Moose Jaw Combined Cycle Power Station Project

Project Description

Submitted to:

The Canadian Environmental Assessment Agency

Submitted by:

Saskatchewan Power Corporation (SaskPower)

May 3, 2019

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Abbreviations and Acronyms

AAFC	Agriculture and Agri-Food Canada
ACC	Air Cooled Condenser
AGC	Automatic Generation Control
AUC	Alberta Utilities Commission
BMP	Beneficial Management Practices
BOP	Balance of Plant
Ca	Calcium
CAAQS	Canadian Ambient Air Quality Standards
CCGT	Combined Cycle Gas Turbine
CCME	Canadian Council of Ministers of the Environment
CDED	Canadian Digital Elevation Data
CEAA	Canadian Environmental Assessment Agency
CEMS	Continuous Emission Monitoring System
CH_4	Methane
Cl	Chloride
CLI	Canada Land Inventory
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_{2e}	Carbon Dioxide equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada

CRA	Commercial, Recreational and Aboriginal
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPC	Engineer-Procure-Construct
EASB	Environmental Assessment and Stewardship Branch
Fe	Iron
GHG	Greenhouse Gas
GJ/hr	Gigajoule per hour
GTG	Gas Turbine Generator
GWP	Global Warming Potentials
HCB	Heritage Conservation Branch
HDD	Horizontal Directional Drilling
HDPE	High-Density Polyethylene
HRIA	Heritage Resource Impact Assessment
HRSG	Heat Recovery Steam Generator
IOS	International Organization for Standardization
kg/MWh	Kilogram per Megawatt Hour
kJ/kWh	Kilojoules per kilowatt hour
kt	Kilotonne
kV	Kilovolt

LAA	Local Assessment Area
LHV	Low Heating Value
M-Alk	M-Alkalinity
Mg	Magnesium
MHI	Ministry of Highways and Infrastructure
MMBtu	Million British Thermal Units Per Hour
MW	Megawatt
MWh	Megawatt hour
Na	Sodium
NH_3	Ammonia
NSPML#160	New Southern Plains Métis Local 160
NO_X	Nitrogen Oxide
N_2O	Nitrous Oxide
NO_2	Nitrogen Dioxide
NO_3	Nitrate
OEM	Original Equipment Manufacturer
PDA	Project Development Area
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter of 2.5 microns in diameter or smaller
PM_{10}	Particulate matter of 10 microns in diameter or smaller
PPM	Parts Per Million
psig	Per Square Inch Gauge

PSL	Permissible Sound Level
RAA	Regional Assessment Area
RM	Rural Municipality
RO	Reverse Osmosis
ROW	Right-of-Way
SAAQS	Saskatchewan Ambient Air Quality Standards
SAR	Species at Risk
SARA	Species at Risk Act
SiO_2	Silicon Dioxide
SKCDC	Saskatchewan Conservation Data Centre
SK ENV	Saskatchewan Ministry of Environment
SOMC	Species of Management Concern
SO_2	Sulphur Dioxide
SO_4	Sulphate
STG	Steam Turbine Generator
SWPPP	Storm Water Pollution Prevention Plan
TDS	Total Dissolved Solids
TLE	Treaty Land Entitlement
ULN	Ultra-Low NO_X
VC	Valued Component
VOC	Volatile Organic Compound
WSA	Water Security Agency

1.0 GENERAL INFORMATION AND CONTACT(S)

The scope of this document is to describe the potential effects of Saskatchewan Power Corporation's (SaskPower) proposed Moose Jaw Combined Cycle Power Station Project (the Project) on environmental, socio-cultural, and economic components, as well as to outline mitigation measures associated with the construction, operation, and decommissioning phases of the Project. The document also provides information on the incidental activities to be constructed by SaskPower, including:

- water infrastructure
- electrical power infrastructure
- a fibre-optic line
- road upgrades, and
- natural gas infrastructure.

The Project is located within 30.5 hectares (ha) of E½ 27-16-26 W2M, which is in the Moose Jaw Industrial Park and currently owned by the City of Moose Jaw. The incidental activities have various starting points before interconnecting to the Project (Figure 1-1).

In addition to the incidental activities and outside of the care and control of SaskPower, TransGas Ltd. is proposing to develop a natural gas pipeline to meet the growing natural gas needs for the City of Moose Jaw, including the Project and other customers within the Moose Jaw Industrial Park. Information on the natural gas line is provided in Section 2.3.4 and Appendix A.

This document is intended to fulfill the requirements of a Project Description under the *Canadian Environmental Assessment Act*, *2012* (Canadian Environmental Assessment Agency [CEAA or the Agency] 2012), Section 8(1) (Government of Canada 2012a) and reflects the requirements of the *Prescribed Information for the Description of a Designated Project Regulations* (Government of Canada 2012b) and the Agency's *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012* (Government of Canada 2015).

1.1 NATURE AND PROPOSED LOCATION OF THE PROJECT

There is a need to build a new power plant in Saskatchewan that can generate electricity by 2024 to:

- meet the growing demand for power in the province of Saskatchewan
- provide replacement power for the retirement of conventional coal-fired generating units
- allow for the integration of intermittent renewables, and
- reduce greenhouse gas (GHG) emissions.

The proposed Project is a nominal 350 megawatt (MW), with a seasonal maximum of 366 MW (see section 2.0 for more information), combined cycle natural gas power station to be located within Moose Jaw, Saskatchewan. Natural gas combined cycle power stations emit up to 60% less carbon dioxide (CO_2) as compared to conventional coal-fired generation in Saskatchewan (SaskPower internal calculation). The Project will provide a back-up to intermittent renewable generation options such as wind and solar. As such, once in service, this Project will play a key role in SaskPower's GHG emissions reduction strategy.

This Project will have one of the best-in-class heat rates, with high efficiency thermal design, and lower CO_2 emissions. The overall thermal efficiency of the Project will approach 58%. The Project is estimated to emit instantaneous values between 371and 392 kilograms of CO_2 per MW hour (kg/MWh) when operating at full load assuming a new and clean condition. Nitrogen Oxides (NOx) and other air emissions will meet or better the national emissions guidelines set out by the CCME (Canadian Council of Ministers of the Environment). This Project is anticipated to operate with efficiencies that will meet or better those of the approved Chinook Combined Cycle Gas Turbine at Swift Current. See Section 2.0 for more information.

1.1.1 Project Background

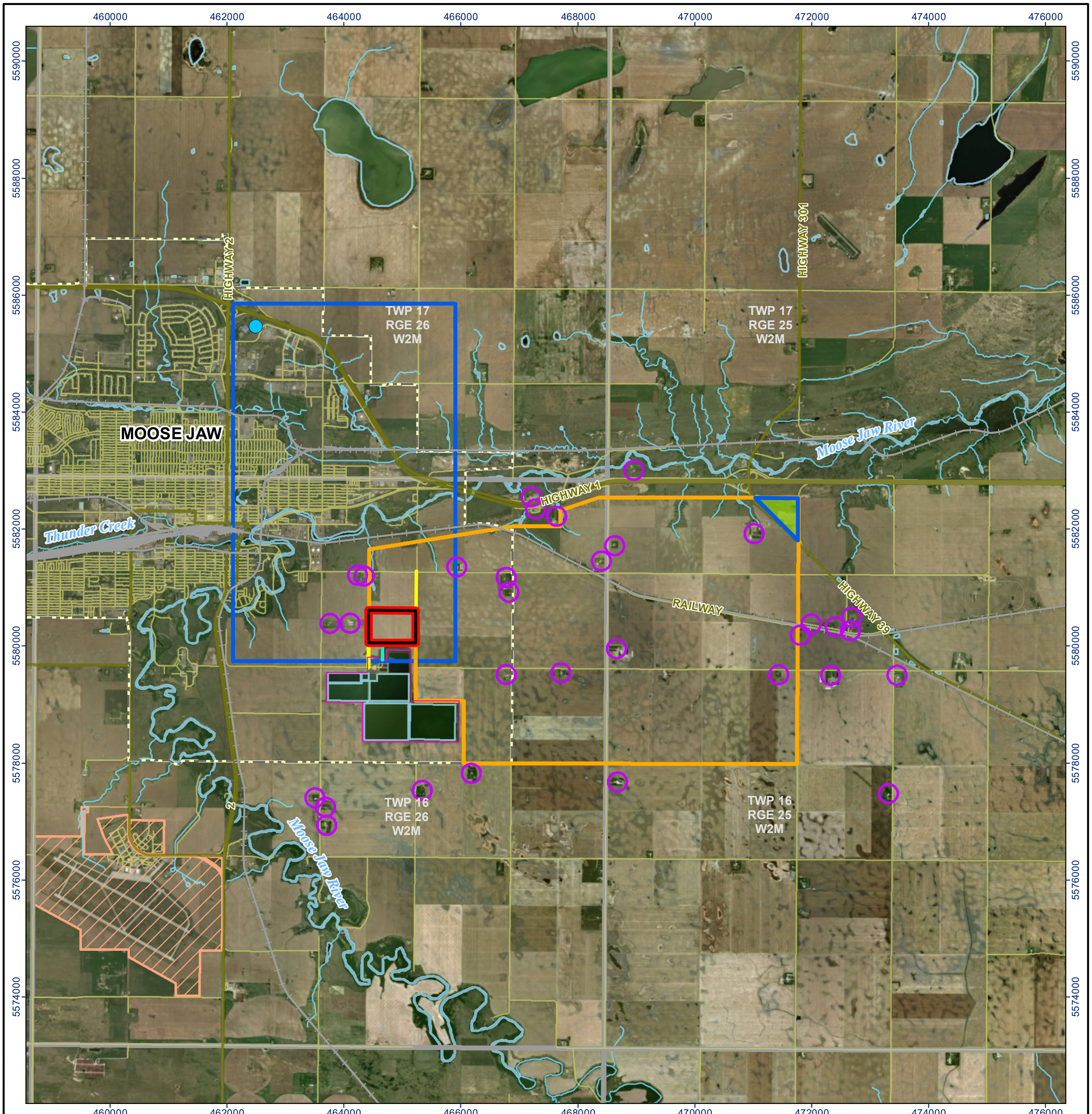
SaskPower is investing approximately $1 billion annually for at least the next decade to upgrade and modernize the province's electricity system. This includes finding cleaner sources of power generation in order to comply with existing regulations, which mandate the phase-out of conventional coal-fired generation as well as new emission standards and emerging regulations. SaskPower has a number of initiatives underway to meet anticipated supply needs including carbon capture technology; additional natural gas projects, hydroelectric (non GHG emitting) facility life extensions; additional wind and hydroelectric projects; utility scale solar projects; flare gas projects; importation of clean hydro power from Manitoba and evaluating the potential for geothermal, nuclear, and biomass power. These initiatives, combined with the development of more demand-side management and energy efficiency programs, will ensure SaskPower can continue to provide reliable, sustainable, and cost-effective electricity to the people of Saskatchewan well into the future.

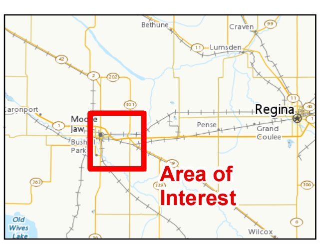
SaskPower is targeting a 40% reduction in GHG emissions from 2005 levels by 2030, exceeding the national target of a 30% reduction. To achieve this target, SaskPower will transition its conventional coal-fired generation facilities to lower GHG emitting supply options including natural gas, and renewables. SaskPower has committed to increase its renewable generation capacity from 25% today to up to 50% by 2030 (SaskPower 2019). Included in these plans is an increase in wind capacity and solar. In order to integrate these renewable supply options that are intermittent by nature, a back-up generation source is required to match electricity generation with electricity demand. Natural gas generation is an ideal candidate as it can quickly ramp up or down as the renewable generation output fluctuates. For Saskatchewan, it is the only practical and economic option for integration of renewables in order to reach SaskPower's 40% emission reduction target by 2030. Other new intermittent generation support options such as hydro are not currently available.

Natural gas generation is a key component to achieving both an increase in renewable capacity and GHG emissions reduction. The transition away from and retirement of SaskPower's conventional coal fired baseload generating units first affects Boundary Dam Units 4 and 5, which are forecasted to be shut down in 2021 and 2024 respectively. The retirement of units will leave a supply shortfall by the end of 2024 that must be backfilled by the construction of a new natural gas power station. The transition of conventional coal-fired generating units to natural gas represents a significant reduction in GHG and other criteria air contaminants.

1.1.2 Project Location

The Project is located on the southeast edge of the City of Moose Jaw within two partial quarter sections of land, SE 27-16-26 W2M and NE 27-16-26 W2M (Figure 1-1). The land is currently owned by the City of Moose Jaw and is within an industrial park, zoned as heavy industrial. SaskPower currently has an option to purchase the land from the City of Moose Jaw. Land titles are presented in Appendix B. Additional details on the location of the Project and incidental projects are provided in Section 3.





Project Site

Incidental Activity Study Area

Potable Water Supply Study Area

SaskPower Pasqua Switch Station

Distribution Line

Roads Upgrade

Moose Jaw Wastewater Treatment Plant

Canadian Forces Base - Moose Jaw

City of Moose Jaw Northeast Reservoir

Occupied Rural Residence

Major Road

Minor Road

Railway

Watercourse

City Limits

Township

Waterbody

0 1 2 Km

(At original document size of 8.5x11)
1:100,000

N

Stantec SaskPower

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Data Sources: Government of Saskatchewan, Government of Canada, SaskPower
3. Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project Location
Moose Jaw, Saskatchewan

Prepared by MDW on 2019-04-25
Technical Review by JHennig on 2019-04-25

Client/Project
113254233-001 REVI

Moose Jaw Combined Cycle Power Station Project

Figure No.
1-1

Title
Project Overview

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1.2 PROPONENT INFORMATION

SaskPower is a Crown Corporation of the Province of Saskatchewan with its corporate head office in Regina. SaskPower is the principal supplier of electricity in the province with an obligation to deliver power to the province in a safe, reliable, cost-effective, and environmentally responsible manner. SaskPower operates under the legislated mandate and authority of the provincial Government of Saskatchewan and its Board of Directors is accountable to the Minister responsible for SaskPower.

1.2.1 Proponent Contact Information

The Project name and proponent contact information are provided below:

Name of the designated project:	Moose Jaw Combined Cycle Power Station Project
Name of the proponent:	Saskatchewan Power Corporation (SaskPower)
Address of the proponent:	2025 Victoria Avenue, Regina, Saskatchewan S4P 0S1
Chief Executive Officer:	Mike Marsh President and Chief Executive Officer SaskPower Phone: 306-566-3271 MMarsh@saskpower.com
Principal contact person:	Michael Dedman Project Manager SaskPower Phone: 306-566-3209 MDedman@saskpower.com

1.2.2 Project Team

SaskPower plans to partner with an engineering, procurement, and construction (EPC) firm to build the Project. The EPC firm will have experience in executing projects with advanced F-class combined cycle facilities in Canada. The EPC firm will be required to support stakeholder engagement, comply with the commitments made within this Project Description, and investigate and commit to procurement opportunities for local and Indigenous vendors.

Burns & McDonnell Canada Ltd. (Burns and McDonnell) participated in the development of this Project Description to ensure the accuracy of the information provided, as this was the basis for emission and noise details. Burns & McDonnell has executed other combined cycle facilities throughout North America including projects in Saskatchewan and Ontario.

SaskPower contracted Stantec Consulting Ltd. (Stantec) to evaluate the environmental effects of the Project and prepare the regulatory submission. Stantec has extensive experience in evaluating the effects of power projects both locally and across Canada.

SaskPower has assigned an experienced internal Project team to guide the Project to completion (Table 1-1).

Table 1-1 Key Project Personnel

SaskPower
Scott Bannerman, P.Eng. – Project Director
Justin Lacelle, P.Eng. – Construction Director
Michael Dedman, P.Eng., PMP – Project Manager
Jeremy Boutin, P.Eng. – Engineering and Commissioning Lead
Darcy Holderness, P. Eng. – Technical Services & Quality Manager
Allison Champion – Environmental Assessment Co-Lead
Randolph Seguin – Environmental Assessment Co-Lead
Robert Turczyn, P. Eng. – Construction Manager
Stantec Consulting Ltd.
Neil Cory – Project Technical Director
Jordan Hennig – Project Manager and Environmental Assessment Lead

1.3 LIST OF JURISDICTIONS AND OTHER PARTIES CONSULTED

SaskPower endeavoured to identify and engage with the regulatory agencies, governmental bodies, Indigenous peoples, stakeholders, and other parties who may hold an interest in this Project, starting with the siting process. These entities are listed in Table 1-2.

Table 1-2 Jurisdictions and Other Parties Engaged by the Project Team

Federal Government	The Agency Nav Canada Transport Canada Canadian Forces Based Moose Jaw, 15 Wing Canadian Forces Based Winnipeg, 17 Wing
Provincial Government	Saskatchewan Ministry of Environment (SK ENV), Environmental Assessment and Stewardship SK ENV, Landscape Conservation Environmental Protection Branch Saskatchewan Ministry of Parks, Culture and Sport, Buffalo Pound Provincial Park TransGas Limited SaskWater Water Security Agency (WSA)
Municipal Government	Rural municipality (RM) of Bratt's Lake No. 129 RM of Pense No. 160 RM of Edenwold No.158 RM of Lajord No. 128 RM Moose Jaw No. 161 RM Sherwood No. 159 City of Moose Jaw Town of Pense Village of Grand Coulee Village of Belle Plaine City of Regina

Local landowners, businesses, special interest groups	Residents near four potential sites were contacted during the initial site options study by SaskPower Sherwood Park Golf & Country Club The Mosaic Company Moose Jaw Watershed Stewards Watershed Association Wascana Upper Qu'Appelle Watershed Association Ducks Unlimited Canada Saskatchewan Wildlife Federation Great Plains Air Zone Moose Jaw Chamber of Commerce Nature Saskatchewan Saskatchewan Environmental Society Native Plant Society of Saskatchewan Nature Conservancy of Canada
Indigenous Communities	Carry the Kettle Nakoda Nation Cowessess First Nation Day Star First Nation File Hills Qu'Appelle Developments George Gordon First Nation Kawacatoose First Nation Muscowpetung First Nation Muskowekwan First Nation Nekaneet First Nation New Southern Plains Métis Local 160 (NSPML#160) Ochapowace First Nation Pasqua First Nation Piapot First Nation Regina Riel Métis Council Sakimay First Nation Standing Buffalo Dakota Nation Star Blanket Cree Nation Wood Mountain Lakota Nation

1.4 ENVIRONMENTAL ASSESSMENT AND REGULATORY REQUIREMENTS OF OTHER JURISDICTIONS

The Project has the potential to be regulated by federal and/or provincial jurisdictions. However, depending on the results of the screening, different regulatory pathways may result. A summary of the federal and provincial processes and “triggers” are described below. Additionally, summary descriptions of municipal, provincial, and federal legislation, regulatory requirements, and permits, licenses, and authorizations that may be applicable to the Project are provided in Section 1.4.4.

1.4.1 Federal

Paragraph 2(a) of the *Regulations Designating Physical Activities* (Government of Canada 2014) states that a review needs to occur through the Minister of Environment under the CEAA 2012 (Government of Canada 2012a) for the construction, operation, decommissioning, and abandonment of a new fossil fuel-fired electrical generating facility with a production capacity of 200 MW or more. The proposed Project is nominally 350 MW in size and is therefore subject to a Screening by the Agency under requirements of

Section 10 of CEAA 2012 (Government of Canada 2012a), to determine if an Environmental Assessment (EA) is required.

The Project is not an incidental activity of a larger Project that is listed in the *Regulations Designating Physical Activities* (Government of Canada 2014). This is a new project and neither the Project nor any of its components are an expansion under CEAA 2012 (Government of Canada 2012a).

1.4.2 Provincial

In addition to federal jurisdiction, the Project may also constitute a “development” for the purposes of *The Saskatchewan Environmental Assessment Act*, as the term is defined by Section 2(d) of the *Act (*Government of Saskatchewan 1980a).

Developments that are likely to have significant environmental implications must be granted approval from the SK ENV - Environmental Assessment and Stewardship Branch (EASB) before proceeding with a project. A separate application will be submitted to the SK ENV-EASB in August 2019 to inform their decisions regarding the acceptability of potential environmental effects from the Project. Following the review, it will be determined if the Project is deemed a development and whether the submission of an environmental impact statement (EIS) is required. At this time, SK ENV has not determined whether an EIS is required for the Project.

Similar to the federal process, through the submission of an EIS, if required, the EA process is intended to provide a detailed review of the biophysical, socio-economic and cultural issues associated with a proposed project. It allows for the public, potential stakeholders, and appropriate government agencies to be made aware of and comment on the potential environmental effects associated with a proposed project.

Table 1-3 Saskatchewan Ministry of Environment Application Timeline

Activity	Anticipated Schedule
Fall Environmental Surveys	August 15 – October 15, 2018 - Completed
Technical Proposal & Survey Consultant Procurement	Winter/Spring 2019 - Completed
Spring Environmental Surveys	April – June 2019
Summer Environmental Surveys	June – September 2019
Technical Proposal Submission to SK ENV	October 2019
Determination if EIS is required	December 2019

1.4.3 Municipal

This Project is not subject to a municipal level EA. Municipal legislation and regulatory requirements relevant to the Project are presented in Section 1.4.4.

1.4.4 Summary of Legislative and Regulatory Requirements

The Project will be subject to several legislative and regulatory requirements including permits, licenses, and authorizations. Project planning is at the early stages and consequently, all of the requirements for permits, licenses, and authorizations are not currently known. A list of municipal, provincial, and federal legislation;

regulatory requirements; and permits, licenses, and authorizations that may be applicable to the Project is provided in Table 1-4. This list will be updated and refined as the Project details are confirmed

Table 1-4 Summary of Potential Legislative and Regulatory Requirements for the Project

Legislation/Regulations	Overseeing Agency	Relevance to Project
Federal Authorities		
The Canadian Environmental Assessment Act (Government of Canada 2012a)	The Agency	The Project is a “designated project” and requires a screening under Sections 8 to 12 of the Act. The Agency may require an EA under CEAA 2012.
Fisheries Act (Government of Canada 1985b)	Fisheries and Oceans Canada (DFO)	The *Fisheries Act* defines requirements by which commercial, recreational and Aboriginal (CRA) fisheries are protected, including the prevention of “serious harm to fish” including fish habitats and to fish that support a CRA fishery. A review of available information indicates that no fish bearing water features are expected to be affected by the Project. The proposed potable water supply pipeline will cross the Moose Jaw River, which is fish bearing; this document describes appropriate mitigation to avoid potential effects through the use of horizontal directional drilling (HDD) techniques.
Species at Risk Act (SARA) (Government of Canada 2002)	Environment and Climate Change Canada	The SARA lists species in Canada that are classified as being extirpated, endangered, threatened, or of special concern. These species are granted special measures to protect them. Federally listed species at risk may occur in the Project area and have the potential to interact with the Project. This document describes appropriate mitigation to avoid potential effects.
Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity (Government of Canada 2018b)	Environment and Climate Change Canada	It establishes a limit of 420 tonnes of CO_2 emissions/GWh of energy produced for natural gas turbines in excess of 150 MW.
Migratory Birds Convention Act (Government of Canada 1994)	Environment and Climate Change Canada	The Migratory Birds Regulations define provisions which are meant to protect native species of migratory birds, nests, and eggs. The Project including the proposed transmission line may interact with migratory birds and this document describes appropriate mitigation to avoid potential effects.
Aeronautics Act (Government of Canada 1985a)	Nav Canada	SaskPower will be required to submit a Land Use Submission Form to Nav Canada prior to Construction.
Aeronautics Act (Government of Canada 1985a), Canadian Aviation Regulations, Standard 621 (Government of Canada 1996)	Transport Canada	SaskPower will be required to submit an Aeronautical Assessment Form for Obstruction Marking and Lighting for Transport Canada to determine the need for the use of marking and lighting on objects that may pose a hazard to aviation. SaskPower will work to ensure compliance with the *Moose Jaw Airport Zoning Regulations*.

Legislation/Regulations	Overseeing Agency	Relevance to Project
Standards Respecting Pipeline Crossings Under Railways (Government of Canada 2000)	Transport Canada	Any utilities, including pipelines, that cross under railways are to be installed, renewed, and maintained in a safe manner, and must conform with the requirements stated within *Standards Respecting Pipeline Crossings Under Railways*.
Provincial Authorities		
The Environmental Assessment Act (Government of Saskatchewan 1980a)	SK ENV	Developments that are likely to have significant environmental implications must be granted approval from the Saskatchewan SK ENV-EASB before proceeding with a project. SaskPower will submit a Technical Proposal to the Saskatchewan SK ENV-EASB to inform their decisions regarding the acceptability of potential environmental effects from the Project. Following the review, the SK ENV-EASB will determine if the Project is deemed a development. If the Project is deemed a development, an EA is required.
Environmental Management and Protection Act (Government of Saskatchewan 2010a)	SK ENV	Air quality is regulated by the SK ENV under the *Environmental Management and Protection Act* which regulates potentially harmful activities and substances to protect the air, land and water resources of the province. SaskPower will be required to meet the requirements of Chapter E.1.2, of the Saskatchewan Environmental Code, adopted pursuant to the *Environmental Management and Protection Act*. The Project will also require industrial works construction and operation approvals including approval to construct and store hazardous substances and/or waste dangerous goods from the Environmental Protection Branch.
The Water Security Agency Act (Government of Saskatchewan 2005)	SK ENV – Fish, Wildlife and Lands Branch; WSA	The Project may require a water rights license to construct and operate works as well as an approval to construct and operate a storm water pond. SaskPower will have to pay an industrial usage fee as required by WSA. In addition, an Aquatic Habitat Protection Permit may be required prior to beginning construction. Types of activities associated with the Project that may require an Aquatic Habitat Protection Permit include the construction of incidental activities (e.g., electrical power infrastructure, road upgrades, water infrastructure); and riparian and aquatic vegetation removal.
The Wildlife Act (Government of Saskatchewan 1998)	SK ENV – Fish and Wildlife Branch	Plant and animal species at risk as defined in the *Wildlife Act*, are protected from being disturbed, collected, harvested, captured, killed, sold or exported without a permit.
The Highway and Transportation Act (Government of Saskatchewan 1997)	Ministry of Highways and Infrastructure (MHI)	The Project may require permits for the movement of oversized and overweight vehicles on provincial highways. Permits may also be required for on premise and off-premise identification signs. SaskPower will work with the Saskatchewan MHI, the RM of Moose Jaw (and any other required RM) and the City of Moose Jaw to obtain necessary agreements or permits for work within existing road allowances and roadway crossings prior to potable water supply pipeline construction.

Legislation/Regulations	Overseeing Agency	Relevance to Project
The Heritage Property Act (Government of Saskatchewan 1980b)	Ministry of Parks, Culture and Sport – Heritage Conservation Branch (HCB)	The HCB has designated each quarter section parcel within the southern half of the Province as either “sensitive” or “non-sensitive” for heritage resources. Developments occurring within a “non-sensitive” land parcel may proceed to development without needing to be submitted to the HCB for evaluation. The Project is within a non-sensitive parcel (SE 27-16-26 W2M) and a sensitive parcel (NE 27-16-26 W2M). The interconnections and incidental activities (e.g., electrical power, road upgrades, water infrastructure) associated have the potential to intersect some sensitive parcels. SaskPower’s in-house archaeologists will review the Project and its components to reduce the potential risk of affecting heritage resources. The Project may require a heritage resource impact assessment (HRIA) to be conducted. The results of the HRIA, if required, will be provided to the HCB who will issue a letter granting clearance for the Project under the *Heritage Properties Act*.
The Occupational Health and Safety Act (Government of Saskatchewan 1993)		The water and gas pipeline trenches will be designed and constructed in accordance with *The Occupational Health and Safety Regulations, 1996; Part XVII Excavations, Trenches, Tunnels and Excavated Shafts.*
Municipal Authority		
Zoning Bylaw (City of Moose Jaw 2019b)	City of Moose Jaw	SaskPower will be required to apply for a Zoning and Building Certificate from the City of Moose Jaw prior to development.
Building Bylaw (City of Moose Jaw 2016)	City of Moose Jaw	All structures and buildings developed for the Project will be required to comply with the Building Bylaw. SaskPower will obtain the necessary building permits for the Project prior to development.

1.5 REGIONAL ENVIRONMENTAL STUDIES

The Project site has not been part of a regional environmental study under Section 74 of CEAA 2012 (Government of Canada 2012a). Additionally, there are no known regional environmental studies being conducted for this area at this time.

2.0 PROJECT INFORMATION

The Project will be a power generation facility which uses natural gas combined cycle gas turbine (CCGT) technology to generate a nominal 350 MW of electricity, with the capability to generate up to a maximum of 366 MW under optimum ambient conditions. Nominal output is used by manufacturers to associate generation options with technology. Actual output from the facility will vary with seasonal ambient conditions at Moose Jaw, SK. The remainder of this report will reference the generating capacity for this facility as a nominal 350 MW of electricity. Project components will include the Project and incidental activities, including water infrastructure, an overhead 230 kilovolt (kV) transmission line, 25 kV power distribution line, fibre-optic line, road upgrades, and natural gas infrastructure.

The Project will be located on the southeast edge of the City of Moose Jaw within two partial quarter sections of land, SE 27-16-26 W2M and NE 27-16-26 W2M (Figure 1-1). The Project will be situated as far south and east on the quarter section as feasible, the total disturbance footprint for the Project, including temporarily disturbed areas during construction, will be approximately 525 m x 580 m (30.5 ha). Construction activities are planned to begin in January 2020 and continue until commissioning and startup, which is expected to occur by the fourth quarter of 2023.

2.1 PROPOSED DEVELOPMENT

The proposed Project is one part of SaskPower's Strategic Supply and Renewable power plan for Saskatchewan. The plan looks to contribute to Canada's ability to meet its environmental obligations and its commitments in respect of climate change. SaskPower is targeting a 40% reduction in GHG emissions from 2005 levels by 2030, exceeding the national target of a 30% reduction. To achieve this target, SaskPower will transition over 1,400 MW of conventional coal-fired generation facilities to lower GHG emitting supply options. This includes a significant focus on additional renewables as SaskPower announced plans to increase its renewable generation capacity from 25% today to up to 50% by 2030 in support of meeting the emission reduction target.

SaskPower is faced with challenges including aging infrastructure and additional power demand. The goal is to ensure SaskPower can meet these challenges with reliable, sustainable, and cost-effective power. This Project is well positioned to address these challenges. By 2024, an increase in demand for power of approximately 279 MW is expected compared to 2019 levels. After 2024, demand is expected to continue to grow at a rate of approximately 0.95% annually to 2030.

To ensure grid reliability, SaskPower must maintain a 13% reserve margin. There is an expected shortfall of approximately 24 MW in January 2025, and up to 147 MW of shortfall in December 2025. The expected shortfall increases thereafter if this Project were not in commercial operation on October 1, 2024. To mitigate the shortage, SaskPower would be required to use other less efficient generation with higher emissions. Furthermore, if this Project is unable to achieve commercial operation in 2024, the expansion of renewable generation capacity will be compromised.

The Project, as proposed, is part of the most cost-effective solution to meet increasing electricity demand as well as replace existing conventional coal-fired generation within the timelines required. It will also result in an overall reduction of GHG and other air emissions. As SaskPower phases out conventional coal-fired generation, leverages carbon capture and storage technology, and adds natural gas and renewables into its system, GHG emission levels will reduce significantly.

SaskPower has a number of generation supply options currently under consideration to meet the growing demand for power over the next 10-20 years. As opposed to a single technology, this Project is part of a sequenced portfolio, of which many other technologies are being considered including:

- gas fired technology including simple cycle / combined cycle / cogeneration
- hydroelectric
- biomass
- solar
- wind
- flare gas
- non-emitting technologies such as clean coal
- evaluation of nuclear, and
- imported power from provinces with hydroelectric resources (Manitoba)

Currently, independent power producer contracts are in place that will triple SaskPower's installed wind capacity to more than 600 MW in the near future. In addition, the competitive procurement process for another 200 MW wind project is expected to begin later in 2019. SaskPower announced last year that the province's first utility-scale solar project will be constructed near Swift Current and recently started the competitive procurement process for another 10 MW solar facility. These two projects will contribute to SaskPower's goal of adding 60 MW of solar generation by 2021 through a combination of competitive procurement, a partnership with the First Nations Power Authority, and community-driven projects. For SaskPower, developing a CCGT facility is a critical enabler for other technologies such as renewables and thus is a necessary first choice.

To integrate these renewable supply options, that are intermittent by nature, a back-up generation source is required to match electricity generation with electricity demand. Natural gas generation is an ideal candidate as it can quickly ramp up or down as the renewable generation output fluctuates. For Saskatchewan, it is the most practical and economic option for integration of renewables to reach SaskPower's 40% emission reduction target by 2030, as other intermittent support options such as hydro resources or grid scale energy storage are either limited in their potential within Saskatchewan or not economically or technically viable at the scale required. To ensure power supply continuity and availability while integrating renewable power sources, the backstop must be in place beforehand.

Natural gas generation is a key component to achieving an increase in renewable capacity, a reduction in GHG emissions, and a cost-effective solution to replace existing conventional coal-fired generation within the timelines required. The transition from conventional coal facilities will require SaskPower's conventional coal-fired baseload generating units be retired, the first of these will be Boundary Dam Units 4 and 5 which are forecasted to shut down by the end of 2021 and 2024, respectively. The retirement of the units will leave a supply shortfall by the end of 2024 that must be backfilled by renewable generation options including hydroelectric import and the construction of a new natural gas power station. The transition of conventional coal-fired generating units to renewables and natural gas represents a significant reduction in GHG and other criteria air contaminants.

The proposed Project is a nominal 350 MW CCGT designed to emit up to 60% less CO_2 than similar sized conventional coal-fired generation units. It will be similar in size to SaskPower's previously approved Chinook Power Station currently under construction near Swift Current. The Project consists of one gas turbine generator (GTG), one heat recovery steam generator (HRSG), one steam turbine generator (STG), and an air cooled condenser (ACC) with other equipment and infrastructure. The basic principle of the Project is to combust natural gas in a gas turbine which is coupled to a generator to produce power. The combustion turbine hot exhaust gases are then used to produce steam in a HRSG. This steam produced is utilized in a steam turbine coupled to a generator to produce additional power. As a result, CCGT facilities are one of the most efficient and reliable generation technologies available.

This proposed Project is to be located south-east of the City of Moose Jaw in the Moose Jaw Industrial Park directly adjacent to the sewage treatment facilities. This land has been designated industrial since 2011 as part of both the RM of Moose Jaw and City of Moose Jaw Official Community Plans. As of April 2017, the land was zoned Heavy Industrial. The Moose Jaw Industrial Park is still under design and development by the City of Moose Jaw (e.g., roads, utilities, etc.). SaskPower commits to continued engagement with the City of Moose Jaw to ensure understanding of the Industrial Park plan goals.

The Project is expected to take approximately 42 months to complete. Construction activities in the first year will include the contractor clearing and levelling the land and the installation of piles, foundations, and underground infrastructure. During the second year of construction, cranes will be mobilized to site for the assembly of the HRSG and the main powerhouse building. Major equipment will arrive to the site during this year. The remainder of the project schedule will include testing, energizing, and commissioning the Project.

During construction, the Project will provide employment opportunities with an estimated 230 full-time jobs required. The Project will also bring financial benefits to the local area as goods and services such as food and lodging, construction materials, sewage disposal, and snow removal will be required. During operation, the Project will provide employment opportunities for approximately 20 people including operators, engineers, and support staff. An annotated preliminary layout configuration of the Project is shown in Figure 2-2.

The Project team determined the layout of the Project through analysis of:

- interconnection tie-ins to the Project (section 2.3.4)
- noise modeling results

- wind direction
- property zoning, and
- stakeholder engagement and neighbouring properties

SaskPower conducted an extensive review and analysis of potential sites for development of a new natural gas power station between 2015 and 2019. The site selection process began with identifying potential geographical regions that were technically feasible for a new natural gas generation facility. Four geographical areas of interest were identified, and SaskPower began broadly sharing information about the need for a future natural gas generation facility which included engagement with First Nations and Métis communities, public engagement, analysis of potential environmental concerns, and consideration of technical requirements.

SaskPower considered feedback and ultimately selected the Site based on; its proximity to renewable generation; load growth requirements near Moose Jaw; public input; constructability and accessibility; performance; and the benefits stemming from existing electrical transmission and natural gas infrastructure in the area and the overall cost of the Project. The Moose Jaw Industrial Park provided a pre-zoned industrial space for the Project, and provided benefits such as the management of process wastewater and sewage through the City of Moose Jaw's Wastewater Treatment Plant's facilities. Within the Industrial Park three alternative locations for the Project site were considered. As part of the site selection process, 15 Wing Moose Jaw was approached, and their input solicited. Two of the alternative locations were deemed unacceptable. Subsequent to the concurrence of 15 Wing Moose Jaw, SaskPower, on December 21, 2018, signed a land option agreement for the third acceptable alternative location with the City of Moose Jaw for land in this area.

SaskPower is committed to ongoing discussions with all stakeholders throughout Project development and the life of the proposed Project. It is SaskPower's intent to meet or better all regulatory requirements related to the construction, operation, and, ultimately, the decommissioning of this Project.

2.2 DESIGNATED PHYSICAL ACTIVITY

Paragraph 2(a) of the *Regulations Designating Physical Activities* (Government of Canada 2014) states that a review needs to occur through the Minister of Environment under the CEAA 2012 (Government of Canada 2012a) for the construction, operation, decommissioning, and abandonment of a new fossil fuel-fired electrical generating facility with a production capacity of 200 MW or more. The proposed Project is a nominal 350 MW CCGT facility and is therefore subject to a Screening by the Agency under requirements of Section 10 of CEAA 2012 (Government of Canada 2012a), to determine if an EA is required.

2.3 COMPONENTS AND ACTIVITIES

The Project has been designed to generate a nominal net output of 350 MW. The Project output is greater than the 200 MW threshold established for new fossil fuel-fired electrical generating facilities under the *Regulations Designating Physical Activities* (Government of Canada 2014).

The Project consists of one GTG, one HRSG, one STG, and an ACC with other equipment and infrastructure. The basic principle of the Project is to combust natural gas in a gas turbine which is coupled to a generator to produce power. The combustion turbine hot exhaust gases are then used to produce steam in a HRSG. This steam produced is utilized in a steam turbine coupled to a generator to produce additional power. As a result, CCGT facilities are one of the most efficient and reliable generation technologies available.

Power output, heat rate, and efficiency for CCGT technologies have improved incrementally over the years, primarily due to the advancement in the design of the gas turbine. For an intermediate to base load CCGT facility, a combined cycle using G, H, and J class gas turbines[1] would have better efficiency. However, output of a CCGT facility using these technologies would be higher than SaskPower's single largest contingency of 350 MW. Due to grid and interconnection constraints, a power plant using these larger gas turbine technologies would require a derate of the power plant to stay near 350 MW, which in turn decreases the efficiency resulting in a higher heat rate and higher emissions.

The 1x1 F-class[2] turbine configuration chosen for the Project is best suited to meet the 350 MW output. Since carbon capture technology is not used for CCGT units, higher efficiency (lower heat rate) means that less CO_2 is generated for every kilowatt of electricity generated. Table 2-1 shows the estimated instantaneous generation output and heat rate of the Project across various ambient conditions with the GTG operating at full load.

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[1] Gas turbines are categorized by manufactures based on their output, firing temperature and pressure ratio. These categorizations are called classes. The letter associated with the class generally refers primarily to when the technology was developed, how it has evolved and the overall output. Generally speaking, H and J-class machines are more efficient than F-Class by 1%-2%, but are too large to be accommodated by SaskPower's transmission system at peak efficiency. The smallest H and J-class combustion turbines output 40 – 80 MW more than the largest F-class turbine.

[2] F-Class turbines are smaller than the G, H and J class turbines, and are the largest, most efficient that can be accommodated by SaskPower's transmission system.

Table 2-1 Theoretical Instantaneous Generation Output and Heat Rate of the Project Operating at Full Load (100%)

Ambient Conditions	-40°C 75% Relative Humidity	-7.4°C 86% Relative Humidity	0°C 83.4% Relative Humidity	15.8°C 69% Relative Humidity	34.6°C 17% Relative Humidity
Net Project Output (MW) [a]	364	366	366	353	301
Net Project Heat Rate (kJ/kWh, LHV) [b]	6,300	6,200	6,190	6,180	6,490
Heat Input (GJ/h, LHV) [c]	2,292	2,270	2,266	2,184	1,951
CO_2 Emissions (kg/MWh) [d]	377	371	371	371	392

[a] MW – Megawatt
[b] kJ/kWh, LHV – Kilojoules per kilowatt hour, low heating value
[c] GJ/h, LHV – Gigajoule per hour, low heating value
[d] kg/MWh – kilogram per megawatt hour
Note: The values represented in this table are instantaneous values rather than an accumulation over time. Output and heat rates are based on the unit in a new and clean condition, with no consideration for facility degradation during operation.

This plant is one of several facilities in SaskPower's fleet that are capable of running at reduced loads to support the renewable portfolio. Table 2-2 shows the estimated instantaneous output and heat rate of the unit at half load while maintaining a NO_x emissions limit of 15 parts per million (ppm). This method of operation represents an extreme reduced efficiency; it is in SaskPower's best interest from environmental, financial, and maintenance perspectives to minimize time operating in this range. At extreme temperatures such as -40°C at 75% RH and 34.6°C at 17% RH (table 2-2) SaskPower has traditionally experienced higher load demand due to increased use of furnaces, air conditioners, etc., therefore it is anticipated that this facility will run at or near full load during these conditions.

The GTG will meet the 15 ppm NOx limit when operating above the outputs indicated in Table 2-1 at the corresponding ambient conditions. SaskPower is requesting that its EPC partner achieve NOx emissions of 12 ppm from the GTG.

Table 2-1 Theoretical Instantaneous Output and Heat Rate of the Project Operating at Half Load

Ambient Conditions	-40°C 75% Relative Humidity	-7.4°C 86% Relative Humidity	0°C 83.4% Relative Humidity	15.8°C 69% Relative Humidity	34.6°C 17% Relative Humidity
Net Project Output (MW) [a]	189	186	187	184	176
Net Project Heat Rate (kJ/kWh, LHV) [b]	7,160	6,940	6,890	6,850	7,160
Heat Input (GJ/h, LHV) [c]	1,351	1,294	1,287	1,262	1,259
CO_2 Emissions (kg/MWh) [d]	424	415	415	410	431

[a] MW – Megawatt
[b] kJ/kWh, LHV – Kilojoules per kilowatt hour, low heating value
[c] GJ/h, LHV – Gigajoule per hour, low heating value
[d] kg/MWh – kilogram per megawatt hour
Note: The values represented in this table are instantaneous values rather than an accumulation over time. Output and heat rates are based on the unit in a new and clean condition, with no consideration for facility degradation during operation. SaskPower does not plan continuous operation at this level.

The facility will be one of SaskPower's most efficient and economical natural gas generating unit. It will operate over its most efficient operating range to support load and provide backup to renewable generation, unless system constraints, such as minimum down times, "must-take" contracts, or scheduled maintenance, require other units be dispatched.

The unit has a relatively flat heat rate curve, meaning the efficiency of the unit does not change much across most of its operating range and is in compatibility with SaskPower's existing and future gas plant fleet. Even though Table 2-2 shows instantaneous CO_2 values of 424 kg/MWh and 431 kg/MWh at extreme temperature conditions of -40°C at 75% RH and 34.6°C at 17% RH respectively, the Project GHG emissions during operation, as described in Section 2.4.1, are estimated to be a maximum 1,038,463 tonnes CO_2e per year (this is below regulatory requirements). This is calculated based on a predicted normal operating year defined as 7,446 operating hours of the gas turbine and the natural gas dew point heater, and 100 operating hours for the emergency fire pump and emergency diesel generator.

The Project will be designed to have a best in class heat rate, resulting in high efficiency and lower CO_2 emissions. Specifically, the Project is expected to emit a maximum of 392 kg/MWh of instantaneous CO_2 at full load and extreme temperature conditions of 34.6°C at 17% RH with an overall thermal efficiency of approximately 58%, resulting in an emission rate well below 420 kg/MWh CO_2 described in the *Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity* (Government of Canada 2018b). Throughout operation, values from the continuous emissions monitoring system (CEMS) will be monitored and reported to verify the operation output aligns with the predicted model to prevent exceedances of CO_2 emissions relative to the 420 kg/GWh annual limit.

It needs to be understood that because of the flat heat curve associated with this type of facility a reduction in power output does not necessarily equate to an exceedance of the annual regulatory

420 kg/MWh CO_2. At full power output the instantaneous emissions are estimated to be 392 kg/MWh of CO_2 and to remain below the 420 kg/MWh annual limit at power outputs as low as 65% within the conditions modeled. This gives the facility the ability to respond to the renewable portfolio while remaining within the CO_2 emissions compliance limits. It should be further noted that at the temperature extremes noted in Table 2-2 that power demand will be high and therefore the facility run at or near full load. It is expected that the plant will only function at CO_2 emission levels above the 420 kg/MWh instantaneous limit less than 3% of the time with the majority of this occurring during start-up operations. Therefore, it is anticipated on an annual basis the 420 kg/MWh CO_2 described in the *Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity* (Government of Canada 2018b) will be met.

The general process of a CCGT facility is described below (Figure 2-1). Pipeline quality natural gas will be used as the only fuel for the unit. Prior to entering the gas turbine, the natural gas will be heated in accordance to Original Equipment Manufacturer (OEM) guidelines using the intermediate pressure feedwater. Increasing the temperature of the natural gas increases the cycle efficiency. The heated natural gas is then combusted in the gas turbine to drive the turbine to generate electricity. Electricity generated by the GTG will be stepped up to 230 kV using the generator step up transformer before interconnecting to the SaskPower transmission system. For this Project, an advanced F-class gas turbine has been selected for the Project. The advanced F-class gas turbine utilizes state-of-the-art technology to improve efficiency and boost output. The gas turbine is equipped with Ultra Low NOx (ULN) burners which optimizes the ratio of combustion air to fuel as well as combustion temperature to control NOx emissions from the natural gas combustion process.

The gas turbine exhaust gas temperature ranges from 590ºC to 630ºC at the outlet of the gas turbine. The hot exhaust gas is ducted from the GTG to the HRSG to generate steam.

The HRSG is a waste heat boiler which produces high pressure, intermediate pressure and low pressure steam. The HRSG also provides a cooling medium to the kettle boiler for the gas turbine compressor air. High temperature air from the compressor is extracted and piped to the kettle boiler. The cooled rotor air is returned to the combustion turbine. The kettle boilers capture the waste heat from the rotor air to heat up low pressure and intermediate pressure feedwater thereby increasing the overall Project output. Amine, phosphate, and ammonia are injected into the steam cycle along with continuous and intermittent boiler blowdown to maintain desired cycle chemistry to minimize corrosion and prevent scale formation.

The exhaust gas exits the HRSG via the stack. The stack is estimated to be approximately 49 m high based on findings from the air dispersion modelling performed specifically for the Project (Appendix C) to meet the Saskatchewan Ambient Air Quality Standards (SAAQS) and Canadian Ambient Air Quality Standards (CAAQS).

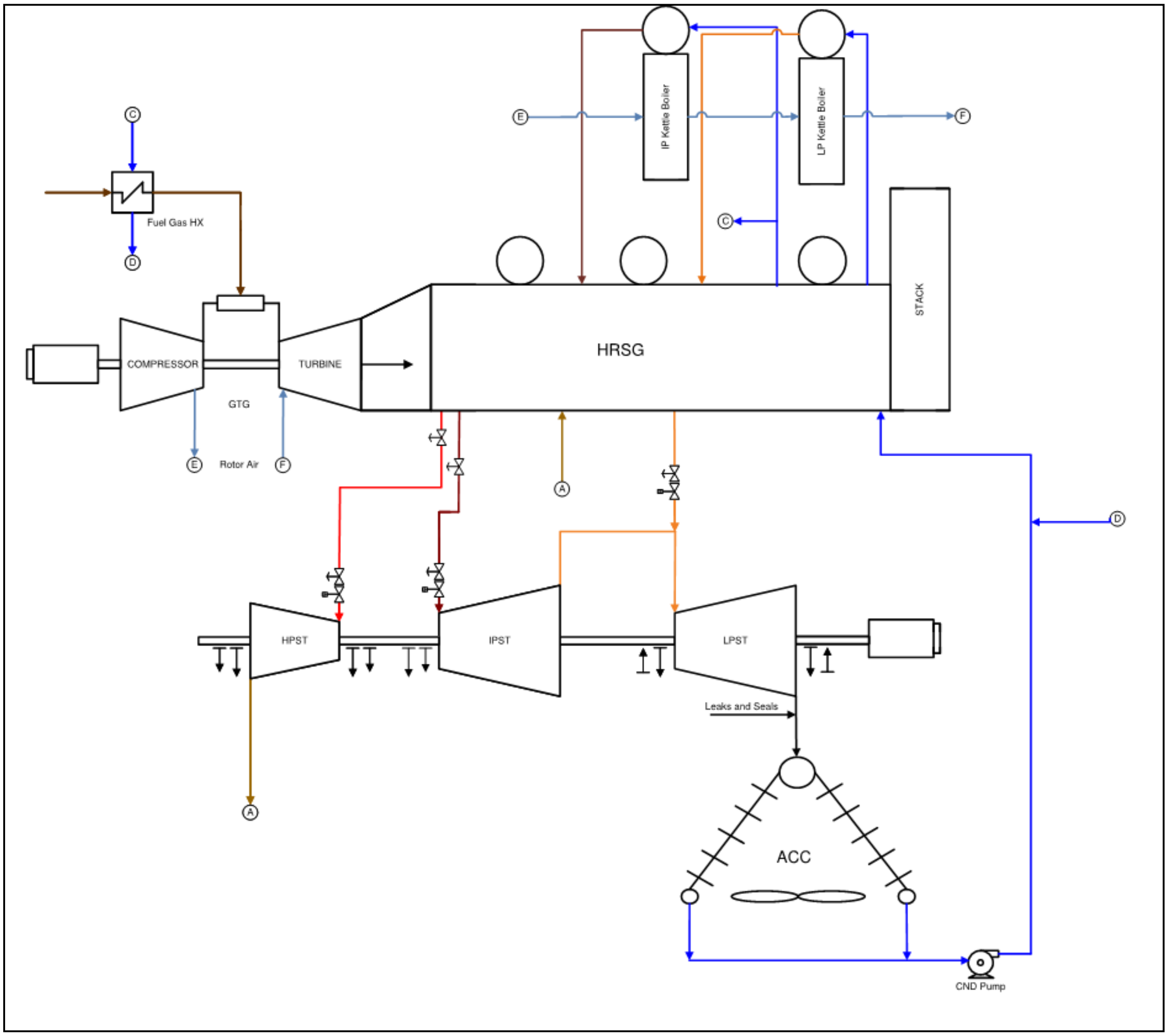
Steam generated in the HRSG is used to drive a steam turbine and generator to produce electricity. Electricity generated by the STG will be stepped up to 230 kV using the generator step up transformer before interconnecting to the SaskPower transmission system. Exhaust steam exits the low pressure section of the turbine and is ducted into the ACC. The ACC is a heat exchanger where ambient air is drawn from the surroundings by the fans to condense the exhaust steam and the condensate collects in the condensate tank. Condensate is then pumped by condensate pumps and boiler feedwater pumps to the HRSG and the steam cycle repeats.

The HRSG boiler blowdown system collects continuous and intermittent blowdown from the HRSG and steam drains local to the HRSG. Drains are routed from the collection points to the boiler blowdown tank where the steam expands and cools and is recycled back to the service water tank for reuse, reducing the overall water consumption of the Project. The boiler blowdown drain, HRSG stack drain, and feedwater pressure relief valves are routed to the Project drains system where the collected drains will be pumped back to the Service/Fire Water Tank for reuse.

Based on the lower heating value (LHV) of natural gas, annual average ambient conditions, the thermal efficiency of the Project is almost 58%. As a result, the CO_2 emissions of the Project are expected to be well below 420 kg/MWh across all ambient conditions when the GTG is operating at full load in compliance with *Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity (*Government of Canada 2018b*)*. Instantaneous CO_2 emissions are estimated to range between 371 kg/MWh to 392 kg/MWh when the GTG operates at full load. As the Project ages, the unit will experience degradation which decreases the Project efficiency thereby increasing CO_2 emissions per MWh. Future degradation will be mitigated by implementing a longterm service agreement with the gas turbine supplier with contractual remedies on performance to ensure the Project will not exceed emission limits of 420 kg/MWh over the life of the Project.

The use of ACC saves water consumption by more than 90% compared to a wet cooled unit. However, the use of an ACC does impact the efficiency of the cycle, increasing the CO_2 emissions in kg/MWh. Due to the temperate climate at Moose Jaw, impact on heat rate using an ACC is much less than a location with a hot climate such as Phoenix, Arizona. A CEMS will be installed at the Project to measure and report emission data per the requirements of the annexed New Source Emission Guidelines for Thermal Electricity Generation (Government of Canada 1999), published in the Canada Gazette, Part 1, and for controlling the unit. The CEMS information will be in accordance with Protocol and Performance Specifications Environmental Protection Service 1/Power Generation/7 referenced in the guidelines.

Figure 2-1 Process Flow Diagram of a Natural Gas Combined Cycle Gas Turbine



Legend

- High Pressure Steam
- Intermediate Pressure Steam
- Low Pressure Steam
- Gas
- Air
- Condensate

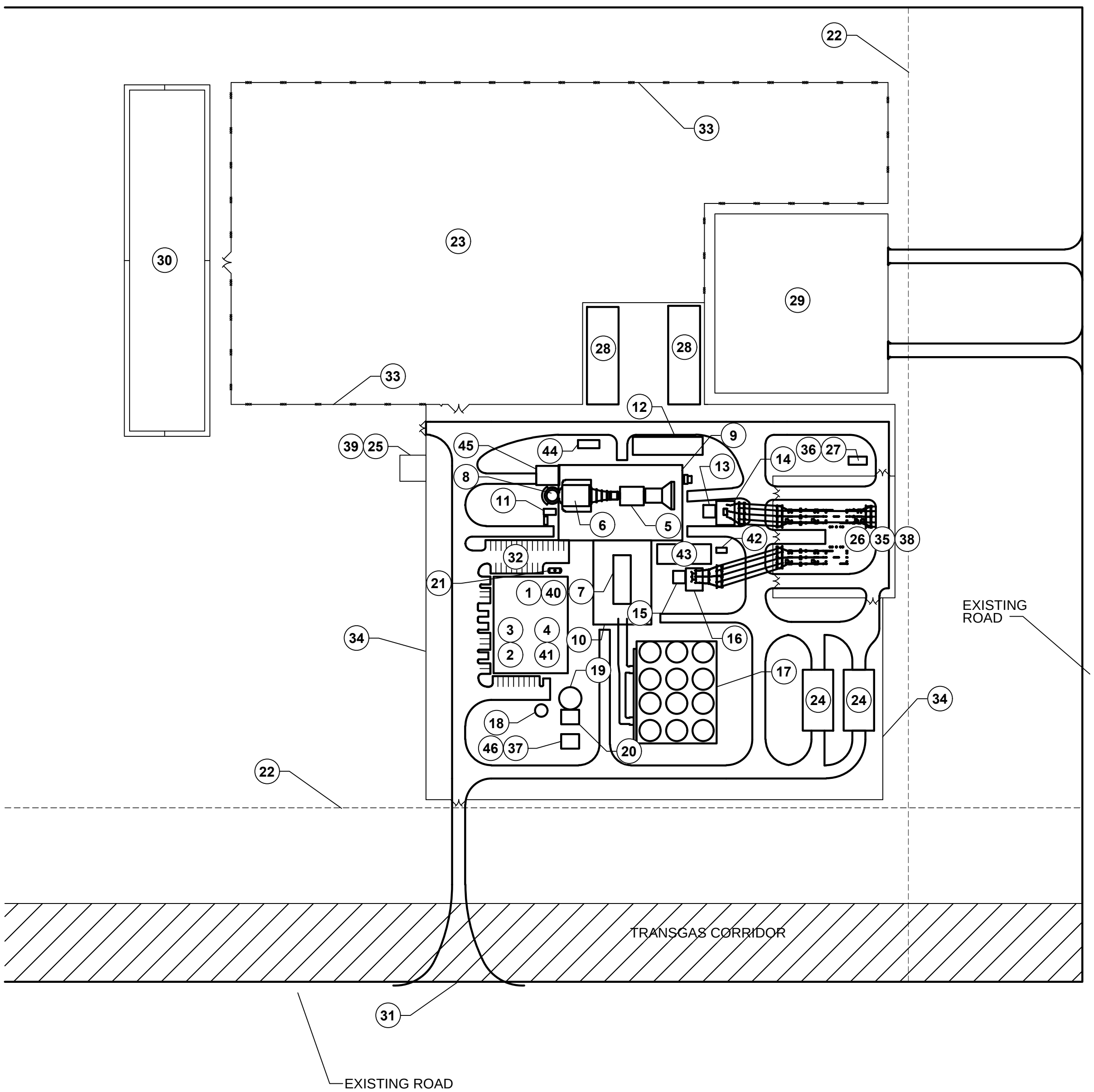
2.3.1 Physical Works Associated with the Designated Project

The Project will be a power generation facility which uses natural gas CCGT technology to generate a nominal 350 MW of electricity. Components will include the Project as well as the following incidental activities:

- an overhead 230 kV transmission line
- a fibre-optic line
- an underground potable water supply pipeline
- a 25 kV power distribution line, and
- road upgrades

Except for the incidental activities, all structures and equipment will be located at E1/2 27-16-26 W2M which SaskPower has the option to purchase from the City of Moose Jaw. This includes the powerhouse, with steam turbine and gas turbine building areas, multipurpose building with main control/administration areas, warehouse, workshop, and water treatment building, ACC, switchyard, and miscellaneous auxiliary buildings and structures.

The land is currently a greenfield site with the only infrastructure on the property being a low pressure natural gas line running along the west side. The site layout illustrates the proposed locations of the physical structures to be erected on the Project site (Figure 2-2, Table 2-3).



KEY NOTES:

1. CONTROL ROOM/ADMINISTRATION/ OFFICES/STAFF FACILITIES
2. WAREHOUSE
3. MAINTENANCE SHOP
4. WATER TREATMENT BUILDING
5. GAS TURBINE GENERATOR (GTG)
6. HEAT RECOVERY STEAM GENERATOR (HRSG)
7. STEAM TURBINE GENERATOR (STG)
8. GTG STACK
9. GTG BUILDING
10. STG BUILDING
11. CONTINUOUS EMISSIONS MONITORING (CEMS) AND HRSG/CONTROL ENCLOSURE
12. CLOSED COOLING WATER FIN FAN COOLER
13. GTG AUXILIARY TRANSFORMER
14. GTG GENERATOR STEP-UP TRANSFORMER
15. STG AUXILIARY TRANSFORMER
16. STG GENERATOR STEP-UP TRANSFORMER
17. AIR COOLED CONDENSER (ACC)
18. DEMINERALIZED WATER STORAGE TANK
19. SERVICE/FIRE WATER STORAGE TANK
20. FIRE PUMP ENCLOSURE
21. OIL/WATER SEPARATOR
22. 100 METER PROPERTY EASEMENT CORRIDOR
23. CONSTRUCTION LAYDOWN
24. STORAGE BUILDING
25. FUEL GAS CUSTODY TRANSFER AREA
26. TRANSMISSION SUBSTATION
27. CONSTRUCTION POWER TRANSFORMER
28. CONSTRUCTION TRAILERS
29. CONSTRUCTION PARKING
30. STORM WATER POND
31. ACCESS ROAD
32. PARKING LOT
33. CONSTRUCTION FENCE
34. PERMANENT FENCE
35. ELECTRICAL TRANSMISSION (230kV) INTERCONNECTION POINT
36. ELECTRICAL DISTRIBUTION (25kV) INTERCONNECTION POINT
37. POTABLE WATER INTERCONNECTION POINT
38. FIBRE-OPTIC INTERCONNECTION POINT
39. NATURAL GAS INTERCONNECTION POINT
40. SEWAGE INTERCONNECTION POINT
41. PROCESS WASTEWATER INTERCONNECTION POINT
42. EMERGENCY DIESEL GENERATOR
43. PLANT CONTROL AND MONITORING MODULE
44. WASH WATER DRAIN TANK
45. FUEL GAS BUILDING
46. POTABLE WATER BUILDING

NORTH

0 50m 100m

SCALE IN METERS

PRELIMINARY - NOT FOR CONSTRUCTION

SaskPower

FIGURE 2-2

Table 2-2 Physical Works Associated with the Project

Number	Facility Components	Key Dimensions
1	CONTROL ROOM/ ADMINISTRATION/OFFICES/STAFF FACILITIES	29 m x 22 m
2	WAREHOUSE	16.5 m x 22 m
3	MAINTENANCE SHOP	9.5 m x 22 m
4	WATER TREATMENT BUILDING	33 m x 22 m
5	GAS TURBINE GENERATOR (GTG)	See item 9
6	HEAT RECOVERY STEAM GENERATOR (HRSG)	See item 9
7	STEAM TURBINE GENERATOR (STG)	See item 10
8	GTG STACK	49 m height
9	GTG BUILDING	75 m x 45 m
10	STG BUILDING	45m x 35 m
11	CONTINUOUS EMISSIONS MONITORING (CEMS) AND HRSG/CONTROL ENCLOSURE	3.5 m x 7.5 m
12	CLOSED COOLING WATER FIN FAN COOLER	10 m x 42 m
13	GTG AUXILIARY TRANSFORMER	2.5 m x 4.5 m
14	GTG GENERATOR STEP-UP TRANSFORMER	5 m x 10 m
15	STG AUXILIARY TRANSFORMER	2.5 m x 4.5 m
16	STG GENERATOR STEP-UP TRANSFORMER	5 m x 10 m
17	AIR COOLED CONDENSER (ACC)	52 m x 52 m, 30 m tall
18	DEMINERALIZED WATER STORAGE TANK	100,000 gal (378,541 litres)
19	SERVICE/FIRE WATER STORAGE TANK	500,000 gal (1,892,706 litres)
20	FIRE PUMP ENCLOSURE	4 m x 10 m
21	OIL/WATER SEPARATOR	1000 gal (3785 litres)
22	100 METER PROPERTY EASEMENT CORRIDOR	N/A
23	CONSTRUCTION LAYDOWN	185 m x 375 m
24	STORAGE BUILDING	18.5 m x 36.5 m
25	FUEL GAS CUSTODY TRANSFER AREA	15m x 15 m
26	TRANSMISSION SUBSTATION	72 m x 72 m
27	CONSTRUCTION POWER TRANSFORMER	5 m x 10 m
28	CONSTRUCTION TRAILERS	62 m x 70 m
29	CONSTRUCTION PARKING	105 m x 105 m
30	STORM WATER POND	35 m x 200 m
31	ACCESS ROAD	110 m x 8 m
32	PARKING LOT	30 stalls
33	CONSTRUCTION FENCE	N/A
34	PERMANENT FENCE	N/A
35	ELECTRICAL TRANSMISSION (230 kV) INTERCONNECTION POINT	N/A
36	ELECTRICAL DISTRIBUTION (25 kV) INTERCONNECTION POINT	N/A

Number	Facility Components	Key Dimensions
37	POTABLE WATER INTERCONNECTION POINT	N/A
38	FIBRE-OPTIC INTERCONNECTION POINT	N/A
39	NATURAL GAS INTERCONNECTION POINT	N/A
40	SEWAGE INTERCONNECTION POINT	N/A
41	PROCESS WASTE INTERCONNECTION POINT	N/A
42	EMERGENCY DIESEL GENERATOR	4 m x 7 m
43	PLANT CONTROL AND MONITORING MODULE	12 m x 31 m
44	WASH WATER DRAIN TANK	3 m x 5 m
45	FUEL GAS BUILDING	5 m x 14 m
46	POTABLE WATER BUILDING	4 m x 10 m

For a more detailed description of the physical works associated with the Project please refer to Section 2.3.3.

2.3.2 Anticipated Size

The land under option to be purchased from the City of Moose Jaw is 44.1 ha, designated for industrial use. The Project area to be used will be situated as far south and east on the quarter section as possible, less a 100 m buffer for easements. The goal is to maximize distance from any occupied dwellings to the west and north of the property.

The total disturbance footprint for the Project, including temporarily disturbed areas during construction, will be approximately 525 m x 580 m (30.5 ha). The total disturbed areas include 185 m x 380 m (7.0 ha) for the construction laydown, facilities and parking and 185 m x 380 m and 230 m x 360 m (8.3 ha) for the powerhouse building, a multipurpose building with control/administration rooms, warehouse, workshop, and water treatment building, ACC, and switchyard which is the total area that will have continued operational activity.

The Project is a nominal 350 MW CCGT with the capability to generate up to a maximum of 366 MW under optimum ambient conditions. Nominal output is used by manufacturers to associate generation options with technology. Actual output from the facility will vary with seasonal ambient conditions at Moose Jaw, SK. with an expected instantaneous CO_2 emission of 371 kg/MWh to 392 kg/MWh when the GTG operates at full load (Table 2-1). Project GHG emissions during operation, as described in Section 2.4.1, are estimated to be a maximum 1,038,463 tonnes CO_2e per year.

2.3.3 Description of Project Activities

2.3.3.1 Operational Physical Works

2.3.3.1.1 Powerhouse

The Powerhouse is a T-shaped building which encloses the GTG, STG, HRSG, and other balance of plant (BOP) electrical and mechanical equipment. The footprint of the building will be approximately

4,400 m^2. The GTG/HRSG portion of the building will be approximately 75 m x 45 m, whereas the STG portion of the building will be approximately 45 m x 35 m. The exhaust stack is anticipated to be 49 m tall and will be constructed from steel. The height of the powerhouse building will range from approximately 15 m to 40 m.

In addition to the GTG, STG, and associated auxiliary equipment, other BOP equipment will be in the powerhouse building. This includes the boiler feedwater pumps, HRSG blowdown tank, air compressors, dryers and receivers, sample panel, etc. The CEMS will also be located indoors in its own enclosure adjacent to the stack.

2.3.3.1.2 Multipurpose Building

A multipurpose building will be constructed to house the operating and maintenance staff. The building is expected to be a pre-engineered steel frame structure with insulated metal panel siding and roof system. The preliminary dimensions of the areas within the multipurpose building are as follows:

- Control Room/Administration Rooms: 29 m x 22 m
- Warehouse: 16.5 m x 22 m
- Maintenance Shop: 9.5 m x 22 m, and
- Water treatment area: 33 m x 22 m

The administration/control room building will contain offices, a lunch room, a distributed control system room, an operating control room, and washroom facilities. The building will be occupied 24 hours a day by operating and support staff. The warehouse will be used for storage of all critical spare parts and day to day consumables that are required for facility operation. The maintenance shop will be used by trade staff to perform routine repair and maintenance for facility equipment.

The water treatment equipment will be located at the south end of the multipurpose building. The water treatment equipment will be used to treat potable water from the City of Moose Jaw and to recycle process water for reuse. The equipment will include mixed bed ion exchangers, a reverse osmosis (RO) system, ultrafilters, chemical storage totes, and chemical feed pumps for cycle chemical control. The mixed bed ion exchangers will be rental units with regeneration taking place offsite by the supplier.

Secondary containment will be installed around all equipment, unloading pads, or storage tanks that contain oil equal to or greater than 189 litres or chemical. The secondary containment will be designed to meet the local, provincial, and federal requirements pertaining to hazardous substances, dangerous goods, and oil storage. If possible, the secondary containment areas will be sloped. Oil containments will include a manual drain valve piped to the oil water separator.

An enclosed breezeway will be constructed to connect the multipurpose building and the powerhouse.

2.3.3.1.3 Balance of Plant Infrastructure

The ACC is a heat exchanger which condenses steam from the steam turbine to condensate. Fans, driven by electric motors, provide cooling air to the heat exchangers. The condensate collects in the condensate manifolds and gravity is used to drain the condensate to the main condensate tank. Condensate is then pumped from the condensate tank to the feedwater system to go through the steam cycle again. The ACC will be located near the south boundary of the Project with an overall dimension of approximately 52 m x 52 m with a height of approximately 30 m.

A 5 m x 14 m pre-engineered fuel gas building will be in the northwest corner of the Project. Inside this building will be a performance gas heater where feedwater is used to heat up fuel gas, a fuel gas filter/separator, and a knockout tank. This equipment will be used to prepare the natural gas for combustion in the gas turbine.

A water/glycol loop will be used in a closed-cycle cooling water system to cool various STG, GTG, and BOP equipment. The water/glycol loop is cooled by a fin-fan heat exchanger. Motor operated fans provide cooling air to the heat exchanger. The closed cooling water fin-fan heat exchanger measures approximately 10 m x 42 m and will be located outdoor adjacent to the powerhouse.

The electrical generator systems convert the mechanical rotating energy of the combustion and steam turbines into electrical energy to supply the power system load through the three-phase Generator Step-Up Transformers (GSUs) to the high-voltage transmission system.

The high-voltage switchyard and transmission system provides the interconnection between the Project electrical system and the utility electrical grid for the transfer of power generated out of the Project, and supply of startup and auxiliary power into the Project.

Two field erected water tanks, fire/service water and demineralized water, will also be located on site. The fire/service water tank will have a capacity of approximately 1,892,706 litres whereas the demineralized tank is estimated to have a capacity of 378,541 litres. The water storage tanks serve to improve operational reliability of the unit in the event of interruption of service from the City of Moose Jaw, or equipment malfunction in producing demineralized water.

Two storage buildings (18.5 m x 36.5 m) will be constructed to support storage of equipment and materials during construction and future operation of the Project.

A 1,000 kilowatt (kW) emergency diesel generator will be installed to ensure the Project is in a ready-to run condition following a unit trip or loss of external power. The emergency diesel generator will be connected to an essential services electrical bus to supply critical facility components.

An oil/water separator located near the multipurpose building is used to separate oil from the water that will be collected from the Project drains. The oil/water separator will be designed to remove 20 micron and larger oil droplets to concentrations of less than 10 parts per million (ppm). It will be designed to store 3,785 litres of oil. The oil/water separator will be constructed as a double walled buried tank and will have a leak monitor to detect a breech in the inner tank wall. Clean effluent will be recycled back to the fire/service water tank while the collected oil will be disposed offsite at an appropriate disposal facility periodically.

A storm water pond will also be constructed for the Project. The storm water pond will be designed to retain all site drainage water. The pond is estimated to be 35 m x 200 m in size.

The access road that will be built on the Project site will be an all-weather crushed rock road. The road will be approximately 110 m in length and 8 m wide. Other roads will be designed to allow year-round access to all areas of the Project site for operation and maintenance activities. All road surfaces will consist of crushed rock.

Permanent parking lots will be located on the north, west, and south sides of the multipurpose building and will have approximately 30 parking stalls to accommodate operation staff and visitors. The parking surface will consist of crushed rock.

A security fence will be constructed around the perimeter of the Project site. The fence will be erected to stop humans and animals from entering the Project site. The fence will be installed early in the construction period for added security and safety.

The Project will include several other permanent small buildings or enclosures including the fire water pump enclosure, emergency diesel generator, and three electrical equipment modules – the plant control and monitoring module, a gas turbine electrical building, and the CEMS and HRSG control enclosure (Figure 2-2). Enclosures will be designed for equipment protection as well as applicable noise mitigation.

An underground wash water drain tank will be located to the north of the GTG building. The 3 m x 5 m tank will collect water from the compressor wash and will be hauled off site periodically for disposal at an approved facility.

2.3.3.2 Construction Temporary Facilities

To support the Project construction process, temporary facilities with be constructed. At the conclusion of the Project, temporary facilities and infrastructure will be removed from the site or converted to permanent facilities for long term operation and maintenance of the Project.

2.3.3.2.1 Security

Site security will be increased throughout the Project lifecycle. In the early construction phases, a permanent site security fence will be erected. A temporary fence surrounding the construction laydown area will also be constructed. Workers will be required to sign in and out of site. When trade staff levels require increased safety and monitoring onsite, temporary site security services will be implemented. This will include a turnstile and a digital access control system to assist with tracking manpower onsite. After commissioning is complete, a permanent closed-circuit television system will be used to monitor and control site access.

2.3.3.2.2 Construction Parking

The construction parking lot will be located on the north side of the Project site as shown on the Project site layout drawing (Figure 2-2). This parking area will be constructed by the site preparation subcontractor and will be approximately 105 m by 105 m. It is expected that construction management personnel at the superintendent level and above will be allowed to park on-site near the construction office trailers. The construction parking lot will remain after the Project construction and commissioning to support future installation and maintenance needs of the Project.

2.3.3.2.3 Construction Laydown

The construction laydown area will be approximately 185 m by 375 m and will be on the north side of the Project site (Figure 2-2). A portion of the construction laydown area will be developed to provide on-site fabrication areas. Piping will be prefabricated at grade elevation in the fabrication area prior to being lifted to the final locations.

2.3.3.2.4 Construction Management Facilities

Construction management office trailers will be constructed early in the Project to house the EPC Contractor and SaskPower construction management personnel. A separate construction office trailer located near the EPC Contractor construction office will be provided for SaskPower site personnel. Prior to the installation of the permanent utilities, temporary facilities will be required such as a portable generator, portable toilets, and sanitary storage facilities. Contractors will use trailers to house the contractor construction management personnel.

A construction trailer area will be installed near the construction management and parking areas (Figure 2-2). The construction trailer area will be approximately 40 m x 50 m and used by all the construction contractors. The construction trailer area will be large enough to house all the skilled labourers on site and it will be used for site wide safety meetings, training, and serving as the break area.

Contractor storage trailers and tool bins will be located by the contractors with approval from the construction management team. Storage trailers and tool bin locations will change as construction progresses.

2.3.3.2.5 Construction Water

A temporary water supply will be required during construction activities between winter 2020 until permanent water can be supplied by SaskPower. Water will be trucked to site and stored in tanks until the permanent water supply system is erected. The overall estimate for construction water consumption is approximately 15 million litres (Table 2-4). Construction water will be used during site preparation and during foundation backfill construction. The water consumption estimates provided below are based on the civil quantities in the Project estimate with water consumption for soil compaction based on typical values. It is estimated that one truck per day for four days per week will be required for dust suppression.

Table 2-3 Estimated Volume of Water Required During the Construction Phase

Construction Activity	Volume (litres)
Site Preparation	5,318,503
Foundations	2,839,058
Dust Suppression	5,678,117
Sanitary	567,811
Miscellaneous	946,352
Total	**15,349,841**

2.3.3.2.6 Temporary Constructions Communications

In order to support construction activities, a fibre connection to site will be installed, which will tie in to the local SaskTel communication network. Routing of this fibre will be determined in consultation with SaskTel and the City of Moose Jaw, but it is anticipated that it will be via road allowances and City of Moose Jaw owned land.

2.3.4 Description of Physical Activities Incidental to the Project

The section provides a description of the physical activities incidental to the designated. In addition to the requirements stated in Paragraph 2(a) of the *Regulations Designating Physical Activities* (Government of Canada 2014), a separate application for the Project, including all incidental activities will be submitted to the SK ENV-EASB in August 2019 for approval. The physical activities incidental to the Project include:

- water infrastructure
- electrical power infrastructure
- a fibre-optic line
- road upgrades, and
- natural gas infrastructure.

2.3.4.1 Waterline infrastructure

2.3.4.1.1 Potable Water Supply

The Project will require a complementary water supply service for facility processes and domestic use. Through the siting process of the Project, SaskPower worked with the WSA to identify the potential water sources for the Project. It was advised there would not be sufficient ground water in the area to service the Project.

Through siting discussions with the City of Moose Jaw it was determined the City of Moose Jaw had sufficient water within their approved withdrawal limits to supply the Project for operation. Therefore, SaskPower and the City of Moose Jaw will partner on the development, design, and construction of the water supply facilities required to support the Project. The city water, fed from the Buffalo Pound Water Treatment Plant, will supply both potable water for domestic uses and makeup water for the steam cycle. During normal operation, the process will require approximately 200 litres/minute (L/m) of raw water. Almost 70% of the process water (approximately 130 L/m) will be recovered and recycled through the steam generation/HRSG blowdown/cooling cycle, leaving an estimated 60-70 L/m of makeup water supply to be supplied by the city, under normal operation conditions depending on ambient conditions. The Project design plan is to reduce the amount of water usage whenever possible.

Water for the Project will be obtained from the City of Moose Jaw via a new underground pipeline. Engineering design discussions are preliminary, but it is expected that the pipeline would be fed from an existing City of Moose Jaw reservoir. SaskPower is currently working with the City to determine the optimal connection location for this pipeline. One potential location is the North East Reservoir which is an existing enclosed water containment structure that stores treated city water. The reservoir is fully contained and there is no access for wildlife or human activities. SaskPower has engaged the services of a third-party engineering firm to conduct a routing study from the Project to the North East Reservoir (Figure 1-1). It is expected that this study will result in several options to be reviewed with the city and other stakeholders to determine a final decision based on cost, scope, and impact.

The routing process for a potable water supply pipeline is guided by SaskPower's established criteria. The goal of the routing guidelines is to identify the potable water supply pipeline route that best fits SaskPower's system requirements, while striving for the lowest levels of impact in five categories: environmental effects, agricultural effects, social effects, economic effects, and technical issues. Each potential route alternative identified during the routing process is evaluated based on a series of factors within each of the above five categories. New infrastructure is required to connect the City's potable water system to the Project. The preliminary scope of work includes a routing study, a hydraulic transient analysis, pumphouse infrastructure modifications and upgrades, pipeline easements, and a pipeline.

SaskPower's schedule of activities for the proposed potable water supply is presented in Table 2-5.

Table 2-4 SaskPower's Schedule for Proposed Potable Water Supply

Project Phase	Project Schedule
City of Moose Jaw Servicing Agreement with SaskPower	Spring/Summer 2019
Preliminary routing studies-If applicable	Spring-Winter 2019
Stakeholder and public engagement	Spring 2019-Completion
Preliminary environmental/archaeological studies	Spring-Fall 2019
Technical Proposal submission to SK ENV	Winter 2019
Preferred route selection	Winter 2020
Detailed/follow-up environmental/archaeological studies	Spring/early Summer 2020
Construction	Summer/Fall 2020
Completion	Spring 2021

The potable water supply pipeline will be constructed of an approximately 14” high density polyethylene (HDPE) pipe. The potable water supply pipeline will be routed within existing developed road allowances, where possible. Public road allowances are not typically zoned therefore, changes to zoning as a result of the potable water supply pipeline installation are not anticipated. The public road allowances to be used for the potable water supply pipeline are owned by either the Province of Saskatchewan (Her Majesty the Queen in Right of Saskatchewan) or the City of Moose Jaw. The pipeline is expected to have a right-of-way (ROW) up to 20 m wide and be approximately 10 km long with a capability of transporting water at approximately 379 litres per minute.

In the alternative, SaskPower is also working with the City of Moose Jaw to negotiate an agreement for the city to provide water to the Project as part of the Moose Jaw Industrial Park water supply development. If the City of Moose Jaw Industrial Park water supply plan is not approved by spring/summer 2019 then SaskPower will move forward with the dedicated line described above.

On Site, the potable water supply pipeline will likely interconnect to the Project from the north. The connection will be made to a Potable Water Building which will be the interface to other infrastructure onsite (Figure 2-2). A minimum 1.9 million litre Service/Fire Water tank will be used for water storage. A combination of ultrafiltration and RO will be used to treat the city water. Two x 100% 2-Pass RO filter systems will supply water to rental mixed bed deionizers and then the Demineralized Water Storage Tank for use throughout the Project. Demineralized water is used as makeup to the steam cycle. To further minimize waste water consumption and discharge, blowdown from the HRSG is recycled to the Service/Fire water tank after being cooled to a temperature acceptable for the water treatment equipment.

The water infrastructure outside of the Project site will be owned and operated by the City of Moose Jaw. SaskPower will enter into a long-term agreement for potable water supply. SaskPower will obtain a water rights license and pay industrial usage fees as required by the WSA. The WSA is responsible for Saskatchewan’s water supply, water treatment, drainage courses, and aquatic habitat, and assigns authority to use water in Saskatchewan, including for industrial purposes.

2.3.4.1.2 Process Wastewater Discharge

The Project will require a complementary infrastructure connection to the City of Moose Jaw Wastewater Treatment Plant lagoons to transport waste water from the Project. SaskPower will be responsible for the design, construction, and operation of the infrastructure, which will be exclusively used for the Project. The waste water will contain effluent water from the water treatment process and it is not expected to contain contaminants in concentrations that would negatively impact migrating birds, wildlife, or the existing treatment facility (Table 2-9). The benefit of sending the water to the City of Moose Jaw is that SaskPower will not be required to build an evaporation pond and the existing infrastructure can used. Ownership and operation of this discharge line will be negotiated with the City of Moose Jaw. SaskPower will enter into a long-term agreement for distribution of discharge water into the city facilities.

2.3.4.1.3 Sanitary Discharge

The Project will require a complementary sanitary waste connection between the Project and the City of Moose Jaw Wastewater Treatment Plant. The City of Moose Jaw is currently investigating infrastructure strategies to support all future proponents of their industrial park. Currently the Project is anticipated to tie into the City system approximately 0.5 km north of the Project. A 6-inch HDPE line will connect to transport the sanitary waste discharge anticipated to be at a rate of approximately 3 liters per minute. Routing of the line to the tie-in location will be determined in consultation with the City of Moose Jaw through summer 2019, but it is anticipated that it will be via road allowances and City of Moose Jaw owned land. Construction is anticipated to be completed no later than May 2021.The sanitary discharge infrastructure leaving the Project will be owned and operated by the City of Moose Jaw. SaskPower will enter into a long-term agreement for these services.

2.3.4.2 Electrical Power Infrastructure

2.3.4.2.1 Electrical Transmission Line Infrastructure

The Project will require a 230 kV transmission line service for facility processes and domestic use. SaskPower is planning to route, construct, and operate an approximately 12 km-long new 230 kV transmission line within a 40 m-wide ROW to interconnect the Project to SaskPower's existing Pasqua Switching Station located in NE 32-16-25 W2M. Transmission line routing, stakeholder engagement, regulatory approvals/permits, construction, and operation are the responsibility of SaskPower. The study area is located partially within the City of Moose Jaw (in part within the Industrial Park) and in the RM of Moose Jaw #161.

In January and early February 2019, a preliminary desktop study of the area between the Project and the Pasqua Switching Station was performed. Based on available information, a study area of approximately 12 sections of land between the Project and the Pasqua Switching Station was identified. The boundaries of the study area are presented in Figure 1-1.

SaskPower's schedule of activities for the proposed Moose Jaw CCGT interconnection 230 kV Transmission Line Project is described in Table 2-6.

Table 2-5 SaskPower's Schedule for Proposed Moose Jaw CCGT interconnection 230 kV Transmission Line Project

Project Phase	Project Schedule
Preliminary routing studies	Spring 2019
Stakeholder and public engagement	Spring 2019- Energization
Preferred route corridor selection	Fall 2019/Winter 2020
Preliminary environmental/archaeological studies	Spring-Fall 2019
Technical Proposal submission to the SK ENV	Winter 2019
Follow-up Environmental/archaeological studies	Spring/early Summer 2021
Environmental provincial permitting	Summer 2021
Construction Station	Spring 2021
Construction Line	Fall 2021
Energization	Spring 2022

2.3.4.2.2 Distribution Line Infrastructure

The Project will require connection to SaskPower's existing power distribution system. SaskPower will be responsible for routing, constructing, and operating the 25 kV construction power to the Project. It is expected that this supply will be tapped off of an existing overhead 25 kV line located directly south of the property. It is anticipated that the total length of the distribution line will be approximately 800 m within a 10 m-wide ROW. Distribution line routing, stakeholder engagement, regulatory approvals/permits, construction, and operation are the responsibility of SaskPower.

2.3.4.3 Fibre Line

Telecommunications through a fibre-optic line will be required for operation of the Project. Installation of this infrastructure is considered complementary and for the sole benefit of the Project. The Project load will be controlled remotely from SaskPower's Grid Control Centre in Regina. The primary method of communication with the Project will be through a Wide Area Network whose central medium for communication is fibre-optics. Existing fibre-optic cables are in place at the Pasqua switching station in support of SaskPower's existing switching station control systems. SaskPower will be responsible for routing, constructing, and operating the fibre-optic line. Approximately 12 km of new fibre-optic cable will be needed. It will be run either underground with a 10 m-wide ROW or strung overhead on existing or to be installed on transmission line structures depending upon feasibility to interconnect the Project to the existing Pasqua switching station at NE 32-16-25 W2M, and as such, will be routed within the transmission line study area (Figure 1-1). A final route for the fibre-optic line is expected to be developed in late 2019.

In order to support construction activities, a secondary fibre-optic connection to site will be installed, which will tie in to the local SaskTel communication network. Routing of this fibre-optic will be determined in consultation with SaskTel and the City of Moose Jaw, but it is anticipated that it will be via road allowances and City of Moose Jaw owned land. A final route for the fibre-optic line is expected to be developed in late 2019.

2.3.4.4 Natural Gas Infrastructure

TransGas is the proponent for developing the Moose Jaw Supply Project and will be the owner-operator. The pipeline will remain in the care and control of TransGas. The natural gas pipeline is subject to its own regulatory approval process with the SK ENV, Saskatchewan Ministry of Energy and Resources, and the Ministry of Parks, Culture and Sport. TransGas will make application to the provincial regulator to obtain approval to proceed with the construction of a new natural gas transmission pipeline that `is approximately 30 km in length (Appendix A).

TransGas is a public utility owned by the Saskatchewan government and is responsible for the distribution of natural gas in Saskatchewan. In 2016, in response to potential increased levels of development in the Moose Jaw area TransGas began the process of determining the infrastructure requirements that would meet the needs of the tenants of the proposed Moose Jaw Industrial Park.

In early 2017, the process of constructing a pipeline was initiated, including: stakeholder engagement, the acquisition of pipeline right of way (ROW), preliminary survey and engineering design, preliminary environmental screening, and the procurement of pipe. These activities continued throughout 2017. Because these facilities have not yet been installed, and in order to meet the needs of the Moose Jaw Industrial Park, including SaskPower, TransGas will increase the nominal pipe size prior to installation to accommodate additional demand.

In response to the recent request for service by SaskPower for development of the Moose Jaw CCGT facility, TransGas is developing a solution that will meet all projected future demand for natural gas in the Moose Jaw area. The gas supply solution that is being proposed will have sufficient capacity for the SaskPower generation facility, the Moose Jaw Industrial Park, and will provide an additional source of supply to meet the growing natural gas needs for the City of Moose Jaw. The route that had originally been identified, and for which pipeline ROW had been acquired, is still the preferred route for accessing the area.

SaskPower's need for elevated pressure service requires that the pipeline have a direct interconnect to the TransGas Belle Plaine interconnect station, which will result in approximately 9 to 11 km of additional pipeline, over and above the original route that was identified in 2017.

The TransGas Customer specific facilities associated with the Project will consist of a short (<2 km length) high pressure feed from this new pipeline to TransGas' Customer Metering, Regulation, and Odorization Facilities. At this location TransGas will measure the gas flow, reduce the pressure to meet the supply requirements of SaskPower, and inject odorant for safety purposes. These TransGas facilities will be placed on a parcel of land, approximately 100m x 100m in size, and situated in a location that has yet to be confirmed, but which may be either adjacent to, or in close proximity (< 1 km) to the Project. Downstream of the TransGas Metering and Regulation Facility, the regulated and odorized gas will be transported a short distance (<1 km in length) to the Fuel Gas Custody Transfer Area at the Project site

(Natural Gas Interconnection Point, Figure 2-2). At this location, TransGas will relinquish custody of the natural gas to SaskPower.

Once construction is complete, as per the TransGas tariff, SaskPower will enter into a service agreement with TransGas to transport the natural gas to the Project. As per *The SaskEnergy Act*, TransGas has the exclusive right to transport gas within Saskatchewan.

2.3.4.4.1 Facility Gas System

The Project natural gas system will begin at the downstream side of the fuel gas metering yard. An emergency stop valve, manually controlled from the control room, will be provided downstream of the metering yard to provide emergency shutoff capabilities in the event of an on-site gas system leak or major facility fire. The pipeline gas will be filtered to remove particulate and trace oil prior to Project use. The gas will be heated above the dew point temperature with a natural gas fired dew point heater prior to pressure regulation. Gas for the gas turbine will be heated by a feedwater heater for performance improvements during normal operation. The heated gas will be routed through a scrubber after the performance heater to remove moisture from the gas in the event of a heater tube leak. Gas will be routed through another fuel gas filter/separator prior to the gas turbine to meet gas turbine manufacturer fuel gas quality requirements. Moisture from knock out tanks and separators will be collected and stored in tanks local to each tank or separator. Tank waste condensable will be manually removed and shipped offsite for proper disposal at an approved facility.

Fuel gas consumption of the gas turbine at full load ranges from 1,750 million British thermal units per hour (MMBtu/h) (LHV)to 2,100 MMBtu/hr, depending on ambient conditions and will require 600 pounds per square inch gauge (psig) at the metering yard. Pressure requirements for gas fired building heaters are expected to be low. Building heat design pressure will be designed to 10 psig or less. Pressure requirement at the metering yard for low pressure supply is estimated to be a maximum of 60 psig. Consumption is estimated at 18 MMBtu/hr.

2.3.4.5 Road Upgrades

New roads are not required for the Project; however, road upgrades are required to support construction traffic and heavy loads being deliver to the Project. The travel route to access the Project will be finalized with consultation from the Rural Municipality (RM) of Moose Jaw and the City of Moose Jaw. Tentatively, north access to the Project site is expected to be via township road 165 (Coteau Street East) and range road 2262 (Corsterphine Ave). South access to the Project site is expected to be via highway 2 onto the City of Moose Jaw Lagoon road and onto township road 164. Portions of these roads will require upgrade to support construction traffic and loads. SaskPower will coordinate with the RM of Moose Jaw, the City of Moose Jaw, and the Saskatchewan MHI to meet compliance with the applicable road restrictions and transportation requirements during the construction period. At this point in time it is expected that approximately 4 km of road will need to be upgraded to a 30 m wide ROW heavy haul road.

2.4 EMISSIONS, DISCHARGES AND WASTES

2.4.1 Atmospheric Emissions

2.4.1.1 Construction Emissions

Air emissions generated during construction of the Project will result from several sources and activities. Particulate matter (PM) is the term used to refer to solid particles and liquid droplets found in the air. The PM is reported according to the diameter of the particle size; PM_{10} refers to coarse dust particles 10 microns in diameter or smaller and typically includes crushing and grinding operations and dust from vehicles on roads. $PM_{2.5}$ refers to fine particles 2.5 microns or less in diameter and can only be seen with an electron microscope. Fine particles are produced from all types of combustion and some industrial processes. The United States (US) Environmental Protection Agency (EPA) emission standards were used to determine construction combustion emission from the Project for PM emissions. There are no PM_{10}, and $PM_{2.5}$ emission standards. Therefore, for conservativeness, it was assumed that PM_{10}, and $PM_{2.5}$ combustion emissions from the Project are equivalent to PM emissions for the purpose of air emissions calculations.

Fugitive dust and fine particulate emissions will be generated from land clearing, site preparation, earth moving and material handling, and vehicles creating dust by traveling on land. In addition, off-road construction equipment (dozers, compressors, etc.) will release combustion by-products such as NO_x, carbon monoxide (CO), and volatile organic compounds (VOCs) when they operate by combusting fuel. Fugitive dust emissions (particulate matter ($PM/PM_{10}/PM_{2.5}$)) will be higher during land clearing and site preparation and during active construction periods when there is increased vehicle traffic on the site from mobile equipment.

In general, the process of estimating construction emissions involves the use of activity parameters and emission factors based on those parameters along with appropriate correction factors. Activities and parameter data has been included in Table 2-7. Information is provided in the table for each piece of equipment associated with the various construction activities and a breakdown of hours each construction activity is expected for each of the three years of construction.

Table 2-6 Estimated Construction Equipment to be Used for the Project

Equipment Type	Fuel Type	Quantity	Estimated Work Hours On-Site		
			Year 1 (hour per year)	Year 2 (hour per year)	Year 3 (hour per year)
Vibratory Compactor	Diesel	2	1,750	0	0
Motor Grader	Diesel	1	975	1,950	650
Dump Truck	Diesel	2	1,250	0	0
Wheel Loader	Diesel	2	2,000	0	0
Dozer	Diesel	2	1,250	0	0
Excavator	Diesel	4	5,000	0	0
Scraper	Diesel	2	1,250	0	0

Equipment Type	Fuel Type	Quantity	Estimated Work Hours On-Site		
			Year 1 (hour per year)	Year 2 (hour per year)	Year 3 (hour per year)
Pavers	Diesel	1	500	0	0
Trencher	Diesel	2	2,600	0	0
Skid Steer	Diesel	6	5,525	5,850	0
Concrete Truck	Diesel	2	500	4,000	0
Concrete Pump Truck	Gasoline	2	250	2,000	0
Flat Bed Truck	Diesel	1	813	1,625	0
Water Truck	Diesel	1	2,600	1,950	488
Forklift 5 Ton	Diesel	10	3,575	17,062.5	4,875
Generators/Compressors	Diesel	14	13,488	14,625	2,438
Pick-up Truck	Gasoline	8	6,500	14,138	3,738
All-Terrain Vehicle	Gasoline	12	17,063	27,300	11,538
Manlift	Diesel	16	0	24,538	8,450
Crawler Cranes <200T	Diesel	6	2,600	8,775	2,275
Crawler Cranes >200T	Diesel	8	6,175	7,963	325
Rough Terrain Cranes	Diesel	12	7,962.5	23,238	5,525

Construction equipment will also emit GHG emissions. To estimate potential CO_2 equivalent (CO_2e) emissions from the construction equipment, emission factors for CO_2, methane (CH_4), and nitrous oxides (N_2O) were obtained from the EPA Mandatory Greenhouse Gas Reporting Rule (EPA 2010) and ratioed with their appropriate Global Warming Potentials (GWP). The potential GHG construction emissions were calculated using the parameter data shown in Table 2-7 and GHG emission factors. The potential emissions are summarized in Table 2-8.

Table 2-7 Estimated Maximum Potential Annual Greenhouse Gas Emission Rates of the Project During Construction

Pollutant	Construction Year 1 (tonnes per year)	Construction Year 2 (tonnes per year)	Construction Year 3 (tonnes per year)	Total Construction Emissions Over 3 years (tonnes)
CO_2	44,130	59,062	10,735	**113,927**
CH_4	1.8	2.4	0.4	**4.6**
N_2O	0.4	0.5	0.1	**1**
CO_2e	44,282	59,266	10,772	**114,320**

2.4.1.2 Operations Emissions

Emission of air contaminants during operation of the Project will result from the combustion of natural gas in the proposed combined-cycle combustion turbine. There will also be emissions of air contaminants generated from the emergency diesel generator, emergency diesel fire pump, and dew point heater. The maximum emissions from any operating load including start-up and shut down emissions for the combustion turbine were used to demonstrate the maximum potential emissions for each pollutant. The maximum potential air emissions associated with the Project, based on 8,760 hours per year of operation, including start-up and shut down emissions for the turbine and auxiliary equipment emissions can be found in Table 2-9.

Table 2-8 Theoretical Maximum Potential Air Emissions Associated with the Project During Operation

Pollutant	Potential Air Emissions (tonnes per year)
NO_x	449.3
CO	163.6
$PM/PM_{10}/PM_{2.5}$	26.8
sulphur dioxide (SO_2)	28.7
CO_2	1,263,467
CO_{2e}	1,264,674

The CO_2 estimate in Table 2-9 is based on a facility operating scenario of 100% load for 100% of the year which is not a realistic operating scenario. Given the Project is designed to be dispatched, under an operating scenario that represents a normal operating year (assuming 85% capacity of the gas turbine at 100% load), the CO_2 emissions would be approximately 1,037,437 tonnes/year (Table 2-10). This more realistic scenario assumes 7,446 operating hours of the gas turbine and the natural gas dew point heater, includes 50 starts a year based on cold start emissions and 100 operating hours for the emergency fire pump and emergency diesel generator. The estimated maximum potential GHG emissions associated with the Project during operation using this scenario can be found in Table 2-10.

For the combustion turbine, the CO_2e emissions are due to CO_2, CH_4, and N_2O emissions. The CO_2e emission factors (for CO_2, CH_4, and N_2O) from the US EPA Mandatory Greenhouse Gas Reporting Rule (EPA 2010) and GWP were used to estimate CO_2e emissions. CO_2e emissions were estimated based on emission information from the gas turbine OEM for CO_2 and Air Pollution (AP)-42 emission factors for CH_4 and N_2O for natural gas. The GWP of m CH_4 and N_2O emissions are normalized to the warming potential of CO_2 (as CO_2e) by multiplying the CH_4 emissions by 25 and the N_2O emissions by 298. Despite the higher warming potentials of CH_4 and N_2O compared to CO_2, it is expected that CO_2 emissions will still account for over 99 percent of the CO_2e GWP for this combustion turbine.

Table 2-9 Estimated Maximum Potential Annual Greenhouse Gas Emissions Associated with the Project During Operation

Pollutant	Combined-Cycle Combustion Turbine[a] (tonnes per year)	Dew Point Heater (tonnes per year)	Emergency Diesel Fire Pump (tonnes per year)	Emergency Diesel Generator (tonnes per year)	Total (tonnes per year)[b]
CO_2	1,035,610	1,735.1	17.9	73.4	**1,037,437**
CH_4	18.7	0.03	0.001	0.003	**18.7**
N_2O	1.9	0.003	0.0001	0.001	**1.9**
CO_2e	1,036,634	1,737	18	74	**1,038,463**

[a] Represents 100% annual average ambient unfired scenario

[b] Based on 7,446 hours of turbine and heater operation, and 100 hours of pump and generator operation, per year

Natural gas power stations using CCGT technology emit 40% as much CO_2 as conventional coal-fired generation in Saskatchewan. For reference, Units 4 and 5 at SaskPower's Boundary Dam Power Station emit approximately 2.3 million tonnes of CO_2 annually to generate 280 MW. Units 4 and 5 are slated for shut down by the end 2021 and 2024, respectively. The Project will result in a greater generation output (a nominal 350 MW) with a lower GHG footprint as indicated in Table 2-10. As SaskPower phases out conventional coal-fired generation and adds natural gas and renewable generation to the system, the GHG emissions will continue to improve (i.e., diminish).

2.4.1.2.1 Gas Turbine Generator

The F-Class GTG will have the most up-to-date technology which includes several technologies to keep emissions low. NOx emissions will be controlled by the use of ULN burners. Emissions of particulates will be low due to the combustion of clean-burning natural gas. In addition, CO and VOC emissions will be minimized through effectively tuned combustion turbine controls. Further, natural gas has the lowest SO_2 emissions of any fuels. The Project is being designed with the best available control technology to achieve ground level effects that will meet the Saskatchewan and CAAQS.

Emissions from the F-Class GTG are dependent on the ambient temperature conditions and operating load, which can vary from 50 percent to 100 percent for combined-cycle operation. To account for representative seasonal climatic variations, potential emissions from the proposed combustion turbine was analyzed at 50, 75, and 100 percent load conditions for ambient temperatures ranging from negative 40 degrees Celsius (°C) to 35°C for combined-cycle operation. Projected emissions were based on data provided by the potential F-Class combustion turbine manufacturers and/or from AP-42 emission factors.

An F-Class GTG was selected based on the Saskatchewan grid and system design requirements. For SaskPower's grid, the optimal CCGT facility size is 350 MW with the flexibility to meet SaskPower's renewable energy plan. The G-Class, H-Class, and J-Class turbines all have outputs larger than 350 MW when installed in a 1x1 CCGT configuration. The H-class 1x1 CCGT is estimated to have output of more than 400 MW under the International Organization for Standardization (ISO) conditions, with an efficiency that is 1-2% better than a 1x1 F-class in an unfired facility. Using G, H, or J-class for the Project would necessitate the unit to be derated to produce less than 350 MW, significant grid reinforcement, and renegotiation of interconnection agreements.

Although the G, H, J-Class gas turbines generally have better efficiency and produce less CO_2 than the F-class on a pounds-per-MWh basis, derating the unit would adversely impact the efficiency advantage of these larger gas turbines. Moreover, the F-class gas turbine also has a lower NOx emission on a ppm basis compared to the H-class. The H-class turbine typically has 25 ppm NOx emission limit. SaskPower is committed to meeting a NOx emission of 15 ppm emission limit at the stack exit. The H-class gas turbine will not meet the NOx emission requirement in this case.

In addition to the combustion turbine, there will also be emissions of air contaminants generated from the emergency diesel generator, emergency diesel fire pump, and dew point heater. Detailed calculations of the combustion turbine and auxiliary equipment's emissions are provided in Appendix C.

2.4.1.2.2 Natural Gas Dew Point Heater

A 3.73 million British thermal units per hour (MMBtu/hr) natural gas-fired dew point heater will be used to heat the natural gas. The emissions are based on 8,760 hours of operation per year, which is the maximum. However, the estimated operational hours of the natural gas dew point heater is expected to be less than half of this estimate so emissions will be considerably less. AP-42 data was used to estimate the emissions from the heater.

2.4.1.2.3 Emergency Diesel Fire Pump

An emergency diesel fire pump will be built to support the Project in case of a fire. The emergency diesel fire pump is expected to have a maximum power output of 330 horsepower (hp) and will be fired solely by ultra-low sulfur # 2 fuel oil. The Project expects to operate the emergency diesel fire pump for up to 100 hours annually for testing and maintenance purposes, and therefore supports a limit on routine hours of operation of the emergency diesel fire pump. Vendor data and AP-42 emission factors were used to determine emissions for the fire pump.

2.4.1.2.4 Emergency Diesel Generator

An emergency diesel generator will be built to provide essential services to the Project in case of a power interruption. The emergency diesel generator is expected to have a maximum power output of 1,000 kW and will be fired solely by ultra-low sulfur #2 fuel oil. The Project expects to operate the emergency diesel generator for up to 100 hours annually for testing and maintenance purposes, and therefore supports a limit on routine hours of operation of the emergency diesel generator. Vendor data and AP-42 emission factors were used to determine emissions from the emergency diesel generator.

2.4.1.2.5 Facility Overview

The Project is expected to emit between 371 kg/MWh to 392 kg/MWh of CO_2 when operating at full load at various ambient conditions. These emission rates are based on the unit in a new and clean condition, with no consideration for facility degradation during operation and are instantaneous values at extreme temperature conditions of -40°C at 75% RH and 34.6oC at 17% RH. Project GHG emissions during operation, as described in Section 2.4.1, are estimated to be a maximum 1,038,463 tonnes CO_2e per year. The long-term service agreements with the gas turbine supplier will remedy the performance degradation to ensure that CO_2 emissions will not exceed 420 kg/MWh during the life of the Project.

As discussed previously, improving the heat rate of the Project will reduce the CO_2 emission per MW of electricity generated. The Project has been designed with the following features to improve the Project heat rate:

- Selecting an advanced F-class turbine to meet the nominal 350 MW requirement outlined by SaskPower
- Capturing waste heat from rotor air using kettle boiler to improve output and heat rate
- Increase temperature of fuel gas using feedwater to improve cycle efficiency
- Selecting a gas turbine capable of meeting SaskPower's forecasted demand with no duct firing to maintain a lower facility heat rate across all operating scenario

Using an ACC does have a slight impact on CO2 emission rates. However, considering the arid condition at the site, its temperate climate, and the large reduction in water consumption (90% or more compared to a wet cooling tower), it is deemed a worthwhile compromise.

2.4.2 Sources and Locations of Liquid Discharges

2.4.2.1 Construction Liquid Discharges

The main sources of plausible liquid discharge during the construction phase include sanitary waste, rain water, snowmelt, and machinery fluids (e.g., diesel fuel, lubricating oils). Each source will be controlled differently to avoid spills and unplanned releases.

During the construction phase, portable toilets will be used by personnel. Sanitary waste will be stored in a septic tank with a holding capacity of approximately 7570 litres and will be pumped and removed from site by licensed contractors and disposed of in accordance with federal, provincial, and municipal regulations.

Rainwater and snowmelt runoff will be monitored and controlled during construction and operation of the Project. The Project site will be graded to drain surface water to temporary drainage ditches and a storm water pond. The storm water pond will be designed to collect the main sources of water including surface water runoff and ACC wash water only (see table 2-12), therefore it is extremely unlikely to come into contact with contaminants given the storage, secondary containment and handling procedures employed at site. The limited possible exception could be very small amounts of hydrocarbons from minor, undetected leakages from vehicles or incidental grease or oil contact when washing dust from the ACC. The storm water pond has been designed to accommodate a 100-year storm event and preliminary design anticipates the pond will be approximately 7,000 m^2 and approximately 2 m-deep. The overflow structure will allow for excess water to slowly release over a period of a few days, until the pond is returned to its normal depth of water. This will be done in accordance with a Drainage approval from the WSA and the release of storm water will be designed to maintain existing drainage patterns on the Project site. Water quality in the storm water pond is expected to be similar to that of natural wetland habitats. Regular testing of storm water prior to release is not part of the storm water pond normal operations, as the pond is designed to collect surface water runoff only and is thus highly unlikely to come into contact with contaminants.

Out of an abundance of caution a storm water pond hydrocarbon monitoring and mitigation procedure will be established and employed throughout the life of the facility (including construction and operation).

Storm pond design and function is such that only a water volume attaining sufficient water head height within the pond can be released, via a controlled pipe conduit(s). Water below that level is lost only through evaporation to the atmosphere. The pond’s controlled pipe conduit(s) will be equipped with manually operated shut-off(s) (i.e., gates. See photo 1 for an example). These shut-off(s) will be maintained in a normally closed position.

Photo 1 Example of manual operated shut-off as a control gate from SaskPower's Queen Elizabeth Power Station located in Saskatoon, SK.

Weekly visual inspections for oil sheen will be conducted during dry weather periods and daily visual inspections during wet weather periods (rainfall events) during both construction and operation phases. Should an oil sheen be detected then hydro-vac units will be contracted to remove the contamination and take it off site for proper disposal by a licenced operator. Further, prior to release of any storm water pond detained water a visual sheen inspection will be conducted and only if no sheen is detected will the shut-offs be opened and the water allowed to pass. Should an oil sheen be detected then hydro-vac units will be employed per above.

In the event of a larger accidental spill the required response actions will immediately be undertaken to control and isolate the spill, and to remove the contaminant and any effected water or soils from site for proper disposal by a licenced contractor. All remedial actions required, water quality limits and mandatory reports as dictated by the Saskatchewan Ministry of Environment's "Guidance Document: Impacted Sites" established under the Saskatchewan Environmental Code (http://publications.gov.sk.ca/documents/66/86827-125d335b-34c4-4072-8e1e-fb9408498231.pdf) will be adhered to, as well as SaskPower's BMP 10 governing Spills and Releases. The scheduled visual sheen inspections would serve as an additional backstop to these protective measures.

In the very unlikely event of a significant influx of hydrocarbons into the storm water pond immediate actions to prevent water birds, species at risk, or other wildlife including but not limited to migratory birds, from contacting the contaminants would include deployment of staff with flags to deter them from entering the pond. Additionally, other devices, such as scare cannons, "scary-man' inflatables, etc., would be utilized until hydro-vac units could be summoned to vacuum up the contaminants and remove them from site for proper disposal.

Given the unlikely probability of any hydrocarbons being translocated to the storm water pond, from any source, combined with the storm water pond hydrocarbon monitoring and mitigation procedure, any possible wildlife exposure will be extremely small both in terms of quantity and time. Any possible exposure to hydrocarbons should not pose a threat to water birds, or other wildlife, that may occasion the storm water pond.

Current site drainage is onto adjacent farmland, via a well-defined intermittently flowing swale which traverses the Project property, and roadside ditches adjacent to the Project. The swale is currently cultivated and susceptible to erosion. SaskPower will seed the portion of the swale on its property to reduce the erosion potential. Water flows from the swale and eventually spills into a small man-made reservoir north of the Project site. The Moose Jaw River is not expected to receive surface runoff or overflow from the storm water pond or drainage ditches, consequently, there will be no adverse environmental effects on fish or fish habitat.

Machinery will be kept in proper working order during construction to avoid spills of machinery fluids such as oils, fuels, and coolants. The site procedures manual will identify proper spill handling techniques such as:

- having a spill kit (including absorbent material and disposal bags) and emergency spill repair kit available on Site,
- having SaskPower employees and contractors working on the Project informed on spill reporting criteria for the Project, and
- insuring awareness of SaskPower's incident reporting through e-mail or phone. For a review of SaskPower's incident mitigations and reporting structure.

Please refer to SaskPower's Environmental Beneficial Management Practices (SaskPower 2018) for Beneficial Management Practices (BMP) #10 Spills and Releases, and a full listing of SaskPower's standard mitigations.

2.4.2.2 Operation Liquid Discharges

The Project will contain various sources of possible liquid discharges that must be controlled during operation.

The Project will utilize an ACC which significantly reduces the water consumption and associated discharges. The estimated process wastewater that will be discharged during normal operation will range between 32 litres/minute and 35 litres/minute (46-50 cubic metres per day (m^3/day)) across various ambient conditions. Table 2-11 describes the estimated water quality for the waste stream. The waste water discharge stream will be limited to the waste stream from the ultrafilter and RO system. The waste stream will be primarily cycled-up water with some chemical additives in the feedwater cycle, including phosphate and ammonia from the HRSG blowdown, chlorine from service water use, and antiscalant, sulfite/sulfate, and caustic, chemically converted to additional sodium bicarbonate, from the RO system. Since a rental mixed bed ion exchange system will be used, all regeneration will take place offsite at the supplier's facility, and no waste disposal is expected from the mixed bed.

The waste water generated from the Project will mainly consist of effluent water from the water treatment process and be discharged to the City of Moose Jaw. The benefit of sending the water to the City of Moose Jaw is that SaskPower will not be required to build an evaporation pond.

Table 2-10 Estimated Water Quality of the Waste Stream (mg/L) Discharged from the Project to the City of Moose Jaw During Operation

Parameter	Concentration (milligram per litre)	Concentration Limits (milligram per litre)
Total Dissolved Solids (TDS)	734	3000[a]
Calcium (Ca)	61	1000[a]
Magnesium (Mg)	36	N/A
Sodium (Na)	78	200[b]
Iron (Fe)	0	5[a]
Ammonia (NH_3)	3	4.82[c]
Cations		
M-Alkalinity (M-Alk)	205	N/A
Sulphate (SO_4)	230	1000[a]
Chloride (Cl)	29	100[a]
Nitrate (NO_3)	0	100[a]
Carbon dioxide (CO_2)	6.5	N/A
Silicon dioxide (SiO_2)	39	N/A

[a] from Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water) (CCME 2014)

[b] from Guidelines for Canadian Drinking Water Quality (Government of Canada 2017)

[c] from Canadian Water Quality Guidelines for the Protection of Aquatic Life, based on neutral pH and 20°C (CCME 2010)

Note: Cations are reported as $CaCO_3$, all others as ion.

During operation of the Project, sanitary waste will be collected and pumped to the city of Moose Jaw. Given sanitary waste water generated during operation will be less than 18 m^3 per day, the waste system will be regulated by The Plumbing and Drainage Regulations.

The storm water pond will be designed for a 100-year storm event and preliminary design anticipates the pond will be approximately 7,000 m^2 and approximately 2 m-deep. For more information on the storm water pond during operation please see Section 2.4.2.1.

In addition to the liquid stream during operation, there are also other liquid waste streams associated with maintenance work. These streams are usually intermittent flows such as gas turbine compressor wash, ACC wash, lube oil, etc. Details regarding the disposal and effects of the intermittent flows can be found in Table 2-12. Final location of drains and trenches is to be determined in final design for construction.

For remedies associated with potential hydrocarbons occurring within the storm water pond please refer to the monitoring and mitigation procedures described in Section 2.4.2.1.

For monitoring and mitigation procedures on other areas such as surrounding soils see Section 2.4.2.1 and SaskPower's BMP's, specifically BMP 10 Spill and Releases.

2.4.2.3 Accidents and Malfunctions

In the event of a liquid discharge due to an accident or equipment malfunction, wastewater drains from the area around the equipment that have the potential to be contaminated will be gravity drained and directed through the oil/water separator. Oil water separator effluent will be pumped and discharged to the water treatment building sump for reuse. Oil will be stored in the separator and removed periodically by a vacuum truck and disposed of at an appropriate facility offsite.

Floor and equipment wastewater drains or floor trenches will be located near equipment which contains or uses oil. The floor trenches will be used to collect and convey drainage inside the Project. Containment curbs, floor trenches, and underground piping will contain, collect, and transport oil contaminated drainage to the oil/water separator(s) for treatment. Oil containment areas will be provided with normally closed isolation valves and gravity drain to the oily drains system.

Table 2-11 Summary of the Estimated Quantities of the Intermittent Liquid Waste Streams

Liquid Waste	Description	Volume		Containment	Disposal Method	Potential Effects on the Environment
		Normal	Maximum			
Waste effluent from HRSG blowdown	Blowdown from HRSG HP,IP, and LP drums. Used to maintain boiler chemistry by blowing down solids from the bottom of the boiler drums into a blowdown tank. Liquid effluent is quenches and sent to the plant sump and vapor is sent to an atmospheric vent.	3.2 m^3/hour	15.9 m^3/hour	Plant Sump	Recycled back to service water storage tank and filtered in plant demineralizer	None
Waste effluent from demineralized water treatment plant	Water treatment plant discharge waste stream	2.1 m^3/hour	4.2 m^3/hour	City of Moose Jaw	Effluent will be pumped to the city of Moose Jaw through an underground pipeline	None
Sampling discharge	Sample panel drains	0.9 m^3/hour	0.9 m^3/hour	Plant Sump	Recycled back to service water storage tank and filtered in plant demineralizer	None
Drainage within powerhouse building	Miscellaneous floor drains and equipment drains	2.3 m^3/hour	2.3 m^3/hour	Plant Sump	Water will be sent through oil water separators and recycled back to the service water tank or sent to the City of Moose Jaw	None; oil water separators will have oil level switches and pump interlock to prevent discharging oil laden water. Oil will be trucked offsite.
Gas turbine water wash	Gas turbine compressor water wash will be a combination of water and cleaning agent that will be collected in a drains tank and trucked offsite.	5.2 m^3/hour	7.9 m^3/hour	Water Wash Drains Tank	Will be treated as hazardous waste and trucked offsite.	None
Air cooled condenser water wash	Air cooled condenser fin wash to remove dust accumulation on the outside of the ACC fins	200 m^3 per wash (wash quantity dependent on weather cycles, est. 2 washes per year)	N/A	N/A	Plant storm water system	Extremely minimal; clean plant water is used in the pressure washer. Potential rare occurrence for hydrocarbons to be present on the ACC and contaminate the waste wash water
Used oil and other solvents (hazardous waste)	Used lube oil and control oil for turbines and other cleaners used in plant	TBD	TBD	Plastic totes or barrels	Oil will be sold or recycled to/by qualified carrier.	None
Sewage	Sanitary waste from admin building	5 m^3/day	N/A	N/A	Sewage will be pumped to the city of Moose Jaw through an underground pipeline	None

Notes: 1. Information in this table is preliminary and values will be updated as required during permit application process.

2.4.3 Types of Wastes and Plans for Disposal

2.4.3.1 Construction

Solid wastes that will be generated during construction will be typical of activities associated with power generation construction, such as packing materials, office wastes, scrap lumber, excess concrete, metals, cables, glass, cardboard containers, and other miscellaneous debris. Solid waste will be collected in large waste containers and hauled off and disposed of by licensed waste contractors in accordance with federal, provincial, and municipal regulations. Waste disposal will occur only at either locally or regionally approved facilities.

2.4.3.2 Operation

Solid wastes generated during the operation phase of the Project will be typical of activities associated with operation of a power generation facility. Wastes will include domestic and office waste generated by operations personnel, packaging wastes from supplies, as well as wastes from ongoing maintenance activities (e.g., oil containers, rags, etc.). Wastes generated during operation will be disposed of by licensed waste contractors in accordance with federal, provincial, and municipal regulations using approved facilities. Table 2-11 provides the estimated quantity of solid wastes that will be generated during operation of the Project.

Table 2-12 Estimated Quantity of Solid Wastes Generated from the Project During Operation

Waste Material	Disposal Method	Estimated Annual Quantity (tonnes)
Waste oil/filters/hazardous waste/oily rags/aerosol cans	Collected and disposed of through registered collectors and recovered/recycled through registered processors/disposal class 2 landfill.	3
Domestic waste	Municipal Landfill	3
Paper/cardboard/tin/plastic	Approved recycling facility	8-15
Scrap metal	Approved recycling facility	15

2.5 CONSTRUCTION, OPERATION, AND DECOMMISSIONING AND ABANDONMENT PHASES AND SCHEDULING

2.5.1 Scheduling and Key Project Phases

The proposed Project schedule is outlined in Table 2-12. The schedule may be affected by SaskPower internal governance approvals and by regulating agency assessments and approvals. The schedule assumes that no federal or provincial EA will be required and there are no SaskPower internal governance approval delays. In the event that an EA is required, the Project milestones will be shifted accordingly based on the time required to conduct the EA.

Table 2-13 Project Schedule

Activity	Anticipated Schedule
Land and Geotechnical Surveys	September 2019
Permit Applications and Approval	October 2019 to December 2020
Site Clearing & Grubbing	January 2020 to February 2020
Site Preparation/Levelling	March 2020 to June 2020
Piling Installation	April 2020 to July 2020
Foundation and Underground Installation	May 2020 to December 2020
Building Erection	October 2020 to September 2021
Equipment Installation	April 2021 to May 2022
Water Interconnection Construction	March to May 2022
Commissioning & Start-up	September 2022 to August 2023
Decommissioning (after estimated 30-year Project life)	2053 to 2055

2.5.1.1 Pre-construction

The Project pre-construction activities are anticipated to start in the fall of 2019. Activities will include land and geotechnical surveys required for design and construction. Land surveys will identify site boundaries and topographic details required for site preparation and grading. Geotechnical surveys will be conducted to gather information on soil consistency and structure needed for piling and foundation design. A site procedure manual will also be developed and will include a site emergency response plan, an environmental management plan, and site safety procedures.

2.5.1.2 Construction

2.5.1.2.1 Site Preparation and Grading

The Project preparation activities will be performed prior to any other construction work. Site preparation construction is expected to take approximately 4-5 months to complete and is ideal for the work to be completed outside of frozen ground conditions. The developed portion of the Site will be stripped of topsoil and organic matter. The topsoil will be stockpiled for use in landscaping. The Site will be excavated or filled, where required, to bring the Site to the required elevations. Excavated materials, where possible, will be used for fill. Soil excavated from the Site shall be stockpiled at a location onsite.

The site will be graded to drain into main collection ditches. The Site surface will be graded to a slope of one vertical to 100 horizontal, where site conditions and elevations allow, permitting rapid removal of surface water. The main collection ditches will have a trapezoidal cross-section shape, with a minimum bottom width of 1.2 m. The side slopes will be designed to the soil conditions present on Site. Ditches shall be designed to be adequately protected from erosion after excavation to maintain slope stability using vegetation or other engineered means.

The general sequence of the site preparation construction will be to begin work in the main facility area and in the construction management trailer and parking lot areas. Following the initial work, the balance of the site preparation construction scope will be performed, which includes installing the site fence, preparing the switchyard area, installing the storm water pond, and installing the main construction roads on the site.

2.5.1.2.2 Foundation Excavation and Construction

Foundation construction will be performed during non-frozen ground conditions. It is preferable that all foundation construction and underground utility work be completed during one construction season, March to December. Piling construction work will begin in April 2020 followed by foundation/substructures construction beginning in May 2020. Using this approach, it is expected that all foundation construction work can be completed by December of the same year. Dewatering activities are not expected during the foundation excavation. In the event that the foundation excavation becomes saturated and dewatering activities need to take place SaskPower will submit a dewatering plan to WSA to ensure the proper permitting is in place.

Duct bank and grounding grid construction and underground piping installation work will be completed during the construction of the foundations in the same areas.

2.5.1.2.3 Building and Equipment Installation

Building construction will begin in late 2020 following completion of foundation construction. The mechanical equipment will be scheduled to be delivered immediately after the mechanical contractor(s) mobilize to site beginning with HRSG component deliveries planned to begin in late 2020.

Above ground electrical construction will begin in August 2021. Electrical equipment installation work will be completed first followed by raceways installation and then cable installation.

Switchyard construction scope will include the above grade poles, line, and miscellaneous components for a complete function transmission line interface connection. Switchyard construction will begin in 2021 and will be completed in time to support electrical backfeed targeted for September 1, 2022.

2.5.1.2.4 Commissioning and Testing

Start-up and commissioning provides for a documented, safe, timely, and orderly testing, start-up and transfer of packages, systems, and facilities. Planning will begin in the engineering stage with the definition of Start-up Packages. Engineering, procurement, and construction planning will support early commissioning of as many start-up packages as practical. Early checkout and testing of as many packages as possible will distribute the start-up workload more efficiently, reducing the risks and uncertainties associated with facility start-up and commissioning.

The principal activities provided during this stage are the following:

- perform Project start-up planning and preparation
- perform start-up and commissioning process
- start-up and commissioning management
- operator training management, and
- performance testing.

The entire startup and commissioning process, including system functional testing, is anticipated to take approximately 12 months. In addition to system checkout and piping hydrotest, lube oil flushing will also be performed for the GTG and STG lube oil systems. Chemical cleaning will be utilized to remove grease and other contaminants in the HRSG. When fuel gas is available in summer 2022, first fire of the GTG will occur. Steam generated in the HRSG from the GTG exhaust heat will be used to generate steam to conduct steam blows. After steam blow is complete, the STG will be started to electrically synchronize to the grid. The project team will then tune the unit to optimize facility performance. The final activities in the commissioning process will be the Project testing. For the Project, it is anticipated that facility testing will include performance tests, demonstration tests, emission tests, and reliability tests.

2.5.1.3 Operation

The Project will be owned and operated by SaskPower. Day to day operation and maintenance will be provided by a staff of operators, engineers, and support staff totaling approximately 20 people. Additional support staff will be available from the other natural gas facilities in the SaskPower fleet.

The Project will operate as a baseload facility with a flexible control scheme to support SaskPower's emission reduction strategy. The Project will provide a regulation range of between 50% and 100% to compensate for the intermittent load from renewable generation and to maintain system reliability. The Project will be operated using Automatic Generation Control (AGC) for the purpose of load following variable renewable generation and will be monitored and controlled in the local control room as well as SaskPower's grid control centre. The Project is not expected to have more than 50 starts per year.

The estimated process wastewater that will be discharged during normal operation will range between 32 litres/minute and 35 litres/minute (46-50 cubic metres per day (m^3/day)) across various ambient conditions. Water that cannot be recycled will be sent to city of Moose Jaw for processing.

Site water from rain, snowmelt, and runoff will be managed through a series of ditches and culverts. In the power block area, there will be on-grade duct banks that will make routing water to ditches difficult. As a result, the storm water in the power block area will be drained to inlets and routed via underground pipes to tie into the new site ditches. Rerouting of surface drainage will be confined to the Project site only. A Storm Water Pollution Prevention Plan (SWPPP) will be developed during site preparation design to implement and control storm water discharge. As the SWPPP has not been fully developed, a basic monitoring and mitigation procedure is described in Section 2.4.2.1.

Major maintenance and refurbishment work on the STG and GTG will be provided by the turbine and generator manufacturer to maintain reliability and efficiency of equipment. A comprehensive long-term service agreement will cover the gas and steam turbine and generator equipment. As the Project is expected to operate as a baseload facility, the planned maintenance intervals are 16,600 hours. A typical maintenance schedule is provided in Table 2-13.

Table 2-14 Turbine Manufacturer's Typical Maintenance Schedule

Equivalent Base Hours* (EBH)	Combustion Turbine Outage	Outage Durations (Days)	Steam Turbine Outage
16,600	Combustion Inspection	8	Borescope Inspection
33,200	Hot Gas Inspection	14	Limited Inspection
49,800	Combustion Inspection	8	Borescope Inspection
66,400	Major Inspection	21	Major Overhaul
83,000	Combustion Inspection	8	Borescope Inspection
99,600	Hot Gas Inspection	14	Limited Inspection
116,200	Combustion Inspection	8	Borescope Inspection
132,800	Major Inspection	28	Major Overhaul
150,000	End of Term		N/A

*Hours are approximate at time of outage

During operation of the Project, the ongoing operation and maintenance of the potable water supply pipeline and associated equipment will be the responsibility of the City of Moose Jaw.

2.5.1.4 Decommissioning and Reclamation

Cleanup activities will be ongoing throughout construction. Upon completion of the construction work, SaskPower and contractor personnel will ensure that any remaining construction materials and other debris are removed. Areas disturbed during construction which will ultimately be outside of the fenced areas shown in Figure 2-2, will be recontoured and covered with the stockpiled topsoil and reseeded with an appropriate seed mix. Disturbed ground within fenced areas, including the construction laydown, parking, and management facilities areas, shall be maintained to support facility operation and maintenance activities. Appropriate mitigation and reclamation measures to address post-construction environmental concerns will be implemented (e.g., erosion control measures). The Project will be monitored post-construction for early detection of weed growth and any noxious, nuisance, or prohibited weeds will be controlled according to SaskPower's Environmental Beneficial Management Practices (SaskPower 2018).

In order for SaskPower to operate the Project, an Authorization to Operate must be obtained from SK ENV. As part of this Authorization, SaskPower is required to provide a comprehensive decommissioning and reclamation plan. This plan is reviewed periodically for completeness and adherence to environmental laws/regulations as they may change periodically. This decommissioning and reclamation plan will guide SaskPower's activities.

The Project is expected to operate until at least 2053. Precise timing for the decommissioning of the Project cannot be predicted at this time as it depends solely on the mode of operation. However, all relevant environmental regulations in existence at the time of decommissioning will be adhered to. A Decommissioning and Reclamation Plan will be developed for the Project outlining the decommissioning and reclamation objectives, methodologies, and estimated costs to be submitted as a required part of the provincial Authorization to Operate application process.

The decommissioning will begin when SaskPower's Asset Management Group determines the station is at the end of life such that the decommissioning activities can ensue. SaskPower will review the Project decommissioning and reclamation plan, formally allocate funds, assign a project manager, and confirm the schedule of the decommissioning and reclamation activities. When a project manager is assigned, he or she will be responsible for engaging with the environmental regulatory agency and will likely begin stakeholder engagement and complete an environmental decommissioning impact review. Decommissioning and reclamation will take approximately two years. An extra year may be required for post decommissioning and reclamation environmental monitoring activities.

Prior to demolition, the following measures will be taken:

- floor drains, trenches, and sumps will be cleaned, and any materials removed will be tested and disposed of at approved facilities, as required,
- oil and chemicals will be drained from the equipment and disposed of at approved facilities,
- recycling of materials, rather than disposal in the landfill will be conducted, wherever practical.
- charged Energy from electrical and mechanical systems will be removed.

During the first year of demolition activities, major equipment, piping, and electrical infrastructure will be removed from site. As the year progresses it is expected that the Project and associated buildings will be removed from site.

The second year will see more underground work progress. Foundations will be removed to 1 m-below grade and the excavation backfilled and rubble will be crushed for use as base material. The gravel surface will be stockpiled on site for possible sale and metal will be sold for salvage. It is anticipated that small diameter underground piping may be left in the ground but any above or below ground storage tanks will be removed. After the decommissioning has been completed, only the foundations and HDPE pipe 1 m-below grade will remain on site. These will be identified in a caveat registered on the property title.

Below is the forecasted decommissioning and reclamation plan for incidental works:

Potable Water Supply

After construction (Section 2.3.4.1.1) the potable water supply pipeline and related assets will be transferred to the complete care, custody, and control of the City of Moose Jaw. The potable water supply pipeline will be used to serve other industrial customers in the area, so will need to be retained following the retirement of the CCGT facility. The potable water supply asset life is expected to be 50 years and it is expected to be in fair to good condition when the Project is retired. The City of Moose Jaw will retain this asset for the remainder of its life and will be responsible for decommission, reclamation, or replacement when required.

Process Wastewater Discharge

The water treatment discharge line (Section 2.3.4.1.2) will be decommissioned in compliance with the Authorization to Operate and in consultation with SK ENV and the City of Moose Jaw. This will include proper disconnection of the infrastructure from the sewage lagoons and either pipe removal or abandonment in place as meets the environmental regulations at the time.

Sanitary Discharge

The sanitary discharge pipeline (Section 2.3.4.1.3) will tie into the City of Moose Jaw infrastructure. Decommissioning will be restricted to that piping from the tie-in point to the Project. Pipe removal or abandonment in place will be determined in conjunction with appropriate authorities and per environmental laws at the time. The remaining pipeline infrastructure, under the care and control of the City of Moose Jaw, will likely be shared by other industrial park customers and left in service.

Electrical Power Infrastructure

The transmission and distribution incidental works (Section 2.3.4.2) specific to the Project will be removed when the CCGT facility is retired. Any reusable equipment, poles, conductors, or hardware will be salvaged. Unusable materials will be disposed in an approved manner and/or sold for scrap.

Fibre-optic Line

The fibre optic communication line (Section 2.3.4.3) to the Project runs between the SaskPower Pasqua Switching Station and the Project site. The line will terminate in a pedestal on the edge of the property. It is expected the fibre optic cable will be abandoned or repurposed by SaskTel or SaskPower following the retirement of the Project.

Road Upgrades

Road infrastructure (Section 2.3.4.5) to and from the Project, which are under the care and control of the City of Moose Jaw, will be maintained following the decommissioning of the Project. Access to the City of Moose Jaw Industrial Park and sewage treatment facilities will necessitate continued to use these roads.

Natural Gas Infrastructure

The natural gas supply pipeline to the Project is provided by and under the care and control of TransGas (Section 2.3.4.4). The pipeline connects to the Project site at the natural gas interconnection point (Figure 2-2). At decommissioning, TransGas will remove the pipeline and evaluate the removal of their supporting infrastructure based on other customer natural gas needs at that time.

Facility Gas System

The Project natural gas system will begin at the downstream side of the fuel gas custody transfer area (Figure 2-2). The Project natural gas system equipment, pipelines and infrastructure will be completely decommissioned and removed at the Project's end of life.

3.0 PROJECT LOCATION

3.1 DESCRIPTION OF THE PROJECT LOCATION

The Project will be located in E½ 27-16-26 W2M, which is in the Moose Jaw Industrial Park and currently owned by the City of Moose Jaw (Photo 2 and Photo 3). This land has been designated industrial since 2011 as part of both the RM of Moose Jaw and City of Moose Jaw Official Community Plans. As of April 2017, the land was zoned M2 Heavy Industrial. SaskPower has signed an option to purchase this land parcel. The center point of the Project is as follows:

- 50˚ 22’ 30.18” N; 105˚ 29’ 39.75” W

A site plan of the Project can be seen in Figure 2-2.

The incidental activities have various starting points before interconnecting to the Project (Figure 1-1). The incidental activities and their start points are presented below:

- process wastewater discharge – 50° 21’ 22.85” N; 105° 29’ 47.22” W;
- sanitary discharge – 50° 22’ 57.88” N; 105° 29’ 52.42” W,
- overhead 230 kV transmission line and underground fibre-optic line – 50°23’27.06”N; 105°23’57.40”W
- underground potable water supply pipeline – 50° 25’ 12.06” N; 105° 31’ 40.77” W
- underground 25 kV power distribution line – 50° 22’ 07.16” N; 105° 29’ 49.89” W
- road upgrades – 50° 22’ 03.68” N; 105° 30’ 01.65” W and 50° 22 ‘55.95” N; 105° 29’ 20.10” W
- natural gas infrastructure – to be determined, but within 1 km of the Project site

The nearest occupied rural residence is located approximately 600 m west of the Project. The Project is located within Treaty 4 area and the nearest First Nation home reserve community is the Piapot First Nation which is located approximately 110 km northeast of the Project (Figure 4-1). Piapot First Nation also have Treaty Land Entitlement (TLE) reserves located approximately 60 km to the southeast of the Project location. The NSPML#160 office is located in Moose Jaw and its members include residents of Moose Jaw and the surrounding Moose Jaw area. The entire Moose Jaw area is claimed as within the Homeland of the Métis.

The closest federal land is the Moose Jaw Canadian Forces Base (15 Wing), approximately 5 km southwest of the Project.

Photo 2: Viewing north along the east edge of SE 27-16-26 W2M

Photo 3: Viewing southwest from the northeast corner of NE 27-16-26 W2M

3.2 LAND AND WATER USE

The Project is located on cultivated land within the City of Moose Jaw Industrial Park (City of Moose Jaw 2019a), an area zoned for heavy industrial use (zone M2; Bylaw No. 5346) (City of Moose Jaw 2019b).

The property Is currently owned by the City of Moose Jaw; however, SaskPower currently holds an option to purchase this property (Appendix B, City of Moose Jaw 2019c).

The mineral titles for the property are currently owned by the City of Moose Jaw.

The City of Moose Jaw bylaw 5346 provides planning guidance for heavy industrial development at the industrial park (City of Moose Jaw 2019b). Power plants are a permitted use within this zone, with general development restrictions and constraints applicable to power plant developments. The proposed Project and City of Moose Jaw land sale were subject to public consultation with little opposition (City of Moose Jaw 2019c).

On behalf of the City of Moose Jaw, an engineering consulting firm is currently preparing a land use concept plan to guide the future subdivision and development of a heavy industrial park within the immediate vicinity of the city lagoons in the city’s southeast quadrant. The land use concept plan establishes the intended industrial use of these lands, identifies and situates key internal road networks required to provide logical boundaries for the subsequent subdivision of lots within the proposed park, and includes a conceptual basis for extending municipal servicers into the area. The initial stage of planning for the area encompasses approximately 300 hectares with industrial build-out projected to occur over the next 10-15 years depending upon economic conditions and market demands.

The Project does not require access to, use or occupation of, or the exploration, development, and production of lands and resources currently used for traditional purposes by Indigenous peoples. To the time of writing (mid-April), concerns over further potential adverse impacts to traditional activities have not been raised during meetings with First Nations or Metis Communities (Section 7.2.2.1 Summary of Indigenous Engagements). Engagement efforts, discussions, and dialogue will continue through the construction and early operation phases of the Project.

4.0 FEDERAL INVOLVEMENT

4.1 FEDERAL FINANCIAL SUPPORT

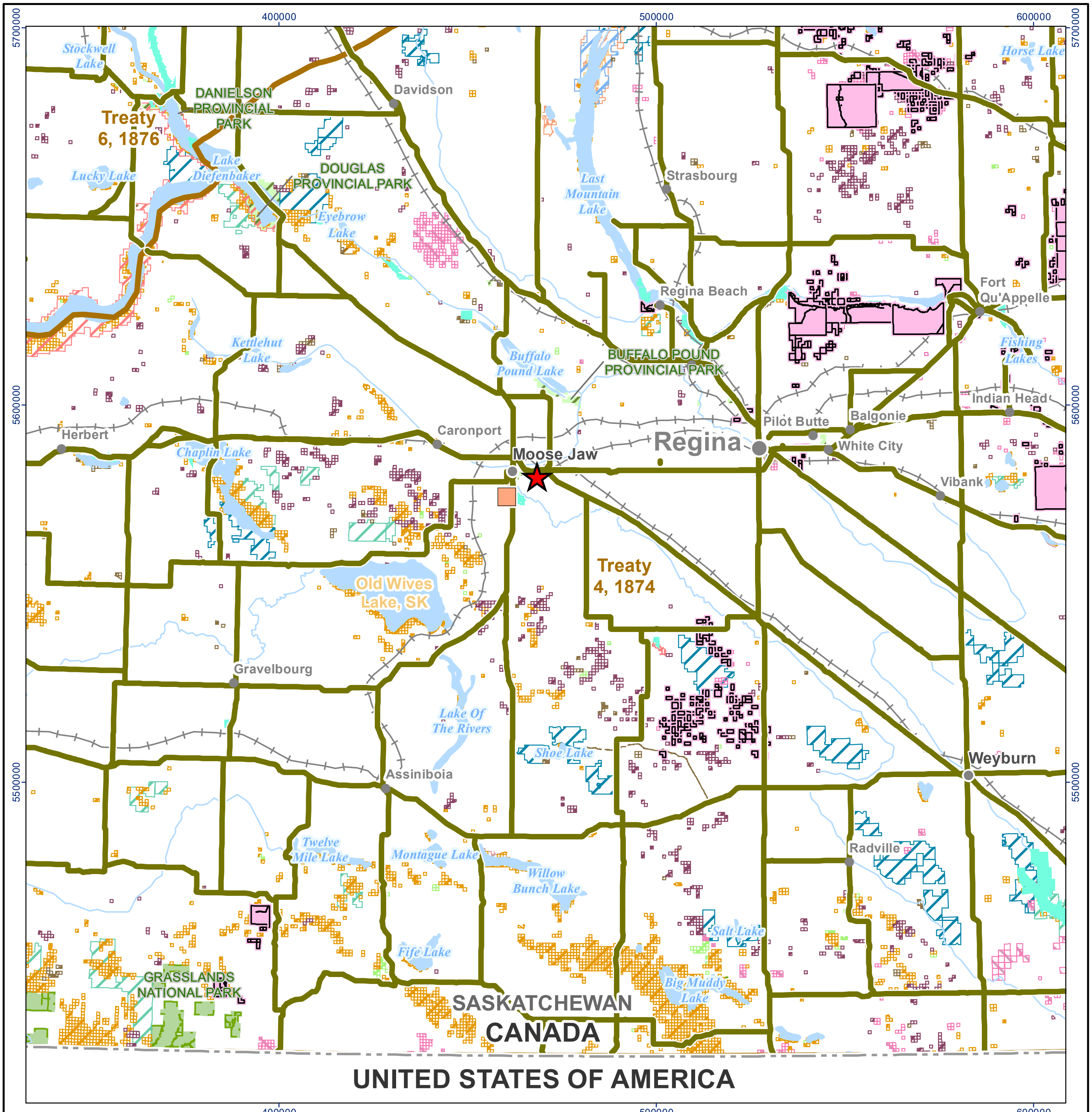
The Project does not include any proposed or anticipated federal financial support.

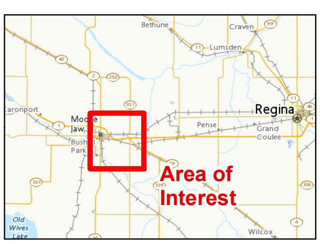
4.2 FEDERAL LANDS

No federal lands would be used for the purpose of carrying out the Project, nor would there be any granting of interest in federal land (i.e., easement, ROW, transfer of ownership) (Figure 4-1).

4.3 FEDERAL LEGISLATIVE OR REGULATORY REQUIREMENTS

Current Project details indicate that a permit is required under the *Aeronautics Act* (Government of Canada 1985a) for marking the Project stacks. An authorization under the *Fisheries Act* (Government of Canada 1985b) is not expected to be required for the construction of the potable water supply pipeline. No other federal permits, licenses, or authorizations are expected at this point. All other federal regulatory requirements shall be adhered to as are applicable (Table 1.4).





Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Data Sources: Government of Saskatchewan, Government of Canada, SaskPower

- Approximate Site Location
- Canadian Forces Base - Moose Jaw
- City/Town
- Major Road
- Minor Road
- Railway
- Watercourse
- Canada/USA Border
- Conservation Easements
- Crown Conservation Easements
- Federal Pastures
- First Nations Treaty Boundary
- Fish and Wildlife Development Fund Lands
- Game Preserve
- Indian Reserve
- Land Claim Selections
- Migratory Bird Sanctuary
- National Wildlife Area
- National Park
- Provincial Park
- Protected Area (Other)
- Ramsar Wetland
- Reservoir Development Areas
- Sask Agriculture and Food Pastures
- Waterbody
- Water Security Agency
- Wildlife Habitat Protection Act (WHPA) Land
- Wildlife Refuge

0 25 50 Km

N

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Stantec SaskPower

Project Location
Moose Jaw, Saskatchewan

Prepared by MDWallace on 2019-05-03
Technical Review by JHennig on 2019-05-03

Client/Project
113254233-007 REVF

Moose Jaw Combined Cycle Gas Turbine Facility

Figure No.
4-1

Title
Administrative Boundaries

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5.0 ENVIRONMENTAL PARAMETERS

5.1 SPATIAL BOUNDARIES

The valued components (VCs) included in this document were reviewed to determine the spatial boundary over which an effect could be reasonably evaluated or to identify constraints in the routing and siting process. Spatial boundaries have been developed for the Project and are defined below (Figure 5-1).

5.1.1 Project Site

Project Development Area (PDA) – The PDA represents the area that could be affected by equipment during Project construction and operation and includes the Project location and incidental activities (Figure 5-1). The footprint associated with construction and operation of the Project is approximately 525 m x 580 m (30.5 ha). Precise footprints are unknown for incidental activities as routing and siting is currently underway (Section 5.1.2).

The term Project PDA is used in some instances to focus the discussion of results specifically on the Project site only, as a sub-set to the overall PDA.

Local Assessment Area (LAA) – The LAA represents the spatial extent within which the Project could have effects on a VC (Figure 5-1). Due to the differences in the spatial extent of potential effects on a VC, different LAA sizes have been used for the assessment and presentation of baseline data. For terrain and soil, and vegetation and wetlands, the LAA comprises a 300 m buffer of the PDA. For wildlife, the LAA comprises a 1,000 m buffer of the PDA.

Regional Assessment Area (RAA) – The RAA represents the regional context over which cumulative effects may occur and can be examined for biophysical, human, cultural, and economic VCs (Figure 5-1). A buffer of 5,000 m from the PDA was used as an area to describe potential regional issues.

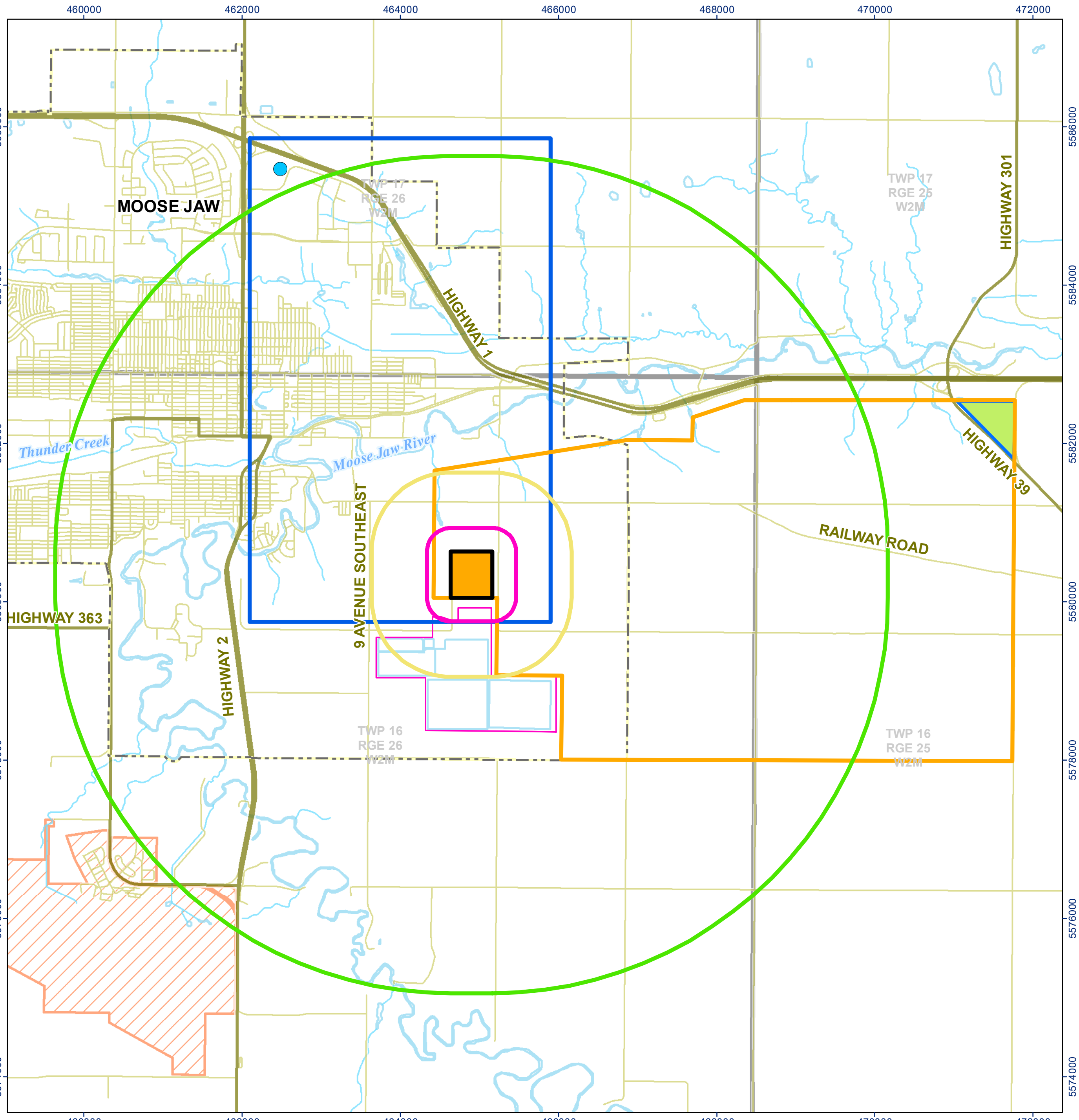
5.1.2 Incidental Activity Study Areas

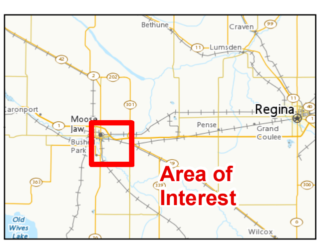
Incidental Activity Study Area – Routing and siting for incidental activities has not been finalized. As such, a study area (2,862.9 ha) has been defined which encompasses the area in which incidental activities could be routed and sited. The Incidental Activity Study Area is described with respect to biophysical and human environment resources to aid in siting of routes and to provide context for the environmental setting, potential environmental effects, and likely mitigation measures. The incidental activities to be routed and sited within this study area and their approximate footprint associated with construction and operation are as follows:

- process wastewater discharge: 9,000 m-long x 10 m-wide ROW (9 ha)
- sanitary discharge: 500 m-long x 10 m-wide ROW (0.5 ha)

- power distribution line: 800 m-long x 10 m-wide ROW (0.8 ha)
- power transmission line: 12,000 m-long x 40 m-wide ROW (48 ha)
- road upgrades: 4,000 m-long x 30 m-wide ROW (12 ha)
- fibre optic line: 12,000 m-long x 10 m-wide ROW (12 ha), and
- natural gas infrastructure: 1,000 m-long x 30 m-wide ROW (3.0 ha) and 100 m x 100 m regulation station (1 ha).

Potable Water Supply Study Area – A Potable Water Supply Study Area (2,323.8 ha) has been defined which encompasses the area in which the potable water supply pipeline ROW could be sited within (Figure 5-1). Routing for the potable water supply pipeline is expected to be approximately 10,000 m long within a 20 m-wide ROW (20 ha) and has not been finalized. The Potable Water Supply Study Area is described with respect to biophysical and human environment resources to aid in the siting of the route in this area and to provide context for the environmental setting, potential environmental effects, and mitigation measures. A separate study area has been developed for the potable potable water supply pipeline because it is the only incidental activity that may require crossing of the Moose Jaw River.





Legend

- Facility PDA
- Terrain and Soils/Vegetation and Wetlands LAA
- Wildlife LAA
- Facility RAA
- Incidental Activity Study Area
- Potable Water Supply Study Area
- Moose Jaw Wastewater Treatment Plant
- SaskPower Pasqua Switching Station
- City of Moose Jaw Northeast Reservoir
- Major Road
- Minor Road
- Watercourse
- Canadian Forces Base - Moose Jaw
- City Limits
- Township
- Waterbody

0 1 2 Km

(At original document size of 8.5x11)
1:75,000

N

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Data Sources: Government of Saskatchewan, Government of Canada, SaskPower

Stantec SaskPower

Project Location
Moose Jaw, Saskatchewan

Prepared by MDWallace on 2019-04-02
Technical Review by JHennig on 2019-04-02

Client/Project
113254233-009 REVD

Moose Jaw Combined Cycle Power Station Project

Figure No.
5-1

Title
Project Study Areas

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5.2 SPECIES OF MANAGEMENT CONCERN

Plant and wildlife Species of Management Concern (SOMC) are defined as federally and provincially legislated species at risk and species identified in federal and provincial tracking lists and activity restriction guidelines, including species:

- listed under Schedule 1, Schedule 2, or Schedule 3 of the federal SARA (Government of Canada 2002) as *endangered*, *threatened*, or *special concern* (Government of Canada 2019)
- listed in *The Wildlife Act* of Saskatchewan (Government of Saskatchewan 1998) as *endangered*, *threatened*, or *vulnerable* (Government of Saskatchewan 2019)
- listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as *endangered*, *threatened*, or *special concern* (Government of Canada 2019)
- assigned a ranking of S1, S2, or S3 (or a combination of these rankings) by the Saskatchewan Conservation Data Center (SKCDC) (SKCDC 2019) and
- included in the Saskatchewan Activity Restriction Guidelines for Sensitive Species (Government of Saskatchewan 2017).

Federal and provincially listed SOMC and their rankings that have the potential to occur within the spatial boundaries defined in Section 5.1 are presented in Appendix D.

6.0 PHYSICAL AND BIOLOGICAL COMPONENTS THAT MAY BE ADVERSELY AFFECTED BY THE PROJECT

This section describes the physical and biological components that have the potential to interact with the Project. Specifically, detailed methods (including desktop review and field surveys), existing conditions, effect pathways and mitigation strategies, and summary of residual effects are presented as they relate to potential Project-related environmental effects.

6.1 AIR QUALITY

This section addresses air quality in the context of the Project. This section outlines the methods and results of the desktop review in addition to identifying potential effect pathways, and mitigation strategies.

6.1.1 Methods

The focus of the following discussion is primarily on Project operations because the operation phase has the most potential to produce adverse air quality effects. Air emissions associated with Project construction are expected to be minor and occur only for short intervals. Refer to Section 2.4.1 for further detail.

The effects of air emissions from Project operations are evaluated using plume dispersion modelling, which accounts for physical characteristics of emission sources, topographic effects, and hourly variations in meteorological conditions. The plume dispersion modelling was undertaken by Burns & McDonnell (2019), and predicts ground-level concentrations for each substance modelled. A detailed description of the dispersion modelling methods is provided in Appendix C. Model results are compared to the SAAQS (Table 6-1) (SK ENV 2016) and the CAAQS (Table 6-2) (CCME 2012). A comparison to the SAAQS is made at the maximum point of impingement in the study area, whereas a comparison to the CAAQS is made at nearby residential receptors.

Table 6-1 Saskatchewan Ambient Air Quality Standards

Pollutant	Averaging Period	micrograms per cubic meter (µg/m^3)
CO	1-hour	15,000
	8-hour	6,000
NO_2	1-hour	300
	24-hour	200
	Annual	45[a]
SO_2	1-hour	450
	24-hour	125
	Annual	20[a]
$PM_{2.5}$	24-hour	28[b]
	Annual	10
PM_{10}	24-hour	50
PM	24-hour	100
	Annual	60[c]

Source: SAAQS, https://envrbrportal.crmp.saskatchewan.ca/Pages/SEQS/Table20-SEQS-SAAQS.pdf
(a) Arithmetic mean
(b) The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations
(c) Geometric means

Table 6-2 Canadian Ambient Air Quality Standards

Pollutant	Averaging Period	Effective 2020	Effective 2025	Statistical Form
		micrograms per cubic meter (µg/m3)		
NO2	1-hour	113	79	3-year average of the 98th percentile of the daily maximum 1-hour average concentrations
	Annual	32	23	Average over a single calendar year of all 1-hour average concentrations
SO2	1-hour	183	170	3-year average of the annual 99th percentile of the SO2 daily maximum 1-hour average concentrations
	Annual	13	10	Average over a single calendar year of all 1-hour average SO2 concentrations
PM2.5	24-hour	27	--	3-year average of the annual 98th percentile of the daily 24-hour average concentrations
	Annual	8.8	--	3-year average of the annual average of all 1-hour concentrations

Source: CAAQS, http://airquality-qualitedelair.ccme.ca/en/

GHG emissions are not modelled; instead, estimated Project GHG emissions are compared to existing provincial and national totals, to put Project-related GHG emissions in to context. This approach is consistent with guidance from the Agency (CEAA 2003). Project GHG emissions are calculated based on a predicted normal operating year defined as 7,446 operating hours of the gas turbine and the natural gas dew point heater, includes 50 starts a year based on cold start emissions and 100 operating hours for the emergency fire pump and emergency diesel generator. See Section 2.4.1 for further details.

6.1.2 Existing Conditions

The dispersion modelling assessment provided in Appendix C summarizes the existing air quality conditions for the southwest region of the province, as established by the SK ENV (SK ENV 2012) through their regional background concentrations. These accepted background concentrations are based on data collected by a series of SK ENV air quality monitoring stations and are considered to be representative of the Project location.

Existing conditions for GHGs emissions are based on the data available on a provincial and national basis from the Environment and Climate Change Canada national reporting system. The provincial and national GHG emissions for 2016 are provided in Table 6-3. Saskatchewan accounted for approximately 9% of Canada's overall GHG emissions in 2016. Additional details on background pollutant concentrations near the Project are provided in Table 6-4.

Table 6-3 National and Provincial Greenhouse Gas Emissions

Region	2016 Greenhouse Gas Emissions (kilotonne CO_{2e})
Canada	704,000
Saskatchewan	76,300
Source: Environment Canada 2018	

Table 6-4 Regional Background Pollutant Concentrations Concentration

Pollutant	Averaging Period	Percentile	Background Concentration		Region
			ppm	µg/m^3	
CO	1-hour	90	0.6	720.0	Southeastern
	8-hour	90	0.6	720.0	
NO_2	1-hour	90	0.019	36.0	Southwestern
	24-hour	90	0.016	30.0	
	Annual	50	0.005	9.4	
SO_2	1-hour	90	0.001	2.6	Southwestern
	24-hour	90	0.001	2.6	
	Annual	50	0.000	0.0	
$PM_{2.5}$	24-hour	90	--	6.6	Southwestern
	Annual	50	--	3.3	
PM_{10}[b]	24-hour	90	--	36.3	Southeastern
PM[c]	24-hour	90	--	6.6	Southwestern
	Annual	50	--	3.3	

Source: Saskatchewan Air Quality Modelling Guideline, 2012
(a) ppm = parts per million; µg/m^3 = micrograms per cubic meter
(b) No PM_{10} background was listed in the modelling guidance for the southwestern region; therefore, the southeastern region background was used.
(c) No PM background was listed in the modelling guidance; therefore, the southwestern region background was used.

6.1.3 Effect Pathways and Mitigation Strategies

The Project will result in the release of substances of interest that will change ambient air quality.

The focus of the air quality assessment is on Project operations because the operation phase has the most potential to produce adverse air quality effects. Air emissions associated with Project construction are expected to be minor and occur only for short intervals. Construction emission sources are expected to include typical construction equipment (e.g., graders, trucks). A list of anticipated construction equipment is provided in Section 2.4.1. Construction equipment is generally diesel-fired and emits NO_X, $PM_{2.5}$, CO, SO_2, and GHGs.

Multiple control measures will be implemented during construction to reduce air emissions and potential effects. After grading, the untraveled or lightly travelled locations will be watered, mulched, overlain with a crushed stone layer, or vegetated to reduce fugitive PM emissions. Activities that potentially generate fugitive PM emissions will be monitored visually by construction personnel. If fugitive emissions become visible, water will be sprayed on the affected areas.

Potential air quality effects from construction activities will vary depending on the level of activity, the specific operations, site conditions, control measures, and prevailing weather conditions. The maximum effects due to construction are expected to occur in areas within the immediate vicinity of the Project site.

Many of the site preparation and construction activities such as land clearing, filling, and grading, will be intermittent and of short duration. These aspects of the construction activities as well as control measures, will serve to reduce potential effects.

The air quality assessment is limited to the consideration of substances for which there are applicable air quality objectives and standards adopted by either or both of the Canada or Saskatchewan regulatory agencies (i.e., SAAQS and CAAQS). The predicted effects are assessed relative to these criteria. For this assessment, nitrogen dioxide (NO_2), SO_2, CO, and particulate matter ($PM_{2.5}$, PM_{10}, and PM) are the primary substances of interest. These substances of interest are combustion by-products emitted by the Project sources. Project sources are described in Section 2.4.1.

The primary air quality mitigation measure for the Project during operation is the use of ULN burners in the combustion turbine, which optimizes the ratio of combustion air to fuel as well as combustion temperature to control NO_X emissions from the natural gas combustion process. NOx emissions will comply with the national emissions guidelines set out by Environment and Climate Change Canada (ECCC 2017). Compliance with the ECCC guidelines will be verified through the installation of a CEMS. In addition, the intermittent sources (i.e., the emergency generator and fire pump) will burn ultra-low sulphur fuel.

The Project is expected to emit between 371 kg/MWh and 392 kg/MWh of instantaneous CO_2 when operating at full load assuming a new and clean condition (refer to Section 2.4.1 for more information). The Project will have a best in class heat rate, resulting in high efficiency and lower CO_2 emissions. The overall thermal efficiency of the plant will approach 58%, resulting in an emission rate far below 420 kilogram (kg) CO_2e per MWh. Additional potential Project emissions are presented in Table 6-5.

Table 6-5 Project Potential Emissions

Pollutant	Project Potential Emissions (tonnes per year)
NO_x	449.3
CO	163.6
$PM/PM_{10}/PM_{2.5}$	26.8
SO_2	28.7

6.1.4 Summary of Residual Effects: Air Quality

Following mitigation, some residual effects on air quality are expected to occur as a result of the Project.

Plume dispersion modelling, as described in Appendix C (Burns & McDonnell 2019), shows that maximum predicted concentrations of the substances of interest are less than the SAAQS for all averaging periods. Maximum predicted concentrations are expected to occur near the Project and decrease with increasing distance from the fence line. Concentrations of the substances of interest at nearby residential receptors are predicted to be less than the CAAQS. The dispersion modelling indicates that the operation of the Project will not cause or contribute to a substantial degradation of ambient air quality (Burns & McDonnell 2019).

The Project GHG emissions during construction, as described in Section 2.4.1, are estimated to be 114,320 tonnes of CO_2e over the three-year construction period. Additional information on how this estimate was calculated can be found in Section 2.4.1.

The Project GHG emissions during operation, as described in Section 2.4.1, are estimated to be 1,038,463 tonnes CO_2e per year. This is calculated based on a predicted normal operating year defined as 7,446 operating hours of the gas turbine and the natural gas dew point heater, and 100 operating hours for the emergency fire pump and emergency diesel generator. This represents approximately 1.4% and 0.14% of provincial and national GHG emissions for 2016, respectively.

It is expected that the plant will function at CO_2 emission levels above the 420 kg/MWh instantaneous limit less than 3% of the time with the majority of this occurring during start-up operations. For further discussion see Section 2.3.

The Project will be designed to have a best in class heat rate, resulting in high efficiency and lower CO_2 emissions. Specifically, the Project is expected to emit a maximum of 392 kg/MWh of instantaneous CO_2 at full load with an overall thermal efficiency of approximately 58%, resulting in an emission rate far below 420 kilogram (kg) CO_2e per MWh.

6.2 NOISE

This section addresses noise in the context of the Project, outlining the methods and results of the desktop review in addition to identifying the potential effect pathways, mitigation strategies, and residual effects.

6.2.1 Methods

The City of Moose Jaw Noise Bylaw, 2014 does not prescribe a numerical limit for construction or operation of a facility such as the Project. Likewise, there are no Provincial or Federal regulations pertaining to environmental noise from the Project. Based on precedent (e.g., previous environmental assessment filings with the SK ENV-EASB), noise assessment for power generation projects follow the requirements set out in the guideline published by the Alberta Utilities Commission (AUC) – Rule 012: Noise Control (AUC 2013). Rule 012 is a receptor-oriented noise regulation in Alberta and has been used for this Project. Rule 012 prescribes permissible sound level (PSL) limits due to operation noise effect from a project. The PSL is applicable at dwelling locations within 1.5 km of a project fence line. If there are no dwelling locations, the PSL is applicable at any point along the 1.5 km boundary from the project fence line.

Nine dwelling locations were identified within 1.5 km of the Project. The PSL is applicable for both the daytime (07:00 to 22:00) and nighttime (22:00 to 07:00) periods and is determined based on local conditions including dwelling unit density in the area and proximity to busy transportation routes (e.g., roadways and rail lines).

Rule 012 does not provide quantitative limits for construction noise effects. The City of Moose Jaw Noise Bylaw, 2014 prohibits audible construction noise at residential dwellings between the hours of 10:00 PM and 7:00 AM. Health Canada provides guidance for construction noise in the document *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise, 2017.* However, a construction noise assessment was not included based on the limited scale and duration of construction activities.

Acoustic modelling was undertaken by Burns & McDonnell (2019), in order to predict the Project operational noise effects and to determine the status of compliance of the Project with the PSLs (Appendix E). Acoustic modelling was completed in accordance with the ISO 9613-2, Acoustics – Sound Attenuation during Propagation Outdoors (ISO 1996) using Computer Aided Design for Noise Abatement (CadnaA) software. The estimated cumulative sound level is the logarithmic sum of the Project noise model results, ambient sound level and sound from third-party facilities. The estimated cumulative sound level is compared with the PSL to determine compliance with Rule 012.

6.2.2 Existing Conditions

The Project is located in an industrial park area within the City of Moose Jaw, adjacent to rural land use areas.

The existing conditions of the acoustic environment is quantified by the baseline sound level. The baseline sound level includes the combined noise effects from ambient sound level and other existing and approved regulated facilities. In accordance with Rule 012, regulated facilities pertain to energy-related facilities only. Two energy-related facilities were identified within the assessment area; the SaskEnergy District Regulator Station, and the Gibson Energy Petroleum Processing Facility. The SaskEnergy District Regulator Station was determined not to be a substantial source of noise emission based on a desktop review of the station. Noise from the Petroleum Processing Facility was extrapolated based on assumed PSL compliance at the closest dwelling to that facility.

No ambient sound measurements were conducted within the study area. However, the noise impact assessment took the conservative approach of using the lowest ambient sound levels recommended by Rule 012. The assumed daytime and nighttime ambient sound levels are 35 dBA and 45 dBA respectively at all dwelling (receiver) locations.

6.2.3 Effect Pathways and Mitigation Strategies

The Project noise effects will affect the existing acoustic environment. The severity of the noise effect decreases with increasing distance from the noise sources. At further distance, the Project noise effect will diminish to a level below the baseline sound level.

During the Project operation, noise emissions will result from the turbine, power generator, combustion air intake, air ventilation inlets and outlets, process cooler, transformers, and combustion exhaust stacks. A complete inventory of noise emission sources and acoustic mitigation performance considered in the assessment are provided in the Burns & McDonnell Moose Jaw Power Station – Noise Impact

Assessment (Burns & McDonnell 2019) provided in Appendix E. In order to comply with Rule 012, the following acoustic mitigation measures are required:

- low-noise fans for ACC and Fan Deck Barrier
- low-noise fans for Air-Cooled Heat Exchanger
- stack silencer for HRSG stack
- inlet Air Silencer and acoustic hood for CTG Inlet Face
- low noise transformers
- 85 dBA sound pressure level limit at 3' for BOP equipment, and
- acoustical building, insulated wall and roof assembly, acoustical louvers, acoustical doors etc. for Engine Hall Walls & Roof.

6.2.4 Summary of Residual Effects: Noise

The estimated cumulative nighttime sound level is compared with the nighttime PSL in Table 6-6. A 40 dBA nighttime PSL is applied at all dwelling (receiver) locations regardless of proximity to transportation or dwelling density as a conservative measure. Noise emission from the Project is the same during the daytime or nighttime, therefore compliance with the more restrictive nighttime PSL implies that the Project will also comply with the daytime PSL. Modeled sound propagation from the Project is illustrated in Figure 4-2 SaskPower Moose Jaw Power Station Emitted A-Weighted Sound Level Contours in Appendix E. Additionally, the model results indicate that the dBC-dBA values will be below 20 at all receptor locations, therefore low frequency noise due to the project is not expected to be an issue. The Project will result in an increase of noise level in the existing acoustic environment; however, the noise effects are below the AUC Rule 012 prescribed noise limits.

Table 6-6 Estimated Nighttime Cumulative Sound Levels (dBA L_{eq})

Receiver Location	Modeled Facility Sound Level	Existing Petroleum Processing Facility Estimated Sound Level	Assumed Nighttime Ambient Sound Level	Cumulative Sound Level	Nighttime Permissible Sound Level
Rec01	36.9	31.7	35	39.6	40
Rec02	36.9	32.9	35	39.8	40
Rec03	32.2	36.7	35	39.7	40
Rec04	31.6	37.3	35	39.9	40
Rec05	33.5	31.0	35	38.1	40
Rec06	37.8	27.7	35	39.7	40
Rec07	34.3	23.1	35	37.6	40
Rec08	34.7	25.4	35	37.9	40
Rec09	31.7	35.5	35	39.1	40

6.3 TERRAIN AND SOIL

This section addresses terrain and soil in the context of the Project, outlining the methods and results of the desktop review in addition to identifying potential effect pathways, mitigation strategies, and residual effects.

6.3.1 Methods

Existing data were used to conduct a desktop analysis of baseline terrain and soil conditions within the Project PDA and LAA, as well as the Incidental Activity Study Area and the Potable Water Supply Study Area. Baseline terrain conditions were obtained from the Canadian Digital Elevation Data (CDED) (Government of Canada 2016). Baseline soil conditions were obtained from the Saskatchewan Soil Information Database Version 4 (SKSID 4.0) (Agriculture and Agri-Food Canada [AAFC] 2009). The databases provide a regional overview of terrain and soil resources for most of Saskatchewan. In addition to these databases, published information and reports were reviewed to confirm and supplement the results of the database data analysis (University of Saskatchewan 1965, AAFC 2017).

The desktop review focused on a general classification and identification of terrain and soil characteristics. These characteristics included slope, topsoil texture, erosion potential, and soil agricultural capability ratings. The slopes were based on the CDED with the slope classes based on the SKSID 4.0 user manual (AAFC 2009). SKSID 4.0 slope classes were further combined due to the low slopes and minor variability of topography. Soil agricultural capability ratings were based on published values associated with SKSID 4.0 (AAFC 2009). The SKSID 4.0 soil agricultural capability class ratings follow the Canada Land Inventory (CLI) rating system (CLI 1972) of soil capability classification for agriculture. The CLI system rates climate, terrain, and soil factors independently, as each factor can control the suitability of a tract of land for crop production.

6.3.2 Existing Conditions

The Project is situated within the Moist Mixed Grassland ecoregion and Regina Plain landscape area. The landscape within the Moist Mixed Grassland ecoregion is typically level to gently undulating, with varying areas that include hummocky uplands, sand dunes, and river valleys. Dark brown chernozems are the dominant soil type within this ecoregion (Acton et al. 1998, University of Saskatchewan 1965).

6.3.2.1 Project Location

Baseline terrain and soil conditions for the Project PDA and LAA were generally found to be similar. Soils typically consist of Rego Dark Brown soils with clay or heavy clay textures.

Very gentle slopes (0-2%) are dominant within the Project PDA and LAA. Slope classes for the within the Project PDA and LAA are presented in Table 6-7.

Table 6-7 Slope Classes within the PDA and Terrain and Soil LAA of the Project

Slope Class	Project PDA (%)	Project LAA (%)	Project PDA (ha)	Project LAA (ha)
Very Gentle (0-2%)	100.0	95.0	30.5	118.8
Gentle (2-5%)	0.0	0.0	0.0	0.0
Moderate (5-10%)	0.0	0.0	0.0	0.0
Strong (10-15%)	0.0	0.0	0.0	0.0
Steep (15-30%)	0.0	1.6	0.0	2.0
Unclassified	0.0	3.4	0.0	4.2
Total	**100**	**100**	**30.5**	**125.0**

The soil agricultural capability ratings for soils in the Project PDA and LAA range from Class 2 (moderate limitations) to Class 6 (suitable for perennial forage crops). Class 2 was the most common rating consisting of 97.3% of the Project PDA and 79.3% of the LAA. Class 2 soils are suitable to support a wide variety of crops with limited management. Specific limitations related to climate, steep slopes, and erosion potential have been identified within the Project PDA (CLI 1972). Soil agricultural capability ratings for the Project PDA and LAA are presented in Table 6-8.

Table 6-8 Soil Agricultural Capability Ratings within the PDA and Terrain and Soil LAA of the Project

Agricultural Capability[1]	Project PDA (%)	Project LAA (%)	Project PDA (ha)	Project LAA (ha)
2 (moderate limitations)	97.3	79.3	29.7	99.1
3 (moderately severe limitations)	2.67	15.7	0.8	19.6
4 (severe limitations)	0.0	0.0	0.0	0.0
5 (very severe limitations)	0.0	0.0	0.0	0.0
6 (perennial forage crops)	0.0	1.6	0.0	2.1
7 (permanent pasture)	0.0	3.4	0.0	4.2
Total	100	100	30.5	125

[1] Soil capability classification for agriculture Report No.2 (CLI 1972)

The Project PDA and LAA have areas with high potential for wind erosion. Additionally, these areas are considered to have low potential for water erosion. Water erosion potential considers the typical rainfall for the area, soil type, soil texture, infiltration rate, slope length, land use, and farming practices.

6.3.2.2 Incidental Activities

Baseline terrain and soil conditions for the Incidental Activity Study Area and the Potable Water Study Area were generally found to be similar to the Project PDA and LAA. Strong slopes (10-15%) are limited within the Incidental Activity Study Area and Potable Water Supply Study Area. Slope classes for the two study areas are presented in Table 6-9.

Table 6-9 Slope Classes within the Incidental Activity and Potable Water Supply Study Areas

Slope Class	Incidental Activity Study Area (%)	Potable Water Supply Study Area (%)	Incidental Activity Study Area (ha)	Potable Water Supply Study Area (ha)
Very Gentle (0-2%)	95.7	33.1	2,740.9	769.6
Gentle (2-5%)	2.4	2.1	67.2	48.4
Moderate (5-10%)	1.5	4.7	43.6	109.2
Strong (10-15%)	0.0	0.0	0.0	0.0
Steep (15-30%)	0.3	0.4	8.9	9.3
Unclassified	0.1	59.7	2.3	1,387.3
Total	100	100	2,862.9	2,323.8

The soil agricultural capability ratings for soils within the Incidental Activity Study Area and Potable Water Supply Study Area range from Class 2 to Class 6. Class 2 was the most common rating in the Incidental Activity Study Area at 86.9%. The Unclassified rating was the highest within the Potable Water Supply Study Area at 59.7%. Class 2 soils are suitable to support a wide variety of crops with limited management. The high amount of soil agricultural capability ratings not available (Unclassified) for the Potable Water Study Area are due to overlap with the City of Moose Jaw (CLI 1972). Soil agricultural capability ratings for the study areas are presented in Table 6-10.

Table 6-10 Soil Agricultural Capability Ratings within the Incidental Activity and Potable Water Supply Study Areas

Agricultural Capability[1]	Incidental Activity Study Area (%)	Potable Water Supply Study Area (%)	Incidental Activity Study Area (ha)	Potable Water Supply Study Area (ha)
2 (moderate limitations)	86.9	21.9	2,847.2	509.8
3 (moderately severe limitations)	11.9	14.8	340.4	344.5
4 (severe limitations)	0.0	0.0	0.0	0.0
5 (very severe limitations)	0.8	1.4	24.1	32.3
6 (perennial forage crops)	0.3	2.2	8.9	49.9

Agricultural Capability[1]	Incidental Activity Study Area (%)	Potable Water Supply Study Area (%)	Incidental Activity Study Area (ha)	Potable Water Supply Study Area (ha)
7 (permanent pasture)	0.0	0.0	0.0	0
Unclassified	0.1	59.7	0.1	1387.3
Total	100	100	2,862.9	2,323.8
[1] Soil capability classification for agriculture Report No.2 (CLI 1972).				

The Incidental Activity Study Area and Potable Water Supply Study Area both have areas with high potential for wind erosion. Additionally, these areas are considered to have low potential for water erosion. Water erosion potential considers the typical rainfall for the area, soil type, soil texture, infiltration rate, slope length, land use, and farming practices.

6.3.3 Effect Pathways and Mitigation Strategies

The Project has the potential to affect terrain and soil through changes in terrain integrity and soil quality and quantity. Terrain integrity includes surface expressions that are influenced by changes in slopes. Soil quality can be measured as agricultural capability because it is based on several features including soil classification, texture, topsoil depth, erosion, salinity, and stoniness. The effect pathways and mitigation strategies for potential effects are described below.

6.3.3.1 Change in Terrain Integrity

Change in terrain integrity has the potential to occur during the construction phase of the Project and incidental activities. During construction, slopes within the Project PDA will be disturbed during site grading. Grading can change the terrain, creating new surface expressions on the landscape. Potential changes to terrain integrity are expected to be limited to steep slopes associated with the Moose Jaw River. Work within the Potable Water Supply Study Area is the only component that is expected to have the potential to interact with steeper portions of the Moose Jaw River valley. Soil exposure from grading can lead to changes in soil quality through increased soil erosion, mass movement, and changes in natural drainage patterns. The disturbance of the soil structure could possibly initiate or accelerate erosional processes. No grading activities are expected to occur during the operation and maintenance phase of the Project or ancillary activities and no additional changes to terrain integrity will occur.

6.3.3.2 Change in Soil Quality and Quantity

Change in soil quality and quantity will occur predominantly during the construction phase of the Project and incidental activities and can be measured as change in soil agricultural capability. Soil agricultural capability influences land use, as lower soil quality can restrict the productivity of land. Changes in soil quality and quantity can be caused by loss of topsoil, admixing, erosion, compaction, and rutting. The construction activities that have the potential to affect soil quality include soil stripping, excavation, trenching, grading, piling installation, and heavy equipment and vehicle traffic.

Topsoil loss can be caused by improper soil handling techniques during soil stripping and grading activities. Soil stripping will remove organic materials and topsoil at locations where excavation and/or grading activities are required. Excavation would be necessary with the installation of Project related infrastructure and building foundations. Grading will be required to level the Project PDA for proper drainage purposes and to facilitate construction activities. Topsoil may be lost during soil stripping activities if topsoil becomes incorporated into the subsoil layer.

Admixing could occur if the topsoil and subsoil are not stripped and/or stored separately. The admixing of subsoil with topsoil can decrease the quality of the topsoil through the loss of organic matter, changing soil chemistry (e.g., increasing soil salinity levels), and increasing stoniness.

The Project PDA, Incidental Activity Study Area, and Potable Water Supply Study Area all have a high potential for wind erosion and low potential for water erosion. The potential for erosion will be further increased through the exposure of soil. Soil will be exposed during the construction phase of the Project and incidental activities from activities such as soil stripping, grading, and stockpiling. The combination of exposed soil with strong wind and/or precipitation weather events may further increase erosion potential.

During construction, repetitive heavy equipment and vehicle traffic can create the risk for admixing, erosion, and topsoil loss through compaction and rutting. Compaction can result in admixing of the topsoil with subsoil and cause changes to infiltration capacity, water-holding capacity, and bulk density of the soil. Reduced water-holding capacity can increase the surface runoff that could lead to water erosion. Rutting creates exposed soil that provides the opportunity for erosion and soil loss. Rutting increases when the soil is saturated, especially during high precipitation events and spring-melt conditions.

Soil disturbance activities are not expected to occur during the operation and maintenance phase of the Project and no additional changes to soil quality and quantity will occur.

6.3.3.3 Mitigation for Change in Terrain Integrity

Mitigation for potential Project related effects on terrain integrity will focus on avoiding areas with poor slope stability. Geotechnical investigations have been completed for the Project PDA and will be completed for the incidental activities, as required, prior to construction. Geotechnical investigations will provide information on slope stability within the Project PDA and for the incidental activities, as required. Areas of steep slopes will be avoided as much as possible during routing and siting of incidental activities. Additionally, HDD methods will be utilized for the Moose Jaw River potable water supply pipeline crossing away from areas of steep slopes. Additionally, structures for the overhead transmission line will be sited to avoid and span areas with steep slopes to the extent feasible. Site-specific reclamation plans will be prepared for areas with potential for slope instability, as required.

6.3.3.4 Mitigation for Change in Soil Quality and Quantity

Proper soil handling techniques such as stripping and storing topsoil and subsoil separately and maintaining adequate distance between topsoil and subsoil stockpiles are examples of effective mitigation measures for preventing topsoil loss. Topsoil loss and admixing will be reduced by using colour change as a guide for stripping topsoil and subsoil layers separately.

Erosion control measures and trenchless methods (i.e., HDD) will be used to avoid constructing within areas of steep terrain. Implementation of these mitigation measures will reduce the potential for soil erosion in areas of high risk. Options to control erosion of soil piles include installation of silt fencing around soil piles, leveling soil piles, and reducing the time between stripping and replacement.

Soil compaction and rutting will be mitigated by restricting heavy equipment and vehicle use to dry or frozen soil conditions for the incidental activities, where feasible. When saturated soil conditions are observed during construction, mitigation measures will be implemented including installing matting, avoidance, and/or temporary shutdowns of constructions activities.

6.3.4 Summary of Residual Effects: Terrain and Soil

Project activities have the potential to cause qualitative changes in terrain integrity and soil quality and quantity through processes such as loss of topsoil, admixing, erosion, compaction, and rutting. These changes could lead to a reduction in slope stability and soil agricultural capability.

Given the minor variability in topography, using HDD methods during the potable water supply pipeline construction to avoid steep slopes that to do occur, as well as the careful siting of the structures for the overhead transmission line, changes to terrain integrity will be limited. Residual changes in soil quality and quantity are also expected to be limited due to the existing soil agricultural capability limitations. Changes to terrain integrity and soil quality and quantity can be addressed through the implementation of the proposed mitigation measures.

6.4 VEGETATION AND WETLANDS

This section addresses vegetation and wetland resources in the context of the Project. These resources include vegetation, wetlands, plant SOMC (Section 5.2), and weed species. This section outlines the methods and results of the desktop review and field surveys and includes a discussion of potential effects, mitigation strategies, and residual effects.

6.4.1 Methods

6.4.1.1 Desktop Review

Provincial databases, aerial photography, and literature sources were reviewed for existing data on vegetation and wetlands. The desktop review determined land cover and wetlands, as well as historical records of Plant SOMC within the LAA, Incidental Activity Study Area, and Potable Water Supply Study Area.

Desktop mapping of wetland boundary and class was completed for the PDA and the vegetation and wetland LAA. Wetland class and boundaries were reviewed and interpreted at a 1:3,000 scale with a minimum polygon size of 100 m^2 for wetlands and 400 m^2 for upland vegetation types using satellite imagery from 2008-2013 (Saskatchewan Geospatial Imagery Collaborative [SGIC] 2008-2013) and 2016 (Google Earth Pro 2018).

Wetlands were classified according to Classification of Natural Ponds and Lakes in the Glaciated Prairie Region (Stewart and Kantrud 1971) (Table 6-11). Imagery from different years was used to make conservative estimates of the wetland boundary.

Table 6-11 Stewart and Kantrud (1971) Wetland Classification

Wetland Class	Central Zone	Description
Class I – ephemeral ponds	Wetland low prairie zone	Ephemeral ponds occur in small swales and contain species such as Kentucky bluegrass (*Poa pratensis*).
Class II – freshwater temporary ponds	Wet meadow zone	In freshwater temporary ponds, the central wet meadow zone is the deepest part of the wetland area and is usually dominated by western wheatgrass (*Pascopyrum smithii*) and foxtail barley (*Hordeum jubatum*).
Class III – seasonal ponds	Shallow marsh zone	Seasonal ponds are wetlands with a shallow marsh zone dominating the deepest part of the wetland area. These ponds are frequently surrounded by a ring of willows (*Salix* spp.) with a wet centre containing sedges (*Carex* spp.).
Class IV – semi-permanent ponds	Deep marsh zone	In semi-permanent ponds and lakes, the deep marsh zone dominates the deepest part of the wetland area. Common cattail (*Typha latifolia*) and bulrushes (*Scirpus* spp.) are typical emergent species.
Class V – permanent ponds	Permanent open water zone	The permanent open water zone dominates the deepest part of the wetland area and is devoid of emergent vegetation.
Class VI – alkali ponds	Intermittent alkali zone	The intermittent alkali zone dominates the deepest part of the wetland area and is devoid of emergent vegetation. Alkali wetlands are characterized by a pH above 7 and a high concentration of salts. The dominant plants are generally salt tolerant.
Class VII – fens	Alkaline fen zone	The fen zone dominates the deepest part of the wetland area. Peripheral wet meadow and low prairie zones are often present. Fen ponds often have floating mats of emergent vegetation, including sedges, grasses, and other herbaceous plants.

The *Weed Control Regulations* (Government of Saskatchewan 2010b) under the *Weed Control Act* (Government of Saskatchewan 2010b) designate some plant species as prohibited, noxious, or nuisance weeds. Using these sources, a list of known noxious weeds under the *Weed Control Act* (Government of Saskatchewan 2010b) was compiled.

6.4.1.2 Field Survey

A reconnaissance-level vegetation assessment was conducted for the Project on September 10, 2018 (Summit, An Earth Services Company 2018). The field surveys included general observations of land cover and dominant plant species. Incidental observations of weed species were recorded during the survey. Follow-up field surveys for the Project are planned for the 2019 field season. Field surveys were not completed within the Incidental Activity Study Area and the Potable Water Supply Study Area as siting of these facilities is on-going and are planned for the 2019 field season.

6.4.2 Existing Conditions

6.4.2.1 Project Location

6.4.2.1.1 Desktop Review

A search of the SKCDC database identified one historical record of plant SOMC within the Project PDA and LAA (Government of Saskatchewan 2019, SKCDC 2018). The record was for pepperwort (*Marsilea vestita*), which is ranked as S3 by the SKCDC (SKCDC 2019) with the observation made in 1896. The accuracy of the location of the historical record of plant SOMC is uncertain due to the large polygon size of the data source and age of the historical record.

Landcover within the Project PDA and LAA is dominated by agricultural lands. Specifically, 100.0% and 93.5% of these areas were found to be cultivated, respectively. The other notable land use was Dugout and is related to the City of Moose Jaw Waste Water Treatment Plant and nearby agricultural lands. The Dugout and Open Water class consisted 5.4% of the Project LAA and includes the City of Moose Jaw Water Treatment Plant lagoons. Landcover classes are presented in Table 6-12.

Table 6-12 Land Cover Classes within the Vegetation PDA and Vegetation and Wetlands LAA of the Project

Land Cover Type	Project PDA (%)	Project LAA (%)	Project PDA (ha)	Project LAA (ha)
Agricultural	100.0	93.5	30.5	116.9
Shrubland and Native Vegetation	0.0	0.0	0.0	0.0
Tame Pasture	0.0	0.0	0.0	0.0
Class I Ephemeral Wetland	0.0	0.0	0.0	0.0
Class II Temporary Wetland	0.0	0.8	0.0	1.0
Class III Season Wetland	0.0	0.3	0.0	0.3
Class IV Semi-Permanent Wetland	0.0	0.0	0.0	0.0
Class V Permanent Wetland	0.0	0.0	0.0	0.0
Dugout and Open Water	0.0	5.4	0.0	6.8
Developed	0.0	0.0	0.0	0.0
Total	100	100	30.5	125

6.4.2.1.2 Field Surveys

A total of 14 unique plant species were observed during field surveys for the Project. There were no plant SOMC observed within the Project PDA or LAA (Summit, An Earth Services Company 2018). Two observations of noxious weeds, Canada thistle (*Cirsium arvense*) and kochia (*Kochia scoparia*), were observed at the Project (Summit, An Earth Services Company, 2018).

6.4.2.2 Incidental Activities

6.4.2.2.1 Desktop Review

A search of the SKCDC database identified two historical records of plant SOMC within the Incidental Activity Study Area and four historical records of plant SOMC within the Potable Water Supply Study Area (Government of Saskatchewan 2019, SKCDC 2018). The records were for pepperwort (*Marsilea vestita*) (identified in both study areas), small lupine (*Lupinus pusillus ssp.pusillus*), racemose milk-vetch (*Astragalus racemosus var. racemosus*), tall beggar's ticks (*Bidens frondosa*), and pepperwort. These plant SOMC are all provincially ranked by the SKCDC as S3, except racemose milk-vetch, which is ranked S2 (SKCDC 2019). None of these plant SOMC are federally listed.

Wetlands of various sizes and classes occur within the Incidental Activity Study Area and the Potable Water Supply Study Area, with most occurring to the east of the Project. Generally, water quality in the Incidental Activity Study Area and the Potable Water Supply Study Area is expected to be similar to other wetlands and shallow waterbodies in the Prairie Pothole Region with low pH and variable salinity (Acton et al., 1998).

Landcover within the Incidental Activity Study Area and Potable Water Supply Study Area is dominated by agricultural lands. Specifically, 89.5% and 46.4% of these areas were found to be cultivated, respectively. Other dominant land uses included developed land at 35.5% of the Potable Water Supply Study Area.

Landcover classes are presented in Table 6-13.

Table 6-13 Land Cover Classes within the Incidental Activity and Potable Water Supply Study Areas

Land Cover Type	Incidental Activity Study Area (%)	Potable Water Supply Study Area (%)	Incidental Activity Study Area (ha)	Potable Water Supply Study Area (ha)
Agricultural	89.5	46.4	2,561.8	1,077.6
Shrubland and Native Vegetation	2.2	7.5	63.2	175.0
Tame Pasture	0.6	6.2	16.3	142.8
Class I Ephemeral Wetland	0.6	0.4	18.0	9.7
Class II Temporary Wetland	4.8	1.1	138.6	26.3
Class III Season Wetland	1.7	0.2	49.1	5.1
Class IV Semi-Permanent Wetland	0.1	0.0	4.0	0.0
Class V Permanent Wetland	0.0	0.0	0.0	0.0
Dugout and Open Water	0.1	2.7	3.39	62.3
Developed	0.3	35.5	8.7	825.2
Total	100	100	2862.9	2323.8

6.4.3 Effect Pathways and Mitigation Strategies

This section addresses the potential effects on vegetation and wetland resources as a result of Project construction and operation, maintenance and decommissioning. The effect pathways and mitigation strategies of these potential effects are described below.

6.4.3.1 Change in Vegetation and Wetlands

Project construction has the potential to cause a change in vegetation and wetlands. Construction of the Project and incidental activities will predominantly affect previously disturbed land uses (e.g., cultivated land and road allowances). Areas disturbed during the construction of incidental activities will be reclaimed and it is expected that vegetation composition will return to pre-construction levels during operation. Project construction and operation and maintenance activities and vehicle traffic could introduce or spread existing weed species occurrences.

Although wetlands were not observed within the footprint of the Project PDA, wetlands of various sizes and classes occur within the Incidental Activity Study Area and the Potable Water Supply Study Area, with most occurring to the east of the Project. There is the potential for the temporary alteration of wetlands to occur during construction of the incidental activities. Generally, water quality in the Incidental Activity Study Area and the Potable Water Supply Study Area is expected to be similar to other wetlands and shallow waterbodies in the Prairie Pothole Region with low pH and variable salinity (Acton et al. 1998). Mitigation measures to reduce or avoid effects to wetlands are provided in Section 6.4.3.3.

6.4.3.2 Change in Plant SOMC

A change in Plant SOMC has the potential to occur during the construction phase of the Project. Plant SOMC were not observed during field surveys. one historical record of plant SOMC occur within the Project PDA and LAA. Additionally, two and four historical records of plant SOMC occur within the Incidental Activity Study Area and the Potable Water Supply Study Area, respectively. There is potential habitat for plant SOMC within the tame pasture, modified native vegetation, as well as wetland areas associated with the incidental activities. Project construction activities may result in the loss of plant SOMC during site clearing activities or through increased competition due to the introduction or spread of weed species. Vehicle traffic during Project operation and maintenance may also increase competition due to the introduction or spread of weed species.

6.4.3.3 Mitigation for Vegetation and Wetlands

There are several mitigation measures that have already been and/or will be implemented to avoid or reduce Project effects to vegetation and wetlands including, but not limited to:

- avoidance or mitigation of Project effects through careful routing and siting. The Project team designed the Project to be sited within cultivated lands, avoiding wetlands and suitable habitat for plant SOMC. Incidental activities will be routed and sited to avoid sensitive land use (e.g., native vegetation, wetlands) to the extent feasible (Appendix F)
- completion of pre-construction plant SOMC and weed surveys, planned for 2019 field season
- staking features (e.g., plant SOMC, if observed, and weed infestations) within the Project prior to construction
- inspecting vehicles so they are clean and free of weeds before entering and leaving the Project or its incidental components
- using HDD methods for the potable water supply pipeline installation, if final routing requires crossing the Moose Jaw River crossing
- following SaskPower's Environmental Beneficial Management Practices (SaskPower 2018), which includes measures to reduce or avoid changes to the distribution and abundance of native vegetation, plant SOMC, and weeds
- reclaiming disturbed areas, including topsoil replacement and seeding when ground conditions and moisture levels permit
- reseeding areas if native vegetation has been removed or damaged using a native seed mix immediately following construction, and
- monitoring the success of native vegetation reclamation if applicable and weed species control.

For a full listing of SaskPower's standard mitigations for vegetation and wetlands please refer to SaskPower's Environmental Beneficial Management Practices (SaskPower 2018).

6.4.4 Summary of Residual Effects: Vegetation and Wetlands

Subsequent to mitigation, some residual effects to vegetation and wetlands are expected to occur as a result of the Project. Construction of the incidental activities could result in the loss of native vegetation and shrubland, wetlands, and tame pasture. These land uses are limited throughout the Project (0% of the Project PDA, approximately 10% of the Incidental Activity Study Area, and approximately 18% of the Potable Water Supply Study Area) however, they are potential habitat for plant SOMC and therefore, plant SOMC could occur within the Project.

No wetlands were observed within the Project PDA (Table 6-8); however, wetlands of varying sizes and classes overlap the incidental activity route corridors (approximately 7% of the Incidental Activity Study Area, Table 6-9, and approximately 3% of the Potable Water Supply Study Area, Table 6-9). Wetlands within the Project will be avoided to the extent feasible through the careful siting of infrastructure. If avoidance is not possible, wetlands may be temporarily affected by constructing during dry or frozen conditions. Through the implementation of the above mitigation measures, permanent loss or alteration/removal of wetlands along the incidental activities is not expected.

It is expected that mitigation measures implemented for pre-construction, during construction, and throughout operation and maintenance will mitigate effects of the potential loss of suitable habitat for plant SOMC. Additionally, when decommissioning occurs, the Project and incidental activities will be reclaimed following the regulatory requirements and best practices at the time (Section 2.5.1.4).

6.5 WILDLIFE AND WILDLIFE HABITAT

Under CEAA 2012, potential interactions of the Project with environmental components should focus on fish, fish habitat, and migratory birds (Government of Canada 2012a). This section addresses terrestrial wildlife and wildlife habitat resources in the context of the Project. While all wildlife species and their habitats are considered as part of the assessment, there is an added focus placed on wildlife SOMC and migratory birds that are known, or have the potential, to occur in the LAA, the Incidental Activity Study Area, and Potable Water Supply Study Area. This section outlines the methods and results of the desktop review and field surveys and includes a discussion of potential effects and mitigation strategies. Effects to migratory birds are primarily discussed here and are also summarized in Section 6.8.3. Fish and fish habitat are discussed in Section 6.6 and 6.8.1.

6.5.1 Methods

6.5.1.1 Desktop Review

Existing information from provincial and federal databases, satellite imagery, literature sources, and field surveys were used to characterize wildlife and wildlife habitat relative to the Project PDA and incidental activity study areas (i.e. the Project). A focus was placed on determining known occurrences of wildlife

SOMC, migratory birds, and availability of their habitat within the Project. Habitat suitability was evaluated to determine the wildlife SOMC and migratory birds that have potential to occur in the Project. Migratory birds are those protected under the *Migratory Birds Convention Act, 1994* (Government of Canada 1994).

The following sources of information were reviewed:

- HABISask Application database search for historical records of SOMC and migratory birds (SBBA 2019; SKCDC 2018)
- SKCDC taxa lists (SKCDC 2019)
- Saskatchewan Power Corporation Moose Jaw - Regina Combined Cycle Gas Turbine Generating Facility: Environmental Baseline Assessment Report (Summit, An Earth Services Company 2018)
- SARA public registry database for SARA- and COSEWIC-listed species (Government of Canada 2019)
- Birds of North America Online database (Cornell Lab of Ornithology and the American Ornithologists' Union 2019)
- satellite imagery such as ESRI World Imagery (Digital Globe 2016), FlySask (SGIC 2008-2013), and Google Earth (Google Earth Pro 2018) and
- publicly available geographic information system (GIS) spatial layers of protected and designated lands (e.g., conservation easements, provincial park and national parks, national wildlife areas, community pastures, ecological reserves, Saskatchewan watershed authority lands, special management areas, *Wildlife Habitat Protection Act* lands, migratory bird sanctuaries, wildlife refuges, fish and wildlife development fund lands, migratory bird concentration sites, and games preserves) (Government of Saskatchewan 2019).

These data sources provided information about potential and historical wildlife SOMC occurrences, sensitive wildlife habitat features (e.g., migratory bird concentration sites), and habitat types present within the Project (i.e., land cover classes). In addition to the historical occurrences of wildlife SOMC, the availability of wildlife habitat within the Project, in combination with a species' range, was used to determine wildlife SOMC and migratory birds with the potential to occur in the Project. Wildlife habitat availability was evaluated based on land cover data, as well as a review of satellite imagery and existing reports documenting Project PDA conditions (Summit, an Earth Services Company 2018). Because land cover classes represent broad habitat types (i.e., are at a coarse scale), a habitat association approach was used to estimate habitat availability. Specifically, each land cover class was evaluated to determine whether it provided suitable habitat using knowledge of seasonal habitat requirements for wildlife, including wildlife SOMC and migratory birds.

6.5.1.2 Field Surveys

The Project has the potential to provide habitat for migratory birds, particularly near the Project PDA where lagoons exist to the south or in proximity to the Moose Jaw River. To better characterize the number and species composition of birds travelling near the Project PDA during the fall migration period, three 45-minute bird movement surveys were conducted on the mornings of October 1, 4, and 9, 2018 in E½ 27-16-26 W2M (Summit, An Earth Services Company 2018). Surveys were conducted from a single, consistent survey point (50° 22' 25.44" N; 105° 30' 1.07" W) on the west side of the Project and >500 m from the observer's vehicle and during periods of suitable weather (i.e., temperature from -6 to 6 degrees Celsius, wind 8-12 km/h, no precipitation). Follow-up field surveys for the Project are planned for the 2019 field season. Field surveys were not completed for the incidental activities as routing and siting of these components is on-going and are planned for the 2019 field season.

6.5.2 Existing Conditions

The Project is within in the Moist Mixed Grassland ecoregion that supports a wide variety of wildlife species, including 51 species of mammals, 198 species of birds, and 13 species of amphibians and reptiles (Acton et al. 1998). Habitat for wildlife in the ecoregion is comprised predominantly of non-arable areas of native prairie, tame pasture, riparian areas, and wetlands that provide important breeding and staging habitats for a diverse number of wildlife species.

6.5.2.1 Project Location

6.5.2.1.1 Desktop Review

The Project PDA is comprised entirely of cultivated farmland, which provides very little habitat for most wildlife species. The LAA is comprised of 93.5% cultivated agricultural land and 6.5% wetland and water features (Table 6-12). Overall, wildlife habitat in the Project PDA and LAA is limited due to the high proportion of anthropogenic disturbance (e.g., residential and commercial development, infrastructure, cultivation) that provide little to no habitat value to most wildlife species, and particularly for SOMC.

The wastewater treatment plant lagoons adjacent to the southern extent of the Project PDA provide staging habitat for migratory birds while the remaining wetland habitats in the LAA provide limited opportunities for breeding and non-breeding migratory birds due to the high levels of previous disturbance (i.e., cultivation).

There are no provincially- or federally-designated lands for wildlife within the LAA; however, the RAA contains a provincial conservation easement 2.5 km west of the Project PDA in section 20-16-26 W2M and N½-17-16-26 W that includes tame pasture and broadleaf shrub and treed riparian habitats along the Moose Jaw River (SKCDC 2018).

The RAA has the potential to provide habitat for 54 SOMC (including 30 SARA-listed species) given historical records and current range extents: 6 invertebrate species, 7 herptile species, 34 bird species, and 7 mammal species (Government of Canada 2019, Appendix D). As described above, the Project PDA is subject to high degrees of existing disturbance and habitat conversion and is predominantly on cultivated farmland. The Project PDA is in an area adjacent to existing disturbance (i.e., wastewater treatment plant lagoons) and in an area zoned for heavy industrial use that will continue to be developed in the future.

There are no historical records of SOMC in the Project PDA or LAA. The RAA contains records for ferruginous hawk (*Buteo regalis*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus excubitorides*), and American badger (*Taxidea taxus taxus*) (SKCDC 2018). There is no suitable SOMC habitat within the Project PDA and suitable habitat in the LAA is limited to wetland and water features (Table 6-12). The RAA has the potential to support 254 bird species, including 220 migratory bird species (as defined by the *Migratory Birds Convention Act, 1994* [Government of Canada 1994]) (SKCDC 2018; Appendix D). There is no suitable migratory bird habitat within the Project PDA (Table 6-12) and suitable habitat in the LAA is limited to wetland and water features (approximately 6% of the LAA, Table 6-12).

Overall, the Project PDA provides very little suitable wildlife habitat while the LAA contains limited potential to provide habitat for migratory birds and SOMC.

6.5.2.2 Field Surveys

The bird migration survey (Summit, an Earth Services Company 2018) yielded observations of the following species and notable migratory events:

- waterfowl species staging on the south adjacent lagoons, feeding in the Project PDA or adjacent quarters, or flying overhead were: Canada goose (*Branta canadensis*), snow goose (*Chen caerulescens*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), gadwall (*Anas strepera*), and lesser scaup (*Aythya affinis*)
- flocks of >200 Canada geese and >10,000 snow geese were observed feeding in parcels adjacent to the Project PDA
- flocks of >1,000 ring-billed [*Larus delawarensis*] and California [*Larus californicus*] gulls were observed staging and flying from the south adjacent lagoons
- one red-tailed hawk was observed adjacent to the Project PDA, and
- no wildlife SOMC were observed.

6.5.2.3 Incidental Activities

6.5.2.3.1 Desktop Review

The Incidental Activity Study Area and Potable Water Supply Study area are comprised primarily of cultivated farmland, which provides minimal suitable habitat for most wildlife species. Specifically, 89.5% of the Incidental Activity Study Area and 46.4% of the Potable Water Study Area is comprised of cultivated land, and 31.5% of land within the Potable Water Supply Study Area is considered developed (Table 6-13). Overall, wildlife habitat associated with the Incidental Activity Study Area and Potable Water Study Area is limited due to the high proportion of anthropogenic disturbance (e.g., residential and commercial development, infrastructure, cultivation) that provide little to no habitat value to most wildlife species, including wildlife SOMC and migratory birds.

The City of Moose Jaw Wastewater Treatment Plant lagoons adjacent to the southern extent of the Project PDA provide staging habitat for migratory birds while the remaining wetland habitats in the Incidental Activity Study Area and Potable Water Study Area provide limited opportunities for breeding and non-breeding migratory birds.

There are no provincially or federally-designated lands for wildlife within the Incidental Activity Study Area and Potable Water Study Area.

The Incidental Activity Study Area and Potable Water Supply Study Area have the potential to provide habitat for 54 SOMC (including 30 SARA-listed species) given historical records and current range extents: 6 invertebrate species, 7 herptile species, 34 bird species, and 7 mammal species (Government of Canada 2019, Appendix D). As described above, the lands within the Incidental Activity Study Area and Potable Water Supply Study Area are subject to high degrees of existing disturbance and habitat conversion and is predominantly on cultivated farmland that has limited potential to provide habitat for wildlife SOMC.

The Incidental Activity Study Area contains records for barn swallow (*Hirundo rustica*) and Sprague's pipit (*Anthus spragueii*). The Potable Water Supply Study area contains historical records of burrowing owl, loggerhead shrike, barn swallow, and American badger (SKCDC 2018). Potential SOMC habitat is limited to shrubland and native vegetation, wetlands, and tame pasture (approximately 10% of the Incidental Activity Study Area and approximately 18% of the Potable Water Supply Study Area, Table 6-13).

6.5.3 Effect Pathways and Mitigation Strategies

This section addresses the potential effects on wildlife and wildlife habitat resources as a result of Project construction and operation and maintenance. The effect pathways and mitigation strategies of these potential effects are described below.

6.5.3.1 Change in Wildlife Habitat

This section discusses the direct and indirect pathways for a change in wildlife habitat, including for migratory birds, during the construction, operation and maintenance, and decommissioning and reclamation phases of the Project.

6.5.3.1.1 Construction

A change in wildlife habitat has the potential to occur during the construction phase of the Project. Vegetation clearing of the Project PDA is the primary pathway for habitat loss during site preparation and infrastructure installation activities. No direct habitat loss is expected within the Project PDA as it comprises entirely of cultivated land (Table 6-12); however it is possible that this land may support migratory birds, including some SOMC. Suitable wildlife habitat is limited to small amounts of native vegetation and shrubland, wetlands, and tame pasture within the Incidental Activity Study Area and Potable Water Supply Study Area (approximately 10% of the Incidental Activity Study Area and approximately 18% of the Potable Water Supply Study Area, Table 6-13). Areas disturbed by incidental activities will return to their pre-construction conditions, except for the overhead transmission line area, which will have exposed infrastructure and may provide nesting opportunities for raptors.

Sensory disturbances associated with construction activities (e.g., noise from increased vehicle traffic, heavy equipment, lights) have the potential to result in indirect habitat loss due to reduced habitat effectiveness (i.e., avoidance). Wildlife species that reside near the Project may be deterred from using nearby habitats during the construction of all Project components. Construction can also affect breeding and rearing success for some wildlife species (Bayne et al. 2008; Francis and Barber 2013) if construction occurs during the nesting season. Responses will vary by species and individuals and may result in some species avoiding the Project PDA and incidental activities during construction because of noise, vibrations, and increased human activity (Habib et al. 2007). However, indirect habitat loss associated with construction of the Project and incidental activities is unlikely as they mainly comprise of cultivated land not suitable for wildlife (Table 6-12 and Table 6-13).

6.5.3.1.2 Operation and Maintenance

Direct habitat loss is not expected to occur during the operation and maintenance phase of the Project. The storm water pond will create potential habitat for wildlife, particularly amphibians, waterbirds, and waterfowl (including migratory birds). The storm water pond is designed to collect surface water runoff and ACC wash water from the Project PDA and is expected to hold water seasonally. When larger rain events occur, the pond will be discharged at a set flow rate until it returns to the normal pond elevation. Water quality in the ponds is expected to be similar to that of natural habitats (Section 2.4.2).

Sensory disturbance during operation and maintenance may result in indirect habitat loss by altering wildlife habitat availability but will be limited to the Project PDA. The increase in noise levels near the Project PDA during operation and maintenance may result in the displacement of wildlife; however, the LAA is comprised of only approximately 6% wildlife habitat (Table 6-12) and effects are expected to be minimal. Potentially-affected species may return after a period of acclimatization. Additionally, affected species are currently exposed to elevated levels of habitat degradation and anthropogenic disturbance which may lessen the severity of potential Project-related effects during both construction and operation and maintenance. The operation and maintenance of all incidental activities will include minimal activity and is not expected to be impose indirect effects on wildlife and wildlife habitat.

6.5.3.1.3 Decommissioning and Reclamation

Direct habitat loss is not expected to occur during the decommissioning and reclamation phase of the Project. Reclamation of the Project and transmission line will include removal of the above-ground Project infrastructure while the remaining Project components will be abandoned (e.g., fibre-optic line) or potentially maintained by another party (e.g., haul road) (Section 2.5.1.4).

Increased sensory disturbances associated with decommissioning and reclamation activities (e.g., noise from increased vehicle traffic, heavy equipment, lights) has the potential to result in indirect habitat loss due to reduced habitat effectiveness for the Project and transmission line components. Removal of noise associated with the Project upon decommissioning has the potential to improve habitat effectiveness in the LAA as compared to the operation and maintenance phase.

6.5.3.2 Change in Wildlife Mortality Risk

6.5.3.2.1 Construction

Site preparation and infrastructure installation activities (e.g., vegetation clearing, vehicle traffic, trenching for the potable water supply pipeline) have the potential to result in a direct increase in wildlife mortality risk for the Project. In particular, construction during the breeding season can result in the destruction of migratory bird nests, den sites, and burrows where wildlife habitat exists. Ground nesting birds are particularly vulnerable during construction in open vegetated habitats (e.g., tame pasture) throughout the breeding season. Direct mortality of wildlife may also occur if individuals come into contact with Project-related traffic. Wildlife species with decreased mobility (i.e., amphibians, small mammals) are at greater risk of direct mortality if individuals are unable to escape construction activities.

Indirect wildlife mortality may occur if active nests are abandoned due to sensory disturbance or if individuals alter behaviours in response to disturbance that makes them more susceptible to predation.

6.5.3.2.2 Operation and Maintenance

Project traffic during the operation and maintenance phase of the Project has the potential to directly increase wildlife mortality risk due to potential vehicle collisions in the LAA, although traffic level increases are expected to be minimal.

The overhead transmission and distribution lines also have the potential to result in an increase in direct mortality risk through migratory bird collisions. While all bird species have the potential to come in contact with overhead transmission and distribution lines, large-bodied, less maneuverable species (e.g., Canada goose, sandhill crane (*Grus canadensis*)) are the most susceptible (Rioux et al. 2013). Additionally, the proximity of the transmission and distribution lines to habitats that concentration birds may create high-risk mortality areas (e.g., wetlands, lagoons, approximately 6% of the LAA, Table 6-8).

Distribution lines are lower to the ground, have reduced spacing between structures for better visibility and generally pose less of a collision risk than transmission lines. Wildlife mortality resulting from electrocution is not anticipated as the separation between phase conductors or between a phase conductor and grounded equipment is expected to exceed the wingspan of species that will perch on 230 kV structures.

6.5.3.2.3 Decommissioning and Reclamation

Increased Project-related traffic volumes during the decommissioning and reclamation phase have the potential to directly increase wildlife mortality risk for the Project and transmission and distribution line components. The remaining incidental activities will be abandoned (e.g., fibre-optic line) and are not anticipated to be a source of wildlife mortality risk. Project-related traffic will be eliminated upon reclamation which will decrease wildlife mortality compared to the operation and maintenance phase.

Decommissioning and reclamation of the transmission line infrastructure will eliminate sources of direct and indirect wildlife mortality and improve wildlife mortality risk as compared to the operation and maintenance phase (Section 2.5.1.4).

6.5.3.3 Mitigation for Change in Wildlife Habitat

Project-specific mitigation measures, along with standard industry practices and avoidance measures will be implemented during construction and operation and maintenance to reduce potential effects on wildlife habitat. For example. direct loss of habitat will be mitigated by strategic routing, minimizing the extent of vegetation cleared where possible, and constructing through temporary and seasonal wetlands during dry or frozen conditions if they cannot be avoided. The Project PDA is located on cultivated farmland that provides minimal habitat for wildlife, including migratory birds or SOMC. Direct loss of habitat for the potable water supply pipeline construction will be mitigated by installing sections of pipe using HDD technology at the Moose Jaw River crossing.

Temporary indirect habitat loss due to sensory disturbance during construction will be mitigated by using standard noise abatement equipment on machinery (i.e., mufflers) to control noise levels. Noise during operation and maintenance will be mitigated by building the Project to acceptable noise standards (i.e., AUC Rule 012 – Noise Control). Mitigation measures typically include applying the guidelines for species specific- setback distances and restricted activity periods (Government of Saskatchewan 2017) for key wildlife features that have been identified and those that may be identified in future pre-construction surveys, if applicable.

The storm water pond will create habitat that can potentially be used by wildlife, including migratory birds. In the very unlikely event of a significant influx of hydrocarbons into the storm water pond as described in Section 2.4.2. immediate actions to prevent water birds, species at risk or other wildlife including but not limited to migratory birds, from contacting the contaminants would be used. Such measures may include deployment of staff with flags to deter them from entering the pond. Additionally, other devices, such as scare cannons, “scary-man’ inflatables, etc., would be utilized until hydro-vac units could be summoned to vacuum up the contaminants and remove them from site for proper disposal. For additional monitoring and mitigation procedures please see Section 2.4.2.

6.5.3.4 Mitigation for Change in Wildlife Mortality Risk

The primary strategy to mitigate wildlife mortality during construction includes timing construction outside of the migratory bird nesting period, outlined by Environment and Climate Change Canada (April 15 to August 17; Government of Canada 2018a), to avoid mortality of ground-nesting or slow-moving wildlife during this sensitive period (i.e., nesting and rearing). The Project will take a minimum of 42 months to complete and year-round construction will be required; however, incidental activities will be constructed outside of the migratory bird nesting period where possible. If construction activities must occur during the migratory bird nesting period in or adjacent to suitable nesting habitat, a pre-construction nest sweep survey will be conducted to avoid any potential disturbance to migratory bird nests. If an active nest or other wildlife feature is encountered, a species appropriate buffer will be applied and work in that area will temporarily shut down until an acceptable mitigation plan is approved by SK ENV.

Overhead transmission line routing will avoid high-risk mortality locations (e.g., wetlands) where possible. In instances where this is not feasible (i.e., adjacent to the lagoons) mitigation measures will be implemented to increase line visibility to migratory birds (i.e., line markers) and reduce the potential for wildlife mortality following SaskPower's Environmental Beneficial Management Practices for line marking (SaskPower 2018).

Wildlife mortality will also be mitigated by maintaining speed limits on and off the Project to limit the risk of vehicle collisions with wildlife. Speed limits will be reduced in areas where species wildlife concerns or movement corridors have been identified. Collisions with wildlife will be reported to provincial regulators as appropriate.

Construction and operation and maintenance personnel will not be permitted to harass or feed wildlife. Nuisance wildlife will be reported to the appropriate authorities (e.g., SK ENV conservation officer).

For a full listing of SaskPower's standard mitigations for wildlife and wildlife habitat please refer to SaskPower's Environmental Beneficial Management Practices (SaskPower 2018)

6.5.4 Summary of Residual Effects: Wildlife and Wildlife Habitat

Subsequent to mitigation, some residual effects on wildlife and wildlife habitat are expected to occur as a result of the Project. The residual effects relate to a change in wildlife habitat and mortality risk are summarized below.

6.5.4.1.1 Change in Wildlife Habitat

The Project is predominantly situated on cultivated or developed lands and adjacent to existing sources of anthropogenic disturbance and habitat conversion that have already compromised habitat effectiveness. Where suitable wildlife habitat does exist, mitigation measures will be used to reduce or eliminate direct and indirect Project-related effects. For example, installation of the transmission line and potable water supply pipeline will occur during frozen or dry condition to the extent feasible, or the potable water supply pipeline installation may use HDD methods to reduce or eliminate effects to wetlands and other water features (e.g., Moose Jaw River).

Mitigation and post-construction reclamation of the incidental activity disturbance areas will maintain suitable wildlife habitat to pre-construction conditions and no permanent loss or alteration of wetlands or wildlife habitat are expected to result from the Project.

Construction of a storm water pond will create potential habitat for wildlife species. With wetland loss continuing throughout prairie Canada (Government of Canada 1991), this created habitat will benefit wildlife species. Upon decommissioning and reclamation, the Project and incidental components will be removed and will be reclaimed to the regulatory requirements and standards of the day (Section 2.3.5.1).

6.5.4.1.2 Change in Wildlife Mortality Risk

Wildlife mortality has the potential to occur through ground disturbance and vehicle collisions even after mitigation measures have been applied. The likelihood of Project activities interacting with wildlife is greater in areas where natural habitats exist (e.g., wetlands) but the risk is greatly reduced with the implementation of mitigation measures.

Mortality risk to wildlife will be reduced through implementation of a mitigation plan, which may include timing clearing activities to occur prior to the migratory bird nesting period, monitoring during construction to identify conflicts with migratory birds, and other mitigation measures. Reduced speed limits and installation of signage where specific wildlife concerns have been identified are also expected to reduce mortality risk to wildlife, including to migratory birds. Incorporating line markers to enhance transmission line visibility in high-risk areas will reduce mortality risk for migratory birds during the operation and maintenance phase.

6.6 FISH AND FISH HABITAT

The Project PDA is located approximately 1.1 km south of the Moose Jaw River, which is the closest fish bearing water feature to the Project. Given the distance to the Moose Jaw River from the Project PDA, no interactions with the fish or fish habitat are expected to occur. The potable water supply pipeline, however, has the potential to interact with the Moose Jaw River as it is expected to cross the river using HDD methods. The remainder of this section will focus on the potential potable water supply pipeline crossing and the potential interaction with fish and fish habitat.

6.6.1 Methods

Existing information from provincial and federal databases, satellite imagery, and literature sources were used to characterize fish and fish habitat relative to the Project. A focus was placed on determining species composition of the Moose Jaw River watershed, known occurrences of SOMC, and habitat suitability to determine the fish species with potential to occur in the Potable Water Supply Study Area.

The following sources of information were reviewed:

- HABISask Application database search for historical records of SOMC and fish species present in the Moose Jaw River and adjacent watersheds (SKCDC 2018)
- Moose Jaw River Watershed Stewards State of the Watershed (MJRWS) Report 2011 (MJRWS 2011)
- Fish Species Distribution in Saskatchewan Technical Report 91-7 (Liaw 1991)
- Moose Jaw River Watershed, Source Water Protection Plan (Saskatchewan Watershed Authority 2006)
- Saskatchewan Stocked Water Guides 2011 – 2018 online database (Government of Saskatchewan 2019)
- SKCDC taxa lists (SKCDC 2019)

- SARA public registry database for SARA- and COSEWIC-listed species (Government of Canada 2019), and
- Satellite imagery such as ESRI World Imagery (Digital Globe 2016), FlySask (SGIC 2008-2013), and Google Earth (Google Earth Pro 2018)

Fish habitat availability in combination with a species range, its occurrence in connected waterbodies, and habitat requirements during different life stages (e.g., spawning, rearing, migration), was used to determine fish species and SOMC with potential to occur in the Potable Water Supply Study Area.

6.6.2 Existing Conditions

The Moose Jaw River flows northwest to Moose Jaw from its headwaters approximately 30 km west of Weyburn, SK. Many small tributaries enter the river from higher elevation terrain to the southwest. Near the town of Rouleau, the Moose Jaw River is joined by Avonlea Creek, a substantial contributor of runoff to the river (MJRWS 2011). In Moose Jaw, the Moose Jaw River is joined by Thunder Creek, approximately 3.25 km upstream of the proposed river crossing. Thunder Creek flows southeast to Moose Jaw from its headwaters near Central Butte, Saskatchewan and flows through Paysen, Kettlehut, and Pelican Lakes. Downstream of the Pelican Lake outlet, Thunder Creek is joined by Sandy Creek and together they are the largest tributary of the Moose Jaw River (MJRWS 2011). From Moose Jaw the Moose Jaw River flows northeast for approximately 33 km, eventually joining the Qu'Appele River downstream of Buffalo Pound Lake.

Historically, the Moose Jaw River was an intermittent stream, flowing only during spring run-off and high precipitation events. The construction of dams along its length has allowed storage of water for most of the year, however, this water often becomes stagnant in summer and winter due to lack of flow, deteriorating the water quality and limiting its potential as a fishery (MJRWS 2011). Within Moose Jaw, the Moose Jaw River is impounded by two dams, located approximately 3.25 km upstream and 1 km upstream of the Project. Fragmentation of fish habitat by control structures along the Moose Jaw River may limit fish movement in low water conditions, further limiting the river's potential as a fishery. However, the Moose Jaw River may provide important spawning and rearing habitat for fish that migrate from connected waterbodies during high-flow events. It is likely fish migrate downstream from Watson (Avonlea) Reservoir, located approximately 60 km southeast of Moose Jaw, and upstream from Buffalo Pound Lake and the Qu'Appelle River system to spawn in the spring (MJRWS 2011).

It is assumed that the Moose Jaw River has instream fish habitat similar to other shallow, slow moving prairie watercourses in southern Saskatchewan and is characterized by low instream cover and a stream bed composition of fine substrates (e.g., clay, silt, sand), with sub dominate substrates of organics, gravel, and cobble. Stream bank composition is predominately fines, therefore the Moose Jaw River is prone to erosion during high-flow events, resulting in silt build-up and sedimentation in the river and requiring bank stabilization measures, particularly in the City of Moose Jaw. The channel width of the Moose Jaw River is variable within the Potable Water Supply Study Area, but is generally between 15 m and 25 m-wide. Riparian vegetation along the Moose Jaw River is comprised primarily of grasses, shrubs, and stands of deciduous and mixedwood forest consistent with the agricultural land use of the area. Residential and commercial development, public parks, and a golf course line the northern bank of the

Moose Jaw River within Moose Jaw. Overhead canopy cover along the Moose Jaw River is low and limited to the immediate shoreline. Fish resources in the Moose Jaw River are comprised of small-bodied, large-bodied, and sport-fish species. Seven fish species are known to occur in the Moose Jaw River; brook stickleback (*Culaea inconstans)*, fathead minnow (*Pimephales promelas*), northern pike (*Esox lucius*), river shiner (*Notropis blennius*), walleye (*Sander vitreus*), white sucker (*Catostomus commersonii*), and yellow perch (*Perca flavescens*), however, other species may migrate into the Moose Jaw River during high-water conditions (Liaw 1991; SKCDC 2018).

An additional 19 species are known to occur in the Qu'Appelle River and Buffalo Pound Lake, approximately 30 km downstream of the Project; bigmouth buffalo *(Ictiobus cyprinellus)*, blacknose dace (*Rhinichthys atrtulus*), burbot (*Lota lota*), chestnut lamprey (*Ichthyomyzon castaneus*), cisco (*Coregonus artedi*), common carp (*Cyprinus carpio*), emerald shiner (*Notropis atherinodes*), goldeye (*Hiodon alosoides*), Iowa darter (*Etheostoma exile*), johnny darter (*Etheostoma nigrum*), lake whitefish (*Coregonus clupeaformis*), longnose dace (*Rhinichthys cataractae*), ninespine stickleback (*Notropis hudsonius)*, northern redhorse sucker (*Moxostoma macrolepidotus*), sand shiner (*Notropis stramineus*), sauger (*Sander canadensis*), spoonhead sculpin (*Cottus ricei*), spottail shiner (*Notropis hudsonius*), and troutperch (*Percopsis omiscomaycus;* Liaw 1991). Connectivity between the Moose Jaw River, Qu'Appelle River, and Buffalo Pound Lake may occur during high-water conditions, but the lack of suitable habitat in the Moose Jaw River and barriers to fish passage in and around the City of Moose Jaw make it unlikely that these species would occur in the Potable Water Supply Study Area. No aquatic species at risk (SAR) have been identified in the Moose Jaw River, however, bigmouth buffalo (SARA-listed as *special concern*) are known to occur in Buffalo Pound Lake, and chestnut lamprey (SARA-listed as *special concern*) are known to occur in the Qu'Appelle River (Government of Canada 2019, SKCDC 2018). SaskPower will consult with DFO during the design and construction of the Moose Jaw River potable water supply pipeline crossing, which is not expected to result in adverse environmental effects on fish or fish habitat

Although sport fish species do occur in the Moose Jaw River (e.g., northern pike, walleye), and it is considered a watercourse which supports a recreational, commercial, or subsistence fishery by the DFO, it has limited importance as a recreational fishery due to its low summer water flow and poor water quality (MJRWS 2011). Northern pike, walleye, and yellow perch were historically stocked in the Moose Jaw River in an attempt to support a recreational fishery, but these efforts were sporadic and largely unsuccessful. The last recorded stocking of the Moose Jaw River was in 1986 (Government of Saskatchewan 2016).

The Moose Jaw River also provides recreational opportunities such as hiking, biking, walking trails, public parks, greenspace, and golfing in Moose Jaw and other communities along its route and the riparian areas along its banks provide habitat for other wildlife species.

6.6.3 Effect Pathways and Mitigation Strategies

DFO considers the Moose Jaw River to be a fish bearing watercourse which directly or indirectly supports existing or potential commercial, recreational, or subsistence fisheries, therefore, it is subject to the prohibition against serious harm to fish (MJRWS 2011, Government of Canada 1985b). Following appropriate discussion and guidance from DFO, best management practices and HDD construction methods will be used to install the potable water supply pipeline below the streambed while avoiding instream work and eliminating a direct effect pathway for fish and fish habitat. However, HDD construction methods have the potential for the inadvertent release of drilling fluid into the river through subsurface fissures, commonly known as frac-out, which has the potential to cause an increase in turbidity.

Prior to beginning construction, a frac out plan will be developed that identifies materials and equipment that would be required for response and cleanup, measures for containing drilling mud and reducing the potential for fluids entering or reentering the watercourse, as well as contact information for applicable authorities and regulators. During HDD activities, the watercourse will be monitored for signs of a frac-out of drilling mud within the watercourse as well as in riparian and upland habitats. If a frac out occurs, measures to avoid causing harm to fish and fish habitat include having appropriate material and equipment onsite for the containment of drilling mud to prevent it from entering or reentering the river. Cleanup activities would be prioritized and conducted in a manner that does not create the potential for greater damage to fish habitat.

In the event that HDD methods fail, the contingency method will include attempting to re-drill at a more suitable location. It is not anticipated that in-stream work involving trenching and pipeline installation would be used as a contingency method, limiting the potential pathways for direct effects to fish and fish habitat. Contingency plans will once again be guided by DFO consultation and best management practices for instream construction.

There are no effect pathways for operation and maintenance and decommissioning and reclamation phases of the potable water supply pipeline.

See Section 2.4.2 for further information on sources and locations of liquid discharges during construction and operations phases of the Project. The Moose Jaw River is not expected to receive surface runoff or overflow from the storm water pond or drainage ditches, consequently, there will be no adverse environmental effects on fish or fish habitat.

The Project wastewater consists of two separate waste streams: a sanitary waste discharged to the City of Moose Jaw sewage system and a process waste stream generated from the waste discharged from process water treatment. Process waste consists of wastes passed through the RO and ultrafiltration systems and discharged to the neighbouring City of Moose Jaw Wastewater Treatment Plant lagoons. As all the Project wastewater is discharged to the City of Moose Jaw, it is not expected to result in adverse environmental effects on fish or fish habitat.

6.6.4 Summary of the Residual Effect: Fish and Fish Habitat

The Project is not expected to interact with fish and fish habitat and, subsequent to mitigation, some residual effects on fish and fish habitat may occur as a result of the Project's incidental potable water supply pipeline component. The residual effects relate to a change in fish and fish habitat are summarized below.

The Project will implement best management practices and discussions with DFO during the design and construction of the Moose Jaw River potable water supply pipeline crossing using HDD methods which is not expected to result in adverse environmental effects on fish or fish habitat. However, HDD methods could result in an inadvertent release of drilling fluid into the stream or, in the event of HDD failure, open excavation methods may be required that could result in a direct effect to fish and fish habitat.

6.7 CHANGES THAT MAY BE CAUSED BY THE PROJECT TO FISH AND FISH HABITAT, LISTED AQUATIC SPECIES AND MIGRATORY BIRDS

6.7.1 Fish and Fish Habitat, as Defined in the *Fisheries Act*

Through the implementation of best management practices and discussions with DFO during the design and construction of the Moose Jaw River potable water supply pipeline crossing, no changes to fish or fish habitat, as defined by the *Fisheries Act* (Government of Canada 1985b), are expected to be caused by the Project PDA or its incidental activities.

6.7.2 Aquatics Species, as Defined by the *Species at Risk Act*

There are no known aquatics SAR, as defined by SARA, expected to occur within the LAA, Incidental Activity Study Area, or Potable Water Supply Study Area, and none are expected to occur due to the lack of suitable aquatic habitats (Government of Canada 2002, 2019). The Project is not expected to adversely affect aquatic species, as defined by the SARA.

6.7.3 Migratory Birds, as Defined by the *Migratory Birds Convention Act*

This section summarizes the potential effects on migratory birds and their habitat resources as a result of Project construction, operation and maintenance, and decommissioning and reclamation activities. Detailed methods (including desktop review and field surveys), existing conditions, effect pathways and mitigation strategies, and summary of residual effects as they relate to migratory birds and potential Project-related environmental effects, are presented in Section 6.

Project-specific mitigation measures, along with standard industry practices and avoidance measures will be implemented during construction and operation and maintenance to eliminate or reduce potential effects on migratory birds. Subsequent to mitigation, some residual effects on migratory birds are expected to occur as a result of the Project. The residual effects relate to migratory birds are summarized below.

Migratory bird mortality has the potential to occur through vegetation clearing, ground disturbance, and vehicle collisions even after mitigation measures have been applied. The likelihood of Project activities interacting with migratory birds is greater in areas where natural habitats exist (e.g., wetlands) but the risk is greatly reduced with the implementation of mitigation measures.

The primary strategy to mitigate wildlife mortality during construction includes timing construction outside of the migratory bird nesting period, outlined by Environment and Climate Change Canada (April 15 to August 17; Government of Canada 2018a), to avoid mortality of ground-nesting or slow-moving wildlife during this sensitive period (i.e., nesting and rearing). The Project will take a minimum of 42 months to complete and year-round construction will be required; however, incidental activities will be constructed outside of the migratory bird nesting period where possible. If an active nest or other wildlife feature is encountered, a species appropriate buffer will be applied and work in that area will temporarily shut down until an acceptable mitigation plan is developed.

Overhead transmission line routing will avoid high-risk mortality locations (e.g., wetlands) where possible. In instances where this is not feasible (i.e., adjacent to the City of Moose Jaw Wastewater Treatment Plant lagoons) mitigation measures will be implemented to increase line visibility to migratory birds (i.e., line markers) and reduce the potential for wildlife mortality following SaskPower's Environmental Beneficial Management Practices for line marking (SaskPower 2018).

Reduced speed limits in the LAA and installation of signage where specific wildlife concerns have been identified are also expected to reduce mortality risk to migratory birds. Incorporating line markers to enhance transmission line visibility in high-risk area will reduce mortality risk for migratory birds during the operation and maintenance phase.

6.8 CHANGES THAT MAY BE CAUSED BY THE PROJECT TO FEDERAL LANDS OR LANDS OUTSIDE OF SASKATCHEWAN

The Project and incidental activities are located on privately owned land. The closest provincial border (Alberta) is located approximately 320 km to the west. The US border is located approximately 150 km to the south. No changes to air quality or other aspects of the environment are expected to occur on federal lands as a result of carrying out the Project. The Project is not expected to cause any changes in air quality or other aspects of the environment that would adversely affect lands outside of Saskatchewan. This conclusion is supported by air quality modeling results that are presented in Appendix C.

6.9 HERITAGE RESOURCES

In Saskatchewan, heritage resources include pre-contact and post-contact period archaeological sites, built heritage sites, structures of historical and/or architectural interest, and palaeontological sites. Heritage resources are the property of the Provincial Crown and are protected under *The Heritage Property Act* (Government of Saskatchewan 1980b). The HCB of the Saskatchewan Ministry of Parks, Culture and Sport has classified each quarter section in southern Saskatchewan as either being "sensitive" or "non-sensitive" for heritage resources. It is a requirement for Projects found to be in "sensitive" quarter sections to be sent in to the HCB for further review. The results of this review process outline if an HRIA is required. Any projects proposed in "non-sensitive" quarter sections may proceed to development without further review.

SaskPower completed an overview level HRIA that outlines the archaeological resource potential of the Project and identifies areas where further investigations are recommended (Appendix G). During the overview HRIA, the SaskPower Archaeologist compared a defined study area with the database of known heritage resources and a predictive GIS model to determine areas where the Project may have the potential to conflict with heritage resources

The overview HRIA identified 17 archaeological sites, including 2 Sites of a Special Nature, 4 palaeontological sites, 2 Public Heritage Properties, and 4 registered cemeteries that have been avoided through the siting of the Project PDA and routing of the incidental activities. Details of these heritage resources are included in Appendix G.

SaskPower has identified that the Moose Jaw River Valley is an area of high heritage resource potential, likely to contain many undocumented archaeological sites. SaskPower recommends that a reconnaissance HRIA be completed at the Project site. A reconnaissance survey “involves field inspection and documentary research to obtain a more precise understanding of the archaeological resources in the immediate study or development area.” (HCB 2010:8).

An inventory HRIA will be required for the waterline route, once the final route has been determined. An inventory HRIA may also be required at the Project site, pending the outcome of the reconnaissance HRIA and along the transmission line, should the final route intersect the Moose Jaw Valley margin. An Inventory HRIA “involves intensive field inspection to locate and record archaeological resources in a specified project area” (HCB 2010). Additionally, SaskPower will refer to the provincial palaeontologist at the Royal Saskatchewan Museum for review of any conflicts, if required.

All HRIAs are to be completed prior to construction in snow-free and frost-free conditions. An HRIA will include a systematic pedestrian survey of the ground to identify surface features (e.g., stone circles, cairns, medicine wheels, etc.) and exposed artifacts lying on the surface. Subsurface testing will be employed during the inventory HRIAs to identify buried artefacts (e.g., stone tools, ceramics, bone, etc.). All HRIA investigations must be led by a qualified archaeologist under a permit issued by the HCB. SaskPower will consider including individuals from the local Indigenous groups as members of the archaeological field crew, should this be requested by the Indigenous groups during SaskPower’s engagement meetings. SaskPower will also consider including an Indigenous monitor to accompany the archaeological field crew upon request.

6.10 CHANGES THAT MAY BE CAUSED BY THE PROJECT TO INDIGENOUS PEOPLES RESULTING FROM CHANGES TO THE ENVIRONMENT

Carrying out the Project is not expected to change the environment such that it would affect Indigenous peoples, including effects to Aboriginal and Treaty Rights, health or socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, or any structure, site, or thing that is of historical, archaeological, palaeontological, or architectural significance. Additional detail is provided below.

6.10.1 Effects on Health and Socio-economic Conditions

No ingestion or inhalation pathways that could trigger the need for a human health risk assessment are anticipated. Air dispersion modelling conducted for the Project shows that maximum predicted concentrations of the substances of interest (e.g., particulate matter 2.5 and 10, total suspended particulates, hydrogen sulphide, nitrogen dioxide) are below the relevant regulatory objectives (SAAQS and CAAQS) for all averaging periods. There are members of the NSPML#160 within the City of Moose Jaw and surrounding area, however, no negative effects are anticipated given that the dispersion modelling indicates that the operation of the Project will not cause or contribute to a substantial degradation of ambient air quality. The modelling also indicates that the predicted concentrations of Project related emissions will decrease with distance from the Project (Appendix C), therefore adverse health effects to Indigenous communities or people are not expected.

The Project is not expected to have any effect on drinking water quality (e.g., surface and groundwater), country foods, or resources traditionally affected by Indigenous peoples (e.g., berries, medicinal plants).

There are members of the NSPML#160 within the City of Moose Jaw and surrounding area but given that the Project will comply with AUC Rule 012 – Noise Control adverse noise effects on Indigenous peoples are not expected.

Socio-economic effects are anticipated to be positive for Indigenous groups due to opportunities for employment. SaskPower will require the selected EPC partner to have and deliver on Indigenous employment targets that reflect the local Indigenous capacity. SaskPower’s Indigenous Procurement Department will monitor and assist with identifying opportunities.

6.10.2 Physical and Cultural Heritage and Structures, Sites, or Things of Historical, Archaeological, Palaeontological, or Architectural Significance

Currently, there are no identified cultural heritage considerations or sites or structures of historical, archaeological, palaeontological, or architectural significance on land subject to development.

The Project PDA is within a non-heritage sensitive parcel (SE 27-16-26 W2M) and a heritage sensitive parcel (NE 27-16-26 W2M), as identified by the Developers’ Online Screening Tool maintained by the Ministry of Park, Culture and Sport. The incidental activities (e.g., transmission line, road, potable water supply pipeline, etc.) associated with the Project have the potential to intersect some heritage sensitive parcels. SaskPower will conduct an HRIA for the Project as required, which will include the development of mitigation measures to reduce the potential effects to Indigenous peoples. These mitigation measures will include a thorough site assessment of the heritage resource.

> *Site assessment is concerned with determining the relative value or significance of each archaeological resource located in unavoidable conflict with development activities. The results are used to determine what type and level of mitigative action, if any, will be needed. Several kinds of significance (e.g. scientific, humanistic, historical, interpretive, economic, etc.) need to be considered when*

> *evaluating archaeological resources. Criteria used to measure these heritage values, and the evaluation process or system itself, must be explicitly documented. Data on which to base a significance determination is most often obtained through systematic test excavation and surface artifact collection. Assessment also involves describing all development-related impacts on sites, establishing when they are expected to occur, and assessing their effect (in as objective and quantitative a manner as possible) on future use of the resource* (HCB 2010:9).

If significant heritage resources, including historical, archaeological, or palaeontological sites, are identified in unavoidable conflict with the Project, a heritage resource impact mitigation, will be completed prior to construction. Mitigation studies involve the implementation of approved measures for reducing adverse, development related impacts on the heritage resource. Options available for mitigating impacts include: site protection measures (e.g. physical barriers, stabilization, protective covering or "capping", etc.), and systematic archaeological data recovery (e.g. complete or partial salvage excavation) (HCB 2010).

6.10.3 Current Use of Lands and Resources for Traditional Purposes

The Project is located on a quarter section that is owned by the City of Moose Jaw and will be purchased by SaskPower. The incidental activities will be developed primarily within private agricultural land, developed road allowances owned by the Province of Saskatchewan, and within the Moose Jaw city limits. Privately owned lands are typically not available for traditional land use and as such, the Project is not expected to affect the ability of Indigenous peoples to exercise Treaty Rights, or use, access, or develop lands and resources currently used for traditional purposes. To date, concerns over further potential adverse impacts to traditional uses in the Project area have not been specifically raised by Indigenous peoples during discussions and engagement efforts (Section 7.2.2.1 Summary of Indigenous Engagements). Engagement efforts will continue through construction and early operation phases of the Project.

The Moose Jaw River is crossed by the proposed potable water supply pipeline for the Project and is the only known fish bearing water feature that has the potential to be affected by the Project. Through the use of standard mitigation measures (e.g., HDD pipeline installation), the Moose Jaw River is not expected to be affected by the Project and therefore, adverse effects to fish and fish habitat and water are not anticipated. In the event that HDD methods fail, the contingency method will include attempting to re-drill at a more suitable location. It is not anticipated that in-stream work involving trenching and pipeline installation would be used as a contingency method, limiting the potential pathways for direct effects to fish and fish habitat. Contingency plans will once again be guided by DFO consultation and best management practices for instream construction.

The Project PDA will be graded to drain surface water to temporary drainage ditches and a storm water pond. The storm water pond will be designed to collect surface water runoff and ACC wash water only, therefore it is unlikely to come into contact with contaminants. Waste water generated from the Project will be discharged to the City of Moose Jaw for treatment. As such, no effects to water quality are expected (see Section 2.4.2).

To date, no potential off site effects to lands or resources by Indigenous peoples have been identified during the early engagement activities with Indigenous communities. See section 3.2 and 7.0 for further information.

To date, no concerns with regard to potential effects on health and socio-economic conditions, physical and cultural heritage, any structure, site, or thing that is of historical, archaeological, palaeontological, or architectural significance have been raised during engagement with Indigenous communities (Section 7.2.2.1 Summary of Indigenous Engagements). Further information regarding engagement with Indigenous communities can be found in Section 7.0. Through ongoing engagement, SaskPower will seek affirmation from Indigenous communities whether lands proposed for the project are currently used by Indigenous peoples for traditional purposes.

7.0 PROPONENT ENGAGEMENT WITH INDIGENOUS COMMUNITIES AND CONSULTATION WITH THE PUBLIC AND OTHER PARTIES

7.1 INTRODUCTION

SaskPower aligns corporate engagement practices with the core values of the International Association of Public Participation (IAP2), a leading international organization advancing the practice of public participation. IAP2 core values acknowledge the desire of people to participate in decisions that affect them and highlights the importance of facilitating understanding and creating opportunities for better decision making.

SaskPower considers the following imperatives when structuring an engagement program:

- Recognizing and communicating the needs of Indigenous communities and all stakeholders, including SaskPower.
- Providing consistent objectives and expectations of the engagement process so all interests and motivations are treated consistently and transparently.
- Seeking input from Indigenous communities as well as stakeholders in designing how they participate.
- Engaging Indigenous communities as well as stakeholders on topics and issues they care about and with scientifically and technically sound facts.

SaskPower's engagement objectives for this Project include:

1. Share meaningful Project information and learn about Indigenous traditional knowledge, as well as stakeholder interests and concerns.
2. Integrate Indigenous traditional knowledge as well as stakeholder interests and concerns into the Project plans to the greatest extent possible.
3. Communicate how Indigenous traditional knowledge as well as stakeholder interests and concerns influence Project plans.
4. Continue to exchange information on topics and issues.

SaskPower is committed to ongoing discussions with Indigenous communities and all stakeholders throughout Project development and the life of the Project.

7.2 INDIGENOUS COMMUNITIES

7.2.1 LIST OF POTENTIALLY AFFECTED AND INTERESTED INDIGENOUS COMMUNITIES

SaskPower contacted the Agency in November of 2018 to discuss and determine an initial list of the Indigenous communities that SaskPower will engage with regarding the Project. CEAA officials provided a list to SaskPower and upon review, SaskPower suggested adding Nekaneet First Nation and Wood Mountain Lakota Nation to the list. A list of 17 potentially affected and interested Indigenous communities was agreed upon (Table 7-1).

Table 7-1 Potentially Affected and Interested Indigenous Communities

Indigenous Community	Approximate Distance from Project (Home Reserve)	Contact Address
Carry the Kettle Nakoda Nation	155 km	P.O. Box 57, Sintaluta, SK S0G 4N0
Cowessess First Nation	230 km	P.O. Box 100, Cowessess SK S0G 5L0
Day Star First Nation	185 km	P.O. BOX 277, Punnichy SK S0A 3C0
George Gordon First Nation	170 km	P.O. BOX 248, Punnichy SK S0A 3C0
Kawacatoose First Nation	190 km	P.O. BOX 640, Raymore SK S0A 3J0
Muscowpetung First Nation	125 km	PO BOX 1310 Fort Qu'Appelle, SK S0G 1S0
Muskowekwan First Nation	200 km	PO BOX 249, Lestock SK S0A 2G0
Nekaneet First Nation	175 km	P.O. Box 548, Maple Creek SK S0N 1N0
NSPML#160 Note, formerly known as Southern Plains Métis Local 160.	5 km	210 - 310 Main North Moose Jaw SK S6H 3K1
Ochapowace First Nation	225 km	P.O. Box 550, Whitewood SK S0G 5C0
Pasqua First Nation	130 km	P.O. Box 79, Pasqua, SK S0G 5M0
Piapot First Nation	135 km	General Delivery, Zehner SK S0G 5K0
Regina Riel Métis Council	67 km	#308 – 1901 Victoria Avenue Regina SK S4P 3R4
Sakimay First Nation	215 km	PO Box 339, Grenfell SK S0G 2B0

Indigenous Community	Approximate Distance from Project (Home Reserve)	Contact Address
Standing Buffalo Dakota Nation	140 km	P.O. Box 128 Fort Qu'Appelle, SK S0G 1S0
Star Blanket Cree Nation	185 km	P.O. Box 456, Balcarres SK S0G 0C0
Wood Mountain Lakota Nation	110 km	P.O. Box 1792, Assiniboia SK S0H 0B0

Through early engagement activities, SaskPower recognizes the local communities and is prepared to engage with any group identified including but not limited to Western Region Three representatives.

7.2.2 DESCRIPTION OF ENGAGEMENT ACTIVITIES CARRIED OUT TO DATE WITH INDIGENOUS COMMUNITIES

SaskPower's engagement approach with Indigenous communities is an iterative model that evolves as the development of the Project progresses. It begins with sharing meaningful project information and learning from the Indigenous communities about their interests and concerns. In February of 2017 through the Project siting process, SaskPower contacted Indigenous communities with letters (along with stakeholders and special interest groups) who were initially identified as possibly being affected by the Project depending on the selected location. The Cowessess First Nation, Sakimay First Nation, and NSPML#160 were contacted and invited to attend the open house events. They continued to receive Project updates (Appendix H).

When the Moose Jaw Industrial Park location was selected, SaskPower prepared Project notification letters for all identified Indigenous communities (Table 7-1). The letters contained a brief description of the Project, its location, and a request to meet face-to-face to discuss the Project. These letters, along with the presentation made by SaskPower to the City of Moose Jaw on December 21, 2018 (which included a map of the final location selected), were sent by email, followed by hardcopy in the mail on January 2, 2019. See Appendix H for an example of the documentation.

Follow up phone calls were made with each Indigenous community's elected leadership during the week of January 7, 2019 to:

- confirm receipt of notification letter;
- confirm the community's understanding of the engagement process; and,
- determine the need for another conversation or a face-to-face meeting as well as future notification preference.

As required, additional follow-up up calls were made to Indigenous communities who had not responded to the initial letter or the primary follow-up phone call.

For each interested Indigenous community, SaskPower offered early engagement activities which included the following:

- presentation (Appendix H) by SaskPower representatives on the Project;
- opportunity for Indigenous communities to ask questions, raise concerns, identify possible adverse effects to Treaty and Aboriginal rights, as well as discuss possible economic opportunities regarding procurement and employment; and
- arrange follow up meetings to continue discussions and provide additional information with regard to the Project.

On April 17, 2019 SaskPower hosted an Open House within the City of Moose Jaw where all Indigenous communities were invited to participate and provide feedback. See Appendix H for the information that shared at the Open House event.

Detailed logs have been kept for each Indigenous community which includes information regarding:

- dates and types of contacts initiated by SaskPower;
- synopsis of discussion and questions raised by Indigenous communities;
- activities carried out by SaskPower to ensure meaningful engagements with Indigenous communities;
- follow up information requested by Indigenous communities and detailed responses from SaskPower; and
- any other issues discussed which fall within the scope of the Project.

The Duty to Consult obligation rests with the government and these early discussions with Indigenous communities may help inform their decision-making process. As proponents of this Project we will engage in any consultation process that government deems necessary to properly move this Project forward.

Table 7-2 Summary of Indigenous Engagements

Indigenous Community	Date	Means of Engagement
Sakimay First Nation	February 2017	Letter sharing information about the need for a future natural gas generation facility, the four geographical areas of interest under consideration, site selection process, information on open house locations and dates, and SaskPower contact information.
	July 2018	Provided update letter that SaskPower had narrowed its focus to the Moose Jaw Industrial Park and Belle Plaine areas.
	January 2, 2019	Project update letter/email that SaskPower had selected the Moose Jaw Industrial Park as the preferred site for the Project.
	January 9, 2019	Follow up call – left message on Chief Acoose's voicemail asking to contact SaskPower to discuss and set up possible meeting time.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
Cowessess First Nation	February 2017	Letter sharing information about the need for a future natural gas generation facility, the four geographical areas of interest under consideration, site selection process, information on open house locations and dates, and SaskPower contact information.
	July 2018	Provided update letter that SaskPower had narrowed its focus to the Moose Jaw Industrial Park and Belle Plaine areas.
	January 2, 2019	Project update letter/email that SaskPower had selected the Moose Jaw Industrial Park as the preferred site for the Project.
	January 9, 2019	Follow up call – left message for Chief Delorme to call SaskPower.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019

MOOSE JAW COMBINED CYCLE POWER STATION PROJECT

Proponent Engagement with Indigenous Communities and Consultation with the Public and Other Parties

Indigenous Community	Date	Means of Engagement
NSPML#160	February 2017	Letter sharing information about the need for a future natural gas generation facility, the four geographical areas of interest under consideration, site selection process, information on open house locations and dates, and SaskPower contact information.
	July 2018	Provided update letter that SaskPower had narrowed its focus to the Moose Jaw Industrial Park and Belle Plaine areas.
	January 9, 2019	Project update letter/email that SaskPower had selected the Moose Jaw Industrial Park as the preferred site for the Project.
	January 10, 2019	President Trudel leaves message with SaskPower to contact him to set up a meeting.
	January 14, 2019	SaskPower returns call to President Trudel. Agree that SaskPower will come to Moose Jaw to meet during the week of January 20, 2019. President Trudel will send SaskPower an email with possible dates and times.
	January 15, 2019	Email from President Trudel requesting a meeting on January 24, 2019 in Moose Jaw at their offices. SaskPower responds and accepts meeting time and date.
	January 24, 2019	Engagement Meeting –SaskPower representatives deliver presentation regarding Project to President Trudel and board members and answer questions.
	March 25, 2019	Email to President Laverne Trudel from SaskPower which includes follow up summary information regarding Air Emissions associated with the Project. SaskPower indicates in email that if further detailed information is required or additional questions arise, please contact SaskPower Indigenous Relations to discuss.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
	April 3, 2019	Phone call from Vice-President confirming that they will be attending the open house and agrees to a meeting at 10:00am at their offices to discuss updates and other matters
	April 17, 2019	Meeting held with SaskPower representatives at NSPML160 offices to discuss the Project, procurement opportunities as well as other possible partnerships with SaskPower. Three members of the NSPML160 attended the open house in Moose Jaw.

MOOSE JAW COMBINED CYCLE POWER STATION PROJECT

Proponent Engagement with Indigenous Communities and Consultation with the Public and Other Parties

Indigenous Community	Date	Means of Engagement
Carry the Kettle Nakoda Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 9, 2019	Follow up call – left message for Chief O'Watch to call SaskPower.
	February 6, 2019	Follow-up text with Chief O'Watch to call SaskPower to set up engagement meeting.
	February 6, 2019	Chief O'Watch return text asks to meet at end of month. SaskPower asks for suitable date time and location to set up.
	March 8, 2019	Engagement meeting held at Carry the Kettle First Nation's Indian Head office with Chief O'Watch and several Councilors.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
	April 17, 2019	Red Eagle Tail Consultants attended the Open House in Moose Jaw on behalf of the Band.
Day Star First Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 9, 2019	Follow up call – left message for Chief Buffalo to call SaskPower.
	January 10, 2019	Chief Buffalo returned call to SaskPower and leaves message and new number to contact him at.
	January 14, 2019	SaskPower returns call and speaks with Chief Buffalo. SaskPower outlines Project and purpose of early engagement. Resends letter and presentation to new email provided. Chief Buffalo will respond back to SaskPower if there is a need to meet or with questions.
	January 28, 2019	Chief Buffalo returns call and asks to meet at Daystar First Nation during the week of February 11. SaskPower gives three dates, 12/13/14 in the morning at 10AM. Chief Buffalo responds that he will get back to SaskPower shortly to set up.
	March 18, 2019	To date, SaskPower has not heard back from Chief Buffalo to arrange a date.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019

MOOSE JAW COMBINED CYCLE POWER STATION PROJECT

Proponent Engagement with Indigenous Communities and Consultation with the Public and Other Parties

Indigenous Community	Date	Means of Engagement
George Gordon First Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 10, 2019	Follow up call – No answer, left message on voice mail for Chief Anderson to call SaskPower.
	March 4, 2019	SaskPower receives delegation letter which provides for “delegation of consultation authority” to George Gordon Developments Ltd., and Wicehtowak Limnos Consulting Services Ltd. (WLCS). SaskPower responds with a request for suitable dates to meeting to discuss project.
	March 15, 2019	SaskPower met with George Gordon First Nation and WLCS and provided a project overview. Various economic opportunities related to the project were discussed and a follow up meeting was requested as the project moves forward.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
	April 17, 2019	Representatives from GGFN/WLCS attended the Open House in Moose Jaw.
Kawacatoose First Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 10, 2019	Follow up call – talked with receptionist, confirmed letter was received and left message for Chief Dustyhorn to call SaskPower to set up meeting and/or discuss any concerns.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
Muscowpetung First Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 10, 2019	Follow up call – Chief Cappo, attempted to leave message to call SaskPower but voicemail was full.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
Muskowekwan First Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 9, 2019	Follow up call – left message for Chief Bellerose to call SaskPower.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019

MOOSE JAW COMBINED CYCLE POWER STATION PROJECT

Proponent Engagement with Indigenous Communities and Consultation with the Public and Other Parties

Indigenous Community	Date	Means of Engagement
Nekaneet First Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 9, 2019	Follow up call – left message for Chief Francis to call SaskPower.
	January 27, 2019	SaskPower texted Chief Francis asking him to contact SaskPower to discuss Project.
	January 28, 2019	SaskPower arranges meeting with Nekaneet representatives for February 26, 2019 at 1:30 PM Regina Office.
	February 26, 2019	SaskPower meets with Chief Alvin Francis and provides overview presentation of the Project. Chief Francis asks about training and employment opportunities as well as procurement. SaskPower ensures Chief Francis that Nekaneet will be invited to all open houses and procurement sessions which will outline opportunities.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
Ochapowace First Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 9, 2019	Follow up call – left message for Chief Bear to call SaskPower.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
Pasqua First Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 9, 2019	Follow up call – left message on Band Office phone for Chief Peigan to call SaskPower.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
Piapot First Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 9, 2019	Follow up call. Spoke with Executive Coordinator regarding letter and possible meeting to discuss Project. Meeting set for January 17, 2019.
	January 17, 2019	Engagement Meeting. SaskPower presented Project overview and answered questions. Follow-up meeting requested. Awaiting suitable date from Chief and Council.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019

Indigenous Community	Date	Means of Engagement
Standing Buffalo Dakota Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 9, 2019	Follow up call – left message for Chief Redman to call SaskPower. Chief Redman returned call and indicated that he will talk with their lawyer and get back to SaskPower if there are any concerns.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
Star Blanket Cree Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 10, 2019	Follow up call – left message for Chief Starr to call SaskPower.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
Wood Mountain Lakota Nation	January 2, 2019	Project notification letter and presentation sent by both email and mail.
	January 9, 2019	Follow up call – Chief Lecaine indicated that she had not seen the letter yet and provided new email address to send to. Chief Lecaine said she will review letter and get back to SaskPower if there is a desire to meet or if there are any concerns. Resent electronic version of letter and presentation.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
Regina Riel Métis Council	January 9, 2019	Project notification letter and presentation sent by both email and mail.
	January 23, 2019	Follow up call – left message for President Brooks.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019
File Hills Qu'Appelle Developments	March 5, 2019	Email notification to Thomas Benjoe, CEO/President of File Hills Qu'Appelle Developments from SaskPower requesting a meeting regarding the project.
	March 27, 2019	Invitation letter sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019

7.2.3 KEY COMMENTS AND CONCERNS BY INDIGENOUS COMMUNITIES

The Indigenous communities below have provided verbal feedback to date.

- NSPML#160 – Support the Project and would like the opportunity to partner with SaskPower on a number of fronts including possible employment for Métis people during construction of the Project. A question was asked about air emissions from the Project and SaskPower has followed up with summary information; SaskPower provided additional information on project emissions and offered to continue discussions in the future if further questions arise.

- Wood Mountain Lakoda Nation – Chief Lecaine indicated that if there are any concerns or questions regarding the Project, she will contact SaskPower.
- Piapot First Nation – No concerns identified to date. Request a follow up meeting with SaskPower.
- George Gordon First Nation – Various economic opportunities related to the project discussed and a follow up meeting was requested as the project moves forward. WLCS requested an opportunity for a band member to gain environmental survey experience on the Project. SaskPower, working with Stantec Consulting, has provided an opportunity for a member of WLCS to be employed to assist in the conducting of the 2019 environmental field surveys as well as provide their Indigenous Traditional Knowledge perspective.
- Nekaneet First Nation – Interested in training, employment, and procurement opportunities.
- Carry the Kettle First Nation – General comments on the problems that Saskatchewan has had regarding consultations with First Nations. Raised the possibility of cumulative effects. Asked about funding to facilitate proper and meaningful consultations. Interested in training, employment, and procurement opportunities.

In summary, to date, no concerns regarding the site selected for the Project or specific potential adverse impacts to Indigenous communities have been raised through the early engagement activities with Indigenous communities. Please note that SaskPower is currently reviewing and synthesizing all the information received during the recent (April 2019) engagement activities.

7.2.4 ONGOING INDIGENOUS ENGAGEMENT INFORMATION GATHERING

SaskPower is committed to ongoing discussions with Indigenous communities throughout the Project development and the life of the Project.

SaskPower continues to ensure detailed study work includes topics of interest/concern to Indigenous communities. Once this work is complete, SaskPower will share the high-level Project layout and construction plans, predicted environmental effects/mitigations, and procurement plans.

SaskPower's engagement objectives at this next stage of the Project development are:

- share meaningful Project information
- continue to learn about Indigenous communities' traditional knowledge, interests, and concerns
- integrate Project mitigations that help address Indigenous communities' traditional knowledge, interests, and concerns to the greatest extent possible, and
- share how Indigenous communities' traditional knowledge, interests, and concerns influenced Project plans

Additionally, all Indigenous communities will be invited to participate and provide feedback in stakeholder Project-related engagements such as:

- procurement information sessions, and
- site tours

It is anticipated that Indigenous cultural ceremonies will likely be required for the Project. SaskPower will determine (through discussions with Indigenous communities) as to what cultural ceremonies or activities may be appropriate for the Project and which communities will conduct and/or participate in each cultural activity.

7.3 PUBLIC ENGAGEMENT

7.3.1 Preliminary Public Engagement

From 2015 to 2016 SaskPower identified potential geographical regions that were technically feasible for a new natural gas generation facility. This technical study work narrowed SaskPower's focus to three potential regions: Belle Plaine area, West Sherwood (an area west of the City of Regina), and Rowatt (an area south of the City of Regina).

In 2016, the City of Moose Jaw approached SaskPower and requested SaskPower consider locating its next natural gas facility in their planned Industrial Park southeast of Moose Jaw. The Industrial Park was added as an area for consideration based on its technical merits and supportive proponent.

In early 2017, SaskPower began broadly sharing information about the need for a future natural gas generation facility, the four geographical areas of interest under consideration, and the siting analysis and process. By seeking community input at this early stage of the Project's development SaskPower engaged the public to ensure interests, concerns, and future community land use plans would be considered alongside technical factors to help determine the location of this Project.

SaskPower's engagement objectives at this stage of the Project development were to:

- share meaningful Project information
- learn and integrate local interests, concerns, and future land use plans into the siting assessment process to the greatest extent possible, and
- share the findings of the site assessment and the ultimate preferred site location

Table 7-3 summarizes the stakeholder outreach activity from February 2017 to December 2018.

Table 7-3 Stakeholder Outreach Activity from February 2017 to December 2018.

Activity	Description	Date
Letters	Over 500 letters were mailed to landowners, businesses, special interest groups, and Indigenous communities initially identified in all four areas under consideration. The package contained information on the Project, a SaskPower contact, and the opportunities to exchange information with SaskPower. See Appendix H for a copy of the mailed package (letter and info sheet).	Feb 1, 2017
Meetings	SaskPower ensured all local municipalities had an opportunity to meet with SaskPower to learn about the Project and exchange information. Local municipalities included: RM Bratt's Lake, RM Pense, Town of Pense, RM Edenwold, RM Lajord, RM Moose Jaw, City of Moose Jaw, RM Sherwood, Village of Grand Coulee, and Village of Belle Plaine. Some villages and towns opted for an electronic package instead of a meeting. See Appendix H for a copy of the presentation.	Feb 7-Mar 8, 2017
Open Houses	An open house was hosted in each area under consideration. SaskPower offered a "come and go" style format for members of the public to learn about the Project and exchange information. All open houses were advertised on the radio and in the paper and ran from Noon to 7:00 PM Pense Town Hall, Pense (~70 attendees) Belle Plaine Town Hall, Belle Plaine (~35 attendees) Wakamow Valley Sportsman Centre, Moose Jaw (~130 attendees) Kronau Memorial Hall, Kronau (~35 attendees)	Feb 15, 2017 [Pense] Feb 16, 2017 [Belle Plaine] Feb 22, 2017 [Moose Jaw] Feb 23, 2017 [Kronau]
Webpage	A dedicated web page containing Project information and the opportunities to exchange information with SaskPower were updated here: https://www.saskpower.com/proposedgas	February 2017 to Present
Toll Free phone number and Email	Both a dedicated toll free phone line and email address were made available for all members of the public and included in all information SaskPower shared regarding the Project.	February 2017 to Present
Phone calls	Provided update to all municipalities that SaskPower had narrowed its focus to the Moose Jaw Industrial Park and Belle Plaine areas. Provided a summary of feedback received to date/how it was incorporated into the siting process and confirmed future notification preferences of all local municipalities. (Local municipalities included: RM Bratt's Lake, RM Pense, Town of Pense, RM Edenwold, RM Lajord, RM Moose Jaw, City of Moose Jaw, RM Sherwood, Village of Grand Coulee, and Village of Belle Plaine.)	July 11 and 12, 2018
Letter/email	Provided update to all stakeholders and Indigenous communities initially identified that SaskPower had narrowed its focus to the Moose Jaw Industrial Park and Belle Plaine areas. Provided a summary of feedback received to date/how it was incorporated into the siting process and confirmed future notification preferences. (Over 500 letters and 150 email addressees) See Appendix H for a copy of the letter and information sheet.	July 13, 2018
Phone Calls/letters/ meetings	Exchanged site specific information with both Moose Jaw Industrial Park and Belle Plaine landowners.	July 2018-Dec 2018

Activity	Description	Date
Meeting	Presented to Moose Jaw City Council at special meeting (broadcast live on local television). Reviewed Project update and requested Council approve resolution to sign the pre-negotiated land option agreement as per this municipality's governance process. Local media reported on this special meeting earlier in the week once the City Council took the motion to sign the land option agreement with SaskPower out of camera. See Appendix H for a copy of the presentation.	Dec 21, 2018
Letter/email	Provided Project update to all landowners, businesses, and special interest groups that SaskPower had selected the Moose Jaw Industrial Park as the preferred site for the Project. (265 letters and 150 email addressees) See Appendix H for a copy of the letter. Note- Project update emails/letters to Indigenous communities were deferred to January 2, 2019 to accommodate band office holiday schedules.	Dec 21, 2018
Meeting	SaskPower met separately with neighbouring landowners near the Project to exchange information and continue to learn about interests and concerns.	Jan 11-25, 2019
Webpage	A dedicated web page containing project information and the opportunities to exchange information with SaskPower were updated here: https://www.saskpower.com/proposedgas	On-going (Feb 2017 – present)
Toll Free phone number and Email	Both a dedicated toll free phone line and email address were made available for all members of the public and included in all information SaskPower shared regarding this project.	On-going (Feb 2017 – present)

7.3.2 KEY COMMENTS AND CONCERNS BY STAKEHOLDERS

SaskPower collected feedback from local municipalities, landowners, special interest groups, and community members throughout all four study areas from February 2017 to the present time. Key interests and concerns are summarized as follows:

- create local jobs and training opportunities
- preserve productive farmland, and make sure plans don't negatively impact farm safety
- look at property effects and share details about potential noise, odour, and emissions
- minimize construction effects such as traffic, noise, and dust
- preserve the quality of water and soil. Ensure drainage issues are addressed. Don't disturb wildlife and natural habitat
- respect nearby recreational areas and,
- keep those interested in the process informed via letters, emails, and face-to-face opportunities

Local municipalities in all four study areas were generally interested in learning more about the Project and discussing potential opportunities to work together. The industrial areas in Belle Plaine and the Moose Jaw Industrial Park aligned best with the key interests and concerns raised during engagement. In July 2018 SaskPower narrowed its focus to these two areas.

The Moose Jaw Industrial Park provided a pre-zoned industrial space for the Project. In addition, the City of Moose Jaw along with its neighbouring municipalities and local business chamber made a concerted effort to voice shared support for Moose Jaw Industrial Park as the preferred location and maintained a steadfast commitment to working with SaskPower to develop the Project.

SaskPower considered all feedback to date and evaluated all factors such as potential environmental effects, constructability and accessibility, performance, availability and cost of natural gas supply infrastructure, cost of transmission interconnection, water supply and wastewater management, and the overall cost of the Project.

7.3.3 OVERVIEW OF ONGOING STAKEHOLDER CONSULTATION ACTIVITIES

SaskPower is committed to ongoing discussions with all stakeholders throughout Project development and the life of the Project.

SaskPower continues to ensure detailed study work includes topics of interest/concern to stakeholders, such as potential effects of noise, emissions, and construction. Between April 13 and 16, 2019 SaskPower hosted small group landowner meetings and a Public Open house on April 17, 2019 where the high-level facility layout and construction plans, predicted environmental effects/mitigations, and procurement plans were shared. See Appendix H for further information.

SaskPower's engagement objectives during this stage of the Project development were to:

- share meaningful Project information
- continue to learn about local interests and concerns
- integrate Project mitigations that help address local interests and concerns to the greatest extent possible, and
- share how stakeholder interests and concerns influenced Project plans

Please note that SaskPower is currently reviewing and synthesizing all the information received during the recent (April 2019) engagement activities.

Table 7-4 below summarizes the planned stakeholder outreach activity moving forward.

Table 7-4 Recent and Planned Stakeholder Outreach Activity

Activity	Description	Proposed Date
Site Office	Host small discussions with Project neighbours and special community groups to share Project information and identify interests and concerns. 23 people booked and attended appointments with SaskPower.	April 13, 15, and 16 2019
Open House	Hosted a “come and go” style format for members of the public to learn about the Project and exchange information. Over 150 people attended this event.	April 2019
Supplier sessions	Review lessons learned on previous natural gas facility experience and collect feedback to consider for this next procurement approach.	To be determined
Presentations	Provide Project information and updates to special interest groups, upon request.	To be determined
Site Tour	Facilitate tour(s) of other natural gas facilities such as the Chinook Power Station.	To be determined
Commitments Registry	Confirm all Project commitments made to stakeholders	To be determined
Webpage	A dedicated web page containing Project information and the opportunities to exchange information with SaskPower were updated here: https://www.saskpower.com/proposedgas	On-going
Toll Free phone number and Email	Both a dedicated toll free phone line and email address were made available for all members of the public and included in all information SaskPower shared regarding this Project.	On-going

Remaining activities to be determined with stakeholders so they continue to direct SaskPower in how they want to participate. SaskPower is still collecting input and hosting discussions with interested members of the public who want more information or were unable to attend the recent events in April 2019.

7.4 JURISDICTIONAL CONSULTATION

The Project team began engaging with various municipal, provincial, and federal regulatory agencies in February 2017 to introduce the Project, discuss technical requirements, any potential concerns, and permitting and approval processes.

7.4.1 FEDERAL ENGAGEMENT

SaskPower engaged with the Agency to discuss the process, content, and procedure for submission of the Project Description. Discussions with Nav Canada, Transport Canada, Canadian Forces based Moose Jaw-15 Wing, and Canadian Forces based Winnipeg-17 Wing were centered on acquiring preliminary approval for the Project. SaskPower addressed aeronautical concerns by completing an Aeronautical Assessment Form for Obstacle Evaluation and a Land Use Proposal for the Project, the potential transmission structures, and the cranes during construction. Electromagnetic interference was also assessed and a thermal and visible plume analysis was completed. All concerns were successfully addressed.

Table 7-5 summarizes the major federal engagement activities from November 2018 to April 2019.

Table 7-5 Federal Engagement Activities from February 2017 to April 2019.

Activity	Description	Date
Email	Crane, stack, and transmission Line applications issued to NAV Canada and Transport Canada.	Sept 2017
Email	Initial approval received from NAV Canada for crane and stack applications.	Dec 15, 2017
Email	NAV Canada and Transport Canada requested that SaskPower consult with the Department of National Defense (DND).	Summer 2018
Email	Submission of crane, stack, and transmission line applications to DND.	Sep 7, 2018
Email	Additional information provided to DND to supplement initial applications.	Oct 1, 2018
Email	Transmission line application approved by DND (17 Wing Winnipeg).	Oct 11, 2018
Meeting	Legislation updates and Moose Jaw Gas Plant Project Introduction	Nov 2, 2018
Email	Electromagnetic impact approved by DND (17 Wing Winnipeg).	Nov 9, 2018
Email	Moose Jaw site approved by DND (15 Wing Moose Jaw).	Nov 26, 2018
Email	Draft Project Description submitted to the Agency for review and comment.	Feb 13, 2019
Email	SaskPower provided clarifications to Air Emissions Modelling and Study Area approach from the Transmission line and water line.	Feb 26, 2019
Email	Comments received from the Agency related to the draft Project Description submission.	Mar 5, 2019
Email	Project Description submitted to the Agency for review and processing.	Apr 9, 2019
Email	Comments received from the Agency related to the Project Description submission.	Apr 18, 2019
Phone meeting	Discussion and clarification of comments received from the Agency	April 25, 2019

7.4.2 PROVINCIAL ENGAGEMENT

Departments and Agencies of the provincial government are in on-going discussions regarding regulatory requirements and insights into engagement, development, and environmental considerations. All regulatory requirements will be adhered to including submission of a project description for examination through the provincial environmental assessment act.

Table 7-6 Provincial Engagement Activities from February 2017 to March 2019.

Activity	Description	Date
Letter	Letters were mailed to Saskatchewan Ministry of Environment, Environmental Assessment and Stewardship and Landscape Conservation Environmental Protection Branches. The package contained information on the Project, a SaskPower contact, and the opportunities to exchange information with SaskPower. See Appendix H for a copy of the mailed package (letter and info sheet).	Feb 1, 2017
Email	Inquiry made to WSA regarding water usage allocations in the Moose Jaw and Regina areas.	Nov 5, 2018
Email	Confirmation from WSA that proposed water usage is within the allocation allotted to the cities of Regina and Moose Jaw and that WSA has no concerns with obtaining water from either city.	Nov 15, 2018
Email	Draft light and heavy vehicle traffic plans issued to Saskatchewan Government Insurance and Saskatchewan Ministry of Highways for review and comment.	Mar 22, 2019
Email	Invitation letter e-mail sent by SaskPower for Public Open House in Moose Jaw being held on April 17, 2019 to Saskatchewan Ministry of Environment, Environmental Assessment and Stewardship and Landscape Conservation Environmental Protection Branches	March 27, 2019

7.4.3 MUNICIPAL GOVERNMENT

Departments and Agencies of the municipal government are in on-going discussions regarding regulatory requirements and insights into engagement, development, and infrastructure such as roads and disposal mechanisms. All regulatory requirements will be adhered.

Table 7-7 summarizes the major municipal government stakeholder activities from February 2017 to April 2019.

Table 7-7 Municipal Government Engagement Activities from February 2017 to April 2019.

Activity	Description	Date
Meetings	SaskPower ensured all local municipalities had an opportunity to meet with SaskPower to learn about the Project and exchange information. Local municipalities included: RM Bratt's Lake, RM Pense, Town of Pense, RM Edenwold, RM Lajord, RM Moose Jaw, City of Moose Jaw, RM Sherwood, Village of Grand Coulee, and Village of Belle Plaine. Some villages and towns opted for an electronic package instead of a meeting. See Appendix H for a copy of the presentation.	Feb 7-Mar 8, 2017
Phone calls	Provided update to all municipalities that SaskPower had narrowed its focus to the Moose Jaw Industrial Park and Belle Plaine areas. Provided a summary of feedback received to date/how it was incorporated into the siting process and confirmed future notification preferences of all local municipalities. (Local municipalities included: RM Bratt's Lake, RM Pense, Town of Pense, RM Edenwold, RM Lajord, RM Moose Jaw, City of Moose Jaw, RM Sherwood, Village of Grand Coulee, and Village of Belle Plaine.)	July 11 and 12, 2018
Meeting	Presented to Moose Jaw City Council at special meeting (broadcast live on local television). Reviewed Project update and requested Council approve resolution to sign the pre-negotiated land option agreement as per this municipality's governance process. Local media reported on this special meeting earlier in the week once the City Council took the motion to sign the land option agreement with SaskPower out of camera. See Appendix H for a copy of the presentation.	Dec 21, 2018
Meetings	Weekly meetings with the City of Moose Jaw to review Project status, including project incidentals and stakeholder engagement activities, and to negotiate coordination between the Project and Moose Jaw's industrial park development plan.	Jan 9, 2019 to Present
Meeting	Provided update to RM of Moose Jaw and discussed RM requirements for road development through their jurisdiction. Also discussed the RM's preferred methods of engagement with SaskPower throughout the project life.	Jan 22, 2019
Meeting	Presented SaskPower's initial draft road use plan to the City and RM of Moose Jaw, and to continue discussions regarding road upgrades and continued maintenance throughout construction and the life of the project.	Mar 25, 2019

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Appendix A ENVIRONMENTAL OVERVIEW FOR THE MOOSE JAW COMBINED CYCLE POWER STATION PROJECT

Moose Jaw Supply Project
Environmental Overview

February 11, 2019

Prepared for:

TransGas Limited

Prepared by:

Stantec Consulting Ltd.

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by TransGas Limited (TransGas), a subsidiary of SaskEnergy Incorporated (SaskEnergy) to prepare an environmental overview for a proposed natural gas pipeline near Moose Jaw, Saskatchewan (the Project). The Project will include the installation of a new 16-24” diameter pipeline within an approximately 30 km-long x 30-50 m-wide right-of-way (ROW). The pipeline will begin by tying into the existing TransGas system near Belle Plaine, Saskatchewan and will terminate at a SaskEnergy town border station (TBS) within the Moose Jaw Industrial Park to be developed at a future date (Figure 2-1).

The objective of this environmental overview is to identify existing conditions along the proposed pipeline route, potential environmental and socio-economic effects, and mitigation measures intended to reduce or avoid effects associated with the construction and operation of the Project.

TransGas is the proponent for developing the Moose Jaw Supply Project and will be the owner-operator. The natural gas pipeline is subject to the regulatory approval process under the Saskatchewan Ministry of Environment, Saskatchewan Ministry of Energy and Resources, and the Ministry of Parks, Culture and Sport. TransGas will make an application to the provincial regulator to obtain approval to proceed with the Project.

2.0 PROJECT DESCRIPTION

2.1 PROJECT OVERVIEW

TransGas is a public utility owned by the Saskatchewan government and is responsible for the transmission of natural gas in Saskatchewan. In 2016, in response to potential increased levels of development in the Moose Jaw area, TransGas began the process of determining the infrastructure requirements that would meet the needs of the tenants of the Moose Jaw Industrial Park that is currently under development, as well as future residential, commercial and industrial growth. To address these requirements, TransGas began exploring development of a new high-pressure natural gas pipeline. SaskEnergy's Local Distribution Utility had also identified a need to reinforce the supply of natural gas into the City of Moose Jaw with a second TBS on the southeast side of Moose Jaw, fed from a second high-pressure transmission pipeline. This distribution system reinforcement would increase the redundancy and reliability of the natural gas supply to the City of Moose Jaw and surrounding area. Collectively, this Project has been named Moose Jaw Supply Project. The projected in-service date for the reinforcement of supply to the City of Moose Jaw had been identified in the long-term capital plan as 2023 - 2025. A decision was made to advance the schedule for development of the new natural gas pipeline, to align with the schedule requirements for the Moose Jaw Industrial Park and tenants, in order to reduce both the potential disturbance from multiple pipelines going to the same area and the demand for redundant capital expenditure.

2.2 PROJECT LOCATION

The Project is in the Moist Mixed Grassland Ecoregion and within the rural municipalities (RMs) of Pense No. 160 and Moose Jaw No. 161 between Belle Plaine and Moose Jaw, Saskatchewan. The pipeline will begin by tying into the existing TransGas system near Belle Plaine, Saskatchewan at SW 23-17-24 W2M and will terminate at a proposed SaskEnergy TBS within the Moose Jaw Industrial Park at SE 27-16-26 W2M. Based on a review of satellite imagery and Agriculture and Agri-food Canada (AAFC) land cover data (AAFC 2017), the Project is predominantly located on cultivated land. The location of the Project is illustrated in Figure 2-1.

2.3 PROJECT SCHEDULE

The proposed Project schedule is provided in Table 2-1.

Table 2-1 – Project Schedule

Description	Schedule
Biophysical and Heritage Resource Studies	Spring and Summer 2020
Regulatory Applications, Permitting and Approvals	Summer 2020
Block Valve and Pipeline Construction	Fall 2021
Reclamation	Fall 2021 to Fall 2022
Commissioning and Start-up	November 2021

2.4 OPTIONS CONSIDERED

TransGas began exploring options to meet all projected future demand for natural gas in the Moose Jaw area in 2016. Since this time, TransGas has considered several options to supply gas to the area including the tie-in points to the existing natural gas transmission system, various route options to the area, and the required infrastructure.

In early 2017, the process of constructing a pipeline was initiated, including: stakeholder engagement, the acquisition of pipeline ROW, preliminary survey and engineering design, preliminary environmental screening and the procurement of pipe. Near the end of 2017, the original customer deferred the in-service date of their project and as a result, TransGas also deferred the installation of the pipeline. TransGas understood that the natural gas pipeline would eventually be required to serve the City of Moose Jaw, Moose Jaw Industrial Park, and surrounding area. As a result, TransGas decided to proceed with the completion of acquisition of pipeline ROW but redeployed the procured pipe to other approved TransGas projects.

In response to the recent request for service by (Saskatchewan Power Corporation) SaskPower for development of the Moose Jaw Combined Cycle Gas Turbine Facility, TransGas is again looking to develop a solution that will meet all projected future demand for natural gas in the Moose Jaw area. Specifically, the option that is being proposed will have sufficient capacity for the Moose Jaw Industrial Park, including SaskPower's proposed generation facility, provide an additional source of supply to meet the growing natural gas needs for the City of Moose Jaw, and avoid the need for multiple pipelines to supply the current demand for natural gas.

The route that had originally been identified, and for which pipeline right of way had been acquired, is still the preferred route for accessing the area. SaskPower's need for elevated pressure service requires that the pipeline have a direct interconnect to the existing TransGas Belle Plaine station, resulting in 9 to 11 km of additional pipeline (depending on final route selection), over and above the original route that was identified in 2017. In addition to providing higher pressure to the Moose Jaw Industrial Park, connecting to the Belle Plaine interconnect will provide access to multiple pipelines and sources of supply which will increase the reliability of service for all customers. TransGas has identified a study area for this additional pipeline and is currently reviewing potential route options.

TransGas' objective for preliminary routing and the review of the study area was to mitigate environmental and socio-economic project-related effects by:

- Avoiding wetlands, drainages, and terrain that would require extensive grading and slope modification
- Avoiding sensitive, unique or high-quality habitat types
- Maintaining a suitable setback distances from occupied residences
- Reducing the length of new pipeline and ROW
- Paralleling existing ROWs or previously disturbed areas where feasible
- Avoiding the need for additional infrastructure (e.g., compression stations)

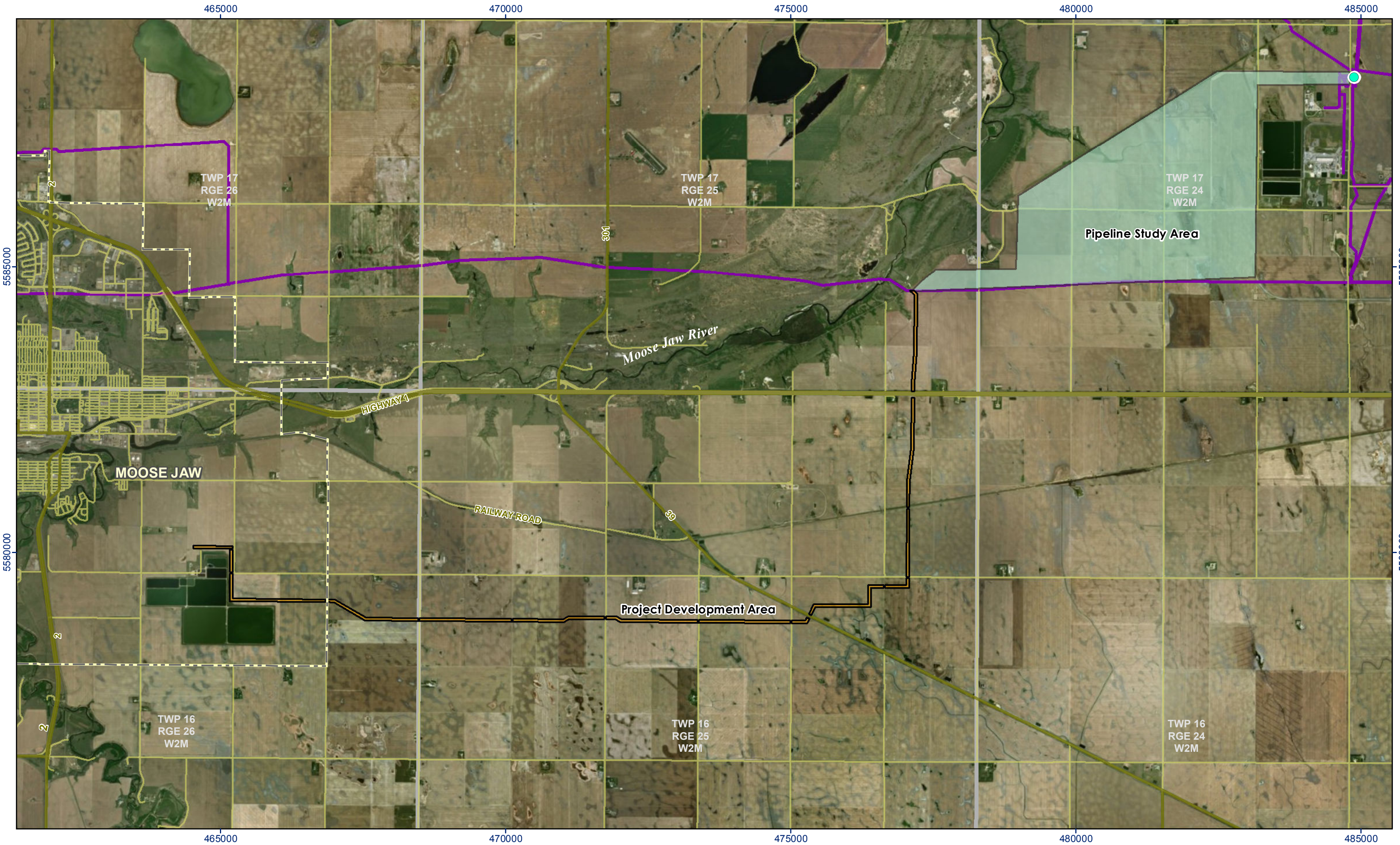
Consistent with the objectives listed above, TransGas evaluated several pipeline route options; however, they were removed from consideration due to stakeholder concerns and routing constraints such as land use and sensitive habitats and terrain, including the Moose Jaw River. Additionally, these objectives will be followed for future routing within the study area for the remaining 9 to 11 km of pipeline.

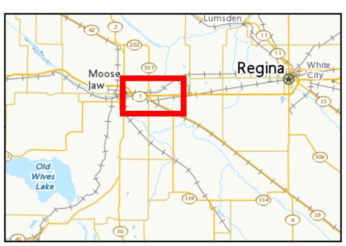
2.5 REQUIRED INPUTS AND OUTPUTS

The coated transmission pipeline will be designed in accordance with TransGas' internal design standards, Canadian Standards Association (CSA) Z662-15 (2015), and Saskatchewan's *The Pipelines Act* (1998) and *The Pipeline Regulations* (2000).

Any waste generated on-site to complete the installation or commission the pipeline will be collected in containers and removed for disposal. Likewise, reusable or recycle material will be placed in their own containers or stored separately for re-use at other projects or transported to the appropriate recycling receiver where feasible. All hazardous materials will be stored and disposed in accordance with established regulations. During operation, garbage and recycling containers will be stored on-site and emptied or removed as necessary.

Waste generation is expected to be limited and confined largely to spent welding rods, covers for shrink sleeves, steel pipe segments that may be cut-out or trimmed, paint cans, and wooden laths. All garbage will be collected daily in secured containers and transported off-site for disposal or recycling.





- Project Development Area (PDA)
- Pipeline Study Area
- Proposed Pipeline Endpoint
- Existing TransGas Natural Gas Transmission Pipeline*
- City Limits
- Major Road
- Minor Road
- Township

*ATTENTION - This data is owned by SaskEnergy, its affiliates or third parties and is provided to you on the following terms:
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N

0 1,500 3,000 metres

(At original document size of 8.5x11)
1:100,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Data Sources: Government of Saskatchewan, Government of Canada
3. Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Stantec TransGas

Project Location
Moose Jaw, Saskatchewan

Prepared by JHiebert on 2019-02-12
Technical Review by JHennig on 2019-02-12

Client/Project
113254238_005 REVA

TransGas Limited
Moose Jaw, Saskatchewan

Figure No.
2-1

Title
Project Location

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Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.0 ENGAGEMENT

Keeping stakeholders informed is an important aspect of all TransGas projects, and as such, TransGas developed a Stakeholder Engagement Plan. The overall goal of the engagement plan is to allow for constructive communication with all stakeholders throughout the Project. Issues, concerns, and knowledge identified and provided by potentially affected or interested parties are important and were considered in the development of the Project and this Environmental Overview.

This section provides an overview of public, Indigenous, and regulatory engagement activities that have been ongoing for the Project since September 2016.

3.1 PUBLIC ENGAGEMENT

The objectives of the Stakeholder Engagement Plan were to:

- Identify all stakeholders;
- Inform stakeholders throughout each stage of the Project;
- Ensure communication with stakeholders is accomplished through effective methods;
- Ensure stakeholders can express input and voice any potential concerns;
- Allow response to stakeholder input concerns;
- Ensure communications with stakeholders are documented; and
- Feedback from stakeholders will be summarized in future regulatory applications, as required. Results from this assessment will be integrated into project plans as deemed necessary

3.1.1 Identification of Interested and Affected Parties

For the Stakeholder Engagement Plan, a list of stakeholders potentially interested in or affected by the Project was compiled by TransGas. The stakeholder groups identified for the Project are:

- Landowners and Public
- Municipal Governments
- Indigenous Communities
- Regulatory Agencies
- Non-government Organizations

To identify the Landowners and Public affected by this project, a line-list will continue to be developed during the planning stage. The final line-list will include landowners, lessees, and third-party stakeholders that may be directly affected by the current proposed route, including those within a minimum of 750 m on either side of ROW.

3.1.2 Public Open Houses

A public open house was held on January 31, 2017 at the Heritage Inn Hotel and Convention Centre in Moose Jaw, SK for the initial 20 km portion of the Project. Letter invitations to the open house were distributed to landowners and stakeholders on January 10, 2017. Additionally, advertisements for the open house were distributed to the RM of Moose Jaw and the City of Moose Jaw to be posted on their community websites, presented in the Moose Jaw Times Herald, and posted on the TransGas website.

The purpose of the open house was to explain the Project in more detail, including the need for the Project, pipeline route, pipeline safety, environmental protection and the planning, construction and operation practices, as well as to collect feedback from the attendees. During the open house, poster boards were displayed to provide attendees with information about the Project. Brochures were also distributed that outlined an overview of the Project, pipeline safety, answers to frequently asked questions, environmental considerations specific to the development of the Project, and information regarding which regulatory agencies are involved in reviewing the Project.

Approximately 15 attendees signed in at the open house. Of the attendees, there were no concerns identified within the survey questionnaire that was distributed. The questionnaire invited respondents to identify concerns with regard to the environment, safety, the potential for the pipeline to affect livelihood, and the proposed route. The questionnaire also invited respondents to provide personal contact information, should the respondent wish to be contacted in response to their concerns.

Throughout the open house, representatives of TransGas were also available to answer questions and address concerns. Concerns raised by attendees were recorded, including responses provided and further follow up, if required. Following the open house, the Project team met to review and address the concerns that were raised, which resulted in minor modifications to the proposed route. Moving forward, TransGas will continue to engage with stakeholders as the route is developed and refined.

3.1.3 Landowner Meetings

Meetings were held with landowners to discuss the Project and request access to property for land and environmental surveys. Landowners were continually engaged throughout the Project as land acquisition occurred.

3.2 INDIGENOUS ENGAGEMENT

TransGas acknowledges that the Project is within Treaty 4 territory and the traditional homeland of the Métis. TransGas initiated voluntary engagement by identifying a list of potentially affected Indigenous communities in close geographic proximity to the Project. The objective of engaging with Indigenous communities is to maintain positive relationships and to identify any specific issues surround the Project. The TransGas Aboriginal Relations department determined, based on the limited size and scope of the Project and the nature of known First Nation and Métis rights in the proposed Project area, the Project will have a demonstrated low impact on First Nations and Métis rights. Based on this information, TransGas Aboriginal Relations identified three communities with whom to engage, which may include the retention of elders and monitors throughout the Project:

- Muskowekwan First Nation

- Sakimay First Nation
- Cowessess First Nation

TransGas understands that information or maps of Indigenous traditional territories are often not readily available and throughout the engagement process, Indigenous communities may be identified that have traditional territory that overlaps with the proposed Project. As such, the list of communities may need to be updated on an on-going basis should additional communities affected by the Project be identified as the Project progresses.

3.3 REGULATORY ENGAGEMENT

3.3.1 Regulatory Meetings

Several regulatory agencies are directly involved in the Project as they are included in the approval stage. The following agencies or organizations have been identified:

- Ministry of Environment
- Ministry of Energy and Resources
- Ministry of Parks, Culture and Sport (Heritage Conservation Branch)
- Saskatchewan Water Security Agency

3.3.2 Municipal Engagement

Multiple meetings were held with the City of Moose Jaw. The topics discussed during these meetings, including future expansion of Industrial Park, and servicing the Industrial Park with water and rail access. TransGas made a presentation to the City of Moose Jaw Council on January 22, 2018. This presentation included an overview of the route. Council had no major concerns with the Project and were excited about the potential opportunities it brings to the City. Questions posed by Council were regarding safety setbacks for development and were addressed during the meeting.

A meeting was held with the Rural Municipality of Moose Jaw No. on September 27, 2016 to discuss the Project and present maps, and Project information.

3.4 ONGOING ENGAGEMENT

As the Project progresses and routing is finalized, information will continue to be available on TransGas' website. Interested parties will be able to contact TransGas, via email or telephone, should they have any concerns.

4.0 ENVIRONMENTAL COMPONENTS SCOPING

4.1 VALUED COMPONENTS

Desktop sources were used to evaluate existing conditions and to identify potential Project-related environment and socio-economic effects. The following valued components were scoped for inclusion in the environmental overview due to their likelihood of being most directly affected based on anticipated Project-environment interactions:

- Terrain and Soil – Potential effects include rutting, admixing, compaction, and erosion resulting from soil exposed during site clearing, grading, and excavation.
- Vegetation and Wetlands – Construction activities might cause a loss or alteration of rare species or sensitive plant communities that may be present and wetland areas may be altered or lost. Operation and maintenance of the pipeline ROW, including weed management and reclamation, may cause loss or alteration of sensitive plant communities and alterations to wetlands.
- Wildlife – Wildlife may come into direct contact with construction equipment resulting in direct mortality. Wildlife habitat will be temporarily lost during construction activities. It is anticipated that the pipeline ROW, and wildlife habitats along it (i.e., wetlands), will be avoided or reclaimed to pre-construction conditions. as vegetation reclaims the ROW.
- Heritage Resources – Construction activities may disturb previously unidentified surface and buried archeological artifacts or features. A Heritage Resource Review Form will be required to be submitted to the Saskatchewan Ministry of Parks Culture and Sport - Heritage Conservation Branch (HCB) for heritage sensitive quarter sections intersected by the Project. Following the submission of the Heritage Resource Review Form, the HCB will either provide clearance or indicate if a Heritage Resource Impact Assessment (HRIA) is required prior to development.

The following components have not been included in the environmental overview because Project interactions are unlikely to occur or can be addressed through standard, well-established mitigation measures:

- Hydrogeology – Groundwater quality and quantity will not be affected during construction activities through the avoidance of construction in or near wetland margins. Additionally, surface disturbances are not expected to affect near surface aquifers or alter subsurface flows.
- Surface Hydrology and Aquatic Resources – Surface water quality or fish habitat are not anticipated to be affected by the Project because there is no fish or fish habitat that occurs in close proximity to the Project, construction activities will be short-term in duration, and surface drainage patterns will be re-established.
- Atmospheric Environment – Noise and air pollution from the Project is not anticipated to have additional direct effects because of the short construction duration and the distance to nearby residences.
- Socio-economic – TransGas is in the process of establishing easement agreements for the pipeline ROW. The size and duration of construction activities for the Project will likely provide limited short-term economic benefits to the local economy.

- Land and Resource Use –The pipeline extends from existing TransGas infrastructure near Belle Plaine, SK to the Moose Jaw Industrial Park, traversing the RMs of Pense No. 160 and Moose Jaw No. 161. The lands traversed by the pipeline are primarily used for cropland. Potential effects include the permanent or temporary loss of existing land use practices and/or resources. It is expected that effects to land use will be temporary and disturbed areas will return to pre-disturbance conditions through the implementation of proper soil handling techniques during construction as well as the reclamation of the ROW,

4.2 ENVIRONMENTAL STUDY AREAS

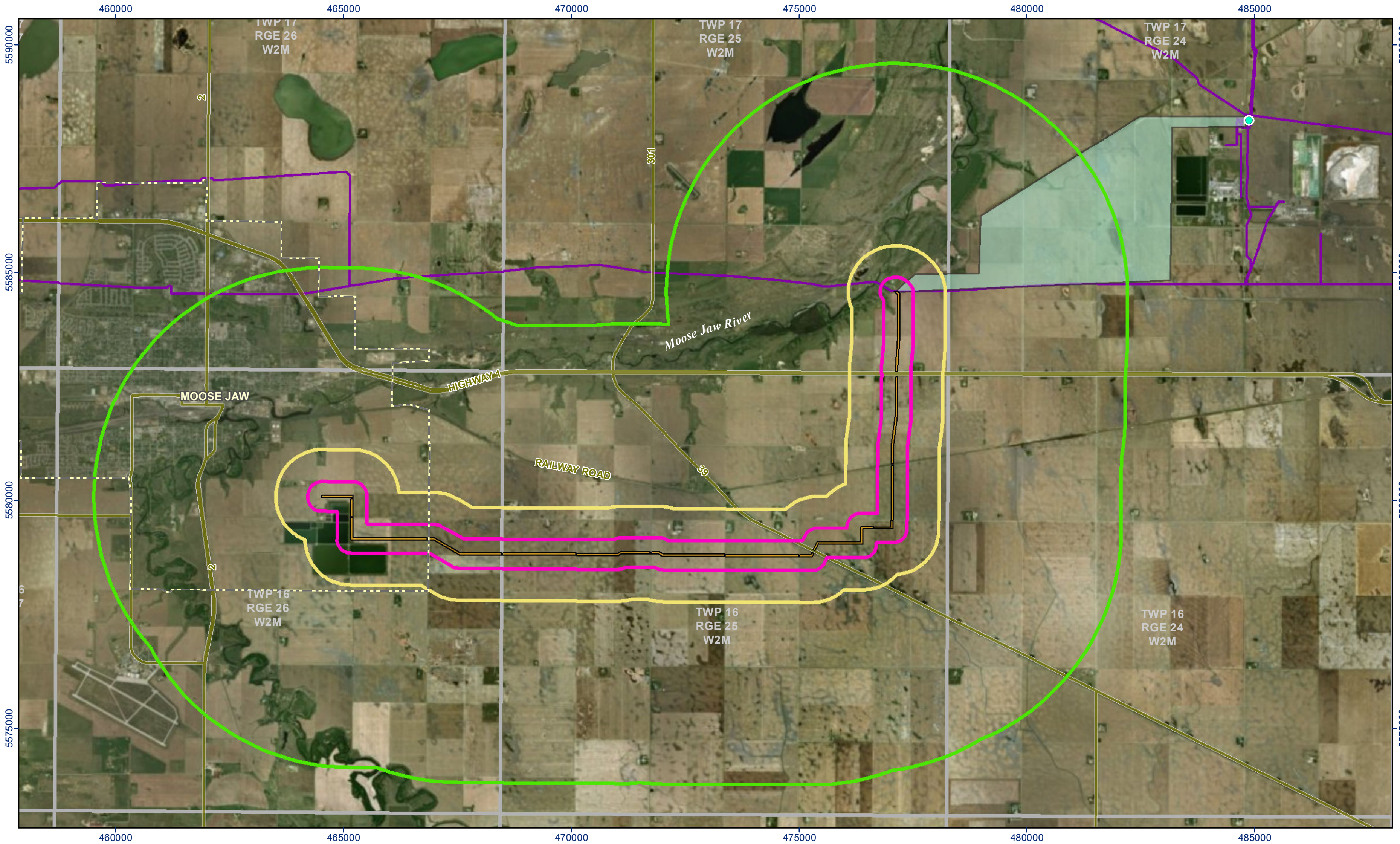
The biophysical components included in the environmental evaluation were screened to determine the spatial boundary over which an effect could be reasonably evaluated. Spatial boundaries are defined below and illustrated in Figure 4-1.

Project Development Area (PDA) The footprint associated with the Project includes areas that may be affected by equipment during construction, operation, and maintenance activities. The route has been finalized for the first 20 km of the Project. As a result, the PDA defined for this portion of the Project is the pipeline ROW (50 m wide) over a distance of 20 km.

The remaining 9 to 11 km of routing has not been finalized, as such, no PDA is defined for this portion. Instead, and in order to support the route selection process, a Project Study Area (1,267 ha) has been defined which encompasses the area in which the remaining pipeline ROW will be sited. Once siting is completed, a PDA will be established and assessed for this portion at that time. The Project Study Area in this document is described with respect to biophysical and human environment resources to aid in the siting of the route in this area.

Local Assessment Area (LAA) An LAA is a component-specific buffer of the PDA that represents the spatial extent within which the Project could have environmental effects on biophysical resources. LAAs have been developed for the different valued components. Specifically, a 300 m buffer of the PDA has been established for terrain and soil, and for vegetation and wetlands, which are called the terrain and soil LAA and the vegetation and wetlands LAA, respectively. The wildlife LAA is a 1 km buffer of the PDA and was established based on the maximum recommended avoidance setback for provincially and federally listed wildlife species of management concern (SOMC) (Section 4.3) that have the potential to occur in the region.

Regional Assessment Area (RAA) The RAA is a 5 km buffer of the PDA that represents a spatial extent that is used to provide broader context of the Project in relation to surrounding environmental effects and biophysical resources.



Project Development Area (PDA)
Pipeline Study Area
Proposed Pipeline Endpoint
Existing TransGas Natural Gas Transmission Pipeline*
Vegetation and Wetlands / Terrain and Soil Local Assessment Area (LAA)
Wildlife LAA
Regional Assessment Area
City Limits
Major Road
Township

N

0 1,500 3,000 metres
(At original document size of 8.5x11)
1:125,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Data Sources: Government of Saskatchewan, Government of Canada
3. Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project Location
Moose Jaw, Saskatchewan

Prepared by JHiebert on 2019-02-12
Technical Review by JHennig on 2019-02-12

Client/Project
113254238_002 REVA

TransGas Limited
Moose Jaw, Saskatchewan

Figure No.
4-1

Title
Environmental Study Areas

Stantec TransGas

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4.3 SPECIES OF MANAGEMENT CONCERN

Species of management concern (SOMC) are defined as federally and provincially legislated species at risk and species identified in federal and provincial tracking lists and activity restriction guidelines, including species:

- Listed under Schedule 1, Schedule 2, or Schedule 3 of the federal SARA (Government of Canada 2002) as *endangered*, *threatened* or *special concern* (Government of Canada 2019);
- Listed in *The Wildlife Act* of Saskatchewan (Government of Saskatchewan 1998) as *endangered*, *threatened* or *vulnerable* (Government of Saskatchewan 2019a);
- Listed by the COSEWIC as *endangered*, *threatened* or *special concern* (Government of Canada 2019);
- Assigned a ranking of S1, S2, or S3 (or a combination of these rankings) by the Saskatchewan Conservation Data Centre (SKCDC; 2018); and
- Included in the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SKMOE 2017).

5.0 ENVIRONMENTAL SETTING

The following sections provide information on the methods and data sources used to establish the existing environmental conditions for the environmental study areas.

5.1 METHODS

5.1.1 Desktop Review

Publicly available sources of information were reviewed for the biophysical and human environment components carried forward in Section 4.1. The sources of information include:

- SKCDC wildlife database for historical records of SOMC and migratory birds (including Saskatchewan Breeding Bird Atlas data; Government of Saskatchewan 2019b);
- SKCDC taxa lists (SKCDC 2018);
- SARA public registry database for SARA- and COSEWIC-listed species (Government of Canada 2019);
- Birds of North America Online database (Cornell Lab of Ornithology and the American Ornithologists' Union 2019);
- Satellite imagery such as ESRI World Imagery (Digital Globe 2016; SGIC 2008-2013; Google Earth Pro 2018);
- Canadian Digital Elevation Data (CDED) (Natural Resources Canada 2016);
- Saskatchewan Soil Information Database Version 4 (SKSID 4.0) (AAFC 2009; University of Saskatchewan 1965);
- AAFC annual crop inventory (AAFC 2017);
- Publicly available GIS spatial layers of protected and designated lands (e.g., conservation easements, provincial park and national parks, national wildlife areas, community pastures, ecological reserves, Saskatchewan watershed authority lands, special management areas, *Wildlife Habitat Protection Act* (WHPA) lands, migratory bird sanctuaries, wildlife refuges, fish and wildlife development fund lands, migratory bird concentration sites, and games preserves) (Government of Saskatchewan 2019b and 2019c); and
- Moose Jaw TBS #2 Lateral Pipeline Project 2017 Field Survey Results (CanNorth 2018).

5.1.2 Desktop Landcover and Wetland Mapping

Desktop mapping of landcover and wetland identification was completed for the PDA and the vegetation and wetland and wildlife LAAs. Wetland class and boundaries were reviewed and interpreted at a scale of 1:3,000 scale with a minimum polygon size of 100 m^2 for wetlands and 400 m^2 for upland vegetation types using satellite imagery from 2008-2011 (SGIC 2008-2011, Google Earth Pro 2018). Wetlands were classified based on permanency according to

Stewart and Kantrud (1971). Imagery from different years was used to make conservative estimates of the wetland boundary.

5.2 RESULTS

Results for the proposed Project are described with respect to each VC. Detailed biophysical information is summarized for the PDA defined for the 20 km of confirmed routing. Additional mapping and observations are stated for the Project Study Area to assist with route selection and identification of potential constraints, such as large wetlands.

5.2.1 Terrain and Soil

The Project is situated within the Moist Mixed Grassland ecoregion and Regina Plain landscape area that is characterized by level to gently undulating terrain, with varying areas that include hummocky uplands, sand dunes, and river valleys. Dark brown chernozems are the dominant soil type within this ecoregion (University of Saskatchewan 1965, Acton et al. 1998).

Baseline terrain conditions for the proposed pipeline PDA and terrain and soil LAA were generally found to be similar (Table 5-1). Very gentle slopes within the 0-2% slope range are dominant within the PDA and LAA, each comprising of 99% or more of the total area. Areas of steep slopes are associated with the Moose Jaw River valley and are expected to be avoided during construction.

Similarly, the Pipeline Study Area is comprised entirely of very gentle slopes.

Table 5-1 – Slopes Classes for the Proposed Pipeline PDA and Terrain and Soil LAA

Slope Classes[1]	PDA (ha)	PDA (%)	Terrain and Soil LAA (ha)	Terrain and Soil LAA (%)
Very Gentle (0-2%)	94.4	100.0	1262.0	99.0
Gentle (2-5%)	0.0	0.0	0.0	0.0
Moderate (5-10%)	0.0	0.0	0.0	0.0
Strong (10-15%)	0.0	0.0	0.0	0.0
Steep Slopes (15-30%)	0.0	0.0	13.3	1.0
Unclassified	0.0	0.0	0.3	0.0
Total	**94.4**	**100.0**	**1275.6**	**100.0**
[1] – Natural Resources Canada 2016				

Soil in the proposed pipeline PDA primarily consist of Orthic Vertisols of the Regina soil association (CanNorth 2018). Soil textures are predominantly clays or heavy clays and were found to be susceptible to erosion. Specifically, all of the PDA and 99% of the terrain and soil LAA were found to have a moderate risk for wind erosion (Table 5-2).

Similarly, the Pipeline Study Area is comprised of 88% moderate and 12% high or very high wind erosion risk.

Table 5-2 – Wind Erosion Risk for the Proposed Pipeline PDA and Terrain and Soil LAA

Wind Erosion Risk[1]	PDA (ha)	PDA (%)	Terrain and Soil LAA (ha)	Terrain and Soil LAA (%)
Low	0.0	0.0	0.0	0.0
Moderate	94.4	100.0	1262.0	98.9
High or Very High	0.0	0.0	0.0	0.0
Extremely High	0.0	0.0	0.0	0.0
Unclassified	0.0	0.0	13.6	1.1
Total	**94.4**	**100.0**	**1275.6**	**100.0**
[1] – AAFC 2009				

5.2.2 Vegetation and Wetlands

The proposed pipeline PDA and vegetation and wetlands LAA are dominated by cultivated landcover (Table 5-3). The PDA contains no native vegetation and areas of shrubland and native vegetation within the vegetation and wetlands LAA are typically limited to areas of topographic relief (e.g., valleys). Although these areas of shrubland and native vegetation have the potential to support plant SOMC, landcover mapping completed for the Project indicates that the PDA and vegetation and wetlands LAA are primarily cultivated land with limited potential to support plant SOMC. Wetlands in the PDA are primarily temporary (Class II) and seasonal (Class III) wetlands (Stewart and Kantrud 1971) that have been affected by agricultural activities, including cultivation during dry years or seasons.

Similarly, the Pipeline Study Area is comprised of 93% agricultural landcover and 7% wetlands that are primarily Class II and III wetlands that have been affected by agricultural activities; there is a single semi-permanent (Class IV) wetland that will be avoided through routing.

Table 5-3 – Land Cover Types within the PDA and Vegetation and Wetlands LAA

Landcover Class[1]	PDA (ha)	PDA (%)	Vegetation and Wetlands LAA (ha)	Vegetation and Wetlands LAA (%)
Agriculture	87.0	92.1	1116.9	87.5
Shrubland and Native Vegetation	0.0	0.0	11.1	0.9
Urban/Developed	0.0	0.0	0.0	0.0
Class I - Ephemeral Wetland	*1.2*	1.2	*9.9*	0.8
Class II - Temporary Wetland	*3.3*	3.2	*71.4*	5.6
Class III - Seasonal Wetland	*2.3*	2.5	*14.8*	1.2
Class IV - Semi-Permanent Wetland	*0.0*	0.0	*0.4*	0.0
Drainage	*0.6*	1.0	*8.3*	0.6
Dugout	*0.0*	0.0	*42.8*	3.4
Total	**94.4**	**100.0**	**1275.6**	**100.0**

[1] – Stewart and Kantrud 1971, SGIC 2008-2011, AAFC 2017

A search of the HABISask SKCDC database found one historical record of a plant SOMC that intersects the proposed pipeline PDA and the vegetation and wetlands LAA. The historical record of plant SOMC was for pepperwort (Marsilea vestita), which is ranked as S3 by the SKCDC (Government of Saskatchewan 2019). The accuracy of the location of the historical records of plant SOMC is uncertain due to the large polygon size of the data source and age of the historical records. Five noxious and one nuisance weed species were identified within the proposed pipeline PDA during a reconnaissance survey completed for the Project in the fall of 2017 (Table 5-4; CanNorth 2018).

Table 5-4 – Weed Species Observed During Field Reconnaissance

Provincial Scientific Name	Provincial Common Name	Weed Designation[1]
Artemesia absinthium	absinthe	noxious
Carduus nutans	nodding thistle	noxious
Cirsium arvense	Canada thistle	noxious
Salsola kali	Russian thistle	nuisance
Sonchus arvenis ssp. Uliginosis	perennial sow thistle	noxious
Sonchus asper ssp. asper	spiny-leaved annual sow thistle	noxious

Note: [1] Weeds are designated under the *Weed Control Act* (Government of Saskatchewan 2010).

5.2.3 Wildlife and Wildlife Habitat

The Project is in the Moist Mixed Grassland ecoregion and supports a wide variety of wildlife species, including 51 species of mammals, 198 breeding species of birds, and 13 species of amphibians and reptiles (Acton et al. 1998). Habitat for wildlife in the ecoregion is comprised predominantly of non-arable areas of native prairie, tame pasture, riparian areas, and wetlands that provide important breeding and staging habitats for a diverse number of wildlife species.

The proposed pipeline PDA, however, is comprised of 92% cultivation and 8% wetlands, while the wildlife LAA is comprised of 92% agricultural land and 8% wetlands (Table 5-5). Overall, wildlife habitat in the PDA and wildlife LAA is limited due to the high proportion of cultivated agricultural land that provides little to no value to most wildlife species. The City of Moose Jaw wastewater treatment plant lagoons adjacent to the Project PDA provide staging habitat for migratory birds while the remaining wetland habitats in the wildlife LAA provide limited opportunities for breeding and non-breeding migratory birds. Wetlands in the PDA are primarily temporary (Class II) and seasonal (Class III) wetlands (Stewart and Kantrud 1971) that have been affected by agricultural activities, including cultivation during dry years or seasons.

Similarly, the Pipeline Study Area is comprised of 93% agricultural landcover and 7% wetlands that are primarily Class II and III wetlands that have been affected by agricultural activities; there is a single semi-permanent (Class IV) wetland that will be avoided through routing.

Table 5-5 – Land Cover Types within the PDA and Wildlife LAA

Landcover Class[1]	PDA (ha)	PDA (%)	Wildlife LAA (ha)	Wildlife LAA (%)
Cultivated	87.0	92.1	3499.2	83.9
Shrubland and Native Vegetation	0.0	0.0	127.1	3.0
Urban/Developed	0.00	0.00	0.00	0.00
Wetland/Water Features	7.4	7.9	545.8	13.1
Total	**94.4**	**100**	**4172.1**	**100**
[1] – Stewart and Kantrud 1971, SGIC 2008-2011, AAFC 2017				

There are no provincially- or federally-designated lands for wildlife within the wildlife LAA; however, the RAA contains a provincial conservation easement 2.5 km west of the Project in section 20-16-26 W2M and N½ 17-16-26 W2M that includes tame pasture, broadleaf shrub, and treed riparian habitats along the Moose Jaw River (Government of Saskatchwan 2019b).

The RAA has the potential to provide habitat for 54 SOMC (including 30 SARA-listed species) given historical records and current range extents: 7 invertebrate species, 6 herptile species, 34 bird species, and 7 mammal species (Appendix A). As described above, the wildlife LAA is subject to high degrees of existing disturbance and habitat conversion, and the PDA is predominantly cultivated farmland.

There are no historical records of SOMC in the proposed pipeline PDA or wildlife LAA and given the lack of wildlife habitat present, SOMC are unlikely to occur. The RAA contains records for monarch (*Danaus plexippus*), northern leopard frog (*Lithobates pipiens*), western painted turtle (*Chrysemys picta*), ferruginous hawk (*Buteo regalis*), burrowing owl (*Athene cunicularia*), short-eared owl (Asio flammeus), common nighthawk (Chordeiles minor), loggerhead shrike (*Lanius ludovicianus excubitorides*), bank swallow (Riparia riparia), barn swallow (*Hirundo rustica*), Sprague's pipit (Anthus spragueii), chestnut-collared longspur (Calcarius ornatus), American badger (*Taxidea taxus taxus*), and olive-backed pocket mouse (*Perognathus fasciatus*) (Government of Saskatchewan 2019b; Figure 5.s). SOMC records in the RAA are limited to areas of wildlife habitat, most notably the Moose Jaw River valley. A section of the Moose Jaw River is provincially-designated as a migratory bird concentration area.

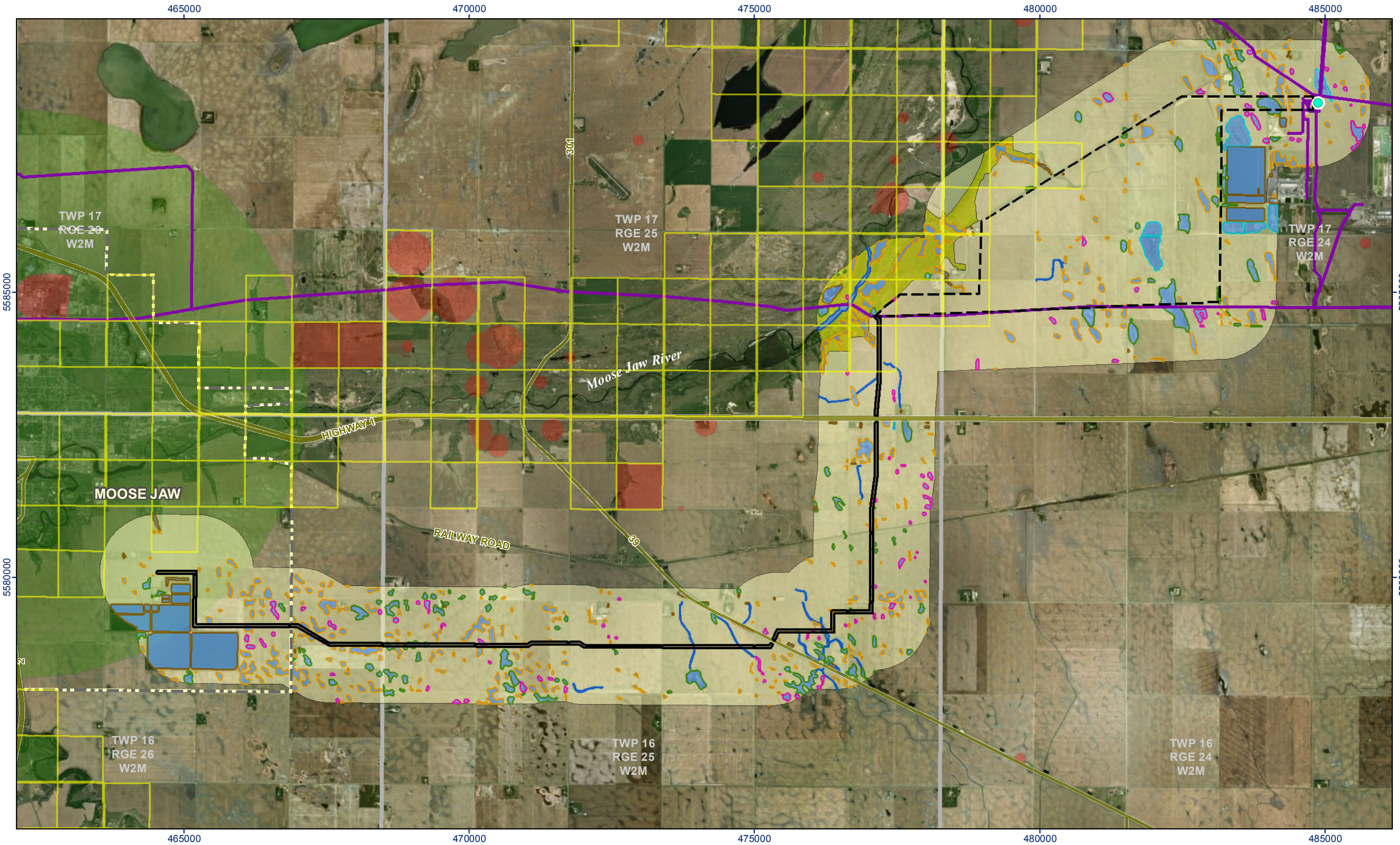
5.2.4 Heritage Resources

In Saskatchewan, heritage resources include pre-contact and post-contact period archaeological sites, built heritage sites and structures of historical and/or architectural interest, and paleontological sites. Heritage resources are the property of the Provincial Crown and are protected under *The Heritage Property Act* (Government of Saskatchewan 1980).

The route will be screened for heritage sensitivity using the HCB Developers' Online Screening Tool. Heritage sensitivity is determined based on the presence of previously recorded heritage resources, the potential for heritage resources to exist (including proximity to waterbodies and/or watercourses, and landscape), previous land disturbance and the nature and scope of the proposed development. Heritage sensitive quarter section identified along the proposed route, will be referred to the HCB for further review.

The results of the HCB's review will outline requirements for an HRIA, if any. The HRIA is to be completed prior to construction in snow-free and frost-free conditions. An HRIA will include a systematic pedestrian survey of the ground to identify surface features (e.g., stone circles, cairns, medicine wheels, etc.) and subsurface testing of parts of the Project Areas to identify potential buried artefacts (e.g., stone tools, bone, etc.). The HRIA must be conducted by a qualified archaeologist under a permit issued by the HCB.

Changes to heritage resources are generally confined to the Project footprint and can be appropriately mitigated prior to construction through conducting an HRIA. If significant heritage resources are identified in unavoidable conflict with the Project footprint, a heritage resource impact mitigation, which is the standard required by the HCB under Section 63 of the *Heritage Property Act* (Government of Saskatchewan 1980), will be completed prior to construction.



Project Development Area
Pipeline Study Area
Proposed Pipeline Endpoint
Existing TransGas Natural Gas Transmission Pipeline*
Heritage Sensitive Quarter Sections

Plant & Wildlife SOMC
Wildlife SOMC
Plant SOMC

Landcover
Agriculture
Shrubland
Urban/Developed

Waterbody/Wetland Class
Ephemeral Wetland
Temporary Wetland
Seasonal Wetland
Semi-Permanent Wetland
Drainage
Dugout

N

0 1,000 2,000 metres
(At original document size of 8.5x11)
1:100,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Data Sources: Government of Canada, Government of Saskatchewan, Saskatchewan Conservation Data Centre (SKCDC), Stantec Consulting
3. Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Stantec TransGas

Project Location
Moose Jaw, Saskatchewan

Prepared by JHiebert on 2019-02-12
Technical Review by JHennig on 2019-02-12

Client/Project
113254233_006 REVC

TransGas Limited
Moose Jaw, Saskatchewan

Figure No.
5-1

Title
Biophysical and Heritage Resources

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6.0 POTENTIAL EFFECTS AND MITIGATION MEASURES

6.1 TERRAIN AND SOIL

The Project has the potential to affect terrain and soil through a change in terrain integrity and soil quality and quantity. Potential effects include wind and water erosion as a result of soil exposed during soil stripping and stockpiling activities, as well as rutting, admixing, and compaction resulting from work during wet conditions or in areas with saturated soil.

Vegetation clearing and removal during construction exposes soil, which can lead to erosion and soil loss. Erosion and soil loss are typically related to exposure to wind and water, including one-time severe weather events.

During construction, compaction and rutting can affect soil structure and reduce the soil's ability to support plant growth. Compaction can reduce pore space through increased bulk density and is largely driven by soil texture, with finer soil (i.e., clay) more prone to compaction than coarser soil (i.e., sand). Compaction can also increase water runoff, leading to reduced water infiltration, increased water erosion and less water for plant uptake. Rutting is largely influenced by moisture; as soil moisture increases, the soil's susceptibility to rutting also increases.

In addition to the implementation of the SaskEnergy/TransGas *Environmental Protection Standards* (2017), potential mitigation measures to reduce potential effects to terrain and soil will include but not be limited to:

- Minimizing the PDA to the extent feasible;
- Topsoil stripping will be limited to the extent feasible to reduce the disturbance area;
- Restricting work to dry or frozen conditions to reduce the potential for rutting, compaction, and clumping;
- Suspending activities if near-saturated soil conditions or high winds exist;
- Properly stripping, stockpiling, and handling surface and subsoil to prevent mixing.;
- Using equipment (i.e., paratiller) to reduce areas with compacted soil, if required;
- Stabilize exposed soil and soil stockpiles to reduce the potential for erosion and soil loss; and
- Implement and maintain appropriate erosion and sediment control measures, as needed, until replaced or long-term storage (i.e., compressor station) topsoil is revegetated or has a self-sustaining cover.

6.2 VEGETATION AND WETLANDS

Potential effects on vegetation include a change in the abundance, distribution or composition of vegetation communities through the loss or alteration of native vegetation due to ground disturbance and equipment travel within PDA and the introduction or spread of weed species or invasive plants. A change in vegetation species abundance or distribution could occur through the potential loss or alteration of rare plant species; however, this is unlikely as there is no native vegetation within the proposed pipeline PDA.

Wetland habitats in the PDA have the potential to be affected by pipeline construction activities. While most temporary and seasonal wetlands are subject to existing agricultural disturbance (e.g., tilling), best management practices will be used to mitigate any potential adverse effect.

The following mitigations will be carried out to reduce or avoid effects to vegetation and wetlands:

- Avoid areas of native vegetation (i.e., potential rare plant habitat) through routing;
- Pipeline construction through seasonal and temporary wetlands will be conducted under dry or frozen conditions while following applicable permit conditions (e.g., aquatic habitat protection permit);
- Reducing the PDA to the extent feasible;
- Identify rare plants prior to, or during construction, and stake or temporary erect fencing to facilitate exclusion;
- Ensuring all vehicles are clean and free of weeds before entering the PDA. Equipment will be inspected by an Environmental Monitor prior to use;
- Conduct reclamation activities, including topsoil replacement and seeding, as soon as feasible following construction when ground conditions and moisture levels permit; and
- Select seed mixture(s), if required, that are consistent and compatible with the current vegetation community. Seed mixes will be certified and approved by TransGas prior to their use.

6.3 WILDLIFE AND WILDLIFE HABITAT

Wildlife habitat within the PDA is limited to the temporary and seasonal wetlands that have been subject to existing agricultural disturbance. Indirect habitat loss (i.e., reduced habitat effectiveness) may occur during construction of the pipeline through temporary sensory disturbance associated with construction activities (e.g., noise and lights from vehicles and equipment). Responses to sensory disturbance will vary depending on species and individuals but could include habitat avoidance of an area because of noise, artificial lights, or vibrations (Bayne et al. 2008), diminished reproductive success (Habib et al. 2007) or increased stress response (Francis and Barber 2013). Sensory disturbance during construction may affect wildlife species in the PDA and wildlife LAA, where suitable habitat exists, but this effect is expected to be low due to the sparsity of wildlife habitat, the short duration of activities, and existing levels of ongoing disturbance.

Project construction has the potential to result in increased mortality risk for wildlife species, including SOMC and migratory birds. Specifically, removal of vegetation and topsoil, and grading activities could result in the destruction of bird nests or animal burrows, and consequently, the accidental mortality of small, less mobile species or individuals (e.g., small mammals, amphibians, reptiles, juvenile birds). In addition, there may be an increased risk of direct mortality to wildlife due to accidental collisions with Project-related equipment or vehicles during construction, including increased traffic volume and use of heavy equipment along local roadways in the wildlife LAA. Increased mortality risk during construction could also occur if animals become trapped in the open pipe trench, before lowering-in of the pipe and backfilling. Trench related mortalities are primarily of concern for amphibians, reptiles, and small mammals that have reduced capabilities to escape entrapment (Woinarski et al. 2000), but this mechanism may affect larger mammalian wildlife species as well.

The potential for wildlife mortality will be short term and limited to the duration of construction activities. Construction of the pipeline will occur in fall 2021 with reclamation occuring between fall 2021 and fall 2022. Construction timing for the pipeline will avoid the migratory bird nesting period, as such, this component of the Project is not expected to have any adverse effect on species nesting within the wildlife LAA. With the implementation of mitigation measures, the risk of wildlife mortality during pipeline installation is expected to be low.

Standard industry practices and avoidance measures, along with Project-specific mitigation measures, will be implemented during construction to reduce effects on wildlife through changes in wildlife habitat and mortality risk. Key mitigation measures will include:

- Loss or modification of wildlife habitat (i.e., wetlands) will be reduced or eliminated by only clearing land within the marked limits of the construction site and adhering to provincial aquatics habitat protection permit (AHPP) conditions;
- Flagging and/or fencing sensitive wildlife features (e.g., active nests, wetlands) in the field, as specified by project environmental permits and approvals and related environmental instructions, prior to commencement of clearing and construction;
- Clearing activities scheduled to occur within suitable habitat during the migratory birds primary nesting period (i.e., Zone B4; April 22 to August 24) (ECCC 2018) will include nest searches prior to construction activities to determine the presence of active nests. If an active migratory bird nest is detected, an appropriate setback (to be determined in consultation with regulatory agencies such ECCC and SKMOE) will need to be established around the nest and construction activities will not be permitted in that area until nesting activities are completed;
- Reporting any previously unidentified sensitive habitat features to TransGas and the environmental monitor who will report the information to appropriate regulator and a mitigation plan will be developed, if required;
- Restricting vehicular traffic and construction activities to the designated construction footprint and temporary workspaces. If boundary stakes are inadvertently damaged or destroyed, they will be replaced immediately;
- Limiting project-related vehicle traffic to the PDA and approved access routes will be required to adhere to designated speed limits. Recreational use of ATVs by construction personnel will be prohibited on the construction site;
- Erecting fencing around open excavations to exclude wildlife;
- Reporting Project-related wildlife deaths or injury and nuisance animals to TransGas and appropriate regulators; and
- Mandated good housekeeping practices and garbage disposal to avoid attracting scavenger species. Construction personnel will not feed, lure or harass wildlife.

7.0 SUMMARY

TransGas is proposing to construct and install a 30 km 16-24” diameter natural gas pipeline to meet increasing demand in the Moose Jaw area. The pipeline will begin by tying into the existing TransGas system near Belle Plaine, SK and will terminate at a proposed SaskEnergy TBS within the Moose Jaw Industrial Park.

A desktop review of publicly available data sources was conducted to provide a baseline characterization of the Project-related biophysical resources. Hydrogeology, surface hydrology, atmospheric, and socio-economic valued components are not included in the environmental overview because Project interactions are unlikely to occur or can be addressed through standard, well-established mitigation measures and best management practices. The environmental overview focuses on valued components that have the greatest likelihood of interacting with the Project and are: terrain and soil, vegetation and wetlands, wildlife and wildlife habitat, and heritage resources.

The PDA is almost entirely cultivated agricultural land interspersed with temporary and seasonal wetlands. There is one historical record of one plant SOMC (pepperwort; 1896) within the proposed pipeline PDA but modern land use in the PDA and vegetation and wetlands LAA has limited potential to support plant SOMC. Six nuisance or noxious weed species were recorded during pipeline ROW field surveys: absinthe, nodding thistle, Canada thistle, Russian thistle, perennial sow thistle, and spiny-leaved annual sow thistle. No prohibited weeds were observed during the surveys. There are no records of wildlife SOMC in the wildlife LAA and there is little potential for wildlife SOMC to inhabit the LAA due to the limited availability of wildlife habitat.

Depending on final routing, the PDA will intersect 4-7 quarter sections of heritage sensitive land associated with the Moose Jaw River valley. The results of an HCB review will guide the requirements of further HRIA, if any, and will be completed prior to construction in snow-free and frost-free conditions. The Project will not proceed with construction until HCB has approved the HRIA permit report and any proposed mitigation measures are implemented.

Overall, the Project is in a highly disturbed and developed landscape and after the application of mitigation measures and best management practices, there is limited potential for interaction with the VCs and Project-related environmental effects are expected to be minimal.

8.0 REFERENCES

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Appendix A WILDLIFE TABLES

A.1 Wildlife SOMC with the Potential to Occur in the Wildlife LAA

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]	SKMOE Activity Restriction Feature (Recommended Setback)[4]
INVERTEBRATES[5]						
Monarch	*Danaus plexippus*	Special Concern	Endangered	-	S2B	-
Verna's flower moth	*Schinia verna*	Threatened	Threatened		S1	-
Gypsy cuckoo bumble bee	*Bombus bohemicus*	Endangered	Endangered	-	S1	-
Yellow-banded bumble bee	*Bombus terricola*	Special Concern	Special Concern	-	S5	-
Nine-spotted lady beetle	*Coccinella novemnotata*	-	Endangered	-	S4	-
Greenish-white grasshopper	*Hypochlora alba*	Special Concern	Special Concern	-	S4	-
HERPTILES						
Plains spadefoot toad	*Spea bombifrons*	-	-	-	S3	Breeding and overwintering habitat (90 m)
Great Plains toad	*Anaxyrus cognatus*	Special Concern	Special Concern	-	S3	Breeding and overwintering habitat (400 m)
Canadian toad	*Anaxyrus hemiophrys*	-	-	-	S4	Breeding and overwintering habitat (90 m)
Northern leopard frog	*Lithobates pipiens*	Special Concern	Special Concern	-	S3	Breeding and overwintering habitat (200 m)
Bullsnake	*Pituophis catenifer sayi*	-	Special Concern	-	S4	-
Western tiger salamander	*Ambystoma mavortium*	Special Concern	Special Concern	-	S4	-
Western painted turtle	*Chrysemys picta*	-	-	-	S3	-
BIRDS						
Sharp-tailed grouse	Tympanuchus phasianellus	-	-	-	S5	Lek (400 m)
Western Grebe	Aechmophorus occidentalis	Special Concern	Special Concern	-	S3B, S3M	Breeding Bird* or Nesting colony (200 m)
Eared grebe	Podiceps nigricollis	-	-	-	S5B	Nesting colony (1000 m)
Horned grebe	Podiceps auritus	Special Concern	Special Concern	-	S5B	-
American bittern	Botaurus lentiginosus	-	-	-	S4B	Breeding bird* (350 m)
Great blue heron	Ardea herodias	-	-	-	S3B	Nesting colony (1000 m)
Black-crowned night-heron	Nycticorax nycticorax	-	-	-	S5B	Nesting colony (1000 m)

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]	SKMOE Activity Restriction Feature (Recommended Setback)[4]
Yellow rail	Coturnicops noveboracensis	Special Concern	Special Concern	-	S3B, S2M	Breeding bird* (350 m)
Whooping crane	Grus americana	Endangered	Endangered	Endangered	SXB, S1M	Staging area (1000 m)
Piping plover	Charadrius melodus	Endangered	Endangered	Endangered	S3B	High-water mark
Long-billed curlew	Numenius americanus	Special Concern	Special Concern	-	S3B, S4M	Breeding bird* (200 m)
Herring gull	Larus argentatus	-	-	-	S5B, S5M	Nesting colony (400 m)
Franklin's gull	Leucophaeus pipixcan	-	-	-	S4B, S4M	Nesting colony (400 m)
Bonaparte's gull	Chroicocephalus philadelphia	-	-	-	S4B, S4M	Nesting colony (400 m)
Black tern	Chlidonias niger	-	-	-	S4B	Nesting colony (400 m)
Common tern	Sterna hirundo	-	-	-	S5B, S5M	Nesting colony (400 m)
Forster's tern	Sterna forsteri	-	-	-	S4B	Nesting colony (400 m)
Turkey vulture	Cathartes aura	-	-	-	S2B, S2M, S2N	-
Ferruginous hawk	Buteo regalis	Threatened	Threatened	-	S4B, S4M	Nest site (1000 m)
Golden eagle	Aquila chrysaetos	-	Not at Risk	-	S3B, S4M, S3N	Nest site (1000 m)
Peregrine falcon	Falco peregrinus	Special Concern	-	-	S1B, S4M, S2N	Nest site (1000 m)
Burrowing owl	Athene cunicularia	Endangered	Endangered	Endangered	S2B	Breeding bird* (500 m)
Short-eared owl	Asio flammeus	Special Concern	Special Concern	-	S3B, S2N	Breeding bird* (500 m)
Common nighthawk	Chordeiles minor	Threatened	Special Concern	-	S4B, S4M	Breeding bird* (200 m)
Chimney swift	Chaetura pelagica	Threatened	Special Concern	-	S2B	Breeding bird* (300 m)
Red-headed woodpecker	Melanerpes erythrocephalus	Threatened	Endangered	-	S1B, S1M	Breeding bird* (100 m)
Loggerhead shrike	Lanius ludovicianus excubitorides	Threatened	Threatened	-	S3B	Breeding bird* (400 m)
Bank swallow	Riparia riparia	Threatened	Threatened	-	S5B, S5M	-
Barn swallow	Hirundo rustica	Threatened	Threatened	-	S5B, S5M	-
Sprague's pipit	Anthus spragueii	Threatened	Threatened	-	S3B	Breeding bird* (250 m)
McCown's longspur	Rhynchophanes mccownii	Special Concern	Threatened	-	S3B	Breeding bird* (200 m)
Chestnut-collared longspur	Calcarius ornatus	Threatened	Threatened	-	S5B	Breeding bird* (200 m)
Bobolink	Dolichonyx oryzivorus	Threatened	Threatened	-	S5B	-
Baird's sparrow	Ammodramus bairdii	Special Concern	Special Concern	-	S4B	-
MAMMALS						
Little brown myotis	*Myotis lucifugus*	Endangered	Endangered	-	S4	Roost/foraging site (500 m)
Big brown bat	*Eptesicus fuscus*	-	-	-	S5	Roost/foraging site (500 m)

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]	SKMOE Activity Restriction Feature (Recommended Setback)[4]
Silver-haired bat	*Lasionycteris noctivagans*	-	-	-	S5B	Roost/foraging site (500 m)
Hoary bat	*Lasiurus cinereus*	-	-	-	S5B	Roost/foraging site (500 m)
American badger	*Taxidea taxus taxus*	Special Concern	Special Concern	-	S3	-
Olive-backed pocket mouse	*Perognathus fasciatus*	-	-	-	S3	-
Pronghorn	*Antilocapra americana*	-	-	-	S3	-

NOTES:
[1] Species listed under Schedule 1 of the Species at Risk Act (Government of Canada 2019)
[2] Species listed under The Wildlife Act; Saskatchewan Ministry of Environment Species at Risk (Government of Saskatchewan 2019a)
[3] Saskatchewan Conservation Data Centre species lists (SKCDC 2019); designations are as follows:
S = province-wide status
1 = critically imperiled / extremely rare: at very high risk of extinction or extirpation due to extreme rarity, very steep declines, high threat level, or other factors
2 = imperiled / very rare: at high risk of extinction or extirpation due to a very restricted range, very few populations, steep declines, threats or other factors
3 = vulnerable / rare to uncommon: at moderate risk of extinction or extirpation due to a restricted range, relatively few populations, recent and widespread declines, threats, or other factors
4 = apparently secure: uncommon but not rare; some cause for long-term concern due to declines or other factors
5 = secure / common: demonstrably secure under present conditions; widespread and abundant; low threat level
S#S# = Range of uncertainty about the exact rarity of the species
B = for a migratory species, applies to the breeding population in the province
M = for a migratory species, rank applies to the transient (migrant) population
N = for a migratory species, applies to the non-breeding population in the province
NA = conservation status is not applicable to the species (e.g. it may have been introduced in Saskatchewan)
[4] Saskatchewan Activity Restriction Guidelines for Sensitive Species (SKMOE 2017)
[5] Includes only SARA- and COSEWIC-listed species
* characterized by breeding bird behavior (e.g., (territorial calling to competing male, mate or young; singing; courtship displays; carrying food or nest materials) or presence of nest or young found incidentally.

Appendix B LAND TITLES

Province of Saskatchewan Land Titles Registry Title

Title #: 149801294
Title Status: Active
Parcel Type: Surface
Parcel Value: $0.00 CAD
Title Value: *$0.00 CAD*
Converted Title: 61MJ08419
Previous Title and/or Abstract #: 138361372

As of: 24 Jan 2019 13:33:45
Last Amendment Date: 28 Dec 2018 13:34:32.220
Issued: 10 Aug 2017 12:37:07.767

Municipality: CITY OF MOOSE JAW

CITY OF MOOSE JAW is the registered owner of Surface Parcel #203368563

Reference Land Description: NE Sec 27 Twp 16 Rge 26 W 2 Extension 2

This title is subject to any registered interests set out below and the exceptions, reservations and interests mentioned in section 14 of *The Land Titles Act, 2000.*

Registered Interests:

Interest #:
179763126

CNV Easement

Value: N/A
Reg'd: 01 Jun 1961 00:10:20
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

NE
Holder:
Saskatchewan Power Corporation
N/A
N/A, Saskatchewan, Canada
Client #: 102198494

Int. Register #: 100516384
Converted Instrument #: 61MJ06204

Interest #:
179763137

CNV Caveat

Value: N/A
Reg'd: 01 May 1991 00:07:45
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

Except all mines and minerals
Holder:
SASKENERGY INCORPORATED
700 - 1777 Victoria Avenue
Regina, Saskatchewan, Canada S4P 4K5
Client #: 105200693

Int. Register #: 100516395
Converted Instrument #: 91MJ04647

Interest #:
183941051

Miscellaneous Interest

Value: N/A
Reg'd: 28 Dec 2018 13:34:32
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

OPTION TO PURCHASE LAND AND RIGHT OF ENTRY DATED DECEMBER 21, 2018 BETWEEN SASKATCHEWAN POWER CORPORATION, AS OPTIONEE AND THE CITY OF MOOSE JAW, AS OPTIONOR

Holder:
SASKATCHEWAN POWER CORPORATION
2025 VICTORIA AVE
REGINA, SK, Canada S4P 0S1
Client #: 100307618

Int. Register #: 123266347

Addresses for Service:

Name	**Address**
Owner: CITY OF MOOSE JAW Client #: 100818435	228 MAIN ST. MOOSE JAW, Saskatchewan, Canada S6H 3J8

Notes:

Parcel Class Code: Parcel (Generic)

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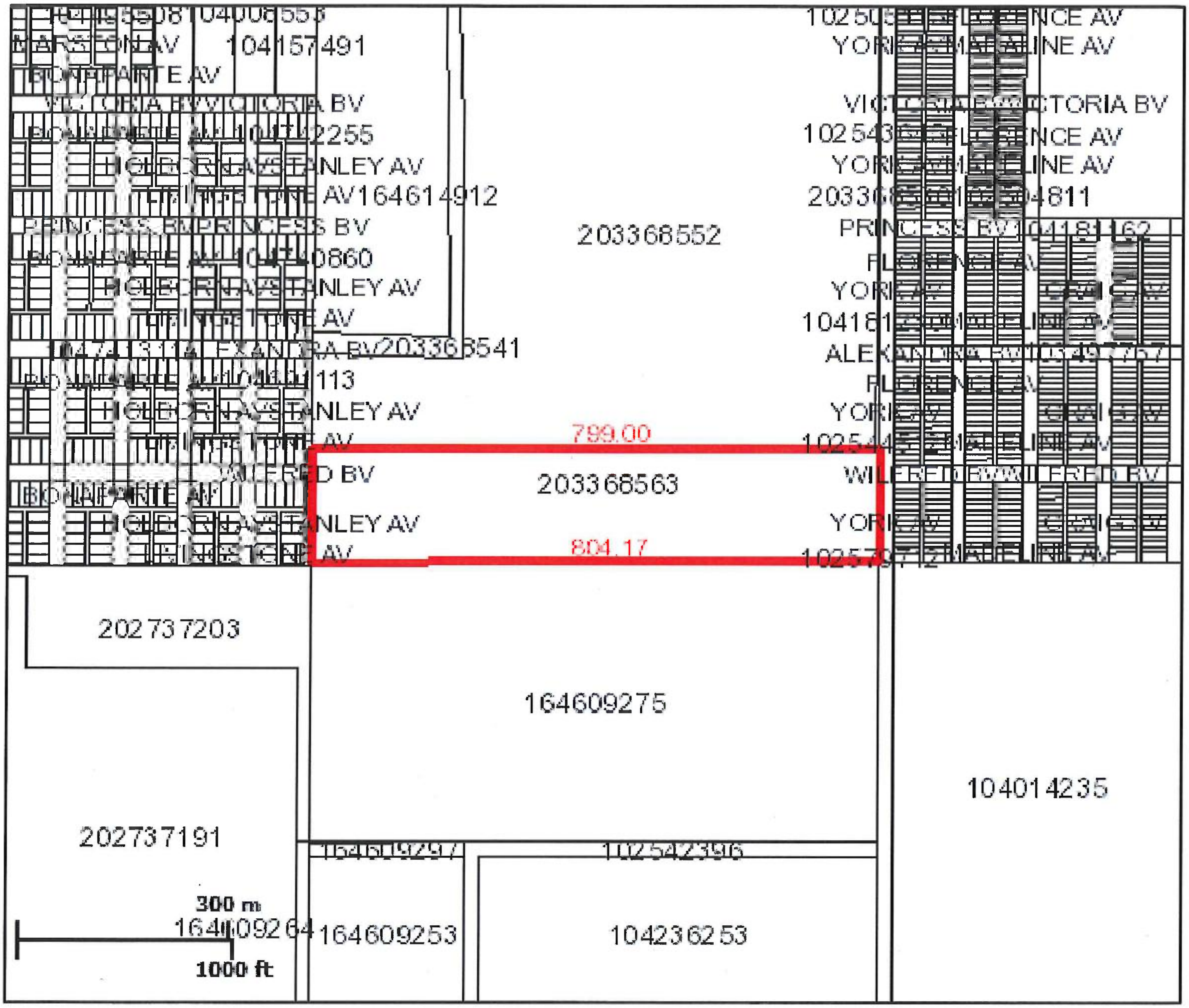
Information Services Corporation

Surface Parcel Number: 203368563

REQUEST DATE:24-Jan-2019 2:47:37 PM



Owner Name(s): CITY OF MOOSE JAW

Municipality: CITY OF MOOSE JAW

Title Number(s): 149801294

Parcel Class: Parcel (Generic)

Land Description: NE 27-16-26-2 Ext 2

Source Quarter Section: NE-27-16-26-2

Commodity/Unit: Not Applicable

Area: 12.786 hectares (31.6 acres)

Converted Title Number: 61MJ08419

Ownership Share: 1:1

Province of Saskatchewan Land Titles Registry Title

Title #: 138106986
Title Status: Active
Parcel Type: Surface
Parcel Value: $0.00 CAD
Title Value: *$0.00 CAD*
Converted Title: 61MJ08419
Previous Title and/or Abstract #: 102884575

As of: 24 Jan 2019 13:31:37
Last Amendment Date: 28 Dec 2018 13:34:32.207
Issued: 15 Sep 2009 10:26:56.903

Municipality: CITY OF MOOSE JAW

CITY OF MOOSE JAW is the registered owner of Surface Parcel #164609275

Reference Land Description: SE Sec 27 Twp 16 Rge 26 W 2 Extension 3
As shown on Plan 101988580

This title is subject to any registered interests set out below and the exceptions, reservations and interests mentioned in section 14 of *The Land Titles Act, 2000.*

Registered Interests:

Interest #:
148799907

CNV Easement

Value: N/A
Reg'd: 20 May 1958 01:23:30
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

SE
Holder:
Saskatchewan Power Corporation
N/A
N/A, Saskatchewan, Canada
Client #: 102198506

Int. Register #: 100516407
Converted Instrument #: EG5010

Interest #:
148799918

CNV Caveat

Value: N/A
Reg'd: 01 May 1991 00:07:45
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

Except all mines and minerals
Holder:
SASKENERGY INCORPORATED
700 - 1777 Victoria Avenue
Regina, Saskatchewan, Canada S4P 4K5
Client #: 105200693

Int. Register #: 100516395

Converted Instrument #: 91MJ04647

Interest #:
182807152

TransGas Easement - SaskEnergy Act (s.19)

Value: N/A
Reg'd: 14 Aug 2018 16:01:35
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

Holder:
TRANSGAS LIMITED
700 - 1777 Victoria Ave
Regina, Saskatchewan, Canada S4P 4K5
Client #: 105200985

Int. Register #: 123050719

Interest #:
183941040

Miscellaneous Interest

Value: N/A
Reg'd: 28 Dec 2018 13:34:32
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

OPTION TO PURCHASE LAND AND RIGHT OF ENTRY DATED DECEMBER 21, 2018 BETWEEN SASKATCHEWAN POWER CORPORATION, AS OPTIONEE AND THE CITY OF MOOSE JAW, AS OPTIONOR

Holder:
SASKATCHEWAN POWER CORPORATION
2025 VICTORIA AVE
REGINA, SK, Canada S4P 0S1
Client #: 100307618

Int. Register #: 123266347

Addresses for Service:

Name	**Address**
Owner: CITY OF MOOSE JAW Client #: 100818435	228 MAIN ST. MOOSE JAW, Saskatchewan, Canada S6H 3J8

Notes:

Under The Planning and Development Act, 2007, the title for this parcel and parcels 104236253, 164609253 may not be transferred or, in certain circumstances, mortgaged or leased separately without the approval of the appropriate planning authority.

Parcel Class Code: Parcel (Generic)

Back

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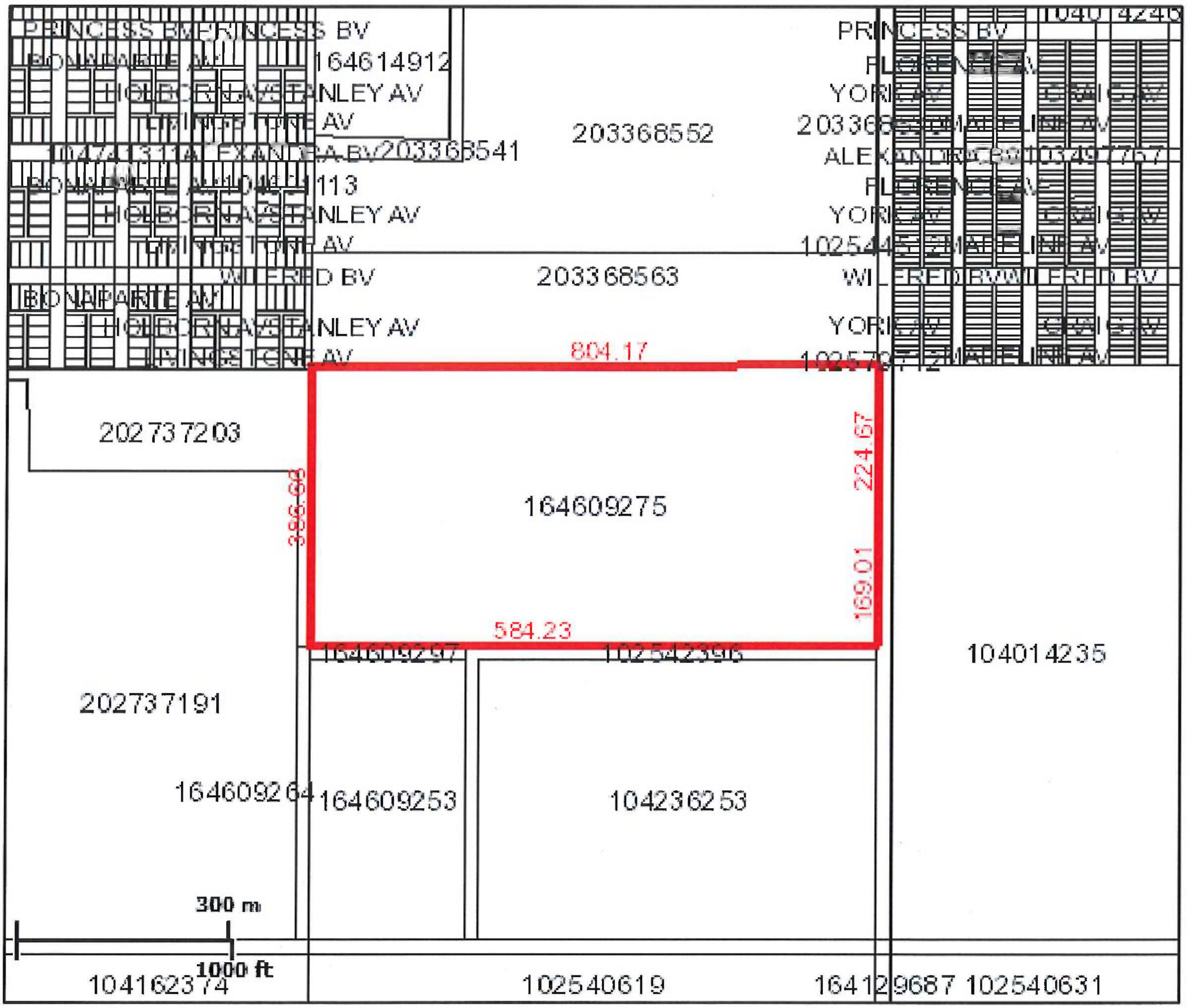
Information Services Corporation

Surface Parcel Number: 164609275

REQUEST DATE:24-Jan-2019 2:46:41 PM



Owner Name(s): CITY OF MOOSE JAW

Municipality: CITY OF MOOSE JAW

Title Number(s): 138106986

Parcel Class: Parcel (Generic)

Land Description: SE 27-16-26-2 Ext 3

Source Quarter Section: SE-27-16-26-2

Commodity/Unit: Not Applicable

Area: 31.653 hectares (78.22 acres)

Converted Title Number: 61MJ08419

Ownership Share: 1:1

DISCLAIMER: THIS IS NOT A PLAN OF SURVEY It is a consolidation of plans to assist in identifying the location, size and shape of a parcel in relation to other parcels. Parcel boundaries and area may have been adjusted to fit with adjacent parcels. To determine actual boundaries, dimensions or area of any parcel, refer to the plan, or consult a surveyor.

Province of Saskatchewan
Land Titles Registry
Uncertified Mineral Title

Title #: 102884597
Title Status: Active - Locked
Parcel Type: Mineral - All
Mineral Value: N/A
Title Value: *N/A*
Converted Title: 61MJ08419
Previous Title and/or Abstract #: 61MJ08419

As of: 06 Mar 2019 15:02:48
Last Amendment Date: 18 Dec 2001 18:15:04.780
Issued: 11 Oct 2001 19:34:49.590

Municipality: CITY OF MOOSE JAW

CITY OF MOOSE JAW is the uncertified owner of all mines and minerals as referenced on Certificate of Title 61MJ08419 in Mineral Parcel #105704557

Reference Land Description: SE Sec 27 Twp 16 Rge 26 W 2 Extension 0
As described on Certificate of Title 61MJ08419.

The registered interests set out below have been registered respecting this uncertified mineral title.

Registered Interests:

Interest #:
101347916

CNV Easement

Value: N/A
Reg'd: 20 May 1958 01:23:30
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

SE
Holder:
Saskatchewan Power Corporation
N/A
N/A, Saskatchewan, Canada
Client #: 102198506

Int. Register #: 100516407
Converted Instrument #: EG5010

Interest #:
101347927

CNV Caveat

Value: N/A
Reg'd: 01 May 1991 00:07:45
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

Except all mines and minerals
Holder:
SASKENERGY INCORPORATED
700 - 1777 Victoria Avenue
Regina, Saskatchewan, Canada S4P 4K5
Client #: 105200693

Int. Register #: 100516395

Converted Instrument #: 91MJ04647

Addresses for Service:

Name	Address
Owner: CITY OF MOOSE JAW Client #: 100818435	228 MAIN ST. MOOSE JAW, Saskatchewan, Canada S6H 3J8

Title Locks:

Date	Type	Description
11 Oct 2001 19:34:50	Uncertified Mineral Title - Non-Producing Area (Transfer Permitted)	mineral title without a mineral certificate

Notes:

Parcel Class Code: Mineral

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Province of Saskatchewan
Land Titles Registry
Uncertified Mineral Title

Title #: 102884564
Title Status: Active - Locked
Parcel Type: Mineral - All
Mineral Value: N/A
Title Value: *N/A*
Converted Title: 61MJ08419
Previous Title and/or Abstract #: 61MJ08419

As of: 06 Mar 2019 15:05:08
Last Amendment Date: 18 Dec 2001 18:15:04.780
Issued: 11 Oct 2001 19:34:42.700

Municipality: CITY OF MOOSE JAW

CITY OF MOOSE JAW is the uncertified owner of all mines and minerals as referenced on Certificate of Title 61MJ08419 in Mineral Parcel #105704546

Reference Land Description: NE Sec 27 Twp 16 Rge 26 W 2 Extension 0
As described on Certificate of Title 61MJ08419.

The registered interests set out below have been registered respecting this uncertified mineral title.

Registered Interests:

Interest #:
101347859

CNV Easement

Value: N/A
Reg'd: 01 Jun 1961 00:10:20
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

NE
Holder:
Saskatchewan Power Corporation
N/A
N/A, Saskatchewan, Canada
Client #: 102198494

Int. Register #: 100516384
Converted Instrument #: 61MJ06204

Interest #:
101347860

CNV Caveat

Value: N/A
Reg'd: 01 May 1991 00:07:45
Interest Register Amendment Date: N/A
Interest Assignment Date: N/A
Interest Scheduled Expiry Date: N/A
Expiry Date: N/A

Except all mines and minerals
Holder:
SASKENERGY INCORPORATED
700 - 1777 Victoria Avenue
Regina, Saskatchewan, Canada S4P 4K5
Client #: 105200693

Int. Register #: 100516395

Converted Instrument #: 91MJ04647

Addresses for Service:

Name	Address
Owner: CITY OF MOOSE JAW Client #: 100818435	228 MAIN ST. MOOSE JAW, Saskatchewan, Canada S6H 3J8

Title Locks:

Date	Type	Description
11 Oct 2001 19:34:43	Uncertified Mineral Title - Non-Producing Area (Transfer Permitted)	mineral title without a mineral certificate

Notes:

Parcel Class Code: Mineral

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Appendix C AIR MODELLING RESULTS

Moose Jaw Power Station Air Dispersion Modelling

SaskPower

Moose Jaw Power Station Project
Project No. 112866

March 2019

Moose Jaw Power Station Air Dispersion Modelling

prepared for

SaskPower
Moose Jaw Power Station Project
Saskatchewan, Canada

Project No. 112866

March 2019

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
$\mu g/m^3$	microgram per cubic meter
AERMAP	AMS/EPA Regulatory Model's terrain pre-processor
AERMOD	AMS/EPA Regulatory Model
ARM	Ambient Ratio Method
BPIP-PRIME	Building Profile Input Program – Plume Rise Model Enhancements
CAAQ	Canadian Ambient Air Quality Standards
CO	carbon monoxide
g/s	grams per second
GEP	Good Engineering Practice
hp	horsepower
HRSG	heat recovery steam generator
kW	kilowatt
m/s	meters per second
Ministry	Saskatchewan Ministry of Environment
MMBtu/hr	million British thermal units per hour
MW	megawatt
NAD 83	North American Datum of 1983
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
ºC	degrees Celsius
OLM	Ozone Limiting Method

Abbreviation	**Term/Phrase/Name**
PM	particulate matter
PM_{10}	particulate matter of 10 microns in diameter or smaller
$PM_{2.5}$	particulate matter of 2.5 microns in diameter or smaller
ppm	parts per million
PVMRM	Plume Volume Molar Ratio Method
SAAQS	Saskatchewan Ambient Air Quality Standards
SaskPower	Saskatchewan Power
SO_2	sulphur dioxide
U.S. EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator

1.0 INTRODUCTION

Pursuant to the Saskatchewan air quality regulatory requirements, Saskatchewan Power (SaskPower) has performed air dispersion modelling to determine compliance with ambient air quality standards for a proposed combined-cycle power plant. The Moose Jaw Power Station Project (Project) is anticipated to be a nominal 350 megawatts (MW) gas-fired power plant which will consist of one F-Class combustion turbine with heat recovery steam generator (HRSG), one steam turbine and associated equipment. The Project will be located southwest of Moose Jaw, Saskatchewan. The combustion turbine will be designed to utilize pipeline-quality natural gas only. In addition to the combustion turbine, one natural gas-fired dew point heater, an emergency diesel fire pump, and an emergency diesel generator will also be included as part of the Project. The location of the Project is shown in Figure A-1 (Appendix A) and a plot plan of the Project is shown in Figure A-2 (Appendix A).

Emission of air contaminants will result from the combustion of natural gas in the proposed combined-cycle combustion turbine. There will also be emissions of air contaminants generated from the emergency diesel generator, emergency diesel fire pump, and dew point heater. Table 1-1 shows the maximum potential air emissions associated with the Project including start-up and shutdown emissions for the turbine and auxiliary equipment emissions. The maximum emissions from any operating load and including start-up and shutdown emissions for the combustion turbine were used to demonstrate the maximum potential emissions for each pollutant.

Table 1-1. Project Potential Emissions

Pollutant	Project Potential Emissions (tonnes per year)
NO_x	449.3
CO	163.6
$PM/PM_{10}/PM_{2.5}$	26.8
SO_2	28.7

1.1 Combustion Turbine

Emissions from the F-Class combustion turbine are dependent on the ambient temperature conditions and operating load, which can vary from 50 percent to 100 percent for combined-cycle operation. To account for representative seasonal climatic variations, potential emissions from the proposed combustion turbine was analyzed at 50, 75, and 100 percent load conditions for ambient temperatures ranging from negative 40 degrees Celsius (°C) to 35°C for combined-cycle operation. Projected emissions were based on data provided by the potential F-Class combustion turbine manufacturer and/or from AP-42 emission factors. Detailed calculations of the combustion turbine and auxiliary equipment's emissions are provided in Appendix B. Start-up and shutdown emissions were based on the start-up profile and 50 start-up/shutdown events per year. One start-up/shutdown event is equal to one start-up plus one shutdown. All start-ups were conservatively assumed to be cold start-ups.

1.2 Auxiliary Equipment

Emissions of air contaminants generated from the dew point heater, emergency diesel fire pump, emergency diesel generator are discussed below.

1.2.1 Natural Gas Dew Point Heater

A 3.73 million British thermal units per hour (MMBtu/hr) natural gas-fired dew point heater will be used to heat the natural gas and will be permitted for 8,760 hours of operation per year. AP-42 data was used to estimate the emissions from the heater. Detailed emissions calculations are provided in Appendix B.

1.2.2 Emergency Diesel Fire Pump

An emergency diesel fire pump will be built to support the Project in case of a fire. The emergency diesel fire pump will have a maximum power output of 330 horsepower (hp) and will be fired solely by ultra-low sulphur # 2 fuel oil. The applicant proposes to operate the emergency diesel fire pump for up to 100 hours annually for testing and maintenance purposes, and therefore supports a limit on routine hours of operation of the emergency diesel fire pump. Vendor data and AP-42 emission factors were used to determine emissions for the fire pump. Detailed calculations of diesel fire pump emissions are provided in Appendix B.

1.2.3 Emergency Diesel Generator

An emergency diesel generator will be built to provide essential services to the plant in case of a power interruption. The emergency diesel generator will have a maximum power output of 1,000 kilowatt (kW) and will be fired solely by ultra-low sulphur # 2 fuel oil. The applicant proposes to operate the emergency diesel generator for up to 100 hours annually for testing and maintenance purposes, and therefore supports a limit on routine hours of operation of the emergency diesel generator. Vendor data and AP-42 emission factors were used to determine emissions from the emergency diesel generator. Detailed calculations of diesel generator emissions are provided in Appendix B.

2.0 AIR DISPERSION MODELLING

Pursuant to the Saskatchewan air quality regulatory requirements, an air dispersion modelling analysis is required for each regulated pollutant. An air quality analysis was performed for nitrogen oxides (NO_x), carbon monoxide (CO), sulphur dioxide (SO_2), particulate matter (PM), particulate matter of 10 microns in diameter or smaller (PM_{10}), and particulate matter of 2.5 microns in diameter or smaller ($PM_{2.5}$) using the U.S. Environmental Protection Agency (EPA)-approved AMS/EPA Regulatory Model (AERMOD). The Saskatchewan Air Quality Modelling Guideline was used to conduct the air dispersion modelling analysis for this Project. A summary of the models, the modelling techniques, and modelling results for the Project are discussed in the following sections.

2.1 Air Dispersion Model

Air dispersion modelling was performed using the latest version of the AERMOD model (Version 18081). The AERMOD model is a steady-state Gaussian air dispersion model that is designed to estimate downwind ground-level concentrations from single or multiple sources using detailed meteorological data. AERMOD is a model currently approved for industrial sources. The Saskatchewan Air Quality Modelling Guideline approves the use of AERMOD and SaskPower has chosen to demonstrate regulatory compliance through its use.

Details of the modelling algorithms contained in the AERMOD model may be found in the User's Guide for AERMOD (EPA, 2018). The regulatory default option was selected for this analysis.

The following default model options were used:

- Gradual Plume Rise
- Stack-tip Downwash
- Buoyancy-induced Dispersion
- Calms and Missing Data Processing Routine
- Calculate Wind Profiles
- Calculate Vertical Potential Temperature Gradient
- Rural Dispersion

2.2 Model Parameters

Modelling runs were conducted at full load and partial loads of the combustion turbine to assess the air quality effects of the Project emissions and to demonstrate the compliance of the predicted maximum ground-level concentrations with applicable Saskatchewan Ambient Air Quality Standards (SAAQS) and

Canadian Ambient Air Quality Standards (CAAQS). The expected hourly emission rates and modelling parameters for the combustion turbine are shown in Table 2-1. These emission rates represent projected worst-case ambient conditions under various operating loads and include start-up and shutdown emissions. The annual emissions are based on worst-case annual emissions.

Table 2-1. Combustion Turbine Maximum Emissions and Modelling Parameters

Pollutant	100% Load	75% Load	50% Load	Start-up/ Shutdown
	grams per second (g/s)			
NO_x	14.2[a]	11.4	8.2	18.9[b]
CO	2.9	2.3	3.8	341.5[b]
$PM/PM_{10}/PM_{2.5}$	0.8[a]	0.7	0.6	0.8
SO_2	0.9[a]	0.7	0.5	0.9
Stack Parameters				
Stack temperature (ºC)[c]	88.9	83.3	79.4	88.4
Exit velocity (m/s)[c]	22.0	16.0	13.3	21.5
Stack height (meters)	48.8			
Stack diameter (meters)	6.4			

(a) Maximum annual emission rate ratioed for 8,760 hours per year
(b) Maximum 1-hour start-up emissions (worst-case combustion turbine emissions during start-up)
(c) m/s = meters per second; ºC = degrees Celsius

The combustion turbine will comply with the guidelines for the reduction of nitrogen oxide emissions from natural gas-fuelled stationary combustion turbines (Government of Canada, 2017). The combustion turbine NO_x emissions in Table 2-1 are based on a NO_x emission limit of 12 parts per million at 15 percent oxygen, which is below the NO_x emission limits published in the guideline. Compliance will be determined with NO_x CEMs.

The expected hourly emission rates and modelling parameters for the auxiliary equipment are shown in Table 2-2. Annual emissions for the emergency diesel fire pump and emergency diesel generator were based on operation of 100 hours per year.

Table 2-2. Auxiliary Equipment Emissions and Modelling Parameters

Pollutant	Dew Point Heater	Diesel Fire Pump	Diesel Generator
	grams per second (g/s)		
NO_x	0.05	0.3 (0.003)	1.8 (0.02)
CO	0.04	0.2	1.0
$PM/PM_{10}/PM_{2.5}$	0.004	0.01 (1.6×10^{-4})	0.05 (5.8×10^{-4})
SO_2	2.8×10^{-4}	0.09 (9.7×10^{-4})	0.2 (0.002)
Stack Parameters			
Stack temperature (ºC)[a]	162.8	573.3	476.7
Exit velocity (m/s)[a]	13.5	78.5	117.4
Stack height (meters)	4.6	4.6	4.6
Stack diameter (meters)	0.4	0.1	0.2

(a) Equivalent g/s emissions averaged over 8,760 hours per year, based on operation of 100 hours, used for annual averaging periods only.
(b) m/s = meters per second; ºC = degrees Celsius

2.3 Modelling Methodology and Parameters

The modelling methodology used for this analysis is summarized in the sections below.

2.3.1 Good Engineering Practice

Emission sources are subject to Good Engineering Practice (GEP) stack height requirements outlined in Section 5.7 of the Saskatchewan Air Modelling Guideline. As GEP height is calculated as the greater of 65 meters (measured from the ground level elevation at the base of the stack) or the height resulting from the following formula:

$$GEP = H + 1.5L$$

Where

H = the height of nearby structure(s) measured from the ground level elevation at the base of the stack; and

L = the lesser dimension (height or projected width) of nearby structure(s) (i.e., building height or the greatest crosswind distance of the building - also known as maximum projected width).

To meet stack height requirements, the point sources were evaluated in terms of the proximity to nearby structures. The purpose of this evaluation is to determine if the discharge from each stack will become caught in the turbulent wake of a building or other structure, resulting in downwash of the plume. Downwash of the plume can result in elevated ground-level concentrations. In EPA's 1985 *Guideline for Determination of Good Engineering Practice Stack Height*, EPA provides guidance for determining whether building downwash will occur. The downwash analysis was performed consistent with the methods prescribed in this guidance document.

Calculations for determining the direction-specific downwash parameters were performed using the most current version of the EPA's Building Profile Input Program – Plume Rise Model Enhancements (Version 04274), otherwise referred to as the BPIP-PRIME downwash algorithm. The BPIP-PRIME model provides direction-specific building dimensions to evaluate downwash conditions. The Project is located in a rural area and the only buildings that could potentially affect emissions from the Project are the on-site structures.

After running the BPIP-PRIME model, it was determined that the GEP stack height for this Project will not exceed 65 meters. A stack height of 48.77 meters (160 feet) was used in the AERMOD modelling. The major on-site buildings and their dimensions are provided in Appendix B.

2.3.2 Receptor Grid

The overall purpose of the modelling analysis is to assess the air quality effects of the Project emissions and to demonstrate the compliance of the predicted maximum ground-level concentrations with applicable SAAQS and CAAQS. The modelling runs were conducted using the AERMOD model in simple and complex terrain mode within a 10- by 10-kilometer Cartesian grid and is shown in Figure C-1 (Appendix C). The grid incorporates the receptor spacing specified in Table 2-3. Receptors were also placed along the fence line boundary at a spacing of 20 meters.

Table 2-3: Receptor Spacing from Fence Line Boundary

Distance from Fence Line (kilometers)	Receptor Spacing (meters)
0 - 0.5	50
0.5 – 2	250
2 – 5	500
5 – 10	1,000

The appropriate Canadian terrain data was downloaded from GeoBase Canada and was used to obtain the necessary receptor elevations. North American Datum of 1983 (NAD 83) was used to develop the Universal Transverse Mercator (UTM) coordinates for this Project.

AERMOD has a terrain preprocessor (AERMAP) which uses gridded terrain data for the modelling domain to calculate not only a XYZ coordinate, but a representative terrain-influence height associated with each receptor location selected. This terrain-influenced height is called the height scale and is separate for each individual receptor. AERMAP (Version 18081) utilized the electronic terrain data to populate the model with receptor elevations.

2.3.3 Meteorological Data

Meteorological data obtained from the Saskatchewan Regional Meteorological Data Sets were used for the modelling analysis. Integrated Surface Hourly meteorological data from Swift Current and upper air data from Glasgow were used for years 2003 to 2007. A profile base elevation of 818 meters was used.

2.3.4 Land Use Parameters

The existing land use for a three-kilometer area surrounding the Project is more than 50 percent rural, and the population density is less than 750 people per square kilometer for the same area. Therefore, rural dispersion coefficients were used in the AERMOD models.

2.3.5 Background Existing Ambient Air Quality

The air quality standards are set up to protect the air quality for all sensitive populations. As such, there is an existing concentration of each criteria pollutant that is present in ambient air that must be included in an analysis to account for items such as mobile source emissions that are not accounted for in the model. Monitored ambient concentrations will be added to the modeled ground level impacts to account for these sources.

For the Project, background values for each pollutant were identified from the representative monitors in the area. The Saskatchewan Ministry of Environment (Ministry) provides regional background air contaminant concentrations for five divisions of Saskatchewan. The values listed in Table 2-4 will be used as background levels and will be added to the modeled impacts for each pollutant for modelling compliance determinations. Per the modelling guideline, for refined modelling, the 90th percentile value from the cumulative frequency distribution of the background monitoring data was used for the 1-hour and 24-hour averaging times. For the annual distribution the 50th percentile was used.

Table 2-4. Southwest Region Background Concentration

Pollutant	Averaging Period	Percentile	Background Concentration[a]		Region
			ppm	µg/m³	
CO	1-hour	90	0.6	720.0	Southeastern
	8-hour	90	0.6	720.0	
NO_2	1-hour	90	0.019	36.0	Southwestern
	24-hour	90	0.016	30.0	
	Annual	50	0.005	9.4	
SO_2	1-hour	90	0.001	2.6	Southwestern
	24-hour	90	0.001	2.6	
	Annual	50	0.000	0.0	
$PM_{2.5}$	24-hour	90	--	6.6	Southwestern
	Annual	50	--	3.3	
PM_{10}[b]	24-hour	90	--	36.3	Southeastern
PM[c]	24-hour	90	--	6.6	Southwestern
	Annual	50	--	3.3	

Source: Saskatchewan Air Quality Modelling Guideline, 2012
(a) ppm = parts per million; µg/m³ = micrograms per cubic meter
(b) No PM_{10} background was listed in the modelling guidance for the southwestern region; therefore, the southeastern region background was used.
(c) No PM background was listed in the modelling guidance; therefore, the southwestern region background was used.

2.3.6 Modelling Thresholds

The SAAQS for the modelled pollutants are shown in Table 2-5.

Table 2-5: Saskatchewan Ambient Air Quality Standards

Pollutant	Averaging Period	SAAQS micrograms per cubic meter ($\mu g/m^3$)
CO	1-hour	15,000
	8-hour	6,000
NO_2	1-hour	300
	24-hour	200
	Annual	45[a]
SO_2	1-hour	450
	24-hour	125
	Annual	20[a]
$PM_{2.5}$	24-hour	28[b]
	Annual	10
PM_{10}	24-hour	50
PM	24-hour	100
	Annual	60[c]

Source: SAAQS, https://envrbrportal.crmp.saskatchewan.ca/Pages/SEQS/Table20-SEQS-SAAQS.pdf
(a) Arithmetic mean
(b) The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations
(c) Geometric means

The CAAQS for the modelled pollutants are shown in Table 2-6.

Table 2-6: Canadian Ambient Air Quality Standards

Pollutant	Averaging Period	CAAQS		Statistical Form
		Effective 2020	Effective 2025	
		micrograms per cubic meter (μg/m^3)		
NO_2	1-hour	113	79	3-year average of the 98th percentile of the daily maximum 1-hour average concentrations
	Annual	32	23	Average over a single calendar year of all 1-hour average concentrations
SO_2	1-hour	183	170	3-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations
	Annual	13	10	Average over a single calendar year of all 1-hour average SO_2 concentrations
$PM_{2.5}$	24-hour	27	--	3-year average of the annual 98th percentile of the daily 24-hour average concentrations
	Annual	8.8	--	3-year average of the annual average of all 1-hour concentrations

Source: CAAQS, http://airquality-qualitedelair.ccme.ca/en/

2.3.7 Intermittent Sources

The emergency diesel generator and emergency diesel fire pump will operate less than 100 hours annually and are considered intermittent sources. In addition to modelling normal plant operation impacts, emergency condition plant operation was modelled with the emergency equipment operating simultaneous to the combustion turbine and natural gas dew point heater.

2.3.8 NO_2 Modelling – Multi Tiered Screening Approach

The AERMOD model predicts ground-level concentrations of any generic pollutant without chemical transformations. Thus, the modeled NO_x emission rate will predict ground-level modeled concentrations of NO_x. The SAAQS and CAAQS modelling concentration standards are presented as NO_2.

Recommended methods for estimating NO_2 concentrations presented in the order of the most conservative first are:

1. Tier I – total conversion, or all NO_x equals NO_2

2. Tier II – use a default NO_2/NO_x ratio
3. Tier III – case-by-case detailed screening methods, such as the Ozone Limiting Method (OLM) or Plume Volume Molar Ratio Method (PVMRM)

The ambient ratio method was used to determine all NO_2 Project modeled results. The EPA has replaced the existing Ambient Ratio Method (ARM) with a revised ARM2 option. ARM2 is based on hourly measurements of the NO_2 to NO_x ratios and provides more detailed estimates of this ratio based on the total NO_x present. The EPA default minimum and maximum ratios of 0.5 and 0.9, respectively, were applied to the model to determine the predicted ground-level concentration of NO_2.

2.4 SAAQS Refined Modelling Results

Refined modelling was performed for CO, NO_x, SO_2, and PM/PM_{10}/$PM_{2.5}$ for the Project for normal plant operation. The combustion turbine and natural gas dew point heater represent normal plant operation. After examining the modelling results for normal plant operation at all combustion turbine load levels, it was determined that all impacts are below the SAAQS. The maximum operating load modeled concentrations for each pollutant and averaging period are presented in Table 2-7.

Table 2-7. Maximum Operating Load Modelled Concentrations for Normal Plant Operation

Pollutant	Averaging Period	UTM Coordinates[a] Easting (meters)	UTM Coordinates[a] Northing (meters)	Year	Worse-Case Maximum Operating Load	Maximum Concentration Predicted (µg/m³)	Maximum Concentration Background (µg/m³)	Maximum Concentration Total (µg/m³)	SAAQS Threshold (µg/m³)
CO	1-hour	464,987.10	5,580,385.20	2007	Start-up/ shutdown	1,256.4	720.0	1,976.4	15,000
	8-hour	465,150.00	5,580,100.00	2005	Start-up/ shutdown	630.6	720.0	1,350.6	6,000
NO_2	1-hour	465,100.00	5,580,650.00	2005	Start-up/ shutdown	43.1[b]	36.0	79.1	300
	24-hour	464,987.10	5,580,385.20	2007	50%	30.5[b]	30.0	60.5	200
	Annual	464,987.10	5,580,385.20	2003	50%	2.9[b]	9.4	12.3	45
SO_2	1-hour	464,987.10	5,580,385.20	2007	75%	4.0	2.6	6.6	450
	24-hour	464,987.10	5,580,385.20	2007	50%	2.1	2.6	4.7	125
	Annual	464,987.10	5,580,385.20	2003	50%	0.2	0.0	0.2	20
$PM_{2.5}$	24-hour	464,987.10	5,580,385.20	5 years	50%	1.1	6.6	7.7	28
	Annual	464,929.80	5,580,385.20	2003	50%	0.2	3.3	3.5	10
PM_{10}	24-hour	464,987.10	5,580,385.20	2007	50%	2.5	36.3	38.8	50
PM	24-hour	464,987.10	5,580,385.20	2007	50%	2.5	6.6	9.1	100
	Annual	464,929.80	5,580,385.20	2003	50%	0.2	3.3	3.5	60

(a) Universal Transverse Mercator NAD 83
(b) ARM2 methodology was used

The following highs were used for each modelled averaging period:

- 1-hour average used the 9th highest concentration for a single calendar year
- 8-hour average used the 5th highest concentration for a single calendar year
- 24-hour average used the 2th highest concentration for NO_2, SO_2, PM_{10}, and PM for a single calendar year
- 24-hour $PM_{2.5}$ used the 8th highest concentration averaged over 5 years
- Annual average used the 1st highest concentration for a single calendar year

Isopleths of the maximum impact concentrations for each pollutant and averaging period are shown in Figures C-2 to C-14 in Appendix C. Model input and output files for each pollutant will be provided via electronic file transfer.

In addition to modelling normal plant operation impacts, emergency condition plant operation was modelled with the emergency equipment operating simultaneous to the combustion turbine and natural gas dew point heater. After examining the modelling results for emergency condition plant operation at all combustion turbine load levels, it was determined that all impacts are below the SAAQS. The maximum operating load modeled concentrations for each pollutant and averaging period for this analysis are presented in Table C-1 in Appendix C.

2.5 CAAQS Refined Modelling Results

Modelling was performed for NO_x, SO_2, and $PM_{2.5}$ to determine Project impacts for normal plant operation at the nearest residential receptors for comparison to the most conservative CAAQS listed in Table 2-6. The combustion turbine and natural gas dew point heater represent normal plant operation. Impacts at the nearest residential receptors within 2-kilometers of the Project were evaluated. The evaluated receptors are listed in Table 2-8 and are shown in Figure C-15 in Appendix C.

Table 2-8. Nearest Modelled Residential Receptors

Receptor ID	UTM Coordinates[a]	
	Easting (meters)	Northing (meters)
Residence 1	464,101	5,580,395
Residence 2	464,306	5,581,091
Residence 3	463,814	5,581,332
Residence 4	463,645	5,581,212
Residence 5	465,069	5,581,685
Residence 6	465,921	5,581,354
Residence 7	466,752	5,579,508
Residence 8	466,670	5,580,994
Residence 9	464,137	5,581,409

(a) Universal Transverse Mercator NAD83

After examining the modelling results at all load levels for normal plant operation, it was determined that the impacts are all below the most conservative CAAQS thresholds at the nearest residential receptors. The maximum operating load modeled concentrations for each pollutant and averaging period are presented in Table 2-9.

Table 2-9. Maximum Operating Load Modelled Concentrations for Normal Plant Operation

Pollutant	Averaging Period	Receptor ID	Year	Worse-Case Maximum Operating Load	Maximum Concentration			CAAQS Threshold[a]
					Predicted	Background	Total	
					micrograms per cubic meter ($\mu g/m^3$)			
NO_2	1-hour	Residence 2	5 Years	Start-up/ shutdown	18.6[b]	36.0	54.6	79
	Annual	Residence 6	2003	50%	0.5[b]	9.4	9.9	23
SO_2	1-hour	Residence 2	5 Years	50%	1.1	2.6	3.7	170
	Annual	Residence 6	2003	50%	0.03	0.0	0.03	10
$PM_{2.5}$	24-hour	Residence 2	5 Years	50%	0.2	6.6	6.8	27
	Annual	Residence 2	5 Years	50%	0.03	3.3	3.3	8.8

(a) The modelled impacts were compared to the most conservative CAAQS threshold
(b) ARM2 methodology was used

The following highs were used for each modelled averaging period:

- 1-hour NO_2 used the 9th highest concentration averaged over 5 years
- 1-hour SO_2 used the 5th highest concentration averaged over 5 years
- 24-hour $PM_{2.5}$ used the 8th highest concentration averaged over 5 years
- Annual NO_2 and SO_2 average used the 1st highest concentration over a single calendar year
- Annual $PM_{2.5}$ average used the 1st highest concentration over 5 years

2.6 Conclusion

The modelling results shown in Table 2-7 and Table 2-9 demonstrate that no exceedances of the NO_2, CO, SO_2, or $PM_{2.5}$/PM_{10}/PM modelling levels are predicted; consequently, the Project will be below the SAAQS and CAAQS.

The operation of the Project will not cause or contribute to a significant degradation of ambient air quality. After examining the results of the model, it has been determined that the modelling requirements for CO, NO_2, SO_2, and PM/PM_{10}/$PM_{2.5}$ have been fulfilled, and no further modelling is required.

3.0 REFERENCES

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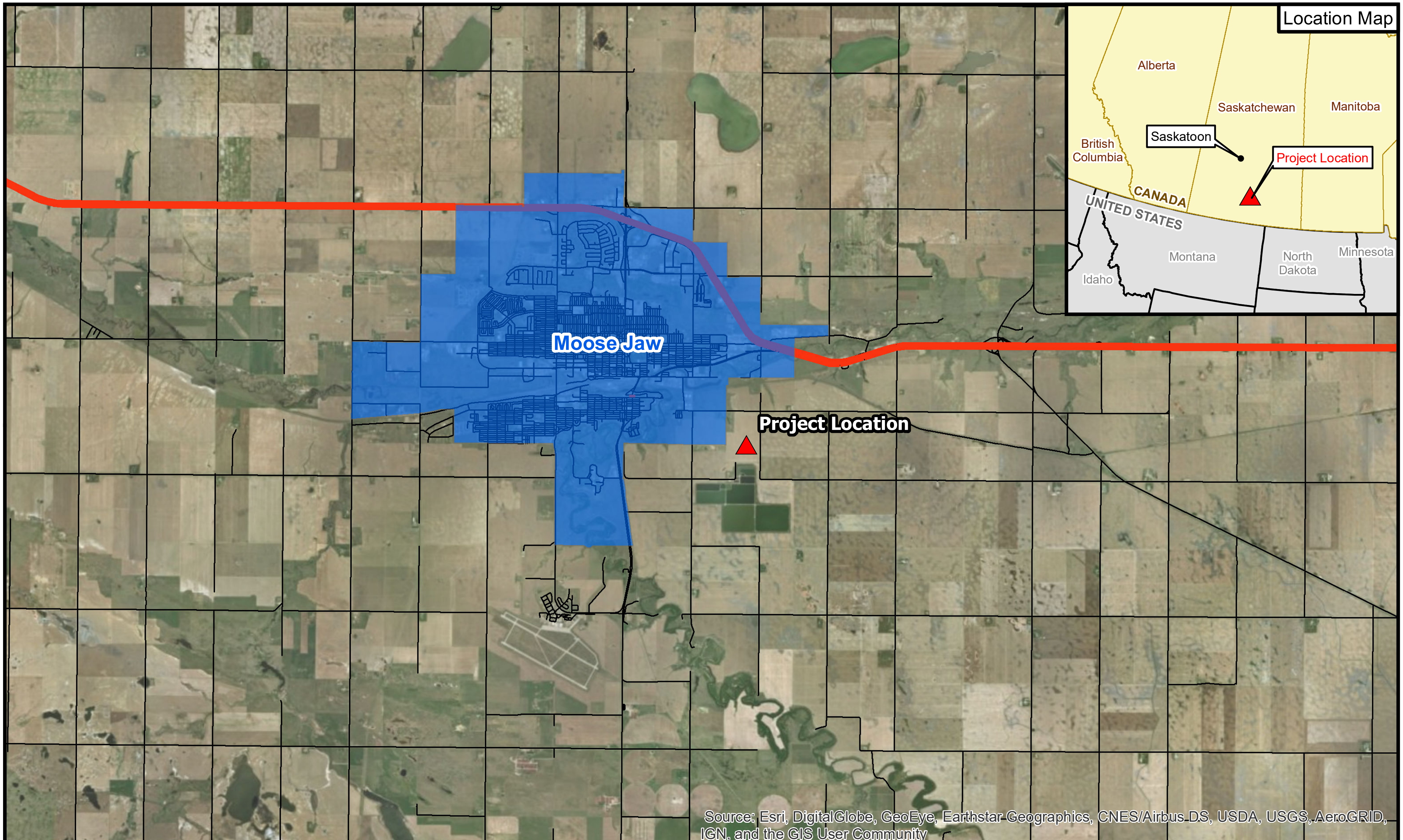
APPENDIX A - FIGURES



Legend

- Project Location
- Municipal Boundary
- Trans-Canada Highway
- Highway
- Road

0 1.5 3
Kilometers

NORTH

Figure A-1
Project Location
Moose Jaw Power Station
SaskPower

Source: ESRI, Geobase, Burns & McDonnell

Issued: 2/12/2019

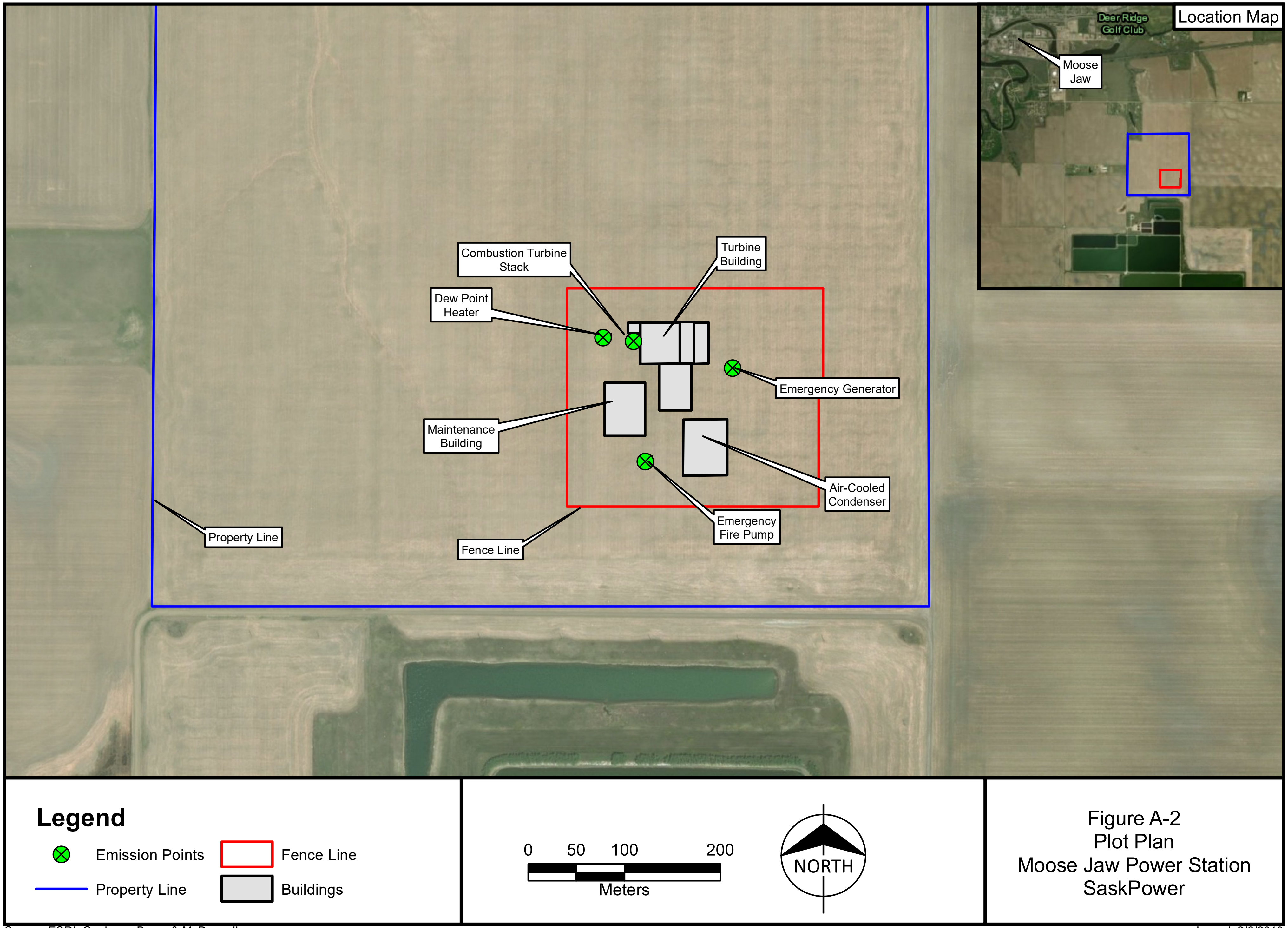


Figure A-2
Plot Plan
Moose Jaw Power Station
SaskPower

Source: ESRI, Geobase, Burns & McDonnell

Issued: 2/8/2019

APPENDIX B – EMISSIONS ESTIMATES

Moose Jaw Power Station Project

Overall Project Emissions

Maximum Annual Emission Rates

Pollutant	Combined-Cycle Combustion Turbine[a] (tonnes per year)	Dew Point Heater (tonnes per year)	Emergency Diesel Fire Pump (tonnes per year)	Emergency Diesel Generator (tonnes per year)	Total (tonnes per year)
NO_x	447.1	1.5	0.10	0.6	**449.3**
CO	161.9	1.2	0.09	0.4	**163.6**
PM	26.6	0.1	0.005	0.02	**26.8**
PM_{10}	26.6	0.1	0.005	0.02	**26.8**
$PM_{2.5}$	26.6	0.1	0.005	0.02	**26.8**
SO_2	28.6	0.01	0.03	0.07	**28.7**

(a) Represents worse-case emissions scenario

Assumptions

Unit	Limitation	Units
Combined Cycle Operation	8,760	Hours Per Year
Number of Cold Startups per year	50	Events Per Year
Hours of Startup/Shutdowns per year	85	Hours Per Year
Natural Gas Dew Point Heater	8,760	Hours Per Year
Emergency Diesel Fire Pump	100	Hours Per Year
Emergency Diesel Generator	100	Hours Per Year
Heating Value of Natural Gas		
Natural Gas	1,020	MMBtu/MMCF

Combined Cycle Combustion Turbine

Hours per year: 8,760
Number of Units: 1

Source Description	Operating Load	NOx Emission Rate (g/s)	CO Emission Rate (g/s)	$PM/PM_{10}/PM_{2.5}$ Emission Rate (g/s)	SO2 Emission Rate (g/s)
Turbine\ HRSG	100%	14.2	2.9	0.8	0.9
	75%	11.4	2.3	0.7	0.7
	50%	8.2	3.8	0.6	0.5

Emissions Including Startup/Shutdown Operation

Predicted Annual Emission Rates - Combined Cycle Combustion Turbine

Pollutant	Emissions (Tonnes per year) per Turbine		
	Normal Operation	Startup/ Shutdown	Max Total Turbine Emissions
NO_x	442.6	4.5	447.1
CO	89.8	72.1	161.9
$PM/PM_{10}/PM_{2.5}$	26.4	0.2	26.5
SO_2	28.3	0.1	28.4

Emissions Including Normal Operation Only

Predicted Annual Emission Rates - Combined Cycle Combustion Turbine

Pollutant	Emissions (Tonnes per year) per Turbine		
	Normal Operation	Startup/ Shutdown	Max Total Turbine Emissions
NO_x	446.9	--	446.9
CO	90.7	--	90.7
$PM/PM_{10}/PM_{2.5}$	26.6	--	26.6
SO_2	28.6	--	28.6

Client	SaskPower		
Project	SaskPower Self Build Combined Cycle	Date:	1/11/2016
	PRELIMINARY Combined Cycle Startup Emissions Estimate		
	1x1 5000F5ee Configuration		

Prepared By	AJC
Checked By	
Preliminary	✓
Final	

	CO		NOx		VOC		CO2		SO2		PM	
	g/Start		g/Start		g/Start		g/Start		g/Start		g/Start	
	GT1	GT2	GT1	GT2	GT1	GT2	GT1	GT2	GT1	GT2	GT3	GT4
Cold Start	1,275,502	N/A	71,214	N/A	176,901	N/A	54,958,616	N/A	1,269.4	N/A	2,268.0	N/A
Warm Start	1,033,737	N/A	53,977	N/A	119,295	N/A	44,115,490	N/A	997.6	N/A	1,814.4	N/A
Hot Start	266,259	N/A	16,783	N/A	32,205	N/A	18,926,596	N/A	400.8	N/A	453.6	N/A
Shutdown	166,468	N/A	19,051	N/A	21,047	N/A	28,544,116	N/A	568.4	N/A	907.2	N/A

	CO		NOx		VOC		CO2		SO2		PM	
	g/s		g/s		g/s		g/s		g/s		g/s	
	GT1	GT2	GT1	GT2	GT1	GT2	GT1	GT2	GT1	GT2	GT1	GT2
Cold Start	341.5	N/A	18.9	N/A	48	N/A	14,326	N/A	0.3	N/A	0.6	N/A
Warm Start	322.6	N/A	16.4	N/A	38	N/A	13,404	N/A	0.3	N/A	0.6	N/A
Hot Start	197.8	N/A	12.6	N/A	24	N/A	12,804	N/A	0.3	N/A	0.5	N/A
Shutdown	274.7	N/A	20.2	N/A	35	N/A	15,539	N/A	0.4	N/A	0.6	N/A

Notes

1) Startup for the Permit is defined as the operation period beginning when continuous fuel flow to the gas turbine is initiated and ending when stack emissions compliance is achieved.

2) Startup for the Contract is defined as the operation period beginning when the gas turbine start is initiated and ending when the steam turbine is accepting full steam flow.

Startup Times

	Permit Time	Contract Time
	Minutes	
Cold Start	70	296
Warm Start	53	195
Hot Start	22	104
Shutdown	32	32

Moose Jaw Power Station Project
Auxiliary Combustion Sources Emissions Calculations

Dew Point Heater

Size	3.73	MMBtu/hr
HHV	1,020	Btu/cf
Operation	8,760	hours/year

Dew Point Heater Stack Parameters

Height (meters)	Temp. (ºC)	Velocity (m/s)	Diameter (meters)	Stack Discharge Type	Fuel
4.6	162.8	13.5	0.4	Vertical	Natural Gas

	Emission Factors			Emissions	
Pollutant	lb/MMcf	lb/MMBtu	Source	g/s	tonnes per year
NO_X	100.0	0.10	AP-42[a]	0.05	1.5
CO	84.0	0.08	AP-42[a]	0.04	1.2
$PM/PM_{10}/PM_{2.5}$	7.6	0.007	AP-42[a]	0.004	0.1
SO_2	0.6	0.0006	AP-42[a]	2.8E-04	0.01

(a) AP-42 Section 1.4 (7/98)

Emergency Fire Pump

Size	330.0	HP
	2.4	MMBtu/hr
	17.5	gal/hr
Operation	100.0	hours/year

Emergency Fire Pump Stack Parameters

Height (meters)	Temp. (ºC)	Velocity (m/s)	Diameter (meters)	Stack Discharge Type	Fuel
4.6	573.3	78.5	0.1	Vertical	Diesel

	Emission Factors				Emissions		
Pollutant	g/kw-hr	g/hp-hr	lb/hp-hr	Source	g/s	tonnes per year	g/s Equivalent
NO_X	4.0	3.0	--	NSPS[a]	0.3	0.1	0.003
CO	3.5	2.6	--	NSPS[a]	0.2	0.09	--
$PM/PM_{10}/PM_{2.5}$	0.2	0.15	--	NSPS[a]	0.01	0.005	1.6E-04
SO_2	--	--	0.002	AP-42[b]	0.09	0.03	9.7E-04

(a) NSPS 40 CFR Part 60, Subapart IIII Limits

NSPS Limits - 40 CFR Part 60, Subapart IIII, (40 CFR 60 Table 4)

	NOx + VOM	CO	PM
g/kW-hr	4.0	3.5	0.20
g/hp-hr	3.0	2.6	0.15

(b) AP-42 Section 3.3 (10/96)

Emergency Generator

Size	1000.0	KW
	745.7	hp
	71.9	gal/hr
	9.9	MMBtu/hr
Operation	100.0	hours/year

Emergency Generator Stack Parameters

Height (meters)	Temp. (ºC)	Velocity (m/s)	Diameter (meters)	Stack Discharge Type	Fuel
4.6	476.7	117.4	0.2	Vertical	Diesel

	Emission Factors				Emissions		
Pollutant	g/kw-hr	g/hp-hr	lb/hp-hr	Source	g/s	tonnes per year	g/s Equivalent
NO_X	6.4	4.8	--	NSPS[a]	1.8	0.6	0.02
CO	3.5	2.6	--	NSPS[a]	1.0	0.4	--
$PM/PM_{10}/PM_{2.5}$	0.2	0.15	--	NSPS[a]	0.05	0.02	5.8E-04
SO_2	--	--	0.002	AP-42[b]	0.2	0.07	0.002

(a) NSPS 40 CFR Part 60, Subapart IIII Limits

NSPS Limits - 40 CFR Part 60, Subapart IIII, (40 CFR 60.4202(a)(2) and 40 CFR 89.112 - Table 1)

	NOx + VOM	CO	PM
g/kW-hr	6.4	3.5	0.2
g/hp-hr	4.8	2.6	0.15

(b) AP-42 Section 3.3 (10/96)

Moose Jaw Power Station Project
Air Dispersion Modeling Inputs

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (°C)	Exit Velocity (m/s)	Stack Diameter (m)	NO_2 24-hour (g/s)	NO_2 Annual (g/s)	NO_2 1-hour (g/s)	CO (g/s)	PM/PM_{10}/$PM_{2.5}$ 24-hour (g/s)	PM/$PM_{2.5}$ Annual (g/s)	SO_2 24-hour (g/s)	SO_2 Annual (g/s)	SO_2 1-hour (g/s)
EP01_100	Turbine 100%	464,926.00	5,580,332.70	565.0	48.8	88.9	22.0	6.4	14.2	14.2	14.2	2.9	0.8	0.8	0.9	0.9	0.9
EP01_75	Turbine 75%	464,926.00	5,580,332.70	565.0	48.8	83.3	16.0	6.4	11.4	14.2	11.4	2.3	0.7	0.8	0.7	0.9	0.7
EP01_50	Turbine 50%	464,926.00	5,580,332.70	565.0	48.8	79.4	13.3	6.4	8.2	14.2	8.2	3.8	0.6	0.8	0.5	0.9	0.5
EP01_SS	Turbine - Starts	464,926.00	5,580,332.70	565.0	48.8	88.4	21.5	6.4	18.9	14.2	18.9	341.5	0.8	0.8	0.9	0.9	0.9
EU02_DPH	Dew Point Heater	464,892.02	5,580,335.18	565.0	4.6	162.8	13.5	0.4	0.05	0.05	0.05	0.04	0.004	0.004	0.00028	0.00028	0.00028
EU03_EG	Emergency Generator	465,027.61	5,580,303.75	565.0	4.6	476.7	117.4	0.2	1.8	0.02		1.0	0.05	0.00058	0.2	0.002	
EU04_EF	Emergency Fire Pump	464,936.95	5,580,205.50	565.0	4.6	573.3	78.5	0.1	0.3	0.003		0.2	0.01	0.00016	0.09	0.00097	

Moose Jaw Power Station Project
Buildings

Building ID	Building Name	Number of Tiers	Tier Number	Base Elevation (m)	Tier Height (m)	Number of Corners	Corner 1 East (X) (m)	Corner 1 North (Y) (m)	Corner 2 East (X) (m)	Corner 2 North (Y) (m)	Corner 3 East (X) (m)	Corner 3 North (Y) (m)	Corner 4 East (X) (m)	Corner 4 North (Y) (m)	Corner 5 East (X) (m)	Corner 5 North (Y) (m)	Corner 6 East (X) (m)	Corner 6 North (Y) (m)	Corner 7 East (X) (m)	Corner 7 North (Y) (m)	Corner 8 East (X) (m)	Corner 8 North (Y) (m)	Corner 9 East (X) (m)	Corner 9 North (Y) (m)	Corner 10 East (X) (m)	Corner 10 North (Y) (m)
ACC	Air Cooled Condenser	1	1	565	21.336	4	464,974.6	5,580,190.2	465,020.6	5,580,190.2	465,020.5	5,580,248.7	464,974.8	5,580,248.5												
CNTRL	Warehouse	1	1	565	9.144	4	464,892.7	5,580,231.4	464,935.3	5,580,231.4	464,935.3	5,580,286.8	464,892.8	5,580,286.8												
GEN	Generator Building	1	1	565	3.048	4	465,025.7	5,580,300.0	465,029.7	5,580,300.0	465,029.7	5,580,308.8	465,025.7	5,580,308.8												
FP	Fire Pump Building	1	1	565	3.3528	4	464,931.6	5,580,210.3	464,931.6	5,580,202.0	464,941.8	5,580,202.0	464,941.8	5,580,210.3												
DPH	Dew Point Heater Building	1	1	565	3.048	4	464,899.0	5,580,337.7	464,899.0	5,580,333.2	464,886.0	5,580,333.2	464,886.0	5,580,337.7												
CTG1	Gas Heater Building	5	1	565	3.6576	10	464,950.1	5,580,258.2	464,983.2	5,580,258.2	464,983.2	5,580,306.6	465,001.1	5,580,306.6	465,001.0	5,580,349.7	464,917.3	5,580,349.7	464,917.1	5,580,338.7	464,930.0	5,580,338.7	464,930.1	5,580,306.6	464,950.1	5,580,306.6
CTG1	Turbine Building	*	2	*	10.668	8	464,950.1	5,580,258.2	464,983.2	5,580,258.2	464,983.2	5,580,306.6	465,001.1	5,580,306.6	465,001.0	5,580,349.7	464,930.0	5,580,349.6	464,930.1	5,580,306.6	464,950.1	5,580,306.6				
CTG1	Steam Turbine Generator	*	3	*	18.288	8	464,950.1	5,580,258.2	464,983.2	5,580,258.2	464,983.2	5,580,306.6	464,986.1	5,580,307.0	464,986.1	5,580,349.9	464,930.0	5,580,349.6	464,930.1	5,580,306.6	464,950.1	5,580,306.6				
CTG1	Turbine Building	*	4	*	24.384	4	464,986.1	5,580,306.6	464,986.0	5,580,349.9	464,930.0	5,580,349.7	464,930.1	5,580,306.6												
CTG1	Turbine Building	*	5	*	38.4048	4	464,971.1	5,580,306.6	464,971.0	5,580,349.7	464,930.0	5,580,349.7	464,930.1	5,580,306.6												

APPENDIX C – MODELLING FIGURES

Figure C-1: 10 km by 10 km Receptor Grid and Elevation Map

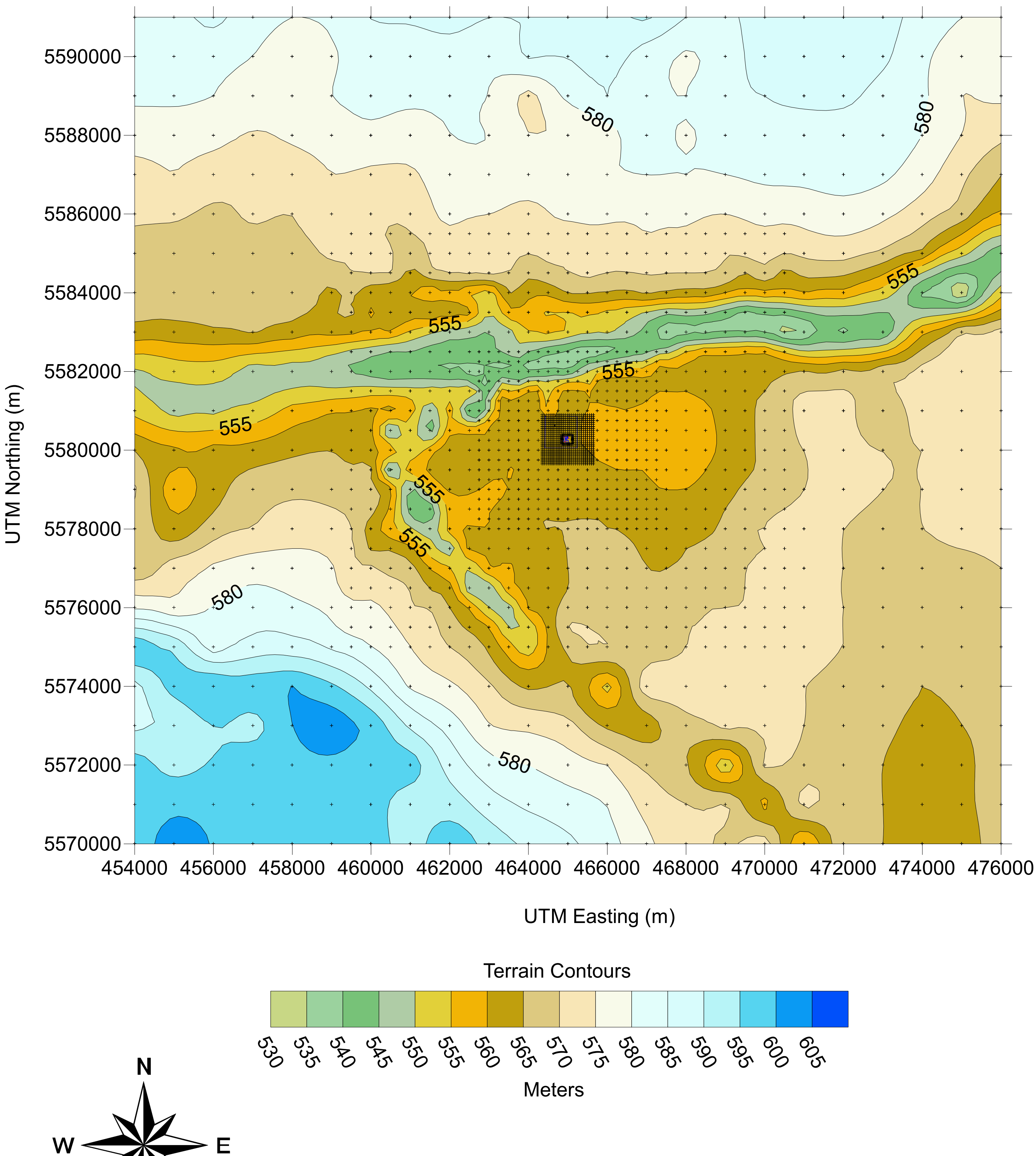


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Figure C-2: CO 1-Hour Concentration Plot
Worst-Case Operating Load Impacts: Start-up/Shutdown Operation

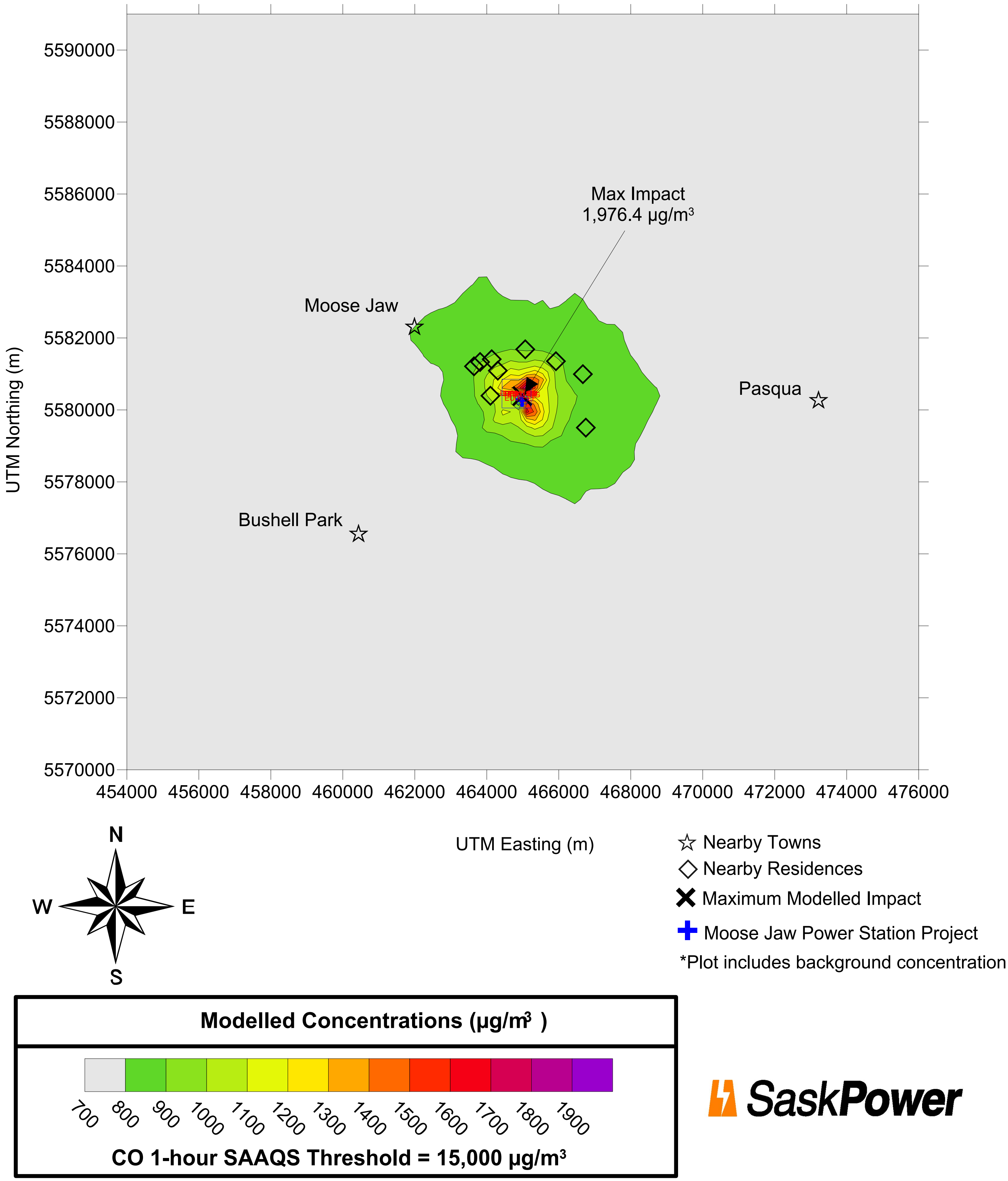

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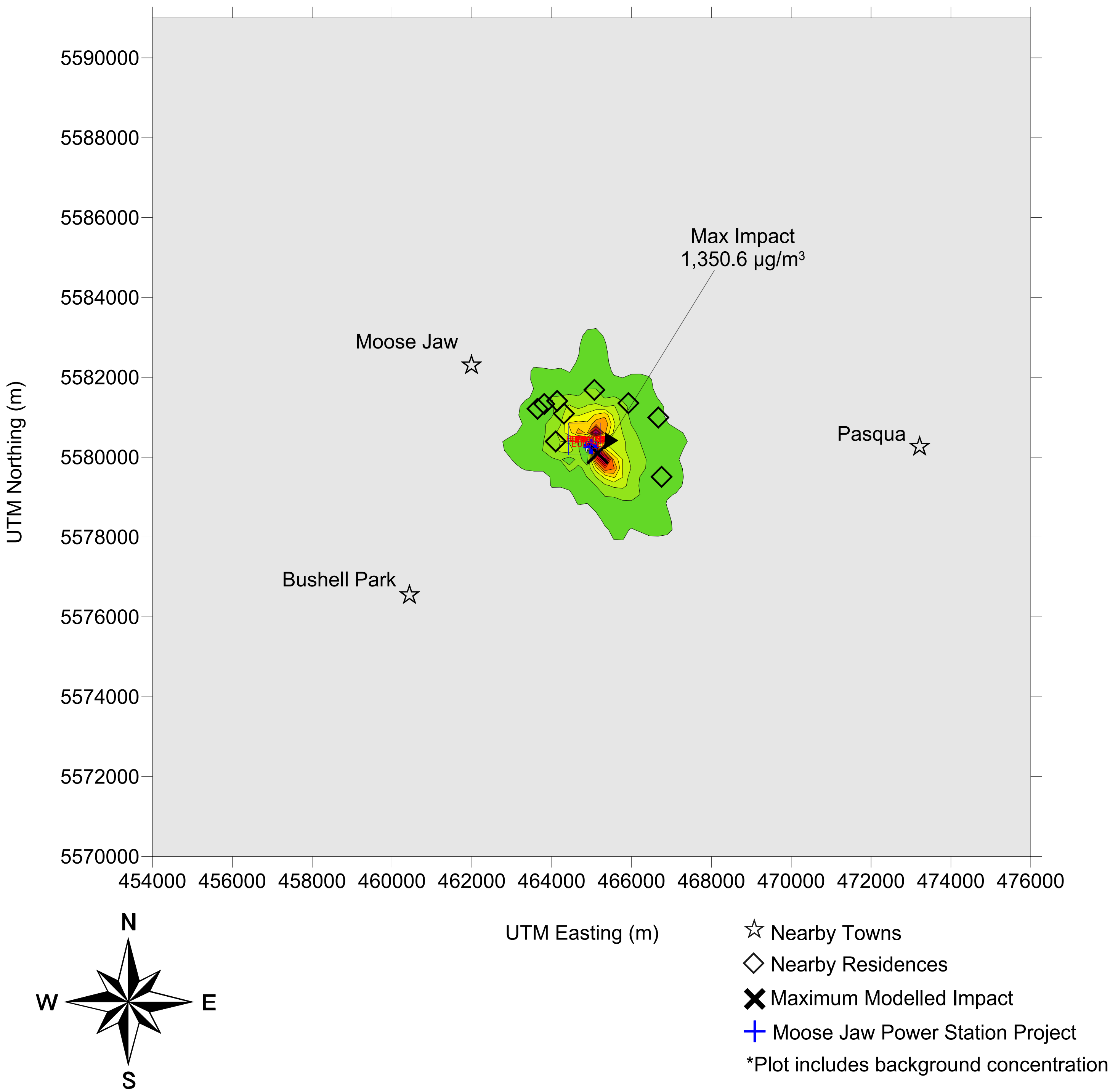
Figure C-3: CO 8-Hour Concentration Plot
Worst-Case Operating Load Impacts: Start-up/Shutdown Operation

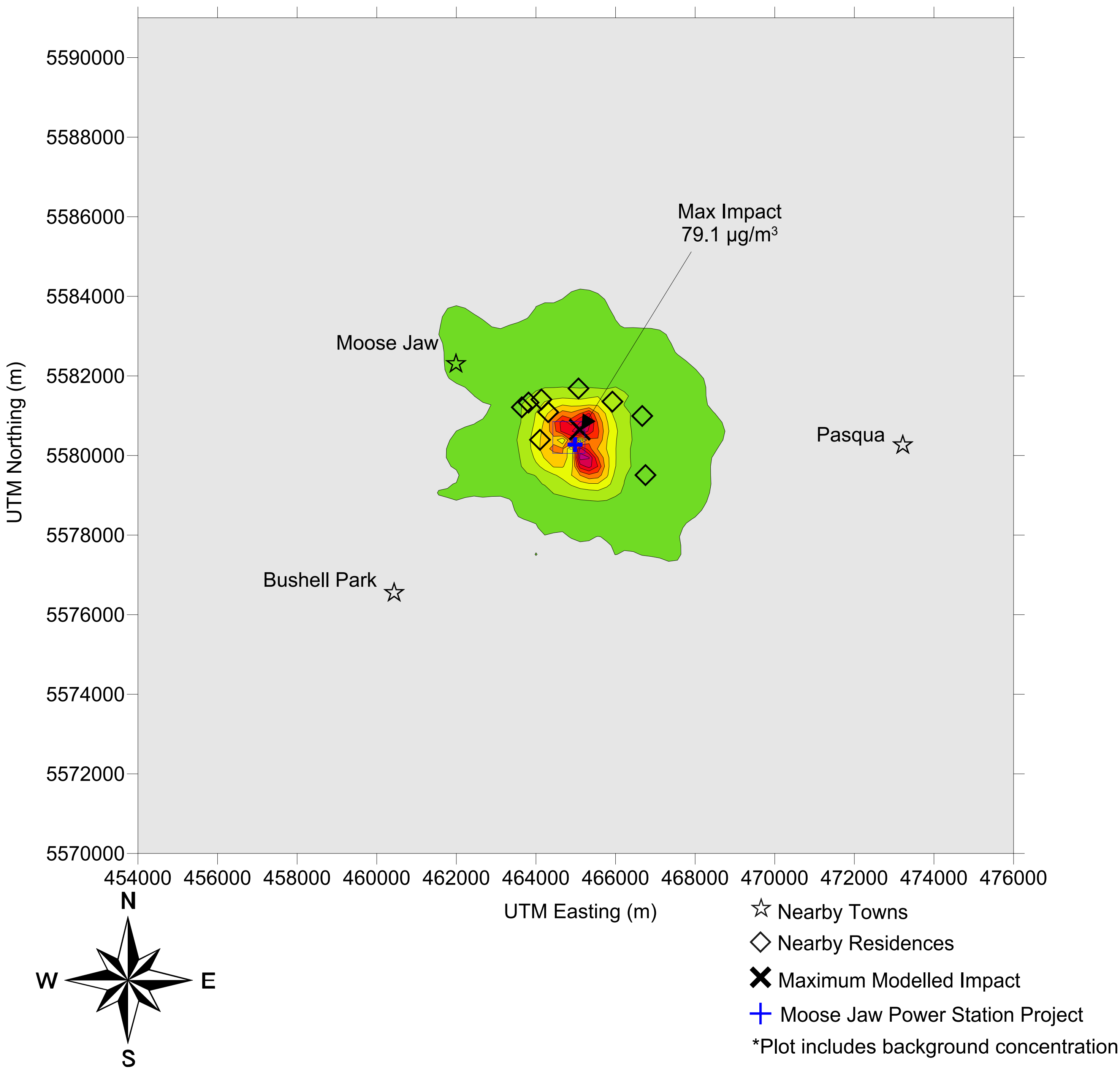


Modelled Concentrations (µg/m³)

720 760 800 840 880 920 960 1000 1040 1080 1120 1160 1200 1240

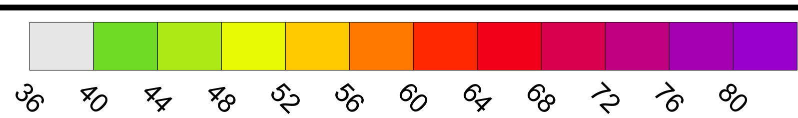
CO 8-hour SAAQS Threshold = 6,000 µg/m³

Figure C-4: NO_2 1-Hour Concentration Plot
Worst-Case Operating Load Impacts: Start-up/Shutdown Operation



*Plot includes background concentration

Modelled Concentrations (µg/m³)



NO_2 1-hour SAAQS Threshold = 300 µg/m³

Figure C-5: NO_2 24-Hour Concentration Plot
Worst-Case Operating Load Impacts: 50% Load Operation

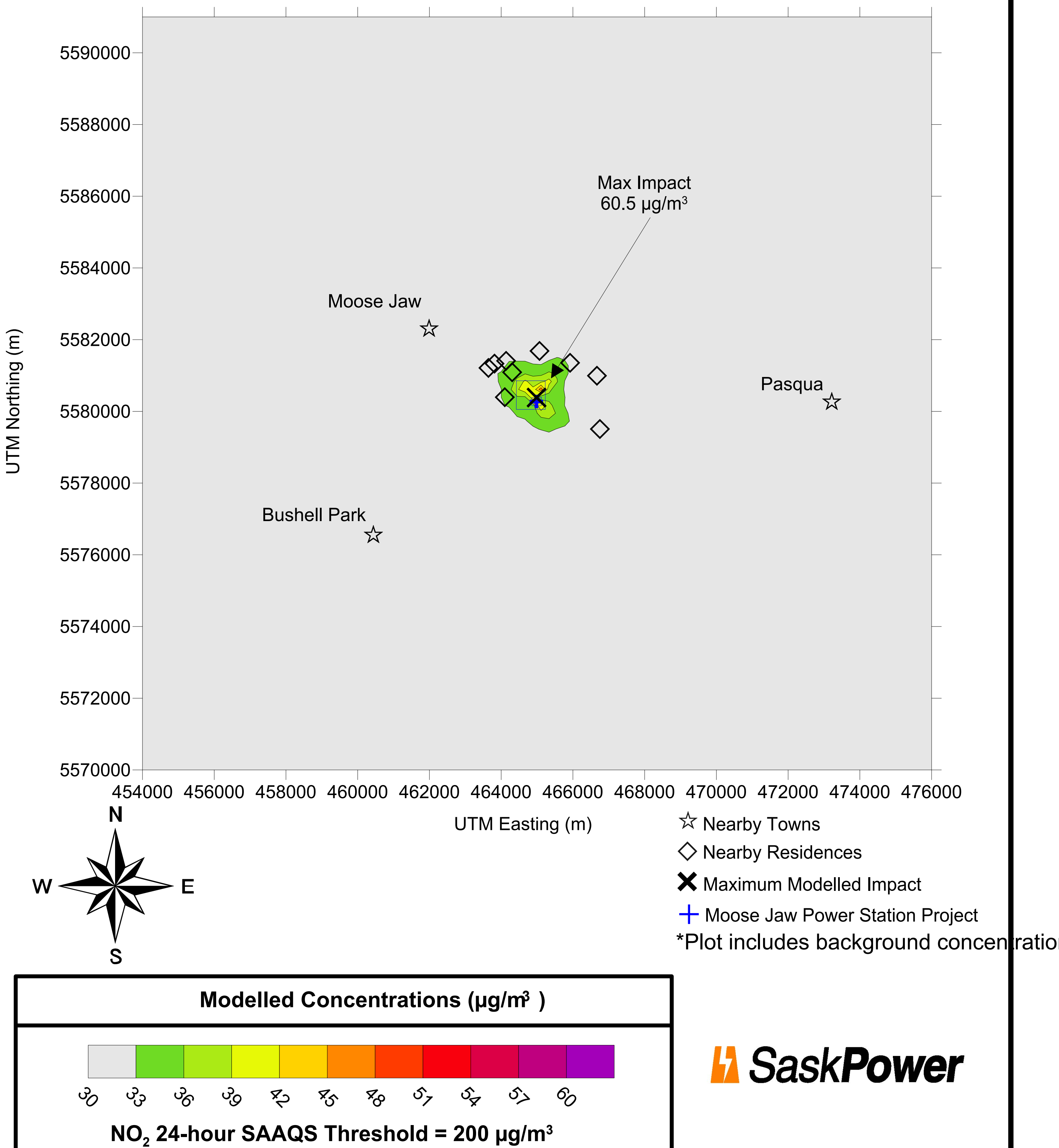


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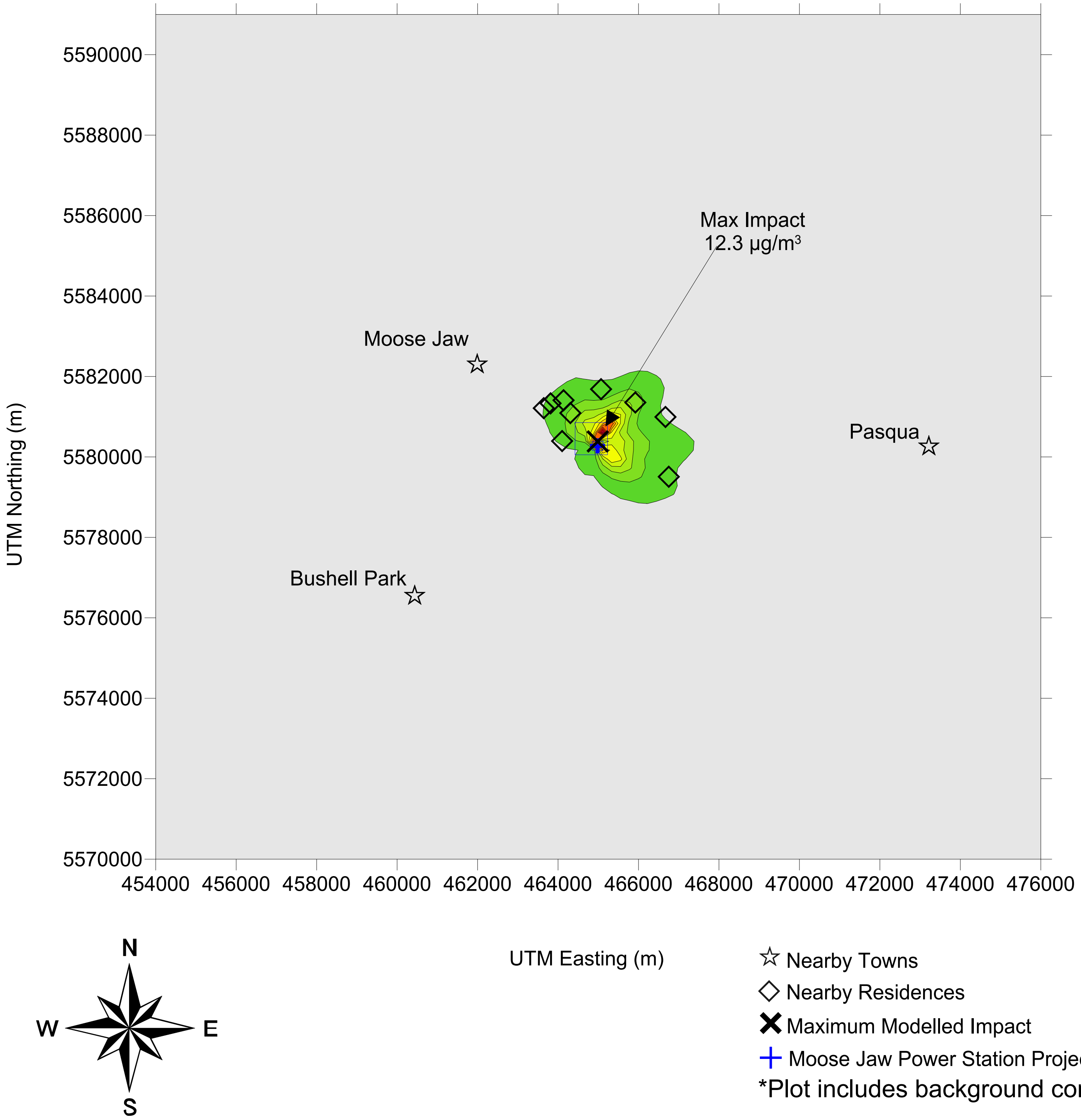
Figure C-6: NO_2 Annual Concentration Plot
Worst-Case Operating Load Impacts: 50% Load Operation



*Plot includes background concentration

Modelled Concentrations (μg/m³)

9.4 9.6 9.8 10 10.2 10.4 10.6 10.8 11 11.2 11.4 11.6 11.8

NO_2 Annual SAAQS Threshold = 45 μg/m³

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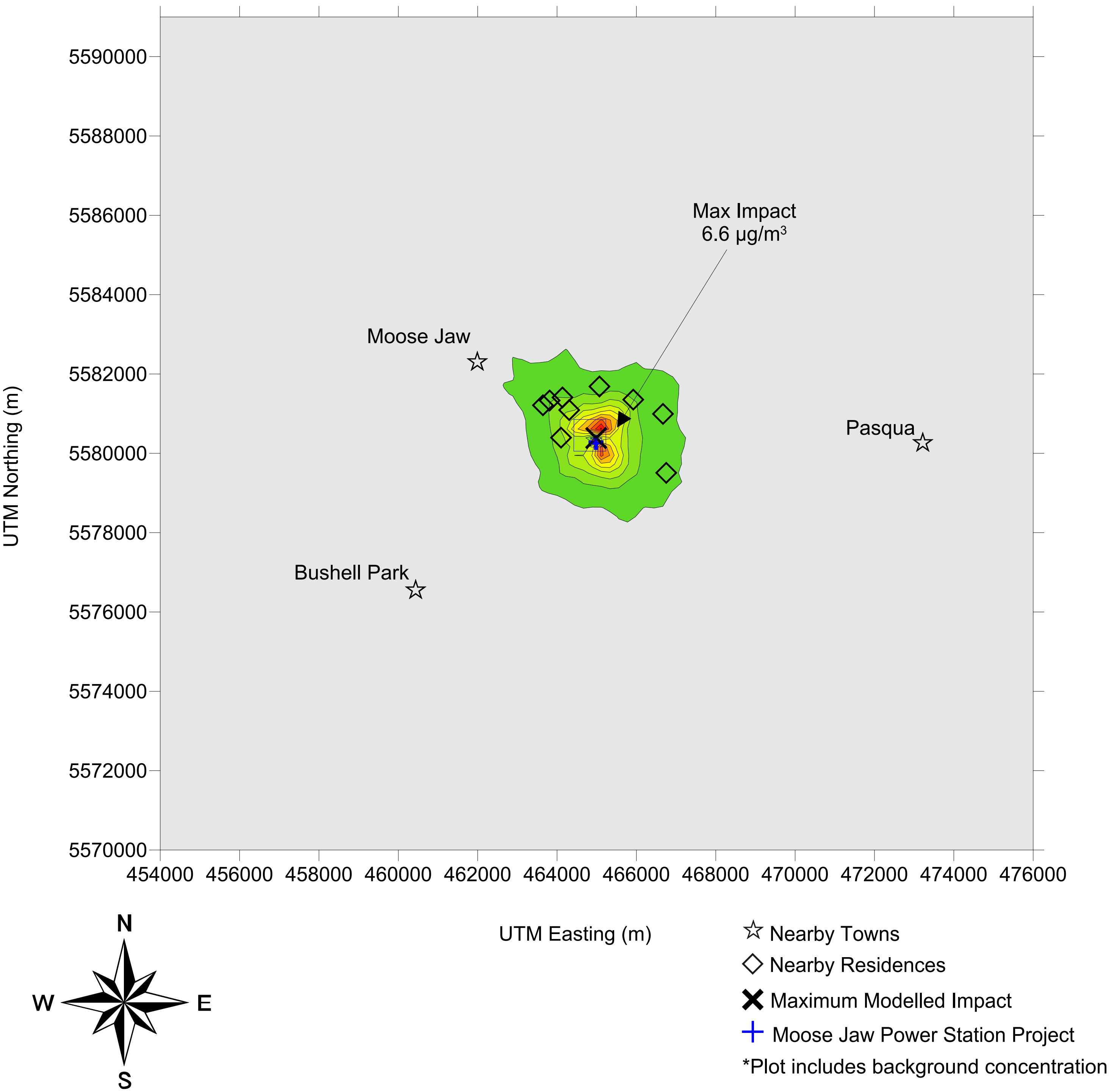
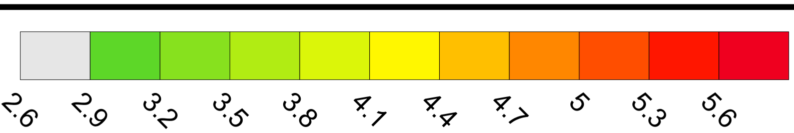
Figure C-7: SO_2 1-hour Concentration Plot
Worst-Case Operating Load Impacts: 75% Load Operation





SO_2 1-hour SAAQS Threshold = 450 µg/m³

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Figure C-8: SO_2 24-hour Concentration Plot
Worst-Case Operating Load Impacts: 50% Load Operation

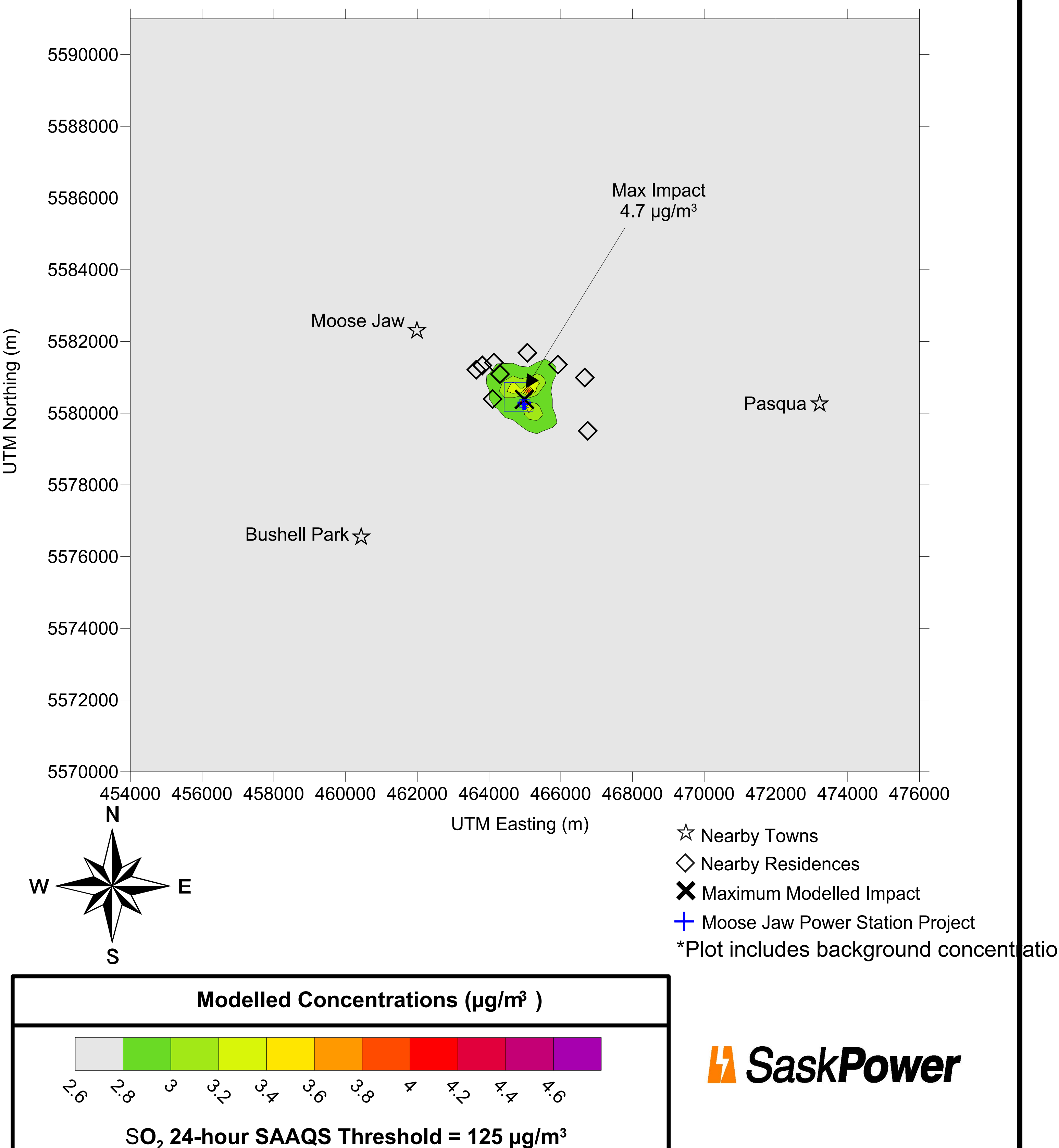

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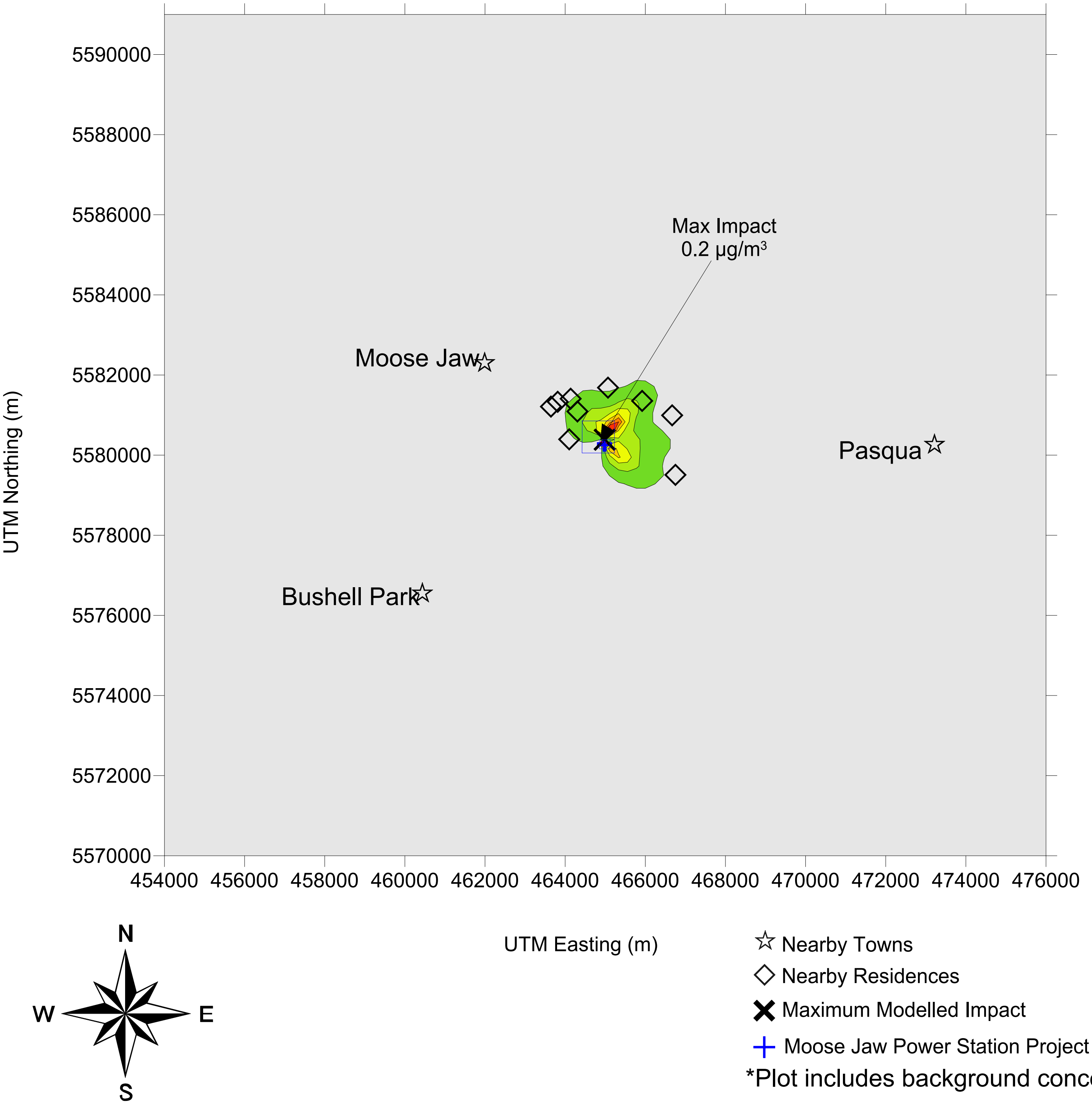
Figure C-9: SO_2 Annual Concentration Plot
Worst-Case Operating Load Impacts: 50% Load Operation



*Plot includes background concentration

Modelled Concentrations (µg/m³)

0 0.02 0.04 0.06 0.08 0.1 0.12 0.14 0.16 0.18 0.2

SO_2 Annual SAAQS Threshold = 20 µg/m³

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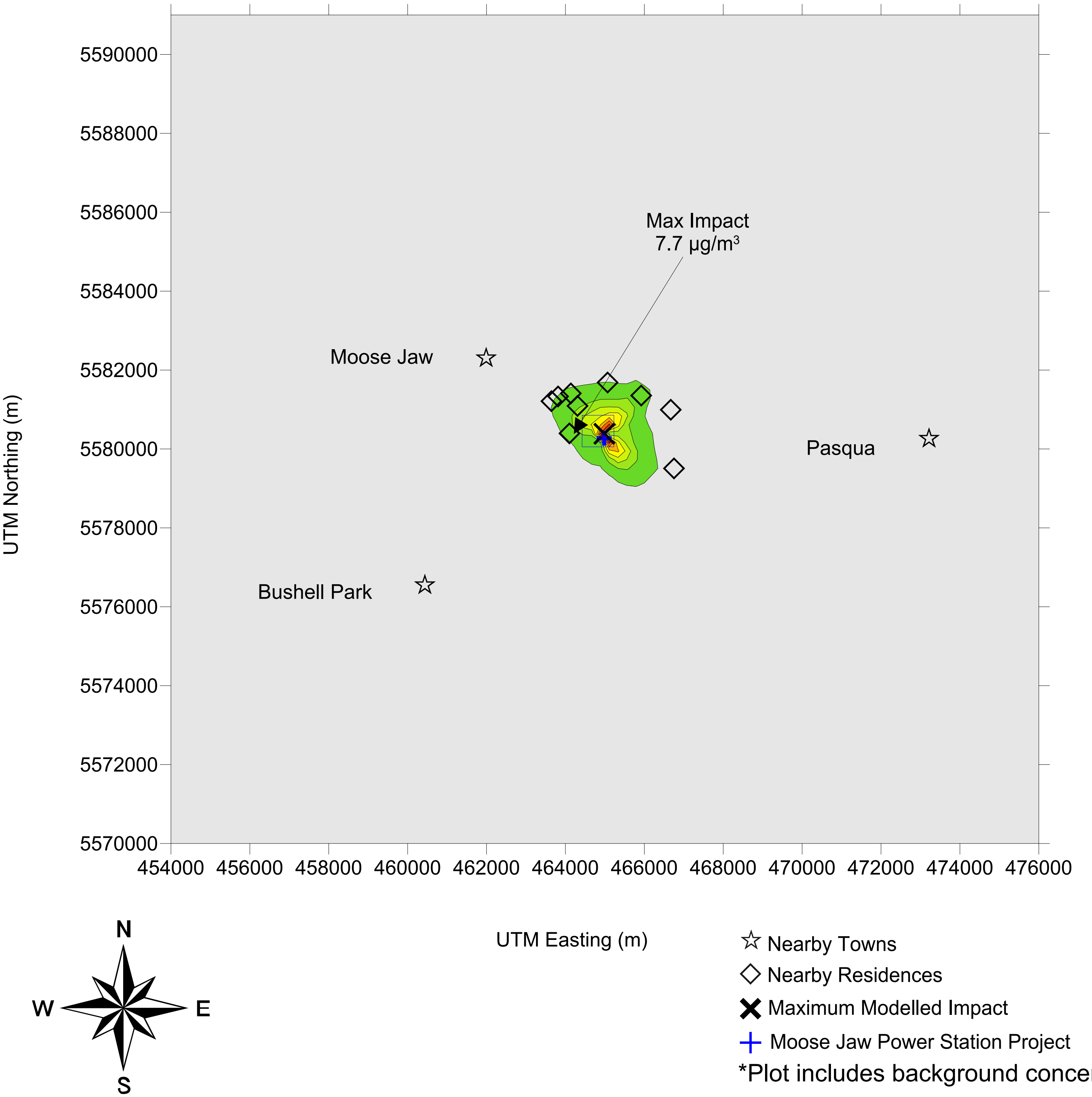
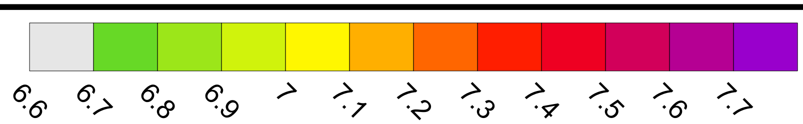
Figure C-10: PM$_{2.5}$ 24-hour Concentration Plot
Worst-Case Operating Load Impacts: 50% Load Operation



*Plot includes background concentration

Modelled Concentrations (µg/m³)



PM$_{2.5}$ 24-hour SAAQS Threshold = 28 µg/m³

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Figure C-11: $PM_{2.5}$ Annual Concentration Plot
Worst-Case Operating Load Impacts: 50% Load Operation

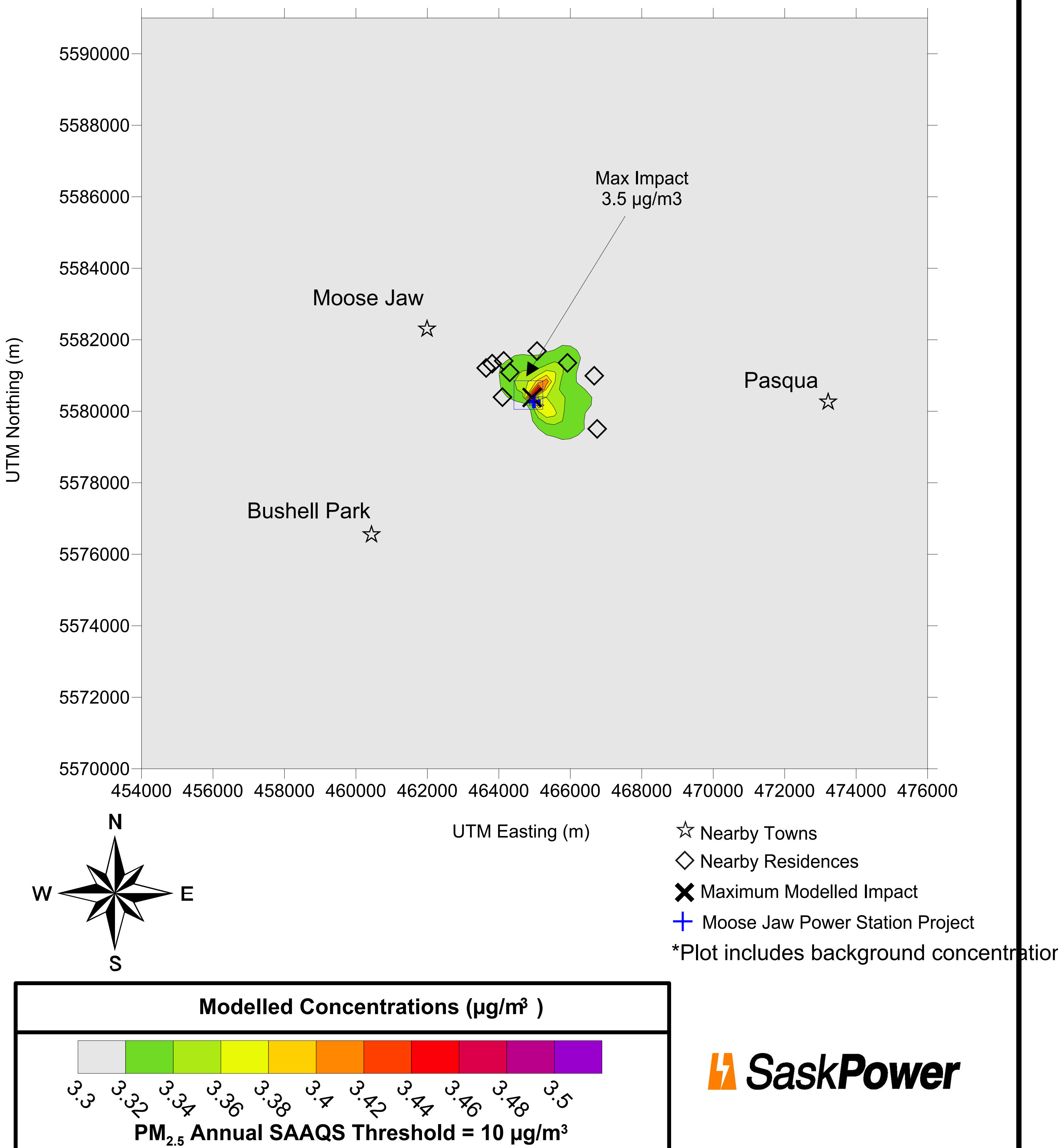
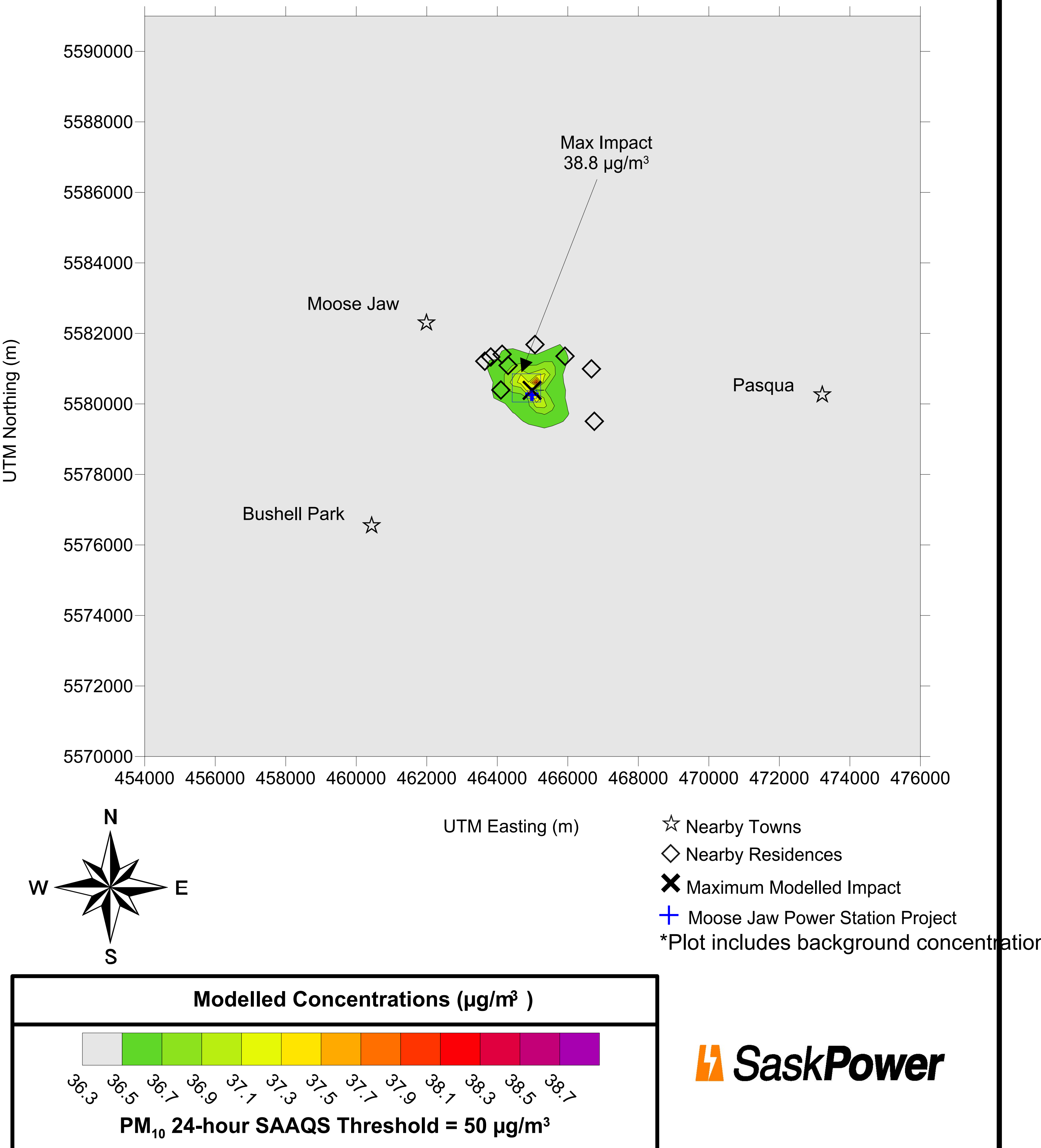
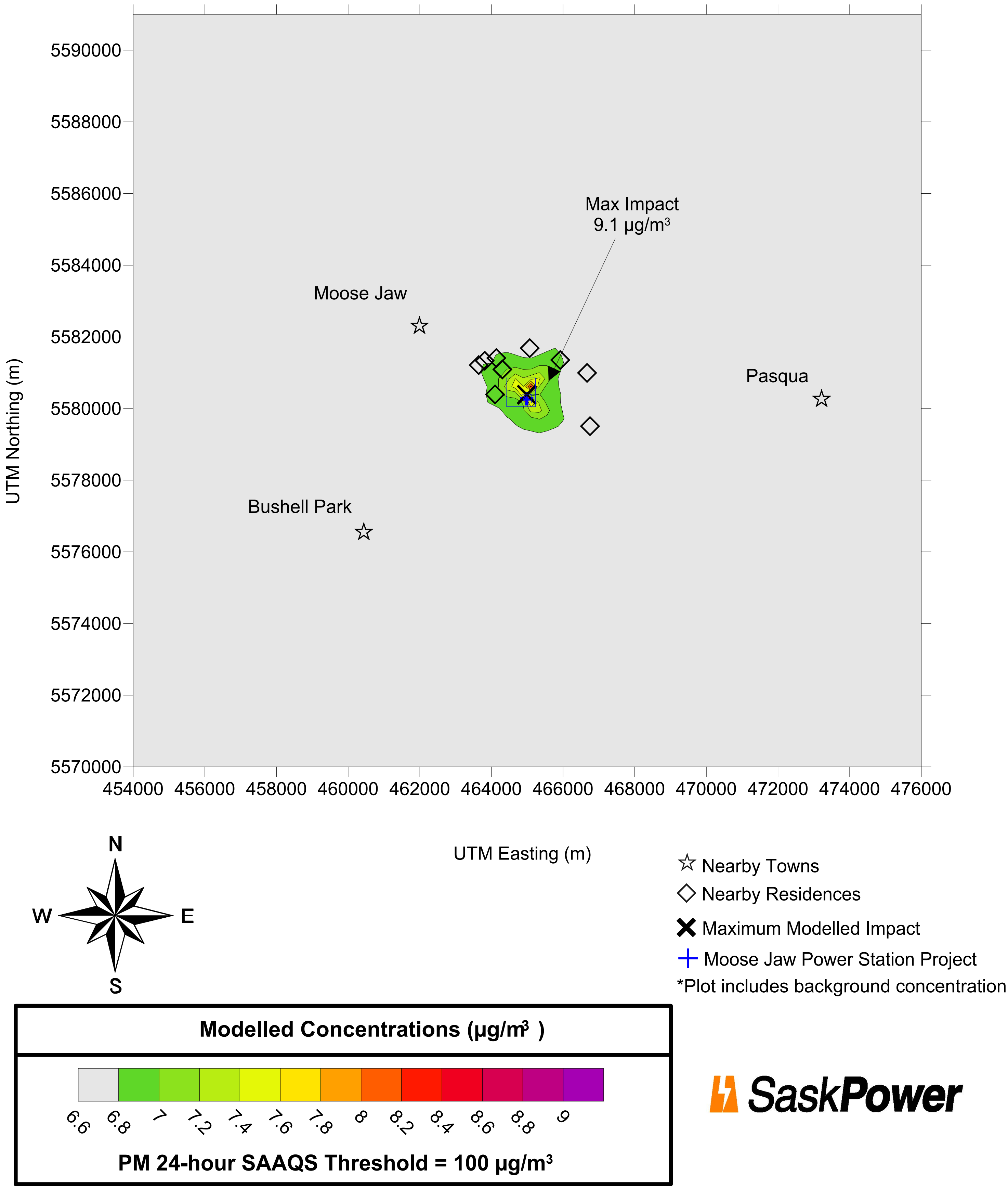


Figure C-12: PM_{10} 24-hour Concentration Plot
Worst-Case Operating Load Impacts: 50% Load Operation



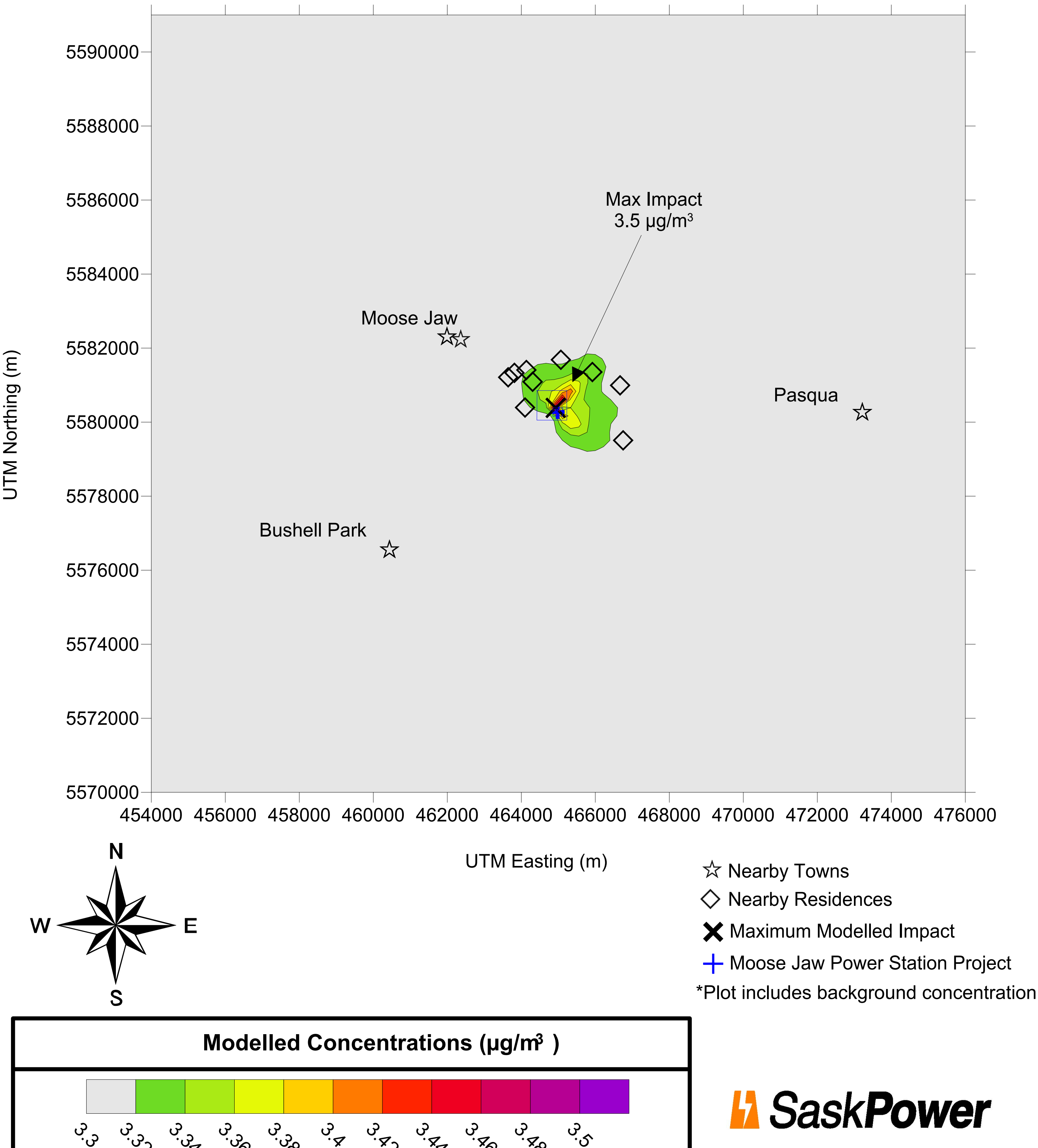
SaskPower

Figure C-13: PM 24-hour Concentration Plot
Worst-Case Operating Load Impacts: 50% Load Operation



SaskPower

Figure C-14: PM Annual Concentration Plot
Worst-Case Operating Load Impacts: 50% Load Operation



PM 24-hour SAAQS Threshold = 60 µg/m³

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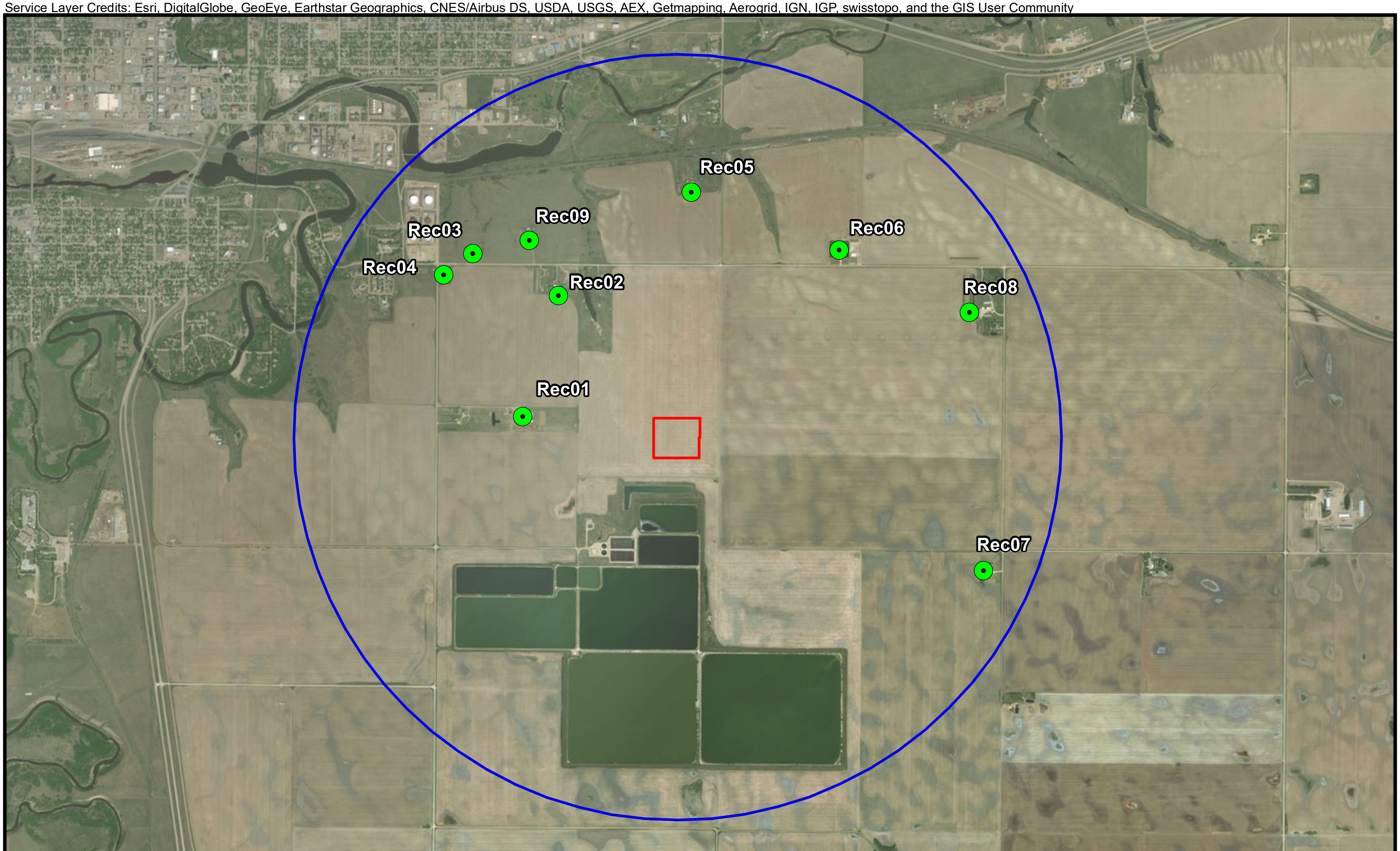
Service Layer Credits: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

- Residential Receptors
- 2-km Buffer
- Facility Fence Line

0 500 1,000 2,000
Meters

NORTH

Figure C-15
Nearest Modelled
Residential Receptors
Moose Jaw Power Station
SaskPower

Source: ESRI, Geobase, Burns & McDonnell

Issued: 3/4/2019

Table C-1. Maximum Operating Load Modelled Concentrations for Emergency Condition Plant Operation

Pollutant	Averaging Period	UTM Coordinates[a]		Year	Worse-Case Maximum Operating Load	Maximum Concentration			SAAQS Threshold
		Easting (meters)	Northing (meters)			Predicted	Background	Total	
						micrograms per cubic meter (µg/m³)			
CO	1-hour	464,987.10	5,580,385.20	2007	Start-up/ shutdown	1,258.2	720.0	1,978.2	15,000
	8-hour	465,150.00	5,580,100.00	2005	Start-up/ shutdown	644.0	720.0	1,364.0	6,000
NO_2	1-hour	465,200.00	5,580,250.00	2005	50%	211.9[b]	36.0	247.9	300
	24-hour	464,891.70	5,580,385.20	2003	50%	117.4[b]	30.0	147.4	200
	Annual	464,987.10	5,580,385.20	2003	50%	3.0[b]	9.4	12.4	45
SO_2	1-hour	464,872.30	5,580,157.70	2004	100%	55.6	2.6	58.2	450
	24-hour	464,891.70	5,580,385.20	2007	50%	17.4	2.6	20.0	125
	Annual	464,987.10	5,580,385.20	2003	50%	0.2	0.0	0.2	20
$PM_{2.5}$	24-hour	464,891.70	5,580,385.20	5 years	50%	3.4	6.6	10.0	28
	Annual	464,929.80	5,580,385.20	2003	50%	0.2	3.3	3.5	10
PM_{10}	24-hour	464,891.70	5,580,385.20	2007	50%	4.8	36.3	41.1	50
PM	24-hour	464,891.70	5,580,385.20	2007	50%	4.8	6.6	11.4	100
	Annual	464,929.80	5,580,385.20	2003	50%	0.2	3.3	3.5	60

(a) Universal Transverse Mercator NAD 83
(b) ARM2 methodology was used

Appendix D SUPPLEMENTAL WILDLIFE INFORMATION

D.1 WILDLIFE SOMC WITH THE POTENTIAL TO OCCUR IN THE WILDLIFE LAA

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]	SKMOE Activity Restriction Feature (Recommended Setback) [4]
INVERTEBRATES[5]						
Monarch	*Danaus plexippus*	Special Concern	Endangered	-	S2B	-
Verna's flower moth	*Schinia verna*	Threatened	Threatened		S1	-
Gypsy cuckoo bumble bee	*Bombus bohemicus*	Endangered	Endangered	-	S1	-
Yellow-banded bumble bee	*Bombus terricola*	Special Concern	Special Concern	-	S5	-
Nine-spotted lady beetle	*Coccinella novemnotata*	-	Endangered	-	S4	-
Greenish-white grasshopper	*Hypochlora alba*	Special Concern	Special Concern	-	S4	-
HERPTILES						
Plains spadefoot toad	*Spea bombifrons*	-	-	-	S3	Breeding and overwintering habitat (90 m)
Great Plains toad	*Anaxyrus cognatus*	Special Concern	Special Concern	-	S3	Breeding and overwintering habitat (400 m)
Canadian toad	*Anaxyrus hemiophrys*	-	-	-	S4	Breeding and overwintering habitat (90 m)
Northern leopard frog	*Lithobates pipiens*	Special Concern	Special Concern	-	S3	Breeding and overwintering habitat (200 m)
Bullsnake	*Pituophis catenifer sayi*	-	Special Concern	-	S4	-
Western tiger salamander	*Ambystoma mavortium*	Special Concern	Special Concern	-	S4	-

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]	SKMOE Activity Restriction Feature (Recommended Setback)[4]
Western painted turtle	*Chrysemys picta*	-	-	-	S3	-
BIRDS						
Sharp-tailed grouse	Tympanuchus phasianellus	-	-	-	S5	Lek (400 m)
Western grebe	Aechmophorus occidentalis	Special Concern	Special Concern	-	S3B, S3M	Breeding Bird* or Nesting colony (200 m)
Eared grebe	Podiceps nigricollis	-	-	-	S5B	Nesting colony (1000 m)
Horned grebe	Podiceps auritus	Special Concern	Special Concern	-	S5B	-
American bittern	Botaurus lentiginosus	-	-	-	S4B	Breeding bird* (350 m)
Great blue heron	Ardea herodias	-	-	-	S3B	Nesting colony (1000 m)
Black-crowned night-heron	Nycticorax nycticorax	-	-	-	S5B	Nesting colony (1000 m)
Yellow rail	Coturnicops noveboracensis	Special Concern	Special Concern	-	S3B, S2M	Breeding bird* (350 m)
Whooping crane	Grus americana	Endangered	Endangered	Endangered	SXB, S1M	Staging area (1000 m)
Piping plover	Charadrius melodus	Endangered	Endangered	Endangered	S3B	High-water mark
Long-billed curlew	Numenius americanus	Special Concern	Special Concern	-	S3B, S4M	Breeding bird* (200 m)
Herring gull	Larus argentatus	-	-	-	S5B, S5M	Nesting colony (400 m)
Franklin's gull	Leucophaeus pipixcan	-	-	-	S4B, S4M	Nesting colony (400 m)
Bonaparte's gull	Chroicocephalus philadelphia	-	-	-	S4B, S4M	Nesting colony (400 m)
Black tern	Chlidonias niger	-	-	-	S4B	Nesting colony (400 m)
Common tern	Sterna hirundo	-	-	-	S5B, S5M	Nesting colony (400 m)
Forster's tern	Sterna forsteri	-	-	-	S4B	Nesting colony (400 m)

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]	SKMOE Activity Restriction Feature (Recommended Setback)[4]
Turkey vulture	Cathartes aura	-	-	-	S2B, S2M, S2N	-
Ferruginous hawk	Buteo regalis	Threatened	Threatened	-	S4B, S4M	Nest site (1000 m)
Golden eagle	Aquila chrysaetos	-	Not at Risk	-	S3B, S4M, S3N	Nest site (1000 m)
Peregrine falcon	Falco peregrinus	Special Concern	-	-	S1B, S4M, S2N	Nest site (1000 m)
Burrowing owl	Athene cunicularia	Endangered	Endangered	Endangered	S2B	Breeding bird* (500 m)
Short-eared owl	Asio flammeus	Special Concern	Special Concern	-	S3B, S2N	Breeding bird* (500 m)
Common nighthawk	Chordeiles minor	Threatened	Special Concern	-	S4B, S4M	Breeding bird* (200 m)
Chimney swift	Chaetura pelagica	Threatened	Special Concern	-	S2B	Breeding bird* (300 m)
Red-headed woodpecker	Melanerpes erythrocephalus	Threatened	Endangered	-	S1B, S1M	Breeding bird* (100 m)
Loggerhead shrike	Lanius ludovicianus excubitorides	Threatened	Threatened	-	S3B	Breeding bird* (400 m)
Bank swallow	Riparia riparia	Threatened	Threatened	-	S5B, S5M	-
Barn swallow	Hirundo rustica	Threatened	Threatened	-	S5B, S5M	-
Sprague's pipit	Anthus spragueii	Threatened	Threatened	-	S3B	Breeding bird* (250 m)
McCown's longspur	Rhynchophanes mccownii	Special Concern	Threatened	-	S3B	Breeding bird* (200 m)
Chestnut-collared longspur	Calcarius ornatus	Threatened	Threatened	-	S5B	Breeding bird* (200 m)
Bobolink	Dolichonyx oryzivorus	Threatened	Threatened	-	S5B	-
Baird's sparrow	Ammodramus bairdii	Special Concern	Special Concern	-	S4B	-

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]	SKMOE Activity Restriction Feature (Recommended Setback) [4]
MAMMALS						
Little brown myotis	*Myotis lucifugus*	Endangered	Endangered	-	S4	Roost/foraging site (500 m)
Big brown bat	*Eptesicus fuscus*	-	-	-	S5	Roost/foraging site (500 m)
Silver-haired bat	*Lasionycteris noctivagans*	-	-	-	S5B	Roost/foraging site (500 m)
Hoary bat	*Lasiurus cinereus*	-	-	-	S5B	Roost/foraging site (500 m)
American badger	*Taxidea taxus taxus*	Special Concern	Special Concern	-	S3	-
Olive-backed pocket mouse	*Perognathus fasciatus*	-	-	-	S3	-
Pronghorn	*Antilocapra americana*	-	-	-	S3	-

NOTES:

[1] Species listed under Schedule 1 of the Species at Risk Act (Government of Canada 2019)

[2] Species listed under The Wildlife Act; Saskatchewan Ministry of Environment Species at Risk (Government of Saskatchewan 2019a)

[3] Saskatchewan Conservation Data Centre species lists (SKCDC 2019); designations are as follows:

S = province-wide status
1 = critically imperiled / extremely rare: at very high risk of extinction or extirpation due to extreme rarity, very steep declines, high threat level, or other factors
2 = imperiled / very rare: at high risk of extinction or extirpation due to a very restricted range, very few populations, steep declines, threats or other factors
3 = vulnerable / rare to uncommon: at moderate risk of extinction or extirpation due to a restricted range, relatively few populations, recent and widespread declines, threats, or other factors
4 = apparently secure: uncommon but not rare; some cause for long-term concern due to declines or other factors
5 = secure / common: demonstrably secure under present conditions; widespread and abundant; low threat level
S#S# = Range of uncertainty about the exact rarity of the species
B = for a migratory species, applies to the breeding population in the province
M = for a migratory species, rank applies to the transient (migrant) population
N = for a migratory species, applies to the non-breeding population in the province
NA = conservation status is not applicable to the species (e.g. it may have been introduced in Saskatchewan)

[4] Saskatchewan Activity Restriction Guidelines for Sensitive Species (SKMOE 2017)

[5] Includes only SARA- and COSEWIC-listed species

* characterized by breeding bird behavior (e.g., (territorial calling to competing male, mate or young; singing; courtship displays; carrying food or nest materials) or presence of nest or young found incidentally.

D.2 Migratory Birds with the Potential to Occur in the Wildlife RAA

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]
Greater White-fronted Goose	*Anser albifrons*				S5M
Canada Goose	*Branta canadensis*				S5B,S5M,S2N
Snow Goose	*Anser caerulescens*				S5M
Tundra Swan	*Cygnus columbianus*				S5M
Wood Duck	*Aix sponsa*				S4B,S4M
American Black Duck	*Anas rubripes*				S4B,S4M
Mallard	*Anas platyrhynchos*				S5
Northern Pintail	*Anas acuta*				S5B,S5M,S4N
Green-winged Teal	*Anas crecca*				S5B,S5M,S2N
Blue-winged Teal	*Spatula discors*				S5B,S5M
Cinnamon Teal	*Spatula cyanoptera*				S4B,S4M
Northern Shoveler	*Spatula clypeata*				S5B,S5M
Gadwall	*Mareca strepera*				S5B,S5M,S2N
Eurasian Wigeon	*Mareca penelope*				SNA
American Wigeon	*Mareca americana*				S5B,S5M,S2N
Canvasback	*Aythya valisineria*				S5B,S5M,S2N
Redhead	*Aythya americana*				S5B,S5M,S2N
Ring-necked Duck	*Aythya collaris*				S5B,S5M
Greater Scaup	*Aythya marila*				S5M
Lesser Scaup	*Aythya affinis*				S5B,S5M,S3N
Surf Scoter	*Melanitta perspicillata*				S4B,S3M
White-winged Scoter	*Melanitta fusca*				S5B,S3M
Bufflehead	*Bucephala albeola*				S5B,S3M,S1N
Common Goldeneye	*Bucephala clangula*				S5B,S3M,S3N
Common Merganser	*Mergus merganser*				S5B,S4M,S2N
Ruddy Duck	*Oxyura jamaicensis*				S5B
Gray Partridge*	*Perdix perdix*				SNA
Ring-necked Pheasant*	*Phasianus colchicus*				SNA
Sharp-tailed Grouse*	*Tympanuchus phasianellus*				S5

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]
Common Loon	*Gavia immer*				S5B
Pied-billed Grebe	*Podilymbus podiceps*				S5B
Western Grebe	*Aechmophorus occidentalis*	Special Concern	Special Concern		S5B
American White Pelican*	*Pelecanus erythrorhynchos*				S3B
Double-crested Cormorant*	*Phalacrocorax auritus*				S4B
American Bittern	*Botaurus lentiginosus*				S4B
Great Blue Heron	*Ardea herodias*				S3B
Great Egret	*Ardea alba*				SNA
Snowy Egret	*Egretta thula*				S1B
Black-crowned Night-Heron	*Nycticorax nycticorax*				S5B
Turkey Vulture*	*Cathartes aura*				S2B,S2M,S2N
Bald Eagle	*Haliaeetus leucocephalus*				S5B,S4M,S4N
Northern Harrier*	*Circus hudsonius*				S5B,S4M,S2N
Sharp-shinned Hawk*	*Accipiter striatus*				S4B,S4M,S2N
Cooper's Hawk*	*Accipiter cooperii*				S4B,S2M,S2N
Northern Goshawk*	*Accipiter gentilis*				S4B,S4M,S3N
Broad-winged Hawk*	*Buteo platypterus*				S4B,S3M
Swainson's Hawk*	*Buteo swainsoni*				S4B
Red-tailed Hawk*	*Buteo jamaicensis*				S5B,S5M,S1N
Ferruginous Hawk*	*Buteo regalis*	Threatened	Threatened		S4B,S4M
Rough-legged Hawk*	*Buteo lagopus*				S4M,S4N
Golden Eagle*	*Aquila chrysaetos*				S3B,S4M,S3N
American Kestrel*	*Falco sparverius*				S5B,S5M,S1N
Merlin*	*Falco columbarius*				S4B
Gyrfalcon*	*Falco rusticolus*				S4N
Peregrine Falcon*	*Falco peregrinus*	Special Concern	Not at Risk		S1B,S4M,S2N
Prairie Falcon*	*Falco mexicanus*				S3
Sora	*Porzana carolina*				S5B
American Coot	*Fulica americana*				S5B
Sandhill Crane	*Antigone canadensis*				S2B,S4M

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]
Whooping Crane	*Grus americana*	Endangered	Endangered	Endangered	SXB,S1M
Black-bellied Plover	*Pluvialis squatarola*				S4M
Semipalmated Plover	*Charadrius semipalmatus*				S1B,S5M
Piping Plover	*Charadrius melodus*	Endangered	Endangered	Endangered	S3B
Killdeer	*Charadrius vociferus*				S5B
American Avocet	*Recurvirostra americana*				S5B,S5M
Spotted Sandpiper	*Actitis macularius*				S5B,S5M
Solitary Sandpiper	*Tringa solitaria*				S5B,S4M
Greater Yellowlegs	*Tringa melanoleuca*				S5B,S5M
Willet	*Tringa semipalmata*				S5B,S4M
Lesser Yellowlegs	*Tringa flavipes*				S5B,S5M
Upland Sandpiper	*Bartramia longicauda*				S5B,S5M
Whimbrel	*Numenius phaeopus*				S4M
Long-billed Curlew	*Numenius americanus*	Special Concern	Special Concern		S3B,S4M
Hudsonian Godwit	*Limosa haemastica*				S4M
Marbled Godwit	*Limosa fedoa*				S5B,S5M
Red Knot	*Calidris canutus*	Endangered	Endangered		S2M
Sanderling	*Calidris alba*				S4M
Semipalmated Sandpiper	*Calidris pusilla*				S4M
Western Sandpiper	*Calidris mauri*				SNA
Least Sandpiper	*Calidris minutilla*				S4B,S4M
White-rumped Sandpiper	*Calidris fuscicollis*				S5M
Baird's Sandpiper	*Calidris bairdii*				S5M
Pectoral Sandpiper	*Calidris melanotos*				S5M
Dunlin	*Calidris alpina*				S5M
Stilt Sandpiper	*Calidris himantopus*				S5M
Short-billed Dowitcher	*Limnodromus griseus*				S1B,S4M
Long-billed Dowitcher	*Limnodromus scolopaceus*				S5M
Wilson's Snipe	*Gallinago delicata*				S5B
Wilson's Phalarope	*Phalaropus tricolor*				S5B,S5M

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]
Red-necked Phalarope	*Phalaropus lobatus*		Special Concern		S4B,S3M
Ring-billed Gull	*Larus delawarensis*				S5B,S5M
California Gull	*Larus californicus*				S5B,S5M
Herring Gull	*Larus argentatus*				S5B,S5M
Franklin's Gull	*Leucophaeus pipixcan*				S4B,S4M
Black Tern	*Chlidonias niger*				S4B
Common Tern	*Sterna hirundo*				S5B,S5M
Rock Pigeon	*Columba livia*				SNA
Mourning Dove	*Zenaida macroura*				S5B
Black-billed Cuckoo	*Coccyzus erythropthalmus*				S5B
Eastern Screech-owl*	*Megascops asio*				S3B,S2N
Great Horned Owl*	*Bubo virginianus*				S5
Snowy Owl*	*Bubo scandiacus*				S5N
Northern Hawk Owl*	*Surnia ulula*				S3B,S5N
Burrowing Owl*	*Athene cunicularia*	Endangered	Endangered	Endangered	S2B
Long-eared Owl*	*Asio otus*				S5B,S2N
Short-eared Owl*	*Asio flammeus*	Special Concern	Special Concern		S3B,S2N
Northern Saw-whet Owl*	*Aegolius acadicus*				S5B,S4N
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened		S4B,S4M
Chimney Swift	*Chaetura pelagica*	Threatened	Threatened		S2B
Ruby-throated Hummingbird	*Archilochus colubris*				S5B,S4M
Rufous Hummingbird	*Selasphorus rufus*				SNA
Belted Kingfisher*	*Megaceryle alcyon*				S5B,S5M
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Threatened	Endangered		S1B,S1M
Yellow-bellied Sapsucker	*Sphyrapicus varius*				S5B,S5M
Downy Woodpecker	*Dryobates pubescens*				S5
American Three-toed Woodpecker	*Picoides dorsalis*				S4
Black-backed Woodpecker	*Picoides arcticus*				S4B,S3N
Hairy Woodpecker	*Dryobates villosus*				S5

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]
Northern Flicker	*Colaptes auratus*				S4
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Special Concern		S4B,S4M
Yellow-bellied Flycatcher	*Empidonax flaviventris*				S5B,S5M
Alder Flycatcher	*Empidonax alnorum*				S5B,S5M
Willow Flycatcher	*Empidonax traillii*				S4B,S4M
Least Flycatcher	*Empidonax minimus*				S5B,S5M
Eastern Phoebe	*Sayornis phoebe*				S5B,S5M
Great Crested Flycatcher	*Myiarchus crinitus*				S5B,S5M
Western Kingbird	*Tyrannus verticalis*				S5B,S5M
Eastern Kingbird	*Tyrannus tyrannus*				S5B,S5M
Northern Shrike	*Lanius borealis*				S1B,S4N
Scissor-tailed Flycatcher	*Tyrannus forficatus*				SNA
Loggerhead Shrike	*Lanius ludovicianus*	Threatened	Threatened		S3B
Yellow-throated Vireo	*Vireo flavifrons*				S2B,S3N
Blue-headed Vireo	*Vireo solitarius*				S5B
Warbling Vireo	*Vireo gilvus*				S5B
Philadelphia Vireo	*Vireo philadelphicus*				S4B
Red-eyed Vireo	*Vireo olivaceus*				S5B
Blue Jay*	*Cyanocitta cristata*				S5
Clark's Nutcracker	*Nucifraga columbiana*				SNA
Black-billed Magpie*	*Pica hudsonia*				S5
American Crow*	*Corvus brachyrhynchos*				S5
Common Raven*	*Corvus corax*				S5
Horned Lark	*Eremophila alpestris*				S5B,S5M,S5N
Purple Martin	*Progne subis*				S5B,S5M
Western Wood-pewee	*Contopus sordidulus*				S5B
Tree Swallow	*Tachycineta bicolor*				S5B,S5M
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*				S5B
Bank Swallow	*Riparia riparia*	Threatened	Threatened		S5B,S5M
Barn Swallow	*Hirundo rustica*	Threatened	Threatened		S5B,S5M

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]
Black-capped Chickadee	*Poecile atricapillus*				S5
Boreal Chickadee	*Poecile hudsonicus*				S5
Red-breasted Nuthatch	*Sitta canadensis*				S5
White-breasted Nuthatch	*Sitta carolinensis*				S5
Brown Creeper	*Certhia americana*				S4B,S3N
House Wren	*Troglodytes aedon*				S5B
Golden-crowned Kinglet	*Regulus satrapa*				S4B
Ruby-crowned Kinglet	*Regulus calendula*				S5B
Eastern Bluebird	*Sialia sialis*				S4B
Mountain Bluebird	*Sialia currucoides*				S5B
Townsend's Solitaire	*Myadestes townsendi*				S3N,S3M
Veery	*Catharus fuscescens*				S5B
Gray-cheeked Thrush	*Catharus minimus*				S4B
Swainson's Thrush	*Catharus ustulatus*				S5B
Hermit Thrush	*Catharus guttatus*				S4B
Wood Thrush	*Hylocichla mustelina*				SNA
American Robin	*Turdus migratorius*				S5B
Varied Thrush	*Ixoreus naevius*				SNA
Gray Catbird	*Dumetella carolinensis*				S5B
Northern Mockingbird	*Mimus polyglottos*				S3B
Brown Thrasher	*Toxostoma rufum*				S5B
European Starling	*Sturnus vulgaris*				SNA
American Pipit	*Anthus rubescens*				S5N
Sprague's Pipit	*Anthus spragueii*	Threatened	Threatened		S3B
Bohemian Waxwing	*Bombycilla garrulus*				S4B
Cedar Waxwing	*Bombycilla cedrorum*				S5B
Tennessee Warbler	*Oreothlypis peregrina*				S5B
Orange-crowned Warbler	*Oreothlypis celata*				S5B
Nashville Warbler	*Oreothlypis ruficapilla*				S5B
Yellow Warbler	*Setophaga petechia*				S5B
Chestnut-sided Warbler	*Setophaga pensylvanica*				S5B
Magnolia Warbler	*Setophaga magnolia*				S5B

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]
Cape May Warbler	*Setophaga tigrina*				S4B
Black-throated Blue Warbler	*Setophaga caerulescens*				S2B
Yellow-rumped Warbler	*Setophaga coronata*				S5B
Black-throated Green Warbler	*Setophaga virens*				S4B
Blackburnian Warbler	*Setophaga fusca*				S4B
Pine Warbler	*Setophaga pinus*				SNA
Palm Warbler	*Setophaga palmarum*				S5B
Bay-breasted Warbler	*Setophaga castanea*				S4B
Blackpoll Warbler	*Setophaga striata*				S5B
Black-and-white Warbler	*Mniotilta varia*				S5B
American Redstart	*Setophaga ruticilla*				S5B
Prothonotary Warbler	*Protonotaria citrea*				SNA
Ovenbird	*Seiurus aurocapilla*				S5B
Northern Waterthrush	*Parkesia noveboracensis*				S5B
Kentucky Warbler	*Geothlypis formosa*				SNA
Connecticut Warbler	*Oporornis agilis*				S2B
Mourning Warbler	*Geothlypis philadelphia*				S5B
Common Yellowthroat	*Geothlypis trichas*				S5B
Wilson's Warbler	*Cardellina pusilla*				S5B
Canada Warbler	*Cardellina canadensis*	Threatened	Threatened		S5B
Yellow-breasted Chat	*Icteria virens*				S4B
American Tree Sparrow	*Spizelloides arborea*				S5B
Chipping Sparrow	*Spizella passerina*				S5B
Vesper Sparrow	*Pooecetes gramineus*				S5B
Lark Sparrow	*Chondestes grammacus*				S5B
Lark Bunting	*Calamospiza melanocorys*		Threatened		S4B
Savannah Sparrow	*Passerculus sandwichensis*				S5B
Grasshopper Sparrow	*Ammodramus savannarum*				S4B
Fox Sparrow	*Passerella iliaca*				S5B
Song Sparrow	*Melospiza melodia*				S5B
Lincoln's Sparrow	*Melospiza lincolnii*				S5B
Swamp Sparrow	*Melospiza georgiana*				S5B,S5M

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]
White-throated Sparrow	*Zonotrichia albicollis*				S5B
Harris' Sparrow	*Zonotrichia querula*		Special Concern		S5B
White-crowned Sparrow	*Zonotrichia leucophrys*				S5B
Golden-crowned Sparrow	*Zonotrichia atricapilla*				SNA
Baird's Sparrow	*Centronyx bairdii*	Special Concern	Special Concern		S4B
Le Conte's Sparrow	*Ammospiza leconteii*				S4B
Dark-eyed Junco	*Junco hyemalis*				S5B
McCown's Longspur	*Rhynchophanes mccownii*	Special Concern	Threatened		S3B
Lapland Longspur	*Calcarius lapponicus*				S4N
Chestnut-collared Longspur	*Calcarius ornatus*	Threatened	Threatened		S5B
Snow Bunting	*Plectrophenax nivalis*				S5N
Rose-breasted Grosbeak	*Pheucticus ludovicianus*				S5B
Black-headed Grosbeak	*Pheucticus melanocephalus*				S4B
Lazuli Bunting	*Passerina amoena*				S5B
Bobolink	*Dolichonyx oryzivorus*	Threatened	Threatened		S5B
Red-winged Blackbird	*Agelaius phoeniceus*				S5B
Western Meadowlark	*Sturnella neglecta*				S5B
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*				S5B
Rusty Blackbird	*Euphagus carolinus*	Special Concern	Special Concern		S4B
Brewer's Blackbird	*Euphagus cyanocephalus*				S5B
Common Grackle	*Quiscalus quiscula*				S5B
Brown-headed Cowbird	*Molothrus ater*				S5B
Orchard Oriole	*Icterus spurius*				S4B
Baltimore Oriole	*Icterus galbula*				S5B
Pine Grosbeak	*Pinicola enucleator*				S2B,S4N
Red Crossbill	*Loxia curvirostra*				S4B,S5N
White-winged Crossbill	*Loxia leucoptera*				S4B,S3N
Common Redpoll	*Acanthis flammea*				S4

Common Name	Scientific Name	SARA[1]	COSEWIC[1]	SKMOE[2]	SKCDC[3]
Hoary Redpoll	*Acanthis hornemanni*				S5N
Pine Siskin	*Spinus pinus*				S5
American Goldfinch	*Spinus tristis*				S5B
Evening Grosbeak	*Coccothraustes vespertinus*		Special Concern		S4
House Sparrow	*Passer domesticus*				SNA
Scarlet Tanager	*Piranga olivacea*				SNA
Western Tanager	*Piranga ludoviciana*				S5B
Gray Jay	*Perisoreus canadensis*				S5
Eared Grebe	*Podiceps nigricollis*				S5B
Horned Grebe	*Podiceps auritus*	Special Concern	Special Concern		S5B
Clay-coloured Sparrow	*Spizella pallida*				S5B
Winter Wren	*Troglodytes hiemalis*				S4B
Purple Finch	*Haemorhous purpureus*				S5B
House Finch	*Haemorhous mexicanus*				S5N

NOTES:

¹ Species listed under Schedule 1 of the Species at Risk Act (Government of Canada 2019)

² Species listed under The Wildlife Act; Saskatchewan Ministry of Environment Species at Risk (Government of Saskatchewan 2019a)

³ Saskatchewan Conservation Data Centre species lists (SKCDC 2019); designations are as follows:

S = province-wide status

1 = critically imperiled / extremely rare: at very high risk of extinction or extirpation due to extreme rarity, very steep declines, high threat level, or other factors

2 = imperiled / very rare: at high risk of extinction or extirpation due to a very restricted range, very few populations, steep declines, threats or other factors

3 = vulnerable / rare to uncommon: at moderate risk of extinction or extirpation due to a restricted range, relatively few populations, recent and widespread declines, threats, or other factors

4 = apparently secure: uncommon but not rare; some cause for long-term concern due to declines or other factors

5 = secure / common: demonstrably secure under present conditions; widespread and abundant; low threat level

S#S# = Range of uncertainty about the exact rarity of the species

B = for a migratory species, applies to the breeding population in the province

M = for a migratory species, rank applies to the transient (migrant) population

N = for a migratory species, applies to the non-breeding population in the province

NA = conservation status is not applicable to the species (e.g. it may have been introduced in Saskatchewan)

* indicates species not protected under the Migratory Birds Convention Act, 1994 (Government of Canada 1994)

Appendix E NOISE IMPACT ASSESSMENT

Noise Impact Assessment

SaskPower

Moose Jaw Power Station
Project No. 112577

Revision 2
3/25/2019

Noise Impact Assessment

prepared for

SaskPower
Moose Jaw Power Station
Moose Jaw, Saskatchewan

Project No. 112577

Revision 2
3/25/2019

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ACC	air-cooled condenser
AUC Rule 012	Alberta Utilities Commission Rule 012
BSL	basic sound level
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
CadnaA	Computer Aided Noise Abatement
CTG	combustion turbine generator
dB	decibels
dBA	decibels A-weighted
dBC	decibels C-weighted
dBC-dBA	difference between dBC and dBA
Facility	Moose Jaw Power Station
Hz	Hertz
HRSG	heat recovery steam generator
ISO	International Organization of Standardization
L_{eq}	equivalent sound level
L_p	sound pressure level
L_w	sound power level
NIA	noise impact assessment
PSL	permissible sound level
Rec	noise-sensitive receiver
STC	sound transmission class

Abbreviation	Term/Phrase/Name
STG	steam turbine generator

1.0 EXECUTIVE SUMMARY

Burns & McDonnell Engineering, Inc. (Burns & McDonnell) has conducted a noise impact assessment (NIA) for SaskPower's proposed Moose Jaw Power Station (Facility) located within the Moose Jaw Industrial Park in Moose Jaw, Saskatchewan. Major equipment to be installed at the 1x1 combined-cycle project (the Project) consists of one combustion turbine generator (CTG), one heat recovery steam generator (HRSG), one steam turbine generator (STG) and an air-cooled condenser (ACC). The purpose of this NIA is to determine the design goal and predict the expected sound levels emanating from the Facility as measured 15 meters from the most impacted dwelling(s) during normal steady state operations. Upset conditions such as startup, shutdown, and bypass operations are not evaluated within this NIA.

Burns & McDonnell reviewed the local noise regulations to determine noise limits applicable to the Facility. Neither the city of Moose Jaw nor Saskatchewan has a numerical noise limit applicable to the Facility. At the request of the SaskPower, the Facility's design goal is to meet the permissible sound level (PSL) as determined by Alberta Utilities Commission Rule 012 (AUC Rule 012).

Burns & McDonnell has not collected ambient sound data at this time, an ambient nighttime sound level of 35 decibels A-weighted (dBA) and daytime sound level of 45 dBA were assumed in this analysis per AUC guidance. The calculated PSLs for the dwellings near the proposed Facility are 40 dBA equivalent sound level (L_{eq}) during nighttime hours and 50 dBA L_{eq} during daytime hours. The more restrictive nighttime level will be used as a design goal for the proposed Facility.

To quantify the noise emitted by the Facility, a noise model of the Facility was developed based on historical and vendor-supplied sound level data. Sound sources were modeled at noise-sensitive receivers in the surrounding community. Receivers were located a minimum of 15 meters from the dwelling in the direction of the Facility.

The cumulative, predicted sound levels (logarithmic sum of Facility emitted noise and assumed ambient noise) are expected to be at or below the PSLs at all nearby dwellings, and low-frequency noise is not expected to be an issue.

2.0 ACOUSTIC TERMINOLOGY

The terms “noise level” and “sound level” are often used interchangeably to describe two different sound characteristics called sound power and sound pressure. Every source that produces sound has a sound power level. The sound power level is the acoustical energy emitted by a sound source and is an absolute number that is not affected by the environment. The acoustical energy produced by a source propagates through the air as air pressure fluctuations. These pressure fluctuations, also called sound pressure, are what human ears hear and microphones measure.

Sound energy is physically characterized by amplitude and frequency. Sound amplitude is measured in decibels (dB) as the logarithmic ratio of a sound pressure to a reference sound pressure (20 microPascals). The reference sound pressure corresponds to the typical threshold of human hearing. A 3-dB change in a continuous broadband sound level is generally considered “just barely perceptible” to the average listener. A 6-dB change is generally considered “clearly noticeable,” and a 10-dB change is generally considered a doubling (or halving, if the sound is decreasing) of the apparent loudness.

Frequency is measured in Hertz (Hz), which is the number of cycles per second. The typical human ear can hear frequencies ranging from approximately 20 to 20,000 Hz. Normally, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the low and high frequencies. As such, the A-weighted scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighted scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighted scale has been applied is expressed in dBA. For reference, the sound pressure level and subjective loudness associated with some common sound sources are listed in Table 2-1.

Sound in the environment is constantly fluctuating, for example, when a car drives by, a dog barks, or a plane passes overhead. Although an instantaneous sound level measured in dBA may indicate the level of noise experienced by an observer at that point in time, environmental noise levels vary continuously. Most ambient environmental noise includes a mixture of noise from some identifiable sources plus a relatively steady background noise where no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) is used to describe sound that is constant or changing in level. The L_{eq} is the average sound level for a specific time period.

Table 2-1: Typical Sound Pressure Levels Associated with Common Sound Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 ft.	--
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 ft.	--
120	Threshold of feeling	Elevated train	Hard rock band
110	--	Jet flyover at 1,000 ft.	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 ft., auto horn at 10 ft., crowd noise at football game	--
90	--	Propeller plane flyover at 1,000 ft., noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 mph) at 50 ft.	Inside auto at high speed, garbage disposal
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner
60	Moderate	Air-conditioner condenser at 15 ft., near highway traffic	General office
50	Quiet	--	Private office
40	--	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20	--	Rustling leaves	Quiet theater, whisper
10	Just audible	--	Human breathing
0	Threshold of hearing	--	--

Sources:
(1) Adapted from *Architectural Acoustics*, M. David Egan, 1988
(2) *Architectural Graphic Standards*, Ramsey and Sleeper, 1994

3.0 APPLICABLE REGULATIONS AND DESIGN GOALS

Burns & McDonnell reviewed the local noise regulations to determine noise limits applicable to the Facility. The Facility will be located in an industrial park within Moose Jaw, Saskatchewan. Neither the city of Moose Jaw nor Saskatchewan has a numerical noise limit applicable to the Facility. At the request of the SaskPower, the Facility's designed goal is to meet the PSLs as determined by AUC Rule 012.

3.1 AUC Rule 012

The purpose of AUC Rule 012 is to provide a procedure to verify that the noise from a facility, measured cumulatively with noise from other energy-related facilities, will not exceed the PSL calculated in accordance with the AUC Rule 012 methodology. The PSL is the maximum daytime or nighttime sound level at a point 15 meters from a dwelling in the direction of a facility. AUC Rule 012 defines a dwelling to be "any permanently or seasonally occupied structure used for habitation for the purpose of human rest; including a nursing home or hospital with the exception of an employee or worker residence, dormitory, or construction camp located within an energy-related industrial plant boundary. Trailer parks and campgrounds may qualify as a dwelling if it can be demonstrated that they are in regular and consistent use."

The cumulative sound level includes the assumed or measured ambient sound level; any existing and approved, but not yet constructed energy-related facilities; and the predicted sound level from the applicant's proposed facility.

Ambient sound level measurements may be taken to quantify the existing sound levels in the area and, in conjunction with the basic sound level (BSL) refine the cumulative PSL. This ambient data would include existing transportation, industrial, extraneous sources in the area, and potentially existing energy-related facilities.

There are two existing energy-related facilities in the area of the proposed Facility. There is an existing Petroleum Processing Facility located approximately 2,600 meters northwest of the proposed Facility and SaskEnergy's District Regulator Station located approximately 2,015 meters northwest of the proposed Facility. The location of these facilities is provided in Figure 3-1.

Within the noise measurement section of AUC Rule 012, low-frequency noise is addressed. The rule provides two conditions that indicate the presence of low-frequency noise at a dwelling. The first condition is if the difference of the dBC and dBA (dBC-dBA) levels is 20 dB or greater. The second condition requires an analysis of one-third octave bands between 20 and 250 Hz. The data necessary to perform the one-third octave band analysis is not readily available during the design phase of a project. Therefore, for this NIA, the dBC-dBA value will be used to indicate if low-frequency noise is a possible issue.

3.2 Permissible Sound Levels

Per the AUC Rule 012, the PSL at a dwelling is the sum of the BSL, daytime adjustment, Class A adjustments, Class B adjustments, and/or Class C adjustments. Based on desktop review, nine nearby dwellings have been identified and will be evaluated within this NIA. All nine dwellings are within 1,500 meters of the proposed Project boundary. The Facility location and nearby dwellings, labeled Receiver (Rec) 01 through 09 are shown in Figure 3-1.

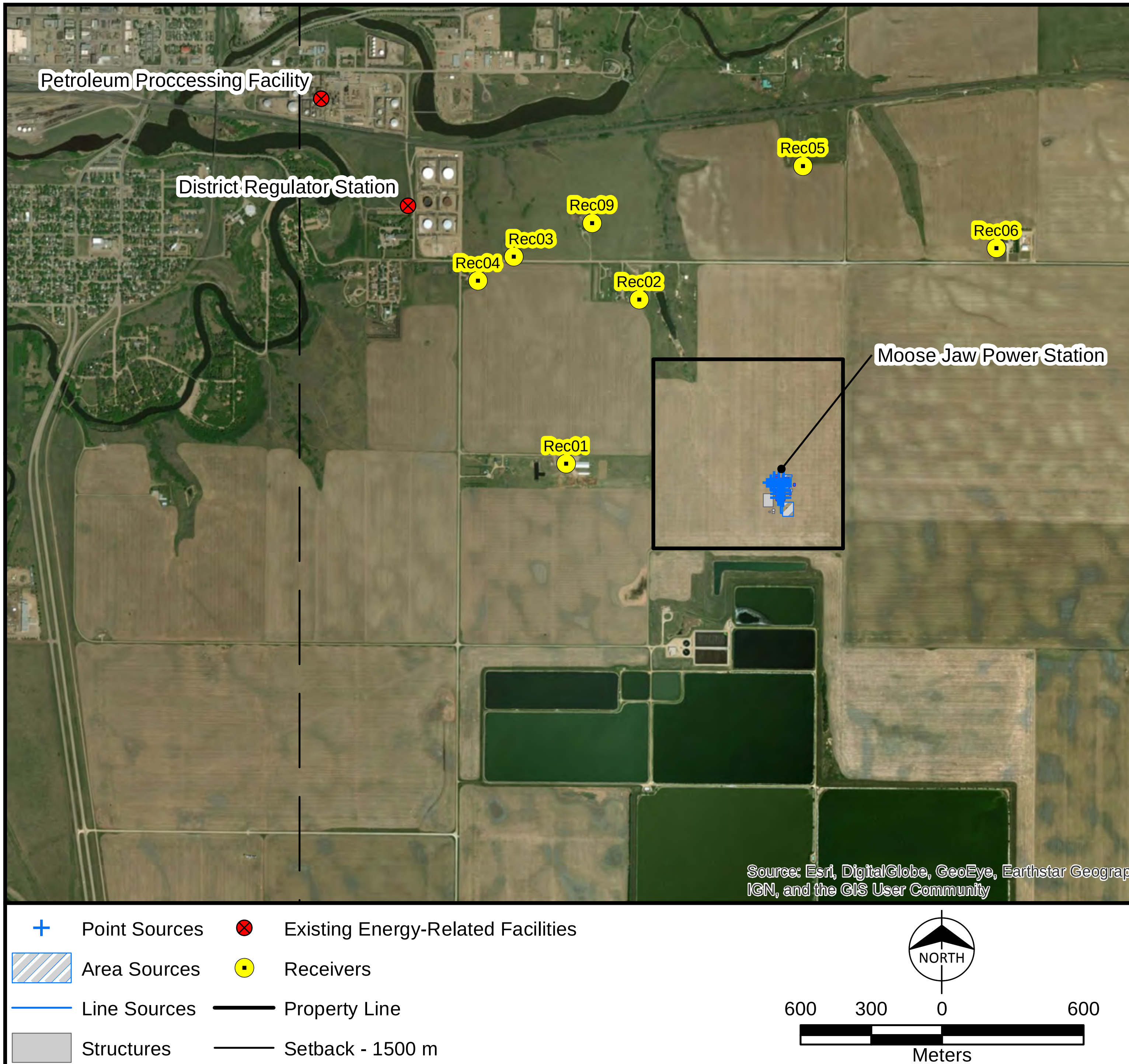

Figure 3-1
SaskPower
Moose Jaw Power Station
Facility and Receiver Locations

Source: ESRI, Burns & McDonnell Engineering Company, Inc.

Issued: 3/25/2019

3.2.1 Basic Sound Level and Assumed Ambient Sound Levels

Per the AUC Rule 012, the nighttime BSL is determined by the number of dwellings per quarter section of land and the distance from the dwelling to transportation noise sources such as a heavily traveled road, railway, or frequent aircraft flyovers. The BSLs based on these factors are provided in Table 3-1. Assumed ambient nighttime sound levels are 5 dBA less than the basic sound level and assumed ambient daytime levels are 5 dBA greater than the basic sound levels in accordance with the AUC Rule 012 methodology.

Table 3-1: Nighttime Basic Sound Levels (dBA L_{eq})

Proximity to Transportation Noise Source	Dwellings per Quarter Section of Land		
	1 to 8 Dwellings	9 to 160 Dwellings	> 160 Dwellings
Category 1[a]	40	43	46
Category 2[b]	45	48	51
Category 3[c]	50	53	56

a) Category 1 dwellings are located more than 500 meters from transportation noise sources such as heavily traveled roads, railways, and are not subject to regular aircraft overflight.
b) Category 2 dwellings are located more than 30 meters but less than 500 meters from transportation noise sources such as heavily traveled roads, railways, and are not subject to regular aircraft overflight.
c) Category 3 dwellings are located less than 30 meters from transportation noise sources such as heavily traveled roads, railways, or are subject to regular aircraft overflight.

The lowest BSL for the identified receivers is based on a desktop review showing there are between 1 and 8 dwellings per quarter section of land, and the dwellings nearest the proposed Facility are more than 500 meters from the heavily traveled roadways, rails, and are not subject to regular aircraft overflight in the area. As a conservative measure, this BSL is assumed for all receivers in the area although some receivers may have a greater population density and / or be located within 500 meters of the railway or aircraft overflight. Therefore, the nighttime BSLs for dwellings in proximity to the Facility is 40 dBA L_{eq}. Per AUC Rule 012, the assumed ambient daytime and nighttime sound levels are 45 and 35 dBA, respectively.

3.2.2 Daytime Adjustment

Per the AUC Rule 012, the daytime adjustment factor is 10 dBA for the hours of 7:00 A.M to 10:00 P.M.

3.2.3 Class A Adjustments

There are two types of Class A adjustments defined within AUC Rule 012: A1 and A2. An A1 adjustment is a +5-dBA seasonal adjustment for measurements during wintertime conditions. This adjustment is not applicable during the design phase of the Project.

An A2 adjustment is an ambient noise monitoring adjustment, applicable if the measured ambient sound level differs from the assumed ambient sound level. The adjustment can range between -10 to +10 dBA. At this time, ambient noise monitoring has not been completed and the assumed ambient sound levels will be used for this analysis with no further adjustment. Ambient sound level measurements may be taken to quantify the existing sound levels in the area and used to refine the cumulative PSL. This ambient data will include existing transportation, industrial, extraneous sources in the area, and any existing energy-related facilities in the area.

3.2.4 Class B Adjustments

Class B adjustments increase the BSL for temporary noise generating activities. Temporary noise generating activities are those lasting up to 60 days and not expected to occur more than once every 12 months. In order to use this adjustment, the Facility must inform the potentially-impacted residence of the duration and character of the temporary noise.

This analysis focuses on the normal, steady-state operation of the Facility and does not utilize any Class B adjustment for temporary noise activities.

3.2.5 Class C Adjustments

Class C adjustments are specific to wind energy projects and are not applicable to this Project.

3.2.6 Calculated Permissible Sound Levels and Project Design Goal

The PSLs for dwellings near the proposed Facility are calculated by taking the sum of the BSL and each of the applicable adjustments. The calculations of the PSLs are provided in Table 3-2.

Table 3-2: Permissible Sound Levels (dBA L_{eq}) at Nearby Dwellings

Time of Day	Basic Sound Level	Sound Level Adjustments					Permissible Sound Level
		Daytime	Class A1	Class A2	Class B	Class C	
Nighttime[a]	40	0	0	0	0	0	40
Daytime[b]	40	10	0	0	0	0	50

a) Nighttime hours are from 10:00 P.M. to 7:00 A.M.
b) Daytime hours are from 7:00 A.M. to 10:00 P.M.

The calculated PSLs for the dwellings near the proposed Facility are 40 dBA L_{eq} during nighttime hours and 50 dBA L_{eq} during daytime hours. These values will be used as a design goal for the proposed Facility.

4.0 CUMULATIVE SOUND LEVELS

The sound levels for the existing Petroleum Processing Facility and the proposed Facility were estimated and added to the assumed ambient sound levels to determine the cumulative sound levels at each critical receiver. To quantify the noise emitted by the Facility, a noise model of the Facility was developed based on historical and vendor-supplied sound-level data. The noise emitted from existing Petroleum Processing Plant was estimated based an assumed sound level at the nearest noise sensitive receiver.

4.1 Existing Energy-Related Sound Sources

4.1.1 Petroleum Processing Facility

There is no measured sound level data available for the existing Petroleum Processing Facility, but it is assumed that it is a significant noise source in the area. To estimate the sound emitted from the Petroleum Processing Facility, it was assumed to be in compliance with AUC Rule 012 limits at the nearest dwelling (i.e., operating at exactly the PSL for that facility-receiver combination). The nearest dwelling is located approximately 200 meters east of the center of the Petroleum Processing Facility. A desktop review estimates the PSL at this location to be 51 dBA. This sound level was then propagated to each of the receivers analyzed within this report. The distance from the center of the Petroleum Processing Facility to the receiver locations in this study and estimated sound levels are provided in Table 4-1.

Table 4-1: Estimated Sound Levels for Petroleum Processing Plant

Receiver Location	Distance to Center of Petroleum Facility (meters)	Existing Petroleum Processing Facility Estimated Sound Level
Rec01	1,845	31.7
Rec02	1,600	32.9
Rec03	1,040	36.7
Rec04	972	37.3
Rec05	2,000	31.0
Rec06	2,930	27.7
Rec07	4,975	23.1
Rec08	3,800	25.4
Rec09	1,185	35.5

4.1.2 District Regulator Station

There is no measured sound level data available for SaskEnergy's District Regulator Station. Based on a desktop review of the station, it consists of two small enclosures an no outdoor noise emitting equipment. It is assumed that it is a not significant noise source in the area and is not included within the analysis of the cumulative sound levels.

4.2 Proposed Moose Jaw Energy Power Station

To quantify the noise emitted by the Facility, a noise model of the Facility was developed based on historical and vendor-supplied sound level data.

4.2.1 Sound Modeling Methodology

Noise modeling was performed using industry-accepted sound modeling software Computer Aided Noise Abatement (CadnaA), version 2019. The software is a scaled, three-dimensional program, which accounts for air absorption, terrain, ground absorption, and reflections and shielding for each piece of noise-emitting equipment and predicts sound pressure levels. The model calculates sound propagation based on International Organization of Standardization (ISO) 9613-2:1996, General Method of Calculation. ISO 9613-2 assesses the sound level propagation based on the octave band center frequency range from 31.5 to 8,000 Hz.

The ISO standard considers sound propagation and directivity. The sound-modeling software calculates sound propagation using omnidirectional, downwind sound propagation and worst-case directivity factors. In other words, the model assumes that each piece of equipment propagates its maximum sound level in all directions at all times. Empirical studies accepted within the industry have demonstrated that modeling may over-predict sound levels in certain directions, and as a result, modeling results are generally considered conservative. The modeled atmospheric conditions were assumed to be calm, and the temperature and relative humidity were left at the program's default values. Reflections and shielding were considered for sound waves encountering physical structures. General modeling parameters used in the model are provided in Table 4-2.

Table 4-2: Sound Model Input Parameters

Model Input	Parameter Value
Ground Absorption	G = 0.5
Foliage	Not Included
Number of Reflections	2
Receptor Height	5 feet above grade
Temperature	50 °F

4.2.2 Sound Sources and Sound Mitigation

To estimate the sound levels emitted by the Facility, each major piece of equipment associated with the proposed Facility was modeled with its expected sound power levels (L_w). Vendor-provided sound data for all equipment was not available; therefore, historical data was used when required. The historical data was taken from projects of similar scope and size. Appendix A provides the octave-band sound power level inputs for the model. A site layout of the major equipment is provided in Figure 4-1.

To meet the PSLs at nearby dwellings, some of the equipment will be required to include noise mitigation measures in their design. Actual mitigation will be selected during detailed design of the Facility. Typical mitigation measures that can be implemented for the equipment may consist of some combination of the following:

- Silencer,
- Acoustical barriers,
- Enclosures or wraps,
- Relocation of equipment,
- Use of low-noise equipment,
- Acoustical building elements, and/or
- Acoustical louvers or silencers for building ventilation.

A summary of the L_w, sound pressure level (L_p), or the required sound transmission class (STC) of major noise sources is provided in Table 4-3.

Table 4-3: Sound Mitigation for Major Sound Sources

Sound Source	Sound Power (L_w), Sound Pressure (L_p), or Required STC Rating	Equipment Sound Level (dBA)[a]	Measurement Location	Typical Form of Mitigation[c]
ACC	L_p	52	400 feet	Low Noise Fan / Fan Deck Barrier
Air-Cooled Heat Exchanger	L_p	54	400 feet	Low Noise Fan
HRSG Stack Exit	L_w (w/o directivity)	100	--	Stack Silencer
CTG Inlet Face	L_w	104	--	Inlet Silencer / Acoustical Hood
Transformers	L_p	85	3 feet	Low Noise Transformer
BOP Equipment	L_p	85	3 feet	Varies
Engine Hall Walls & Roof	STC	35[b]	--	Acoustical Building: Insulated Wall & Roof Assembly, Acoustical Louvers, Acoustical Doors, etc.

a) Modeled sound power levels per individual frequency bands are provided for each noise source in Appendix A.
b) Required transmission loss values per individual frequency bands are provided for engine walls and roof in Appendix A.
c) Common forms of mitigation provided, actual mitigation will be selected during detailed design of the Facility.

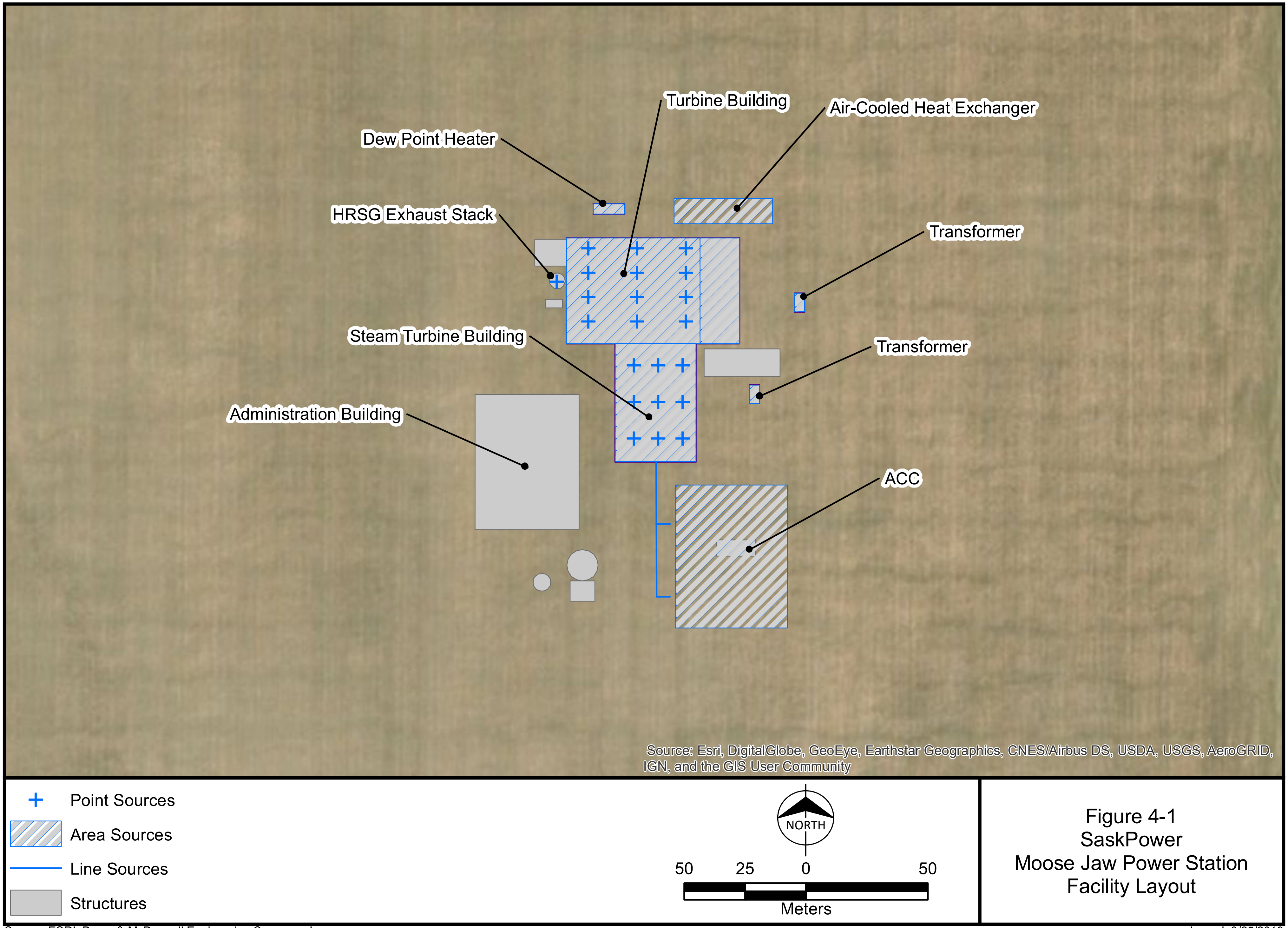

Figure 4-1
SaskPower
Moose Jaw Power Station
Facility Layout

Source: ESRI, Burns & McDonnell Engineering Company, Inc.

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4.3 Ambient Sound Levels

This analysis uses the assumed ambient sound levels of 45 dBA for daytime hours and 35 dBA for nighttime hours provided in AUC Rule 012. Ambient sound levels measurements may be taken to quantify the existing sound levels in the area and be used to refine the cumulative PSL. Burns & McDonnell has not collected ambient data at this time, so the assumed ambient sound levels were used for further analysis.

4.4 Estimated Cumulative Sound Levels

Sound sources were propagated out to the noise-sensitive receivers in the surrounding community. Receivers were located a minimum of 15 meters from the dwelling in the direction of the Facility. The predicted sound levels, assumed ambient sound levels, assumed sound level from nearby energy-related facilities, and cumulative sound levels are provided and compared to the nighttime PSL in Table 4-4. The cumulative sound levels are the logarithmic sum of the modeled and assumed ambient sound levels. The cumulative sound levels for the Facility are expected to be at or below the PSL at all nearby dwellings.

Table 4-4: Estimated Cumulative Sound Levels (dBA Leq)

Receiver Location	Modeled Facility Sound Level	Existing Petroleum Processing Facility Estimated Sound Level	Assumed Nighttime Ambient Sound Level	Cumulative Nighttime Sound Level	Nighttime Permissible Sound Level
Rec01	36.9	31.7	35	39.6	40
Rec02	36.9	32.9	35	39.8	40
Rec03	32.2	36.7	35	39.7	40
Rec04	31.6	37.3	35	39.9	40
Rec05	33.5	31.0	35	38.1	40
Rec06	37.8	27.7	35	39.7	40
Rec07	34.3	23.1	35	37.6	40
Rec08	34.7	25.4	35	37.9	40
Rec09	31.7	35.5	35	39.1	40

The estimated sound levels emitted by the Facility can be seen graphically in Figure 4-2. The figure shows sound generated from the Facility, projected outward to nearby dwellings, represented in 5-dB contours. The contours represent the expected sound levels of the Facility only, without the influence of sound generated by extraneous sources.

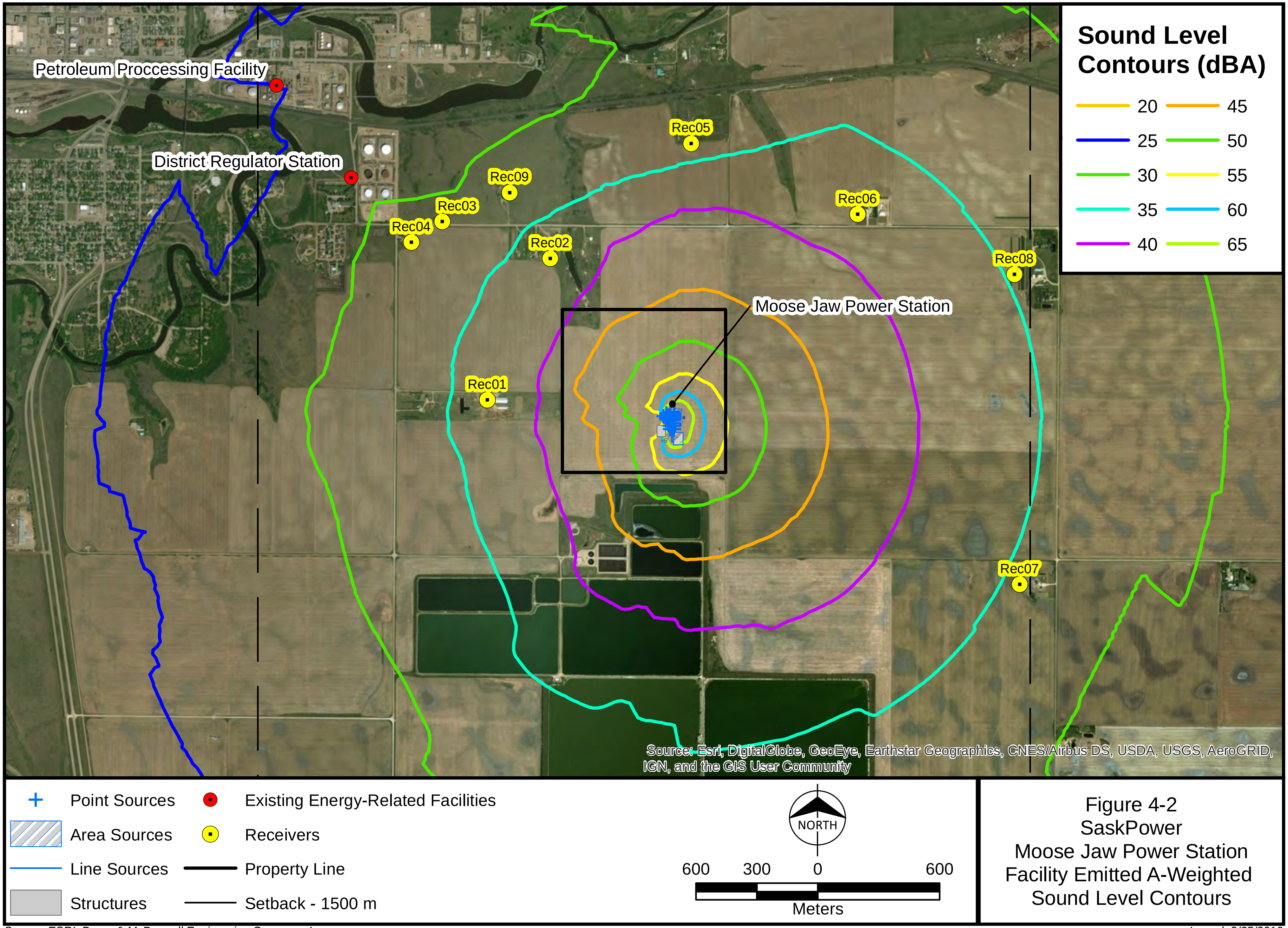

Figure 4-2
SaskPower
Moose Jaw Power Station
Facility Emitted A-Weighted
Sound Level Contours

Source: ESRI, Burns & McDonnell Engineering Company, Inc.

Issued: 3/25/2019

4.5 Low-Frequency Noise Analysis

The modeled sound levels for each dwelling were analyzed for low-frequency noise by comparing the dBC and dBA sound levels. The dBC, dBA, and the dBC-dBA values are provided and compared to the AUC Rule 012 thresholds in Table 4-4.

Table 4-5: Low-Frequency Sound Level Analysis

Receiver Location	Modeled Facility dBC Sound Level	Modeled Facility dBA Sound Level	Modeled dBC-dBA Value	AUC Rule 012 dBC-dBA Threshold
Rec01	56.2	36.9	19.3	20
Rec02	54.9	36.9	18.0	20
Rec03	50.8	32.2	18.6	20
Rec04	50.6	31.6	19.0	20
Rec05	50.8	33.5	17.3	20
Rec06	56.3	37.8	18.5	20
Rec07	52.9	34.3	18.6	20
Rec08	53.5	34.7	18.8	20
Rec09	48.1	31.7	16.4	20

The sound modeling shows that the dBC-dBA values at the dwellings are less than 20 dB. Based on this evaluation, noise emitted from the Facility is not expected to exceed the AUC Rule 012 threshold for dBC-dBA levels.

In free-field conditions, the dBC-dBA level typically increases as distance from the source increases. This is caused by the difference in propagation rates for low-frequency and higher-frequency sound. Additional factors such as topography, shielding, directivity, and sound source location may create scenarios where dBC-dBA level does not increase over distance.

5.0 CONCLUSION

Burns & McDonnell has conducted a NIA for the proposed Moose Jaw Power Station located within the Moose Jaw Industrial Park in Moose Jaw, Saskatchewan. Neither the city of Moose Jaw nor Saskatchewan has a numerical noise limit applicable to the Facility. At the request of SaskPower, the Facility is to be designed to meet the noise limits determined by the methodology defined in AUC Rule 012.

The cumulative sound levels (logarithmic sum of Facility emitted noise, existing energy-related facility noises, and assumed ambient noise), are expected to be at or below the PSLs at all nearby dwellings, and low frequency noise is not expected to be an issue.

APPENDIX A - MODELED SOUND POWER LEVELS

Appendix A
SaskPower - Moose Jaw Power Station
Model Input Sound Power Levels

Source	Number of Sources	Sound Power Level										Justification
		Octave band Frequency (dB) (Hz)									Overall	
		31.5	63	125	250	500	1000	2000	4000	8000	dBA	
Building Vent Fans	32	72	98	97	94	89	87	81	75	69	92	BMCD Estimated - 85 dBA at 3 ft
HRSG Stack Exit	1	111	110	110	105	98	85	72	74	59	100	BMCD Estimated
Air-Cooled Heat Exchanger	1	113	113	112	109	104	102	96	90	84	107	BMCD Estimated
ACC	1	123	116	114	109	106	103	95	91	87	108	BMCD Estimated
Transformers	2	102	102	106	106	106	90	85	78	73	104	BMCD Estimated - 85 dBA at 3 ft
Gas Turbine Building	1	126	113	101	91	79	74	64	58	43	93	BMCD Estimated
Steam Turbine Building	1	110	107	105	92	83	69	62	59	48	91	BMCD Estimated
Dew Point Heater	1	107	104	102	97	94	90	83	79	75	96	BMCD Estimated - 85 dBA at 3 ft
GT Inlet Filter Face	1	124	123	120	110	96	95	85	95	95	107	BMCD Estimated
GT Inlet Duct	1	121	120	117	107	93	92	82	92	92	104	BMCD Estimated
ACC Exhaust Duct	3	84	90	92	88	84	78	72	67	58	85	BMCD Estimated - 85 dBA at 3 ft
Transmission Loss		dB per Octave Band									STC	
Gas Turbine Building	1	10	16	17	24	32	41	49	52	57	35	BMCD Estimated
Steam Turbine Building	1	10	16	17	24	32	41	49	52	57	35	BMCD Estimated

CREATE AMAZING.

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Appendix F SASKPOWER'S ESTABLISHED TRANSMISSION LINE ROUTING GUIDELINES

SaskPower

ENGINEERING STANDARD

TRANSMISSION LINE ROUTING GUIDELINES T01/606 Rev 01

Lines Design, Engineering & Construction

				EKR	EOM
2014-05-21	1	Approved	S. Hodzic	E. Klein-Rutten	E. O'Mullane
1985-06-11	0	Approved	R.E Bergen	R.E Bergen	R.E Bergen
Date	**Rev.**	**Status**	**Prepared By**	**Checked By**	**Approved By**

T01/606 REVISION HISTORY

Rev 1 Updates:

- Revised out-dated standard to include new processes and guidelines for transmission line routing.

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1 OBJECTIVE:

The objective of the route development and planning process is to identify a preferred route which provides the optimum location for the line while maintaining the lowest level of impact to the following categories:

- Technical
- Environmental
- Agricultural
- Social
- Economic

2 ROLES AND RESPONSIBILITIES OF TEAM MEMEBERS

The following team members are required during the route selection process:

Project delivery representative -	Responsible for making sure the project is delivered in budget, on schedule, and within scope while managing project risks and escalation of issues that cannot be resolved within the team.
Engineering representative -	Responsible for ensuring the design and technical aspects of the project are achievable.
Stakeholder representative -	Responsible for managing the project stakeholders and ensuring they are informed and involved in the routing process.
System Planning & Development representative -	Responsible for ensuring the project definition, development and execution meets our overall system and/or client requirements.
Environmental representative -	Responsible for ensuring the project minimizes environmental impacts as well as ensures required mitigation measures are identified and achievable.
Lands department representative -	Responsible for obtaining land easements, identifying potential risks to land acquisition and ensuring that the easements for the potential routes are attainable.
Asset Management representative -	Responsible for identifying concerns and risks with operating and maintaining the transmission line within the proposed route options.
Construction Representative -	Responsible for identifying the concerns and risks with access and construction operations within the proposed route options.

3 STAGES OF EXECUTION:

Although this may vary depending on the size of the project, a typical project would follow these defined stages:

- Establish Study Area
- Preliminary Desktop Study
- Define Potential Route Alternatives
- Initial Stakeholder Engagement and Public Consultations
- Define Preferred Route
- Additional Stakeholder Engagement and Public Consultations

3.1 Establish Study Area

The extents of the study area are defined by the start and end points of the transmission line (typically a substation or existing line tap location). Once the general location of the proposed project is defined, a preliminary review of the area is completed to identify any major land use, environmental or existing development constraints that would pose significantly higher levels of potential impacts. If practical, these areas should be removed from the study area and avoided during route selection (e.g., urban areas, protected lands, large water bodies, etc.)

3.2 Preliminary Desktop Study

Available information is compiled from multiple sources and analyzed to develop preliminary routing options. Using the technical expertise of staff and external consultants, SaskPower's project team will identify all potential route alternatives in the study area. The desktop study includes the identification and review of environmental, cultural, and existing land use constraints within the study area using available GIS systems, field data and satellite imagery.

3.3 Define Potential Route Alternatives

Once the available desktop information is gathered, a site trip or helicopter reconnaissance will be completed to assess the study area's current conditions and identify any recent activities in the area that may pose issues with the potential route options. Once completed, the project team will then review and eliminate potential line route options that clearly have higher impacts or major constraints compared to other route options. At this stage the corridor width must be a minimum of 300 m wide and can potentially be larger to accommodate special needs for unique situations.

A report is then created documenting the project history, knowledge gained from the desktop studies and field work completed that identifies the remaining route options as the most advantageous overall. This document is called the Potential Route Alternatives Recommendations (PRAR) document. The PRAR document shall include a quantitative route comparison metrics that must identify the comparative aspects of each route. (Refer to Section 5.0)

3.4 Initial Stakeholder Engagement and Public Consultations

The next stage would involve consultation with local municipal councils, Aboriginal groups, landowners and other stakeholders who may be potentially impacted or have an interest in the proposed project. The Stakeholder Engagement group determines the consultation plan appropriate for the project. Information and data documented in the PRAR document is used during consultations to inform stakeholders and the general public of the proposed project and to obtain feedback on all of the proposed route corridors.

3.5 Define Preferred Route

The project team will meet and review the information gathered from the stakeholder engagements and all of the available information collected at this time to determine which of the potential route options will be the final preferred route for the project. The preferred corridor width should not exceed 300 m at this stage in the project.

Once the final route corridor is determined, a report is then created to document all of the information, routing commitments and knowledge gathered on the potential routes and provide the rational for the selection of the final corridor. This document is called the Preferred Route Recommendations (PRR) document.

3.6 Additional Stakeholder Engagement and Public Consultations

Once the Preferred Route Recommendations document is completed, the Stakeholder Engagement group will then arrange a second round of consultations with local municipal councils, Aboriginal groups, landowners and other stakeholders who may be potentially impacted or have an interest in the proposed project. The rationale for selection of the preferred route corridor is presented during consultations and additional feedback regarding constraints and preferences is gathered. The commitments and constraints captured are then used to aid the lines designer during detailed line design and structure placement.

4 LINE ROUTING REQUIREMENTS AND CONSIDERATIONS:

The following are key items (although not an exhaustive list) that should be considered when reviewing potential routes for any transmission line project. **The considerations listed below are guidelines that are adaptive and may be adjusted on a project by project basis to meet the best land use planning practices in the area affected.**

4.1 Technical Considerations:

4.1.1 General

- Proposed routes must take into consideration the maximum allowable spans of the structures to be used, depending on the type of crossing, additional setbacks might be required.

- Whenever reasonably possible, the proposed routes should make attempts to minimize crossing and/or paralleling any existing or proposed infrastructure that could potentially become a constraint for structure placement or overhead conductors. This would be infrastructure such as SaskEnergy, Transgas, SaskTel, Aerodromes or visible landing strips, SaskWater, Canadian National Railway's (CNR), Canadian Pacific Railway's (CPR), Transport Canada, Nav Canada, pipeline facilities, resource extraction companies, and communication tower sites. The designing engineer must be consulted to determine the required horizontal and vertical clearances from their facilities.
- Alternatively, attempts should be made to utilize certain existing infrastructure to limit the impact to undisturbed lands. This would be infrastructure that can be paralleled, such as other SaskPower facilities (e.g., existing transmission and distribution lines) and highway corridors where appropriate.
- When crossing existing facilities is unavoidable, attempts should be made to ensure the crossing is as close to 90 degrees as possible.
- Avoid, where practical, routing transmission line within proximity to saline waters as this may require special structure design.
- Avoid, where practical, areas subject to high contamination/pollution (i.e., Oil and gas plants and potash mines).
- Avoid, where practical, routing in areas susceptible to soil instability and erosion (e.g., steep slopes).
- Structures siting shall avoid "islanding" structures and must ensure access to each structure is possible for routine maintenance and patrols.

4.1.2 Oil and Gas facilities

- When paralleling or crossing an above ground oil and gas facility, a minimum horizontal clearance of 22.5 m must be maintained from wells or the transmission line structure fall over distance plus 3 m from any above ground well equipment, whichever is furthest. This clearance requirement is based on SaskPower Construction Standards Manual C-24-02.08. Well site easement dimensions need to be identified and prudently avoided as it is unlikely permission will be obtained from the easement owner to have any portion of our transmission line right of way on their lease.
- The transmission line route should avoid paralleling existing pipelines for more than 1 km and within a distance of 1 km, where practical. As per TransGas "AC Voltage Hazard Assessment Guideline"

4.1.3 Railway infrastructure

The following distances should be considered as guide when attempting to route within proximity to existing railway facilities. Attempts should be made to avoid routing on existing railway lands where practical.

Description	Transmission Line Classification	Minimum Distance Required
Parallels < 1 mile (1.6 km)	> 345 kV	300 feet (91 m)
Parallels 1 - 2 miles (1.6 – 3.2 km)	> 200 kV	400 feet (122 m)
Parallels 2 - 3 miles (3.2 – 4.8 km)	> 60 kV	500 feet (152 m)
Parallels > 3 miles (4.8 km)	> 0.75 kV	800 feet (244 m)

Note: The above values are CPR recommended distances from the edge of rail to the closest conductor of the transmission line; refer to CPR Electromagnetic interference screening tool, 2014

4.1.4 Public considerations

- Maintain a minimum of 2.5 km clearance to the limits of any town, village, organized hamlet or hamlet as any of those are defined in The Municipalities Act and 5.0 km from the limits of a city where practical (prudent avoidance).
- Maintain up to 160 m clearance to habitable buildings where practical (prudent avoidance).

Recommended Clearances to Habitable Buildings

Line Voltage	Required Clearance
72 kV	31 m
138 kV	46 m
230 kV	61 m

Note: Habitable Buildings include house, school, church, hall, store, service station, house trailer, dwelling or other premises suitable to human occupancy.

Recommended Clearances to Outbuildings

Line Voltage	Required Clearance
72 kV	16 m
138 kV	23 m
230 kV	31 m

Note: Outbuildings include barn, Quonset, machine shed, chicken house, granary, garage or other such building.

Where the above is not achievable, SaskPower adheres to the minimum clearances specified in the most current version of CSA standard C22.3 No. 1

4.1.5 Other technical considerations

- As required, appropriate internal and external personnel, departments, etc. should be engaged during the routing process to ensure existing and planned developments/constraints are identified and considered when defining the potential routes. (e.g. Consult with the distribution, operations and maintenance groups regarding plans in the area for new distribution line developments).
- Maintain adequate clearances to communication antennas. A minimum horizontal

clearance of transmission line structure fall over distance plus 3 m must be maintained. This clearance requirement is based on SaskPower Construction Standards Manual C-24-02.10.

- Maintain recommended clearances from all registered airports and aerodromes. Refer to "TP1247- Aviation Land Use in the Vicinity of Airports" for recommended clearances.
- Avoid, where practical, routing over barns, quonsets, granaries, garages, fuel tanks, feed lots and hay staking areas. The minimum horizontal clearance shall be 15 m from the conductor. Refer to SaskPower Construction Standards Manual C-24-02.13.
- Avoid, where practical, routing through or near known gravel pits and deposits, as they can expand their excavating operations in the future and pose a risk to the transmission line structure foundation stability. Gravel pits must be identified during the desktop study as they may require additional corridor widths to accommodate future development.
- Maintain adequate clearance to water wells, signs, billboards, luminaires and traffic lights, ski lifts, boat launches and cemeteries. These facilities should be located outside of the transmission line right-of-way.

4.2 Environmental Considerations:

- Attempt to maintain a 15 m buffer from any semi-permanent water body and a 30 m buffer from any permanent water body or waterway where practical.
- Avoid, where practical, parks and protected areas (e.g., Provincial and National parks and historic sites, National Wildlife Areas, Ecological Reserves and Bird Sanctuaries).
- Avoid, where practical, designated lands(e.g., Wildlife Habitat Protection Act(WHPA), Fish and Wildlife Development lands(FWDL), Ministry of Agriculture(MOA) Native Prairie, Prairie Farm Rehabilitation Administration, etc.).
- Avoid, where practical, lands with conservation easements(e.g., Ducks Unlimited (DL), Saskatchewan Wildlife Federation (SWF), Nature Conservancy of Canada (NCC), etc.).
- Avoid, where practical, sand hill and sand dune complexes.
- Avoid, where practical, contiguous blocks of native grassland (Ministry of Environment (MOE) guidelines indicate Transmission lines should cross on lands already modified by human activity to avoid any further disturbance of natural habitat).
- Avoid, where practical, coulee crossings and other sensitive terrain features (e.g., steep slopes, drainages, major rivers, etc.).
- Avoid, where practical, large water body, flood plain and wetland crossings.
- Avoid, where practical, important bird areas and migratory bird concentration sites.
- Minimize the amount of new off right-of-way access required for construction.

4.3 Agricultural Considerations:

- In cultivation areas, route along quarter lines or blind lines, parallel to crop lines where practical.
- Avoid, where practical, placing deflection structures and guy wires on cultivated lands, minimizing the amount of crop land taken out of production.
- Limit the number of structures on cultivated land. Instead, endeavour to locate them in residual spaces, groves or land that would least impact existing farming operations.
- Avoid, where practical, deviating routes onto adjoining landowners property to miss

obstacles that can be mitigated or relocated (bins, tree rows etc.).

- In areas with existing sprinkler irrigation, the landowner should be consulted to ensure the proposed route will not interfere with or impede the known path and operation of the sprinkler irrigation system. Refer to SaskPower Standard Engineering Practices #7.

4.4 Social Considerations:

- Utilize existing utility corridors or parallel existing infrastructure where practical.
- Approach urban areas through existing industrial zones, when practical.
- Avoid, where practical, recreation sites, parks, scenic areas, established trails and other tourism features.
- Avoid, where practical, proximity to existing or planned populated areas where practical.
- Where practical, endeavour to engage stakeholders and landowners in structure placement.
- Avoid, where practical, routing in archaeological sensitive lands and cultural heritage sites.
- Avoid, where practical, or minimize impacts to Aboriginal Traditional Land Use sites.
- Utilize undeveloped road allowances, where practical.

4.5 Economic Considerations:

- Minimize capital costs by minimizing transmission line length.
- Minimize capital costs by minimizing the quantity of deflections along the route.
- Minimize incremental system loss costs by minimizing line length.
- Minimize incremental maintenance costs by minimizing line length.
- Minimize environmental mitigation costs by avoiding water bodies, wetlands and known environmentally sensitive areas.
- Minimize routing on federal crown and other lands where easement acquisition cannot be exercised.
- Minimize easement compensation costs by avoiding high value lands where practical.

5 TYPICAL ROUTE COMPARISON METRICS

Not all metrics are applicable for all projects. These are representative of the metrics that could be used or have been used previously when comparing the merits of each potential route alternative.

5.1 Environmental

- Kilometres of designated land crossed (i.e., WHPA, FWDL, SWF, DU, NCC, MOA) broken down by each designation.
- Kilometres of treed area crossed.
- Kilometres of grassland crossed (native and tame).
- Kilometres of sand hills sensitivity land crossed (i.e., high and extremely high wind erosion potential).
- Kilometres of surface water crossed.
- Hectares of surface water within 800 m.

- Number of surface water bodies crossed >200 m.
- Number of coulees crossed.

5.2 Agricultural

- Kilometres of cultivated land crossed.
- Kilometres of cultivated land crossed on quarter line or blind line.

5.3 Residential/Commercial

- Number of Residences or businesses within 60 m.
- Number of Residences or businesses within 160 m.
- Number of Residences or businesses within 800 m.

5.4 Technical

- Transmission line length (km).
- Number of corridor deflections.
- Kilometres of parallel infrastructure (i.e., within 1 km of existing TLs, access roads/trails, pipelines, etc.).
- Number of active and abandoned wells within 100 m.
- Number of crossings (i.e. stream, road, rail, pipelines, distribution lines) .
- Kilometres of % slope crossed >/ 15%.
- Water body crossing length (m) (if multiple crossings exist).

5.5 Cost

- Cost ($) (as per typical breakdown or total).

6 REFERENCES

1. SaskPower Construction Standards Manual C-24-02.08, 1987
2. SaskPower Construction Standards Manual C-24-02.10, 2004
3. SaskPower Construction Standards Manual C-24-02.13, 1997
4. Canadian Standards Association "Overhead Systems", CSA C22.3 No. 1
5. Transportation Canada "Aviation Land Use in the Vicinity of Airports", TP-1247E, 2005
6. Transgas AC Voltage Hazard Assessment Guideline, 2012
7. CPR Electromagnetic interference screening tool, 2014
8. SaskPower Standard Engineering Practices No. 7, 1982.
9. Transmission Line Routing Review in Saskatchewan, Transmission Line Routing review panel, February 2001

Appendix G HERITAGE RESOURCE IMPACT ASSESSMENT

Appendix F

Heritage Resource Impact Assessment - Overview

Prepared by

Riel Cloutier
Resource Specialist (Archaeology)

Environmental Assessment

Environment Department
SaskPower

February 1st, 2019

SaskPower
Powering the future

1. Introduction

1.1 The Heritage Screening Process

As part of the internal project development process, an *Overview* level heritage resource impact assessment (HRIA) was undertaken for the proposed Moose Jaw CCGT project. "An *Overview* is a preliminary statement of the archaeological resource potential of an area or region in which a development is proposed. The *Overview* should identify where conflicts between archaeological resources and development are likely to occur and recommend where and perhaps how subsequent investigations should be undertaken" (Ministry of Parks, Culture and Sport, 2010:8)

The first part of this overview HRIA involved overlaying the proposed development study area with a map of all known heritage resources in the province (Figure 1). It also involved predicting (by means of a predictive GIS model built for this purpose, as well relying on the professional judgment of the professional archaeological screener) where any as-of-yet undiscovered heritage resources may be present within the study area.

Using these tools, SaskPower's Archeologist was able to identify where potential conflicts between the proposed project and known heritage resources. SaskPower's Archeologist was also able to make recommendations as to which areas within the study area will require field assessments to determine if any heritage resources are present prior to any development taking place. Some preliminary field reconnaissance may be done using our in-house resources, but the field studies will largely be contracted out to a third-party consultant. This consultant will obtain an Archaeological Research Permit from the provincial regulator (the Saskatchewan Heritage Conservation Branch). Their field studies will consist of a visual inspection of the archaeologically sensitive areas that SaskPower's Archeology group has prescribed. The consultant will also conduct 'shovel testing' in areas were buried archaeological deposits are suspected. In some cases, deep testing by means of a backhoe or auger may also be required. SaskPower's Archeologists support the idea of members of the local indigenous community accompanying the consultant field crew and contributing to the discussions about the heritage resources of the area, should this be something they are interested in.

The consultant will submit a report to the provincial regulator following the conclusion of their field assessment. This report will make recommendations as to what (if any) further studies or mitigations SaskPower should undertake. SaskPower will have the ability to comment upon the report before and after it is submitted. Once the regulator has approved the report, they will issue us a letter detailing what (if any) further mitigation SaskPower will be required to undertake prior to allowing us to proceed with the development. SaskPower commits to fulfilling the obligations set forth by the provincial regulator.

1.2 Culture History of Saskatchewan.

There are approximately 12,000 years of human history in the province of Saskatchewan represented by approximately 24,000 archaeological sites discovered to date. Archaeologists have divided this history into two main periods: The Pre-Contact Period (everything that happened before indigenous groups encountered Europeans) and the Post-Contact Period (everything that happened after contact was made). The Pre-Contact Period if further subdivided into two three broad time periods: The Early Plains Period, the Middle Plains Period, and the Late Plains period. These periods roughly correspond to a shift in material culture and corresponding subsistence strategies. The material culture of the Early Plains Period (From approximately 12,000 to 8,000 years before present) is defined by the presence of large spear points. It is believed that the hunter-gatherers of this time period relied on mammoth and other large megafauna as part of their subsistence. The Middle Plains Period (8,000 to 2,000 years before present) saw the introduction of the innovative atlatl, a javelin-like spear thrower. The projectile points from this period are smaller than the spear points of the previous era. The people of this era hunted bison as their main subsistence strategy. The Late Plains Period (2,000 years ago until the time of contact with Europeans) saw the introduction of the bow and arrow as well as pottery into the material culture. The people of this era practiced communal bison hunting in addition to the hunting practices of past eras.

The material culture of the early, middle and late pre-contact periods can be further subdivided into archaeological cultures based on distinctive stylistic attributes of the projectile points they manufactured. Each style or 'typology' of projectile point can be attributed to a specific age range largely based on sites where these artifacts have been found alongside materials which were then radiocarbon dated. When these diagnostic artifacts are found at an archaeological site, they can be used to effectively determine the age of the site even in the absence of materials that could be radiocarbon dated.

Table 1. Culture History of the Saskatchewan

Period	Diagnostic Artifact / Name of Archaeological Material Culture	Date Range (in radiocarbon years before present)
Early Plains Period	Clovis	12,000 - 11,000
	Folsom	10,900 - 10,200
	Agate Basin	10,500 - 9,500
	Cody Complex	9,500 - 8,000
Middle Plains Period	Mummy Cave Complex	8,000 - 5,000
	Oxbow	5,000 - 3,000
	McKean Lanceolate	4,400 - 3,400
	McKean - Duncan/Hanna	3,900 - 3,200
	Pelican Lake	3,300 -1,800
Late Plains Period	Besant	2,200 - 1,300
	Avonlea	1,700 - 1,000
	Prairie Side-notched	1,200 - 550
	Plains Side-notched	550 - 200
Post -Contact Period	Fur Trade Era	1750 AD - 1875 AD (Calendar Years)
	Early European Settlement	1875 AD – 1914 AD (Calendar Years)
	Modern Era	1914 - Present

The types of archaeological sites found within Saskatchewan can also be classified into categories. Broadly speaking, they are classified by the number of artifacts found at the site and if there are any archaeological features found on the surface (such as stone rings or cairns). In general, sites with a dense intact layer of artifacts lying undisturbed beneath the ground are considered more significant and worthier of further investigation than sites where the artifacts have been found in an already disturbed context (such as lying on the surface of a cultivated field or recovered form the ploughzone of a cultivated field). All sites with intact archaeological features on the ground surface are assumed to have an intact sub-surface component as well, until it can be proven otherwise. Archaeological sites with multiple intact archaeological components from different eras of history are generally considered more significant than sites with a single component.

In addition, the Saskatchewan *Heritage Property Act (1980)* has defined all sites with evidence of a ceremonial or ritual aspect as a special class of archaeological site called a *Site of a Special Nature (SSN)*. These sites include all sites with a “pictograph, petroglyph, human skeletal material, burial object, burial place or mound, boulder effigy, or medicine wheel”. The provincial regulator has zero appetite to entertain the possibility of intentionally impacting one of these sites with any kind of development project. Avoidance of these sites is highly recommended and even approaching the limits of a Site of a Special Nature will trigger the need for a detailed field inspection of the project area surrounding the SSN. Should an SSN be discovered during the field investigation phase of the heritage resource impact assessment, changing the development footprint so that it avoids the site area will be most likely required. Discovering an SSN fortuitously during the construction phase of the project will most likely result in a stop work order being issued while the site is investigated and consultation with the local indigenous groups is conducted.

2.0 Heritage Resource Overview of the Moose Jaw CCGT Project Area

2.1 Heritage Inventory of the Study Area

The study area was designed to include the Moose Jaw CCGT plant site, the Pasqua Station, and all possible sources for the waterline that will feed the plant. Though not defined at the time of the overview, the transmission line between the CCGT plan and Pasqua station, and any potential infrastructure upgrades are assumed to be contained within this study area as well. Please note that the natural gas line which will be evaluated, permitted and constructed by TransGas is outside of the care and control of SaskPower and therefore was not taken into consideration for this assessment.

There are a wide variety of heritage resources contained within the study area (Figure 1). The inventory of heritage resources is summarized in Table 2. In addition to the known heritage resources, the entire Moose Jaw River valley is considered “archaeologically sensitive”, meaning that there is a very good chance that additional unrecorded heritage resources are present within the valley margins. Any development that proposes to intersect the valley margins (such as the proposed waterline) will trigger a field investigation HRIA by a third-party consultant. This area of archaeological sensitivity is illustrated on the heritage inventory map (Figure 1).

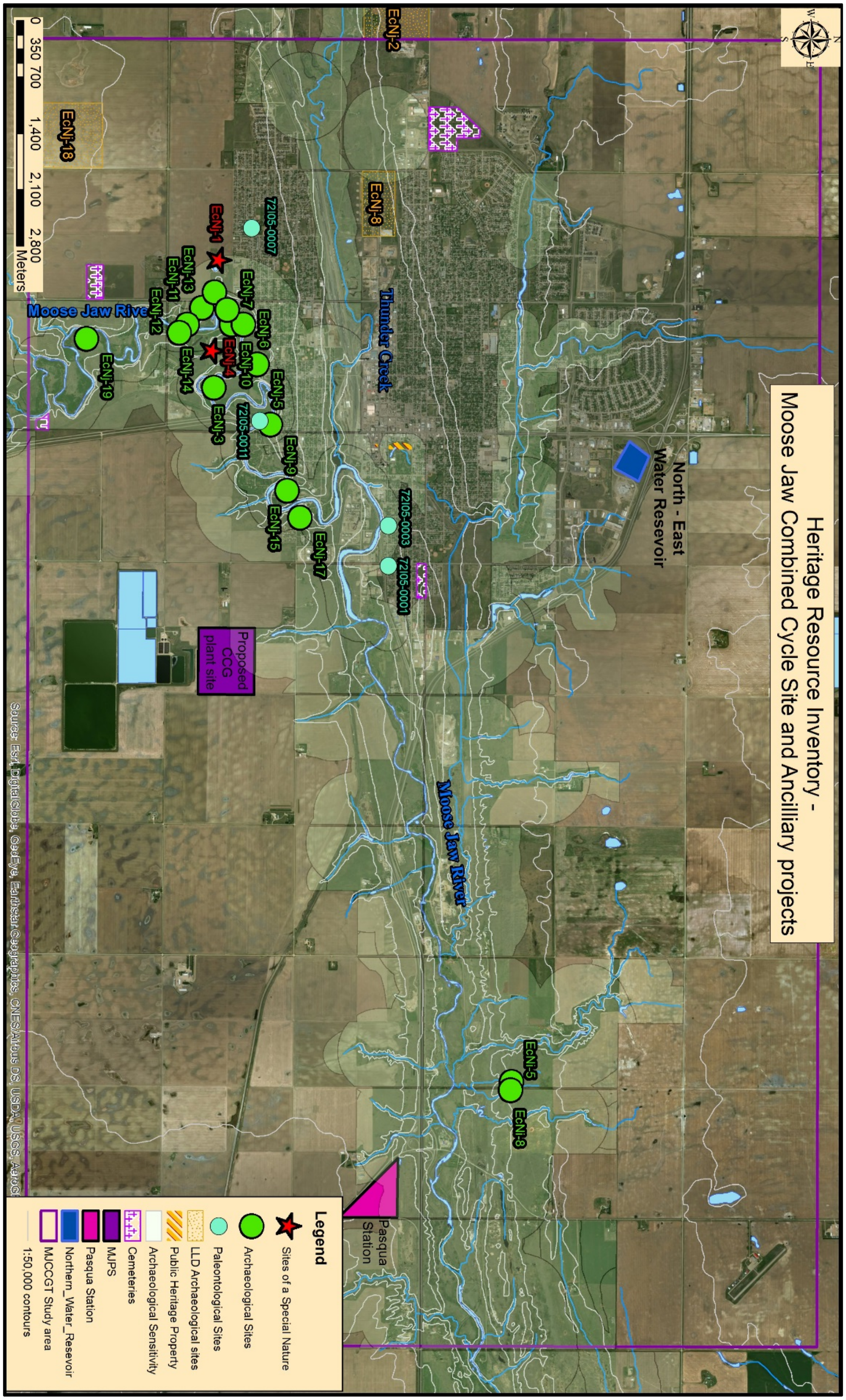


Figure 1: Heritage Resource Inventory of the Study Area

Table 2. Heritage Resources within the Study Area

Resource Type	Number
Site of a Special Nature	2
Archaeological Site	17
Paleontological Site	4
Public Heritage Property	2
Registered Cemeteries	4

2.1.1 Sites of a Special Nature

There are two Sites of a Special Nature within the study area: sites EcNj-1 and EcNj-4. Both of these sites contain human burials.

Site EcNj-1 was recorded as an archaeological site in 1960 and, unfortunately, there weren't very many details recorded at that time that indicate what was found and where exactly it was. There is a map showing between four and seven graves near an abandoned farm building just south of Moose Jaw and west of the Moose Jaw River valley. This places this burial site approximately five kilometres due west from the proposed Moose Jaw CCGT plant site. The proximity of the graves to the abandoned farm building suggests that these graves date to the early settlement/pioneer period and probably do not represent indigenous burials.

Site EcNj-4 is a cluster of approximately forty Lakota burials interred between the years of 1880 and 1902, located on the east bank of "The Turn" (the major bend in the Moose Jaw River), approximately four kilometers west of the proposed CCGT plant site. The site was identified in 1964 by George Ferguson, a Lakota man who had siblings buried at this site. No archaeological investigations have ever been done at this site, and the exact location of the graves and their present condition is not known.

2.1.2 Archaeological Sites

There are a total of 17 archaeological sites within the study area (Tables 3 and 4). All but one of these sites are located within the Moose Jaw River valley complex. The majority of these sites (nine) are located at a large bend in the river (known locally as "the Turn") where the watercourse changes direction; from flowing north to flowing in a more easterly direction. In the historic record, this location is well documented as being a gathering spot for indigenous groups; specifically, the Nakota, Dakota, and Lakota First Nations (Krozser 1989: 23). The concentration of archaeological sites at this location, particularly the large multi-component sites, indicates that this was an area of significance extending well into the pre-contact times. The other sites scattered along the Moose Jaw River valley speak to the desirability of the valley as a location where water, fuel, and bison would have been plentiful while also serving as a viable transportation corridor for groups moving through the plains. The whole area is considered to be "archaeologically sensitive", meaning that any broad, level terrace or bench within the valley is likely to contain an archaeological site.

Table 3 Types of archaeological sites within the study area.

Type	Number
Artifact Find (5 or fewer artifacts)	3
Artifact Scatter (6 or more artifacts)	4
Artifact / Feature Combination	6
Single Surface Feature	1
Recurrent Surface Features	2
Unknown	1

Table 4 Culture History of the Study Area

Period	Diagnostic Artifact (Date Range in RCYBP)	Number of Components at Sites Within study area
Middle Plains Period	Pelican Lake (3,300 -1,800)	1
Late Plains Period	Besant (2,200 - 1,300)	1
	Avonlea (1,700 - 1,000)	2
	Prairie Side-notched (1,200 - 550)	3
	Plains Side-notched (550 - 200)	3
Post -Contact Period	Early European Settlement (1875 AD - 1914AD)	3

One pair of sites in particular, the Garratt and Davies sites (EcNj-6 and EcNj-7), represent a significant archaeological resource. While these are recorded as separate archaeological sites, they essentially represent a long continuous archaeological deposit located along the bank of the Moose Jaw River at the bend of the Moose Jaw river (currently Kingsway Park). These sites have produced thousands of pieces lithic debitage and pottery fragments, as well as hundreds of formed stone tools. Also present at both sites are large deposits of processed bison bone. These artifact assemblages indicate that these sites were a large campsite (the Garratt site) and a butchering site (the Davies site) located near a large ‘kill site’ (likely a bison jump or pound, given that these sites are in the bottom of the valley). The artifacts from these sites date to the Late Plains Period and include all the archaeological cultures known to exist in Saskatchewan from 2,000 years ago up until the time of contact.

2.1.3 Paleontological Sites

There are four recorded paleontological sites within the study area. The site locations (middle of urban areas) look suspicious to SaskPower’s Archaeologist and they suspect that locational data for these sites may be generalized. Likely all four of these sites were found eroding out of the valley wall along the Moose Jaw River valley. All four sites represent fossils found in the Bearpaw formation and date to the Campanian -Maastrichtian age of the Upper Cretaceous epoch (83.6 million to 66 million years ago). The fossils recovered at these sites include the clam-like *Inoceramus,* and examples of the *Baculite* and *Jeletzkyte* genus of ammonite. SaskPower’s Archaeologist is not qualified to comment on the significance of these finds, as this is outside their area of expertise. However, any perceived conflict with these sites will entail consultation with the provincial regulator and, likely, the provincial paleontologist at the Royal Saskatchewan Museum to determine if any mitigation measures are required.

2.1.4 Public Heritage Properties

Public Heritage Properties are heritage resources that have been designated at the provincial or municipal level as being significant to the people of Saskatchewan. These types of properties are typically buildings and structures that have a special significance in the local or provincial histories.

There are two Public Heritage Properties within the study area, both located in the urban area of the City of Moose Jaw. These properties (the Moose Jaw Public Library building and the St. Johns Anglican Church) may require special concessions or permissions if we were to impact the grounds upon which they sit.

2.1.5 Registered Cemeteries

There are four registered cemeteries within the study area. These sites will be avoided by the Moose Jaw CCGT plant and its ancillary projects. Should one of the ancillary projects impact the area immediately adjacent to one of the cemeteries, a field inspection will be conducted to determine the likelihood of burials being present within our proposed impact zone. Further mitigation may be recommended pending the outcome of this assessment.

2.2 Recommendations

2.2.1 The Moose Jaw CCGT plant site:

There is only a slim possibility of there being an archaeological site present on or near the proposed Moose Jaw CCGT plant site. This area is a low depositional environment that has been cultivated. In this case, due diligence could be satisfied by using SaskPower's in-house resources to conduct an archaeological *Reconnaissance Study* on the proposed site. A *Reconnaissance* survey "involves field inspection and documentary research to obtain a more precise understanding of the archaeological resources in the immediate study or development area. A Reconnaissance study usually serves to supplement the Overview study, especially where documentary sources needed for assessing resource potential are inadequate" (Ministry of Parks, Culture and Sport, 2010:8). This would involve a surface inspection of the cultivated field, possibly combined with shovel testing along the areas adjacent to the ephemeral draw. Further mitigations may be recommended based on the results of this Reconnaissance study.

2.2.2 The Moose Jaw CCGT – Pasqua Station 230kV interconnection

The proposed route for the transmission line between the plant site and the Pasqua station was not known at the time of this overview. SaskPower's Archeologist is working on the assumption that the transmission line will follow a fairly direct route between the two facilities. There are no known heritage resources within the area between the two facilities. However, the valley margin to the north of these facilities is considered heritage sensitive. Should the proposed transmission line intersect the valley margin, an Inventory HRIA will be required. Further field studies may be required based on the results of the HRIA.

2.2.3 Waterline

The water supply required for the operation of the Moose Jaw CCGT plant will be drawn from a City of Moose Jaw water reservoir (Figure 1). The water will be transported to the plant site by means of a pipeline. While the exact route for the pipeline has not yet been determined, for the water line to reach the plant site it must traverse the archaeologically sensitive Moose Jaw River valley. The SaskPower Archaeologist has recommended to the project team that the waterline be routed such that it avoids all known archaeological resources, as any direct conflict with one of these sites would likely require even more detailed assessment and possibly mitigative excavation. Given the heritage sensitivity of the area, an *Inventory* HRIA will be required for the waterline once the preferred route corridor has been identified. An *Inventory* survey "involves intensive field inspection to locate and record archaeological resources in a specified project area" (Ministry of Parks, Culture and Sport, 2010:8). This HRIA will be contracted out to a third-party consultant. Further field assessments may be required should any archaeological resources be identified during the inventory HRIA.

In addition to the potential archaeological resources that may be present, the waterline route could potentially intersect paleontological site 72I05-0001 or 72105-0003. The paleontological site locations are somewhat generalized and do not have a high degree of accuracy. Should the preferred route corridor pass near the vicinity of one of these sites, the Heritage Conservation Branch will be consulted as to how they want SaskPower to proceed. Likely the matter will be referred to the provincial paleontologist at the Royal Saskatchewan Museum, as they are the official regulator of paleontological resources in the province. If these sites are significant, the provincial paleontologist may require SaskPower to have the sites relocated and assessed prior to construction. SaskPower will abide by any requirements the provincial paleontologist sets forth.

2.2.4 Other Ancillary projects (Road, fibre, Distribution line)

SaskPower's Archaeologist is working with Project team to understand the final plans for these additional ancillary projects (roads, fibre and distribution line). As a guideline, should the footprint for any of these projects approach any of the recorded locations of heritage resources in the study area, then an inventory HRIA will be conducted to evaluate if the resource is at risk of being impacted. Similarly, should the ancillary projects infringe upon the archaeologically sensitive area of the Moose Jaw River valley, then they will likewise be subjected to an inventory HRIA. SaskPower's archeologist will conduct a full overview of all ancillary projects to determine next steps, once their locations are known.

References Cited

Saskatchewan Ministry of Parks, Culture and Sport

2010 Permit Policy. Electronic document. http://publications.gov.sk.ca/documents/96/97824-PermitPolicy.pdf. Accessed Feb 1st, 2019

Krozser, Katherine

1989 The Late Prehistoric Period at the Turn in Kingsway Park. Master's Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon, Saskatchewan.

Appendix H SITING CONSULTATION

Stakeholder Engagement
8SE – 2025 Victoria Avenue
Regina SK Canada S4P 0S1
Phone (306) 566-1008
Fax (306) 566-3131
Toll-Free (855) 566-1008

February 1, 2017

LETTER TO ENVIRONMENTAL STAKEHOLDERS

Dear Sir/Madam:

Re: Potential Future Gas Generation Project

SaskPower is committed to making sure Saskatchewan has the power it needs, when it needs it. We evaluate Saskatchewan's energy needs on an on-going basis to ensure that the province has enough reliable, sustainable and affordable energy to meet its electrical demands into the future.

SaskPower's future planning has identified a need to pre-select a site for a future natural gas generation facility in the Regina/Moose Jaw area. This additional generation could be needed as early as 2022. The attached overview map shows the four areas of interest identified for additional evaluation: West Sherwood, Belle Plaine, Rowatt and the Moose Jaw Industrial Park.

SaskPower's goal is to have 50% of our power generation capacity from renewable sources by 2030. However, natural gas continues to play an important role in our supply mix to generate power. Natural gas is an ideal back up to wind and solar. It is highly efficient and less expensive than many other options, and produces less than half the carbon dioxide emissions of a conventional coal-fired power station.

The selection of a location for a future natural gas generation station will be based on results of the public consultation and other factors such as the availability and cost of the fuel supply infrastructure; the availability and cost of connecting to the transmission grid; availability and cost of water supply; environmental considerations; constructability within the area of the site; and accessibility to the site location.

Public consultations are an important part of the planning process for SaskPower to gather the information needed to assist in siting future generation. Consultation is beginning with local officials, landowners, and the general public and we would like to invite you to attend an open house information session to learn more about the potential future gas generation project and offer comments to SaskPower's project team.

…. /2

Four public open house information sessions are planned as follows:

Pense Town Hall
Pense, SK
Wednesday, February 15, 2017

Belle Plaine Town Hall
Belle Plaine, SK
Thursday, February 16, 2017

Wakimow Valley Sportsman Centre
Moose Jaw, SK
Wednesday, February 22, 2017

Kronau Memorial Hall
Kronau, SK
Thursday, February 23, 2017

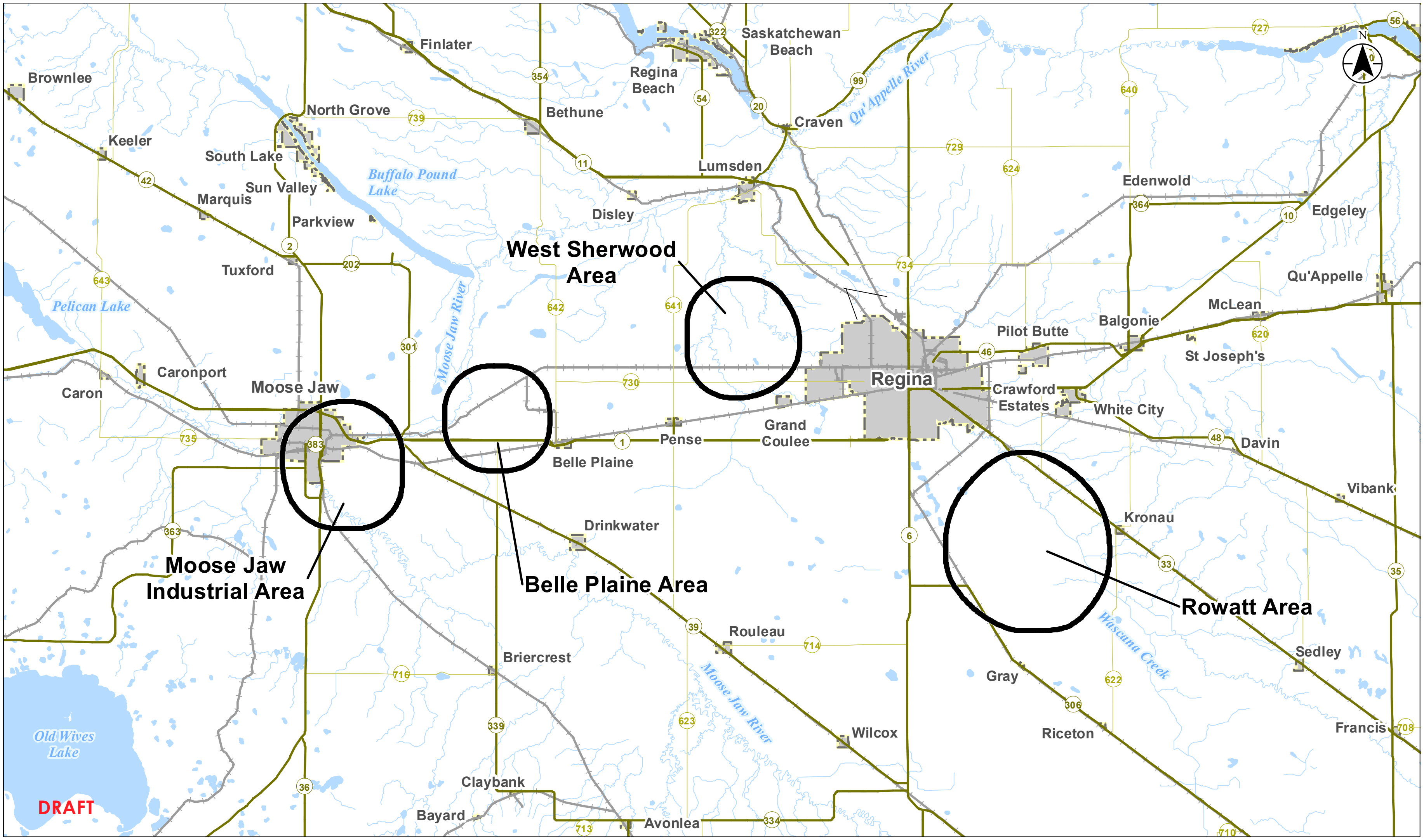
All events are come and go from noon until 7:00 p.m.

Thank you in advance for your interest in this project. Please call me at 1-855-566-1008 if you have any questions about the open house or the potential future natural gas generation project.

Sincerely,

<Original Signed By>

Myrna Broadfoot
Stakeholder Engagement
Enc



Area of Interest for Gas Generation

Major Road

Minor Road

Railway

Town/City Limit

Waterbody

Watercourse

0 8,200 16,400 metres

1:650,000 (At original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license with the Government of Saskatchewan and Government of Canada.

SaskPower

Project Location
Near Regina, SK

111100205-057 REVB
Prepared by ctownsend on 2017-01-25
Technical Review by gsamuelson on 2017-01-25

Project

Proposed Natural Gas Generation Project - Siting Study Areas

DRAFT

SaskPower

Aboriginal Relations
8SE – 2025 Victoria Avenue
Regina SK Canada S4P 0S1
Phone (306) 566-4046
Fax (306) 566-3131

February 7, 2017

First Nation Name
Address
Location
Postal Code

Dear Chief and Council:

Re: Potential Future Gas Generation Project

SaskPower is committed to making sure Saskatchewan has the power it needs, when it needs it. We evaluate Saskatchewan's energy needs on an on-going basis to ensure that the province has enough reliable, sustainable and affordable energy to meet its electrical demands into the future.

SaskPower's future planning has identified a need to pre-select a site for a future natural gas generation facility in the Regina/Moose Jaw area. This additional generation could be needed as early as 2022. The attached overview map shows the four areas of interest identified for additional evaluation: West Sherwood, Belle Plaine, Rowatt and the Moose Jaw Industrial Park. We have also included more detailed maps for the West Sherwood and Rowatt study areas.

SaskPower's goal is to have 50% of our power generation capacity from renewable sources by 2030. However, natural gas continues to play an important role in our supply mix to generate power. Natural gas is an ideal back up to wind and solar. It is highly efficient and less expensive than many other options, and produces less than half the carbon dioxide emissions of a conventional coal-fired power station.

The selection of a location for a future natural gas generation station will be based on results of the public consultation and other factors such as the availability and cost of the fuel supply infrastructure; the availability and cost of connecting to the transmission grid; availability and cost of water supply; environmental considerations; constructability within the area of the site; and accessibility to the site location.

Public consultations are an important part of the planning process for SaskPower to gather the information needed to assist in siting future generation. Consultation is beginning with local officials, landowners, and the general public and we would like to invite you to attend an open house information session to learn more about the potential future gas generation project and offer comments to SaskPower's project team.

…. /2

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Belle Plaine, SK
Thursday, February 16, 2017

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Moose Jaw, SK
Wednesday, February 22, 2017

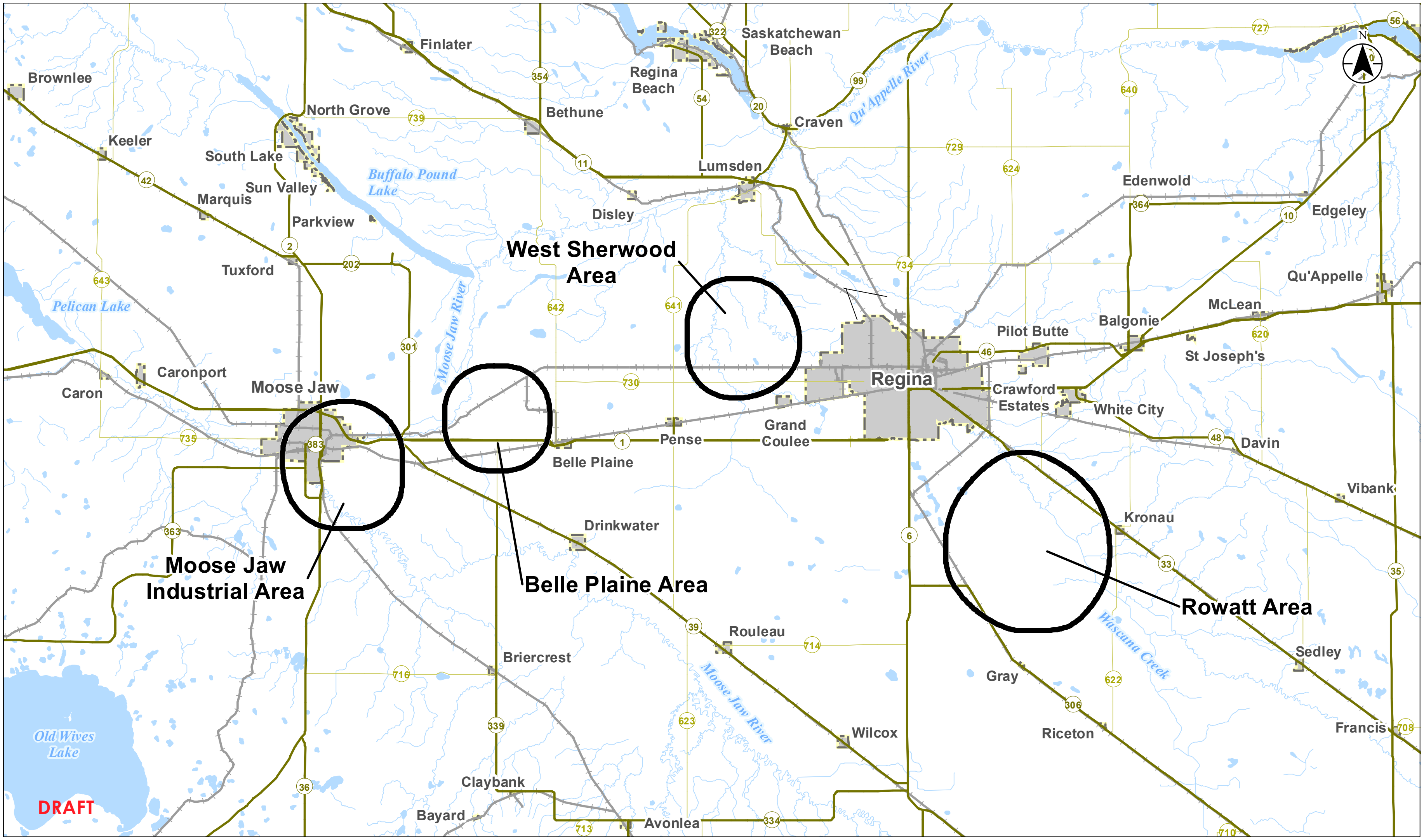
Kronau Memorial Hall
Kronau, SK
Thursday, February 23, 2017

All events are come and go from noon until 7:00 p.m.

Thank you in advance for your interest in this project. Please call me at 1-306-566-4046 if you have any questions about the open house or the potential future natural gas generation project.

Sincerely,

Consultant Name
Aboriginal Relations



- Area of Interest for Gas Generation
- Major Road
- Minor Road
- Railway
- Town/City Limit
- Watercourse
- Waterbody

0 8,200 16,400 metres

1:650,000 (At original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license with the Government of Saskatchewan and Government of Canada.

SaskPower

Project Location
Near Regina, SK

111100205-057 REVB
Prepared by ctownsend on 2017-01-25
Technical Review by gsamuelson on 2017-01-25

Project

Proposed Natural Gas Generation Project - Siting Study Areas

DRAFT

SaskPower

Stakeholder Engagement
8SE – 2025 Victoria Avenue
Regina SK Canada S4P 0S1
Phone (306) 566-1008
Fax (306) 566-3131
Toll-Free (855) 566-1008

February 1, 2017

LETTER TO LANDOWNERS

Dear Sir/Madam:

Re: Potential Future Gas Generation Project

SaskPower is committed to making sure Saskatchewan has the power it needs, when it needs it. We evaluate Saskatchewan's energy needs on an on-going basis to ensure that the province has enough reliable, sustainable and affordable energy to meet its electrical demands into the future.

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You are receiving this letter because you hold title to land within the Belle Plaine area of interest. A detailed map of this area is attached for your reference.

SaskPower's goal is to have 50% of our power generation capacity from renewable sources by 2030. However, natural gas continues to play an important role in our supply mix to generate power. Natural gas is an ideal back up to wind and solar. It is highly efficient and less expensive than many other options, and produces less than half the carbon dioxide emissions of a conventional coal-fired power station.

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an open house information session to learn more about the potential future gas generation project and offer comments to SaskPower's project team.

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Belle Plaine, SK
Thursday, February 16, 2017

Wakimow Valley Sportsman Centre
Moose Jaw, SK
Wednesday, February 22, 2017

Kronau Memorial Hall
Kronau, SK
Thursday, February 23, 2017

All events are come and go from noon until 7:00 p.m.

Thank you in advance for your interest in this project. Please call me at 1-855-566-1008 if you have any questions about the open house or the potential future natural gas generation project.

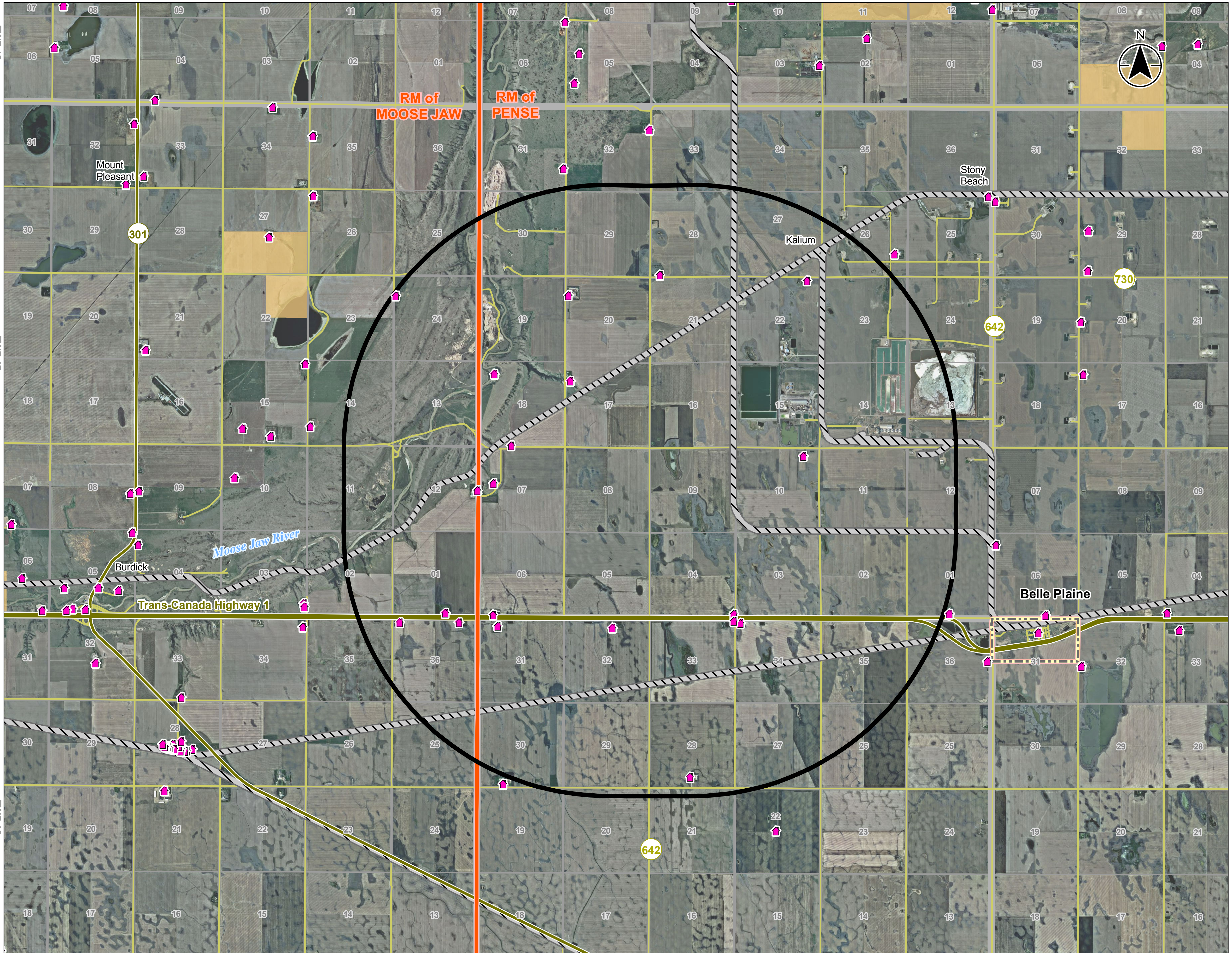
Sincerely,

<Original Signed By>

Myrna Broadfoot
Stakeholder Engagement
Enc

RGE 25 W2M RGE 24 RGE 23

TWP 18 TWP 17 TWP 16



SaskPower

- Area of Interest for Gas Generation
- Residence*
- Rail Buffer (120 m wide)
- Agricultural Crown Land (MOA)
- Major Road
- Minor Road
- Rural Municipality Boundary
- Town/City Limit
- Township
- Section

0 2 4 Kilometres

1:75,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features: Produced under license from the Government of Saskatchewan.
3. Orthoimagery: SGIC, 2012-2013.

***Disclaimer of Residences:**
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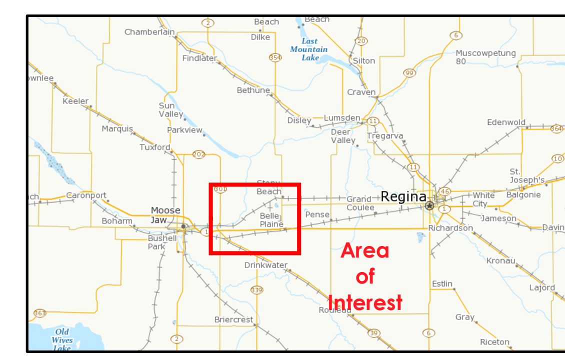

Project Location
Belle Plaine, SK

111100205-051 REVE
Prepared by acory on 2017-01-24
Technical Review by gsamuelson on 2017-01-24

Project

Proposed Natural Gas Generation Project - Siting Study Belle Plaine Area

Disclaimer: Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

SaskPower

Stakeholder Engagement
8SE – 2025 Victoria Avenue
Regina SK Canada S4P 0S1
Phone (306) 566-1008
Fax (306) 566-3131
Toll-Free (855) 566-1008

February 1, 2017

LETTER TO LANDOWNERS

Dear Sir/Madam:

Re: Potential Future Gas Generation Project

SaskPower is committed to making sure Saskatchewan has the power it needs, when it needs it. We evaluate Saskatchewan's energy needs on an on-going basis to ensure that the province has enough reliable, sustainable and affordable energy to meet its electrical demands into the future.

SaskPower's future planning has identified a need to pre-select a site for a future natural gas generation facility in the Regina/Moose Jaw area. This additional generation could be needed as early as 2022. The attached overview map shows the four areas of interest identified for additional evaluation: West Sherwood, Belle Plaine, Rowatt and the Moose Jaw Industrial Park.

You are receiving this letter because you hold title to land within the Moose Jaw Industrial area of interest. A detailed map of this area is attached for your reference.

SaskPower's goal is to have 50% of our power generation capacity from renewable sources by 2030. However, natural gas continues to play an important role in our supply mix to generate power. Natural gas is an ideal back up to wind and solar. It is highly efficient and less expensive than many other options, and produces less than half the carbon dioxide emissions of a conventional coal-fired power station.

The selection of a location for a future natural gas generation station will be based on results of the public consultation and other factors such as the availability and cost of the fuel supply infrastructure; the availability and cost of connecting to the transmission grid; availability and cost of water supply; environmental considerations; constructability within the area of the site; and accessibility to the site location.

Public consultations are an important part of the planning process for SaskPower to gather the information needed to assist in siting future generation. Consultation is beginning with local officials, landowners, and the general public and we would like to invite you to attend an open house information session to learn more about the potential future gas generation project and offer comments to SaskPower's project team.

…. /2

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Pense, SK
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Belle Plaine, SK
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Kronau Memorial Hall
Kronau, SK
Thursday, February 23, 2017

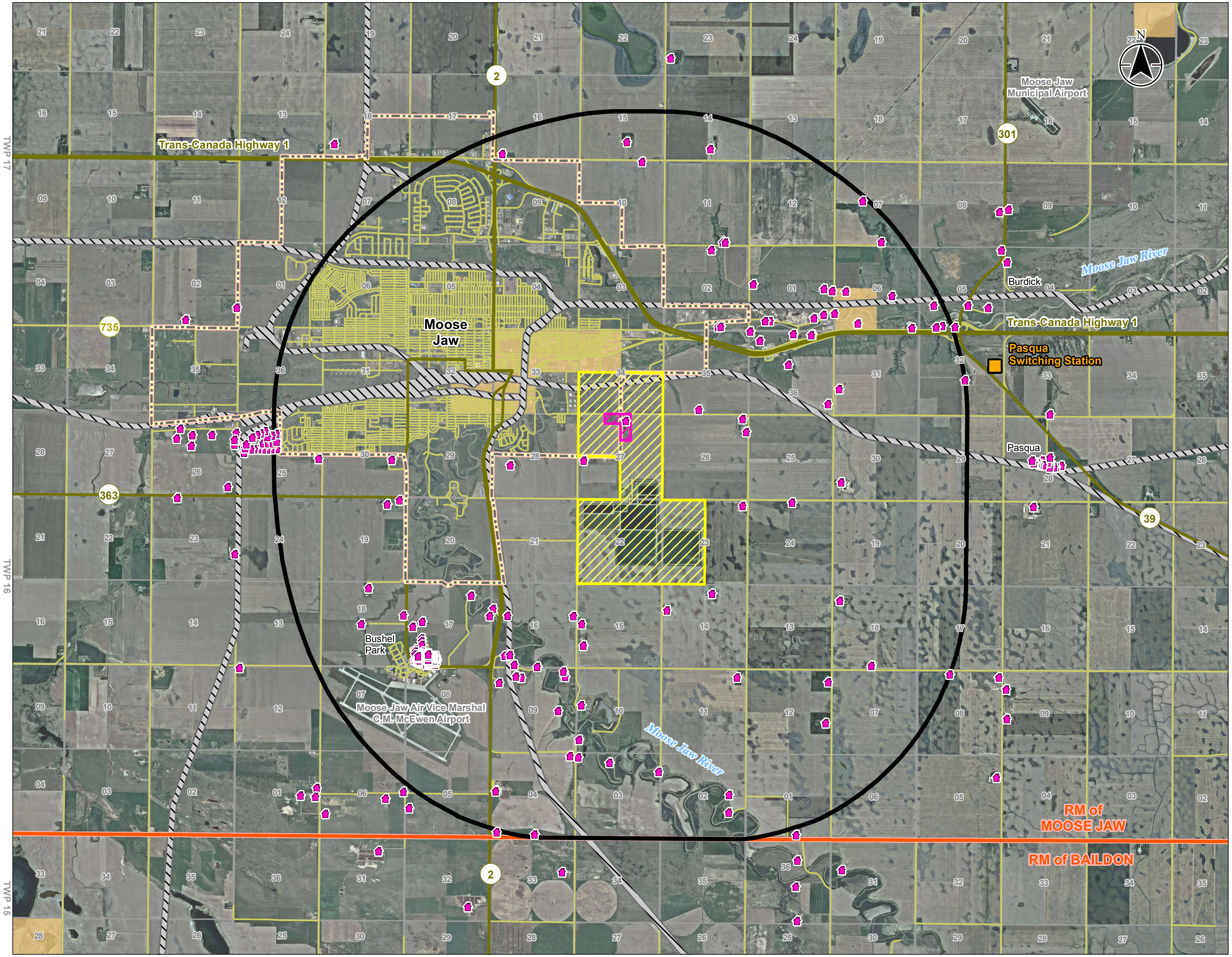
All events are come and go from noon until 7:00 p.m.

Thank you in advance for your interest in this project. If you have any questions about the open house or the potential future natural gas generation project, please contact me by email at mbroadfoot@saskpower.com or by telephone at 1-855-566-1008.

Sincerely,

<Original Signed By>

Myrna Broadfoot
Stakeholder Engagement
Enc



SaskPower

- Area of Interest for Gas Generation
- Pasqua Switching Station
- Residence*
- Country Residential
- Moose Jaw Industrial Park
- Rail Buffer (120 m wide)
- Agricultural Crown Land (MOA)
- Major Road
- Minor Road
- Rural Municipality Boundary
- Town/City Limit
- Section

0 2 4 Kilometres

1:75,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features: Produced under license from the Government of Saskatchewan.
3. Orthoimagery: SGIC, 2012-2013.

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Project Location

Moose Jaw, SK

111100205-053 REVH
Prepared by acory on 2017-01-26
Technical Review by gsamuelson on 2017-01-26

Project

Proposed Natural Gas Generation Project - Siting Study Moose Jaw Industrial Area

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Stakeholder Engagement
8SE – 2025 Victoria Avenue
Regina SK Canada S4P 0S1
Phone (306) 566-1008
Fax (306) 566-3131
Toll-Free (855) 566-1008

February 1, 2017

LETTER TO LANDOWNERS

Dear Sir/Madam:

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You are receiving this letter because you hold title to land within the Rowatt area of interest. A detailed map of this area is attached for your reference.

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…. /2

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Wednesday, February 15, 2017

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Belle Plaine, SK
Thursday, February 16, 2017

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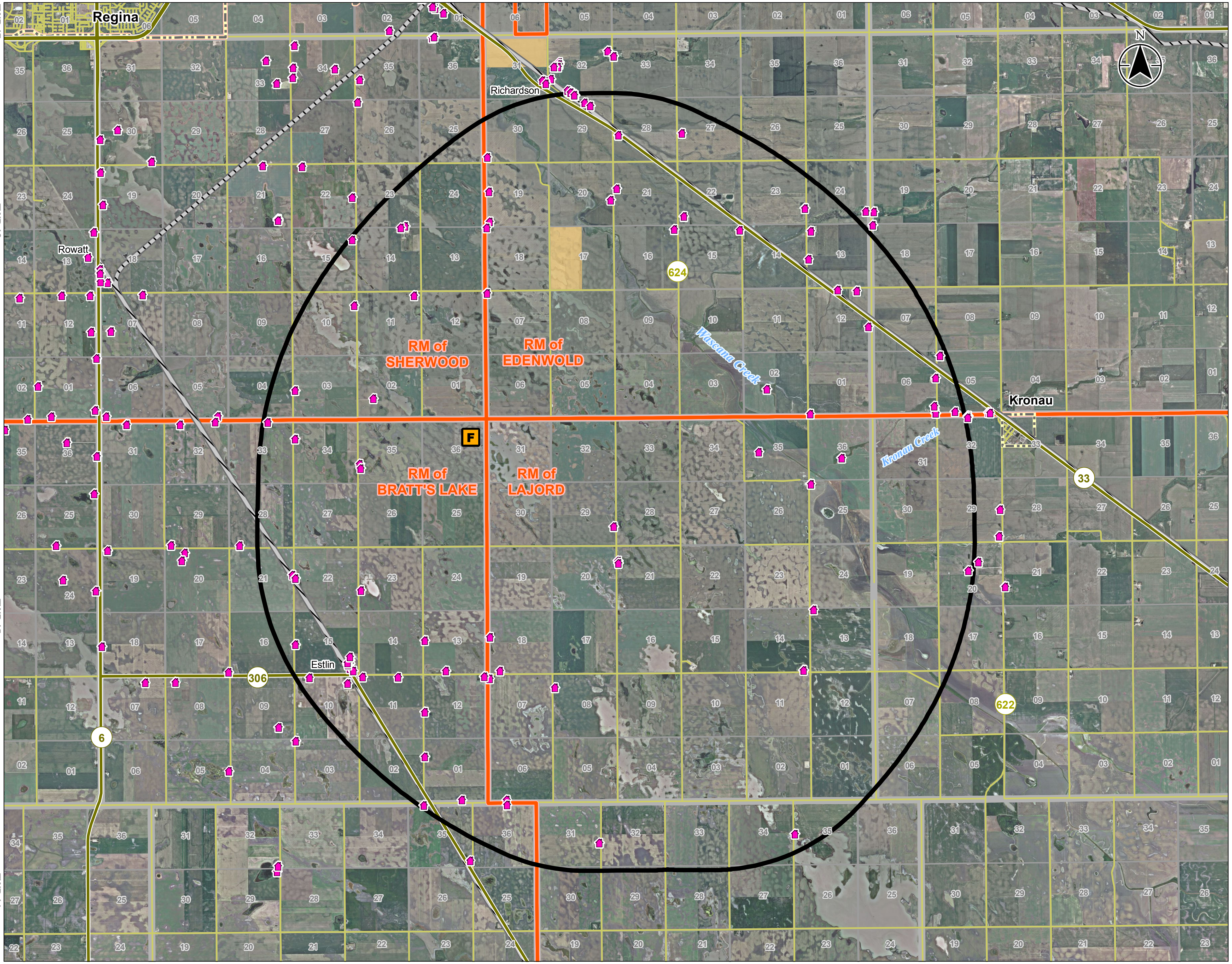
<Original Signed By>

Myrna Broadfoot
Stakeholder Engagement
Enc



SaskPower

- Area of Interest for Gas Generation
- Future Switching Station
- Residence*
- Rail Buffer (120 m wide)
- Agricultural Crown Land (MOA)
- Major Road
- Minor Road
- Rural Municipality Boundary
- Town/City Limit
- Township
- Section

0 2 4 Kilometres

1:100,000 (At original document size of 11x17)

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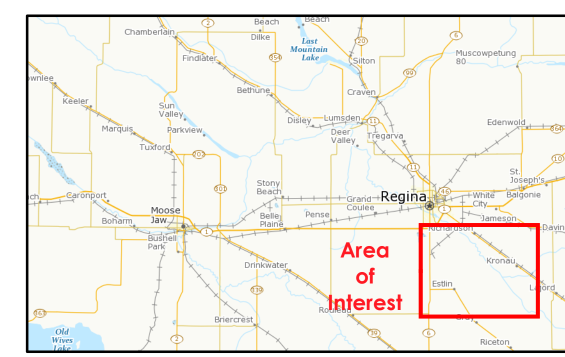


Project Location
Regina, SK

111100205-052 REVF
Prepared by acory on 2017-01-24
Technical Review by gmsamuelson on 2017-01-24

Project

Proposed Natural Gas Generation Project - Siting Study Rowatt Area

Stakeholder Engagement
8SE – 2025 Victoria Avenue
Regina SK Canada S4P 0S1
Phone (306) 566-1008
Fax (306) 566-3131
Toll-Free (855) 566-1008

February 1, 2017

LETTER TO LANDOWNERS

Dear Sir/Madam:

Re: Potential Future Gas Generation Project

SaskPower is committed to making sure Saskatchewan has the power it needs, when it needs it. We evaluate Saskatchewan's energy needs on an on-going basis to ensure that the province has enough reliable, sustainable and affordable energy to meet its electrical demands into the future.

SaskPower's future planning has identified a need to pre-select a site for a future natural gas generation facility in the Regina/Moose Jaw area. This additional generation could be needed as early as 2022. The attached overview map shows the four areas of interest identified for additional evaluation: West Sherwood, Belle Plaine, Rowatt and the Moose Jaw Industrial Park.

You are receiving this letter because you hold title to land within the West Sherwood area of interest. A detailed map of this area is attached for your reference.

SaskPower's goal is to have 50% of our power generation capacity from renewable sources by 2030. However, natural gas continues to play an important role in our supply mix to generate power. Natural gas is an ideal back up to wind and solar. It is highly efficient and less expensive than many other options, and produces less than half the carbon dioxide emissions of a conventional coal-fired power station.

The selection of a location for a future natural gas generation station will be based on results of the public consultation and other factors such as the availability and cost of the fuel supply infrastructure; the availability and cost of connecting to the transmission grid; availability and cost of water supply; environmental considerations; constructability within the area of the site; and accessibility to the site location.

Public consultations are an important part of the planning process for SaskPower to gather the information needed to assist in siting future generation. Consultation is beginning with local officials, landowners, and the general public and we would like to invite you to attend

…. /2

an open house information session to learn more about the potential future gas generation project and offer comments to SaskPower's project team.

Four public open house information sessions are planned as follows:

Pense Town Hall
Pense, SK
Wednesday, February 15, 2017

Belle Plaine Town Hall
Belle Plaine, SK
Thursday, February 16, 2017

Wakimow Valley Sportsman Centre
Moose Jaw, SK
Wednesday, February 22, 2017

Kronau Memorial Hall
Kronau, SK
Thursday, February 23, 2017

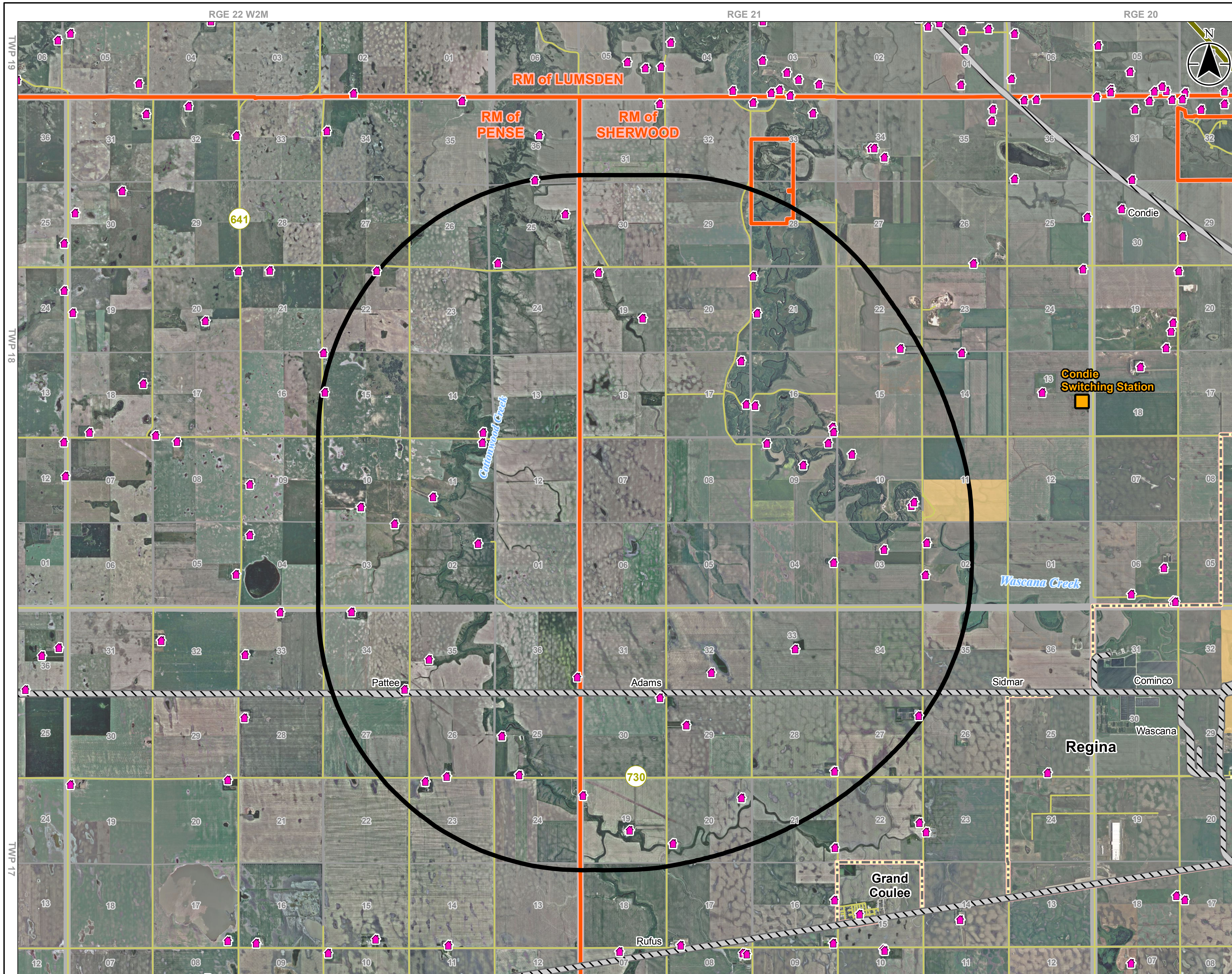
All events are come and go from noon until 7:00 p.m.

Thank you in advance for your interest in this project. Please call me at 1-855-566-1008 if you have any questions about the open house or the potential future natural gas generation project.

Sincerely,

<Original Signed By>

Myrna Broadfoot
Stakeholder Engagement
Enc



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- Area of Interest for Gas Generation
- Condie Switching Station
- Residence*
- Rail Buffer (120 m wide)
- Agricultural Crown Land (MOA)
- Major Road
- Minor Road
- Rural Municipality Boundary
- Town/City Limit
- Township
- Section

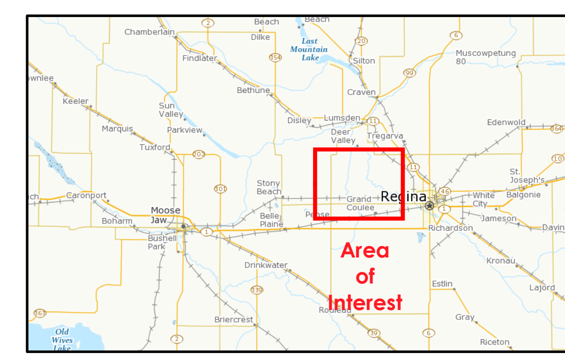
0 2 4 Kilometres

1:75,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features: Produced under license from the Government of Saskatchewan.
3. Orthoimagery: SGIC, 2012-2013.

***Disclaimer of Residences:**
Residences were digitized for an assessment area based on visual interpretation of orthoimagery and Google Earth Street View (where available). The orthoimagery sources included BING Aerial, ESRI World Imagery (2010-2012), SGIC (2012-2013), and City of Regina Airphotos from 2014. A subset of the database was field verified in July 2016. Residences have not be verified to confirm occupancy.



Project Location
Grand Coulee, SK

111100205-050 REVG
Prepared by acory on 2017-01-24
Technical Review by gsamuelson on 2017-01-24

Project

Proposed Natural Gas Generation Project - Siting Study West Sherwood Area

Disclaimer: Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

Proposed Natural Gas Generation Project

Siting Studies – Regina/Moose Jaw Area

SaskPower evaluates Saskatchewan's energy needs on an on-going basis to ensure the province has enough reliable, sustainable and affordable energy to meet its electrical demands into the future.

As part of SaskPower's Supply Development Plan, SaskPower has identified the need to pre-select a site for a future natural gas generation facility in the Regina/Moose Jaw area. Four areas of interest have been identified for additional evaluation: West Sherwood, Rowatt, Belle Plaine and the Moose Jaw Industrial Park. SaskPower's objective is to select a site for the future/potential development of a natural gas generation facility in order to effectively respond to future demand when it is needed.

Site selection criteria

The selection of a location for a future natural gas generation station will be based on results of the public consultation and further studies, including:

- Availability and cost of the fuel supply infrastructure;
- Availability and cost of connecting to the transmission grid;
- Availability of water supply;
- Environmental considerations;
- Constructability within the area of the site; and
- Accessibility to the site location.

How does natural gas fit into our renewables strategy?

- Our goal is 50% of our power generation capacity from renewable sources by 2030;
- Balancing our need for a diverse mix of power options with your need for reliable and cost-effective electricity;
- Wind and solar are intermittent - can't rely on wind or solar technology to provide electricity 100% of the time;
- Natural gas generation provides reliable baseload power and supports expansion of renewables;
- Natural gas has about half the CO_2 emissions of coal-fired generation, can be put into service quickly and ramped up or down as needed to follow intermittent renewable options.

For additional information on this project, please contact SaskPower's Stakeholder Engagement Department at publicconsultation@saskpower.com or 1-855-566-1008.

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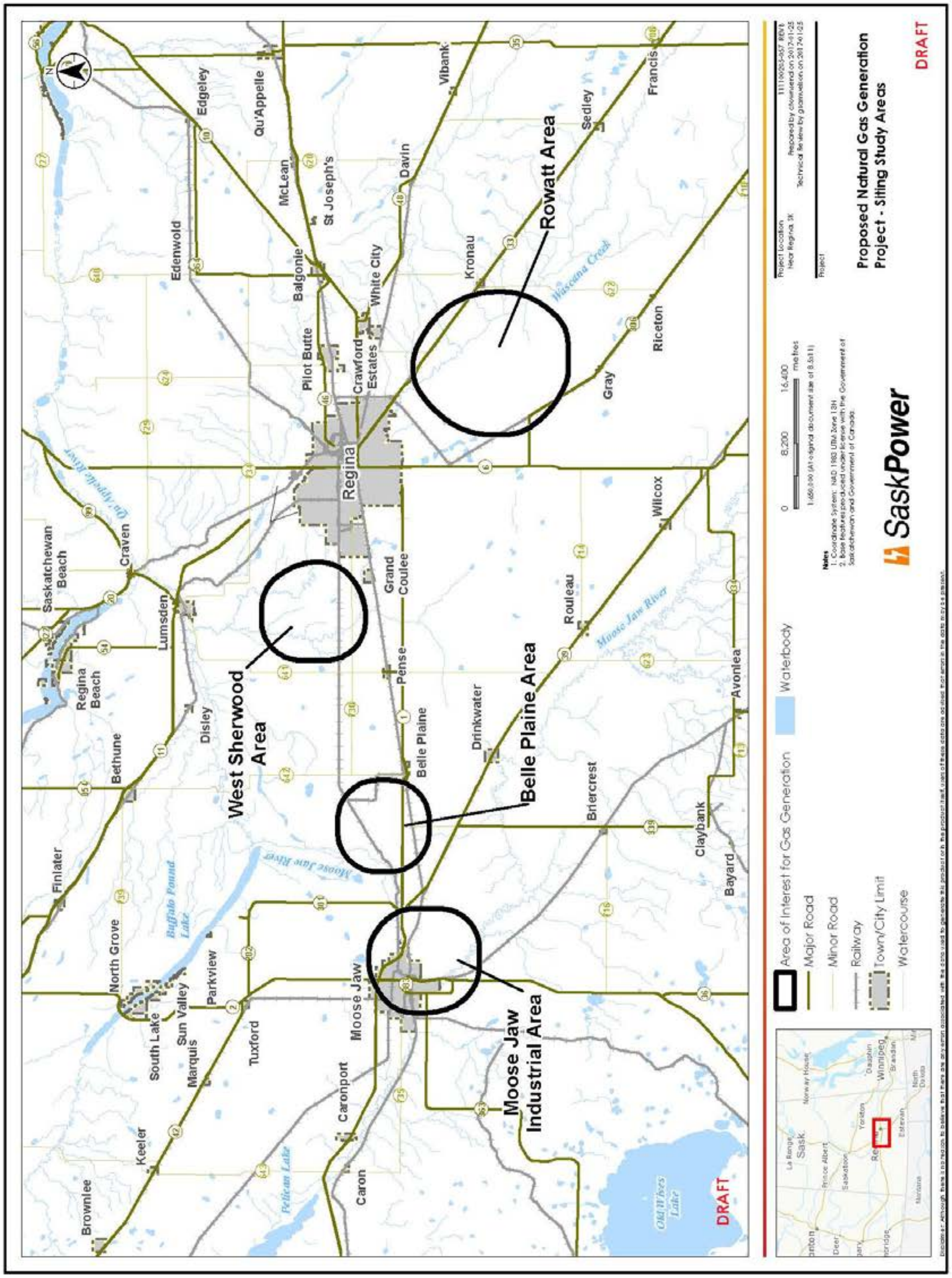
Proposed Natural Gas Generation Project

Siting Studies – Regina/Moose Jaw Area

OVERVIEW MAP OF AREAS OF INTEREST



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Potential Future Natural Gas Generation Project

February 2017

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AGENDA

- Introduction
- Site Selection
- Natural Gas Generation Overview
- Environmental Considerations
- Next steps
- Discussions/Questions

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INTRODUCTION

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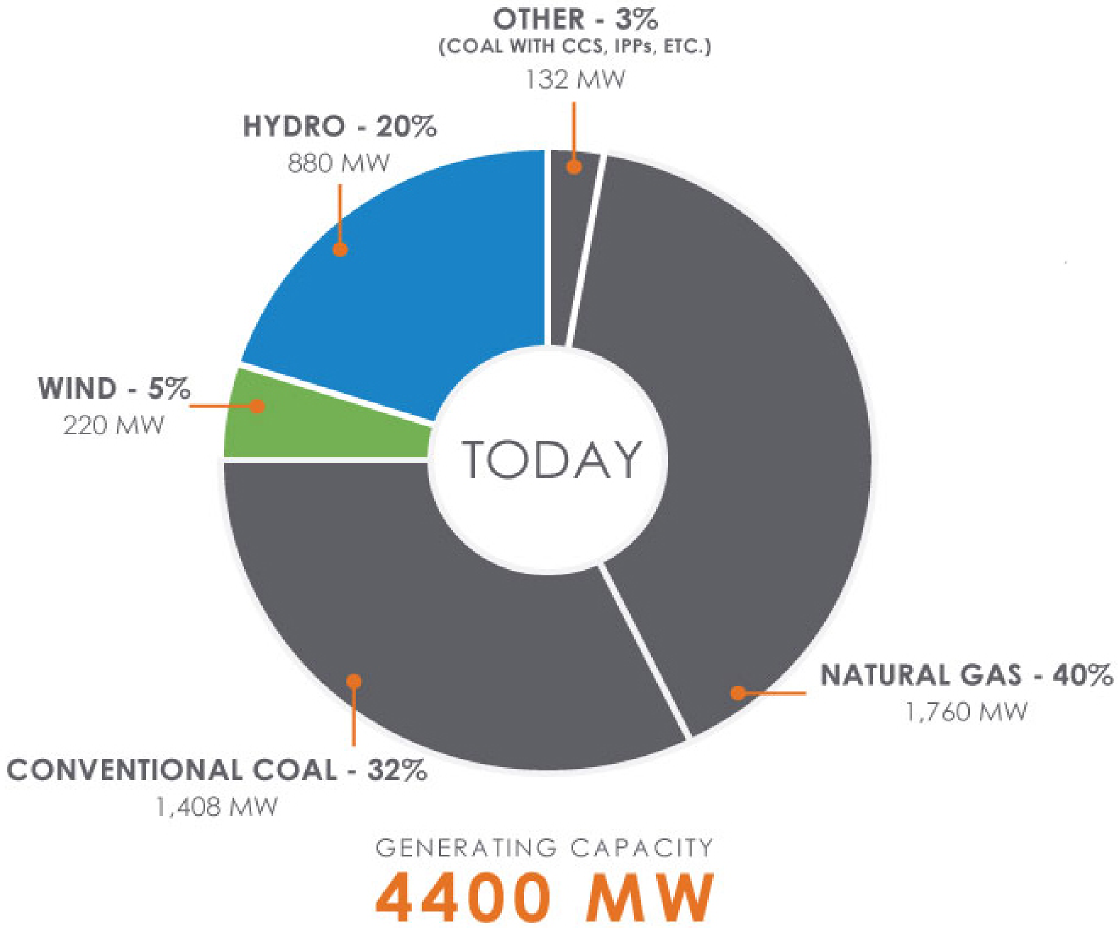
GENERATING CAPACITY - TODAY



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OUR KEY CHALLENGES

- Demand for power growing significantly
- Aging system requires annual $1billion investment
- Emissions regulations eliminate one of our primary **baseload** power sources: coal without carbon capture
- Adding more renewable (but **intermittent**) generation sources

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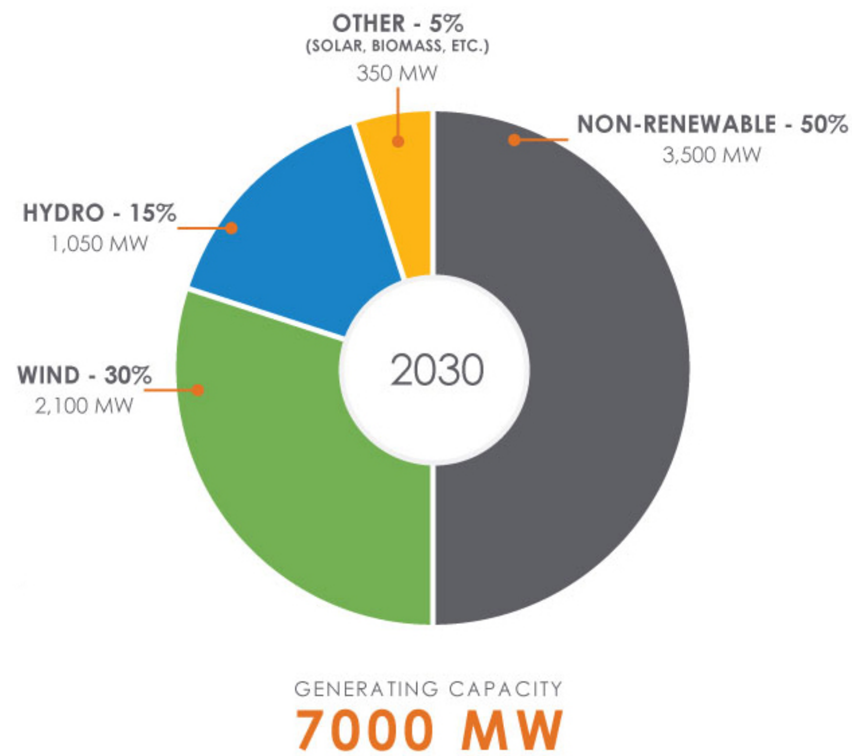
POTENTIAL GENERATING CAPACITY - 2030

SaskPower's goal is to reduce GHG emissions by about 40% from 2005 levels by 2030.

To help our emissions reduction goal, SaskPower has set a goal to have up to 50% of our power generation capacity from renewable sources by 2030.

We'll meet this target by:

- adding more wind power
- installing about 60 megawatts of utility scale solar by 2021.
- Looking at the potential for more hydro projects in Saskatchewan as well as importing hydro from other provinces.



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ELECTRICAL GENERATION OPTIONS

- SaskPower has a wide range of electrical generation options to meet Saskatchewan’s electrical supply.

- The ideal supply portfolio:
  - Meets our emission and renewable targets; and
  - balances cost, reliability and sustainability.

- Renewable generation will play a large role in the future plans.

- Natural gas generation supports the development of intermittent renewable generation due to its flexibility.

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SITE SELECTION

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SITE SELECTION INTRODUCTION

- SaskPower's objective is to select a site or site(s) for the future/potential development of a natural gas fired facility in order to meet future demand when it is needed.
- At this time it is anticipated that a future gas-fired plant could be needed as soon as 2022. However, it is important to note that the schedule may fluctuate depending on electricity demand in Saskatchewan and other factors.
- The size of the plant is still to be determined. SaskPower is reviewing options around 350 MW, similar to the Chinook Power plant and is considering options of developing a larger facility (approx. 700 MW).
- SaskPower continues to monitor all generation options.

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BENEFITS OF PRESELECTING A SITE OR SITES

- The next new natural gas generation site will be best suited to meet electric system needs.
- Gas and electrical costs can be optimized.
- Local communities will be able to incorporate the potential power plant into their land use plans.
- Positions SaskPower to ensure future generation and transmission system capacity is available and enables SaskPower to effectively respond to future load growth.

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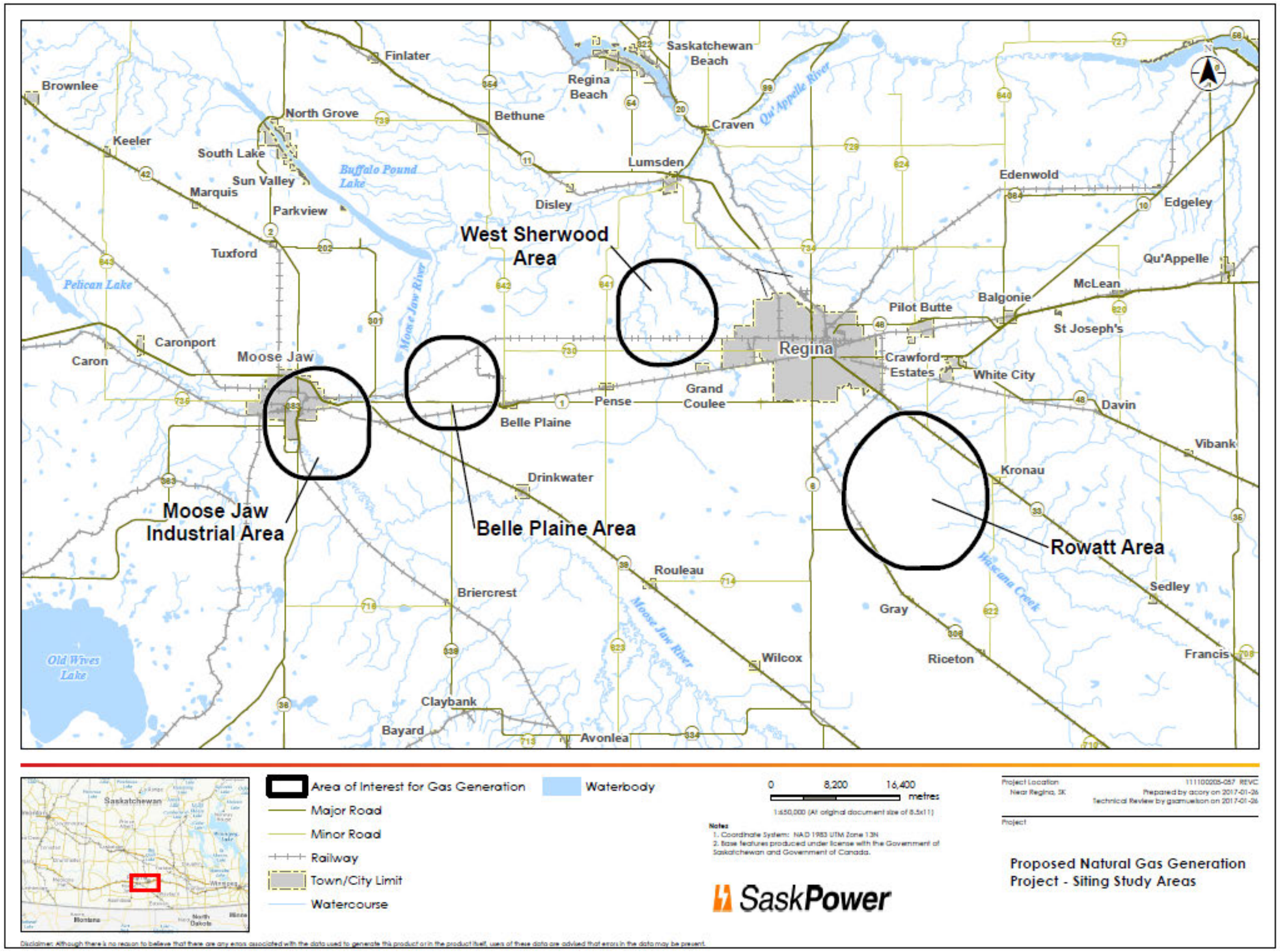
AREAS OF INTEREST



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SITE SELECTION PROCESS

- Analysis will be conducted in the areas of interest to select potential sites for new natural gas generation based on:
  - Availability and cost of the fuel supply infrastructure (gas pipeline).
  - Exploratory cost of connecting to the transmission grid.
  - Water availability at the site for a combined cycle gas plant.
  - Wastewater Management
  - Environmental impacts associated with construction, operation and maintenance of the facility.
  - Constructability within the area of the site.
  - Accessibility to the site location.

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Natural Gas Generation Overview

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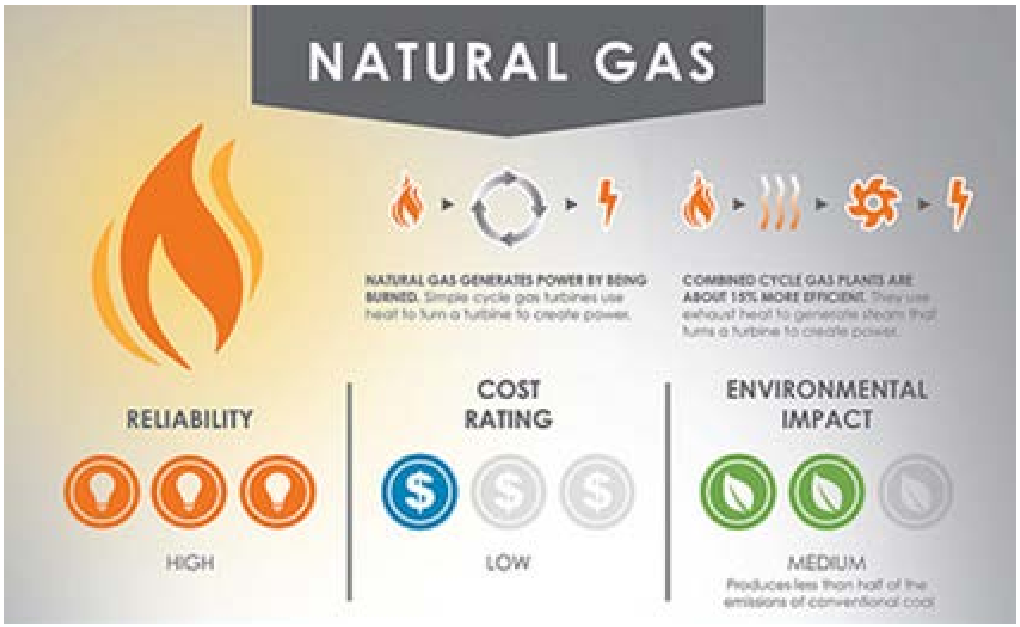
NATURAL GAS HELPS US ADD RENEWABLES



- Lower CO_2 emissions
- Shorter build time
- Provides ideal back-up to wind/solar

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APPLICATIONS OF NATURAL GAS GENERATION

Combined Cycle

- Provides intermediate and base-load capability
- Gas is utilized more efficiently
- Load following capability
- Lower emissions output per KW

Simple Cycle

- Provides peak load and load following capability
- Provides fast start-up
- Faster and less expensive to construct
- Less equipment, smaller footprint
- Less water usage

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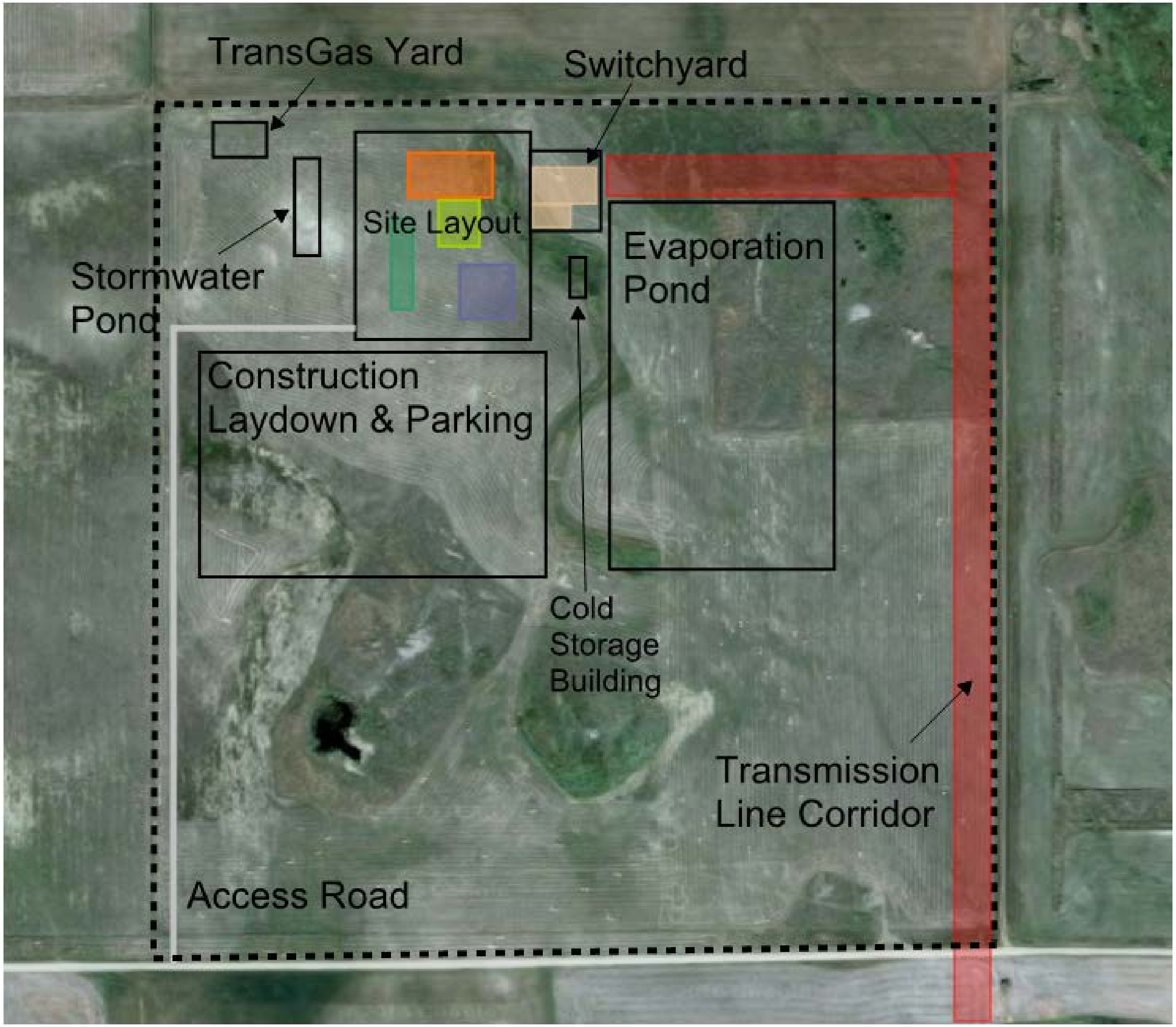
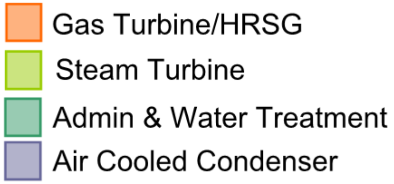
COMBINED CYCLE NATURAL GAS FACILITY EXAMPLE

North Battleford Generating Station - Combined Cycle Power Plant, 2013

Example: CHINOOK GENERAL ARRANGEMENT





- Typical Footprint (350 MW plant) – approximately 40 to 75 acres (plant, construction facilities, parking, laydown area.
- Evaporation pond may or may not be needed.
- Larger options (~700 MW) – close to a quarter section – if an evaporation pond is needed.

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SIMPLE CYCLE LAND REQUIREMENTS

- Typical Footprint – 7 to 15 acres to support the plant, construction facilities, parking and laydown area.
- SaskPower purchased approximately 40 acre parcels for the development of its last two simple cycle natural gas facilities.

Ermine Power Station (2 x LM6000PD)

Environmental Considerations

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ENVIRONMENTAL CONSIDERATIONS

- Noise – A new gas generating facility will be required to meet recognized noise regulations. The effect on nearby residences is determined performing noise modeling.
- Air – A new gas generating facility will be required to meet Saskatchewan air quality standards. Air emissions modeling is completed to confirm compliance.
- Water – Water assessments will be undertaken to determine the water supply source and confirm the site's capability to support the natural gas generation facility.
- Environmental Impact Analysis - A new generating facility will have to assess the potential impact on socio-economical and environmental components.
- Other Environmental Considerations
  - Review under The Canadian Environmental Act may be required for federal approval.
  - Review under The Environmental Assessment Act (provincial) will be required for provincial approval.

MAJOR NOISE SOURCES (unmitigated)

The table below identifies the major noise sources from a combined cycle power plant and typical sound levels at 120 metres.

Equipment Name	dBA at 120 metres
Gas Turbine – Combustion Air Inlet (with 16' silencer)	42
Gas Turbine – Generator Set	62
Steam Turbine – Generator Set	58
Air Cooled Condenser	55
Heat Recovery Steam Generator – Casing (including transition duct)	61
Heat Recovery Steam Generator – Stack (unmitigated)	67
Lube Oil Cooler (standard)	54
Transformers	40

Noise from the Gas Turbine Enclosures, Steam Turbine Generator and Heat Recovery Steam Generator Casing can be minimized when located within a building.

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TYPICAL NOISE LEVELS

Table 2 Typical Noise Levels	
Noise Source	**dB(A)**
pneumatic chipper at 1 metre	115
hand-held circular saw at 1 metre	115
textile room	103
newspaper press	95
power lawn mower at 1 metre	92
diesel truck 50 km per hour at 20 metres	85
passenger car 60 km per hour at 20 metres	65
conversation at 1 metre	55
quiet room	40

Source Canadian Center for Occupational Health and Safety

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NOISE MITIGATION TECHNIQUES

- **Equipment Specification** – Most equipment is specified to meet 85 dBA at 3 feet. More stringent requirements can be imposed on the equipment suppliers if necessary to meet the standard. For outdoor equipment it is common to specify noise levels at a distance of 120 metres. The ACC can be specified to meet 52 dBA at 120 metres.
- **Facility Orientation** – Facility can be oriented to minimize the noise effects at specific receptors (residences) by directing noise away from them and by using facility building to screen the noise.
- **Equipment Location** – Most of the equipment on the site is expected to be within buildings or enclosures which helps to limit noise levels at site boundaries.
    - Buildings – The majority of the noise sources are expected to be located within a building including the gas turbine generator, HRSG, steam turbine generator, and pumps.

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NOISE MITIGATION TECHNIQUES (cont'd)

  - **Enclosures** – Outdoor equipment can be installed in enclosures to help mitigate noise.
  - **Location on site** – Major noise sources that cannot be located in a building include the Gas Turbine Generator Air Intake, Heat Recovery Steam Generator Stack, Lube Oil Cooler and the Air Cooled Condenser. During the design of the plant layout, special consideration can be taken to ensure that this equipment is located such that the contribution to the overall noise levels at the site boundaries is limited to ensure noise standards are met.
- **Silencers** – Silencers can be included in the plant design to further limit noise levels. Silencers are commonly specified for the stack, gas turbine air intake, building ventilation as well as steam vents.
- **Noise barriers** – Noise barriers can be constructed on site between the equipment and the site boundary as necessary to further reduce noise levels.

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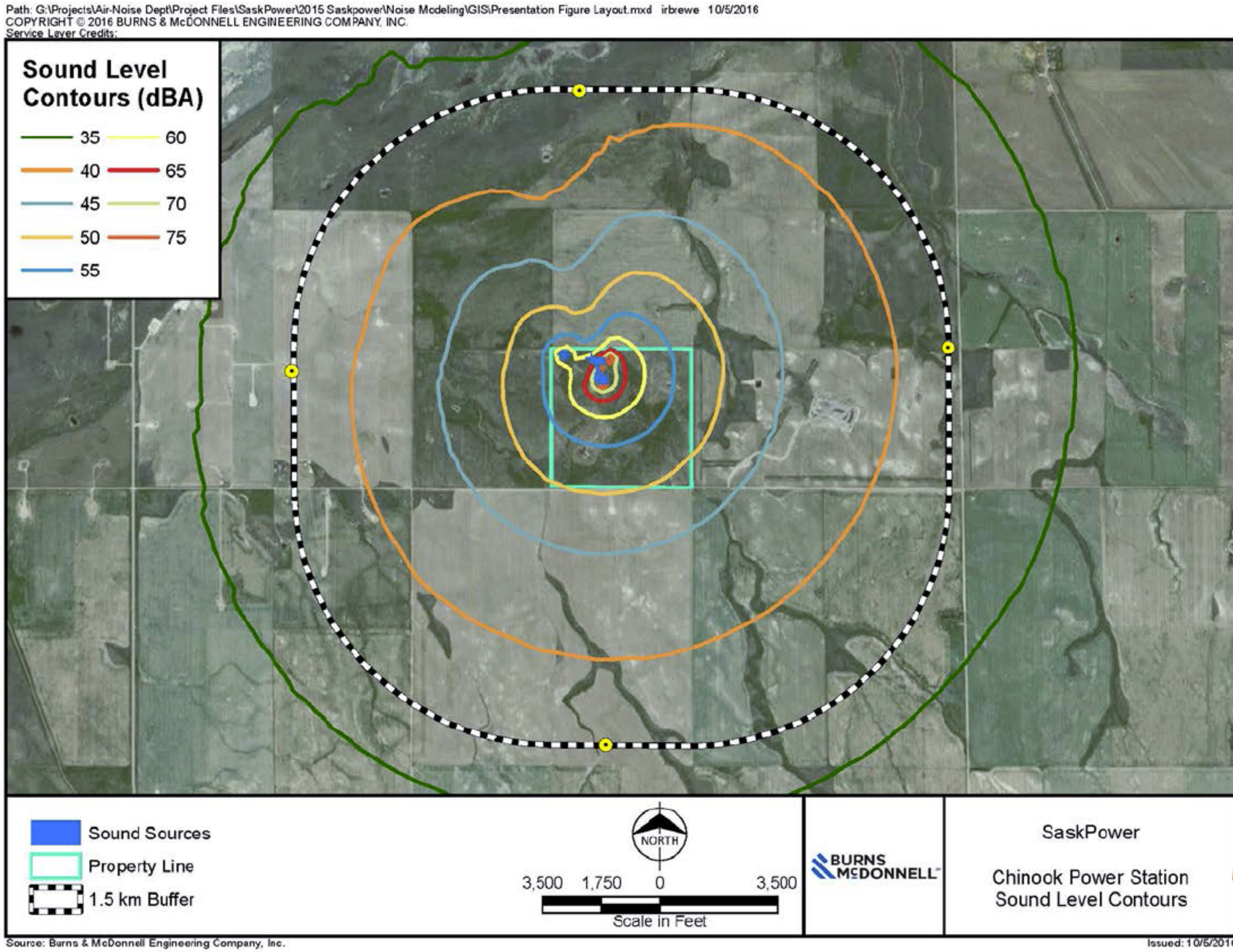
Example: PROJECTED CHINOOK OPERATION NOISE LEVELS



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AIR QUALITY

- Major air emissions contaminants from a natural gas generation facility include:
  - NO_X (NO_2 and NO)
  - $PM_{2.5}$
  - CO

- A new facility must comply with Saskatchewan's Ambient Air Quality Standards (AAQS) and Canada-Wide Standards (CWS)

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AIR DISPERSION MODELING

What is an Air Dispersion Model?

- Air dispersion modeling is the mathematical simulation of how air pollutants disperse in the ambient atmosphere from emission sources.

The Air Dispersion Models will be used for air quality analysis

- The AERMOD model is recommended by Saskatchewan Ministry of Environment for this purpose.
- It is an AMS/EPA Regulatory Model (AMS/EPA: American Meteorological Society/Environmental Protection Agency)

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AIR DISPERSION MODEL

- **Inputs**: Emission sources, buildings, meteorological data, geophysical data (terrain and surface roughness), and user-defined receptor grid.
- **Outputs**: Maximum air impacts at a single receptor for a specific time and pollutant averaging period (e.g. hourly and annually).

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MODELLED IMPACTS

- Saskatchewan Ambient Air Quality Standards (SAAQS) established so risk to human health and ecosystem health are minimized.

- The modelled impacts include ambient background concentrations, which is the portion of ambient concentration due to natural and nearby sources. These concentrations were provided by the Saskatchewan Ministry of Environment.

- The modelled results represent the maximum impact at a single receptor for a specific time and averaging period.

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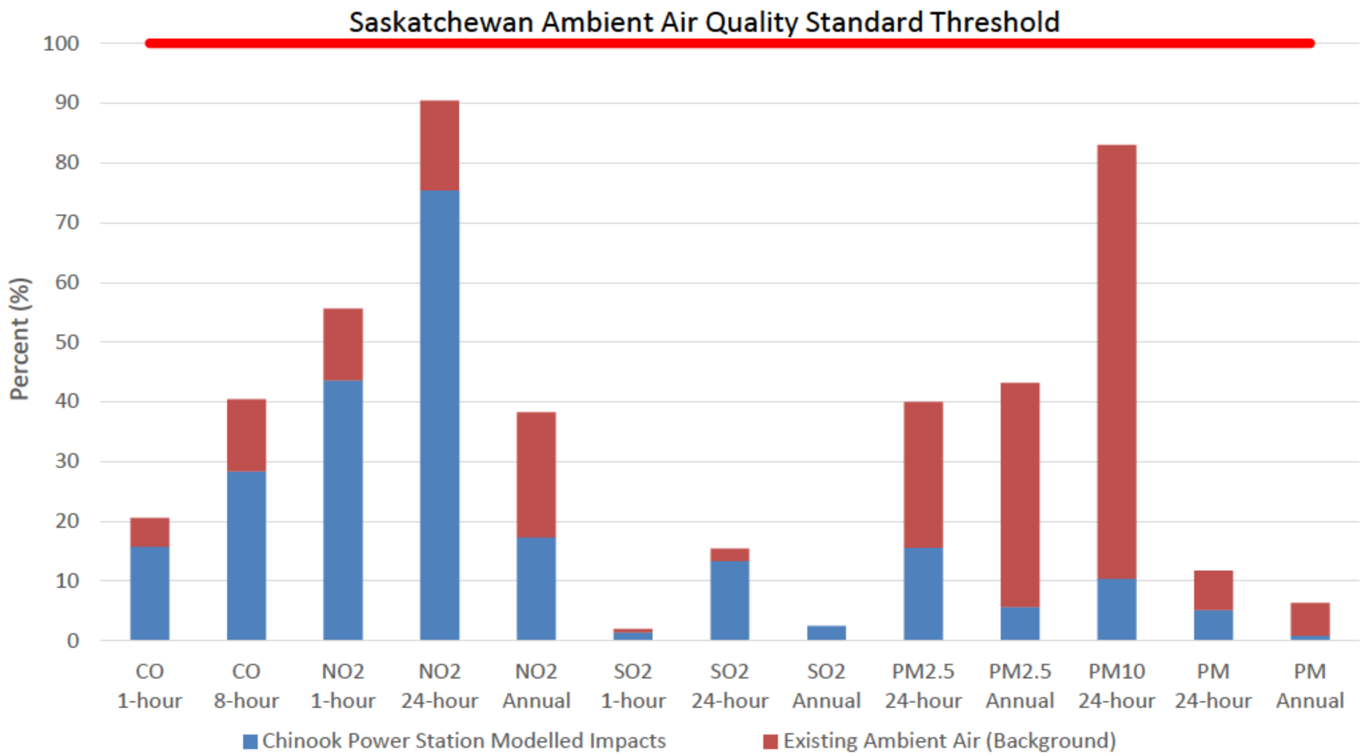
Example CHINOOK MODELLED IMPACTS



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NEXT STEPS

- Acquire land options
- Conduct site assessments and evaluations
- Additional public consultation
- Recommend land purchase

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OPEN HOUSES

Four public open house information sessions are planned as follows:

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Pense, SK
Wednesday, February 15, 2017

Belle Plaine Town Hall
Belle Plaine, SK
Thursday, February 16, 2017

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Questions?

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Potential Future Natural Gas Generation Project

SITE SELECTION

February 2017

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SITE SELECTION INTRODUCTION

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- The size of the plant is still to be determined. SaskPower is reviewing options around 350 MW, similar to the Chinook Power plant and is considering options of developing a larger facility (approx. 700 MW).
- SaskPower continues to monitor all generation options.

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BENEFITS OF PRESELECTING A SITE OR SITES

- The next new natural gas generation site will be best suited to meet electric system needs.
- Gas and electrical costs can be optimized.
- Local communities will be able to incorporate the potential power plant into their land use plans.
- Positions SaskPower to ensure future generation and transmission system capacity is available and enables SaskPower to effectively respond to future load growth.

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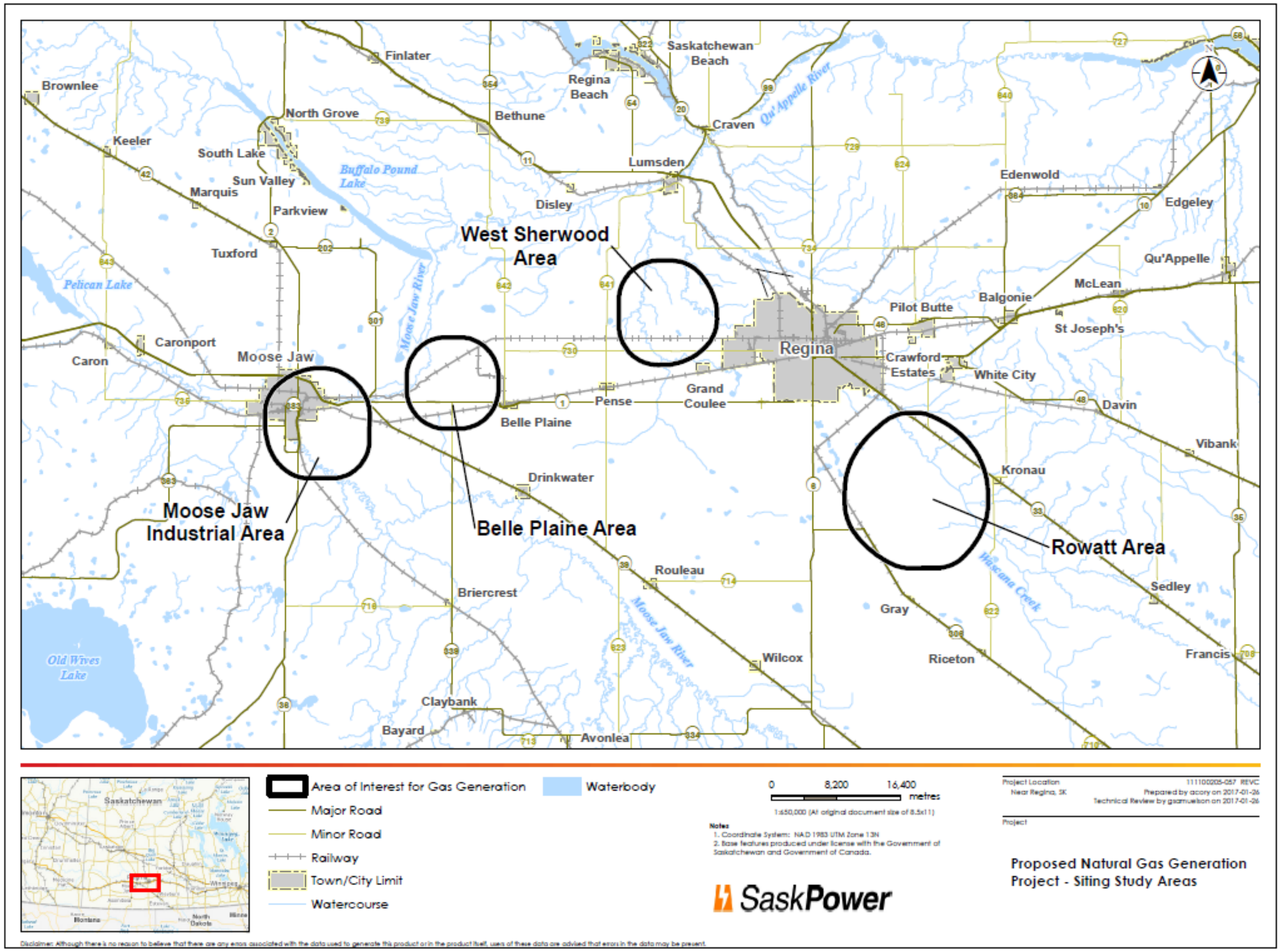
AREAS OF INTEREST



SITE SELECTION PROCESS

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North Battleford Generating Station - Combined Cycle Power Plant, 2013

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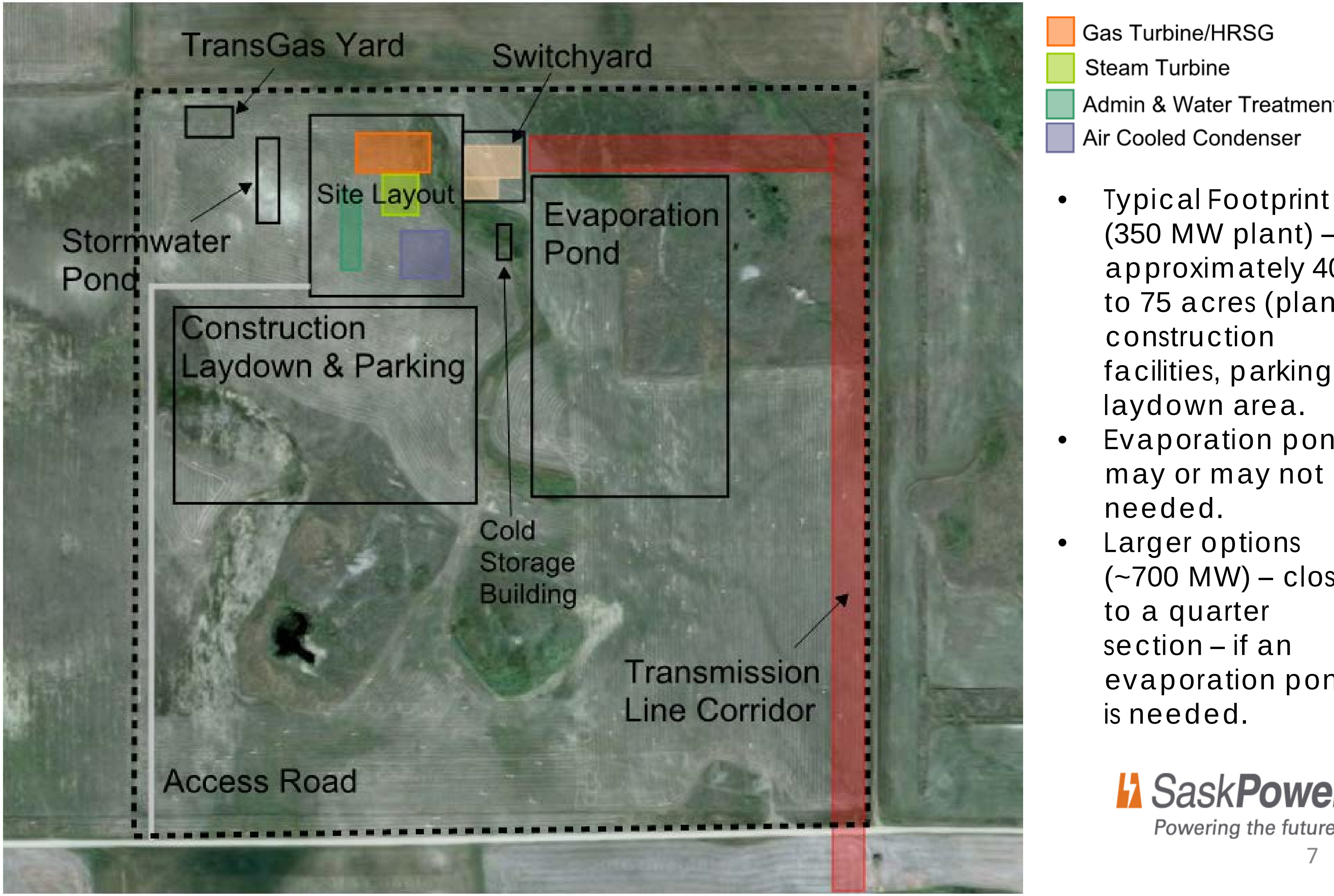

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Potential Future Natural Gas Generation Project

SUPPLY PLANNING

February 2017

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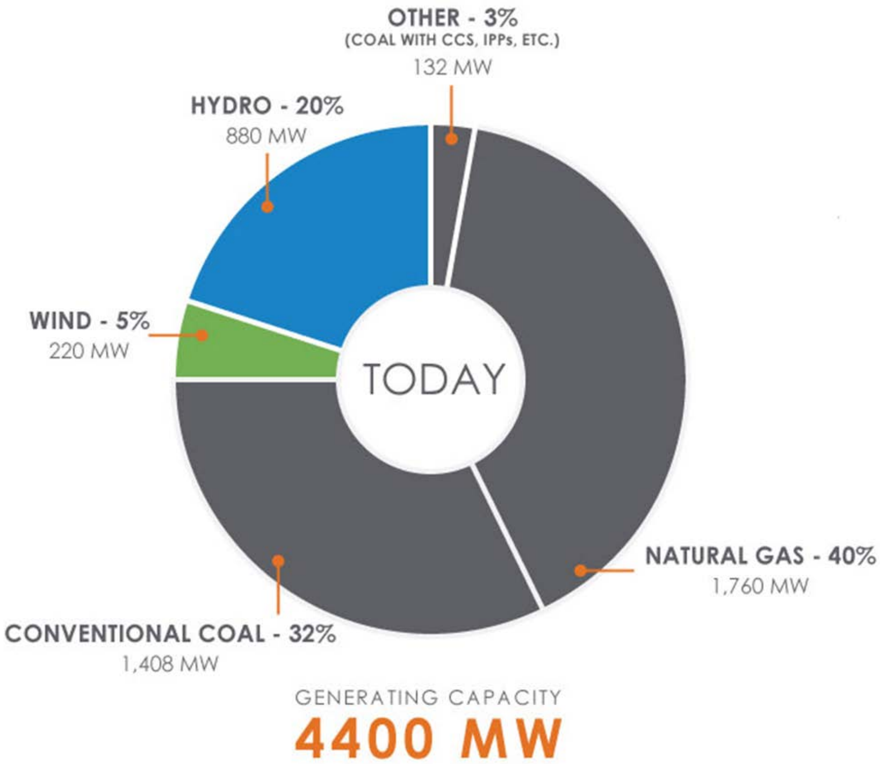
GENERATING CAPACITY - TODAY



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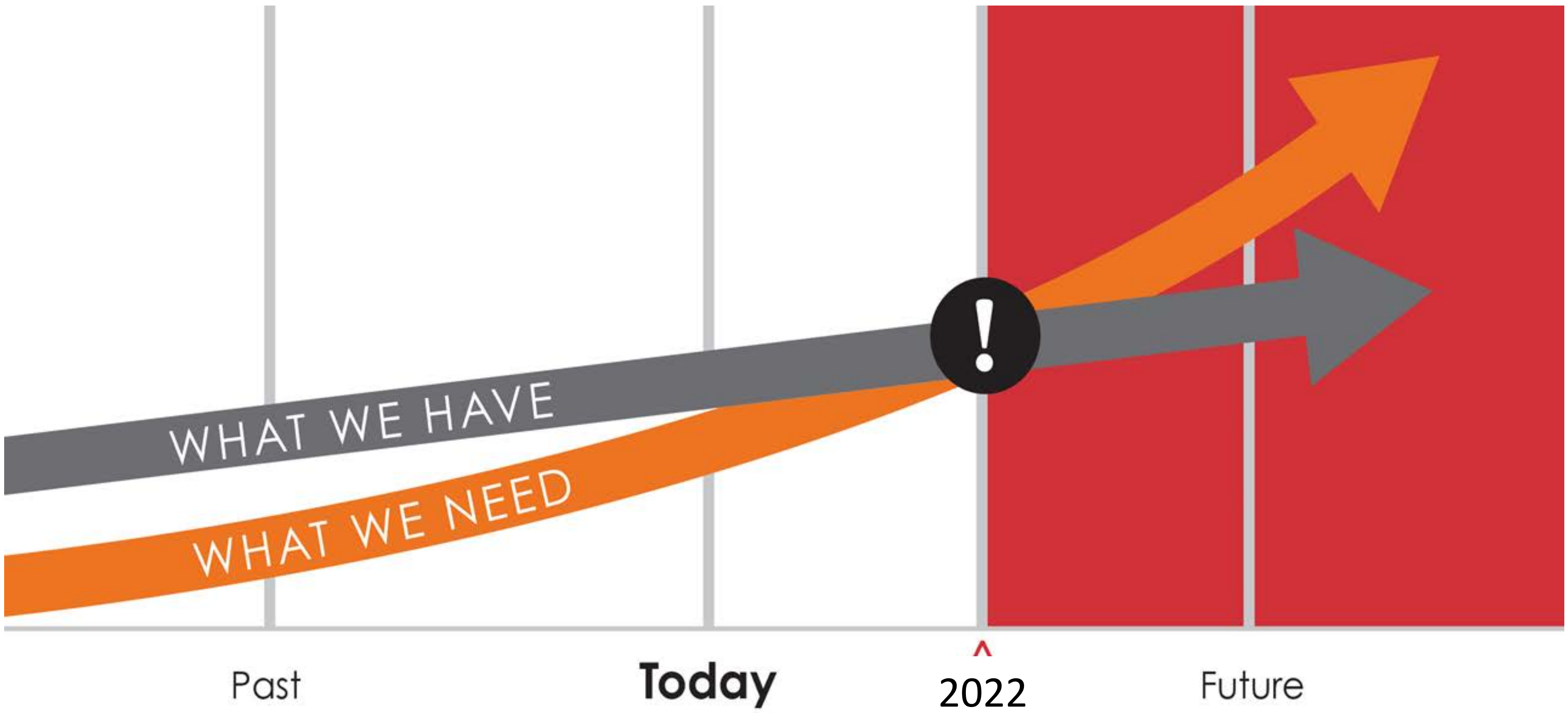
KEY CHALLENGE:

INCREASING DEMAND FOR POWER IN SASKATCHEWAN

AS EARLY AS 2022, WE'LL NEED ADDITIONAL ELECTRICITY TO MEET THE GROWING DEMAND



NATURAL GAS POWER STATION

- SaskPower requires additional generation to:
  - meet the growing demand for power in the province of Saskatchewan
  - support the integration of intermittent renewable generation (wind & solar)
  - provide replacement power for the retirement and/or refurbishment of conventional coal-fired generating units
- Natural gas continues to be key in our supply mix to generate power. It’s less expensive than many other options, and highly efficient. It also produces less than half the carbon dioxide emissions of a conventional coal-fired power station.

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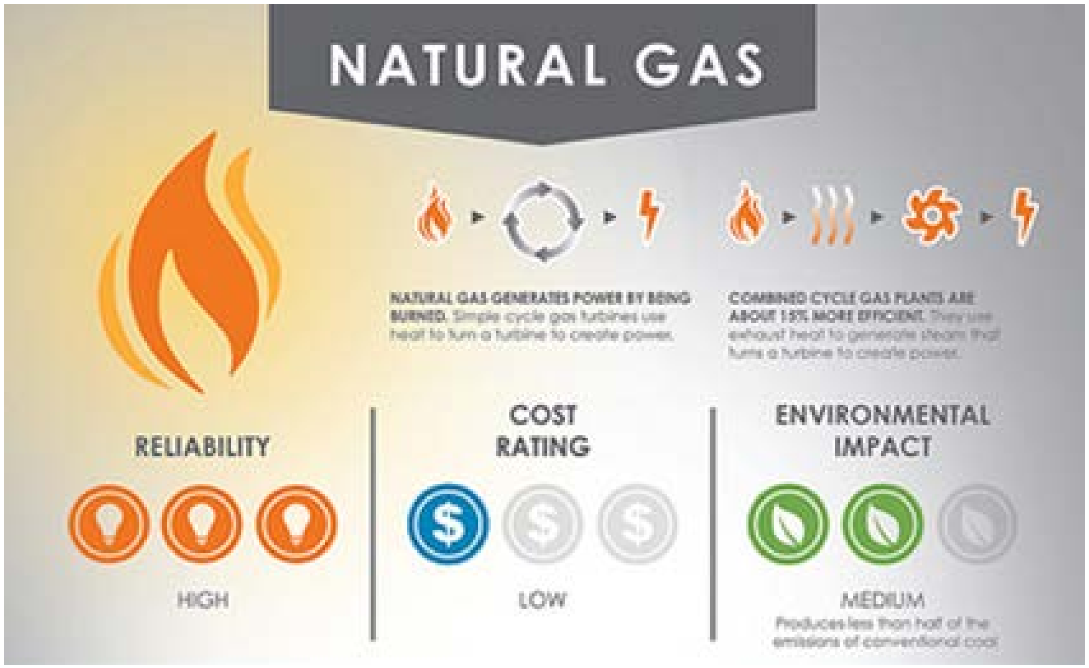
NATURAL GAS HELPS US ADD RENEWABLES



- Lower CO_2 emissions
- Shorter build time (5 yrs)
- Provides ideal back-up to wind/solar

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OTHER INITIATIVES

Wind: RFQ in market (100-200 MW)

- 1,600 MW between 2019-2030
- projects developed by independent power producers (IPPs)
- 100-200 MW projects

Solar: RFP Q1 2017 (10 MW)

- 60 MW by 2021
- will involve IPPs, First Nations Power Authority and community driven projects

Hydro

- 50 MW Tazi Twé project in partnership with Black Lake First Nation
- Community voted in favour – November 2015
- Pending approval, work to begin mid-2017
- In-service late 2020

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OTHER INITIATIVES

Agreements with Manitoba Hydro

- 25 MW agreement (2015-2022)
- 100 MW agreement (2020-2040)

Biomass

- Ongoing discussions with Meadow Lake Tribal Council and Paper Excellence

Geothermal

- Deep Earth Energy Production (DEEP) – evaluation ongoing in SE Sask.

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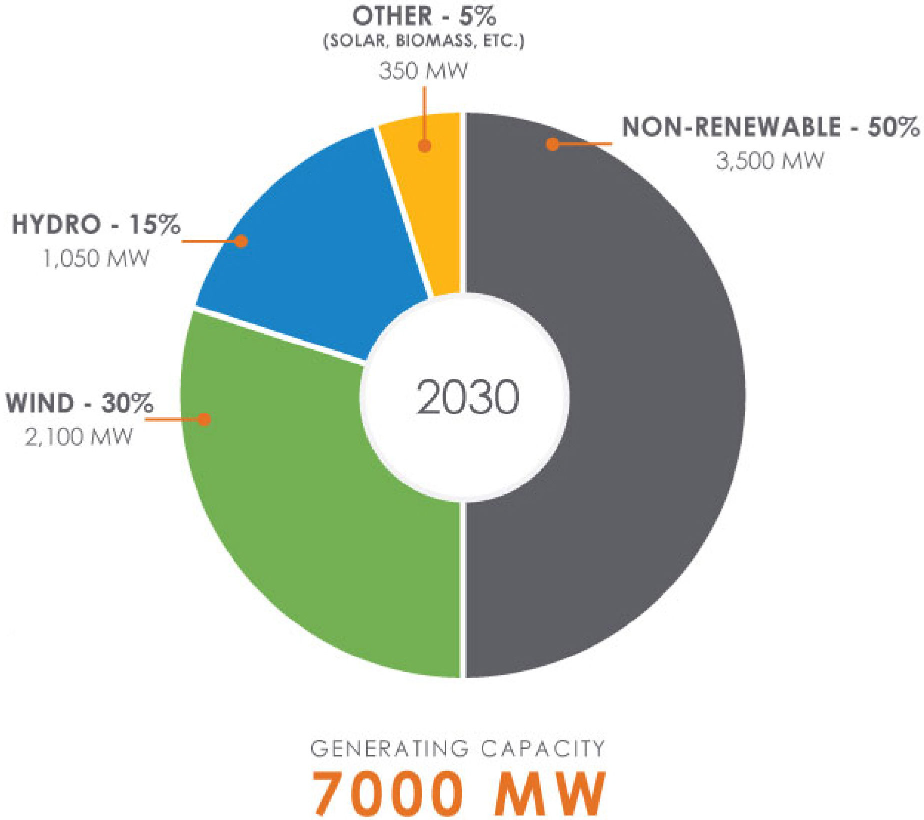
POTENTIAL GENERATING CAPACITY - 2030



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Potential Future Natural Gas Generation Project

NOISE & AIR EMISSIONS MODELLING

February 2017

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MAJOR NOISE SOURCES (unmitigated)

The table below identifies the major noise sources from a combined cycle power plant and typical sound levels at 120 metres.

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Noise from the Gas Turbine Enclosures, Steam Turbine Generator and Heat Recovery Steam Generator Casing can be minimized when located within a building.

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TYPICAL NOISE LEVELS

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newspaper press	95
power lawn mower at 1 metre	92
diesel truck 50 km per hour at 20 metres	85
passenger car 60 km per hour at 20 metres	65
conversation at 1 metre	55
quiet room	40

Source Canadian Center for Occupational Health and Safety

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NOISE MITIGATION TECHNIQUES

- **Equipment Specification** – Most equipment is specified to meet 85 dBA at 3 feet. More stringent requirements can be imposed on the equipment suppliers if necessary to meet the standard. For outdoor equipment it is common to specify noise levels at a distance of 120 metres. The ACC can be specified to meet 52 dBA at 120 metres.
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    - Buildings – The majority of the noise sources are expected to be located within a building including the gas turbine generator, HRSG, steam turbine generator, and pumps.

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NOISE MITIGATION TECHNIQUES (cont'd)

  - **Enclosures** – Outdoor equipment can be installed in enclosures to help mitigate noise.
  - **Location on site** – Major noise sources that cannot be located in a building include the Gas Turbine Generator Air Intake, Heat Recovery Steam Generator Stack, Lube Oil Cooler and the Air Cooled Condenser. During the design of the plant layout, special consideration can be taken to ensure that this equipment is located such that the contribution to the overall noise levels at the site boundaries is limited to ensure noise standards are met.
- **Silencers** – Silencers can be included in the plant design to further limit noise levels. Silencers are commonly specified for the stack, gas turbine air intake, building ventilation as well as steam vents.
- **Noise barriers** – Noise barriers can be constructed on site between the equipment and the site boundary as necessary to further reduce noise levels.

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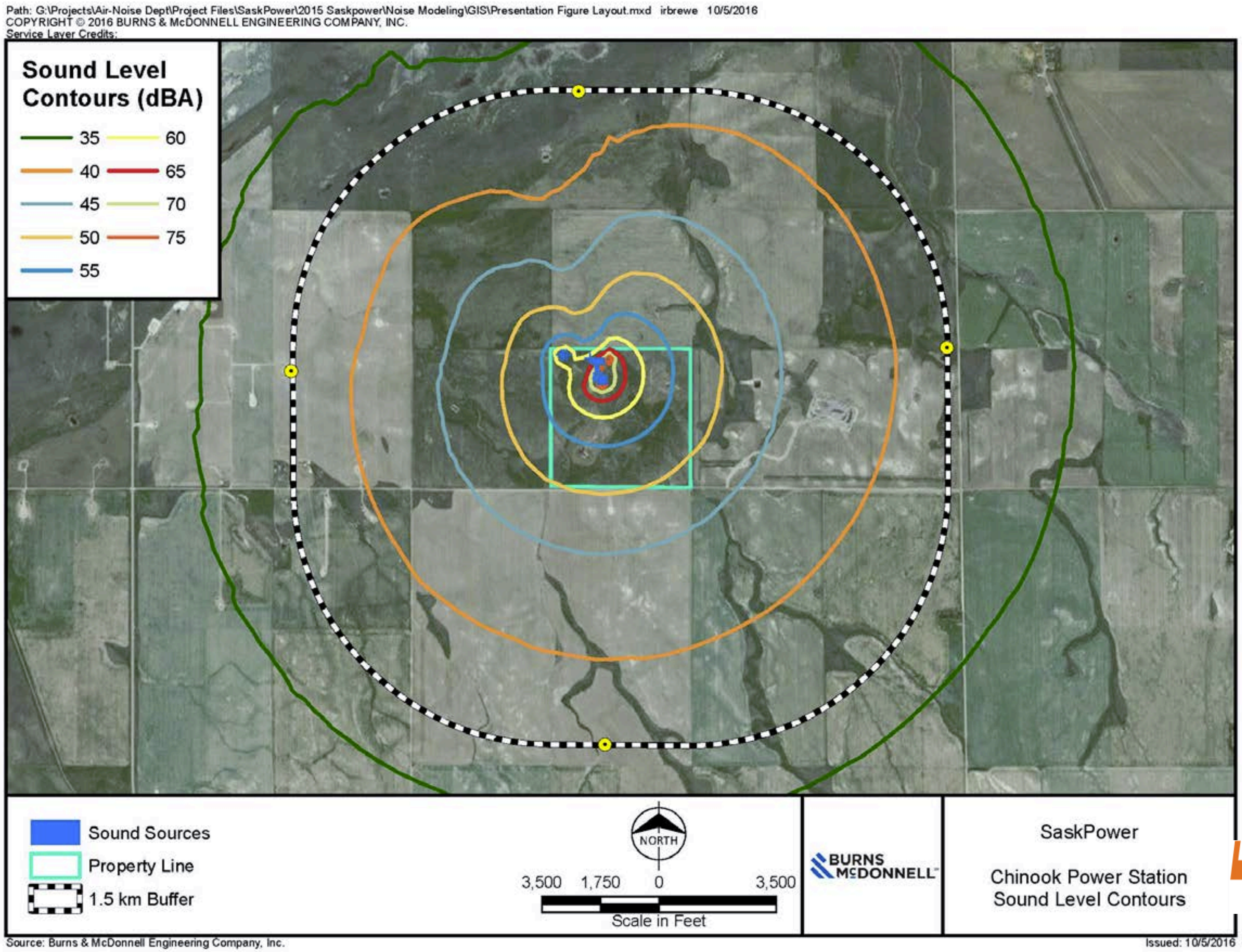
Example: PROJECTED CHINOOK OPERATION NOISE LEVELS



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AIR QUALITY

- Major air emissions contaminants from a natural gas generation facility include:
  - NO_X (NO_2 and NO)
  - $PM_{2.5}$
  - CO

- A new facility must comply with Saskatchewan's Ambient Air Quality Standards (AAQS) and Canada-Wide Standards (CWS)

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AIR DISPERSION MODELING

What is an Air Dispersion Model?

- Air dispersion modeling is the mathematical simulation of how air pollutants disperse in the ambient atmosphere from emission sources.

The Air Dispersion Models will be used for air quality analysis

- The AERMOD model is recommended by Saskatchewan Ministry of Environment for this purpose.
- It is an AMS/EPA Regulatory Model (AMS/EPA: American Meteorological Society/Environmental Protection Agency)

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AIR DISPERSION MODEL

- **Inputs**: Emission sources, buildings, meteorological data, geophysical data (terrain and surface roughness), and user-defined receptor grid.
- **Outputs**: Maximum air impacts at a single receptor for a specific time and pollutant averaging period (e.g. hourly and annually).

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MODELLED IMPACTS

- Saskatchewan Ambient Air Quality Standards (SAAQS) established so risk to human health and ecosystem health are minimized.

- The modelled impacts include ambient background concentrations, which is the portion of ambient concentration due to natural and nearby sources. These concentrations were provided by the Saskatchewan Ministry of Environment.

- The modelled results represent the maximum impact at a single receptor for a specific time and averaging period.

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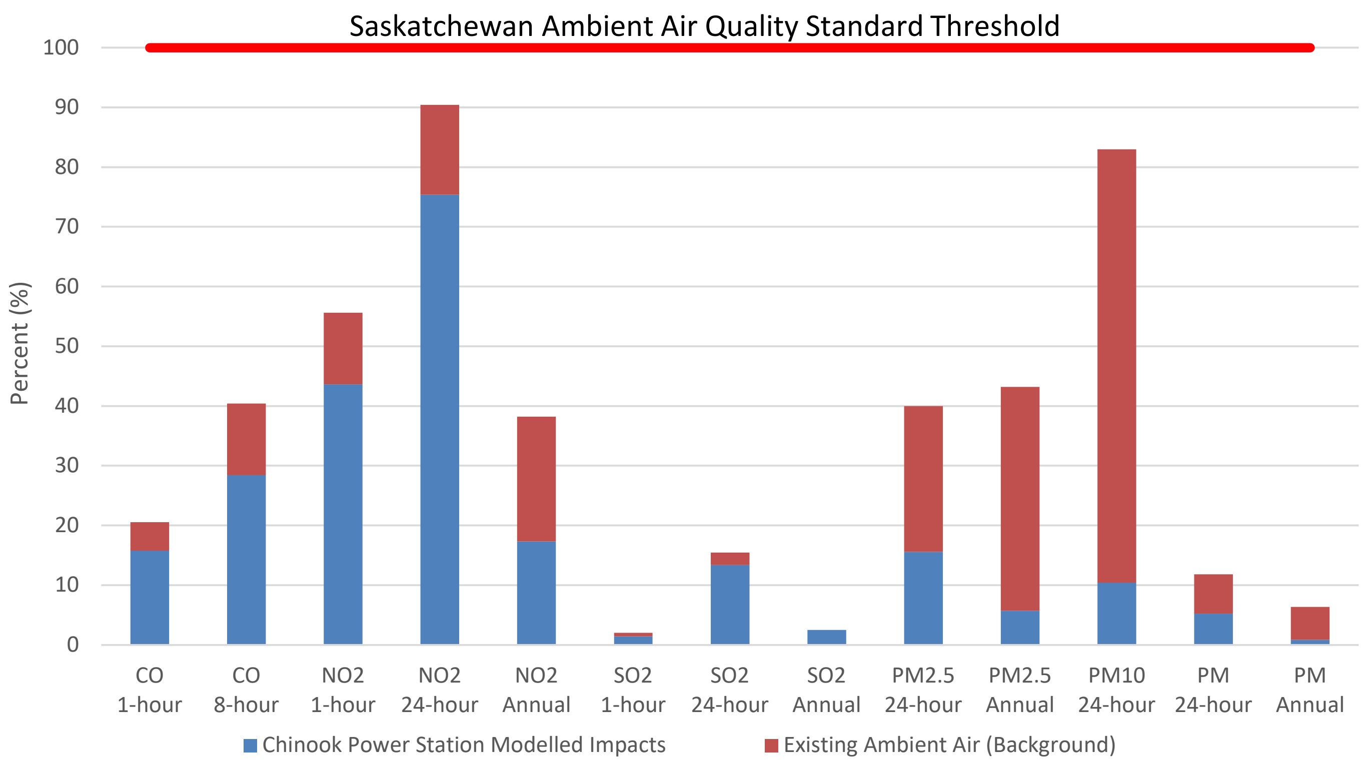
Example CHINOOK MODELLED IMPACTS



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POTENTIAL FUTURE GAS GENERATION PROJECT
BELLE PLAINE AREA OF INTEREST

OPEN HOUSE QUESTIONNAIRE – FEBRUARY 2017

We appreciate your interest in the Potential Future Gas Generation Project. To enable us to respond to your concerns about this project and to assist us in assessing the effectiveness of our Open House, it would be helpful if you could take a few moments to reply to the following questions.

Based on your knowledge of the Belle Plaine area of interest, are there any special land uses or environmental issues that are of concern to you?

Based on your knowledge of the supply options available to SaskPower at this time, how would you rate a natural gas generation facility?

High_____ Medium_____ Low______ Unacceptable______

Comments:

Based on what you learned at this Open House, what aspects of the potential project would be of concern to you?

Comments:

Did the Project Team representatives answer your questions to your satisfaction and were your concerns addressed?

Yes _________ No ________ Partly ________

Comments:

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How did you find the display information?

Very Informative ___ Informative ___ Somewhat Informative ___ Not Informative ___

Comments:

Is there any additional information you would like to receive about this Project?

This section is for any other comments or questions you may have about this Project:

Please provide the following information to allow us to respond to your comments:

Name ____

Mailing Address ____

Postal Code __________Phone ____________ Email _________________________________

Contact us at:

Mail: SaskPower, Stakeholder Engagement
8SE, 2025 Victoria Avenue, Regina, SK. S4P 0S1

Phone: 1-855-566-1008 | Fax: 1-306-566-3131

Email: publicconsultation@saskpower.com

THANK YOU FOR ATTENDING THE
POTENTIAL FUTURE GAS GENERATION PROJECT OPEN HOUSE

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POTENTIAL FUTURE GAS GENERATION PROJECT
MOOSE JAW INDUSTRIAL PARK AREA OF INTEREST

OPEN HOUSE QUESTIONNAIRE – FEBRUARY 2017

We appreciate your interest in the Potential Future Gas Generation Project. To enable us to respond to your concerns about this project and to assist us in assessing the effectiveness of our Open House, it would be helpful if you could take a few moments to reply to the following questions.

Based on your knowledge of the Moose Jaw Industrial Park area of interest, are there any special land uses or environmental issues that are of concern to you?

___

___

___

Based on your knowledge of the supply options available to SaskPower at this time, how would you rate a natural gas generation facility?

High_____ Medium_____ Low______ Unacceptable______

Comments:

___

___

Based on what you learned at this Open House, what aspects of the potential project would be of concern to you?

Comments:

___

___

___

Did the Project Team representatives answer your questions to your satisfaction and were your concerns addressed?

Yes _________ No ________ Partly ________

Comments:

___

___

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How did you find the display information?

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THANK YOU FOR ATTENDING THE
POTENTIAL FUTURE GAS GENERATION PROJECT OPEN HOUSE

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POTENTIAL FUTURE GAS GENERATION PROJECT
ROWATT AREA OF INTEREST

OPEN HOUSE QUESTIONNAIRE – FEBRUARY 2017

We appreciate your interest in the Potential Future Gas Generation Project. To enable us to respond to your concerns about this project and to assist us in assessing the effectiveness of our Open House, it would be helpful if you could take a few moments to reply to the following questions.

Based on your knowledge of the Rowatt area of interest, are there any special land uses or environmental issues that are of concern to you?

Based on your knowledge of the supply options available to SaskPower at this time, how would you rate a natural gas generation facility?

High_____ Medium_____ Low______ Unacceptable______

Comments:

Based on what you learned at this Open House, what aspects of the potential project would be of concern to you?

Comments:

Did the Project Team representatives answer your questions to your satisfaction and were your concerns addressed?

Yes _________ No ________ Partly ________

Comments:

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Comments:

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8SE, 2025 Victoria Avenue, Regina, SK. S4P 0S1

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Email: publicconsultation@saskpower.com

THANK YOU FOR ATTENDING THE
POTENTIAL FUTURE GAS GENERATION PROJECT OPEN HOUSE

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POTENTIAL FUTURE GAS GENERATION PROJECT
WEST SHERWOOD AREA OF INTEREST

OPEN HOUSE QUESTIONNAIRE – FEBRUARY 2017

We appreciate your interest in the Potential Future Gas Generation Project. To enable us to respond to your concerns about this project and to assist us in assessing the effectiveness of our Open House, it would be helpful if you could take a few moments to reply to the following questions.

Based on your knowledge of the West Sherwood area of interest, are there any special land uses or environmental issues that are of concern to you?

Based on your knowledge of the supply options available to SaskPower at this time, how would you rate a natural gas generation facility?

High_____ Medium_____ Low______ Unacceptable______

Comments:

Based on what you learned at this Open House, what aspects of the potential project would be of concern to you?

Comments:

Did the Project Team representatives answer your questions to your satisfaction and were your concerns addressed?

Yes _________ No ________ Partly ________

Comments:

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Very Informative ___ Informative ___ Somewhat Informative ___ Not Informative ___

Comments:

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Phone: 1-855-566-1008 | Fax: 1-306-566-3131

Email: publicconsultation@saskpower.com

THANK YOU FOR ATTENDING THE
POTENTIAL FUTURE GAS GENERATION PROJECT OPEN HOUSE

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We want your input on a
PROJECT NEAR YOU

The Chinook Natural Gas Power Station outside Swift Current closely resembles the project we're working on.

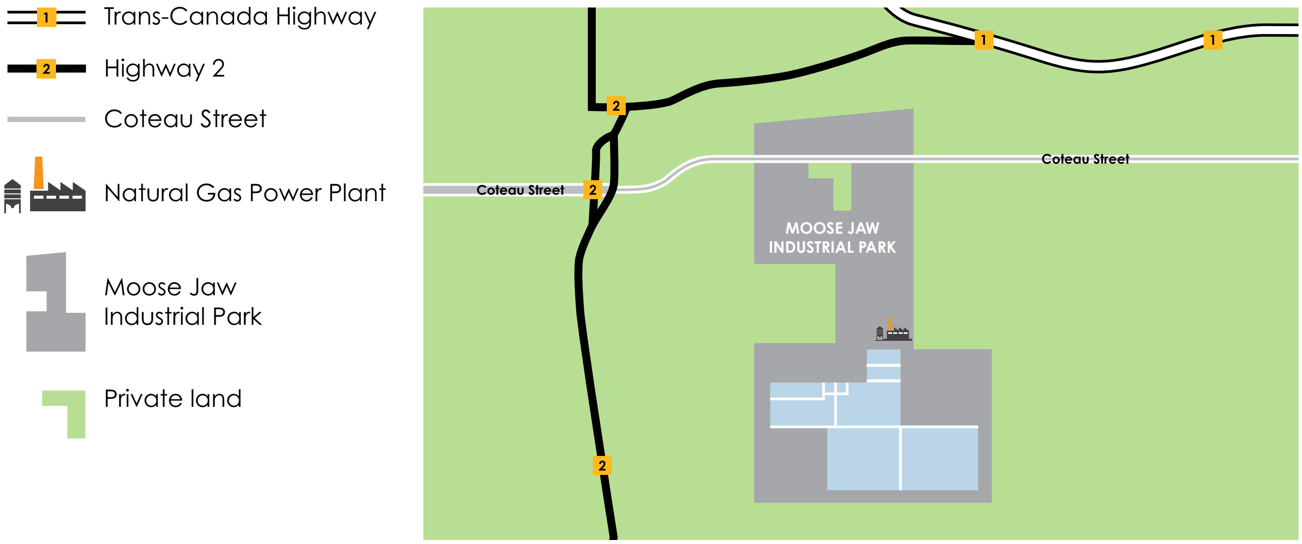
SaskPower is planning to build a natural gas power station in Moose Jaw.

The project is an economic opportunity for the community and surrounding area. For the province, it will mean a steady source of power that runs 24/7 so we can use more wind and solar in the future.

We're looking for your feedback on:

- How this project might affect you.
- How we can lessen effects.
- What else we should know as we complete our site studies.

We want your input on a PROJECT NEAR YOU



We've been working with communities on the location for the proposed natural gas facility since 2017. Now that we've landed on Moose Jaw Industrial Park, we want to work with you to understand how the project might affect you and how we can work together moving forward. Throughout the project and beyond, we promise to keep you informed and listen to your interests and concerns.

Please join us to learn more and provide input. There are a couple options for you:

1. As a nearby landowner, it'd be our pleasure to meet with you in-person. To ensure we can accommodate everyone in small groups, please **call 1-306-566-3067** to book a time on Sat. April 13, Mon. April 15 or Tues. April 16.

TIMESLOTS AVAILABLE (APRIL 13,15,16):

9:00 a.m. – 10:00 a.m.	12:45 p.m. – 1:45 p.m.	
10:15 a.m. – 11:15 a.m.	2:00 p.m. – 3:00 p.m.	
11:30 a.m. – 12:30 p.m.	3:15 p.m. – 4:15 p.m.	

Evening times available on Mon. and Tues.

5:15 p.m. – 6:15 p.m.
6:30 p.m. – 7:30 p.m.

2. We'll also hold an open house for the general public on April 17 from 12 p.m. to 7 p.m. at Wakamow Valley Sportsman Centre. You're welcome to come and go during this time. City of Moose Jaw representatives will also be there to share the latest Southeast Industrial concept plan.

1-306-566-3067
PublicConsultation@SaskPower.com

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March 27, 2019

Chief (insert name)
(insert name) First Nation
(Address)
(Location) SK (postal code)

Re: Invitation to Open House regarding the future power station in Moose Jaw

Dear Chief (insert last name):

SaskPower has selected Moose Jaw's Industrial Park as the preferred location for our next 350-megawatt natural gas plant. This project is an important part of SaskPower's plans to ensure reliable electricity, meet the growing demand for power and to support the integration of renewable generation options, like wind and solar.

In earlier correspondence, SaskPower requested an engagement session with your community to deliver a presentation and answer any questions you may have regarding the project. We have not yet heard back from you, however, SaskPower is willing to meet with your community to discuss the project at your convenience.

The project is proceeding and once some more detailed study work is complete, we'll share the high-level plant layout and construction plans, predicted environmental impacts and mitigations as well as our procurement plans with you, so we can continue to exchange and gather information. We want to ensure your interests and concerns are built into the project plans to the greatest extent possible. We would also encourage you to share information regarding Indigenous traditional knowledge and any possible adverse impacts to Aboriginal and Treaty rights with regard to hunting, fishing, trapping and other traditional uses.

Find attached to this letter, an invitation to the public open house that will be held on April 17, 2019 from 12 p.m. to 7 p.m. at Wakamow Valley Sportsman Centre in Moose Jaw. Feel free to come and go during this time.

Please call me at 306-566-3874 or email dajohnston@saskpower.com to arrange a face to face meeting with SaskPower or if you require additional clarification regarding the Moose Jaw project.

Warmest regards,

Dan Johnston
Consultant, Indigenous Relations
Corporate & Regulatory Affairs, SaskPower

BENEFITS TO THE COMMUNITY

We're looking for a partner to build this power station with, and we're committed to making sure there are opportunities for local and Indigenous participation. We'll provide updates on where we're at in the procurement process. Let us know if you'd like to sign up for our supplier session notification list.

Our economic study predicts direct and indirect benefits will be realized in Moose Jaw and the surrounding area.

- Employment will peak at over 500 people
- $140 million generated for Saskatchewan businesses
- Over 3 years of construction, the facility will employ an average of 230 workers per year
- x20 When complete the power station will employ 20 people
- x35 35 other positions will be created from the provision of services to the plant and spending of plant employees

WE WANT YOUR INPUT

We're looking for your feedback on:

- How this project might affect you.
- How we can lessen effects.
- What else we should know as we complete our site studies.

We promise to ensure interests, concerns and Indigenous knowledge are built into the project plans as much as possible.

Go to **www.saskpower.com/ProposedGas** and sign up for project email updates

Email: **PublicConsultation@saskpower.com**

Phone: **1-833-566-3435** (toll-free in Saskatchewan)

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Get familiar with the

NATURAL GAS POWER STATION IN MOOSE JAW

The Chinook Natural Gas Power Station outside Swift Current closely resembles the project we're working on.

WHY IT'S NEEDED

Saskatchewan's need for power continues to grow. In 2017-18, demand for power went up by 5.5%. The new power station will produce 350 megawatts. That's enough power for a city the size of Saskatoon. As a natural gas facility, it will also be a steady source of power that runs 24/7. This will allow us to use more wind and solar in the future and will help meet our goal to reduce our emissions by 40% from 2005 levels by 2030.

NATURAL GAS IS SAFE & EFFICIENT

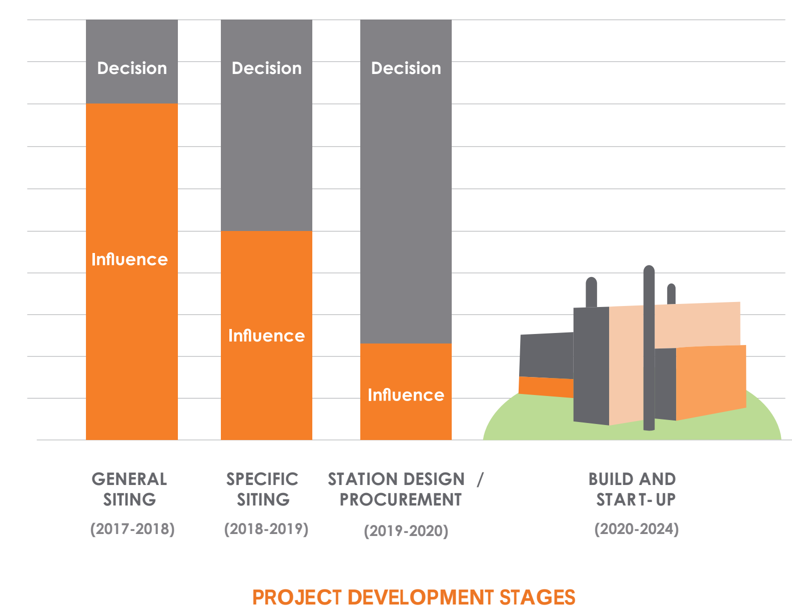
Natural gas continues to be key in our supply mix to generate power. Saskatchewan currently has nine natural gas power stations. Our first natural gas facility, the Success Power Station, was commissioned in 1967 and operated safely for 50 years until being decommissioned in 2017. Natural gas is less expensive than many other options and is highly efficient. It also produces less than half the carbon dioxide emissions of a conventional coal-fired power station.

PROJECT TIMELINE

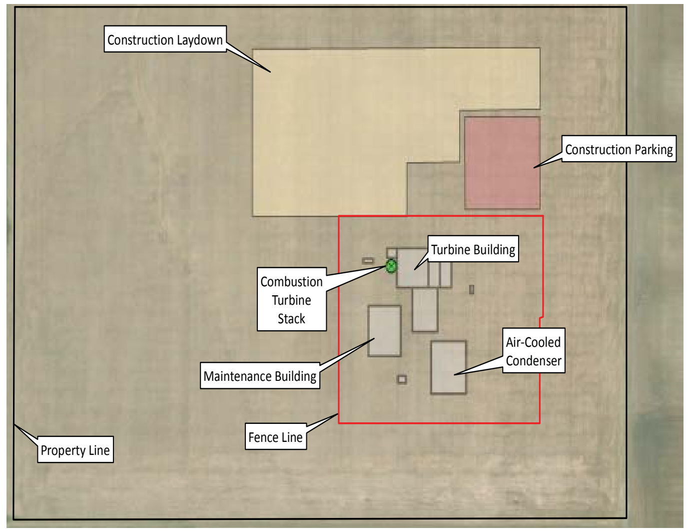
We've been working with communities on the location for the proposed natural gas facility since 2017. Now that we've landed on Moose Jaw Industrial Park, we want to continue to work with you to understand how the project might affect you, how we can lessen effects and what else we should know as we complete our site-specific studies.

We plan to begin construction in 2020 so the power station is in operation by 2024 or earlier. The schedule is contingent on regulatory review and approval. Throughout the project and beyond, we promise to keep you informed and listen to your interests and concerns.

PUBLIC INPUT IN DECISION MAKING



WHAT WILL BE BUILT



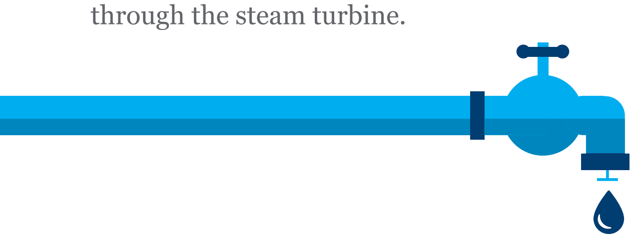
This will be a combined-cycle power station, with two major electrical generators.

1. Natural Gas Fired Turbine Generator – natural gas is burned and drives a turbine. The turbine is connected to a generator that creates power, which is sent to the grid.
2. Steam Turbine Generator – heat from the natural gas turbine is used to make steam. That steam is used to turn another turbine and another generator.

Together, these turbines produce up to 50 per cent more electricity from the same fuel than a traditional simple cycle-plant. Both generators will be enclosed in the main powerhouse building. An air-cooled condenser and a multi-purpose building with control/administration room, and water treatment plant are other major structures on the site. The power station will operate 24 hours a day to generate power for our customers.

We estimate up to 500 workers will be required over a three-year construction period.

The power station will use less than 1 per cent of Moose Jaw's average water consumption. Most of the water will be used to generate steam and 65 per cent of water will be recycled. We are planning to purchase water from the City of Moose Jaw, as we need very clean water to put through the steam turbine.



We are working with both the City of Moose Jaw and the Rural Municipality of Moose Jaw to develop a plan for road use. We plan to use existing roads but upgrade them to support construction and heavy load traffic.

SaskPower will also need to build a transmission line to connect the new power station to the grid. We'll be back to provide more details and get additional input from landowners this fall. The natural gas will be supplied by TransGas, and they will route, construct and operate the gas pipeline.

During operation, we're required to not make noise greater than 50 decibels (dB) during the day and 40 dB at night for the house nearest to us. During construction, some noisy activities will be unavoidable for limited weeks, such as pile driving for a suitable foundation and steam blows to clean out our equipment after installation. When possible, we'll let you know about these events in advance.

40 dB RUSTLING LEAVES

PLANT OPERATION: 40-50 dB FROM THE NEAREST HOUSE

50 dB CONVERSATION AT HOME

CONSTRUCTION NOISE: 60dB+ FOR LIMITED DAYS

70 dB A VACUUM CLEANER

100 dB A LAWNMOWER OR MOTORCYCLE

150 dB A JET TAKING OFF

Air emissions from a natural gas power station include: nitrogen oxide, particulate matter, carbon monoxide, carbon dioxide and sulphur dioxide. The new facility will follow provincial and federal air quality standards to minimize risk to human health and the environment.

A cloud or "plume" will exit the plant's stack. It will look different depending on the temperature. There is little to no plume in the summer when operating.

Like your furnace chimney in winter, there is a steady steam plume consisting of mostly water vapour. This photo was taken at the North Battleford Generating Station on a cold day in February.

SaskPower is taking steps to reduce effects of lighting by reducing colour temperature to create yellow light and carefully choosing a fixture layout, orientation and quantity of lights required. This will result in less glare for drivers, less impact on wildlife, less impact on night skies and less impact on nearby landowners.

LOOKING AFTER THE ENVIRONMENT

We've already been screening in the area to flag and protect endangered plants and animals, significant archaeology and natural water patterns. You know your land best. If you've observed something in the area we might not know about such as wildlife, seasonal nesting or breeding grounds, please let us know.

A third party environmental assessment program began in 2018 and will continue into 2019. Results of the environmental assessment program influenced project design in many ways. During the project siting stage, land cover type, potential habitat, wetlands / waterbodies and rare species records were evaluated. During the project design stage, we considered the cultivated natural drainage on the land and planned the location and orientation of the plant in a way that would avoid drainage effects. During project construction and operation, SaskPower's environmental beneficial practices will be followed.

Both the Canadian Environmental Assessment Agency (CEAA) and the Saskatchewan Ministry of Environment will complete an environmental evaluation to determine if an environmental assessment is required.

SaskPower has submitted a Project Description to CEAA which is currently under review and includes a public comment period. A Technical Proposal will be developed and submitted to the province in fall 2019.

We want your input on a

PROJECT NEAR YOU

The Chinook Natural Gas Power Station outside Swift Current closely resembles the project we're working on.

SaskPower is planning to build a natural gas power station in Moose Jaw.

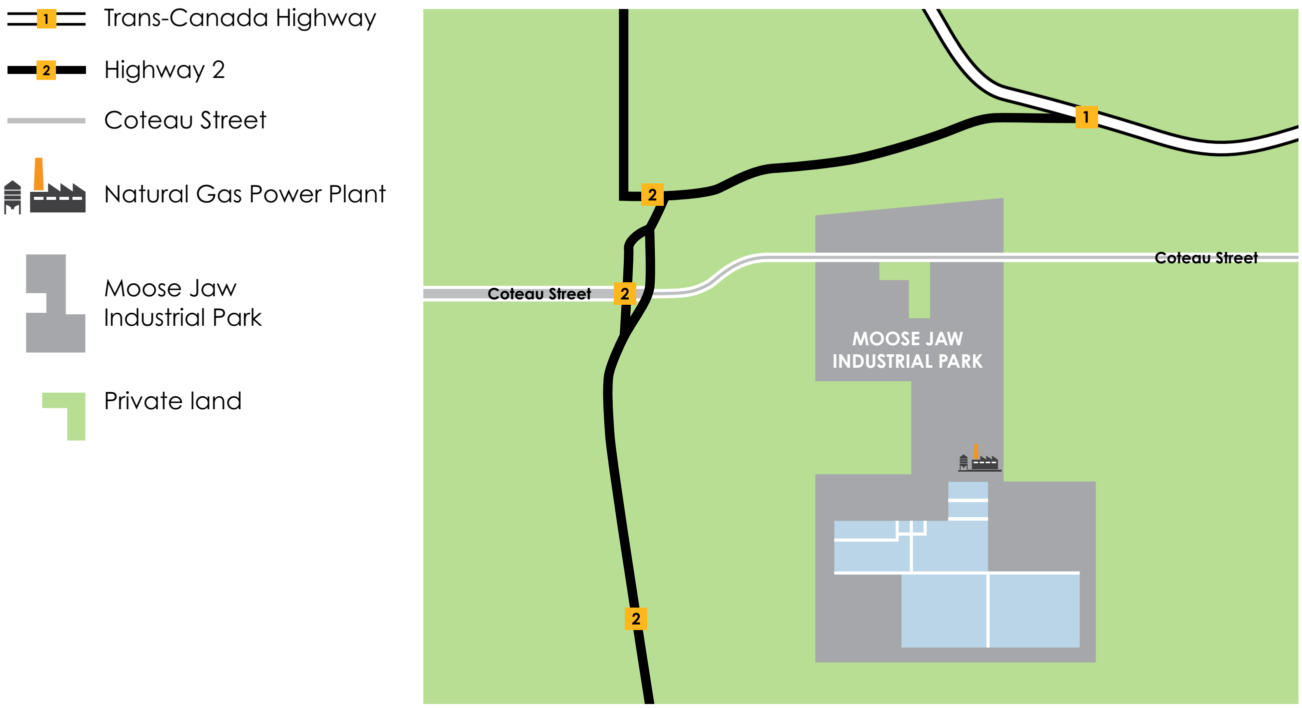
The project is an economic opportunity for the community and surrounding area.
For the province, it will mean a steady source of power that runs 24/7 so we can use more wind and solar in the future.

We're looking for your feedback on:

- How this project might affect you.
- How we can lessen effects.
- What else we should know as we complete our site studies.

We want your input on a

PROJECT NEAR YOU



We've been working with communities on the location for the proposed natural gas facility since 2017. Now that we've landed on Moose Jaw Industrial Park, we want to work with you to understand how the project might affect you and how we can work together moving forward. Throughout the project and beyond, we promise to keep you informed and listen to your interests and concerns.

Please join us to learn more and provide input.

We'll hold an open house on April 17 from 12 p.m. to 7 p.m. at Wakamow Valley Sportsman Centre. Feel free to come and go. City of Moose Jaw representatives will be there to share the latest Southeast Industrial concept plan.

We're also holding in-person meetings for landowners near Moose Jaw Industrial Park. We welcome you to reach out if you'd like to set up an appointment.

1-833-566-3435
PublicConsultation@SaskPower.com

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THE FUTURE POWER STATION IN MOOSE JAW

NOISE

SOUND IS MEASURED IN DECIBELS (dB)

20 dB
RUSTLING LEAVES

50 dB
A CONVERSATION AT HOME

70 dB
A VACUUM CLEANER

100 dB
A LAWNMOWER OR MOTORCYCLE

150 dB
A JET TAKING OFF

PLANT OPERATION
40-50 dB
FROM THE NEAREST HOUSE

CONSTRUCTION NOISE
60 dB+
FOR LIMITED DAYS

DURING OPERATION **WE'RE REQUIRED TO NOT MAKE NOISE GREATER THAN 50 dB** DURING THE DAY, 40 dB AT NIGHT FOR THE HOUSE NEAREST TO US.

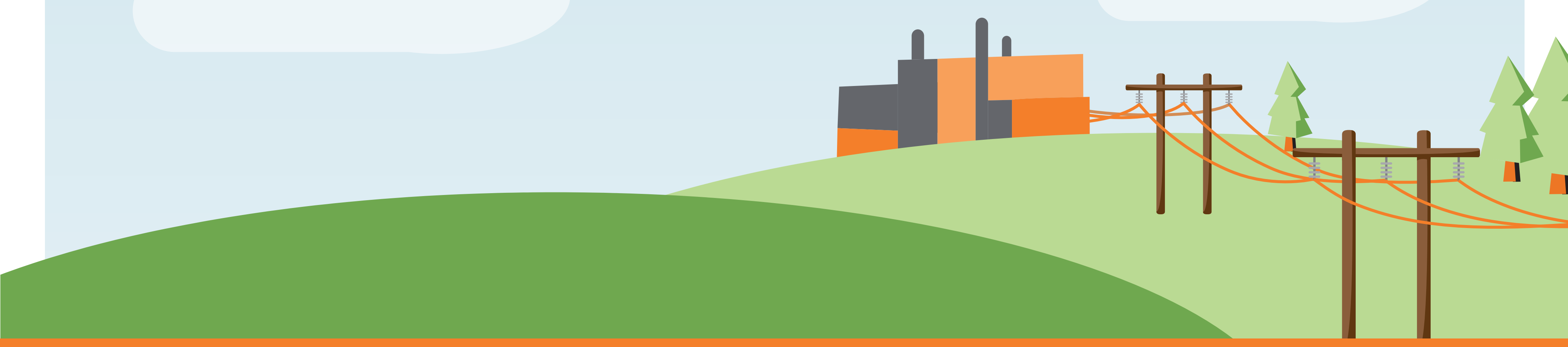
We will achieve this by:

1. Installing silencing devices.
2. Selecting equipment to decrease how loud it gets.
3. Containing noisy equipment in buildings.
4. Building the plant in a layout that minimizes noise carried downwind.

SOME SUBSTANTIAL NOISE WILL BE **UNAVOIDABLE**

- **Early construction** - pile driving for a suitable foundation. This is typically during the daytime and takes a couple months.
- **End of construction** - steam blows to clean out our piping. This noise will be off-and-on for a few weeks.

** When possible, we'll let you know about these events in advance.*



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THE FUTURE POWER STATION IN MOOSE JAW

WATER USE

MOST OF THE WATER WILL BE USED TO **GENERATE STEAM.**

THE POWER STATION WILL USE LESS THAN **1%** OF MOOSE JAW'S **AVERAGE WATER CONSUMPTION.**

WE MUST USE VERY CLEAN WATER TO PUT IT THROUGH THE STEAM TURBINE.

THIS WON'T IMPACT YOUR ABILITY TO GET WATER.

WHY

Why is SaskPower planning to purchase water from the City of Moose Jaw for this project?

- RELIABLE SOURCE
- LESS WASTEWATER DISCHARGE
- FEWER ON-SITE WATER TREATENT FACILITIES
- COST EFFECTIVE

HOW

How will SaskPower use water responsibly?

65% OF WATER USED WILL BE RECYCLED

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THE FUTURE POWER STATION IN MOOSE JAW

LIGHTING

SASKPOWER IS TAKING STEPS TO **REDUCE EFFECTS** OF LIGHTING BY:

1

Reducing colour temperature to create yellow light.

2

Carefully choosing a fixture layout, orientation and quantity of lights required.

THE **RESULTS:**

1. **Less glare** for drivers
2. **Less impact** on wildlife
3. **Less impact** on night skies
4. **Less impact** on nearby land owners

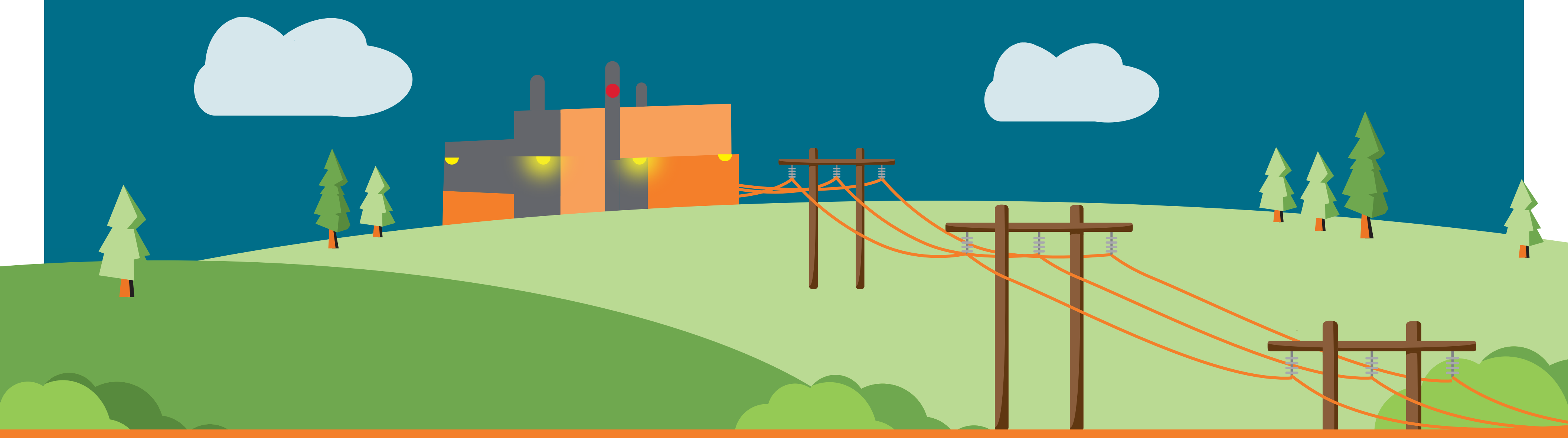
SAFETY FIRST

Our top priority is to make sure all personnel on site are safe and we're visible to aircraft.

The power station in Moose Jaw will operate

24 HOURS

a day to generate power for SaskPower's customers.



THE FUTURE POWER STATION IN MOOSE JAW

ECONOMIC STUDY

SHORT-TERM

Employment will peak at over

500 PEOPLE

$140 MILLION

generated for Saskatchewan businesses.

Over 3 years of construction, the facility will employ an average of

230

workers per year.

LONG-TERM

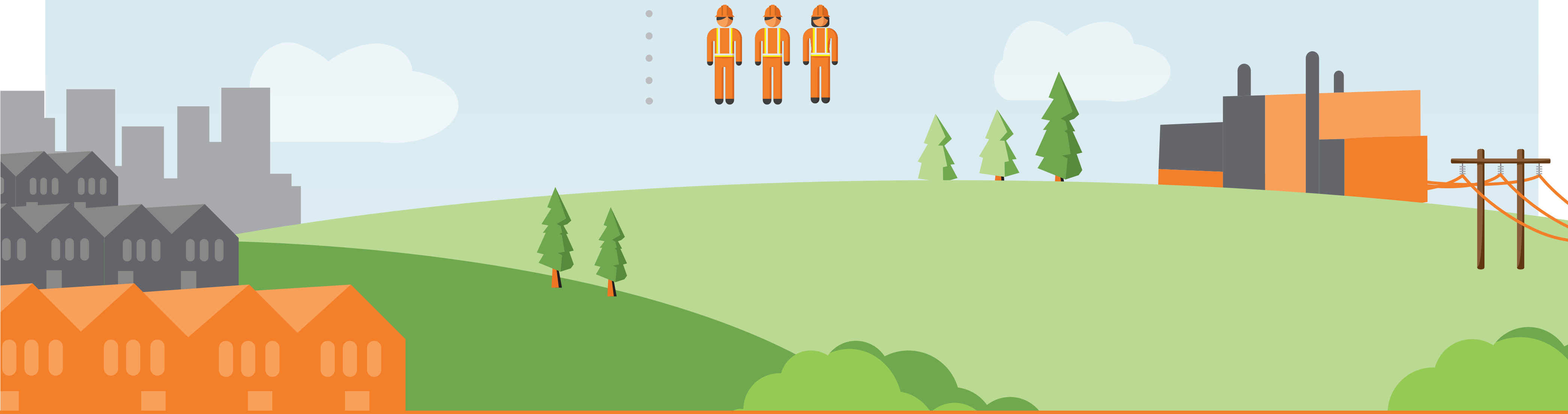
WHEN COMPLETE, THE POWER STATION WILL EMPLOY

20 PEOPLE

AND

35 OTHER POSITIONS

WILL BE CREATED FROM THE PROVISION OF SERVICES TO THE PLANT AND SPENDING OF PLANT EMPLOYEES.



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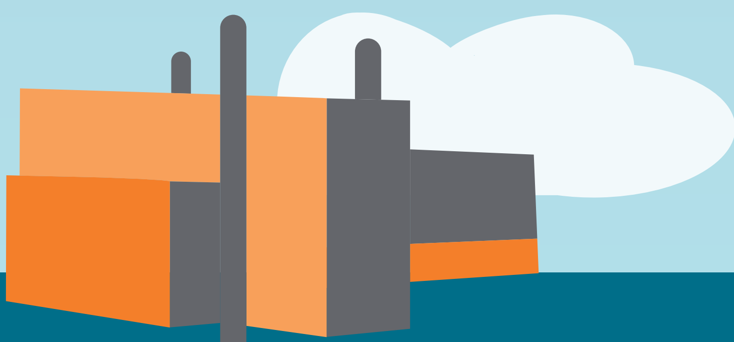
THE FUTURE POWER STATION IN MOOSE JAW

AIR QUALITY

AIR EMISSIONS
FROM A NATURAL GAS POWER STATION INCLUDE:

- NITROGEN OXIDE
- PARTICULATE MATTER
- CARBON MONOXIDE AND CARBON DIOXIDE
- SULPHUR DIOXIDE



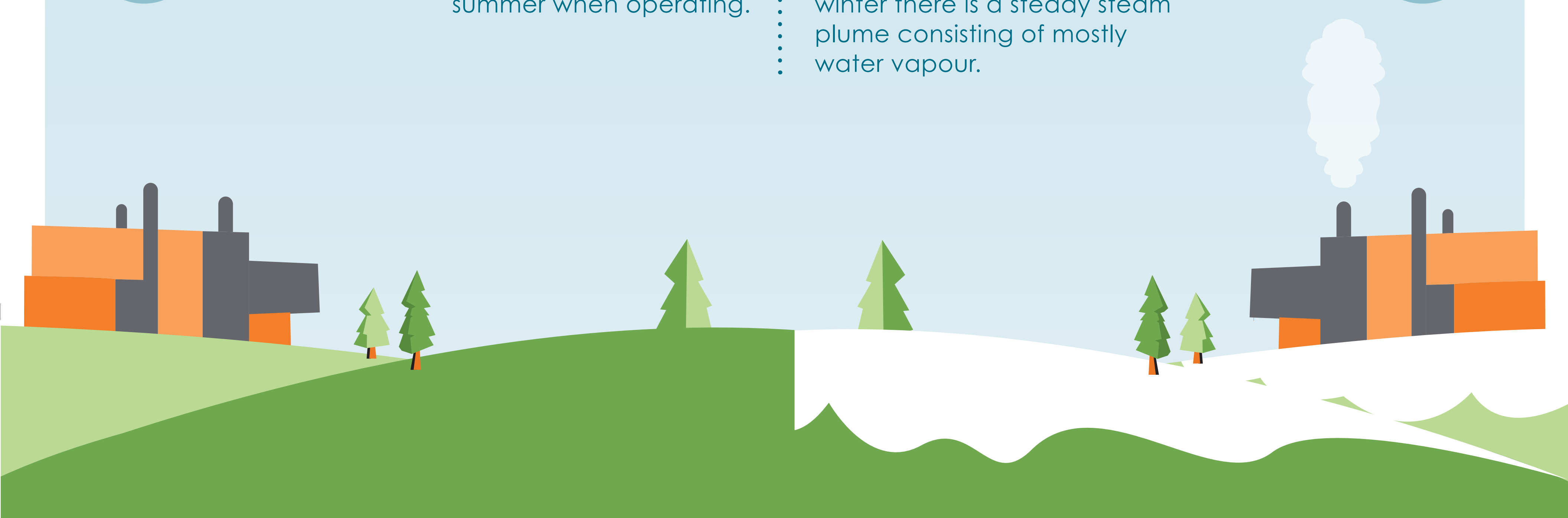
THE NEW FACILITY WILL FOLLOW
PROVINCIAL AND FEDERAL AIR QUALITY STANDARDS.
THIS WILL HELP:

1. **Minimize risk** to human health
2. **Minimize risk** to environment

A CLOUD OR "PLUME" WILL EXIT THE PLANT'S STACK. IT WILL LOOK DIFFERENT DEPENDING ON THE TEMPERATURE.

There is little to no plume in the summer when operating.

Like your furnace chimney in winter there is a steady steam plume consisting of mostly water vapour.

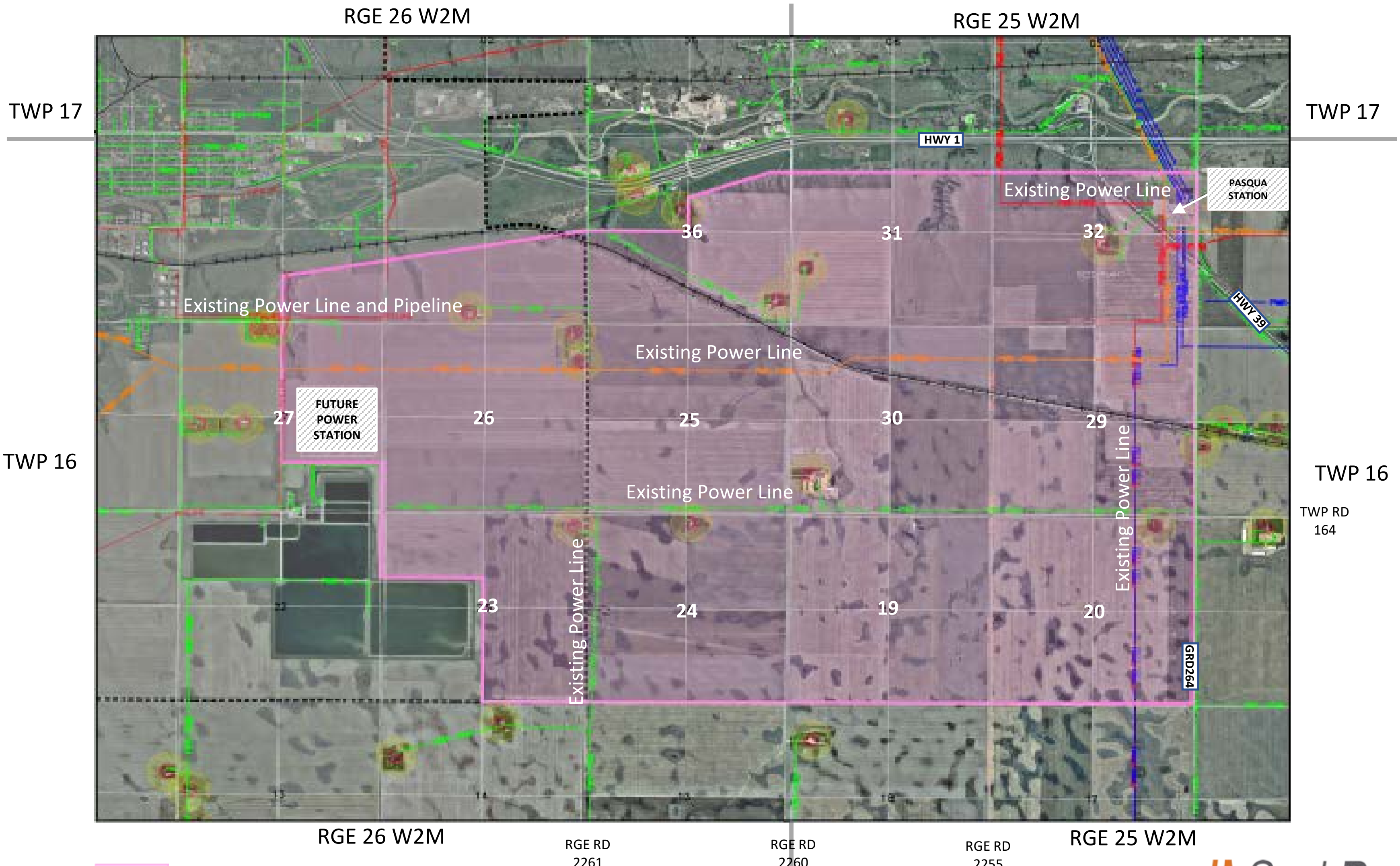


SaskPower
Powering the future®

We want your input on the Study Area for the new Power Station Transmission Line

Once we build the new power station, we'll need to connect it to the grid with a new transmission line. We're looking for feedback on how you use the land within the study area below. We also plan to begin environmental surveys in the study area, April 2019.

A land specialist may contact you for access permission.



Transmission Line Study Area

Occupied Residence (red line is 60m buffer, yellow line is 160m buffer)

Note: General reference map only, not for survey or legal use.

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Appendix I CONCORDANCE TABLE

	Required Information as Stated in the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012*	Location of Information in the Project Description
1.1	Describe the nature of the designated project, and proposed location.	1.1, 2.1, 2.3
1.2	Proponent contact information.	1.2.1
1.2.1	Name of the designated project.	1.2.1
1.2.2	Name of the proponent.	1.2.1
1.2.3	Address of the proponent.	1.2.1
1.2.4	Chief Executive Officer or equivalent (including name, official title, email address and telephone number).	1.2.1
1.2.5	Principal contact person for purposes of the Project Description (include name, official title, email address and telephone number).	1.2.1
1.3	List of any jurisdictions and other parties including Aboriginal groups and the public that were consulted during the preparation of the project description.	1.3, 7.2, 7.3, 7.4
1.4	Information on whether the designated project is subject to the environmental assessment and/or regulatory requirements of another jurisdiction(s).	1.4
1.5	Information on whether the designated project will be taking place in a region that has been the subject of an environmental study.	1.4.1
2.1	General description, including the context and objectives of the project. Indicate whether the designated project is a component of a larger project that is not listed in the *Regulations Designating Physical Activities*.	1.4.1
2.2	Provisions in the *Regulations Designating Physical Activities* that describe the designated physical activities that are proposed to be carried out as a part of the designated project.	1.4.1
2.3	**Components and Activities**	
2.3.1	Describe the physical works associated with the designated project (e.g., large buildings, other structures, such as bridges, culverts, dams, marine transport facilities, mines, pipelines, power plants, railways, roads, and transmission lines) including their purpose, approximate dimensions, and capacity. Include existing structures or related activities that will form part of or are required to accommodate or support the designated project.	2.3
2.3.2	Anticipated size or production capacity of the designated project, with reference to thresholds set out in the *Regulations Designating Physical Activities*, including a description of the production processes to be used, the associated infrastructure, and any permanent or temporary structures. The production capacity does not refer to the planned production capacity of a project but the maximum production capacity based on the project's design and operating conditions.	2.3.2
2.3.3	If the designated project or one component of the designated project is an expansion, describe the size and nature of the expansion with reference to the thresholds set out in the *Regulations Designating Physical Activities*.	1.4.1, 1.4.4

	Required Information as Stated in the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012*	Location of Information in the Project Description
2.3.4	Description of the physical activities that are incidental to the designated project. In determining such activities, the following criteria shall be taken into account: • nature of the proposed activities and whether they are subordinate or complementary to the designated project; • whether the activity is within the care and control of the proponent; • if the activity is to be undertaken by a third party, the nature of the relationship between the proponent and the third party and whether the proponent has the ability to "direct or influence" the carrying out of the activity; • whether the activity is solely for the benefit of the proponent or is available for other proponents as well; and, • the federal and/or provincial regulatory requirements for the activity.	2.3
2.4	**Emissions, discharges and waste**	
2.4.1	Sources of atmospheric contaminant emissions during the designated project phases (focusing on criteria air contaminants and greenhouse gases, or other non-criteria contaminants that are of potential concern) and location of emissions.	2.4.1
2.4.2	Sources and location of liquid discharges.	2.4.2
2.4.3	Types of wastes and plans for their disposal (e.g., landfill, licenced waste management facility, marine waters, or tailings containment facility).	2.4.3
2.5	**Construction, operation, decommissioning and abandonment phases and scheduling.**	
2.5.1	Anticipated scheduling, duration and staging of key project phases, including preparation of the site, construction, operation, decommissioning and abandonment.	2.5
2.5.2	Main activities in each phase of the designated project that are expected to be required to carry out the proposed development (e.g. activities during site preparation or construction might include, but are not limited to, land clearing, excavating, grading, de-watering, directional drilling, dredging and disposal of dredged sentiments, infilling, and installing structures).	2.5,
3.1	**Description of the designated project's location**	
3.1.1	Coordinates (i.e. longitude/latitude using international standard representation in degrees, minutes, seconds) for the centre of the facility or, if for a linear project, provide the beginning and end points.	1.1.2
3.1.2	Site map/plan(s) depicting location of the designated project components and activities. The map/plan(s) should be at an appropriate scale to help determine the relative size of the proposed components and activities.	Table 2-3, Figure 1-1, Figure 2-2

	Required Information as Stated in the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012*	Location of Information in the Project Description
3.1.3	Map(s) at an appropriate scale showing the location of the designated project components and activities relative to existing features, including but not limited to: • watercourses and waterbodies with names where they are known; • linear and other transportation components (e.g., airports, ports, railways, roads, electrical power transmission lines and pipelines); • other features of existing or past land use (e.g., archaeological sites, commercial development, houses, industrial facilities, residential areas and any waterborne structures); • location of Aboriginal groups, settlement land (under a land claim agreement) and, if available, traditional territory; • federal land including, but not limited to National parks, National historic sites, and reserve lands; • nearby communities; • permanent, seasonal or temporary residences; • fisheries and fishing areas (i.e., Aboriginal, commercial and recreational); • environmentally sensitive areas (e.g., wetlands, and protected areas, including migratory bird sanctuary reserves, marine protected areas, National Wildlife areas, and priority ecosystems as defined by Environment Canada); and, • provincial and international boundaries.	Figure 1-1, Figure 2-2, Figure 2-3
3.1.4	Photographs of work locations to the extent possible.	3.1
3.1.5	Proximity of the designated project to: • any permanent, seasonal or temporary residences; • traditional territories, settlement land (under a land claim agreement) as well as lands and resources currently used for traditional purposes by Aboriginal peoples; and, • any federal lands.	6.10.3, 7.2.1
3.2	**Land and Water Use:**	
3.2.1	Information on zoning designations.	1.4.4, 2.1, 2.3.4
3.2.2	Legal description of land to be used (including information on sub-surface rights) for the designated project, including the title, deed or document and any authorization relating to a water lot.	Appendix B
3.2.3	Any applicable land use, water use (including ground water), resource management or conservation plans applicable to or near the project site. Include information on whether such plans were subject to public consultation.	3.2
3.2.4	Description on if the designated project is going to require access to, use or occupation of, or the exploration, development and production of lands and resources currently used for traditional purposes by Aboriginal peoples.	7.2

	Required Information as Stated in the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012*	Location of Information in the Project Description
4.1	Description on if there is any proposed or anticipated federal financial support that federal authorities are, or may be, providing to support the carrying out of the designated project.	1.4.1, 4.0
4.2	Describe any federal lands that may be used for the purpose of carrying out the designated project. This is to include any information on any granting of interest in federal land (i.e., easement, right of way, or transfer of ownership).	1.4.1, 4.2
4.3	List of any federal permits, licences or other authorizations that may be required to carry out the project.	1.4.1, 1.4.4
5.1	Description of the physical and biological setting, including the physical and biological components in the area that may be adversely affected by the project (e.g., air, fish, terrain, vegetation, water, wildlife, including migratory birds, and known habitat use).	6.0
5.2	Description of any changes that may be caused as a result of carrying out the designated project to: (a) fish and fish habitat, as defined in the *Fisheries Act*; (b) marine plants, as defined in the *Fisheries Act;* and, (c) migratory birds, as defined in the *Migratory Birds Convention Act, 1994*.	6.7.1, 6.7.2, 6.7.3
5.3	Description of any changes to the environment that may occur, as a result of carrying out the designated project, on federal lands, in a province other than the province in which the project is proposed to be carried out, or outside of Canada.	6.8
5.4	Description of the effects on Aboriginal peoples of any changes to the environment that may be caused as a result of carrying out the designated project, including effects on health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.	6.10
6.1	List of Aboriginal groups that may be interested in, or potentially affected by, the designated project.	7.2.1
6.2	Description of the engagement or consultation activities carried out to date with Aboriginal groups, including: • names of Aboriginal groups engaged or consulted to date with regard to the project; • date(s) each Aboriginal group was engaged or consulted; and, • means of engagement or consultation (e.g., community meetings, mail or telephone).	7.2.2
6.3	Overview of key comments and concerns expressed by Aboriginal groups identified or engaged to date, including any responses provided to these groups.	7.2.3

	Required Information as Stated in the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012*	Location of Information in the Project Description
6.4	Consultation and information-gathering plan that outlines the ongoing and proposed Aboriginal engagement or consultation activities, the general schedule for these activities and the type of information to be collected (or, alternatively, an indication of why such engagement or consultation is not required).	7.2.4
7.1	An overview of key comments and concerns expressed to date by stakeholders and any responses that have been provided.	7.3.2
7.2	An overview of any ongoing or proposed stakeholder consultation activities.	7.3.3
7.3	A description of any consultations that have occurred with other jurisdictions that have environmental assessment or regulatory decisions to make with respect to the project.	1.3