland. Considering the locations of artesian piezometers as described in Tetra Tech (2015) (Figure 6), Triton recommends that any development is restricted, at a minimum, to 20m from the riparian boundary or the top of the nearest slope leading down to the wetland, whichever is further. For wetlands outside of the Hudson Bay Swale Wetland Complex, the standard minimum 20m development buffer (Appendix B), as recommended by Stantec (2012), is sufficient to conserve wetland habitats, as many of these wetlands have been surrounded by cultivation for many years.

As part of this initiative, the City should assess the effects of the infill actions across the wetland within the Hudson Bay Swale Wetland Complex. Monitoring of changes in drainage flow and changes in vegetation may suggest that the wetlands are expanding (or receding) as a result of the change in wetland connectivity along the Hudson Bay Swale Wetland Complex. The City may consider bolstering the City's *Wetland Policy* and working with the Saskatoon North Partnership for Growth (P4G) to provide specific protections for large significant wetland assets, such as that within the Hudson Bay Swale Wetland Complex, in order to enhance conservation of important natural areas.

Further wetland investigations would benefit the planning of the Riel Industrial Sector. Updated wetland verifications and functional assessments within the Study Area would inform the selection of candidate wetlands for ecological enhancement, or for incorporation into stormwater management systems.

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Riel Industrial Amendment Natural Area Screening

Figure 7.
Wetlands and Natural Areas
(Stantec 2012)

Study Area

Study Area 500m Buffer

Wetland Class (Stantec 2012)

2

3

4

5

Trees

Sources and Disclaimer
Base map Source: ESRI
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Scale 1:30,000

Projection: NAD 1983 UTM Zone 13N

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4.6 Vegetation

The Study Area is located within the Saskatoon Plain landscape of the Moist Mixed Grassland Ecoregion. The Saskatoon Plain landscape area is a level glacial till plain with limited surface drainage around the SSR. The landscape is comprised of gently undulating glaciolacustrine landscapes within the southern portion and thinner deposits of discontinuous cover on an eroded, stony, and gravely glacial till surface towards the north. At the northern margin of the area, the eroded till plain has a large amount of gravel and is covered with a very thin, sandy deposit (Acton, Padbury, & Stushnoff, 1998).

Within the Saskatoon Plain landscape, native mixed-grass vegetation is limited to sandy soils where a variety of grasses and shrubs are the most characteristic species on the uplands. Saline areas exist in depressional areas and are dominated by various salt-tolerant grasses, such as alkali grass (*Puccinella spp.*) and red samphire (*Salicornia rubra*). Aspen (*Populus tremuloides*) is present within non-saline areas and associated with high water tables (Acton, Padbury, & Stushnoff, 1998).

The southern portion of the Hudson Bay Swale Wetland Complex was surveyed by AMEC in 2002 (AMEC, 2002). The dominant vegetation in the larger wetlands were cattail and sedge species, while smooth brome and dock species dominated the smaller wetlands. Typically, the smaller wetlands were surrounded by a ring of willows (*Salix spp.)*. No rare species were observed during AMEC's surveys as they were completed in the winter. A subsequent survey by Stantec was completed in the summer of 2009, which found cattail spp., common bulrush (*Typha latifolia*), Baltic rush (*Juncus balticus*), Sedge spp., and Wheatgrass spp. within the south half of the Hudson Bay Swale Wetland Complex (Stantec, 2012).

Field investigations were conducted by Stantec in 2012 to support the *North/Northwest Natural Area Screening Study* (Stantec, 2012). Dominant vegetation observed during the 2012 field surveys within the wetlands included species common to the region, such as common cattail, sago pondweed, creeping spike-rush, common plantain, and common chickweed. Dominant vegetation observed within the tree stands included trembling aspen, balsam poplar, western snowberry, wolf willow, willow species, prickly rose, and smooth brome. Due to the agricultural activities within the Study Area, weed species were common within or adjacent to the majority of natural areas, and included noxious species such as Canada thistle (*Cirsium arvense*), absinthe (*Artemisia absinthium*), nodding thistle (*Carduus nutans*), narrow leaved hawksbeard (*Crepis tectorum*), and cleavers (*Gallium aparine*), as well as nuisance species such as dandelion (*Taraxacum officinale*), quack grass (*Elymus repens*), and fox-tail barley (*Hordeum jubatum*).

Two provincially tracked plant species, narrow-leaved cattail (*Typha angustifolia)* and northern blue-eyed grass (*Sisyrinchium septentrionale*) were observed at two locations within the Study Area. Meadow pussytoes (*Antennaria arcuate*), narrow-leaved cattail, and narrow-leaved water plantain (*Alisma gramineum*) were found within the 500m Study Area buffer (Figure 8) during Stantec's field surveys in 2012 (Stantec, 2012). A search of the HABISask database identified twelve additional occurrences of provincially tracked plant species within the Study Area or within 500 m of the Study Area. Table 9 provides a list of all provincially tracked species that were previously recorded. No

federally listed plant species have been previously documented within 500 m of the Study Area.

Table 9. Provincially Tracked Plant Species Previously Recorded within 500 m of the Study Area.

Common Name	*Scientific Name*	*Provincial S-Rank*[1]
Awned Cyperus[2]	*Cyperus squarrosus*	S3
Bristle-leaved Sedge[2]	*Carex eburnea*	S3
Chaffweed[2]	*Anagallis minima*	S3
Engelmann's Spike-rush[2]	*Eleocharis engelmannii*	S3
Hudson's Cinquefoil[2]	*Potentilla hudsonii*	S2
Low Whitlowwort[2]	*Paronychia sessilifora*	S3
Macoun's Gentian[2]	*Gentianopsis virgata* ssp. *macounii*	S3
Menzie's Catchfly[2]	*Silene menziesii*	S3
Narrow-leaved Water Plantain[2,3]	*Alisma gramineum*	S3
Northern Blue-eyed-grass[2,3]	*Sisyrinchium septentrionale*	S3
Plains Rough Fescue[2]	*Festuca hallii*	S3
Rocky Mountain Sedge[2]	*Carex saximontana*	S3
Wood Lily[2]	*Lilium philadelphicum*	S4

Notes:

No species of management concern that are federally listed by COSEWIC or under Schedule 1 of the *SARA* have been previously documented within 500 m of the Study Area.

1 Provincial S-ranks are assigned by the Saskatchewan Conservation Data Centre and are defined as follows: S1 = Critically imperilled/extremely rare; S2 = Imperilled/very rare; S3 = Vulnerable/rare to uncommon; S4 = Apparently Secure; S5 = Secure/common.

2 Species record identified on HABISask (Saskatchewan Conservation Data Centre, 2023).

3 Species recorded by Stantec (2012).

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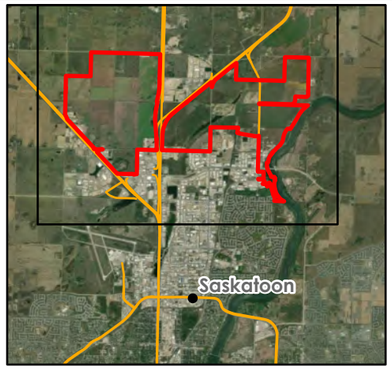
Riel Industrial Amendment Natural Area Screening

Figure 8.
Rare Plants in the Riel Industrial Area



Study Area

Study Area 500m Buffer

Rare Plants Survey (Stantec 2012)

- Meadow pussytoes (S1)
- Narrow leaved cattail (S1?)
- Narrow leaved water plantain (S3)
- Northern blue-eyed grass (S3?)

Historic Rare and Endangered Species

- Animal Assemblage
- Vascular Plant
- Vertebrate Animal

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During Stantec's field investigations in 2012, numerous weed species listed as noxious or nuisance under the *Weed Control Act* were documented. While their field investigations included the majority of the current Riel Industrial Sector Study Area, their surveys also covered a larger area to the west and southwest of current Study Area and the exact locations of the documented weeds are unknown. However, given the agricultural land use with the current Study Area and existing disturbance, weed species documented in 2012 have a high likelihood of occurring within the Study Area. A full list of weed species observed is provided in Table 10.

The iMap Invasives database was reviewed to identify documented occurrences of noxious and nuisance weed species within the Study Area. No weed species have been reported to iMap within the majority of the Study Area; however, numerous weed records were identified along the SSR valley within or directly adjacent to the east portion of the Study Area (Naturserve, 2023). The most common weed occurrence identified through iMap is European Buckthorn (*Rhamnus cathartica L.*).

Table 10. Weed Species Previously Documented Within the Study Area

Common Name	Scientific Name	Provincial Designation[1]
Absinthe[2,3]	*Artemisia absinthium L.*	Noxious
Nodding Thistle[2,3]	*Carduus nutans L.*	Noxious
Canada Thistle[2]	*Cirsum arvense (L.) Scop.*	Noxious
Narrow-leaved Hawk's-beard[2]	*Crepis tectorum L.*	Noxious
Quack Grass[2]	*Elymus repens*	Nuisance
Leafy Spurge[3]	*Euphorbia esula*	Noxious
Cleavers[2]	*Galium aparine L.*	Noxious
Foxtail Barley[2]	*Hordeum jubatum ssp. jubatum*	Nuisance
Prickly Lettuce[2]	*Latuca serriola L.*	Noxious
Oxeye Daisy[2,3]	*Leucanthemum vulgare Lam.*	Noxious
European Buckthorn[3]	*Rhamnus cathartica L.*	Noxious
Common Tansy[2]	*Tanacetum vulgare L.*	Noxious
Dandelion[2]	*Taraxacum officinale ssp. officinale*	Nuisance

Notes:

[1] Noxious and nuisance species listed under the *Weed Control Act* (Government of Saskatchewan, 2010).

[2] Species identified by Stantec (2012).

[3] Species record identified on iMap Invasives (Naturserve, 2023).

4.6.1 Recommendations

The Riel Industrial Sector Study Area is dominated by disturbed land (i.e., cultivated or developed lands). During planning of the Study Area, effort should be made to conserve habitat where rare plant species are known to occur. Rare vegetation species would benefit from the conservation of natural areas and habitat patches with known rare plant occurrences. Prior to initiating development, it is recommended to complete rare plant surveys as per the *Species Detection Survey Protocol: 20.0 Vascular Plant* (Government of Saskatchewan, 2021) within natural areas to verify documented occurrences of rare

plants and determine if mitigation measures should be implemented. If conservation of rare plant habitat is not feasible within the development planning, then mitigation options such as transplantation and/or seed collection could be considered if any S1and S2 provincially ranked species are discovered during pre-development detection surveys (Stantec, 2012).

4.7 Wildlife

Wildlife species typical of an agricultural landscape with numerous wetlands and wooded groves in proximity of a city can vary from small rodent species to large ungulate species and migratory birds. Also included in the Study Area are the SSR valley and the Hudson Bay Swale Wetland Complex, which provide the highest quality habitats within the area. The SSR valley and riparian forest are important for a wide variety of species (e.g., white-tailed deer, small mammals, migratory birds, etc.). The Hudson Bay Swale Wetland Complex is important for nesting and migrating waterfowl, shorebirds, and a variety of prairie-dwelling small mammals (Stantec, 2006).

One incidental sighting of a Common Nighthawk (*Chordeiles minor*) was recorded on the east side of the WHP, and an Osprey (*Pandion haliaetus*) nest was observed south of the Study Area near the Saskatoon Waste Water Treatment Plant during breeding bird surveys conducted by X-terra in 2022. Sprague's Pipits (*Anthus spragueii*) were observed at two locations within the Study Area during surveys conducted by Stantec in 2012 (Figure 9).

Loggerhead Shrike (*Lanius ludovicianus*) have not been documented during previous assessments conducted within the Study Area and HABISask identified no historic occurrences; however, a loggerhead shrike was identified by a citizen (including photographic evidence) in May 2022 near the Hudson Bay Swale Wetland Complex (eBird, 2023). This species is known to nest in shelterbelts within the region, though no nesting locations have been documented within the Study Area.

The Study Area is within a core whooping crane (*Grus americana*) migration corridor. The most recently documented observation of whooping cranes within the Study Area was reported to the SCDC in 2005, in which six individuals were observed at the Silverwood Golf Course. While Whooping Cranes do not breed in central Saskatchewan, migratory stopover sites are important habitats.

Amphibian surveys were conducted by Stantec within the majority of the Study Area in 2012 and X-terra completed amphibian surveys within the east portion of the Study Area in 2022. While Boreal Chorus Frogs (*Pseudacris maculata*) and Wood Frogs (*Lithobates sylvaticus*) were documented during both the Stantec and X-terra surveys, no species of management concern (SOMC) were documented within the Study Area. Stantec further described several wetlands within the Study Area as "medium" for amphibian habitat (Stantec, 2012), including the Hudson Bay Swale Wetland Complex.

A search of the HABISask database identified thirteen previously documented occurrences of SOMC within the Study Area and 500m buffer. A full list of wildlife SOMC that have been previously documented within the Study Area is provided in Table 11.

The Hudson Bay Swale Wetland Complex was highlighted as ecologically significant in the *North Industrial Sector Plan Natural Areas Screening – Resource Overview Report* (Stantec 2006). Wetlands like this complex provide a multitude of ecological services, including acting as groundwater recharge areas, providing natural flood attenuation and reduction, maintaining local and regional biodiversity, providing wildlife habitats, and climate amelioration values (e.g., carbon sequestration). Additionally, a natural area like the Hudson Bay Swale Wetland Complex provides aesthetic and cultural values, such as greenspace for recreation, nature viewing, and natural buffer zones.

Important wildlife habitat within the Study Area is concentrated along the Hudson Bay Swale Wetland Complex and Opimihaw Creek, leading down to the banks of the SSR toward the Meewasin Conservation Easement and Chief Mistawasis Bridge (City of Saskatoon, 2015). These areas together form a large undeveloped habitat area and corridor for wildlife to use and has the potential to be used by several federally-listed species at risk.

The infill of the Hudson Bay Swale Wetland Complex has the potential to cause changes in the surface water regime, with the potential to influence drainage patterns over time, causing changes in vegetation and potentially habitat utilization by wildlife species. Likewise, the proposed Saskatoon Freeway could have similar implications, with the potential to create a physical barrier across the Hudson Bay Swale Wetland Complex, limiting movement of wildlife and disconnecting the Green Network that currently exists there.

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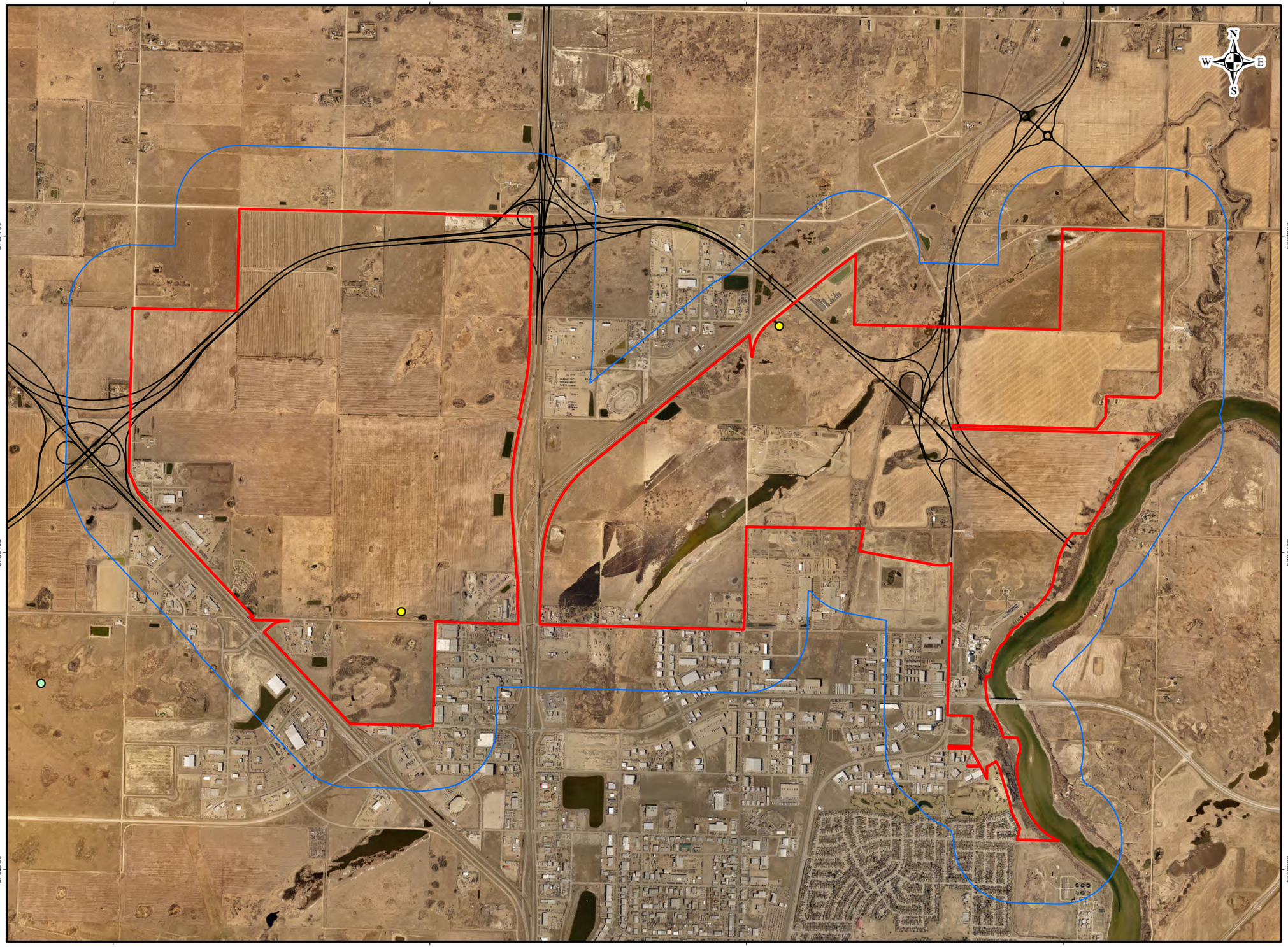

Riel Industrial Amendment Natural Area Screening

Figure 9.
Wildlife in the Riel Industrial Area (Stantec 2012)

Freeway Phase 1

Study Area

Study Area 500m Buffer

Species

Bobolink (S5B- Threatened)

Sprague's Pipit (S3B-Threatened)

Sources and Disclaimer
Base map Source: ESRI
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Scale 1:30,000

Projection: NAD 1983 UTM Zone 13N

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Table 11. Wildlife Species of Management Concern That Have Been Previously Documented Within the Study Area and 500m buffer.

Species	Provincial S-Rank[1]	Provincial Status[2]	Federal Status	Location[9]
Birds				
American Tree Sparrow[5,7] (*Spizelloides arborea*)	S1B, S5M	--	--	Buffer
Baird's Sparrow[5] (*Centronyx bairdii*)	S4B	--	Special Concern[3,4]	SA&B
Barn Swallow[5,7] (*Hirundo rustica*)	S4B	--	Special Concern[3] Threatened[4]	SA&B
Cooper's Hawk[5] (Accipiter cooperii)	S4B, S2N, S2M	--	--	Buffer
Harris's Sparrow[5] (*Zonotrichia querula*)	SUB, S5M	--	Special Concern[3,4]	Buffer
Horned Grebe[5,7] (*Podiceps auratus*)	S5B	--	Special Concern[3,4]	Study Area
Lesser Yellowlegs[5,7] (*Tringa flaviceps*)	S4B	--	Threatened[3]	Study Area
Loggerhead Shrike[7] (*Lanius ludovicianus*)	S3B	--	Threatened[3,4]	Study Area
Osprey[5] (*Pandion haliaetus*)	S3B	--	--	Buffer
Red-necked Phalarope[7] (*Lobipes lobatus*)	S4B,S3M	--	Special Concern	Study Area
Rusty Blackbird[7] (*Euphagus carolinus*)	S3B,SUN	--	Special Concern	Study Area
Sprague's Pipit[6] (Anthus spragueiii)	S3B	--	Threatened[3,4]	Study Area
Turkey Vulture[5] (*Cathartes aura*)	S3B	--	--	SA&B
Whooping Crane[5] (*Grus americana*)	SXB, S1M	Endangered	Endangered[3,4]	SA&B
Mammals				
American Badger[5] (*Taxidea taxus taxus*)	S3	--	Special Concern[3,4]	SA&B
Amphibians				
Northern Leopard Frog[5] (*Lithobates pipiens*)	S3	--	Special Concern[3,4]	Buffer

Notes:

-- Species has no conservation status designation within the relevant jurisdiction

[1] Provincial S-ranks are assigned by the Saskatchewan Conservation Data Centre and are defined as follows:

S1 = Critically imperilled/extremely rare; S2 = Imperilled/very rare; S3 = Vulnerable/rare to uncommon; S4 = Apparently Secure; S5 = Secure/common; B = breeding population of a migratory bird species; M = transient population of a migratory bird species; N = non-breeding population of a migratory bird species; U = uncertain in Saskatchewan because of limited or conflicting information (unrankable); X = believed to be extinct or extirpated from Saskatchewan.

[2] Saskatchewan Wildlife Act status definitions:
Endangered: any native wild species that is threatened with imminent extirpation or extinction.
Threatened: any native wild species that is likely to become endangered if the factors leading to its endangerment are not reversed.
Vulnerable: any native wild species that is of special concern because of low or declining numbers due to human activities or natural events but that is not endangered or threatened.

[3] COSEWIC status definitions:
Endangered: A wildlife species facing imminent extirpation or extinction.
Threatened: A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern: A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

[4] SARA status definitions:
Endangered: a species facing imminent extirpation or extinction
Threatened: a species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern: a species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

[5] Species record identified on HABISask (Saskatchewan Conservation Data Centre, 2023).

[6] Species recorded by Stantec (2012).

[7] Species record identified on eBird (2023).

[8] Species recorded by X-terra (2022).

[9] Location : Within Study Area (Study Area); Within 500m Buffer (Buffer); Within Both Areas (SA&B)

4.7.1 Recommendations

The Riel Industrial Sector Plan area is dominated by disturbed land (i.e., cultivated or developed lands). Wildlife would benefit from the retention and linkage of remnant habitat patches, including wetlands, tree stands, and grasslands. In particular, the Hudson Bay Swale Wetland Complex provides a relatively large natural area with connectivity to grasslands north of the Study Area. Conservation of the Hudson Bay Swale Wetland Complex should be prioritized as a consideration in the planning and development of the Riel Industrial Sector. Special consideration should be given to the portions of the Hudson Bay Swale Wetland Complex that are ranked as "preserve" under the City's *Wetland Policy* in order to facilitate habitat connectivity.

Stantec (2012) found that not all the wetlands within the Hudson Bay Swale Wetland Complex were assessed as "preserve" rank; however, the portions that were considered "Manage 1" could be used as tools to facilitate linkage between the "preserve" areas and stormwater management within the Study Area.

Wildlife utilizing the Hudson Bay Swale Wetland Complex are somewhat restricted from direct access to the SSR by way of development and agriculture to the east. Thus, the connectivity along the Hudson Bay Swale Wetland Complex to Opimihaw Creek valley is the most likely corridor route in the area. The City should consider including the portion of the Hudson Bay Swale that is outside the Study Area and travels around WHP as part of the *Green Infrastructure Strategy* (City of Saskatoon, 2020) in order to preserve a significant movement corridor for wildlife. As the Hudson Bay Swale Wetland Complex to Opimihaw Creek corridor will lie in conflict with the proposed Saskatoon Freeway, Triton recommends that the City explore dedicated wildlife crossing design options in consultation with Ministry of Environment and Ministry of Highways to facilitate wildlife movement through the area once the Saskatoon Freeway is built (Figure 9).

As a by-product of promoting the ecology of the area, there may be opportunity to also utilize this corridor for the development of trails and interpretive infrastructure, in alignment with the *Green Infrastructure Strategy* (2020), as well as in keeping with goals of the WHP viewshed and 1.8km radial visual buffer.

In order to successfully implement both a wildlife corridor and facilitate public use, wildlife field studies using provincial species detection protocols are recommended. These studies would characterize wildlife utilization of this area and determine what level of human interaction can be sustained while still conserving the habitat use and connectivity that currently exists along the Hudson Bay Swale Wetland Complex.

4.8 Heritage

An archaeological assessment was previously completed using aerial and satellite imagery, with reference to the Provincial Inventory of Archaeological Records (Stantec, 2006). One heritage resource was recorded just outside the east boundary of the Study Area (SW-01-38-5-W3M) in proximity to Opimihaw Creek valley and WHP. This "Krahn site" is a multicomponent site extending back to the Paleoindian time (AMEC 2002).

The Study Area contains some areas that appear to be native grasslands, including areas on the riverbank where archaeological potential is considered to be high. Two historic homesteads are known within the Study Area, which include the Caswell and Valley Crest Homestead Sites (City of Saskatoon, 2015). As such, a thorough heritage screening is warranted to determine which portions of the Study Area may have heritage concerns.

A heritage screening was conducted for the east and West block of the Riel Industrial Sector Study Area to locate heritage sensitivities. Table 12 and Table 13 outline the quarter sections screened for the area with a corresponding sensitivity. Any improvements or modification of the land in quarter sections with sensitivity requires a referral to the Provincial Heritage Conservation Branch to determine if a Heritage Resources Impact Assessment (HRIA) is required prior to development occurring.

Heritage sensitivity is assigned to uncultivated land formed on glacial till, and areas that "contained unbroken native prairie, and met some of the following standard criteria:

- Within the same quarter section as (or within 500 m of) a previously recorded site, unless it is shown to be of low heritage significance;
- Within 1 km of permanent rivers/streams;

- Within 1 km of well-formed valleys containing permanent and/or seasonal watercourses;
- Within 1 km of permanent/seasonal water bodies that are greater than 2 km in length/width;
- Within 1 km of smaller water bodies that are located in well-defined drainage basins;
- On hummocky terrain (defined by 3 or more contour intervals and 4 or more sloughs per quarter section)" (Stantec, 2012).

Table 12. Heritage sensitivity screening report for the East block of the Study Area.

Location	*Sensitivity*	*Location*	*Sensitivity*
NE-20-37-05-3	Y	SE-28-37-05-3	C
NW-21-37-05-3	N	SW-28-37-05-3	Y
NW-23-37-05-3	Y	SE-29-37-05-3	N
SW-23-37-05-3	Y	SE-33-37-05-3	N
NW-25-37-05-3	Y	SW-33-37-05-3	N
NE-26-37-05-3	Y	NE-34-37-05-3	Y
NW-26-37-05-3	Y	NW-34-37-05-3	N
SE-26-37-05-3	Y	SE-34-37-05-3	C
SW-26-37-05-3	Y	SW-34-37-05-3	C
NE-27-37-05-3	N	NE-35-37-05-3	C
NW-27-37-05-3	C	NW-35-37-05-3	Y
SE-27-37-05-3	N	SE-35-37-05-3	Y
SW-27-37-05-3	N	SW-35-37-05-3	C
NE-28-37-05-3	Y	NW-36-37-05-3	Y
NW-28-37-05-3	N	SW-36-37-05-3	Y
Y = Heritage Sensitive, C = Conditionally Heritage Sensitive, N = Not Heritage Sensitive			

Table 13. Heritage sensitivity screening report for the West block of the Study Area.

Location	*Sensitivity*	*Location*	*Sensitivity*
NE-19-37-05-3	N	SW-30-37-05-3	N
NE-20-37-05-3	Y	NE-31-37-05-3	N
NW-20-37-05-3	N	NW-31-37-05-3	N
NE-29-37-05-3	N	SE-31-37-05-3	N
NW-29-37-05-3	N	SW-31-37-05-3	N
SE-29-37-05-3	N	NE-32-37-05-3	N
SW-29-37-05-3	N	NW-32-37-05-3	N
NE-30-37-05-3	N	SE-32-37-05-3	N
NW-30-37-05-3	N	SW-32-37-05-3	N
SE-30-37-05-3	N		
Y = Heritage Sensitive, C = Conditionally Heritage Sensitive, N = Not Heritage Sensitive			

4.8.1 Wanuskewin Heritage Park

Wanuskewin Heritage Park, a Provincial Heritage Property and National Historic Site of Canada, includes significant natural and archaeological resources representing over 6,400 years of history of the Northern Plains Indigenous peoples and is an important cultural center (Wanuskewin Heritage Park, 2023). The area is located at the northeast corner of the Study Area, within the 500m buffer. WHP was designated as a Provincial Heritage Property in 1984, protecting the property under *Heritage Property Act* (Saskatchewan Ministry of Parks, Culture and Sport, 2019). In 1987, the property was declared a National Historic Site by Queen Elizabeth II (Wanuskewin Heritage Park, 2023) ensuring that heritage resources within the area are protected.

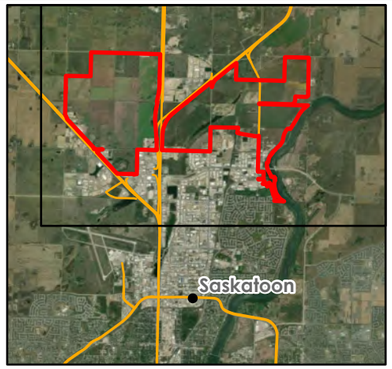
In 2016 it was announced that WHP would be pursuing United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site designation, which would make it the first World Heritage Site in Saskatchewan. Opimihaw Creek – a tributary of the South Saskatchewan River – runs through WHP, of which the banks and surrounding areas are known to contain significant archeological resources. WHP intends to submit the final UNESCO nomination dossier to Parks Canada for review. If approved, Parks Canada will bring the dossier to Paris for UNESCO World Heritage Committee review (Wanuskewin Heritage Park, 2023).

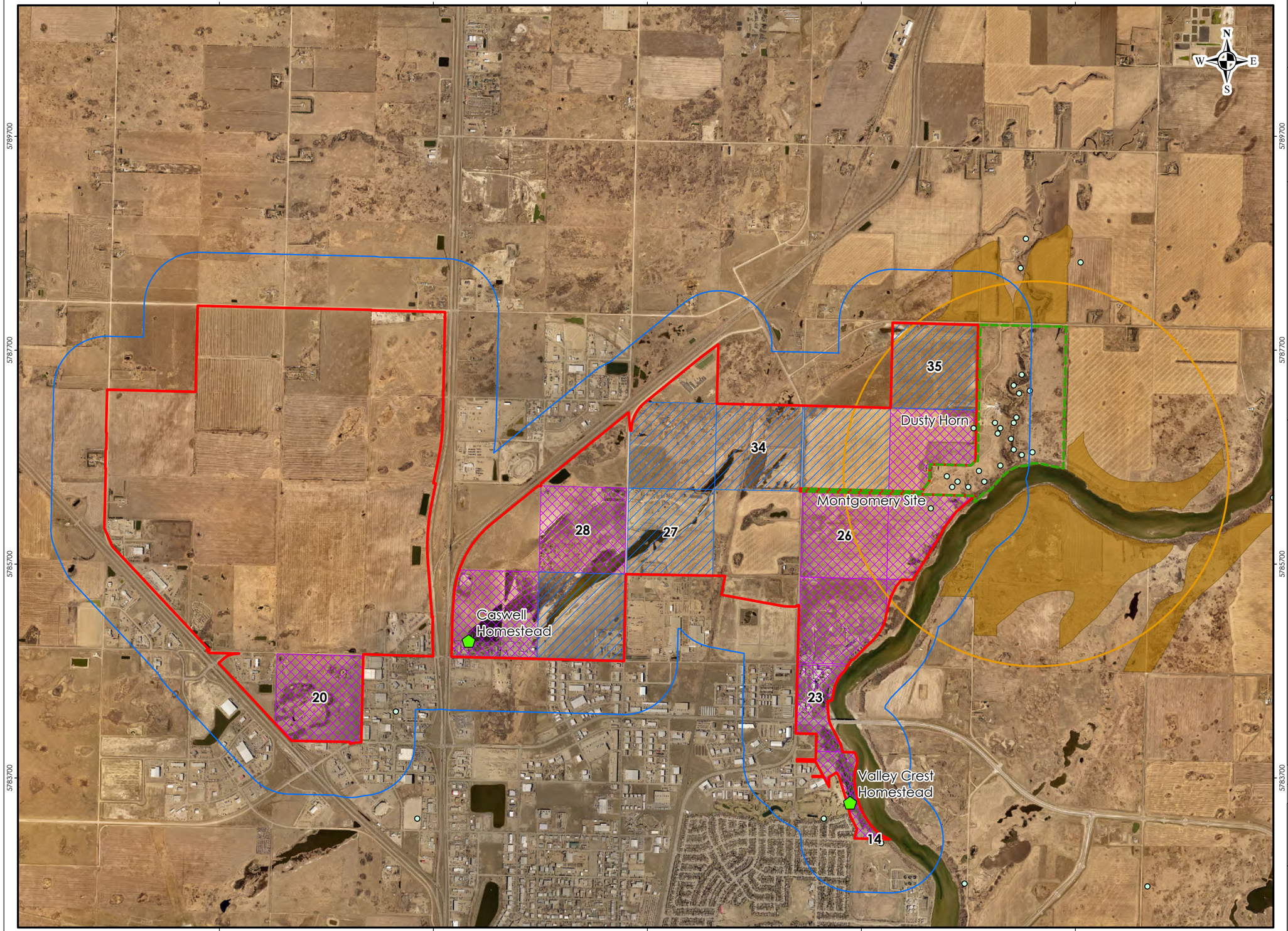
As discussed in Section 4.2.2.3, past studies have determined that development restrictions, including a 1.8km visual buffer and Wanuskewin viewshed, be put in place surrounding WHP in order to ensure that developments conserve the unique character of the park and protect the natural views from important areas within WHP.

Currently the City of Saskatoon is leasing three quarters of land within the Study Area for use as pasture for the Wanuskewin bison herd. The final use for these lands is still under consultation and discussion between the City and WHP.

Riel Industrial Amendment
Natural Area Screening

Figure 10.
Heritage Sensitive Quarter Sections





- Heritage Site
- Homestead
- Study Area
- Study Area 500m Buffer
- Wanuskewin 1.8km Visual Buffer
- Wanuskewin Heritage Park Boundary
- Wanuskewin Viewshed

Heritage Sensitivity

- Conditionally Sensitive
- Sensitive

Sources and Disclaimer
Base map Source: ESRI
Disclaimer: This map is a visual aid only to be used together with the accompanying report, including and incorporating any disclaimer contained therein. This map has been prepared to illustrate the results of our work, and is **not intended to be used for navigational purposes**. Information displayed on this map is based, in whole or in part, on geographic information that may have been provided by third parties, including government data. Triton Environmental Consultants Ltd. disclaims (without limiting the generality of the foregoing) all responsibility for the accuracy of any such third party information, regardless of the source.

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Scale 1:35,000

Projection: NAD 1983 UTM Zone 13N

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4.9 Ecological Connectivity

As part of the NAS, the City requested an evaluation of ecological connectivity within and beyond the Study Area, within the context of the International Union for Conservation of Nature's (IUCN) *Guidelines for conserving connectivity through ecological networks and corridors* (2020). Anthropogenic fragmentation of habitats and ecosystems can disrupt connectivity, and without connectivity, ecosystems cannot function properly (Hilty, et al., 2020).

At a high level, connectivity has two main components: functional connectivity and structural connectivity. Functional connectivity describes the ability for genetics to move through habitats, while structural connectivity is a measure of habitat permeability – the movement of individuals from patch to patch (Hilty, et al., 2020).

An 'ecological network for conservation' as defined by IUCN is a system composed of protected areas, other effective area-based conservation measures (OECMs), and ecological corridors (Hilty, et al., 2020). The relationship between these three components is summarized in Table 14. Differences in the role of protected areas, OECMs and ecological corridors (from Hilty et al 2020).Table 14.

Table 14. Differences in the role of protected areas, OECMs and ecological corridors (from Hilty et al 2020).

	Protected Areas	OECMs	Ecological Corridors
MUST conserve *in situ* biodiversity	●	●	
MAY conserve *in situ* biodiversity			●
MUST conserve connectivity			●
MAY conserve connectivity	●	●	

The level of development around the perimeter of the Study Area and agricultural practice within the West block of the Study Area has isolated the small wetlands and treed areas; however, some movement between these areas is likely to still occur, as the cultivation currently does not pose a physical barrier. Within the East block, the Hudson Bay Swale Wetland Complex provides a long contiguous natural corridor across the entire block, connecting the complex to Opimihaw Creek and ultimately the SSR.

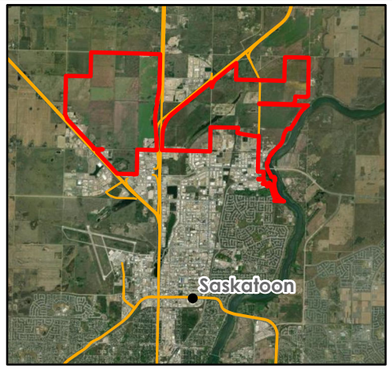
Within the 500m buffer of the Study Area, at the confluence of Opimihaw Creek and the SSR, there is also a connection to the Meewasin Conservation Easement (City of Saskatoon, 2015) area downslope of the chemical plants, which continues southward to connect with the Silverwood Off Leash Area.

Visible barriers within the Study Area include Highways 11 and 12 which restrict wildlife movement between the East and West blocks of the Study Area. Commercial and industrial development at the south boundary of the Hudson Bay Swale Wetland Complex also poses a barrier. Additionally, the infill of the Hudson Bay Swale Wetland Complex, and the CN Rail line bisecting the East block, may be potentially impeding movement of wildlife along this corridor. The proposed Saskatoon Freeway route and associated interchanges along the north portion of the Study Area is likely to present challenges for maintaining connectivity during both construction and eventual traffic operations (Figure 11).

The proposed Phase 1 of the Saskatoon Freeway bisects the northern extent of the Study Area, including the Hudson Bay Swale Wetland Complex. Pending confirmation of the Phase 1 detailed design and construction methods from Ministry of Highways, consideration should be made in terms of conserving habitat connectivity to the SSR. Vegetation and wildlife assessments have been suggested to provide insight into the value of the Hudson Bay Swale Wetland Complex from an ecological perspective. The interfacing of the Hudson Bay Swale Wetland Complex with the Saskatoon Freeway would ideally be informed by the framework of the City's *Wetland Policy*, the 2020 *Green Infrastructure Strategy,* and goals for preserving habitat connectivity alongside development.

Riel Industrial Ammendment Natural Area Screening

Figure 11.
Natural Area Connectivity with Current and Proposed Development



- Freeway Phase 1
- HBS Wetland Complex (2023)
- Meewasin Valley Natural Area
- Riel Industrial Sector Boundary
- Silverwood Golf Course
- Study Area
- Study Area 500m Buffer
- Connected Habitat
- Wanuskewin Heritage Park

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Projection: NAD 1983 UTM Zone 13N

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4.9.1 Recommendations

In order to effectively conserve connectivity, Triton recommends further investigation into the value of the Hudson Bay Swale Wetland Complex as an ecological corridor. Previous field studies have identified that this area is used by wildlife species; however, in order to successfully establish conservation targets based on habitat utilization, field studies are recommended. Collection of data related to seasonal habitat usage, species diversity, and density will provide the City with ability to target specific areas and core habitats/corridors for conservation (Hilty, et al., 2020).

Further studies would also inform the City on the potential impacts that the proposed Saskatoon Freeway may have on connectivity, suggest potential solutions or mitigations to minimize the effects of the Saskatoon Freeway, and promote wildlife use through the area. Triton recommends field studies in all four seasons to ensure that seasonal migration and habitat utilization can be observed.

Until such an assessment is completed, further development within the boundaries of the Hudson Bay Swale Wetland Complex should be restricted. The 2015 *Riel Industrial Sector Plan* discussed assigning Municipal and Environmental Reserve to the Riel Industrial Sector as a whole. Triton recommends assigning the majority of dedicated reserve parcels to the areas surrounding the Hudson Bay Swale Wetland Complex as well as using those areas to conserve a corridor along the Hudson Bay Swale Wetland Complex to Opimihaw Creek and ultimately along the SSR valley. Establishing buffers for the area aligns with the City's *Wetland Policy*, green initiatives, and has been consistently recommended through the *Riel Industrial Sector Plan* (2015), *North/Northwest Natural Area Screening Study, City of Saskatoon* (2012), and the 2020 *Partnership for Growth – Green Network Refinement Stage 1: Natural Areas Screening (Desktop)*.

5.0 Summary

The Riel Industrial Sector Study Area has been reviewed for potential environmental constraints to be considered during sector and concept planning. This report outlines the environmental components that align with the City's *Green Infrastructure Strategy*, *Wetland Policy*, and sector planning goals.

The findings of the report have resulted in the identification of key features, and recommendations to inform future planning within the Study Area. A summary of recommendations is found in Table 15.

Table 15 . Summary of recommendations.

Section	Component	Recommendation
4.2.2	Development Restrictions	1. Conduct a specific study on the potential impacts of developments within the Wanuskewin Heritage Park visual buffer and viewshed, including the lands leased to Wanuskewin Heritage Park that had been designated as To Be Determined within the 2015 *Riel Industrial Sector Plan*. This study should also consider any additional protections that may arise from a successful UNESCO World Heritage Site nomination.
4.3	Potentially Contaminated Sites	2. Sector and concept planning should consider in more detail the types of hazardous materials currently being stored within the Study Area and 500m buffer and if exclusion of any hazardous material storage is warranted, given the shallow groundwater within the Study Area. 3. The City should compare the results of the GeoHub database search with internal contaminated sites records to confirm the completeness of the information within this report. 4. Phase 1 Environmental Site Assessments should be completed on sites with potential contamination prior to development to determine the likelihood of contamination and evaluate the need for field sampling.

Section	Component	Recommendation
4.3.1	Hudson Bay Swale Wetland Complex Infill	5. Triton recommends monitoring this area and working with the landowner to ensure that proper planning and permitting are in place prior to any further modification of this area. 6. The City should explore legal and legitimate methods of reconnaissance to collect evidence with respect to modification of the Hudson Bay Swale Wetland Complex, industrial waste regulations, and the *Environmental Management and Protection Act, 2010.* 7. The City should explore its jurisdiction to halt further modification of the Hudson Bay Swale Wetland Complex by infilling and other modifications. 8. Field visits are recommended for any infill sites to document current in situ conditions.
4.4.1	Surface drainage	9. Triton recommends that the City monitor changes to the wetlands within the Hudson Bay Swale Wetland Complex. 10. Triton recommends the use of air imagery to monitor the margins of the wetlands against the historic margins to determine if infilling is causing those wetlands to hold more water, thus affecting downstream flows and potentially causing issues for stormwater management across the East block of the Study Area.

Section	Component	Recommendation
4.4.4	Groundwater	11. Additional groundwater monitoring by a qualified professional is recommended for the Study Area. 12. The City should explore what role the Hudson Bay Swale Wetland Complex may play in the mitigation of impacts to groundwater, through potential incorporation into a stormwater management plan for the Study Area. 13. Since the area is closely tied to the Upper Floral aquifer, avoidance of excavation and development within the boundaries of the wetlands within the Hudson Bay Swale Wetland Complex (Figure 5) is the recommended primary mitigation against impacts to groundwater. 14. In keeping with the 20m riparian buffer suggested by Stantec (2012) and within the 2015 *Riel Industrial Sector Plan,* Triton recommends considering a minimum 45m buffer from the riparian margin of the Hudson Bay Swale Wetland Complex for unmitigated development and minimum buffer of at least 20m from the riparian margin or the top of the nearest slope leading into the Hudson Bay Swale Wetland Complex, whichever is further, for developments that mitigate risks to the Hudson Bay Swale Wetland Complex. 15. The City should consult with professional engineers to assess and make specific recommendations on construction planning and practises in high groundwater areas to ensure safe excavations and minimize the risk of impacting water supply to rural properties that could be using the aquifers for water supply. 16. Triton recommends that the City consider restricting use of underground storage tanks (UST) within the East block of the Study Area.

4.5	Wetlands and Natural Areas	17. It is recommended to conserve the Hudson Bay Swale Wetland Complex as an important natural area within the City of Saskatoon. 18. It is recommended to implement the management and protection strategies proposed by Stantec for the Hudson Bay Swale Wetland Complex in the 2012 report *North/Northwest Natural Area Screening Study*. 19. The City, in consultation with Ministry of Environment and Ministry of Highways, should consider the effects of the proposed Saskatoon Freeway infrastructure on drainage patterns and habitat connectivity. 20. Updated functional assessments, as well as wildlife and rare plant species detection surveys, are recommended to provide the City with an updated understanding of habitat utilization of the Hudson Bay Swale Wetland Complex. 21. The City should consider rehabilitation of wetlands outside the 4km airport buffer and the establishment of a 20m development buffer around the boundary of those wetlands (Stantec, 2012). Buffers to be measured from the nearest margin of riparian vegetation to the boundary of the proposed development. 22. Triton recommends a minimum 45m buffer from the riparian margin of the Hudson Bay Swale Wetland Complex for unmitigated development and minimum buffer of at least 20m from the riparian margin or the top of the nearest slope leading into the Hudson Bay Swale Wetland Complex, whichever is further, for developments that mitigate risks to the Hudson Bay Swale Wetland Complex. Buffers to be measured from the nearest margin of riparian vegetation to the boundary of the proposed development. 23. Triton recommends maintaining wetlands designated as "Preserve" under the City's Wetland Policy and native seeding disturbed areas within the 20m buffer of the wetlands. 24. The City should assess the effects of the infill actions across the Hudson Bay Swale Wetland Complex through monitoring of changes in drainage flow and vegetation. Assessing infill actions may suggest that

Section	Component	Recommendation
		the wetlands are expanding (or receding) as a result of the change in wetland connectivity along the Hudson Bay Swale Wetland Complex. 25. The City should consider bolstering the City's *Wetland Policy* and working with the Saskatoon North Partnership for Growth (P4G) to provide specific protections for large significant wetland assets, such as that within the Hudson Bay Swale Wetland Complex, in order to enhance conservation of important natural areas. 26. Further wetland investigations would benefit the planning of the Riel Industrial Sector. Updated wetland verifications and functional assessments within the Study Area are recommended to inform the selection of candidate wetlands for ecological enhancement, or for incorporation into stormwater management systems. 27. Portions of the Hudson Bay Swale Wetland Complex that are ranked "Manage 1" under the City's *Wetland Policy* could be used by the City as tools to facilitate linkage between "Preserve" wetland areas and for stormwater management within the Study Area.
4.6	Vegetation	28. Prior to development, it is recommended to complete rare plant surveys as per the *Species Detection Survey Protocol: 20.0 Vascular Plant* (Government of Saskatchewan, 2021) within natural areas to verify documented occurrences of rare plants and determine if mitigation measures should be implemented.

Section	Component	Recommendation
4.7	Wildlife	29. Wildlife field studies using provincial species detection protocols are recommended to characterize wildlife utilization of this area and determine what level of human interaction can be sustained while still conserving the habitat use and connectivity that currently exists along the Hudson Bay Swale Wetland Complex. 30. Minimizing natural area loss and degradation is recommended by incorporating green buffer zones around natural areas, particularly wetland complexes, such as the Hudson Bay Swale Wetland Complex, to align with the City's *Wetland Policy* and *Green Infrastructure Strategy*. Green buffer width should be based on the results of the recommended habitat utilization surveys for the Hudson Bay Swale Wetland Complex (Recommendation #26). Green buffer widths are recommended to be 30m from the riparian margins of the Hudson Bay Swale Wetland Complex in areas with low wildlife use and up to 100m for high wildlife use areas. Green buffers would include the wetland development buffers. 31. Conservation of the Hudson Bay Swale Wetland Complex should be prioritized as a consideration in the planning and development of the Riel Industrial Sector, with particular consideration given for the wetland areas that are ranked as "Preserve" under the City's *Wetland Policy* in order to facilitate habitat connectivity. 32. The City should consider including the portion of the Hudson Bay Swale Wetland Complex that is outside the Study Area and travels around the Wanuskewin Heritage Park as part of the *Green Infrastructure Strategy* (City of Saskatoon, 2020) in order to preserve a significant movement corridor for wildlife. 33. Triton recommends that the City explore dedicated wildlife crossing design options in consultation with Ministry of Environment and Ministry of Highways to facilitate wildlife movement through the area once the Saskatoon Freeway is built (Figure 9).

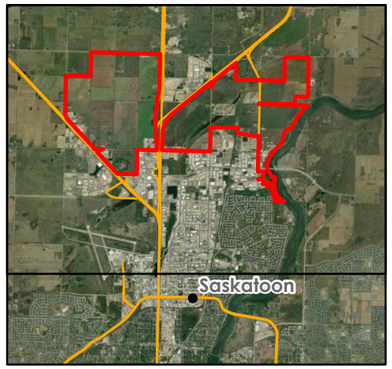
Section	Component	Recommendation
4.8	Heritage	34. Heritage referrals should be submitted to the Heritage Conservation Branch for review prior to initiation of any works on heritage sensitive lands. 35. The Wanuskewin Heritage Park visual buffer and viewshed should continue to be considered when planning for development in the northeast corner of the Study Area. Triton recommends working with Wanuskewin Heritage Park to create guidelines for development within these areas. 36. The City should continue to keep informed of the Wanuskewin Heritage Park UNESCO nomination process in order to be proactive in incorporating any additional protections or mitigations that may result from UNESCO World Heritage Site designation.
4.9	Ecological Connectivity	37. Triton recommends further investigation into the value of the Hudson Bay Swale Wetland Complex as an ecological corridor through further studies facilitating the collection of data related to seasonal habitat usage, species diversity, and density within the Hudson Bay Swale Wetland Complex, to provide the City with ability to target specific areas and core habitats/corridors for conservation (Hilty, et al., 2020). Field studies in all four seasons would ensure that seasonal migration and habitat utilization can be observed. 38. Triton recommends assigning the majority of dedicated municipal and environmental reserve parcels to the areas surrounding the Hudson Bay Swale Wetland Complex, as well as using those areas to conserve an ecological corridor along the Hudson Bay Swale Wetland Complex to Opimihaw Creek and ultimately along the SSR valley. 39. The City should consult with Ministry of Environment and Ministry of Highways to ensure that City goals with respect to the *Wetland Policy* and habitat connectivity are communicated and, to the extent possible, incorporated into the design and construction planning of the Saskatoon Freeway.

5.1 Development Considerations/Constraints Map

In consideration of current and future development of the Riel Industrial Sector, the known development considerations have been summarized on Figure 12, based on the desktop assessment that has been undertaken. On Figure 12 are the development buffers for the Saskatoon Airport, chemical plants, and Wanuskewin Heritage Park. These require consideration and engagement prior to planning development at the sector and concept plan stage.

Riel Industrial Ammendment Natural Area Screening

Figure 12. Summary of Constraints and Recommendations



- Freeway Phase 1
- Airport 8km Buffer
- Airport Water Storage 4km Buffer
- Chemical Plant 1km Buffer
- Anticipated High Groundwater Table
- Recommended Monitoring
- Recommended Wildlife & Vegetation Survey
- Study Area
- Study Area 500m Buffer
- Wanuskewin Heritage Park
- Wetlands
- Trees
- Wanuskewin Heritage Park 1.8km Visual Buffer
- Wanuskewin Viewshed

Sources and Disclaimer
Base map Source: ESRI
Disclaimer: This map is a visual aid only to be used together with the accompanying report, including and incorporating any disclaimer contained therein. This map has been prepared to illustrate the results of our work, and is **not intended to be used for navigational purposes**. Information displayed on this map is based, in whole or in part, on geographic information that may have been provided by third parties, including government data. Triton Environmental Consultants Ltd. disclaims (without limiting the generality of the foregoing) all responsibility for the accuracy of any such third party information, regardless of the source.

Project Number: **11730**	Prepared By: **IO**	Revision: **02**
Date: **September 22, 2023**	Reviewed By: **SH**	Page Size: **11x17**

0 750 1,500 2,250 m

Scale 1:40,000

Projection: NAD 1983 UTM Zone 13N

TRITON Environmental Consultants

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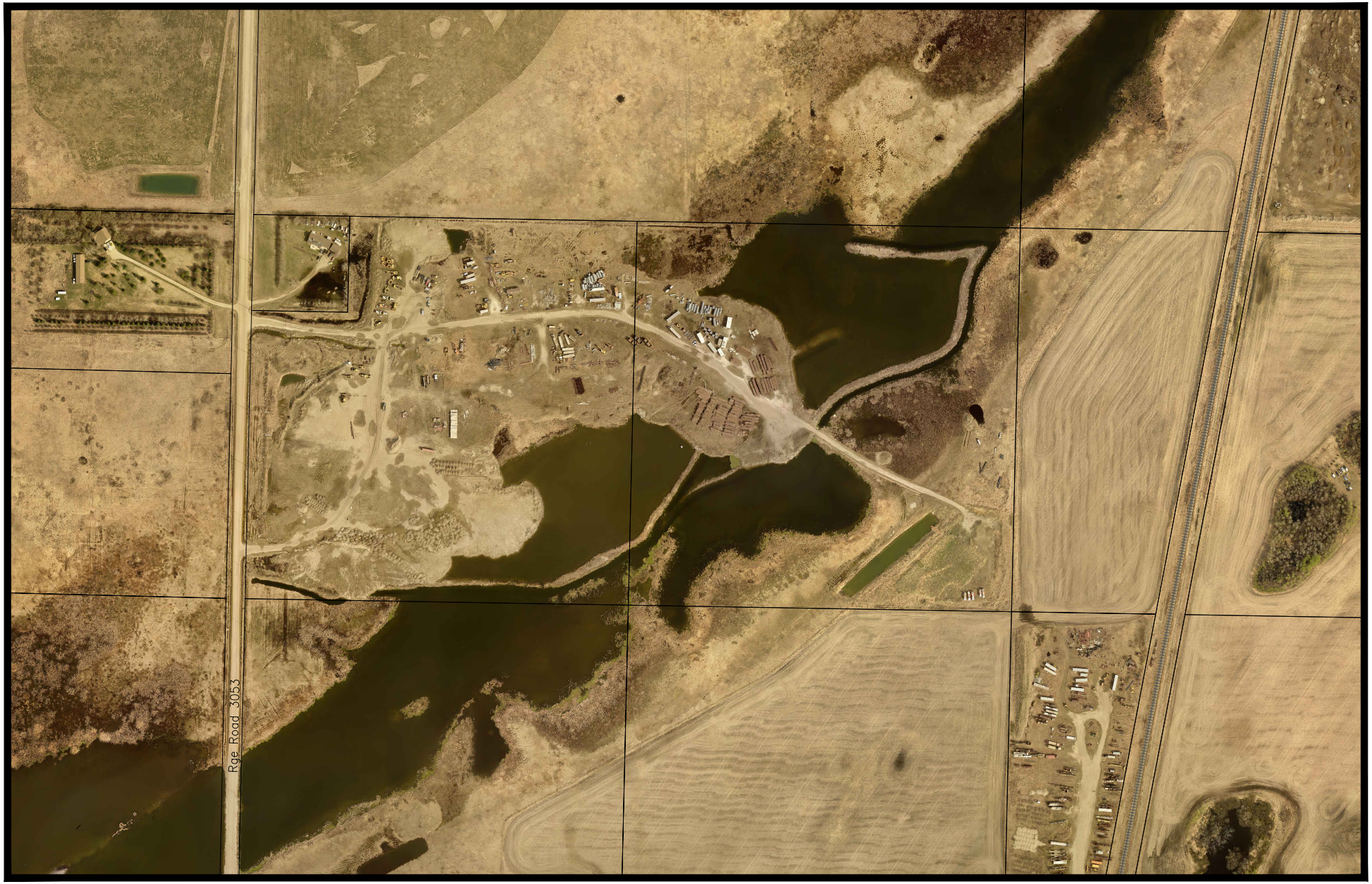
APPENDIX A
Aerial Photolog of the Hudson Bay Swale Wetland Complex Infill at NW-27-37-05 W3M

2021 Aerial Image

2019 Aerial Image

2017 Aerial Image

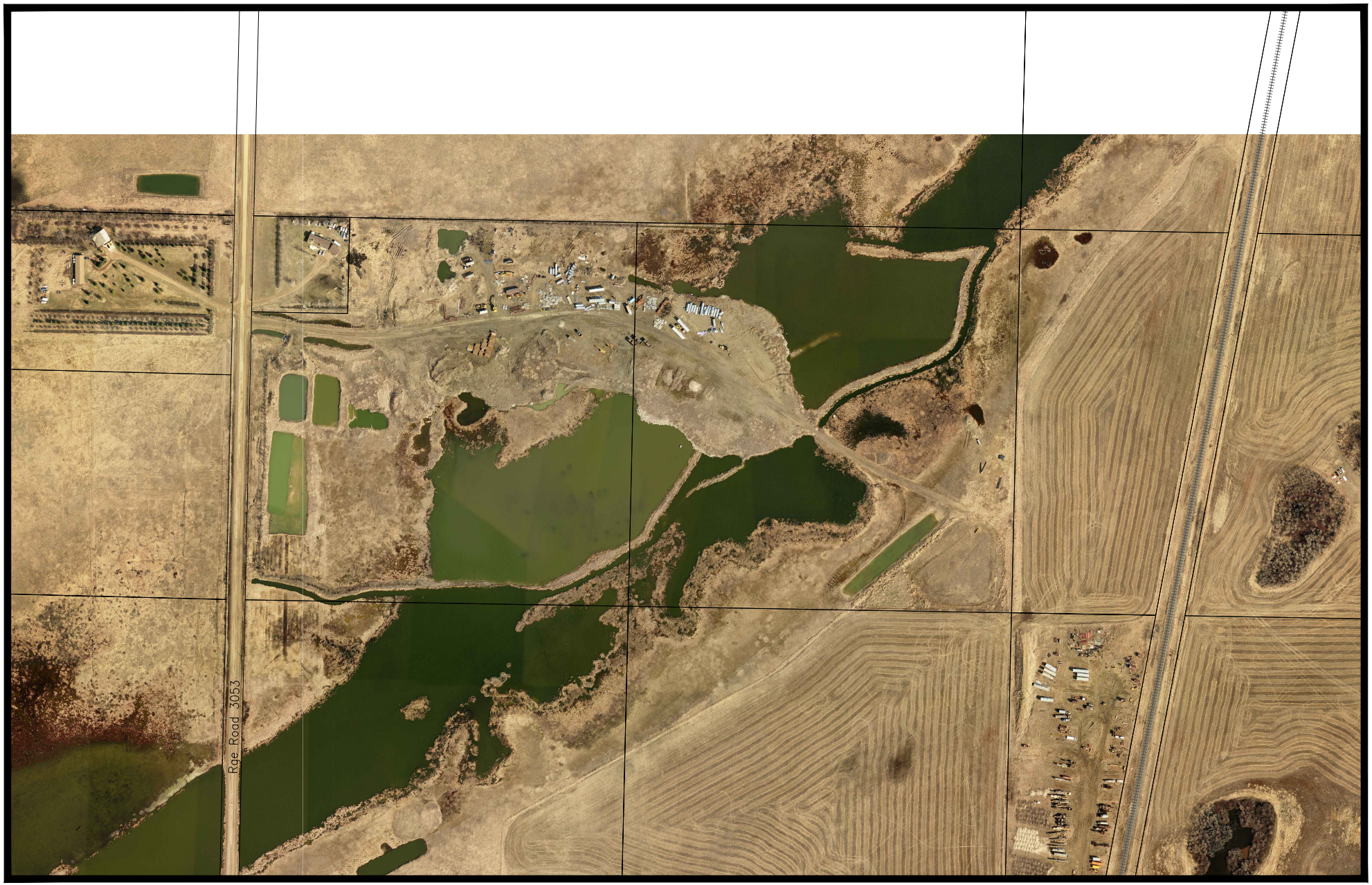
2015 Aerial Image



2013 Aerial Image

2011 Aerial Image

2008 Aerial Image



2008 FlySask Image

2006 ISC Image

2005 Aerial Image

2001 Aerial Image

1997 Aerial Image

APPENDIX B
Wetland Management and Protection Strategies (Excerpt from *2012 North/Northwest Natural Area Screening Study* (Stantec, 2012))

Wetland Management and Protection Strategies as described within section 7.2.2 in the 2012 Stantec report: *North/Northwest Natural Area Screening Study, City of Saskatoon*:

- Given the ecological and hydrological significance of the North Swale, it is recommended that wetlands located outside the 4 km airport buffer zone with a Management Class of Manage 1 be rehabilitated. Wetlands within the 4 km buffer of the airport should not be rehabilitated, to discourage use by geese and other large birds.

- Establish a minimum 20 m buffer around the ecological boundary of the North Swale wetlands. One exception to this is where the ecological boundary within Section 24-37-5- W3M borders the highway/road; it is not necessary to buffer the ecological boundary at these locations.

- A 20 m buffer is recommended, rather than a 15 m buffer, as the majority of the ecological boundary of the swale is located at the wetland boundary and therefore the additional up and buffer is recommended for the protection of water quality. However, an extra buffer for the maintenance of wildlife habitat is not required.

- Seed any disturbed lands within the 20 m buffer using species native to the area.

- Establish a fence between the outer edge of the buffer and any adjacent land use, producing an "ecological buffer zone". This zone is required to reduce encroachment into the buffer by non-compatible activities (e.g., storage of materials, parking of vehicles, etc.). Encroachment by commercial and industrial land uses will have a serious detrimental impact upon the natural vegetation bordering the Swale, thereby also affecting wildlife habitat, water quality, and the natural functions of the wetlands.

- Enforce land use within the ecological buffer zone. Activities associated with adjacent industrial and commercial land uses should not be allowed to spill into the zone.

- Maintain the "Preserve" wetlands in a natural state. To accomplish this it is recommended that the "Manage 1" wetlands be used for a more direct linkage to any stormwater management plan created for the area. For example, lands adjacent to the "Manage 1" wetland could be used for the development of forebays, or as connections to forebays or retention ponds located beyond the North Swale boundary (this could occur within the ecological boundary).

- With the exception of stormwater management activities and developments discussed, no other land uses should be allowed within the ecological buffer zone.

In order to prevent the degradation of wetland functions and values during the construction ad post construction of a stormwater management system, it is important that best management practices (BMPs) be implemented. Table G.1 provides a list of BMPs and outlines the benefits for each, the pollutants that are controlled, and some general construction requirements. The BMPs are based on the following two documents, which are recommended to be used as guides during construction and maintenance of any potential stormwater management system:

- Minnesota Urban Small Sites BMP Manual – Stormwater Best Management Practices for Cold Climates (Barr Engineering Company, 2001).

- Protecting Water Quality in Urban Areas – Best Management Practices for Dealing with Storm Water Runoff from Urban, Suburban, and Developing Areas of Minnesota (Minnesota Pollution Control Agency, 2000).

Table G.1. Best Management Practices

Type of Practice	Area of Benefit	Storm Protection Benefit	Pollutants Controlled	Construction Requirements
Nonstructural Source Controls				
Street Sweeping	Street right-of-way.	Reduction in potential for clogging storm drains with debris. Some oil and grease control possible.	Paper and plastics, leaves and twigs, dust, and oil and grease.	Acquire street sweeping equipment.
Sidewalk Cleaning	Sidewalk right-of-way in areas of heavy foot traffic.	Reduction in pollutants entering storm drain.	Oil and dirt.	None.
Clean and Maintain Storm Drain Channels Annually	Channel capacity and receiving water. Upstream flood control benefits. Includes benefits to channel wildlife habitat and vegetation.	Prevent erosion in channel. Improve capacity by removing silt and sedimentation. Remove debris that is habitat destroying or toxic to wildlife.	Silt and sediment and the contaminants contained therein. Plastic, glass, paper, and metal thrown or washed in channel.	None.
Clean and Inspect Storm Inlets and Catch Basins Annually	Site dependent flood control benefits.	Allows proper drainage to prevent flooding and continued proper operation of facilities.	Silt and sediment and the contaminants contained therein. Plastic, glass, paper, and metal thrown or washed into facilities.	None.
Clean and Inspect Debris Basins Annually	Site dependent flood control benefits.	Allows proper drainage to prevent flooding and continued proper operation of facilities.	Silt and sediment and the contaminants contained therein. Plastic, glass, paper, and metal thrown or washed into facilities.	None.
Storm Drains Cleaned and Maintained Every 3 to 6 Years	Flood control and water quality benefits.	Allows proper drainage to prevent flooding and continued proper operation of facilities.	Silt and sediment and the contaminants contained therein. Plastic, glass, paper, and metal thrown or washed into facilities.	None.
Storm System Pump Stations Cleaned and Maintained Annually	Site dependent flood control and water quality benefits.	Prevents flooding and allows continued proper operation of facilities.	Silt and sediment and the contaminants contained therein. Plastic, glass, paper, and metal thrown or washed into facilities.	None.
Inspect and Maintain Sewer System	Storm drain system and receiving water.	Prevents and eliminates sewer system surcharges.	Contaminants, toxics, and coliform bacteria.	None.
Minor Structural Source Controls				
Storm Drain Inlet Protection	Storm drain drainage area.	Prevent debris from entering storm drain.	Dirt, leaves, twigs, paper, plastic, and other incidentals.	Not available.
Outlet Protection	Storm drain receiving water.	Prevent erosion at the outlet of pipes or paved channels and protect downstream water quality.	Turbidity and sediment.	Structural apron lining at the outlet location. Made of riprap, grouted riprap, concrete, or other structural materials.
Slope Stabilization and Erosion Control Measures	Site and topography dependent.	Reduce silt and sediment load to storm drains.	Silt and sediment and the contaminants therein.	None.
Interceptor Swale	Dependent on flow velocity. Max. velocity for earth channel is 6 fps. Max. velocity for vegetated or riprap channel is 8 fps.	Shorten length of exposed slopes and intercept and divert storm runoff from erodible areas.	Sediment and silt and the contaminants contained therein.	Excavation drainageway across disturbed areas or rights-of-way.

Type of Practice	Area of Benefit	Storm Protection Benefit	Pollutants Controlled	Construction Requirements
Improve and Maintain Natural Channels	Channel capacity and receiving water. Upstream flood control benefits. Includes benefits to channel wildlife habitat and vegetation.	Prevent erosion in channel. Improve capacity by removing silt and sedimentation. Remove debris that is habitat destroying or toxic to wildlife.	Silt and sediment and the contaminants contained therein. Plastic, glass, paper, and metal thrown or washed in channel.	None.
Diversion Channel	Dependent of flow velocity. Maximum velocities: 5 fps for vegetated channel and 8 fps for riprap channel. Not for use on slopes greater than 15%. Drainage area should be 5 acres or less.	Intercept and convey runoff to outlets at nonerosive velocity.	Sediment and erosion controls.	Lined drainageway of trapezoidal cross section.
Grass-Lined Channel	Site dependent but of larger capacity than interceptor or perimeter swales.	Intercept runoff and convey runoff from site.	Sediment and silt and the contaminants contained therein.	Excavation of channel or improvements to natural channel. Stabilization with vegetation.
Storm Drain Drop Inlet Protection	Areas less than 1 to 2 acres.	Filters sediment from runoff before it enters inlet. Provides relatively good protection.	Sediment and the contaminants contained therein.	Barrier around storm drain inlet. Useful for areas where storm drain is operational before area runoff area is stabilized.
Riprap	Site dependent	Provides stabilization and erosion control for stream banks and channels, outlet, and slopes.	Erosion and sediment.	Placement of rock on area to be stabilized. May also require use of filter fabric liner.
Gabions	Site dependent	Provides stabilization and erosion control for stream banks, outlet, and slopes.	Erosion and sediment.	Placement of wire cage will with rocks over area to be stabilized. May also require use of filter fabric liner.
Vegetative Control	Applicable and effective for most sites.	Provides stabilization and erosion control for streambanks, swales, channels, outlets, slopes, open disturbed areas. Can be up to 99% effective with established cover. Temporary seeding can be up to 90% effective.	Erosion and sediment.	Site preparation (can include land leveling and installation of irrigation system), seeding or planting, and netting or mulching to establish seed. Can also include other sodding, ground cover, shrubs, trees, and native plants.
Filter Strips	Site dependent.	Receives overland flow slowing runoff and trapping particulates. Can be 30 to 50% effective for sediment control.	Silt, sediment, trash, organic matter, and to an extent, soluble pollutants through infiltration.	Grading and vegetative establishment. Should have a minimum width of 15 to 20 feet. Good performance is achieved with a 50 to 75 foot width.
Fence Open Channels	Site dependent.	Prevent windblown trash from entering channel. Prevents illegal dumping in channel.	Trash and pollutants.	Construction of fences.
Discharge Elimination Methods				
French Drains and Subsurface Drains	Dependent on site topography and soil permeability.	Provides drainage of "wet" soils to allow establishment of vegetation. Can reduce runoff.	Sediment.	Underground perforated pipe leading to a surface water outlet. Pipe size, bedding and depth is dependent on site conditions.

Type of Practice	Area of Benefit	Storm Protection Benefit	Pollutants Controlled	Construction Requirements
Infiltration Trench and Dry Well	Small drainage areas. Runoff from rooftops, parking lots, residential, etc.	Provides temporary storage of runoff and infiltration to soil. Not for use in areas where groundwater could become contaminated.	Prevents 100% of pollutants from entering surface water. Oil, grease, floating organic matter, and settleable solids should be removed before water enters trench.	Excavation of a shallow trench 2' to 10' deep. Backfilled with coarse stone aggregate.
Exfiltration Trench	Site dependent.	Prevent silting on underlying filter gravel or rock bed. Retain first flush, reduce runoff volume and peak discharge rate and promote water quality improvement.	Prevents pollutants from entering surface water. Oil, grease, floating organic matter, and settleable solids should be removed before water enters trench.	Uses perforated pipe with suitable membrane filter material. Installed before receiving water outlet or in groundwater recharge area.
Porous Pavement	Site dependent. Requires relatively flat surface.	Allow infiltration of surface runoff. Reduce runoff volume and pollutant loadings from low volume traffic areas.	Oil and grease.	Install porous pavement. May require twice as much paving material as standard asphalt to achieve same strength.
Retention Basin	Best for sites of 5 to 50 acres.	Promotes infiltration to groundwater and reduces runoff volume and velocity. Filters pollutants.	Sediment, trace metals, nutrients, and oxygen-demanding substances.	Excavation of a basin over permeable soils. Size is site dependent. Depth is 3 to 12 feet.
Floatables and Oil Removal				
Clarifiers and Oil and Water Separators on Parking Structures	Parking lot structure and receiving water.	Collect debris before it can enter storm drain.	Oil, grease, and antifreeze from vehicles and foods and food wrappers.	Install grit and separators.
Oil and Grit Separators	Site dependent. For heavy traffic areas or areas with high potential for oil spills.	Remove pollutants.	Sediments and hydrocarbons.	Install oil and grit separators on storm drains.
Sediment/Grease Trap	Installed on storm drain inlets.	Intercept and trap sediment and grease from runoff.	Sediment, oil, and grease.	Install sediment and grease traps.
Solids Removal				
Detention Basin	Four acres of drainage area for each acre/foot of storage provided to retain a permanent pool of water.	Temporary storage of storm runoff until release. Can also improve water quality.	Sediment, trace metals, hydrocarbons, nutrients, and pesticides.	Excavation of a basin over soils which will cause excessive seepage. May require a liner. Can be used aesthetically as a small pond in landscaping.
Extended Detention Basin	Size for a minimum detention time of 24 hours.	Temporary storage of runoff for an extended period of time. Can improve water quality.	Sediment, trace metals, hydrocarbons, nutrients, and pesticides.	Excavation of a basin over soils which will cause excessive seepage. May require a liner. Can be used aesthetically as a small pond in landscaping.
Bar Screens	Site dependent.	Restrict passage of objects which may obstruct pump station suction bays.	Large debris.	Install bar screens before pump station suction bays.

Minnesota Board of Water and Soil Resources. 2010b.

Minnesota Board ofWater andSoil Resources. 2010b.CComprehensive General Guidance for Minnesota Routine Assessment Method (MnRAM) Evaluating Wetland Function, Version 3.4(beta). Accessed online: http://www.bwsr.state.mn.us/wetlands/mnram/MnRAM%20_Comprehensive_Guidance_3.4beta_2010.pdf