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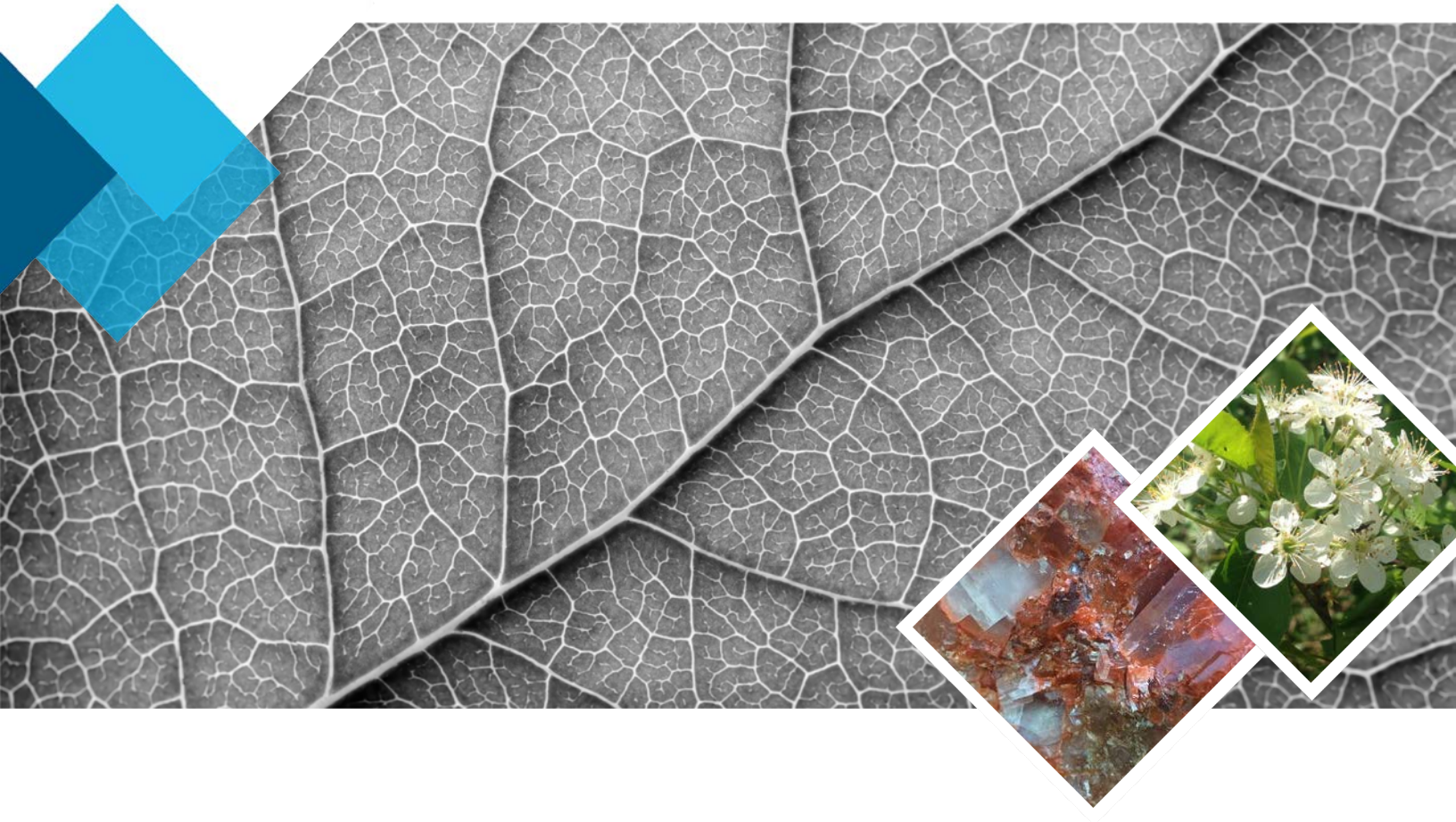
The Broadview Project

Technical Proposal

Canada Golden Fortune Potash Corp.



Environment & Geoscience

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Executive Summary

Canada Golden Fortune Potash Corporation (CGFPC) is proposing to develop a new one million tonne per year greenfield solution potash mine, referred to as the Broadview Project. The project is located on CGFPC's KP 437 potash permit in the southeastern portion of the Saskatchewan potash district. CGFPC has retained SNC-Lavalin Inc. (SNC-Lavalin) to prepare this Technical Proposal (TP) for the project.

Solution mining will be used to extract sylvinite from the Prairie Evaporite Formation from a depth of approximately 1,600 m. Solution mining uses hot water or a brine solution to dissolve underground water-soluble minerals and extract the solution from the ground via large diameter wells. The dissolved potash is then transported to the surface for processing to crystallize out potassium chloride. The mine site will include a core facilities area and a mine well field for potash extraction. The core facilities area will include the processing plant, administration buildings, maintenance building, raw water pond, tailings management area (TMA), product storage, rail load-out, security and parking. The mine well field will be developed in stages and will include numerous well pads with injection and recovery wells. The main mining and processing activities will include injection and solution recovery, evaporation and crystallization, product drying and screening, product compaction, and product storage and shipping.

Ancillary projects will include a transmission line, natural gas supply, raw water supply, rail spur line, communications lines, and potential municipal road or highway upgrades. The raw water source has not yet been identified, and water sourcing investigations are currently ongoing.

Construction is expected to commence as early as late 2018, pending environmental approvals and economic conditions, and will take approximately three years to complete. Operations will begin following construction and last for 50 years. However, the potash resource could allow mining to continue for as long as 100 years at the proposed production rate.

CGFPC has developed a community engagement plan to ensure interested or affected stakeholders are informed of the proposed project and given the opportunity to provide feedback that can be incorporated into project planning. CGFPC's community engagement plan includes appropriate and empathetic engagement approaches used to encourage stakeholder feedback during information sharing, private, and public meetings. The engagement program includes identification of stakeholders, a project notification letter mail-out, a public engagement website, meetings with various stakeholder groups, and public open houses. Engagement activities are already well underway and feedback for the proposed project has been positive throughout the initial phases of engagement.

CGFPC has commenced assessments of climate, air, hydrogeology, terrain and soils, vegetation, wildlife, hydrology, fish and fish habitat, socio-economics, and heritage resources. The effects assessment is focused on Valued Ecosystem Components (VECs) which are aspects of the natural and socio-economic environment that are valued because of their ecological, scientific, resource, socio-economic, cultural, health, or aesthetic importance and which have a potential to be adversely affected by the project. VECs will be refined during the Environmental Assessment process and by the project experts, as well as consultation with regulators and stakeholder engagement. Preliminary potential project effects and potential mitigation measures are outlined in Table A.

CGFPC will prepare an Environmental Protection Plan that outlines specific environmental protection and contingency measures that will be utilized during construction, operation and closure. The specifics of the plan will be determined in conjunction with MOE. Progressive reclamation will be completed during operation where possible, and final reclamation and closure will be completed once mining operations have ceased.

Table A Preliminary potential project effects and preliminary mitigation measures

Phase: Construction	Phase: Operation	Phase: Decommissioning / Tailings Dissolution	Project Activity / Component	Potential Environmental Effects	Potential Environmental Design and Mitigation Measures
X			Site clearing	- Loss of soil, wetland habitat, native prairie habit, and protected plant species - Disturbance to wildlife species and migratory birds - Sedimentation into surface water receptors - Effects to heritage resources - Spreading of invasive/weedy species	- Siting of project in area already disturbed by agricultural activities - Limit disturbance by routing linear developments along existing corridors where possible - Wetland compensation - Rare species mitigation and offsetting - Setbacks for protected habitat and species - Soil surveys and profiling - Seeding - Pre-construction rare plant and wildlife surveys (including bird sweeps) - Construction environmental management plan (topsoil management, sediment and erosion control, equipment cleaning, heritage resources management plan, etc.) - On-site construction environmental manager
X	X	X	Air and noise emissions (mobile equipment, dust)	- Air emissions can affect local air quality, crops, soils, vegetation, wildlife health, surface water quality, fish - Noise emissions can result in disturbance to wildlife and humans	- Limit idling of vehicles - Use equipment that is maintained in good operating condition - Limiting timing of certain construction activities - Dust control
	X		Air and noise emissions (materials handling equipment, stacks)		- Fitting internal combustion engines with appropriate mufflers/noise suppressors - Compliance with emissions limits - Emission controls on stationary emissions sources (e.g. scrubbers, baghouses) - High efficiency and low NO_X burners - Enclosures around conveyor belts - Dust control - Housing stationary equipment in buildings to insulate noise
X	X	X	Surface drainage - alteration	- Site runoff from graded site can affect local surface drainages and result in changes to water quality and quantity	- Runoff management plan (e.g., grading, ditches, culverts) to: route freshwater around the site and returned to pre-development watercourses; and contain site runoff an direct to a pond for treatment - Sediment and erosion control - Adequate sizing of brine reclaim pond and other ponds to contain brine under normal and flood conditions
X	X		Increased traffic	- Increased chance of vehicular collisions with humans and wildlife	- Traffic management plan - Road improvements
X	X	X	Accidental spill / release	- Effects to soils/groundwater	- Spill response plan - Secondary containment
	X	X	Brine migration from TMA	- Vertical and lateral seepage/migration of brine to soils/groundwater	- Select TMA site in area where surficial geology will provide natural containment - Containment system (e.g., liner, berms, slurry wall) - Brine collection and management (e.g., diversion ditch, pump back wells) - Monitoring program to monitor brine migration and to monitor effectiveness of the containment system - Decommission wells that are no longer required
	X	X	Deep brine injection	- Effects to soils/groundwater through leakage of brine	- Multiple casing strings, pressure tested seals, injection tubing inhibitor, geologic seal, cathodic protection - Leak monitoring
X	X		Linear developments (roads, rail)	- Effects to wildlife	- Avoidance of major wildlife corridors

Phase			Project Activity / Component	Potential Environmental Effects	Potential Environmental Design and Mitigation Measures
Construction	Operation	Decommissioning / Tailings Dissolution			
					- Wildlife crossing opportunities - Wildlife crossing signs - Speed limits
	X		Mine operation	- Disturbance to wildlife species and migratory birds	- Construct fencing to deter wildlife from entering mine site - Reduced speed limits in areas where wildlife exist - Development of a site-specific wildlife management plan - Deter use of site by breeding migratory and non-migratory bird species - Collect food waste in suitable receptacles to limit attraction of wildlife
	X		Solution mining	- Ground subsidence can effect surface drainage patterns	- Pillars can be left in between caverns to increase stability - Secondary mining can reduce total subsidence as more material stays in the cavern - Monitoring

List of Abbreviations and Acronyms

Term	Definition
BP	Before Present
CAAQS	CAAQS
CAC	criteria air contaminant
CEAA	*Canadian Environmental Assessment Act*
CEMP	Construction Environmental Management Plan
CGFPC	Canada Golden Fortune Potash Corporation
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ERP	Emergency Response Plan
GHG	greenhouse gases
H_2O	water
H_2S	hydrogen sulphide
HCB	Heritage Conservation Branch
HRIA	Heritage Resource Impact Assessment
IDF	Intensity-Duration-Frequency
KCl	potassium chloride
KL	potash lease
KP	potash permit
MOE	Ministry of Environment
MgO	magnesium oxide
NO	nitric oxide
NO_X	nitrogen oxide
NO_2	nitrogen dioxide
N_2O	nitrous oxide
NAAQO	National Ambient Air Quality Objectives
NAPS	National Air Pollution Surveillance
NO_X	nitrogen oxides
NaCl	sodium chloride
NO	nitric oxide
NO_X	nitrogen oxides
NO_2	nitrogen dioxide
O_3	ozone
PM	particulate matter

Term	Definition
$PM_{2.5}$	particulate matter of an aerodynamic diameter less than 2.5 microns
PM_{10}	particulate matter of an aerodynamic diameter less than10 microns
PFRA	Prairie Farm Rehabilitation Administration
PVC	polyvinyl chloride
RM	rural municipality
PAH	polycyclic aromatic hydrocarbon
SAAQO	Saskatchewan Ambient Air Quality Objectives
SESAA	Southeast Saskatchewan Airshed Association
SARA	*Species at Risk Act*
SKCDC	Saskatchewan Conservation Data Center
SO_2	sulphur dioxide
STP	sewage treatment plant
TDS	total dissolved solids
TMA	tailings management area
TOR	terms of reference
TP	Technical Proposal
TSP	total suspended particulate– particulate matter of an aerodynamic diameter less than 30 microns
VEC	Valued Ecosystem Component
WMO	World Meteorological Organization
WSA	Water Security Agency
WWDR	Water Well Drilling Record
WMZ	Wildlife Management Zone

List of Units

Term	Definition
%	percent
°C	degrees Celsius
cm	centimetre
ha	hectare
kg	kilogram
km	kilometre
km/h	kilometres per hour
km^2	square kilometre
kPa	kilopascal
kt	kilotonne
kWh/y	kilowatt hours per year
m	metre
m^2	square metres
m^3/hr	cubic metres per hour
m^3/s	cubic metres per second
m^3/y	cubic metres per year
Mm^3/y	million cubic metres per year
mm	millimetre
masl	metres above sea level
Mt	million tonnes
MW/h	megawatt per hour
MW/year	megawatt per year
ppb	parts per billion
t	tonne
t/h	tonne per hour
µm	micrometre
$µg/m^3$	micrograms per cubic metre

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4 Federally and Provincially Listed Species
5 Explanation of the Species Rankings

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1 Introduction

Canada Golden Fortune Potash Corporation (CGFPC) is proposing to develop a new one million tonne per year greenfield solution potash mine, referred to as the Broadview Project. The Project is located on CGFPC's KP 437 potash permit in the southeastern portion of the Saskatchewan potash district (**Figure 1.1** and **Figure 1.2**). CGFPC has retained SNC-Lavalin Inc. (SNC-Lavalin) to prepare this Technical Proposal (TP) for the project.

1.1 Proponent

CGFPC is a private resource company engaged in the exploration and development of potash mineral deposits in Saskatchewan, Canada. CGFPC's goal is to develop a solution potash mine with in Saskatchewan. CGFPC owns 100% of the Crown mineral rights on two potash permits (KP 437 and KP 442) in Saskatchewan. The company's main focus is on the KP 437 potash permit.

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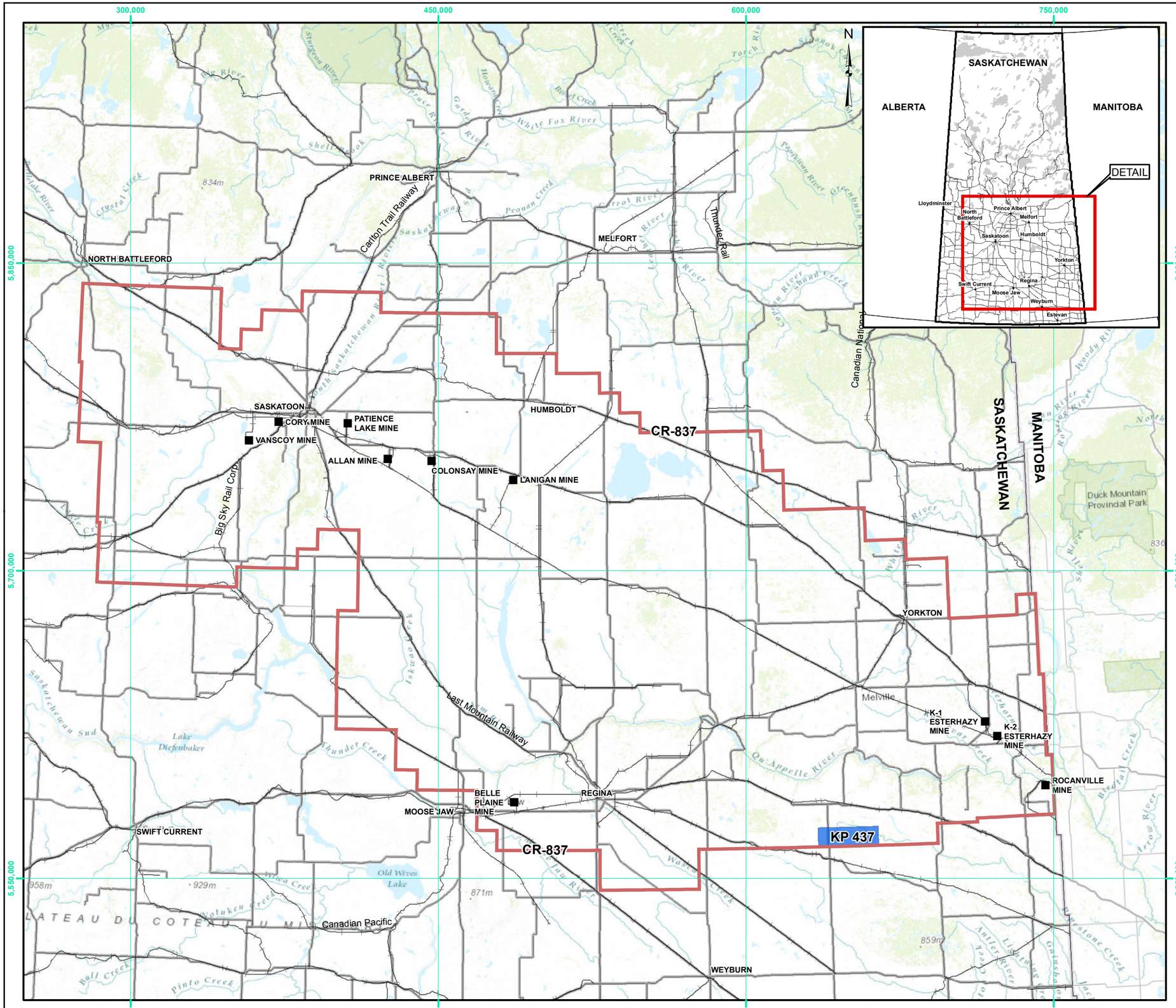
1.2 Statement of Need

Potassium from potash is used to produce fertilizers that help to meet the growing global demand for food. Fertilizers play an important role in maintaining and increasing crop yields. The global demand for fertilizers has grown over the last decade, particularly in developing countries.

The project will also have significant short- and long-term benefits for the local and regional economy. Benefits will include the creation of jobs, purchase of supplies and services, payment of taxes during construction, operation, and decommissioning, as well as royalty payments to the province during operation.



LEGEND

- POTASH MINE
- POTASH DISPOSITION OUTLINE (CR-837)
- KP 437
- RAILWAY
- HIGHWAY

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, SASKADMIN2013, SASKGRID2013.
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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 6.0 DATASET, 2012-09-28.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.
7. POTASH DISPOSITION OBTAINED FROM SASKATCHEWAN MINISTRY OF ECONOMY (MINING AND PETROLEUM GEOATLAS).

REFERENCE DRAWINGS

DWG No.	DATE	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DRN BY	CHK

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SCALE: 1:1,850,000

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CLIENT
CANADA GOLDEN FORTUNE POTASH CORPORATION

PROJECT LOCATION
BROADVIEW PROJECT

TITLE
KP 437 LOCATION WITHIN THE SASKATCHEWAN POTASH DISTRICT

DES BY	LM	DRN BY	KVG	DATE	2017 04 03	FIG No. 1.1	REV 0
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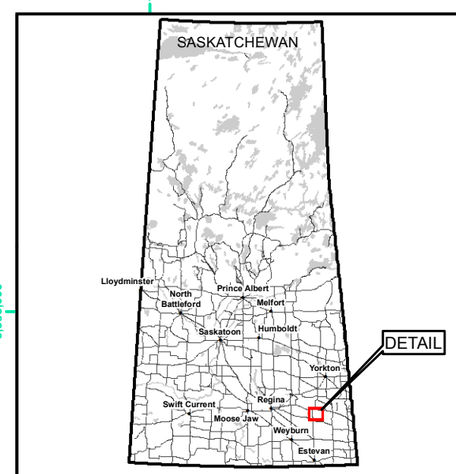

630,000 640,000 650,000 660,000 670,000

5,585,000 5,575,000 5,565,000 5,555,000

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16-09-W2 16-08-W2 16-07-W2 16-06-W2 16-05-W2

15-09-W2 15-08-W2 15-07-W2 15-06-W2 15-05-W2

14-09-W2 14-08-W2 14-07-W2 14-06-W2 14-05-W2

Grenfell

Oakshela

Baring

Glenavon

Peebles

Dalzell

Kipling Marsh

Kipling Marsh

RM OF WOLSELEY No. 155

RM OF ELCAPO No. 154

RM OF CHESTER No. 125

RM OF KINGSLEY No. 124

BROWN HILL RESERVOIR

MARSTON LAKE

EKAPO LAKE

Elapo Creek

Pipestone Creek

Adair Creek

Moose Mountain Creek

Canadian Pacific

Canadian National

1 47 48 8

LEGEND

- RAILWAY
- HIGHWAY
- 10 METRE ELEVATION CONTOUR (masl)
- WATERCOURSE
- KP 437
- RURAL MUNICIPALITY
- WATERBODY
- WATERBODY (INTERMITTENT)

NOTES

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6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.

REFERENCE DRAWINGS

DWG No.	DATE	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DRN BY	CHK

0 900 1,800 3,600 5,400 7,200 METRES

SCALE: 1:150,000

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CLIENT	PROJECT LOCATION
CANADA GOLDEN FORTUNE POTASH CORPORATION	BROADVIEW PROJECT

TITLE

KP 437 LOCATION

DES BY	GP	DRN BY	FT	DATE	2017 04 18	FIG No.	1.2	REV	0
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1.3 Regulatory Framework

1.3.1 Provincial

The Saskatchewan environmental assessment process begins with the submission of a Technical Proposal (TP) to the Saskatchewan Ministry of Environment (MOE). The TP is intended to provide MOE with sufficient 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:

- Have an effect on 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 TP has been prepared in accordance with the Technical Proposal Guidelines (Government of Saskatchewan 2014) for submission to the Environmental Assessment Branch. It includes a description of the proposed project, the biological, physical, and human environments, and a discussion of potential environmental and socio-economic effects of the project and mitigation measures. The TP also includes a discussion of cumulative effects, stakeholder engagement, monitoring programs, and project decommissioning and reclamation.

1.3.2 Federal

The federal environmental assessment (EA) process is legislated by the Canadian Environmental Assessment Act (CEAA), 2012. Under the Act, an EA of a designated project may be required when there is the potential for adverse environmental effects that are within federal jurisdiction including:

- Fish and fish habitat;
- Other aquatic species;
- Migratory birds;
- Federal lands;
- Effects that cross provincial or international boundaries;

- Effects that impact on Aboriginal peoples, such as their use of lands and resources for traditional purposes; and
- Changes to the environment that are directly linked to or necessarily incidental to any federal decisions about a project.

The Regulations Designating Physical Activities (SOR/2012-147) identify the physical activities that constitute the designated projects that may require an EA by the Canadian Environmental Assessment Agency, by the Canadian Nuclear Safety Commission, or by the National Energy Board. Proponents must provide to the Agency a description of their proposed project if it is captured by regulations outlining projects likely to require federal environmental assessment. Projects conducted on federal lands may also require a federal EA if there is potential for any adverse environmental effects as described above. CEAA 2012 also gives the Minister of Environment the power to designate a physical activity not identified in the regulations if it has the potential to cause adverse environmental effects as defined by the Act, or if public concerns related to those effects may warrant the designation. Potash mines are presently not included in CEAA 2012.

1.3.3 Other Permits / Approvals / Licences

CGFPC will obtain all other federal, provincial, and municipal permits required for construction and operation of the project. Attachment 1 lists the potential additional permits/approvals/licences.

Other regulatory requirements include those required for project utilities, such as natural gas, electricity, and telecommunications. These will be the responsibility of the utility provider and are outside the scope of this assessment.

1.4 Scope of the Effects Assessment

The temporal scope of the assessment includes project construction, operation and decommissioning. Project construction is expected to commence as early as late 2018 and take approximately three years to complete. The proposed mine is expected to operate for as long as 100 years; however, the actual life span of the facility is dependent on the mine's continuing economical and technical viability.

The geographic scope of the assessment varies by project component. Each component has a defined regional study area described in Section 4; local study areas will be defined once the facility location has been determined. The study areas are preliminary and may be refined during the various assessments.

2 Project Description

This project description is based on a scoping level design. Preliminary assumptions made for the study are being reviewed during the ongoing engineering studies and all project components and dimensions are subject to change based on the outcome of the that study, as well as future feasibility and detailed design studies.

2.1 Location

The Broadview Project is located on CGFPC's KP 437 potash permit centered at UTM Zone 13 N 649673 E / 5570281 N (**Figure 1.1**). The centre of KP 437 is approximately 120 km east of Regina and 16 km south of the Town of Grenfell. The KP 437 permit covers 281 km^2 and approximately 108 sections in the southeast edge of the Commercial Potash Mining Belt. In September 2014, CGFPC acquired 100% interest in the KP 437 potash permit, transferred from Canada Potash Corporation. CGFPC holds the permit and exclusive rights to explore and prospect for subsurface minerals within KP 437. CGFPC is working with MOE to transfer the potash permit (KP 437) to a potash lease (KL 280). The transfer is expected to be completed in June 2017.

An existing port on the west coast of Canada is expected to be used for product distribution.

2.2 Mineral Resource

An exploration program commenced in 2015 on KP 437. A potash resource has been outlined within the KP through the drilling of eight wells at a nominal three to five kilometre spacing. All drill holes were drilled vertically and cored from the lower Dawson Bay Formation to below the Esterhazy Member of the Prairie Evaporite Formation. Core samples from eight holes were selected for geochemical assay. Each drill hole was logged with geophysical wireline tools. CGFPC also completed 127.5 km of 2D and 117.1 km^2 of 3D seismic exploration on KP 437 in 2015. The deposit has an inferred resource of sufficient magnitude to sustain a minimum 100-year mine life. The potash beds consist of two major units, the Patience Lake and the Esterhazy Members. The mineral resource estimate includes:

- 86.20 million tonnes of sylvite expressed as KCl in the Patience Lake Member with an average thickness of 4.97 m within the target mining area; and
- 87.91 million tonnes of sylvite expresses as KCl in the Esterhazy Lake Member with an average thickness of 4.94 m within the target mining area.

2.3 Construction

It is yet to be determined how existing services and infrastructure will accommodate the construction phase of the project, because a plant site location has not been finalized. Utilities capable of supplying major infrastructure required for operations (power, water, natural gas, and telecommunications) are not currently available within the project area and will have to be brought to site, and temporary utilities will likely be utilized for the construction phase of the project. Discussions with utility suppliers are currently underway.

Prior to construction, the site will be cleared and grubbed of all vegetation and large boulders. Topsoil will be stripped prior to rough grading of the site. All topsoil stripped will be salvaged and stockpiled for later use. Surface water will be managed using cut off ditches that will intercept water and prevent upstream runoff from entering the site. On-site water management will either divert water off site from areas where water quality is not a concern, or to a storm water management area.

A temporary construction camp is expected to be used along with temporary infrastructure, such as laydown areas, temporary office space for construction management, temporary bathroom facilities, water treatment, and material storage facilities.

Environmental protection during construction will be managed through the development and implementation of a construction environmental management plan (CEMP). This CEMP will specify requirements for material handling and storage, spill response, erosion and sediment control, ecological risk management, traffic control plans, site security, surface and groundwater protection and management, soil management, emissions and heritage management. The goal of the CEMP will be to ensure environmental effects are minimized during construction and that all activities associated with construction are in line with relevant regulations and approvals.

2.4 Mining

2.4.1 Mining Method

Solution mining will be used to extract sylvinite from the Prairie Evaporite Formation. Sylvinite predominately consists of potassium chloride (KCl) and sodium chloride (NaCl), and is the most important ore for potash production. Solution mining uses hot solution (water or brine) to dissolve underground soluble minerals and extract the solution from the ground via large diameter injection and production boreholes.

The potash is produced from dissolution in cavern webs within the target mining zone. A number of directional wells are drilled from a single well pad to the bottom of the lowest potash member, and mining commences from this level upwards. Controlled perforation and directional/horizontal drilling methods are utilized to forcedly connect well boreholes and to increase dissolution surface. Perforation and horizontal wells have been widely employed in the oil and gas industry, but are newer to the Saskatchewan Potash industry. The connection of well boreholes (cavern web arms) from one well pad forms a dissolution channel net, also called a cavern web, and solvent dissolves potash from the walls of arms. Each cavern web has pairs of injection/production wells, and is controlled from a single pad. Injection and production wells are switched in a regular periodic basis in order to evenly grow cavern web. Numerous cavern webs are built to satisfy target production.

After cavern formation, there are two phases to cavern web growth. The first phase, early cavern web development occurs by injecting fresh water into the ground and pumping out the resultant brine through wells situated an optimal distance apart. This flushing action erodes the soluble salt and potassium and ultimately results in increasing borehole diameters of arms of a cavern web. Each cavern web arm must be “grown” large enough to reach certain dissolution surfaces, thus to supply “feed” to the processing plant. During the second phase, a sodium chloride brine is used to selectively dissolve potassium chloride. Saturated sodium chloride recycled back from the processing plant is injected to cavern webs. As only potassium chloride greater than a certain grade can be dissolved by saturated sodium chloride solvent, mining proceeds mainly laterally through the potash beds and sodium chloride is left within the cavern webs to form sponge-structured residue. The potash brine solution will then be pumped to the surface via production wells and brought to the processing plant to produce potassium chloride through evaporation and crystallization.

Dissolution tests and mechanical tests of rock samples have been completed. The data is currently under interpretation to understand the rock physical properties and to evaluate rock stability and subsidence. The proper arm diameter of cavern web and spacing between arms (pillar size) are still being determined. Based on recent understandings, the cavern web tends to be more stable, causing less subsidence, compared to existing dual well caverns in Saskatchewan for the following reasons:

1. The selective mining horizon is limited by potash grade; where the lower the potash grade, the less potash that can be mined. The cavern webs develop lateral extension compared to vertical elongation of current dual well caverns. The proposed mining thickness for the Broadview Project is only 5 m to 10 m, and current operational dual well caverns are 20 m to 30 m thick; and,

2. Sponge-structured sodium chloride residue left within cavern webs acts as a support, and the volume of such residue is 60% to 70% of the whole rock volume, whereas current operational dual well caverns create actual void in the target zone, and with 40% to 45% extraction ratio, leave only 55% to 60% of the whole rock volume.

CGFPC is conducting research on the cavern web and pillar dimensions. A subsidence analysis will also be completed to assess potential impacts to infrastructure, the existing environment (topographical changes), and set back buffers from buildings, residences, or other surface structures. The final subsidence buffers will comply with any regulatory requirements and subsidence monitoring will be completed periodically. During operation, local surveys will be conducted periodically to monitor the cavern web growth and ensure cavern web stability is controlled.

2.4.2 Mine Well Field Pads and Pipelines

The wellfield mining components include well pads and underground pipelines to connect the well pads to the core mine facilities. Each cavern web is connected through wells to the surface facilities. To minimize above ground disturbance, these surface facilities are grouped together in “pads” from which a number of wells are drilled and equipment is installed for connecting and controlling the caverns.

A number of well pads will be constructed to initiate the mining phase, and additional well pads will be constructed as the mining area requires expansion to meet target production. Each pad will have up to sixteen production / injection wells to develop a single cavern web. Each cavern web is estimated to have an economic life of 9 to 12 years. Each pad is also expected to have a concrete rig pad with buried distribution piping, a valve house with a blanketing fluid storage tank, electrical transformers, an oil separation tank and a brine tank.

2.5 Site Infrastructure

The mine site will include a core mining facilities area and a mine well field for potash extraction. The core facilities area will include the processing plant, administration buildings, maintenance building, equipment and parts storage, raw water pond, TMA, product storage, rail loadout, security and parking, etc. A conceptual schematic of the core facilities area is presented in **Figure 2.1**.

Figure 2.1 Conceptual Site layout schematic

2.6 Potash Processing

Annual operational time of the processing plant is 320 days (7,680 hours); 45 days of maintenance time is planned.

2.6.1.1 Evaporation and Crystallization

Production brine from cavern will be circulated through thermal evaporation followed by KCl cooling and crystallization. The production brine from cavern has flow rate of 1,620 t/h and a temperature of 75 ^{o}C. The production brine is further concentrated by thermal evaporation, and a total of 329.6 t/h NaCl byproducts are produced. The NaCl byproducts are used to develop the NaCl solvent. The temperature of concentrated brine from evaporation will decrease to 89.3 ^{o}C after KCl heat recovery stage, and further decrease to 32.2 ^{o}C after KCl cooling water stage. The nd temperature for KCl crystallizer is 15 ^{o}C. NaCl solvent from the cooling crystallization is recycled to circulate through thermal evaporation and crystallization again. A total of 109.6 t/h of waste brine, mainly NaCl and $MgCl_2$, is purged for deep well injection.

The KCl product is K60 with 40.5% of H_2O in composition. The KCl production rate is 130.2 t/h, which is equivalent to approximately one million tonnes per year. Demands for power, gas and water are approximately 646,732,800 kWh/y, 86,016,000 m^3/y and 4.2 million m^3/y, respectively.

2.6.1.2 Centrifuging and Drying

KCl slurry from the KCl processing plant will be sent to a KCl centrifuge after being thickened. Wet KCl will be sent to KCl drying beds for drying after centrifuge dehydration. The dry and finished KCl products will be delivered to the packaging and storage workshop through a pneumatic conveying system.

The spiral screen scraper centrifuge will be selected for the KCl centrifuge. Internal heating drying beds will be selected for the KCl drying. An air heater is installed in the drying bed, creating the higher thermal efficiency and larger drying capacity in the unit area.

2.6.1.3 Product Screening

Finished KCl products from the KCl processing plant will be sieved in the packaging and storage workshop. The sieving products are divided into three specifications, including oversize products (particle size greater than qualified size), qualified products and undersize products (particle size less than qualified size). The qualified products are directly delivered to storage as standard KCl products. The oversize products are crushed by a pellet crusher and mixed with the undersize products, and delivered to storage.

2.6.1.4 Product Storage and Loadout

Finished KCl products, after drying in the KCl processing plant by drying beds, will be delivered to the packaging and storage workshop by using a pneumatic conveying system. Eight storage silos of 500 m^3 each will be built in the packaging and storage workshop, creating a total storage capacity of about 5,000 tonnes.

Transportation of products will mainly rely on rail, but may utilize truck transportation during initial phases of mining when production levels are lower. The storage workshop will be built along the railway line spur at the mine site.

2.6.2 Tailings Management Area

A Tailings Management Area (TMA) will be used to store salt from the processing plant. The TMA contains mother liquor barrels, a salt storage area, and disposal wells. Solid wastes include NaCl byproduct and insoluble compositions in brine, such as gypsum, quartz, clay, and chlorite. Liquid wastes include condensate water from KCl processing plant and high magnesium waste brine. The insoluble compositions in brine and NaCl byproduct from initial operation will be stored in the salt storage area. NaCl byproduct from normal operation will be dissolved by condensate water and sent back for mining. The high magnesium waste brine from KCl processing plant will be temporally stored in the mother liquor barrels, and injected into a deep disposal well(s) after pressurization by pumps. Perimeter ditches will be installed around the perimeter of the salt pile to intercept any releases or runoff. Preliminary design assumptions for the facility will be developed to size the facility. The TMA will be designed in accordance with applicable guidelines and safety factors.

2.7 Utilities and Services

2.7.1 Power

A total of 646,732,800 kWh/y power is required for operation with annual production of one million tonnes of KCl.

2.7.2 Raw Water

CGFPC has commenced a water sourcing study. CGFPC's anticipated peak water demand is 4.2 Mm^3/y. All viable options are being explored with the anticipated outcome of selecting a primary surface water source and/or potentially a groundwater source.

CGFPC has completed a desktop water sourcing study. There are no viable surface water sources in the immediate vicinity of the Broadview Project area. Potential surface water sources are present north of the area, in the vicinity of the Qu'Appelle River Valley and further to the west (**Figure 2.2**). Pasqua and Echo Lakes, Mission and Katepwa Lakes, and Crooked Lake, or some combinations thereof, are possible surface water sources. Buffalo Pound Lake is the western most surface water source that will be considered. The feasibility of these sources will be evaluated as part of the selection process. These sources range from 30 km to 160 km from KP 437.

Groundwater is also being investigated as a potential source. The most viable groundwater source is the Hatfield Valley Aquifer which is located north of the Broadview Project area. This aquifer may be capable of meeting the water demand for the proposed mine site but would need to be investigated further to assess capacity and affects under several usage scenarios.

A water sourcing field investigation and pumping test is currently underway. CGFPC will discuss potential supply with the Saskatchewan Water Security Agency.

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5,625,000 5,505,000

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Young Jansen Wynyard Invermay Springside Canora Foam Lake Badgerville Kamsack Duck Mountain Provincial Park Duck Mountain Provincial Park Shell River Waitrous Lewis Creek Lanigan Creek Nokomis TOUCHWOOD UPLANDS 694m Raymore Theodore Whitesand River Yorkton Creek Springside Togo San Clara 836m Shell River Imperial Punnichy 717m 767m BEAVER HILLS Kelliher Yorkton Roblin Valley River Grandview Gilbert Plains Ituna Saltcoats Strasbourg West Loon Creek Southey Cupar Melville Bredenbury Churchbridge Langenburg Russell Qu' Appelle River Regina Beach Mission Lake Fort Qu'Appelle Pasqua Lake Echo Lake Katepwa Lake Lemberg Neudorf Crooked Lake Stockholm Esterhazy Spy Hill Rossburn Buffalo Pound Lake Lumsden Qu'Appelle Indian Head Caronport Regina Pense Moose Jaw Wolseley Grenfell Broadview Rocanville Birtle Shoal Lake Vibank Whitewood Pipestone Lake 05N 100 Wapella Hamiota Montmartre Rouleau Briercrest Sedley Wascana Creek Francis Pipestone Creek Moosomin 05N 090 Moosomin Lake Windthorst Kipling Kennedy Elkhorn Wilcox 871m Avonlea Milestone Moose Jaw River Lang Wawota Sioux Valley Fillmore 678m Souris River Gainsborough Creek Jackson Creek Gopher Creek Virden Yellow Grass 859m Manitou Creek Lightning Creek Pipestone Creek Oak Lake Stoughton Weyburn Griffin Arcola Carlyle Manor Redvers Reston Pangman Moose Mountain Creek Ogema Graham Creek Souris River Radville Benson Midale Lampman Willow Bunch Bengough Macoun Alameda Oxbow Melita Hitchcock Camduff Torquay Estevan Bienfait 745m Long Creek Coronach North Portal

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DANIELS SHERIDAN DIVIDE BURKE RENVILLE BOTTINEAU BOTTINEAU BOTTINEAU

SHERIDAN

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LEGEND

KP 437

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, SASKADMIN2013, SASKGRID2013.
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 6.0 DATASET, 2012-09-28.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.
7. THIRD PARTY DRILLING RECORDS ARE PLACED IN THE GEOGRAPHIC CENTER OF THE AVAILABLE LEGAL LAND DESCRIPTION AND THEIR LOCATION WILL BE SUBJECT TO ERROR.

REFERENCE DRAWINGS

DWG No.	DATE	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DRN BY	CHK

0 7,500 15,000 30,000 45,000 60,000 METRES

SCALE: 1:1,275,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
CANADA GOLDEN FORTUNE POTASH CORPORATION	BROADVIEW PROJECT

TITLE

POTENTIAL SURFACE WATER SOURCES

DES BY GP	DRN BY FT	DATE 2015 06 03	FIG No. **2.2**	REV 0
CHK BY	APP BY	DWG No. 624190-H-01-E-001		11x17

Path: \\sli1653\Projects\CGFPC\624190 EIA_KP43714.0 Execution\4.5 GIS and Drawings\GIS\DRAWINGS\624190-H-01-E-001.mxd

2.7.3 Natural Gas

Preliminary calculation shows a total of 86,016,000 m^3/y natural gas is required for operation with annual production of one million tonnes of KCl.

2.7.4 Access Roads

A new paved access road to the site will be constructed from the nearest access point. Turning lanes will be required at the site access to ensure traffic safety.

2.7.5 Rail

An on-site rail system will be constructed with a spur line connecting to an existing mainline rail system. An on-site rail maintenance facility will also be constructed for repair/maintenance of the engine and rail cars.

2.7.6 Communications

It is assumed that all communications can be developed and provided by SaskTel.

2.8 Emissions and Waste

2.8.1 Air and GHG Emissions

Emissions generated during facility construction will include: (i) dust/particulate matter from earthworks (clearing, excavation); (ii) dust/particulate matter from vehicles moving on site and on gravel roads; (iii) emissions from heavy equipment engines; and (iv) emissions from temporary construction buildings/accommodations.

During operation, the project will emit particulate matter/dust, greenhouse gases, and other contaminants of concern. Potash processing can generate significant quantities of dust. Dust suppression will be achieved by designing material free-fall transfer points with the lowest possible vertical drop and by controlling the drop rate. Dust containment will be achieved by ensuring process and materials handling equipment are properly enclosed or sealed. Scrubbers or baghouses may be used to handle emissions from the KCl dryers. High efficiency, low NO_X burners will be used to limit NO_X emissions. Air emission modelling and a greenhouse gas assessment will be conducted as part of the EIS to understand potential emissions and implement appropriate mitigation measures.

Project emissions during construction and operation will include:

- Sulphur dioxide (SO_2);
- Nitrogen oxides (NO_x in the form of NO and NO_2);
- Carbon monoxide (CO);
- Particulate matter including:
  - Particulate matter with of an aerodynamic diameter less than 30 microns (Total Suspended Particulate [TSP]);
  - Particulate matter of an aerodynamic diameter less than 10 microns (PM_{10});
  - Particulate matter of an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$);
- Greenhouse gases, including:
  - Carbon dioxide (CO_2);
  - Methane (CH_4); and
  - Nitrous oxide (N_2O).

2.8.2 Brine

Excess brine from the TMA will be disposed of via deep well injection. A water balance for the mine site will determine brine injection requirements. Injection modelling will determine the injection horizon, injection pressures, and injection well field layout.

2.8.3 Sewage

A wastewater treatment system to collect, treat and dispose of domestic sewage will be provided at the plant site. The system will likely consist of a package sewage treatment plant (STP) and gravity collection PVC pipe network. Treated effluent will be released or used as irrigation water and sludge will be disposed of at a landfill.

2.8.4 Solid Waste

The facility will generate solid waste which will be separated into hazardous waste, recyclable waste and domestic waste. A waste management plan will be created outlining management procedures for waste generated during construction and operation.

Hazardous waste may include waste oil, oil filters, lubricants, solvents, and batteries. Hazardous materials will be managed in accordance with the Hazardous Substances and Waste Dangerous Goods Regulations. It will be stored and labelled in appropriate containers and removed from site using a qualified third party and disposed of in licensed facilities.

Recyclable waste may include metal, plastic, cardboard and paper. Recyclable wastes will be stored in a metal dumpster and recycled through a qualified third party.

Solid wastes (domestic waste) will be stored in a metal dumpster and sent to the municipal landfill using a qualified third party.

2.9 Alternatives

CGFPC is in the process of assessing potential site locations, water sourcing options, mine layouts and processing technologies.

2.9.1 Site Selection Study

A site selection study is currently underway to determine the optimal location of the TMA and mine site facilities based on environmental, social, geotechnical, contaminant release, land ownership, operational and cost considerations. Site selection for a TMA involves the consideration of many, often conflicting, factors. The goal of site selection is to rule out unfavourable sites and identify a preferred location for further investigation.

2.9.2 Water Source

CGFPC is investigating the potential use of various water sources, including groundwater sources and surface water sources.

2.9.3 Mining

CGFPC is evaluating mining technologies in an effort to reduce the amount of waste stored at surface and water requirements for the operation.

CGFPC is conducting a study to employ selective mining method as major mining method for the Broadview Project. Selective solution mining method uses brine to dissolve potash, leaving salt in the cavern. It has been widely used in secondary mining phase in existing potash solution mines in Saskatchewan, and the method has advantages (i) of taking out less sodium chloride waste, and (ii) of increasing cavern stability. Sponge-structure salt residue in caverns increases the cavern stability, and allows the development of cavern webs, and greater extraction ratios. CGFPC is conducting a study on proper cavern web dimensions and pillar size to control surface subsidence while getting more potash out of ground.

2.10 Occupational Health and Safety

CGFPC is committed to the health and safety of its employees. CGFPC will develop an Occupational Health and Safety Plan for all project phases that complies with *The Saskatchewan Employment Act, The Occupational Health and Safety Amendment Act, 2012*, and The Occupational Health and Safety Regulations, 1996. .

2.11 Conceptual Decommissioning and Reclamation

The objectives of decommissioning and reclamation will be to restore the area to a state similar to the surrounding lands that will be both safe and environmentally stable. At the time of facility closure, the following decommissioning activities may be undertaken:

- Mine well fields and subsurface infrastructure will be decommissioned;
- Well heads will be cut off and capped;

- Water, oil and brine retention structures will be drained, infilled and landscaped similar to other disturbed areas. All fluids removed from the ponds will be tested and disposed of appropriately;
- Pipelines will be drained and either dismantled (above ground pipelines) or abandoned in place (underground);
- Reclamation studies for the TMA will be further assessed and may include long-term natural dissolution, backfilling and/or re-injection;
- All buildings no longer required will be demolished;
- All salvageable material (i.e., metals, equipment, electronics) will be sorted and reused, sold, or recycled. The remaining materials will be removed from site and disposed in an approved facility;
- All hazardous materials will be identified for recycling or disposal;
- Concrete pads and building foundations no longer required will be demolished;
- Site roads and rail lines no longer required will be decommissioned and reclaimed;
- On-site utilities will be removed;
- Areas where contaminated soils may be present will be assessed and remediated as required;
- Surface drainage conditions will be restored similar to pre-existing conditions; and
- All disturbed areas will be reclaimed. Reclamation will generally consist of re-contouring the site, replacing topsoil, and re-vegetating to restore the land surface to as near as possible to the original conditions; and
- Salvageable topsoil will be used to re-contour the landscape, where applicable. Plant species selected to provide a vegetative cover on each cap will be compatible with the surrounding vegetation to ensure that the established vegetation will provide a self-sustaining cover.

Progressive reclamation methods will be utilized wherever possible. The site may also be evaluated for alternative industrial uses. The timeline for the implementation of a detailed decommissioning plan will be determined in the future. The expected life span of the mine is currently a minimum of 60 years, however this will likely be re-evaluated several times over the course of the mine life.

A more detailed conceptual decommissioning and reclamation plan will be developed during detailed engineering and permitting. An estimate of the decommissioning cost will be included in the plan.

The long-term storage of chemicals and products and subsequent removal at the site will require monitoring an adequate period of post-closure monitoring. This monitoring will likely consider surface and groundwater chemistry and permanent cover of vegetation. A detailed plan to monitor the site after decommissioning will be developed in consultation with the provincial government.

2.12 Workforce

Construction of the mine site will approximately take three years. Up to 2,500 workers will be required during peak construction. Approximately 180 workers are anticipated for site operations. Preference would be placed on hiring a local workforce wherever possible, and materials and services would be sourced locally where feasible.

2.12.1 Schedule

A preliminary schedule is presented in **Table 2.1**, however, this schedule is subject to change. Construction of the mine is expected to begin as early as late 2018, pending environmental approvals and economic conditions, and is expected to take three years to complete. Initial potash production is targeted for 2020. The current mine life is for 50 years, with operations potentially occurring for as long as 100 years.

Table 2.1 Preliminary schedule outlining completion of project milestones

Task	Date
Scoping Study	2015 to 2017
Environmental Baseline Studies	2015 to 2017
Environmental Impact Assessment (EIA) Submission	2017 to 2018
Environmental Impact Assessment (EIA) Approval	2018
Feasibility Study	2018
Construction Permit	2018
Substantial Completion of Detailed Engineering	2018
Construction	2018 to 2020
Operation	2020+

3 Engagement Plan

CGFPC has developed a community engagement plan to ensure interested or affected stakeholders are informed of the proposed project and given the opportunity to provide feedback that can be incorporated into project planning. Community engagement is an integral part of the Environmental Assessment process for developments within Saskatchewan under *The Environmental Assessment Act (1980a)*. In order to receive ministerial approval, proponents are requested to demonstrate a sufficient level of effort to advise and seek feedback on the interests and concerns stakeholders may have with a proposed development.

CGFPC's community engagement plan includes appropriate and empathetic engagement approaches used to encourage stakeholder feedback during information sharing, private, and public meetings. It includes phased engagement activities for both public and First Nations / Métis engagement. The overall objectives of the engagement program include.

- Ensure interested groups are informed of the proposed project and environmental assessment;
- Obtain feedback to identify concerns and ideas that can be incorporated into project planning;
- Create and maintain good working relationships with stakeholders so sustainable decisions regarding aspect of project planning, project construction and project operation can be made; and,
- Provide opportunities for current and future relationship building with stakeholders.

First Nations and Métis engagement will also focus on collecting data on traditional knowledge and land use in the region.

Engagement activities will be phased where:

- Phase I is being completed from Q1 to Q2 2017 to engage stakeholders early in the EIA process. CGFPC will introduce the project and its alternatives, describe the EIA and engagement process, receive feedback including concerns and ideas that can be incorporated into project planning, and address concerns about the project. Phase 1 has been initiated and is currently nearing completion.
- Phase II is scheduled for Q3 2017 to Q4 2017 to engage stakeholders during the EIA process and to provide additional information when potential effects are better understood. CGFPC will continue to share information about the project, present outcomes of the Phase I engagement, present outcomes of the impact assessment, continue to obtain feedback including concerns and ideas that can be incorporated into project planning, and address concerns about the project.
- Phase III is scheduled for Q4 2017 to Q1 2018 to engage stakeholders near the completion of the EIA process. CGFPC will provide information to stakeholders collected during Phase I and II and continue to obtain feedback including concerns and ideas that can be incorporated into project planning and design.

3.1 Preliminary Identification of Stakeholders

Community engagement includes all stakeholders with an interest in, or who may potentially be impacted by the Broadview Project. These may include nearby communities and rural municipalities, regulatory bodies, landowners, and First Nations and Métis groups. Recognized stakeholders are presented in **Table 3.1**. Identified First Nations and Métis groups include Indian Reserve (IR) Chiefs and Council as well as Regional Métis Nation Directors with titled land, political jurisdiction boundaries or potential traditional knowledge or traditional land-use in proximity to the proposed project. Stakeholder identification will be an ongoing process and other stakeholders will be included as the project progresses.

Table 3.1 Stakeholders included in the community engagement program

Stakeholders	Approximate Distance to KP 437
Rural Municipality	
RM of Kingsley No. 124	Within KP 437
RM of Chester No. 125	Within KP 437
RM of Elcapo No. 154	Borders KP 437
RM of Wolseley No. 155	Borders KP 437
Community*	
Village of Glenavon	3.0 km
Town of Grenfell	10.4 km
Town of Broadview	9.5 km
Town of Kipling	13.4 km
Village of Windthorst	11.9 km
Town of Wolseley	15.5 km
Unincorporated Community of Peebles	6.8 km
Unincorporated Community of Candiac	10.5 km
Regulatory Agency/Utility Providers	
SaskWater	Utility provider
Ministry of Environment	Environmental regulator
Water Security Agency	Water regulator
First Nation and Métis Groups	
Kahkewistahaw	9.0 km
Ochapowace	9.8 km
Carry the Kettle	5.7 km
Cowessess	Within KP 437
Sakimay	19.4 km
Flying Dust	38.2 km
Métis Eastern Region IIa	Judicial boundary near KP 437
Métis Eastern Region III	KP 437 within judicial boundaries

**Distances measured from edge of RMs and KP 437*

3.1.1 Project Notification

3.1.1.1 Packages

CGFPC provided project notification packages to the RMs of Kingsley, Chester, Elcapo and Wolseley, the Towns of Grenfell, Broadview, Wolseley and Kipling, the Villages of Glenavon, and Windthorst, and the First Nation and Métis groups (Carry the Kettle, Kahkewistahaw, Ochapowace, Cowessess, Sakimay, Flying Dust, Métis Eastern Region IIa and Métis Eastern Region III) in January of 2017. Distributed project notification packages included information about the project, the environmental assessment process, and the public engagement program (Attachment 2). The packages also included a location map, link to the public engagement website, and contact information for CGFPC.

3.1.1.2 Letters

CGFPC distributed 2,450 project notification letters through Canada Post distribution service on 31 January 2017. The letters provided introductory information about the project, the environmental assessment process, and the public engagement program (Attachment 2). The letters also included a location map and link to the public engagement website. Letters were distributed to all mailboxes (houses, apartments, farms and businesses) in the following communities:

- Town of Broadview
- Village of Glenavon
- Town of Grenfell
- Town of Kipling
- Candiac (unincorporated community)
- Peebles (unicorporated community)
- Village of Windthorst
- Town of Wolseley

3.1.2 Engagement Website

A public engagement website for the Broadview Project was activated on 2 February 2017 (www.broadviewproject.ca). The website provides company profiles for CGFPC, shares information about the project, and features a contact portal for stakeholders to provide feedback and questions related to the project. The website will be updated regularly as the project progresses. Software associated with the website will log the number of website visits and all information collected from the website will be compiled for inclusion in the EIA. Information on the project is also available on CGFPC's website at www.goldenpotash.com.

3.1.3 Meetings

3.1.3.1 Phase I Meetings

3.1.3.1.1 Rural Municipality & Town Council Meetings

In March and April 2017, CGFPC met with the RMs of Kingsley and Elcapo and the Towns of Broadview and Grenfell and the Villages of Windthorst and Glenavon. The meetings were used to provide updates on the proposed project, answer questions on the project, discuss the provincial environmental assessment process, and introduce project representatives from SNC-Lavalin. Meetings with the Town of Wolseley and the RMs of Chester and Wolseley are scheduled for May and June 2017. CGFPC will schedule additional meetings with rural municipalities and town councils as the project progresses.

3.1.3.1.2 First Nation Meetings

CGFPC held meetings in March with Kahkewistahaw, Cowessess, and Carry the Kettle First Nations to introduce Chief and Councils to the project. CGFPC plans to hold meetings with Sakimay, Ochapawace, and Flying Dust First Nations in June 2017. Meetings will also be held with the Directors of the Métis Nation Eastern Region III and the Métis Nation Eastern Region IIa in June 2017. CGFPC will schedule additional meetings with interested First Nation and Métis groups as the project progresses.

3.1.3.1.3 Regulatory Agency Meetings

CGFPC plans to hold in-person meetings with the MOE to introduce the proposed project, establish a working relationship, as well as understand key expectations. Meetings will also be held with Water Security Agency and SaskWater to provide project updates and to continue discussions on the project's water source and delivery.

3.1.4 Open Houses

At least two rounds of open house information sessions are being held in multiple locations in the project region. Each open house is being held at a public venue (community hall/town hall) as informal, drop-in style events with information displayed on posters, a PowerPoint presentation, and hand-outs. Open house advertisement posters are being placed in various locations in the communities at least one week in advance of each open house as well as on the engagement website. Advertisement ads for the open houses are also being placed in multiple local newspapers and the Regina Leader Post for two weeks prior to each open house.

Attendees of each open house receive an information hand-out and are encouraged to read the information panels on display. Project representatives are on hand to answer questions and provide additional information when required. Feedback forms are available to all open house attendees and contact information for engagement officers (email address, website, and phone numbers) are being provided for feedback collection purposes.

3.1.4.1 Phase I Open Houses

The Phase I open houses are largely as outlined in **Table 3.2**. The open houses were advertised as outlined in **Table 3.3**. Public open house notifications were also placed on numerous community websites and Facebook pages (**Table 3.3**). Phase I open house materials, including advertisements, posters, a PowerPoint presentation, an information hand-out, and a questionnaire, are presented in Attachment 2.

Table 3.2 Phase I open houses

Community	Date	Number of Attendees	Number of Completed Questionnaires
Town of Broadview	25-Apr-2017	58	15
Town of Grenfell	26-Apr-2017	69	8
Town of Kipling	2-May-2017	25	1
Village of Glenavon	3-May-2017	17	5
Town of Wolseley	19-Jun-2017	n/a	n/a

Table 3.3 Phase I open house advertisements

Community	Date
Advertisements	
Regina Leader Post	Saturday 22-Apr-17 Saturday 29-Apr-17
Grenfell & Broadview Sun Express	24-Apr-17 week edition 1-May-17 week edition
Kipling The Citizen	24-Apr-17 week edition 1-May-17 week edition
Indian Head-Wolseley News	24-Apr-17 week edition 1-May-17 week edition
White City/Emerald Park Community Newsletter	24-Apr-17 week edition 1-May-17 week edition
Websites/Facebook	
Town of Grenfell	
Town of Broadview	
Town of Kipling	
Town of Wolseley	
Village of Glenavon	
RM of Chester	
RM of Elcapo	
RM of Kingsley	

3.1.5 Stakeholder Feedback

Stakeholders will have the opportunity to provide feedback and ask questions throughout the entire process. Stakeholder feedback is being collected in a variety of ways including; feedback forms provided to all attendees during publically held information sessions; verbally at open houses and meetings; by emailing or phoning engagement advisors; and through the contact portal feature located on the public engagement website. Feedback collected throughout the process is being documented in a detailed communication log.

3.1.5.1 Phase I Stakeholder Feedback

3.1.5.1.1 Rural Municipality and Town Meetings

Overall the project was received favorably during RM and Town meetings. General questions included: the viability of the mine, water source, transportation of the product, mineral rights, land acquisition, investments, mine site and distance to well pads, tailing management areas, and job opportunities. Main concerns expressed included: the mine site location and footprint, timeline, water source, water use, pipelines, air pollution, residual effects, land acquisition, road traffic, tailings, power and employment.

3.1.5.1.2 First Nation Meetings

Feedback obtained during meetings with First Nation communities including interest in economic, business, and job opportunities as well as Impact Benefit Agreements. Primary concerns expressed included the environment, adverse effects to First Nation treaty rights, and water use. Some of the communities indicated they have internal environmental and consultation policies they would like followed. Some communities also expressed that they would like continued engagement.

3.1.5.1.3 Open Houses

Approximately 169 members of the public attended the four open houses (**Table 3.2**). Overall the project was received favorably by those in attendance. Feedback obtained from the open house via questionnaires, verbal communication, and follow-up emails was generally positive. Primary concerns expressed to the project representatives were mainly related to water sourcing, water usage, mine facility location, and mining by-products (tailings). Other concerns expressed during the open houses included the potential increase of traffic and noise to rural communities and the potential increase of human population during the construction phase of the project. Project representatives explained that the results of water sourcing and potential mine site location studies, which are currently in progress, will be presented to the public in future open houses (Phase II – fall 2017). Project representatives further explained that mitigation and monitoring measures will be in place to ensure these effects are minimized.

3.1.5.1.4 Individual Correspondence

Approximately 12 members of the public contacted CGFPC, including people with land in KP 437, with questions or comments on the project. Overall the feedback obtained from these individuals was positive. People were interested in learning more about the project and its schedule, as well job and subcontractor opportunities. Concerns expressed were related to water sourcing, general environmental impacts, and why the project was named after the Town of Broadview rather than closer towns (Grenfell).

3.1.6 Engagement Documentation

CGFPC will keep detailed tracking records of all engagement activities, as well as a tracking table of the concerns, issues, and suggestions raised by the various stakeholders. A detailed response will be provided for all concerns, issues and suggestions in the Environmental Impact Statement.

4 Description of the Environment

A baseline description of the environment was prepared using existing data for the region. This information is being used to support ongoing and future environmental studies.

4.1 Atmospheric Environment

A baseline description of the environment was prepared using data from the nearest existing meteorological and air quality stations. A defined atmospheric environment study area will be determined during future phases of the project.

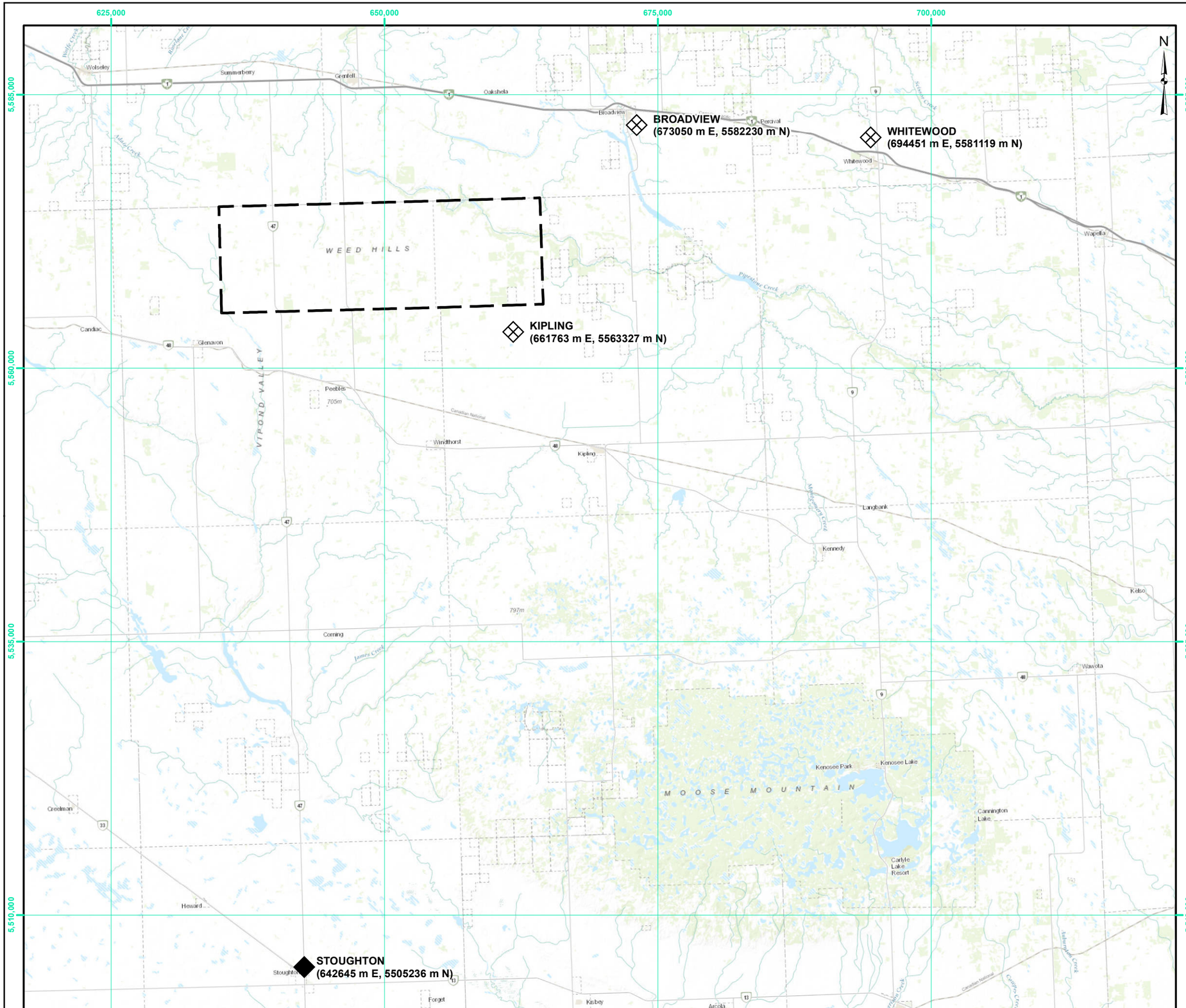
4.1.1 Climate

Climate data for the region were obtained from three Environment and Climate Change Canada (ECCC) weather stations: the Kipling, Whitewood, and Broadview stations (ECCC 2016a). The Kipling station is located approximately 14 km southeast of the centre of KP 437 (UTM Zone 13 N 673050 E / 5582231 N), the Whitewood station is located approximately 46 km northeast of the centre of KP 437 (UTM Zone 13 N 694451 E / 5581119 N), and the Broadview station is located approximately 26 km northeast of the centre of KP 437 (UTM Zone 13 N 661763 E / 5563327 N) (**Figure 4.1**). The Kipling and Whitewood stations record daily average data whereas the Broadview station collects hourly data.

The stations were chosen because of their proximity to KP 437 and their long periods of record. The Kipling and Whitewood stations meet the World Meteorological Organization (WMO) standards (ECCC 2016a). Although the Broadview station does not meet WMO standards (e.g., station has seven to nine years of missing data): hourly data, wind data, and Intensity-Duration-Frequency (IDF) were available for this station; its temperature and precipitation data is comparable to the Kipling and Whitewood stations; and it meets the WMO standards for wind.

The study area is located in the semi-arid region of the Canadian prairies, characterized by four seasons with long, cold winters and short, hot summers. Climate normals for the three stations, including air temperature, precipitation and wind data, are presented in **Table 4.1** and **Figure 4.2** to **Figure 4.4**. Daily average temperature ranged from up to 15.5 °C and 15.6 °C in July to 14.7 ^{o}C and -15.0 ^{o}C in January at the Kipling and Whitewood stations, respectively. The daily average temperature at the Broadview station ranged from an 18.1 ^{o}C in July to -14.2 ^{o}C in January. The annual average temperatures were 2.5 ^{o}C to 2.6 ^{o}C at all three stations. Annual average wind speed is approximately 16.3 km/h and prevailing wind directions are generally from the west and southeast.

Average annual precipitation at the Kipling and Whitewood stations were 467 mm and 506 mm, respectively, with 27% and 29% of the precipitation occurring as snowfall. Average annual precipitation at Broadview was slightly lower at 425 mm, with approximately 26% of the precipitation occurring as snowfall. The mean annual gross evaporation for the region is approximately 800 mm (Agriculture and Agri-Food Canada [AAFC] 2002); this is significantly higher than the annual average precipitation because the project is located in a semi-arid region. IDF curves help describe the extreme rainfall events that might occur in the study area and provide vital information for surface water runoff estimation and design of hydraulic structures. Relatively high intensity rainstorms are summarized in **Table 4.2** for ECCC's Broadview station. Based on the IDF curves, the precipitation events of 50-year and 100-year return period rainstorms of 24-hour duration are approximately 82 mm and 90 mm, respectively (ECCC 2014a).



LEGEND

- METEOROLOGICAL STATION (ENVIRONMENT AND CLIMATE CHANGE CANADA)
- AIR QUALITY STATION (SESAA)
- KP 437

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, SASKADMIN2013, SASKGRID2013.
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6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.

REFERENCE DRAWINGS

DWG No.	DATE	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DRN BY	CHK

0 2,125 4,250 8,500 12,750 17,000 METRES

SCALE: 1:350,000

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CLIENT	PROJECT LOCATION
CANADA GOLDEN FORTUNE POTASH CORPORATION	BROADVIEW PROJECT

TITLE

METEOROLOGICAL AND AIR QUALTIY STATION LOCATIONS

DES BY	GP	DRN BY	FT	DATE	2015 06 03	FIG No.	4.1	REV	0
CHK BY		APP BY		DWG No.	624190-H-15-E-001			11x17	

Path: \\sli1653\Projects\CGFPC\624190 EIA_KP437\4.0 Execution\4.5 GIS and Drawings\GIS\DRAWINGS\624190-H-15-E-001 (Meteorological Station).mxd

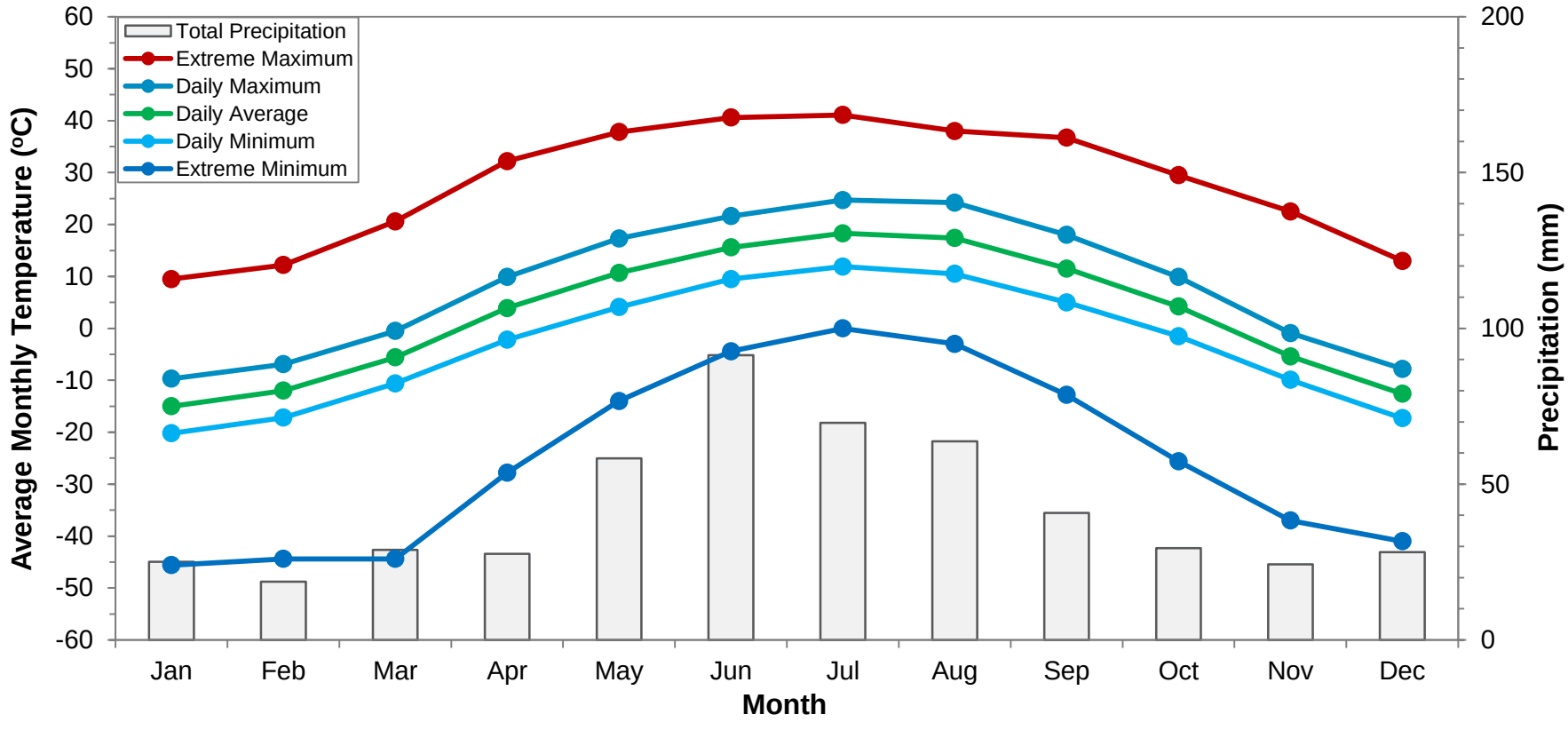

Figure 4.2 Temperature and precipitation normals for ECCC's Kipling Station (1981 to 2010; ECCC 2016a)

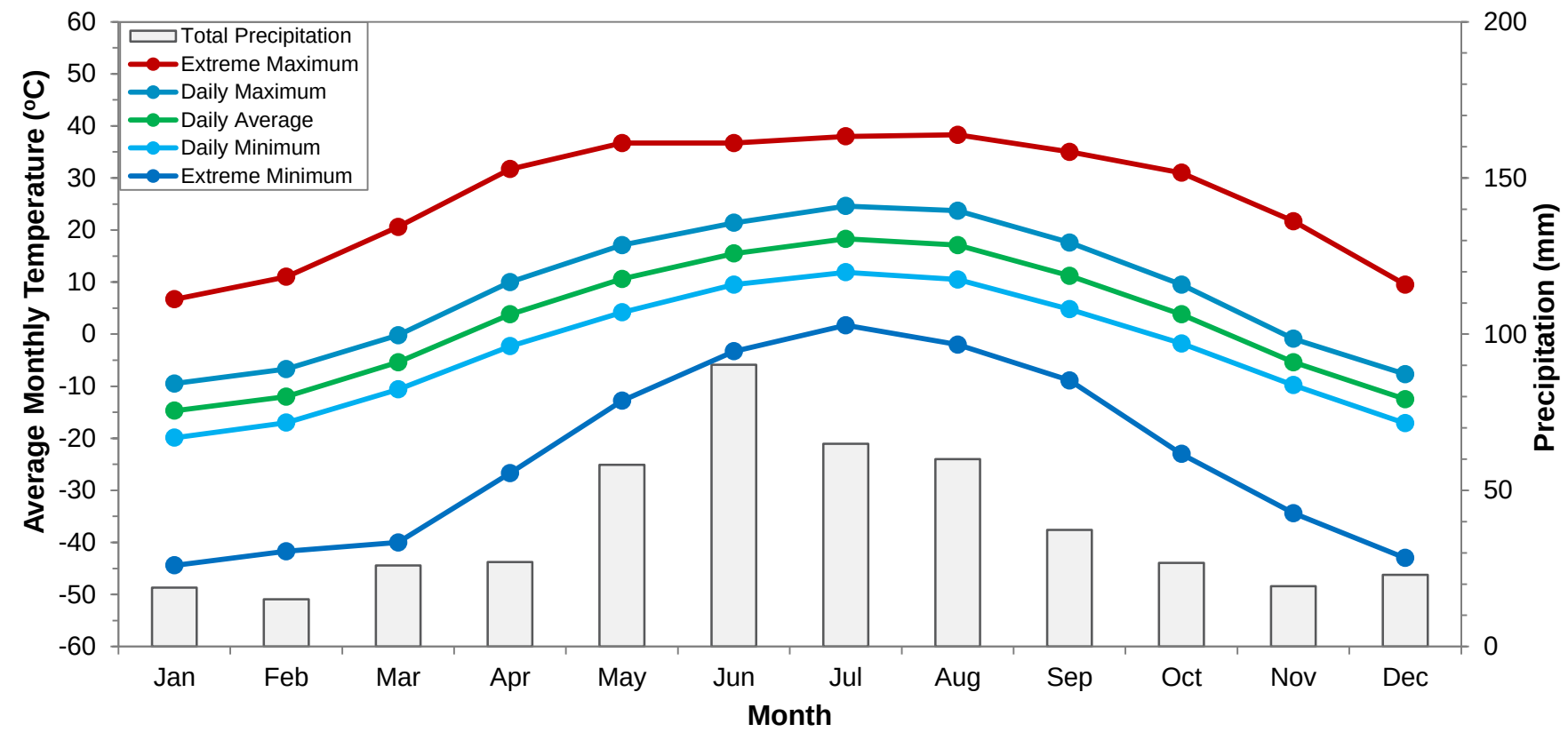

Figure 4.3 Temperature and precipitation normals for ECCC's Whitewood Station (1981 to 2010; ECCC 2016a)

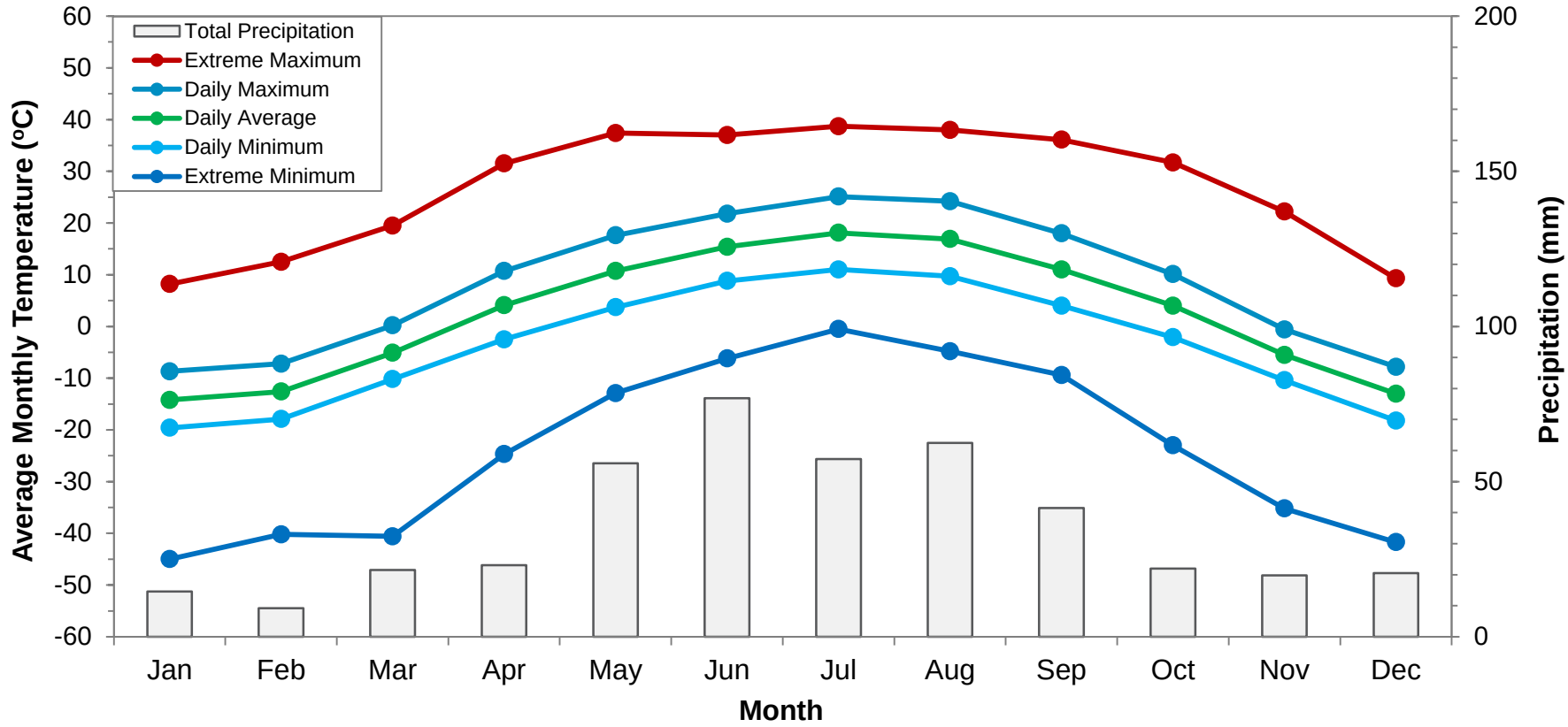

Figure 4.4 Temperature and precipitation normals for ECCC's Broadview Station (1981 to 2010; ECCC 2016a)

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Building what matters

Table 4.1 Climate normals for ECCC's Kipling, Whitewood, and Broadview stations (1981 to 2010)

Climate Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature – Kipling													
Daily Average (°C)	-14.7	-12.0	-5.4	3.8	10.6	15.5	18.3	17.1	11.2	3.8	-5.4	-12.5	2.5
Daily Maximum (°C)	-9.5	-6.7	-0.2	10.0	17.1	21.4	24.6	23.7	17.6	9.5	-0.9	-7.7	8.2
Daily Minimum (°C)	-19.9	-17.0	-10.6	-2.3	4.2	9.5	11.9	10.5	4.8	-1.8	-9.8	-17.1	-3.1
Extreme Maximum (°C)	6.7	11.0	20.6	31.7	36.7	36.7	38.0	38.3	35.0	31.0	21.7	9.5	38.3
Extreme Minimum (°C)	-44.4	-41.7	-40.0	-26.7	-12.8	-3.3	1.7	-2.0	-8.9	-23.0	-34.4	-43.0	-44.4
Days with max temp > 0°C	4.5	6.4	16.3	26.9	30.8	30.0	31.0	31.0	30.0	27.7	13.8	5.5	253.9
Temperature – Whitewood													
Daily Average (°C)	-15.0	-12.0	-5.6	3.9	10.7	15.6	18.3	17.4	11.5	4.2	-5.4	-12.6	2.6
Daily Maximum (°C)	-9.7	-6.9	-0.5	9.9	17.3	21.6	24.7	24.2	18.0	9.9	-0.9	-7.8	8.3
Daily Minimum (°C)	-20.2	-17.2	-10.6	-2.2	4.1	9.5	11.9	10.5	5.0	-1.5	-9.9	-17.3	-3.2
Extreme Maximum (°C)	9.5	12.2	20.6	32.2	37.8	40.6	41.1	38.0	36.7	29.5	22.5	13.0	41.1
Extreme Minimum (°C)	-45.6	-44.4	-44.4	-27.8	-14.0	-4.4	0.0	-3.0	-12.8	-25.6	-37.0	-41.0	-45.6
Days with max temp > 0°C	4.8	6.8	15.6	26.7	30.8	30.0	31.0	31.0	30.0	27.8	13.4	5.9	253.8
Temperature – Broadview													
Daily Average (°C)	-14.2	-12.6	-5.1	4.1	10.7	15.4	18.1	16.9	11.0	4.0	-5.5	-13.0	2.5
Daily Maximum (°C)	-8.7	-7.2	0.2	10.7	17.6	21.8	25.1	24.2	18.0	10.1	-0.6	-7.8	8.6
Daily Minimum (°C)	-19.6	-17.9	-10.2	-2.5	3.7	8.8	11.0	9.7	4.0	-2.1	-10.4	-18.2	-3.7
Extreme Maximum (°C)	8.2	12.5	19.5	31.5	37.4	37.0	38.7	38.0	36.1	31.7	22.2	9.3	38.7
Extreme Minimum (°C)	-45.0	-40.2	-40.6	-24.7	-12.9	-6.2	-0.5	-4.8	-9.4	-23.0	-35.2	-41.7	-45.0
Days with max temp > 0°C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Precipitation – Kipling													
Rainfall (mm)	0.4	1.3	5.8	13.7	49.9	90.1	64.9	60.0	35.1	16.3	2.5	1.2	341.1
Snowfall (cm)	19.2	13.7	20.4	13.7	8.3	0.1	0.0	0.0	2.2	10.5	16.9	22.0	127.1
Precipitation (mm)	18.9	15.1	26.0	27.1	58.2	90.2	64.9	60.0	37.3	26.8	19.3	23.0	466.6
Extreme Daily Rainfall (mm)	2.8	9.4	22.0	36.0	42.6	95.5	65.2	70.4	80.5	57.2	7.6	10.4	95.5
Extreme Daily Snowfall (cm)	22.4	16.0	34.3	46.5	41.4	3.0	0.0	0.0	21.8	29.0	50.0	25.0	50.0
Extreme Daily Precipitation (mm)	22.4	16.0	34.3	55.0	49.0	95.5	65.2	70.4	80.5	57.2	51.2	25.0	95.5

Climate Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation – Whitewood													
Rainfall (mm)	0.6	0.9	5.6	14.4	51.4	91.2	69.7	63.8	39	18.6	2.7	1.5	359.4
Snowfall (cm)	24.5	17.9	23.3	13.3	7	0.2	0.0	0.0	1.9	10.9	21.6	26.7	147.2
Precipitation (mm)	25.1	18.7	28.9	27.6	58.3	91.4	69.7	63.8	40.8	29.5	24.3	28.2	506.5
Extreme Daily Rainfall (mm)	7.0	10.0	19.8	37.2	85.3	87.8	142.2	79.8	73.2	48.5	15.2	8.8	142.2
Extreme Daily Snowfall (cm)	31.5	27.2	30.5	30.5	37.6	6.2	0.0	0.0	20.3	31.0	37.0	24.2	37.6
Extreme Daily Precipitation (mm)	31.5	28.0	30.5	40.0	85.3	87.8	142.2	79.8	73.2	48.5	40.6	24.2	142.2
Precipitation – Broadview													
Rainfall (mm)	0.2	0.7	5.2	16.5	49.8	76.8	57.3	62.5	39.1	13.9	4.0	0.4	326.3
Snowfall (cm)	17.1	10.4	18.0	7.1	6.3	0.1	0.0	0.0	2.6	8.8	17.3	24.2	111.8
Precipitation (mm)	14.6	9.2	21.5	23.1	55.9	76.9	57.3	62.5	41.5	22.0	19.8	20.5	424.7
Extreme Daily Rainfall (mm)	1.8	9.4	15.8	50.4	35.8	52.4	37.0	90.4	64.8	29.4	15.0	2.7	90.4
Extreme Daily Snowfall (cm)	18.8	8.9	25.0	20.6	28.6	2.6	0.0	0.0	15.0	24.4	22.0	22.0	28.6
Extreme Daily Precipitation (mm)	18.0	9.4	23.7	50.4	36.4	52.4	37.0	90.4	64.8	41.7	22.0	18.2	90.4
Wind – Broadview													
Average Monthly Speed (km/h)	17.4	17.3	16.9	17.1	17.4	15.5	13.7	13.8	15.9	17.1	16.5	17.2	16.3
Most Frequent Direction	W	W	SE	SE	SE	W	W	SE	W	W	W	W	W
Maximum Hourly Speed (km/h)	76	76	74	70	71	78	70	72	76	78	85	85	76

Source: ECCC 2016a

Table 4.2 Extreme rainfall (mm) at the Broadview meteorological station

Return Period (years)	Duration	
	1-hour	24 hours
1 in 2	15.3	37.9
1 in 5	21.6	51.9
1 in 10	25.7	61.2
1 in 25	31.0	72.9
1 in 50	34.9	81.6
1 in 100	38.8	90.2

Source: ECCC 2014

4.1.2 Air

4.1.2.1 Air Quality

Air quality in Saskatchewan is managed by air quality standards and objectives of criteria air contaminants (CACs), which include the following pollutants:

- Sulphur dioxide (SO_2);
- Hydrogen sulfide (H_2S);
- Nitrogen oxides (NO_x in the form of NO and NO_2);
- Carbon monoxide (CO);
- Ozone (O_3);
- Particulate matter of an aerodynamic diameter ≤ 10 µm (PM_{10});
- Particulate matter of an aerodynamic diameter ≤ 2.5 µm ($PM_{2.5}$); and
- Particulate matter of an aerodynamic diameter ≤ 30 µm – Total Suspended Particulate (TSP).

SO_2 and NO_2 are key criteria pollutants based on primary (health-based) and secondary (welfare-based) considerations. Air quality standards and objectives define maximum allowable concentrations over specific averaging periods (**Table 4.3**). Air quality in Saskatchewan is governed by: the Saskatchewan Ambient Air Quality Standards (SAAQS) (Government of Saskatchewan 2016a), the National Ambient Air Quality Objectives (NAAQO), and the Canadian Ambient Air Quality Standards (CAAQS) (Canadian Council of Ministers of the Environment 1999). CAAQS are replacing the NAAQO limits.

SNC-Lavalin obtained ambient air quality data from a nearby station operated by the Southeast Saskatchewan Airshed Association (SESAA) (Fairbank, pers comm. 2016). The station is located in the Town of Stoughton, (population 694 people [Statistics Canada 2012]). The Stoughton station is located approximately 65 km south of the centre of KP 437 at (UTM Zone 13 N 642645 E / 5505236 N). The Stoughton station collects air quality data on an hourly basis for SO_2, NO, NO_2, NO_X, H_2S, $PM_{2.5}$, rain, temperature, wind speed and direction. The station does not collect measurements for CO and PM_{10}.

Air emissions in the region are dominated by road dust generated at rural, gravel roads and agricultural activities associated with land cultivation. There may be localized emissions (VOCs, NO_X, SO_2, CO, polycyclic aromatic hydrocarbons [PAH]) associated with diesel burning of agricultural machinery and coal/oil burning associated with residential heating. There is only one industrial site (TransCanada Pipelines Ltd.) within five kilometers of the KP 437. The TransCanada Pipelines Ltd. Grenfell station emits NO_X, CO, and $PM_{2.5}$. There are two warehousing and storage facilities within a 20 km radius of the KP 437 emitting dust (Viterra Inc. Qu'appelle Valley HP and Lois Dreyfus Commodities Canada Ltd.).

SNC-Lavalin averaged the hourly ambient air quality data for the Stoughton station to match the averaging periods used by the air quality objectives and standards (**Table 4.3**). The $PM_{2.5}$ 24-hour average (34 µg/m^3) exceeds the SAAQS and NAAQOs of 28 µg/m^3 and 15 µg/m^3, respectively. H_2S exceeds the SAAQS for all averaging periods. All other pollutants are below the standards/objectives. The exact source of those exceedances is not clear, however, are inferred to be from local emission sources or from activities proximal to the measurement station. The station is located in Stoughton's outskirts and likely the cause for air quality exceedances is traffic.

Table 4.3 Averaged ambient air quality data from the Stoughton SESAA station (January to December, 2015), exceedances are bolded

Pollutant	Period	SESAA Data (µg/m^3)	SAAQS (µg/m^3)	NAAQO (µg/m^3)	CAAQS[a] (µg/m^3)
SO_2	Annual	1.4	20[b]	30	13[b]
	24-hour	9	125	150	-
	1-hour	44	450	450	185[c]
NO_2	Annual	4	45[b]	100	-
	24-hour	18	200	200	
	1-hour	44	300	400	-
H_2S	24-hour	**16**	5	-	-
	1-hour	**66**	12	-	-
$PM_{2.5}$	Annual	9	10	-	10[d]
	24-hour	**34**	28[e]	15	28[e]

[a] CAAQS for SO_2 are effective 2020
[b] arithmetic mean
[c] the 3-year average of the annual 4th highest (99th percentile daily maximum 1-hour average concentrations)
[d] the 3-year average of the annual average concentrations
[e] the 3-year average of the annual 98th percentile (8th highest) of the daily 24-hour average concentrations
Source: Fairbank, pers. comm. 2016.

4.1.2.2 Greenhouse Gases

Greenhouse gas emissions (GHG) contribute to climate change and are a key issue for new and existing developments. Federal reporting of GHG emissions is required through Notices under *The Canadian Environmental Protection Act, 1999*, as per the Greenhouse Gas Emissions Reporting Program (Environment and Climate Change Canada 2016b). Under this program, facilities releasing more than 50 kilotonnes (kt) of carbon dioxide equivalent (CO_2e) must submit an annual report on their emissions; reporting is voluntary for facilities emitting less than 50 kt of CO_2e per year. GHG emissions are undergoing increased regulation globally through the Paris Agreement and through the Pan-Canadian Framework on Clean Growth and Climate Change in Canada. Pricing carbon pollution is central to this Framework and provincial governments are collaborating with the federal government to establish provincial GHG reduction policies, including carbon pricing. The Province of Saskatchewan has not yet determined how GHG reduction/carbon pricing will be addressed. Although there is uncertainty on impending GHG reduction initiatives through regulations and/or carbon pricing, CGFPC recognizes the need to reduce GHG emissions.

In 2015, the Province of Saskatchewan emitted 75 Mt CO_2e, approximately 10% of Canada's emitted 722 Mt CO_2e (ECCC 2017a). Based on the Reported Facility Greenhouse Gas Data (ECCC 2017b), there are nine potash mines reporting GHG emissions in Saskatchewan. In 2015, emissions from these potash mines ranged from 52 kt CO_2e (0.07% of provincial emissions) to 692 kt CO2e (0.92% of provincial emissions) and averaged 157 kt CO_2e (0.21% of provincial emissions).

4.2 Hydrogeological Setting

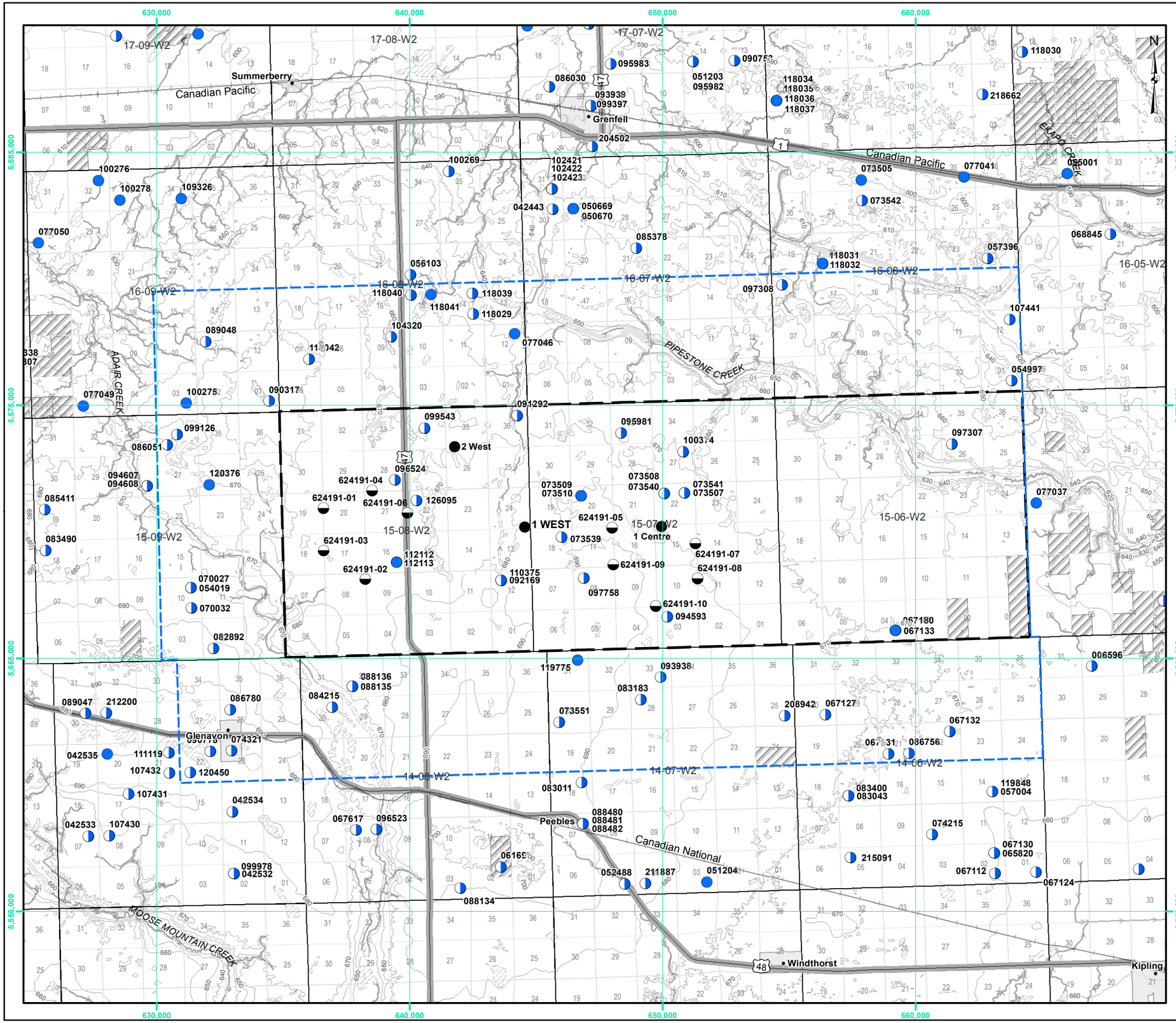
Hydrogeological data was compiled from a hydrogeological desktop study and subsequent hydrogeological drilling, instrumentation and testing program conducted for the project in 2015. The desktop study compiled readily available information from third party water well borings in the hydrogeological study area. In general, the Water Well Drilling Record number (WWDR) provided by the Saskatchewan Watershed Security Agency (WSA) was used to identify existing third party boreholes for the hydrogeological investigations (**Figure 4.5**). The hydrogeological study area extends well beyond the boundaries of KP 437 potash permit to bring in stratigraphic control and provide a robust interpretation (**Figure 4.5**).

Only those boreholes with a combination of driller's logs and geophysical signatures were utilized in the interpretation. The existing boreholes were rarely engineered (i.e. no geologist, technologist, or engineer was on site to provide lithologic logs), and the stratigraphy reported on the logs is based on drillers descriptions which, in SNC-Lavalin's experience, can be unreliable. An interpretation of the stratigraphy at each existing borehole (i.e. a lithologic strip log) was created using the geophysical signatures supplemented with the driller's notes. This is SNC-Lavalin's best interpretation of the stratigraphy and hydrogeology based on the available information. While third party boreholes may be subject to error, they have been utilized to extend the stratigraphy beyond the area directly investigated by SNC-Lavalin and are supplemental to site-specific investigations completed for the Broadview Project.

A hydrostratigraphic drilling, instrumentation, and testing investigation has been conducted to determine the Quaternary–aged stratigraphy and establish baseline groundwater conditions within the Broadview Project area. The investigation included deep stratigraphic drilling (ten boreholes to the Pierre Formation shale) and shallow drilling (ten boreholes to the shallow oxidized/unoxidized till contact of the Saskatoon Group). All work was directed by a senior geological engineer / hydrogeologist. Vibrating wire piezometer stacks were installed targeting the major intertill aquifers above the Pierre Formation shale while standpipe piezometers were installed at the first oxidized/unoxidized contact in the Floral Formation. Baseline measurements, analysis and reporting are being completed.

4.2.1 Regional Geological Setting

Successive marine transgression and regression in the Upper Cretaceous Period deposited a thick, complex sequence of marine silt and clay deposits across central Saskatchewan. The Cretaceous constitutes the base of exploration associated with the shallow hydrostratigraphic characterization, as it is the base of “fresh-water” exploration in the area. In general, aquifers below the Cretaceous Shales are not used for human consumption or agricultural purposes. The Pierre Formation is the uppermost “bedrock” unit encountered in the Broadview Project area. It is composed of non-calcareous, grey, marine clay and silt (“shale”). The Pierre Formation is found across the Broadview Project hydrogeological study area.



LEGEND

- VIBRATING WIRE PIEZOMETER
- BOREHOLE
- THIRD PARTY WATER WELL
- THIRD PARTY BOREHOLE
- KP 437
- HYDROGEOLOGICAL STUDY AREA LIMIT
- RAILWAY
- HIGHWAY
- 10 METRE ELEVATION CONTOUR (masl)
- WATERCOURSE
- WATERBODY
- WATERBODY (INTERMITTENT)
- URBAN MUNICIPALITY
- FIRST NATIONS LANDS

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
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6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.
7. THIRD PARTY DRILLING RECORDS ARE PLACED IN THE GEOGRAPHIC CENTER OF THE AVAILABLE LEGAL LAND DESCRIPTION AND THEIR LOCATION WILL BE SUBJECT TO ERROR.

REFERENCE DRAWINGS

DWG No.	DATE	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DRN BY	CHK

0 900 1,800 3,600 5,400 7,200 METRES

SCALE: 1:150,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
CANADA GOLDEN FORTUNE POTASH CORPORATION	BROADVIEW PROJECT

TITLE

BOREHOLE LOCATIONS

DES BY	GP	DRN BY	FT	DATE	2015 06 03	FIG No. 4.5	REV 0
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Millions of years of post-depositional erosion of the Upper Cretaceous and Tertiary deposits resulted in the creation of a “badland” geomorphology across much of Saskatchewan. This “badland” landscape was well developed, with a number of valleys incised through scattered erosional remnants of the Tertiary bedrock deposits and Upper Cretaceous marine shales.

The Hatfield Valley is one of the major shallow bedrock features in Saskatchewan and spans the entire province, running from northwest Saskatchewan to southeast Saskatchewan, and into neighbouring provinces. The Hatfield Valley was cut into the bedrock by a combination of preglacial erosion and fluvial erosion during the advance of the first continental glacier. Prior to glaciation, erosion and subsequent alluvial and colluvial deposition of sediments filled the Hatfield Valley. These sediments are generally comprised of preglacial quartz and chert sands and gravels, interbedded with organic rich silts and clays. Millions of years of deposition resulted in these preglacial deposits partially infilling the Hatfield Valley.

The stratified preglacial sediments deposited between the bedrock surface and the glacial sediments are formally called the Empress Group (Whitaker and Christiansen 1972). These preglacial sediments sit unconformably on the bedrock surface and have been informally called the lower unit of the Empress Group. The sediments from the bedrock surface to the ground surface are collectively called “drift”. They are divided into preglacial and post-glacial drift.

Over the past two million years, Saskatchewan has undergone at least eight periods (and possibly 10 periods) of significant glacial advance. The final deglaciation occurred in the Pleistocene Epoch between approximately 17,000 and 10,000 years ago (Christiansen 1979). Glaciation in the Pleistocene resulted in a complex arrangement of proglacial and glacial sediments interbedded with non-glacial stratified sediments (fluvial, lacustrine, etc.) deposited between glaciations and during interstadal deglaciation. Erosional valleys produced during interglacial periods were intermixed with preglacial valleys forming complex stratigraphic arrangements. The alluvial and colluvial deposits that were laid during preglacial and interglacial periods in the valleys, were covered by tills during the final stages of glaciation, forming deep buried valley aquifer systems, often flanked by more regionally extensive blanket aquifer systems. These systems are now buried with deposits from subsequent glacial and non-glacial periods, often with limited surface indication of their presence at depth. These deposits form the most significant fresh-water aquifers in the province.

The complex arrangement of glacial, glaciofluvial and glaciolacustrine deposits within the study area are formally divided into two primary groups: 1) the Sutherland Group and 2) the Saskatoon Group (Christiansen 1992). These units are further subdivided into formal formations (in ascending order, the Mennon Formation, the Dundurn Formation, the Warman Formation, the Floral Formation, the Battleford Formation, and the Surficial Stratified Deposits). Both the Sutherland Group and the Saskatoon Group are primarily comprised of unsorted till, formed by glacial erosion and the reworking of Precambrian-aged igneous and metamorphic rocks, Paleozoic limestones and Cretaceous marine shales during glacial advance. Significant intratill and intertill stratified deposits also comprise the Quaternary deposits.

The till units of the Sutherland Group generally have a higher clay content compared to the overlying Saskatoon Group tills due to a higher percentage of marine shale being incorporated into the matrix of the till. Similarly, the Saskatoon Group tills have higher carbonate contents due to incorporation of Paleozoic limestones and dolomites into the matrix. The lithological compilation, combined with carbonate content signatures, can be used to help identify each formation in the Quaternary aged sequence. The intertill stratified deposits between the till groups and the individual till formations, represent the major aquifers across the Broadview Project area.

Melting of the last glacier deposited a till plain characterized by a hummocky topography of kettles and eskers, covered with glacial and glaciofluvial/glaciolacustrine deposits and post glacial sediments (Surficial Stratified Deposits).

The complex stratigraphic arrangements of the Cretaceous and Quaternary deposits were further complicated by extensive faulting due to either the dissolution of the deep (mid-Devonian) Prairie Evaporite deposits beneath the area, and subsequent collapse of near surface sediments (Christiansen and Sauer 2001) or by continental tectonic extension in Cenozoic time possibly combined with melting of gas hydrates during glacial retreat (Gendzwill and Stauffer 2006).

These depressions were infilled (generally with till) during subsequent glaciations, often resulting in discontinuous and hydraulically isolated accumulations of valley infill deposits. Delineation of these collapse structures is important as they are often significant enough to displace aquifer units, resulting in lateral connectivity disruptions and significant aquifer boundary effects during water production.

The stratigraphy of interest within this investigation area (in ascending order) is:

1. The Pierre Formation,
2. The Empress Group (where present)
3. The Sutherland Group:

    a) The Mennon Formation,
    b) The Dundurn Formation, and
    c) The Warman Formation,

4. The Saskatoon Group:

    a) The Floral Formation,
    b) The Battleford Formation, and
    c) The Surficial Stratified Deposits.

A stratigraphic column for the Broadview Project area is provided in **Figure 4.6**. All materials between the ground surface and the bedrock surface are collectively referred to as drift. Bedrock refers to the Upper Cretaceous silt and clay materials that constitute the stratigraphic base for the “fresh water” drilling investigations.

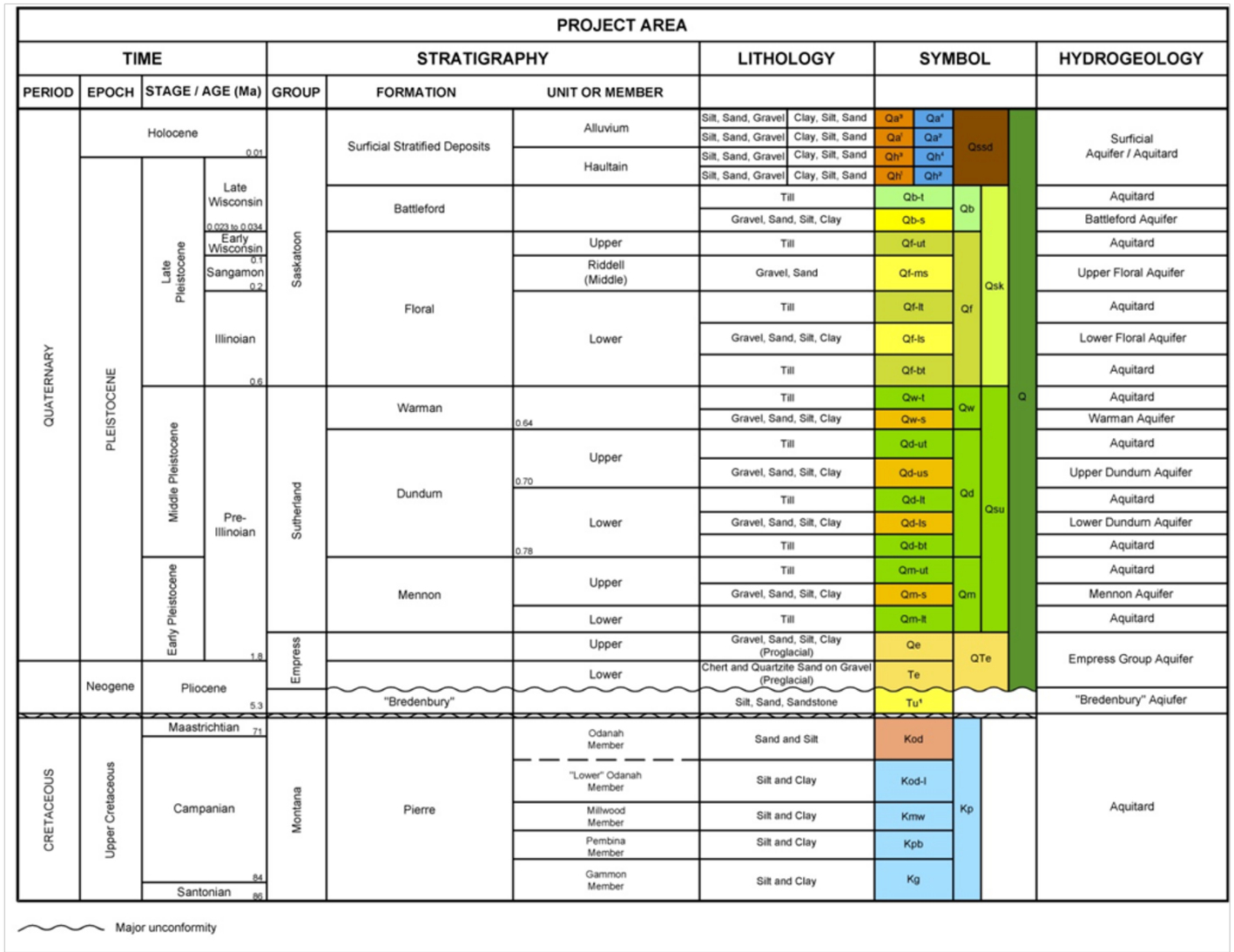


Figure 4.6 Stratigraphic column and hydrostratigraphy in the study area (not to scale)

4.2.1.1 Bedrock Stratigraphy

The Upper Cretaceous Pierre Shale of the Montana Group forms the surface bedrock unit in the area. Only a few boreholes in the study area exist that have encountered bedrock deposits. The bedrock surface is found at elevations ranging from 613.3 masl (42534) to 447.9 masl (77041) in the study area. The high variability of depth to bedrock can be attributed mainly to preglacial, glacial, and post glacial erosion. In addition, isolated bedrock lows are often indicative of salt dissolution collapse, and subsequent downward faulting of the bedrock surface and overlying deposits.

The Pierre Shale is generally comprised of non-calcareous, grey to dark grey, stiff, high plasticity, over-consolidated silt and clay. This unit should be considered the base of environmental work in the area. No significant sand or aquifer horizons exist within this unit, but concretionary and bentonitic rich beds are common. The bentonitic horizons can be used as structural marker beds for stratigraphic interpretations where identified. The shale is generally blocky and brecciated indicating glacial disturbance of the upper horizons.

4.2.1.2 Preglacial Drift Deposits

4.2.1.2.1 The Empress Group

The Empress Group was first described by Whitaker and Christiansen (1972) as the materials between the bedrock and the oldest (deepest) till. The Empress Group is composed of preglacial and proglacial stratified sediments. The Empress Group includes a wide variety of complexly bedded lithologies that were lain down as fluvial, lacustrine, and colluvial deposits on the bedrock surface prior to and during glaciation.

The Empress Group can be divided into a lower and an upper unit. The lower unit is comprised of valley fill sediments which generally consist of quartzite and chert gravels and finer clastic deposits. This unit is Tertiary in age (preglacial) and is often non-calcareous. The upper unit contains clastic lithologies derived from igneous, metamorphic, and carbonate rocks that were deposited proglacially during the first glacial advance. The upper unit is generally found along the shoulders of the primary Hatfield Valley channel deposits; however, it can also be found within the bedrock valleys and along the bedrock uplands. These deposits are generally calcareous due to high concentrations of carbonate derived lithologies, generally distinguishing them from the lower (often non-calcareous) unit. For this study, the Empress Group has not been differentiated into an upper and lower unit.

The Empress Group is interpreted to exist at three locations: northeast and northwest of the Broadview Project area, and as an erosional remnant at one location within the project area.

4.2.1.3 Quaternary Drift Deposits

The successive advance and retreat of continental glaciers deposited till sequences that characterize the complex overburden stratigraphy throughout the investigation area. The accumulation of sediments from the top of the Upper Cretaceous bedrock surface to the ground surface is collectively referred to as “glacial drift”. The Quaternary glacial drift has been investigated intermittently, and a number of papers have been published on the deposits (e.g. Christiansen 1968a; Christiansen 1968b; Christiansen 1977; Christiansen 1990; Christiansen 1992; Christiansen and Sauer 1994; etc.). The Quaternary deposits represent glacial and postglacial sediments that are formally separated into the Sutherland Group and the Saskatoon Group.

The Sutherland Group and Saskatoon Group are differentiated based on the carbonate content of the tills, the stratigraphic relationship between the till and inner-till deposits, Atterberg limits, pre-consolidation pressures, the presence of oxidized zones, and geophysical signatures.

4.2.1.3.1 The Sutherland Group (Qsu)

The Sutherland Group (Qsu) generally lies between the Empress Group or bedrock and the Saskatoon Group. The Sutherland Group tills are commonly olive in oxidized zones and have a lower electrical resistance, higher natural gamma log signature, and higher clay content than the Saskatoon Group tills. All of the tills of the Sutherland Group are highly over-consolidated (pre-consolidation pressures >2,000 kpa), as they have been consolidated by several glaciations.

Christiansen (1992) separated the Sutherland Group into three formal formations, including (in ascending order):

1. The Mennon Formation (Qm),
2. The Dundurn Formation (Qd), and
3. The Warman Formation (Qw).

Each of the formations of the Sutherland Group represent at least one distinct glacial period. The Dundurn Formation is comprised of at least two separate glaciations (three separate glacial periods may be represented within the Dundurn Formation). It is also thought that the Mennon Formation may represent two distinct glaciations. Separation of the formations of the Sutherland Group generally requires the use of laboratory testing data, in conjunction with visual descriptions, the mapping of intertill (not intratill) deposits, and paleo-oxidized horizons.

The Mennon Formation (Qm)

The Mennon Formation (Qm) is divided informally into three mappable units in the study area. In ascending order, these units are:

1. A lower till unit (Qm-lt) overlying Empress Group or bedrock deposits,
2. An intertill stratified deposit (Qm-s), at the break between the upper and lower till units, and
3. An upper till unit (Qm-ut).

Tills of the Mennon Formation are generally comprised of a grey, unoxidized, weakly calcareous, low to medium plasticity, clayey silt till with varying accumulations of coarser and finer fractions. The Mennon Formation has a low carbonate content compared to the overlying till formations. The Mennon Formation is found over a large portion of the study area, and is interpreted to be encountered at elevations between 615.7 masl (83183) and 491.9 masl (77050), and thicknesses up to 60.7 m (624191-08).

The break between the Mennon Formation and the Dundurn Formation is determined based on the presence of a mappable stratified unit (Qd-ls) and/or a unoxidized-to-oxidized contact, as well as a higher natural gamma log signature.

The Dundurn Formation (Qd)

The Dundurn Formation (Qd) is divided informally into five mappable units in the study area. In ascending order, these units are:

1. A basal till unit (Qd-bt);
2. A lower intertill stratified unit (Qd-ls);
3. A lower till unit (Qd-lt);
4. An intertill stratified deposit (Qd-us) at the break between the upper and lower till units; and
5. An upper till unit (Qd-ut).

Differentiation of these units is based on unoxidized-to-oxidized horizons, mappable stratified deposits, and/or carbonate content. The carbonate content of the Dundurn Formation is higher than that of the Warman or Mennon Formations, but typically lower than that of the Floral Formation. The carbonate content often decreases across the lower unit of the Dundurn Formation (Qd-lt). Differentiation of the Mennon Formation, the Dundurn Formation, and the Warman Formation is difficult without carbonate contents or the presence of intertill stratified deposits.

Tills of the Dundurn Formation are generally comprised of grey, unoxidized, calcareous, silt till with varying accumulations of coarser and finer fractions. The Dundurn Formation is found over most of the study area, and has been interpreted to exist in thicknesses up to 105.4 m (624191-04) in the study area. This formation has been encountered at elevations ranging from 653.9 masl (61694) to 536.4 masl (68845). The upper till unit of the Dundurn Formation is readily identifiable from the overlying Warman Formation based on carbonate content.

The Warman Formation (Qw)

The Warman Formation (Qw) lies between the Dundurn Formation and the Floral Formation, where present. It is divided into two mappable units in the study area. In ascending order, these units are:

1. A stratified intertill unit (Qw-s); and
2. A till unit (Qw-t).

The Warman Formation is differentiated from the overlying and underlying formations based on the presence of mappable stratified deposits (Qf-ls and Qw-s, respectively), a unoxidized to oxidized contact, carbonate contents, geophysical signatures, and Atterberg limits.

The Warman Formation has relatively low carbonate contents, making it readily identifiable from the overlying Saskatoon Group tills and the underlying upper till unit of the Dundurn Formation.

Tills of the Warman Formation are generally comprised of grey, medium to highly plastic, calcareous, clayey silt till. The Warman Formation has been encountered in thicknesses up to 28.4 m (73508), in the study area. The elevation to this unit ranges from 664.9 masl (61694) to 597.3 masl (50670), where encountered in the study area.

4.2.1.3.2 The Saskatoon Group (Qsk)

The Saskatoon Group (Qsk) was first proposed by Christiansen (1968a) as the portion of drift lying between the Sutherland Group and the topographic surface. The Saskatoon Group tills have higher carbonate contents and resistivity signatures, and are generally coarser in lithology as compared to the underlying Sutherland Group tills (i.e. the Sutherland Group tills generally have significantly higher clay content). The higher clay content of the Sutherland Group tills is also reflected by Atterberg limits (when available), with a higher plasticity index relative to Saskatoon Group tills.

The Saskatoon Group is formally separated into three formations, including (in ascending order):

1. The Floral Formation (Qf);
2. The Battleford Formation (Qb); and
3. The Surficial Stratified Deposits (Qssd).

The Floral Formation (Qf)

The Floral Formation (Qf) is the thickest unit belonging to the Saskatoon Group in the Broadview Project area. In the study area, the Floral Formation (Qf) is divided into five units. In ascending order, these units are:

1. A basal till unit (Qf-bt);
2. An intertill stratified deposit (Qf-ls);
3. A lower till unit (Qf-lt);
4. An intertill stratified deposit (Qf-ms); and
5. An upper till unit (Qf-ut).

Delineation of these units is based on unoxidized-to-oxidized horizons and/or mappable stratified deposits, and, to a lesser extent, carbonate contents. Tills of the Floral Formation are predominantly firm to hard, low to high plasticity silt till, with varying accumulations of coarser and finer fractions. The Floral Formation has been encountered at elevations between 695.3 masl (61694) and 662.2 masl (51204) in the study area, and in thicknesses up to 70.0 m (624191-01).

The upper till unit of the Floral Formation is identified by iron and manganese stained fractures and strong oxidization (where present). The firm to hard consistency and fractured nature of this upper till unit make it readily identifiable from the Battleford Formation till, which is generally much softer than the Floral Formation. The Floral Formation tills have a pre-consolidation pressure of 1,800 ± 200 kPa, whereas till of the Battleford Formation has a pre-consolidation pressure of 400-750 kPa (Sauer et al., 1993). The presence of a mappable stratified unit (Qb-s) at the contact can also be used. The contact between the Floral Formation and the overlying Battleford Formation is non-conformable.

The Battleford Formation (Qb)

The Battleford Formation (Qb) was first described by Christiansen (1968b) and is typically composed of soft, massive, oxidized till, and is the youngest till formation of the Saskatoon Group. The Battleford Formation till was deposited during the last glaciation period and has not been overridden by any subsequent glaciers. As a result, it is readily separated from the underlying Floral Formation based on consistency. In the study area, the Battleford Formation has been interpreted to be encountered in thicknesses up to 11.6 m (97307), with an average thickness of 3.9 m.

The Surficial Stratified Deposits (QssD)

The Surficial Stratified Deposits (Qssd) are the top unit of the Saskatoon Group. These postglacial sediments include topsoil, fluvial, lacustrine, and aeolian deposits. The Surficial Stratified Deposits are divided into Haultain and alluvium. Alluvium is found in river valleys, whereas clays, silts, sands, and gravels of the Haultain unit can be found at the ground surface anywhere else.

4.2.2 Hydrogeology

Deposits of sand, gravel, and cobble comprise high hydraulic conductivity units that form the paths of least resistance for groundwater flow and solute transport. These units are called aquifers. Conversely, silt and clay rich (e.g. till) deposits form low hydraulic conductivity units that impede groundwater flow and solute transport. These units are called aquitards. The spatial arrangement of the aquifers and aquitards form the hydrostratigraphy of the site. When combined with the physical characteristics of the hydrostratigraphic units, an overall view of the hydrogeology of the site can be determined.

Bedrock silts, sands, gravels, and preglacial valley fill sediments form major “fresh water” aquifers across Saskatchewan. The preglacial Hatfield Valley is the major bedrock feature in the vicinity of the study area. The Hatfield Valley extends from Alberta (in the Cold Lake area) and across to the southeast corner of Saskatchewan and into Manitoba. The main channel of the Hatfield Valley is located north of the study area.

In addition to the major buried channel aquifers incised into the marine shale, sand and gravel sediments deposited by retreating and/or advancing glaciers are found at breaks between the major till units. These deposits are called intertill stratified deposits. These intertill stratified deposits form broad, laterally extensive aquifers, and/or small channel aquifers, depending on their depositional setting and subsequent erosional history.

The key to determining if an aquifer unit beneath a site has the potential to become a major conduit for contaminant transport, is to determine if the aquifer is an intertill (deposited between glaciations) or an intratill (deposited during glaciation) deposit. Generally, only the intertill sediments deposited during glacial retreat or advance form laterally extensive aquifers. Although intratill deposits are generally abundant, they typically only form isolated, discontinuous pockets, and are therefore not significant with respect to potential solute migration.

Based on available information, at least nine significant aquifer horizons exist in the vicinity of the study area (**Figure 4.6**). Other aquifers may exist, but they have not been interpreted to exist based on available information. In ascending order, the major aquifer horizons are:

1. The Empress Group Aquifer (QTe) – Formed by a complex arrangement of stratified deposits within the Hatfield Valley and along the bedrock uplands;
2. The Mennon Aquifer (Qm-s) – Formed by intertill stratified deposits, typically between the lower and upper till units of the Mennon Formation;
3. The Lower Dundurn Aquifer (Qd-ls) – Formed by intertill stratified deposits, typically between the Mennon Formation and the lower till unit of the Dundurn Formation;
4. The Upper Dundurn Aquifer (Qd-us) – Formed by intertill stratified deposits between the upper and lower till units of the Dundurn Formation;
5. The Warman Aquifer (Qw-s) – Formed by intertill stratified deposits between the upper till unit of the Dundurn Formation and the till unit of the Warman Formation;
6. The Lower Floral Aquifer (Qf-ls) – Formed by a complex network of till and intertill stratified deposits typically located at the Saskatoon Group/Sutherland Group contact;
7. Upper Floral Aquifer (Qf-ms) – Formed by a complex network of till and intertill stratified deposits usually situated between the upper and lower till units of the Floral Formation;
8. The Battleford Aquifer (Qb-s) – Formed by intertill stratified deposits between the Floral Formation and the Battleford Formation till; and
9. The Surficial Stratified Deposits (Qssd) – Formed by postglacial deposition of alluvial, fluvial, lacustrine, and aeolian deposits.

4.2.2.1 The Empress Group Aquifer (QTe)

Sands and gravels of the Empress Group are interpreted to exist at two locations, northwest and northeast of the Broadview Project area. These deposits may be connected to the Hatfield Valley Aquifer System. The Hatfield Valley Aquifer System crosses Saskatchewan in a northwest to southeast direction, and is one of the largest “fresh water” aquifer systems in the province. The Hatfield Valley Aquifer System is formed by the main Hatfield Valley Aquifer and other aquifer horizons that are laterally connected to the main channel. The Hatfield Valley Aquifer is up to 30 km wide in places; with a thickness that often exceeds 100 m along the thalweg of the channel. The main channel of the Hatfield Valley Aquifer is located north of the study area.

Northwest of the project area, the Empress Group was interpreted to exist at an elevation of 542.4 masl with a thickness of 59.1 m (77049). This aquifer was also interpreted northeast of the project area at 461.89 masl (77041) and a thickness of 14.0 m. Within the Broadview Project area, the Empress Group was interpreted to be encountered at 544.5 masl and a thickness of 2.1 m at one testhole (624191-07); this appears to be an erosional remnant with no apparent connectivity to the Empress Group aquifers north, west and east.

4.2.2.2 The Sutherland Group Aquifers

A complex arrangement of till and intertill deposits constitute the sediments of the Sutherland Group within the study area. Based on available data, four mappable aquifer horizons exist within the Sutherland Group; in ascending order, these aquifers are: 1) the Mennon Aquifer, 2) the Lower Dundurn Aquifer, 3) the Upper Dundurn Aquifer, and 4) the Warman Aquifer.

4.2.2.2.1 The Mennon Aquifer (Qm-s)

A complex arrangement of gravel, sand, silt, and clay often overlying the lower till unit of The Mennon Formation (where it is not eroded), or the bedrock surface generally comprises the Mennon Aquifer in the study area. This informally named aquifer is interpreted to be discontinuous and found in isolated patches within the study area. The Mennon Aquifer is interpreted to be encountered in thicknesses between 2.1 m (54019) and 22.0 m (94608) and at elevations between 578.3 masl (54019) and 538.3 masl (67180).

4.2.2.2.2 The Lower Dundurn Aquifer (Qd-ls)

The Lower Dundurn Aquifer is generally comprised of a complex arrangement of gravel, sand, silt, and clay, overlying either the basal Dundurn Formation till, the upper Mennon till, or the bedrock surface within the study area. This unit is interpreted to be largely continuous in the study area. The Lower Dundurn Aquifer is interpreted to be encountered in thicknesses up to 30.0 m (1 Centre), and at elevations between 623.0 masl (94593) and 497.24 masl (77041).

4.2.2.2.3 The Upper Dundurn Aquifer (Qd-us)

The Upper Dundurn Aquifer is comprised of a complex arrangement of oxidized and unoxidized gravels, sands, silts, and clays. The Upper Dundurn Aquifer is interpreted to be discontinuous, but has been interpreted to be present over large portions of the study area. It is interpreted to be encountered in thicknesses up to 26.8 m (77046) and at elevations between 643.1 masl (83183) and 517.4 masl (77041) in the study area.

4.2.2.2.4 Warman Aquifer (Qw-s)

The Warman Aquifer is generally comprised of a complex arrangement of gravels, sands, silts, and clays at the contact between the Warman Formation till and the underlying Dundurn Formation. The Warman Aquifer is interpreted to be encountered in thicknesses between 0.9 m (50669) and 10.4 m (97758) in the study area. The elevation of the top of the aquifer varies between 658.2 masl (61694) and 593.7 masl (50670). The Warman Aquifer is interpreted to be discontinuous and occurring as isolated pockets across the study area.

4.2.2.3 The Saskatoon Group Aquifers

A complex arrangement of till and intertill deposits comprise the sediments of the Saskatoon Group within the study area. Based on available data, four mappable aquifer horizons exist within the Saskatoon Group. In ascending order, these aquifers are: 1) the Lower Floral Aquifer, 2) the Upper Floral Aquifer, 3) the Battleford Aquifer, and 4) the Surficial Stratified Deposits. While the aquifers of the Saskatoon Group are discontinuous they are often laterally extensive across large areas of the study area.

4.2.2.3.1 The Lower Floral Aquifer (Qf-ls)

Interbedded stratified deposits often occur at the contact between the Sutherland Group and the Saskatoon Group in the study area. This unit has been informally called the Lower Floral Aquifer, and forms broad laterally extensive aquifer units across much of central Saskatchewan. The Lower Floral Aquifer has been interpreted to exist discontinuously across the study area, and is used as a water source by a number of groundwater users in the region. This unit was interpreted to be present at elevations ranging between 664.1 masl (73551) and 542.1 masl (57396) and at thicknesses ranging from 0.3 m (86780) to 21.6 m (97308).

4.2.2.3.2 The Upper Floral Aquifer (Qf-ms)

Interbedded stratified deposits occur at the contact between the upper and lower till units of the Floral Formation within the study area. This unit has been informally called the Upper Floral Aquifer (i.e. the Riddell Member of the Floral Formation). The Upper Floral Aquifer is commonly complexly stratified, and can include significant till horizons due to interstadial glacial retreat and advance. Where present in the study area, the elevations and thickness of the Upper Floral Aquifer ranges from 681.9 masl (82892) to 579.9 masl (54993) and 0.3 m (50669) to 16.5 m (88481), respectively. It can form broad laterally extensive aquifer units across central Saskatchewan, and is interpreted to be discontinous in the area.

4.2.2.3.3 The Battleford Aquifer (Qb-s)

Interbedded stratified deposits of gravel, sand, silt, and clay occur within the study area at the contact between the Floral Formation and the Battleford Formation. This unit has been informally called the Battleford Aquifer, and occurs in isolated pockets across the study area. Based on available information, this unit is interpreted to have an average thickness of 2.7 m, and is encountered at elevations ranging from 689.6 masl (97758) to 599.1 masl (57396).

4.2.2.3.4 The Surficial “Aquifer” (Qssd)

Mappable accumulations of stratified gravel, sand, silt, and clay exist at the surface within the study area. These sediments are formally called the Surficial Stratified Deposits. This aquifer has been encountered in thicknesses up to 6.1 m (85411) but it is generally absent in the project area. It is noted that thin accumulations of the Surficial Stratified Deposits could occur in the study area.

4.2.2.4 Aquitards

The silt and clay rich till of the Sutherland Group and the Saskatoon Group form the major aquitards for the area, and will be the primary barriers to subsurface contamination at the site. Areas with thick (>20 m) sequences of tills have been encountered before the first major aquifer unit. CGFPC will attempt to site the main surface facility in a favourable place with regards to the hydrostratigraphy based on their ongoing studies.

4.3 Terrestrial Environment

A baseline description of the terrestrial environment in the region was compiled using existing data sources. The regional study area for the desktop terrestrial environment description covers the extent of KP 437.

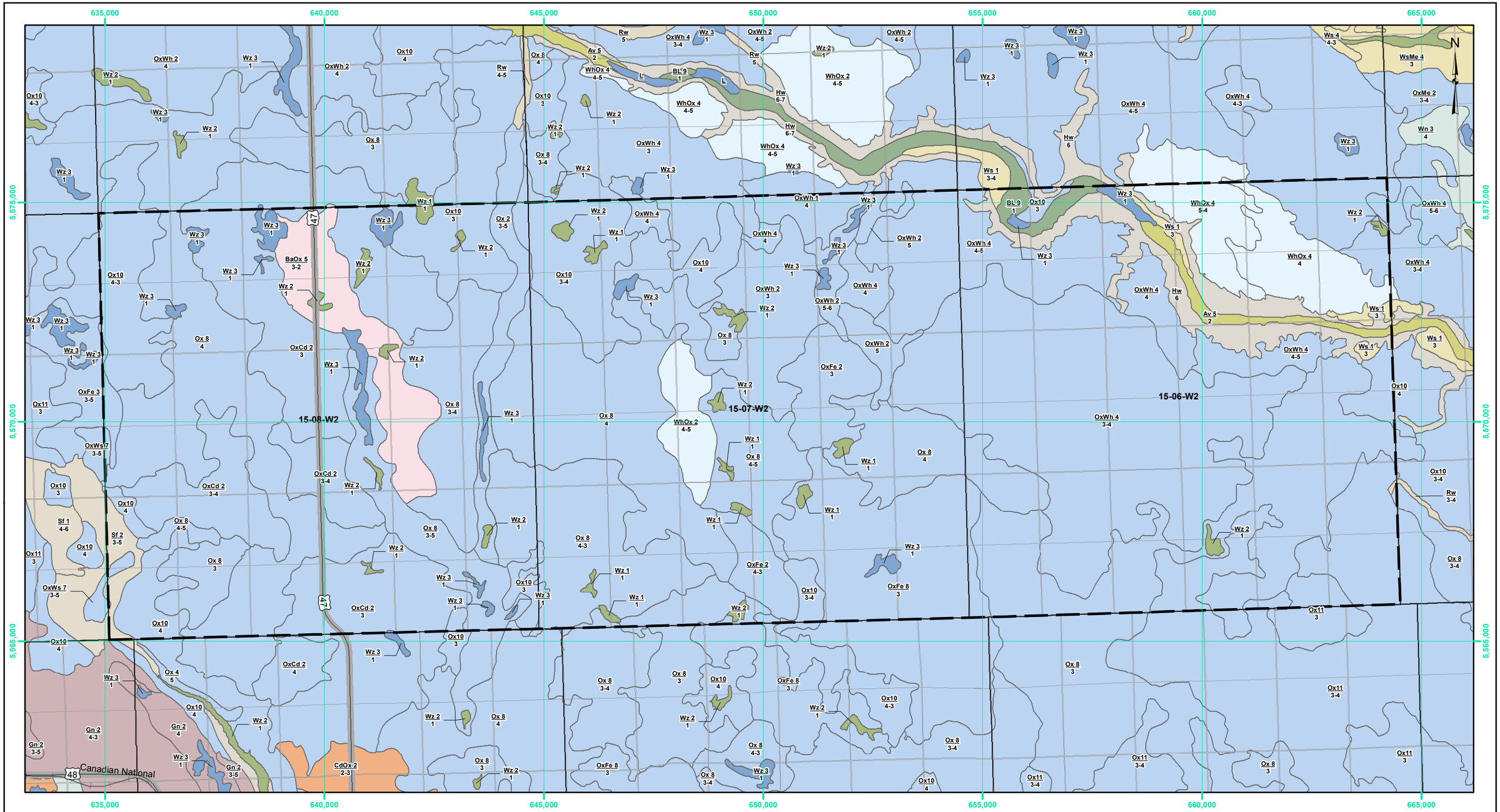
Land use within the KP terrestrial regional study area is primarily agricultural with cropland and pastureland occupying the majority of the area. The land is highly modified and minimal native Saskatchewan landscape still exists in the area, other than within some uncultivated areas near water bodies and crop edges.

4.3.1 Terrain and Soils

The terrestrial regional study area is located entirely within the Kipling Plain Landscape Area in the Aspen Parkland Ecoregion of the Prairie Ecozone (Acton et al. 1998). Landforms within the Kipling Plain Landscape Area are predominantly influenced by glacial activity, with surface deposits of glacial till shaping the local topography. Elevations vary from approximately 600 m to 670 m, with some areas exceeding 700 m.

Surface deposits at upland sites within the regional study area contain nearly equal amounts of sand, silt, and clay, resulting in a loamy texture (Saskatchewan Soil Survey 1987 and 1985). These loamy morainal deposits are distributed unevenly, resulting in a hummocky landscape with irregular patterns of short slopes giving rise to emergent knolls and rounded depressional zones or “kettles”. Local runoff is shed from upper slopes and collects in depressional zones, which often lack external surface drainage. This results in the formation of numerous small, interconnected wetlands with varying degrees of water permanence. Wetlands account for approximately 5% to 40% of land cover in the regional study area, although the distribution of wetlands is not uniform throughout. Slope grades within the area range from gentle to strong (2% to 15% incline), but are generally with 2% to 10% incline for the majority of the regional study area. Some nearly level areas occurring in some depressions and wetlands.

The regional study area is within the Black Soil Zone of Saskatchewan and the soils are Chernozemic, having formed under grassland vegetation (Saskatchewan Soil Survey 1985 and 1987). Upland sites within the regional study area are mainly comprised of soils in the Oxbow Association, which occurs as both a singular soil association and as the dominant component of several mixed associations (such as Oxbow-Whitewood, Oxbow-Cudworth, Oxbow-Whitesand, and Oxbow-Fremantle associations, **Figure 4.7**). Other soil associations are present, but occupying a smaller area on the landscape (**Figure 4.7**). The agricultural capabilities of these soils are moderately limited by the presence of steep and irregular slopes, as well as locally dry, eroded and infertile knolls. The majority of soils in the regional study area are Class 2 or Class 3 soils, indicating moderate to moderately severe restrictions on crop type without the application of conservation practices (**Figure 4.8**). There also exist some soils with no crop restrictions (Class 1), as well as soils that are generally unsuitable for crop development (Class 6 and 7 soils). Wetland soils can be found in numerous undrained depressions scattered throughout the regional study area. These soils have severe limitations due to poor drainage, seepage from local runoff, and elevated salinity around wetland margins. The effect of salinity is fairly minor in the area, ranging from 0% to 3% of the regional study area, with an average reduction in crop yields in affected areas of less than 2%. A complete listing of all soil associations and soil capability classes within the regional study area are presented in Attachment 3 (Tables 3-A and 3-B).



LEGEND

- RAILWAY
- HIGHWAY
- KP 437

SOIL CLASSIFICATION

- Av - ALLUVIUM
- BaOx - BALCARRES-OXBOW
- Bl - BAGWA LAKE
- CdOx - CUDWORTH-OXBOW
- Gn - GLENAVON
- Hw - HILLWASH
- L - WATER
- Ox - OXBOW
- OxCd - OXBOW-CUDWORTH
- OxFe - OXBOW-FREMANTLE
- OxMe - OXBOW-MEOTA
- OxWh - OXBOW-WHITEWOOD
- OxWs - OXBOW-WHITESAND
- Rw - RUNWAY
- Sf - SWIFT CREEK
- Wh - WHITEWOOD
- WhOx - WHITEWOOD-OXBOW
- Wn - WINDTHORST
- Ws - WHITESAND
- WsMe - WHITESAND-MEOTA
- Wz - WETLAND

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, SASKADMIN2013, SASKGRID2013.
3. CADASTRAL BOUNDARIES ARE FOR INFORMATIONAL PURPOSES ONLY AND SHOULD NOT BE CONSIDERED SUITABLE FOR LEGAL, ENGINEERING, OR SURVEYING PURPOSES.
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

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	APP

0 550 1,100 2,200 3,300 4,400 Metres

SCALE: 1:85,000

SNC·LAVALIN

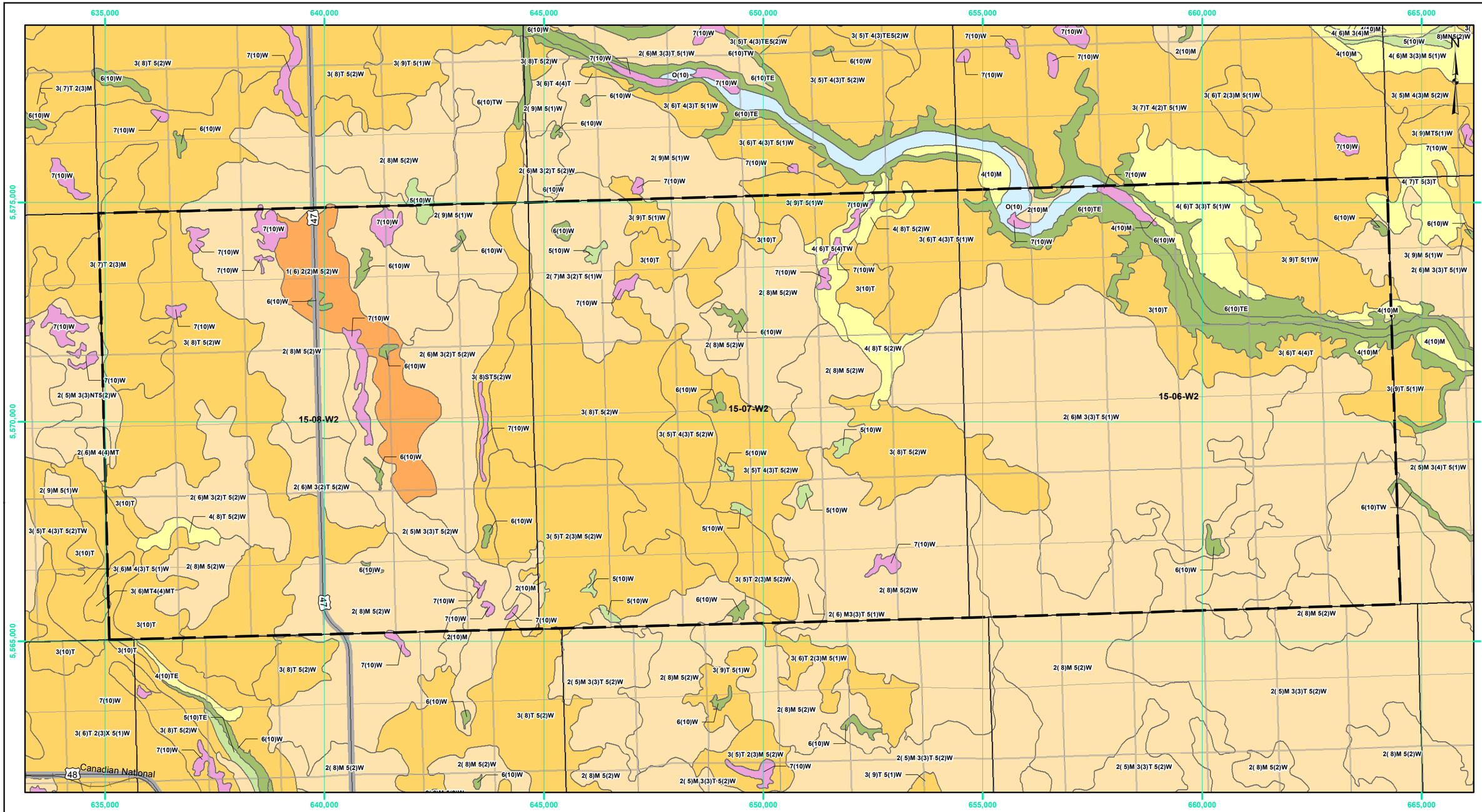
CLIENT
CANADA GOLDEN FORTUNE POTASH CORPORATION

PROJECT LOCATION
BROADVIEW PROJECT

TITLE
SOILS CLASSIFICATION WITHIN KP 437

DES BY	HY	DRN BY	KVG	CHK BY		DATE	2017 05 02		
SIZE	11x17	FIG No.	**4.7**	DWG No.	631260-E-08-E-003			REV	0

Path: \\sli16531\Projects\CGFPC\624190 EIA_KP437\4.0 Execution\4.5 GIS and Drawings\GIS\DRAWINGS\631260-E-08-E-004(Soil Classification Regional).mxd



LEGEND

- RAILWAY
- HIGHWAY
- KP 437

SOIL CAPABILITY FOR AGRICULTURE

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 0

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, SASKADMIN2013, SASKGRID2013.
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.

REFERENCE DRAWINGS

DWG. No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	APP

0 550 1,100 2,200 3,300 4,400 Metres

SCALE: 1:85,000

SNC·LAVALIN

CLIENT
CANADA GOLDEN FORTUNE POTASH CORPORATION

PROJECT LOCATION
BROADVIEW PROJECT

TITLE
SOILS CAPABILITY CLASSES WITHIN KP 437

DES BY	HY	DRN BY	KVG	CHK BY		DATE	2017 05 02
SIZE	11x17	FIG No.	**4.8**	DWG No.	631260-E-08-E-003	REV	0

Path: \\sli1653\Projects\CGFPC\624190 EIA_KP437\4.0 Execution\4.5 GIS and Drawings\GIS\DRAWINGS\631260-E-08-E-003(Soil Capability Regional).mxd

4.3.2 Vegetation and Wetlands

The regional study area is located within the Kipling Plain Landscape Area in the Aspen Parkland Ecoregion of the Prairie Ecozone (Acton et al. 1998). Land use within the ecoregion is largely agricultural, with cultivated cropland comprising approximately 80% of the landscape. However, remnant patches of aspen parkland are scattered throughout the region. Hummocky landscapes support grassland communities on upper slopes, aspen groves in lower areas, and wetlands in undrained depressions.

Woodlands: Trembling aspen is the dominant tree species in woodlands throughout the region, with balsam poplar becoming prominent in low, saturated zones (Acton et al. 1998). Manitoba maple (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), eastern cottonwood (*Populus deltoids*), and bur oak (*Quercus macrocarpa*) are also present, but restricted to riparian woods along major watercourses. Woodlands in the southern extent of the ecoregion typically have a shrub stratum of Saskatoon (*Amelanchier alnifolia*), beaked hazelnut (*Corylus cornuta*), red osier dogwood, chokecherry (*Prunus virginiana*), and rose (*Rosa* spp.). Understories contain an assemblage of herbs and grasses such as sarsaparilla (*Aralia nudicaulis*), wild lily-of-the-valley (*Maianthemum canadense*), smooth wild strawberry (*Fragaria virginiana*), Canada wild rye (*Elymus canadensis*), as well as fowl and Kentucky bluegrasses.

Grasslands: Upland areas within the eastern part of the ecoregion support diverse native grassland communities characterized by a diverse composition of moist mixed grass prairie species (Acton et al. 1998). Climax grasslands are typically dominated by rough fescue (*Festuca hallii*), porcupine grass (*Hesperostipa spartea*), blue grama grass (*Bouteloua gracilis*), wheatgrasses (*Elymus* spp.), and little bluestem (*Schizachyrium scoparium*) (Tannas 2003; Thorpe 2014). Big bluestem (*Andropogon gerardii*) and Kentucky bluegrass become more prevalent at lower elevations and in depressional zones where soils retain moisture more readily. Associated herb species include prairie crocus (*Anemone patens*), small-leaved pussytoes (*Antennaria microphylla*), low goldenrod (*Solidago missouriensis*), white prairie aster (*Symphyotrichum falcatum*), and golden bean (*Thermopsis rhombifolia*). Short shrubs like wolf willow (*Elaeagnus commutata*) and western snowberry become increasingly prominent in locations where the fire regime has been altered through suppression (Thorpe 2014). Although the majority of grassland landscapes within the Prairie Ecozone have been converted for agricultural use, fragments of native prairie communities remain on valley and coulee slopes that are too steep for cultivation and too dry for aspen encroachment.

Wetlands: Glacial kettles occur frequently across the landscape as a result of uneven glacial till depositions. These undrained depressions support distinctive wetland vegetational zones that vary in species composition in accordance with soil saturation and permeability (Stewart and Kantrud 1971). Common species found within the distinctive wetland vegetational zones in the Aspen Parkland Ecoregion are presented in **Table 4.4**. Vegetational zones may occupy the central area of a depression or they may form a peripheral band around a deeper zone (Stewart and Kantrud 1971). Increased levels of soluble salts in surface water result in a shift in vegetation composition, favoring salt tolerant species such as salt grass, Nuttall's alkali grass, prairie bulrush, and seaside arrowgrass (*Triglochin maritima*). In extremely saline conditions, annual halophytes like red samphire (*Salicornia rubra*) and sea-blite provide some groundcover (Acton et al. 1998).

Table 4.4 Wetland vegetational zones

Wetland Vegetational Zone	Surface Water Permanence	Scientific Name	Common Name
Low Prairie Zone (not included in wetland classifications)	Retains surface water for a few weeks in early spring before soil pore ice has melted	*Poa pratensis*	Kentucky bluegrass
		Symphoricarpos occidentalis	western snowberry
		Anemone canadensis	Canada anemone
		Solidago canadensis	Canada goldenrod
Wet Meadow	Retains surface water in early spring and during heavy rainfall	*Poa palustris*	fowl bluegrass
		Carex sartwellii	Sartwell's sedge
		Carex pellita	woolly sedge
		Juncus balticus	Baltic rush
Shallow Marsh	Retains surface water through spring and early summer	*Alisma triviale*	broad-leaved water plantain
		Sparganium angustifolium	narrow-leaved bur-reed
		Glyceria grandis	tall manna grass
		Persicaria amphibia	water smartweed
Deep Marsh	Retains surface water for most or all of the year, except in periods of drought	*Typha latifolia*	broadleaf cattail
		Schoenoplectus tabernaemontani	soft-stem bulrush
		Potamogeton richardsonii	Richardson's pondweed
		Utricularia vulgaris	common bladderwort
Permanent Open Water	Retains surface water year-round, even during periods of drought, and contains only submergent vegetation (e.g., large ponds and lakes)	*Stuckenia vaginata*	sheathed pondweed
		Ruppia cirrhosa	western widgeon-grass

Source: AESRD 2015; Stewart and Kantrud 1971.

4.3.2.1 Protected Species

There are 66 provincially listed plant species endemic to the ecoregion, 14 of which had recorded historical occurrences within the Kipling Plain Landscape Area. Seventeen provincially listed species have a moderate potential for occurrence within the regional study area, and two have a high potential for occurrence based on habitat conditions within the regional study area, known community associations, regional topography, and soil properties (**Table 4.5**). No federally listed plant species are expected to occur within the regional study area. All listed plants with the potential to occur are listed in Attachment 4 (Table 4-A). Explanations and descriptions of the listed species rankings used to describe these species are presented in Attachment 5.

Table 4.5 Provincially listed plant species with a moderate to high potential for occurrence within the regional study area

Scientific Name	Common Name	SKCDC Ranking	Habitat Association	Potential For Occurrence
Achnatherum richardsonii	Richardson's needlegrass	S3	Grassy upland fescue prairie bordering woods or shrublands	**Moderate** - historical documentation in landscape area, suitable habitat likely to occur
Botrychium minganense	common moonwort	S1	Mesic to wet riparian woods and wet meadows	**Moderate** - historical documentation in landscape area, suitable habitat likely to occur
Bouteloua curtipendula var. curtipendula	sideoats grama	S3	Eroded or stony, well-drained prairie slopes	**Moderate** - suitable habitat likely to occur
Carex alopecoidea	foxtail sedge	S3	Riparian woods, in particular shaded deciduous woodlands, and sedge meadows	**Moderate** - historical documentation in landscape area, suitable habitat likely to occur
Carex assiniboinensi	Assiniboine sedge	S3	Deciduous woods and shrub thickets	**Moderate** - historical documentation in landscape area, suitable habitat likely to occur
Carex granularis	granular sedge	S3	Shallow marsh zones of slightly brackish and moderately brackish wetlands	**Moderate** - historical documentation in Pipestone Creek valley, suitable habitat may be present
Carex hystericina	porcupine sedge	S3	Wet woods, clearings, sloughs and shores	**Moderate** - suitable habitat likely to occur
Castilleja sessiliflora	downy paintbrush	S3	Dry, sandy prairie slopes	**Moderate** - historical documentation in landscape area, suitable habitat likely to occur

Scientific Name	Common Name	SKCDC Ranking	Habitat Association	Potential For Occurrence
Cypripedium parviflorum var. makasin	small yellow lady's-slipper	S3	Moist semi-open woods, wet meadows, and roadsides	**High** – multiple recorded occurrences in the region, suitable habitat likely to occur
Dichanthelium leibergii	Leiberg's panicgrass	S1	Relic tall grass prairie patches and moist grasslands	**Moderate** - historical documentation in landscape area, suitable habitat likely to occur
Elymus diversiglumis	various-glumed wild rye	S3	Moist riparian deciduous woods and thickets	**Moderate** - suitable habitat likely to occur
Erigeron strigosus var. strigosus	whitetop fleabane	S3	Grassy open prairie, shores, and woodland clearings	**Moderate** - suitable habitat likely to occur
Onosmodium molle ssp. occidentale	western false gromwell	S2	Margins of riparian woods and shrublands	**Moderate** - suitable habitat likely to occur
Panicum virgatum var. virgatum	switchgrass	S2	Mesic-moist meadows, low grasslands	**Moderate** - historical documentation in landscape area, suitable habitat likely to occur
Sisyrinchium mucronatum	mucronate blue-eyed grass	S3	Moist or seasonally moist grassland	**Moderate** - suitable habitat likely to occur
Solidago ptarmicoides	upland white goldenrod	S3	Dry-mesic open prairie with sandy, calcareous soil	**Moderate** - suitable habitat likely to occur
Sporobolus heterolepis	prairie dropseed	S3	Open prairie, pastures, open woods and roadsides	**Moderate** - suitable habitat likely to occur

Scientific Name	Common Name	SKCDC Ranking	Habitat Association	Potential For Occurrence
Streptopus amplexifolius var. amplexifolius	twisted stalk	S3	Moist riparian woods, aspen groves, wooded streambanks	**Moderate** - suitable habitat likely to occur
Viola pedatifida	crowfoot violet	S3	Moist prairie and clearings	**High** – multiple recorded occurrences in the region, suitable habitat likely to occur

Source: Flora of North America Editorial Committee 1993; Government of Saskatchewan 2016b; Harms and Leighton 2011a, 2011b, 2011c, and 2014; Looman and Best 1987; Moss 1994; SKCDC 2017a; Saskatchewan Soil Survey 1985 and 1987; Tannas 2003; USFS 2016; W.P. Fraser Herbarium 2006.

4.3.3 Wildlife

A diversity of wildlife is supported by the Aspen Parkland Ecoregion and the Kipling Plain Landscape Area. Fifty-five mammal species have been confirmed, 320 migratory and resident bird species, 11 reptile and amphibian species, and hundreds of invertebrate species (Acton et al. 1998, **Table 4.6** to **Table 4.8**).

Table 4.6 Typical mammals occurring within the distinctive habitats of the Kipling Plain Landscape Area

Habitat	Common Name	Scientific Name	Comments
Open Grassland	coyote	*Canis latrans*	Mammals will also utilize aspen stands for coverage and foraging
	porcupine	*Erethizon dorsatum*	
	white-tailed jackrabbit	*Lepus townsendii*	
	striped skunk	*Mephitis mephitis*	
	white-tailed deer	*Odocoileus virginianus*	
	deer mouse	*Peromyscus maniculatus*	
	Richardson's ground squirrel	*Spermophilus richardsonii*	
Fragmented Deciduous Forest	red fox	*Vulpes vulpes*	Supports less common mammals
	moose	*Alces alces*	
	cougar	*Puma concolor*	
	black bear	*Ursus americanus*	
Wetland	North American river otter	*Lontra canadensis*	May be present in other water features
	muskrat	*Ondatra zibethicus*	

Source: Acton et al. 1998; SKCDC 2017b

Table 4.7 Common birds found in the distinctive habitats in the Kipling Plain Landscape Area

Habitat	Common Name	Scientific Name	Comments
Open Grassland	northern harrier	*Circus cyaneus*	
	American crow	*Corvus brachyrhynchos*	
	horned lark	*Eremophila alpestris*	
	clay-colored sparrow	*Spizella palia*	
	tree swallow	*Tachycineta bicolor*	
	sharp-tailed grouse	*Tympanuchus phasianellus*	
	ruffed grouse	*Bonasa umbellus*	
Aspen Stands and Deciduous Forests	great horned owl	*Bubo virginianus*	
	red tailed hawk	*Buteo jamaicensis*	
	common raven	*Corvus corax*	
	least flycatcher	*Empidonax minimus*	
	hairy woodpecker	*Picoides villosus*	
	yellow warbler	*Setophaga petechia*	
Wetlands and Lentic Water Features	northern shoveler	*Anas clypeata*	Temporary, semi-permanent, and permanent wetlands are utilized by water birds as breeding areas during the summer and staging areas during the fall
	blue-winged teal	*Anas discors*	
	killdeer	*Charadrius vociferus*	
	black tern	*Chlidonias niger*	
	Wilson's snipe	*Gallinago delicata*	
	eared grebe	*Podiceps nigricollis*	
	sora	*Porzana carolina*	
	American avocet	*Recurvirostra americana*	

Acton et al. 1998; Cornell 2013; SKCDC 2017b

Table 4.8 Common reptiles, amphibians, and invertebrates recorded within the Kipling Plain Landscape Area

Classification	Common Name	Scientific Name	Comments
Reptiles	western painted turtle	*Chrysemys picta bellii*	These species may be observed in a combination of aquatic, riparian, and/or grasslands habitats
	western plains garter snake	*Thamnophis radix haydenii*	
Amphibians	Canadian toad	*Bufo hemiophrys*	Known to utilize select aquatic, riparian, and/or grassland habitats
	wood frog	*Rana sylvatica*	
Invertebrates	bee	Anthopila spp.	Inhabit a variety of habitats
	beetle	Coleoptera spp.	
	butterfly	Rhopalocera spp.	
	moth	Heterocera spp.	
	spider	Araneae spp.	
	snail	Gastropoda spp.	

Source: Acton et al. 1998; SKCDC 2017b and 2017c

4.3.3.1 Protected Species

Up to 26 provincially and/or federally listed wildlife species have been confirmed within the Kipling Plain Landscape Area. Based on known habitat conditions within KP 437, **Table 4.9** lists species with moderate or high potential for occurrence within KP 437. A query of the HABISask database lists two species that have historically occurred within the regional study area; The bobolink and the burrowing owl (Government of Saskatchewan 2016b). All listed species with the potential to occur are listed in Attachment 4 (Table 4-B).

Table 4.9 Provincially and/or federally listed wildlife species in the Aspen Parkland Ecoregion and their likelihood of occurrence based on known habitat conditions within KP 437

Common Name	Scientific Name
Moderate Potential for Occurrence	
western grebe	*Aechmophorus occidentalis*
western tiger salamander	*Ambystoma mavortium*
Baird's sparrow	*Ammodramus bairdii*
short-eared owl	*Asio flammeus*
burrowing owl	*Athene cunicularia*
turkey vulture	*Cathartes aura*
common nighthawk	*Chordeiles minor*
yellow rail	*Coturnicops noveboracensis*
monarch butterfly	*Danaus plexippus*
barn swallow	*Hirundo rustica*
loggerhead shrike	*Lanius ludovicianus*
red-headed woodpecker	*Melanerpes erythrocephalus*
horned grebe	*Podiceps auritus*
red-bellied snake	*Storeria occipitomaculata*
bank swallow	*Riparia riparia*
olive-sided flycatcher	*Contopus cooperi*
High Potential for Occurrence	
bobolink	*Dolichonyx oryzivorus*
American badger	*Taxidea taxus taxus*
northern leopard frog	*Lithobates pipiens*

Source: COSEWIC 2004a, 2004b, 2006, 2007a, 2007b, 2008, 2009a, 2009b, 2010b, 2012a, 2012b, 2013, and 2014; SKCDC 2017b

4.4 Aquatic Environment

4.4.1 Hydrologic Setting

A desktop assessment of the regional surface drainage was completed using topographic and surface water data from various sources including the Water Survey of Canada (WSC 2016). A hydrologic regional study area was delineated over an approximately 756 km^2 area (**Figure 4.9**) to cover KP 437 and the area of potential hydrological influence associated with the proposed Broadview Project.

The regional study area is located in the semi-arid region of the Canadian Prairies along the drainage divide of three drainage basins: Lower Qu'Appelle River Basin, Upper Souris River Basin, and Lower Souris River Basin. The majority of the regional study area is located within the Lower Souris River drainage, and the dominant surface water features include Pipestone Creek, Marston Lake, Moose Mountain Creek, and several intermittent wetlands.

Pipestone Creek flows southeast through the northeast corner of the KP 437 and eventually drains into Oak Lake southwest of Brandon, Manitoba. Marston Lake is located approximately 5 km north of KP 437 and drains into the Ekapo Creek which eventually drains into the Qu'Appelle River. The Qu'Appelle River is located approximately 25 km north of Grenfell, Saskatchewan. Moose Mountain Creek is located along the southwest corner of the KP437 area and drains south into the Souris River.

The topography of the regional study area is typical 'knob and kettle' dry grassland, with poorly defined drainage characterized by small potholes and sloughs that break up the drainage pattern. . The terrain slope classes within and around the study area range from gently sloping (2% to 5%) to strongly sloping (10% to 15%) with small nearly level wetland areas (0% to 0.5%), as described by Saskatchewan Soil Survey (1985 and 1987).

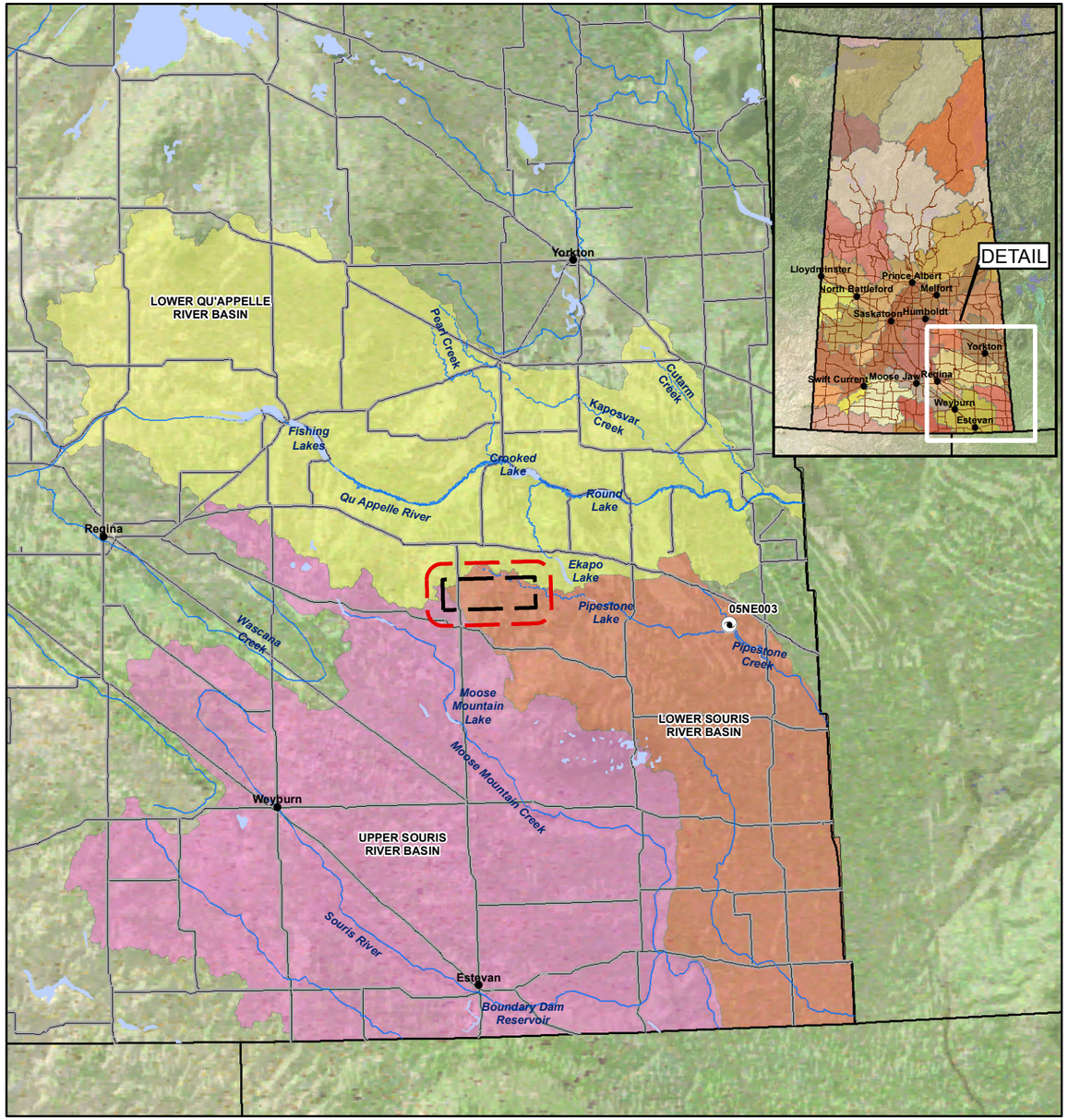
The prairie surface water supply for majority of the regional study area varies seasonally. Most precipitation is stored in the form of soil moisture, and is eventually removed in the form of evapotranspiration. Typical annual evaporation exceeds annual precipitation significantly. During the fall and winter approximately between November and March, water is stored in the form of snow and ice (lake and ground) which prevents runoff from occurring in the drainage basins. Although winter has the lowest levels of precipitation, spring runoff is typically generated by the storage of up to five months of precipitation in the snowpack, which is released in a brief melt period. Most of the natural runoff occurs between March and May in the regional study area and its surroundings. Occasional summer and fall rains provide sufficient moisture to produce brief periods of runoff events.

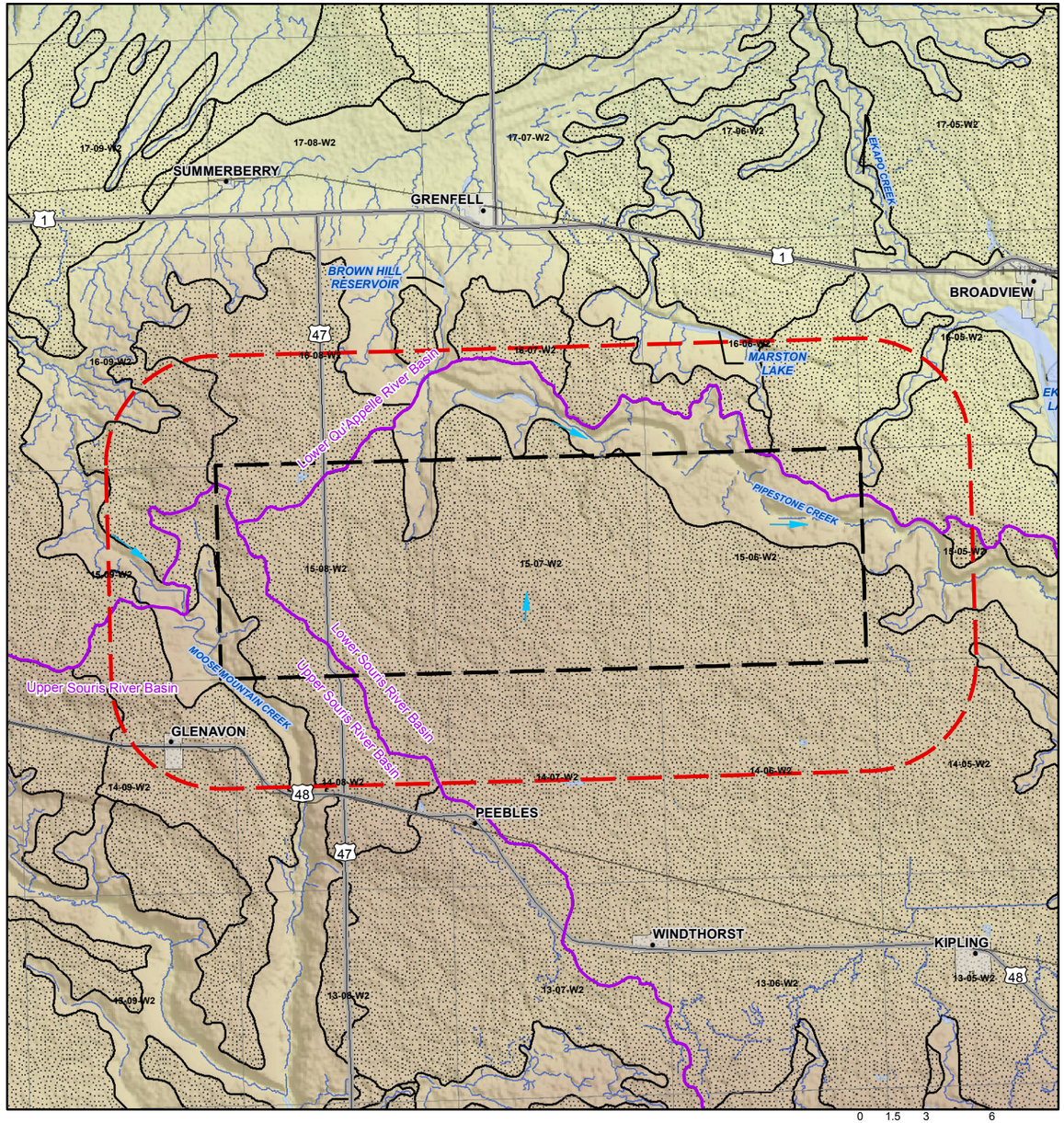
Due to the numerous wetlands which collect significant amounts of the surface runoff in the headwaters region and high evaporation demands, the normal runoff is significantly less than the normal annual precipitation. In drought years, the runoff can diminish to a small fraction of the normal value, and in wet years it can greatly exceed the normal.

The dominant surface water flow direction within KP 437 is toward the north and northwest towards Pipestone Creek. The creek experiences relatively high flow events during spring freshet and high intensity rainfalls (summer and fall) with relatively low flows during remainder of the year.

A considerable portion of the land within the KP 437 acts like a local closed basin and does not contribute to drainage into the major creek/river systems in the prairies under normal runoff events. The remaining portion of the area is located in close proximity to the watercourses and frequently contributes runoff to nearby creeks/rivers due to clayey soils and having relatively less number of wetlands.

A summary of the flow characteristics of Pipestone Creek is presented in **Table 4.10** and **Figure 4.10**. Typical peak runoff events occur during early spring due to the melting of the snow accumulated over the winter period, and early summer caused by high intensity rainfall events.





LEGEND

- HYDROMETRIC STATION
- FLOW DIRECTION
- RAILWAY
- HIGHWAY
- KP 437
- REGIONAL STUDY AREA
- PROVINCIAL DRAINAGE BASIN
- URBAN MUNICIPALITY
- MAJOR WATERBODY
- NON-CONTRIBUTING DRAINAGE AREA

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. TOPOGRAPHIC FEATURES OBTAINED FROM CANVEC V12.0 DATASET, NATURAL RESOURCES CANADA EARTH AND SCIENCES SECTOR CENTRE FOR TOPOGRAPHIC INFORMATION, 2013-09-30.
3. HIGHWAYS AND ROADS OBTAINED FROM THE NATIONAL ROAD NETWORK SASKATCHEWAN EDITION 6.0 DATASET, 2012-09-28.
4. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.
5. PROVINCIAL DRAINAGE BASINS OBTAINED FROM THE WATER SECURITY AGENCY OF SASKATCHEWAN.
6. DRAINAGE BASINS EXTEND BEYOND THE LIMITS SHOWN.
7. HYDROMETRIC STATIONS OBTAINED FROM THE WATER SURVEY OF CANADA.
8. CLIMATE STATION OBTAINED FROM ENVIRONMENT CANADA.
9. NON-CONTRIBUTING DRAINAGE AREAS OBTAINED FROM THE PFRA WATERSHED PROJECT VERSION 8 - 2008.03.31.
10. DEM SOURCE: NASA SHUTTLE RADAR TOPOGRAPHY MISSION (2000).

REFERENCE DRAWINGS

DWG. No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	APP

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CANADA GOLDEN FORTUNE POTASH CORPORATION

PROJECT LOCATION
BROADVIEW PROECT

TITLE
REGIONAL HYDROLOGICAL SETTING

DES BY	LB	DRN BY	KVG	CHK BY		DATE	2017 05 04
SIZE	11x17	FIG No.	**4.9**	DWG No.	631260-W-04-E-006	REV	0

Path: \\SLI16531\projects\CGFPC\624190 EIA_KP437\4.0 Execution\4.5 GIS and Drawings\GIS\DRAWINGS\631260-W-04-E-006(Regional Hydrological Setting).mxd

Table 4.10 Hydrometric data from Pipestone Creek (Water Survey of Canada 2016)

Station ID	Station Name	Drainage Area (km^2)		Data Period	Daily Peak Flow (m^3/s)	Maximum Daily Average Flow (m^3/s)	
		Gross	Effective			Spring	Summer
05NE003	Pipestone Creek above Moosomin Lake	2,730	655	1960-2015	87.4	7.75	2.64

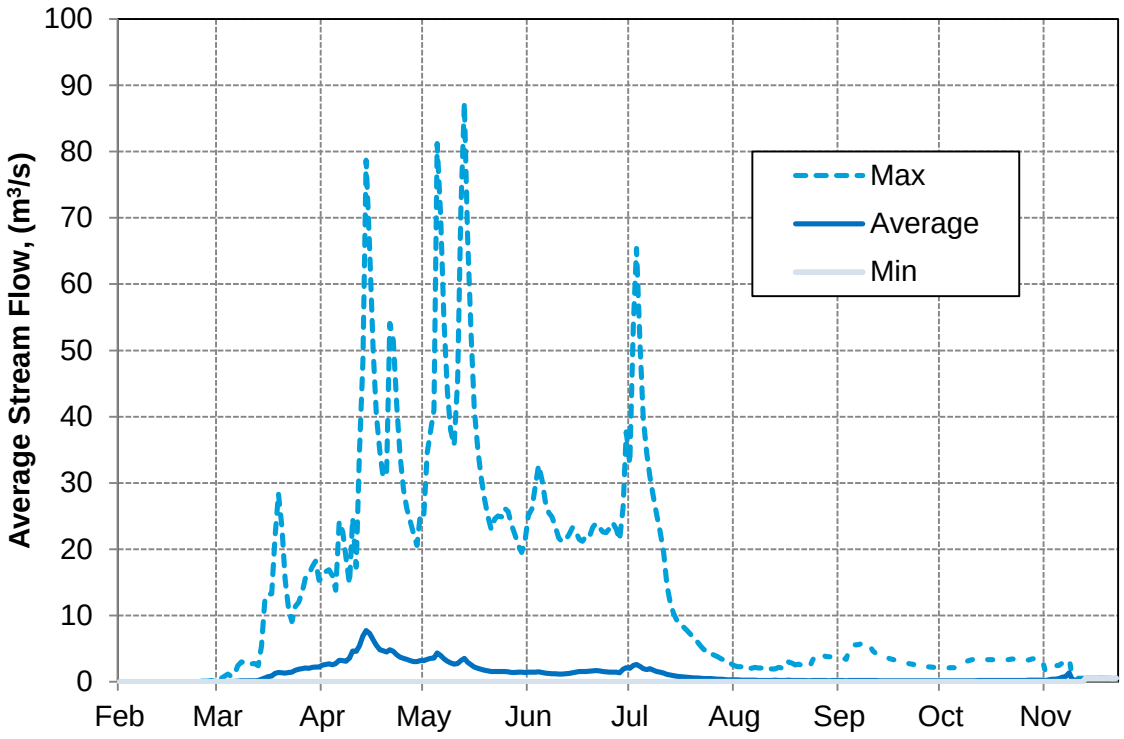


Figure 4.10 Average daily stream flow of Pipestone Creek above Moosomin Lake (05NE003), 1960 to 2015 (Water Survey of Canada 2016)

4.4.2 Fish and Fish Habitat

A baseline description of the fish and fish habitat in the region was prepared using existing data sources. The regional study area for fish and fish habitat included watercourses and tributaries found within the Lower Souris River Basin, where KP 437 is primarily located (**Figure 4.10**). Small portions of KP 437 also fall within the Moose Mountain and Qu'Appelle Basin, but it is unlikely that there would be any impacts to fish or fish habitat as there are no major watercourses for these basins that are also within KP 437. The fish and fish habitat study focused on Pipestone Creek, its tributaries, and water bodies that connect to Pipestone Creek as these appear to be the most significant watercourses located in the regional study area, and the only watercourse that is likely to be affected by mine and minefield development. Pipestone Creek is the most significant source of fish habitat near the regional study area and six fish species have been known to inhabit the creek, including:

- Brook stickleback (*Culaea inconstans)*;
- Fathead minnow (*Pimphales promelas*);
- Iowa darter (*Etheostoma exile*);
- Pearl dace (*Margariscus margarita*);
- Northern pike (*Esox lucius*); and
- White sucker (*Catostomus commersonii*, McCulloch and Franzin 1996 and Government of Saskatchewan 2016).

All of these are common in Saskatchewan and are not listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or on the *Species at Risk Act* (SARA). There is limited fish habitat in the regional study area as Pipestone Creek originates approximately 11 km upstream of the regional study area.

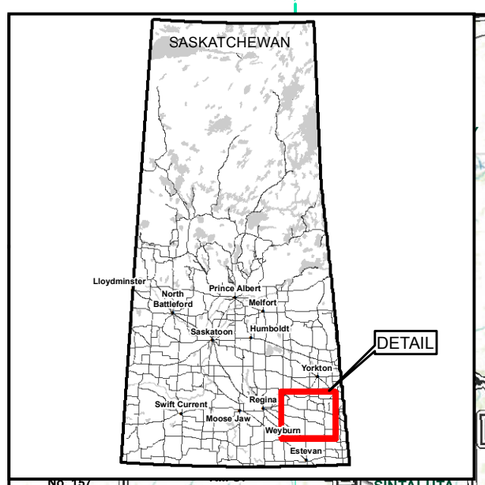
Multiple water bodies exist downstream (southeast) of Pipestone Creek with an increased number of fish species; including Moosomin Lake and Oak Lake. Major barriers to fish passage downstream from the project include dams at Oak Lake, Moosomin Lake and Pipestone Lake. Multiple projects have failed to provide fish passage past the Oak Lake dam. An unsuccessful fish ladder was built on the east side of the lake, and another fish ladder was built in the 1990's but also failed (Government of Manitoba 2012). Several additional unnamed dams, spillways and culverts also likely inhibit fish migration between the section of Pipestone Creek in the regional study area and more fish diverse areas downstream.

In 2012, the Lower Souris Watershed mitigated the most severe barrier to upstream fish migration into Pipestone Creek from Moosomin Lake by replacing a low level land crossing with a drop ford bridge at NW-25-13-33 W1. A 2008 study implicated the low level crossing as the highest risk barrier to fish passage. The removal of this barrier has the potential to increase the number and diversity of fish species in Pipestone Creek and the regional study area. No studies or observations of fisheries presence are known to have occurred in the regional study area since the barrier was mitigated (Kyle, pers comm. 2015).

4.5 Human Environment

A baseline description of the human environment in the region was prepared using existing data sources. The human environment study areas vary by component:

- The regional study area for the Rural Municipalities (RMs) includes the RMs within and/or adjacent to KP 437, as well as the City of Regina (**Figure 4.11**);
- The regional study area for First Nations includes First Nation communities within Treaty 4 who reside in proximity to KP 437 (**Figure 4.12**); and,
- The regional study area for the heritage resources includes KP 437 (**Figure 4.13**).



600,000 650,000 700,000

5,585,000 5,535,000

N

BANGOR
ATWATER
KILLALY
RM OF GRAYSON No. 184
RM OF LANGENBURG No. 181
GRAYSON
YARBO
LEMBERG
RM OF MCLEOD No. 185
NEUDORF
DUBUC
RM OF FERTILE BELT No. 183
STOCKHOLM
ESTERHAZY
RM OF SPY HILL No. 152
MELVILLE BEACH
MOOSE BAY
SUNSET BEACH
WEST END BIRD'S POINT
TANTALLON
RM OF ROCANVILLE No. 151
RM OF WILLOWDALE No. 153
RM OF ELCAPO No. 154
RM OF WOLSELEY No. 155
INDIAN HEAD No. 156
SINTALUTA
WOLSELEY
GRENFELL
BROADVIEW
PERCIVAL
WHITEWOOD
WAPELLA
RM OF MARTIN No. 122
ODESSA
KENDAL
RM OF FRANCIS No. 127
MONTMARTRE
RM OF MONTMARTRE No. 126
CANDIAC
GLENAVON
RM OF CHESTER No. 125
PEEBLES
RM OF KINGSLEY No. 124
RM OF SILVERWOOD No. 123
WINDTHORST
KIPLING
FRANCIS
LANGBANK
KENNEDY
OSAGE
CORNING
RM OF HAZELWOOD No. 094
RM OF WAWKEN No. 093
WAWOTA
RM OF WALPOLE No. 092
RM OF WELLINGTON No. 097
RM OF FILLMORE No. 096
RM OF GOLDEN WEST No. 095
FILLMORE
KENOSEE LAKE
CANNINGTON LAKE
CREELMAN
RM OF WEYBURN No. 067
RM OF GRIFFIN No. 066
HEWARD
RM OF TECUMSEH No. 065
RM OF BROCK No. 064
RM OF MOOSE MOUNTAIN No. 063
RM OF ANTLER No. 061
PHEASANT HILLS
MOOSE MOUNTAIN
637m
614m
705m
797m

LEGEND

- COMMUNITY
- RAILWAY
- KP 437
- URBAN MUNICIPALITY
- RURAL MUNICIPALITY

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, SASKADMIN2013, SASKGRID2013.
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 6.0 DATASET, 2012-09-28.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.

REFERENCE DRAWINGS

DWG No.	DATE	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DRN BY	CHK

0 3,050 6,100 12,200 18,300 24,400 METRES

SCALE: 1:500,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
CANADA GOLDEN FORTUNE POTASH CORPORATION	BROADVIEW PROJECT

TITLE

RURAL MUNICIPALITIES

DES BY	LM	DRN BY	KVG	DATE	2017 05 04	FIG No. 4.11	REV 0
CHK BY		APP BY		DWG No.	624190-E-21-E-001		11x17

Path: \\sli1653\Projects\CGFPC\624190 EIA_KP437\4.0 Execution\4.5 GIS and Drawings\GIS\DRAWINGS\624190-E-21-E-001 (RM Land) - Regina.mxd

600,000 650,000 700,000

5,585,000 5,535,000

N

FORT SAN
B-SAY-TAH
FORT QU'APPELLE
LI13RET
BALCARRES
ABERNETHY
SANDY BEACH
KATEPWA BEACH
TAYLOR BEACH
LEMBERG
NEUDORF
KILLALY
PHEASANT HILLS
637m
BANGOR
ATWATER
GRAYSON
DUBUC
STOCKHOLM
YARBO
GERALD
ESTERHAZY
MELVILLE BEACH
MOOSE BAY
SUNSET BEACH
WEST END
BIRD'S POINT
TANTALLON
614m
QU'APPELLE
INDIAN HEAD
SINTALUTA
WOLSELEY
SUMMERBERRY
GRENFELL
BROADVIEW
PERCIVAL
WHITEWOOD
WAPELLA
ODESSA
KENDAL
MONTMARTRE
CANDIAC
GLENAVON
PEEBLES
705m
WINDTHORST
KIPLING
LANGBANK
KENNEDY
FRANCIS
797m
CORNING
OSAGE
WAWOTA
FILLMORE
CREELMAN
HEWARD
STOUGHTON
NORTH WEYBURN
KENOSEE LAKE
CANNINGTON LAKE
MOOSE MOUNTAIN

LEGEND

RAILWAY

KP 437

MAP NUMBER	FIRST NATION LAND
1	OCEAN MAN
2	FLYING DUST
3	PHEASANT RUMP NAKOTA
4	WHITE BEAR
5	COWESSESS
6	OCHAPOWACE
7	KAHKEWISTAHAW
8	SAKIMAY
9	CARRY THE KETTLE NAKODA
10	OKANESE
11	STAR BLANKET
12	TREATY FOUR RESERVE GROUNDS
13	WA-PII-MOOS-TOOSIS
14	STANDING BUFFALO
15	LITTLE BLACK BEAR

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, SASKADMIN2013, SASKGRID2013.
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 6.0 DATASET, 2012-09-28.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.

REFERENCE DRAWINGS

DWG No.	DATE	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DRN BY	CHK

0 3,050 6,100 12,200 18,300 24,400 METRES

SCALE: 1:500,000

SNC·LAVALIN

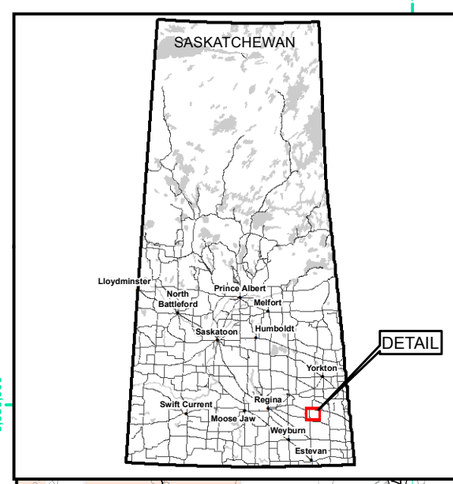
CLIENT	PROJECT LOCATION
CANADA GOLDEN FORTUNE POTASH CORPORATION	BROADVIEW PROJECT

TITLE

FIRST NATIONS

DES BY	LM	DRN BY	JS	DATE	2015 06 19	FIG No. 4.12	REV 0
CHK BY		APP BY		DWG No.	624190-E-21-E-001		11x17

Path: \\sli1653\Projects\CGFPC\624190 EIA_KP437\4.0 Execution\4.5 GIS and Drawings\GIS\DRAWINGS\624190-E-21-E-001 (First Nation Land).mxd



640,000 650,000 660,000

5,580,000 5,570,000 5,560,000

Grenfell

BROWN HILL RESERVOIR

Canadian Pacific

EKAPO CREEK

MARSTON LAKE

PIPESTONE CREEK

16-07-W2 16-06-W2

15-08-W2 15-07-W2 15-06-W2

14-08-W2 14-07-W2 14-06-W2

Glenavon

Peebles

Canadian National

DETAIL

N

LEGEND

- RAILWAY
- HIGHWAY
- 10 METRE ELEVATION CONTOUR (masl)
- WATERCOURSE
- KP 437
- HERITAGE SENSITIVE LOCATION
- WATERBODY
- WATERBODY (INTERMITTENT)
- URBAN MUNICIPALITY
- FIRST NATIONS LANDS
- Cemetery

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.
2. HERITAGE SENSITIVE LOCATIONS OBTAINED FROM HERITAGE RESOURCES BRANCH, SASKATCHEWAN TOURISM PARKS CULTURE AND SPORT.
3. BASE CADASTRAL DATA ADAPTED FROM HER MAJESTY IN RIGHT OF SASKATCHEWAN OR INFORMATION SERVICES CORPORATION OF SASKATCHEWAN, SASKADMIN2013, SASKGRID2013.
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6. HIGHWAYS AND ROADS OBTAINED FROM THE NATIONAL ROAD NETWORK SASKATCHEWAN EDITION 6.0 DATASET, 2012-09-28.
7. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.

REFERENCE DRAWINGS

DWG No.	DATE	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DRN BY	CHK

CONFIDENTIAL

0 750 1,500 3,000 4,500 6,000 METRES

SCALE: 1:125,000

SNC·LAVALIN

CLIENT
CANADA GOLDEN FORTUNE POTASH CORPORATION

PROJECT LOCATION
BROADVIEW PROJECT

TITLE
HERITAGE SENSITIVITY

DES BY	GP	DRN BY	FT	DATE	2015 06 03	FIG No. 4.13	REV 0
CHK BY		APP BY		DWG No.	624190-H-14-E-001		11x17

Path: \\sli1653\Projects\CGFPC\624190 EIA_KP437\4.0 Execution\4.5 GIS and Drawings\GIS\DRAWINGS\624190-H-14-E-001 (Heritage Screening).mxd

4.5.1 Socio-Economic Environment

Regional demographic data was obtained from Statistics Canada. The 2016 census data was available for populations, and 2006 and 2011 census data provided information on households, education, and income (Statistics Canada 2008, 2012, and 2017). Additional information was obtained on rural municipalities (RM), villages, towns, and First Nations reserves from the 2011 National Household Survey (NHS) (Statistics Canada 2013). If data was not available from the 2011 census, the 2006 Saskatchewan Community Profiles were used (Statistics Canada 2008). In some cases, data may have been suppressed for data quality or confidentiality reasons.

4.5.1.1 Land Use

Land use in the area is primarily agricultural with rural centres of population. There is a mixture of cropland and cattle pastures interspersed with native aspen parkland. The project lies within Wildlife Management Zone (WMZ) 34 and is bordered by WMZ 17, 32, 33, 34, 35 and 36. Fishing within the area is managed as part of the southern fishing zone. Hunting and fishing opportunities are available to residents and non-residents and include seasons for sport fish, big game, upland birds, and migratory waterfowl.

4.5.1.2 Communities

The KP 437 is located within the Rural Municipalities (RM) of Kingsley No. 124 and Chester No. 125, and the RMs of Wolsey No. 155 and Elcapo No. 154 are immediately north of KP 437 (**Figure 4.11**). The closest community is the Town of Grenfell, which is approximately 16 km north of the centre of KP 437. Other nearby communities include Wolseley, Broadview, Kipling, Windthorst, Peebles, and Glenavon. The City of Regina is located approximately 120 km west of the centre of KP 437.

4.5.1.3 Population

The study area has a population of over 220,000 people, the majority of which live in Regina (**Table 4.11**, Statistics Canada 2012). Overall the population of the study area has grown significantly (11%) between 2006 and 2011, however most of that was due to growth in Regina. This compares to the average provincial level of 6.3% growth.

Table 4.11 Population profiles for the study area, 2011 and 2016 (Statistics Canada 2017)

Community	Population 2011	Population 2016	Population Change 2011 to 2016	Average Age of Population 2016
RM of Kinglsey (No. 124)	421	444	5.5%	42.9
Town of Kipling	1,051	1,074	2.2%	43.9
Subtotal	*1,472*	*1,518*	*3.13%*	*n/a*
RM of Chester (No. 125)	373	383	2.7%	40.6
Village of Windthorst	215	211	-1.9%	50.2
Village of Glenavon	176	182	3.4%	48.1
Subtotal	*764*	*776*	*1.57%*	*n/a*
RM of Elcapo (No. 154)	481	488	1.5%	42.7

Community	Population 2011	Population 2016	Population Change 2011 to 2016	Average Age of Population 2016
Town of Grenfell	1,049	1,099	4.8%	46.8
Town of Broadview	574	552	-3.8%	51.7
Subtotal	*2,104*	*2,139*	*1.66%*	*n/a*
RM of Wolseley (No. 155)	405	372	-8.1%	42.1
Town of Wolseley	864	854	-1.2%	48.7
Subtotal	*1,269*	*1,226*	*-3.39%*	*n/a*
Regional Total	*5,609*	*5,659*	*0.89%*	*n/a*
Regina	*193,150*	*215,106*	*11.4%*	*38.4*
Total	**198,759**	**220,765**	**11.07%**	**n/a**
Saskatchewan	1,033,381	1,098,352	6.3%	39.1

n/a – not applicable

4.5.1.4 Education

Over 80% of individuals between 25 and 64 years of age in the regional study area have attained a high school diploma/equivalent or a postsecondary certificate, diploma or degree (**Table 4.12**; Statistics Canada 2007 and 2013). This is above the average provincial education level of 75.3%.

Table 4.12 Education level of individuals 25 to 64 years of age in the study area, 2006/2011 (Statistics Canada 2007 and 2013)

Community	No Certificate, Diploma or Degree	High School Diploma or Equivalent	Postsecondary Certificate, Diploma or Degree	Total
RM of Kingsley (No. 124)[1]	50(18.2%)	40(14.5%)	185(67.3%)	275
Town of Kipling	150(27%)	160(28.8%)	245(44.1%)	555
Subtotal	200(24.1%)	200(24.1%)	430(51.8%)	*830*
RM of Chester (No. 125)[1]	55(23.9%)	85(37%)	90(39.1%)	230
Village of Windthorst	0(0%)	15(12%)	110(88%)	125
Village of Glenavon	35(35%)	15(15%)	50(50%)	100
Subtotal	90(19.8%)	115(25.3%)	250(54.9%)	*455*
RM of Elcapo (No. 154)	45(18.8%)	65(27.1%)	125(52.1%)	240
Town of Grenfell	30(7.2%)	155(37.3%)	230(55.4%)	415
Town of Broadview	50(22.7%)	25(11.4%)	145(65.9%)	220
Subtotal	125(14.3%)	245(28%)	500(57.1%)	*875*
RM of Wolseley (No. 155)[1]	60(19.4%)	120(38.7%)	130(41.9%)	*310*
Town of Wolseley	25(7.8%)	125(39.1%)	170(53.1%)	320
Subtotal	85(13.5%)	245(38.9%)	300(47.6%)	*630*
Regional Total	500(17.9%)	805(28.9%)	1480(53%)	*2,790*

Community	No Certificate, Diploma or Degree	High School Diploma or Equivalent	Postsecondary Certificate, Diploma or Degree	Total
Regina	28,850(18.5%)	46,905(30%)	80,440(51.5%)	*156,195*
Total	**30,350(18.4%)**	**49,320(30%)**	**84,880(51.6%)**	**164,565**
Saskatchewan	200,430(24.7%)	228,755(28.2%)	383,320 (47.1%)	812,505

[1] 2006 Census Data was used where 2011 Census data was not available
n/a – not applicable or may be insufficient data

4.5.1.5 Settlement History

Settlement in the region began around 1882. Like the rest of the Canadian prairies, the region became the new home for many European and American settlers lured by the abundance of cheap land and the promise of prosperity and freedom. Many original settlers came from Ontario and the British Isles, with a large amount of German descendants settling the area later on. The Town of Grenfell was named to honour Pasco du Grenfell, a prominent railway company official (University of Regina 2007).

4.5.1.6 Regional Economy

The regional area within and surrounding the potash permit is rural, and agriculture is an important economic activity. The proximity of the region to the TransCanada Highway No. 1 enhances economic opportunities for distribution related business activities. Essential local services to support the region are located throughout nearby towns. Volunteer firefighting services are located in the surrounding towns of Grenfell, Broadview, Kipling and Glenavon. Advanced firefighting services from Regina may also be utilized to support the area when required. Policing services are provided by an RCMP detachment in Broadview, and basic healthcare is provided at clinics located in Grenfell, Broadview and Kipling. The City of Regina, located approximately 120 km west, is Saskatchewan's capital and provides a comprehensive offering of services utilized by surrounding communities.

Income levels for the RMs and communities in and adjacent to the proposed project were compiled (**Table 4.13**; Statistics Canada 2008 and 2013). The median income for an individual in the RMs of Kingsley ($17,974), Chester ($19,081) and Wolseley ($21,781) were slightly below the provincial average of $31,408, while the average income in the RMs of Elcapo ($33,393) and Grenfell ($39,309) were above the provincial average. Income average and range statistics were not available for the RM's of Kingsley, Chester and Wolseley for the 2006 or 2011 Census due to data confidentiality or integrity issues.

Table 4.13 Total income of individuals over the age of 15 in the study area, 2006/2011 (Statistics Canada 2007 and 2013)

Total income of individuals in 2010	RM of Kingsley	RM of Chester	RM of Elcapo	RM of Wolseley	Town of Grenfell	Town of Broadview	Saskatchewan
< $5,000	n/a	n/a	20	n/a	80	25	71,795
$5,000 to $9,999	n/a	n/a	0	n/a	30	15	53,605
$10,000 to $14,999	n/a	n/a	0	n/a	45	50	62,920
$15,000 to $19,999	n/a	n/a	30	n/a	125	60	75,270
$20,000 to $29,999	n/a	n/a	55	n/a	110	85	108,765
$30,000 to $39,999	n/a	n/a	55	n/a	110	80	100,155
$40,000 to $49,999	n/a	n/a	25	n/a	55	40	81,730
$50,000 to $59,999	n/a	n/a	25	n/a	50	55	58,995
$60,000 to $79,999	n/a	n/a	75	n/a	55	0	77,820
$80,000 to $99,999	n/a	n/a	0	n/a	85	25	40,360
$100,000 and over	n/a	n/a	0	n/a	0	0	44,775
Average Income	**n/a**	**n/a**	**41,063**	n/a	**46,469**	**32,854**	**40,798**
Median Income	**17,974**[1]	**19,081**[1]	**33,393**	**21,781**[1]	**39,309**	**24,950**	**31,408**

[1] *2006 Census Data was used where 2011 Census data was not available*

4.5.1.7 First Nations

In Saskatchewan, there are 70 First Nations, 63 of which are affiliated with the nine Saskatchewan Tribal Councils. Saskatchewan First Nations have five linguistic groups including Cree, Dakota, Dene (Chipewyan), Nakota (Assiniboine), and Saulteaux (Aboriginal Affairs and Northern Development 2010).

First Nation communities with reserve land in the study area include Carry the Kettle Nakoda First Nation, Cowessess First Nation, Flying Dust First Nation, Kahkewistahaw First Nation, Ochapowace First Nation, and Sakimay First Nation (**Figure 4.12**).

The majority of populations within the First Nation reserve land are decreasing in the study area. The median age of the First Nations reserves in the study are considerably younger than the average age of non-First Nations populations (**Table 4.11** and **Table 4.14**; Statistics Canada 2012).

Table 4.14 Population profiles for First Nations reserves in the study area

First Nation Reserve	Population 2011	Population 2016	Population Change 2011 to 2016 (%)	Median Age of Population
Carry The Kettle	673	443	-34.2%	36.4
Cowessess	672	540	-19.6%	33.3
Flying Dust	506	577	14.0%	30.6
Kahkewistahaw	523	502	-4.0%	28.4
Ochapowace	540	426	-21.1	28.5
Sakimay	311	147	-52.7%	28.4
Total	**3,225**	**2,635**	**-18.29%**	**n/a**

4.5.2 Heritage Resources

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 (1980)*. *The Heritage Property 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 HCB's Developers' Online Screening Tool was used to screen the KP 437 for heritage sensitivity. Forty percent of the study area (173 of 432 quarters) have been listed as Heritage Sensitive (**Figure 4.2**). Lands that are designated as not sensitive do not require *Heritage Property Act* clearance and will not be evaluated further. Heritage sensitivity is based on whether the land is cultivated, the presence or absence of nearby archaeological sites and the general topography of the area. Lands that are Heritage Sensitive lands may require an impact assessment and possibly mitigation of any heritage resources identified before any impacts are allowed.

5 Potential Impacts and Mitigation Measures

5.1 Effect Assessment Approach

The effects assessment is focused on Valued Ecosystem Components (VECs) which are aspects of the natural and socio-economic environment that are valued because of their ecological, scientific, resource, socio-economic, cultural, health, or aesthetic importance and which have a potential to be adversely affected by the project. VECs will be refined during the Environmental Assessment process and by the project experts, as well as through consultation with regulators and stakeholder engagement.

Effects will be evaluated using a stepwise approach. This begins with characterization of the interaction between the project and the VEC with respect to the nature of the interaction, location, and magnitude. First and foremost, avoidance will be implemented where possible. Where effects cannot be avoided, mitigation measures are identified and incorporated into the project design. Mitigation measures will be determined using best practices and in collaboration with the regulators; compensation measures will be considered where mitigation is not feasible. Residual effects are effects that remain after applying the proposed mitigation. These effects will be evaluated for significance with respect to the direction, geographic extent, magnitude, duration, frequency, likelihood and reversibility.

5.2 Effects and Recommended Mitigative Measures

The following sections provide a preliminary overview of potential effects of the proposed project on the atmospheric, hydrogeologic, terrestrial, aquatic, and human environments, and suggests possible mitigative measures to eliminate or reduce these effects. All effects will be assessed in much greater detail during the EIA process.

5.2.1 Atmospheric Environment

5.2.1.1 Air

Potential effects to air quality will include the emission of contaminants such as dust (particulate matter [PM]), nitrogen oxides (NO_x), carbon monoxide (CO), sulphur dioxide (SO_2), greenhouse gases (GHGs), and particulate matter (i.e., dust during construction and potash and salt dust during operation). These emissions may come from plant operations, processing, vehicle and mobile equipment use, and other plant infrastructure (Section 2.8.1). In particular, potash processing can generate significant quantities of dust. Changes to air emissions and dust deposition also have the potential to affect local soil, cropland, vegetation, wildlife health, fish and wildlife habitat and surface water quality. Air dispersion modelling will be conducted to understand the impacts of the project on local and regional air quality and recommend appropriate environmental mitigation features (emission control, dust control) that can be incorporated into the project design. In addition, environmental design features (e.g. emission controls on stationary emission sources and dust control systems) will be incorporated into the design of the proposed project. Compliance with regulatory emission requirements will be maintained. Although the exact mitigation measures will be determined when the engineering design of the proposed project is farther along, some typical mitigation measures may include:

- Enclosure of process and materials handling equipment (e.g. conveyors) to reduce dust output;
- Use of scrubbers or baghouses to handle emissions from KCl dryers;
- Use of cyclones and pulse jet collectors to collect dust from all dry potash handling equipment such as conveyors, bucket elevators, screens, dryers, and coolers;
- Install high efficiency and low and ultra-low NOx burners;
- Install emission control devices on stationary emission sources, e.g., particulate traps;
- Install catalytic oxidizers on combustion equipment;
- Install emission controls on stationary emissions sources (e.g. baghouses);
- Limit traffic speeds and control dust on unpaved roads; and
- Limit vehicle idling.

5.2.1.2 Greenhouse Gas Emissions

The project will emit greenhouse gases (GHG) including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), which can contribute to climate change. The project design will aim to minimize GHG emissions where possible. Although the exact mitigation measures will be determined when the engineering design of the proposed project is farther along, mitigation measures may include:

- Best management practices during construction, including use of well-maintained equipment and limiting vehicle idling;
- Use of current energy efficient technology; and
- Development of a GHG management plan, which may include venting management, fugitive emissions management, and implementation of an energy efficiency program.

5.2.1.3 Noise

Noise levels may increase during construction; however, CGFPC will follow best practices to minimize the impact due to noise, such as limiting the timing of certain construction activities, fitting internal combustion engines with appropriate mufflers, and informing nearby residents of construction activities which may include significant noise emissions. If noise studies determine that operational noise levels will exceed permissible sound levels, mitigation measures will be considered.

5.2.2 Hydrogeological Setting

Potential effects on the near surface “freshwater” groundwater system due to the project will be assessed based on collected baseline data, analysis, and detailed modelling studies. Potential effects to the near surface groundwater flow system and mitigation/management measures to control these effects are discussed below.

The most important factor to consider when optimizing the mine site location is to ensure that facilities are placed in an area that has as much natural containment as possible. The silt and clay-rich till of the Sutherland Group and the Saskatoon Group form the major aquitards for the area and will be the primary barriers to subsurface contamination.

In general, surface facilities should be placed in an area that has thick accumulations of unoxidized till over major aquifer units. Surface facilities should also be placed over a site that has as few laterally extensive aquifers as possible. Areas in the immediate vicinity of surface water features should also be avoided. Project siting studies coupled with confirmatory drilling will be used to better determine the most suitable placement for mine facilities.

While substantial engineering effort is required to limit brine migration during the operations and decommissioning phase, impact to the subsurface beneath the TMA is an inevitable result of the storage of excess salt on surface. The high TDS concentration of the brine will result in a change in groundwater quality for the portions of aquifers affected by brine migration. However, through the use of the perimeter dykes and ditches and strategically located slurry walls, it is expected that the spatial extent of brine migration will be localized to the site footprint. Should migration extend outside of the controls boundary, a series of pump back wells could be used to mitigate impact in the area. A numerical groundwater flow and transport model will be used to evaluate regional groundwater impacts in terms of both groundwater quantity and groundwater quality. Vertically the model extends from surface to the top of the Pierre Formation Shale (the base of most “fresh” groundwater exploration in the area).

Excess brine from the TMA will be disposed of via deep well injection. Numerical modeling of the disposal horizon will be used to evaluate if it is capable of accepting the predicted brine volumes at rates consistent with operational requirements and post-operational dissolution rates. Loss of injection well control could result in brine inflows to other stratigraphic units or even the release of brine to surface. However, injection wells are designed with multiple barriers of protection to prevent brine inflows to the “fresh” water aquifers and the stratigraphic units overlying the disposal horizon (e.g. the Mannville Group and the Prairie Evaporite Formation (mining horizon) are considered the most important units from an underground mining perspective). Safety design features in injection wells include:

- Multiple casing strings grouted into place;
- Pressure tested seals certified with geophysical methods (temperature logs, cement bond integrity logs, radioactive tracer surveys, oxygen activation logs, etc.);
- Injection tubing inhibitor (usually diesel);
- Leak monitoring, instrumented to record pressures and flow rates;
- Geologic seal (bedrock shale); and
- Cathodic protection.

Monitoring and testing assures that the integrity of the wells is maintained. Groundwater monitoring during the life of the facility will be used to more accurately determine when and where secondary containment measures are required (if any). The TMA design and ongoing monitoring will ensure that local groundwater users are not affected in terms of quality or quantity of groundwater.

Spills and materials handling during all phases of the project could have a localized effect on the groundwater quality, though an effort will be made to site the plant where thick tills and no surficial aquifers exist. Immediate spill clean-up, soil removal, and a remediation plan should be sufficient to remedy potential impacts on shallow groundwater quality. Ore processing and product storage at other potash mine sites in Saskatchewan have resulted in local effects to the near surface groundwater system as well. Facility design and strict protocols for materials handling are expected to mitigate these potential impacts. Installation of perimeter containment measures is a potential secondary mitigation method.

During construction, exploration wells, water wells, and groundwater monitoring instrumentation that exists within the TMA, and is no longer of use, will be decommissioned. This will be done to eliminate direct pathways for brine migration to “freshwater” aquifers once the surface storage of salt begins during operation.

5.2.3 Terrestrial Environment

Project effects to the terrestrial environment will be largely limited to the area within the surficial footprint of the project. The extent of these effects will be determined once mine infrastructure plans have been developed and future terrestrial studies are completed. Effects to these resources will be substantially minimized through the proper implementation of appropriate planning and mitigation measures. Mitigation measures will be implemented for soil resources, sensitive habitats, and listed species, occurring within or adjacent to the project footprint. Setbacks, where applicable, will be established by a qualified professional prior to construction commencement and an on-site environmental monitor will be present during construction to prevent unnecessary disturbance from construction activities.

5.2.3.1 Terrain and Soils

Project activities associated with construction and operation of the proposed project have the potential to cause effects to soils and terrain such as: decreased slope stability; admixing of soils; soil compaction; soil contamination; changes to agricultural capability; wind and water erosion; and topsoil loss.

A topsoil management plan will be prepared prior to construction to minimize effects on soils and preserve landscape integrity. The plan will include recommendations for preparation, stripping and backfill protocols, contingency measures, spill response planning; identification of high-risk locations and reclamation plans. Mitigation activities will be supervised by an environmental monitor to ensure prescribed strategies are implemented in accordance with the topsoil management plan. The effectiveness of the reclamation will be monitored post-construction to ensure stabilization and re-vegetation success.

5.2.3.2 Ecology

5.2.3.2.1 Sensitive Habitat

The project may affect both wetland habitat, native prairie and other sensitive habitats located in the project area. Although many of the sensitive habitat areas have already been impacted by current land use, some areas may still be relatively undisturbed and the function of these areas, even if disturbed, may still be locally important.

Wetlands provide hydrological, water quality, and habitat benefits for native vegetation and local and migratory wildlife. Plants, invertebrates, and animals use the wetlands as a water supply, foraging area, breeding activities and cover. Due to the abundance and distribution of wetlands within the area, total avoidance may not be feasible; however, efforts will be made to avoid wetlands as much as possible.

If possible, construction activities with the potential to affect wetland habitat will be carried out during dry or frozen conditions. Sediment and erosion control plans will be developed to prevent or minimize silt from entering wetlands. Regular cleaning of equipment will reduce the risk of spreading invasive or weedy plant species to vulnerable wetland communities. If the removal of wetlands is required to for project development, replacement of wetlands will be completed to compensate for the loss.

If native moist mixed grassland habitat is discovered within the study area, mitigation will be developed should any disturbance be required. Grassland areas with temporary disturbance from construction will be re-seeded using appropriate seed blends selected to mimic the local graminoid community. This will allow for the successful encroachment of associated forb and shrub species, promoting the re-establishment of a diverse grassland community. Native grassland areas will be avoided where possible and alternative mitigation or compensation will be used when disturbance cannot be avoided.

Pastureland is often comprised of both native and non-native vegetation and is impacted by grazing activities. Although much of the native prairie is no longer intact, these areas still provide valuable habitat for wildlife species, particularly for breeding activities. Disturbances in these areas may still require mitigation, particularly during the breeding season for sensitive species that may utilize these habitats that have the potential to occur within the project area.

Weedy and invasive species, including species designated as nuisance and noxious weeds under the *Weed Control Act* (Government of Saskatchewan 2010a), are expected to be present at previously disturbed sites within the project footprint, such as cultivated fields, roadside rights-of-way, and heavily grazed pastureland. Construction and operation activities have the potential to facilitate the spread of these species, and best practices will be used to minimize this (e.g. cleaning of equipment prior to relocation to ensure that weed propagules are not introduced to cropland or areas of native habitat; management of weeds on-site). A construction environmental management plan will be developed which will include site specific protocols for preventing the introduction or spreading of nuisance, noxious or prohibited weed species.

5.2.3.2.2 Vegetation

The project has the potential to affect protected plant species that fall within or adjacent to the project footprint. Seventeen listed plant species have moderate potential to occur in the study area, and two listed plant species have a high potential to occur in the study area. To avoid the potential disturbance of listed plants occurring just outside of the project footprint, setbacks will be established around nearby individuals and clusters. Recommended setback distances for listed species are provided by MOE (Government of Saskatchewan 2015) and are dependent on the type of disturbance and the species present. Prior to the commencement of construction, rare plant surveys will be completed in all sensitive habitats identified in the EIA that are adjacent to areas requiring disturbance during construction. Once sensitivities are identified, appropriate setback distances will be determined by a qualified professional and will be visibly staked at the appropriate setback distance. Sensitivities will be monitored by a qualified professional for the entire duration of construction activities, or until the sensitivity no longer is present. This method will ensure that construction personnel are aware of the locations of the sensitivities, minimizing the risk of accidental disturbance.

If avoidance is not feasible, mitigation measures will be determined based on the species and mitigation plans will be developed through consultation with the MOE.

5.2.3.2.3 Wildlife and Wildlife Habitat

The project has the potential to affect protected wildlife species that fall within or adjacent to the project footprint. Suitable nesting habitat for migratory birds is abundant the study area, hence, a high potential exists for the project to disturb migratory birds, especially those nesting in the ground. Sixteen listed wildlife species have moderate potential to occur in the study area, and three listed wildlife species have a high potential to occur in the study area. A species at risk (SAR) is defined as any species protected under the federal *Species at Risk Act* (SARA) (Minister of Justice 2002) and/or the Saskatchewan Wildlife Act (Saskatchewan Regulations 1998, Saskatchewan Regulations 1981). Under these acts, it is considered a provincial and/or federal offence to kill, harm, harass, capture, possess, sell, or export an individual belonging to an extirpated, endangered, or threatened species. The impacts of widespread agriculture and settlement in the Prairie Ecozone have greatly diminished the natural habitats, populations, and ranges of local wildlife. Because of this, a high number of federally and provincially listed wildlife occurs in the Aspen Parkland Ecoregion. Any required mitigation for wildlife will be developed in consultation with the MOE. It is always best practice to avoid areas occupied by listed species.

Recommended setback distances for provincially listed wildlife species are provided by MOE (2015) and are dependent on the type of disturbance and the species present. Avoidance guidelines for migratory birds are established by Environment and Climate Change Canada (ECCC 2014b) and recommend scheduling disruptive activities outside of the migratory bird nesting season. Throughout all phases of construction, wildlife surveys will be completed to identify any sensitivities that may exist that could be either directly or indirectly affected by the proposed construction activities. Surveys will be completed by a qualified professional ahead of disturbance, and requirements will be determined based on recent observations within the project area, applicable sensitive timing windows such as breeding/nesting periods, and expected species occurrences based on ecological features within and surrounding the proposed area of disturbance When sensitivities are identified, appropriate setback distances will be determined by a qualified professional and will be visibly staked at the appropriate setback distance. Offsets will remain in place for the life of the project where appropriate. Sensitivities will be monitored by a qualified professional for the entire duration of construction activities that may result in any level of disturbance, or until the sensitivity no longer is present. All construction personnel working within areas of sensitivities will be made aware of the locations of the sensitivities and best practice for working around the specific sensitivities, minimizing the risk of accidental disturbance.

5.2.4 Aquatic Environment

5.2.4.1 Hydrologic Setting

The only major regional hydrological feature within the study area is Pipestone Creek and placement of mine infrastructure away from this will avoid effects to the regional hydrology. The project has the potential to affect local hydrological conditions due to changes in infiltration rates, changes to the topography and the footprint of the numerous wetlands, and alterations to drainage due to subsidence. Project effects on surface water quality are expected to be minimal because there is no planned discharge to water bodies; however, surface water quality could be affected by dust and air emissions. The following mitigation measures can be considered to minimize effects of the proposed project on local drainage patterns:

- Development of a runoff management plan, including installation of culverts and ditch grading to control drainage and eliminate or mitigate any flooding;
- Sediment and erosion control measures during construction and maintenance at any locations where construction or maintenance activities will cause potential erosion into surface drainage features;
- Appropriate regulatory approvals (e.g. Saskatchewan Water Security Agency) where required for diversion of any significant surface water runoff and/or construction of any surface drainage features (e.g. culverts, berms, ditches); and
- Avoidance of wetlands where possible and/or compensation by enhancing or creating wetlands at another location. Wetland mitigation/compensation will be determined through consultation with MOE.

5.2.4.1.1 Ground Subsidence

Surface subsidence is expected to occur as creep of the deeply situated salt rocks causes slow cavern closure and deformation of the rocks toward the mined caverns. Numerical modelling will be completed to estimate the maximum potential subsidence expected to occur over the influence area of mining at the end of the mine life period. Subsidence distribution pattern depends mainly on the geometry of the cavern, and marginally on the rock properties in the overburden rock above the cavern. Mitigation measures will be recommended to minimize any significant subsidence impact to the environment as required.

5.2.4.2 Fish and Fish Habitat

The proposed project has the potential to affect fish and fish habitat at Pipestone Creek and its major tributaries. Mine construction and operations could result in fish mortality, egg or young mortality, or habitat degradation and loss. The project effects and mitigation measures required will be highly dependent on the project's location within KP 437. Potential effects to fish and fish habitat include:

- Direct habitat loss as a result of project placement;
- Erosion from construction activities into creek and tributaries;
- Ground subsidence as a result of solution mining, which can change watercourse flow dynamics;
- Site water management (run-off, operational discharge);

- Effects to surface water quality from emissions;
- Migration of brine into the aquatic environment; and
- Accidental releases into Pipestone Creek or its tributaries.

Effects to the aquatic environment would be best achieved through avoidance of permanent disturbance to Pipestone Creek and its tributaries. Placement of the mine site and associated infrastructure away from these watercourses will greatly reduce the effects aquatic environment. Where temporary disturbance cannot be avoided, Construction activities near Pipestone or any of its major tributaries should be scheduled to avoid sensitive timing windows for fish species present in these watercourses. Timing windows are established to protect sensitive periods including spawning, rearing and migration.

Where impacts to fish and fish habitat cannot be avoided, appropriate mitigation would be developed to reduce the potential for impacts to fisheries productivity. Mitigation may include aquatic monitoring and protection plans, site-specific erosion and sediment control plans, environmental construction management and monitoring and fish rescue operations. Where loss of productivity is unavoidable, compensation plans may be required to offset the loss. Mitigation and compensation activities will be developed in consultation with appropriate regulatory agencies (e.g. MOE, DFO) and all required permits or approvals will be obtained prior to the commencement of construction activities.

Brine ponds/tanks will be present on site to contain water used in mine operations. Excess brine will be likely be disposed of via injection wells into saline aquifers to avoid impacting surface water and fresh water aquifers. The containment ponds for the tailings water will be designed so that a containment system will prevent migration of saline water through the soil. These containment ponds will also be designed with perimeter dykes.

Accidental releases into Pipestone Creek or any of its tributaries from construction equipment of from plant infrastructure (e.g. brine pipelines) may also impact fish and fish habitat. A spill response plan will be developed in order to mitigate the impacts these releases may cause.

5.2.5 Human Environment

5.2.5.1 Socio-Economic Environment

Both positive and negative socio-economic effects, both short and long-term, may result from the proposed project. Local suppliers, contractors, and labourers will be utilized whenever possible to retain expenditures within the Saskatchewan economy. Both construction and operation of the mine would require a large number of temporary, contract or permanent positions, many who would be local. Significant royalties and taxes would be generated annually by the project for provincial and local governments. There is also the potential for negative socio-economic effects, such as increased pressure on local communities (e.g. traffic, increases in population, demand for services), increased wear and degradation to local infrastructure and demands for local resources (e.g. water). Other proposed potash mines in the region have experienced both support and concerns. Some of the main concerns include increased demand on water supplies and risk of contamination to groundwater. CGFPC will conduct further socio-economic studies to ensure effects to the socio-economic environment are understood and appropriate mitigation measures can be implemented.

5.2.5.2 Heritage Resources

Completion of a Heritage Resources Impact Assessment (HRIA) will minimize the potential for effects to heritage sites and/or artifacts during construction and aid in obtaining clearance for the project.

5.2.5.3 Traffic Effects

The mine will likely result in an increase in local traffic. A traffic impact assessment may be required to forecast the effects on traffic and recommend improvements to roads to consider both traffic flow and safety.

5.2.6 Accidents and Malfunctions

Construction and operation of the project may result in accidents and malfunctions, including spills, natural gas leaks, explosions, fires, etc. CGFPC will prepare a detailed Emergency Response Plan (ERP) to prevent potential of accidents/malfunctions and to mitigate their effects if they do occur. The ERP will outline procedures, actions, and lines of authority in the event of an emergency to provide a timely and coordinated response to emergencies.

The risk of a spill of brine, fuel or other hazardous material has the potential to impact the surrounding environment. Several mitigation measures are in place to reduce the risk of spills and in the unlikely event that one will occur, will limit the extent of disturbance. Vehicles and equipment will be kept in good condition, properly maintained, and free of leaks. Spill kits will be available at various locations around the site. Brine pipelines will be designed with leak detection and routine inspections will be completed to assess pipeline integrity and risk.

5.2.7 Effects of Climate Change on the Project

In addition to effects of the project on climate change, there is the potential that a changing climate could affect the project. Potential effects include increased fire risk or increased winter precipitation. These issues will be assessed during detailed design and mitigation efforts will either be built into the design, or management plans will be developed.

5.2.8 Summary of Effects, Mitigation Measures, and Residual Effects

A summary of the potential environmental effects and potential mitigation and environmental design measures is included in **Table 5.1**.

5.3 Commitments Register

A preliminary commitments register is provided in **Table 5.2** and outlines potential monitoring and mitigation commitments that will be conducted to minimize or eliminate environmental effects resulting from the project.

Table 5.1 Preliminary potential project effects and potential mitigation measures

Phase			Project Activity / Component	Potential Environmental Effects	Potential Environmental Design and Mitigation Measures
Construction	Operation	Decommissioning / Tailings Dissolution			
X			Site clearing	- Loss of soil, wetland habitat, native prairie habit, and protected plant species - Disturbance to wildlife species and migratory birds - Sedimentation into surface water receptors - Effects to heritage resources - Spreading of invasive/weedy species	- Siting of project in area already disturbed by agricultural activities - Limit disturbance by routing linear developments along existing corridors where possible - Wetland compensation - Rare species mitigation and offsetting - Setbacks for protected habitat and species - Soil surveys and profiling - Seeding - Pre-construction rare plant and wildlife surveys (including bird sweeps) - Construction environmental management plan (topsoils management, sediment and erosion control, equipment cleaning, heritage resources management plan, etc.) - On-site construction environmental manager - Limit idling of vehicles - Use equipment that is maintained in good operating condition - Limiting timing of certain construction activities - Dust control
X	X	X	Air and noise emissions (mobile equipment, dust)		
	X		Air and noise emissions (materials handling equipment, stacks)	- Air emissions can affect local air quality, crops, soils, vegetation, wildlife health, surface water quality, fish - Noise emissions can result in disturbance to wildlife and humans	- Fitting internal combustion engines with appropriate mufflers/noise suppressors - Compliance with emissions limits - Emission controls on stationary emissions sources (e.g. scrubbers, baghouses) - High efficiency and low NO_X burners - Enclosures around conveyor belts - Dust control - Housing stationary equipment in buildings to insulate noise
X	X	X	Surface drainage - alteration	- Site runoff from graded site can affect local surface drainages and result in changes to water quality and quantity	- Runoff management plan (e.g., grading, ditches, culverts) to: route freshwater around the site and returned to pre-development watercourses; and contain site runoff an direct to a pond for treatment - Sediment and erosion control - Adequate sizing of brine reclaim pond and other ponds to contain brine under normal and flood conditions
X	X		Increased traffic	- Increased chance of vehicular collisions with humans and wildlife	- Traffic management plan - Road improvements
X	X	X	Accidental spill / release	- Effects to soils/groundwater	- Spill response plan - Secondary containment

Phase			Project Activity / Component		Potential Environmental Effects		Potential Environmental Design and Mitigation Measures
Construction	Operation	Decommissioning / Tailings Dissolution					
	X	X	Brine migration from SSA	-	Vertical and lateral seepage/migration of brine to soils/groundwater	-	Select TMA site in area where surficial geology will provide natural containment - Containment system (e.g., liner, berms, slurry wall) - Brine collection and management (e.g., diversion ditch, pumpback wells) - Monitoring program to monitor brine migration and to monitor effectiveness of the containment system - Decommission wells that are no longer required
	X	X	Deep brine injection	-	Effects to soils/groundwater through leakage of brine	-	Multiple casing strings, pressure tested seals, injection tubing inhibitor, geologic seal, cathodic protection - Leak monitoring
X	X		Linear developments (roads, rail)	-	Effects to wildlife	-	Avoidance of major wildlife corridors - Wildlife crossing opportunities - Wildlife crossing signs - Speed limits
	X		Mine operation	-	Disturbance to wildlife species and migratory birds	-	Construct fencing to deter wildlife from entering mine site - Reduced speed limits in areas where wildlife exist - Development of a site-specific wildlife management plant - Deter use of site by breeding migratory and non-migratory bird species - Collect food waste in suitable receptacles to limit attraction of wildlife
	X		Solution mining	-	Ground subsidence can effect surface drainage patterns	-	Pillars can be left in between caverns to increase stability - Secondary mining can reduce total subsidence as more material stays in the cavern - Monitoring

Table 5.2 Commitments register

Project phase						Description	TP Reference Section
Prior to Approval	Design	Pre-construction	Construction	Post-construction	Operations		
X						Conduct an Environmental Impact Assessment (EIA) and prepare and Environmental Impact Statement (EIS) to obtain MOE approval for the project. The EIA will include the following components: conceptual mine and TMA development plan; air assessment, hydrogeological investigation; soils/vegetation/wildlife assessment; hydrology assessment and subsidence analysis; socio-economic assessment; heritage assessment, and community engagement program.	1.3.1
		X				Obtain surface rights as required.	2.1
	X	X	X	X	X	Design, construct and operate project to meet or exceed industry standards.	2
			X	X	X	Prepare an environmental protection plan for construction, operation and closure. The plan will include emergency response and environmental management and monitoring plans.	6
		X	X	X	X	Prepare a Health and Safety Management System for construction and operation.	2.10
X						Prepare a decommissioning and reclamation plan.	2.11
	X		X			Design surface grading and culverts to contain all site runoff and direct it to the appropriate ponds/SSA.	5.2.4.1
		X				Obtain all project regulatory approvals (federal, provincial and municipal) prior to construction/operation.	1.3
		X		X		Employ wetland compensation, as required, and wetland best management practices including the application of setbacks using stakes or installation of appropriate isolation, sediment and erosion control measures (e.g. silt fencing).	5.2.3
		X		X		Construction Environmental Management Plan (CEMP) will be developed and environmental monitor will be present during construction to provide detailed directions for management of topsoil (i.e. topsoil management plan), waste, wetlands (e.g. setbacks, sediment and erosion control), listed and protected species and habitat (e.g. setbacks, protection of native grassland), noise, spills and general environmental management during construction (e.g. equipment cleaning).	5
		X		X		Establish physical setbacks for rare vegetation and native grassland (where applicable) or alternative mitigation/offsetting measures approved by MOE.	5.2.3
		X	X			Conduct pre-construction wildlife surveys for listed wildlife and if found, implement MOE approved mitigation measures. May include establishment of physical setbacks or alternative mitigation and potential offsetting). Obtain Research Permits for the wildlife surveys.	5.2.3
		X		X		Conduct breeding bird surveys throughout the breeding bird season (April to September) o locate the potential for active bird nests occurring through observations of breeding bird behavior within the project area of disturbance immediately prior to construction and apply appropriate setbacks based on species and anticipated level of disturbance, and observed changes to behavior during construction activities. Identify potential habitat and risk, and establish a deterrent strategy to avoid nesting activities within construction areas.	5.2.3
				X	X	Develop an environmental monitoring plan for construction and operation.	6.3
X	X	X	X	X	X	Undertake community engagement during the EIA review process.	3

5.4 Residual Effects

Residual effects are predicted to occur to drainage patterns, biological habitat, wetland areas, vegetation, land use and socio-economics, however, an assessment of the significance of these effects is premature and will be conducted during the EIA.

5.5 Cumulative Effects

The cumulative effects assessment considers the anticipated residual environmental effects of the project in combination with other past, present and/or reasonably foreseeable future projects or activities in the area. A review of agricultural activity and other projects/industry in the region will be conducted to select projects to be considered for the cumulative effects assessment.

6 Monitoring

6.1 Environmental Management and Protection Plan

CGFPC will prepare an Environmental Management and Protection Plan that outlines specific environmental management and protection and contingency measures that will be utilized during construction, operation and closure. The specifics of the plan will be determined in conjunction with MOE.

6.2 Emergency Response Plan

CGFPC will prepare an Emergency Response Plan for construction and operation.

6.3 Environmental Monitoring

CGFPC will conduct an environmental monitoring program for the project that will include monitoring during construction and operation. Results of the monitoring will be reported annually to MOE in accordance with the project approvals and the Environmental Management and Protection Act and Regulations (2010b). The specifics of the plan will be determined in conjunction with MOE and may include:

- Air emission monitoring and stack sampling;
- Soil sampling;
- Ecological Monitoring;
- Groundwater monitoring;
- Surface water monitoring;
- Monitoring of brine pond levels; and
- Monitoring of TMA stability and dyke integrity.

7 Closure

This Technical Proposal has been prepared by SNC-Lavalin Inc. on behalf of Canada Golden Fortune Potash Corporation for submission to the Saskatchewan Ministry of Environment. It has been prepared in accordance with the Technical Proposal Guidelines. Please contact us at +1.306.668.8080 or matthew.tyree@snclavalin.com if you have any questions.

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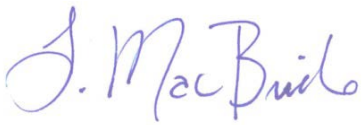

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Glossary

Term	Definition
aeolian	Pertains to wind activity in the study of geology and weather, and specifically to the wind's ability to shape the Earth's surface.
alluvial	Sediments deposited in water.
ambient	Of or relating to the immediate surroundings of something.
aquifer	Water-bearing, permeable rock or unconsolidated sediment (typically gravel, sand, or silt) from which groundwater can be extracted in useable quantities using a water well.
aquitard	A low-permeability geologic that inhibits the flow of groundwater.
Atterberg limits	Basic measure of the nature of a fine-grained soil. Depending on the water content, it may appear in four states: solid, semi-solid, plastic and liquid. In each state the consistency and behavior of a soil is different and thus so are its engineering properties. Can be used to distinguish between different types of silts and clays.
baghouse	Air pollution control device that removes particulates out of air or gases released from industrial exhaust streams.
baseline	Conditions prior to development or disturbance.
bedrock	Consolidated rock underlying soil/unconsolidated rock.
borehole	An exploratory drill hole used for the classification and sampling of geological units.
brackish	A slightly salty solution (typically water). Intermediate between freshwater and brine water.
brine	Water saturated or strongly impregnated with salts and other soluble minerals.
calcareous	Containing or consisting of calcium carbonate.
carbonate	A mineral compound characterized by a fundamental anionic structure of CO_3.
carnallite	Evaporite mineral, a hydrated potassium magnesium chloride with formula $KMgCl_3 \cdot 6(H_2O)$.
cathodic protection	A technique used to protect a metal surface against corrosion.
Cenozoic	The latest of the four eras into which geologic time is divided; it extends from the close of the Mesozoic Era, about 65 million years ago, to the present.
centrifuge	A piece of equipment used to separate substances based on their density through rotation around a fixed axis.
channelized	The artificial modification of the watercourse to change its course or flow pattern, typically for some desired benefit (such as flood control).
chert	A hard, dense microcrystalline or cryptocrystalline sedimentary rock, consisting chiefly of interlocking crystals of quartz less than 30 µm in diameter.
clarifier	Process used to purify liquids (separation of liquids and solids) by settling. Uses a settling tank built with mechanical means for continuous removal of solids being deposited by sedimentation.
clastic	Pertaining to a rock or sediment composed principally of fragments derived from pre-existing rocks or minerals and transported some distance from their places of origin.
clay	Soil particles smaller than 0.002 mm (ISO 14688).
cobble	A rock fragment between 64 mm and 256 mm in diameter, rounded or otherwise abraded in the course of aqueous, aeolian, or glacial transport.
colluvial	Loose sediment that has accumulated at the base of a slope through the action of gravity.
conceptual design	The very first phase of design and will feed into more detailed design phases.
concretionary	Characterized by, consisting of, or producing a hard, compact aggregate of mineral

Term	Definition
	matter, subspherical to irregular in shape, formed by precipitation from water solution around a nucleus, such as a shell or bone, in a sedimentary or pyroclastic rock. Concretions are generally different in composition from the rock in which they occur and represent a concentration of some minor constituent of that rock.
Cretaceous	Geologic time period, began 145 million years ago and ended 66 million years ago.
crystallization	A chemical-solid separation technique where mass transfer of a solute from a liquid solution to a pure solid crystalline phase occurs.
culvert	A structure that allows water to flow under a road, railroad, trail, or similar obstruction.
cumulative effects	Effects on the environment caused by the combined results of multiple projects and/or past, current and future activities.
deciduous	Refers to a tree or shrub that sheds its leaves annually.
dolomite	A common rock-forming mineral $CaMg(CO_3)_2$.
drift	A general term for all rock material transported by glaciers and deposited directly from the ice or through meltwater.
ecoregion	Large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions.
ecozone	Ecozone is the broadest biogeographic division of the Earth's land surface, based on distributional patterns of terrestrial organisms. Canada has 15 terrestrial and five aquatic ecozones.
emissions	A substance discharged into the environment.
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.
Environmental Impact Statement	Report that documents the effects for a proposed project on the environment and used as a decision-making tool.
erosion	Action of exogenic processes (such as water or wind) which remove soil and rock from one location on the Earth's crust, then transport it to another location where it is deposited.
esker	Long, winding ridge of stratified sand and gravel, examples of which occur are deposited by streams which flowed under glaciers.
evaporite	A salt or mineral deposit left after the evaporation of a body of water.
evaportranspiration	Sum of evaporation and plant transpiration from the Earth's land and ocean surface to the atmosphere.
extirpated species	Species which is locally extinct.
fault	A fracture or break in the Earth's crust across which displacement has occurred.
fluvial	Of or pertaining to rivers.
forb	A herbaceous flowering plant that is not a graminoid (grasses, sedges and rushes).
formation	The fundamental lithostratigraphic unit which consists of a certain number of rock strata that have a comparable lithology, facies or other similar properties.
geomorphology	Study of the origin and evolution of topographic and bathymetric features created by physical or chemical processes operating at or near the earth's surface.
glacial till or till	Unstratified sediment deposited directly by glacial ice.
glaciofluvial	Sediments deposited by glacier melt streams.
glaciolacustrine	Sediments deposited in glacial and proglacial lakes.
graminoid	Grasses. They are monocotyledonous, usually herbaceous plants with narrow leaves growing from the base.
gravel	Any loose rock that is larger than 2 mm and less or equal to 63 mm.
groundwater	Water located beneath the ground surface in soil pore spaces and in the fractures of lithologic formations.

Term	Definition
habitat	Natural environment in which a species of animal, plant or other organism lives.
halite	Mineral form of sodium chloride (NaCl).
heritage resource	An archaeological or paleontological object, or a property of interest for its historical, cultural, environmental, archaeological, paleontological, aesthetic, or scientific value.
herpetofauna	Amphibians and reptiles.
hydraulic conductivity	Ease with which water can move through pore spaces of fractures in a medium.
hydrogeology	Area of geology that deals with the distribution and movement of groundwater in the soil and rocks of the Earth's crust.
hydrology	Study of the movement, distribution, and quality of surface water.
insolubles	Material that is not easily dissolved by water.
interbed	A layer or stratum that is between two other layers.
intertill	Material deposited between glaciations.
interstadial	Stadials and interstadials are phases dividing the Quaternary period, the last 2.6 million years. Stadial are colder periods and interstadials are warmer.
kettle	A depression in glacial drift formed by the melting of a detached block of stagnant ice that was buried in the drift.
lacustrine	Pertaining to, produced by, or inhabiting a lake or lakes.
lentic	Refers to stationary or relatively still water.
limestone	Sedimentary rock consisting chiefly of the mineral calcite (calcium carbonate, $CaCO_3$), with or without magnesium carbonate.
lithology	The description of rocks on the basis of such characteristics as colour, mineralogical composition, and grain size.
lithostatic pressure	The pressure or stress imposed on a layer of soil or rock by the weight of the overlying material.
loam	A rich, permeable soil composed of a mixture of relatively equal and moderate proportions of clay, silt and sand particles, usually containing organic matter.
matrix	Finer-grained material enclosing, or filling the interstices between, the larger grains or particles of a sediment or sedimentary rock.
material free-fall transfer points	Locations along a conveyor route where material moves from a higher elevation to a lower elevation. This is where a considerable portion of dust or emissions can be generated.
mechanical vapour recompression	Evaporation method where a blower or air compressor is used to increase the pressure of the vapour produced, which causes an increase in condensation temperature. This in turn causes the vapour to heat the liquid the vapour was produced from.
mitigation	In reference to the preservation of environmental components, actions, strategies, or measures implemented to avoid or reduce the severity of impacts to the environment.
mother liquor	Part of a liquid solution that is left over after crystallization.
native prairie	Grassland ecosystem. This is a threatened ecosystem and covers only a small fraction of its historic range.
non-conformable	An unconformity between rock/soil units representing a break in geological time.
organic	Pertaining or relating to a compound containing carbon, especially as an essential component; organic compounds usually have hydrogen bounded to the carbon atom.
Paleozoic	The earliest of three geologic eras of the Phanerozoic eon. The Paleozoic spanned from roughly 542 to 251 million years ago and is subdivided into six geologic periods; from oldest to youngest they are: the Cambrian, Ordovician, Silurian, Devonian, Carboniferous, and Permian.
particulate matter	Microscopic solids or liquids suspended in the air.
piezometer	Small diameter water well used to monitor the groundwater in the materials it is

Term	Definition
	installed in.
permeability	The capacity of a porous rock, sediment, or soil for transmitting a fluid; it is a measure of the relative ease of fluid flow under unequal pressure.
Pleistocene	Geological epoch which lasted from 2.58 million years ago to 11,700 years ago.
preglacial	Pertaining to the time preceding a period of glaciation.
precipitate	Creation of solid material from a solution.
proglacial	Immediately in front of or just beyond the outer limits of a glacier or ice sheet, generally at or near its lower end.
propagule	A vegetative structure of a plant that can become detached from a plant and can grow into a new plant.
Quaternary	Geologic time period, began 2.58 million years ago to the present.
reagent	A substance or mixture that is used in chemical analysis or reactions.
reclamation	The process of reconverting disturbed land to its former use or other productive use. In other words, to return an industrial or disturbed site to a more natural state.
remediation	The process of removal of pollution or contaminants from environmental media, such as soil, groundwater, sediment, or surface water.
residual effects	Effects that remain after applying the proposed mitigation.
riparian zone	An interface zone between land and water. Typically this refers to river and stream banks and has a unique vegetation community.
sand	Soil particles larger than silts, with diameters greater than 0.063 mm and less than 2 mm in diameter.
scrubbers	A diverse group of air pollution control devices that remove particulates and/or gases from industrial exhaust streams.
sedge	Family of graminoid flowering plants that superficially resemble grasses.
sediment	Solid particles of material broken down from weathering and erosion, and transported by wind, water, or ice.
setback	The distance in which construction activities are to be set back from an environmentally sensitive feature.
shale	A fine-grained sedimentary rock, the original constituents of which were clay minerals or muds. Characterized by its thin laminate breaking with an irregular curving fracture, often splintery and usually parallel to the often-indistinguishable bedding plane.
silt	Soil particles larger than clay but smaller than sand particles. Defined by ISO14688 as particles between 0.002 mm and 0.063 mm in diameter.
stratified	Formed, arranged, or laid down in layers or strata.
stratigraphy	A field of geology that studies rock and soil layers and layering.
subsidence	The motion of the surface of the earth as it shifts downward that results in a decreased elevation (sinking). This can result from mining activities as the earth shifts to fill in the space made by mining.
sylvite	Mineral form of potassium chloride (KCl).
sylvinite	A form of potash ore that is a mixture of sylvite (KCl) and halite (NaCl).
Tertiary	Geologic time period, began 66 million years ago and ended 2.58 million years ago.
thalweg	The centreline or deepest portion of a channel.
thickener	Process used to concentrate solids (separation of liquids and solids) by settling.
tributary	A small stream or river that flows towards and merges with another watercourse.
unconformable	Representing a break or gap in the geologic record.
Valued Ecosystem Component	Aspects of the natural and socio-economic environment that are valued because of their ecological, scientific, social, cultural, economic, archaeological or aesthetic importance and which have a potential to be affected by the project

Term	Definition
wetland	A land area that is permanently or seasonally saturated with water such that it takes on the characteristics of a distinct ecosystem.
wireline log	The acquisition and analysis of geophysical data as a function of borehole depth.

Attachment 1

Potential Permits/Licences/Approvals/Authorizations

Table A.1 Potential additional permits/approvals/licences

Permit / Approval / Licence	Description	Regulatory Agency / Legislation
Federal		
Fisheries Act Self Assessment / Review / Authorization	The Fisheries Act requires that projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada (DFO). This applies to work being conducted in or near waterbodies that support fish that are part of or that support a commercial, recreational or Aboriginal fishery [Section 35(1)]. If your project is not listed as one of the exempt waterbody types, and its activities are not listed on the list of criteria where DFO review is not required, you must submit a request for review to DFO before proceeding further and may or may not require an authorization. The Act also prohibits the deposition of deleterious substances in a waterway [Section 36(1) to 36(6)]. DFO encourages self-assessment.	Fisheries and Oceans Canada (DFO) • *The Fisheries Act*
Provincial		
Environmental Protection Plan	Facilities with an industrial source are required to submit environmental protection plans to MOE prior to operation.	MOE, Environmental Protection Branch • *The Environmental Management and Protection Act* (2010) • The Environmental Management and Protection (Saskatchewan Environmental Code Adoption) Regulations
Aquatic Habitat Protection Permit	A permit is required: to alter the bed, bank or boundary / shoreline of any waterbody or watercourse; to remove or add any material to the bed, bank or boundary / shoreline of any waterbody or watercourse; or to remove vegetation from the bed, bank or boundary / shoreline or any waterbody or watercourse.	MOE • *The Environmental Management and Protection Act* (2010) • The Water Regulations (2002)
Research Permit	A permit is required to conduct surveys, research, or other activities to detect or observe and species, wild species or wild species at risk, or assess the habitat of any species, wild species or wild species at risk for a commercial, scientific, or academic purpose	MOE • *The Wildlife Act, 1998* • The Wildlife Regulations
Boiler Licences / Permits - Installation or Repair / Alteration Permit, Licence to Operate	A permit is required to install, alter, or repair a boiler. A licence is required to operate a boiler (called a Certification of Qualification). Operation of a boiler also requires an Inspection Certificate.	TSA • The Boiler & Pressure Vessel Act (1999) • The Boiler & Pressure Vessel Regulations (2007) • The Technical Safety Authority of Saskatchewan Act (2010)
Decommissioning & Reclamation Plan / Financial Assurance	An EIS requires a proponent to address preliminary decommissioning, reclamation and closure plans. Section 9(1) of the regulations require a financial assurance in the form and amount acceptable to the minister for the construction, alteration, operation, temporary closure, closure or decommissioning of a facility in section 8(2). D&R plans are typically required to be updated every five years.	MOE, Environmental Protection Branch • *The Environmental Management and Protection Act* (2010) • The Environmental Management and Protection (General) Regulations • The Mineral Industry Environmental Protection Regulations, 1996
Drainage Control	Permit required to construct and operate drainage works.	WSA • *The Drainage Control Act* • The Drainage Control Regulations (1981)
Heritage Resource Impact Assessment (HRIA) Permit or 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 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 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.	Ministry of Parks, Culture and Sport, Heritage Conservation Branch • *The Heritage Property Act* (1980)
Approval to Construct, Alter or Extend / Approval to Operate / Approval to Decommission	Approval must be received to construct, install, alter, extend, operate or temporarily close a pollutant control facility or decommission and reclaim a mining site. Approval may be contingent on first receiving approval under The Environmental Assessment Act.	MOE, Environmental Protection Branch • *The Environmental Management and Protection Act (2010)* • The Mineral Industry Environmental Protection Regulations, 1996
Pipeline Licence - Licence to Construct, Alter, Operate, or Abandon a Pipeline	No person shall construct, alter, operate or abandon a pipeline or discontinue the operation of a pipeline unless that person holds a licence authorizing the construction, alteration, operation, abandonment or discontinuation.	MECON • *The Pipelines Act*
Sewage Works Permits - Permit to Construct a Sewage Works / Permit to Operate a Sewage Works	Applies to construction and operation of sewage works regulated by MOE, including sewage works with a treatment capacity of greater than 18 m3 per day. Construction of a smaller system below the above threshold is permitted through the Saskatoon Health Region.	MOE • *The Environmental Management and Protection Act (2010)* • The Water Regulations (2002)

Storage Facility - Approval to Construct or Upgrade and Operate a Storage Facility / Approval to Decommission a Storage Facility	Ministerial approval is required to: store hazardous substances or waste dangerous goods; and/or construct, install, alter or expand a storage facility for the storage of hazardous substances or waste dangerous goods.	MOE • *The Environmental Management and Protection Act (2010)* • The Hazardous Substances and Waste Dangerous Goods Regulations (1989)
Water Rights Licence	Required to use water for any construction of works or operation including for diversion of surface water, groundwater pumping, groundwater investigation, well drilling, water use from both surface and groundwater sources.	WSA • *Water Security Agency Act (2005)* • Ground Water Regulations (1966) • Saskatchewan Watershed Authority Regulations (2006) • *Provincial Lands Act (1979)* • *The Environmental Management & Protection Act (2010)*
Approval to Construct / Operate Works	Required to convey / impound water from both surface and groundwater sources.	WSA • *Water Security Agency Act (2005)* • Ground Water Regulations (1966) • Saskatchewan Watershed Authority Regulations (2006) • *Provincial Lands Act (1979)* • *The Environmental Management & Protection Act (2010)*
Well Licence / Well Injection Licence	A licence is required to drill, operate and produce. A licence is required to dispose of non-oil and -gas wastes via a disposal or injection well. The application requires a complete plan for the proposed disposal.	MECON, Well Licensing Unit • *The Oil & Gas Conservation Act (1979)* • The Oil & Gas Conservation Regulations (2012)
Municipal		
Building Permit	A permit will be issued under a building bylaw authorizing construction of all or part of any building or an alteration to an existing building is planned. Fire prevention and protection systems approval (fire protection services in place for all construction work) must be demonstrated as a part of the application for a building permit.	Rural Municipality • *The Planning & Development Act (2007)* • *Fire Prevention Act (1992)* • Fire Code Regulations (1993)
Development Permit	Development Permit authorizes the carrying out of any building, engineering, exploration or any development or operation, in, on, or overland, or the making of any material change in the use of any building/land.	Rural Municipality • *The Planning & Development Act (2007)* • *The Municipalities Act (2006)*

Attachment 2

Phase I Community Engagement Materials

- Notification Letters
- Open House Advertisements
- Open House Posters
- Open House Presentation
- Open House Information Sheet
- Open House Questionnaire

Public Notification

Proposed Broadview Project

Canada Golden Fortune Potash Corporation (CGFPC) is proposing to develop a new solution potash mine in southeast Saskatchewan. The Broadview Project is located on CGFPC's KP437 potash permit approximately 100 km east of Regina and 12 km south of the Town of Grenfell (See Reverse for Map). The KP437 potash permit is currently being assessed. CGFPC has retained SNC-Lavalin Inc. (SNC-Lavalin) to conduct an Environmental Impact Assessment (EIA) for the proposed project.
SNC-Lavalin is distributing this notification letter to communities and stakeholders surrounding the project area to provide notification of the project and studies being conducted, to present a map of the project area, and to provide contact information for SNC-Lavalin and CGFPC.

Environmental Assessment Process

Minimization of the environmental impact of the proposed project is a key consideration for both CGFPC and SNC-Lavalin. As a requirement of the EIA, numerous submissions must be made to the Ministry of Environment, including an Environmental Impact Statement (EIS). The EIS is the report that documents the projects effects and mitigation measures and is used by regulators in the decision making process. Ministry of Environment approval must be given for the proposed project to proceed. Environmental studies for the Broadview Project commenced in November 2014 and are expected to continue throughout 2017.

Public Participation

A major component of the EIA processes is public engagement. Throughout the EIA process, SNC-Lavalin will assist CGFPC with public engagement. The objective of public engagement is to inform and update community members and stakeholders on the project, and provide opportunities for individuals and groups to ask questions, discuss the project and provide feedback. Information gathered from public engagement, including comments, concerns, and ideas to minimize effects, will be considered in project planning and design. This information will be included in the EIS.

To learn more about The Broadview Project, CGFPC, SNC-Lavalin, Project Updates and Open Houses scheduled in your area please visit the proposed project website at **www.broadviewproject.ca,** or contact us directly at **info@broadviewproject.ca**.

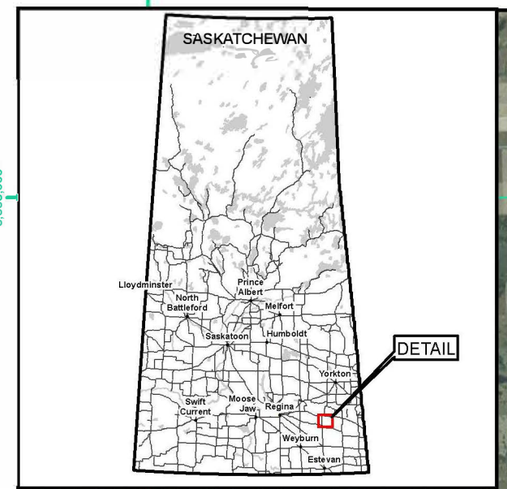
Sincerely,

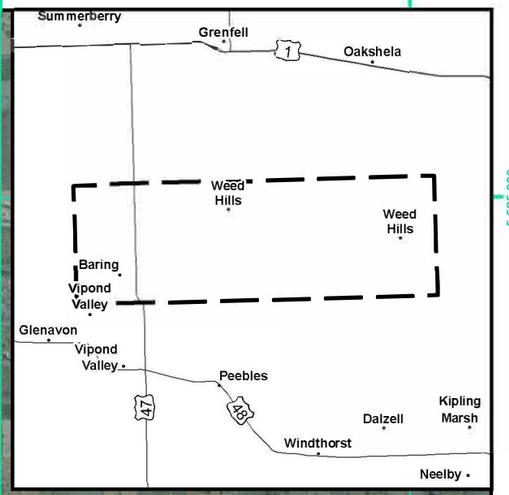
Brad Schiele
Public Engagement Advisor
SNC-Lavalin Inc.

150-203 Packham Avenue
Saskatoon, SK. S7N 4K5
Tel: 306-242-2822
brad.schiele@atlheritage.com

Junjie Liu
Project Manager
Canada Golden Fortune Potash Corp.

300-402, 21st Street East
Saskatoon, SK. S7K 0C3
cgfpc.junjieliu@gmail.com





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LEGEND

BROADVIEW PROJECT / KP 437

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, SASKADMIN2013, SASKGRID2013.
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.
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6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.
7. THIRD PARTY DRILLING RECORDS ARE PLACED IN THE GEOGRAPHIC CENTER OF THE AVAILABLE LEGAL LAND DESCRIPTION AND THEIR LOCATION WILL BE SUBJECT TO ERROR.

REFERENCE DRAWINGS

DWG No.	DATE	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DRN BY	CHK

0 900 1,800 3,600 5,400 7,200 METRES

SCALE: 1:150,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
CANADA GOLDEN FORTUNE POTASH CORPORATION	BROADVIEW

TITLE

SITE PLAN

DES BY	GP	DRN BY	FT	DATE	2015 06 03	FIG No.		REV	0
CHK BY		APP BY		DWG No.	624190-TPP-H-01-E-003			11x17	

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19 January 2017

Cowessess First Nation
Box 100
Cowessess, Saskatchewan S0G 5L0

RE: Proposed Broadview Project – Community Notification
Canada Golden Fortune Potash Corporation

Dear Chief Cadmus Delorme and Council,

Introduction

Canada Golden Fortune Potash Corporation (CGFPC) is proposing to develop a new solution potash mine in southeast Saskatchewan. The Broadview Project is located on CGFPC's KP437 lease approximately 100 km east of Regina and 12 km south of the Town of Grenfell (Attachment 1). The KP437 lease is currently being assessed. CGFPC has retained SNC-Lavalin Inc. (SNC-Lavalin) to conduct an Environmental Impact Assessment (EIA) for the proposed project.

SNC-Lavalin is distributing this notification letter to communities and stakeholders surrounding the project area to provide notification of the project and studies being conducted, to present a map of the project area, and to provide contact information for SNC-Lavalin and CGFPC.

Environmental Assessment Process

Minimization of the environmental impact of the proposed project is a key consideration for both CGFPC and SNC-Lavalin. As a requirement of the EIA, numerous submissions must be made to the Ministry of Environment, including an Environmental Impact Statement (EIS) to achieve project approval. Heritage Resources Impact Assessments are a major component of the EIS, and are completed to record and avoid heritage resources (e.g. archaeological sites) during project planning. The EIS is the report that documents the projects effects and mitigation measures and is used by regulators in the decision making process. Environmental and Heritage Assessments for the Broadview Project commenced in November 2014 and are expected to continue throughout 2017.

Public Participation

A major component of the EIA processes is First Nation and Métis engagement. Throughout the EIA process, SNC-Lavalin will assist CGFPC with engaging First Nation and Métis community leaders near the proposed project area. The objective of engagement is to inform and update community leaders on the project, and provide opportunities for community leaders to ask questions, discuss the project and provide feedback. The engagement process is also used to build strong working relationships between involved groups, and learn about each

community's customs and traditions. Information gathered from community feedback, including comments, concerns, and ideas to minimize effects, will be considered in project planning and design. This information will be included in the EIS.

We will also be sending a project information package to your office which outlines the proposed Broadview Project in more detail once the Technical Proposal has been submitted to the regulators. SNC-Lavalin will contact your office to schedule a preliminary meeting with Chief Delorme and Council to introduce ourselves and discuss the proposed project. Chief and Council meetings for all communities interested in participating are tentatively planned for winter/spring of 2017. In addition, members of your community are encouraged to attend open houses scheduled in your area throughout the public engagement processes.

To learn more about The Broadview Project, CGFPC, SNC-Lavalin, Open House Schedule or the EIA Process please visit the proposed project website at **www.broadviewproject.ca,** or contact us directly at **info@broadviewproject.ca**.

Please feel free to contact SNC-Lavalin for any questions regarding public engagement and CGFPC for any questions regarding the proposed project.

Sincerely,

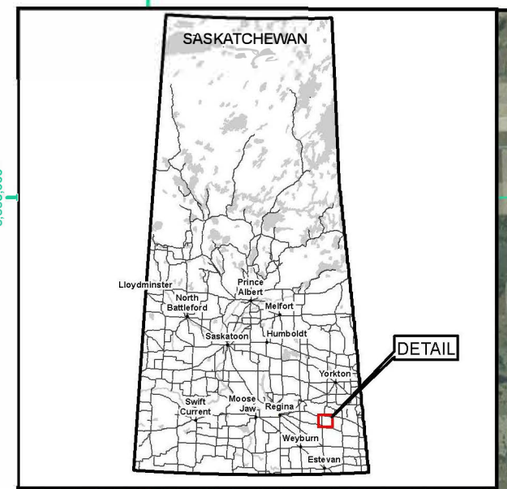
Brad Schiele
Public Engagement Specialist
SNC-Lavalin Inc.

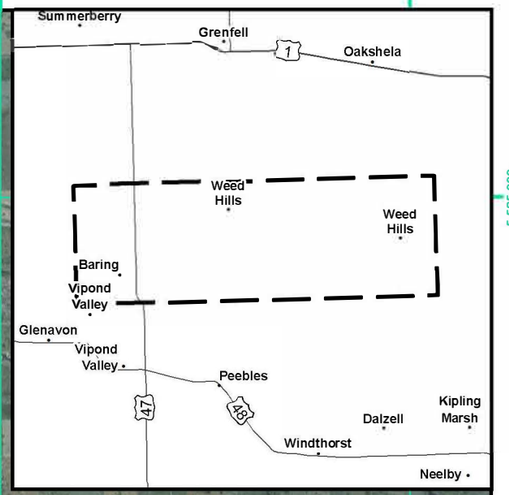
150-203 Packham Place
Saskatoon, Saskatchewan S7N 4K5
Tel: 306-242-2822
brad.schiele@atlheritage.ca

Junjie Liu
Project Manager
Canada Golden Fortune Potash Corp.

300-402, 21st Street East
Saskatoon, Saskatchewan S7K 0C3
cgfpc.junjieliu@gmail.com

Attachment 1: Location Map





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LEGEND

BROADVIEW PROJECT / KP 437

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REVISIONS

REV	DATE	DESCRIPTION	DRN BY	CHK

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SCALE: 1:150,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
CANADA GOLDEN FORTUNE POTASH CORPORATION	BROADVIEW

TITLE

SITE PLAN

DES BY	GP	DRN BY	FT	DATE	2015 06 03	FIG No.		REV	0
CHK BY		APP BY		DWG No.	624190-TPP-H-01-E-003			11x17	

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19 January 2017

Town of Broadview
PO Box 430
Broadview, Saskatchewan S0G 0K0

RE: Proposed Broadview Project – Community Notification
Canada Golden Fortune Potash Corporation

Dear Mayor Mills and Councillors,

Introduction

Canada Golden Fortune Potash Corporation (CGFPC) is proposing to develop a new solution potash mine in southeast Saskatchewan. The Broadview Project is located on CGFPC's KP437 lease approximately 100 km east of Regina and 12 km south of the Town of Grenfell (Attachment 1). CGFPC has retained SNC-Lavalin Inc. (SNC-Lavalin) to conduct an Environmental Impact Assessment (EIA) for the proposed project.

SNC-Lavalin is distributing this notification letter to communities and stakeholders surrounding the project area to provide notification of the project and studies being conducted, to present a map of the project area, and to provide contact information for SNC-Lavalin and CGFPC.

Environmental Assessment Process

The EIA includes the preparation and submission of a Technical Proposal, Terms of Reference, and Environmental Impact Statement (EIS) pursuant to *The Environmental Assessment Act* (the Act). It also includes a public engagement program.

The EIA process begins when a proponent submits a Technical Proposal to the Environmental Assessment Branch of the Ministry of Environment for screening in order to determine whether the proposed project is likely to be considered a development under the Act, in which an EIA will be required. The Technical Proposal will introduce the project and provide a discussion of potential environmental and socio-economic effects and mitigation measures. CGFPC will also develop the Terms of Reference to outline the specific studies they plan to undertake and how this information will be presented in the EIS.

The EIS is the report that documents the project effects and mitigation measures and is used by the regulators in the decision-making process. The anticipated environmental assessments that will be included in the EIS are:

- Hydrogeological investigation;
- Biophysical assessment including soils, vegetation, aquatics, wildlife and habitat;
- Hydrology assessment and subsidence analysis;
- Air, dustfall and noise assessments;
- Traffic impact assessment;
- Environmental risk assessment;
- Socio-economic assessment; and
- Heritage Resources Impact Assessment.

Public Participation

Environmental studies commenced in November 2014 and are expected to continue throughout 2017. During this time, SNC-Lavalin will assist CGFPC with public engagement. Our objective is to inform and update community members and stakeholders on the project, and provide opportunities for individuals and groups to ask questions, discuss the project and provide feedback. Information gathered from community feedback, including comments, concerns, and ideas to minimize effects, will be considered in project planning and design. This information will be included in the EIS.

We will also be sending your office a project information package outlining the proposed Broadview Project in more detail once the Technical Proposal has been submitted to the regulators. SNC-Lavalin will then contact administration offices to schedule preliminary meetings with communities that have responded with interest in participating in the engagement process. In addition to meeting with community representatives, public open houses for all communities interested in participating are tentatively planned for winter/spring of 2017.

In Summary

SNC-Lavalin has prepared this notification letter to inform you of the Broadview Project and to begin the public engagement process. Please feel free to contact SNC-Lavalin for any questions regarding public engagement and CGFPC for any questions regarding the proposed project.

To learn more about The Broadview Project, CGFPC, SNC-Lavalin, Open House Schedule and the EIA Process please visit the proposed project website at **www.broadviewproject.ca**, or contact us directly at **info@broadviewproject.ca.**

Sincerely,

Brad Schiele
Public Engagement Advisor
SNC-Lavalin Inc.

150-203 Packham Avenue
Saskatoon, Saskatchewan S7N 4K5
Tel: 306-242-2822
brad.schiele@atlheritage.ca

Junjie Liu
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300-402, 21st Street East
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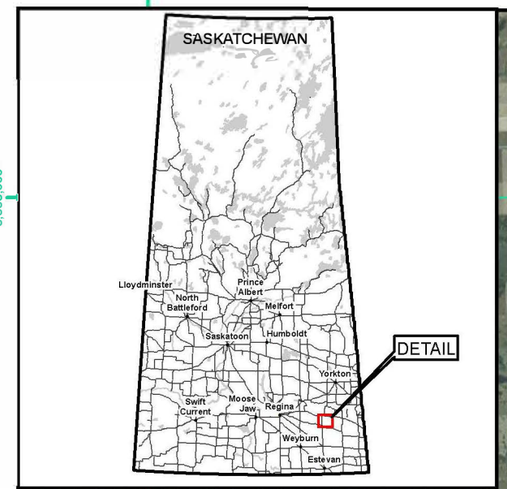

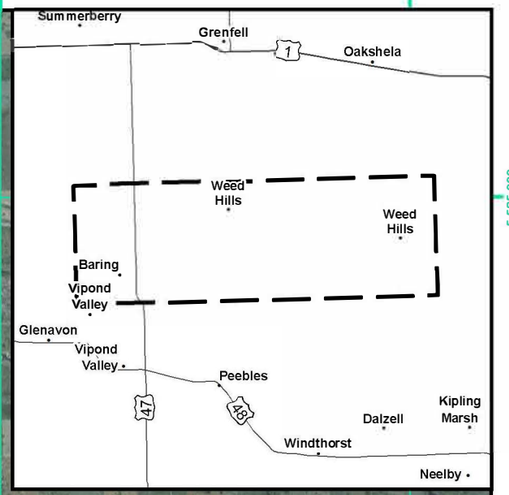

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LEGEND

BROADVIEW PROJECT / KP 437

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Vandals paint graffiti in towns

Public works cleans up mess

By Andrea Nicholl
news@grenfellsunexpress.com

Citizens in Grenfell and Broadview are concerned after vandals defaced public and private property in the two communities.

Broadview resident Alec Wyllie said spray-paint covered the east and west walls of the community hall, rear exterior of the Broadview Bakery, and personal properties including vehicles, out buildings, and a travel trailer. According to Wyllie, the vandals marked the properties sometime on or around April 10, while reports of vandalism in Grenfell surfaced the week prior.

At the April 6 Grenfell council meeting, Coun. Tyler Thomlinson relayed residents' concerns about properties that had been painted with graffiti. Chief Administrative Officer (CAO) Dean Yaremchuk responded to the concern, advising council the town can address vandalism on public property but private property cleanup is the responsibility of owners.

"We formally haven't made a complaint to the RCMP, but will send them information regarding the concern that we received," said Yaremchuk. "Any graffiti on public property has been removed and cleaned by our staff, and that will be an ongoing job for us, however, the private property we can't do too much about."

Broadview town foreman Brent Bagshaw said the public works department responded and remedied the situation immediately, and reported the incidents to the RCMP. He said the cleanup to remove the vandalism not only takes time and resources but costs the municipality money.

Vandals have targeted both private and public property recently, painting graffiti on buildings and vehicles in Grenfell and Broadview. While the Town of Grenfell and Town of Broadview are monitoring and cleaning the graffiti from public property, cleaning up vandalized private property is the responsibility of owners.

"I'm trying to arrange a meeting with the RCMP, I think that's our next step," said Broadview's Mayor Carol Mills. "We have to get to the bottom of this."

Broadview RCMP, which polices Broadview, Grenfell, Whitewood and surrounding communities, will release its 2017/18 annual performance plan in the coming weeks. The plan, which evaluates and addresses community-specific issues pertaining to crime, may include a target to reduce/eliminate public mischief.

Glenavon recognizes supporters

By Andrea Nicholl
news@grenfellsunexpress.com

The Village of Glenavon is celebrating the rejuvenation of its Sportsplex and the generosity of its citizens.

The Glenavon and District Sportsplex board hosted a community appreciation supper on April 6 to recognize the generosity of the many businesses and residents who contributed to the renovations and repairs of the combination skating and curling rink.

"We just send a big thank you to those who donated," said Nancy Wozniak, Sportsplex board secretary-treasurer. "If we didn't get these donations our rink may have been shut down; it was a get it done, or else situation."

The Sportsplex board fundraised through 2016 and part of 2017 for roof replacement, and necessary repairs including drywall, doors, and eavesdrops. The community banded together to raise $32,533 for the rink — paying for a significant portion of the roof ($42,352) and additional repairs.

"These donations helped save our rink and keep it alive," said Wozniak.

Western Financial Group, Embridge Gas, and local contractor Fred Thue Construction made donations of $5,000 each to help offset the costs of repairs.

"Giving back to the community where we live and work gives us great pride," said Gloria Scott, Wolseley branch manager of Western Financial Group. "It is a great honour to be able to give these funds to help with the renovations and be able to contribute to a project that all members of the community will be able to enjoy."

Sportsplex board president Jeff Mish said while the number of groups using the ice for hockey, skating and curling has declined, it is an important asset to the community.

"We don't have a whole lot of people using the ice surface anymore so we don't have a lot of people paying ice rental or skating fees so we just hoped the public would help with fundraising to keep it going," he said, adding the board was elated with the community's support. "It's a nice place to have for people to go."

Canada Day poster winners

The Canada Day 150 Committee held a Canada Day poster contest for students at Grenfell Elementary Community School. The winning posters will be placed in a 25-year time capsule, along with other memorable, during the Canada Day festivities. Committee members Colin Traub and Bobbi Jo Urschel presented the students with first, second, and third prizes. Back row: Brooklyn Reiger, Angeley McLean, Kaden Bowen, Breelyn Guidry, Shea Hubbard, Braden Bolingbroke. Middle: Levi Schick, Xavier Doane, Darienn Wolfe. Front: Zachary Garvey, Tanner McCormack, Arial Guevara Garcia.

Alberta deer poacher fined

An Alberta resident and former hunting television personality was recently fined $5,600 after a Broadview provincial court judge found him found guilty on several charges under The Saskatchewan Wildlife Act and Regulations.

In 2011, Alberta Fish and Wildlife officials contacted Saskatchewan Ministry of Environment conservation officers with reason to believe that a white-tailed deer had been illegally taken near Grenfell.

Saskatchewan conservation officers determined that a white-tailed buck had been shot in the wrong wildlife management zone and unlawfully taken back to Alberta.

Jason David, 43, of Hinton, Alta., was fined for hunting without a licence, being in unlawful possession of wildlife, the unlawful export of wildlife and falsifying his big game draw application.

NOTICE OF PUBLIC OPEN HOUSE

Canada Golden Fortune Potash Corp (CGFPC) – Broadview Project

CGFPC is proposing to develop a solution potash mine (Broadview Project) located south of Grenfell, SK. As part of the public engagement process, CGFPC will be presenting project details at four open houses scheduled:

- **April 25, 2017 - Town of Broadview (4 p.m. to 8 p.m.)**
  Happy Hours Club

- **April 26, 2017 - Town of Grenfell (4 p.m. to 8 p.m.)**
  Legion Hall

- **May 02, 2017 - Town of Kipling (4 p.m. to 8 p.m.)**
  Kipling Community Centre

- **May 03, 2017 - Village of Glenavon (4 p.m. to 8 p.m.)**
  Glenavon Centennial Hall

Anyone interested in the proposed Broadview Project is encouraged to attend the public open houses.

For information, please contact:
Brad Schiele p: 306-220-6409 e: info@broadviewproject.ca

Information on this project is available on the Broadview Project's website: www.broadviewproject.ca

Advertisement placed in the Indian Head-Wolseley News in the 24-Apr-17 and 1-May-17 weekly editions

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Advertisement placed in the Regina Leader Post on Saturday 22-Apr-17 and Saturday 29-Apr-17

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Vol. 122 Issue No. 44
Agreement # 40006725
Monday, May 1, 2017

Students Pitch-In to clean up Grenfell

Pitching in to clean up
Brooklyn Manovich was just one of the many excited students out picking up litter during the annual Pitch-In Week, presented and participated in by Grenfell Elementary Community School and Grenfell High School students April 22 to 29. Andrea Nicholl/Grenfell Sun Express

Celebration of Earth Day

By Andrea Nicholl
news@grenfellsunexpress.com

Elementary and high school students have done their part to beautify Grenfell and save the environment by pitching in and picking up litter throughout the community.

Earth Day was held on April 22, with more than six million Canadians making a conscious effort to reduce their environmental footprint. Students at Grenfell Elementary Community School (GECS) and Grenfell High School (GHS) celebrated, and participated in the annual Pitch-In Week from April 22 to 29.

The environmental efforts saw participation by more than 300 students and staff and resulted in the collection of litter from ditches, yards, and community spaces.

Elementary school co-ordinator Deb Peterson said the annual clean up has been running more than 14 years and was initiated when the schools became community schools.

"When we became community schools it became an event that we would work with the community on," she explained. "Sometimes kids, especially the teenagers, get a bad rap and this shows people that no, they are good kids and they're out helping and contributing to their community."

Coun. Constance Mackenzie, a retired teacher and chair of council's environmental services committee, said the Pitch-In Week helps children appreciate and become more aware of nature's value.

"It is a long range process but pitching in and caring for the environment while their young wakes up their respect and love for the environment," she explained. "Hopefully that translates into a more mature respect for the environment when they grow to become adults."

While the Pitch-In Week is spearheaded and participated in by elementary and high school students, Mackenzie said the children carry the message home, making a difference in their own neighbourhoods.

"Kids can be a powerful force. When my own son was in school he learned about recycling and really took an interest... he preached about it at home and I finally bit in to it. Kids have a way of pushing their parents into doing things."

Not only does the Pitch-In Week promote environmental awareness amongst the students, but it also teaches the children and youth to take pride in their community, said Peterson.

"It's their town and they can help look after it too."

Open houses held to present potash project

By Andrea Nicholl
news@grenfellsunexpress.com

Open houses were held last week to familiarize area residents and stakeholders of the proposed solution potash mine for a parcel of land 12 kilometres south of Grenfell.

The mine has been dubbed the Broadview Project and is proposed by Canada Golden Fortune Potash Corporation (CGFPC) and will cover approximately 281 square kilometres, across the RMs of Kinglsey and Chester.

The project is in the preliminary stages, undergoing assessment and feasibility studies, along with a public engagement process. Public engagement commenced in February with the distribution of 25,000 mailouts to residences in the scope of the project area, and has continued with consultations with First Nations communities and public open houses in Broadview, Grenfell, and Kipling.

"We want to build a good relationship and work with locals, so we came here today to introduce our project, listen to the people, and get to know each other as much as we can," CGFPC CEO Michael Xiao said through his project manager and translator Junjie Liu.

Early engagement and public transparency has been a priority of CGFPC from the beginning, with hopes that residents and stakeholders will have a forum to ask questions, voice concerns, and provide feedback.

"We came here early because we want to know are there questions and are there concerns so during the design process and planning stage we can minimize any impact to locals," said Xiao. "Without local support we don't think we will succeed because, even for a small project, we have to work in the community and with locals for a long time — for decades."

Xiao and Liu said more than 100 visitors attended the Broadview and Grenfell open houses, held April 24 and 25, with residents and stakeholders expressing support and some concerns related to transportation and water sourcing.

Brad Schiele, public engagement specialist with SNC-Lavalin, said the concerns are valid and will be addressed during a second series of open houses when possible site locations are identified and particulars can be answered. He said these first open houses are simply an effort to introduce the group and mining project.

Matthew Tyree, operations manager of Environmental Impact Assessment and Community Engagement at SNC-Lavalin, introduced the Broadview Project to area residents during a series of public open houses held in Broadview, Grenfell, and Kipling last week. The proposed solution mine could be operational as soon as 2019.
Andrea Nicholl/Grenfell Sun Express

"I think this will be good for Grenfell and for Broadview," said area resident Vern Sens. "It will be good for our businesses, restaurants and shops."

The information gathered from the public consultations will be considered in project planning and design, and will be included in the Environmental Impact Statement (EIS) submitted to the Ministry of Environment.

The hope, said Liu, is to have a second series of public open houses in the fall and to submit the EIS to the Ministry by the fourth quarter of 2017; government's project approval or denial should be known in early 2018.

While there is no definitive timeline, if all goes smoothly, CGFCP is projecting an operating date of 2019 or 2020.

For more information visit broadview-project.ca

Welcome

to the Broadview Project

Purpose of this Open House

- Introduce the proposed Broadview Project
- Explain the Provincial Environmental Assessment process
- Provide information on our ongoing environmental and feasibility studies
- Receive feedback, comments, concerns, and questions regarding the project

Community engagement is an important part of the Environmental Assessment process.

We encourage you to take this opportunity to review the display boards, speak with representatives from CGFPC and our consultant team, ask questions, and provide comments on the provided comment form.

Canada Golden Fortune Potash Corporation

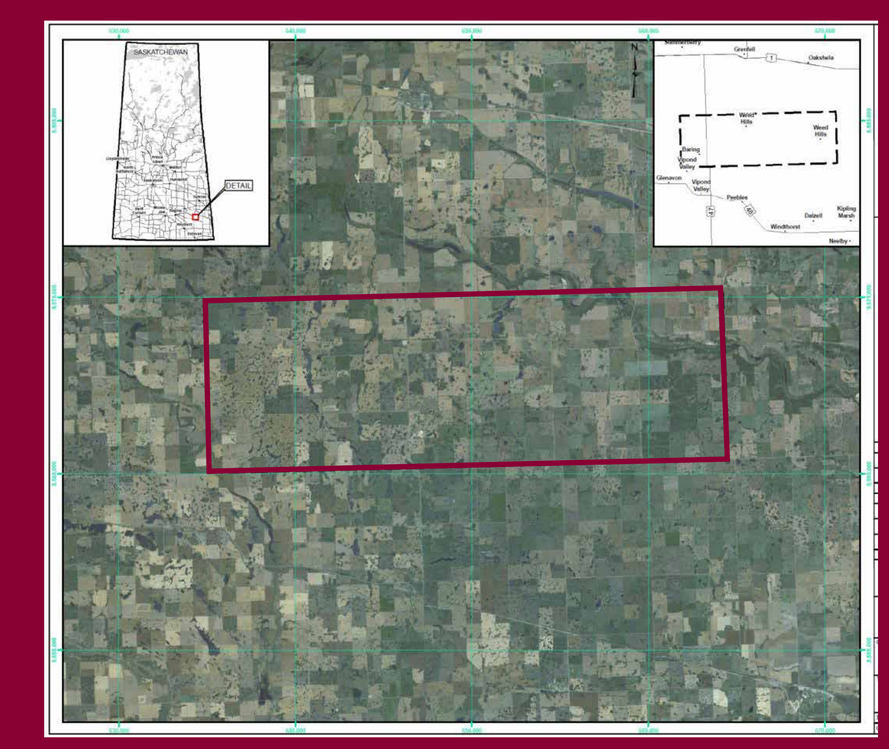
Canada Golden Fortune Potash Corporation (CGFPC) is a private resource company engaged in the exploration and development of potash mineral deposits in Saskatchewan. CGFPC's head office is located in Saskatoon, SK. CGFPC owns 100% of the crown mineral rights on two potash permits (KP437 and KP442), and their goal is to develop a potash solution mine in Saskatchewan.

SNC-Lavalin Inc. (SNC-Lavalin) was retained by CGFPC to provide environmental and engineering services for the project. Founded in 1911, SNC-Lavalin is one of the leading engineering and construction groups in the world and a major player in the ownership of infrastructure. Our Saskatchewan team of leading environmental specialists, earth scientists, and engineers specialize in consulting for the Saskatchewan potash mining industry.

Broadview Project

Oxbow

金圣
CGFPC



KP 437 Potash Permit Location

ABOUT THE BROADVIEW PROJECT

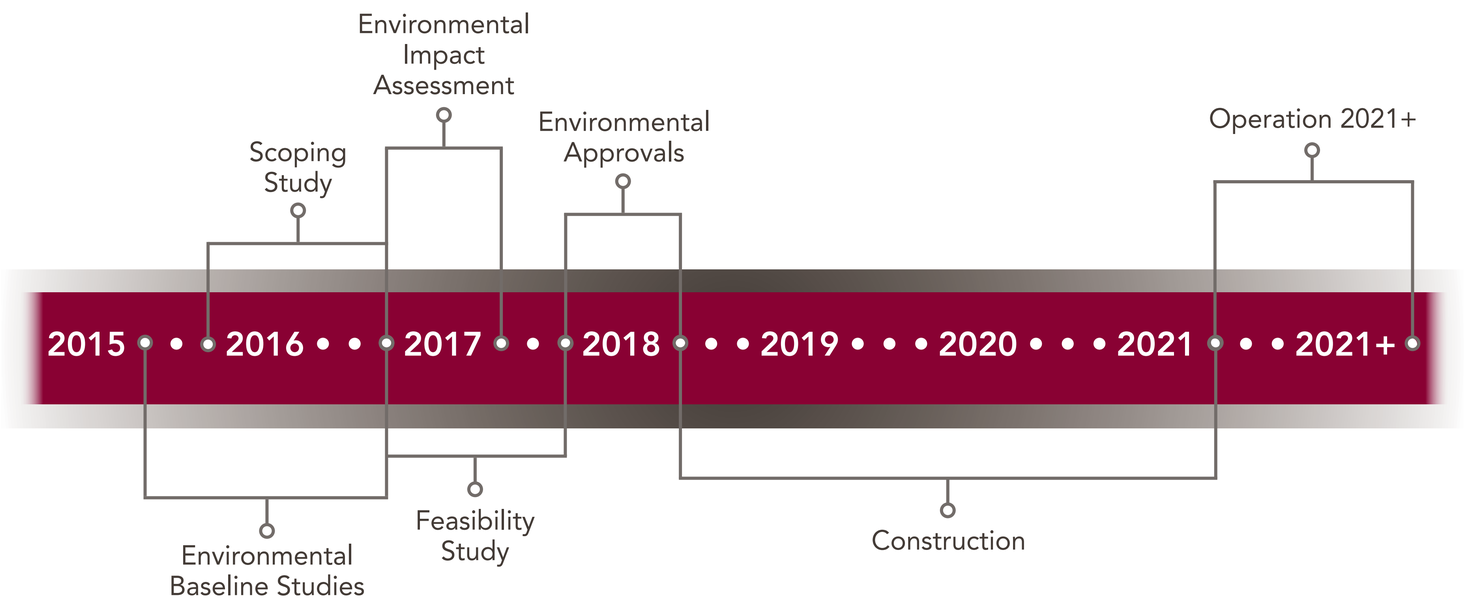
- Proposed greenfield solution potash mine
- Capacity of approximately one million tonnes potash/year
- Located within the KP 437 potash permit in the southern portion of the Saskatchewan potash district

ABOUT POTASH

- Potash is a mineral rich in potassium chloride (KCl)
- Sylvinite is the most important ore for potash production, and includes a mixture of sylvite (KCl) and halite (NaCl)
- Potassium from potash is used to produce fertilizers that help meet the growing global demand for food
- Approximately 95% of the world's potash is used as fertilizer

EMPLOYMENT AND ECONOMY

- Benefits will include the creation of jobs, purchase of supplies and services, and payment of taxes and royalties
- Local workforce will be utilized wherever possible
- Local services and material sourcing will be used where feasible
- Peak construction could include up to 2,500 workers
- Site operations will have up to 180 employees

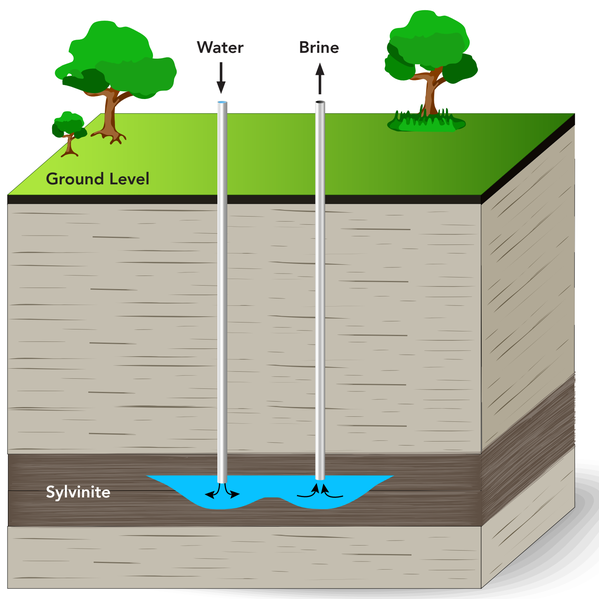


Solution Mining

"CGFPC is currently evaluating various scenarios for processing technology and water sourcing for the Broadview Project."

MINING WELL FIELD

- Mining wells and their surface facilities are grouped together in "pads" in the well field
- Wells are directionally drilled from the pad to the mining horizon
- Pipelines connect the pads to the processing facilities



- Solution mining is the preferred method of mining due to the depth of the potash between 1,500 m and 1,600 m
- Solution mining uses water to dissolve and extract underground water-soluble minerals (KCl and NaCl)
- Works by injection into the mining horizon to dissolve the sylvinite, then pumping the brine to the surface for processing
- Evaporation and crystallization are then used to recover the potash from the brine

PLANT SITE

Process Plant

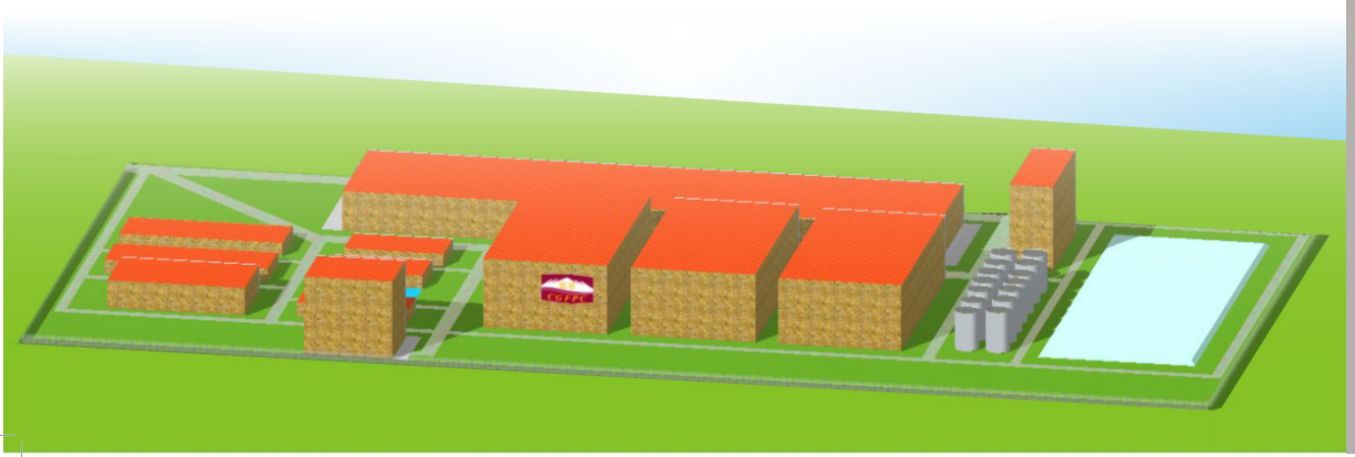
- Brine will be pumped from the well field to the process plant
- The plant will use evaporation and crystallization to precipitate KCl
- Potash will undergo drying, screening and compaction

Tailings Management Area

- Mother liquor barrels, a salt storage area, and disposal wells
- Waste (NaCl and $MgCl_2$) will be stored and disposed of via deep well injection

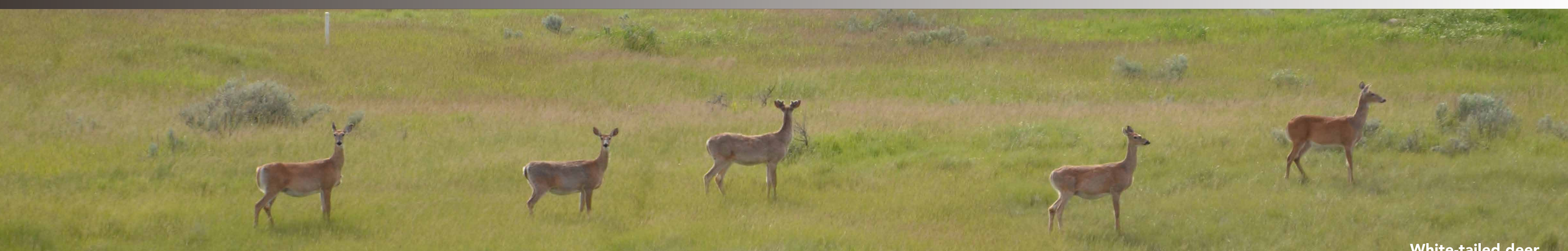
Product Storage and Shipping

- Annual production of one million tonnes of KCl
- Product will be conveyed from drying beds to the storage area
- Project will be shipped by rail and/or truck



UTILITIES AND SERVICES

Power	• SaskPower will supply a new transmission line
Natural Gas	• TransGas will provide a new low pressure pipeline
Raw Water	• Evaluating groundwater and surface water sources • Water requirements will range from approximately 3,000,000 tonnes/year to 3,500,000 tonnes/year • CGFPC will discuss water requirements with the Saskatchewan Water Security Agency
Communications	• SaskTel will provide all communications services



White-tailed deer

Environmental Assessment Process

BROADVIEW PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

- Baseline environmental studies commenced in 2015 and further assessments are ongoing
- Potential interactions between the project and the environment will be evaluated
- Mitigation measures will be incorporated into project design

NEXT STEPS

- CGFPC will submit a Technical Proposal (TP) to the Ministry of Environment (MOE)
- If the project is considered a Development it will require an EIA

COMMUNITY ENGAGEMENT PROCESS

- Community engagement is an important part of the EIA process
- CGFPC is initiating early engagement with:
  - Public (landowners, communities, and Rural Municipalities)
  - First Nation and Métis communities
  - Government and regulatory agencies
- Engagement program will continue throughout the EIA process

HOW YOU CAN PARTICIPATE

Your opinions and concerns are important to CGFPC. You can participate by speaking with our representatives and filling in a comment form. These comments will be included and discussed in the EIA.

QUESTIONS OR CONCERNS

Brad Schiele
Public Engagement Specialist
SNC-Lavalin Inc.

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Junjie Liu
Project Manager
Canada Golden Fortune Potash Corp.

300-402, 21st Street East
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Tel: 306-668-6893
info@goldenpotash.com

ENVIRONMENTAL ASSESSMENT PROCESS IN SASKATCHEWAN

Submit Technical Proposal (TP)

- Describes project, environment and potential environmental impacts and mitigation measures

MOE will use the TP to determine any regulatory requirements

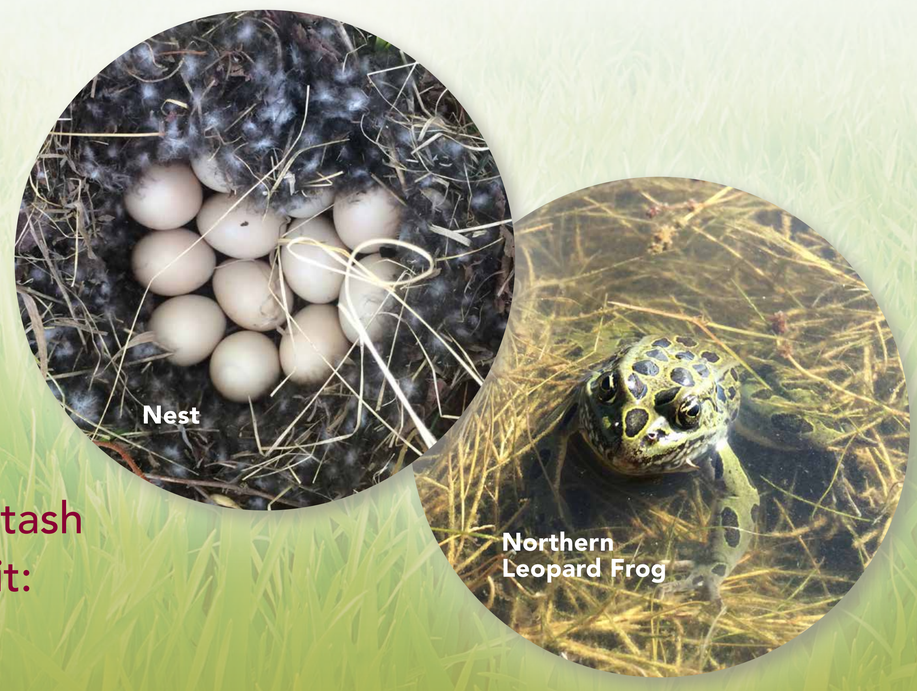
- Is the project considered a development pursuant to *The Environmental Assessment Act*?

YES

- Requires an Environmental Impact Assessment (EIA)

NO

- Project proceeds subject to conditions and regulatory requirements



Nest

Northern Leopard Frog

To learn more about the Broadview Project, Canada Golden Fortune Potash Corporation, SNC-Lavalin, additional open houses, or the EIA please visit:
www.goldenpotash.com | www.broadviewproject.ca

Environmental Impact Assessment

ATMOSPHERIC ENVIRONMENT

- On-site weather station collected climate data from 2015 to 2016
- On-site data compared to long-term data from the Environment and Climate Change Canada weather stations
- Air dispersion modeling will be conducted to predict potential effects on air quality
- During operations the mine will be required to report all emissions to Environment and Climate Change Canada

Drill Rig

Air Quality Monitoring Station

HYDROGEOLOGICAL ENVIRONMENT

- A hydrogeological framework for the study area was established to aid in site selection
- Hydrogeological baseline data will help site surface facilities at a location where limited risk exists to underlying aquifers
- Historic borehole drilling records within KP 437 were used
- Numerical modeling of groundwater flow and contaminanttransport will be used to evaluate cumulative impacts of the facility

***AIR EMISSIONS** in Saskatchewan are regulated for the following pollutants:*

SO_2	H_2S	NO_x	CO	O_3	$PM_{2.5}$ & PM_{10}
Sulphur dioxide	Hydrogen sulphide	Nitrogen oxides	Carbon monoxide	Ozone	Particulate Matter

"During operations the mine will be required to report all emissions to Environment and Climate Change Canada."

Environmental Impact Assessment

Red-winged Blackbird

TERRAIN & SOILS

- Landscape influenced by glacial activity from most recent ice-age
- Gently hummocky terrain with numerous, small wetlands
- Land-use is primarily agricultural
- Good quality soils
- Soil management plan will be developed to minimize effects to soils

VEGETATION

- Project is located within the Aspen Parkland Ecoregion
- Field vegetation assessment was completed in 2015 and 2016 and identified:
  - 396 individual plant species
  - 4 protected plant species

WILDLIFE

- Federal legislation protects nests, eggs, and young of all migratory birds
- Considerable breeding bird habitat exists in the area, including wetlands, grasslands, trees and shrubs, cropland, and man-made structures

180 wildlife species including 13 protected species were observed in the area along with wildlife and bird surveys conducted in 2015 and 2016, which identified:

19 MAMMAL SPECIES

Protected Mammals

American Badger

4 REPTILE AND AMPHIBIAN SPECIES

Protected Amphibians

Northern Leopard Frog

13 SPECIES OF PROTECTED WILDLIFE

Protected Invertebrates

Monarch Butterfly

144 BIRD SPECIES

Protected Birds

Baird's Sparrow
Barn Swallow
Bank Swallow
Bobolink
Common Nighthawk
Horned Grebe
Long-billed Curlew
Olive-sided Flycatcher
Semipalmated Plover
Turkey Vulture

Yellow Lady's Slipper

Environmental Impact Assessment

HOW DO WETLANDS BENEFIT THE ENVIRONMENT?

- Filter silt and sediment from water
- Reduce nutrient levels of water
- Reduce flooding
- Provide essential habitat for wildlife and migratory birds

HYDROLOGICAL ENVIRONMENT

- Pipestone Creek and some small oxbow lakes are the major surface water features, in addition to small tributaries and numerous wetlands
- Water levels peak in the spring
- Stream discharge monitoring, a drainage assessment, and a surface water and aquatic sediment sampling program was initiated in spring 2015
- Surface water modeling will be conducted to assist with development of a drainage plan for the project

FISH AND FISH HABITAT

- Field fisheries survey was conducted in 2016
  - Electrofishing
  - Minnow traps
  - Gill nets
- Five fish species totaling 2,782 individual fish captured:

- No fish species at risk were found in field or desktop study
- Fish habitat in the study area varies in complexity and is capable of supporting small and large bodied fish, but significant barriers to migration exist (culverts, dams, reservoirs, etc.)

Environmental Impact Assessment

Artifacts from a lithic surface scatte

Grooved maul

SOCIO-ECONOMICS

- Socio-economic impact assessments are used to identify and evaluate the potential socio-economic and cultural impacts of a proposed project on the lives and circumstances of people and their communities
- Desktop data was compiled regarding demographics, economy and land use
- KP 437 potash permit is located within:
  - Rural Municipalities of Kinglsey (RM No. 124) and Chester (RM No. 125)
  - Treaty 4 Territory
  - Nearest town is Grenfell, SK

HERITAGE RESOURCES

What are Heritage Resources?

- Archaeological objects
- Paleontological objects
- Any property of interest for its architectural, historical, cultural, environmental, archaeological, paleontological, aesthetic, or scientific value
- Protected under *The Heritage Property Act*

Heritage Resources Impact Assessment (HRIA) was conducted in 2015

- The proposed project area was referred to the Heritage Conservation Branch (HCB) for review
- The HCB required an HRIA on lands with archaeological potential
- The HRIA consisted of a desktop and field assessment
- The HRIA found five previously unidentified heritage resources, all with limited heritage significance

Environmental Protection

"Environmental protection measures will be incorporated into all phases of the project."

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Downy Paintbrush

Cedar Waxwing

Turbidity Curtain

"Environmental monitoring will be conducted in accordance with project approvals and reported to the Ministry of Environment."

PLANNING / DESIGN

- Environmental Baseline Studies
- Environmental Impact Assessment
- Community Engagement
- Mitigation measures will be built into the design

CONSTRUCTION

- Surface water / groundwater management
- Rare plants / wildlife management
- Heritage resources management
- Soil / erosion management
- Noise / air quality / dust control
- Waste management
- Spills prevention / response

OPERATION

- Wastewater & brine management
- Waste management
- Air emissions monitoring
- Surface water / groundwater monitoring
- Salt storage area management
- Spills prevention / response
- Wildlife management

DECOMMISSIONING & RECLAMATION

- Capping of all well heads
- Demolition and removal of infrastructure, buildings, and utilities
- Drainage and infilling of ponds / ditches
- Long-term tailings dissolution
- Re-contouring, replacing topsoil, revegetation
- Post-closure monitoring


Welcome
to the Broadview Project
CGFPC

Outline

1. Canada Golden Fortune Potash Corporation

2. Broadview Project
   - Broadview Project, Timeline, Potash, Exploration, Solution Mining, Mine Site/Wellpad Layout, Utilities, Water Sourcing, Emissions

3. Environmental Assessment Process
   - Process, Next Steps, Community Engagement, Environmental Impact Assessment

4. Environmental Studies
   - Climate, Air, Acoustics, Hydrogeology, Vegetation, Wildlife, Hydrology, Fish & Fish Habitat, Socio-economics, Heritage Resources

5. Project Benefits

6. Environmental Protection

Canada Golden Fortune Potash Corporation (CGFPC)

- A private resource company engaged in the exploration and development of potash mineral deposits in Saskatchewan
- Head office is located in Saskatoon, SK
- Owns 100% of the crown mineral rights on two potash permits (KP 437 and KP 442)
- Goal is to develop a potash solution mine in Saskatchewan

Broadview Project

- Proposed potash solution mine
- Located in the southeastern edge of the potash district
- KP 437 potash permit

2018 to 2021 **Construction**

2021 **Operation**

1M tonnes
of potash per year

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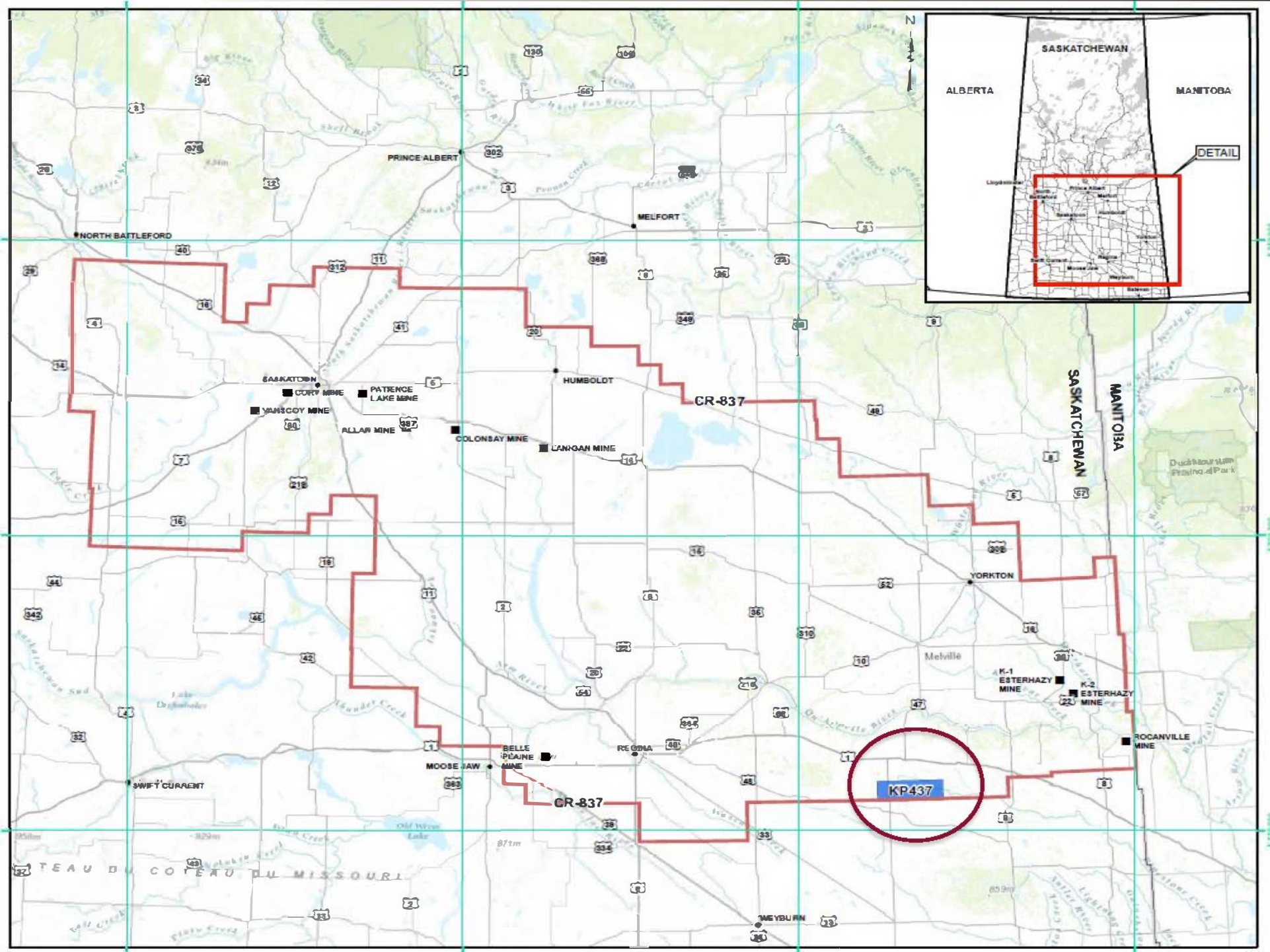
CGFPC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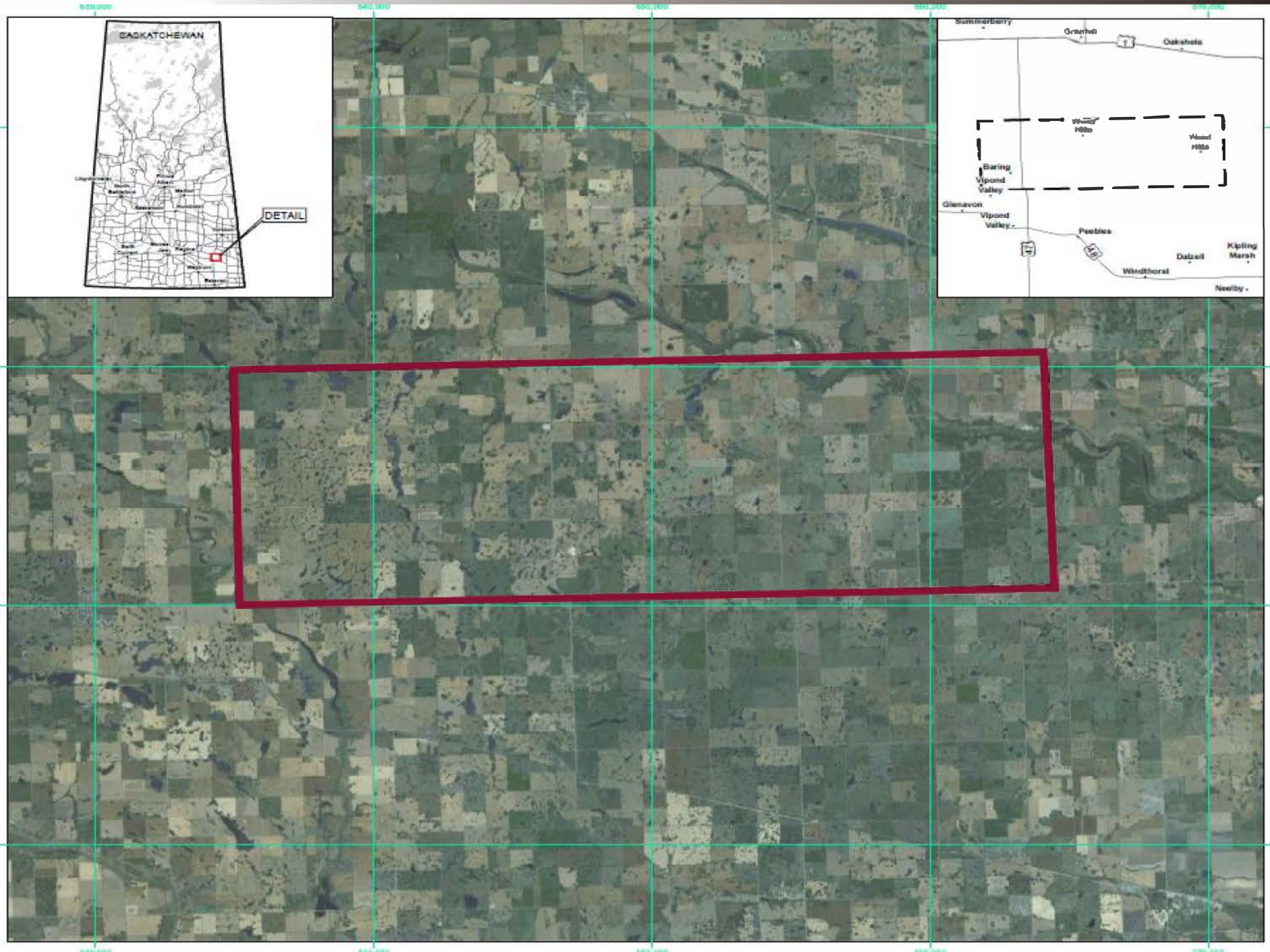
SASKATCHEWAN
ALBERTA
MANITOBA
DETAIL
PRINCE ALBERT
MELFORT
NORTH BATTLEFORD
SASKATOON
CORY MINE
PATIENCE LAKE MINE
VANSCOY MINE
ALLAN MINE
COLONSAY MINE
LANIGAN MINE
HUMBOLDT
CR-837
SASKATCHEWAN
MANITOBA
YORKTON
Melville
K-1 ESTERHAZY MINE
K-2 ESTERHAZY MINE
ROCANVILLE MINE
BELLE PLAINE MINE
MOOSE JAW
REGINA
SWIFT CURRENT
CR-837
KP437
WEYBURN
COTEAU DU MISSOURI

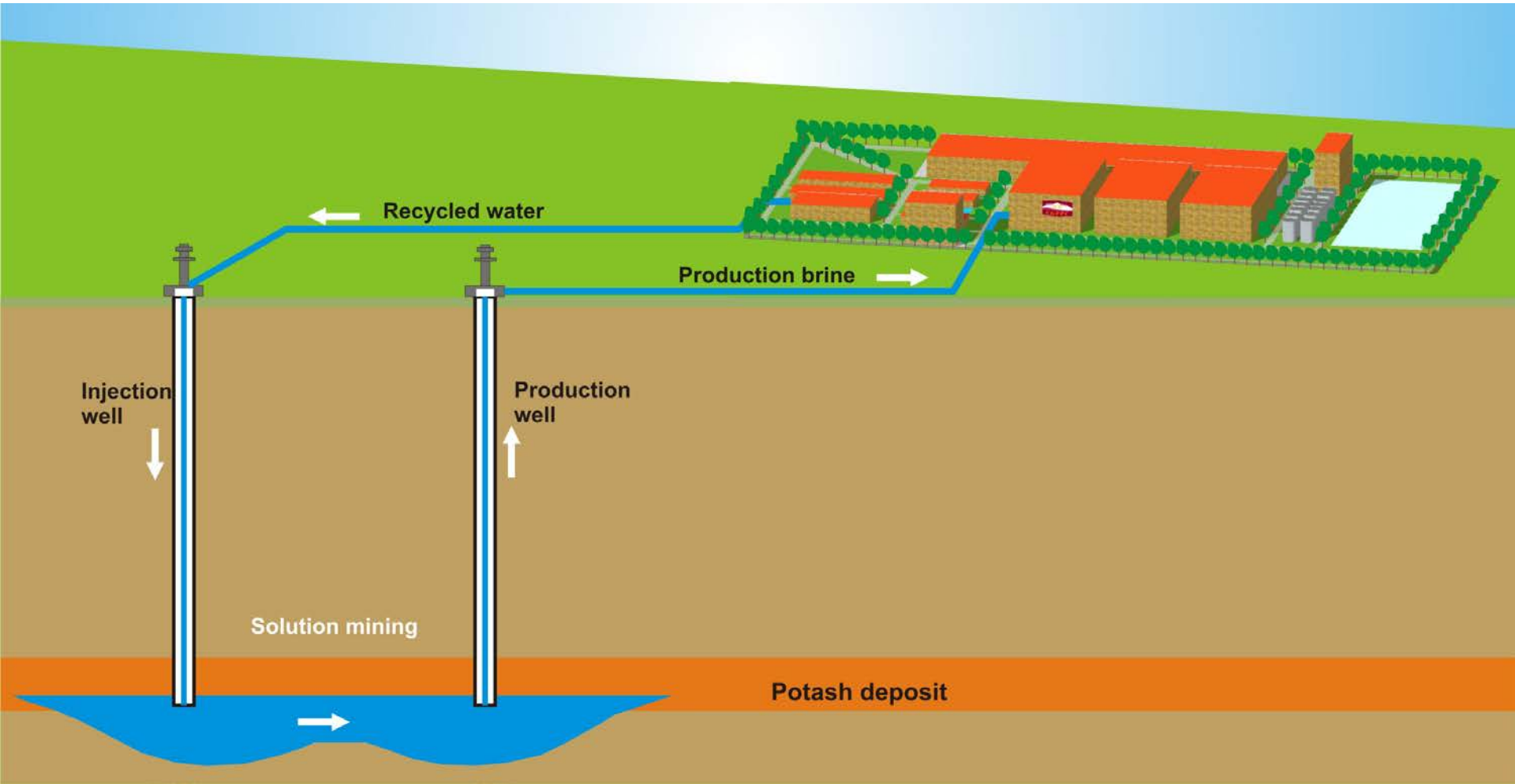

SASKATCHEWAN
DETAIL
Summerberry
Grenfell
Oakshela
Baring
Vipond
Valley
Glenavon
Vipond
Valley
Peebles
Dalzell
Kipling
Marsh
Windthorst
Neelby

Potash

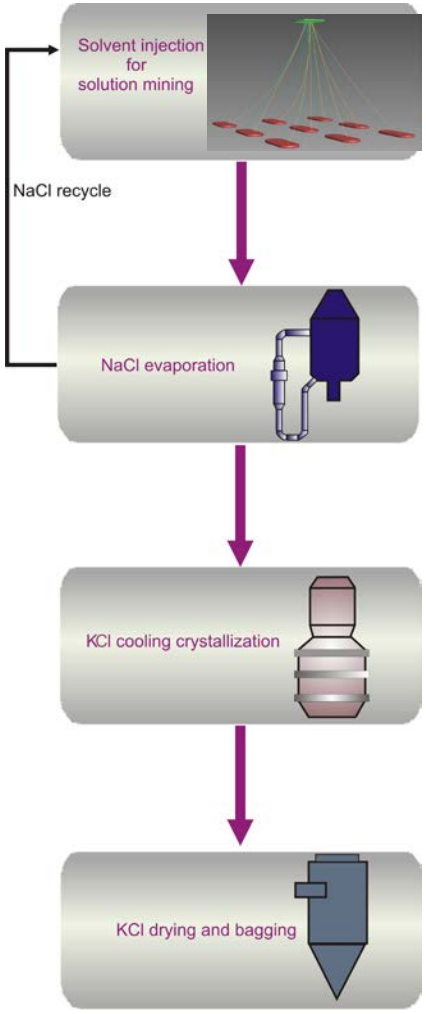
- Potash occurs in the Prairie Evaporite Formation
  - Patience Lake & Esterhazy members
- Sylvinite is the most important ore for potash production, and includes a mixture of sylvite (KCl) and halite (NaCl)
- Potassium from potash is used to produce fertilizers that help meet the growing global demand for food
- Potash is essential for major plant functions, such as enzyme activation and protein production
- Approximately 95% of the world's potash is used as fertilizer

Exploration

Solution Mining



Solution Mining



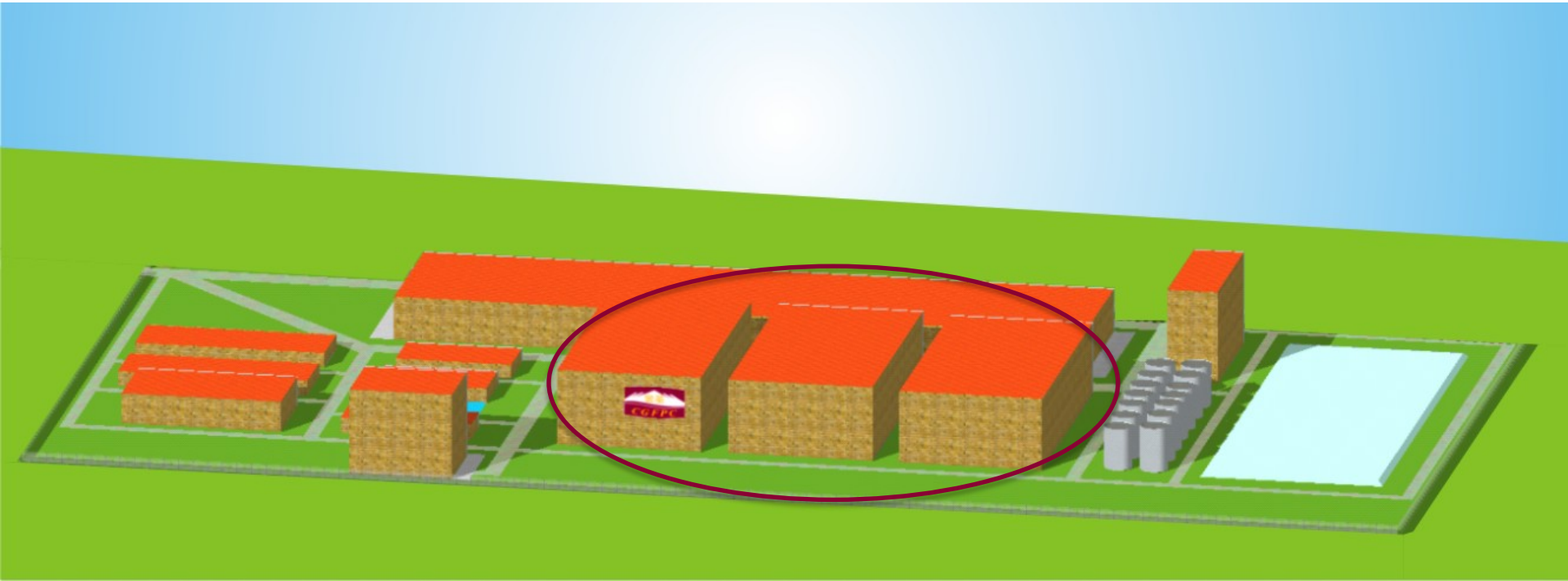
- Recycled water is used as solvent for solution mining, minimizing water consumption
- NaCl byproduct is recycled for solution mining, minimizing NaCl tailings
- Optimal design and multiple measures to minimize environmental impacts

金圣 CGFPC

Conceptual Mine Site Layout

Process Plant

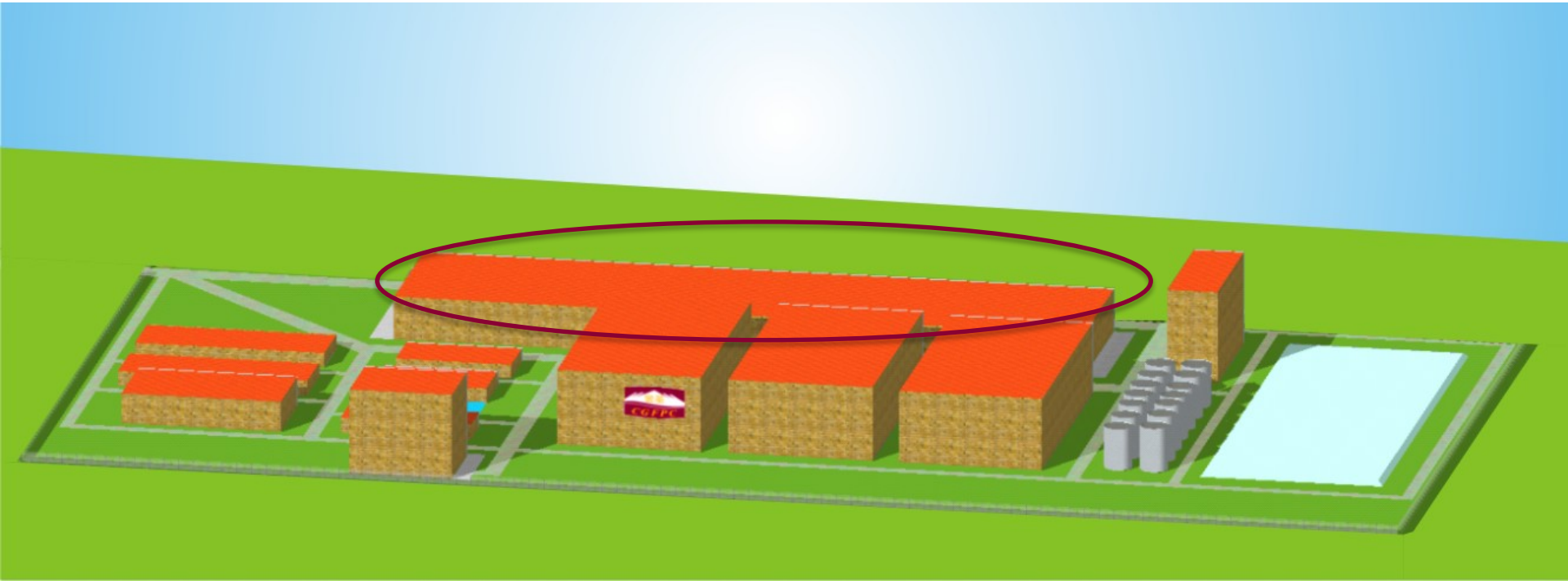
- Brine is pumped from the well field to the process plant
- Plant uses evaporation to precipitate NaCl and vacuum crystallization to precipitate KCl
- KCl slurry undergoes centrifuge dehydration followed by drying in drying beds



Conceptual Mine Site Layout

Packaging, Storage, and Loadout

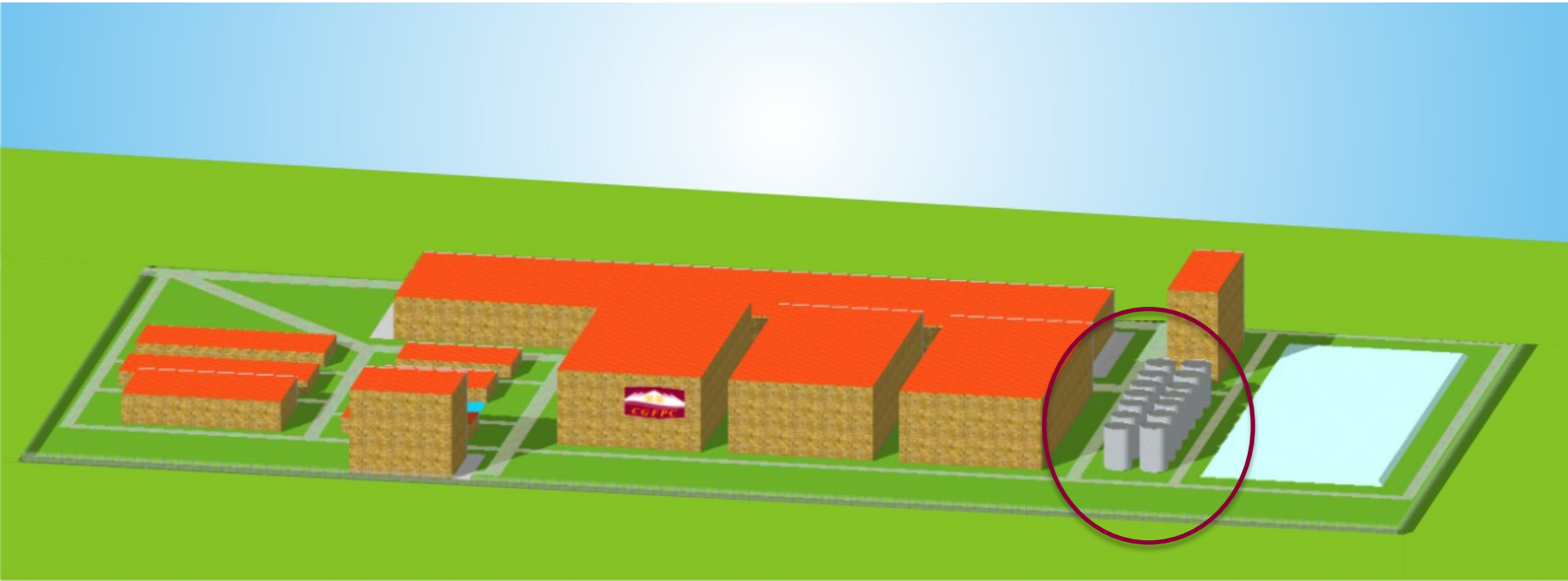
- KCl products are conveyed to the packaging and storage workshop
- They are sieved and separated into standard and granular products
- Product is loaded onto rail and/or truck for distribution



Conceptual Mine Site Layout

Mother Liquor Tanks

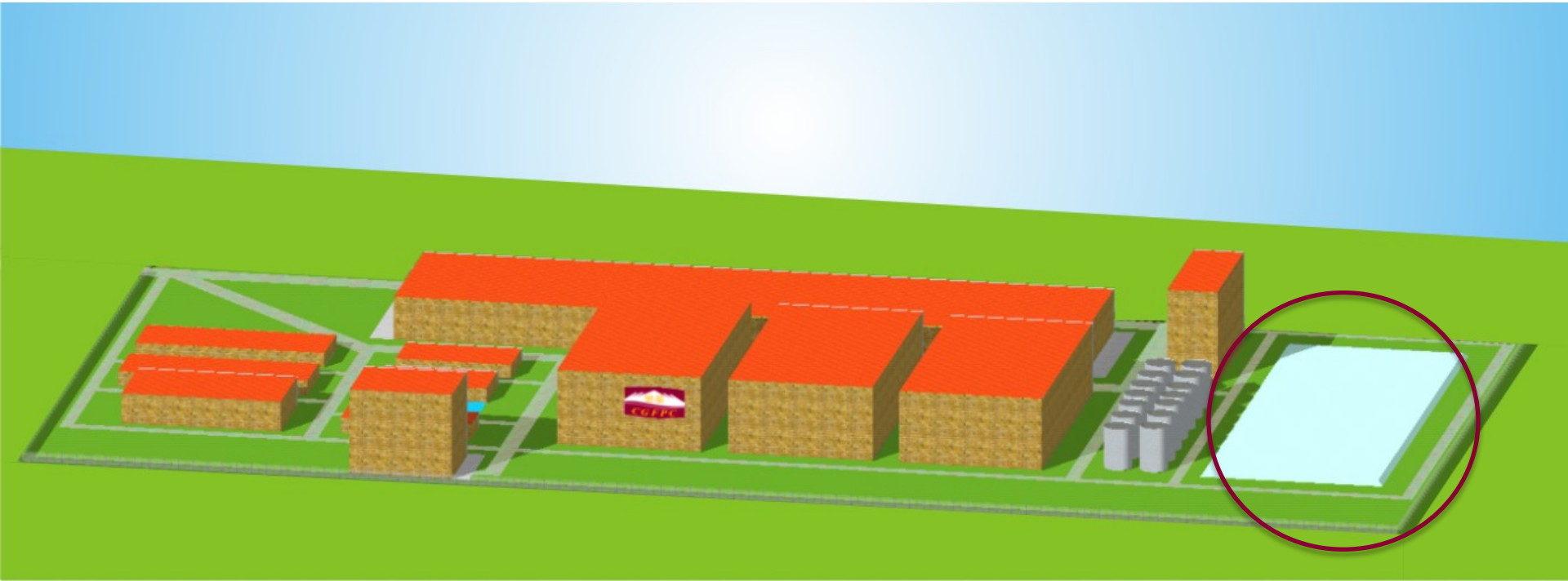
- High magnesium liquor from the processing plant will be temporally stored in the mother liquor barrels
- Excess brine will be disposed of via deep well injection



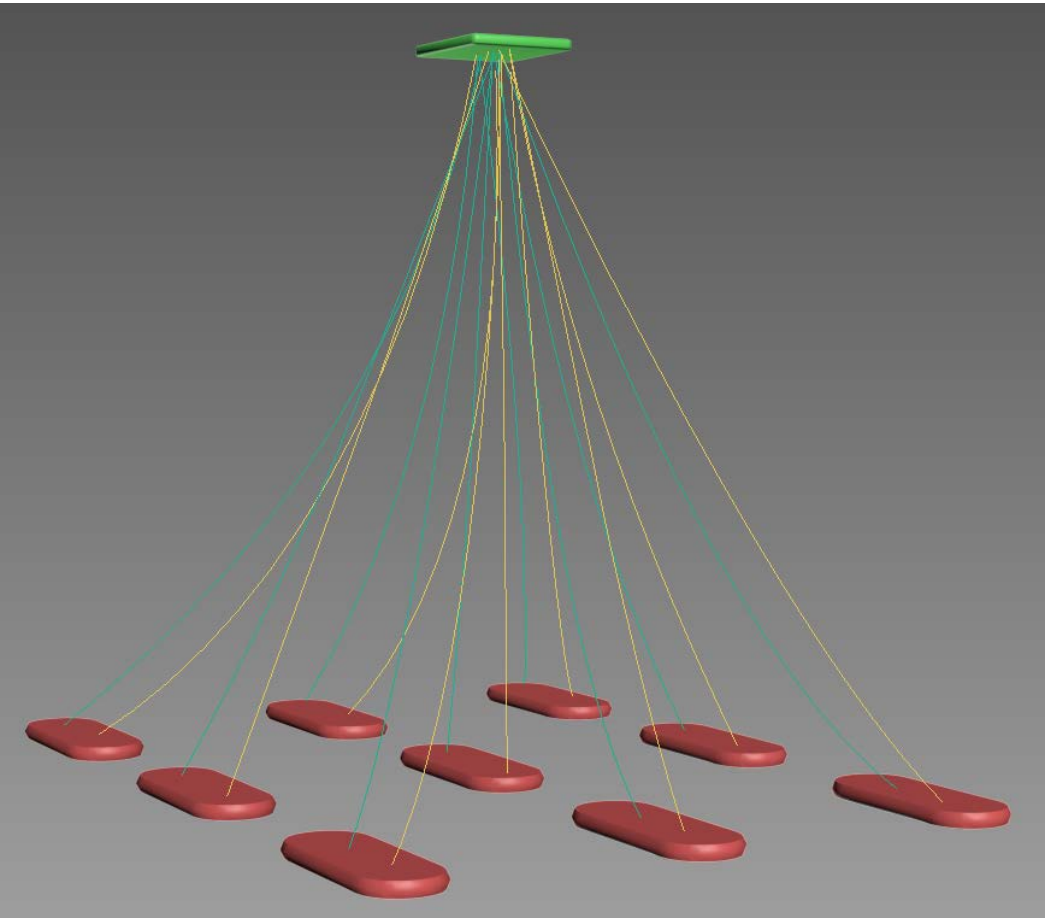
Conceptual Mine Site Layout

Tailings Management Area

- Byproduct from the process plant is pumped to the tailings area during initial production
- Byproduct from normal operation will be dissolved by condensate water and re-used in the mining process



Conceptual Well Pad Layout



- The wells and associated surface facilities are grouped together in “pads” in the well field
- Wells are directionally drilled from the pad to the mining horizon
- One to two well pads will be constructed when mining commences, and additional well pads will be constructed as mining progresses

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UTILITIES AND SERVICES

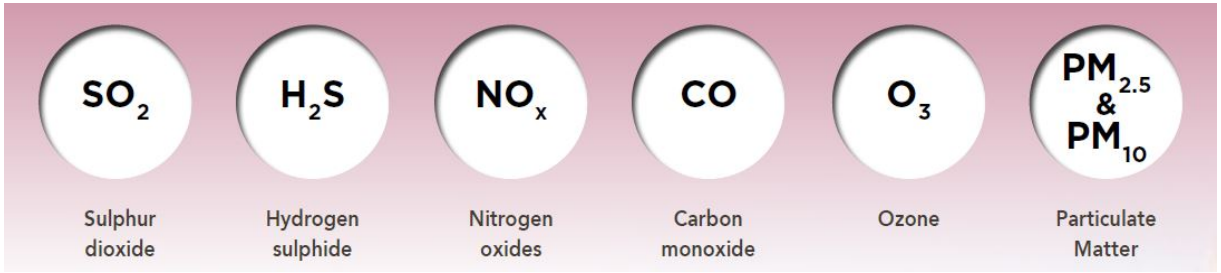
Power	• SaskPower will supply a new transmission line
Natural Gas	• TransGas will provide a new low pressure pipeline
Raw Water	• Evaluating groundwater and surface water sources • Water requirements will range from approximately 3,000,000 tonnes/year to 3,500,000 tonnes/year • CGFPC will discuss water requirements with the Saskatchewan Water Security Agency
Communications	• SaskTel will provide all communications services

Water Sourcing

- Water is required for operations (brine solution for mining), sewage and domestic use, fire suppression systems
- Water sourcing studies are ongoing to investigate nearby surface and groundwater sources
- Water will be transported to the mine via pipeline
- Water requirements will range from 3,000,000 tonnes/year to 3,500,000 tonnes/year

Project Emissions

Land	Salt will be managed in the Tailings Management Area
Water	Excess brine will be disposed of via deep well injection
Air	Air Emissions in Saskatchewan are regulated for:

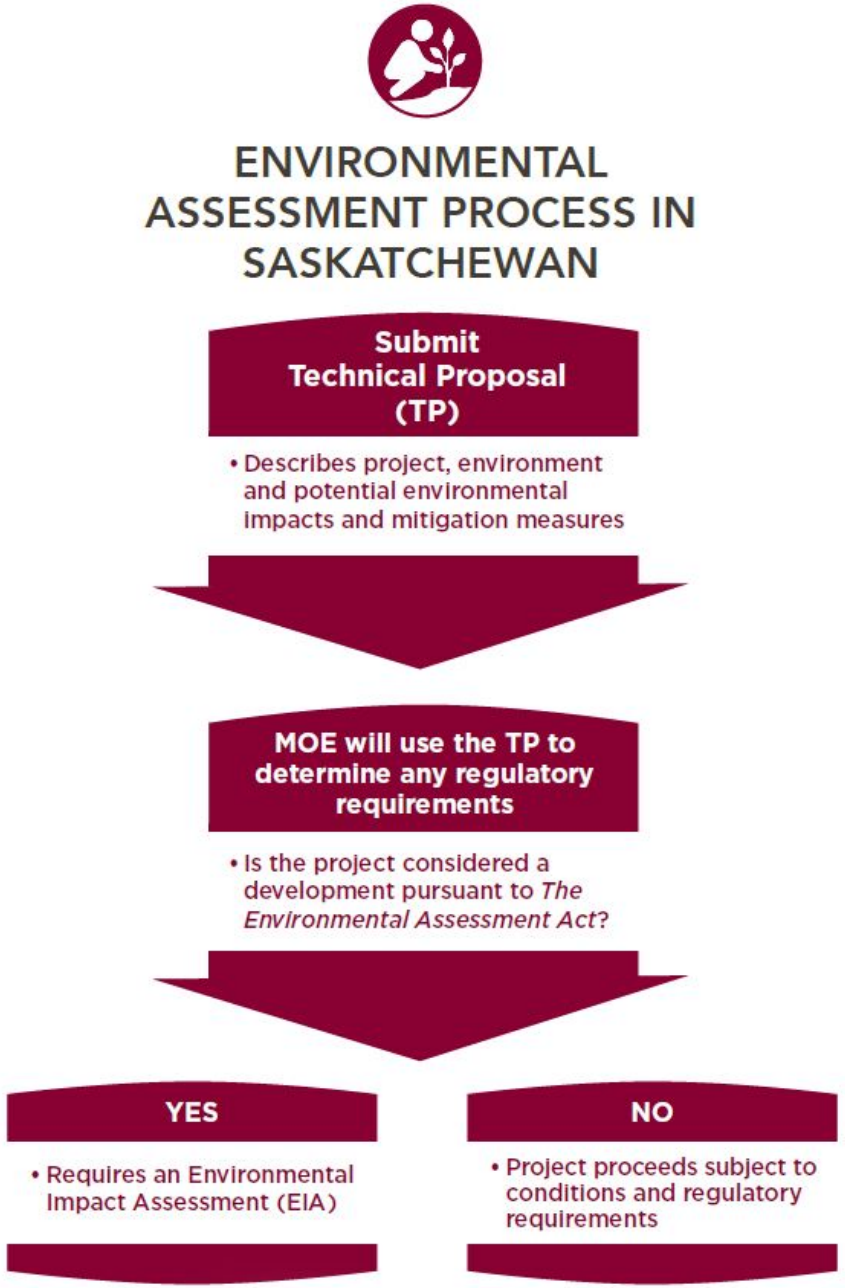


Air dispersion modeling will be conducted to predict effects on air quality

The facility will be required to report all air emissions to Environment and Climate Change Canada

Next Steps

- CGFPC will submit a Technical Proposal to the Ministry of Environment
- Project will likely be considered a Development and will require an EIA
- EIA will take approximately one year to complete



Community Engagement

- Community engagement and participation is important to CGFPC
- Public is encouraged to ask questions and provide comments and concerns regarding the proposed project
- CGFPC is engaging with:
  - The public (landowners, communities, Rural Municipalities)
  - First Nation and Métis communities
  - Government and regulatory agencies

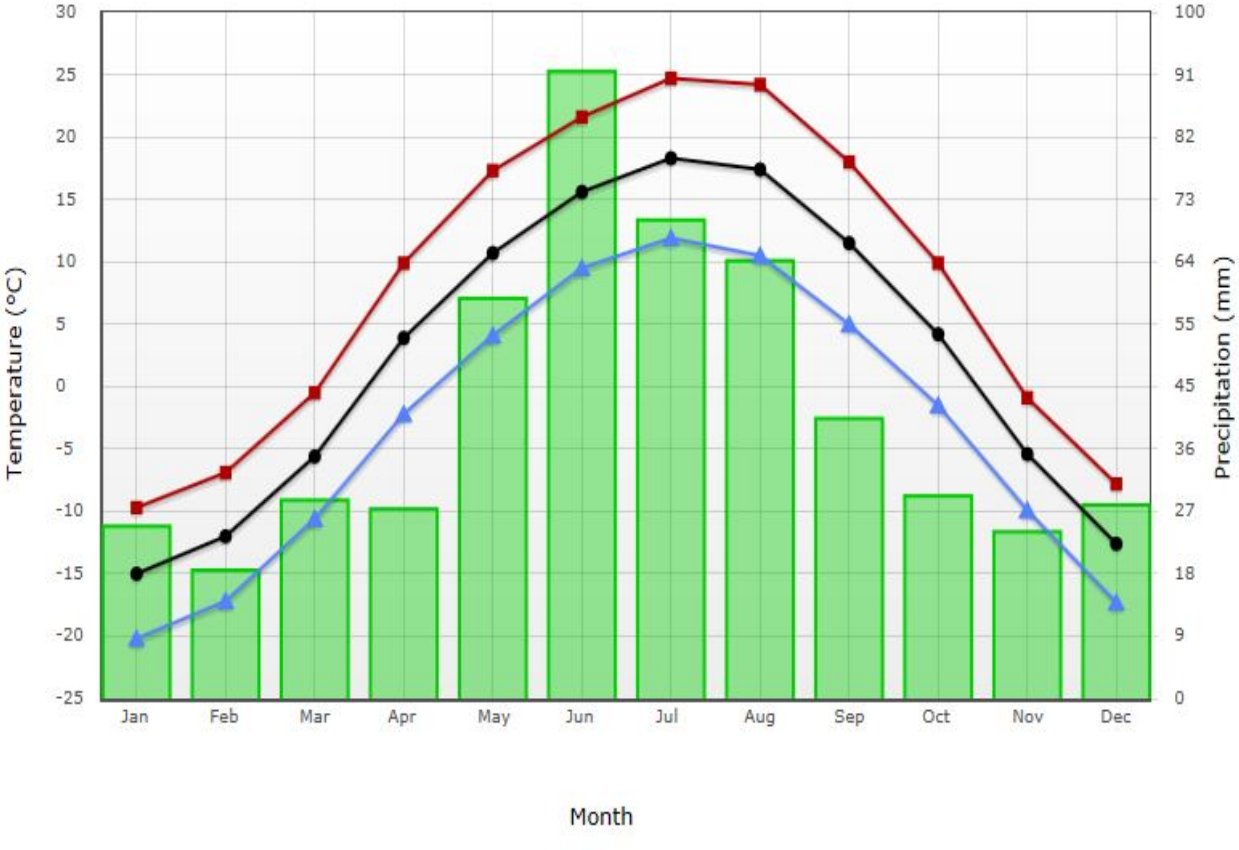
Environmental Impact Assessment

- Baseline environmental studies began in 2015 and are ongoing
- Environmental studies will become more focused once a mine site is selected
- Environmental studies include:
    1) Climate, Acoustics, and Air Quality
    2) Hydrogeology
    3) Vegetation and Wildlife
    4) Hydrology, Fish, and Fish Habitat
    5) Heritage Resources and Socio-economics

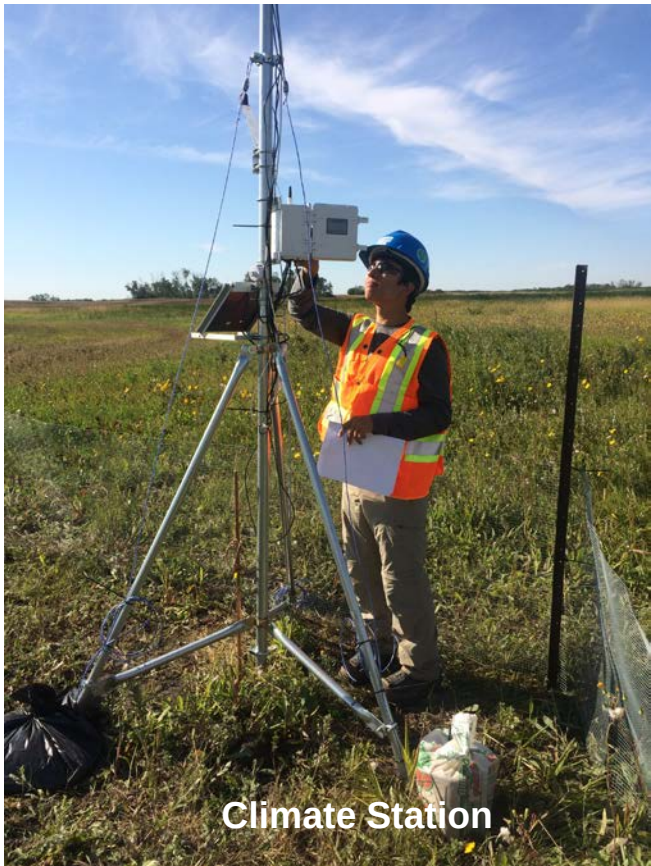
- Potential Interactions between the project and the environment will be assessed
- Mitigation measures will be incorporated into project design

Climate

- Climate Normals
  - 30-year climate normal data was obtained from Environment & Climate Change Canada (ECCC)



- Site-Specific Data
  - On-site climate data collected for a one-year period



Acoustics & Air Quality

- Acoustics
  - Noise monitoring was conducted on KP 437 to determine ambient noise levels
  - Noise modelling will be conducted

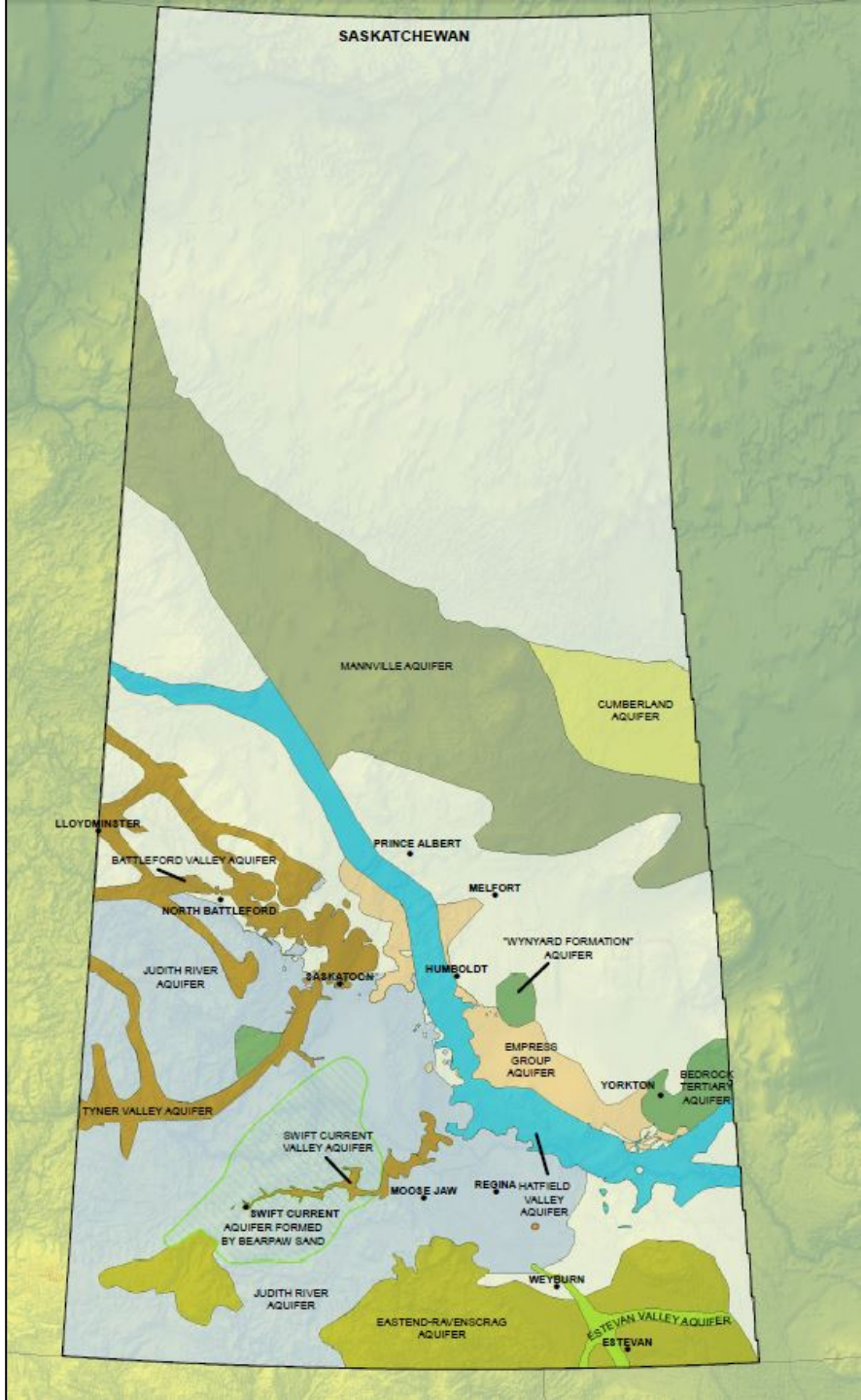
- Air Quality
  - Ambient air quality data obtained from the Southeast Saskatchewan Airshed Association (SESAA)
  - On-site ambient air quality data collected for a one-year period
  - Air dispersion modelling will be conducted to predict potential effects on air quality
  - The mine will be required to report all emissions to Environment & Climate Change Canada (ECCC)


Noise Monitoring Station


Air Quality Stations

Hydrogeology

- Various hydrogeologic studies were conducted to aid in site selection and support the project feasibility studies and the Environmental Impact Assessment, including:
  - Desktop review to establish a hydrostratigraphic framework
  - Groundwater well drilling, instrumentation, and testing
  - Groundwater flow and contaminant transport modelling
  - Injection modelling



Vegetation

- Project is located within the Aspen Parkland Ecoregion
- Land use within KP 437 is primarily agricultural (cropland & pasture land)
- Minimal native landscape, typically only in some uncultivated areas near water bodies and crop edges
- Field vegetation surveys were conducted in 2015 and 2016 and identified:
  - 396 individual plant species
  - 4 provincially protected plant species


Crowfoot Violet


Downy Paintbrush


Native Dominant Grassland


Yellow Lady Slippers

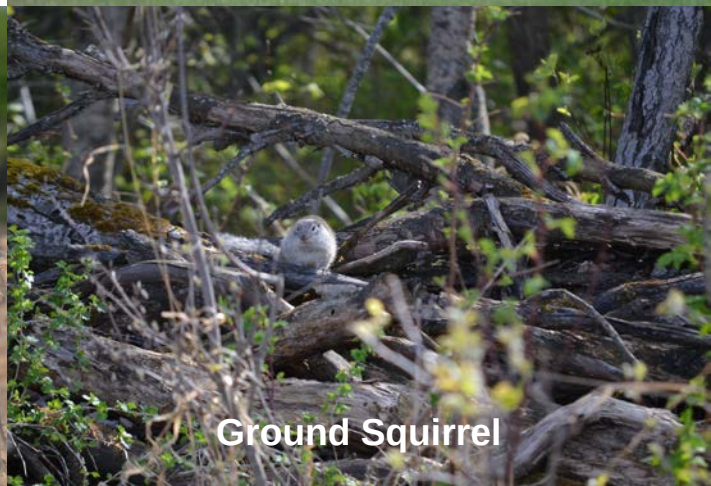
Wildlife

- Migratory bird nests, eggs and young are protected by federal legislation
- Breeding bird habitat includes wetlands, grasslands, trees, shrubs, cropland and man-made structures
- Wildlife and bird surveys were conducted in 2015 and 2016 and identified 180 wildlife species including 13 protected species


American Goldfinch


Moose


Red-winged Black Bird


Ground Squirrel

Wildlife

19 MAMMAL SPECIES

Protected Mammals

American Badger

4 REPTILE AND AMPHIBIAN SPECIES

Protected Amphibians

Northern Leopard Frog

13 SPECIES OF PROTECTED WILDLIFE

Protected Invertebrates

Monarch Butterfly

144 BIRD SPECIES

Protected Birds

Baird's Sparrow

Barn Swallow

Bank Swallow

Bobolink

Common Nighthawk

Horned Grebe

Long-billed Curlew

Olive-sided Flycatcher

Semipalmated Plover

Turkey Vulture

Hydrology

- Pipestone Creek is the largest watercourse in the area. There are also some tributaries, wetlands, and oxbow lakes
- Ongoing hydrology studies include a drainage assessment, stream discharge measurements, and water quality & sediment samples
- Surface water modeling will be conducted to aid in the development of a drainage plan for the project

Fish and Fish Habitat

- Electrofishing, minnow traps & fish habitat assessments completed at Pipestone Creek and its tributaries
- Five fish species captured
  - White sucker
  - Fathead minnow
  - Brook stickleback
  - Iowa darter
  - Pearl dace
- Fish habitat was classified as moderate to simple

Human Environment

Socio-economics

- Socio-economic effects assessments are used to assess potential effects of the project on people and communities
- Data will be collected regarding demographics, economy, and land use
- KP 437 is located within the RMs of Chester and Kingsley

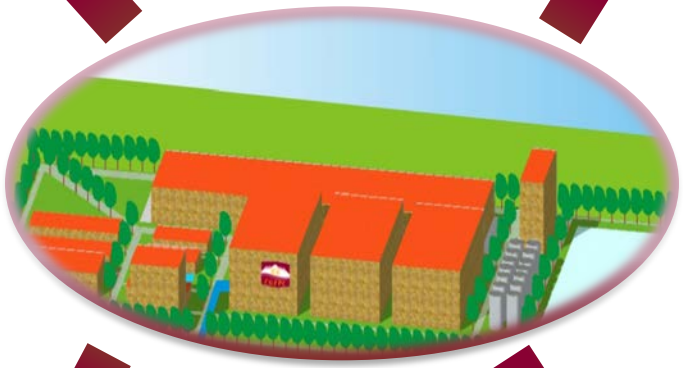
Heritage

- A heritage resources impact assessment was conducted on the KP 437 potash permit
- KP 437 contains 5 previously unidentified heritage resources
  - 4 sites have low archaeological significance
  - 1 site has moderate archaeological significance and will require further work if the site is within the project footprint

Project Benefits

Creation of local jobs:
Up to 2,500 jobs during construction
Up to 180 jobs during operation
Local workforce will be utilized wherever possible

Purchase of supplies and services locally



Local infrastructure development

Payment of taxes and royalties to the RMs and provincial government

Community activities support

Significant short- and long-term benefits for the local and regional economy

Environmental Protection

PLANNING / DESIGN

- Environmental Baseline Studies
- Environmental Impact Assessment
- Community Engagement
- Mitigation measures will be built into the design

CONSTRUCTION

- Surface water / groundwater management
- Rare plants / wildlife management
- Heritage resources management
- Soil / erosion management
- Noise / air quality / dust control
- Waste management
- Spills prevention / response

OPERATION

- Wastewater & brine management
- Waste management
- Air emissions monitoring
- Surface water / groundwater monitoring
- Salt storage area management
- Spills prevention / response
- Wildlife management

DECOMMISSIONING & RECLAMATION

- Capping of all well heads
- Demolition and removal of infrastructure, buildings, and utilities
- Drainage and infilling of ponds / ditches
- Long-term tailings dissolution
- Re-contouring, replacing topsoil,
- Re-vegetation
- Post-closure monitoring

Questions or Concerns?

Please speak to our representatives
and provide your comments.
We value your feedback!

www.broadviewproject.ca
www.goldenpotash.com

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CGFPC

Open House Information Sheet

Proposed Broadview Project

Canada Golden Fortune Potash Corporation (CGFPC) is proposing to develop a new solution potash mine in southeast Saskatchewan, referred to as the Broadview Project. The project is located on CGFPC's KP437 potash permit approximately 100 km east of Regina and 12 km south of the Town of Grenfell (See Reverse for Map). The KP437 potash permit is currently being assessed. CGFPC has retained SNC-Lavalin Inc. (SNC-Lavalin) to conduct an Environmental Impact Assessment (EIA) for the proposed project.

Environmental Assessment Process

Minimization of the environmental impact of the proposed project is a key consideration for both CGFPC and SNC-Lavalin. As a requirement of the EIA, numerous submissions must be made to the Ministry of Environment, including an Environmental Impact Statement (EIS). The EIS is the report that documents the project's effects and mitigation measures and is used by regulators in the decision-making process. Ministry of Environment approval must be given for the proposed project to proceed. Environmental studies for the Broadview Project commenced in November 2014 and are expected to continue throughout 2017.

Public Participation

A major component of the EIA processes is public engagement. Throughout the EIA process, SNC-Lavalin will assist CGFPC with public engagement. The objective of public engagement is to inform and update community members and stakeholders on the project, and provide opportunities for individuals and groups to ask questions, discuss the project and provide feedback. Information gathered from public engagement, including comments, concerns, and ideas to minimize effects, will be considered in project planning and design. This information will be included in the EIS.

To learn more about the Broadview Project, CGFPC, SNC-Lavalin, Project Updates and Open Houses scheduled in your area please visit www.goldenpotash.com and www.broadviewproject.ca, or contact us directly at info@broadviewproject.ca.

Sincerely,

Brad Schiele
Public Engagement Specialist
SNC-Lavalin Inc.
150-203 Packham Avenue
Saskatoon, SK. S7N 4K5
Tel: 306.242.2822
brad.schiele@atlheritage.com

Junjie Liu
Project Manager
Canada Golden Fortune Potash Corp.
300-402, 21st Street East
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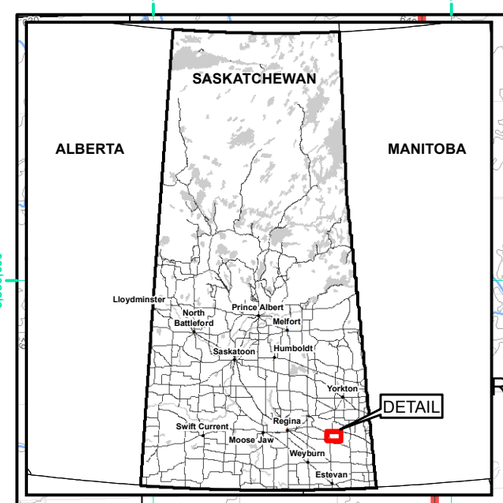
info@goldenpotash.com



RM OF WOLSELEY
No. 155

RM OF ELCAPO
No. 154

RM OF CHESTER
No. 125

RM OF KINGSLEY
No. 124

BROWN HILL RESERVOIR

MARSTON LAKE

EKAPO LAKE

Ekapo Creek

Pipestone Creek

Canadian Pacific

Canadian National

Baring

Glenavon

16-07-W2

16-06-W2

16-05-W2

15-08-W2

15-07-W2

15-06-W2

14-08-W2

14-07-W2

14-06-W2

1

47

48

635,000 640,000 645,000 650,000 655,000 660,000 665,000 670,000

5,580,000 5,575,000 5,570,000 5,565,000 5,560,000

CANADA GOLDEN FORTUNE POTASH CORPORATION BROADVIEW PROJECT KP 437 SITE PLAN

LEGEND

- PROJECT AREA
- COMMUNITY
- RAILWAY
- HIGHWAY
- 10 METRE ELEVATION CONTOUR (masl)
- WATERCOURSE
- WATERBODY
- WATERBODY (INTERMITTENT)
- RURAL MUNICIPALITY

0 1,000 2,000 4,000 Meters

SCALE: 1:100,000

SNC·LAVALIN

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, SASKADMIN2013, SASKGRID2013.
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 6.0 DATASET, 2012-09-28.
6. RAILWAYS OBTAINED FROM THE NATIONAL RAILWAY NETWORK SASKATCHEWAN EDITION 1.0 DATASET, 2012-11-07.

Broadview Project
Questionnaire

Thank you for attending the Broadview Project open house. Please take a few moments to reply to these questions and leave your comments. All feedback is important to us and will be considered during future project planning. All questions and requests for information will be supplied within 30 days.

(1) Have you visited our public engagement website (www.broadviewproject.ca) for the proposed project? YES or NO

(2) Canada Golden Fortune Potash Corporation strongly believes in keeping the public informed. Do you have any suggestions on how we can better update you as more information is known about the project?

(3) a) Do you have concerns with the proposed project?

THANK YOU FOR YOUR FEEDBACK

(3) b) How do you think we can mitigate your concerns about the proposed project?

(4) Do you have any other comments/questions about the proposed project?

(5) Can we contact you directly to discuss your comments? YES or NO

THANK YOU FOR YOUR FEEDBACK

(6) If YES, how would you like us to respond to your questions/comments (circle one).

Email Mail Phone

Your contact Information

Name: _____

Address: _____

Phone: _____

Email: _____

(7) Would you like to be added to the proposed project contact list, to receive email updates about the proposed project? YES or NO

Please contact us at any time:

Brad Schiele
Public & Indigenous Engagement
SNC-Lavalin
Email: brad.schiele@atlheritage.ca
Phone: 306-242-2822

THANK YOU FOR YOUR FEEDBACK

Attachment 3

Soil Map Units and Capability Classes for Agriculture

Table 3-A Soil map units occurring within the regional study area

Map Unit	Soil Association	Soil Type Distribution	Associated Landforms
Av5	Alluvium	mainly poorly drained soils	gently sloping floodplains as well as gently sloping undulating depressional landscapes cut by stream channels
BaOx5	Balcarres-Oxbow	mainly orthic Balcarres soils, with orthic and calcareous Oxbow soils on upper slopes and knolls, and poorly drained soils in depressions	undulating landscapes having gentle or very gentle slopes
BL9	Bagwa Lake	very poorly drained, water table remains at or on the surface for the greater part of the time the soil is not frozen; either Gleysolic or Organic	depressional and level areas
Hw	Hillwash	mainly shallow, eroded and weakly developed soils on steep, gullied valley side slopes	steeply sloped creek and river valleys
Ox8	Oxbow	mainly orthic Oxbow soil, with calcareous Oxbow soil on upper slopes and knolls, and poorly-drained soil in depressions	hummocky to hummocky-rigid with eroded knolls and numerous undrained depressions
Ox10	Oxbow	mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes	undulation and hummocky landforms, with gently to strong slopes and few undrained depressions
OxCd2	Oxbow-Cudworth	mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls, orthic Cudworth soils on lower slopes, and poorly drained soils in depressions	hummocky landscapes having gentle to moderate slopes
OxFe2	Oxbow-Fremantle	mainly orthic Oxbow soils on mid-slopes, calcareous Oxbow soils on knolls and upper slopes, and orthic Fremantle soils on lower slopes, and poorly drained soils in depressions	hummocky landscapes having gentle to moderate slopes
OxFe8	Oxbow-Fremantle	mainly a mixture of orthic and carbonated Oxbow soils on mid and lower slopes, with calcareous Fremantle soils occurring randomly on the landscape, and poorly drained soils in depressions.	hummocky landscapes having gentle slopes

Map Unit	Soil Association	Soil Type Distribution	Associated Landforms
OxWh1	Oxbow-Whitewood	mainly orthic Oxbow soils on mid and upper slopes, with orthic Whitewood soils on lower slopes. Some poorly drained soils occur in some depressional areas.	hummocky landscapes having gently slopes
OxWh2	Oxbow-Whitewood	mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, orthic Whitewood soils on lower slopes, and poorly drained soils in depressions	hummocky landscapes with gently to moderate slopes
OxWh4	Oxbow-Whitewood	mainly orthic Oxbow soils on mid-slopes, calcareous Oxbow soils on knolls and upper slopes, and orthic Whitewood soils on lower slopes. Similar to OxWh2 soils, except with fewer depressions and poorly drained soils	hummocky landscapes with gentle to moderate slopes
OxWs7	Oxbow-Whitesand	mainly orthic Oxbow soils, with calcareous Whitesand and calcareous Oxbow soils on upper slopes and knolls	hummocky landscapes that have moderate to steep slopes, and hummocky-ridged landscapes with moderate slopes
Rw	Runway	mainly a mixture of poorly drained soils on channel bottoms and eroded or weakly developed soils on channel sideslopes	dissected landscapes, large gullies or ‘draws’ with steep slopes and variable stones
Sf2	Swift Creek	mainly orthic Swift Creek soils, with calcareous and slightly eroded Swift Creek soils on knolls, and poorly drained soils in depressions	Hummocky dissected or inclined landscapes that have gentle to strong slopes
WhOx2	Whitewood-Oxbow	mainly orthic Whitewood soils on lower and mid-slopes, with orthic Oxbow soils on mid and upper slopes, calcareous Oxbow soils on upper slopes, and poorly drained soils in depressions.	hummocky landscapes, typically on south and west facing slopes as well as on knolls
WhOx4	Whitewood-Oxbow	mainly orthic Whitewood soils on mid- and lower slopes, with orthic Oxbow soils on mid- and upper slopes, and calcareous soils on upper slopes and knolls.	hummocky and hummocky dissected landscapes having gentle to strong slopes

Map Unit	Soil Association	Soil Type Distribution	Associated Landforms
Ws1	Whitesand	mainly orthic Whitesand soils.	very gently to gently sloping undulating landscapes as well as gently to strongly sloping hummocky or inclined landscapes
Wz1	Wetland	mainly poorly drained soils, with shallow open water in central areas	wetlands that flood in spring and evaporate by midsummer, also known as wet meadows
Wz2	Wetland	a combination of poorly drained soils and shallow open water.	wetlands that flood in spring and persist until late summer or fall, and occasionally throughout the winter, also known as marshes
Wz3	Wetland	mainly shallow open water, with some poorly drained soils in marginal areas.	Wetlands that remain flooded but some may become dry during periods of prolonged extreme drought, also referred to as open water wetlands

Table 3-B Soil capability classes occurring within the regional study area

Map Unit	Capability Classes Present	Soil Limitations	Landscape Limitations
1(6)2(2)M5(2)W	Class 1 (60%) Class 2 (20%) Class 5 (20%)	insufficient water-holding capacity	excess water
2(5)M3(3)NT5(2)W	Class 2 (50%) Class 3 (30%) Class 5 (20%)	insufficient water holding capacity, excessive soil salinity	excess water
2(5)M3(3)T5(2)W	Class 2 (50%) Class 3 (30%) Class 5 (20%)	insufficient water holding capacity	unfavorable topography, excess water
2(5)M3(4)T5(1)W	Class 2 (50%) Class 3 (40%) Class 5 (10%)	insufficient water holding	unfavorable topography, excess water
2(6)M3(2)T5(2)W	Class 2 (60%) Class 3 (20%) Class 5 (20%)	insufficient water holding capacity	unfavorable topography, excess water
2(6)M3(3)T5(1)W	Class 2 (60%) Class 3 (30%) Class 5 (10%)	insufficient water holding capacity	unfavorable topography, excess water
2(6)M4(4)MT	Class 2 (60%) Class 4 (40%)	insufficient water holding capacity	unfavorable topography
2(7)M3(2)T5(1)W	Class 2 (70%) Class 3 (20%) Class 5 (10%)	insufficient water holding capacity	unfavorable topography, excess water
2(8)M5(2)W	Class 2 (80%) Class 5 (20%)	insufficient water holding capacity	excess water
2(9)M5(1)W	Class 2 (90%) Class 5 (10%)	insufficient water holding capacity	excess water
2(10)W	Class 2 (100%)	none	excess water
3(5)T2(3)M5(2)W	Class 3 (50%) Class 2 (30%) Class 5 (20%)	insufficient water holding capacity	unfavorable topography, excess water
3(5)T4(3)T5(2)W	Class 3 (50%) Class 4 (30%) Class 5 (20%)	none	unfavorable topography, excess water
3(6)M4(3)T5(1)W	Class 3 (60%) Class 4 (30%)	insufficient soil water holding capacity	excess water

Map Unit	Capability	Soil Limitations	Landscape Limitations
	Class 5 (10%)		
3(6)T4(4)T	Class 3 (60%) Class 4 (40%)	none	unfavorable topography
3(6)MT4(4)MT	Class 3 (60%) Class 4 (40%)	insufficient water holding capacity	unfavorable topography
3(6)T2(3)M5(1)W	Class 3 (60%) Class 2 (30%) Class 5 (10%)	insufficient water holding	unfavorable topography, excess water
3(6)T4(3)T5(1)W	Class 3 (60%) Class 4 (30%) Class 5 (10%)	none	unfavorable topography, excess water
3(7)T2(3)M	Class 3 (70%) Class 2 (30%)	none	unfavorable topography, excess water
3(7)T4(2)T5(1)W	Class 3 (70%) Class 4 (20%) Class 5 (10%)	none	unfavorable topography, excess water
3(8)ST5(2)W	Class 3 (80%) Class 5 (20%)	multiple soil limitations are present	unfavorable topography, excess water
3(8)T5(2)W	Class 3 (80%) Class 5 (20%)	none	unfavorable topography, excess water
3(9)M5(1)W	Class 3 (90%) Class 5 (10%)	insufficient water holding capacity	excess water
3(9)T5(1)W	Class 3 (90%) Class 5 (10%)	none	unfavorable topography, excess water
3(10)T	Class 3 (100%)	none	unfavorable topography
4(6)T3(3)T5(1)W	Class 4 (60%) Class 3 (30%) Class 5 (10%)	none	unfavorable topography, excess water
4(6)T5(4)TW	Class 4 (60%) Class 5 (40%)	none	unfavorable topography, excess water
4(7)T5(3)T	Class 4 (70%) Class 5 (30%)	none	unfavorable topography
4(8)T5(2)W	Class 4 (80%) Class 5 (20%)	none	unfavorable topography, excess water
4(10)M	Class 4 (100%)	none	excess water
5(10)W	Class 5 (100%)	none	excess water
6(10) TE	Class 6 (100%)	none	unfavorable topography, damage from wind and/or

Map Unit	Capability	Soil Limitations	Landscape Limitations
			water erosion
6(10) TW	Class 6 (100%)	none	unfavorable topography, excess water
6(10)W	Class 6 (100%)	none	excess water
7(10)W	Class 7 (100%)	none	excess water
0(10)*	Class 0 (100%)	N/A	N/A

**Class 0 soils are organic and not rated for agricultural capability*
Source: (Saskatchewan Soil Survey 1987 and 1985).

Attachment 4

Federally and Provincially Listed Species

Table 4-A Listed plant species within the Aspen Parkland Ecoregion

Scientific Name	Common Name	COSEWIC Status	Provincial Ranking	Habitat Association	Potential for Occurrence	Potential Habitat in KP 437t
Achnatherum richardsonii	Richardson's needlegrass	not listed	S3	grassy upland fescue prairie bordering woods or shrublands	moderate - suitable habitat likely	Pipestone Creek valley, untilled coulees and hillsides
Amelanchier sanguinea	round-leaved serviceberry	not listed	S1	well-drained deciduous wooded slopes	low - suitable habitat may occur	potential habitat not identified in regional study area
Botrychium lunaria	mingan moonwort	not listed	S2	semi-open to open woods, drying prairie sloughs, and moist meadows	low - suitable habitat may occur	potential habitat not identified in regional study area
Botrychium minganense	common moonwort	not listed	S1	mesic to wet riparian woods and wet meadows	moderate - historical documentation in landscape area, suitable habitat likely	deciduous riparian woods, Pipestone Creek valley
Bouteloua curtipendula var. curtipendula	sideoats grama	not listed	S3	eroded or stony, well-drained prairie slopes	moderate - suitable habitat likely	Pipestone Creek valley, untilled coulees and hillsides
Calystegia sepium var. angulata	hedge bindweed	not listed	S3	sandy soil along shrub thickets and fence-rows	low - suitable habitat may occur	potential habitat not identified in regional study area
Carex alopecoidea	foxtail sedge	not listed	S3	riparian woods, in particular shaded deciduous woodlands, and sedge meadows	moderate - historical documentation in landscape area, suitable habitat likely	deciduous riparian woods, Pipestone Creek valley
Carex assiniboinensi	Assiniboina sedge	not listed	S3	deciduous woods and shrub thickets	moderate - historical documentation in landscape area, suitable habitat likely	deciduous riparian woods, Pipestone Creek valley
Carex buxbaumii	brown Sedge	not listed	S3	wet calcareous shrubland, sloughs and pond margins	low - historical documentation in landscape area, suitable habitat may occur	potential habitat not identified in regional study area
Carex crawei	Crawe's sedge	not listed	S3	seepy, often calcareous sedge meadows, fens, bogs, and shores	low - suitable habitat may occur	potential habitat not identified in regional study area
Carex granularis	granular sedge	not listed	S3	shallow marsh zones of slightly brackish and moderately brackish wetlands	moderate - historical documentation in Pipestone Creek valley, suitable habitat may be present	temporary wetlands unaltered by cultivation or grazing
Carex hystericina	porcupine sedge	not listed	S3	wet woods, clearings, sloughs and shores	moderate - suitable habitat likely	deciduous riparian woods, Pipestone Creek valley
Carex saximontana	Rocky Mountain sedge	not listed	S3	valleys, moist to dry shaded woods and shrub thickets	low - suitable habitat may occur	potential habitat not identified in regional study area
Carex tetanica	rigid sedge	not listed	S1	low prairies and moist meadows, often with calcareous soils	low - suitable habitat may occur	potential habitat not identified in regional study area
Carex vulpinoidea var. vulpinoidea	fox sedge	not listed	S3	wet shores and moist meadows	low - suitable habitat may occur	potential habitat not identified in regional study area

Scientific Name	Common Name	COSEWIC Status	Provincial Ranking	Habitat Association	Potential for Occurrence	Potential Habitat in KP 437t
Castilleja coccinea	scarlet Indian paintbrush	not listed	S1	moist meadows and tall grass prairie	low - suitable habitat may occur	potential habitat not identified in regional study area
Castilleja sessiliflora	downy paintbrush	not listed	S3	dry, sandy prairie slopes	moderate - historical documentation in landscape area, suitable habitat likely	Pipestone Creek valley, untilled coulees and hillsides
Cirsium drummondii	short-stemmed thistle	not listed	S3	moist open prairie in wooded areas	low - suitable habitat may occur	potential habitat not identified in regional study area
Cirsium muticum	swamp thistle	not listed	S3	wet woods, clearings, sloughs and lakeshores	low - suitable habitat may occur	potential habitat not identified in regional study area
Corallorhiza striata	striped coralroot	not listed	S3	fresh to mesic aspen woods and occasionally mixed wood s	low - suitable habitat may occur	potential habitat not identified in regional study area
Corispermum americanum var. americanum	American bugseed	not listed	S3	sandy shores and prairies, sand dunes, disturbed roadsides, and old fields	very low - no exposed sand features present	potential habitat not identified in regional study area
Corispermum villosum	hairy bugseed	not listed	S2	sandy shores and prairies, sand dunes, disturbed roadsides, and old fields	very low - no exposed sand features present	potential habitat not identified in regional study area
Crataegus succulenta	long-spined hawthorn	not listed	S1	shrubby slopes, depressions, and open woods	low - suitable habitat may occur	potential habitat not identified in regional study area
Cypripedium parviflorum var. makasin	small yellow lady's-slipper	not listed	S3	moist semi-open woods, wet meadows, and ditches	high - multiple recorded occurrences in area, suitable habitat likely	roadside rights-of-way, well-drained grasslands, open woods and clearings
Delphinium glaucum	tall larkspur	not listed	S2	open aspen woods and clearings	low - suitable habitat may occur	potential habitat not identified in regional study area
Dichanthelium leibergii	leiberg’s panicgrass	not listed	S1	relic tall grass prairie patches and moist grasslands	moderate - historical documentation in landscape area, suitable habitat likely	Pipestone Creek valley, untilled coulees and hillsides
Doellingeria umbellata	flat-topped aster	not listed	S2	moist, open woods and clearings, wooded bogs, and marsh edges	low - suitable habitat may occur	potential habitat not identified in regional study area
Drosera linearis	narrow-leaved sundew	not listed	S1	wet bogs or fens	very low - no bog/fen areas present	potential habitat not identified in regional study area
Echinacea angustifolia var. angustifolia	prairie purple coneflower	not listed	S3	dry prairie slopes and roadsides	low - suitable habitat may occur	potential habitat not identified in regional study area
Eleocharis compressa	flattened spike-rush	not listed	S3	wet, usually calcareous bogs, fens, and wetlands	low - suitable habitat may occur	potential habitat not identified in regional study area
Eleocharis elliptica	flat-stemmed spike-rush	not listed	S3	wet open or treed bogs, fens, and wetlands	very low - no bog/fen areas present	potential habitat not identified in regional study area

Scientific Name	Common Name	COSEWIC Status	Provincial Ranking	Habitat Association	Potential for Occurrence	Potential Habitat in KP 437t
Eleocharis engelmannii	Engelmann's spike-rush	not listed	S3	shores, marshes, and drying slough bottoms	low - suitable habitat may occur	potential habitat not identified in regional study area
Elymus diversiglumis	various-glumed wild rye	not listed	S3	moist riparian deciduous woods and thickets	moderate - suitable habitat likely	deciduous riparian woods, Pipestone Creek valley
Elymus glaucus ssp. glaucus	blue wild rye	not listed	S3	dry to moist open woods, shrub thickets and meadows	low - suitable habitat may occur	potential habitat not identified in regional study area
Erigeron strigosus var. strigosus	whitetop fleabane	not listed	S3	grassy open prairie, shores, and woodland clearings	moderate - suitable habitat likely	Pipestone Creek valley, untilled coulees and hillsides
Gentiana andrewsii var. dakotica	closed blue gentian	not listed	S2	meadows and moist prairies	low - suitable habitat may occur	potential habitat not identified in regional study area
Gentianopsis virgata ssp. virgata	narrow-leaved fringed gentian	not listed	S3	moist woods and low areas	low - suitable habitat may occur	potential habitat not identified in regional study area
Heliopsis helianthoides ssp. occidentalis	rough ox-eye	not listed	S2	roadsides, woods, and moist meadows	low - historical documentation in landscape area, suitable habitat may occur	potential habitat not identified in regional study area
Hypoxis hirsute	eastern yellow star-grass	not listed	S2	moist to dry prairies and occasionally in open deciduous woods	low - suitable habitat may occur	potential habitat not identified in regional study area
Juncus interior var. interior	inland rush	not listed	S3	wet to drying mudflats, slough bottoms, shores, and field depressions	low - suitable habitat may occur	potential habitat not identified in regional study area
Lactuca biennis	tall blue lettuce	not listed	S3	moist woods and shrub thickets	low - suitable habitat may occur	potential habitat not identified in regional study area
Liparis loeselii	yellow twayblade	not listed	S1	wet, seepy depressions in meadows, fens, and sloughs	very low - suitable habitat unlikely to occur	potential habitat not identified in regional study area
Lotus unifoliolatus var. unifoliolatus	prairie bird's-foot-trefoil	not listed	S2	slough bottoms, streamlet margins, and seepy slopes	low - suitable habitat may occur	potential habitat not identified in regional study area
Mimulus glabratus var. jamesii	small yellow monkey-flower	not listed	S2	streamlet edges	low - suitable habitat may occur	potential habitat not identified in regional study area
Nothocalais cuspidata	prairie false-dandelion	not listed	S3	dry, often eroded grassland slopes	low - suitable habitat may occur	potential habitat not identified in regional study area
Onosmodium molle ssp. occidentale	western false gromwell	not listed	S2	margins of riparian woods and shrublands	moderate - suitable habitat likely	deciduous riparian woods, Pipestone Creek valley
Oryzopsis canadensis	Canadian ricegrass	not listed	S2	sandy aspen woods and tall/mixed grass prairie	low - suitable habitat may occur	potential habitat not identified in regional study area

Scientific Name	Common Name	COSEWIC Status	Provincial Ranking	Habitat Association	Potential for Occurrence	Potential Habitat in KP 437t
Panicum virgatum var. virgatum	switchgrass	not listed	S2	mesic-moist meadows, low grasslands	moderate - historical documentation in landscape area, suitable habitat likely	Pipestone Creek valley, untilled coulees and hillsides
Parnassia glauca	glaucous grass-of-parnassus	not listed	S3	wet, calcareous fens or sedge meadows	low - suitable habitat may occur	potential habitat not identified in regional study area
Piptatherum canadense	Canadian ricegrass	not listed	S2	sandy aspen woods and tall/mixed grass prairie	low - suitable habitat may occur	potential habitat not identified in regional study area
Potentilla rubricaulis	five-foliate cinquefoil	not listed	S3	dry, sandy prairie and open pine woods	low - historical documentation in landscape area, suitable habitat may occur	potential habitat not identified in regional study area
Prenanthes alba	white lettuce	not listed	S3	semi-shaded deciduous or mixed woods and clearings	low - suitable habitat may occur	potential habitat not identified in regional study area
Prunus pumila var. besseyi	western sandcherry	not listed	S2	sandy pine woods or prairie banks	low - suitable habitat may occur	potential habitat not identified in regional study area
Rosa blanda	smooth wild rose	not listed	S1	riparian woods and shrub thickets	low - historical documentation in landscape area, suitable habitat may occur	potential habitat not identified in regional study area
Ruppia maritima	widgeon grass	not listed	S3	submersed in quiet, often saline or alkaline lakes, ponds or sloughs	low - historical documentation in landscape area, suitable habitat may occur	potential habitat not identified in regional study area
Scirpus pallidus	pale bulrush	not listed	S3	marshy shores, moist ravine bottoms, moist meadows, streamsides, and ditches	low - suitable habitat may occur	potential habitat not identified in regional study area
Sisyrinchium mucronatum	mucronate blue-eyed grass	not listed	S3	moist or seasonally moist grassland	moderate - suitable habitat likely	Pipestone Creek valley, untilled coulees and hillsides
Sisyrinchium septentrionale	northern blue-eyed grass	not listed	S3	moist grassland, grassy streambanks	low - suitable habitat may occur	potential habitat not identified in regional study area
Solidago ptarmicoides	upland white goldenrod	not listed	S3	dry-mesic prairie with sandy, calcareous soil	moderate - suitable habitat likely	Pipestone Creek valley, untilled coulees and hillsides
Sporobolus heterolepis	prairie dropseed	not listed	S3	open prairie, pastures, open woods and roadsides	moderate - suitable habitat likely	Pipestone Creek valley, untilled coulees and hillsides
Streptopus amplexifolius var. amplexifolius	twisted stalk	not listed	S3	Moist riparian woods, aspen groves, wooded streambanks	moderate - suitable habitat likely	deciduous riparian woods, Pipestone Creek valley
Teucrium canadense var.occidentale	hairy germander	not listed	S3	lake and stream shore flats, prairie depressions, wetland margins	low - suitable habitat may occur	potential habitat not identified in regional study area
Townsendia hookeri	hooker's townsendia	not listed	S1	dry embankments and eroded slopes in short grass prairie	very low - suitable soil and habitat not present	potential habitat not identified in regional study area

Scientific Name	Common Name	COSEWIC Status	Provincial Ranking	Habitat Association	Potential for Occurrence	Potential Habitat in KP 437t
Viburnum lentago	nannyberry	not listed	S2	moist, shady deciduous woods	low - suitable habitat may occur	potential habitat not identified in regional study area
Viola labradorica	northern blue violet	not listed	S1	moist deciduous or mixed woods and clearings	low - suitable habitat may occur	potential habitat not identified in regional study area
Viola pedatifida	crowfoot violet	not listed	S3	moist prairie and clearings	high - multiple recorded occurrences in area, suitable habitat likely	Pipestone Creek valley, untilled coulees and hillsides

Source: Flora of North America Editorial Committee 1993; Government of Saskatchewan 2016b; Harms and Leighton 2011a, 2011b, 2011c, and 2014; Looman and Best 1987; Moss 1997; SKCDC 2017a; Saskatchewan Soil Survey 1991; Tannas 2003; USFS 2016; W.P. Fraser Herbarium 2006.

Table 4-B Listed wildlife species within the Aspen Parkland Ecoregion

Scientific Name	Common Name	Class	COSEWIC Status	SARA Status	Provincial Ranking	Habitat Association	Potential for Occurrence	Potential Habitat in KP 437
Aechmophorus occidentalis	western grebe	Aves	Special Concern	n/a	S3B,S3M	medium to large wetlands and lakes	moderate - suitable habitat likely	medium to large wetlands, Pipestone Creek valley
Ambystoma mavortium	western tiger salamander	Amphibia	Special Concern	n/a	S4	grasslands, meadows, semi permanent to permanent water features with no predatory fish	moderate - suitable habitat likely	medium to large wetlands and surrounding areas
Ammodramus bairdii	Baird's sparrow	Aves	Special Concern	n/a	S4B	mixed grass and fescue prairie	moderate - suitable habitat likely	Pipestone Creek valley - mixed grassland on coulee slopes
Anaxyrus cognatus	Great Plains toad	Amphibia	Special Concern	Special Concern	S3	grasslands and seasonal wetlands	very low - eastern edge of range	potential habitat not identified in regional study area
Anthus spragueii	Sprague's pipit	Aves	Threatened	Threatened	S3B,S3M	large, open areas mixed native grasslands	very low – suitable habitat not present	potential habitat not identified in regional study area
Asio flammeus	short-eared owl	Aves	Special Concern	Special Concern	S3B,S2N,S3M	native and tame grasslands	moderate - suitable habitat likely	pastureland, Pipestone Creek valley
Athene cunicularia	burrowing owl	Aves	Endangered	Endangered	S2B,S2M	open native prairie, slopes very gentle to level	very low - suitable habitat not present	potential habitat not identified in regional study area
Cathartes aura	turkey vulture	Aves	n/a	n/a	S3B,S3M	open habitat including grasslands and pastures; abandoned buildings for nesting	moderate - suitable habitat likely	pastureland, abandoned homesteads, Pipestone Creek valley
Chaetura pelagica	chimney swift	Aves	Threatened	Threatened	S2B,S2M	wetlands and large hollow trees	low - suitable habitat may occur	potential habitat not identified in regional study area
Chelydra serpentina	snapping turtle	Reptilia	Special Concern	Special Concern	S3	ponds, shallow river edges, and slow streams	low - suitable habitat may occur	potential habitat not identified in regional study area

Scientific Name	Common Name	Class	COSEWIC Status	SARA Status	Provincial Ranking	Habitat Association	Potential for Occurrence	Potential Habitat in KP 437
Chordeiles minor	common nighthawk	Aves	Threatened	Threatened	S4B, S4M	open habitats including grasslands and pastures	moderate - suitable habitat likely	open pastureland, Pipestone Creek valley
Coturnicops noveboracensis	yellow rail	Aves	Special Concern	Special Concern	S3B,S3M	wet meadows and wetlands usually with sedges	moderate - suitable habitat likely	wet meadows, wetland margins, riverbanks
Danaus plexippus	monarch	Insecta	Endangered	Endangered	S2B	open habitats including pastures, meadows, roadsides, and abandoned farmlands with milkweed and wild flowers	moderate - suitable habitat likely	roadsides, pastureland, Pipestone Creek valley
Dolichonyx oryzivorus	bobolink	Aves	Threatened	n/a	S4B,S4M	native or tame grasslands with tall grasses	high – suitable habitat present, known occurrences in area	pastureland, hayfields
Hirundo rustica	barn swallow	Aves	Threatened	n/a	S5B,S5M	open habitats including grasslands, pastures, hayfields, and wetlands; barns and outbuildings for nesting	moderate - suitable habitat likely	active or abandoned farmyards, sheds and other structures
Lanius ludovicianus excubitorides	loggerhead shrike	Aves	Threatened	Threatened	S2B,S2M	open grasslands, pastures, small trees, and shrubs	moderate - suitable habitat likely	pastureland, Pipestone Creek valley
Lithobates pipiens	northern leopard frog	Amphibia	Special Concern	Special Concern	S3	wetlands, riparian areas, wet meadows, and prairie	high – suitable habitat present, known occurrences in area	wetlands and surrounding areas, riverbanks
Melanerpes erythrocephalus	red-headed woodpecker	Aves	Threatened	Threatened	S1B,S1M	grasslands, riparian woods, and woodland edges	moderate - suitable habitat likely	wooded areas with standing dead trees
Myotis lucifugus	little brown myotis	Mammalia	Endangered	n/a	S4	large diameter trees, wetlands and waterways, and woodland edges	low - suitable habitat may occur	potential habitat not identified in regional study area
Numenius americanus	long-billed curlew	Aves	Special Concern	Special Concern	S3B,S4M	native grasslands	low - eastern edge of range, suitable habitat may occur	potential habitat not identified in regional study area
Podiceps auritus	horned grebe	Aves	Special Concern	n/a	S5B,S5M	semi-permanent or permanent wetlands	moderate - suitable habitat likely	medium to large wetlands
Riparia riparia	bank swallow	Aves	Threatened	n/a	S5B,S5M	riverbanks, lake bluffs, grasslands, and wetlands	low - suitable habitat may occur	potential habitat not identified in regional study area
Storeria occipitomaculata	red-bellied snake	Reptilia	n/a	n/a	S3	moist woodlands, wetland margins, riparian areas	moderate - suitable habitat likely	wetlands, Pipestone Creek valley
Taxidea taxus taxus	American badger	Mammalia	Special Concern	n/a	S3	grasslands, shrublands, and woodland edges	high - suitable habitat present, known occurrences in area	roadsides, pastureland

Source: COSEWIC, 2004a, 2004b, 2006, 2007a, 2007b, 2008, 2009a, 2009b, 2010a, 2010b, 2012a, 2012b, 2013, and 2014; Government of Saskatchewan 2016b; SKCDC, 2017b, 2017c.

Attachment 5

Explanation of the Species Rankings

Table 5-A Provincial rank definitions

Rank	Status	Definition
S1	Critically Imperilled	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	Imperilled	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 fairly 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, 2016; NatureServe 2012).

Table 5-B Codes and modifiers used to further describe provincial species rankings

Code	Definition
A	accidental or casual in the province, including species recorded infrequently that are far outside their range (birds or butterflies)
B	for a migratory species, rank applies to the breeding population in the province)
N	for a migratory species, rank applies to the non-breeding population in the province)
M	for a migratory species, rank applies to the transient population
H	historical occurrence but without recent verification (e.g. within 20 years)
U	status uncertain in Saskatchewan, because of limited information
X	believed to be extinct or extirpated
NR	rank is not yet assigned (not ranked)
NA	conservation status is not applicable to the species

Species rank modification codes provided by the SKCDC (2016).

Table 5-C – Federal 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 definition and status categories from COSEWIC (SKCDC, 2016).

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