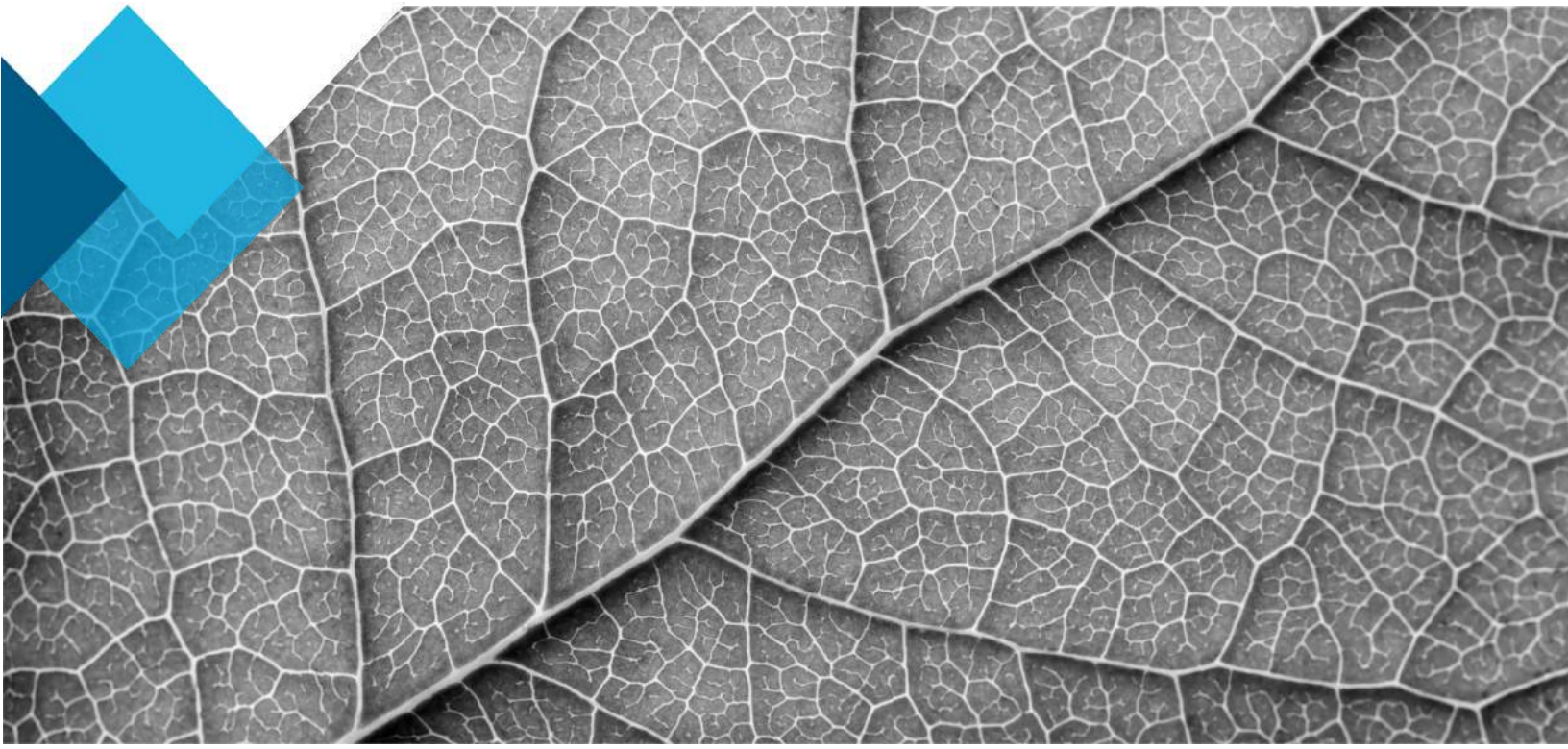
SNC·LAVALIN

Environmental and Regulatory Review

Saskatoon Freeway Functional Planning Study

Saskatchewan Ministry of Highways and Infrastructure



Environment & Geoscience

August 2020

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Executive Summary

SNC-Lavalin Inc. (SNC-Lavalin) conducted an Environmental and Regulatory Review in support of the Ministry of Highways and Infrastructure (the Ministry) Saskatoon Freeway Functional Planning Study (SFFPS). The Ministry is conducting a functional planning study to determine how the Saskatoon Freeway will look and operate. The study is scheduled to be completed in 2022.

Once constructed, the freeway is expected to be a minimum four-lane, 55-kilometre freeway that will be routed around the City of Saskatoon, with roadway connections at eight provincial highways as well as some municipal roads. The planned route begins at Highway 11 south of Saskatoon and is routed counter-clockwise around the City connecting with Highway 7 west of the city (**Figure 1.1**). It will potentially consist of 16 interchanges, five railway overpasses, at least two flyovers and a bridge crossing the South Saskatchewan River. The functional planning study commenced with a 500 m wide corridor that was identified in preceeding general location studies. Information gained within the functional planning study is used to determine where the centre line of the freeway will be and will define interchange concepts, service roads and access points on and off the freeway. When complete, the functional planning study will more precisely identify the amount of land required for construction and allow for a more precise cost estimate for the construction phase.

The objectives of this environmental and regulatory review are:

- Provide an overview of the federal and provincial assessment processes; potential federal, provincial, and municipal regulatory approvals / permits that may be required; and key environmental legislation relevant to the proposed project;
- Provide an overview of land use, soils, vegetation, fish, wildlife, and heritage resources in the region with a focus on Species of Conservation Concern (SOCC) and other environmental sensitivities based on exising information;
- Complete preliminary surveys in environmentally sensitive areas (e.g. Northeast and small swale, Hudson Bay swale, west swale, South Saskatchewan River valley);
- Identify areas requiring further biological surveys through the desktop review as well as reconnaissance field surveys;
- Identify potential routing sensitivities, which may include protected lands, environmentally sensitive areas and habitat, SOCC, areas of public concern, and heritage resources;
- Recommend potential design, construction and operational mitigations to avoid or reduce impacts, with a focus on environmentally sensitive areas; and
- Solicit input from stakeholder groups to gain information and feedback.

This study includes recommendations for future studies and general constraints/mitigations for the entire corridor, as well as site-specific constraints/mitigations for Phase 1 of the freeway (South Saskatchewan River valley, Hudson Bay swale, and Wanuskewin Heritage Park). Due to the phased nature of the functional planning study, site-specific constraints/mitigations for Phase 2 (Northeast swale and small swale) and Phase 3 (west swale) will be described in an addendum to this report. Subsequent reports will incorporate the results of surveys completed by Meewasin Valley Authority and the results of additional survey work underway in 2020.

Recommended future studies include:

- Environmental and heritage surveys for any ancillary roads, interchanges, and/or laydown areas that fall outside the corridor;
- Wetland classification surveys;
- Various species detection surveys, including: grassland bird, prairie raptor, snow track, rare vascular plant, auditory amphibian, burrowing owl, short-eared owl, sharp-tailed grouse, common nighthawk and yellow rail surveys; and
- A heritage resources impact assessment.

General routing contraints and mitigation measures are described for the following environmental sensitivities:

- Surface water and wetlands (approximately 8% of the project area);
- Native grasslands (approximately 14% of the project area);
- Widllife and Species of Conservation Concern;
- Heritage resources; and
- Contaminated sites.

Routing considerations and mitigation measures specific to Phase 1 are described for the following sensitive areas:

- The South Saskatchewan River valley is an ecologically important feature, serves as a natural corridor for wildlife movement, habitat for fish species, and has a high potential for archaeological finds;
- The Hudson Bay swale is an ecologically sensitive feature and is being considered for future inclusion into the City's natural area protection plan; and
- Wanuskewin Heritage Park is located northeast of the proposed freeway corridor and is classified as a provincial heritage site as well as is currently seeking UNESCO World Heritage status. It is surrounded by a 1.8 km radial buffer and has a high potential to contain heritage resources.

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1 Introduction

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1.1 Project Overview

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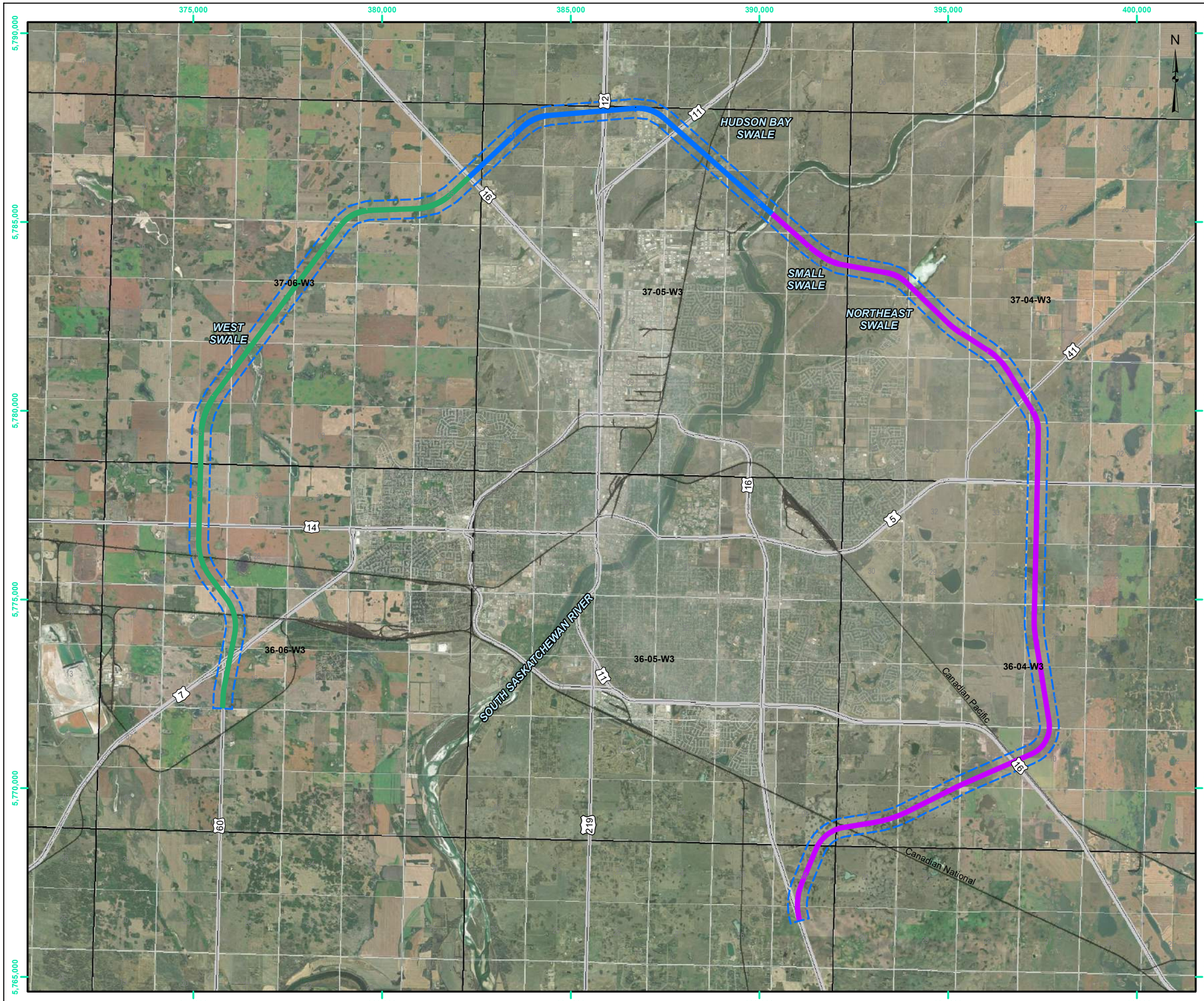
Once constructed, the freeway is expected to be a minimum four-lane, 55-kilometre freeway that will be routed around the City of Saskatoon, with roadway connections at eight provincial highways as well as some municipal roads. The planned route begins at Highway 11 south of Saskatoon and is routed counter-clockwise around the City connecting with Highway 7 west of the city (**Figure 1.1**). It will potentially consist of 16 interchanges, five railway overpasses, two flyovers and a bridge crossing the South Saskatchewan River.

The functional planning study commenced with a 500 m wide corridor that was identified in preceeding general location studies. Information gained within the functional planning study is used to determine where the centre line of the freeway will be and will define interchange concepts, service roads and access points on and off the freeway. When complete, the functional planning study will more precisely identify the amount of land required for construction and allow for a more precise cost estimate for the construction phase. The study is broken into three phases including (**Figure 1.1**):

- Phase 1: North of Saskatoon between the South Saskatchewan River and Highway 16;
- Phase 2: East of Saskatoon between the South Saskatchewan River and Highway 11 (southeast terminus of the Saskatoon Freeway corridor); and
- Phase 3: West side of Saskatoon between Highway 16 and Highway 7 (southwest terminus of the Saskatoon Freeway corridor).



LEGEND

PRELIMINARY FREEWAY ALIGNMENT

- STUDY PHASE 1 (2019-2020)
- STUDY PHASE 2 (2020-2021)
- STUDY PHASE 3 (2021-2022)
- RAILWAY
- HIGHWAY
- PROPOSED FREEWAY CORRIDOR

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
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DISCLAIMER

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	HY	KVG	HY	JP

0 500 1,000 2,000 3,000 4,000 METRES

SCALE: 1:100,000

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CLIENT	PROJECT LOCATION
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE	SASKATOON FREEWAY

TITLE

PROPOSED SASKATOON FREEWAY CORRIDOR

DATE	DWG No.	FIG No.	REV
2019 03 05	659183-0000-4EDD-0021	1.1	00

SIZE 11x17

Path: \\sli1653\Projects QMS\SMH\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0021 Proposed Freeway Corridor.mxd

1.2 Study Objective

The objectives of this environmental and regulatory review are:

- Provide an overview of the federal and provincial assessment processes; potential federal, provincial, and municipal regulatory approvals / permits that may be required; and key environmental legislation relevant to the proposed project.
- Provide an overview of land use, soils, vegetation, fish, wildlife, and heritage resources in the region with a focus on Species of Conservation Concern (SOCC) and other environmental sensitivities based on exising information;
- Complete preliminary surveys in environmentally sensitive areas (e.g. Northeast and small swale, Hudson Bay swale, west swale, South Saskatchewan River valley);
- Identify areas requiring further biological surveys through the desktop review as well as reconnaissance field surveys;
- Identify potential routing constraints, which may include protected lands, environmentally sensitive areas and habitat, SOCC species, areas of public concern, and heritage resources;
- Recommend potential design, construction and operational mitigations to avoid or reduce impacts, with a focus on environmentally sensitive areas; and
- Solicit input from stakeholder groups to gain information and feedback.

2 Regulatory Considerations

The following section describes: the federal and provincial assessment processes; potential federal, provincial, and municipal regulatory approvals / permits that may be required; and key environmental legislation relevant to the proposed project. The information is based on current legislation.

2.1 Environmental Assessment

2.1.1 Federal

The federal environmental assessment process is legislated by the *Impact Assessment Act*. The Physical Activities Regulations (SOR/2019-285) identify the physical activities that constitute the designated projects that may require a federal environmental assessment. Under the regulations, "the construction, operation, decommissioning and abandonment of a new all-season public highway that requires a total of 75 km or more of new right of way" is considered a designated project. The proposed freeway does not meet the 75 km threshold hence is not expected to require a federal environmental assessment.

2.1.2 Provincial

The Environmental Assessment Act provides a coordinated review of developments in Saskatchewan and provides an approval-in-principle that is not intended to duplicate regulatory programs but acts as an umbrella to ensure all relevant impacts for a project are addressed (Government of Saskatchewan 2018). The Saskatchewan environmental assessment process begins with the submission of a Technical Proposal (TP) to the Saskatchewan Ministry of Environment (ENV). The TP is intended to provide ENV with enough information to determine regulatory requirements, including whether the project is considered a development pursuant to *The Environmental Assessment Act*. If the project is not considered a development, the project may proceed as proposed, subject to any conditions and applicable provincial regulatory requirements. If the project is considered a development, it will require ministerial approval and be subject to an Environmental Impact Assessment (EIA). The Act defines a development to mean any project, operation or activity, or any alteration or expansion of any project, operation or activity, which is likely to:

- Influence any unique, rare, or endangered feature of the environment;
- Substantially utilize any provincial resource, and in doing so, pre-empt the use, or potential use of that resource for any other purpose;
- Cause the emission of any pollutants or create by-products, residual or waste products which require handling and disposal in a manner that is not regulated by any other Act or regulation;
- Cause widespread public concern because of potential environmental changes;
- Involve a new technology that is concerned with resource utilization and that may induce significant environmental change; and/or
- Have a significant impact on the environment or necessitate a further development, which is likely to have a significant impact on the environment.

The proposed project has the potential to influence a unique, rare, or endangered feature of the environment (e.g. the Northeast and small swales) and has the potential to cause widespread public concern because of potential environmental changes, hence, will require submission of a TP to determine if the project is subject to an EIA.

Developments subject to an EIA must submit an Environmental Impact Statement (EIS) to the Environmental Assessment and Stewardship Branch (EASB) of ENV for review and approval. The EIS is then reviewed by the Saskatchewan Environmental Assessment Review Panel (SEARP), a multidisciplinary panel consisting of representatives from various provincial ministries and agencies with environmental and socioeconomic interests or responsibilities. If the EIS does not contain all the required information, ENV will issue Technical Review Comments and direct the proponent to provide additional information to address deficiencies. Once the EIS is complete, it will be made available for public review. Following the completion of the public review period, the EASB will make a recommendation to the Minister for a decision on whether the project can proceed with conditional approval. Conditions may include, among other things, a requirement to compensate for lost wetland and grassland habitat. Once approval is granted, the proponent can apply for additional permits and approvals.

2.1.3 Meewasin Valley Authority

The Meewasin Valley Authority (MVA) is a conservation agency dedicated to conserving the cultural and natural resources of the South Saskatchewan River valley. The MVA has the power to coordinate or control the development of public land in accordance with the Development Plan as per section 10 of *The Meewasin Valley Authority Ac*t. The Saskatoon Freeway is located, in part, on lands under the jurisdiction of the MVA (Schedule A of the Act) however the Province is exempt from the MVA Development Review process and not subject to Development Review by the Authority. MVA is a key member of the Technical Working Group (TWG) for Environment and Heritage established as part of the Project Team and has been contracted by the Ministry to collect baseline environmental data within the Northeast swale and surrounding area (including the small swale). As part of the TWG, MVA will participate in mitigation planning for the freeway design through environmentally sensitive areas to ensure that changes made to the river channel within their jurisdiction are compatible with the Authority's Development Plan.

2.2 Regulatory Approvals / Permits and Requirements

Numerous other environmental federal and provincial approvals / permits may be required for development of the proposed project. The project will also be subject to various environmental legislation. **Table 2.1** provides a list of potential approvals / permits and key legislation, however, this list is not inclusive and there may be other applicable approvals / permits and legislation. The Ministry will continue to engage with provincial and municipal agencies as the project progresses and once the layout is determined to discuss applicable approvals and permits.

Table 2.1 Potential environmental permits / approvals and key legislation

Permit and/or Approval	Description	Agency	Applicable Legislation or Regulation
Federal			
Migratory Birds Damage or Danger Permit	The Act prohibits the disruption or loss of active migratory nests, or harm or loss of eggs, young, and breeding adults. Under section 26(1) of the regulations, permits are required: to scare or kill migratory birds; for the collection, destruction, and disposal of eggs of migratory birds; for the removal, relocation, and/or destruction of birds/nests/eggs.	Environment and Climate Change Canada (ECCC)	› *Migratory Birds Convention Act, 1994* › Migratory Birds Regulations
n/a	The *Species at Risk Act* (SARA), provides legal protection of species listed in Schedule 1 to prevent them from becoming extirpated or extinct, and to provide necessary actions for the recovery of a species. Key considerations under SARA include protection of species' critical habitat (Sections 52 and 58); prohibition of killing, harming or taking of species at risk (Section 32); and prohibition of damage or destruction of residences of Species at Risk (Section 33).	ECCC	› *Species at Risk Act*
Fisheries Act Self Assessment / Review / Authorization	The Act requires that projects avoid causing the death of fish [Section 34.4(1)], as well as the avoiding the harmful alteration, disruption or destruction of fish habitat [Section 35(1)] unless authorized by the Minister of Fisheries and Oceans Canada (DFO). This applies to work being conducted in or near almost all waterbodies in Canada. Activities within the South Saskatchewan River and other watercourses will be subject to a request for review to DFO before proceeding and is expected to require an authorization. The Act also prohibits the deposition of deleterious substances in a waterway [section 36(1) to 36(6)].	Fisheries and Oceans Canada (DFO)	› *Fisheries Act*
Approval for a Major Work	An owner who proposes to construct, place, alter, rebuild, remove or decommission a major work in, on, over, under, through or across any navigable water must make an application for an approval to the minister.	Transport Canada	› *Canadian Navigable Waters Act*

Permit and/or Approval	Description	Agency	Applicable Legislation or Regulation
Provincial			
n/a	This Act protects the air, land, and water resources of Saskatchewan through the regulation and control of potentially harmful activities and substances. It regulates activities and materials that may affect the environment, including hazardous substances, hazardous waste, industrial waste, sewage and sewage works and waterworks. EMPA sets out permitting/approval processes; environmental protection plans, corrective action plans, reporting responsibilities; and consequences/penalties.	ENV	› *The Environmental Management and Protection Act, 2010* › The Environmental Management and Protection (Saskatchewan Environmental Code Adoption) Regulations › The Hazardous Substances and Waste Dangerous Goods Regulations
Aquatic Habitat Protection Permit (AHPP)	Section 38(4) of the Act prohibits the direct or indirect alteration of any waterbody or wetland without express authorization to do so. Aquatic habitat alteration may be allowed if authorization has been provided via a permit, a previously accepted environmental protection plan, or the Environmental Code (section 38(5)). Authorizations are not required if the watercourse or waterbody is wholly contained within the boundaries of land owned by the person carrying out the alteration and the surface water does not flow directly or indirectly into other surface water that is not wholly contained within the boundaries of that land (section 38(6)).	ENV	› *The Environmental Management and Protection Act, 2010*
n/a	This Act protects wildlife and wild species at risk in Saskatchewan (including most migratory and non-migratory birds that are not protected federally) from being disturbed, collected, harvested, captured, killed, sold or exported without a permit (Sections 31, 32 and 33). In addition, the den, nest, dam, or usual place of habitation of wildlife and wild species at risk is also protected from disturbance and destruction.	ENV	› *The Wildlife Act, 1998* › The Wildlife Regulations
Research Permit	Section 21(2) of the Act requires permits for surveys, research or other activity to detect or observe any species, wild species or wild species at risk, or assess the habitat of any species, wild species at risk, for a commercial, scientific, academic or other purpose prescribed in the regulations without a licence issued by the director.	ENV	› *The Wildlife Act, 1998* › The Wildlife Regulations
Special Collection Permit	This Act protects fish, crustaceans, molluscs, and aquatic invertebrates in Saskatchewan. It also protects the eggs or sperm from these species, as well as the individual parts of these species. This includes species not considered SOCC. Under Section 13 of this Act "*No person shall fish or acquire, raise, possess, use, culture, import, introduce, process, package, market, carry or transport any fish or dispose of any fish or allow any fish to be wasted except in accordance with any licence or any provisions of this Act or the Fisheries Act (Canada) or its regulations.*"	ENV	› *The Fisheries Act, 1994*

Permit and/or Approval	Description	Agency	Applicable Legislation or Regulation
n/a	This Act concerns the spread and propagation of Prohibited, Noxious, and Nuisance Weeds. Section 26(1) outlines requirements for machines to be thoroughly cleaned, inside and out, to ensure the removal or destruction of any prohibited or noxious weeds before the machine is moved. Permits would be required if chemicals were to be used near waterbodies/watercourses.	n/a	› *The Weed Control Act, 2010*
n/a	These Acts concern the spread and propagation of pests that may affect the environment. Sections 5 to 7 require that every person take measures to destroy pests, soils, or any other matter that may contain pests. Requirements for training and certification associated with the application of of pest control products are also stipulated.	n/a	› *The Pest Control Act* › *The Pest Control Products (Saskatchewan) Act*
Water Rights Licence	Under section 50 of the Act a licence is required for the right to use water (surface water or groundwater).	WSA	› *The Water Security Agency Act*
Approvals to Construct / Operate Drainage Works	Under section 59 of the Act and section 11 of the regulations, approval is required for the construction, extension, alteration and operation of drainage works.	WSA	› *The Water Security Agency Act* › The Water Security Agency Regulations
Heritage Property Act Clearance / Heritage Resource Impact Assessment (HRIA) Permit / Mitigation / Research Investigation Permit	If an operation or activity which may be undertaken is likely to result in the alteration, damage or destruction of heritage property, the minister may require under section 63(that person to: (a) carry out an assessment to determine the effect of the proposed operation or activity on that heritage property; (b) prepare and submit to the minister a report containing the assessment mentioned in clause (a); and (c) undertake any salvage, preservation or protective measures, or any other action, that the minister may specify. A Research Permit is required under section 67 to: (a) carry out a survey; (b) make collections; or (c) conduct excavations or other activities; which may disturb or dislocate archaeological or palaeontological objects on a heritage property.	MPCS	› *The Heritage Property Act, 1980*
Utility Crossing Agreements	Agreements with utility companies to regarding movement of existing utilities to accommodate the freeway.	Various utility and oil and gas companies	n/a

n/a - denotes no permit/approval required

3 Stakeholder Engagement

Stakeholder engagement is an ongoing process that will continue throughout the duration of the functional planning study. The goal of the stakeholder engagement program is to build an understanding with stakeholders and the public; create safe environments for information sharing and feedback; and develop appropriate engagement and communication tools and solutions that are sensitive and responsive to the needs of stakeholders. The program includes engagement with all affected and interested community members, including: landowners, associations, community groups, rural and urban levels of government, non-profit corporations, industry representatives, utility corporations, heritage groups, environmental groups, Metis organizations, and First Nations communities and entities.

The final alignment of the Saskatoon Freeway has the potential to impact Treaty and/or Aboriginal rights and/or traditional use and will trigger Duty to Consult obligations with regards to fish and wildlife management, land reservations, land use planning, changes to public access, and environmental approvals.

In addition to general stakeholder engagement activities, the functional planning study also includes a series of Technical Working Group (TWG) meetings. Each key discipline has a TWG that forms part of the overall Project Team. The goal of the TWG meetings is to solicit feedback related to specific studies and to share information related to the progress and findings of the functional planning studies. Specifically, the Environment & Heritage TWG meeting includes; in additional to members from the Ministry and the Project Team, the following invited participants:

- The Meewasin Valley Authority;
- Wanuskewin Heritage Park;
- The City of Saskatoon;
- The Northeast Swale Watchers (resigned from the TWG in Spring 2020);
- The Saskatoon Tribal Council;
- The Water Security Agency (joined TWG in Spring 2020);
- The Saskatchewan Ministry of Environment (joined TWG in Summer 2020); and
- The Saskatchewan Nature Society (joined TWG in Summer 2020).

Main environmental and heritage concerns noted to date include:

- Road infrastructure planned within environmentally sensitive areas, specifically the Northeast swale and small swale and, to lesser extent, the Hudson Bay swale and west swale;
- Stormwater management within environmentally sensitive areas;
- Loss of wetlands throughout the project area;
- Changes to the hydrology of the area;
- Disturbance to archaeological and heritage features that may be located within the corridor; and
- Road infrastructure planned in proximity to Wanuskewin Heritage Park (specifically related to noise and viewscape).

4 Description of the Environment

This section provides a high-level description of the hydrometeorological environment, biophysical environment, protected areas and heritage resources based on existing available data as well as reconnaissance biological field-level surveys.

4.1 Hydrologic Environment

4.1.1 Methods

A desktop review of the hydrometeorological conditions of the region was conducted, based on a hydrological study area including the proposed freeway corridor and key regional water features. Data was collected from the various sources including:

- Topographical datasets from Natural Resources of Canada (2013);
- Climate data from Environment and Climate Change Canada (ECCC 2019), based on the Saskatoon Airport meteorological station (Climate ID: 4057120);
- Evaporation data from Agricultural and Agri-Food Canada (2010); and
- Stream flow data from various Water Survey of Canada (WSC) hydrometric stations (WSC, 2019), shown on **Figure 4.1**.

A flow frequency analysis was completed using the SNC-Lavalin flow assessment and simulation tool (FAST, Henze et. al. 2018). General drainage conditions of the study area were described.

Detailed drainage analysis was completed by the drainage TWG and is further described in the Functional Planning report.

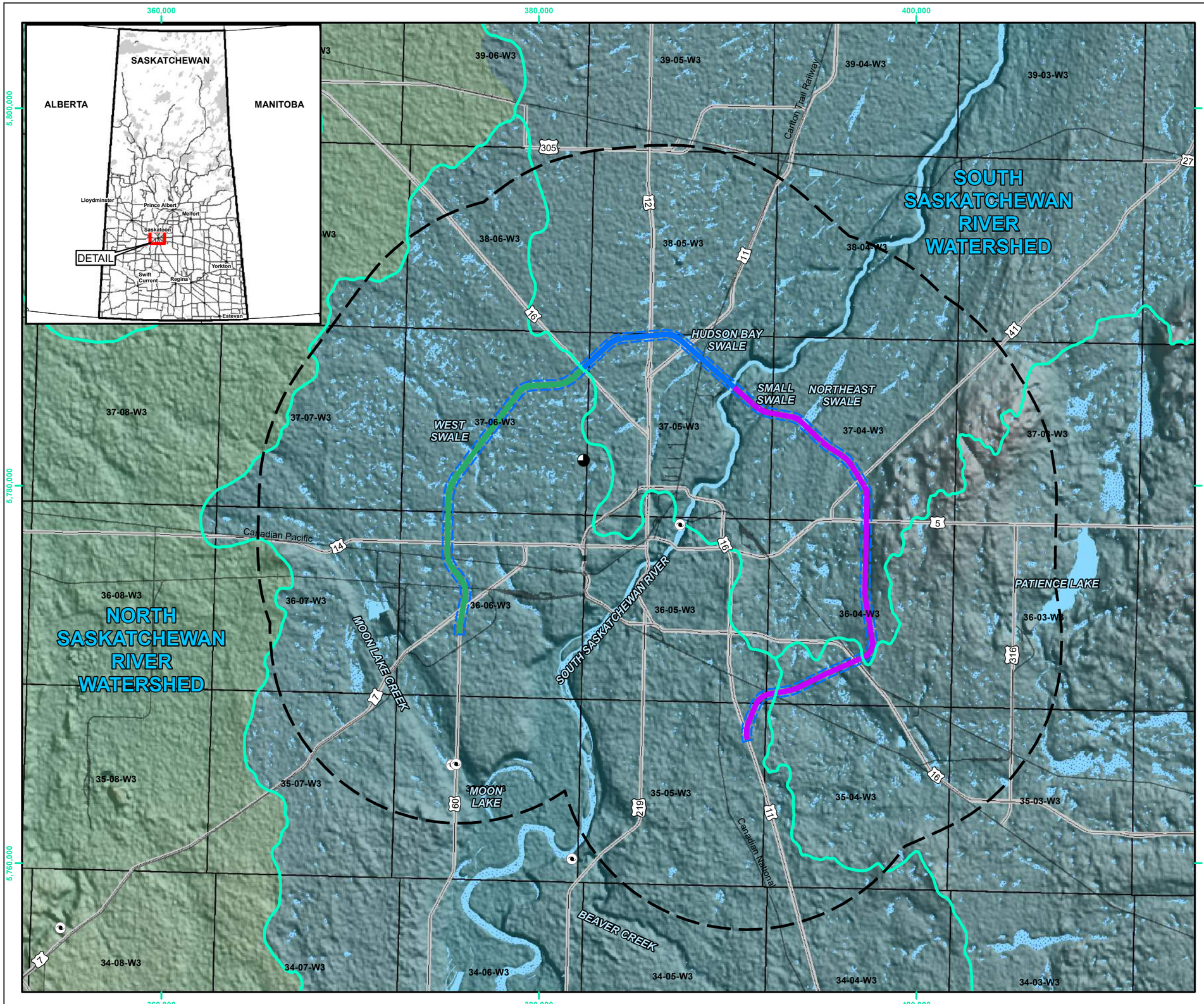
4.1.2 Results

The proposed freeway corridor is located within the South Saskatchewan River Watershed and in the Saskatoon Plain landscape of the Moist Mixed Grasssland Ecoregion in the Prairie Ecozone (Acton et al. 1998). The ground elevation in the study area slopes from approximately 510 masl in the west to 535 masl in the east to 490 masl at the South Saskatchewan River which is entrenched nearly 60 m into the Saskatoon Plain. The local landscape consists of undulating, sandy to silty glacio-lacustrine plains (Action and Ellis, 1978). Regional drainage characteristics of the study area include limited runoff to downstream areas due to large internal wetlands, sloughs and lakes. The hydrometeorological conditions of the proposed freeway location are described in the following sections.

4.1.2.1 Climate

The proposed location of the freeway is in the semi-arid region of Canada where warm-moist summers and cold-dry winters prevail. Historical air temperature profiles (daily minimum, average, and maximum), precipitation (rainfall and snowfall, water equivalent), and evaporation averages of the area are presented in **Figure 4.2**. Historical extreme air temperature and precipitation events are presented in **Table 4.1**.

The daily average temperature over the 30-year period (1981 to 2010) ranges from a high of 18.5ºC in July to a low of -15.5ºC in January (ECCC 2019). The average annual precipitation is approximately 354 mm, with 26% occurring as snowfall. The highest average monthly rainfall typically occurs in June (65.8 mm), and the highest average monthly snowfall occurs in January (17.5 mm, water equivalent). Most of the snowfall occurs from the middle of October to the middle of April.



LEGEND

- SASKATOON AIRPORT CLIMATE STATION
- HYDROMETRIC GAUGING STATION
- STUDY PHASE 1 (2019-2020)
- STUDY PHASE 2 (2020-2021)
- STUDY PHASE 3 (2021-2022)
- RAILWAY
- HIGHWAY
- WATERCOURSE

WATERBODY

- Unknown
- Permanent
- Intermittent
- HYDROLOGY STUDY AREA
- PROPOSED FREEWAY CORRIDOR

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2016, SASKGRID2016.
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REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	LB	KG	HY	JP

0 1 2 4 6 8 KILOMETRES

SCALE: 1:175,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE	SASKATOON FREEWAY

TITLE

HYDROLOGY OVERVIEW

DATE	2019 03 05	DWG No.	659183-0000-4HDD-0001	FIG No.	4.1	REV	00

SIZE 11x17

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Table 4.1 Extreme daily climate events at the Saskatoon climate station (ECCC 2019)

Parameter	Quantity	Date
Rainfall (mm)	96.6	24 June 1983
Snowfall (depth in cm)	36.0	10 January 2007
High Air Temperature (ºC)	40.6	05 June 1988
Low Air Temperature (ºC)	-50.0	01 February 1893

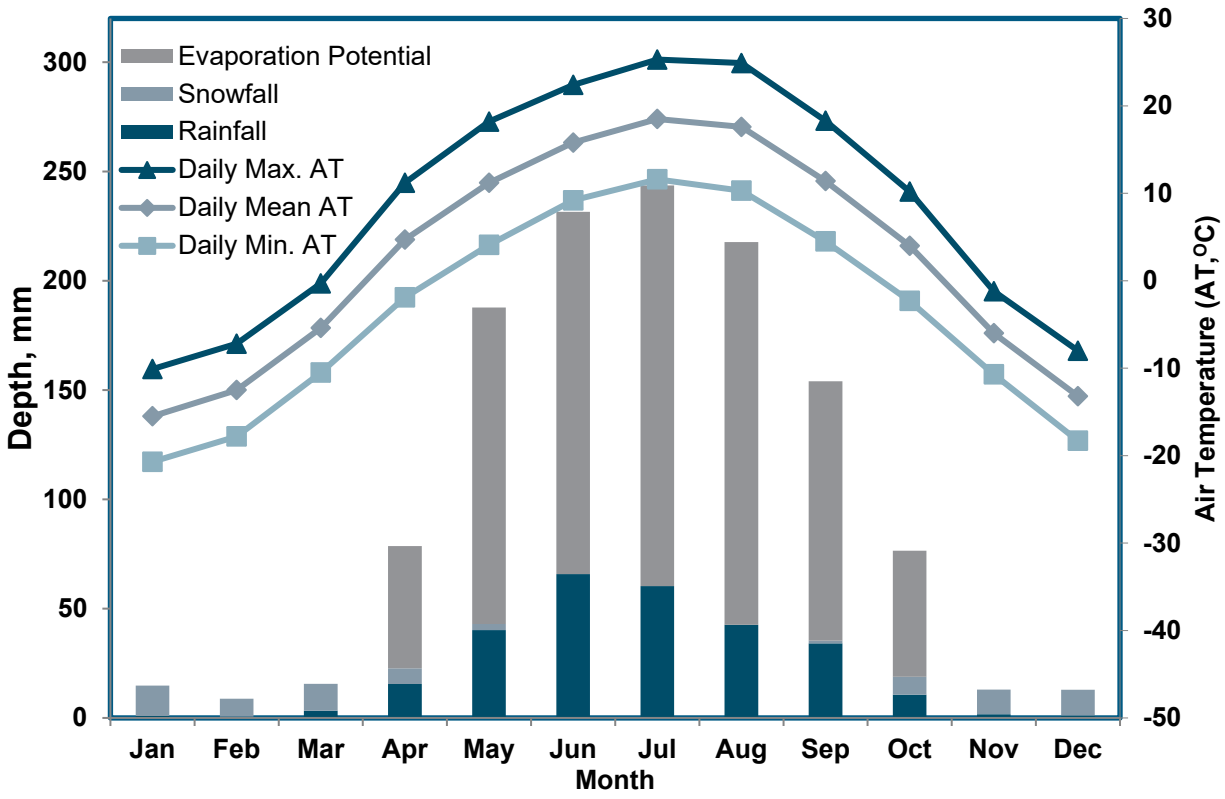


Figure 4.2 Precipitation and air temperature (AT) normals over a 30-year period (1981 to 2010) data obtained from ECCC (2019), and average evaporation potential estimates over a 71-year period (1935 to 2006) data obtained from AAFC (2010)

Monthly averages of evaporation potential estimates for the Saskatoon station over a 71-year period (1935 to 2006, AAFC 2010) are presented in **Figure 4.2**. The annual average of the evaporation potential is 901 mm. Gross evaporation typically peaks in July with an average value of 183.3 mm. During winter (November to March), there is no significant gross evaporation due to low air temperatures and/or ice and snow cover. The air temperature profiles support the gross evaporation trend. The plots indicate a significant moisture deficit in the project area due to a higher evaporation demand than available precipitation during the months with average air temperatures above 0°C.

Intensity-Duration-Frequency (IDF) curves describe probability of extreme rainfall events. The IDF curves are vital information for estimating surface water runoff and to design hydraulic structures such as culvert crossings for the proposed freeway. The IDF curves for the Saskatoon climate station are summarized in **Table 4.2** (ECCC 2018). The extreme rainfall events of 50-year and 100-year return periods each with 24hour duration are approximately 82.8 mm and 92.1 mm, respectively.

Detailed analysis was completed by the drainage TWG and is further described in the Phase 1 Functional Design Report.

Table 4.2 Saskatoon climate station IDF curves summary (based on data from 1960 to 2017) from ECCC (2018)

Return Period	Duration	
(years)	1-Hour	24-Hours
1 in 2	14.7	36.1
1 in 5	26.0	51.1
1 in 10	33.4	61.0
1 in 25	42.8	73.5
1 in 50	49.8	82.8
1 in 100	56.7	92.1

4.1.2.2 Runoff

The dominant surface water features that intersect the proposed freeway corridor are the South Saskatchewan River, Hudson Bay swale, Northeast swale, and the west swale (**Figure 4.1**). Numerous wetlands are also present within the proposed freeway corridor. The South Saskatchewan River flows northeast, merges with North Saskatchewan River 42 km east of Prince Albert, becomes the Saskatchewan River, and flows into Lake Winnipeg. A summary of the gauged streamflow of the South Saskatchewan River is presented in **Figure 4.3**. The gauging station is at approximately 10 km upstream of the freeway crossing along the river. The gauging station has a gross drainage are`a of 141,000 km^2 and an effective drainage area of 88,100 km^2.

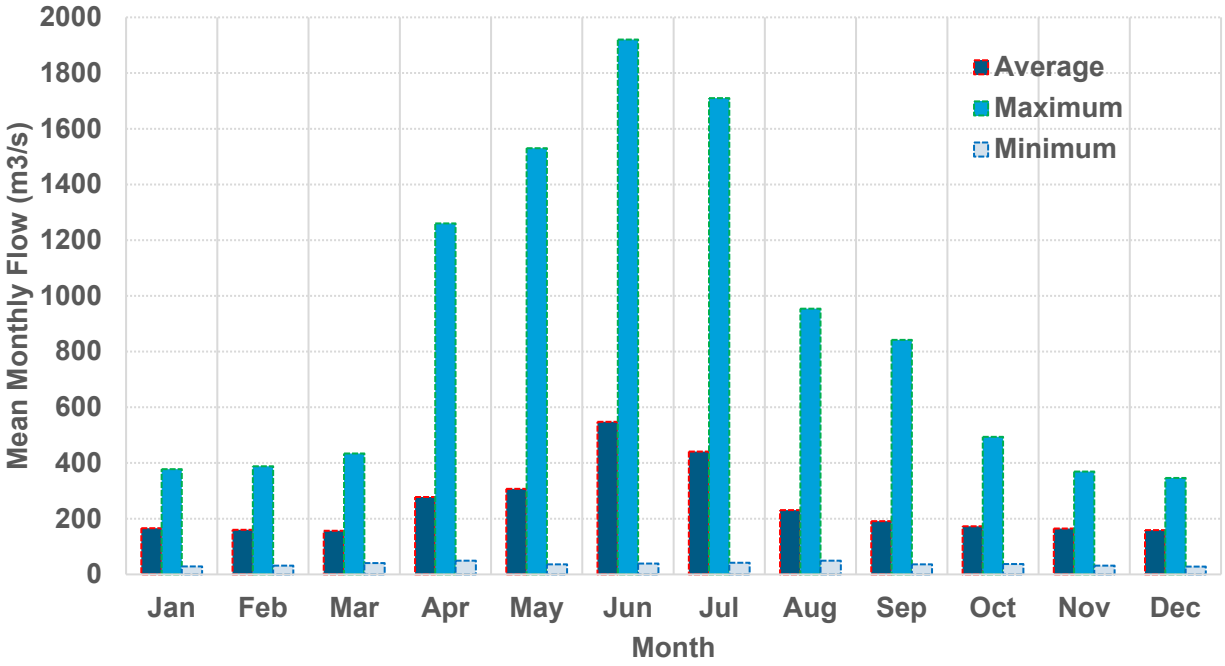


Figure 4.3 Monthly stream flow summary of South Saskatchewan River at Saskatoon (05HG001) over a period of 106 years (1911 to 2017) (data obtained from WSC (2019)

The South Saskatchewan River typically peaks in June following the upstream snowmelt in April and the subsequent delayed flows from the Gardner Dam located approximately 150 km upstream along the river. The flow summary indicates monthly average flow to a maximum of approximately 1,900 m^3/sec in June. The maximum instantaneous flow observed was approximately 4,190 m^3/sec occurred in June 1953. **Figure 4.4** presents a summary of flow frequency analysis completed by using the stream flow data and four probability distributions. The observed extreme flow of 4,190 m^3/sec is close to the 1 in 100-year estimates of Pearson III and Gumbel (EV1) distributions.

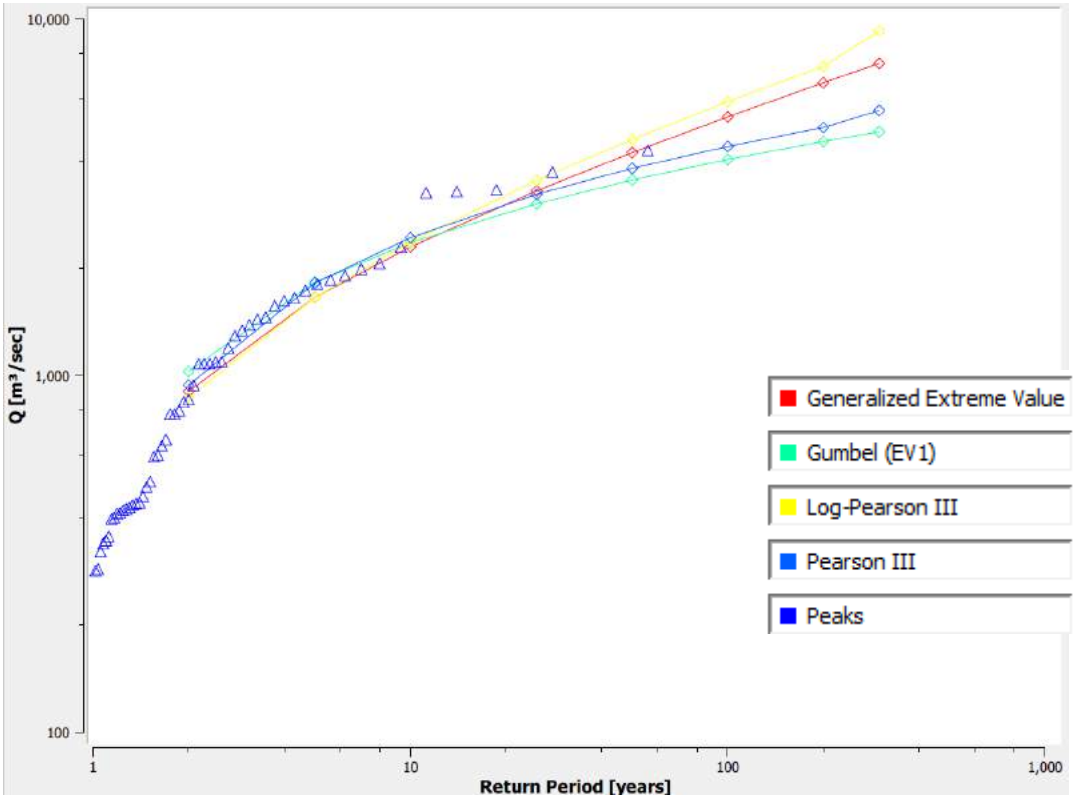


Figure 4.4 A summary of the flow frequency analysis for the South Saskatchewan River

Streamflow and runoff in the study area varies seasonally. Although winter has the lowest levels of precipitation, spring runoff releases the storage of up to five months of precipitation in the snowpack, during a brief melt period. On average, approximately 75% of the natural runoff and streamflow occurs between March and June. Occasional summer and fall rains provide sufficient moisture to produce brief periods of runoff that account for the remaining 25% of the average annual flow. The stormwater from the City of Saskatoon drains into the South Saskatchewan River. Numerous wetlands are present in the the study area which collect significant amounts of the surface runoff, and combined with the high evaporation demands, the normal runoff is significantly less than the normal annual precipitation. In drought years, the runoff can diminish to a small fraction of the normal value, and in wet years it can greatly exceed the norm. The dominant land use in the study area is agriculture. The surface water runoff generation potential in the study area is affected by the seasonal variation of onsite agricultural land use characteristics, precipitation, antecedent soil moisture conditions, and wetland water levels.

Detailed analysis was completed by the drainage TWG and is further described in the Phase 1 Functional Design Report.

4.2 Terrain and Soils

4.2.1 Methods

A desktop analysis of the terrain and soils in the soils study area was conducted using soil reports from Agriculture and Agri-Food Canada (2012), the Saskatchewan Institute of Pedology (Acton and Ellis 1978), and the Saskatchewan Land Resource Unit (2009). These reports are available for the majority of the crop producing regions in the province and were used to provide a description of the soil landscape in the soils study area. Terrain and soil data for the soils study area were summarized, including soil classification and descriptions, soil capability class, and local topography. Soil classification and soil capability maps for the soils study area were developed using digitized databases sourced from the literature.

The vegetation and soils study area includes the proposed freeway corridor surrounded by a 300 m buffer zone (**Figure 4.5**). The vegetation and soils study area occupies approximately 6,034 ha and the proposed freeway right-of-way occupies approximately 2,716 ha.

4.2.2 Results

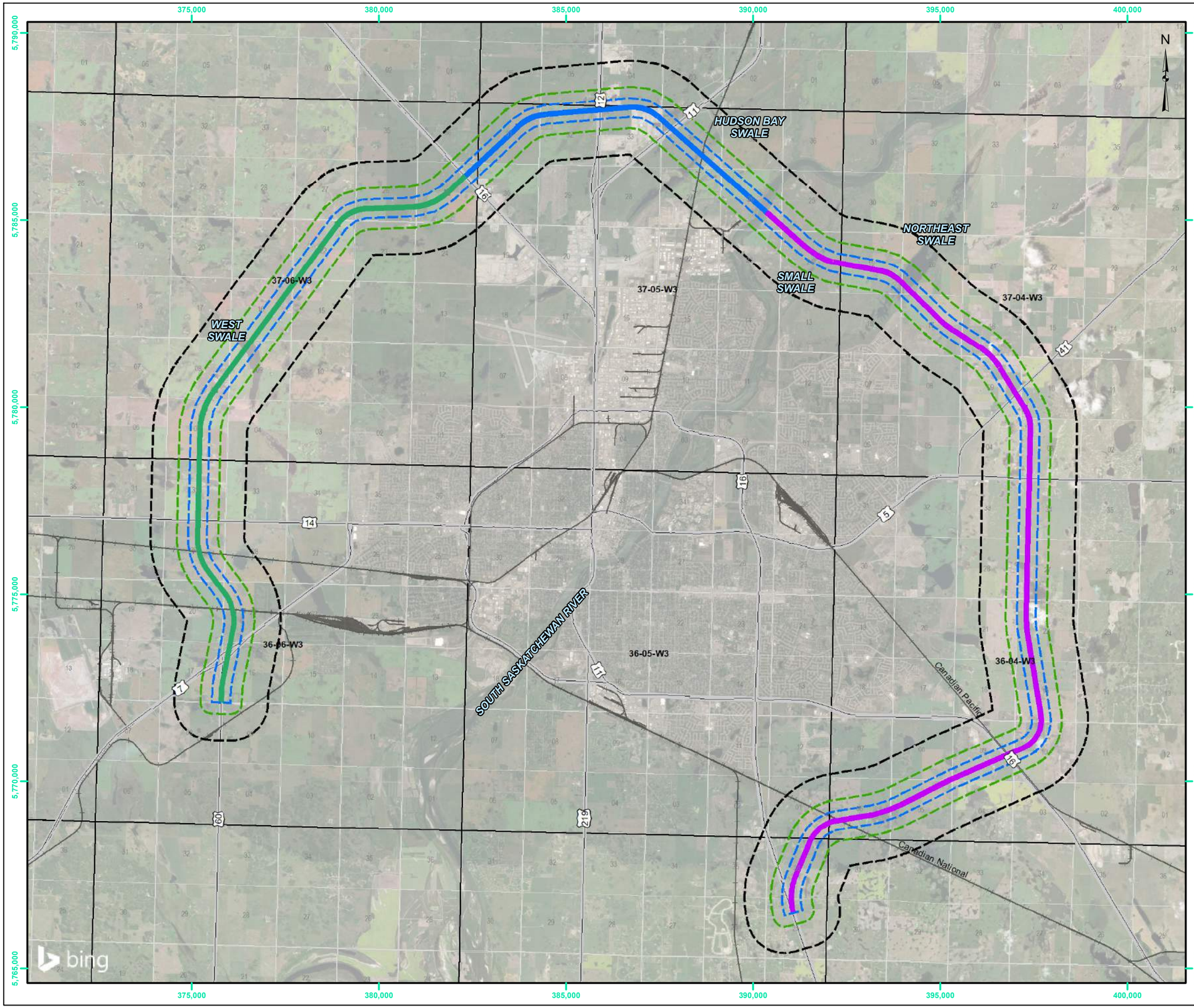
4.2.2.1 Terrain

The soils study area is located in the Moist Mixed Grassland Ecoregion of the Prairie Ecozone (Acton et al. 1998). However, the project is very close to the border of the Aspen Parkland Ecoregion. The landscape in this area is generally undulating, with local relief typically less than three metres, except in the Minichinas Hills where some rolling hills are found (Acton et al. 1978). The South Saskatchewan River valley is a relatively deep valley which contains the lowest elevations in the area. Surficial deposits are primarily glacio-fluvial and glacio-lacustrine in origin, deposited during the most recent glacial period. In most locations in the region, the landforms have remained relatively unchanged since the glaciers retreated, and only local runoff and wind erosion have influenced the area since that time. The South Saskatchewan River valley is an exception, as recent alluvial and colluvial soil deposits are present in the floodplains and valleys of this river.

The soils in the study area fall within the Dark Brown Soil Zone of Saskatchewan (Saskatchewan Land Resource Unit 2009; Acton and Ellis 1978). The soils in the study area are composed of multiple associations and map units (Appendix B).

The deposits generally consist of an undulating sandy to clayey material of glaciolacustrine origin, with a matrix with embedded stones and gravels (Acton et al. 1978). These deposits are distributed unevenly, resulting in a hummocky landscape with irregular patterns of short, steep slopes giving rise to emergent knolls and rounded depressional zones or “kettles” which form small to large wetlands on the landscape.

The majority of the vegetation and soils study area is between 490 masl and 535 masl, with the highest elevations located to the east, and the lowest elevations in the South Saskatchewan River valley. The range of slope classes within the vegetation and soils study area varies between very gently sloping to strongly sloped (0% to 30% incline). The majority of the study area however ranges between very gently sloping to roughly undulating (0.5% to 5%), with steep slopes near the South Saskatchewan River valley.



LEGEND

PRELIMINARY FREEWAY ALIGNMENT

- STUDY PHASE 1 (2019-2020)
- STUDY PHASE 2 (2020-2021)
- STUDY PHASE 3 (2021-2022)
- RAILWAY
- HIGHWAY
- PROPOSED FREEWAY CORRIDOR
- VEGETATION AND SOIL STUDY AREA
- WILDLIFE STUDY AREA

NOTES

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REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	HY	KVG	HY	JP

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SCALE: 1:100,000

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PROJECT LOCATION
SASKATOON FREEWAY

TITLE
BIOPHYSICAL STUDY AREAS

DATE	DWG No.	FIG No.	REV
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4.2.2.2 Soil Classification

The vegetation and soils study area is within the Dark Brown Soil Zone of Saskatchewan and the soils are primarily Chernozemic, having formed under grassland vegetation. The distribution of soil associations and a description of soil map units occurring within the vegetation and soils study area is presented in **Figure 4.5**. Approximately 60% of the soils in the study area are Bradwell, Elstow, or Scott Soils, with smaller contributions from a number of other map units.

Asquith soils are dark brown soils that occur throughout the study area. The soils are neutral to moderately alkaline, and soil texture ranges from loamy sand to loam, with sandy loam being predominate. Asquith soils are generally free of stones, although some areas where glacial till is close to the surface may be excessively stony. The landscape of Asquith soils range from gently undulating to moderately rolling, and generally exhibit a knoll and depression pattern. There are three types of Asquith soils that occur within the vegetation and soils study area: Orthic, Carbonated, and Saline dark brown soils. Asquith soils are generally Class 4 or Class 5 soils for agricultural capability

Alluvium soils are a diverse complex of soils of various origins that occur in a single map unit in the northern portion of the study area. These soils extremely variable in texture, ranging from sand to loam. Alluvium soils are associated with flood plains of major rivers and streams. Alluvium soils are generally free of stones but may be underlain by till deposits. Alluvium soils in the region are dominantly carbonated or saline rego humic Gleysols, associated with poorly drained floodplains. Generally speaking, these soils are uncultivated Class 5 and Class 6 soils for agricultural capability.

Biggar soils are dark brown soils that occur in the northern portion of the study area. The soils are neutral to strongly alkaline and are sandy loam to loamy sand in texture. Biggar soils range from stone free to excessively stony. Landforms generally follow a weak knoll and depression pattern. There are three types of Biggar soils that occur within the study area: Orthic, Carbonated, and Saline. Biggar soils are all Class 4 soils for agricultural capability. Biggar soils also are found in complex with eroded till Weyburn soils in the northern part of the study area.

Bradwell soils are dark brown soils that occur in the northern portion of the study area. The soils are generally slightly acidic to neutral and are predominantly loam and fine/very fine sandy loam in texture. Bradwell soils are generally stone-free but may slight to moderate stoniness where glacial till is present in the surface. There are multiple types of Bradwell soils that can be found in the study area: Orthic, Calcareous, Eluviated, Carbonated, and Saline. Bradwell soils are all Class 3 for agricultural capability. Bradwell soils are also found in complex with Biggar, Elstow, and Weyburn soils in the study area.

Elstow soils are dark brown soils that occur predominantly in the western portion of the study area. The soils are generally low in salinity and are predominantly loam in texture, but may have a mixture of silt loam, silty clay loam, and clay loam. Elstow soils are generally stone free but low to moderate amount of stones may be present in areas where glacial till is present in the surface. Landforms are generally undulating with a knoll and depression pattern. There are two types of Elstow soils that occur within the study area: Orthic and Eluviated. Elstow soils are all Class 3 soils for agricultural capability. Elstow soils are also found in complex with Hanley and Sutherland soils in the study area.

Hillwash soils are a complex of Regosolic, Chernozemic and Podzolic soils that occur in a single map unit along the northern portion of the study area, along the South Saskatchewan River. Landforms are gently to steeply sloping, with areas dominated by Regosolic soil being steep and areas dominated by Chernozemic soils being gently sloped. Hillwash soils are classified as Class 5 and Class 6 for agricultural capability.

Hanley soils are dark brown soils that occur on the southeastern portion of the study area. The soils are generally low in salinity and are predominantly loam in texture, but may have a mixture of silt loam, silty clay loam, and clay loam. Hanley soils are generally stone free but low to moderate amount of stones may be present in areas where glacial till is present in the surface. Landforms are generally undulating with a knoll and depression pattern. Only one type of Hanley soils occur within the study area: Solonetzic. Hanley soils are Class 3 and Class 4 soils for agricultural capability. Hanley soils are also found in complex with Elstow soils.

Runway soils are a complex of Chernozemic, Regosolic and Gleysolic soils that occur in a single map unit in the northern portion of the study area. Landforms are gently to moderately sloping with Regosolic soils occurring on the upper portion of steeper areas, and Chernozemic soils occurring on gently sloped areas or mid-portions of steeper areas. Runway soils are excessively to exceedingly stony. Runway soils are Class 5 and Class 6 soils for agricultural capability.

Scott soils are Dark Brown soils that occur in the eastern portion of the study area. Scott soils are moderately acidic and are primarily loamy in texture. Scott soils will occasionally have a thin layer of gravel between the lacustrine material and glacial till, but are generally stone free. Scott soils are found in complex with Weyburn soils in the study area. Scott soils are Class 3 soils for agricultural capability.

Sutherland soils are dark brown soils that occur in the north and northeastern portions of the study area. The soils are low in salinity and are primarily clay and clay loam but can have a heavy clay texture. Sutherland soils are generally free of stones. Landforms are generally gently undulating with a knoll and depression pattern, but may be roughly undulating with a knoll and depression in complexes with Weyburn soils. The soils within the study area are dominantly Orthic or Rego. Sutherland soils are Class 2 and Class 3 for agricultural capability. Sutherland soils are found in complex with Elstow soils in the northern portion of the study area.

Tuxford soils are dark brown soils that occur throughout the study area. The soils are frequently slightly to moderately saline and are clay loam or clay in texture. Tuxford soils are generally free of stones, but slight to moderate amount of stones may occur where shallow glacial till is present on the surface. The soils are Class 3 and Class 4 for agricultural capability. Tuxford soils that occur within the study area are dominantly Solonetz or Solod. Tuxford soils are found in complex with Elstow soils in the eastern portion of the study area.

Valor soils are Regosolic soils that occur in a single map unit in the southern portion of the study area. The soils are mildly to moderately alkaline and are sand or loamy sand in texture. Valor soils are generally free of stones. Landforms are range from undulating, with broad mounds and shallow blow-out pits to hilly dunes. Valor soils in the study area are dominantly Orthic Regosol soils and are Class 6 for agricultural capability.

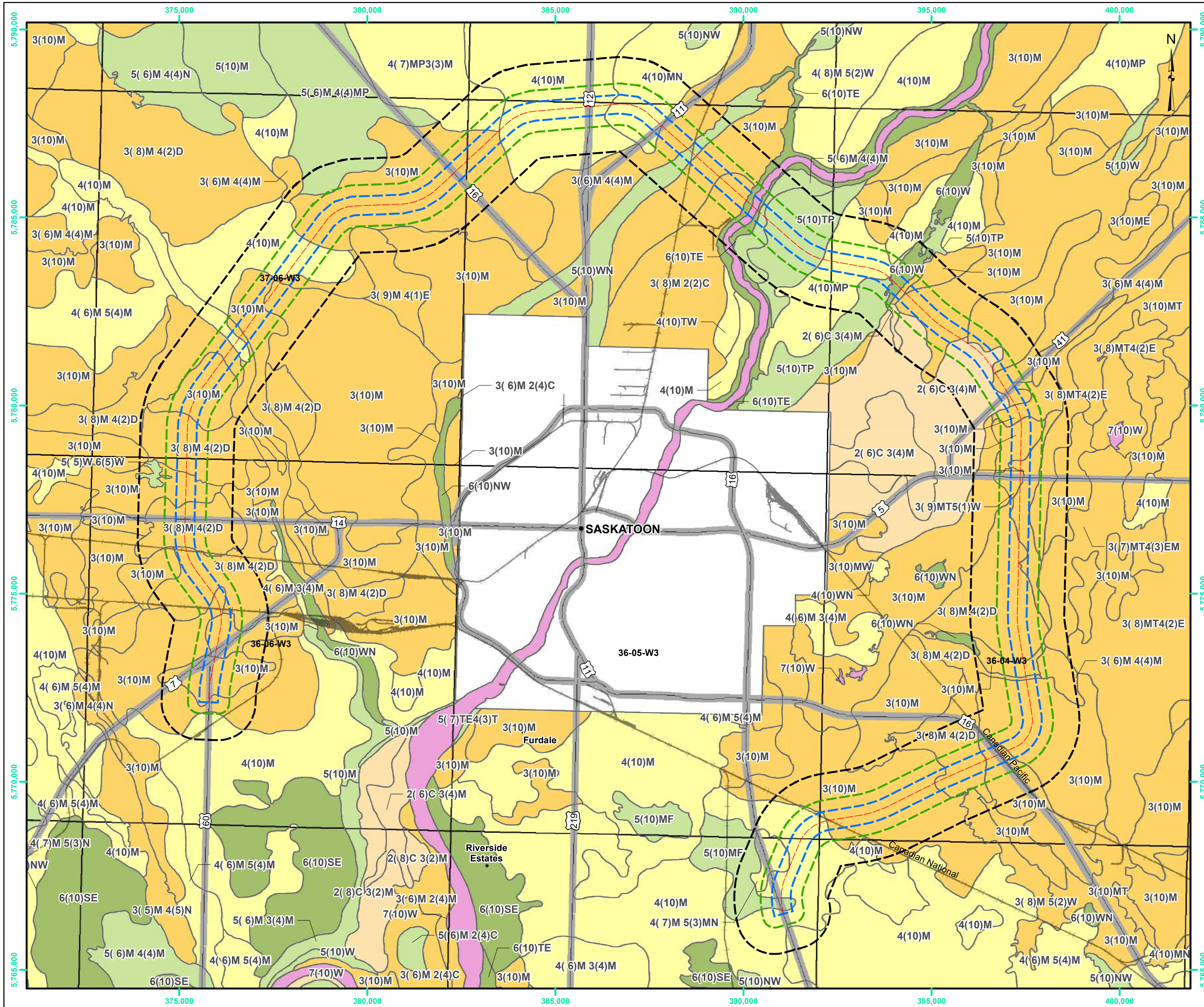
Weyburn soils are dark brown soils that occur throughout the study area. The soils are low in salinity and range from sandy loam to clay loam in texture but are most commonly loam. Weyburn soils are generally moderately stony but may be exceedingly stony in outwash deposits. Landforms range from gently undulating to strongly rolling, but roughly undulating and gently rolling are most common. There are three types of Weyburn soils that occur within the study area: Orthic, Calcareous, and Orthic Regosol. Weyburn soils are can be Class 3, Class 4 or Class 5 for agricultural capability; soils with a loam or clay texture are considered Class 3, sandy loams are Class 4, and moderately and strongly rolling soils are Class 5. Weyburn soils are also found in complex with Bradwell, Asquith, and Biggar soils.

4.2.2.3 Soil Capability for Agriculture

The agricultural capabilities of cropland within the study area are limited by a range of soil and landscape properties that impact the soil's ability to produce annual crops (Saskatchewan Soil Survey 1987 and 1985). Soils are rated based on their ability for sustained production of common crops and the requirement for conservation practices. Generally speaking, lower numbered soil classes are capable of producing crops with the greatest yields. Most land within the area has moderately severe agricultural limitations arising from to soil limitations such as an insufficient moisture holding capacity, as well as landscape limitations such as unfavorable topography or erosion limitations. In some instances, soils are severely limited by excess water due to poor drainage, a high groundwater table, or overland runoff. These locations occur most often as wetlands and small localized depression that retain water for most of the growing season. **Figure 4.7** shows the distribution of soil capability classes within the study area. A description of the soil limitations occurring within the study area is provided in Appendix B.

Gentle undulation within the study area uplands results in the presence of Class 2 through Class 7 soils. The majority of the landscape is composed of Class 3 and Class 4 soils. Landscape limitations such as the presence of excess water and unfavourable topography are the greatest agricultural limitations in the area. Land areas for each capability class within the vegetation and soils study area are presented in Table 4.3.

- **Class 1** soils (soils with no limitations) are not present within the vegetation and soils study area.
- **Class 2** soils are able to support a wide range of cultivated crops, although they exhibit some moderate limitations that may require the application of moderate conservation practices (Saskatchewan Soil Survey 1987 and 1985). In the soils and vegetation study area, Class 2 soils are limited by insufficient precipitation, insufficient soil moisture holding capacity, and/or poor soil structure and/or permeability.
- **Class 3** soils have moderately severe limitations that restrict the range of crops that can be produced or require special conservation practices in order to produce additional crops. Soils in Capability Class 3 are limited by insufficient soil moisture holding capacity, unfavourable topography, and/or soil damage caused by erosion.
- **Class 4** soils have a marginal capacity for sustained crop production due to severe limitations that restrict the range of viable crops and/or require special conservation practices. Class 4 soils in the vegetation and soils study area are limited by insufficient soil moisture holding capacity, poor soil structure and/or permeability, excess water not caused by flooding, excess soil salinity, excessive stoniness, soil damage caused by erosion, and/or insufficient water holding capacity.
- **Class 5** soils have very severe limitations that restrict their use to the production of native or tame forage species, and are often used for pastureland or hay production. Class 5 soils in the vegetation and soils study area are limited by insufficient soil moisture holding capacity, excess soil salinity, low soil fertility, insufficient water holding capacity, unfavourable topography, and/or excess stoniness.
- **Class 6** soils are generally capable of only producing native forage crops, and improvement or conservation practices are not feasible. Class 6 soils in the vegetation and soils study area are limited by unfavourable topography, soil damage caused by erosion, and/or excess water not caused by flooding.
- **Class 7** soils have no capability for agriculture or permanent pasture, and in this area the soils are limited by excess water.



LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- HIGHWAY
- RAILWAY
- PROPOSED FREEWAY CORRIDOR
- VEGETATION AND SOIL STUDY AREA
- WILDLIFE STUDY AREA

SOIL CAPABILITY FOR AGRICULTURE

- CLASS 2
- CLASS 3
- CLASS 4
- CLASS 5
- CLASS 6
- CLASS 7

NOTES

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5. SOILS DATA (SKSISV3, 21-JAN-2009) OBTAINED FROM THE SASKATCHEWAN LAND RESOURCE UNIT, UNIVERSITY OF SASKATCHEWAN, SASKATOON, SASK.
6. REFER TO APPLICABLE SOILS SURVEY REPORT (AGRICULTURE AND AGRI-FOOD CANADA) FOR DETAILED SOIL CLASSIFICATION INFORMATION.

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

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SCALE: 1:100,000

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PROJECT LOCATION SASKATOON FREEWAY

TITLE SOIL CAPABILITY

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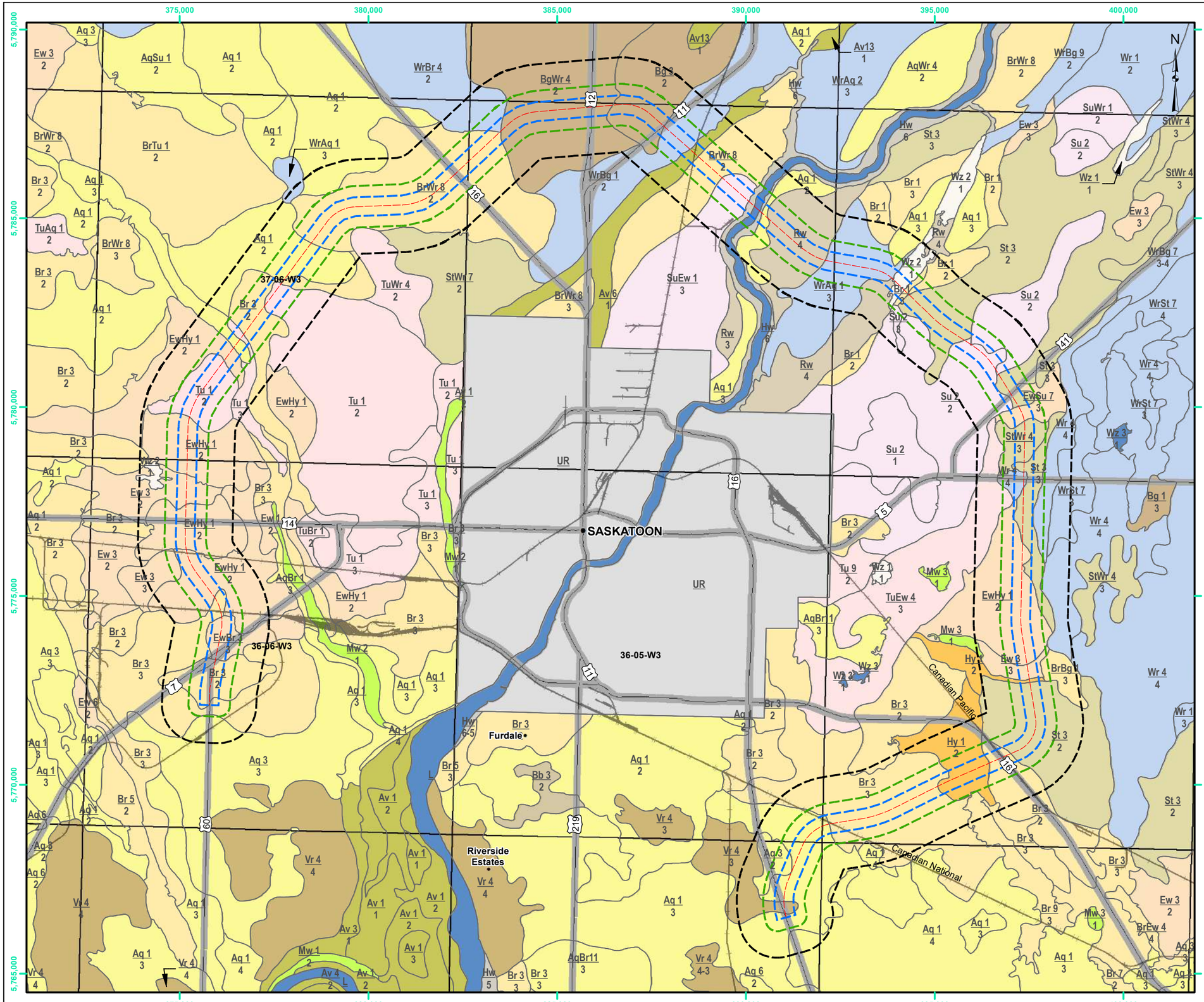

LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- HIGHWAY
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SOIL CLASSIFICATION

- Aq - ASQUITH
- AV - ALLUVIUM
- Bb - BOWL BOG
- Bg - BIGGAR
- Br - BRADWELL
- Ew - ELSTOW
- GX - GREY SOLIC
- Hw - HILLWASH
- Hy - HANLEY
- Mw - MEADOW
- Rw - RUNWAY
- St - SCOTT
- Su - SUTHERLAND
- Tu - TUXFORD
- UR - URBAN
- Vr - VALOR
- Wr - WEYBURN
- Wz - WATER

NOTES

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3. CADASTRAL BOUNDARIES ARE FOR INFORMATIONAL PURPOSES ONLY AND SHOULD NOT BE CONSIDERED SUITABLE FOR LEGAL, ENGINEERING, OR SURVEYING PURPOSES.
4. SOILS DATA (SKSISV3, 21-JAN-2009) OBTAINED FROM THE SASKATCHEWAN LAND RESOURCE UNIT, UNIVERSITY OF SASKATCHEWAN, SASKATOON, SASK.
5. REFER TO APPLICABLE SOILS SURVEY REPORT (AGRICULTURE AND AGRI-FOOD CANADA) FOR DETAILED SOIL CLASSIFICATION INFORMATION.

DISCLAIMER

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	HY	KVG	HY	JP

0 500 1,000 2,000 METRES

SCALE: 1:100,000

SNC·LAVALIN

CLIENT
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE

PROJECT LOCATION
SASKATOON FREEWAY

TITLE
SOIL CLASSIFICATION

DATE	DWG No.	FIG No.	REV
2019 03 05	659183-0000-4EDD-0009	2.3	00

SIZE 11x17

Path: \\sli1653\Projects QMS\SMH\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0009 Soil Classification.mxd

Table 4.3 Land area by soil capability class in the vegetation and soils study area

Capability Class	Land Area (ha)	% of Study Area
Class 1	0	0
Class 2	157.9	2.6
Class 3	4,257.1	70.5
Class 4	1,211.9	20.1
Class 5	316.5	5.2
Class 6	69.3	1.1
Class 7	21.6	0.4
Total	**6,034.4**	**100**

4.3 Biological Environment

4.3.1 Regulatory Context

4.3.1.1 Species of Conservation Concern (SOCC) and Species at Risk (SAR)

The study gives particular attention to plant and wildlife Species of Conservation Concern (SOCC), breeding birds, sensitive wildlife features, wetlands, and other environmental sensitivities that may be present in the study area. For the purpose of this study, an SOCC is defined as any plant or wildlife species that meets one or more of the following criteria:

- Listed under Schedule 1, Schedule 2, or Schedule 3 of the federal *Species at Risk Act* (SARA) as *Endangered*, *Threatened*, or *Special Concern*;
- Currently under consideration for addition to Schedule 1 of SARA;
- Assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as *Endangered*, *Threatened*, or *Special Concern*;
- Listed as a designated species in *The [Saskatchewan] Wildlife Act*, *1998*;
- Ranked as *S1*, *S2*, *S3*, or tracked by the Saskatchewan Data Conservation Centre (SKCDC); and/or
- Assessed as a sensitive species or feature under The Saskatchewan Ministry of Environment (ENV) Saskatchewan Activity Restriction Guidelines (ARGs) for Sensitive Species (ENV 2017).

For the purposes of this study, a Species at Risk (SAR) is defined as species that meets one or more of the following criteria, representing a small subset of the SOCC:

- Listed under Schedule 1 of SARA as *Endangered*, *Threatened*, or *Special Concern*; and/or
- Listed as a designated species in *The [Saskatchewan] Wildlife Act, 1998*.

Explanations of federal and provincial SOCC and SAR rankings are provided in Appendix A.

4.3.1.2 Breeding Birds

Aside from a few non-native and/or common species, all migratory and resident breeding birds and their nests are protected under federal and/or provincial legislation. For the purpose of this study, breeding bird species are defined as those with legislative protection that meet one or more of the following criteria:

- Identified under the federal *Migratory Birds Convention Act, 1994* and Migratory Birds Regulations; and/or,

- Identified under *The [Saskatchewan] Wildlife Act, 1998* and The [Saskatchewan] Wildlife Regulations, 1981.

4.3.1.3 General Wildlife and Sensitive Wildlife Features

The *[Saskatchewan] Wildlife Act, 1998* provides protection for the majority of wildlife in Saskatchewan (1998, c.W-13.12, s.32.). This legislation also provides protection for sensitive wildlife features such as dens, hibernacula, leks, nests, setts (badger residences), etc. Some non-native and nuisance species are exempt from this legislation, such as most rodent species.

4.3.1.4 Wetlands

Wetlands and some species that inhabit them are protected under a combination of federal and provincial legislation, including:

- *The Environmental Management and Protection Act, 2010*
- *The Water Security Agency Act*
- *The Environmental Assessment Act*
- *The Wildlife Act, 1998*
- *The Wildlife Habitat Protection Act*
- *Species at Risk Act*
- *Migratory Birds Convention Act, 1994*

Where impacts to wetlands cannot be avoided, proponents are required to compensate for the loss of wetland habitat as a condition of approval under *The Environmental Assessment Act* or the *Impact Assessment Act* (if applicable).

4.3.2 Land Cover

4.3.2.1 Methods

SNC-Lavalin conducted a land cover mapping exercise to identify current land cover types and land use practices within the wildlife study area, vegetation and soils study area, and proposed freeway corridor. The following geospatial data sources were used to generate a land cover map and estimate the areas occupied by each land cover type:

- The Saskatchewan Digital Land Cover (SDLC) raster dataset (SRC 2003) for land cover data and the locations of active farmsteads, towns, and residences;
- The CanVec series hydrographic features vector dataset (NRC 2013) for additional waterbody land cover data;
- The National Railway Network dataset (NRC 2016) for the locations of active rail lines; and
- The National Road Network dataset (NRC 2017) for the locations of highways, range roads, and township roads.

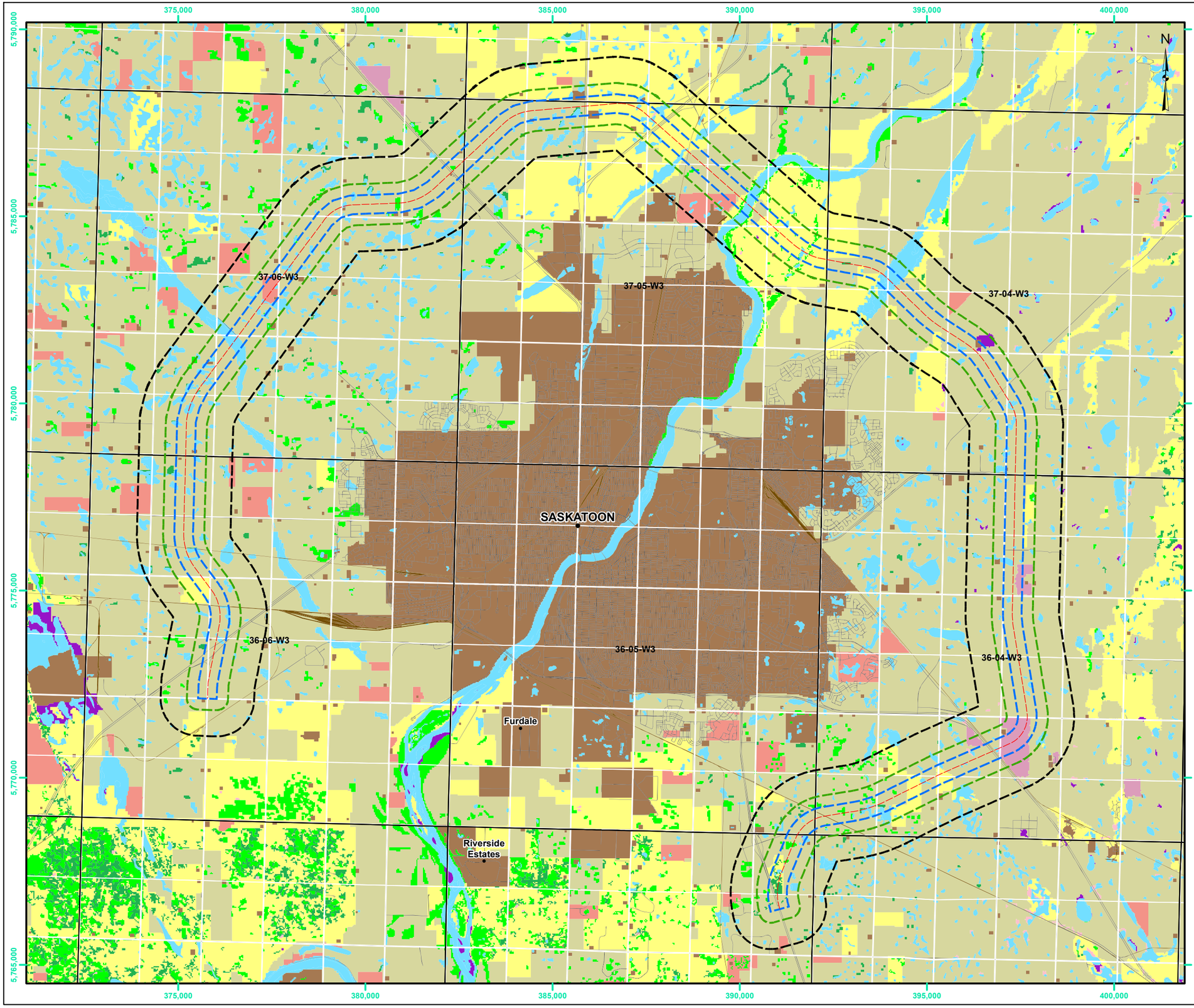
4.3.2.2 Results

The results of the land cover mapping exercise are presented in **Table 4.4** and **Figure 4.8**. Cultivated land accounts for most of the land cover within the proposed freeway corridor, vegetation and soils study area, and wildlife study area. Unseeded grassland and waterbodies such as rivers and wetlands also provide significant land cover in all three of the areas examined. All other land cover types identified during this exercise account for less than 3% of land cover within the proposed freeway corridor and the study areas.

Table 4.4 Land cover mapping results

Land Cover Type	Proposed Freeway Corridor		Vegetation and Soils Study Area		Wildlife Study Area	
	Total Area (ha)	% of Corridor	Total Area (ha)	% of Study Area	Total Area (ha)	% of Study Area
cropland[1]	1,990.1	73.3	4,341.4	71.9	10,043.4	71.8
unseeded grassland[1]	340.9	12.5	851.8	14.1	1,987.0	14.2
waterbody/wetland/marsh[1,2]	193.0	7.1	431.7	7.2	1,061.9	7.6
seeded grassland[1]	66.1	2.4	127.9	2.1	160.1	1.1
hardwood open[1]	31.0	1.1	72.3	1.2	184.6	1.3
hay crop (forage)[1]	31.0	1.1	54.8	0.9	204.9	1.5
road[3]	23.5	0.9	54.9	0.9	131.5	0.9
tall shrub[1]	19.2	0.7	32.5	0.5	57.0	0.4
farmstead/town[1]	15.5	0.6	45.7	0.8	117.9	0.8
railway[4]	2.6	0.1	5.8	0.1	17.3	0.1
herbaceous fen[1]	1.8	0.1	2.6	0	8.9	0.1
mud/sand/saline[1]	1.7	0.1	12.8	0.2	16.8	0.1

Source: (1 – SRC 2003; 2 – NRC 2013; 3 – NRC 2017; 4 – NRC 2016).



LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- HIGHWAY
- RAILWAY
- PROPOSED FREEWAY CORRIDOR
- VEGETATION AND SOIL STUDY AREA
- WILDLIFE STUDY AREA
- CROPLAND
- HAY CROP (FORAGE)
- UNSEEDED GRASSLAND
- TALL SHRUB
- SEEDED GRASSLAND
- HARDWOOD OPEN
- WATERBODY/WETLAND
- HERBACEOUS FEN
- MUD/SAND/SALINE
- FARMSTEAD / TOWN
- RAILWAY
- ROAD

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2016, SASKGRID2016.
3. CADASTRAL BOUNDARIES ARE FOR INFORMATIONAL PURPOSES ONLY AND SHOULD NOT BE CONSIDERED SUITABLE FOR LEGAL, ENGINEERING, OR SURVEYING PURPOSES.
4. SASKATCHEWAN DIGITAL LAND COVER OBTAINED THROUGH THE SASKATCHEWAN MINISTRY OF ENVIRONMENT. ORIGINAL DATASET CREATED BY SRC.

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	HY	KVG	HY	JP

0 500 1,000 2,000 METRES

SCALE: 1:100,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE	SASKATOON FREEWAY

TITLE: LAND COVER

DATE	DWG No.	FIG No.	REV
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SIZE 11x17

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4.3.3 Vegetation

4.3.3.1 Methods

SNC-Lavalin conducted a desktop vegetation review to describe regional terrestrial and wetland vegetation patterns. The vegetation and soils study area includes the proposed freeway corridor surrounded by a 300 m buffer zone (**Figure 4.5**), based on the maximum applicable setback distance for plant SAR identified in the Saskatchewan ARGs for Sensitive Species (ENV 2017). The vegetation and soils study area occupies approximately 6,034 ha. The proposed freeway corridor occupies approximately 2,716 ha.

4.3.3.1.1 Ecoregion and Landscape Area Review

SNC-Lavalin conducted a desktop review of landscape features and vegetation patterns typical of the ecoregion and landscape areas in which the vegetation and soils study area is located. The plant species and communities that occupy any given location are determined by complex interactions between multiple factors. On a regional scale, vegetation patterns are dictated by climate, while landforms, soils, and hydrologic regimes are more influential locally. Agriculture and other human activities are greatly influential at all scales (Acton et al. 1998; Thorpe 2014a). Information for this review was obtained from the following sources:

- The Hunting, Angling, and Biodiversity Information of Saskatchewan (HABISask) tool (Government of Saskatchewan 2019) for ecological land classification maps;
- The Ecoregions of Saskatchewan (Acton et al. 1998) for biophysical characteristics of landscapes at the ecoregion and landscape area levels;
- The Saskatchewan Rangeland Ecosystems publication series (Thorpe 2014a to 2014e) for information on common plant communities and their relationship with soil properties at a local level; and
- Steward and Kantrud's Classification of Natural Ponds and Lakes in the Glaciated Prairie Region (1971) for information on common prairie wetland plant communities and their relationship with surface water permanence and salinity.

4.3.3.1.2 Plant SOCC Screening

A screening exercise was conducted to identify plant SOCC with the potential for occurrence within the vegetation and soils study area. SOCC occurrence and spatial data was obtained from the following sources:

- The SKCDC for a list of recorded plant SOCC occurrences by landscape area (SKCDC 2019a);
- The HABISask tool (Government of Saskatchewan 2019) for (i) a list of plant SOCC occurrences that were previously detected within the region (known as element occurrences), (ii) the locations of federal and/or provincial lands requiring environmental protection, and (iii) predictive distribution models for plant SAR;
- Available studies in the region with data less than 10 years old and with spatial plant SOCC data that could be readily extracted (e.g. presented on maps or with UTM coordinates), including:
  - Final Screening Report, Holmwood East Natural Area Screening Study (Golder 2015);
  - North/Northwest Natural Area Screening Study, City of Saskatoon (Stantec 2012);
  - North Commuter Parkway – Baseline Terrestrial and Aquatic Field Studies, and Heritage Resource Impact Assessment (Stantec 2013a); and
  - North Central/North East Natural Area Screening Study, City of Saskatoon (Stantec 2013b).

Information on plant SOCC habitat requirements was obtained through a review of literature, taxonomic keys, COSEWIC status reports, and herbarium data from the Virtual Herbarium of Plants at Risk in Saskatchewan (W.P. Fraser Herbarium 2006). Current federal and provincial species rankings were

provided by the SARA Public Registry (Government of Canada 2019) and the SKCDC (2019b) (Appendix B).

4.3.3.1.3 Wetland Delineation

SNC-Lavalin conducted a desktop wetland delineation exercise to estimate the area occupied by wetland habitat within the proposed freeway corridor (500 m). A multi-year satellite imagery review was performed to identify and digitize the boundaries of wetlands occurring within or partially within the corridor. Recent high-resolution satellite imagery provided by the Ministry (2018) was cross-referenced with seven sets of imagery taken during the growing season by Google, Maxar Technologies (2011a, 2011b, 2011c, 2012a, 2012b, 2013, and 2014) to account for changing climatic conditions and land use regimes.

Wetland boundary digitization was completed by a qualified GIS technician with experience interpreting satellite imagery and digitizing wetlands using ArcMap version 10.6 (Esri Software). Wetland boundaries were delineated based on the greatest boundary extent visible within the representative imagery sets (Government of Alberta 2015). These digitized boundaries represent SNC-Lavalin's best attempt to capture the spatial dimensions of wetlands within the study area and may be subject to interpreter error, naturally occurring variation due to changing climatic conditions (Stuart and Kantrud 1971), and/or permanent alterations that impact drainage or surface water retention.

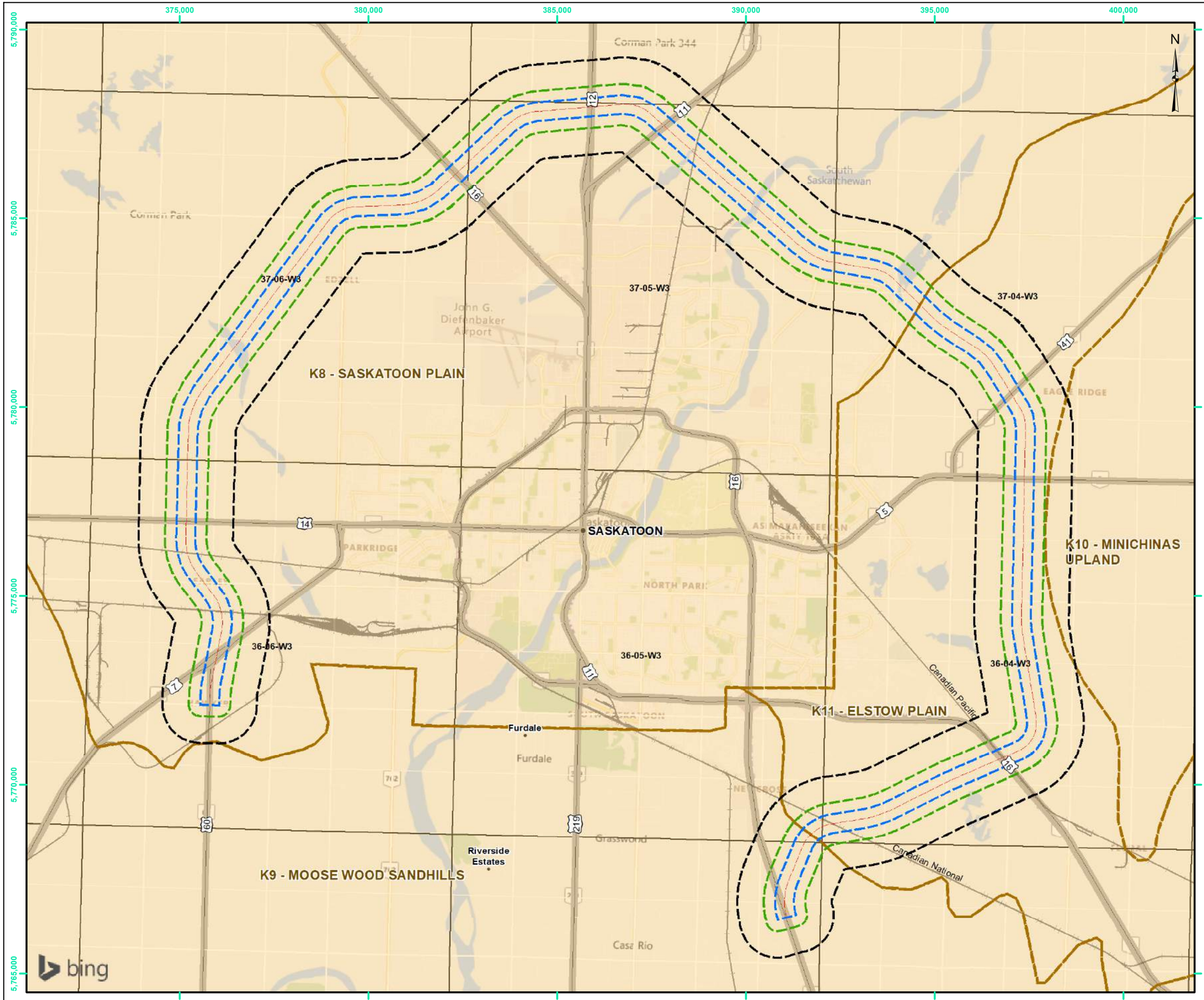
4.3.3.2 Results

4.3.3.2.1 Ecoregion and Landscape Area Review

4.3.3.2.1.1 Moist Mixed Grassland Ecoregion

The vegetation and soils study area is located within the Moist Mixed Grassland Ecoregion of the Prairie Ecozone, and includes portions of the Saskatoon Plain, Moose Wood Sand Hills, Minichinas Upland; and Elstow Plain Landscape Areas (**Figure 4.9**) (Acton et al. 1998). Land use within the Moist Mixed Grassland Ecoregion is largely agricultural, with cultivated cropland comprising approximately 80% of the landscape. However, remnant patches of native vegetation are scattered throughout the region. Untilled landscapes show a regular alternation between grasslands on upper slopes, shrublands in lower areas, and wetlands in poorly drained basins. While present, woodland habitat occurs infrequently due to climatic conditions within the ecoregion. Common plant communities associated with these habitats are described below.

Woodlands within the Moist Mixed Grassland Ecoregion are represented by trembling aspen *(Populus tremuloides*) stands surrounding wetland habitat and occasionally the north-facing slopes of coulees (Acton et al. 1998). Stands occurring on loamy sites typically have a shrub stratum dominated by western snowberry (*Symphoricarpos occidentalis*) and prairie rose (*Rosa arkansana*), while understories are composed of herbs such as western Canada violet (*Viola canadensis var. rugulosa*), showy aster (*Eurybia conspicua*), smooth aster (*Symphyotrichum laeve var. geyeri*), and Kentucky bluegrass (*Poa pratensis*). Shrub stratum composition on sandy sites shifts towards prostrate shrubs like creeping juniper (*Juniperus horizontalis*) and bearberry (*Arctostaphylos uva-ursi*), while hay sedge (*Carex foenea*) becomes a prominent understory herb. Eastern cottonwood (*Populus deltoids*) occasionally occurs in the riparian zones of deep valleys where conditions are moist.



LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- HIGHWAY
- RAILWAY
- PROPOSED FREEWAY CORRIDOR
- VEGETATION AND SOIL STUDY AREA
- WILDLIFE STUDY AREA
- MOIST MIXED GRASSLAND ECOREGION
- LANDSCAPE AREA

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2016, SASKGRID2016.
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4. SERVICE LAYER CREDITS: © 2020 MICROSOFT CORPORATION © 2020 HERE.
5. ECOLOGICAL FRAMEWORK OBTAINED FROM CANADIAN SOIL INFORMATION SYSTEM, AGRICULTURE AND AGRI-FOOD CANADA, ENVIRONMENT CANADA.

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	HY	KVG	HY	JP

0 500 1,000 2,000 METRES

SCALE: 1:100,000

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CLIENT
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE

PROJECT LOCATION
SASKATOON FREEWAY

TITLE
LANDSCAPE AREAS

DATE 2019 03 05 | DWG No. 659183-0000-4EDD-0005 | FIG No. 4.9 | REV 00

SIZE 11x17

Path: \\sli1653\Projects QMS\SMHI\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0005 Landscape Areas.mxd

Shrublands typically occupy woodland margins, depressions, lower slopes, or occur in association with sandy soils (Acton et al. 1998). Hoary sagebrush (*Artemisia cana*) and prairie rose are common on drier sites, while more moist, sheltered sites are colonized by patches of western snowberry. Shrub cover on the lower slopes of valleys and coulees is usually denser and may include wolf willow (*Elaeagnus commutata*), saskatoon (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*), and western snowberry. Creeping juniper and hoary sagebrush often assume dominance on sandy soils.

Grasslands on undisturbed upland sites support diverse communities with species compositions that vary based on slope position and soil type. Upper slopes with loamy soils are occupied by low growing, drought resistant shortgrasses like blue grama (*Bouteloua gracilis*), June grass (*Koeleria macrantha*), and needle and thread grass (*Hesperostipa comata*) (Tannas 2003, Thorpe 2014b). Midgrasses like wheatgrasses (*Elymus* spp.), porcupine grass (*Hesperostipa curtiseta*), little bluestem (*Schizachyrium scoparium*), and green needlegrass (*Nassella viridula*) assume dominance on mid-slopes and more mesic sites, eventually transitioning to plains rough fescue (*Festuca hallii*) and Hooker's oat grass (*Avenula hookeri*) on lower and toe slopes if dense shrub stands are not present (Acton et al. 1998). Sites with clayey lacustrine deposits see an increase in the dominance of June grass and northern wheatgrass (*Elymus lanceolatus*) (Thorpe 2014c). Pasture sage (*Artemisia frigida*) is the most frequently occurring grassland herb on all sites, and prairie spike-moss (*Selaginella densa*) often forms low, creeping mats along the grassland understory.

Sandy areas support a distinct assemblage of native grassland species due to the rapid infiltration and limited retention of rainwater characteristic of sandy soils (Acton et al. 1998). Grasses such as Indian rice grass (*Achnatherum hymenoides*), sand grass (*Calamovilfa longifolia*), and sand dropseed (*Sporobolus cryptandrus*), and forbs including prairie sunflower (*Helianthus couplandii*) and lance-leaved psoralea (*Psoralidium lanceolatum*) are restricted to these sites (Tannas 2003; Thorpe 2014d). Shrub cover is often higher than on loamy sites due to increased water availability and favorable conditions for root penetration. Active and stabilized sand dunes provide important habitat for a number of plant SOCC.

Saline soils occur frequently within the Moist Mixed Grassland Ecoregion (Acton et al. 1998). Western wheatgrass (*Pascopyrum smithii*), northern wheatgrass, and June grass are common on somewhat saline uplands, while salt-tolerant graminoids such as saltgrass (*Distichlis spicata*), Nuttall's alkaligrass (*Puccinellia nuttalliana*), Douglas' sedge (*Carex douglasii*), and mat muhly (*Muhlenbergia richardsonis*) occupy low-lying sites where moisture and salinity levels are higher (Tannas 2003, Thorpe 2014e). Frequently associated forbs and low shrubs include gumweed (*Grindelia squarrosa*), tufted white prairie aster (*Symphyotrichum ericoides var. pansum*), Nuttall's saltbush (*Atriplex gardneri var. gardneri*), and winter-fat (*Krascheninnikovia lanata*).

Wetlands occupy glacial kettles and depressions throughout the ecoregion. These undrained depressions support distinctive wetland vegetational zones with plant community composition varying in accordance with soil saturation and permeability (Acton et al. 1998; Stewart and Kantrud 1971):

- Low prairie zones (ephemeral wetlands) retain surface water for a short period in early spring before soil pore ice melts. Surface water is not present during most of the growing season, allowing for the establishment of moist grassland vegetation such as Kentucky bluegrass, slender wheatgrass (*Elymus trachycaulus*), and western snowberry. Low prairie zones occurring on agricultural land are usually fully seeded to field crops or tame forage grasses.
- Wet meadow zones (temporary wetlands), which retain surface water for a few weeks in early spring and during heavy rainfall, are usually dominated by fine-textured graminoid species such as fowl bluegrass (*Poa palustris*), woolly sedge (*Carex pellita*), and Baltic rush (*Juncus balticus*).

- Shallow marsh zones (seasonal wetlands), which retain surface water through spring and into early summer, can be identified by emergent vegetation such as broad-leaved water plantain (*Alisma triviale*), water smartweed (*Persicaria amphibia*) and tall manna grass (*Glyceria grandis*). During periods of surface water drawdown, needle spike-rush (*Eleocharis acicularis*) and golden dock (*Rumex maritimus*) may also be dominant species.
- Deep marsh zones (semi-permanent wetlands) retain surface water for most or all of the year, except in periods of drought. Vegetation in this zone alternates between coarse emergents such as broad-leaved cattail (*Typha latifolia*) and soft-stem bulrush (*Schoenoplectus tabernaemontani*) and submergent plants like Richardson's pondweed (*Potamogeton richardsonii*) and Siberian water-milfoil (*Myriophyllum sibiricum*).
- Permanent open water zones (permanent wetlands) retain surface water year-round, even during periods of drought, and are typically devoid of emergent vegetation. Deep water submergents like western widgeon-grass (*Ruppia cirrhosa*) and sheathed pondweed (*Stuckenia vaginata*) may be present, although deeper wetlands and lakes are often unvegetated.

Wetlands with high surface water salinity favor the establishment of salt-tolerant species, such as Nuttall's alkaligrass, saltgrass, red samphire (*Salicornia rubra*), and sea-blite (*Suaeda calceoliformis*) (Acton et al. 1998; Stewart and Kantrud 1971). Wetlands with saturated alkaline soils and sodium bicarbonate rich surface water usually support fen vegetation such as water sedge (*Carex aquatilis*), spotted water-hemlock (*Cicuta maculata*), tufted hair grass (*Deschampsia cespitosa*), and hoary willow (*Salix candida*) (Stewart and Kantrud 1971).

4.3.3.2.1.2 Saskatoon Plain Landscape Area

The Saskatoon Plain Landscape Area is a level glacial lake and eroded glacial till plain with very gently undulating topography (Acton et al. 1998). It encompasses most of the City of Saskatoon and the surrounding areas located north and west of the city. Cereals are the major crop, and most of the land within the Saskatoon Plain has been converted to cropland. Native moist mixed grassland vegetation is limited to sandy sites in the South Saskatchewan River valley. Grassland and shrubland communities associated with sandy soils are common on upland sites, while saline depressions are vegetated by salt-tolerant species like Nuttall's alkaligrass and red samphire. Trembling aspen stands occur frequently in non-saline areas with high water tables, such as the South Saskatchewan River's riparian corridor.

4.3.3.2.1.3 Moose Wood Sand Hills Landscape Area

The Moose Wood Sand Hills Landscape Area is an expanse of moderately to strongly sloping sand dunes and level alluvial plains that follows the South Saskatchewan River south of the City of Saskatoon (Acton et al. 1998). Land use within the Moose Wood Sand Hills is predominantly agricultural, consisting mainly of rangeland and pastureland. Only about 40% of the landscape area has been converted to cropland, most of which is located on the northern edge of the landscape area where productive sandy loam soils are present. Native moist mixed grassland vegetation is common on sandy sites that are unsuitable for crop production, including three large community pastures that were once managed by the Prairie Farm Rehabilitation Administration Community Pasture Program. Upland sites with partially stabilized sandy soils are dominated by graminoids, while cover from sand-adapted shrub species like creeping juniper increases on more stable sites. Trembling aspen stands are common in locations with high water tables, and the alluvial flats along the South Saskatchewan River support diverse riparian woodlands comprised of Manitoba maple (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), and eastern cottonwood.

4.3.3.2.1.4 Minichinas Upland Landscape Area

The Minichinas Upland Landscape Area is a hilly morainal upland located east of the City of Saskatoon (Acton et al. 1998). The hummocky morainal landscapes are moderately to steeply sloping with numerous

glacial kettles. Cereals are the major crop, and most of the land within the Minichinas Upland has been converted to cropland. While fragmented patches of native moist mixed grassland are interspersed with cropland throughout much of the landscape area, continuous expanses of native vegetation are largely restricted to steeply sloping hummocky morainal landscapes in the east. Grassland and shrubland communities occupy upland sites, and non-saline glacial kettles provide habitat for wetland vegetation such as sedges (*Carex* spp.) surrounded by bluffs of willows (*Salix* spp.) and trembling aspen. Salt-tolerant wetland species like saltgrass, Nuttall's alkaligrass, and red samphire often assume dominance in depressions where conditions are saline.

4.3.3.2.1.5 Elstow Plain Landscape Area

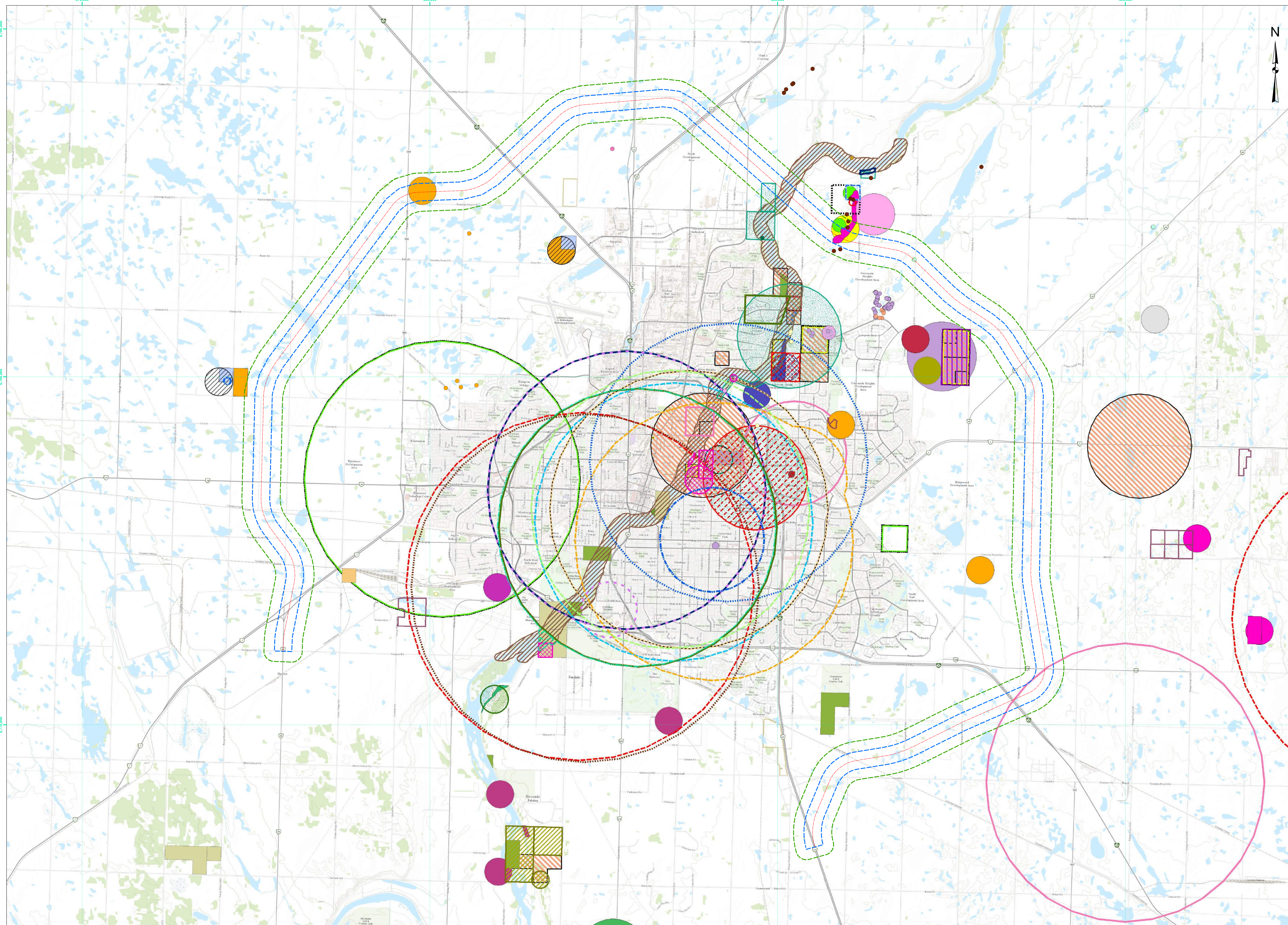
The Elstow Plain Landscape Area is a glacial lake plain that transitions from hummocky and kettled glaciolacustrine landscapes in the east to very gently undulating glaciolacustrine plains in the west (Acton et al. 1998). The northwestern edge of the landscape area falls within the City of Saskatoon. Cereals are the major crop, and most of the land within the Elstow Plain has been converted to cropland. Large expanses of native moist mixed grassland vegetation are associated with steep hummocky morainal landscapes that are unsuitable for crop production. Fragmented patches of native vegetation are also interspersed with cropland throughout the landscape area. Plant community composition and distribution is similar to that of the Minichinas Upland Landscape Area.

4.3.3.2.2 Plant SOCC Screening

There are 89 plant SOCC with recorded occurrences in the Saskatoon Plain, Moose Wood Sand Hills, Minichinas Upland; and Elstow Plain Landscape Areas (SKCDC 2019a), including two SAR. Appendix C presents a list of all 89 species, their current provincial and federal species rankings, and known habitat associations. Explanations of federal and provincial species rankings are provided in Appendix B.

A search of HABISask produced records of 23 plant SOCC and 297 plant SOCC element occurrences within the region, including one SAR element occurrence (**Figure 4.10**; **Table 4.5**) (Government of Saskatchewan 2019). Of these, 13 SOCC and 15 element occurrences are located within the vegetation and soil study area. Appendix D provides a list of all 297 element occurrences. No federal or provincial lands requiring environmental protection were identified within the vegetation and soils study area. HABISask's predictive distribution model identified potentially suitable habitat for two SAR spread throughout entire the vegetation and soils study area:

- 170.5 ha of potential smooth goosefoot (*Chenopodium subglabrum*) habitat. This species is listed as a Schedule 1 *Threatened* species under SARA.
- 146.4 ha of potential slender mouse-ear cress (*Transberingia bursifolia ssp. virgata*) habitat. This species is listed as a Schedule 1 *Threatened* species under SARA and as a *Threatened* species in *The [Saskatchewan] Wildlife Act, 1998.*



LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- PROPOSED FREEWAY CORRIDOR
- VEGETATION AND SOIL STUDY AREA
- PRIVATE CONSERVATION LANDS

VASCULAR PLANT

- AMERICAN BUGSEED
- AWNED CYPERUS
- BLUE WILD RYE
- BLUEFLAG
- BRISTLE-LEAVED SEDGE
- BRISTLY GOOSEBERRY
- BUSHY CINQUEFOIL
- CALIFORNIA AMARANTH
- CHAFFWEED
- COLUMBIA NEEDLEGRASS
- CRAWE'S SEDGE
- CROWFOOT VIOLET
- CURVED YELLOW-CRESS
- DRY GOOSEFOOT
- DWARF CLUBRUSH
- EARLY CINQUEFOIL
- ENGELMANN'S SPIKE-RUSH
- FEW-FLOWERED ASTER
- GREEN SPURGE
- HAIRY BUGSEED
- HOOKER'S BUGSEED
- INDIAN MILK-VETCH
- LEATHERY GRAPE-FERN
- LESSER FRINGED GENTIAN
- LONGSTEM WATER-WORT
- MARSH FELWORT
- MENZIES' CATCHFLY
- MUCRONATE BLUE-EYED-GRASS
- NARROW-LEAVED WATER PLANTAIN
- NORTHERN BLUE-EYED-GRASS
- PALE BULRUSH
- PALE MOONWORT
- PALLAS' BUGSEED
- PLAINS ROUGH FESCUE
- PRAIRIE DUNEWORT
- PURSH'S MILK-VETCH
- RED BULRUSH
- RED-STEMMED CINQUEFOIL
- ROCKY MOUNTAIN SEDGE
- SAND-DUNE WHEATGRASS
- SANDHILLS CINQUEFOIL
- SMALL DROPSEED
- SMALL YELLOW LADY'S SLIPPER
- SMOOTH GOOSEFOOT *
- SMOOTH HAWK'S-BEARD
- SMOOTH WILD ROSE
- SOFT WILD BERGAMOT
- STRIPED CORAL-ROOT
- TALL BEGGAR'S-TICKS
- TALL BLUE LETTUCE
- WHITE-TOP
- YELLOW-RATTLE
- YUKON SILVERWEED

*** DENOTES A SPECIES AT RISK**

NOTES

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REFERENCE DRAWINGS

DWG No	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	HY	KVG	HY	JP

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SCALE: 1:50,000

SNC · LAVALIN

CLIENT SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE

PROJECT LOCATION SASKATOON FREEWAY

TITLE HABISASK PLANT SOCC DATA

DATE 2019 03 05 **DWG No** 659183-0000-4EDD-0003 **FIG No. 2.6** **REV** 00

SIZE 22 x 34

Path: \\sli1653\Projects QMS\SMHI\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0003 Plant SOCC_REV.mxd

Table 4.5 HABISask plant SOCC screening results

Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	SAR	Element Occurrence(s) within Study Area?
Achnatherum nelsonii ssp. dorei	Columbia needlegrass	Poaceae	S3	not ranked	not ranked		no
Alisma gramineum	narrow-leaved water plantain	Alismataceae	S3	not ranked	not ranked		yes
Almutaster pauciflorus	few-flowered aster	Asteraceae	S3	not ranked	not ranked		yes
Amaranthus californicus	California amaranth	Amaranthaceae	S2	not ranked	not ranked		no
Anagallis minima	chaffweed	Primulaceae	S3	not ranked	not ranked		no
Astragalus australis	Indian milk-vetch	Fabaceae	S3	not ranked	not ranked		no
Astragalus purshii var. purshii	Pursh's milk-vetch	Fabaceae	S3	not ranked	not ranked		no
Bidens frondosa	tall beggar's-ticks	Asteraceae	S3	not ranked	not ranked		no
Blysmopsis rufa	red bulrush	Cyperaceae	S3	not ranked	not ranked		no
Botrychium campestre	prairie dunewort	Ophioglossaceae	S2	not ranked	not ranked		yes
Botrychium pallidum	pale moonwort	Ophioglossaceae	S1	not ranked	not ranked		no
Carex crawei	Crawe's sedge	Cyperaceae	S3	not ranked	not ranked		yes
Carex eburnea	bristle-leaved sedge	Cyperaceae	S3	not ranked	not ranked		no
Carex saximontana	Rocky Mountain sedge	Cyperaceae	S3	not ranked	not ranked		yes
Chenopodium desiccatum	dry goosefoot	Chenopodiaceae	S3	not ranked	not ranked		no
Chenopodium subglabrum	smooth goosefoot	Chenopodiaceae	S3	Threatened	Schedule 1, Threatened	✓	no
Corallorhiza striata var. striata	striped coral-root	Orchidaceae	S3	not ranked	not ranked		no
Corispermum americanum var. americanum	American bugseed	Chenopodiaceae	S3	not ranked	not ranked		no
Corispermum hookeri var. hookeri	Hooker's bugseed	Chenopodiaceae	S2	not ranked	not ranked		no
Corispermum pallasii	Pallas' bugseed	Chenopodiaceae	S2	not ranked	not ranked		no
Corispermum villosum	hairy bugseed	Chenopodiaceae	S2	not ranked	not ranked		no
Crepis runcinata ssp. hispidulosa	smooth hawk's-beard	Asteraceae	S1	not ranked	not ranked		no
Cyperus squarrosus	awned cyperus	Cyperaceae	S3	not ranked	not ranked		no
Cypripedium parviflorum var. makasin	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked		no
Elatine triandra	longstem water-wort	Elatinaceae	S2	not ranked	not ranked		no
Eleocharis engelmannii	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked		yes
Elymus glaucus ssp. glaucus	blue wild rye	Poaceae	S3	not ranked	not ranked		no
Elymus lanceolatus ssp. psammophilus	sand-dune wheatgrass	Poaceae	S2	not ranked	not ranked		no

Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	SAR	Element Occurrence(s) within Study Area?
Erigeron strigosus	white-top	Asteraceae	S3	not ranked	not ranked		no
Festuca hallii	plains rough fescue	Poaceae	S3	not ranked	not ranked		yes
Gentianopsis virgata	lesser fringed gentian	Gentianaceae	S3	not ranked	not ranked		yes
Iris versicolor	blueflag	Iridaceae	S1	not ranked	not ranked		no
Lactuca biennis	tall blue lettuce	Asteraceae	S3	not ranked	not ranked		no
Lomatogonium rotatum	marsh felwort	Gentianaceae	S3	not ranked	not ranked		no
Monarda fistulosa var. mollis	soft wild bergamot	Lamiaceae	S3	not ranked	not ranked		no
Potentilla anserina ssp. yukonensis	Yukon silverweed	Rosaceae	S2	not ranked	not ranked		no
Potentilla concinna var. concinna	early cinquefoil	Rosaceae	S2	not ranked	not ranked		yes
Potentilla lasiodonta	sandhills cinquefoil	Rosaceae	S2	not ranked	not ranked		yes
Potentilla rubricaulis	red-stemmed cinquefoil	Rosaceae	S3	not ranked	not ranked		no
Potentilla supina ssp. paradoxa	bushy cinquefoil	Rosaceae	S3	not ranked	not ranked		no
Rhinanthus minor ssp. minor	yellow-rattle	Scrophulariaceae	S2	not ranked	not ranked		no
Ribes oxyacanthoides ssp. setosum	bristly gooseberry	Grossulariaceae	S2	not ranked	not ranked		no
Rorippa curvipes	curved yellow-cress	Brassicaceae	S3	not ranked	not ranked		no
Rosa blanda	smooth wild rose	Rosaceae	S1	not ranked	not ranked		no
Sceptridium multifidum	leathery grape-fern	Ophioglossaceae	S3	not ranked	not ranked		yes
Scirpus pallidus	pale bulrush	Cyperaceae	S3	not ranked	not ranked		no
Silene menziesii	Menzies' catchfly	Caryophyllaceae	S3	not ranked	not ranked		yes
Sisyrinchium mucronatum	mucronate blue-eyed-grass	Iridaceae	S3	not ranked	not ranked		no
Sisyrinchium septentrionale	northern blue-eyed-grass	Iridaceae	S3	not ranked	not ranked		yes
Sporobolus neglectus	small dropseed	Poaceae	S2	not ranked	not ranked		no
Trichophorum pumilum	dwarf clubrush	Cyperaceae	S1	not ranked	not ranked		no
Viola pedatifida	crowfoot violet	Violaceae	S3	not ranked	not ranked		no

Source: (Government of Saskatchewan 2019; SKCDC 2019b)

Occurrence records of seven plant SOCC were obtained in the review of previous studies conducted within the region (**Table 4.6**) (Golder 2015; Stantec2012, 2013a, and 2013b). These studies did not contain records of plant SAR occurrences. A total of 16 individual SOCC occurrences were identified by the review, including one occurrence of Engelmann's spike-rush (*Eleocharis engelmannii*) within the vegetation and soils study area (**Figure 4.11**).

Table 4.6 Plant SOCC identified in previous studies

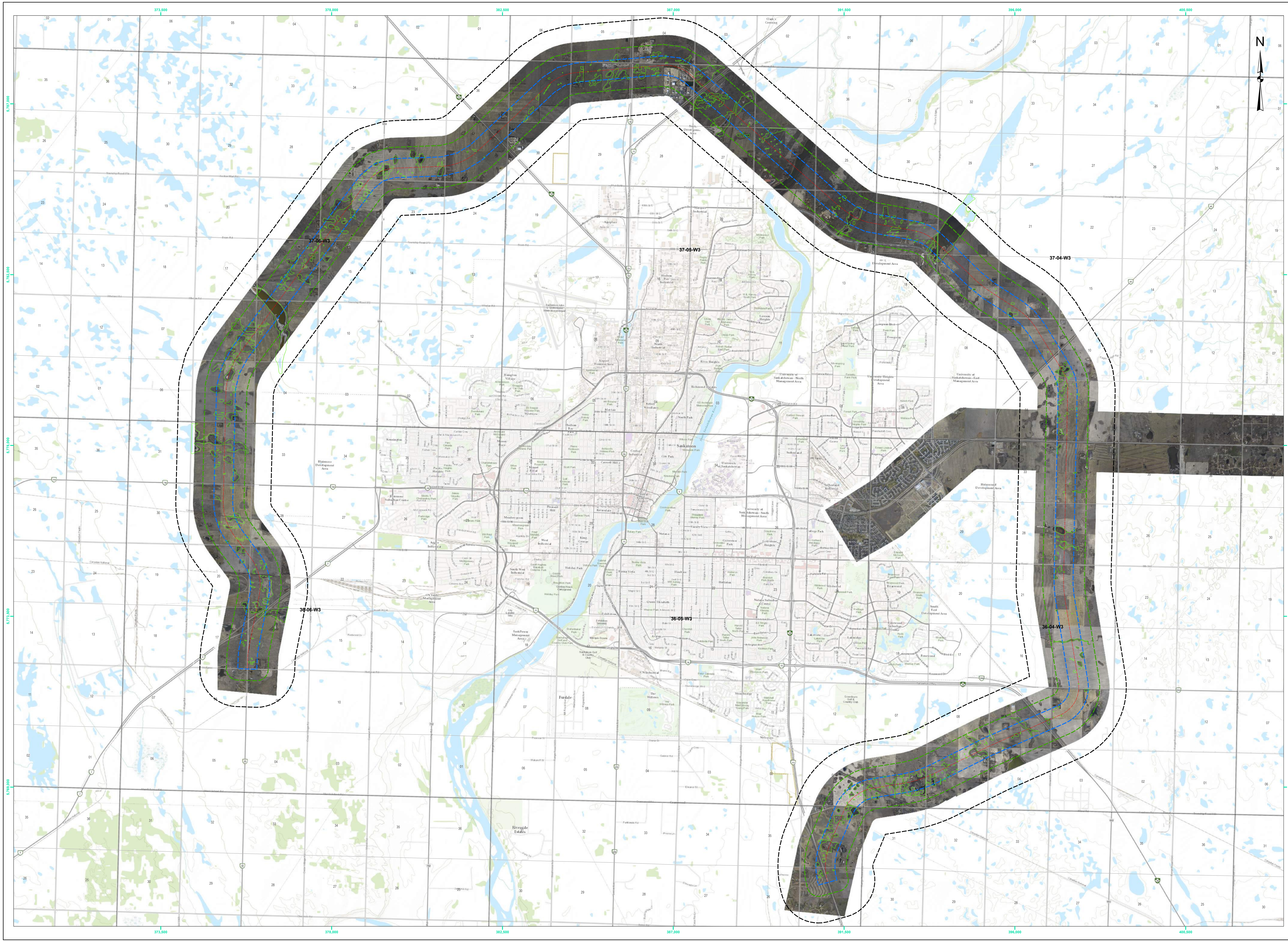
Scientific Name	Common Name	Family	SKCDC Ranking	Number of Occurrences	Occurrences within Study Area
Alisma gramineum	narrow-leaved water plantain	Alismataceae	S3	5	0
Antennaria corymbose	flat-topped pussy-toes	Asteraceae	S1	2	0
Astragalus purshii	Pursh's milk-vetch	Fabaceae	S3	1	0
Bidens frondosa	tall beggar's-ticks	Asteraceae	S3	1	0
Eleocharis engelmannii	Engelmann's spike-rush	Cyperaceae	S3	4	1
Rorippa curvipes	curved yellow-cress	Brassicaceae	S3	2	0
Sisyrinchium septentrionale	northern blue-eyed-grass	Iridaceae	S3	1	0

Source: (Golder 2015; Stantec 2012, 2013a, and 2013b; SKCDC 2019b)

Vegetation surveys in select areas (e.g. the Northeast and small swales) will be completed during Phase 2 studies.

4.3.3.2.3 Wetland Delineation

The desktop wetland delineation exercise identified 452.6 ha of potential wetland habitat within the proposed freeway corridor (**Figure 4.12**).



LEGEND

- WETLAND / WATERCOURSE
- PRELIMINARY FREEWAY ALIGNMENT
- PROPOSED FREEWAY CORRIDOR
- VEGETATION AND SOIL STUDY AREA
- WILDLIFE STUDY AREA

NOTES

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6. WETLANDS DIGITIZED BASED OFF OF IMAGERY PROVIDED BY SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE AND CROSS-REFERENCED WITH AND GOOGLE EARTH IMAGERY.

REFERENCE DRAWINGS

DWG No	DESCRIPTION

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REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	KH	KG	HY	JP

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CLIENT	PROJECT LOCATION
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE	SASKATOON FREEWAY

TITLE

DIGITIZED WETLANDS

DATE 2019 07 23	DWG No 659183-0000-4EDD-0011	FIG No. 2.7	REV 00

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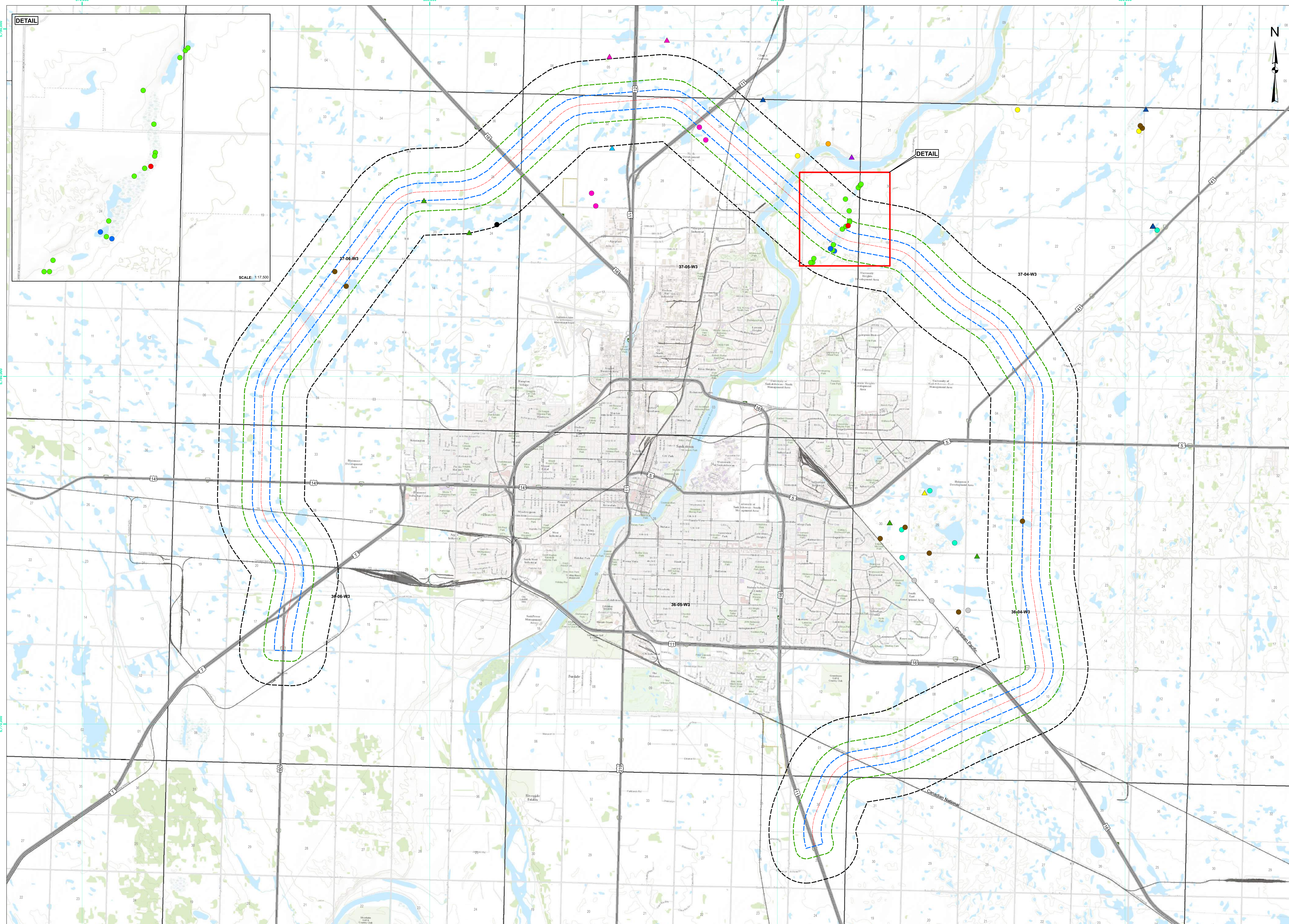

LEGEND

PLANT

- CURVED YELLOW-CRESS
- ENGELMANN'S SPIKE-RUSH
- FLAT-TOPPED PUSSY-TOES
- PURSH'S MILK-VETCH
- TALL BEGGAR'S-TICKS
- NARROW-LEAVED WATER PLANTAIN
- NORTHERN BLUE-EYED-GRASS

WILDLIFE

- AMERICAN WHITE PELICAN
- BAIRD'S SPARROW *
- BARN SWALLOW *
- BOBOLINK *
- GREAT BLUE HERON
- HORNED GREBE *
- LOGGERHEAD SHRIKE *
- SPRAGUE'S PIPIT *
- NORTHERN LEOPARD FROG *
- TURKEY VULTURE
- PRELIMINARY FREEWAY ALIGNMENT
- RAILWAY
- HIGHWAY
- PROPOSED FREEWAY CORRIDOR
- VEGETATION AND SOIL STUDY AREA
- WILDLIFE STUDY AREA

* DENOTES A SPECIES AT RISK

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4. TOPOGRAPHIC FEATURES OBTAINED FROM CANVEC V12.0 DATASET, NATURAL RESOURCES CANADA EARTH AND SCIENCES SECTOR CENTRE FOR TOPOGRAPHIC INFORMATION, 2013-09-30.
5. HIGHWAYS AND ROADS OBTAINED FROM THE NATIONAL ROAD NETWORK SASKATCHEWAN EDITION 9.0 DATASET, 2017-06-05.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 2.0 DATASET, 2016-10-06.
7. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
8. WILDLIFE AND PLANT SOCC LOCATIONS DIGITIZED FROM REPORTS, STANTEC. (NOVERMBER 19, 2013). NORTH CENTRAL/NORTH EAST NATURAL AREA SCREENING STUDY, CITY OF SASKATOON. PG 64-70., STANTEC. (SEPTEMBER 16, 2012). NORTH/NORTHWEST NATURAL AREA SCREENING STUDY, CITY OF SASKATOON. PG 61., STANTEC. (OCTOBER 30, 2013). NORTH COMMUTER PARKWAY - BASELINE TERRESTRIAL AND AQUATIC FIELD STUDIES, AND HERITAGE RESOURCE IMPACT ASSESSMENT. PG 44., AND GOLDER ASSOCIATES. (NOVEMBER 16, 2015). HOLMWOOD EAST NATURAL AREA SCREEING STUDY. PG 12.

REFERENCE DRAWINGS

DWG No	DESCRIPTION
Golder Associates, 2013 1526165	Holmwood East Natural Area Screening Study
Stantec 2013	North Commuter Parkway - Baseline Terrestrial and Aquatic Field Studies, and Heritage Resource Impact Assessment
Stantec 2013	North Central/ North East Natural Area Sceening Study, City of Saskatoon
Stantec 2012	North/Northwest Natural Area Screening Study, City of Saskatoon

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	LM	KVG	HY	JP

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CLIENT	PROJECT LOCATION
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE	SASKATOON FREEWAY

TITLE

WILDLIFE AND PLANT SOCC FROM PREVIOUS STUDIES

DATE	DWG No	FIG No.	REV
2019 07 30	659183-0000-4EDD-0013	4.11	00

Path: \\sli1653\Projects QMS\SMHI\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0013 Previously Recorded Plants and Wildlife.mxd

4.3.4 Wildlife

4.3.4.1 Methods

SNC-Lavalin conducted a desktop review of wildlife and wildlife habitat as well as field-level rapid assessment surveys. For the purpose of this review, wildlife includes fish, bird, mammal, amphibian, reptile and insect species.

The wildlife study area includes the proposed freeway corridor surrounded by a 1,000 m buffer that extends from the edge of each side of the proposed freeway corridor (**Figure 4.5**), based on the maximum applicable setback distance for wildlife SAR identified in the Saskatchewan ARGs for Sensitive Species (ENV 2017). The wildlife study area occupies approximately 13,991 ha. The proposed freeway corridor occupies approximately 2,716 ha.

4.3.4.1.1 Ecoregion Review

SNC-Lavalin conducted a desktop review of commonly occurring wildlife species, including breeding birds and SOCC, and wildlife habitat features typical of the Moist Mixed Grassland Ecoregion. Each individual species has unique requirements for food, shelter, and breeding which inform habitat selection (Acton et al. 1998). Habitat availability at a local scale is greatly influenced by topography, vegetation, hydrologic regimes, and land use practices. Locations that contain a variety of habitat types are more likely to support a diverse assemblage of wildlife species. A list of wildlife species known to occur within the ecoregion and descriptions of their associated habitats was obtained from The Ecoregions of Saskatchewan (Acton et al. 1998).

4.3.4.1.2 Wildlife SOCC Screening

A screening exercise was conducted to identify wildlife SOCC with the potential for occurrence within the wildlife study area. SOCC occurrence and spatial data was obtained from the following sources:

- The HABISask tool (Government of Saskatchewan 2019) for (i) a list of wildlife SOCC occurrences and animal assemblages that were previously detected within the region (known as element occurrences), (ii) the locations of federal and/or provincial lands requiring environmental protection, and (iii) predictive distribution models for wildlife SOCC;
- Available studies in the region with data less than 10 years old and with spatial wildlife SOCC data that could be readily extracted (e.g. presented on maps or with UTM coordinates), including:
  - Final Screening Report, Holmwood East Natural Area Screening Study (Golder 2015),
  - North/Northwest Natural Area Screening Study, City of Saskatoon (Stantec 2012),
  - North Commuter Parkway – Baseline Terrestrial and Aquatic Field Studies, and Heritage Resource Impact Assessment (Stantec 2013a), and
  - North Central/North East Natural Area Screening Study, City of Saskatoon (Stantec 2013b).

Current federal and provincial species rankings were provided by the SARA Public Registry (Government of Canada 2019) and the SKCDC (2019c and 2019d) (Appendix A).

4.3.4.1.3 Field Surveys

4.3.4.1.3.1 Field Survey Design

An examination of satellite imagery was completed and used to infer the land use in each quarter-section within the proposed freeway corridor and identify quarter-sections with high value wildlife habitat.

SNC-Lavalin completed field-level surveys of wildlife and wildlife habitat within the wildlife study area but focussed on areas within the proposed freeway corridor. The majority of quarter sections intersected by the proposed freeway corridor were surveyed, with the exception of quarter sections that appeared to have limited or low-quality habitat. SNC-Lavalin did not complete field surveys within the area located between the Northeast swale and the South Saskatchewan River valley, as this area was surveyed by the Meewasin Valley Authority (MVA). Data associated with MVA's surveys will be presented in an addendum during Phase 2.

Data from the field surveys were used to develop recommendations for future surveys. Detailed species detection surveys were not completed as the project is not expected to be constructed for at least 10 years or more.

4.3.4.1.3.2 Field Surveys

Field surveys consisted of rapid assessment surveys, either conducted as roadside surveys or more in-depth meandering surveys. Some quarter sections where roadside surveys were initially conducted were re-surveyed using meandering surveys if they could not be fully assessed by roadside survey or potential high value wildlife habitat was observed. Meandering surveys were conducted for quarter sections deemed to have potential for high value wildlife habitat or if the quarter met one or more of the following criteria:

- Quarter contained potential native-dominant pasture/prairie or large undisturbed patches of wildlife habitat such as large wetlands or tree stands;
- Quarter contained previously identified SOCC species that may still be present;
- Quarter contained habitat that cannot be assessed from the road due to distance or an obstructed view;
- A roadside survey was determined to be insufficient to characterize the potential habitat; and/or
- The area was of special interest to project stakeholders (described below).

The rapid assessment roadside surveys were completed at 59 points covering 61 quarter sections within the wildlife study area; however, most assessments were located within the proposed freeway corridor. Some quarter sections were evaluated by two roadside surveys if they could be assessed from two different roads and if the first roadside survey was not enough to assess the habitat within the quarter. Some roadside surveys also assessed more than a single quarter section (i.e. both sides of the road had quarter sections crossed by the proposed freeway corridor. Locations for these surveys are provided in Appendix E and **Figure 4.13**. Roadside surveys were completed from June to September 2019. Survey locations were selected prior to beginning field surveys each day and adjusted in the field to allow the surveyor to assess as much habitat within the target quarter section as possible. The surveyor parked in a safe location and walked to the roadside survey location. The surveyor was equipped with binoculars and a spotting scope to assist with data collection. The surveyor attempted to wait for a break in traffic to conduct the auditory portion of the survey so ambient noise was low, and collected the following data:

- An incidental list of all wildlife visually and aurally observed, including SOCC and SAR species;
- A description of the available habitat features (cropland, wetlands, shrublands, tree stands, shelterbelts, grasslands, swales, etc.) and significant developments (industrial, residential, etc.);
- Land use within the quarter section;
- GPS coordinates of assessment location; and
- Photographs of the location and its associated habitat.

Areas of specific interest to stakeholders were identified during Technical Working Group (TWG) meetings. These areas are primarily the swales and other natural areas that surround the City of Saskatoon and include:

- The Hudson Bay swale (Phase 1);
- The Northeast swale and small swale (Phase 2);
- The South Saskatchewan River (Phase 2);
- The west swale (Phase 3);
- Seasonal creeks/drainages (Phase 2 and 3); and
- Native dominant grassland or land with remnant portions of native dominant grassland (All phases).

Meandering surveys were completed in 21 quarter-sections intersected by the proposed freeway corridor. Locations of these assessments are provided in Appendix E and **Figure 4.14**. Some quarters were assessed together if the habitat was similar between them. In this case, individual wildlife species lists were not generated for each quarter, but for the entire group of quarter sections assessed together. Meandering surveys were completed in August and September 2019. Some quarter sections underwent both roadside and meandering surveys. Locations for meandering surveys were determined based on desktop and previous roadside surveys. The surveyor parked on site in a safe location and completed a survey of the area by walking and inspecting all habitat types. The surveyor was equipped with binoculars and a spotting scope to assist with data collection. The data collected during the meandering surveys was the same as the data collected during the roadside surveys, but because of the increased time on-site, more detailed habitat descriptions and incidental wildlife lists were collected during meandering surveys.

SNC-Lavalin also completed snow tracking surveys in the winter of 2020 in the western portions of Phase 1 (between the Hudson Bay swale and the west bank of the South Saskatchewan River). Three transects spaced approximately 250 m apart were completed within the project corridor. Transects were located:

- At the northern limit of the project corridor;
- At the centre of the project corridor; and
- At the southern limit of the project corridor.

Each transect was visited twice during appropriate snow conditions during the winter. All tracks and other sign of wildlife (live animals, bed sites, rub sites, feces, excavations, etc.) were recorded.

Land access permissions were not required for access from public roads. Form A requests were sent out via registered mail to inform landowners and occupants of the intent to access private land for on-foot assessments. SNC-Lavalin also provided notification in the form of a phone call or voice message which was delivered prior to accessing the land (if required).

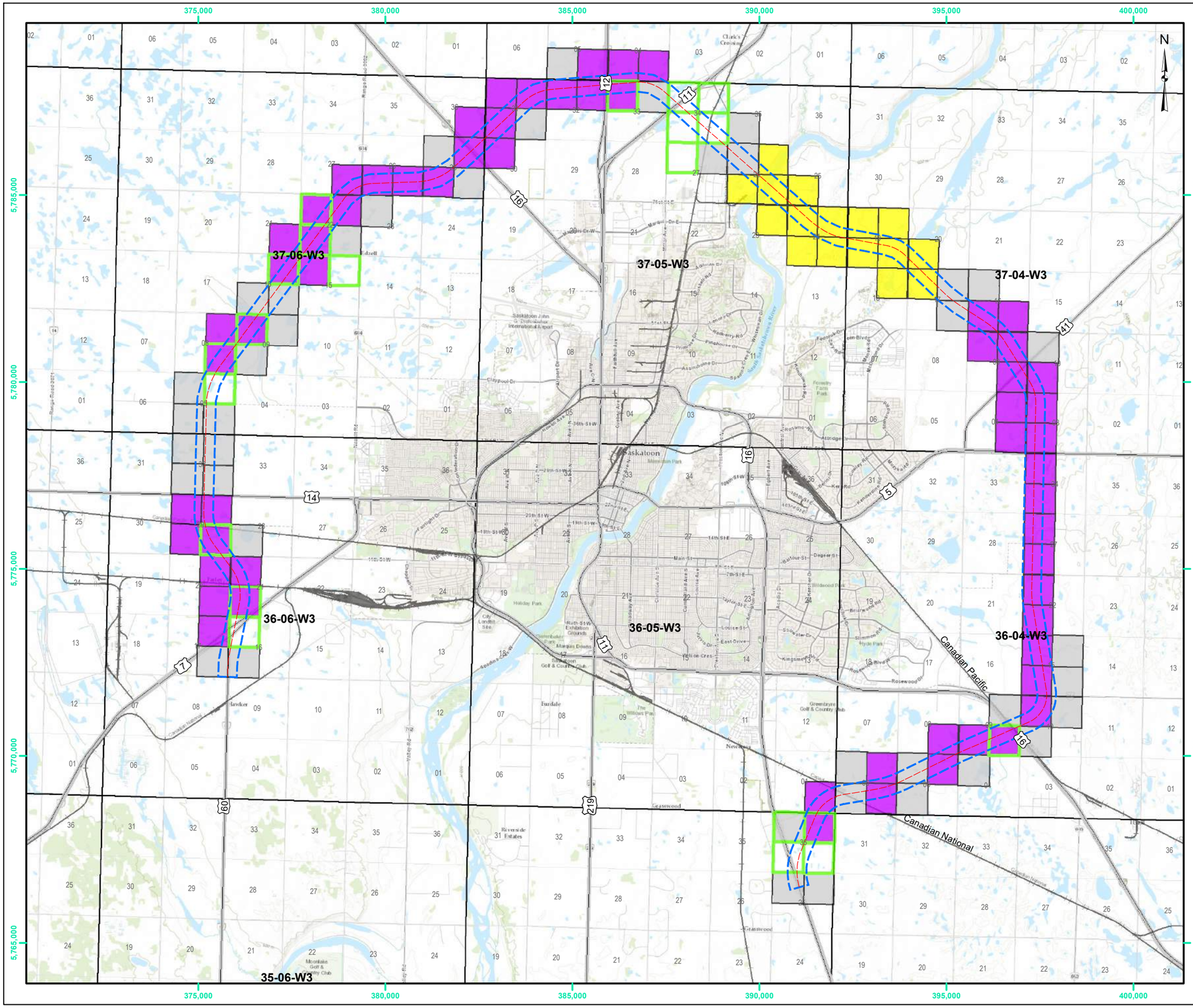
4.3.4.1.3.3 Ongoing Wildlife Field Surveys to Support the SFFPS

Ongoing field surveys to support the SFFPS are scheduled for the winter of 2019/2020 and spring/summer 2020.

SNC-Lavalin completed snow track surveys for the proposed freeway in accordance with ENV (2014) protocols. The primary focus of these snow track surveys was to identify key wildlife travel corridors. The identification of these corridors may help siting of wildlife crossings, if required. Surveys focussed on the Phase 1 portion of the project, as well as within the Northeast swale and small swale.

SNC-Lavalin will also complete additional wildlife surveys during the spring and summer of 2020 in selected areas observed to have potentially high value habitat. These will include the Northeast swale and small swale, west swale, Hudson Bay swale and areas of pasture lands in Phase 2 and 3. The scope of the 2020 surveys is to be determined based on discussions with the Ministry and results of MVA surveys in the

Northeast swale and small swale. Species specific surveys, where completed, will be conducted in accordance with ENV (2014) protocols.



LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- RAILWAY
- HIGHWAY
- PROPOSED FREEWAY CORRIDOR

FIELD ASSESSED QUARTER SECTIONS

- DESKTOP QUARTER
- MEANDERING SURVEY QUARTER
- MVA-SURVEYED QUARTER
- ROADSIDE SURVEY QUARTER

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2016, SASKGRID2016.
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REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

PA	2020 04 24	ISSUED FOR REVIEW	HY	KVG	HY	JP
REV	**DATE**	**DESCRIPTION**	**DES**	**DRN**	**CHK**	**APP**

0 500 1,000 2,000 3,000 4,000 METRES

SCALE: 1:100,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE	SASKATOON FREEWAY

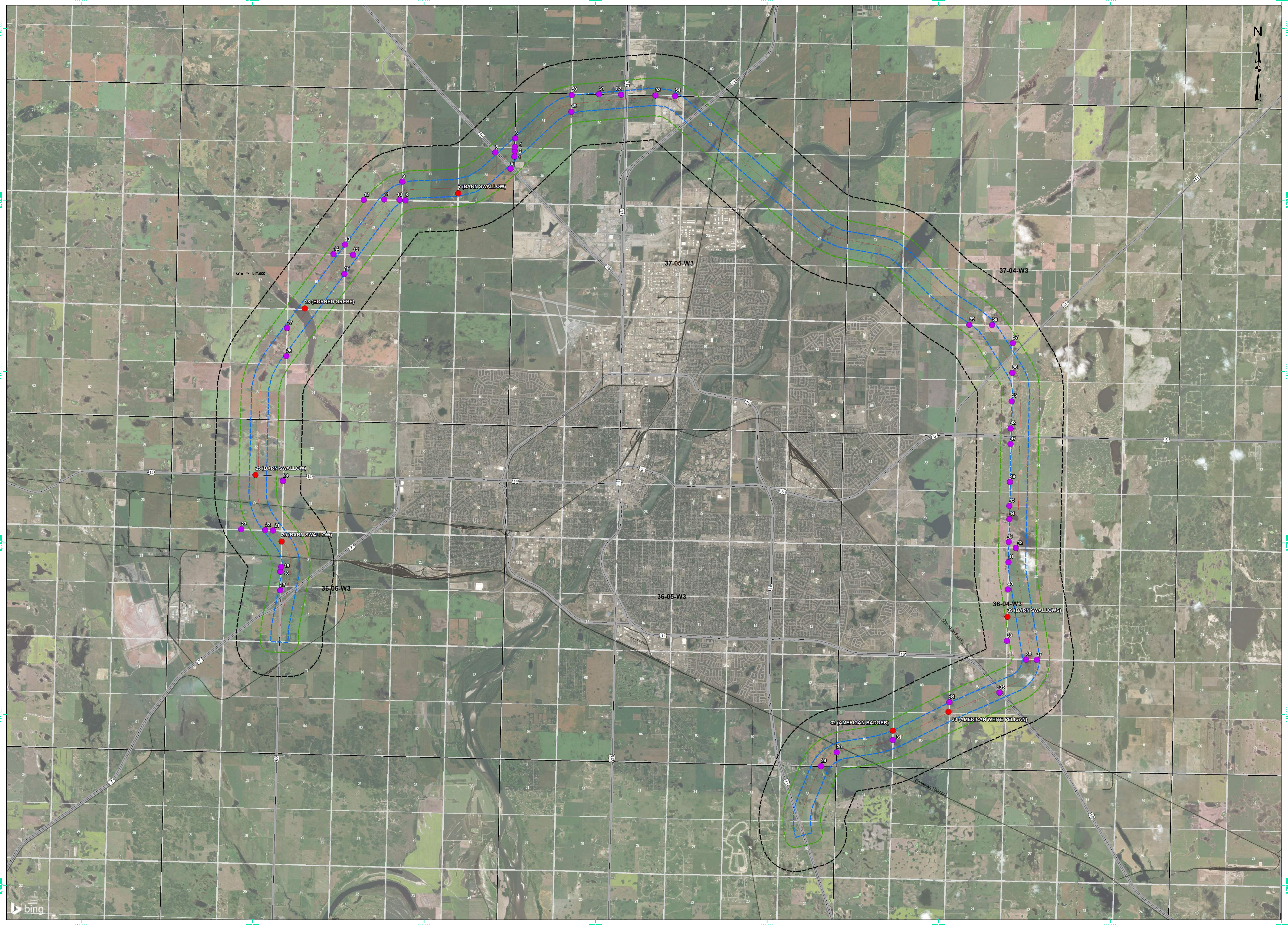
TITLE

RAPID ASSESSMENT SURVEY LOCATIONS – ROADSIDE AND MEANDERING SURVEYS

DATE	2019 10 28	DWG No.	659183-0000-4EDD-0015	FIG No. 4.14	REV	00

SIZE 11x17

Path: \\sli1653\Projects QMS\SMH\l659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0015 Field Assessed QS.mxd



LEGEND

- ROADSIDE SURVEY LOCATION – SOCC IDENTIFIED
- ROADSIDE SURVEY LOCATION
- PRELIMINARY FREEWAY ALIGNMENT
- RAILWAY
- HIGHWAY
- PROPOSED FREEWAY CORRIDOR
- VEGETATION AND SOIL STUDY AREA
- WILDLIFE STUDY AREA

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
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4. TOPOGRAPHIC FEATURES OBTAINED FROM CANVEC V12.0 DATASET, NATURAL RESOURCES CANADA EARTH AND SCIENCES SECTOR CENTRE FOR TOPOGRAPHIC INFORMATION, 2013-09-30.
5. HIGHWAYS AND ROADS OBTAINED FROM THE NATIONAL ROAD NETWORK SASKATCHEWAN EDITION 9.0 DATASET, 2017-06-05.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 2.0 DATASET, 2016-10-06.
7. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

REFERENCE DRAWINGS

DWG No	DESCRIPTION

REVISIONS

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00	2020 07 23	ISSUED FOR INFORMATION	TL	KG	HY	JP

0 500 1,000 2,000 Metres

SCALE: 1:50,000

SNC · LAVALIN

CLIENT
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE

PROJECT LOCATION
SASKATOON FREEWAY

TITLE
RAPID ASSESSMENT SURVEY LOCATIONS – ROADSIDE SURVEYS

DATE 2019 08 07 | **DWG No** 659183-0000-4EDD-0014 | **FIG No. 4.13** | **REV** 00

Path: \\sli1653\Projects QMS\SMHI\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Drawings\Biophysical\659183-0000-4EDD-0014 Point Counts.mxd

4.3.4.2 Results

4.3.4.2.1 Ecoregion Review

A large diversity of wildlife is supported by the Moist Mixed Grassland Ecoregion, including 51 mammal species (Acton et al. 1998). Common mammals occurring in open grassland habitat include: coyote (*Canis latrans*), porcupine (*Erethizon dorsatum*), white-tailed jackrabbit (*Lepus townsendii*), striped skunk (*Mephitis mephitis*), white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), deer mouse (*Peromyscus maniculatus*), Richardson's ground squirrel (*Spermophilus richardsonii*), red fox (*Vulpes vulpes*), and American badger (*Taxidea taxus taxus*) (SKCDC 2019c). Fragmented deciduous woodland habitat supports less common mammals like moose (*Alces alces*), cougar (*Puma concolor*), and black bear (*Ursus americanus*). Mammals associated with wetland habitat and other water features include North American beaver (*Castor canadensis*), North American river otter (*Lontra canadensis*) and muskrat (*Ondatra zibethicus*) (SKCDC 2019c).

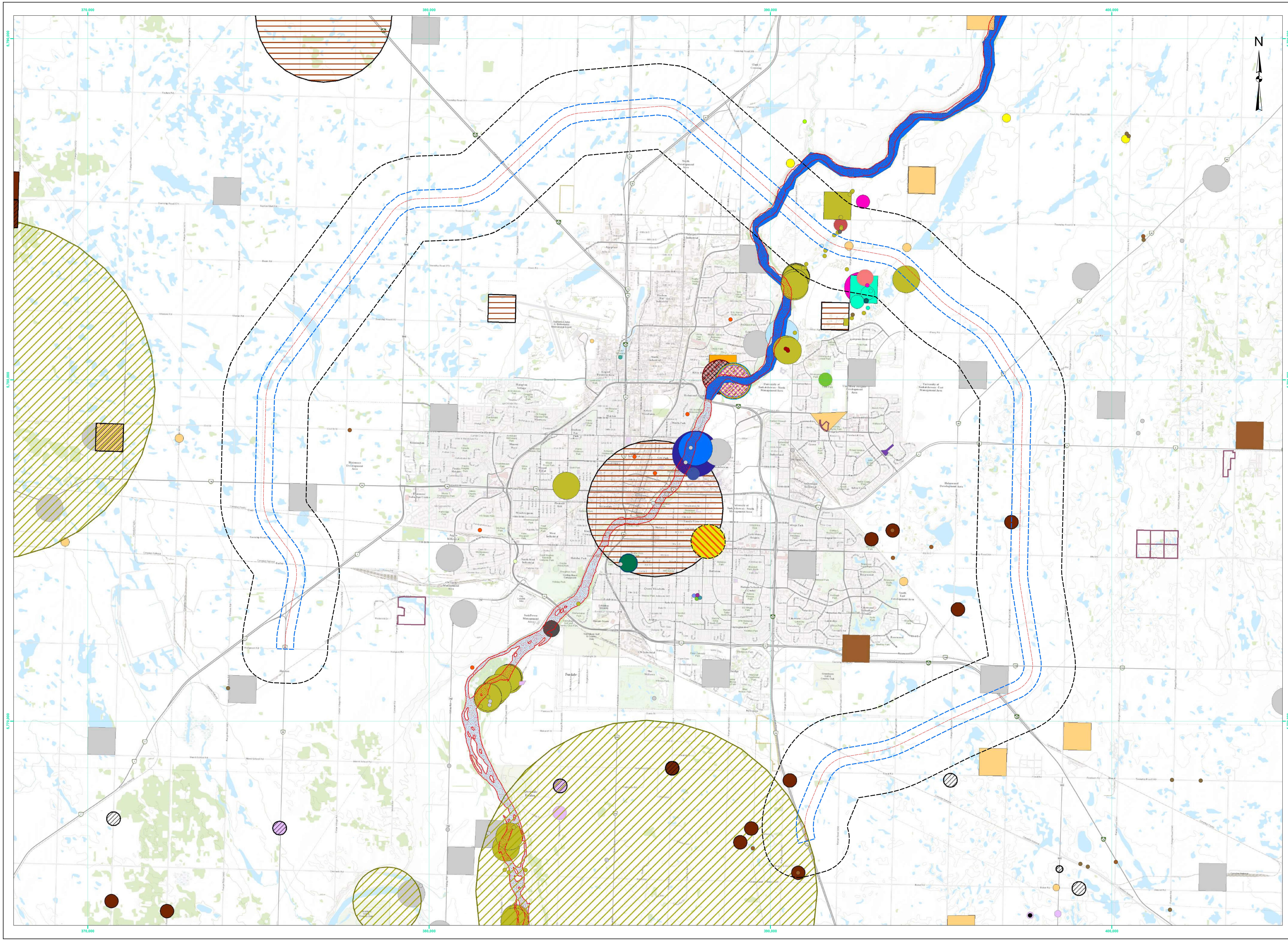
Thirteen species of reptiles and amphibians have been recorded in the Moist Mixed Grassland Ecoregion (Acton et al. 1998). The western painted turtle (*Chrysemys picta belliil)* and the western plains garter snake (*Thamnophis radix haydenii*) are common reptiles observed in a combination of aquatic, riparian, and grassland habitats. Amphibians such as Canadian toad (*Bufo hemiophrys*) and wood frog (*Rana sylvatica*) inhabit select aquatic, riparian, and grassland habitats (SKCDC 2019c).

A total of 198 migratory and resident birds have been recorded in the Moist Mixed Grassland Ecoregion (Acton et al. 1998). Common birds found in open grassland habitat include northern harrier (*Circus cyaneus*), American crow (*Corvus brachyrhynchos*), horned lark (*Eremophila alpestris*), clay-coloured sparrow (*Spizella pallida*), and sharp-tailed grouse (*Tympanuchus phasianellus*). Birds associated with aspen stands and deciduous woodland habitat include ruffed grouse (*Bonasa umbellus*), great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), common raven (*Corvus corax*), least flycatcher (*Empidonax minimus*), hairy woodpecker (*Picoides villosus*), and yellow warbler (*Setophaga petechia*). Wetlands and lentic water features are predominantly populated by waterbirds, such as northern shoveler (*Anas clypeata),* blue-winged teal (*Anas discors*), killdeer (*Charadrius vociferus*), black tern (*Chlidonias niger*), Wilson's snipe (*Gallinago delicata*), eared grebe (*Podiceps nigricollis*), sora (*Porzana carolina*) and American avocet (*Recurvirostra americana*) (Cornell Lab of Ornithology 2019; SKCDC 2019c). Wetlands in the wildlife study area are used by waterfowl as summer breeding areas and spring/fall staging areas.

4.3.4.2.2 Wildlife SOCC Screening

A search of HABISask produced records of 42 wildlife SOCC and 254 wildlife SOCC element occurrences within the region, including 15 SAR and 216 SAR element occurrences (Government of Saskatchewan 2019) (**Figure 4.15**; **Table 4.7**). Appendix D provides a list of all 254 element occurrences. A total of 14 SOCC (including 9 SAR) and 51 SOCC element occurrences (including 44 SAR element occurrences) are located within the wildlife study area. HABISask also identified one migratory bird concentration site within the wildlife study area (**Figure 4.15**). This site follows the South Saskatchewan River into the City of Saskatoon and is locally significant for thousands staging waterfowl (Government of Saskatchewan 2019). No federal or provincial lands requiring environmental protection were identified within the wildlife study area. HABISask's predictive distribution model identified potentially suitable habitat for 16 wildlife SOCC (including 15 SAR) within the wildlife study area (**Table 4.8**).

Occurrence records of 10 wildlife SOCC, including seven SAR, were obtained in the review of previous studies conducted within the region (**Table 4.9**) (Golder 2015; Stantec 2012, 2013a, and 2013b). A total of 44 individual SOCC occurrences were identified, including 21 occurrences within the wildlife study area (**Figure 4.11**).



LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- PROPOSED FREEWAY CORRIDOR
- WILDLIFE STUDY AREA
- PRIVATE CONSERVATION LANDS

ANIMAL ASSEMBLAGE

- MIGRATORY BIRD CONCENTRATION SITE

VERTEBRATES

- BAIRD'S SPARROW *
- BARN SWALLOW *
- BOBOLINK *
- COMMON NIGHTHAWK *
- COOPER'S HAWK
- HARRIS'S SPARROW
- HORNED GREBE *
- LAKE STURGEON
- LITTLE BROWN MYOTIS *
- LOGGERHEAD SHRIKE *
- NORTHERN LEOPARD FROG *
- NORTHERN SHRIKE
- OLIVE-BACKED POCKET MOUSE
- OSPREY
- PRONGHORN
- RUSTY BLACKBIRD *
- SHARP-TAILED GROUSE
- SHORT-EARED OWL *
- SPRAGUE'S PIPIT *
- TURKEY VULTURE
- WHOOPING CRANE *
- YELLOW RAIL *

INVERTEBRATES

- GROUND BEETLE
- BICOLORED SALLOW MOTH
- BROWN HARPALINE BEETLE
- CLAY-BEACH BEMBIDION BEETLE
- COMMON GREEN DARNER
- ELUSIVE CLUBTAIL
- FIELD BEMBIDION BEETLE
- INDISCRIMINATE BUMBLE BEE
- LANCE-TIPPED DARNER
- MONARCH *
- SALT BEMBIDION BEETLE
- STRIPED MEADOWHAWK
- SUCKLEY'S BUMBLE BEE
- TULE BLUET
- TWENTY-SPOTTED LADY BEETLE
- TWICE-STABBED LADY BEETLE
- WESTERN RED DAMSEL
- WHITE HEELSPLITTER
- YELLOW-BANDED BUMBLE BEE *

*** DENOTES A SPECIES AT RISK**

SIZE 22 x 34

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2016, SASKGRID2016.
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6. CONSERVATION EASEMENTS OBTAINED FROM THE FISH AND WILDLIFE BRANCH AND THE LANDS BRANCH OF THE MINISTRY OF ENVIRONMENT. ONLY CONSERVATION EASEMENTS WITHIN STUDY AREA ARE SHOWN.

REFERENCE DRAWINGS

DWG No	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	HY	KVG	HY	JP

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SCALE: 1:50,000

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CLIENT SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE

PROJECT LOCATION SASKATOON FREEWAY

TITLE HABISASK WILDLIFE SOCC DATA

DATE 2019 03 05 **DWG No** 659183-0000-4EDD-0002 **FIG No.** 4.15 **REV** 00

Path: \\sli1653\Projects QMS\SMHI\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0002 Wildlife SOCC_Rev.mxd

Table 4.7 HABISask wildlife SOCC screening results

Common Name	Scientific Name	Taxonomic Group	SKCDC Ranking	COSEWIC Status	SARA Status	SAR	ARG for Species or Feature	Element Occurrence(s) within Study Area?
Baird's sparrow	*Centronyx bairdii*	bird	S4B; tracked	Special Concern	Schedule 1, Special Concern	✓	n/a	yes
barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	✓	n/a	yes
bicolored sallow moth	*Sunira bicolorago*	insect	S3	n/a	n/a		n/a	no
bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	✓	n/a	no
brown harpaline beetle	*Harpalus fuscipalpis*	insect	S3	n/a	n/a		n/a	no
clay-beach bembidion beetle	*Bembidion patruele*	insect	S3	n/a	n/a		n/a	no
common green darner	*Anax junius*	insect	S3	n/a	n/a		n/a	no
common nighthawk	*Chordeiles minor*	bird	S4B, S4M; tracked	Special Concern	Schedule 1, Threatened	✓	breeding bird	no
Cooper's hawk	*Accipiter cooperii*	bird	S4B, S2N, S2M	Not at Risk	n/a		nest site	no
elusive clubtail	*Stylurus notatus*	insect	S2	n/a	n/a		n/a	no
field bembidion beetle	*Bembidion rupicola*	insect	S3	n/a	n/a		n/a	no
ground beetle	*Bembidion intermedium*	insect	S3	n/a	n/a		n/a	no
ground beetle	*Bembidion rapidum*	insect	S3	n/a	n/a		n/a	no
Harris's sparrow	*Zonotrichia querula*	bird	SUB, S5M; tracked	Special Concern	No Status		n/a	no
horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	✓	n/a	yes
indiscriminate bumble bee	*Bombus insularis*	insect	S3	n/a	n/a		n/a	no
lake sturgeon	*Acipenser fulvescens*	fish	S2	Endangered	No Status		selected waters*	yes
lance-tipped darner	*Aeshna constricta*	insect	S2	n/a	n/a		n/a	no
little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	✓	roost/foraging site	no
loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	✓	breeding bird	yes
monarch	*Danaus plexippus plexippus*	insect	S2B	Endangered	Schedule 1, Special Concern	✓	n/a	no
northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	✓	breeding and overwintering habitat	yes
northern shrike	*Lanius borealis*	bird	S1B, S4N, S4M	n/a	n/a		n/a	no
olive-backed pocket mouse	*Perognathus fasciatus*	mammal	S3	n/a	n/a		n/a	yes
osprey	*Pandion haliaetus*	bird	S2B, S2M	n/a	n/a		nest site	yes
pronghorn	*Antilocapra americana*	mammal	S3	n/a	n/a		n/a	no
rusty blackbird	*Euphagus carolinus*	bird	S3B, SUN, S3M	Special Concern	Schedule 1, Special Concern	✓	breeding bird	yes
salt bembidion beetle	*Bembidion insulatum*	insect	S3	n/a	n/a		n/a	no

Common Name	Scientific Name	Taxonomic Group	SKCDC Ranking	COSEWIC Status	SARA Status	SAR	ARG for Species or Feature	Element Occurrence(s) within Study Area?
sharp-tailed grouse	*Tympanuchus phasianellus*	bird	S5; tracked	n/a	n/a		lek	yes
short-eared owl	*Asio flammeus*	bird	S3B, S2N, S3M	Special Concern	Schedule 1, Special Concern	✓	breeding bird	yes
Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	✓	breeding bird	no
striped meadowhawk	*Sympetrum pallipes*	insect	S3	n/a	n/a		n/a	no
Suckley's bumble bee	*Bombus suckleyi*	insect	S3	n/a	n/a		n/a	no
tule bluet	*Enallagma carunculatum*	insect	S3	n/a	n/a		n/a	no
turkey vulture	*Cathartes aura*	bird	S3B, S3M	n/a	n/a		n/a	yes
twenty-spotted lady beetle	*Psyllobora vigintimaculata*	insect	S2	n/a	n/a		n/a	no
twice-stabbed lady beetle	*Chilocorus stigma*	insect	S3	n/a	n/a		n/a	no
western red damsel	*Amphiagrion abbreviatum*	insect	S2	n/a	n/a		n/a	no
white heelsplitter	*Lasmigona complanata*	insect	S3	n/a	n/a		n/a	no
whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	✓	staging area	yes
yellow rail	*Coturnicops noveboracensis*	bird	S3B, S3M	Special Concern	Schedule 1, Special Concern	✓	breeding bird	yes
yellow-banded bumble bee	*Bombus terricola*	insect	S5; tracked	Special Concern	Schedule 1, Special Concern	✓	n/a	no

*Proponent is required to contact the Department of Fisheries and Oceans (DFO) if the project is located in or near: the waters of the North Saskatchewan, South Saskatchewan, and Saskatchewan Rivers (including large connected waters such as the Torch River), and the waters of the Churchill River below the confluence of the Reindeer River
Source: (ENV 2017; Government of Saskatchewan 2019; SKCDC 2019c and 2019d)

Table 4.8 HABISask wildlife SAR habitat predictive distribution model results

Common Name	Scientific Name	Taxonomic Group	SKCDC Ranking	COSEWIC Status	SARA Status	SAR	ARG for Species or Feature	Amount of Potential Habitat within Study Area (km^2)
American badger	*Taxidea taxus taxus*	mammal	S3	Special Concern	Schedule 1, Special Concern	✓	n/a	97.7
Baird's sparrow	*Centronyx bairdii*	bird	S4B; tracked	Special Concern	Schedule 1, Special Concern	✓	n/a	45.1
bank swallow	*Riparia riparia*	bird	S4B, S5M	Threatened	Schedule 1, Threatened	✓	n/a	47.8
bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	✓	n/a	124.6
burrowing owl	*Athene cunicularia*	bird	S2B, S2M	Endangered	Schedule 1, Endangered	✓	breeding bird	55.7
chestnut-collared longspur	*Calcarius ornatus*	bird	S3B	Threatened	Schedule 1, Threatened	✓	breeding bird	11.0
common nighthawk	*Chordeiles minor*	bird	S4B, S4M; tracked	Special Concern	Schedule 1, Threatened	✓	breeding bird	56.2
ferruginous hawk	*Buteo regalis*	bird	S3	Threatened	Schedule 1, Threatened	✓	nest site	27.5
golden eagle	*Aquila chrysaetos*	bird	S3B, S3N, S4M	Not at Risk	n/a		nest site	3.6

Common Name	Scientific Name	Taxonomic Group	SKCDC Ranking	COSEWIC Status	SARA Status	SAR	ARG for Species or Feature	Amount of Potential Habitat within Study Area (km^2)
horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	✓	n/a	135.4
loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	✓	breeding bird	119.9
monarch	*Danaus plexippus plexippus*	insect	S2B	Endangered	Schedule 1, Special Concern	✓	n/a	57.6
northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	✓	breeding and overwintering habitat	76.4
piping plover	*Charadrius melodus circumcinctus*	bird	S3B	Endangered	Schedule 1, Endangered	✓	high-water mark	23.1
short-eared owl	*Asio flammeus*	bird	S3B, S2N, S3M	Special Concern	Schedule 1, Special Concern	✓	breeding bird	45.5
Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	✓	breeding bird	75.7

Source: (ENV 2017; Government of Saskatchewan 2019; SKCDC 2019c)

Table 4.9 Wildlife SOCC identified in previous studies

Common Name	Scientific Name	Taxonomic Group	SKCDC Ranking	COSEWIC Status	SARA Status	SAR	ARG for Species or Feature	Number of Occurrences	Occurrences within Study Area
American white pelican	*Pelecanus erythrorhynchos*	bird	S5B, S5M	Not at Risk	n/a		nesting colony	1	0
Baird's sparrow	*Centronyx bairdii*	bird	S4B; tracked	Special Concern	Schedule 1, Special Concern	✓	n/a	3	1
barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	✓	n/a	10	3
bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	✓	n/a	1	1
great blue heron	*Ardea herodias*	bird	S5B; tracked	n/a	n/a		nesting colony	2	2
horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	✓	n/a	5	0
loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	✓	breeding bird	3	0
northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	✓	breeding and overwintering habitat	14	11
Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	✓	breeding bird	4	2
turkey vulture	*Cathartes aura*	bird	S3B, S3M	n/a	n/a		n/a	1	1

Source: (ENV 2017; Golder 2015; Stantec 2012, 2013a, and 2013b; SKCDC 2019c)

4.3.4.2.3 Field Surveys

In total, 73 quarter sections were surveyed by roadside or meandering surveys or both (Appendix Eand **Figure 4.16**). A summary of all field data is presented in this section and is then broken down by project phase (1, 2 and 3) in the subsequent subsections.

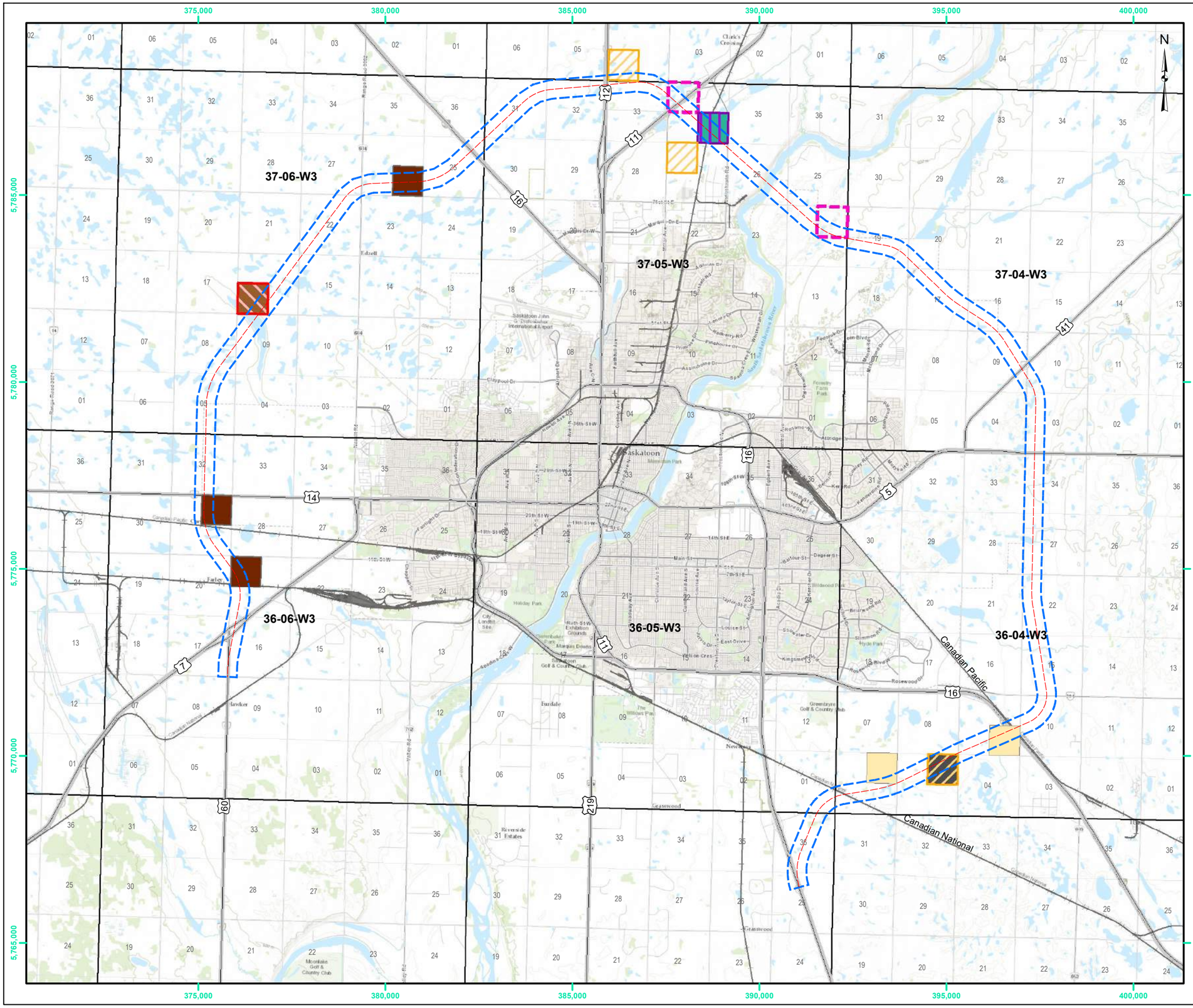
Sixty-one quarters were surveyed by roadside rapid assessment surveys. Species detections ranged from zero to 18 species detected per quarter for roadside survey locations. Data for the surveys are presented in Appendix E and photographs of the representative habitat for each surveyed quarter section are presented in Appendix F.

Twenty-one quarters were surveyed by a meandering rapid assessment survey. Species detections ranged from zero to 30 species detected per quarter. Data for the surveys are presented in Appendix E and photographs of the representative habitat for each assessed quarter section are presented in Appendix F.

A total of 81 wildlife species were incidentally observed during the field studies (Appendix E). This consisted of nine mammal species, two amphibian species, a single reptile species, and 70 bird species. Nine SOCC were also observed, with a number of these SOCC being observed in multiple locations (**Table 4.10**). SOCC were identified in 10 different quarter sections (**Figure 4.16**).

Table 4.10 Field observed SOCC within the proposed freeway corridor

Common Name	Scientific Name	Taxonomic Group	SARA Status	SKCDC Status	ARG Feature	Quarters Observed	SAR
American badger	*Taxidea taxus*	mammal	schedule 1, special concern	S3; tracked	n/a	SE 09-36-04-3, NE 06-36-04-3,	✓
American white pelican	*Pelecanus erythrorhynchos*	bird	n/a	S5B, S5M	nesting colony	NE 05-36-04-3, SW 04-38-05-3, NW 27-37-05-3	
barn swallow	*Hirundo rustica*	bird	schedule 1, threatened	S5B, S5M; tracked	n/a	SE 26-37-06-3, NW 21-36-06-3, NE 29-36-06-3,	✓
double crested cormorant	*Phalacrocorax auritus*	bird	n/a	S5B, S5M	nesting colony	NE 05-36-04-3	
eared grebe	*Podiceps nigricollis*	bird	n/a	S5B, S5M	nesting colony	SE 34-37-05-3	
great blue heron	*Ardea herodias*	bird	n/a	S5B; tracked	nesting colony	SE 34-37-05-3	
horned grebe	*Podiceps auritus*	bird	schedule 1, special concern	S5B, S5M; tracked	n/a	SW 16-37-06-3	✓
red-necked phalarope	*Phalaropus lobatus*	bird	schedule 1, special concern	S4B, S3M; tracked	breeding bird	SW 16-37-06-3	✓
Turkey vulture	*Cathartes aura*	bird	n/a	S3B, S3M; tracked	n/a	NW 34-37-05-3 NE 34-37-05-3	



LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- RAILWAY
- HIGHWAY
- PROPOSED FREEWAY CORRIDOR
- AMERICAN BADGER
- AMERICAN WHITE PELICAN
- BARN SWALLOW
- DOUBLE CRESTED CORMORANT
- EARED GREBE
- GREAT BLUE HERON
- HORNED GREBE
- RED-NECKED PHALAROPE
- TURKEY VULTURE

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2016, SASKGRID2016.
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REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR REVIEW	HY	KVG	HY	JP

0 500 1,000 2,000 3,000 4,000 METRES

SCALE: 1:100,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE	SASKATOON FREEWAY

TITLE

FIELD IDENTIFIED SOCC SPECIES

DATE	DWG No.	FIG No.	REV
2019 10 28	659183-0000-4EDD-0016	4.16	00

SIZE 11x17

Path: \\sll1653\Projects QMS\SMH\l659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0016 Field SOCC.mxd

4.3.4.2.3.1.1 Phase 1

Phase 1 of the proposed freeway corridor intersects approximately 24 quarter sections, 19 of which were surveyed at the field-level. Twelve of these quarter sections were surveyed from roadside surveys and seven by meandering surveys. Both paved and gravel roads are present throughout the Phase 1 corridor. Land use between Highway No. 12 and Highway No. 16 (the western half of the phase) within the corridor was dominated by cropland. Three residential properties were observed in this section of the Phase. Very little natural habitat remains in this area, with the best quality wildlife habitat located within planted tree rows, as well as some small to medium sized wetlands.

Land use within the Phase 1 corridor was most diverse between Highway No. 12 and the South Saskatchewan River Valley, with a mixture of tame and native pasture, industrial property, wetland habitat, road developments, cropland, snow storage facilities, riparian and river valley habitat, and the Hudson Bay swale.

The Hudson Bay swale is in the eastern section of the Phase 1 corridor, approximately one-kilometre west of the South Saskatchewan River. The Hudson Bay swale extends across approximately eight quarter sections, two of which are within the Saskatoon Freeway corridor. The swale is located in a native vegetation dominated pasture. The swale is bordered by a railroad track on its eastern end and has a significant development in NW 27-37-05-W3 that has been built into the wetland and has likely impacted the wetland shape and how the water flows through the area. There is also a snow dump on the west side of Wanuskewin Rd. that potentially has drainages inputs into the Hudson Bay swale.

Considerable wildlife activity was identified in the area, with large numbers of birds, as well as signs of frequent mammal usage. No amphibians were observed during the survey, but potential habitat existed in the area. Three SOCC species were also observed during the on-foot survey; great blue herons, turkey vultures and American white pelicans.

NW 33-27-05-W3 contained suitable habitat for a number of SOCC/SAR. This quarter has been at least partially seeded but includes sections of native vegetation. Cattle were in the pasture at the time of survey, and the area had been heavily grazed in some locations. The pasture also contained completed bird nests and several dugouts that have the potential to support overwintering amphibians.

Outside of the Hudson Bay swale, one additional SOCC was observed, a group of American white pelicans (**Table 4.10** and **Figure 4.16**).

A total of 981 wildlife sign observations were made during the 2020 snow tracking surveys. Hares/rabbits (299), small rodents (239), deer (189), and coyotes (156) were the most frequently observed wildlife signs (**Table 4.11**). Two active American badger excavations (*Taxidea taxus taxus),* an SOCC, were observed during the surveys. Observations were found throughout the transects, but the greatest concentrations of tracks were recorded on the west bank of the South Saskatchewan River, and at several locations within the Hudson Bay swale.

Table 4.11 Wildlife sign observations in Phase 1

Species/Taxa	Scientific Name	Number of wildlife sign observations
American badger	*Taxidea taxus taxus*	2
bird spp.	*n/a*	56
coyote	*Canis latrans*	156
Canada Goose	*Branta canadensis*	1
Deer (white-tailed or mule)[a]	*Odocoileus virginianus/hemionus*	189
hare/rabbit (snowshoe hare or white-tailed jackrabbit)[a]	*Lepus spp.*	299
Hungarian partridge	*Perdix perdix*	13
Red fox	*Vulpes vulpes*	2
Sharp-tailed grouse	*Tympanuchus phasianellus*	15
small rodent[a]	*Mus/Microtus spp.*	239
Weasel[a] (Stoat, least weasel, etc.)	*Mustela spp*	11

[a] *No distinction was made in these taxa, due to track similarities.*

4.3.4.2.3.1.2 Phase 2

The Northeast swale and small swale are the most significant natural habitat features present within this phase of the project. These swales will be described in an addendum as data collection in these areas is still underway.

Beginning southeast of the Northeast swale, the proposed freeway corridor crosses approximately 62 quarter sections in Phase 2, 30 of which were surveyed by SNC-Lavalin at the field-level and an additional 16 quarter sections that were surveyed by the MVA. Of the 30 quarter sections surveyed by SNC-Lavalin, 27 were surveyed from the roadside and five by meandering surveys. Almost all the quarter sections surveyed by SNC-Lavalin have been developed into agricultural cropland. There are approximately 12 residential developments throughout Phase 2. A small industrial site is also located on SW and SE 16-37-04-W3. Both paved and gravel roads are present throughout the phase. Some natural remnant habitat exists throughout these quarter sections in the forms of small to medium sized wetlands, treed wetlands, small undeveloped patches of grassland, and tree stands. The proposed corridor intersects a large wetland complex which is primarily located in SE 06-36-04-W3 but extends to adjacent quarter sections.

Two small ephemeral creeks/drainages intersected by the proposed freeway crossing are present within this phase (NW 15-36-04-W3 and SE 09-36-04-W3). Both drainages were dry at the time of visit, but likely hold some water during flood events or spring thaw. Fish habitat is unlikely within these drainages (**Section 4.3.5**), but they likely contain temporary habitat for amphibians and breeding birds.

A full section of hayland and pastureland (section 36-35-05-3), which contains suitable habitat for several SOCC/SAR, is present at the southeast end of the corridor in Phase 2. The north and west end of this section has significant road developments. A portion of the section had been recently hayed and bailed prior to the site visit, but some remained unhayed and was likely used as pastureland. Considerable wildlife activity was observed in the section during the field survey. No SOCC species were observed, however there was considerable habitat for nesting and breeding birds, including a diversity of habitat (large wetlands, tree stands, and remnant native prairie). There is also considerable habitat for amphibians and mammals.

Three SOCC were observed in Phase 2; American badger, American white pelican, and double-crested cormorants (**Table 4.10** and **Figure 4.16**).

4.3.4.2.3.1.3 Phase 3

Phase 3 of the proposed freeway corridor intersects approximately 44 quarter sections, 26 of which were surveyed at the field-level. Twenty-three of these quarters were surveyed from the roadside and 10 by meandering surveys. As in Phase 2, most of the area has been developed into agricultural cropland. There appear to be approximately 10 residential properties within the proposed freeway corridor. A large industrial site has also been developed in SE 20-36-06-W3, which is crossed by a small portion of the proposed freeway corridor. Both paved and gravel road developments are present throughout the phase. Some natural remnant habitat exists throughout these quarter sections in the forms of small to medium sized wetlands, treed wetlands, small undeveloped patches of grassland, and tree stands. The proposed freeway corridor intersects another large wetland complex primarily located in SW 21-36-06-W3 and NW 16-36-06-W3.

This phase of the corridor intersects the west swale, a large wetland located west of the City of Saskatoon. The swale complex extends over multiple quarter sections but two quarter sections containing a part of the west swale are within the corridor (SW 16-37-06-W3 and NW 09-37-06-W3). The portions of the swale within the corridor are located within cropland fields which have been tilled very close to the edge of the wetland. In areas where it is not tilled to the edge, tame pasture vegetation such as brome grass dominates the area. Much of the original wetland vegetation has been lost due to the tillage. The boundary of the water body itself did not appear to have been disturbed by development. During the initial roadside survey, water levels were low but water was still present within the wetland. During the meandering survey however, the water in the wetland had completely evaporated within the proposed freeway corridor. Considerable avian activity was observed during this roadside assessment, including two SOCC/SAR species, horned grebe and red-necked phalarope.

Outside of the west swale, barn swallows (an SOCC and SAR) were observed in three locations (**Table 4.10** and **Figure 4.16**). These were the only additional SOCC observed in the phase.

4.3.5 Fish and Fish Habitat

4.3.5.1 Methods

SNC-Lavalin conducted a desktop review of available data to describe fish and fish habitat in the wildlife study area. These data were obtained through a review of satellite imagery, previous desktop and field studies in the area, academic literature, and the following databases and reports:

- The federal *Species at Risk Act* (SARA) Public Registry for information on species-at-risk that may potentially occur within or adjacent to the study areas and to determine their status under the Act (Government of Canada 2014);
- The HABISask tool (Government of Saskatchewan 2019) for fish species that have been recorded in the area;
- The Saskatchewan Conservation Data Center (SKCDC) for fish species of conservation concern (SOCC) or species at risk (SAR) that may occur within the area (SKCDC 2019); and
- Relevant literature and previous studies completed in the area.

4.3.5.2 Results

The wildlife study area is located entirely within the South Saskatchewan River Watershed. The proposed project will cross the South Saskatchewan River at one location, northeast of the City of Saskatoon and approximately one km downstream of the newly developed Chief Mistawasis Bridge. A review of existing land ownership information did not identify any Fish and Wildlife Development Fund lands or First Nations lands within any the wildlife study area (Government of Saskatchewan 2019).

The South Saskatchewan River is impounded upstream by the Gardiner Dam, which is essentially impassable to fish. The dam also has a significant effect on the river's thermal regime and nutrient concentration (Knight Piesold 2010; Partners for the Saskatchewan River Basin 2009), which reduces its overall value for fish habitat. However, fish habitat is still present for multiple species throughout the river. The proposed crossing is located approximately 7.5 km downstream of the City of Saskatoon weir which functions to elevate the water levels within the city. The weir is currently a considerable fish migration barrier, which segments the fish habitat in the river. However, an area downstream of the weir was identified as suitable habitat for fish spawning for a number of species, including lake sturgeon (*Acipenser fulvescens*), walleye (*Sander vitreus*), sauger (*Sander canadensis*), and sucker species (Knight Piesold 2010).

There are approximately 41 total species of fish within the Moist Mixed Grassland Ecoregion and 47 species that have been found in the Aspen Parkland Ecoregion. In addition, at least 34 species of fish have been previously captured within the South Saskatchewan River and its tributaries (Knight Piesold 2010; Atton and Merkowsky 1983; Miles and Sawchyn 1988; Acton et al. 1998, SPRR 1991, Appendix G).

Six fish species that have the potential to be found in this portion of the river are identified as SOCC (SPRR 1991; Error! Reference source not found.). One fish SOCC (lake sturgeon, *Acipenser fulvescens*) element occurrence was identified in the HABISask query. A total of 83 individual lake sturgeon were captured and radio tagged by the Water Security Agency from 2009 to 2012 (ENV 2019), and the river contains habitat important for this species.

Table 4.12 SOCC fish occurring within the South Saskatchewan River

Common Name	Scientific Name	SKCDC Rank	COSEWIC Status	SARA Status
blacknose dace	*Rhinicthys obtusus*	S3	not ranked	not ranked
common shiner	*Luxilus cornutus*	S3	not ranked	not ranked
flathead chub	*Platygobio gracilis*	S3	not ranked	not ranked
lake sturgeon	*Acipenser fulvescens*	S2	Endangered	not ranked
mooneye	*Hiodon tergisus*	S3	not ranked	not ranked
river shiner	*Notropis blennis*	S3	not ranked	not ranked

Source: SPPR 1991

4.4 Socio-Economic Environment

4.4.1 Parks and Indigenous Lands

4.4.1.1 Methods

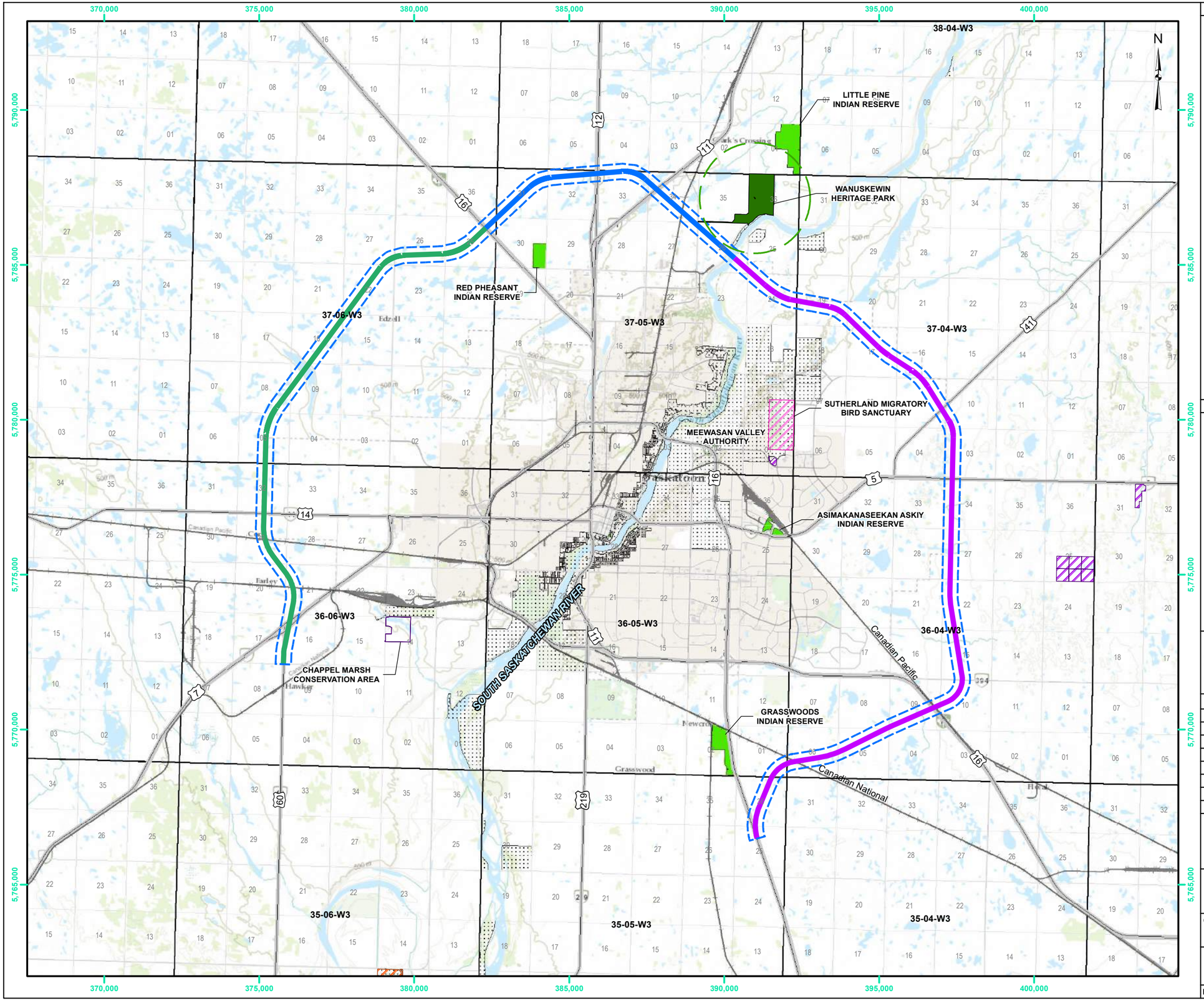
A desktop review of protected and First Nations lands within the proposed freeway corridor and surrounding area was conducted using the following resources:

- The HABISask tool (Government of Saskatchewan 2019) for conservation easements, wildlife habitat protection lands, and migratory bird sanctuaries; and
- Information Services Corporation (2019) for parks and First Nations Lands.

4.4.1.2 Results

The proposed freeway corridor does not intersect any protected lands, however it does intersect the 1.8 km radial buffer surrounding the Wanuskewin Heritage Park (**Figure 4.17**). According to the City of Saskatoon (2015), adjacent landowners and the Wanuskewin Heritage Park Administration must undergo further study and discussion to clarify the types of development that are appropriate within the buffer.

The project is located in Treaty 6 Territory, which extends across central portions of Saskatchewan and Alberta. Treaty 6 was signed in 1876 by Crown represenatatives and Cree, Assiniboine, and Ojibway leaders at Fort Carlton (23 and 28 August 1876) and Fort Pitt (9 September 1876), SK (Taylor 1985). The proposed freeway corridor does not intersect any Indigenous reserves, however, nearby First Nations communities include the Little Pine, Red Pheasant, Asimakaniseekan Askiy, and Grasslands Indian Reserves (**Figure 4.17**).



LEGEND

PRELIMINARY FREEWAY ALIGNMENT

- STUDY PHASE 1 (2019-2020)
- STUDY PHASE 2 (2020-2021)
- STUDY PHASE 3 (2021-2022)
- RAILWAY
- HIGHWAY
- PROPOSED FREEWAY CORRIDOR
- MIGRATORY BIRD SANCTUARY
- PRIVATE CONSERVATION LANDS
- WILDLIFE HABITAT PROTECTION
- WANUSKEWIN HERITAGE PARK
- FIRST NATION LAND

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
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5. CONSERVATION EASEMENTS, WILDLIFE HABITAT PROTECTION AND MIGRATORY BIRD SANTUARY OBTAINED FROM HABISASK, GOVERNMENT OF SASKATCHEWAN.
6. PARK AND FIRST NATION LAND OBTAINED FROM INFORMATION SERVICES CORPORATION (ISC).

DISCLAIMER

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	HY	KVG	HY	JP

0 1,000 2,000 4,000 METRES

SCALE: 1:120,000

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CLIENT
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE

PROJECT LOCATION
SASKATOON FREEWAY

TITLE
PROTECTED AREAS

DATE 2019 03 05 | **DWG No.** 659183-0000-4EDD-0021 | **FIG No** 4.17 | **REV** 00

SIZE 11x17

Path: \\sli1653\Projects QMS\SMH\l659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0021 Protected Areas_remake.mxd

4.4.2 Heritage Resources

SNC-Lavalin Inc. (SNC-Lavalin) completed a desktop baseline heritage resource study to support the SFFPS and identify known heritage resources and areas of archaeological potential. This section provides a summary of the study and the full study is included as Appendix H. The project was also submitted for review by the Heritage Conservation Branch (HCB).

4.4.2.1 Regulatory Context

In Saskatchewan, heritage resources are managed by the HCB of Saskatchewan Parks, Culture and Sport under the authority of *The Heritage Property Act*. The HCB maintains a heritage sensitivity database which identifies lands in Saskatchewan as either heritage sensitive or not heritage sensitive. Projects conducted on heritage sensitive land require clearance from the HCB to determine if a Heritage Resources Impact Assessment (HRIA) is required, whereas projects on not sensitive land are granted clearance under Act. Project conducted on uncharacterized lands are evaluated based on geography and topographical features using the Developers' Online Screening Tool.

4.4.2.2 Methods

The baseline heritage resources study area includes the proposed freeway corridor plus a large area of terrain similar to the project area, covering approximately 850 km^2 (**Figure 4.18**). The desktop review included a review of data from the following databases:

- The HCB's Heritage Sensitivity database to identify heritage sensitive lands;
- The HCB's Archaeological Site Inventory, which contains site inventory forms for all archaeological sites recorded in the province;
- The HCB's Archaeological Permit database, which contains information on most of the heritage work that has been done in Saskatchewan;
- The Saskatchewan Genealogical Society (SGS 2019) cemetery index for records of cemeteries; and
- The Saskatchewan Homestead Index (SHI 2019) for records of homestead documents.

4.4.2.3 Results

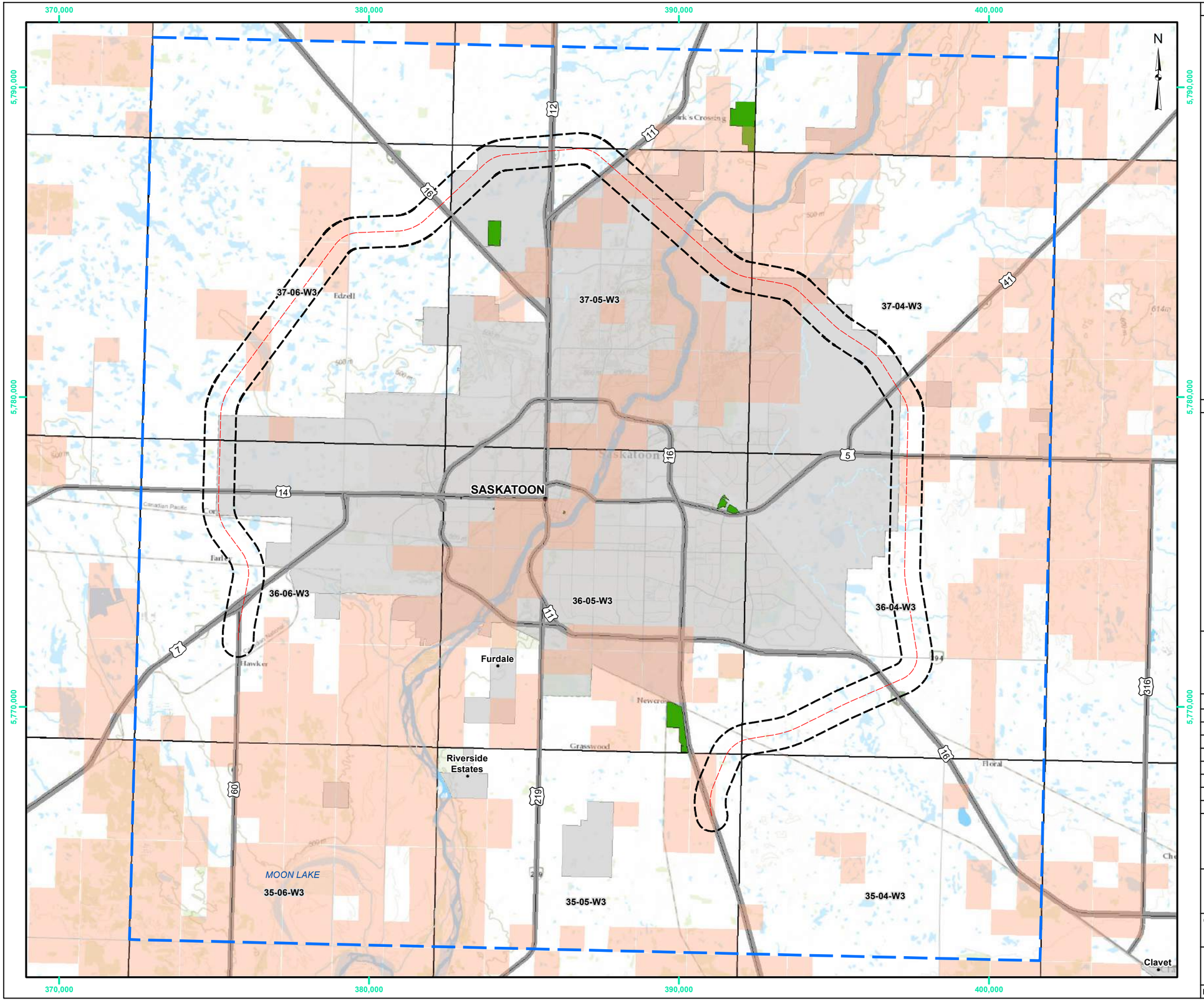
4.4.2.3.1 Heritage Sensitive Lands

There are 425 heritage sensitive quarter sections in the study area, representing approximately 33% of the lands in the study area (**Figure 4.18**). The proposed freeway corridor crosses 37 heritage sensitive quarter sections, representing approximately 26% of the corridor. The sensitive quarter sections are scattered along the corrdior with a definite concentration near the Saskatchewan River crossing and Wanuskewin Heritage Park.

4.4.2.3.2 Previous Heritage Studies

Archaeological work in the study area has been conducted professionally since the early 1980s. Prior to that, amateur and professional archaeologists recorded sites on an informal basis, often without detailed assessment. Approximately 6,386 ha (7.7%) of the study area and 57 ha of the proposed freeway corridor (1%) have been assessed for heritage resources (**Figure 4.19**).

The earliest permitted archaeological work in the study area under *The Heritage Property Act* occurred in 1982. Several of the larger heritage assessments that have been conducted in the study area are listed in **Table 4.13** and described in more detail in Appendix H. Smaller projects have not been included in the table but the footprints of these studies are included in **Figure 4.19**.



LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- HIGHWAY
- HERITAGE SENSITIVE LOCATION
- FIRST NATION LAND
- URBAN MUNICIPALITY
- PRELIMINARY FREEWAY ALIGNMENT 500 METER CORRIDOR
- HERITAGE STUDY AREA
- TOWNSHIP

NOTES

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4. TOPOGRAPHIC FEATURES OBTAINED FROM CANVEC V12.0 DATASET, NATURAL RESOURCES CANADA EARTH AND SCIENCES SECTOR CENTRE FOR TOPOGRAPHIC INFORMATION, 2013-09-30.
5. HIGHWAYS AND ROADS OBTAINED FROM THE NATIONAL ROAD NETWORK SASKATCHEWAN EDITION 9.0 DATASET, 2017-06-05.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 2.0 DATASET, 2016-10-06.
7. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY.
8. HERITAGE CONSERVATION BRANCH, SASKATCHEWAN PARKS, CULTURE AND SPORT. THE DATASET INDICATES WHETHER ANY PORTION OF A QUARTER-SECTION IS HERITAGE SENSITIVE. IN THIS CASE, HERITAGE SENSITIVE DESCRIBES THE POTENTIAL OF A QUARTER TO CONTAIN INTACT ARCHAEOLOGICAL OR PALAEONTOLOGY SITES.
9. FIRST NATION LEGISLATED BOUNDARIES OBTAINED FROM ISC.

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	JL	KVG	HY	JP

0 1,250 2,500 5,000 METRES

SCALE: 1:120,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE	SASKATOON FREEWAY

TITLE

HERITAGE RESOURCE OVERVIEW STUDY AREA

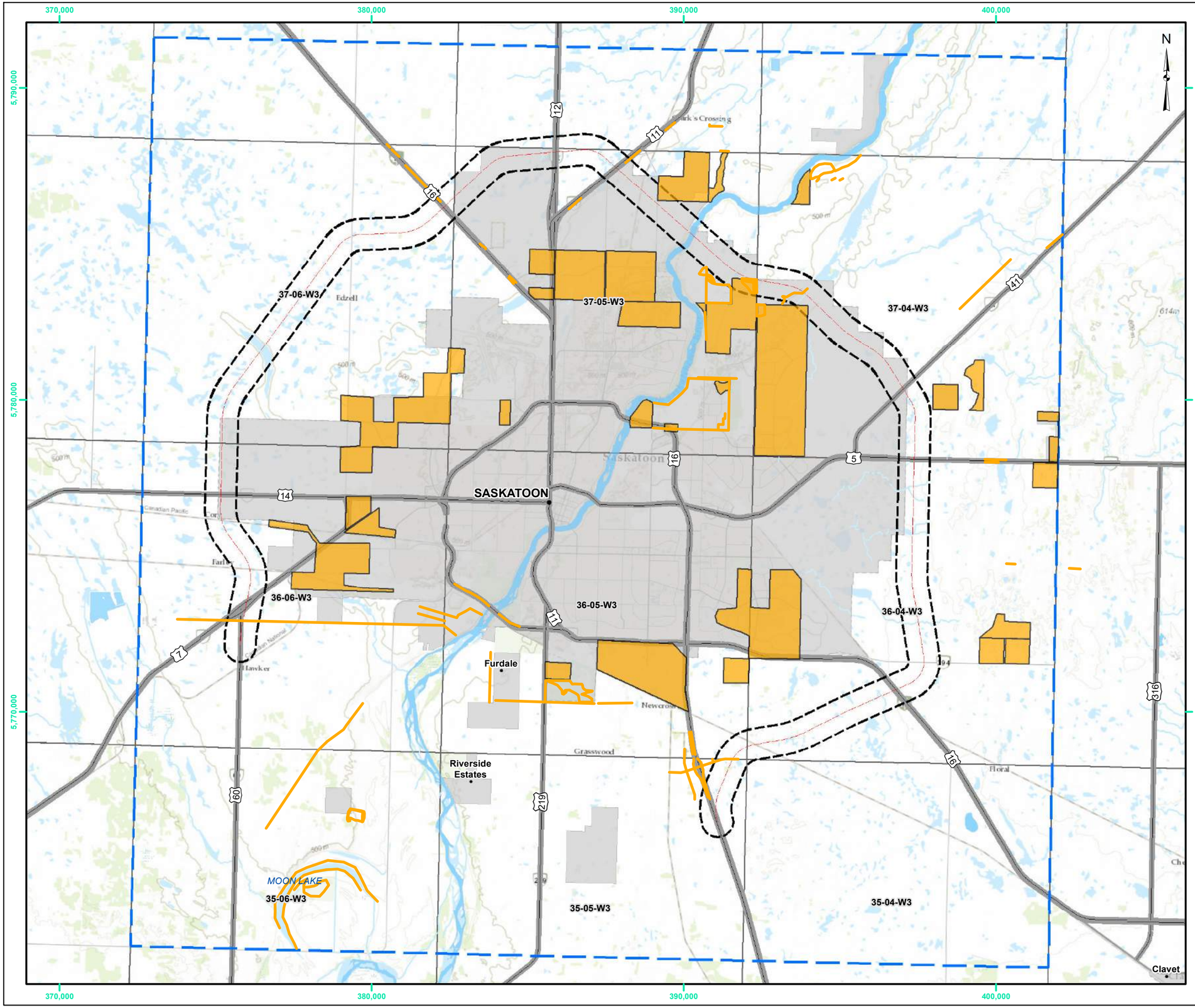
DATE	DWG No.	FIG No.	REV
2019 08 09	659183-0000-4EDD-0018	2.8	00

SIZE 11x17

Path: \\sli1653\Projects QMS\SMH\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0018 Heritage Resource Overview.mxd

Table 4.13 Selected archaeological studies in the study area

Permit	Permit Holder	Project	Results	Reference	Comment
82-000-05	Linnamae, U.	*Archaeological survey of proposed 1980 & 1981 suburban development areas of the City of Saskatoon and the Silverwood Site*	FbNp-4	Linnamae 1982	Recommend test excavations
82-026	Walker, E.G.	*Archaeological resource assessment: The Tipperary Creek Project*	17 Sites	Walker 1982	Avoidance and mitigation
83-017	Walker, E.G.	*Saskatoon perimeter archaeological resource assessment*	FaNp-7	Walker 1983	Test excavation
93-000	Jones, Tim E.H.	*Saskatoon Natural Grasslands Archaeological Survey*		Jones 1993	Further assessment
96-025	Ramsay A.M. and C.L. Ramsay	*Heritage assessment of a proposed residential development northeast of Saskatoon, Saskatchewan, (SE¼ and NE¼ of 31-37-4-W3M) HRIA Permit #96-025*	FbPn-62 to 68	Ramsay et. al 1996	No further work recommended
98-030	Ramsay, C.L.	*Heritage resource impact assessment of a proposed subdivision for Eagle Ridge Estates Inc. at SE¼-10-37-4-W3M*	FaNo-10, 16, 17	Ramsay 1998	No further work
01-031	Paquin, Todd A.	*Heritage resources impact assessment program, Tower Hill Developments, Discover Ridge Subdivision, Permit No. 01-031*	FaNo-19	Paquin 2001	No further work
01-038	Friesen, Nathan	*Heritage resource impact assessment of highway re-alignment and interchange at Grasswood Road and Highway 11*	FaNp-29	Friesen 2001	380 m from freeway corridor; no further work
04-090	Novecosky, Brad	*Heritage resources impact assessment program, Tower Hill Ranch Ltd. Hidden Ridge Subdivision Project, Permit No. 04-90*		Novecosky 2004	No further work
08-066	Enns-Kavanagh, K.	*Final report on the Heritage Resources Impact Assessment of NE-14-37-5-W3M*	FbNp-78	Enns-Kavanagh 2008	Site avoidance and mitigation
09-088	Enns-Kavanagh, K.	*Final Report on the monitoring of depression cleanup at FbNp-78, the Hutchins Homestead, in NE-14-37-5-W3M*		Enns-Kavanagh 2009	No recommendations
11-100	Schwab, M.	*Final report, heritage resources impact assessment of proposed Greenbryre Estates, HRIA Permit #2011-11*		Schwab 2011	No further work
13-224	Markowski, M. and K. Wolfe	*Associated Engineering, Eagle Heights Country Estates, W½ 11 37 4 W3M, heritage resources impact assessment, Permit No. 13-224*		Markowski and Wolfe 2013	No further work
13-097	Hein, Lisa	*HRIA of the proposed City of Saskatoon North Commuter Bridge and Central Avenue Extension Project*	FbNp-83, FbNp-84	Hein 2013	Within corridor Test excavations
14-129	Huynh, Tam	*Permit No. 14-129, Ridgewood Estates Subdivision SE 14-36-4 W3M, heritage resources impact assessment*		Huynh 2014	No further work recommended
17-050	Stead, Lauren	*Heritage Resource Detailed Assessment: FbNp-82, FbNp-83, and FbNp-84 – University Heights Neighbourhood 3*	FbNp-82, 83, 84	Stead 2017	Test excavations at FbNp-83



LEGEND

- LINEAR HERITAGE RESOURCE IMPACT ASSESSMENT
- PRELIMINARY FREEWAY ALIGNMENT
- HIGHWAY
- AREAL HERITAGE RESOURCE IMPACT ASSESSMENT
- URBAN MUNICIPALITY
- PRELIMINARY FREEWAY ALIGNMENT 500 METER CORRIDOR
- HERITAGE STUDY AREA
- TOWNSHIP

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5. HIGHWAYS AND ROADS OBTAINED FROM THE NATIONAL ROAD NETWORK SASKATCHEWAN EDITION 9.0 DATASET, 2017-06-05.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 2.0 DATASET, 2016-10-06.
7. LINEAR AND AREAL HERITAGE RESOURCE IMPACT ASSESSMENT DATA OBTAINED FROM THE HERITAGE CONSERVATION BRANCH OF SASKATCHEWAN.

DISCLAIMER

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	JL	KVG	HY	JP

0 1,250 2,500 5,000 METRES

SCALE: 1:120,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE	SASKATOON FREEWAY

TITLE

ARCHAEOLOGICAL PROJECTS IN THE STUDY AREA

DATE	DWG No.	FIG No.	REV
2019 08 09	659183-0000-4EDD-0019	2.9	00

SIZE 11x17

Path: \\sli1653\Projects QMS\SMH\l659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0019 Archaeological Projects.mxd

4.4.2.3.3 Heritage Sites

The study area contains 176 recorded archaeological sites including both Historic Period sites and Precontact Period sites, however only three archaeological sites were identified in the proposed freeway corridor (**Table 4.14**; **Figure 4.20**) including (site locations have been redacted as per HCB requirements):

- **FbNq-6:** A surface lithic scatter of material dating to the Middle and Late Plains Indian Periods (approximately between 7,500 BP to 170 BP) located in [redacted] (Epp and Dyck 1983). It was identified in 1965 by an amateur archaeologist. Material collected at that time included two Pelican Lake projectile points, two hafted bifaces, and 18 other lithic artifacts including scrapers and lithic debitage. Pelican Lake artifacts date from the Middle Prehistoric Period, approximately between 3,300 to 1,850 BP. The site has not been professionally assessed;
- **FbNp-83:** Historic Period site relating to homesteading located in [redacted] (Hein 2013). The site was further investigated with test excavations (Stead 2017) which recovered a variety of domestic artifacts including cutlery, glass, metal, and wood fragments. According to the homestead application, the site was occupied at least between 1909 after the application was submitted until 1913 when the land patent was granted. No further details of the occupancy are available. Test excavations were conducted at the site and no further archaeological work is recommended; and
- **FbNp-84:** Historic Period site relating to homesteading located in [redacted] (Hein 2013. FbNp-84 contains several depressions believed to be limestone quarries possibly used by the homesteader. The site was mapped, and several depressions were tested. No further work at FbNp-84 was recommended.

All 176 sites in the study area are summarized in **Table 4.14**, grouped by Township and by Chronological Period. The distribution of the sites are concentrated along the South Saskatchewan River valley (**Figure** 4.20). This may result in part from where archaeological studies have been done, but it also likely indicates a pattern of occupation. Experience throughout Saskatchewan indicates that major river systems were a significant attractor for Precontact people and usually exhibit high site density within the first few hundred metres from the river.

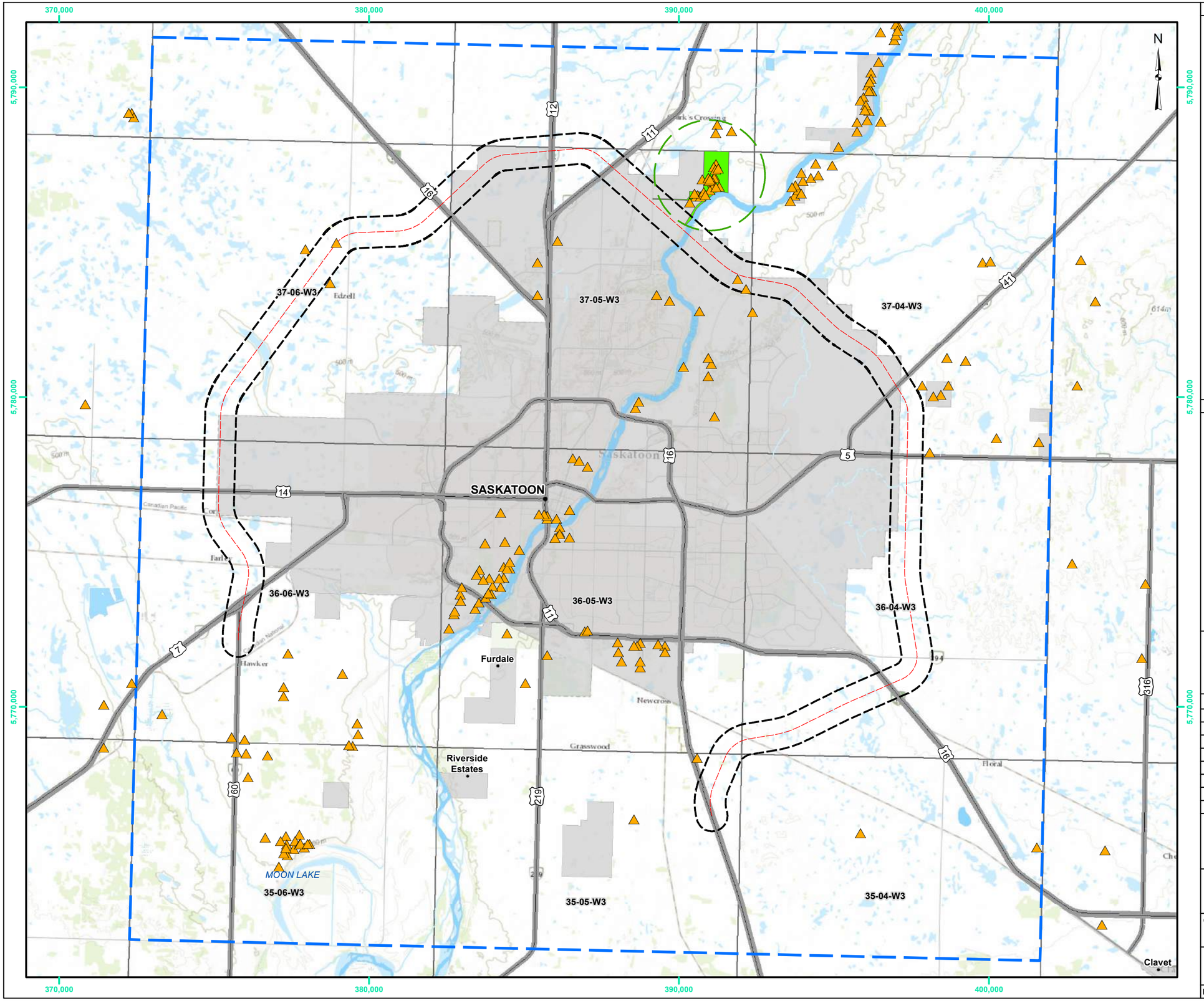
Sites are also concentrated within the Wanuskewin Heritage Park. The park is now listed on the National Register of Historic Sites (Historic Places 2019) and is under consideration as a UNESCO World Heritage site. The park contains sites representing at least 6,000 years of cultural history on the northern Plains including camp sites, tipi rings, stone cairns, bison kill sites, and a medicine wheel.

4.4.2.3.4 Cemeteries

The Saskatchewan Cemetery Index was reviewed to determine if any known cemeteries are within the proposed freeway corridor. No cemeteries were identified.

4.4.2.3.5 Homesteads

SNC-Lavalin identified 109 unique homestead applications within the proposed freeway corridor (SHI 2019; Appendix H, **Attachment I**). Some of these files may have the potential to be Contact period heritage sites which are currently not catalogued by the HCB. The existence of a homestead application file does not necessarily imply that heritage resources are present on a property. However, it indicates that historic period resources may be present and should be investigated. If historical remains are in fact present, the homestead documents are one of the initial sources in determining heritage significance.



LEGEND

- HERITAGE SITE
- PRELIMINARY FREEWAY ALIGNMENT
- HIGHWAY
- URBAN MUNICIPALITY
- PRELIMINARY FREEWAY ALIGNMENT 500 METER CORRIDOR
- HERITAGE STUDY AREA
- TOWNSHIP
- WANUSKEWIN HERITAGE PARK
- WANUSKEWIN HERITAGE PARK VISUAL BUFFER

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2016, SASKGRID2016.
3. CADASTRAL BOUNDARIES ARE FOR INFORMATIONAL PURPOSES ONLY AND SHOULD NOT BE CONSIDERED SUITABLE FOR LEGAL, ENGINEERING, OR SURVEYING PURPOSES.
4. TOPOGRAPHIC FEATURES OBTAINED FROM CANVEC V12.0 DATASET, NATURAL RESOURCES CANADA EARTH AND SCIENCES SECTOR CENTRE FOR TOPOGRAPHIC INFORMATION, 2013-09-30.
5. HIGHWAYS AND ROADS OBTAINED FROM THE NATIONAL ROAD NETWORK SASKATCHEWAN EDITION 9.0 DATASET, 2017-06-05.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 2.0 DATASET, 2016-10-06.
7. HERITAGE SITE DATA OBTAINED FROM THE HERITAGE CONSERVATION BRANCH OF SASKATCHEWAN.

DISCLAIMER

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	JL	KVG	HY	JP

0 1,250 2,500 5,000 METRES

SCALE: 1:120,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE	SASKATOON FREEWAY

TITLE

HERITAGE SITES IN THE STUDY AREA

DATE	DWG No.	FIG No.	REV
2019 08 09	659183-0000-4EDD-0020	4.20	00

SIZE 11x17

Path: \\sli1653\Projects QMS\SMH\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0020 Heritage Sites.mxd

Table 4.14 Summary of archaeological sites in the study area

	Township and Range										
Chronological Period	T35 R4	T35 R5	T35 R6	T35 R3	T36 R3	T37 R4	T37 R5	T37 R6	T38 R4	T38 R5	Total
Eurocanadian				**12**		**1**	**7**		**3**	**1**	**24**
Artifact scatter				3					1		4
Artifact/Feature combination				7		1	2		1		11
Midden				1							1
Multiple feature							3		1		4
Recurrent features							1			1	2
Single feature				1			1				2
Precontact	**2**	**2**	**23**	**38**	**8**	**22**	**28**	**2**	**14**	**2**	**141**
Artifact find	1	2	3	10	2	12	4		4		38
Artifact scatter	1		15	18	5	9	14	2	9	1	74
Artifact/Feature combination			4	10			7		1		22
Burial			1		1						2
Medicine wheel							1				1
Midden							1				1
Recurrent features						1					1
Single feature										1	1
Unknown							1				1
Precontact/Eurocanadian				**3**			**1**	**1**			**5**
Artifact scatter				1				1			2
Artifact/Feature combination				2							2
Single feature							1				1
SSN							1				1
Burial							1				1
Unknown				**4**		**1**					**5**
Artifact scatter				2		1					3
Artifact/Feature combination				1							1
Single feature				1							1
Total	**2**	**2**	**23**	**57**	**8**	**24**	**37**	**3**	**17**	**3**	**176**

5 Recommendations

This section includes recommendations for future studies and general constraints/mitigations for the entire corridor, as well as site-specific constraints/migitations for Phase 1 of the freeway (South Saskatchewan River valley, Hudson Bay swale, and Wanuskewin Heritage Park). Due to the phased nature of the functional planning study and the plans for additional survey work in 2020, site-specific constraints/migitations for Phase 2 (Northeast swale and small swale) and Phase 3 (west swale) will be described in an addendum to this report, after the MVA data is incorporated and additional survey work is complete.

5.1 Future Studies

The following studies should be conducted prior to and/or during detailed design to develop a stronger understanding of potential sensitivities and mitigation measures.

5.1.1 Areas Outside Corridor

This environmental and regulatory review was based on the proposed freeway corridor as outlined in **Figure 1.1**. Additional environmental and heritage surveys may be required for any ancillary roads, interchanges, and/or laydown areas that fall outside the corridor.

5.1.2 Surface Water and Wetlands

Surface water and wetlands are located throughout the quarter sections intersected by the freeway (**Figure 4.12**). The following studies should be conducted to better understand wetland haibitat within the corridor and to minimize impacts to surface water:

- Wetland classification surveys will be required in areas where disturbance to wetlands cannot be avoided; and
- Detailed stormwater management studies should be implemented to minimize impacts to surface water and comply with MHI's policy of maintaining existing drainage patterns.

5.1.3 Species of Conservation Concern (SOCC)

5.1.3.1.1 Species Detection Survey Recommendations

Data from the desktop review and rapid assessment surveys were used to develop recommendations for future species detection surveys that may be required in support of future permitting of the project. This report does not contain any field-based recommendations for future surveys within the area surveyed by MVA and will be amended during Phase 2.

The following general species detection surveys can detect multiple species that may use diverse and varied habitats are recommended for essentially all quarter sections within the corridor, as suitable habitat exists for at least some target species in all quarter sections:

- Grassland bird surveys;
- Snow track surveys;
- Prairie raptor surveys; and
- Rare vascular plant surveys.

Rare vascular plant surveys may not be required in a limited number of quarters that have no native habitat left (no edge habitat, wetlands, trees, ditches with native vegetation, grassland, etc). However, most quarters have at least remnant habitat left that could support rare vascular plant species. A reconnaissance wetland survey should be conducted to further identify areas for rare vascular plant surveys.

Additional species detection surveys are recommended if potential habitat for the target species was identified, or if the species itself was identified during the desktop surveys. Species detection surveys and their associated habitat are presented in **Table 5.1**. There are a number of species detection surveys that were not considered (e.g. swift fox, piping plover, western grebe, etc.) as the proposed freeway corridor is located outside the species natural range, or the habitat for these species is unlikely to be present within the proposed freeway corridor.

Table 5.1 Species detection surveys and associated habitat

Species detection survey	Target species	Associated habitat
auditory amphibian	northern leopard frog	wetlands of varying size and permanence for breeding, foraging, and overwintering. overwintering areas may also include large wetlands, rivers, lakes which do not freeze to the bottom
burrowing owl	burrowing owl	native prairie or tame pasture on rolling topography with unoccupied mammal burrows
short-eared owl	short-eared owl	tall native grass prairie or tame pasture, meadows near wetlands, and brushy grasslands with relatively few trees
sharp-tailed grouse	sharp-tailed grouse	open prairie, shrubby sandhills, coulees, and the margins of watercourses and farmland. very dependent on open grassland and shrubland for breeding and return to the same areas year after year for breeding
yellow rail	yellow rail	wetland and marsh complexes dominated by sedges and emergent vegetation. large sedge meadows that provide suitable cover for the species are preferred
common nighthawk	common nighthawk	short, sparse vegetation on flat rolling topography, including sand dunes, beaches, burned areas, forest clearings, logged areas, pastures, open forests, bogs, marshes, gravelled areas, and rocky outcrops.

Fifty-five quarter sections are recommended for one or more future habitat-specific species detection surveys (**Figure 5.1**). All recommendations are based on available habitat, as none of the target species were incidentally identified during field surveys. Habitat for a specific survey may be found throughout the quarter, or in a small portion of the quarter (e.g. a wetland with the potential for northern leopard frogs located in a corner of a quarter section). Previous studies and HABISask data identified northern leopard frogs, sharp-tailed grouse, and short-eared owls, but these locations were all within the Northeast swale and small swale, areas being surveyed by MVA. Whooping cranes were identified during the desktop survey on HABISask at one location within the proposed freeway corridor (NE 09-36-04-W3), however breeding habitat for whooping cranes was not present at this location and it is assumed they were likely observed foraging in the area during migration. Additionally, whooping cranes were not observed during field surveys and there are no species detection surveys for them in Saskatchewan. Barn swallows were also previously observed within the proposed freeway corridor, but these can be detected during future grassland bird surveys. **Table 5.2** provides the number of quarter sections that are recommended for targeted species

detection surveys. Appendix E lists each quarter section with at least one recommended survey and the types of surveys associated with that quarter.

Auditory amphibian surveys were the mostly commonly recommended habitat specific species detection survey, as potentially suitable wetlands were found throughout the study area. The target species (northern leopard frogs) will use wide varieties of wetland habitat for the varying stages of their lives, including differing wetland habitat requirements for breeding, foraging, and overwintering. These wetland areas were found distributed throughout the proposed freeway corridor, and as such any quarters with intact wetlands were recommended for future amphibian surveys.

Short-eared owl, sharp-tailed grouse, common nighthawk, and burrowing owl surveys were recommended in fewer locations, and generally these species can be found in pasture/prairie habitat that is not disturbed during the nesting season. Some examples of this may include the pasture and native dominant areas located adjacent to the swales, as well as the remnant pasture found within the proposed freeway corridor. These areas are primarily located near the Hudson Bay swale, as well as the pasture areas near the south end of Phase 2 and Phase 3.

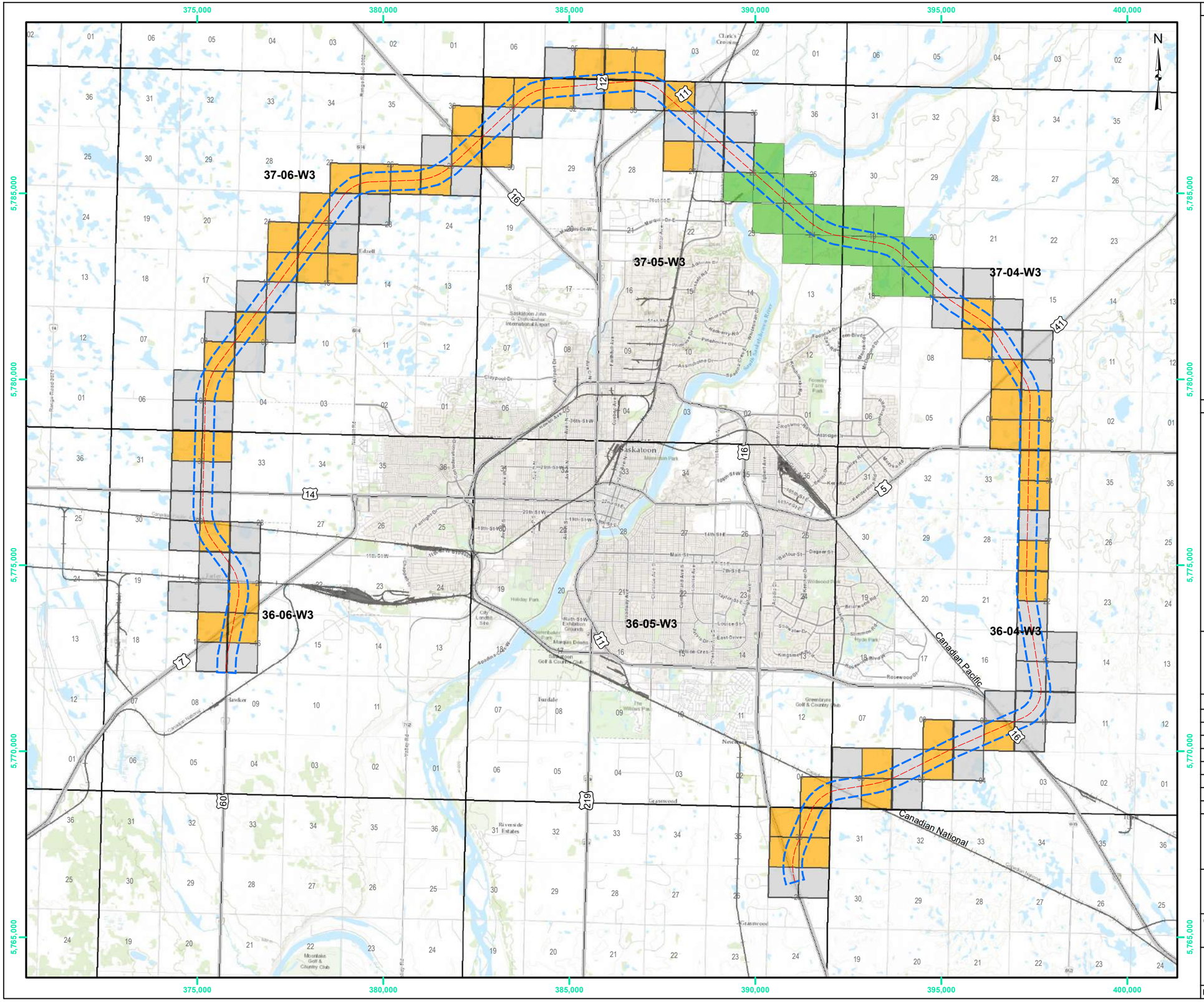
Yellow rail surveys were recommended in relatively few areas. Yellow rails tend to have very specific breeding habitat requirements, which include the requirement of dry mat of dead wetland vegetation surrounding a relatively shallow wetland (or portion thereof) from previous growing seasons (COSEWIC 2001). Many of the wetlands in the study area do not have appropriate habitat, and it is likely they may only be found adjacent to the swales and larger wetlands that have not been tilled up to the water boundary. These areas are primarily located in large wetlands such as the Hudson Bay swale and the wetland complex located in SE 06-36-04-W3.

Table 5.2 Recommendations for targeted species detection surveys

Species detection survey	Target species	Number of quarter sections
auditory amphibian	northern leopard frog	47
burrowing owl	burrowing owl	16
short-eared owl	short-eared owl	18
sharp-tailed grouse	sharp-tailed grouse	18
yellow rail	yellow rail	10
common nighthawk	common nighthawk	18

5.1.4 Heritage Resources

The proposed freeway corridor passes through lands that have been identified as Heritage Sensitive, hence, a project referral to the HCB has been submitted. This referral will initiate a review of the project and will likely identify areas that require a Heritage Resource Impact Assessment.



LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- RAILWAY
- HIGHWAY
- PROPOSED FREEWAY CORRIDOR
- GENERAL SPECIES DETECTION SURVEYS
- HABITAT SPECIFIC SPECIES DETECTION SURVEYS
- MVA SPECIES DETECTION SURVEYS

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
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REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 07 23	ISSUED FOR INFORMATION	HY	KVG	HY	JP

0 500 1,000 2,000 3,000 4,000 METRES

SCALE: 1:100,000

SNC·LAVALIN

CLIENT
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE

PROJECT LOCATION
SASKATOON FREEWAY

TITLE
QUARTERS RECOMMENDED FOR ADDITIONAL SPECIES DETECTION SURVEYS

DATE	2019 10 28	DWG No.	659183-0000-4EDD-0016	FIG No. 5.1	REV	00

SIZE 11x17

Path: \\sli1653\Projects QMS\SMH\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Biophysical\659183-0000-4EDD-0017 Quarters Additional Surveys.mxd

5.2 Routing Considerations and Mitigation Measures

5.2.1 General

Mitigation measures followed the mitigation hierarchy of Avoid, Minimimize, Offset, Reclaim (Figure 5.2).

The project team used a Multiple Account Evaluation (MAE) approach to assess preferred routing within the assigned corridor. The MAE utilizes a diverse group of agencies and groups with strong local knowledge, as well as members of the design team, participating in a design workshop to help the Ministry determine the best alignment and interchange layout for the Saskatoon Freeway. The design workshop was structured to enable an innovative atmosphere in which a diverse group of stakeholders collaborate to generate and select a framework that address the various sections of the Saskatoon Freeway. The goal of the design workshop was to provide the Province with advice on the freeway design that addresses local needs for today and meets the future capacity needs. That advice was provided after participants considered technical input from highway design specialists on road design standards, and environmental, geotechnical and safety concerns.

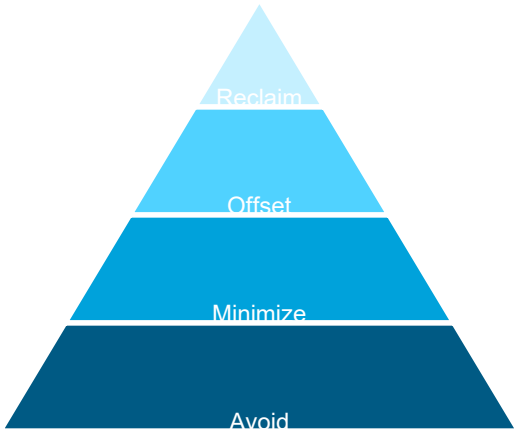

Figure 5.2 Mitigation heirarchy

The objectives of the Design Workshop were for the participants to:

- Review alternatives developed by the design team and determine if other alternatives exist;
- Provide input from the perspective of individuals who work and live in the community;
- Identify best value performance criteria and evaluate which alternative will provide the best value; and,
- Provide considerations for the design team to examine during design of the preferred alternative.

Design workshop participants were asked to provide their issues, concerns, and requirements with respect to the project, which allowed for the group to understand issues from each participant. Participants were asked to provide constructive criticism of scenarios or to identify opportunities to make the design better for road users, local municipalities or environmental effects. Several examples of issues of concern were listed to generate discussion: land issues such as severance, changing land values and encroachments, access to and from the freeway as well as across the freeway, impacts on the environment and driver comprehension (i.e. is the design confusing to motorists).

In addition to the local stakeholders, engineers were present to help explain technical issues like interchange design standards, traffic capacity and safety, constructability and cost. **Section 5.2** of the Saskatoon Freeway Functional Design Report provides additional detail regarding the design workshop for Phase 1. Additional design workshops will be completed in subsequent phases of the project using a similar process.

5.2.1.1 Surface Water and Wetlands

Wetlands are abundant throughout the project corridor and serve as important habitat for wildlife and vegetation. Wetlands are protected in Saskatchewan and proponents are required to compensate for the loss of wetland habitat (**Section 4.3.1.4**), hence, where possible, routing should aim to minimize the total area of wetland habitat affected. For areas where impacts to wetlands are unavoidable, the following mitigations should be considered to reduce impacts:

- A drainage plan should be developed to preserve drainage patterns and minimize potential impacts to the surrounding surface water system. For example, surface water inputs into adjacent wetlands should not cause adverse impacts to the ecological function of undisturbed areas;
- Ancillary roads and laydown areas should avoid wetland habitat where possible;
- An Aquatic Habitat Protection Permit (AHPP) in accordance with *The Environmental Management and Protection Act, 2010* should be obtained for works within the bed, bank, or boundary of a waterbody / wetland, or discharge with adverse effects on water;
- A Drainage Permit may be required for effects to drainage;
- Erosion and sediment control measures should be implemented to protect adjacent wetland areas and the river valley;
- Where impacts to wetlands cannot be avoided, wetland compensation and monitoring should be conducted; and
- Pre-construction species detection surveys for SOCC (e.g. northern leopard frog) should be conducted in wetlands with the potential to support SOCC, followed by suitable mitigation where required.

5.2.1.2 Native Grasslands

Unseeded grassland comprises 14.2% of the project corridor and provides important habitat for a variety of wildlife species. Proponents in Saskatchewan may be required to compensate for the loss of grassland habitat (i.e. compensation has been a condition in some recent ministerial decisions), hence, where possible, routing should aim to minimize the total area of grassland habitat affected. For areas where impacts to grasslands are unavoidable, the following mitigations should be considered to reduce impacts:

- Ancillary and/or temporary construction roads and laydown areas should avoid grassland habitat where possible;
- Disturbed areas should be restored to grassland habitat using native species and compensation for loss of native grasslands should be considered where permanent impacts cannot be avoided; and
- Pre-construction species detections surveys for SOCC should be conducted in native prairie/pasture areas with the potential to support SOCC, followed by suitable mitigation where required.

5.2.1.3 Wildlife and Species of Conservation Concern

A large diversity of wildlife, including Species of Conservation Concern (SOCC) and Species at Risk (SAR), were identified within the proposed freeway corridor. Additional species and occurrences of SOCC and SAR are likely to be identified as more surveys are completed (**Section 5.1.2**). The majority of wildlife and bird species in Saskatchewan are protected by provincial and federal legislation, hence, where possible, routing should aim to minimize effects to areas of important wildlife habitat. There are additional legal protections for SOCC and SAR. Where routing cannot avoid crossing into habitat utilized by wildlife and SOCC/SAR, the following mitigations should be considered to reduce impacts:

- Consider the Environment and Climate Change Canada (ECCC) avoidance guidelines for breeding birds when scheduling construction activities;
- Conduct breeding bird surveys prior to and during construction during the general nesting period;

- Consider design measures that employ strategies to preserve wildlife movement corridors;
- Acquire permits for relocation or removal of wild species, if appropriate;
- Construction activities should consider the restricted activity timing windows for the protection of fish and fish habitat outlined by Fisheries and Oceans Canada (DFO 2013).
- Conduct pre-construction surveys in areas where SOCC/SAR have potential to be found;
- Establish setbacks around wildlife and plant SOCC occurrences prior to construction in accordance with the Saskatchewan Activity Restriction Guidelines (ARGs). Contact ENV or ECCC if project activities fall within listed setback distances;
- Implement construction options that caused the minimal loss of SOCC/SAR habitat, such as bridging over sensitive habitat;
- Implement wildlife crossings to maintain a naturalized connection between habitat on either side of the proposed freeway;
- Consider the implementation of exclusion barriers on the underside of bridge structures to prevent birds roosting on infrastructure; and
- Consider implementing design options that reduce sensory impacts to wildlife (noise, light pollution), such as reduce lighting, dark-sky compliant lighting, sound barriers, etc.

5.2.1.4 Heritage Resources

The proposed freeway corridor passes through areas that have the potential to contain heritage resources, ranging from the earliest occupations to more recent homestead sites. The presence of a concentration of important heritage resources at Wanuskewin Heritage Park highlights the potential of some portions of the proposed freeway route to affect heritage resources. Some of these heritage resources may be sufficiently significant to require extensive mitigation or even require avoidance, and this can affect both the project design and timetable.

5.2.1.5 Contaminated Sites

The potential for contamination exists in areas with current or previous industrial activity. Prior to construction, a Phase 1 Environmental Site Assessment should be completed to identify areas have the potential for contamination. This will allow for the development of a suitable mitigation plan and facilitate estimating costs associated with contaminated material clean-up and/or hauling.

5.2.2 Phase 1

5.2.2.1 South Saskatchewan River Crossing

The South Saskatchewan River valley is an ecologically important feature, serves as a natural corridor for wildlife movement, habitat for fish species, and has a high potential for archaeological finds. As such the location of the crossing should be chosen to minimize disturbance to the channel and banks as much as possible. The following mitigations should be employed for the river crossing:

- Bridge elevation should ensure that wildlife movement through the river valley is preserved;
- Consider the implementation of exclusion barriers on the underside of bridge structures to prevent birds roosting on infrastructure;
- Placement and size of bridge abutments should be considered and minimized as much as practical so that disturbance to the banks is reduced;
- Placement and size of the piers should be minimized as much as practical to limit impacts to fish habitat within the river channel. Compensation for disturbance to fish habitat will likely be required once the final design of the piers and construction plans are known;

- Measures to protect the water quality in the river (i.e. as a result of spills and/or road salt/gravel application) should be considered in bridge designs;
- Species specific surveys for SOCC should be conducted in the river valley prior to disturbance and suitable mitigation measures should be developed based on the results; and
- Construction activities should consider the restricted activity timing windows for the protection of fish and fish habitat outlined by Fisheries and Oceans Canada (DFO 2013).

5.2.2.2 Hudson Bay Swale

The Hudson Bay swale is an ecologically sensitive feature and is being considered for future inclusion into the City's natural area protection plan (pers. comm. Genevieve Russell). Based on this, project designs should consider avoiding or minimizing direct impacts to the Hudson Bay swale where possible. Should impacts to the Hudson Bay swale be unavoidable the following mitigations should be employed:

- Measures to preserve drainage in unimpacted areas of the swale should be taken;
- If the swale forms part of the road drainage network, measures should be taken to ensure that surface water inputs into the swale do not cause adverse impacts to the ecological function. This could include pre-treatment of road runoff using forebay systems and installation of permanent erosion and sediment control measures;
- Implement wildlife crossings to maintain a naturalized connection between habitat on either side of the proposed freeway;
- Consider implementing design options that reduce sensory impacts to wildlife (e.g. noise, light pollution), such as reduce lighting, dark-sky compliant lighting, sound barriers, etc.;
- Depending on the regulatory regime in place at the time of construction, compensation for impacts to this feature may be required;
- Consider restoration of previously impacted areas of the swale as a component of the compensation plan; and
- Species specific surveys for SOCC should be conducted in the swale prior to disturbance and suitable mitigation measures should be developed based on the results.

5.2.2.3 Wanuskewin Heritage Park

Wanuskewin Heritage Park is located northeast of the proposed freeway corridor and is classified as a provincial heritage site. The proposed freeway corridor intersects the 1.8 km radial buffer surrounding the park (**Section 4.4.1**). The area in and adjacent to the park has a high potential to contain heritage resources. Additionally, Wanuskewin is seeking UNESCO World Heritage status which requires natural landscapes adjacent to the park to be preserved. The following mitigations are recommended in areas adjacent to Wanuskewin Heritage Park:

- Heritage assessment of the proposed corridor should be undertaken early in the planning and design process and a suitable mitigation plan should be developed;
- Freeway designs in the vicinity of Wanuskewin should include considerations for viewscape to preserve views from the west edge of the Park; and
- Freeway designs in the vicinity of Wanuskewin should include considerations for noise mitigation to preserve sound levels in the Park. A noise study should be conducted in future planning stages to better understand the potential for noise impacts.

5.2.3 Phase 2

Specific mitigation measures for Phase 2 will be developed once additional survey work is complete.

5.2.4 Phase 3

Specific mitigation measures for Phase 3 will be developed once additional survey work is complete.

6 Closure

This Environmental and Regulatory Review been prepared by SNC-Lavalin Inc. to support the Ministry of Highways and Infrastructure Saskatoon Freeway Functional Planning Study.

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Environment & Geoscience
Engineering, Design and Project Management

7 References

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Appendix A

Provincial and Federal Status Rankings

Table A.I Provincial species rank definitions
Table A.II Codes and modifiers used to further describe provincial species rankings
Table A.III Federal species rank definitions

Table A.I Provincial species rank definitions

Rank	Status	Definition
S1	critically imperiled	at very high risk of extirpation in Saskatchewan due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors
S2	imperiled	at high risk of extirpation in Saskatchewan due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors
S3	vulnerable	at moderate risk of extirpation in Saskatchewan due to a restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors
S4	apparently secure	at a fairly low risk of extirpation in Saskatchewan due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of recent declines, threats, or other factors
S5	secure	at very low or no risk of extirpation in Saskatchewan due to an extensive range, abundant populations or occurrences, with little to no concern from declines or threats

Ranks provided by the SKCDC are intended to indicate a species' risk of extirpation. They do not necessarily reflect its management priority. In addition, some species may be rare in the province yet not at risk of extirpation" (SKCDC 2019e)

Table A.II Codes and modifiers used to further describe provincial species rankings

Code	Definition
SH	historical occurrence but without recent verification (e.g. within 20 years)
SU	status uncertain in Saskatchewan because of limited or conflicting information (unraked)
SX	believed to be extinct or extirpated from the province
SNR	rank is not yet assigned, or species has not yet been assessed (not ranked)
SNA	conservation status is not applicable to the species (includes introduced species)

Species rank modification codes provided by the SKCDC (2019e)

Table A.III Federal species rank definitions

Rank	Definition
Extinct (X)	a species that no longer exists
Extirpated (XT)	a species no longer existing in the wild in Canada, but occurring elsewhere
Endangered (E)	a species facing imminent extirpation or extinction
Threatened (T)	a species likely to become endangered if limiting factors are not reversed
Special Concern (SC)	a species that is particularly sensitive to human activities or natural events but is not an endangered or threatened species
Data Deficient (DD)	a species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction
Not at Risk (NAR)	a species that has been evaluated and found to be not at risk

Species rank modification codes provided by COSEWIC (SKCDC 2019e)

Appendix B

Soil Classification and Capability Class Information

Table B.I Soil map units occurring within the vegetation and soils study area
Table B.II Soil capability classes occurring within the vegetation and soils study area

Table B.I Soil map units occurring within the vegetation and soils study area

Map Unit	Soil Association	Soil Type Distribution	Associated Landforms
Aq 1	Asquith	dominantly Orthic dark brown soils	gently to roughly undulating, with knolls and depressions
Aq 3	Asquith	dominantly Orthic dark brown soils, with Chernozemic soils	gently to roughly undulating, with knolls and depressions
Aq 6	Asquith	combination of Chernozemic and Gleysolic soils, with high salinity areas and poorly-drained soil in depressions	gently to roughly undulating, with knolls and depressions
Bg 3	Biggar	dominantly Orthic dark brown soils, with a combination of Carbonated and/or Saline Chernozemic soils on lower slopes and knolls	gently undulating, with knolls and depressions
BgWr 4	Biggar-Weyburn	dominantly Orthic Biggar soils, with Weyburn soils occurring randomly on eroded tills	gently undulating, with unpatterned and outwash plains
Br 1	Bradwell	dominantly Orthic dark brown soils	gently to roughly undulating, weakly patterned, with knolls and drained depressions
Br 3	Bradwell	dominantly Orthic dark brown soils, with Eluviated dark brown soil in eroded areas	gently to roughly undulating, weakly patterned, with knolls and depressions
BrBg 1	Bradwell-Biggar	dominantly Orthic Bradwell soils, with Biggar soils occurring randomly on slopes	gently to roughly undulating, weakly patterned, with knolls and depressions
BrWr 8	Bradwell-Weyburn	dominantly Orthic Bradwell soils, with Weyburn soils occurring randomly on glacial tills	gently to roughly undulating, weakly patterned, with knolls and depressions
Ew 3	Elstow	dominantly Orthic dark brown soils, with Eluviated dark brown soil	gently to roughly undulating, weakly patterned, with knolls and depressions, or gently to moderately sloping and dissected
EwBr 3	Elstow-Bradwell	dominantly Orthic Elstow soils, with Bradwell soils occurring randomly on slopes Elstow soils may be found on upper or lower slopes	roughly undulating, weakly patterned, with knolls and depressions
EwHy 1	Elstow-Hanley	dominantly Orthic Elstow soils, with Hanley soils occurring randomly on slopes Elstow soils may be found on upper or lower slopes	gently undulating and unpatterned or weakly patterned, with knolls and depressions
EwSu 7	Elstow-Sutherland	dominantly Orthic Elstow soils, with Sutherland soils occurring randomly on slopes Elstow soils may be found on upper or lower slopes	roughly undulating, weakly patterned, with knolls and depressions
Hw	Hillwash	mixture of Regosolic soils on steep, eroding slopes and Chernozemic soils on gentle slopes	glacial drainage channel with steep sloping
Hy 1	Hanley	dominantly dark brown Solonetzic soils, with a combination of Solonetz, Solodized Solonetz, and Solod soils	gently undulating, with knolls and depressions, and dissected
Rw	Runway	mixture of Regosolic soils on upper portions of steep slopes and Chernozemic soils on mid-portions of steep slopes Gleysolic soils may occur in poorly drained systems	moderately sloping, with eskers, and ridge moraines
StWr 4	Scott-Weyburn	dominantly Orthic Elstow soils occurring on lower slopes, with Weyburn soils occurring randomly on glacial tills	roughly undulating with knolls and depressions
Su 2	Sutherland	dominantly Orthic dark brown soils on lower and mid-slopes, with Rego dark brown soil on upper slopes	roughly undulating with knolls and depressions

Map Unit	Soil Association	Soil Type Distribution	Associated Landforms
SuEw 1	Sutherland-Elstow	dominantly Orthic Sutherland soils, with Elstow soils occurring randomly in lake marginal areas	roughly undulating and unpatterned
Tu 1	Tuxford	dominantly dark brown Solonetz soils on upper slopes, with Solod soil on lower flats and depressions	gently to roughly undulating and unpatterned or weakly patterned, with knolls and depressions, or dissected
TuEw 4	Tuxford-Elstow	dominantly Solonetz Tuxford soils, with Elstow soils occurring randomly in lake marginal areas	roughly undulating, with knolls and depressions
Vr 4	Valor	dominantly Orthic Regosol soils	weak dunes, with undulating and gently rolling aeolian plains
Wr 4	Weyburn	dominantly Orthic dark brown soils, combinations of Calcareous and Orthic Regosol soils	gently rolling, with knob and kettle, and dissected moraine
WrAq 1	Weyburn-Asquith	dominantly Orthic Weyburn soils occurring on upper slopes, with Asquith soils occurring randomly on lower slopes	roughly undulating and unpatterned
WrBg 1	Weyburn-Biggar	dominantly Orthic Weyburn soils, with Asquith soils occurring randomly on slopes Weyburn soils are scattered throughout all slope positions	gently undulating with knolls and depressions
WrBr 4	Weyburn-Bradwell	dominantly Orthic Weyburn soils occurring on upper slopes, with Bradwell soils occurring randomly on lower slopes	gently undulating with knolls and depressions

Source: (Acton and Ellis 1978).

Table B.II Soil capability classes occurring within the vegetation and soils study area

Map Unit	Capability Classes Present	Soil Limitations	Landscape Limitations	Climatic Limitations
2(6)C 3(4)M	Class 2 (60%) Class 3 (40%)	insufficient soil moisture holding capacity		moisture deficiency due to insufficient precipitation
3(6)M 4(4)M	Class 3 (60%) Class 4 (40%)	insufficient soil moisture holding capacity		
3(7)MT 4(3)M	Class 3 (70%) Class 4 (30%)	insufficient soil moisture holding capacity	unfavorable topography	
3(8)M 2(2)C	Class 3 (80%) Class 2 (20%)	insufficient soil moisture holding capacity		moisture deficiency due to insufficient precipitation
3(8)MT 4(2)E	Class 3 (80%) Class 4 (20%)	insufficient soil moisture holding capacity	unfavorable topography, erosion limitations	
3(8)M 4(2)D	Class 3 (80%) Class 4 (20%)	insufficient soil moisture holding capacity	poor structure and/or permeability	
3(8)M 5(2)W	Class 3 (80%) Class 5 (20%)	insufficient soil moisture holding capacity	excess water not caused by flooding	
3(9)MT 5(1)W	Class 3 (90%) Class 5 (10%)	insufficient soil moisture holding capacity	unfavorable topography, excess water not caused by flooding	
3(10)M	Class 3 (100%)	insufficient soil moisture holding capacity		
3(10)ME	Class 3 (100%)	insufficient soil moisture holding capacity	erosion limitations	
4(7)MP 3(3)M	Class 4 (70%) Class 3 (30%)	insufficient soil moisture holding capacity	excess stoniness	
4(7)M 5(3)MN	Class 4 (70%)			

Map Unit	Capability Classes Present	Soil Limitations	Landscape Limitations	Climatic Limitations
	Class 5 (30%)	insufficient soil moisture holding capacity, excessive soil salinity		
4(10)M	Class 4 (100%)	insufficient soil moisture holding capacity		
4(10)MN	Class 4 (100%)	insufficient soil moisture holding capacity, excessive soil salinity		
4(10)MP	Class 4 (100%)	insufficient soil moisture holding capacity	excess stoniness	
5(5)M 6(5)MP	Class 5 (50%) Class 6 (50%)	insufficient soil moisture holding capacity	excess stoniness	
5(6)M 4(4)M	Class 5 (60%) Class 4 (40%)	insufficient soil moisture holding capacity		
5(6)M 4(4)MP	Class 5 (60%) Class 4 (40%)	insufficient soil moisture holding capacity	erosion limitations	
5(10)MF	Class 5 (100%)	insufficient soil moisture holding capacity	erosion limitations	
5(10)TP	Class 5 (100%)		unfavorable topography, excessive stoniness	
5(10)WN	Class 5 (100%)	excessive soil salinity	excess water not caused by flooding	
6(10)TE	Class 6 (100%)		unfavorable topography, erosion limitations	
6(10)W	Class 6 (100%)		excess water not caused by flooding	
7(10)W	Class 7 (100%)		excess water not caused by flooding	

Appendix C

Plant Species of Conservation Concern with Occurrences in the Landscape Areas

Table C.I Plant SOCC with occurrences in the Saskatoon Plain, Moose Wood Sand Hills, Minichinas Upland, and Elstow Plain Landscape Areas

Table C.I Plant SOCC with occurrences in the Saskatoon Plain, Moose Wood Sand Hills, Minichinas Upland, and Elstow Plain Landscape Areas

Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	Habitat Association
Achnatherum nelsonii ssp. dorei	Columbia needlegrass	Poaceae	S3	no status	no status	prairie hillsides and flats, meadows, open woods, clearings
Alisma gramineum	narrow-leaved water plantain	Alismataceae	S3	no status	no status	wet to drying mudflats, muddy shores, wet to drying wetland edges and seasonal wetlands
Allium cernuum var. cernuum	nodding onion	Liliaceae	S1	no status	no status	woodlands, upland prairies
Almutaster pauciflorus	few-flowered aster	Asteraceae	S3	no status	no status	saline seasonal wetlands and mudflats, damp alkaline soils
Amaranthus californicus	California amaranth	Amaranthaceae	S2	no status	no status	lake shores, roadsides, waste places
Ambrosia acanthicarpa	bur ragweed	Asteraceae	S2	no status	no status	dry, active to semi-stabilized sand dunes
Amphiscirpus nevadensis	Nevada bulrush	Cyperaceae	S3	no status	no status	saline and often alkaline seasonal wetlands, streams
Anagallis minima	chaffweed	Primulaceae	S3	no status	no status	drying slough margins, prairie depressions
Antennaria dimorpha	low pussytoes	Asteraceae	S2	no status	no status	dry sand, silt, gravel, or clay in short-grass prairie
Astragalus australis	Indian milk-vetch	Fabaceae	S3	no status	no status	gravel banks along rivers, gravel slopes
Astragalus purshii var. purshii	Pursh's milk-vetch	Fabaceae	S3	no status	no status	eroded short-grass and mixed-grass prairie
Bidens frondosa	tall beggar's-ticks	Asteraceae	S3	no status	no status	roadsides, railroads, wetland margins, ditches
Blysmopsis rufa	red bulrush	Cyperaceae	S3	no status	no status	seepy, often calcareous sedge meadows, fens, saline wetlands
Botrychium campestre	prairie dunewort	Ophioglossaceae	S2	no status	no status	open grassland, stabilized sand dune meadows, calcareous or alkaline prairie
Botrychium lunaria	common moonwort	Ophioglossaceae	S1	no status	no status	semi-open to open woods, moist meadows
Botrychium minganense	Mingan moonwort	Ophioglossaceae	S1	no status	no status	mesic open aspen woods and ditches; open fields and meadows, gravel slopes, shores
Botrychium pallidum	pale moonwort	Ophioglossaceae	S1	no status	no status	moist shrubby meadows, open regrowth woods
Cardamine nymanii	meadow bitter cress	Brassicaceae	S3	no status	no status	bogs, swampy sites
Carex crawei	Crawe's sedge	Cyperaceae	S3	no status	no status	seepy, often calcareous sedge meadows, fens, bogs, shores
Carex eburnea	bristle-leaved sedge	Cyperaceae	S3	no status	no status	open or semi-open moist woodlands, calcareous springs and seeps
Carex hystericina	porcupine sedge	Cyperaceae	S3	no status	no status	wet woods, moist meadows, muddy spring and brook margins
Carex saximontana	Rocky Mountain sedge	Cyperaceae	S3	no status	no status	moist to dry shaded deciduous woods, valleys, shrub thickets
Castilleja coccinea	scarlet paintbrush	Scrophulariaceae	S1	no status	no status	moist meadows, open woods, roadsides
Chenopodium desiccatum	dry goosefoot	Chenopodiaceae	S3	no status	no status	sand dunes
Chenopodium subglabrum	smooth goosefoot	Chenopodiaceae	S3	Threatened	Schedule 1, Threatened	active to stabilized sand dune blowouts
Cirsium drummondii	short-stemmed thistle	Asteraceae	S3	no status	no status	open prairies and woods
Corallorhiza striata var. striata	striped coral-root	Orchidaceae	S3	no status	no status	moist deciduous woods
Corispermum americanum var. americanum	American bugseed	Chenopodiaceae	S3	no status	no status	sandy shores and prairies, sand dunes, disturbed roadsides, old fields
Corispermum hookeri var. hookeri	Hooker's bugseed	Chenopodiaceae	S2	no status	no status	sandy and gravely shores of rivers and streams, sand dunes
Corispermum pallasii	Pallas' bugseed	Chenopodiaceae	S2	no status	no status	sandy dunes, sandy and gravelly shores, waste places
Corispermum villosum	hairy bugseed	Chenopodiaceae	S2	no status	no status	sandy pine barrens, shores, sand dune blowouts, roadsides, sandy waste places, old fields
Crepis runcinata ssp. hispidulosa	smooth hawk's-beard	Asteraceae	S1	no status	no status	moist saline meadows
Cyperus schweinitzii	Schweinitz's flatsedge	Cyperaceae	S3	no status	no status	active sand dune blowouts
Cyperus squarrosus	awned cyperus	Cyperaceae	S3	no status	no status	moist to drying mudflats, wetland bottoms, tilled depressions
Cyperus strigosus	straw-colored umbrella-sedge	Cyperaceae	SH	no status	no status	shores of Little Manitou Lake
Cypripedium parviflorum var. makasin	small yellow lady's slipper	Orchidaceae	S3	no status	no status	rich, moist, semi-open woodland, moist to wet meadows, stream margins, bogs, fens
Cypripedium parviflorum var. pubescens	large yellow lady's-slipper	Orchidaceae	S2	no status	no status	moist grassland, bogs, wet meadows, moist deciduous woods
Dalea villosa var. villosa	hairy prairie clover	Fabaceae	S2	Special Concern	Schedule 1, Special Concern	stabilized to semi-active sand dune blowouts
Elatine triandra	longstem water-wort	Elatinaceae	S2	no status	no status	moist to drying mudflats, wetland bottoms, tilled depressions
Eleocharis elliptica	slender spike-rush	Cyperaceae	S3	no status	no status	seepy, often calcareous sedge meadows, fens, bogs, shores
Eleocharis engelmannii	Engelmann's spike-rush	Cyperaceae	S3	no status	no status	moist to drying mudflats, wetland bottoms, tilled depressions
Elodea canadensis	Canada waterweed	Hydrocharitaceae	S3	no status	no status	shallow, quiet waters of calcareous lake bays, stream margins, alkaline ponds

Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	Habitat Association
Elymus glaucus ssp. glaucus	blue wild rye	Poaceae	S3	no status	no status	dry to moist open woodlands, shrublands, and meadows
Elymus lanceolatus ssp. psammophilus	sand-dune wheatgrass	Poaceae	S2	no status	no status	active sand dune blowouts
Erigeron strigosus var. strigosus	daisy fleabane	Asteraceae	S3	no status	no status	sandy, clay, shale, and alkaline soils in grasslands, shores, forest clearings
Festuca hallii	plains rough fescue	Poaceae	S3	no status	no status	dry to mesic open prairie
Festuca idahoensis	Idaho fescue	Poaceae	S1	no status	no status	open wooded slopes, brushy high meadows
Gentiana fremontii	moss gentian	Gentianaceae	S3	no status	no status	calcareous and saline soil in springy meadow depressions
Gentiana puberulenta	downy gentian	Gentianaceae	SH	no status	no status	mesic prairie
Gentianopsis virgata ssp. virgata	lesser fringed gentian	Gentianaceae	S3	no status	no status	calcareous and saline soil in springy meadow depressions
Hornungia procumbens	oval-purse	Brassicaceae	S3	no status	no status	clayey saline areas
Impatiens noli-tangere	yellow touch-me-not	Balsaminaceae	S2	no status	no status	shaded wet meadows, moist woodlands, streambanks
Iris versicolor	blueflag	Iridaceae	S1	no status	no status	wet ditches, wetland margins, shorelines
Lactuca biennis	tall blue lettuce	Asteraceae	S3	no status	no status	moist woods and shrub thickets
Lomatogonium rotatum	marsh felwort	Gentianaceae	S3	no status	no status	calcareous and saline soil in springy meadow depressions
Lupinus pusillus ssp. pusillus	small lupine	Fabaceae	S3	no status	no status	dry sandy soils, stabilized sand dunes
Marsilea vestita	pepperwort	Marsileaceae	S3	no status	no status	seasonal wetlands, wet depressions, river floodplains
Monarda fistulosa var. mollis	soft wild bergamot	Lamiaceae	S3	no status	no status	mesic to dry shrublands, meadows, open woodlands
Myosurus apetalus var. montanus	bristly mousetail	Ranunculaceae	S2	no status	no status	wetland margins, mudflats, tilled depressions
Myosurus minimus	least mousetail	Ranunculaceae	S3	no status	no status	wetland margins, alkaline mudflats, tilled depressions
Najas flexilis	flexible naiad	Najadaceae	S3	no status	no status	shallow freshwater ponds, lake bays, slow streams
Oenothera caespitosa ssp. caespitosa	gumbo evening primrose	Onagraceae	S3	no status	no status	dry, clayey hillsides, gumbo flats
Platanthera dilatata var. dilatata	scentbottle	Orchidaceae	S3	no status	no status	spruce woods with open muskeg, calcareous wet meadows, fens, bogs
Polygala alba	white milkwort	Polygalaceae	S3	no status	no status	eroded or stony grassland slopes and coulees
Potamogeton strictifolius	upright narrow-leaved pondweed	Potamogetonaceae	S3	no status	no status	submersed in quiet, often saline or alkaline semi-permanent to permanent wetlands and lakes
Potentilla anserina ssp. yukonensis	Yukon silverweed	Rosaceae	S2	no status	no status	dry, sandy and gravelly stream and lakeshores, grasslands, open pine woodlands, waste places
Potentilla concinna var. concinna	early cinquefoil	Rosaceae	S2	no status	no status	dry, open sandy prairie slopes and coulees
Potentilla effusa var. effusa	branched cinquefoil	Rosaceae	S2	no status	no status	dry, rocky slopes, slightly moist meadows, grasslands, limestone grasslands
Potentilla hudsonii	Hudson's cinquefoil	Rosaceae	S2	no status	no status	dry, rocky slopes, sand dune blowouts, open spots in thin-soiled and/or heavily grazed prairie
Potentilla lasiodonta	sandhills cinquefoil	Rosaceae	S2	no status	no status	dry, sandy prairies
Potentilla rubricaulis	red-stemmed cinquefoil	Rosaceae	S3	no status	no status	dry, sandy prairies, open pine woods
Potentilla supina ssp. paradoxa	bushy cinquefoil	Rosaceae	S3	no status	no status	sandy lakeshores, riverbanks, wetland margins, low moist places on sandy soil
Rhinanthus minor ssp. minor	yellow-rattle	Scrophulariaceae	S2	no status	no status	moist open woodlands
Ribes oxyacanthoides ssp. setosum	bristly gooseberry	Grossulariaceae	S2	no status	no status	stream banks, rocky slopes, open woodlands
Rorippa curvipes	curved yellow-cress	Brassicaceae	S3	no status	no status	non-alkaline, drying mudflats and edges of wetlands in sandy or clay soil
Rosa blanda	smooth wild rose	Rosaceae	S1	no status	no status	riparian woods and shrub thickets
Ruppia maritima	beaked ditch-grass	Ruppiaceae	S3	no status	no status	submersed in quiet, often saline or alkaline semi-permanent to permanent wetlands and lakes
Sambucus racemosa ssp. pubens	red elderberry	Caprifoliaceae	S2	no status	no status	semi-open deciduous or mixed woods
Sceptridium multifidum	leathery grape-fern	Ophioglossaceae	S3	no status	no status	mesic to wet, sandy, open shrub thickets and woods
Scirpus pallidus	pale bulrush	Cyperaceae	S3	no status	no status	marshy shores, moist ravine bottoms, seasonal wetland zones, stream banks, ditches
Shinnersoseris rostrata	beaked annual skeleton-weed	Asteraceae	S2	no status	no status	dry, sandy soil in semi-active to stabilized sand dunes
Silene menziesii	Menzies' catchfly	Caryophyllaceae	S3	no status	no status	woodlands, clearings, grasslands, gravelly places, riverbanks
Sisyrinchium mucronatum	mucronate blue-eyed-grass	Iridaceae	S3	no status	no status	moist or seasonally moist grassland
Sisyrinchium septentrionale	northern blue-eyed-grass	Iridaceae	S3	no status	no status	dry to moist meadows, stream banks, often in gravelly soil
Sporobolus neglectus	small dropseed	Poaceae	S2	no status	no status	dry and often disturbed sand or gravel barrens, dry open ground, rocky waste places, urban sites
Teucrium canadense var. occidentale	hairy germander	Lamiaceae	S3	no status	no status	temporary wetland margins, moist meadows, prairie depressions

Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	Habitat Association
Trichophorum pumilum	dwarf clubrush	Cyperaceae	S1	no status	no status	moist to wet alkaline marshes, shorelines, floodplains, boggy pond margins
Viola pedatifida	crowfoot violet	Violaceae	S3	no status	no status	dry to mesic grasslands and coulees with well-drained soils

Source: (COSEWIC 2000 and 2006; Ertter 2018; Flora of North America Editorial Committee 1993+; Government of Canada 2019; Harms and Leighton 2011a, 2011b, and 2014; Harms et al. 2018; Leighton 2012; Looman and Best 1987; Moss 1994; SKCDC 2019a and 2019b; W.P. Fraser Herbarium 2006)

Appendix D

HABISask Query Results

Table D.I Plant SOCC element occurrences

Table D.II Wildlife SOCC element occurrences

Table D.I Plant SOCC element occurrences

Element Occurrence ID	Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Vegetation and Soils Study Area?
16876	*Achnatherum nelsonii ssp. dorei*	Columbia needlegrass	Poaceae	S3	not ranked	not ranked	1938	no
999948723	*Alisma gramineum*	narrow-leaved water plantain	Alismataceae	S3	not ranked	not ranked	2013	no
999948724	*Alisma gramineum*	narrow-leaved water plantain	Alismataceae	S3	not ranked	not ranked	2013	no
999948725	*Alisma gramineum*	narrow-leaved water plantain	Alismataceae	S3	not ranked	not ranked	2013	no
999958797	*Alisma gramineum*	narrow-leaved water plantain	Alismataceae	S3	not ranked	not ranked	2012	no
999958999	*Alisma gramineum*	narrow-leaved water plantain	Alismataceae	S3	not ranked	not ranked	2012	yes
999969205	*Alisma gramineum*	narrow-leaved water plantain	Alismataceae	S3	not ranked	not ranked	1956	no
999974283	*Alisma gramineum*	narrow-leaved water plantain	Alismataceae	S3	not ranked	not ranked	1995	no
9052	*Almutaster pauciflorus*	few-flowered aster	Asteraceae	S3	not ranked	not ranked	1965	yes
999973151	*Amaranthus californicus*	California amaranth	Amaranthaceae	S3	not ranked	not ranked	1979	no
1792	*Anagallis minima*	chaffweed	Primulaceae	S3	not ranked	not ranked	1952	no
9186	*Anagallis minima*	chaffweed	Primulaceae	S3	not ranked	not ranked	1965	no
944	*Astragalus australis*	Indian milk-vetch	Fabaceae	S3	not ranked	not ranked	1972	no
1066	*Astragalus australis*	Indian milk-vetch	Fabaceae	S3	not ranked	not ranked	1972	no
6715	*Astragalus australis*	Indian milk-vetch	Fabaceae	S3	not ranked	not ranked	1970	no
999974649	*Astragalus australis*	Indian milk-vetch	Fabaceae	S3	not ranked	not ranked	2001	no
999948726	*Astragalus purshii var. purshii*	Pursh's milk-vetch	Fabaceae	S3	not ranked	not ranked	2013	no
999974298	*Bidens frondosa*	tall beggar's-ticks	Asteraceae	S3	not ranked	not ranked	1996	no
999976532	*Bidens frondosa*	tall beggar's-ticks	Asteraceae	S3	not ranked	not ranked	1992	no
999976533	*Bidens frondosa*	tall beggar's-ticks	Asteraceae	S3	not ranked	not ranked	1992	no
1253	*Blysmopsis rufa*	red bulrush	Cyperaceae	S3	not ranked	not ranked	1940	no
10941	*Blysmopsis rufa*	red bulrush	Cyperaceae	S3	not ranked	not ranked	1993	no
16582	*Blysmopsis rufa*	red bulrush	Cyperaceae	S3	not ranked	not ranked	1951	no
999954865	*Botrychium campestre*	prairie dunewort	Ophioglossaceae	S2	not ranked	not ranked	1994	yes
999954866	*Botrychium campestre*	prairie dunewort	Ophioglossaceae	S2	not ranked	not ranked	1994	no
999974501	*Botrychium pallidum*	pale moonwort	Ophioglossaceae	S1	not ranked	not ranked	1994	no
4221	*Carex crawei*	Crawe's sedge	Cyperaceae	S3	not ranked	not ranked	1970	no
6393	*Carex crawei*	Crawe's sedge	Cyperaceae	S3	not ranked	not ranked	1972	no
10940	*Carex crawei*	Crawe's sedge	Cyperaceae	S3	not ranked	not ranked	1993	yes
999976298	*Carex crawei*	Crawe's sedge	Cyperaceae	S3	not ranked	not ranked	1970	no
999974512	*Carex eburnea*	bristle-leaved sedge	Cyperaceae	S3	not ranked	not ranked	1993	no
999974513	*Carex eburnea*	bristle-leaved sedge	Cyperaceae	S3	not ranked	not ranked	1994	no
999974514	*Carex eburnea*	bristle-leaved sedge	Cyperaceae	S3	not ranked	not ranked	1994	no
999974515	*Carex eburnea*	bristle-leaved sedge	Cyperaceae	S3	not ranked	not ranked	1993	no
999976539	*Carex eburnea*	bristle-leaved sedge	Cyperaceae	S3	not ranked	not ranked	1992	no
999976540	*Carex eburnea*	bristle-leaved sedge	Cyperaceae	S3	not ranked	not ranked	1992	no
999976541	*Carex eburnea*	bristle-leaved sedge	Cyperaceae	S3	not ranked	not ranked	1992	no
999976542	*Carex eburnea*	bristle-leaved sedge	Cyperaceae	S3	not ranked	not ranked	1992	no
999976543	*Carex eburnea*	bristle-leaved sedge	Cyperaceae	S3	not ranked	not ranked	unknown	no
17173	*Carex saximontana*	Rocky Mountain sedge	Cyperaceae	S3	not ranked	not ranked	1937	yes
1913	*Chenopodium desiccatum*	dry goosefoot	Chenopodiaceae	S3	not ranked	not ranked	1979	no
762	*Chenopodium subglabrum*	smooth goosefoot	Chenopodiaceae	S3	Threatened	Schedule 1, Threatened	2017	no

Element Occurrence ID	Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Vegetation and Soils Study Area?
999974526	*Corallorhiza striata var. striata*	striped coral-root	Orchidaceae	S3	not ranked	not ranked	1993	no
14897	*Corispermum americanum var. americanum*	American bugseed	Chenopodiaceae	S3	not ranked	not ranked	1970	no
16082	*Corispermum hookeri var. hookeri*	Hooker's bugseed	Chenopodiaceae	S2	not ranked	not ranked	1964	no
16083	*Corispermum hookeri var. hookeri*	Hooker's bugseed	Chenopodiaceae	S2	not ranked	not ranked	1921	no
16097	*Corispermum pallasii*	Pallas' bugseed	Chenopodiaceae	S2	not ranked	not ranked	1992	no
16106	*Corispermum villosum*	hairy bugseed	Chenopodiaceae	S2	not ranked	not ranked	1992	no
999969060	*Crepis runcinata ssp. hispidulosa*	smooth hawk's-beard	Asteraceae	S1	not ranked	not ranked	1993	no
999969063	*Crepis runcinata ssp. hispidulosa*	smooth hawk's-beard	Asteraceae	S1	not ranked	not ranked	1920	no
16602	*Cyperus squarrosus*	awned cyperus	Cyperaceae	S3	not ranked	not ranked	1970	no
16603	*Cyperus squarrosus*	awned cyperus	Cyperaceae	S3	not ranked	not ranked	1965	no
999971646	*Cypripedium parviflorum*	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked	2017	no
999988482	*Cypripedium parviflorum var. makasin*	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked	2018	no
999988483	*Cypripedium parviflorum var. makasin*	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked	2018	no
999988484	*Cypripedium parviflorum var. makasin*	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked	2018	no
999988485	*Cypripedium parviflorum var. makasin*	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked	2018	no
999988486	*Cypripedium parviflorum var. makasin*	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked	2018	no
999988487	*Cypripedium parviflorum var. makasin*	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked	2018	no
999988488	*Cypripedium parviflorum var. makasin*	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked	2018	no
999988489	*Cypripedium parviflorum var. makasin*	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked	2018	no
999988490	*Cypripedium parviflorum var. makasin*	small yellow lady's slipper	Orchidaceae	S3	not ranked	not ranked	2018	no
8084	*Elatine triandra*	longstem water-wort	Elatinaceae	S2	not ranked	not ranked	1967	no
8394	*Elatine triandra*	longstem water-wort	Elatinaceae	S2	not ranked	not ranked	1939	no
3102	*Eleocharis engelmannii*	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked	1965	no
3843	*Eleocharis engelmannii*	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked	1966	yes
6915	*Eleocharis engelmannii*	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked	1965	no
7227	*Eleocharis engelmannii*	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked	1965	no
999958862	*Eleocharis engelmannii*	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked	2012	no
999958863	*Eleocharis engelmannii*	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked	2012	no
999958864	*Eleocharis engelmannii*	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked	2012	no
999958865	*Eleocharis engelmannii*	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked	2012	no
999958866	*Eleocharis engelmannii*	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked	2012	no
999976344	*Eleocharis engelmannii*	Engelmann's spike-rush	Cyperaceae	S3	not ranked	not ranked	1965	yes
917	*Elymus glaucus ssp. glaucus*	blue wild rye	Poaceae	S3	not ranked	not ranked	1931	no
4464	*Elymus lanceolatus ssp. psammophilus*	sand-dune wheatgrass	Poaceae	S2	not ranked	not ranked	1970	no
999974023	*Elymus lanceolatus ssp. psammophilus*	sand-dune wheatgrass	Poaceae	S2	not ranked	not ranked	1996	no
589	*Erigeron strigosus*	white-top	Asteraceae	S3	not ranked	not ranked	1960	no
999973160	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1974	no
999973170	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1986	no
999973172	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1980	yes
999973183	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1989	no
999973207	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1985	yes
999973228	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1986	no
999973275	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1990	no
999973282	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1992	no

Element Occurrence ID	Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Vegetation and Soils Study Area?
999973283	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1994	no
999973285	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1994	no
999973287	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1993	no
999973288	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1993	no
999973289	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	1951	no
999988474	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	2018	no
999988475	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	2018	no
999988476	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	2018	no
999988477	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	2018	no
999988478	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	2018	no
999988479	*Festuca hallii*	plains rough fescue	Poaceae	S3	not ranked	not ranked	2018	no
999984240	*Gentianopsis virgata*	lesser fringed gentian	Gentianaceae	S3	not ranked	not ranked	2018	yes
16261	*Iris versicolor*	blueflag	Iridaceae	S1	not ranked	not ranked	1994	no
16898	*Lactuca biennis*	tall blue lettuce	Asteraceae	S3	not ranked	not ranked	1954	no
8154	*Lomatogonium rotatum*	marsh felwort	Gentianaceae	S3	not ranked	not ranked	1962	no
999969035	*Monarda fistulosa var. mollis*	soft wild bergamot	Lamiaceae	S3	not ranked	not ranked	1915	no
999969037	*Monarda fistulosa var. mollis*	soft wild bergamot	Lamiaceae	S3	not ranked	not ranked	1930	no
16932	*Potentilla anserina ssp. yukonensis*	Yukon silverweed	Rosaceae	S2	not ranked	not ranked	1901	no
16928	*Potentilla concinna var. concinna*	early cinquefoil	Rosaceae	S2	not ranked	not ranked	1963	yes
16929	*Potentilla concinna var. concinna*	early cinquefoil	Rosaceae	S2	not ranked	not ranked	1992	no
16930	*Potentilla concinna var. concinna*	early cinquefoil	Rosaceae	S2	not ranked	not ranked	1952	no
17033	*Potentilla lasiodonta*	sandhills cinquefoil	Rosaceae	S2	not ranked	not ranked	1990	no
17034	*Potentilla lasiodonta*	sandhills cinquefoil	Rosaceae	S2	not ranked	not ranked	1950	no
999984241	*Potentilla lasiodonta*	sandhills cinquefoil	Rosaceae	S2	not ranked	not ranked	1993	yes
2118	*Potentilla rubricaulis*	red-stemmed cinquefoil	Rosaceae	S3	not ranked	not ranked	1939	no
6665	*Potentilla rubricaulis*	red-stemmed cinquefoil	Rosaceae	S3	not ranked	not ranked	1952	no
770	*Potentilla supina ssp. paradoxa*	bushy cinquefoil	Rosaceae	S3	not ranked	not ranked	1992	no
16950	*Potentilla supina ssp. paradoxa*	bushy cinquefoil	Rosaceae	S3	not ranked	not ranked	1992	no
16964	*Potentilla supina ssp. paradoxa*	bushy cinquefoil	Rosaceae	S3	not ranked	not ranked	1950	no
999976588	*Potentilla supina ssp. paradoxa*	bushy cinquefoil	Rosaceae	S3	not ranked	not ranked	1992	no
999976589	*Potentilla supina ssp. paradoxa*	bushy cinquefoil	Rosaceae	S3	not ranked	not ranked	1992	no
999976590	*Potentilla supina ssp. paradoxa*	bushy cinquefoil	Rosaceae	S3	not ranked	not ranked	1992	no
407	*Rhinanthus minor ssp. minor*	yellow-rattle	Scrophulariaceae	S2	not ranked	not ranked	1992	no
999974011	*Rhinanthus minor ssp. minor*	yellow-rattle	Scrophulariaceae	S2	not ranked	not ranked	1996	no
16698	*Ribes oxyacanthoides var. setosum*	bristly gooseberry	Grossulariaceae	S2	not ranked	not ranked	1938	no
5908	*Rorippa curvipes*	curved yellow-cress	Brassicaceae	S3	not ranked	not ranked	1988	no
6992	*Rosa blanda*	smooth wild rose	Rosaceae	S1	not ranked	not ranked	1974	no
999974301	*Sceptridium multifidum*	leathery grape-fern	Ophioglossaceae	S3	not ranked	not ranked	1995	yes
966	*Scirpus pallidus*	pale bulrush	Cyperaceae	S3	not ranked	not ranked	1992	no
1212	*Silene menziesii*	Menzies' catchfly	Caryophyllaceae	S3	not ranked	not ranked	1992	yes
16724	*Silene menziesii*	Menzies' catchfly	Caryophyllaceae	S3	not ranked	not ranked	1993	no
16750	*Sisyrinchium mucronatum*	mucronate blue-eyed-grass	Iridaceae	S3	not ranked	not ranked	1915	no
16762	*Sisyrinchium septentrionale*	northern blue-eyed-grass	Iridaceae	S3	not ranked	not ranked	1958	yes
16763	*Sisyrinchium septentrionale*	northern blue-eyed-grass	Iridaceae	S3	not ranked	not ranked	1960	no

Element Occurrence ID	Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Vegetation and Soils Study Area?
999958917	*Sisyrinchium septentrionale*	northern blue-eyed-grass	Iridaceae	S3	not ranked	not ranked	2012	no
5188	*Sporobolus neglectus*	small dropseed	Poaceae	S2	not ranked	not ranked	1993	no
8505	*Trichophorum pumilum*	dwarf clubrush	Cyperaceae	S1	not ranked	not ranked	1940	no
1391	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	unknown	no
3933	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	unknown	no
999958934	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	unknown	no
999959000	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2014	no
999959001	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2014	no
999959002	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2014	no
999959003	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2013	no
999959004	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2015	no
999959005	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2014	no
999959006	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2013	no
999959007	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2013	no
999959008	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2016	no
999959010	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2011	no
999959011	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2012	no
999959012	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2012	no
999959013	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2012	no
999959242	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2012	no
999959243	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2012	no
999959244	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2012	no
999959245	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2012	no
999959246	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2012	no
999974959	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	1951	no
999988316	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988317	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988318	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988319	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988320	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988321	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988326	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988327	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988328	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988329	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988330	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988331	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988332	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988333	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988334	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988335	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988336	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988337	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988338	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no

Element Occurrence ID	Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Vegetation and Soils Study Area?
999988339	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988340	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988341	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988342	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988343	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988344	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988345	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988346	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988347	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988348	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988349	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988350	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988351	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988352	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988353	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988354	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988355	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988356	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988357	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988358	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988359	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988360	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988361	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988362	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988363	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988364	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988365	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988366	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988367	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988368	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988369	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988370	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988371	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988372	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988373	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988374	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988375	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988376	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988377	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988378	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988379	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988380	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988381	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988382	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no

Element Occurrence ID	Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Vegetation and Soils Study Area?
999988383	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988384	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988385	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988386	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988387	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988388	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988401	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988402	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988403	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988404	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988405	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988406	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988407	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988408	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988409	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988410	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988411	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988412	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988413	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988414	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988415	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988416	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988417	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988418	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988419	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988420	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988421	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988422	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988423	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988424	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988425	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988426	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988427	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988428	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988429	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988430	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988431	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988432	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988433	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988434	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988435	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988436	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988437	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988438	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no

Element Occurrence ID	Scientific Name	Common Name	Family	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Vegetation and Soils Study Area?
999988439	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988440	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988441	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988442	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988443	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988444	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988445	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988446	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988447	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988448	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988449	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988450	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988451	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988452	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988453	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988454	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988455	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988456	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988457	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988458	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988459	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988460	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988461	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988462	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988463	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988464	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988465	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988466	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988467	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988468	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988469	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988470	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988471	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988472	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no
999988473	*Viola pedatifida*	crowfoot violet	Violaceae	S3	not ranked	not ranked	2018	no

Source: (Government of Saskatchewan 2019; SKCDC 2019b)

Table D.II Wildlife SOCC element occurrences

Element Occurrence ID	Common Name	Scientific Name	Taxonomic Group	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Wildlife Study Area?
999987264	Baird's sparrow	*Centronyx bairdii*	bird	S4B; tracked	Special Concern	Schedule 1, Special Concern	2013	yes
999987265	Baird's sparrow	*Centronyx bairdii*	bird	S4B; tracked	Special Concern	Schedule 1, Special Concern	2013	no
999987266	Baird's sparrow	*Centronyx bairdii*	bird	S4B; tracked	Special Concern	Schedule 1, Special Concern	2013	no
999941255	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2012	no
999942031	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2013	no

Element Occurrence ID	Common Name	Scientific Name	Taxonomic Group	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Wildlife Study Area?
999979753	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2018	no
999979794	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2017	no
999984499	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2011	no
999984500	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2011	yes
999984501	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2011	no
999984502	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2011	no
999987267	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2013	no
999987268	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2013	no
999987269	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2013	no
999987357	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2012	no
999987358	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2012	no
999989081	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2017	no
999989082	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2017	no
999989086	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2017	no
999989106	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2017	no
999990349	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2017	no
999990440	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2017	yes
999990450	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2017	no
999990468	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2018	yes
999990542	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2018	no
9999102698	barn swallow	*Hirundo rustica*	bird	S5B, S5M; tracked	Threatened	Schedule 1, Threatened	2019	no
9999106481	bicolored sallow moth	*Sunira bicolorago*	insect	S3	n/a	n/a	2016	no
999989075	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2017	no
999989080	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2017	no
999989089	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2017	no
999991231	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2018	no
999991306	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2018	no
999991358	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2017	no
999991372	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2018	no
999991383	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2018	no
999991401	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2017	no
999999314	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2018	no
999999342	bobolink	*Dolichonyx oryzivorus*	bird	S4B, S4M; tracked	Threatened	Schedule 1, Threatened	2018	no
9999106230	brown harpaline beetle	*Harpalus fuscipalpis*	insect	S3	n/a	n/a	1939	no
9999106109	clay-beach bembidion beetle	*Bembidion patruele*	insect	S3	n/a	n/a	1960	no
9999102480	common green darner	*Anax junius*	insect	S3	n/a	n/a	2012	no
9999105195	common green darner	*Anax junius*	insect	S3	n/a	n/a	2013	no
999938421	common nighthawk	*Chordeiles minor*	bird	S4B, S4M; tracked	Special Concern	Schedule 1, Threatened	unknown	no
999979736	common nighthawk	*Chordeiles minor*	bird	S4B, S4M; tracked	Special Concern	Schedule 1, Threatened	2018	no
999979737	common nighthawk	*Chordeiles minor*	bird	S4B, S4M; tracked	Special Concern	Schedule 1, Threatened	2017	no
9999102593	common nighthawk	*Chordeiles minor*	bird	S4B, S4M; tracked	Special Concern	Schedule 1, Threatened	2019	no
9999102466	Cooper’s hawk	*Accipiter cooperii*	bird	S4B, S2N, S2M	Not at Risk	n/a	2018	no
9999105221	elusive clubtail	*Stylurus notatus*	insect	S2	n/a	n/a	2016	no
9999106114	field bembidion beetle	*Bembidion rupicola*	insect	S3	n/a	n/a	1960	no

Element Occurrence ID	Common Name	Scientific Name	Taxonomic Group	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Wildlife Study Area?
9999106100	ground beetle	*Bembidion intermedium*	insect	S3	n/a	n/a	1960	no
9999106110	ground beetle	*Bembidion rapidum*	insect	S3	n/a	n/a	1960	no
9999102840	Harris's sparrow	*Zonotrichia querula*	bird	SUB, S5M; tracked	Special Concern	No Status	2013	no
999940568	horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	2012	no
999940573	horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	2012	no
999942040	horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	unknown	no
999976648	horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	2015	no
999984416	horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	2011	no
999984417	horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	2011	no
999984418	horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	2011	no
999987270	horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	2013	no
999987356	horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	2012	no
999991430	horned grebe	*Podiceps auritus*	bird	S5B, S5M; tracked	Special Concern	Schedule 1, Special Concern	2017	yes
9999105924	indiscriminate bumble bee	*Bombus insularis*	insect	S3	n/a	n/a	1942	no
999924328	lake sturgeon	*Acipenser fulvescens*	fish	S2	Endangered	No Status	unknown	no
999954716	lake sturgeon	*Acipenser fulvescens*	fish	S2	Endangered	No Status	2009	yes
9999105185	lance-tipped darner	*Aeshna constricta*	insect	S2	n/a	n/a	2011	no
9999101017	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	1980	no
9999101020	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	1978	no
9999101037	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	1989	no
9999101046	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	2001	no
9999101116	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	2014	no
9999101117	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	2014	no
9999101118	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	2015	no
9999101135	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	2017	no
9999101151	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	2018	no
9999101171	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	2011	no
9999101175	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	1994	no
9999102451	little brown myotis	*Myotis lucifugus*	mammal	S4B, S4N; tracked	Endangered	Schedule 1, Endangered	2017	no
13791	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2008	no
13823	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2008	yes
999923985	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2005	no
999923990	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2005	no
999936400	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2009	no
999939443	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	unknown	no
999971535	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2017	yes
999975284	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2018	no
999975361	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2016	no
999984396	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2011	no
999984397	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2011	no
999989105	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2017	no
999990066	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2018	no
999999281	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2018	no
999999341	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2018	no
9999100956	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2017	yes

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9999100957	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2017	yes
9999102244	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2003	no
9999102245	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2003	no
9999102714	loggerhead shrike	*Lanius ludovicianus*	bird	S2B, S2M	Threatened	Schedule 1, Threatened	2018	no
999975058	monarch	*Danaus plexippus plexippus*	insect	S2B	Endangered	Schedule 1, Special Concern	2016	no
999976632	monarch	*Danaus plexippus plexippus*	insect	S2B	Endangered	Schedule 1, Special Concern	2018	no
999938422	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	unknown	no
999938491	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2012	no
999959226	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2012	no
999959227	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	no
999959228	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	no
999959229	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	no
999959230	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	no
999959231	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	no
999959235	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2015	no
999959236	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2015	no
999959237	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2016	yes
999987160	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	no
999987161	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
999987162	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
999987163	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
999987164	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
999987165	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
999987166	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
999987167	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
999987168	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
999987169	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
999987170	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
999987171	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	no
999987172	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	no
999987288	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2013	yes
9999100959	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100960	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100961	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100962	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100963	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100965	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2017	no
9999100966	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2017	no
9999100967	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2017	no
9999100968	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100969	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100970	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100971	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100972	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100973	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes

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9999100974	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100975	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100976	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100978	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100980	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100981	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100982	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100983	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100984	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100985	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100986	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100987	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100988	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100989	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100990	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100991	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100992	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100993	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	yes
9999100994	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100995	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999100996	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2017	no
9999100997	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2017	no
9999101001	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2017	no
9999101003	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999101004	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2017	no
9999101006	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2018	no
9999102732	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2014	no
9999102738	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2017	no
9999103366	northern leopard frog	*Lithobates pipiens*	amphibian	S3	Special Concern	Schedule 1, Special Concern	2002	no
9999102711	northern shrike	*Lanius borealis*	bird	S1B, S4N, S4M	n/a	n/a	2018	no
9999102712	northern shrike	*Lanius borealis*	bird	S1B, S4N, S4M	n/a	n/a	2018	no
761	olive-backed pocket mouse	*Perognathus fasciatus*	mammal	S3	n/a	n/a	1965	no
1390	olive-backed pocket mouse	*Perognathus fasciatus*	mammal	S3	n/a	n/a	1958	no
2746	olive-backed pocket mouse	*Perognathus fasciatus*	mammal	S3	n/a	n/a	1955	yes
9999102764	osprey	*Pandion haliaetus*	bird	S2B, S2M	n/a	n/a	2019	yes
9999102765	osprey	*Pandion haliaetus*	bird	S2B, S2M	n/a	n/a	2018	no
9999102511	pronghorn	*Antilocapra americana*	mammal	S3	n/a	n/a	2019	no
9999102674	rusty blackbird	*Euphagus carolinus*	bird	S3B, SUN, S3M	Special Concern	Schedule 1, Special Concern	2018	yes
9999106096	salt bembidion beetle	*Bembidion insulatum*	insect	S3	n/a	n/a	1960	no
999980233	sharp-tailed grouse	*Tympanuchus phasianellus*	bird	S5; tracked	n/a	n/a	2016	yes
9999100952	sharp-tailed grouse	*Tympanuchus phasianellus*	bird	S5; tracked	n/a	n/a	unknown	yes
9999102837	sharp-tailed grouse	*Tympanuchus phasianellus*	bird	S5; tracked	n/a	n/a	2019	yes
999959239	short-eared owl	*Asio flammeus*	bird	S3B, S2N, S3M	Special Concern	Schedule 1, Special Concern	2014	no
999959240	short-eared owl	*Asio flammeus*	bird	S3B, S2N, S3M	Special Concern	Schedule 1, Special Concern	2011	yes
999959241	short-eared owl	*Asio flammeus*	bird	S3B, S2N, S3M	Special Concern	Schedule 1, Special Concern	2010	yes

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9999100954	short-eared owl	*Asio flammeus*	bird	S3B, S2N, S3M	Special Concern	Schedule 1, Special Concern	2017	yes
9999100955	short-eared owl	*Asio flammeus*	bird	S3B, S2N, S3M	Special Concern	Schedule 1, Special Concern	2018	no
999989076	Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	2017	no
999989077	Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	2017	no
999990650	Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	2018	no
999990659	Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	2018	no
999990750	Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	2017	no
999990766	Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	2017	no
999990777	Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	2018	no
9999101010	Sprague's pipit	*Anthus spragueii*	bird	S3B, S3M	Threatened	Schedule 1, Threatened	2018	no
9999105223	striped meadowhawk	*Sympetrum pallipes*	insect	S3	n/a	n/a	2014	no
9999105942	Suckley's bumble bee	*Bombus suckleyi*	insect	S3	n/a	n/a	1950	no
9999105200	tule bluet	*Enallagma carunculatum*	insect	S3	n/a	n/a	2016	no
999987271	turkey vulture	*Cathartes aura*	bird	S3B, S3M	n/a	n/a	2013	yes
9999102581	turkey vulture	*Cathartes aura*	bird	S3B, S3M	n/a	n/a	2018	no
9999106468	twenty-spotted lady beetle	*Psyllobora vigintimaculata*	insect	S2	n/a	n/a	2016	no
9999106350	twice-stabbed lady beetle	*Chilocorus stigma*	insect	S3	n/a	n/a	2016	no
9999100958	western red damsel	*Amphiagrion abbreviatum*	insect	S2	n/a	n/a	2013	no
9999105193	western red damsel	*Amphiagrion abbreviatum*	insect	S2	n/a	n/a	2013	no
9999105194	western red damsel	*Amphiagrion abbreviatum*	insect	S2	n/a	n/a	2013	no
9999102731	white heelsplitter	*Lasmigona complanata*	insect	S3	n/a	n/a	2018	no
9999101543	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2018	no
9999101544	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2018	no
9999101546	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2018	no
9999101552	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2018	no
9999101603	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2015	no
9999101614	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2015	no
9999101615	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2015	no
9999101621	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2015	no
9999101738	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2016	no
9999101784	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2017	no
9999101798	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2017	no
9999101799	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2017	no
9999101861	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2017	no
9999103488	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1972	no
9999103544	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1976	no
9999103576	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1990	no
9999103586	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1992	no
9999103589	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1992	no
9999103590	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1992	no
9999103599	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1992	no
9999103604	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1992	no
9999103620	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1996	no
9999103626	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1996	no
9999103635	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1996	no

Element Occurrence ID	Common Name	Scientific Name	Taxonomic Group	SKCDC Ranking	COSEWIC Status	SARA Status	Last Observation	Located within Wildlife Study Area?
9999103655	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2005	no
9999103755	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2013	no
9999103760	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2013	no
9999103761	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2013	no
9999103768	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2013	no
9999103769	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2013	no
9999103820	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2014	no
9999103908	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1973/	no
9999103964	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1980	no
9999104077	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1986	no
9999104140	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1988	no
9999104154	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1988	yes
9999104314	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1990	no
9999104403	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1992	yes
9999104474	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1994	no
9999104529	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	1996	no
9999104819	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2005	no
9999104830	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2005	no
9999104836	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2005	yes
9999104839	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2005	no
9999104909	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2008	no
9999104919	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2008	yes
9999104921	whooping crane	*Grus americana*	bird	SXB, S1M	Endangered	Schedule 1, Endangered	2008	no
9999100951	yellow rail	*Coturnicops noveboracensis*	bird	S3B, S3M	Special Concern	Schedule 1, Special Concern	2016	yes
9999105959	yellow-banded bumble bee	*Bombus terricola*	insect	S5; tracked	Special Concern	Schedule 1, Special Concern	1942	no

Source: (Government of Saskatchewan 2019; SKCDC 2019c and 2019d)

Appendix E

Field Wildlife Data

Table E.I Field visited quarter section summaries

Table E.II Field-observed wildlife species

Table E.III Future survey recommendations by quarter section

Table E.I Field visited quarter section summaries

Quarter Section	Project Phase	Roadside or Meandering	Roadside Survey No.	UTM Coordinates (Zone Easting Northing)	Date	Available Habitat	Land Use	Avian Species Detected	Mammal Species Detected	Amphibian/Reptile Species Detected
NE 25-37-06-3	1	roadside	1	13N 382634 5786272	26/06/2019	cropland, wetland, modified grassland, tree stand	cropland	BBMA, CORA, AMRO	n/a	n/a
NW 30-37-05-3	1	roadside	2	13N 382643 5786426	26/06/2019	cropland, wetland, tree stand	cropland, residence	RWBL, BBMA	n/a	n/a
SE 36-37-06-3	1	roadside	3	13N 382657 5786801	26/06/2019	cropland, tree rows	cropland, residence	BBMA, CORA	n/a	n/a
SW 31-37-05-3	1	roadside	3	13N 382657 5786801	26/06/2019	cropland	cropland	CORA	n/a	n/a
SE 36-37-06-3	1	roadside	4	13N 382642 5786547	26/06/2019	modified grassland	residence	VESP, BBMA, CCSP, GRAP, BRTH	white-tailed jackrabbit	n/a
NE 25-37-06-3	1	roadside	5	13N 382072 5786387	26/06/2019	cropland, modified grassland	cropland, residence	SOSP, CORA,	n/a	n/a
NE 25-37-06-3	1	roadside	6	13N 382519 5785914	26/06/2019	cropland, modified grassland	cropland, residence	CORA, SOSP	Richardson's ground squirrel	n/a
SE 26-37-06-3	3	roadside	7	13N 380993 5785198	26/06/2019	cropland, modified grassland, wetland	cropland, residence, industrial	RWBL, BARS, EAKI, KILL	n/a	boreal chorus frog
SW 25-37-06-3	3	roadside	7	13N 380993 5785198	26/06/2019	cropland, wetland, tree stand	cropland, residence	AMRO, BAOR	n/a	n/a
SW 26-37-06-3	3	roadside	8	13N 379452 5784997	27/06/2019	cropland, wetland	cropland	RWBL, AMGO, CCSP	n/a	n/a
SW 26-37-06-3	3	roadside	9	13N 379363 5785537	27/06/2019	cropland, wetland	cropland	RWBL, CORA, TRES, AMGO, CCSP	n/a	n/a
SE 27-37-06-3	3	roadside	9	13N 379363 5785537	27/06/2019	cropland, wetland	cropland	AMRO, CORA, RWBL, TRES,	n/a	n/a
NE 22-37-06-3	3	roadside	10	13N 379284 5785004	27/06/2019	cropland	cropland	COGR	n/a	n/a
NE 22-37-06-3	3	roadside	11	13N 378836 5785015	27/06/2019	cropland	cropland	HOLA	n/a	n/a
SE-27-37-06-3	3	roadside	11	13N 378836 5785015	27/06/2019	cropland, wetland	cropland	RWBL, SAVS, SOSP, VESP, EAKI	n/a	n/a
NW 22-37-06-3	III	roadside	12	13N 378238 5785007	27/06/2019	cropland, wetland	cropland, residence	VESP, RWBL, CCSP	Richardson's ground squirrel	n/a
SE 21-37-06-3	III	roadside	13	13N 377691 5783701	27/06/2019	modified grassland, cropland	residence	CCSP, YEWA	n/a	n/a
SE 21-37-06-3	III	roadside	13	13N 377691 5783701	27/06/2019	cropland, wetland	cropland	CCSP, ROPI, YHBL, YEWA	n/a	n/a
NE 16-37-06-3	III	roadside	14	13N 377361 5783426	27/06/2019	pasture/grassland, cropland	cropland, pasture	COGR, MODO, WEME, RTHA, EAKI, AMRO, RWBL	n/a	n/a
SE 21-37-06-3	III	roadside	14	13N 377361 5783426	27/06/2019	cropland	cropland, residence	AMRO, COGR, EAKI, MODO, RTHA, WEME	n/a	n/a
SW 22-37-06-3	III	roadside	15	13N 377927 5783404	27/06/2019	cropland, wetland	cropland	YHBL, CCSP, CORA, RTHA, ROPI	n/a	n/a
NW 15-37-06-3	III	roadside	15	13N 377927 5783404	27/06/2019	pasture/grassland	commercial	ROPI, KILL, WEME, RWBL	Richardson's ground squirrel	n/a
NW 15-37-06-3	III	roadside	16	13N 377675 5782846	27/06/2019	pasture/grassland	commercial	KILL, WEME, COGR, ROPI	n/a	n/a
NE 16-37-06-3	III	roadside	16	13N 377675 5782846	27/06/2019	pasture/grassland, wetland	residence	AMRO, RWBL, TRES	Richardson's ground squirrel	n/a
NE 17-36-06-3	III	roadside	17	13N 375807 5773621	26/07/2019	cropland, wetlands	cropland, residence	AMRO, BAOR, SOSP, CCSP, BCCH, BHCO, TRES, ROPI, MALL, RWBL, BRBL, EAKI	n/a	boreal chorus frog
SE 20-36-06-3	III	roadside	18	13N 375808 5774161	26/07/2019	cropland	cropland, industrial	AMCR, RWBL, WEME	Richardson's ground squirrel	western plains garter snake
SW 21-36-06-3	III	roadside	19	13N 375834 5774304	26/07/2019	cropland, wetlands	cropland	WEME, RBGU, FRGU, CCSP	Richardson's ground squirrel	n/a
NW-21-36-06-3	III	roadside	20	13N 375846 5775043	26/07/2019	cropland	cropland	CCSP, AMCR, BARS, SAVS, VESP, MODO, CORA	n/a	n/a
NE 20-36-06-3	III	roadside	21	13N 375592 5775362	26/07/2019	cropland, aspen stand	cropland	VESP, CCSP, CORA, BLJA, YEWA, SOSP, COYE, AMCR	white-tailed deer, coyote	n/a
SE 29-36-06-3	III	roadside	22	13N 375579 5775369	26/07/2019	cropland, wetlands	cropland	RWBL, CORA	n/a	n/a

Quarter Section	Project Phase	Roadside or Meandering	Roadside Survey No.	UTM Coordinates (Zone Easting Northing)	Date	Available Habitat	Land Use	Avian Species Detected	Mammal Species Detected	Amphibian/Reptile Species Detected
SW 29-36-06-3	III	roadside	23	13N 374665 5775399	26/07/2019	cropland	cropland	CAGO, NOSH, VESP, SOSP, AMCR, TRES, RTHA, RWBL, KILL, COGR	n/a	n/a
NW 29-36-06-3	III	roadside	24	13N 375082 5776986	26/07/2019	cropland	cropland	RWBL, AMCR, MODO, VESP, HOLA, CCSP, ROPI	Richardson's ground squirrel	n/a
NE 29-36-06-3	III	roadside	25	13N 375887 5776812	26/07/2019	cropland, wetland, shelterbelt	cropland	BARS, LCSP, BCCH, CORA	red fox, Richardson's ground squirrel	n/a
SE 08-37-06-3	III	roadside	26	13N 375984 5780449	26/07/2019	cropland, wetland	cropland	RWBL, YHBL, VESP, MALL, BRBL, HOLA	n/a	n/a
NE 08-37-06-3	III	roadside	27	13N 376007 5781266	26/07/2019	cropland	cropland, residence	CCSP, KILL, AMCR, RWBL, VESP	n/a	n/a
NW 09-37-06-3	III	roadside	28	13N 376007 5781266	26/07/2019	cropland, swale/wetland	cropland	WILL, KILL, MALL, GADW, RTHA, AMAV, BWTE, NOSH, RNPH, CCSP, YHBL, RWBL, BHCO, HOGR	n/a	n/a
NE 36-35-05-3	II	roadside	29	13N 391640 5768483	07/08/2019	pasture	pasture, hayland residence	RTHA, SOSP, AMCR, SAVS, MALL, BWTE, CCSP, MAWR, KILL, MODO, HOSP, YEWA, NOSH, GRCA, SOSA, RBGU, GRYE, COYE	n/a	n/a
SE 01-36-05-3	II	roadside	30	13N 391638 5768495	07/08/2019	cropland, wetlands, shrubs	cropland, residence	YEWA, HOLA, BCCH, MALL, ROPI, FRGU, RBGU, RWBL, EAKI, SOSP, CEDW	moose	n/a
SE 06-36-04-3	II	roadside	31	13N 393659 5769249	07/08/2019	cropland, wetland, tree stand	cropland, residence	YEWA, MAWR, RWBL, COYE, MALL, SOSP	n/a	n/a
NE 06-36-04-3	II	roadside	32	13N 393664 5769526	07/08/2019	modified grassland	hayland	SOSP, RWBL, COYE, EAKI, BRBL, BBMA, AMCR	american badger, white-tailed deer, red fox	n/a
NE 05-36-04-3	II	roadside	33	13N 395289 5770075	07/08/2019	cropland, wetland	cropland	COGR, SOSP, VESP, MAWR, AWPE, DCCO	n/a	n/a
SE 08-36-04-3	II	roadside	34	13N 395312 5770357	07/08/2019	cropland, wetland	cropland, residence	AMCR, CORA, RWBL	n/a	n/a
SW 09-36-04-3	II	roadside	34	13N 395312 5770357	07/08/2019	cropland, wetland	cropland, residence	RTHA, RWBL, CCSP, KILL	coyote	n/a
SE 09-36-05-3	II	roadside	35	13N 396771 5770636	07/08/2019	cropland, aspen stand, wetland/stream	cropland	TRES, BRBL, SOSP	n/a	n/a
NW 10-36-04-3	II	roadside	36	13N 397545 5771602	07/08/2019	cropland	cropland, residences	RTHA	n/a	n/a
NE 10-36-04-3	II	roadside	37	13N 397857 5771594	07/08/2019	cropland, aspen stand	cropland	AMCR, SOSP, AMGO, CCSP	n/a	n/a
SW 15-36-04-3	II	roadside	38	13N 396987 5772147	09/08/2019	cropland, wetlands	cropland, residences	CCSP, ROPI	Richardson's ground squirrel	n/a
NW 15-36-04-3	II	roadside	39	13N 397001 5772848	09/08/2019	cropland, wetlands	cropland, residence	GRPA, EAKI, AMRO, CHSP, SOSP, WTSP, CCSP, ROPI, RWBL, BARS	white-tailed deer	n/a
SW 22-36-04-3	II	roadside	40	13N 397016 5773640	09/08/2019	cropland	cropland	AMCR, CCSP	vole spp., white-tailed jackrabbit	n/a
NW 22-36-04-3	II	roadside	41 42	13N 397033 5774441 13N 397247 5774859	09/08/2019	cropland, aspen stand, tame pasture	cropland	HOWR, SOSP, WILL, WEME, CORA, VESP, SORA, RWBL, MAWR	n/a	n/a
SW 27-36-04-3	II	roadside	43 44	13N 397043 5775031 13N 397057 5775698	09/08/2019	cropland, wetlands	cropland	MODO, SOSP, NOSH, WILL, RWBL, KILL, BWTE, GWTE, GADW, WEME, MALL, GRYE, AMGO, WISN	n/a	n/a
NW 27-36-04-3	II	roadside	45	13N 397058 5776080	09/08/2019	cropland, tame pasture, wetland	cropland, residence	AMGO, CCSP	n/a	n/a
SW 34-36-04-3	II	roadside	46	13N 397077 5776776	09/08/2019	cropland, tame pasture, wetland	cropland, residence	BAOR, CCSP, AMCR, EAKI	n/a	n/a

Quarter Section	Project Phase	Roadside or Meandering	Roadside Survey No.	UTM Coordinates (Zone Easting Northing)	Date	Available Habitat	Land Use	Avian Species Detected	Mammal Species Detected	Amphibian/Reptile Species Detected
NW 34-36-04-3	II	roadside	47	13N 397096 5777885	09/08/2019	cropland, wetland	cropland, residence	CORA, HOLA	n/a	n/a
SW 03-37-04-3	II	roadside	48	13N 397095 5778338	15/08/2019	cropland, modified grassland	cropland, farmstead	AMGO, MODO, COYE	n/a	n/a
SE 04-37-04-3	II	roadside	48	13N 397095 5778338	15/08/2019	cropland, wetland, tree stand	cropland, farmstead	MALL	n/a	n/a
NW 31-37-05-3	1	roadside	49	13N 384291 5787574	15/08/2019	cropland, shrubland, wetland	cropland	AMGO, YEWA, SOSP, CCSP, SAVS	n/a	n/a
NW 32-37-05-3	1	roadside	49	13N 384291 5787574	15/08/2019	cropland, wetland, shrubland	cropland, residence	AMGO, WBNU, CCSP	n/a	n/a
NE 31-36-05-3	1	roadside	50	13N 384305 5788061	15/08/2019	cropland, shrubland, wetland	cropland	Sparrow Sp.	n/a	n/a
NW 32-37-05-3	1	roadside	50	13N 384305 5788061	15/08/2019	cropland, shrubland, wetland	cropland, residence	Sparrow Sp.	n/a	n/a
NW 32-37-05-3	1	roadside	51	13N 385098 5788086	15/08/2019	cropland, wetland, shrubland	cropland, residence	CORA, BBMA, WBNU	n/a	n/a
NE 32-37-05-3	1	roadside	51	13N 385098 5788086	15/08/2019	cropland, wetland, shrubland	cropland, industrial	N/A	n/a	n/a
SE 05-38-05-3	1	roadside	52	13N 385740 5788073	15/08/2019	pasture/grassland, wetland	residence	AMGO, RWBL, CHSP, VESP, HOWR	n/a	n/a
NE 32-37-05-3	1	roadside	52	13N 385740 5788073	15/08/2019	cropland, wetland, shrubland	cropland, industrial	HOSP	n/a	n/a
SE 04-38-05-3	1	roadside	53	13N 386742 5788046	15/08/2019	pasture/grassland	pasture	AMGO	n/a	n/a
NW 33-37-05-3	1	roadside	53	13N 386742 5788046	15/08/2019	pasture/grassland	pasture	AMGO	n/a	n/a
SW 04-38-05-3	1	roadside	53	13N 386742 5788046	15/08/2019	pasture/grassland, wetland	pasture	AMGO, AWPE	n/a	n/a
SE 05-38-05-3	1	roadside	54	13N 387317 5788032	15/08/2019	pasture/grassland, shrubland, tree stand	residence	AMGO, GRCA	n/a	n/a
NE 04-37-04-3	II	roadside	55	13N 397126 5779130	15/08/2019	cropland, wetland	cropland	VESP, MODO	n/a	n/a
NW 03-37-04-3	II	roadside	55	13N 397126 5779130	15/08/2019	cropland, wetland	cropland	VESP, MAWR	n/a	n/a
SW 10-37-04-3	II	roadside	56	13N 397142 5779962	15/08/2019	cropland, wetland	cropland, residence	MALL, GRYE, COGR, BBMA	n/a	n/a
SE 09-37-04-3	II	roadside	56	13N 397142 5779962	15/08/2019	cropland, tree stand	cropland	HOSP	n/a	n/a
NE 09-37-04-3	II	roadside	57	13N 397161 5780827	15/08/2019	cropland	cropland	N/A	n/a	n/a
SE 16-37-04-3	II	roadside	58	13N 396558 5781351	15/08/2019	cropland, modified grassland	cropland, industrial	VESP	n/a	n/a
SW 16-37-04-3	II	roadside	59	13N 395894 5781361	15/08/2019	cropland, wetland	cropland, industrial	N/A	n/a	n/a
NW 09-37-04-3	II	roadside	59	13N 395894 5781361	15/08/2019	cropland, wetland	cropland	N/A	n/a	n/a
NW 34-37-05-3 NE-34-37-05-3	1	meandering	N/A	N/A	29/08/2019	modified grassland, native dominant grassland	pasture	TUVU, RTHA, CCSP, AMCR, CAGO, SAVS, ROPI	Richardson's ground squirrel	n/a
SE 34-37-05-3 SW-34-37-05-3	1	meandering	N/A	N/A	29/08/2019	swale, modified grassland, native dominant grassland	pasture, snow dump	NOSH, WILL, SOSP, KILL, RUDU, EAGR, RLHA, CORA, SOSA, BWTE, MAWR, MALL, AMAV, CCSP, GBHE, AMGO, MODO, BLJA, SAVS, CAGO	white-tailed jackrabbit	n/a
NW 27-37-05-3	1	meandering	N/A	N/A	29/08/2019	swale, pasture	gravel operation	AMCO, AMAV, MALL, GADW, BAEA, BWTE, KILL, CAGO, CANV, NOSH, PBGR, SPSA, AWPE	n/a	n/a
SW 22-37-06-3	III	meandering	N/A	N/A	10/09/2019	cropland, wetlands, pastures	cropland	N/A	n/a	n/a
NW 22-37-06-3	III	meandering	N/A	N/A	10/09/2019	cropland, pasture	cropland, residential	CCSP, WEME, MAWR, AMGO, CORA, ROPI, SWHA, MODO	white-tailed deer, white-tailed jackrabbit	n/a
NW 33-37-05-3	1	meandering	N/A	N/A	10/09/2019	pasture, wetlands	pasture, residence	RBGU, WEME, ROPI, CCSP, GRSP, MALL, RUDU	n/a	n/a
NE 16-37-06-3	III	meandering	N/A	N/A	10/09/2019	cropland, tame pasture	cropland	RBGU, WEME, ROPI, CCSP, GRSP, MALL, RUDU	n/a	n/a
SW 21-36-06-3	III	meandering	N/A	N/A	13/09/2019	cropland, hayland, tree stand, wetlands	cropland	RTHA, AMGO, BBMA, MODO, VESP, AMCR, SACR	moose, white-tailed deer	n/a
NW 16-36-06-3	III	meandering	N/A	N/A	13/09/2019	cropland, wetland	cropland, residential	RUDU, GRYE, RTHA, GRPA, AMGO, YRWA, SOSP, YEWA, CHSP, SACR	white-tailed deer	n/a
SE 29-36-06-3	III	meandering	N/A	N/A	13/09/2019	cropland	cropland	RTHA, SAVS, BBMA	n/a	n/a

Quarter Section	Project Phase	Roadside or Meandering	Roadside Survey No.	UTM Coordinates (Zone Easting Northing)	Date	Available Habitat	Land Use	Avian Species Detected	Mammal Species Detected	Amphibian/Reptile Species Detected
NE 05-37-06-3	III	meandering	N/A	N/A	13/09/2019	cropland, wetland	cropland	RTHA, SACR	white-tailed deer	n/a
SE 08-37-06-3	III	meandering	N/A	N/A	13/09/2019	cropland	cropland	SACR, SAVS, MAWR, CHSP	white-tailed deer	n/a
NW 09-37-06-3	III	meandering	N/A	N/A	14/09/2019	swale, modified grassland	pasture, residence	CAGO, GRPA, BBMA, SAVS, MERL, AMGO, SWTH, WEME	white-tailed deer, mouse spp.	n/a
NW 15-37-06-3	III	meandering	N/A	N/A	14/09/2019	modified grassland, wetland	pasture, residence	WEME, SACR, BBMA, BRBL	white-tailed deer	n/a
NE, NW, SE, SW 36-35-05-3	II	meandering	N/A	N/A	14/09/2019	hayland, modified grassland, native grassland	hayland, pasture	CCSP, CAGO, AMGO, ALFL, SOSP, YEWA, BCCH, BBMA, BLJA, AMCR, CEDW, RTHA, NOHA, MALL, AMCO, AMRO, BWTE, KILL, SPSA, LEFL, GHOW, NOSH, NOPI	porcupine, vole spp., coyote, white-tailed deer, moose	boreal chorus frog, wood frog
SE 09-36-04-3	II	meandering	N/A	N/A	14/09/2019	cropland, creek, wetlands	cropland	GRSP, CCSP, AMRO, BAWW, SWHA, BAEA, AMGO	white-tailed deer, coyote, american badger	n/a

Table E.II Field-observed wildlife species

Taxonomic Order	Common Name	Scientific Name	SARA Status	SKCDC Status	Activity Restriction Guidelines	SOCC	SAR
Bird	alder flycatcher	*Empidonax alnorum*	Secure	S5B, S5M	N/A		
Bird	American avocet	*Recurvirostra americana*	N/A	S4B, S4M	N/A		
Mammal	American badger	*Taxidea taxus*	Schedule 1, Special Concern	S3; Tracked	N/A	✓	✓
Bird	American crow	*Corvus brachyrhynchos*	N/A	S5B, S4N, S5M	N/A		
Bird	American goldfinch	*Spinus tristis*	N/A	S5B	N/A		
Bird	American robin	*Turdus migratorius*	N/A	S5B, SUN, S5M	N/A		
Bird	American white pelican	*Pelecanus erythrorhynchos*	Not at Risk	S5B, S5M	Nesting Colony		
Bird	bald eagle	*Haliaeetus leucocephalus*	Not at Risk	S5B, S5N, S4M	N/A		
Bird	Baltimore oriole	*Icterus galbula*	N/A	S5B, S5M	N/A		
Bird	barn swallow	*Hirundo rustica*	Schedule 1, Threatened	S5B, S5M; Tracked	N/A	✓	✓
Bird	black and white warbler	*Mniotilta varia*	N/A	S5B, S5M	N/A		
Bird	black-billed magpie	*Pica hudsonia*	N/A	S5	N/A		
Bird	black-capped chickadee	*Poecile atricapillus*	N/A	S5	N/A		
Bird	blue jay	*Cyanocitta cristata*	N/A	S5	N/A		
Bird	blue-winged teal	*Spatula discors*	N/A	S5B, S5M	N/A		
Amphibian	boreal chorus frog	*Pseudacris maculata*	N/A	S5	N/A		
Bird	Brewer's blackbird	*Euphagus cyanocephalus*	N/A	S4B, SUN, S4M	N/A		
Bird	brown thrasher	*Toxostoma rufum*	N/A	S5B, S5M	N/A		
Bird	brown-headed cowbird	*Molothrus ater*	N/A	S5B, SUN, S5M	N/A		
Bird	Canada goose	*Branta canadensis*	N/A	S5B, S2N, S5M	N/A		
Bird	cedar waxwing	*Bombycilla cedrorum*	N/A	S5B, S5M	N/A		
Bird	chipping sparrow	*Spizella passerina*	N/A	S5B, S5M	N/A		
Bird	clay-coloured sparrow	*Spizella pallida*	N/A	S5B, S5M	N/A		

Taxonomic Order	Common Name	Scientific Name	SARA Status	SKCDC Status	Activity Restriction Guidelines	SOCC	SAR
Bird	common grackle	*Quiscalus quiscula*	N/A	S5B	N/A		
Bird	common raven	*Corvus corax*	N/A	S5	N/A		
Bird	common yellowthroat	*Geothlypis trichas*	N/A	S5B, S5M	N/A		
Mammal	coyote	*Canis latrans*	N/A	S5	N/A		
Bird	double-crested cormorant	*Phalacrocorax auritus*	Not at Risk	S5B, S5M	Nesting Colony	✓	
Bird	eared grebe	*Podiceps nigricollis*	N/A	S5B, S5M	Nesting colony	✓	
Bird	eastern kingbird	*Tyrannus tyrannus*		S5B, S5M			
Bird	Franklin's gull	*Leucophaeus pipixcan*	N/A	S4B, S4M	N/A		
Bird	gadwall	*Mareca strepera*	N/A	S5B, S2N, S5M	N/A		
Bird	grasshopper sparrow	*Ammodramus savannarum*	N/A	S4B	N/A		
Bird	gray catbird	*Dumetella carolinensis*	N/A	S5B, S5M	N/A		
Bird	gray partridge	*Perdix perdix*	N/A	SNA	N/A		
Bird	great blue heron	*Ardea herodias*	N/A	S5B; Tracked	Nesting colony	✓	
Bird	greater yellowlegs	*Tringa melanoleuca*	N/A	S5B, S5M	N/A		
Bird	great-horned owl	*Bubo virginianus*	N/A	S4	N/A		
Bird	green-winged teal	*Anas crecca*	N/A	S5B, S2N, S5M	N/A		
Bird	horned grebe	*Podiceps auritus*	Schedule 1, Special Concern	S5B, S5M; Tracked	N/A	✓	✓
Bird	horned lark	*Eremophila alpestris*	N/A	S4B, S3N, SUM	N/A		
Bird	house wren	*Troglodytes aedon*	N/A	S5B, S5M	N/A		
Bird	killdeer	*Charadrius vociferus*	N/A	S5B, S5M	N/A		
Bird	least flycatcher	*Empidonax minimus*	N/A	S5B, S5M	N/A		
Bird	Leconte's sparrow	*Ammospiza leconteii*	N/A	S5B, S5M	N/A		
Bird	mallard	*Anas platyrhynchos*	N/A	S5B, S5M	N/A		
Bird	marsh wren	*Cistothorus palustris*	N/A	S4B, S4M	N/A		

Taxonomic Order	Common Name	Scientific Name	SARA Status	SKCDC Status	Activity Restriction Guidelines	SOCC	SAR
Bird	merlin	*Falco columbarius*	Not at Risk	S5B, S5N, S5M	N/A		
Mammal	moose	*Alces alces*	N/A	S5	N/A		
Bird	mourning dove	*Zenaida macroura*	N/A	S5B, S5M	N/A		
Bird	northern harrier	*Circus hudsonius*	Not at Risk	S4B, S4M	N/A		
Bird	northern pintail	*Anas acuta*	N/A	S5B, S4N, S5M	N/A		
Bird	northern shoveler	*Spatula clypeata*	N/A	S5B, S5M	N/A		
Mammal	north american porcupine	*Erethizon dorsatum*	N/A	S4	N/A		
Mammal	red fox	*Vulpes vulpes*	N/A	S5	N/A		
Bird	red-necked phalarope	*Phalaropus lobatus*	Schedule 1, Special Concern	S4B, S3M; Tracked	Breeding bird	✓	✓
Bird	red-tailed hawk	*Buteo jamaicensis*	Not at Risk	S5B, S1N, S5M	N/A		
Bird	red-winged blackbird	*Agelaius phoeniceus*	N/A	S5B, SUN, S5M	N/A		
Mammal	Richardson's ground squirrel	*Urocitellus richardsonii*	N/A	S5	N/A		
Bird	ring-billed gull	*Larus delawarensis*	N/A	S5B, S5M	N/A		
Bird	rock pigeon	*Columba livia*	N/A	SNA	N/A		
Bird	ruddy duck	*Oxyura jamaicensis*	N/A	S5B	N/A		
Bird	savannah sparrow	*Passerculus sandwichensis*	N/A	S5B, S5M	N/A		
Bird	solitary sandpiper	*Tringa solitaria*	N/A	S5B, S4M	N/A		
Bird	song sparrow	*Melospiza melodia*	N/A	S5B, S5M	N/A		
Bird	spotted sandpiper	*Actitis macularius*	N/A	S4B, S4M	N/A		
Bird	Swainson's hawk	*Buteo swainsoni*	N/A	S4B, S4M	N/A		
Bird	tree swallow	*Tachycineta bicolor*	N/A	S5B, S5M	N/A		
Bird	turkey vulture	*Cathartes aura*	N/A	S3B, S3M; Tracked	N/A		
Bird	vesper sparrow	*Pooecetes gramineus*	N/A	S5B, S5M	N/A		
Bird	western meadowlark	*Sturnella neglecta*	N/A	S4B, S4M	N/A		
Reptile	western plains garter snake	*Thamnophis radix*	N/A	S5	N/A		

Taxonomic Order	Common Name	Scientific Name	SARA Status	SKCDC Status	Activity Restriction Guidelines	SOCC	SAR
Bird	white-breasted nuthatch	*Sitta carolinensis*	N/A	S5	N/A		
Mammal	white-tailed deer	*Odocoileus virginianus*	N/A	S4	N/A		
Mammal	white-tailed jackrabbit	*Lepus townsendii*	N/A	S4	N/A		
Bird	white-throated sparrow	*Zonotrichia albicollis*	N/A	S5B, S5M	N/A		
Bird	willet	*Tringa semipalmata*	N/A	S4B, S4M	N/A		
Bird	Wilson's snipe	*Gallinago delicata*	N/A	S5B, S5M	N/A		
Amphibian	wood frog	*Lithobates sylvaticus*	N/A	S5	N/A		
Bird	yellow warbler	*Setophaga petechia*	N/A	S5B, S5M	N/A		
Bird	yellow-headed blackbird	*Xanthocephalus xanthocephalus*	N/A	S5B, S5M	N/A		

Table E.III Future survey recommendations by quarter section

Quarter Section	Amphibian Auditory	Burrowing Owl	Short-eared Owl	Sharp-tailed Grouse	Yellow Rail	Common Nighthawk
NE 04-37-04-3	✓					
NE 05-36-04-3	✓					
NE 05-37-06-3	✓					
NE 06-36-04-3	✓	✓	✓			✓
NE 15-37-06-3	✓	✓	✓	✓		✓
NE 16-37-06-3	✓	✓	✓	✓	✓	✓
NE 17-36-06-3	✓					
NE 25-37-06-3	✓				✓	
NE 31-37-05-3	✓					
NE 32-36-06-3	✓					
NE 36-35-05-3	✓	✓	✓	✓	✓	✓
NW 03-37-04-3	✓					
NW 09-37-04-3	✓					
NW 09-37-06-3	✓					
NW 15-37-06-3		✓	✓	✓		✓
NW 16-36-06-3	✓					
NW 21-36-06-3						
NW 22-36-04-3	✓					

Quarter Section	Amphibian Auditory	Burrowing Owl	Short-eared Owl	Sharp-tailed Grouse	Yellow Rail	Common Nighthawk
NW 22-37-06-3	✓	✓	✓	✓	✓	✓
NW 27-36-04-3						
NW 27-37-05-3	✓				✓	
NW 29-36-06-3						
NW 30-37-05-3	✓					
NW 31-37-05-3	✓					
NW 32-36-06-3	✓					
NW 32-37-05-3	✓					
NW 33-37-05-3		✓	✓	✓		✓
NW 34-36-04-3	✓		✓	✓		✓
NW 34-37-05-3	✓	✓	✓	✓		✓
NW 36-35-05-3	✓	✓	✓	✓	✓	✓
SE 01-36-05-3	✓					
SE 04-37-04-3	✓					
SE 04-38-05-3		✓	✓	✓		✓
SE 05-38-05-3	✓	✓	✓	✓		✓
SE 06-36-04-3	✓				✓	
SE 08-36-04-3	✓					
SE 08-37-06-3	✓					
SE 09-36-04-3	✓					
SE 09-37-04-3	✓					
SE-36-35-05-3	✓	✓	✓	✓	✓	✓
SE 21-36-06-3	✓					
SE 21-37-06-3	✓	✓	✓	✓		✓
SE 26-37-06-3	✓				✓	
SE 27-37-06-3	✓					
SE 29-36-06-3	✓					
SE 36-37-06-3				✓		
SW 03-37-04-3		✓	✓	✓		✓
SW 04-38-05-3	✓	✓	✓	✓		✓
SW 16-37-04-3	✓					
SW-36-35-05-3	✓	✓	✓	✓	✓	✓
SW 22-37-06-3	✓					
SW 25-37-06-3	✓					
SW 26-37-06-3	✓					
SW 27-36-04-3	✓					
SW 34-36-04-3	✓		✓	✓		✓

Appendix F

Field Survey Photographs

Appendix F

Field Assessment Photo Appendix

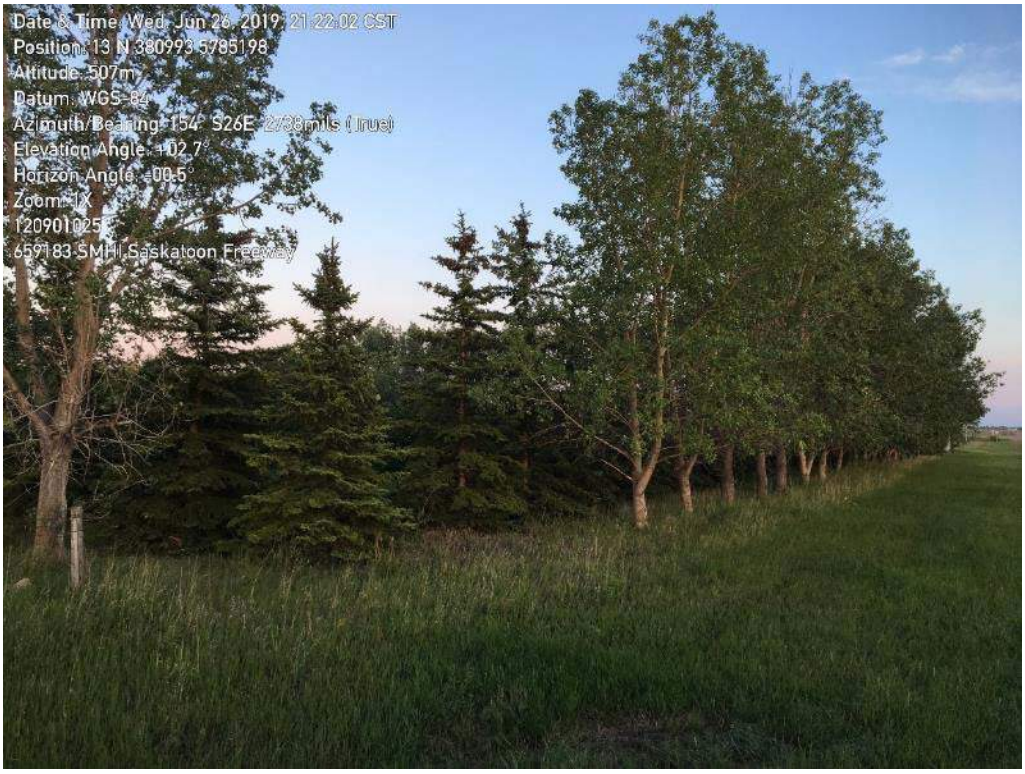
Photograph F.1 SE-36-37-06-W3 Cropland habitat; 26-Jun-19

Photograph F.2 SW-36-37-06-W3 Cropland habitat and residence; 26-Jun-19

Photograph F.3 NW-30-37-05-W3 Tree stand and cropland habitat adjacent to commercial development and residence; 26-Jun-19

Photograph F.4 SE-26-37-06-W3 Wetland habitat and residence adjacent to cropland; 26-Jun-19

Photograph F.5 SE-36-37-06-W3 Grassland/pasture, hayland, and cropland habitat and residence. Another photo of this quarter section habitat is presented in Photograph F.1; 26-Jun-19



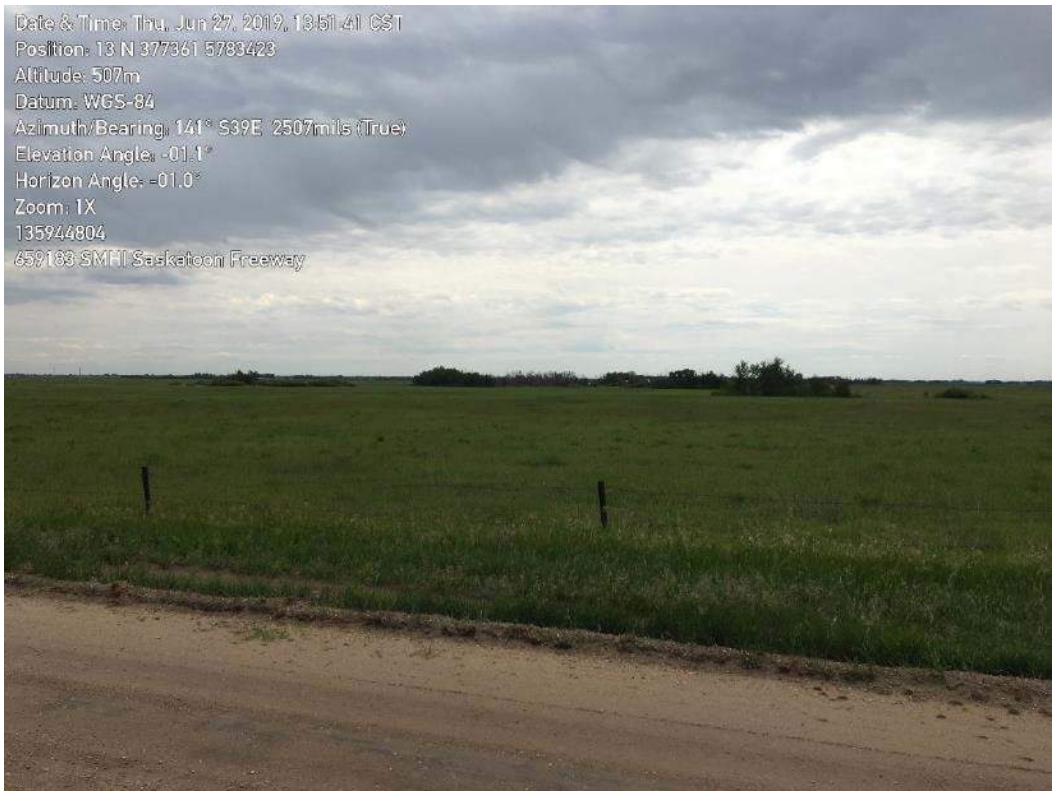
Photograph F.6 SW-25-37-06-W3 Tree stand habitat and residence adjacent to cropland; 26-Jun-19

Photograph F.7 NE-25-37-06-W3 Cropland habitat north of Highway 16; 26-Jun-19

Photograph F.8 SW-31-37-05-W3 Cropland habitat north of Highway 16; 26-Jun-19

Photograph F.9 SE-21-37-06-W3 Grassland/pasture habitat and residence; 27-Jun-19

Photograph F.10 NE-25-37-06-W3 Grassland/tame pasture and cropland habitat south of Highway 16; 26-Jun-19



Photograph F.11 NE-16-37-06-W3 Grassland/pasture and wetland habitat; 27-Jun-19

Photograph F.12 SE-27-37-06-W3 Cropland, wetland, and tree stand habitat; 27-Jun-19

Photograph F.13 NE-22-37-06-W3 Cropland and tilled wetland habitat; 27-Jun-19

Photograph F.14 SW-26-37-06-W3 Cropland and tilled wetland habitat; 27-Jun-19

Photograph F.15 NW-15-37-06-W3 Grassland/tame pasture habitat and residence; 27-Jun-19

Photograph F.16 SW-22-37-06-W3 Tree stand and cropland habitat; 27-Jun-19

Photograph F.17 NE-08-37-06-W3 Cropland habitat and residence; 26-Jul-19

Photograph F.18 NW-09-37-06-W3 Cropland, tame grassland/pasture, and swale habitat; 26-Jul-19

Photograph F.19 NE-29-36-06-W3 Cropland and tree stand/row habitat; 26-Jul-19

Photograph F.20 SE-08-37-06-W3 Cropland and tilled and seeded wetland habitat; 26-Jul-19

Photograph F.21 SE-29-36-06-W3 Cropland habitat; 26-Jul-19

Photograph F.22 SW-29-36-06-W3 Cropland, wetland, and tree stand habitat; 26-Jul-19

Photograph F.23 NE-20-36-06-W3 Cropland and treed (in ditch) habitat; 26-Jul-19

Photograph F.24 NE-20-36-06-W3 Former yard site habitat. Another photo of this quarter section habitat is presented in Photograph F.23; 26-Jul-19

Photograph F.25 SW-21-36-06-W3 Cropland and wetland habitat; 26-Jul-19

Photograph F.26 NW-21-36-06-W3 Cropland habitat; 26-Jul-19

Photograph F.27 NE-17-36-06-W3 Wetland, tree stand, and cropland habitat; 26-Jul-19

Photograph F.28 SE-20-36-06-W3 Mowed lawn and industrial site; 26-Jul-19

Photograph F.29 NW-10-36-04-W3 Cropland habitat and adjacent residence; 07-Aug-19

Photograph F.30 NE-10-36-04-W3 Tree stand habitat within cropland quarter; 07-Aug-19

Photograph F.31 SW-09-36-04-W3 Cropland and wetland habitat; 07-Aug-19

Photograph F.32 SE-09-36-04-W3 Ephemeral creek/drainage and cropland habitat; 07-Aug-19

Photograph F.33 SE-08-36-04-W3 Cropland and tilled wetland habitat; 07-Aug-19

Photograph F.34 NE-05-36-04-W3 Wetland and cropland habitat and residence; 07-Aug-19

Photograph F.35 SE-06-36-04-W3 Wetland and grassland/pasture habitat; 07-Aug-19

Photograph F.36 NE-06-36-04-W3 Wetland, tree stand, and grassland/hayland habitat; 07-Aug-19

Photograph F.37 SE-01-36-05-W3 Cropland habitat and tilled wetland habitat; 07-Aug-19

Photograph F.38 SW-06-36-04-W3 Cropland, wetland, and tree stand habitat; 07-Aug-19

Photograph F.39 NW-34-36-04-W3 Cropland habitat and tilled wetland habitat; 09-Aug-19

Photograph F.40 NE-36-35-05-W3 Wetland and grassland/pasture habitat and residence; 07-Aug-19

Photograph F.41 NW-27-36-04-W3 Grassland/pasture habitat; 09-Aug-19

Photograph F.42 SW-34-36-04-W3 Cropland habitat and residence; 09-Aug-19

Photograph F.43 SW-27-36-04-W3 Cropland habitat; 09-Aug-19

Photograph F.44 NW-27-36-04-W3 Wetland and cropland habitat. Another photo of this quarter sections habitat is presented in Photograph F.41; 09-Aug-19

Photograph F.45 NW-22-36-04-W3 Cropland and tree stand habitat; 09-Aug-19

Photograph F.46 NW-22-36-04-W3 Grassland and wetland habitat. Another photo of this quarter sections habitat is presented in Photograph F.45; 09-Aug-19

Photograph F.47 NW-15-36-04-W3 Ephemeral creek and cropland habitat; 09-Aug-19

Photograph F.48 SW-22-36-04-W3 Cropland and tilled wetland habitat; 09-Aug-19

Photograph F.49 SW-10-37-04-W3 Wetland, treestand, and cropland habitat; 15-Aug-19

Photograph F.50 SW-15-36-04-W3 Cropland habitat; 09-Aug-19

Photograph F.51 SE-05-38-05-W3 Residence/yard habitat; 15-Aug-19

Photograph F.52 SE-09-37-04-W3 Cropland and wetland habitat; 15-Aug-19

Photograph F.53 SE-04-38-05-W3 Grassland/pasture habitat; 15-Aug-19

Photograph F.54 NE-31-37-05-W3 Cropland habitat; 15-Aug-19

Photograph F.55 NW-32-37-05-W3 Hayland and wetland habitat; 15-Aug-19

Photograph F.56 SW-16-37-04-W3 Cropland habitat; 15-Aug-19

Photograph F.57 NE-04-37-04-W3 Cropland and wetland habitat; 15-Aug-19

Photograph F.58 NW-09-37-04-W3 Cropland and dugout habitat; 15-Aug-19

Photograph F.59 SW-03-37-04-W3 Unused pasture, wetland, and cropland habitat; 15-Aug-19

Photograph F.60 SW-32-37-05-W3 Cropland, tree stand, and wetland habitat; 15-Aug-19

Photograph F.61 NE-32-37-05-3 Cropland habitat and developed industrial site; 15-Aug-19

Photograph F.62 SW-04-38-05-W3 Grassland/pasture habitat and developed industrial site; 15-Aug-19

Photograph F.63 SE-04-37-04-3 Tree stand, wetland, and cropland habitat; 15-Aug-19

Photograph F.64 NW-08-37-04-3 Cropland habitat; 15-Aug-19

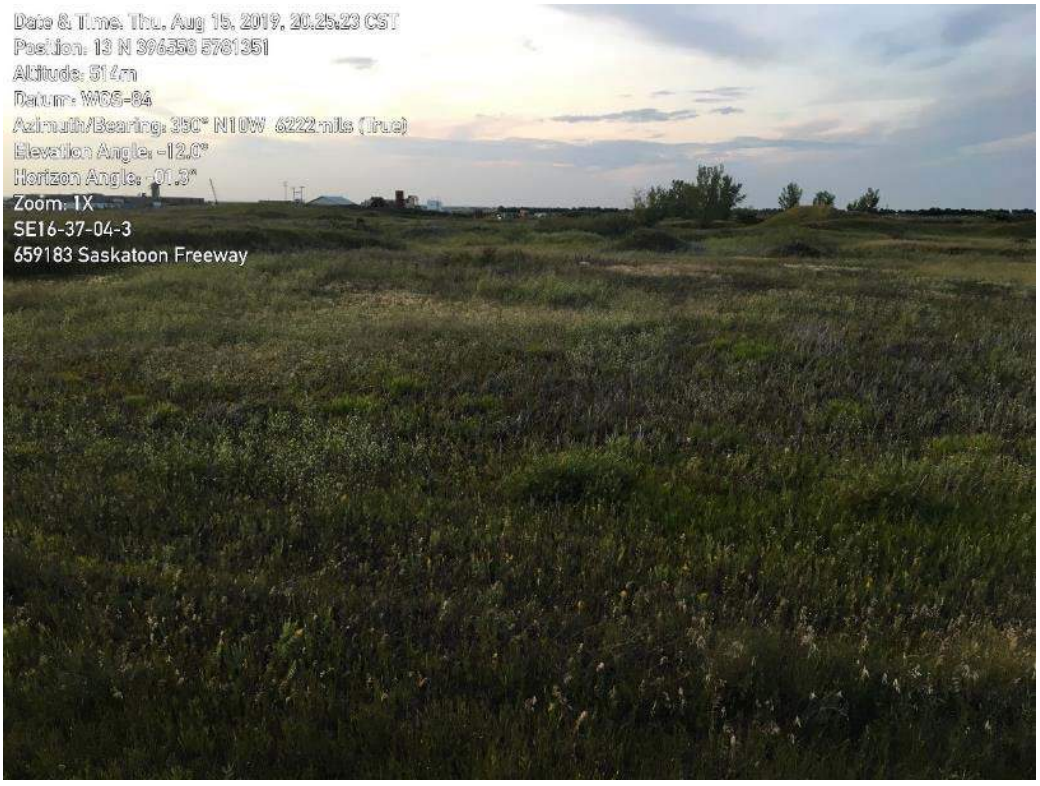
Photograph F.65 SE-04-38-05-W3 Grassland habitat. Photo note is mislabeled; 15-Aug-19

Photograph F.66 NE-09-37-04-W3 Cropland habitat; 15-Aug-19

Photograph F.67 NE-31-37-05-W3 Cropland and wetland habitat; 15-Aug-19

Photograph F.68 NE-03-37-04-W3 Grassland, wetland, and cropland habitat; 15-Aug-19

Photograph F.69 NE-28-37-05-W3 Hudson Bay swale; 29-Aug-19



Photograph F.70 SE-16-37-04-W3 Grassland habitat near gravel operation; 15-Aug-19

Photograph F.71 SE-34-37-05-W3 Hudson Bay swale; 29-Aug-19

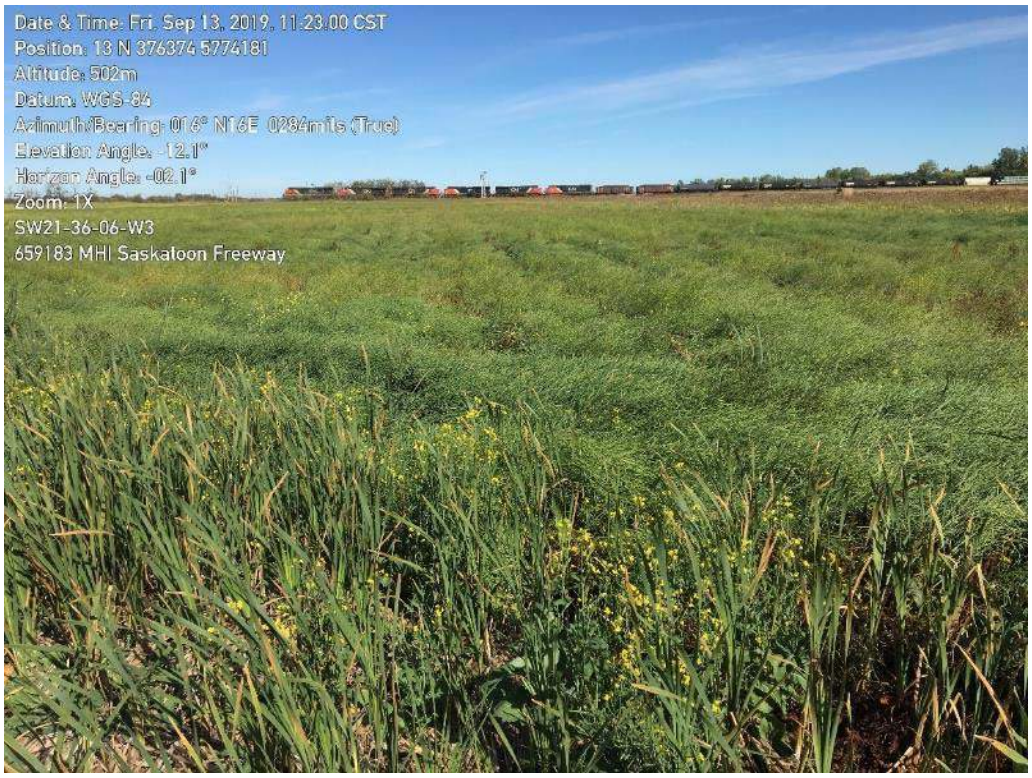
Photograph F.72 SW-34-37-05-W3 Native dominant grassland near Hudson Bay swale; 29-Aug-19

Photograph F.73 NE-05-37-06-W3 Cropland and wetland habitat; 13-Sep-19

Photograph F.74 NW-34-37-05-W3 Native-dominant pasture near Hudson Bay swale; 29-Aug-19

Photograph F.75 SE-08-37-06-W3 Cropland and wetland habitat; 13-Sep-19

Photograph F.76 NW-16-36-06-W3 Cropland and wetland habitat; 13-Sep-19.



Photograph F.77 SW-21-36-06-W3 Cropland and wetland habitat; 13-Sep-19

Photograph F.78 SE-29-36-06-W3 Cropland habitat; 13-Sep-19

Photograph F.79 NW-09-37-06-W3 West swale; Another photo of this quarter section habitat is presented in Photograph F.18; 14-Sep-19

Photograph F.80 NW-15-37-06-W3 Tame Pasture; 14-Sep-19

Photograph F.81 SE-9-36-4-W3 Uncultivated tame pasture; 16-Sep-19

Photograph F.82 Section 36-35-05-W3. Grassland/pasture habitat. Another photo of this quarter section is presented in Photograph F.40; 16-Sep-19

Appendix G

Fish Species within the South Saskatchewan River Watershed

Table G.I. Fish species found in the South Saskatchewan River Watershed

Table G.I. Fish species found in the South Saskatchewan River Watershed

Common Name	Scientific Name	SKCDC Rank	COSEWIC Status	SARA Status
blacknose dace	*Rhinicthys obtusus*	S3	-	-
brook stickleback	*Culaea inconstans*	S5	-	-
brook trout	*Salvelinus fontinalis*	SNA	-	-
burbot	*Lota lota*	S5	-	-
cisco	*Coregonus artedi*	S5	-	-
common shiner	*Luxilus cornutus*	S3	-	-
emerald shiner	*Notropis atherinoides*	S5	-	-
fathead minnow	*Pimephales promelas*	S5	-	-
finescale dace	*Chrosomus neogaeus*	S4	-	-
flathead chub	*Platygobio gracilis*	S3	-	-
goldeye	*Hiodon alosoides*	S4	-	-
Iowa darter	*Etheostoma exile*	S5	-	-
lake chub	*Couesius plumbeus*	S5	-	-
lake sturgeon	*Acipenser fulvescens*	S2	Endangered	-
lake whitefish	*Coregonus clupeaformis*	S5	Not at Risk	-
longnose dace	*Rhinichthys cataractae*	S5	-	-
longnose sucker	*Catostomus catostomus*	S5	-	-
mooneye	*Hiodon tergisus*	S3	-	-
mountain sucker	*Catostomus platyrhynchus*	S1	Threatened	Threatened
northern pike	*Esox lucius*	S5	-	-
shorthead redhorse	*Moxostoma macrolepidotum*	S4	-	-
pearl dace	*Margariscus machtriebi*	S5	-	-
quillback sucker	*Carpiodes cyprinus*	S4	-	-
rainbow trout	*Oncorhynchus mykiss*	SNA	-	-
river shiner	*Notropis blennis*	S3	-	-
sauger	*Sander canadensis*	S5	-	-
silver redhorse	*Moxostoma anisurum*	S4	-	-
slimy sculpin	*Cottus cognatus*	S4	-	-
spoonhead sculpin	*Cottus ricei*	S5	Not at Risk	-
spottail shiner	*Notropis hudsonius*	S5	-	-
trout-perch	*Percopsis omiscomaycus*	S5	-	-
walleye	*Sander vitreus*	S5	-	-
white sucker	*Catostomus commersonii*	S4	-	-
yellow perch	*Perca flavescens*	S5	-	-

Appendix H

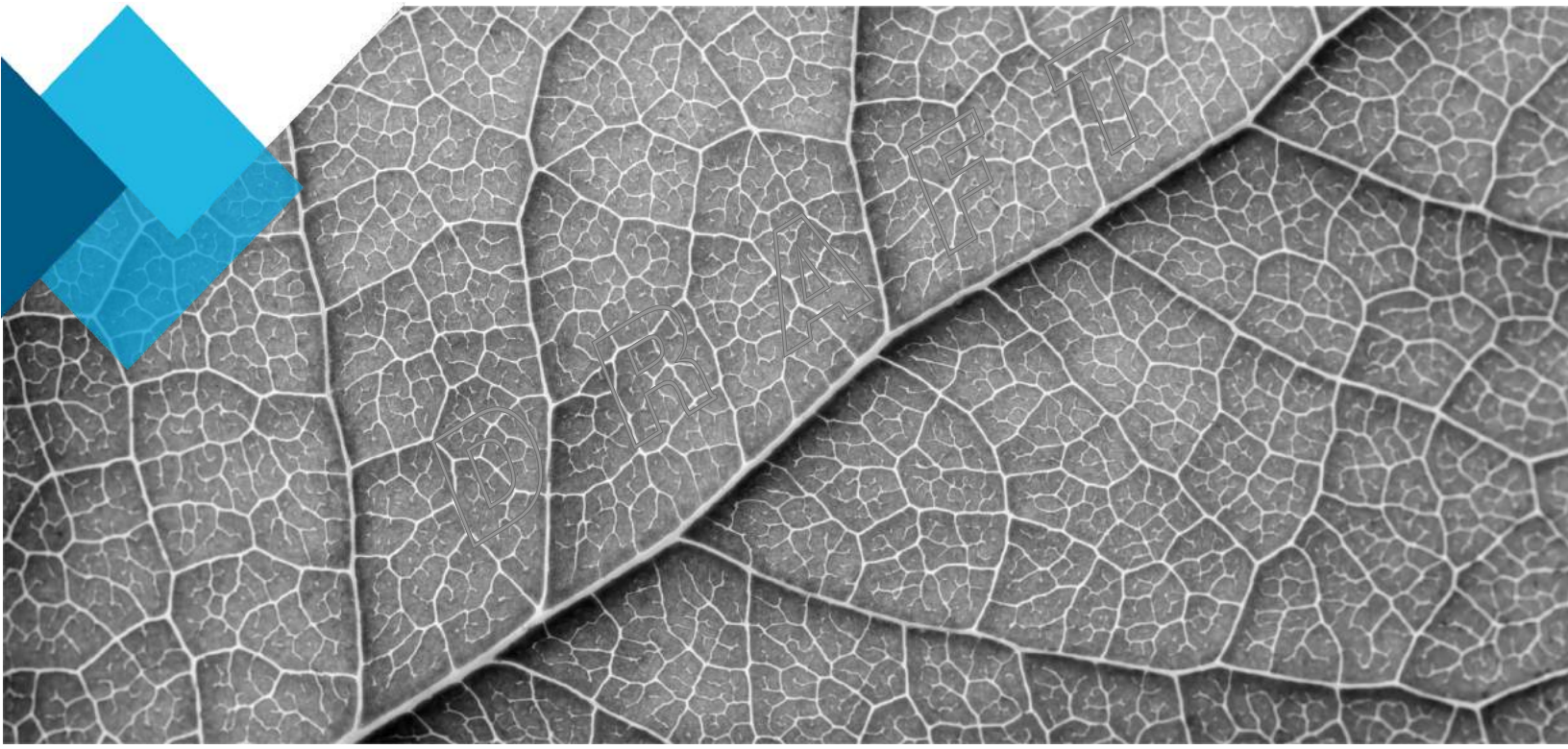
Desktop Baseline Heritage Resources Study

SNC·LAVALIN

Desktop Baseline Heritage Resource Study

Saskatoon Freeway Functional Planning Study

Saskatchewan Ministry of Highways and Infrastructure (MHI)



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Internal Ref: 659183

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The findings, conclusions, and recommendations in this report (i) have been developed in a manner consistent with the level of skill normally exercised by professionals currently practicing under similar conditions in the area, and (ii) reflect SNC-Lavalin's best judgment based on information available at the time of preparation of this report. No other warranties, either expressed or implied, are made with respect to the professional services provided to Saskatchewan Ministry of Highways and Infrastructure (MHI) or the findings, conclusions, and recommendations contained in this report. The findings and conclusions contained in this report are valid only as of the date of this report and may be based, in part, upon information provided by others. If any of the information is inaccurate, new information is discovered, or project parameters change, modifications to this report may be necessary.

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Executive Summary

SNC-Lavalin Inc. (SNC-Lavalin) completed a desktop baseline heritage resource study on behalf of the Saskatchewan Ministry of Highways and Infrastructure (MHI) to support the Saskatoon Freeway Functional Planning Study. This heritage resource study includes a desktop analysis of known heritage resources and areas of archaeological potential that may be affected by the proposed project.

Based on the number of known archaeological sites in the Study Area (176), one might expect as many as 11 or 12 archaeological sites ignoring environmental factors specific to the proposed route. Factors to be considered that could affect this number include the relative proximity of Wanuskewin Heritage Park, an area that includes a very high site density. The extent to which this site density extends beyond the park area is not known, nor whether it extends to the southeast side of the river. Another factor is that the proposed route crosses the South Saskatchewan River only once, while the river extends across the entire Study Area.

The proposed freeway corridor passes through 37 quarter sections that have been identified by the Heritage Conservation Branch (HCB) as Heritage Sensitive, approximately 26% of the quarter sections the corridor crosses. The heritage sensitivity rating, however, only addresses the potential for land to contain Precontact Period heritage sites. The review of the Homestead records for the route identified at least 109 unique homestead applications in lands within the proposed freeway corridor. Some of these may relate to EuroCanadian heritage sites that may require reporting and assessment.

The proposed freeway corridor passes through areas that have the potential to contain heritage resources ranging from the earliest occupations to more recent homestead sites. Because the route passes through lands that have been identified as Heritage Sensitive by the HCB, a project referral to the HCB is required. This referral will initiate a review of the project and potential impacts to heritage resources by the HCB which will issue either project clearance or requirements for further assessment.

The presence of a concentration of important heritage resources at Wanuskewin Heritage Park highlights the potential of some portions of the proposed corridor to affect heritage resources. Some of these heritage resources may be sufficiently significant to require extensive mitigation or even require avoidance, and this can affect both the project design and timetable. Heritage assessment of the proposed freeway corridor should be undertaken early in the planning and design process to avoid potential delays.

Abbreviations, Acronyms, and Glossary

Term	Definition
Artifact	An object modified by humans.
Artifact find	An archaeological site containing five or fewer artifacts.
Artifact scatter	An archaeological site containing six or more artifacts.
BP	Before present. In archaeological terms, dates are calculated using 1950 CE as a base.
Burial	Complete or partial remains of a human skeleton, with or without associated grave goods.
CE	Common Era.
Feature	An arrangement of artifacts or stones representing an activity area such as a cairn, tipi ring, or hearth.
Historic Period	The Historic Period refers to the approximate time of recorded European contact with indigenous Americans.
Homestead	An Historic Period site likely dating between 1872 and 1930 relating to the establishment of homesteads under the *Dominion Lands Act.*
NFW	No further work recommended.
HCB	Heritage Conservation Branch, Saskatchewan Parks, Culture and Sport.
Medicine Wheel	A stone feature consisting of at least two of the following: a large central cairn, a stone ring(s), or radiating lines of stone.
Precontact Period	Includes all archaeological sites dating to before European contact with indigenous Americans; in Saskatchewan, approximately between 11,000 BP and 1,750 CE.
RM	Rural Municipality.
Stratified	Heritage sites that contain more than one cultural deposit separated into distinct depositional layers.
SKCDC	Saskatchewan Conservation Data Centre.
SRC	Saskatchewan Research Council.

Units

Term	Definition
%	percent
cm	centimetre
ha	hectare
km	kilometre
m	metre

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I Homestead Data

1 Introduction

SNC-Lavalin Inc. (SNC-Lavalin) completed a desktop baseline heritage resource study on behalf of the Saskatchewan Ministry of Highways and Infrastructure (MHI) to support the Saskatoon Freeway Functional Planning Study. This heritage resource study includes a desktop analysis of known heritage resources and areas of archaeological potential and will support the route selection.

The proposed project is an approximately 55 km long freeway that will circle the majority of the City of Saskatoon. Sections of the project are located within City property, while other portions are in the RM of Corman Park No. 344 (**Figure 1.1**). The proposed freeway will connect at Highway 11 to the south and Highway 60 to the southwest. Currently MHI has identified a 500 m wide corridor for the proposed freeway, and the functional planning study will select a preferred right-of-way within the corridor.

1.1 Regulatory Context

In Saskatchewan, heritage resources are managed by the Heritage Conservation Branch (HCB) of Saskatchewan Parks, Culture and Sport under the authority of The Heritage Property Act. The Act defines heritage property as: archaeological objects; paleontological objects; and any property of interest for its architectural, historical, cultural, environmental, archaeological, paleontological, aesthetic, or scientific value. In practice, heritage properties include historic structures, archaeological sites, and paleontological sites.

The Heritage Sensitivity database identifies lands as either Heritage Sensitive or Not Heritage Sensitive. A quarter section of land is deemed to be Heritage Sensitive based on the presence of any one of several criteria such as: native prairie, proximity to a significant topographic feature such as a river valley, or the presence of a known heritage site. For lands that are Heritage Sensitive, the HCB requires the project proponent to refer the proposed development to the HCB for review. The HCB may then require a Heritage Resource Impact Assessment (HRIA). Lands that are deemed to be Not Heritage Sensitive require no further heritage resource assessment and are granted clearance under The Heritage Property Act. A project referral and HRIA are outside the scope of this study.

The Archaeological Site Inventory includes the site inventory forms for all archaeological sites recorded in the province. These forms contain information on a number of factors describing the heritage resource including site location, site type, age, the kind and number of site features, and artifacts observed and collected, among others. This database records the fundamental data used to manage heritage resources in Saskatchewan.

The Archaeological Permit Report Database includes most of the archeological reports that have been prepared since the onset of heritage legislation in Saskatchewan in 1980. The database shows the project footprint for proposed developments and the area assessed for each project. This database records lands where archaeological assessments have been conducted and reviewed by the HCB. The data is used to manage the clearance process for future development.

1.2 Study Area

The baseline heritage resources Study Area was an informal and arbitrary area chosen to include the proposed freeway corridor plus a larger area of terrain similar to the project area. The Study Area boundary is shown in **Figure 1.1**. The Study Area is 28.8 km (18 miles) square and contains 853.4 km^2 (329.5 miles^2) of land.

1.3 Environmental Setting

1.3.1 Terrain and Surficial Geology

The Study Area is in the Moist Mixed Grassland Ecoregion of the Prairie Ecozone (Acton et al. 1998). The landscape in this area is generally undulating, with local relief typically less than three metres, except in the Minichinas Hills where some rolling hills are found (Acton and Ellis 1978). The South Saskatchewan River valley is a relatively deep valley which contains the lowest elevations in the area. Surficial deposits are primarily glacio-fluvial and glacio-lacustrine in origin, deposited during the most recent glacial period. In most locations in the region, the landforms have remained relatively unchanged since the glaciers retreated, and only local runoff and wind erosion have influenced the area since that time. The South Saskatchewan River valley is an exception, as recent alluvial and colluvial soil deposits are present in the floodplains and valleys of this river.

1.3.2 Land Cover

The results of the land cover mapping exercise (SNC-Lavalin 2019) are presented in **Table 1.1**. About 75% of the land is cropland that has been or is being cultivated. Cultivation can have significant impacts on shallowly buried archaeological deposits; however, areas disturbed by cultivation have the potential for more deeply buried and possibly stratified heritage deposits. Habitable lands that are more or less undisturbed (Hardwood Open, Native Dominant Grassland, and Tall Shrub) make up approximately 21% of the Study Area. The extent of potential disturbance on these lands is not clear, but it is these lands that have the best potential for undisturbed shallowly buried heritage deposits.

Table 1.1 Land Cover in the Study Area

	Area in Study Area(ha)	% of Study Area	Area in Freeway Corridor (ha)
Cultivated land	48,991	57.4	
Farmstead	12,332	14.4	
Hardwood open	2,825	**3.3**	
Hay crop (forage)	2,159	2.5	
Herbaceous fen	168	0.2	
Marsh	1,635	1.9	
Mud/sand/saline	238	0.3	
Native dominant grassland	14,087	**16.5**	
Pasture (seeded grassland)	270	0.3	
Tall shrub	1,170	**1.4**	
Waterbody	1,469	1.7	

1.3.3 Wildlife in the Moist Mixed Grassland Ecoregion

A diversity of wildlife is supported by the Landscape Areas within the Moist Mixed Grassland Ecoregion. The border of the Aspen Parkland Ecoregion is located approximately 10 km north of the Study Area, so there is likely considerable habitat for wildlife found in both ecoregions (Acton et al. 1998). Upwards of 55 mammal species have been found in the Ecoregions. Common mammals occurring in open, grassland habitat and the transitional zone between ecoregions include: coyote, porcupine, white-tailed jackrabbit, striped skunk, white-tailed deer, mule deer, deer mouse, Richardson's ground squirrel, red fox, and American badger. Although not present now, bison would have been common in the area and would have been a significant resource. The fragmented deciduous forest habitat of the Aspen Parkland Ecotone supports less common mammals like moose, cougar, and black bear. Mammals associated with wetland habitat and other water features include North American beaver, North American river otter, and muskrat.

A total of 320 migratory and resident birds have been recorded in the Moist Mixed Grassland and Aspen Parkland Ecoregions, with considerable overlap of the species in the Ecoregions (Acton et al. 1998). Common birds found in open, grassland habitat include northern harrier, American crow, horned lark, clay-coloured sparrow, and sharp-tailed grouse. Birds associated with aspen stands and deciduous forest habitat include ruffed grouse, great horned owl, red-tailed hawk, common raven, least flycatcher, hairy woodpecker, and yellow warbler. Wetlands and lentic water features are predominantly populated by waterbirds, such as northern shoveler, blue-winged teal, killdeer, black tern, Wilson's snipe, eared grebe, sora, and American avocet (SKCDC 2019). Temporary, semi-permanent, and permanent wetlands in the Study Area are used by waterfowl as summer breeding areas and spring/fall staging areas. Some of the migrant waterfowl and upland game such as grouse may have been food resources for pre-contact people. Other smaller birds may have been utilized for their feathers or bones for ceremonial or ornamental purposes.

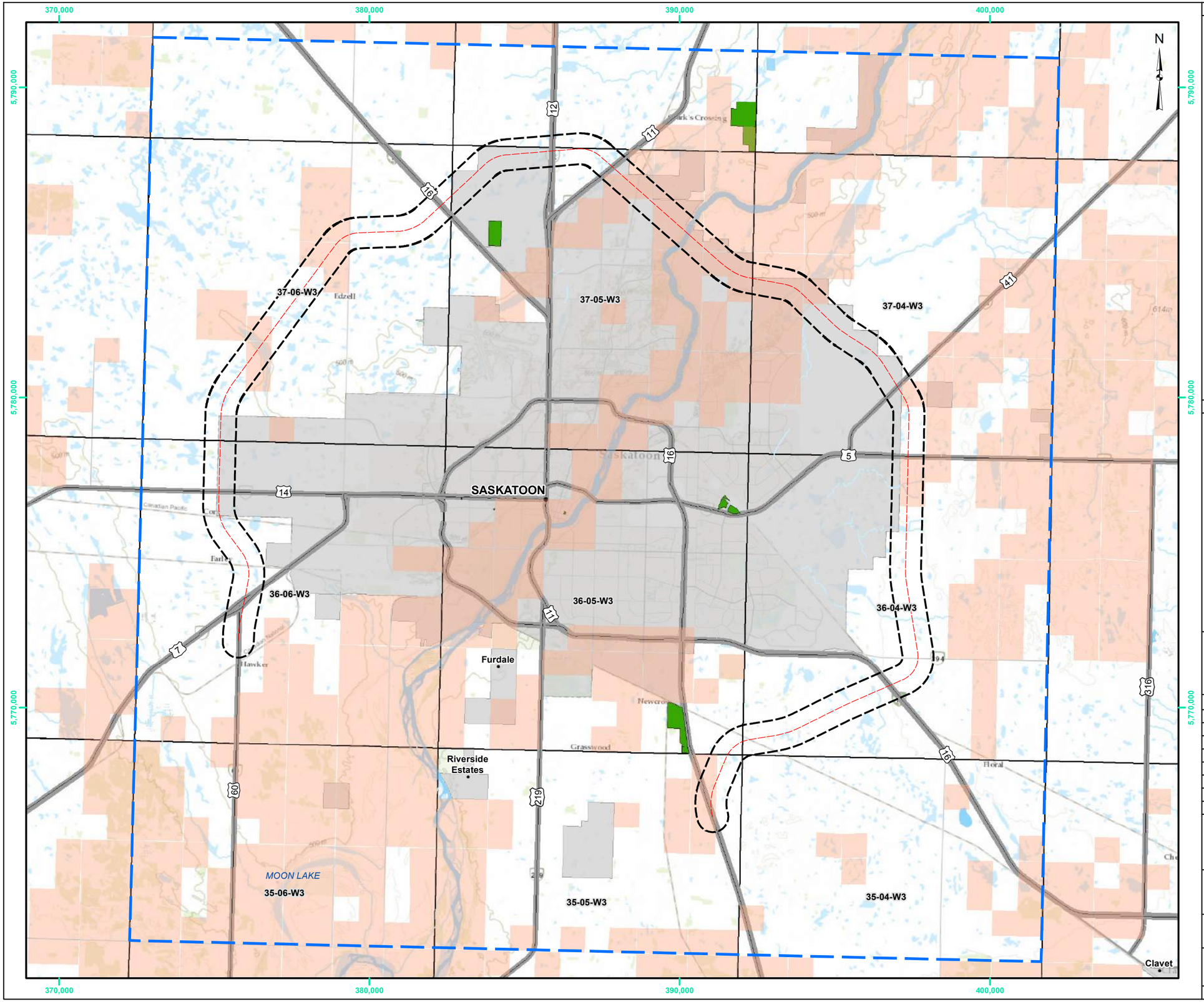
2 Desktop Study Methods

A desktop heritage resources overview study was conducted to collect available information for heritage resources in and around the Study Area.

The HCB maintains three main databases relating to heritage resources in the province: the Heritage Sensitivity database, the Archaeological Site Inventory, and the Archaeological Permit database. These databases contain information on most of the heritage work that has been done in Saskatchewan. These databases were searched for relevant information.

The Saskatchewan Genealogical Society (SGS) cemetery index was searched to obtain records of cemeteries within, or directly adjacent to, proposed freeway corridor. The SGS database contains the name and location of over 3,486 cemetery and burial sites in the province. The collecting of burial records for these cemeteries is an ongoing project of the SGS (SGS 2019).

The Saskatchewan Homestead Index (SHI) was searched to obtain records of homestead files within the Study Area. From this data, homesteads on lands overlapping the freeway corridor were extracted. The Saskatchewan Homestead Index is a file locator database to the homestead files at the Saskatchewan Archives. It contains 360,000 references to those men and women who, from 1872 to 1930, under the terms of the Dominion Lands Act, took part in the homestead process in the area now known as Saskatchewan (SHI 2019). Some of these files may have the potential to be Contact period heritage sites which are currently not catalogued by the HCB.



LEGEND

- PRELIMINARY FREEWAY ALIGNMENT
- HIGHWAY
- HERITAGE SENSITIVE LOCATION
- FIRST NATION LAND
- URBAN MUNICIPALITY
- PRELIMINARY FREEWAY ALIGNMENT 500 METER CORRIDOR
- HERITAGE STUDY AREA
- TOWNSHIP

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2016, SASKGRID2016.
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6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 2.0 DATASET, 2016-10-06.
7. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
8. HERITAGE CONSERVATION BRANCH, SASKATCHEWAN PARKS, CULTURE AND SPORT. THE DATASET INDICATES WHETHER ANY PORTION OF A QUARTER-SECTION IS HERITAGE SENSITIVE. IN THIS CASE, HERITAGE SENSITIVE DESCRIBES THE POTENTIAL OF A QUARTER TO CONTAIN INTACT ARCHAEOLOGICAL OR PALAEONTOLOGY SITES.
9. FIRST NATION LEGISLATED BOUNDARIES OBTAINED FROM ISC.

DISCLAIMER

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
PA	2019 08 09	ISSUED FOR REVIEW	JL	KVG		

0 1,250 2,500 5,000 METRES

SCALE: 1:120,000

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SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE

PROJECT LOCATION
SASKATOON FREEWAY

TITLE
HERITAGE RESOURCE OVERVIEW STUDY AREA

DATE	2019 08 09	DWG No.	659183-0000-4EDD-0015	FIG No.	1.1	REV	PA

SIZE 11x17

Path: \\sli1653\projects qms\SMH\I659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Heritage\659183-0000-4EDD-0015 Heritage Resource Overview.mxd

3 Results

3.1 Heritage Sensitivity

The heritage sensitivity results are presented in **Figure 1.1**. Of the 1,296 quarter sections located in the Study Area, 425 (32.8%) are Heritage Sensitive. The remaining 871 (67.2%) are Not Heritage Sensitive. The proposed freeway corridor will cross approximately 141 quarter sections (excluding very small fragments), including 37 quarters (26%) that are identified as Heritage Sensitive. The Heritage Sensitive quarters are scattered along the route with a definite concentration near the Saskatchewan River crossing and Wanuskewin Heritage Park. The slight difference in relative amounts of Heritage Sensitive lands in the Study Area compared with the freeway corridor and buffer indicates that the data from the Study Area is a good analogue for what might be expected in the proposed route.

3.2 Previous Research

The earliest permitted archaeological work in the Study Area under *The Heritage Property Act (1980)* occurred in 1982. Since that time, archaeological work in the area is largely related to subdivision development. **Table 2.1** presents a list of several of the larger subdivision assessments conducted in the Study Area since permitted archaeological work began. Smaller projects have not been included in **Table 2.1,** but the footprints of these studies are included in **Figure 2.1**.

Walker (1982) conducted an archaeological survey of the Tipperary Creek area after the property had been acquired by the Meewasin Valley Authority. The Tipperary Creek survey area, part of which is now known as Wanuskewin Heritage Park, was composed of 420 acres (170 ha) of cultivated land along and above Tipperary Creek, a tributary on the north/west side of the South Saskatchewan River. At the time of the work, the Tipperary Creek survey area is several kilometres north of the residential area of Saskatoon, but a portion of the survey is now located within the proposed freeway corridor.

The Tipperary Creek survey identified 17 heritage sites (Walker 1982: iii), including 15 prehistoric sites and two historic period sites. Wanuskewin Heritage Park is now listed on the National Register of Historic Sites (Historic Places 2019) and is under consideration as a UNESCO World Heritage site. The park contains sites representing at least 6,000 years of cultural history on the northern Plains including camp sites, tipi rings, stone cairns, bison kill sites, and a medicine wheel.

The Tipperary Creek survey identifies a pattern of land use that is relevant to the present review. As the National Register notes: “The pattern of land use is clear, being richest along the riverbanks and disappearing as the valley becomes shallower” (Historic Places 2019).

In 1983, Ernie Walker conducted the Saskatoon Perimeter Archaeological Survey on many land parcels around the perimeter of Saskatoon totalling 11 square miles (28.5 km^2). At that time, no archaeological work had been conducted on any of the parcels and no archaeological sites were known to exist on the property (Walker 1990). Over 90% of the area surveyed was under cultivation. Cultivated lands were walked in transects with 30 m spacing and available exposures were examined. Shovel testing was not done. In uncultivated lands, shovel tests were excavated at 20 m or 50 m intervals.

The Saskatoon Perimeter survey identified one archaeological site and nine “find spots” due to the provincial practice at the time of separating archaeological sites with larger accumulations of cultural material from those with fewer artifacts. Standard practice now is to record all archaeological finds as sites, with the possible exception of single non-retouched artifacts such as a lithic flake or bone fragment.

Later studies in the area show a clear pattern of following the growth of the city as it expanded outwards. However, few of these studies intersect with the freeway corridor. The lack of intersection between previous archaeological studies and the proposed freeway corridor limits the direct application of this data to the present review, but it can be used as a guide to expected future results.

Walker’s original perimeter study (Walker 1983) provides the best analogue to the present review. Walker’s study selected study sites in a roughly circular perimeter around the city in areas seen as potential locations for future development. These sites are now well inside the proposed corridor, but the circular pattern provides a direct analogy to the present study.

Ramsay (1998) reports on the assessment of the Eagle Ridge Estates subdivision in SE10-37-4-W3. This quarter is within 150 m of the northeast edge of the proposed freeway corridor and is along the edge of the Strawberry Hills uplands. This quarter was largely in cultivation with a small portion of intact native prairie. Three sites were assessed, all in the cultivated areas of the quarter. One site was a previously recorded artifact find, the other two were newly identified artifact finds. All three sites were shovel tested. No intact cultural deposits were identified and no further work was recommended.

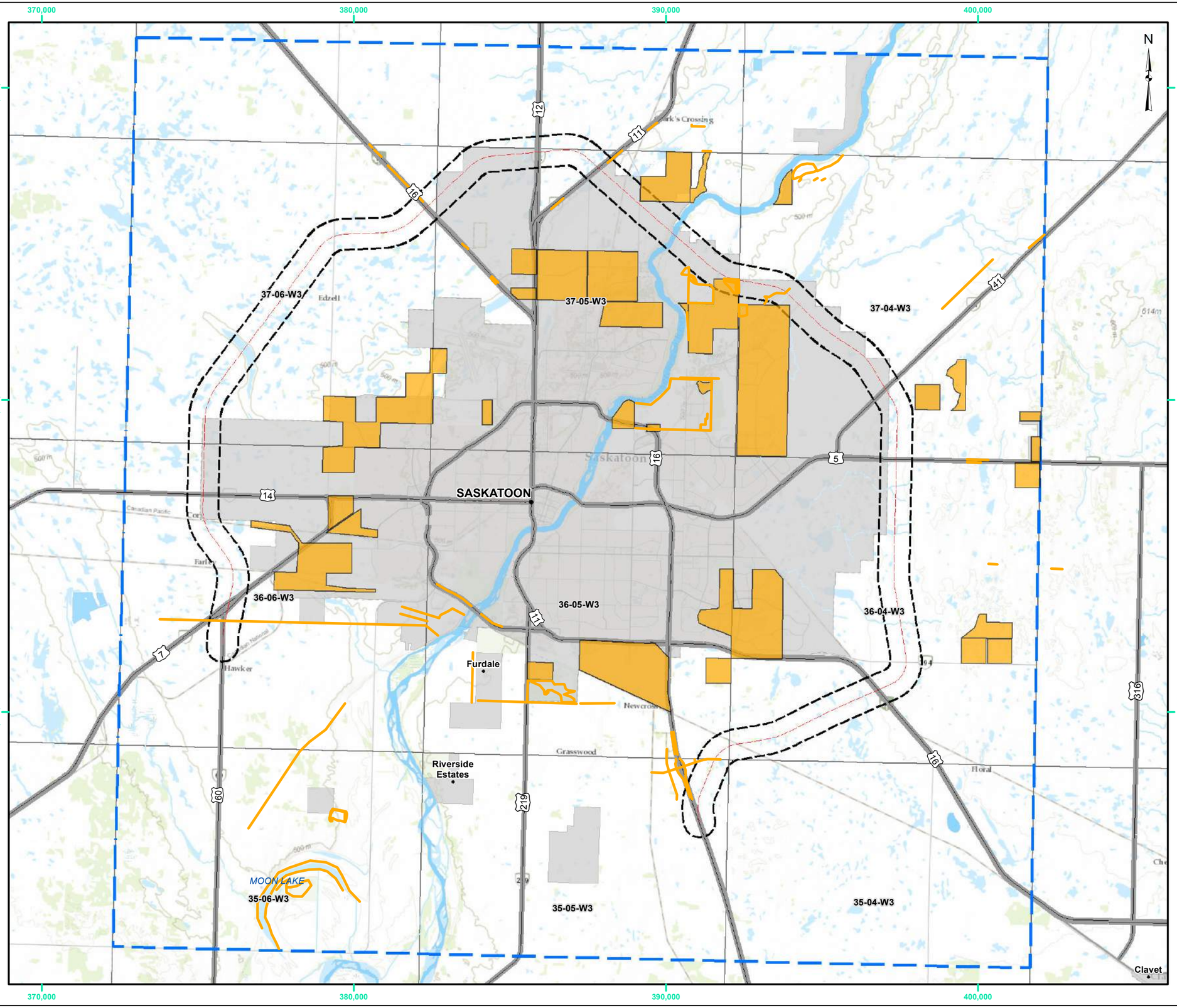
Markowski and Wolfe (2013) assessed a portion of W½ 11-37-4-W3 in advance of a proposed residential subdivision. This project is also in the Minichinas Upland near the northeast part of the freeway route. Slightly more than half of the development area was native prairie and was assessed. The uncultivated portion was not assessed. One archaeological site, FbNo-9, had previously been reported on the property. Native portions of the study area were assessed using pedestrian traverses and shovel testing. The presumed location of FbNo-9 was shovel tested but was not relocated. No further work was recommended, and the project was granted clearance to proceed.

Novecosky (2004) assessed portions of NE13-36-4-W3 and NW14-36-4-W3 just to the east of the southeast corner of the proposed freeway. The area assessed was apparently native prairie in the Minichinas Upland. The terrain is hummocky with many small sloughs interspersed through the Aspen Parkland, a landform that is normally thought to have high archaeological potential. The area was walked and shovel tested with negative results. The project received clearance to proceed without further concerns for heritage resources.

Huynh (2014) assessed a portion of SE14-36-4-W3 in the Minichinas Upland about 1.2 km east of the freeway route. Approximately one third (18 ha) of the quarter section was native prairie and was assessed. The remainder was cultivated and was not surveyed. No heritage resources were identified during the assessment, despite the fact the area was deemed to have a high potential to contain archaeological deposits. Clearance for the project was granted.

Table 2.1 Selected Archaeological Studies in the Study Area

Permit	Permit Holder	Project	Results	Reference	Comment
82-000-05	Linnamae, U.	*Archaeological survey of proposed 1980 & 1981 suburban development areas of the City of Saskatoon and the Silverwood Site*	FbNp-4	Linnamae 1982	Recommend test excavations
82-026	Walker, E.G.	*Archaeological resource assessment: The Tipperary Creek Project*	17 Sites	Walker 1982	Avoidance and mitigation
83-017	Walker, E.G.	*Saskatoon perimeter archaeological resource assessment*	FaNp-7	Walker 1983	Test excavation
93-000	Jones, Tim E.H.	*Saskatoon Natural Grasslands Archaeological Survey*		Jones 1993	Further assessment
96-025	Ramsay A.M. and C.L. Ramsay	*Heritage assessment of a proposed residential development northeast of Saskatoon, Saskatchewan, (SE¼ and NE¼ of 31-37-4-W3M) HRIA Permit #96-025*	FbPn-62 to 68	Ramsay et. al 1996	No further work recommended
98-030	Ramsay, C.L.	*Heritage resource impact assessment of a proposed subdivision for Eagle Ridge Estates Inc. at SE¼-10-37-4-W3M*	FaNo-10, 16, 17	Ramsay 1998	No further work
01-031	Paquin, Todd A.	*Heritage resources impact assessment program, Tower Hill Developments, Discover Ridge Subdivision, Permit No. 01-031*	FaNo-19	Paquin. 2001	No further work
01-038	Friesen, Nathan	*Heritage resource impact assessment of highway re-alignment and interchange at Grasswood Road and Highway 11*	FaNp-29	Friesen 2001	380 m from freeway corridor; no further work
04-090	Novecosky, Brad	*Heritage resources impact assessment program, Tower Hill Ranch Ltd. Hidden Ridge Subdivision Project, Permit No. 04-90*		Novecosky 2004	No further work
08-066	Enns-Kavanagh, K.	*Final report on the Heritage Resources Impact Assessment of NE-14-37-5-W3M*	FbNp-78	Enns-Kavanagh 2008	Site avoidance and mitigation
09-088	Enns-Kavanagh, K.	*Final Report on the monitoring of depression cleanup at FbNp-78, the Hutchins Homestead, in NE-14-37-5-W3M*		Enns-Kavanagh 2009	No recommendations
11-100	Schwab, M.	*Final report, heritage resources impact assessment of proposed Greenbryre Estates, HRIA Permit #2011-11*		Schwab 2011	No further work
13-224	Markowski, M. and K. Wolfe	*Associated Engineering, Eagle Heights Country Estates, W½ 11 37 4 W3M, heritage resources impact assessment, Permit No. 13-224*		Markowski and Wolfe 2013	No further work
13-097	Hein, Lisa	*HRIA of the proposed City of Saskatoon North Commuter Bridge and Central Avenue Extension Project*	FbNp-83, FbNp-84	Hein 2013	Within corridor Test excavations
14-129	Huynh, Tam	*Permit No. 14-129, Ridgewood Estates Subdivision SE 14-36-4 W3M, heritage resources impact assessment*		Huynh 2014	No further work recommended
17-050	Stead, Lauren	*Heritage Resource Detailed Assessment: FbNp-82, FbNp-83, and FbNp-84 – University Heights Neighbourhood 3*	FbNp-82, 83, 84	Stead 2017	Test excavations at FbNp-83



LEGEND

- LINEAR HERITAGE RESOURCE IMPACT ASSESSMENT
- PRELIMINARY FREEWAY ALIGNMENT
- HIGHWAY
- AREAL HERITAGE RESOURCE IMPACT ASSESSMENT
- URBAN MUNICIPALITY
- PRELIMINARY FREEWAY ALIGNMENT 500 METER CORRIDOR
- HERITAGE STUDY AREA
- TOWNSHIP

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2016, SASKGRID2016.
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5. HIGHWAYS AND ROADS OBTAINED FROM THE NATIONAL ROAD NETWORK SASKATCHEWAN EDITION 9.0 DATASET, 2017-06-05.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 2.0 DATASET, 2016-10-06.
7. LINEAR AND AREAL HERITAGE RESOURCE IMPACT ASSESSMENT DATA OBTAINED FROM THE HERITAGE CONSERVATION BRANCH OF SASKATCHEWAN.

DISCLAIMER

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
PA	2019 08 09	ISSUED FOR REVIEW	JL	KVG		

0 1,250 2,500 5,000 METRES

SCALE: 1:120,000

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PROJECT LOCATION
SASKATOON FREEWAY

TITLE
ARCHAEOLOGICAL PROJECTS IN THE STUDY AREA

DATE	2019 08 09	DWG No.	659183-0000-4EDD-0016	FIG No.	2.1	REV	PA

SIZE 11x17

Path: \\SLI1653\Projects QMS\SMH\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Heritage\659183-0000-4EDD-0016 Archaeological Projects.mxd

Hein (2013) conducted an assessment on the proposed route of McOrmon Drive as it approaches the South Saskatchewan River northwest of Saskatoon (Hein 2013). This work identified two historic homesteads (FbNp-83 and 84) located in **LOCATION REDACTED AS PER HCB REQUIREMENTS**. These sites are within the 500 m freeway corridor. This assessment consisted of a number of linear transects near and across the proposed Saskatoon Freeway; one follows the northwest edge of the Swales.

This work was followed up by Stead (2017) who returned to these sites as well as another previously recorded homestead, FbNp-82, to further assess these sites. Mapping and testing work were done at the sites and no further work was recommended at FbNp-82 and FbNp-84. Further testing was recommended at FbNp-83. FbNp-83 is about 480 m from the proposed freeway route.

3.3 Heritage Sites

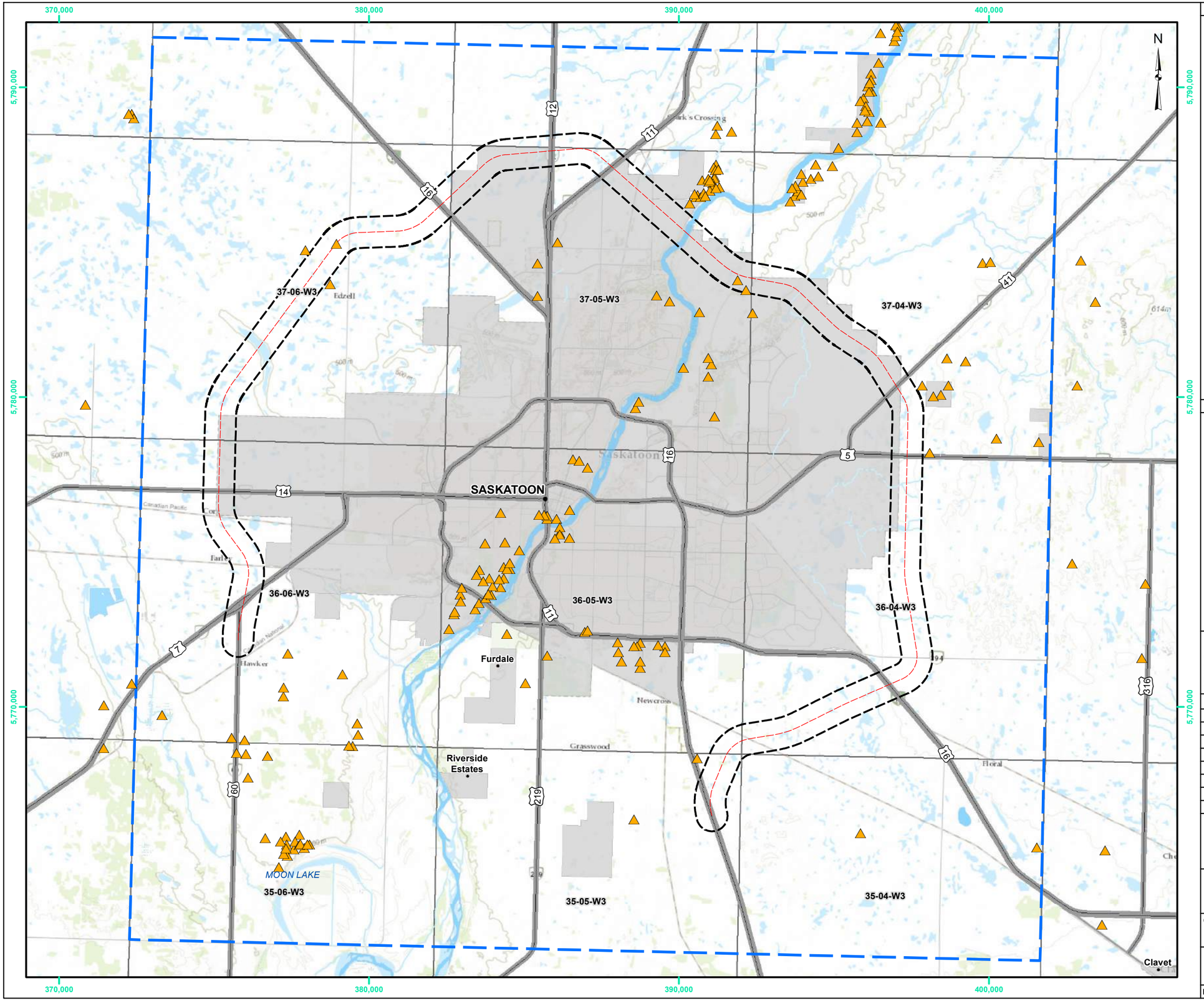
The Study Area contains 176 recorded heritage sites, most of which were identified during impact assessment studies conducted in advance of development, but also includes a smaller number of sites reported prior to regulation or by amateurs and professionals outside of permitted studies. **Table 2.2** presents a summary of these sites grouped by Township and by Chronological Period. Heritage sites have been recorded in all but two of the townships in the Study Area, but this is likely a factor of where archaeological studies have been done rather than indicating an underlying pattern of location. As the table shows, heritage sites recorded in the Study Area span the full range of site type and ages. **Figure 2.2** shows the locations of the known heritage sites in the Study Area. The distribution of these sites exhibits a clear pattern; archaeological site density is much higher along the Saskatchewan River valley. Again, this may result in part from where archaeological studies have been done, but it also likely indicates a pattern of occupation. Experience throughout Saskatchewan indicates that major river systems were a significant attractor for Precontact people and usually exhibit high site density within the first few hundred metres from the river.

Three heritage sites are known to exist within the proposed freeway corridor. FbNq-6 is a lithic scatter site located in **LOCATION REDACTED AS PER HCB REQUIREMENTS**. It was identified in 1965 by an amateur archaeologist. Material collected at that time included two Pelican Lake projectile points, two hafted bifaces, and 18 other lithic artifacts including scrapers and lithic debitage. Pelican Lake artifacts date from the Middle Prehistoric Period, approximately between 3,300 to 1,850 BP. The site has not been professionally assessed.

FbNp-83 and FbNp-84 are Historic Period homestead sites that were identified in **LOCATION REDACTED AS PER HCB REQUIREMENTS** during survey and assessment of the proposed North Commuter Bridge right-of-way (ROW) (Hein, 2013). FbNp-83 was further investigated with test excavations (Stead 2017) which recovered a variety of domestic artifacts including cutlery, glass, metal, and wood fragments. According to the homestead application, the site was occupied at least between 1909 after the application was submitted until 1913 when the land patent was granted. No further details of the occupancy are available. Test excavations were conducted at the site and no further archaeological work is recommended. FbNp-84 contains several depressions believed to be limestone quarries possibly used by the homesteader. The site was mapped, and several depressions were tested. No further work at FbNp-84 was recommended.

Table 2.2 Summary of Archaeological Sites in the Study Area

	Township and Range										
Chronological Period	T35 R4	T35 R5	T35 R6	T35 R3	T36 R3	T37 R4	T37 R5	T37 R6	T38 R4	T38 R5	Grand Total
Eurocanadian				**12**		**1**	**7**		**3**	**1**	**24**
Artifact scatter				3					1		4
Artifact/Feature combination				7		1	2		1		11
Midden				1							1
Multiple feature							3		1		4
Recurrent features							1			1	2
Single feature				1			1				2
Precontact	**2**	**2**	**23**	**38**	**8**	**22**	**28**	**2**	**14**	**2**	**141**
Artifact find	1	2	3	10	2	12	4		4		38
Artifact scatter	1		15	18	5	9	14	2	9	1	74
Artifact/Feature combination			4	10			7		1		22
Burial			1		1						2
Medicine wheel							1				1
Midden							1				1
Recurrent features						1					1
Single feature										1	1
Unknown							1				1
Precontact/Eurocanadian				**3**			**1**	**1**			**5**
Artifact scatter				1				1			2
Artifact/Feature combination				2							2
Single feature							1				1
SSN							1				1
Burial							1				1
Unknown				**4**		**1**					**5**
Artifact scatter				2		1					3
Artifact/Feature combination				1							1
Single feature				1							1
Total	**2**	**2**	**23**	**57**	**8**	**24**	**37**	**3**	**17**	**3**	**176**



LEGEND

- HERITAGE SITE
- PRELIMINARY FREEWAY ALIGNMENT
- HIGHWAY
- URBAN MUNICIPALITY
- PRELIMINARY FREEWAY ALIGNMENT 500 METER CORRIDOR
- HERITAGE STUDY AREA
- TOWNSHIP

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2016, SASKGRID2016.
3. CADASTRAL BOUNDARIES ARE FOR INFORMATIONAL PURPOSES ONLY AND SHOULD NOT BE CONSIDERED SUITABLE FOR LEGAL, ENGINEERING, OR SURVEYING PURPOSES.
4. TOPOGRAPHIC FEATURES OBTAINED FROM CANVEC V12.0 DATASET, NATURAL RESOURCES CANADA EARTH AND SCIENCES SECTOR CENTRE FOR TOPOGRAPHIC INFORMATION, 2013-09-30.
5. HIGHWAYS AND ROADS OBTAINED FROM THE NATIONAL ROAD NETWORK SASKATCHEWAN EDITION 9.0 DATASET, 2017-06-05.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 2.0 DATASET, 2016-10-06.
7. HERITAGE SITE DATA OBTAINED FROM THE HERITAGE CONSERVATION BRANCH OF SASKATCHEWAN.

DISCLAIMER

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
PA	2019 08 09	ISSUED FOR REVIEW	JL	KVG		

0 1,250 2,500 5,000 METRES

SCALE: 1:120,000

SNC·LAVALIN

CLIENT
SASKATCHEWAN MINISTRY OF HIGHWAYS AND INFRASTRUCTURE

PROJECT LOCATION
SASKATOON FREEWAY

TITLE
HERITAGE SITES IN THE STUDY AREA

DATE	2019 08 09	DWG No.	659183-0000-4EDD-0017	FIG No.2.2	REV	PA

SIZE 11x17

Path: \\sli\1653\projects qms\SMH\659183_Saskatoon Freeway Functional Planning Study\40_Execution\45_GIS_Dwgs\4.5.1 GIS\Drawings\Heritage\659183-0000-4EDD-0017 Heritage Sites.mxd

3.4 Cemeteries

The Saskatchewan Cemetery Index was reviewed to determine if any known cemeteries are within the proposed freeway corridor. No cemeteries were identified within the proposed freeway corridor.

3.5 Homesteads

The Saskatchewan Homestead Index is a listing of homestead documents in the Saskatchewan Archives. Using the freeway corridor as a filter, the search of the index identified 174 homestead documents on file at the Archives. Of these, a number appear to be duplicated references possibly due to co-applicants or database errors. Excluding duplicate file numbers, there are 109 unique applications for lands along the proposed route. The listing of the Saskatchewan Archives Homestead file numbers including legal locations is included in Attachment I.

The existence of a homestead application file does not necessarily imply that heritage resources are present on a property. However, it indicates that historic period resources may be present and should be investigated. If historical remains are in fact present, the homestead documents are one of the initial sources in determining heritage significance.

4 Summary

Archaeological work in the Study Area has been conducted professionally since the early 1980s. Prior to that, amateur and professional archaeologists recorded sites on an informal basis, often without detailed assessment. Some of these early sites remain in the database with no additional information beyond the original recording and some of these cannot be located more accurately than the quarter section.

In that time, permitted archaeological assessments have examined approximately 6,386 ha, or approximately 7.7% of the total Study Area (82,950 ha). The Study Area contains 176 recorded archaeological sites including both Historic Period sites and Precontact Period sites. These sites date from the Early Precontact Period (possibly as early as 11,000 BP) to more recent Historic Period sites dating to homesteading in the early 1,900s. Many of these sites contain archaeological components dating from multiple periods, so that an Historic Period structure may be standing on much earlier Precontact Period deposits. Many Precontact Period sites were utilized over very long periods of time, as the results of excavations at sites in Wanuskewin Heritage park attest.

The proposed freeway corridor is approximately 55 km long and 500 m wide. Three archaeological sites are known to exist within the corridor. FbNq-6 is a surface lithic scatter of material dating to the Middle and Late Plains Indian Periods (approximately between 7,500 BP to 170 BP) (Epp and Dyck 1983). The other two are Historic Period sites relating to homesteading (FbNp-83 and FbNp-84).

The estimated area within the proposed freeway corridor that has been assessed for heritage resources is approximately 57.2 ha. This number was calculated based on the data provided by HCB for permitted project footprints (**Figure 2.1**)**.** This amounts to approximately 1% of the proposed freeway corridor. Based on the number of known archaeological sites in the Study Area (176), one might expect as many as 11 or 12 archaeological sites ignoring environmental factors specific to the proposed route. Factors to be considered that could affect this number include the relative proximity of Wanuskewin Heritage Park, an area that includes a very high site density. The extent to which this site density extends beyond the park area is not known, nor whether it extends to the southeast side of the river. Another factor is that the proposed route crosses the South Saskatchewan River only once, while the river extends across the entire Study Area.

The proposed freeway corridor passes through 37 quarter sections that have been identified by the HCB as Heritage Sensitive. This is about 26% of the quarters that the route crosses. The heritage sensitivity rating, however, only addresses the potential for land to contain Precontact Period heritage sites. The review of the Homestead records for the route identified at least 109 unique homestead applications in lands within the proposed freeway corridor. Some of these may relate to EuroCanadian heritage sites that may require reporting and assessment.

5 Recommendations

The proposed freeway corridor passes through areas that have the potential to contain heritage resources, ranging from the earliest occupations to more recent homestead sites. Because the route passes through lands that have been identified as Heritage Sensitive by the HCB, a project referral to the HCB is required. This referral will initiate a review of the project and potential impacts to heritage resources by the HCB which will issue either project clearance or requirements for further assessment.

The presence of a concentration of important heritage resources at Wanuskewin Heritage Park highlights the potential of some portions of the proposed freeway route to affect heritage resources. Some of these heritage resources may be sufficiently significant to require extensive mitigation or even require avoidance, and this can affect both the project design and timetable. Heritage assessment of the proposed corridor should be undertaken early in the planning and design process.

6 Closure

SNC-Lavalin Inc. (SNC-Lavalin) prepared this desktop baseline heritage resource study on behalf of the Saskatchewan Ministry of Highways and Infrastructure (MHI) to support the Saskatoon Freeway Functional Planning Study.

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Environment & Geoscience
Engineering, Design and Project Management

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Attachment I

Homestead Data

File Number	Name	Q	Sec.	T	R	M
166726	Lasher, Simeon Martin	NE	4	36	4	W3
370-30	Lasher, Simeon Martin	NE	4	36	4	W3
485491	Lasher, David William	NW	4	36	4	W3
597169	Fiddell, William H.	SE	4	36	4	W3
597169	Lasher, David W.	SE	4	36	4	W3
597169	Lasher, Samuel M.	SE	4	36	4	W3
127712	Temperance Colonization Society	SE	4	36	4	W3
597169	Temperance Colonization Society	SE	4	36	4	W3
1432275	Searles, Frederick James	SE	4	36	4	W3
676421	Floral School District No. 688	SW	4	36	4	W3
676421	Lasher, David William	SW	4	36	4	W3
037408A	Richardson, George	NE	6	36	4	W3
569600	Tulloch, Charles H.	NW	6	36	4	W3
569600	Tupper, Haynes Alvin	NW	6	36	4	W3
841629	Tupper, George Viker	SE	6	36	4	W3
944623	Clark, J. Wesley	SW	6	36	4	W3
944623	Clark, John Thomas	SW	6	36	4	W3
1150776	Patience, Herbert Lorne	NE	10	36	4	W3
679186	Hoge, William	NW	10	36	4	W3
685096	Frazer, George Robert	SE	10	36	4	W3
146323A	Patience, William Uriah	SW	10	36	4	W3
655899	Hunt, Isaac L.	NE	22	36	4	W3
1327635	Lewis, George E.	NE	22	36	4	W3
771692	Hunter, William W.	NW	22	36	4	W3
632503	Winmill, William George	SE	22	36	4	W3
632503	Wilcox, Arthur William	SE	22	36	4	W3
602133	Ross, Vital	SW	22	36	4	W3
602133	Kershaw, William	SW	22	36	4	W3
620060	Evans, Robert Hammersley	NE	28	36	4	W3
620060	Winmill, Myron Thomas	NE	28	36	4	W3
683504	Clement, George Thomas	NW	28	36	4	W3
537194	Evans, John	SE	28	36	4	W3
1249820	Taylor, Alfred	NE	34	36	4	W3
869321	Sutherland, Donald George	NW	34	36	4	W3
829224	Rose, Daniel	SE	34	36	4	W3
829224	Witt, Windsor Charles	SE	34	36	4	W3
829224	Freeborn, Joseph Allen	SE	34	36	4	W3
803376	Welker, Dennis	SW	34	36	4	W3
658331	Kirkpatrick, Ernest A.	NW	16	36	6	W3
658331	Kirkpatrick, Walter Lee	NW	16	36	6	W3
821835	Barber, Wallace Herbert	SE	16	36	6	W3
536231	Kirkpatrick, Wilbur Allan	SW	16	36	6	W3

File Number	Name	Q	Sec.	T	R	M
1845159	Tinant, Henry	NW	17	36	6	W3
426662	Hope, Edward Alexander	NW	20	36	6	W3
426664	King, D.S.	NW	20	36	6	W3
318877	Smith, Henry	NE	28	36	6	W3
164902	Hocking, Martin	NW	28	36	6	W3
332765	Smith, Henry	NW	28	36	6	W3
164902	Smith, Charles Stephen	S	28	36	6	W3
164902	Smith, William Henry	S	28	36	6	W3
164902	Canadian Pacific Railway	SW	28	36	6	W3
403227	Lusk, William Charles	N	32	36	6	W3
403227	Jackson, James	NE	32	36	6	W3
403227	Lusk, David	NE	32	36	6	W3
005532A	Bennett, Robert	NW	32	36	6	W3
516794	Lusk, David	SW	32	36	6	W3
317-49	Hunter, William	SW	4	37	4	W3
181284	Hunter, William	SW	4	37	4	W3
1502700	Mighton, Abigail (Mrs.)	NE	10	37	4	W3
957816	Welker, James Marion	NW	10	37	4	W3
1313278	Mighton, Joseph Alexander	SE	10	37	4	W3
1228041	Schmidt, Ernest Herman	SW	10	37	4	W3
725391	Murphy, William	NE	16	37	4	W3
725391	Sommerfeld, Paul L.	NE	16	37	4	W3
725391	Summerfeld, Paul L.	NE	16	37	4	W3
725391	Murphy, William	NE	16	37	4	W3
725391	Sommerfeld, Paul L.	NE	16	37	4	W3
725391	Summerfeld, Paul L.	NE	16	37	4	W3
127712	Branley, John L.	NW	16	37	4	W3
663509	Brawley, J.L.	NW	16	37	4	W3
663509	Royal Bank of Canada	NW	16	37	4	W3
127712	Little, George Thomas	NW	16	37	4	W3
362840	Temperance Colonization Society	NW	16	37	4	W3
894053	Temperance Colonization Society	NW	16	37	4	W3
127712	Branley, John L.	NW	16	37	4	W3
663509	Brawley, J.L.	NW	16	37	4	W3
663509	Royal Bank of Canada	NW	16	37	4	W3
127712	Little, George Thomas	NW	16	37	4	W3
362840	Temperance Colonization Society	NW	16	37	4	W3
894053	Temperance Colonization Society	NW	16	37	4	W3
692874	McDonald, David Marshall	SW	16	37	4	W3
692874	McDonald, David Marshall	SW	16	37	4	W3
362840	Little, George Thomas	NW	17	37	4	W3
362840	Little, George Thomas	NW	17	37	4	W3

File Number	Name	Q	Sec.	T	R	M
1656109	Mosley, Daniel Albert	NW	19	37	4	W3
2861360	Rabenberg, Martha (Mrs.)	SE	19	37	4	W3
1685339	Ketchum, Jesse	SW	19	37	4	W3
127712	Richardson, Thomas William	E	20	37	4	W3
1612403	Blackley, David	NE	20	37	4	W3
1612403	Stephenson, George W.	NE	20	37	4	W3
127712	Stephenson, George William	NE	20	37	4	W3
1161348	Anderson, Thomas Edward	NW	20	37	4	W3
127712	Blackley, David	SE	20	37	4	W3
127712	Blackley, Helen	SE	20	37	4	W3
127712	Standard Trusts Company	SE	20	37	4	W3
362854	Anderson, Newton Joseph	SW	20	37	4	W3
023035A	Mosley, Daniel Albert	NE	24	37	5	W3
1474634	Donaldson, Alfred Sidney	NW	24	37	5	W3
1474634	Pettit, John Willis	NW	24	37	5	W3
923497	Reaney, George	SE	24	37	5	W3
1162929	Hutchins, William Reuben	SW	24	37	5	W3
1162929	Stahl, Joseph A.	SW	24	37	5	W3
1162929	Woods, W.F.	SW	24	37	5	W3
1804590	Baker, Frank Harry	SE	25	37	5	W3
1804590	Horne, Richard H.	SE	25	37	5	W3
1685347	Manuel, Frederick	SW	25	37	5	W3
1685347	Parkhurst, Reginald P.	SW	25	37	5	W3
1685347	Pettit, John Willis	SW	25	37	5	W3
822340	Lindsay, Alexander John	NE	26	37	5	W3
822340	Morris, Walter	NE	26	37	5	W3
1777410	Hickey, Catherine (Mrs)	SE	26	37	5	W3
722529	Adamson, A.J.	NW	30	37	5	W3
722528	Adamson, A.J.	NW	30	37	5	W3
762296	Adamson, A.J.	NW	30	37	5	W3
762296	Canada Territories Corporation Limited	NW	30	37	5	W3
762296	Pambrun, Frederick	NW	30	37	5	W3
683308	Hovey, Willis J.	SE	30	37	5	W3
066572A	Gendron, Louis	SW	30	37	5	W3
783726	Dickson, Alexander Forest	NE	32	37	5	W3
783726	Kennedy, Duncan	NE	32	37	5	W3
783726	Scharf, Silias	NE	32	37	5	W3
1198259	Dewar, John Duncan	NW	32	37	5	W3
783727	Willison, James Thomas	SE	32	37	5	W3
783727	Rice, George	SE	32	37	5	W3

File Number	Name	Q	Sec.	T	R	M
783727	Scharf, Abram	SE	32	37	5	W3
070721A	McKee, William Herbert	SW	32	37	5	W3
736421	Heinrichs, Peter	NE	34	37	5	W3
736421	Loewen, Bernhard B.	NE	34	37	5	W3
767378	Dyck, Peter John	NW	34	37	5	W3
1198261	Sunderland, Frank	SE	34	37	5	W3
686207	Ward, William	SW	34	37	5	W3
686207	Neufeldt, Johann S.	SW	34	37	5	W3
686207	Neufeldt, Peter J.	SW	34	37	5	W3
786507	Haynes, Alfred	NE	36	37	5	W3
096701A	Penner, Jacob	NW	36	37	5	W3
1153644	Dyck, Henry K.	SE	36	37	5	W3
1165358	Peters, Jacob K.	SW	36	37	5	W3
688047	Richards, Thomas	NE	6	37	6	W3
692671	Richards, William Henery	NW	6	37	6	W3
516586	Partridge, Frederick W.	SE	6	37	6	W3
757992	McCormack, William James	SW	6	37	6	W3
4031513	Cherry, J. C.	NW	9	37	6	W3
638121	Crawford, James	NE	16	37	6	W3
638121	Crawford, James R.	NE	16	37	6	W3
598810	Lang, Alexander	NW	16	37	6	W3
598810	Whittle, Frederick	NW	16	37	6	W3
764748	Lindsay, George	SE	16	37	6	W3
764494	Lindsay, Alexander	SW	16	37	6	W3
880842	Fuhr, William	NE	22	37	6	W3
144078A	Pultz, Frank	NW	22	37	6	W3
775047	Wilker, Charles H.	NW	22	37	6	W3
725000	Kyle, Thomas	SE	22	37	6	W3
711883	Graham, George	NE	26	37	6	W3
711883	Sandberg, John A.	NE	26	37	6	W3
583418	Lindsay, David Franklin	NE	28	37	6	W3
990532	Stahl, Andreas	NW	28	37	6	W3
841439	Becker, Titus	SW	28	37	6	W3
768569	Marr, Gordon A.	NE	36	37	6	W3
745466	Kizer, James Austin	NW	36	37	6	W3
759923	Doney, Henry Bliss	SE	36	37	6	W3
759923	Jefferies, Francis Barnes	SE	36	37	6	W3
759923	Jefferies, Francis Barnes	SE	36	37	6	W3
708574	Gendron, Francis Arthur	SW	36	37	6	W3
708574	Gendron, John Joseph	SW	36	37	6	W3
1249993	Barton, Hubert Ernest	NE	36	35	5	W3
1249999	Maule, Richard Lawrence	SE	36	35	5	W3

File Number	Name	Q	Sec.	T	R	M
631212	Vandal, Frederic	SE	36	35	5	W3
815537	Dyck, Jacob	NE	4	38	5	W3
712549	Braun, Dietrich	NW	4	38	5	W3
712549	Toews, Cornelius	NW	4	38	5	W3
712549	Friesen, Jacob J.	NW	4	38	5	W3
815537	Friesen, Peter N.	NE	4	38	5	W3
120802A	Penner, Abraham P.	SE	4	38	5	W3
010901A	Gougeon, William	SW	4	38	5	W3

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