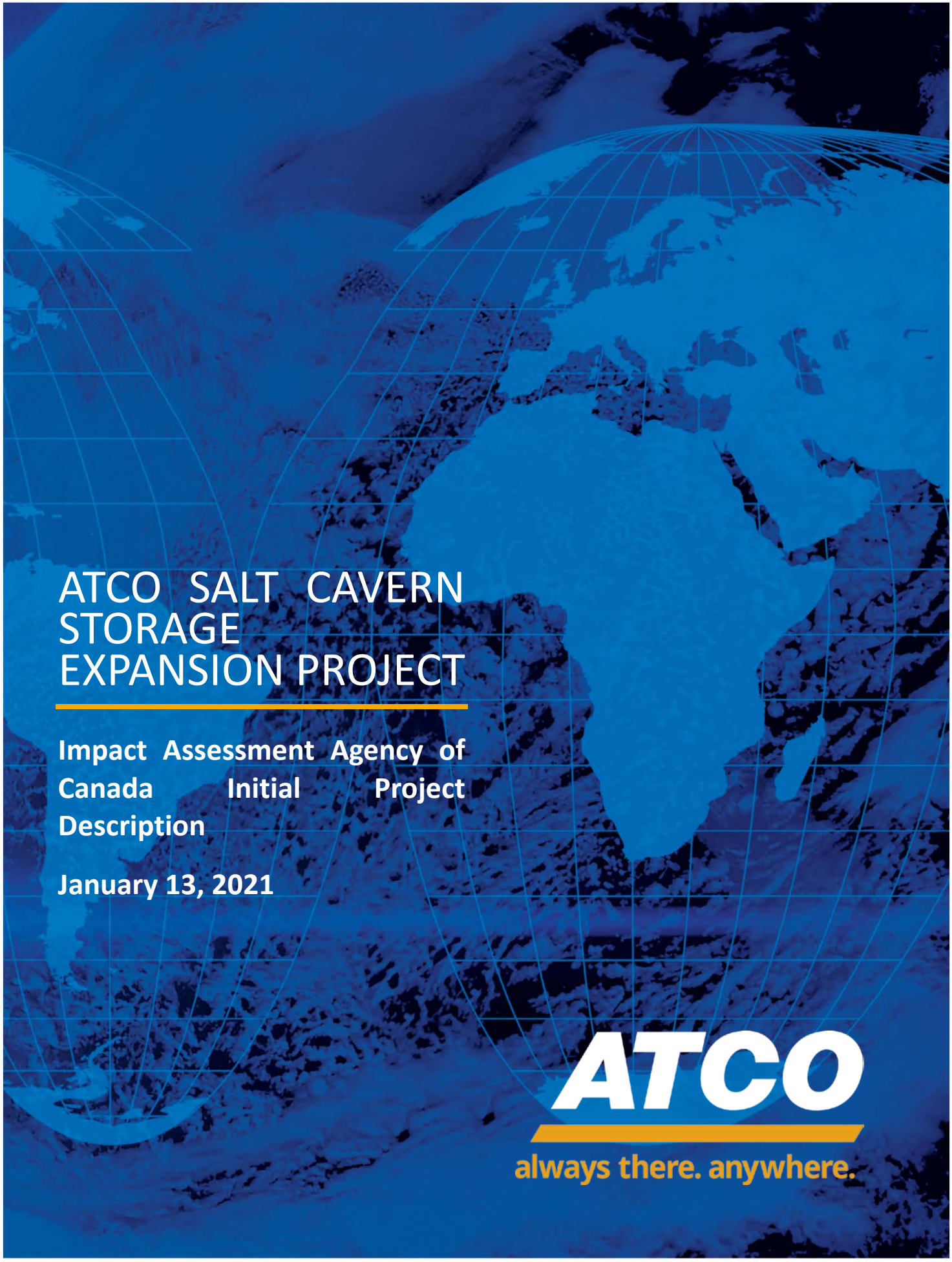

ATCO SALT CAVERN STORAGE EXPANSION PROJECT

Impact Assessment Agency of Canada Initial Project Description

January 13, 2021

ATCO

always there. anywhere.

INITIAL PROJECT DESCRIPTION

ATCO SALT CAVERN STORAGE EXPANSION PROJECT

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INITIAL PROJECT DESCRIPTION

ATCO SALT CAVERN STORAGE EXPANSION PROJECT

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ATCO SALT CAVERN STORAGE EXPANSION PROJECT

INTRODUCTION

ATCO Energy Solutions Ltd. (AES; ATCO Energy Solutions), a fully owned subsidiary of ATCO Ltd. (ATCO), is pleased to submit this Project Description of the ATCO Salt Cavern Storage Expansion Project (the proposed Project; the Project). AES is part of the ATCO Group of Companies, a collection of energy, technology, utility and structures and logistics companies belonging to the broader ATCO Group.

This Project Description has been prepared in accordance with the Impact Assessment Agency of Canada (IAA) *Information and Management of Time Limits Regulations, Schedule 1*, the *Strategic Assessment of Climate Change*, and the *Impact Assessment Act Guide to Preparing an Initial Project Description and a Detailed Project Description*.

PART A: GENERAL INFORMATION

1. THE PROJECT'S NAME, TYPE OR SECTOR AND PROPOSED LOCATION

ATCO Energy Solutions owns and operates the Strathcona Salt Cavern Storage Facility at SW 34-55-21-W4M in the Alberta Industrial Heartland (AIH). This existing facility consists of four natural gas liquids (NGL) storage caverns, each with a capacity of approximately 100,000 m^3. and containing propane, butane or ethylene. These caverns serve industrial customers in the AIH. A fifth cavern is currently under construction. Associated facilities at the site include a product handling facility, a brine pond, an office building, buried pipelines, access roads, and parking facilities.

The ATCO Salt Cavern Storage Expansion Project (the proposed Project; the Project), would expand this existing storage facility capacity with the development four additional salt caverns to store Natural Gas Liquids (NGLs) for the growing petrochemical industry. Each cavern would have a working capacity of approximately 100,000 m^3 for a total expansion size of approximately 400,000 m^3. The proposed Project would also include associated surface facilities including a product handling facility and a brine pond and would be located at the existing SW 34-55-21-W4M site and extend onto NW 27-55-21-W4M. The proposed Project would be wholly contained on private land owned by AES. The Project Location is shown in Figure 1.

ATCO Energy Solutions builds, owns and operates energy and water-related infrastructure. The company focuses on offering natural gas storage, transportation and services, electric transmission and substations, and industrial water infrastructure solutions to the energy industry.

The Alberta Industrial Heartland is a joint land use planning and development initiative between five municipalities in the Edmonton Capital Region to attract investment to the region. It is the largest hydrocarbon processing region and one of the most established value-add manufacturing centres in Canada, making the region a critical partner in Canada's energy future (AIHA 2020). The Alberta Industrial Heartland is guided by the Alberta Industrial Heartland Association (AIHA), a non-profit association of municipalities dedicated to sustainable eco-industrial development (AIHA 2020). The Alberta Industrial Heartland has a strong industrial base of oil and gas processing, chemical manufacturing, hydrocarbon storage and loading facilities including underground salt caverns, and power generation facilities. Future industrial growth in the region is expected to be held to some of the highest environmental standards in the world, including technologies for carbon capture and storage, emissions reduction, progressive energy technology that modernizes plastics production and emerging energy solutions (AIHA 2020).

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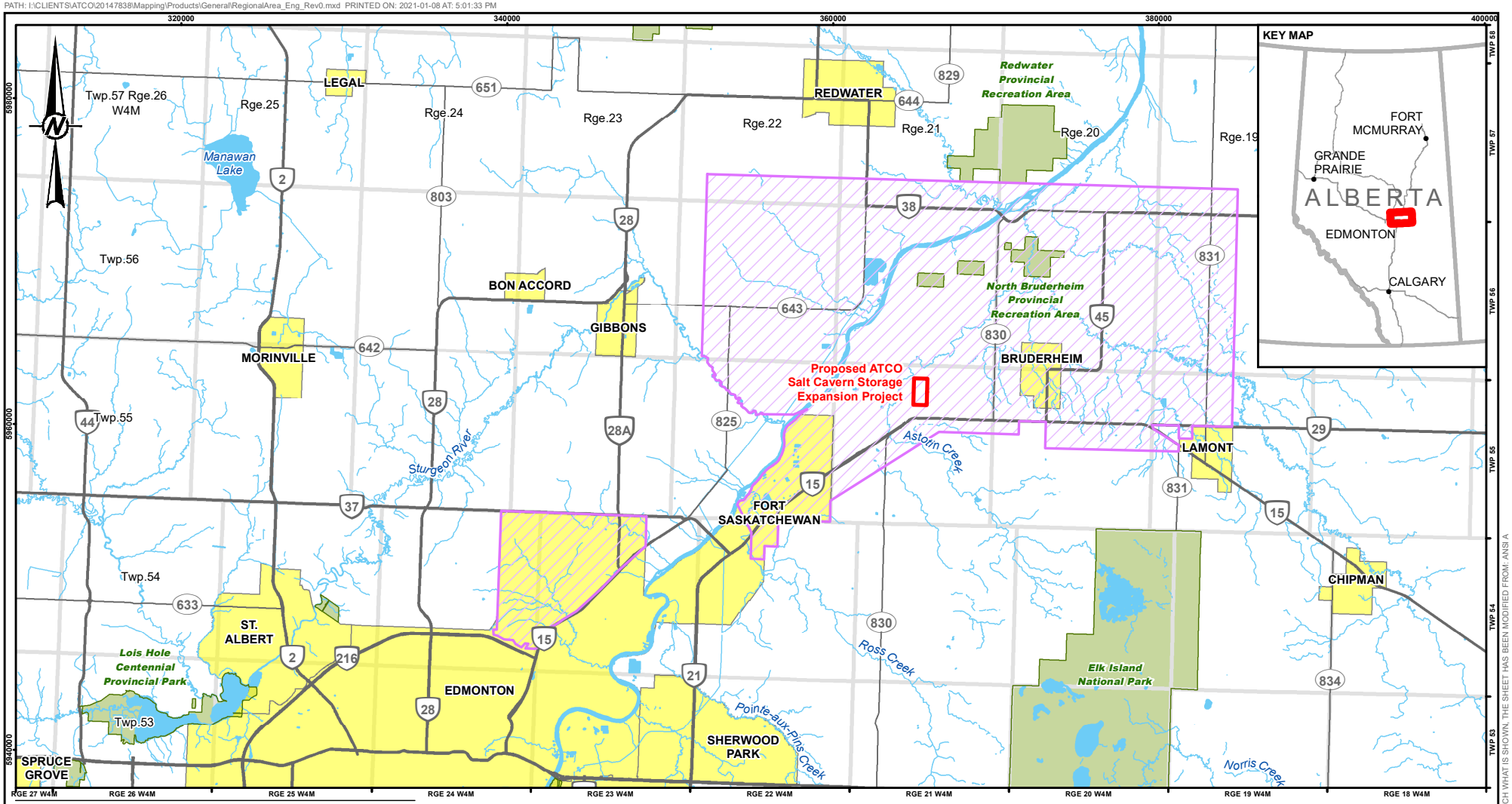

LEGEND

- PROJECT AREA
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- WATERCOURSE
- ALBERTA INDUSTRIAL HEARTLAND BOUNDARY
- PARK / PROTECTED AREA
- POPULATED PLACE
- WATERBODY

0 5 10

1:350,000 KILOMETRES

REFERENCE(S)

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PREPARED	AB
REVIEWED	SL
APPROVED	TC

PROJECT
PROPOSED ATCO SALT CAVERN STORAGE EXPANSION PROJECT

TITLE
PROJECT LOCATION

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2. PROPONENTS NAME AND CONTACT INFORMATION

ATCO Energy Solutions Ltd.

Name of the Project:	ATCO Salt Cavern Storage Expansion Project
Name of Proponent:	ATCO Energy Solutions Ltd.
Address of Proponent:	5302 Forand St. SW Calgary, AB T3E 8B4
Senior Vice President & General Manager:	Mike Shaw
Principal Contact Person:	Jennifer Rumas Manager, Commercial Regulatory & Government Relations **Phone:** 403-993-4259 **Email:** Jennifer.rumas@atco.com **Website:** https://www.atco.com

3. ENGAGEMENT WITH JURISDICTIONS OR AGENCIES

A summary of any engagement undertaken with any jurisdiction or other party, including a summary of the key issues raised and the results of the engagement, and a brief description of any plan for future engagement.

ATCO Energy Solutions (AES) and ATCO Group have a strong understanding of the Alberta Industrial Heartland and a long-term presence in the area. This understanding is based on existing operations, projects currently under construction, and projects in the planning, regulatory approval, and assessment phases. AES continues to work successfully with area stakeholders and the agencies which govern development and operation of energy infrastructure and facilities, as well as water infrastructure projects, within the Alberta Industrial Heartland. AES intends to build on positive experience and established relationships in the area to progress the development of this proposed Project.

Engagement on the proposed Project commenced in the Spring of 2020. Due to restrictions surrounding the COVID-19 pandemic, engagement activities have been conducted remotely by video or teleconference, by email and by distributing information packages to stakeholders. Engagement will be ongoing throughout the lifecycle of the Project.

AES consulted the Impact Assessment Agency of Canada (IAAC) to introduce the Project and determine the need for an Initial Project Description. The need was confirmed by IAAC in May 2020. AES has met with IAAC several times over 2020 to discuss Project planning and the proposed approach to the Initial Planning Phase as required by the Impact Assessment Act.

The Project was also introduced in a teleconference meeting with Strathcona County officials on March 27, 2020. AES provided information on the proposed Project scope and schedule and sought confirmation regarding the regulatory processes and requirements applicable to the Project. Further engagement is planned as the Project enters detailed design.

AES has also consulted the Environmental Assessments Branch of Alberta Environment and Parks (AEP). A letter to confirm that an Environmental Impact Assessment (EIA) was not required by AEP was submitted on December 1, 2020. A letter from AEP confirming an EIA was not required was received on December 21, 2020.

Initial engagement with area stakeholders began at the end of Q4 2020. Jurisdictions, agencies, and non-Indigenous Stakeholders that have been engaged or consulted during the Initial Planning Phase are shown in Table 1. This includes various government agencies, regional associations and local landowners and residents. Engagement with Indigenous groups is discussed in Section 4.

Table 1: Jurisdictions, Agencies and Non-Indigenous Stakeholders Engaged or to be Engaged during the Initial Planning Phase

Federal Government	Impact Assessment Agency of Canada Fisheries and Oceans Canada Environment and Climate Change Canada
Provincial Government	Alberta Energy Regulator Alberta Environment and Parks
Municipal Government	Strathcona County Beaver County Lamont County City of Edmonton
Local Landowners, Occupants and Residents	24 Landowners, occupants and residents within 1.5 km radius of the Project site at SW 34-55-21-W4M and NW 27-55-21-W4M
Mineral Rights Holders	48 mineral rights holders within a 1.5 km radius of the Project site at SW 34-55-21-W4M and NW 27-55-21-W4M
Regional Associations	Alberta Industrial Heartland Association (AIHA)

Engagement and consultation activities will continue throughout the permitting phase of the Project at the request of interested stakeholders and in accordance with the requirements of provincial approvals and to effectively respond to any arising concerns or requests for information. AES will engage the Alberta Energy Regulator (AER) and Strathcona County as required to support permitting requirements of the various components of the Project and in alignment with the schedule provided in Section 11. AES will continue to engage with these and any other applicable regulators throughout the operation of the facility.

AES will also further engage local landowners, occupants and residents within a 1.5 km radius of the Project and will meet Participant Involvement Program requirements prior to submission of regulatory applications for the various project

components. Formal participant involvement activities are anticipated to continue in Spring of 2021 and then throughout the development and construction phases as per the Project schedule provided in Section 11 and as per applicable energy development regulation requirements. Continued engagement or consultation with interested stakeholders is expected to occur through teleconference, telephone or email. In-person engagement and consultation will be limited due to the COVID-19 pandemic.

No issues have been raised to date from engagement with jurisdictions, agencies or area stakeholders. AES will continue to work with stakeholders throughout all phases of the proposed Project to ensure any issues are addressed and concerns are appropriately mitigated. AES has developed positive relationships with local stakeholders since developing its initial Strathcona Salt Cavern Storage Project and will work with stakeholders throughout the design, construction and operating phases of the Project, including communicating changes or updates to the Project through its development.

Engagement with IAAC will continue via email and teleconference meetings throughout the Planning Phase of the Proposed Project.

4. ENGAGEMENT WITH INDIGENOUS GROUPS

A list of the Indigenous groups that may be affected by the carrying out of the project, a summary of any engagement undertaken with the Indigenous peoples of Canada, including a summary of key issues raised and the results of the engagement, and a brief description of any plan for future engagement.

As described in Section 1, the Project area is located in the AIH, an area of the Province that has been designated for Heavy Industrial (Heartland) use. The Project area is a 130 hectares (320 acre) parcel that includes the existing Strathcona Salt Cavern Storage Facility. The land in SW-34-55-21-W4M has been continually farmed and cultivated since it was first homesteaded in the early 1900s (Alberta Genealogical Society 2020) and the land in NW 27-55-21-W4M is currently cultivated. The Project area contains low suitability habitat for wildlife species and vegetation species. Additionally, the lands are privately owned by AES and no traditional uses of the Project site by Indigenous groups or peoples have been identified in previous regional studies for the area (Stantec 2010; Stantec 2013).

AES, in conjunction with IAAC, identified 24 First Nations and Métis Settlements, and one Métis Region (Indigenous Communities) that will be engaged during the Agency-led engagement period. AES initiated engagement with each of these Indigenous Communities at the beginning of December 2020 with the distribution of a Project Information Package on the proposed Project. The package included information regarding the scope of the proposed Project, its location, schedule, contact information, and information specific to AES' existing presence and operations in the area. The Project Information Package was sent to an additional nine Indigenous Communities that will not be involved in the Agency-led engagement for a total of 33 Indigenous Communities.

A First Nation Consultation Adequacy Assessment (FNCAA) will be submitted to the Alberta Aboriginal Consultation Office for their consultation intensity recommendation for the Project. Once a response is provided, AES will follow the recommendation of the Government of Alberta.

AES does not anticipate that First Nations Consultation will be required due to the land location and nature of the proposed Project. AES will continue engagement activities with Indigenous Communities throughout development and are committed to working with these and any other Indigenous Communities as appropriate to address their interests.

Indigenous Communities included to-date in AES' engagement activities and their proximity to the proposed Project are shown below in Table 2.

Table 2: Indigenous Groups and Proximity to the Proposed Project

Indigenous Group	Distance from Project
Treaty 6	
Alexander First Nation	NW 51 km
Bearspaw First Nation (Stoney Nakoda Nations)	SW 315 km
Beaver Lake Cree Nation	NE 120 km
Chiniki First Nation (Stoney Nakoda Nations)	SW 315 km
Enoch Cree Nation #440	SW 60 km
Ermineskin Cree Nation	S 120 km
Kehewin Cree Nation	E 150 km
Louis Bull Tribe	S 110 km
Montana First Nation	S 125 km
Paul First Nation	W 90 km
Saddle Lake Cree Nation	NE 91 km
Samson Cree Nation	S 115 km
Stoney Nakoda Nations	SW 325 km
Wesley First Nation (Stoney Nakoda Nations)	SW 315 km
Whitefish Lake First Nation #128	NW 270 km
Treaty 7	
Blood Tribe	S 480 km
Piikani Nation	SW 485 km
Siksika Nation	S 335 km
Tsuut'ina Nation	SW 335 km
Treaty 8	
Chipewyan Prairie Dene Nation	NE 120 km
Alberta Métis	
Métis Nation of Alberta – Region 4	SW 39 km[1]
Lac St. Anne Metis (Gunn Métis Local 55)	SW 70 km[1]
Buffalo Lake Metis Settlement	N 90 km[1]
Kikino Metis Settlement	NE 90 km
Elizabeth Metis Settlement	NE 195 km
Fishing Lake Metis Settlement	E 180 km
Metis Nation of Alberta – Region 2	NE 160 km[1]

Table 2: Indigenous Groups and Proximity to the Proposed Project

Indigenous Group	Distance from Project
Non-Treaty Nations	
Descendants of Michel First Nation	NE 200 km[1]
Friends of Michel First Nation Society (Michael First Nation)	NE 200 km[1]
Foothills Ojibway First Nation	W 300 km

[1]*Distances noted are to offices or postal boxes*

Since distribution of the Project Information Packages, AES has further engaged with those Indigenous Communities who have followed up with specific Project questions. To date, these communities are: Chipewyan Prairie Dene First Nation, Ermineskin First Nation, Kehewin Cree First Nation, Montana First Nation, Samson Cree Nation, and Stoney Nakoda Nations. These follow up engagements began in December 2020 and have consisted of telephone calls and emails to provide additional project information. No in-person engagement has taken place due to concerns and restrictions arising from the COVID-19 pandemic. AES will continue to engage with any Indigenous Communities interested in the proposed Project. To date, no formal concerns or issues have been raised during follow up discussions. Communities have expressed a desire to discuss or receive further information on:

- Project location relative to Traditional Use Lands
- Depth of the caverns in relation to groundwater
- Potential impacts to tributaries of the North Saskatchewan River
- Potential procurement or employment opportunities
- Site visits

AES will continue to engage with these communities into 2021, primarily via telephone and email. AES will also continue engagement with other Indigenous Communities following submission of the Initial Project Description and throughout the Project as applicable. Future engagement activities will vary depending on the nature and extent of impacts on communities, and how each Indigenous group wants to be engaged.

AES is looking at alternatives to site visits (such as virtual tours) to protect the health and safety of AES workers and Indigenous Communities while COVID-19 remains a risk. Engagement in 2021 will continue to be conducted through teleconference, telephone, video meetings, and email or mailed information requests as much as practicable.

5. REGIONAL ASSESSMENTS AND RELEVANT ENVIRONMENTAL STUDIES

Any study or plan, relevant to the project, that is being or has been conducted in respect of the region where the project is to be carried out, including a regional assessment that is being or has been carried out under section 92 or 93 of the Act or by any jurisdiction, including by or on behalf of an Indigenous governing body, if the study or plan is available to the public.

The proposed Project is located approximately 14 km northeast of Fort Saskatchewan and approximately 30 km northeast of Edmonton, in the AIH. The AIH is a joint land use planning and development initiative between five municipalities in the Edmonton Capital Region. The Alberta Industrial Heartland is guided by the Alberta Industrial Heartland Association (AIHA), a non-profit association of municipalities dedicated to sustainable eco-industrial development (AIHA 2020). Created in 1998, AIHA promotes responsible development in the region, where more than 40 companies including AES currently have operations (AIHA 2020).

No regional assessments as defined in Sections 92 and 93 of the *Impact Assessment Act* have taken place in the Alberta Industrial Heartland.

Land use in the AIH is addressed by an Area Structure Plan Bylaw (Strathcona County 2018c). The Project site is in the Strathcona Heavy Industrial Policy Area as per the Alberta Industrial Heartland Area Structure Plan Bylaw (Strathcona County 2020b) and is zoned as “Heavy Industrial (Heartland)” as specified by Strathcona County.

Strathcona County has prepared a Municipal Development Plan according to the legislative framework in the *Municipal Government Act* to manage growth, development and sustainability in an orderly manner for the next twenty years (Strathcona County 2020b). The Municipal Development Plan includes specific policies that deal with development near the North Saskatchewan River and the conservation and quality of water, land, air and natural resources within Strathcona County.

The proposed Project will be located in the Fort Air Partnership airshed, which extends from Elk Island National Park at the southern boundary of the airshed up to the village of Newbrook, approximately 80 km north of the Project site. The airshed includes the communities of Fort Saskatchewan, Gibbons, Bon Accord, Bruderheim, Lamont, Redwater, Waskatenau and Thorhild, as well as Elk Island National Park. The Fort Air Partnership does not extend to the City of Edmonton, which is located to the southwest of the Fort Air Partnership Boundary. The Fort Air Partnership monitors and collects air quality using ten (10) continuous monitoring stations and forty-seven (47) passive monitors. The data is compared to provincial Ambient Air Quality Objectives and used to inform policy and management decisions by government and other organizations (Fort Air Partnership 2020).

Under the Alberta Land Stewardship Act, a regional management plan is under development for the region of the North Saskatchewan River watershed where the Project is located (NSRAC 2015). The North Saskatchewan Region has approximately 85,780 km^2 (approximately 13%) of Alberta’s total land base (AEP 2020). The purpose of regional planning is to support the numerous policies and strategies that guide natural resource development, support economic growth and protect our environment. Regional plans will integrate these policies and strategies at the regional level and provide the policy direction and clarity for decision makers at the federal, provincial and local levels. Based on Terms of Reference

for Developing the North Saskatchewan Regional Plan (GoA 2014b), AES will ensure that the Project meets with the spirit and intent of the plan.

A regional Groundwater Quality Monitoring Framework will be developed as a component of the North Saskatchewan Regional Planning process (NCIA 2020). Alberta Environment and Parks has also developed several regional frameworks for this area as part of the Cumulative Effects Management Framework, including the Water Management Framework for the Industrial Heartland and Capital Region (Alberta Environment 2008), and the Capital Region Air Quality Management Framework (ESRD 2012). In addition, the Northeast Capital Industrial Association (NCIA) has developed a Regional Noise Management Model and Regional Noise Management Plan Reports annual reports (NCIA 2020).

6. STRATEGIC ASSESSMENTS

Any strategic assessment, relevant to the project, that is being or has been carried out under section 95 of the Act.

The Alberta Industrial Heartland has not been the subject of a strategic assessment under section 95 of the *Impact Assessment Act*.

ATCO Energy Solutions reviewed the Strategic Assessment of Climate Change (SACC; ECCC 2020b). The SACC was developed by Environment and Climate Change Canada (ECCC) to enable consistent, predictable, efficient and transparent consideration of climate change throughout federal impact assessments (ECCC 2020b). The SACC applies to all projects designated under the *Impact Assessment Act.*

The objective of the SACC is to enable consistent, predictable, efficient and transparent consideration of climate change through the impact assessment process (ECCC 2020b). The SACC applies to all designated projects under the Impact Assessment Act and additionally will be used as a guidance document for projects that are not subject to impact assessment (i.e., projects on federal land or projects proposed outside of Canada by Canadian proponents). It is a requirement of the SACC that upstream greenhouse gas (GHG) concentrations be quantified as part of the Project planning process.

An estimate of GHG emissions associated with the proposed Project is provided in Section 23 of this Initial Project Description and has been calculated in accordance with the requirements of Section 3 of the SACC. Overall, the GHG emissions associated with Project construction and operation are low in magnitude when compared to provincial and national emission totals.

The proposed Project has a planned lifespan of 25 years and is expected be in operation from 2024 to 2049. As the proposed Project is planned to cease operations prior to 2050, a plan to achieve net-zero emissions by 2050 is not required in accordance with Section 5.3 of the SACC. However, AES will evaluate opportunities to reduce Project-related emissions where practicable. Due to the low level of emissions expected from the proposed Project at this time, it is anticipated that reductions in emissions could be achieved through the use of low carbon fuels. In particular, the majority of emissions associated with the facility would be from the electric drive motors. One approach to achieving net-zero emissions would be to purchase green electricity to power the facility. Similarly, low carbon fuels such as renewable natural gas or low carbon hydrogen could be used to offset emissions from gas-fired equipment. It is anticipated that these options will be readily available post-2030 to support achieving these goals.

PART B: PROJECT INFORMATION

7. PROJECT PURPOSE AND NEED

A statement of the purpose of and need for the project, including any potential benefits.

The purpose of the Project is to expand the NGL storage capacity at AES' existing Strathcona Salt Cavern Storage Facility to serve additional customers. The proposed Project will add approximately 400,000 m^3 of NGL storage capacity to serve customers in the Alberta Industrial Heartland. NGL's are a critical feedstock for the petrochemical industry. Additional storage capacity is required by 2024 to support continued operations and growth of the petrochemical industry in the AIH.

Cavern storage is a proven safe technique to effectively store NGLs. The addition of NGL storage will support the Alberta Natural Gas Vision and Strategy to grow the Alberta economy and help reduce global emissions through the processing and transport of liquid natural gas and associated petrochemical processing and manufacturing (GoA 2020b).

Global demand for petrochemical products is expected to grow. The Government of Alberta has identified petrochemical processing as a growth area in the Natural Gas Vision and Strategy and has committed up to $650 million in financial incentives under the first and second rounds of the Petrochemicals Diversification Program (GoA 2020b). Additional funding is expected to be provided by the Alberta Petrochemicals Incentive Program between 2020 and 2030 (Alberta Energy 2020). Expanding storage capacity will support Alberta's ability to attract and retain investment in the petrochemical sector. Alberta's chemicals sector, comprised predominantly of petrochemicals, was valued at C$12.1 billion and employed about 58,400 people directly and indirectly in 2019. The Alberta government projects that Alberta's petrochemical section could grow to more than C$30 billion and 90,000 direct and indirect jobs by 2030 (GoA 2020b). Expansion of secure storage capacity in the Alberta Industrial Heartland is expected to support continued investment and growth within the region.

The proposed Project is ideally located to serve the requirements of the natural gas processing and petrochemical industries. Natural gas liquids are recovered from most gas sources and must be removed to meet pipeline specifications. Petrochemical processing is expected to increase in Western Canada with the addition of propane and ethane processing facilities between the present time and the late 2020s (Rodwell 2020).

8. PHYSICAL ACTIVITIES REGULATION

The provisions in the schedule to the Physical Activities Regulations describing the project, in whole or in part.

The proposed Project is subject to Section 38(f) of the Schedule of the *Physical Activities Regulation*:

> *"38 The expansion of one of the following: (f) an existing natural gas liquids storage facility, if the expansion would result in an increase in storage capacity of 50% or more and a total storage capacity of 100 000 m^3 or more."*

The proposed Project is subject to the review of a Project Description because the total NGL storage capacity at AES' existing Strathcona Salt Cavern Storage Facility is approximately 430,000 m^3 with an additional 100,000 m^3 under construction. The increase in storage capacity that would result from the proposed Project is approximately 400,000 m^3, which represents an increase in the total volume of storage that is more than 50% and greater than 100,000 m^3.

No other criteria presented in the Schedule to the *Physical Activities Regulation* are applicable to the proposed Project.

9. PROJECT ACTIVITIES AND PHYSICAL WORKS

A list of all activities, infrastructure, permanent or temporary structures and physical works to be included in and associated with the construction, operation and decommissioning of the project.

The proposed Project will be an expansion of AES' existing Strathcona Salt Cavern Storage Facility. Existing infrastructure includes four NGL caverns, a product handling facility, a brine pond and auxiliary buildings. These facilities have been in operation since 2016. A fifth cavern is currently under development and will be operational in 2022. Existing and new facilities and infrastructure are shown in Figure 2. The Project site, zoning, and nearby infrastructure is shown in Figure 3. ATCO Energy Solutions' mineral rights and the locations of other salt caverns in the region are shown in Figure 4.

The proposed Project consists of the construction and operation of four new underground salt caverns and associated surface facilities and infrastructure for the storage of additional NGL products. The NGL products proposed to be stored in the caverns are propane, butane and condensate. The caverns will be developed in the Lotsberg formation, which is located approximately 1,800 m below surface. Once developed, each cavern will have an approximate total volume of 120,000 m^3 and will have a working NGL product storage capacity of approximately 100,000 m^3.

All Project facilities related to this expansion are proposed to be developed on land, and within mineral rights, owned or controlled by AES. Three of the four caverns are targeted for commercial operation in Q2 2024. The fourth cavern is targeted for commercial operation in Q4 2024.

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LEGEND

- PROJECT AREA
- SITE PLAN - EXISTING FACILITY
- SITE PLAN - NEW FACILITY
- LOCAL ROAD
- WATERCOURSE

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1:13,500 METRES

REFERENCE(S)

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PROJECT
PROPOSED ATCO SALT CAVERN STORAGE EXPANSION PROJECT

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SITE PLAN

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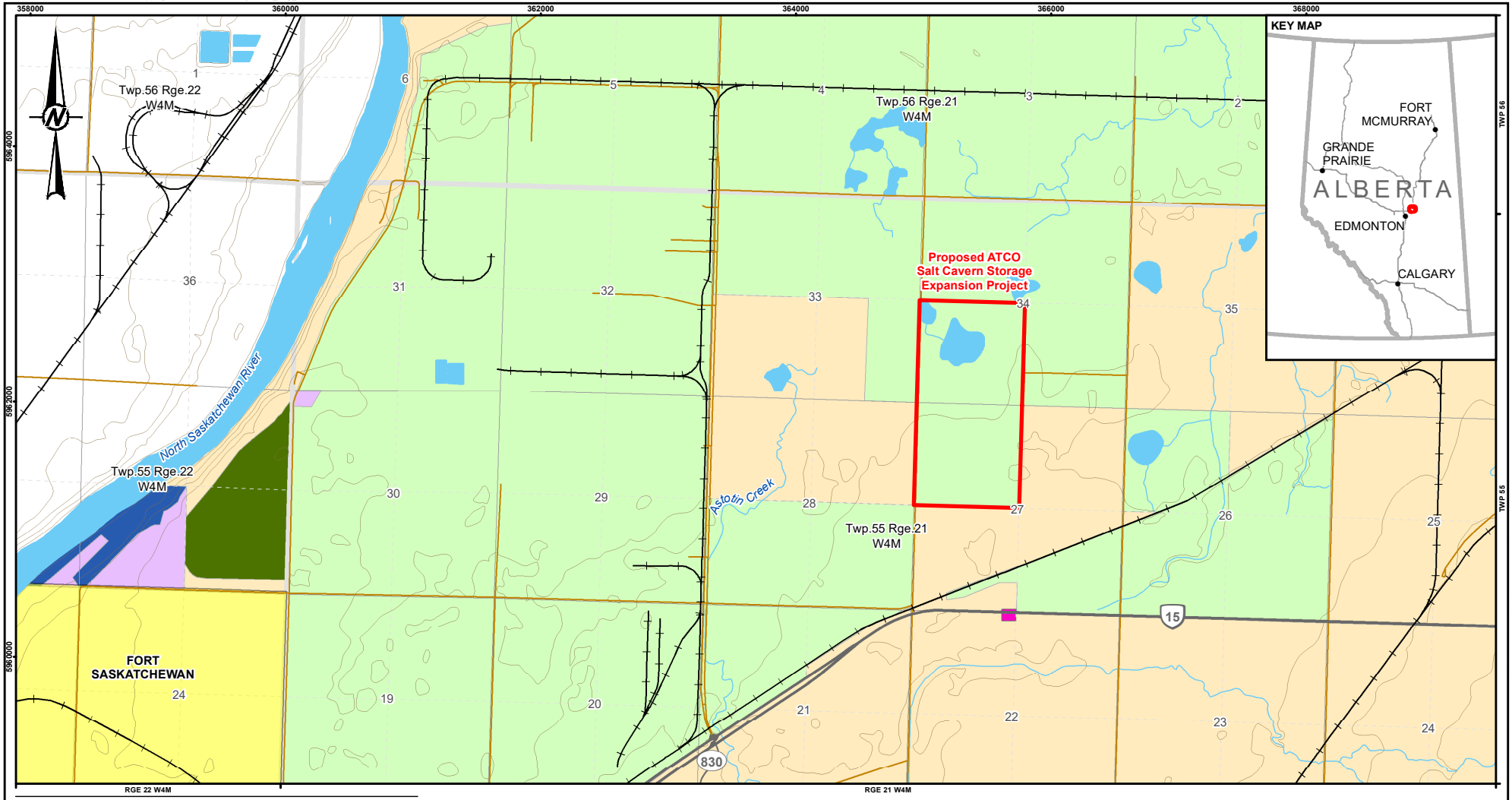

LEGEND

- PROJECT AREA

LAND USE ZONING

- AGRICULTURE: GENERAL
- CONSERVATION
- HEAVY INDUSTRIAL
- HEAVY INDUSTRIAL (HEARTLAND)
- HIGHWAY COMMERCIAL
- MEDIUM INDUSTRIAL (HEARTLAND)
- ELEVATION CONTOUR (10 m)
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- LOCAL ROAD
- RAILROAD
- WATERCOURSE
- WATERBODY

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1:45,000 KILOMETRES

REFERENCE(S)

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PROJECT
PROPOSED ATCO SALT CAVERN STORAGE EXPANSION PROJECT

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PROJECT SITE

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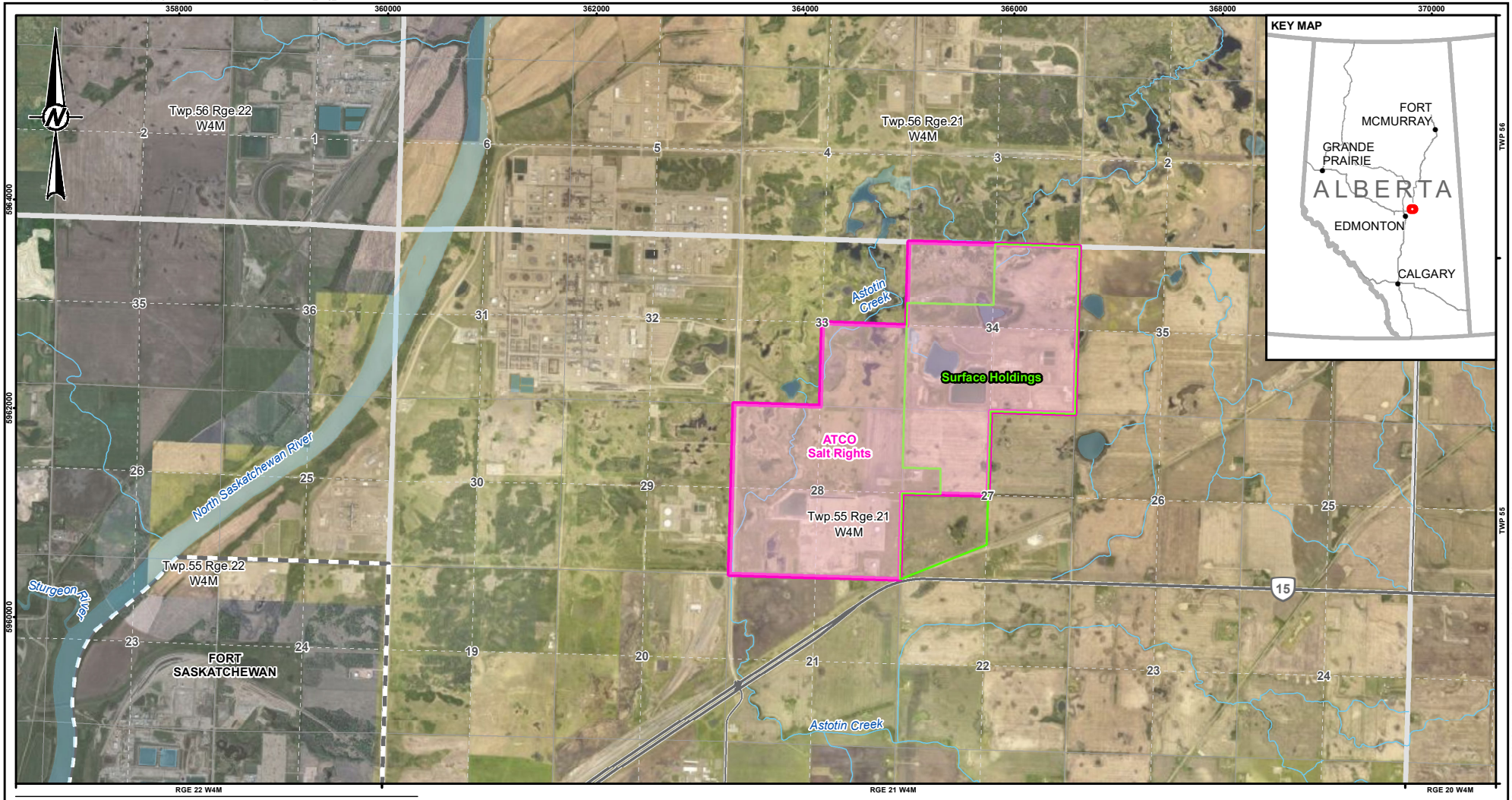

LEGEND

- ATCO SALT RIGHTS
- ATCO SURFACE HOLDINGS
- WATERCOURSE
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- POPULATED PLACE
- WATERBODY

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APPROVED	TC

PROJECT
PROPOSED ATCO SALT CAVERN STORAGE EXPANSION PROJECT

TITLE
LOCATION OF ATCO LANDS AND SALT RIGHTS

PROJECT NO.	CONTROL	REV.	FIGURE
20147838		0	4

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The facilities and infrastructure required for the Project are identified in Table 3. New facilities required for the Project are identified in section A and described in Section 9.1. Existing AES infrastructure which will be used to support development of the proposed Project is identified in section B and described in Section 9.2. Information on third party infrastructure is provided in section C and described in Section 9.3.

Table 3: Components of Proposed Development

Component	Description
A. New AES Facilities	
Salt caverns and injection wells	Four wells Four underground caverns to be developed in the Lotsberg salt formation, approximately 1,800 m below surface Target cavern size – 120,000 m^3 Working cavern storage capacity – approximately 100,000 m^3
Brine pond	Storage pond Capacity- approximately 400,000 m^3 Will consist of either a single or a double cell pond
Brine pump house	Piping, pumps, degasification facilities
NGL product handling facilities	Piping, pumps, separators, dehydration units
Cavern washing pipelines	Water and brine pipelines connecting the new cavern wells to existing AES cavern washing facilities
Brine disposal well	One disposal well completed in the Nisku formation
NGL pipelines	Two pipelines of approximately 4 km each connecting the Project site to customer meter stations Metering facilities to be located on the Project site
B. Existing AES Infrastructure	
Cavern washing pipelines	Water and brine pipelines connecting the new cavern washing pipelines to existing AES cavern washing facilities
Cavern washing facility	Water pumps, tank, pumps, and piping for water and brine
Brine disposal wells	One existing disposal well completed in the Nisku formation
Water intake and pipeline system	Water intake on the North Saskatchewan River, pumps, and pipeline system
C. New Third-Party Infrastructure	
Utilities	Natural gas and electric utility service extended to the Project expansion site by the local franchised utility operators

9.1 New Infrastructure Associated with the Project

Salt Caverns and Injection Wells

The Project includes the development of four salt caverns in the Lotsberg formation, which is located approximately 1,800 m below surface. Once developed, each cavern will have an approximate total volume of 120,000 m^3 and will have a working NGL product storage capacity of approximately 100,000 m^3.

Four wells will be drilled by AES into the Lotsberg formation and completed for cavern development. Following completion activities, the application for approval of the storage scheme by the AER will be submitted. Following AER approval of the storage scheme, the wells will be used for cavern development and ultimately for cavern operations after development is complete.

Brine Pond and Brine Pump House

A brine pond and brine pump house will be used in the operation of the storage caverns. The brine pond will hold a maximum of approximately 400,000 m^3 of brine with a nominal depth of 8 m and will occupy an area of approximately 50,000 m^2 (5 ha). The brine pond may consist of a single cell or two cells, each with a volume of approximately 200,000 m^3. The brine pond will be surrounded by a fence at the top of the slope to limit access by land animals and people. As brine is displaced into the pond from the caverns, it will flow through a de-gasifier to ensure no NGL products enter the brine pond.

The brine pump house will be used to withdraw NGL products from the caverns. The brine pump house will contain approximately 560 kW of electrically driven pumps capable of moving up to approximately 1,300 m^3 per hour of brine into the caverns.

NGL Product Handling Facilities

The NGL product handling facilities consist of pumps and product processing equipment, and related auxiliary facilities required for the delivery of NGL products into and out of the storage caverns. Pumps and product processing equipment include:

- electrically driven pumps (approximately 9000 kW) for injecting the NGL products into the caverns;
- filtration and separation equipment to condition the products withdrawn from the caverns; and
- dehydrators to remove any water from the products prior to delivery to the pipeline systems.

The design capacity of product injection and withdrawal from the NGL product handling facilities will be up to 330 m^3 per hour per product, based on the customer needs for each of the NGL products. Auxiliary facilities will consist of office, maintenance, electrical and control buildings.

An internal site road network will be developed to provide operator access to the various process areas. Strathcona County will develop an access approach from Range Road 213 to AES' proposed site. This access will be for AES sole use. The specific location of the required access road will be determined during the detailed design phase of the Project in coordination with Strathcona County.

Cavern Washing Pipelines

New cavern washing pipelines, approximately 800 m long for fresh water and brine, will be constructed below ground to connect the existing cavern washing infrastructure and brine disposal wells to the new salt cavern wells. These lines will be used in the development and future operation of the salt caverns.

Brine Disposal Well

One new brine disposal will be developed for the proposed Project. This disposal well will be completed in the Nisku disposal formation approximately 1,000 m below surface. AES will amend its existing disposal scheme to add the well, which will be utilized for the disposal of brine during cavern mining.

NGL Pipelines

Two pipelines, each approximately 4 km, will be constructed to convey NGL product to and from AES' customer. These pipelines will be installed in the same pipeline right-of-way. One pipeline will convey condensate and the other will convey a propane/butane/condensate mix.

9.2 Existing Facilities

The proposed Project will be developed on lands of, and adjacent to the existing Strathcona Salt Cavern Storage Facility operated by AES. ATCO Energy Solutions owns and is the operator of an existing cavern washing facility and of associated water and brine pipelines which are located on lands of, and adjacent to the Project. The cavern development infrastructure used in the development of AES' existing Strathcona Salt Cavern Storage Facility salt caverns will be used to develop the caverns for the proposed Project. The cavern washing facility is housed within a building and contains three electrically driven water pumps that total approximately 1,566 kW.

Water for cavern washing activities will be provided through an existing AES owned and operated industrial water system consisting of an intake and pump station on the North Saskatchewan River and a pipeline from the river pump station to the cavern washing facility. The water works and diversion licenses are under *Water Act* Approval 346745-00-00 and *Water Act* Licence numbers 31016-00-00 and 327841-00-04, respectively. No amendments to AES' existing *Water Act* Licences are required to support the development of the caverns for the Project. The proposed Project will not result in an increase in approved water withdrawal rates.

Brine generated by the cavern washing activities will be disposed through one existing brine disposal well (license number 0097920), owned and operated by AES and located in SE 34-55-21 W4M and one new brine disposal well described above.

9.3 Third Party Infrastructure

Natural gas and electricity utility service will be extended to the proposed Project site by the local franchised utility operators.

9.4 Description of Project Activities

The activities to be performed in relation to the proposed Project include:

- Construction of the components of the Project
- Operation for the life of the Project (anticipated to be 25 years); and
- Decommissioning of the Project facilities following completion of operations

These Project activities are solely for the benefit of AES, which is building the Project infrastructure to provide services required by our customer.

Permanent and Temporary Structures

Permanent structures will consist of office, maintenance, electrical and control buildings, surface piping, treating facilities, pumps, pipelines for underground water, brine and onsite product, and four underground storage caverns.

Temporary equipment, consisting of pumps and tanks, will be used to manage the control fluid which is required during the cavern development operations.

During construction, temporary structures will be required for construction offices, equipment storage, workforce muster points and various other functions. The temporary structures will be similar to those typically used on large construction sites (e.g. integrated workforce trailer systems). All temporary structures will be removed from the site once construction is complete.

9.4.1 Construction

The construction activities required for the proposed Project will be within the care and control of AES. Various mechanical, civil, structural, electrical and other service contractors will be procured to perform the various activities required for drilling, brine pond construction, pipeline construction and product handling facility and related surface construction. These contractors will be procured as service providers to AES and any ability of these contractors to direct or influence the carrying out of the activity will be limited to related safety and environmental management activities.

Third party infrastructure required to support the Project but outside of the care and control of AES consists of the power line extensions and gas utility connections required into the Project site to support the new infrastructure. Power line extension into the Project site will be under the care and control of Fortis Alberta. Gas utility connections will be under

the care and control of the local gas utility. AES is a customer of these third parties and will not have the ability to direct or influence the carrying out of these activities.

Salt Caverns and Injection Wells (Salt Cavern Development)

Construction of the new cavern wells will commence with stripping the topsoil from the well pad area, followed by grading and gravelling of the well pad. The cavern wells will be drilled to a depth of approximately 1,900 m, terminating in the Lotsberg formation. The wells will be completed for water injection.

Caverns will be developed by injecting fresh water into the newly drilled wells to dissolve the salt and create a brine solution which is pushed out of the cavern by the injected fresh water. The brine will be disposed through disposal wells into a deep secure formation. This process occurs continuously for 40 to 50 weeks until the desired cavern size is achieved.

Brine Pond and Brine Pump House

Topsoil and subsoil will be stripped from across the proposed brine pond area and stockpiled. The area will be excavated, and berms will be constructed to create the desired brine pond volume. Dewatering will be required during the excavation of the pond and will be conducted in accordance with the conditions of *Water Act* Approval to dewater the area for construction. The brine pond may consist of one single cell or two cells separated by an earthen berm.

Two layers of high-density polyethylene (HDPE) liner will be installed over the excavated pond, between which a leak detection system will be installed. The leak detection system will be comprised of a network of weeping tile piping connected to sumps. A secondary system will also be used to control groundwater beneath the bottom liner.

The brine pump house will be constructed in conjunction with the brine pond. Once the location has been excavated to the required depth, the foundation of the pump house will be constructed, followed by installation of mechanical and electrical components and the pump house building.

NGL Product Handling Facilities

Construction of the product handling facility will begin with site preparation and grading. Once the site has been prepared, buried utilities will be installed, followed by above ground piping and facilities, building foundations, pumping and treating equipment, and office, maintenance, electrical and control buildings.

Cavern Washing Pipelines

Construction of the fresh water and brine pipelines will commence with stripping the topsoil from the route, followed by excavating the required trench, installing the piping, and backfilling. Once construction is complete, this disturbed area will be restored.

Brine Disposal Well

Construction of the brine disposal well will commence with stripping the topsoil from the well pad area, followed by grading and gravelling of the well pad. A disposal well will be drilled to a depth of approximately 1,000 m, terminating in the Nisku formation. After drilling is completed, the well will be completed in accordance with *AER Directive 051: Injection and Disposal Wells – Well Classifications, Completions. Logging, and Testing Requirements* (AER 1994).

NGL Pipelines

Construction of the NGL pipelines will commence with stripping the topsoil from the route, followed by excavating the required trench, installing the piping, and backfilling. Once construction is complete, this disturbed area will be restored.

Third Party Infrastructure

Extension of electric and natural gas services will be conducted in accordance with the requirements of AES' utility providers.

9.4.2 Operation

The operation of the proposed Project will be within the care and control of AES. The main facilities associated with operating the Project are pumps, separators and dehydrators that will transfer the NGL products into or out of the storage caverns to meet customer requirements, and the brine pond which will facilitate product injection and withdrawal. Maintenance activities on these facilities will be ongoing throughout the operating life of the facilities.

AES commenced operation of its Strathcona Salt Cavern Storage Facility in 2016 and has a strong record of operating safely and in a manner that protects and maintains the surrounding environment. Our existing facilities are operated and maintained under a comprehensive asset management system that includes ongoing surveillance and inspections, management of change, operator training, detailed operating manuals and an emergency preparedness and response plan. A Process Control System operates to control the facility's safety systems and operators are on-site 24 hours a day, seven days a week to provide continuous monitoring.

A specific Operations, Maintenance, and Surveillance (OMS) Manual is in place for the brine pond and integrity manuals are in place to ensure well, pipeline, and other equipment integrity. AES has also implemented specific Operating Procedures and Preventative Maintenance programs for the facility and reviews and updates these procedures, manuals and programs at least every three years. The Strathcona Salt Cavern Storage Facility is an ABSA regulated facility, requiring the operations staff to be fully qualified power engineers. The facility is supervised by a Chief Power engineer and each shift has oversight by a shift engineer.

9.4.3 Decommissioning

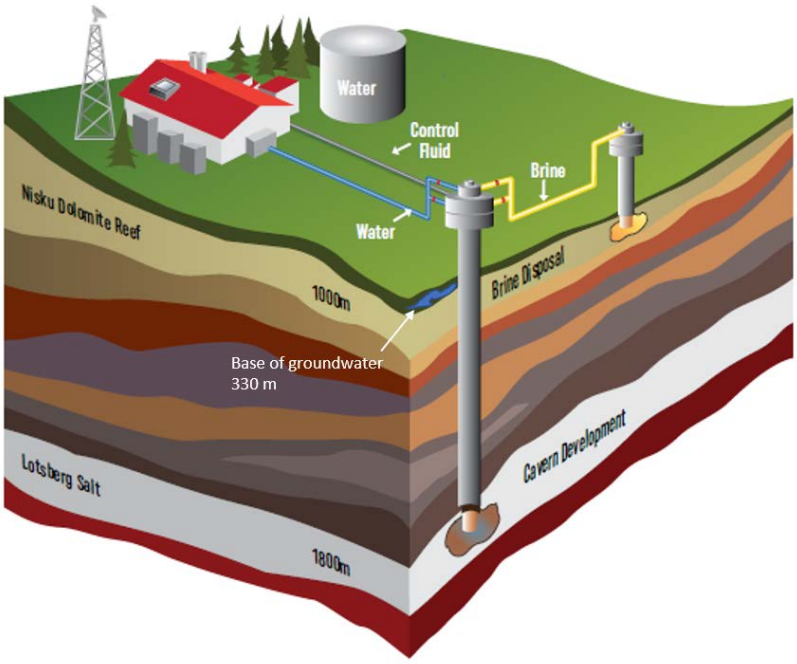
The decommissioning of the salt caverns and associated facilities and infrastructure will include removing all buildings and surface equipment and returning the project site to an equivalent pre-development land capability. The storage caverns will be filled with brine and the wells will be abandoned as per AER requirements.

AES currently manages its asset retirement obligation (ARO) liabilities as per the International Financial Accounting Standards (IFRS), the AER's *Directive 001 Requirements for Site-Specific Liability Assessments in Support of the ERCB's Liability Management Programs* (AER 2012), *Directive 006: Licensee Liability Rating (LLR) Program and Licence Transfer Process* (AER 2016a) , *Directive 011: Licensee Liability Rating (LLR) Program: Updated Industry Parameters and Liability Costs* (AER 2015), and *Directive 024 Large Facility Liability Management Program* (AER 2016b).

9.5 Background: Underground Cavern Development and Operation

Salt caverns are developed in an underground salt layer formation deep below the ground surface. The salt layer is accessed by drilling from the surface down to the required depth in the formation. The well is then completed for water injection, and cavern development can commence, as shown in Figure 5. Surface facilities required for cavern development are fresh water pumps and a pipeline from a water source to the cavern wells, a brine disposal pipeline from the cavern wells to the disposal wells, and control fluid handling facilities. The AES caverns will be developed approximately 1,800 m below surface (top of cavern) and approximately 1,500 m below shallow groundwater.

Figure 5: Solution Mining Process (not to scale)



A salt cavern is formed by dissolving the natural salt below surface in a process known as solution mining, or cavern washing. This process involves injecting water down a completed well and into the salt layer, where the water dissolves the salt, creating a void (cavern) in the salt layer. As new water is injected, the brine (a solution of salt dissolved in water) that is formed is then displaced back up to surface and down a disposal well (refer to Figure 5 and Figure 1 of Figure 6).

The disposal well is completed into a disposal formation at a depth of about 1,000 m, which is significantly below surface so there would be no interaction with surficial features or fresh groundwater.

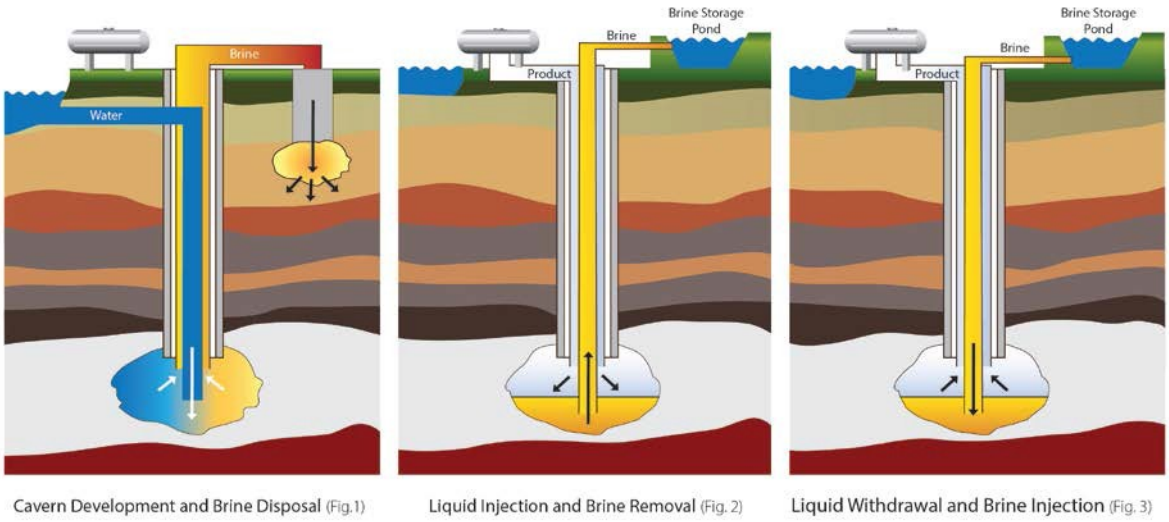
At the onset of the development of a cavern, a solution mining program is developed to control the flow of the water to the well to obtain the desired cavern shape. Periodic testing is completed throughout the washing phase to monitor the size and shape of the cavern and evaluate the results of the program.

The control fluid is comprised of a hydrocarbon liquid that is less dense than water which floats on the brine. It is pumped into the cavern during the washing process to help protect and shape the roof section of the cavern. The amount of control fluid used is governed by the wash program, with all of the fluid being removed prior to commencing full storage operations.

The washing process continues until the desired cavern size and shape are obtained. Cavern integrity is then verified, and product storage operations can commence once the product handling surface facilities are completed.

During operation of the storage caverns, saturated brine is used to facilitate the movement of the storage product and ensure that cavern integrity is maintained. The cavern is initially filled completely with brine prior to beginning storage operations. As product is pumped into the cavern, brine is displaced and is stored in a surface level brine pond (refer to Figure 2 of Figure 6). When product is withdrawn from the cavern, brine is pumped into the cavern and product is displaced up the storage well to the surface for transport (refer to Figure 3 of Figure 6). The cavern is kept full of liquid at all times to maintain pressure in the underground structure and to avoid movement of the salt that could compromise the integrity of the cavern.

Figure 6: Cavern Development and Operation



10. ESTIMATED MAXIMUM PROJECT CAPACITY

An estimate of the maximum production capacity of the project and a description of the production processes to be used.

The target size of each of the four underground storage caverns is 120,000 m^3. Each cavern will have a working storage capacity of approximately 100,000 m^3. Working storage capacity is limited by the sump at the bottom of each cavern, which is taken up by brine fluid, preventing the full cavern volume from being utilized for storage of NGL product.

With the exception of brine to be used in the ongoing operation of the Project, no production of any materials or substances will occur as part of the project. All NGL products stored in the proposed salt caverns will be produced and consumed by third parties. Product will be conveyed from a third-party location via pipeline to the caverns and injected. When NGLs are injected, brine is displaced and pumped to the surface where it undergoes a de-gasification process and is stored in the brine pond. Brine is re-injected when the customer requests withdrawal of their NGLs. A sufficient quantity of brine will be retained on site in a brine pond to enable the injection and withdrawal of NGLs from the caverns.

11. PROJECT SCHEDULE

The anticipated schedule for the project's construction, operation, decommissioning and abandonment, including any expansions of the project.

The proposed Project is planned to be in service by Q2 2024. Construction of the Project is planned to commence in Q2 2020 by drilling wells and beginning the solution mining process. Construction of surface facilities (i.e. the product handling facility and brine pond) would commence in 2022.

Site preparation would begin in Q2 2021 with the first three caverns planned to come on stream in Q2 2024. The caverns are planned to be drilled in phases. The first cavern is planned to be drilled in Q3 2021, with the second and third caverns planned for Q1 2022. The fourth cavern is expected to follow in Q2 2022. Washing would occur from Q2 2022 to Q3 2023.

Construction of the product handling facility is expected to commence in Q2 2022 and construction of the brine pond is expected to commence in Q3 2022. The majority of the construction is expected to be completed by the end of 2023 with tie-ins and commissioning planned to occur in Q4 2023 and Q1 2024.

The anticipated schedule for the Project is shown in Table 4. A drill and wash date for the fourth cavern has not been confirmed, however it would occur after the drill and wash dates for the first three caverns.

Table 4: Project Schedule

Key Project Phase	Start	Finish
Prepare site (grading and leveling)	Q3 2021	Q3 2021
Construct cavern washing pipelines	Q3 2021	Q1 2022
Drill Disposal Well	Q4 2021	Q4 2021
Drill Cavern Well #1	Q3 2021	Q1 2022
Drill Cavern Well #2	Q1 2022	Q1 0222
Drill Cavern Well #3	Q1 2022	Q2 2022
Drill Cavern Well #4	Q2 2022	Q3 2022
Construct Product Handling Facility	Q3 2022	Q4 2023
Construct brine pond and pump house	Q3 2022	Q4 2023
Construct connecting pipelines	Q2 2023	Q4 2023
Commissioning	Q4 2023	Q2 2024
Begin commercial operation	Q2 2024	2049
Decommission and abandon[1]	2049	-

[1] *Decommissioning and abandonment is based on a 25-year lifespan of the salt caverns.*

12. PROJECT ALTERNATIVES

A list of (a) potential alternative means of carrying out the project that the proponent is considering and that are technically and economically feasible, including through the use of best available technologies; and
(b) potential alternatives to the project that the proponent is considering and that are technically and economically feasible and directly related to the project.

Typically, when geology favours development of salt caverns, it is the preferred method for NGL storage (US Department of Energy 2017). Alternatives to the storage of NGL products in salt caverns include above ground storage in pressurized vessels or refrigerated tanks. AES is not considering these alternatives to the proposed Project for the following reasons:

- The proposed Project will require approximately 400,000 m^3 of NGL product storage capacity. To store NGLs in pressurized vessels, the land needed for this volume of NGL product storage would significantly increase the project's footprint. Approximately 200 storage bullets would be required to store the same volume as one cavern.

- To store NGLs in refrigerated tanks, a substantial amount of energy would be required to cool, continually refrigerate, and reheat the NGL product for storage purposes.

- Above ground storage tanks would require pressure relief systems, resulting in increased fugitive emissions from the project that would not occur with storage in underground caverns.

- Use of above ground storage presents the risk of vessel failure and accidental release of NGL product to the environment.

The project, as proposed was chosen over the alternative means presented in this section for safety, environmental and financial reasons. Salt caverns are considered the safest way to store large volumes of NGLs. The products are contained approximately 1,800 m below ground in impermeable salt formations, with only limited surface footprint and facilities. The deep subsurface nature of caverns reduces the number of environmental and health receptors that could be impacted by the project than if surface infrastructure was selected. These factors, in combination with the additional cost, energy and land footprint that would be required for surface storage are the main reasons salt caverns are the preferred storage method for large volumes of NGLs.

As of 2018, Alberta had approximately 28.4 million barrels of NGL storage capacity in above and below ground facilities (CERI 2018). These facilities are mainly clustered around the market hubs, pipeline connections, and fractionation facilities near Edmonton and the Alberta Industrial Heartland. Approximately 24 million barrels of storage capacity consists of underground salt caverns and the remaining 4.4 million barrels of capacity are in above ground tanks (CERI 2018).

Alternative means of carrying out the project currently under consideration include:

- The use of electric pumps for the injection and withdrawal of product from the caverns. The use of electric pumps over natural gas engine driven pumps reduce emissions associated with the project.
- The specific locations of the brine pond and product handling facility within the Project site
- The use of low emissions calcium chloride dehydration of NGL product versus molecular sieve dehydration which requires greater energy input.
- The need for a gas chromatograph to measure the composition of the product received and delivered from the storage facility

PART C: LOCATION INFORMATION AND CONTEXT

13. GEOGRAPHIC INFORMATION

A description of the project's proposed location, including
(a) its proposed geographic coordinates, including, for linear development projects, the proposed locations of major ancillary facilities that are integral to the project and a description of the spatial boundaries of the proposed study corridor;
(b) site maps produced at an appropriate scale in order to determine the project's proposed general location and the spatial relationship of the project components;
(c) the legal description of land to be used for the project, including, if the land has already been acquired, the title, deed or document and any authorization relating to a water lot;
(d) the project's proximity to any permanent, seasonal or temporary residences and to the nearest affected communities;
(e) the project's proximity to land used for traditional purposes by Indigenous peoples of Canada, land in a reserve as defined in subsection 2(1) of the Indian Act, First Nation land as defined in subsection 2(1) of the First Nations Land Management Act, land that is subject to a comprehensive land claim agreement or a self-government agreement and any other land set aside for the use and benefit of Indigenous peoples of Canada; and
(f) the project's proximity to any federal lands.

The geographic centre of the proposed Project area is Latitude 53^{o} 47' 27.23 and Longitude 113^{o} 02' 45.13".

The Project is located approximately 14 km northeast of the City of Fort Saskatchewan and approximately 30 km north of the City of Edmonton, in Strathcona County, Alberta and within the Alberta Industrial Heartland which is zoned for heavy industrial development. The Project is located approximately 500 m north of secondary Highway 15 and will be located within SW-34-55-21-W4M and NW-27-55-21-W4M.

The proposed Project will be developed on private lands owned by AES. AES holds the land title (fee simple) for SW 34-55-21 W4M and NW 27-55-21-W4M. Copies of the legal title for the land parcels are provided in Appendix A.

The caverns will be developed in the Lotsberg Salt Formation at SW 34-55-21 W4M where AES holds Special Mineral Lease No. 3712020336. The development area of the Project is approximately 320 hectares in size (2 quarter sections) and the Project footprint is approximately 15 ha.

The closest community to the Project is the Town of Bruderheim, which is approximately 5 km east of the Project area. There are several residences within 1.6 km of the Project. The Project will be adjacent to AES's existing and operational Strathcona Salt Cavern Storage Facility. Proximity of the project site to nearby residences and communities is shown in Figure 7. Nearby energy infrastructure, occupied residence, and archaeological sites are shown in Figure 8.

ATCO Energy Solutions is not aware of Traditional Land Use within the Project area. The proposed Project is located in Métis Harvesting Area D, which extends from the east to the west of the province and from near Ponoka as the southernmost extent to north of Conklin. No lakes or rivers where Métis Harvesting is permitted are located within 10km of the Project area (GoA 2019).

The closest First Nation reserve is the Alexander Cree Nation, approximately 50 km northwest of the Project area. The closest federal lands to the Project are Elk Island National Park, located approximately 13 km to the southeast of the Project area. First Nations reserves are shown in Figure 8. Environmentally Sensitive Areas, Federal Lands, and Airports are shown at a smaller scale in Figure 9. Note that due to the scale, no First Nations reserve lands are visible in Figure 9.

AES acknowledges that many of the Indigenous communities engaged as part of the project have harvested, fished, or hunted in the AIH area in pre- or post-contact eras and have ancestral connections to the land. Although the landscape has changed through cultivation and later development, members of Indigenous Communities may still feel connections to the area.

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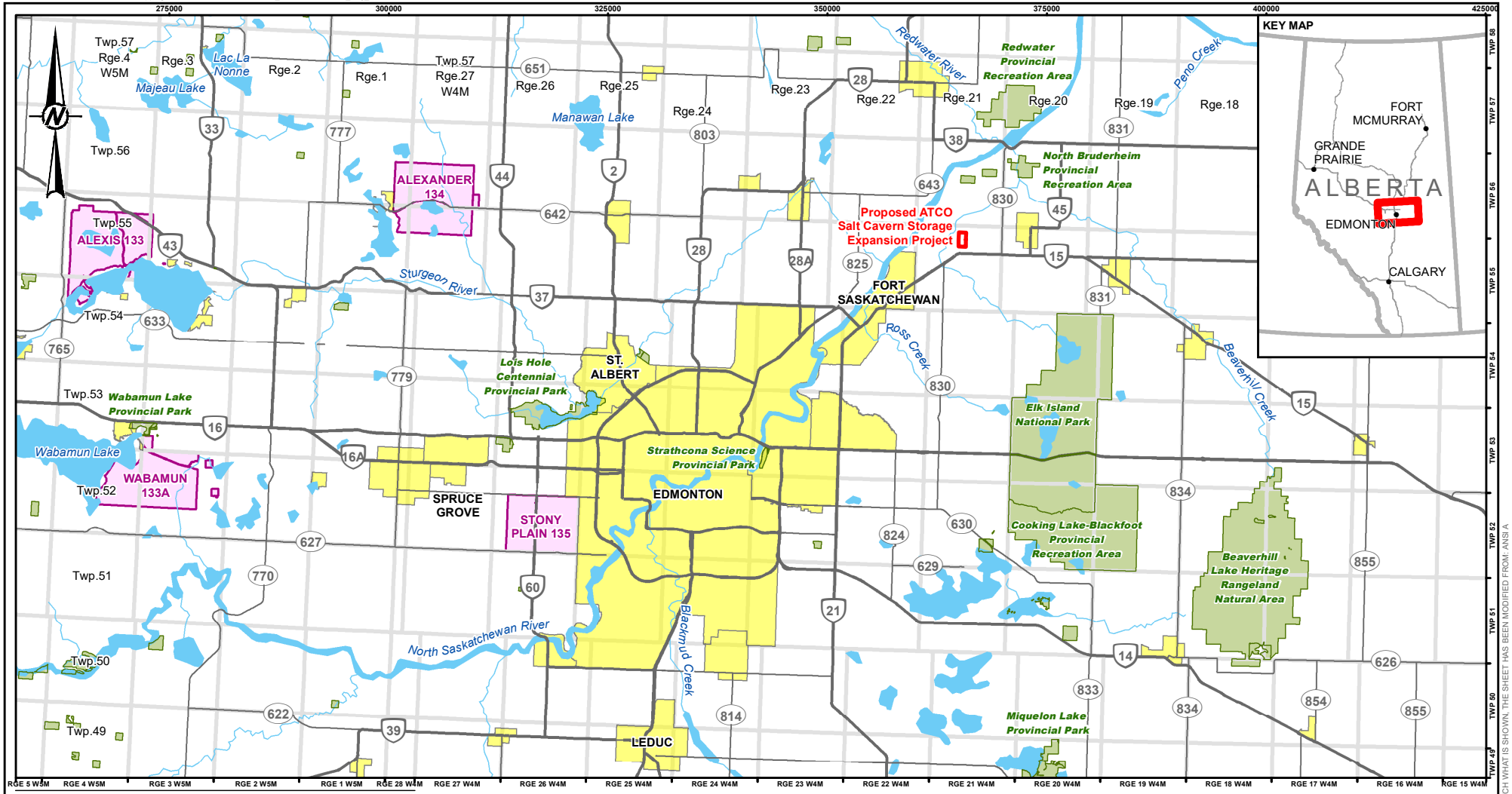

LEGEND

- PROJECT AREA
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- WATERCOURSE
- FIRST NATION RESERVE
- PARK / PROTECTED AREA
- POPULATED PLACE
- WATERBODY

0 10 20

1:650,000 KILOMETRES

REFERENCE(S)

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ATCO ENERGY SOLUTIONS

CONSULTANT
GOLDER

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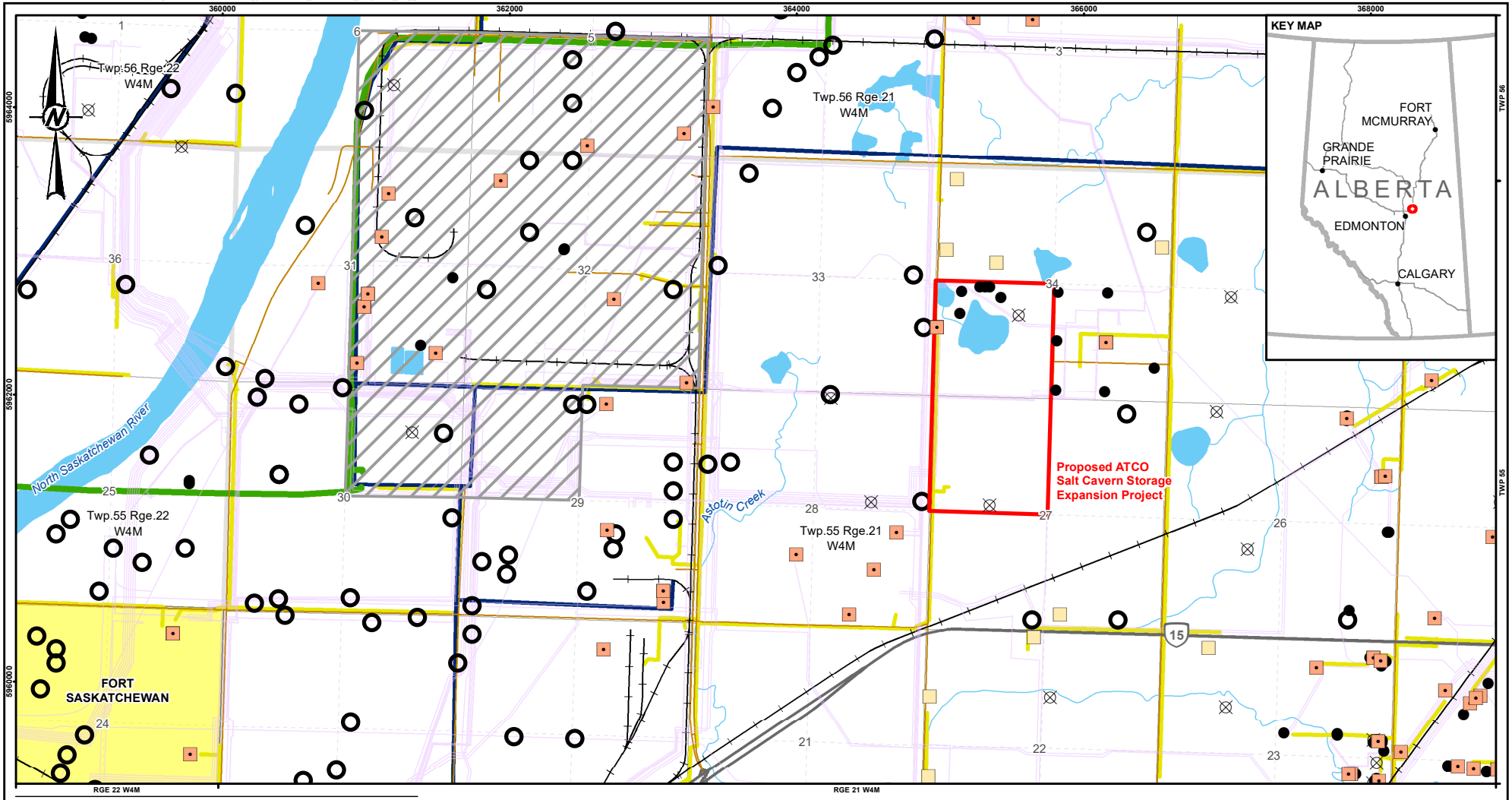

LEGEND

- ABANDONED OIL/GAS WELL
- ACTIVE OIL/GAS WELL
- HISTORIC RESOURCE SITE
- OIL/GAS FACILITY
- RESIDENCE

TRANSMISSION AND DISTRIBUTION LINE TYPES

- 240 kV
- 138 kV
- 13.8 kV or 25 kV
- INDUSTRIAL SITE
- PROJECT AREA

- PIPELINE
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- LOCAL ROAD
- RAILROAD
- WATERCOURSE
- WATERBODY

0 1 2
1:40,000 KILOMETRES

NOTE(S)

AVERTISSEMENT : CE DOCUMENT CONTIENT DES INFORMATIONS SENSIBLES SUR LES RESSOURCES HISTORIQUES QUI SONT PROTÉGÉES EN VERTU DES DISPOSITIONS DE LA LOI SUR LES RESSOURCES HISTORIQUES DE L'ALBERTA. CES INFORMATIONS DOIVENT ÊTRE UTILISÉES UNIQUEMENT POUR AIDER À LA PLANIFICATION DU PROJET PROPOSÉ. ELLES NE DOIVENT PAS ÊTRE DIFFUSÉES, ET AUCUNE COPIE DE CE DOCUMENT NE DOIT ÊTRE FAITE SANS L'AUTORISATION ÉCRITE DE HISTORIC RESOURCES MANAGEMENT BRANCH, ALBERTA CULTURE, MULTICULTURALISM AND STATUS OF WOMEN.

REFERENCE(S)

LISTING OF SIGNIFICANT HISTORICAL SITES & AREAS, OCTOBER 2020 EDITION, OBTAINED FROM ALBERTA CULTURE AND TOURISM. OIL AND GAS FACILITIES (OCTOBER 27, 2020) OBTAINED FROM IHS MARKIT CANADA ULC. OIL AND GAS WELLS (NOVEMBER 18, 2020) OBTAINED FROM ALBERTA ENERGY REGULATOR. RAILROADS, LOCAL ROADS AND HIGHWAYS, WATERCOURSES AND WATERBODIES OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. POPULATED PLACES © GOVERNMENT OF ALBERTA 2020. ALL RIGHTS RESERVED. RESIDENCES OBTAINED FROM STANTEC (2014).
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT
ATCO ENERGY SOLUTIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2021-01-08
DESIGNED	SL
PREPARED	AB
REVIEWED	SL
APPROVED	TC

PROJECT
PROPOSED ATCO SALT CAVERN STORAGE EXPANSION PROJECT

TITLE
ENERGY INFRASTRUCTURE, OCCUPIED RESIDENCES AND ARCHAEOLOGICAL SITES

PROJECT NO.	CONTROL	REV.	FIGURE
20147838		0	8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI A
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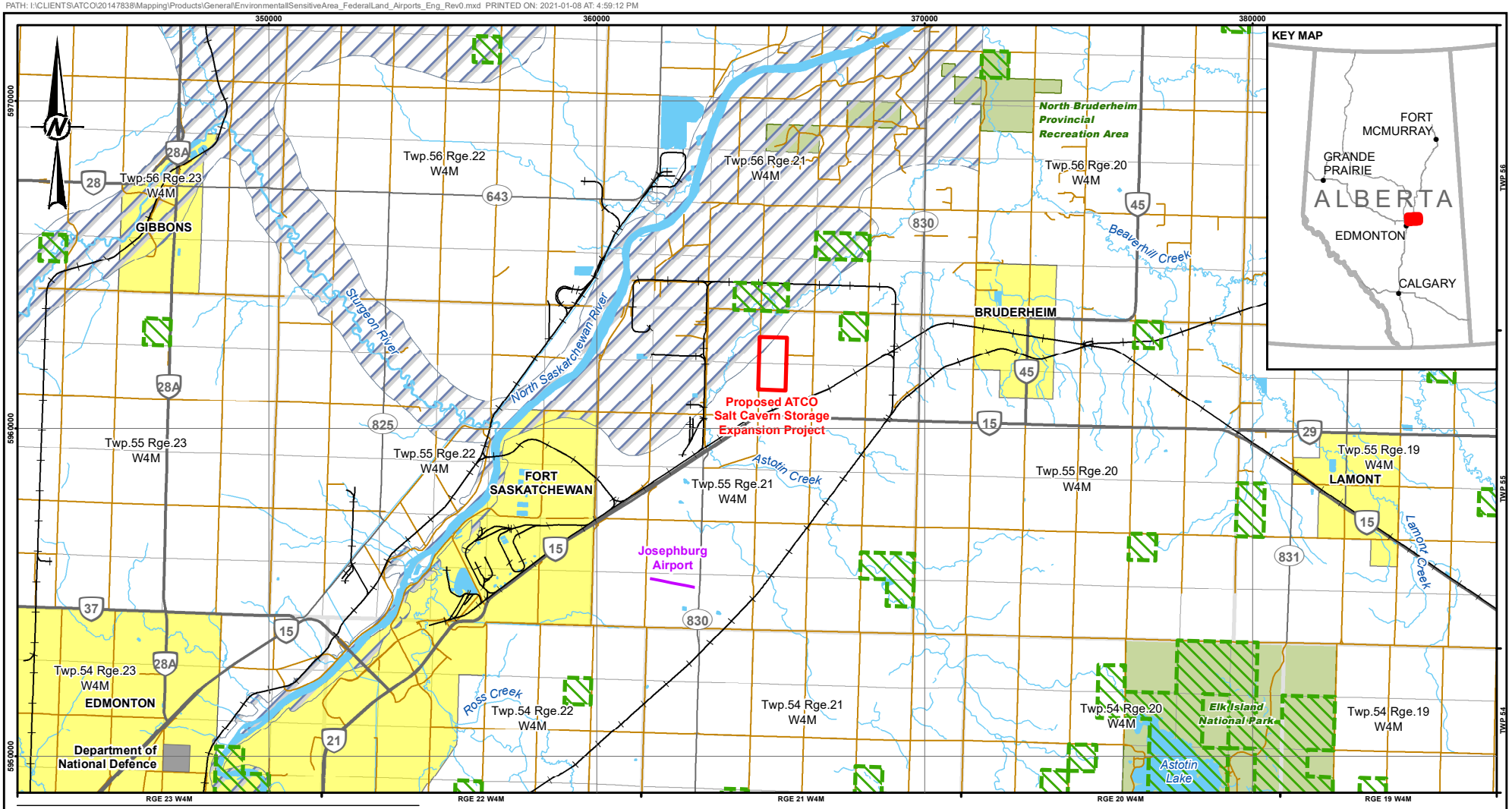

LEGEND

- PROJECT AREA
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- LOCAL ROAD
- RAILROAD
- RUNWAY
- WATERCOURSE
- ENVIRONMENTALLY SENSITIVE AREA
- FEDERAL MILITARY LAND
- KEY WILDLIFE AND BIODIVERSITY ZONE
- PARK / PROTECTED AREA
- POPULATED PLACE
- WATERBODY

0 5 10

1:175,000 KILOMETRES

REFERENCE(S)

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PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT
ATCO ENERGY SOLUTIONS

CONSULTANT
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YYYY-MM-DD	2021-01-08
DESIGNED	SL
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PROJECT
PROPOSED ATCO SALT CAVERN STORAGE EXPANSION PROJECT

TITLE
ENVIRONMENTALLY SENSITIVE AREAS, FEDERAL LANDS AND AIRPORTS

PROJECT NO.	CONTROL	REV.	FIGURE
20147838		0	9

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI A

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14. PHYSICAL ENVIRONMENT

A brief description of the physical and biological environment of the project's location, based on information that is available to the public.

The proposed Project is located in the Dry Mixedwood Natural Subregion of the Boreal Forest Natural Region and the Central Parkland Natural Subregion of the Parkland Natural Region of Alberta (Natural Regions Subcommittee 2006).

The Dry Mixedwood Natural Subregion is characterized by level to gently undulating glacial till or lacustrine plains. It has the warmest summers of the Boreal Region and the most days favourable to plant growth (Natural Regions Committee 2006). Aspen stands (*Populus tremuloides*) and cultivated landscapes, with fens in the low-lying areas dominate this landscape. Jack pine (*Pinus banksiana*) stands with lichen in the understory occupy dry, rapidly drained eolian or glaciofluvial deposits. In areas where water is in slightly greater quantity, the dominant stand types consist of mixed jack pine, aspen and white spruce (*Picea glauca*) in pure or mixed formation (Natural Regions Subcommittee 2006).

The Central Parkland Natural Subregion is the most densely-populated region in the province, and most of its native vegetation has been altered by human development. Groves of aspen and balsam poplar (*Populus balsamifera*) are intermixed with grasslands and depressional wetlands (Natural Regions Subcommittee 2006). Temperature, precipitation and growing seasons are characterized as intermediate between the dry, warm grasslands to the south and the cooler, moist boreal forests to the west and north.

The Project is located in the AIH and is surrounded by a number of petroleum, petrochemical, and chemical facilities that contribute to the overall emissions inventory in the region. The climate and meteorology in the AIH exhibit a general tendency for regional winds from the northwest, due to the proximity to the North Saskatchewan River. Wind speeds in the exposed rural areas of the AIH average from 3.2 to 3.6 m/s (11 to 13 km/h). Annual precipitation across the AIH is uniform (Jacques-Whitford & RWDI 2007).

Wetlands are common, occupying approximately 10% of the subregion. Marshes, willow shrub lands and seasonal ponds are the most common types of wetlands encountered (Natural Regions Committee 2006).

The Project area is located within the North Saskatchewan River watershed in an area of relatively flat topography with localized depressional features. Local topographic relief is relatively low, and generally slopes northwest towards the North Saskatchewan River located approximately 4,500 m west-northwest of the site. At the edge of the river valley, the topography slopes steeply toward the river (approximately 30% slope).

At the time of the wetland assessment site visit in August 2020, the Project area was composed of the existing Strathcona Salt Cavern Storage Facility surface infrastructure and agricultural land. Given the extensive existing disturbance across and in the vicinity of the Project area, and the agricultural ground cover, these lands are considered to have low potential habitat value for wildlife, and limited potential to support rare plant species. Environmentally Sensitive Areas and Federal Lands are shown in Figure 9.

The topography in the general area of the Project is gently undulating. The Quaternary deposits in the region consist of pre-glacial, lacustrine, aeolian, and fluvial deposits. The pre-glacial Beverly Channel, which has been infilled with sand and gravel deposits (Empress Formation), is the most widely used aquifer in this area.

The Project site is located within the boundaries of the North Saskatchewan Air Zone, which includes both the Capital Region Airshed Zone and the Fort Air Partnership (FAP) Airshed Zone. The North Saskatchewan Air Zone is characterized by a strong industrial base of oil refineries, chemical manufacturing, and power generation. Future industrial activity in the region is also expected to include NGL terminalling and processing as well as additional bitumen upgrading. Current industrial activity, in combination with vehicle use, home heating and urban activity, results in local and regional emissions of NO_2, SO_2, $PM_{2.5}$ and O_3.

The AIH climate is generally characterized by mild summers and cold, relatively dry winters. The Köppen-Geiger climate classification system identifies the region as a Dfc, which is a sub-arctic climate characterized by snow in the winter, generally humid, with cool summers (Kottek et al. 2006). ECCC maintains a network of climate stations across the country and the station at Fort Saskatchewan provides information on the local climate. Based on a 30-year data record, the most recent of which is publicly available is the 1981 to 2010 period, climatic conditions shown in tables 5 and 6.

Table 5: Regional Temperature Extremes and Averages, 1981 - 2010

Temperature (°C)	
Extreme maximum	36.5°
Extreme minimum	-45.6°
Warmest average month	July, 17.1°
Coldest average month	January, -17.3°
Average annual number of frost-free days	117 days

Source: ECCC 2020a

Table 6: Regional Precipitation Extremes and Averages, 1981 - 2010

Precipitation	
Average annual rainfall	345 mm
Average annual snowfall	109.7 cm
Average total precipitation	454.6 mm
Wettest average month	July, 92.0 mm
Driest average month	December, 20.2 mm

Source: ECCC 2020a

Wind data are not reported from the Fort Saskatchewan station, but are available from a station approximately 20 km to the east located in Elk Island National Park. Winds recorded at Elk Island station show an average annual wind-speed of 6.4 kilometres per hour (km/hr) and little variability by month, ranging from a high of 7.7 km/hr in May, to a low of 5.4 km/hr in August.

The FAP monitors air quality in the region through ten continuous ambient air quality monitoring stations. In 2019, FAP also operated a regional passive monitoring network, monitoring for sulphur dioxide (SO_2) and hydrogen sulphide (H_2S). During 2019, one hundred fifty-one (151) 1-hour exceedances of Fine Particulate ($PM_{2.5}$), H_2S, and Ozone (O_3) parameters were reported (FAP 2019). Of these 151 exceedances, four were attributed to local industry. The largest contributor to 1-hour exceedances in 2019 was wildfire smoke, with ninety-nine (99) recorded exceedances. In 2019, thirty-eight (38) 24-hour exceedances of parameters were reported. Of these 38 exceedances, one was attributed to local industry (FAP 2019). The largest contributor to 24-hour exceedances was wildfire smoke, with 17 recorded exceedances (FAP 2019).

In general, air quality in the FAP is good, with monitoring stations reporting Air Quality Health Index Low Risk levels between 85 to 100% of the time (FAP 2019). No station exceeded more than 0.051% of time in the High-Risk category and no station exceeded more than 0.07% of time in the Very High-Risk category (FAP 2019). In 2019, FAP monitoring stations captured 56,085 hours of air quality data (FAP 2019).

The Project is within the North Saskatchewan River watershed, which is part of the Saskatchewan River Basin. The North Saskatchewan River is a glacier-fed river that flows east from the Canadian Rockies to central Saskatchewan. The Project area is located approximately 5 km east of the North Saskatchewan River and east of the lower portion of Astotin Creek in an area consisting of agricultural field and mixed industrial land use. Astotin Creek is the closest permanent water body which supports fish and fish habitat, as defined by the *Fisheries Act*, and aquatic life, as defined by the *Species at Risk Act*. Astotin Creek is located approximately 200 m from the Project area boundary.

Fish inventories of Astotin Creek have shown presence of small-bodied fish, including brook stickleback (*Culaea inconstans*), fathead minnow (*Pimephales promelas*), and one large-bodied fish, white sucker (*Catostomus commersonii*; FWMIS 2021). No sport fish have been reported and Astotin Creek is not stocked (FWMIS 2021). No benthic invertebrate surveys for Astotin Creek are available for public review. Although no sensitive species have been identified in Astotin Creek, it drains into the North Saskatchewan River Watershed. The North Saskatchewan River supports habitat for lake sturgeon (*Acipenser fulvescens*), a species that is designated as Threatened under Alberta's Wildlife Act and recommended by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to be designated Endangered under the *Species at Risk Act* (SARA). The designation of Endangered status under SARA is pending (GoA 2021). The lake sturgeon is considered At-Risk by DFO (DFO 2021).

There are no surface waterbodies or watercourses present on the Project site. There are 15.58 hectares of wetlands within the Project area and a 0.10-hectare ephemeral (Class I) water body (Golder 2020). The majority of the wetlands are Graminoid Marsh. Wetland W3, a 5.22-hectare wetland in the centre of SW 34-55-21 is Crown claimed and AES has retained this wetland for drainage.

The Government of Alberta has implemented the Water Management Framework for the Industrial Heartland and Capital Region (the WMF; AEP 2016). The goal of the WMF is to improve water quality in the North Saskatchewan River by minimizing load discharge, setting contaminant concentration thresholds in the Devon to Pakan reach of the North Saskatchewan River, and assigning values to contaminant concentration thresholds to inform management responses (AEP 2016). The WMF seeks to minimize impacts to water quantity by optimizing the use of existing and new withdrawal infrastructure and increasing the use of retained water (AEP 2016).

The Project area offers limited high-quality wildlife habitat given its level of agricultural and industrial development. Cultivated land typically provides low suitability habitat for wildlife, however, the following species can potentially be found:

- Canada goose (*Branta Canadensis*) may use cultivated fields during migration
- Diurnal and nocturnal raptors such as Swainson's hawk (*Buteo swainsoni*) or great gray owl (*Strix nebulosa*), both listed as sensitive (AEP 2015), may use the Project area to forage for small rodents
- Ungulates may use the Project area for feeding and traveling
- Small mammals may use the Project area for traveling and foraging

No terrestrial wildlife species have been reported in the Project area during previous wildlife inventories. Four bird species, black-throated green warbler (*Dendroica virens*), Clark's nutcracker (*Nucifraga columbiana*), sora (*Porzana Carolina*), and white-winged scoter (*Melanitta fusca*), have been reported in the Project area during previous wildlife inventories (FWMIS 2021). All four species are considered sensitive in Alberta (GoA 2015). None of the species observed on the site have been assessed by COSEWIC, nor are they listed as Extirpated, Endangered, Threatened, or Special Concern under SARA.

Approximately 10 hectares in the northwest corner of SW-34-55-21-W4M sits within a Key Wildlife Biodiversity Zone (KWBZ) and the Project area sits within Environmentally Significant Area (ESA) 454 (refer to Figure 9; ESRD 2009).

- KWBZs are areas identified by AEP as having high biodiversity potential and/or being key ungulate winter habitat. Restricted activity periods apply to all projects in the KWBZs.
- ESAs are locations that are essential for the conservation of biodiversity in Alberta. The site is within ESA 454, a provincially important ESA located within the Boreal Natural Region and established for the protection of provincially listed vascular plants and mosses.

Although a portion of the Project site is within a KWBZ and ESA 454, the lands have been disturbed by development of the existing Strathcona Salt Cavern Storage facility and by long-term agricultural activity. There is no high suitability habitat present for ungulates or extensive native vegetation. The Project area is identified as having low wildlife habitat suitability on the basis that that the surrounding area is heavily industrialized, with a major industrial complex located nearby. The proposed Project is located in an area that has been under cultivation for more than 40 years, with virtually all native habitats having been displaced.

15. HEALTH, SOCIAL AND ECONOMIC CONTEXT

A brief description of the health, social and economic context in the region where the project is located, based on information that is available to the public or derived from any engagement undertaken.

Health Context

The most recent census data available for review was the Strathcona County Census 2018. The 2020 Census was cancelled in response to the state of public health emergency declared by the Government of Alberta in response to the COVID-19 pandemic (Strathcona County 2020a). In 2018, the total population of Strathcona County was 98,381, with 71,332 people living in Sherwood Park (the Urban Service Area) and 27,049 living outside of Sherwood Park in smaller cities and towns, farms, country residential communities, and other hamlets (the Rural Service Area; Strathcona County 2018a).

Strathcona County is located in the Alberta Health Services Edmonton Zone. The Community Profile of Strathcona County excluding Sherwood Park indicates that the long-term health of the population is consistent with the rest of Alberta, with minor deviations between prevalence of chronic health conditions between residents of Strathcona County and the rest of Alberta (Alberta Health Services 2019). The leading causes of mortality in Fort Saskatchewan are neoplasms (e.g., cancer), circulatory disease, and external causes (i.e., injuries). This is consistent with the mortality rate of the province of Alberta, with slightly higher incidences of neoplasms and circulatory system mortality in the Rural Service Area versus Alberta and a slightly higher incidence of external causes for the province of Alberta compared to the Rural Service Area (Alberta Health Services 2019).

Residents within the Edmonton Zone have access to numerous patient services, with most services located within the urban centres. Approximately 99% of the residents of the Rural Service Area of Strathcona County receive medical care from outside their geographic zone. There are 0.0 family physicians per 1,000 people within the Rural Service Area (Alberta Health Services 2019). The closest hospital to the project is the Fort Saskatchewan Community Hospital, offering a range of acute and outpatient care.

In Alberta, Health indicators are aggregated at the Alberta Health Services Zone-level. The statistics provided in this section apply to the Edmonton Zone, which includes the City of Edmonton and Strathcona County, Sturgeon Count East Sturgeon County West, Beaumont, Luduc & Devon, Thorsby, Westview and the cities of Sherwood Park, Stony Plain & Spruce Grove, and St. Albert (Alberta Health Services 2019). Prevalence of obesity and overweight health indicators in the Edmonton Zone are consistent with Alberta averages, with a slightly higher prevalence of obesity in men in the Edmonton Zone (26.6% versus 23.3% province-wide; Alberta Health Service 2019).

Self-perceived mental health indicators in the Edmonton Zone are consistent with the rest of Alberta, with approximately 70% of respondents at a local and provincial level reporting that they consider themselves to be in excellent or very good health (Alberta Health Services 2019). The most common mental health services accessed in the Edmonton Zone are outpatient community mental health treatment services. Approximately 93% of mental health services accessed were outpatient community mental health treatment service. Slightly fewer Edmonton Zone residents accessed addiction residential treatment and detox services in comparison to all of Alberta. Slightly more residents of the Edmonton Zone accessed opioid dependency programs than in comparison to all of Alberta (Alberta Health Services 2019).

No impacts to human health are predicted as a result of the proposed Project.

Four new operators are expected to be hired as a result of this Project. ATCO's priority is always safety, and all employees support and adhere to our core value of "Safety First, Always." Safety is the first consideration in everything we do and factors into every business, construction and operational decision made and every action taken to ensure that we conduct our operations in a safe, responsible manner. We believe that a job can only be done if it can be done safely and with a mind to operational sustainability. AES has a comprehensive health and safety management system and our health and safety policies and procedures are continually improved to ensure the protection of our employees and contractors, and the public.

As a critical infrastructure provider, ATCO is also committed to responsible development and environmental and social sustainability. We care for the natural, cultural and historical resources of the communities in which we work and serve and understand that our success depends on our ability to operate in a sustainable and responsible manner, today and in the future. ATCO considers the environment in our designs and works to minimize any adverse environmental impacts from our operations. As part of our annual Stewardship Report we share key metrics demonstrating our commitment to our collaborative and long-term approach to environmental stewardship. Key metrics from 2019 include:

- Since 2008, our direct (Scope 1) emissions have reduced by 51% with reductions primarily related to decreased energy output from our electricity generating assets, fuel-switching and other efficiencies;
- A 59% reduction in sulphur oxide emissions and 44% reduction in nitrogen oxide emissions in 2019;
- Fugitive emissions decreased 19% since 2017;
- 775 tonnes of GHG emissions avoided at ATCO operations in 2019 by switching to renewable energy sources.
- 5% hydrogen successfully blended with natural gas as part of the Clean Energy Innovation Hub in Australia, with a long-term goal of blending up to 15% hydrogen.

Social Context

The population of the Rural Service Area has increased by approximately 2,000 or 7.9% since 2005. The population of the Rural Service Area in 2005 was 25,169 and increased to 27,049 in 2018. The median age of Strathcona County inclusive of the Urban Service Area and Rural Service Area increased from 37 in 2005 to 40 in 2018. As of 2014, the average life expectancy of men in Strathcona County was 79.53 years and 84.18 years for women (GoA 2014a). The average life expectancy of men in Canada was 79.7 years and 83.9 years for women (Statistics Canada 2018).

As of 2016, approximately 4% of the population of Strathcona County identified as Indigenous (Strathcona County 2016). This is higher than the Alberta average of 2.8% of the population, however most Indigenous peoples in Strathcona County reside in the Urban Service Area. As of 2016, 0.8% of the Rural Service Area of Strathcona County identified as Indigenous (Alberta Health 2017). There are no First Nations Reserves or Métis Settlements located within the boundaries of Strathcona County.

Of the 97,020 residents of Strathcona County surveyed in the 2016 Canada census, 7,150 identified as visible minorities (Government of Canada 2016). There is no data available on the number of people in Strathcona County who identify as LGBTQ+2S (Sherwood Park News 2020).

The Strathcona County Rural Service Area has a lower percentage (4.9%) of lone-parent families compared Alberta in general (11.5%; Alberta Health Services 2019). Female lone-parent families outnumber male lone-parent families at a rate of nearly 2:1 (4.9% to 2.7%; Alberta Health Services 2019). The Rural Services area also has a lower percentage (7.7%) of after-tax low-income families than Alberta in general (15.6%; Alberta Health Service 2019). Food bank usage statistics for the Rural Service Area are not available, however Strathcona County (Urban Service Area and Rural Service Area) noted an 87% increase in usage of the Strathcona Food Bank from 4,897 visits in 2014 to 9,151 visits in 2017 (Strathcona County 2018b). The increase in food bank usage coincided with the decline in oil prices that impacted oil and gas employment across Alberta.

One women's shelter for abused women and children operates in Strathcona County (A Safe Place 2020). The shelter is located outside of the Rural Service Area. There are no women's emergency centres within the Rural Service Area (GoA 2020a). No seniors' emergency, homeless shelters, second stage (i.e., non-crisis), or long-term supportive housing is available in Strathcona County (GoA 2020a). All types of emergency and homeless shelters are available in Edmonton (GoA 2020a).

ATCO is committed to enhancing and sustaining a workplace culture that is inclusive and diverse and this vision is embedded in ATCO's Core Values of Agility, Caring, Collaboration and Integrity. ATCO believes that organizations with diverse teams perform better and improve creativity and innovation. All employees have the responsibility to maintain an environment that is safe, respectful and productive and everyone has the right to be treated fairly within the workplace in an environment that recognizes and accepts diversity.

While the proposed Project will only result in the addition of approximately four permanent employees, AES is committed to ensuring that our vision for inclusion and diversity remains a key consideration in our hiring process and part of our contractor selection process for construction activities.

ATCO has also long demonstrated that building respectful and mutually beneficial relationships defines how we do business. Along with our Indigenous and community partners, we are continually exploring new ways to collaborate. We recognize the need to continue to work to understand unique perspectives of neighboring communities and Indigenous Peoples and take a long-term approach to building relationships based on trust. As of the end of 2019, we maintain 50 formal JV partnerships, MOUs and other relationships with Indigenous Communities, including some that have lasted decades. In 2019, they generated over $220 million of economic benefits for our Indigenous partners.

Economic Context

The most recent economic information available for Strathcona County is in the 2018 Strathcona County Community Social Profile. It is assumed that the continued depression in global oil and gas prices and economic impacts from the COVID-19 pandemic have also impacted the financial environment in Strathcona County. The primary industry in Strathcona County is petrochemical and hydrocarbon processing. Associated sectors, such as engineering, construction,

manufacturing, business accommodation, and the general service sector are all highly dependent on petrochemical and hydrocarbon processing (Strathcona County 2017).

The median income in Strathcona County is higher than the Alberta and Canada average. The median income of all households in 2016 was $140,039, while the Albertan median was $109,997 and the federal median was $88,306 (Strathcona County 2018b). In 2018, approximately 50% of the population of Strathcona County were employed full or part time. The other 50% included children who were not yet in school, students including K-12 and post-secondary students, retirees, and those who were not in the workforce. (Strathcona County 2018a).

In 2011, 65% of employed residents in Strathcona County worked outside of Strathcona County and 50% of workers employed in Strathcona County did not live in Strathcona County (Strathcona County 2017). Strathcona County's location in close proximity to the capital city of Edmonton and the associated road infrastructure (e.g., Anthony Henday ring road) allows for direct access to and around the Edmonton region, facilitating improved inter-community travel and movement of goods (Strathcona County 2017). Strathcona County is part of the Edmonton Metropolitan Region and is part of the Edmonton Metropolitan Region Growth Plan (EMRB 2017). The Edmonton Metropolitan Regional Structure to 2044 designates much of the south portion of Strathcona County as Zoned and/or Designated Country Residential or Natural Living System (ERMB 2017). The proposed Project is located in a Major Employment Area (ERMB 2017).

The proposed Project is expected to result in four additional full-time operators and an increase in temporary work during the construction period. Where possible, AES will source construction personnel from the local area. Some temporary specialist positions may be filled from outside the region if they cannot be filled locally. During operation of the project, AES will require additional contractor support and will source contractors, maintenance personnel, and other contractors from the local area where practicable.

Expansion of NGL product storage will also indirectly contribute to economic growth in the region as other operators expand their facilities or new facilities are built.

PART D: FEDERAL, PROVINCIAL, TERRITORIAL, INDIGENOUS AND MUNICIPAL INVOLVEMENT AND EFFECTS

16. FINANCIAL SUPPORT FROM FEDERAL AUTHORITIES

A description of any financial support that federal authorities are, or may be, providing to the project.

The Project will be fully funded by the proponent and does not include any proposed or anticipated federal financial support.

17. USE OF FEDERAL LANDS FOR PROJECT

The Project will be constructed on lands owned by AES. There will be no federal lands used for the purpose of carrying out the Project.

18. JURISDICTIONS THAT HAVE POWERS, DUTIES OR FUNCTIONS IN RELATION TO AN ASSESSMENT OF THE PROJECT'S ENVIRONMENTAL EFFECTS.

A list of any jurisdictions that have powers, duties or functions in relation to an assessment of the project's environmental effects.

In addition to the proposed Project being under the jurisdiction of the Impact Assessment Agency, the proposed Project will be subject to approvals required and issued by the Alberta Energy Regulator (AER) under the *Oil and Gas Conservation Act* (OGCA), the *Environmental Protection and Enhancement Act* (EPEA) and the *Water Act*. The Project will also require permitting under the *Municipal Development Act*.

Approvals and licenses required for the salt caverns, brine pond and associated surface facilities for the Project include:

- OGCA requirements under *AER Directive 056: Energy Development Applications and Schedules for the development of energy related infrastructure including wells, facilities and pipelines* (AER 2019)
- OGCA requirements for Scheme Approval for the salt cavern washing and storage programs
- AER *Directive 051*: Injection and Disposal Wells – Well Classifications, Completions, Logging and Testing Requirements (AER 1994)
- Environmental Protection and Enhancement Act (EPEA) Approval to construct, operate and reclaim the brine pond, to be issued by the AER under the Industrial Approval Application (Activities Designation Regulation). This Approval is anticipated to be obtained as an amendment to AES' existing brine pond EPEA Approval.
- Water Act Approval for the purpose of constructing a brine pond pursuant to the *Water (Ministerial) Regulation* and the *Dam and Canal Safety Directive*

Approvals and licenses already in place that will be used as part of the proposed Project include AES' existing Water Act Approval 356745-00-00 for its water intake on the North Saskatchewan River and Water Act Licenses for the diversion of water for the development of salt caverns. AES currently holds Water Act Licence 00346745-00-00 for the purpose of cavern solution mining and Water Act Licence 31016-00-04 for the purposes of industrial processing. AES will not require any additional *Water Act* Licences to divert water for the purposes of the Project.

The Project is also regulated by zoning and development permit requirements administered by Strathcona County and the Municipal Development Plan, under the Municipal Government Act. Preliminary discussions with Strathcona County have occurred regarding the development permit requirements and schedule for the proposed Project. Considerations include, but are not limited to: site grading, access, road use, civil design, structural design, electric design, utilities and traffic impact.

A Historical Resources Act (HRA) clearance application will also be submitted to Alberta Culture for review under the *Historical Resources Act*. The HRA clearance application would encompass all parts of the Project, including the salt caverns, brine pond and surface facilities. AES applied for and obtained HRA clearance for the existing facility on SW 34-55-21 W4M prior to beginning construction. The lands in NW-27-55-23-W4M were previously held by ATCO Power Canada Ltd. (ATCO Power) and historic resources clearance was submitted and obtained in 2014 in support of the Heartland Generating Station, which ultimately was not constructed. As HRA clearance is based on footprint, AES will obtain appropriate clearance for the Project footprint and will follow all guidance from Alberta Culture prior to commencing construction.

A First Nation Consultation Adequacy Assessment will be submitted to the Alberta Aboriginal Consultation Office for their consultation intensity recommendation for the Project. Once a response is provided, AES will follow the recommendation of the Government of Alberta.

Additional provincial regulatory requirements that will be met prior to operation of the Project include:

- AER *Directive 038: Noise Control* (Directive 038; AER 2007)
- AER *Directive 058: Oilfield Waste Management Requirements for the Upstream Petroleum Industry* (Directive - 58; AER 2006) AER *Directive 060: Upstream Petroleum Industry Flaring, Incinerating and Venting* (Directive 060; AER 2020)
- AER *Directive 071: Emergency Preparedness and Response Requirements for the Petroleum Industry* (AER 2017)

No other federal or provincial approval requirements are anticipated for the Project.

PART E: POTENTIAL EFFECTS OF THE PROJECT

19. POTENTIAL EFFECTS ON FISH AND FISH HABITAT, AQUATIC SPECIES AND MIGRATORY BIRDS

A list of any changes that, as a result of the carrying out of the project, may be caused to the following components of the environment that are within the legislative authority of Parliament:

- *fish and fish habitat, as defined in subsection 2(1) of the Fisheries Act;*
- *aquatic species, as defined in subsection 2(1) of the Species at Risk Act; and*
- *migratory birds, as defined in subsection 2(1) of the Migratory Birds Convention Act, 1994.*

Fish and Fish Habitat

There are no fish bearing waterbodies or watercourses present on the Project site. The nearest water body that supports fish and fish habitat is Astotin Creek, located approximately 200 m from the Project area boundary. Fish inventories of Astotin Creek have shown presence of small-bodied fish, including brook stickleback (*Culaea inconstans*), fathead minnow (*Pimephales promelas*), and one large-bodied fish, white sucker (*Catostomus commersonii*; FWMIS 2021). No sport fish have been reported and Astotin Creek is not stocked (FWMIS 2021). No benthic invertebrate surveys for Astotin Creek are available for public review.

The proposed Project is located in the Beaverhill subwatershed of the North Saskatchewan River (NSWA 2021). Although average annual precipitation is generally high in the region, most precipitation occurs between May and September, when potential evapotranspiration is as large as 450 mm. As a result, there is generally little surface runoff. Spring snowmelt is one of the most important contributors to local runoff to wetlands (Ameli and Creed 2017). Subsurface connectivity modeling completed by Ameli and Creed (2017) suggests that subsurface connectivity exists between the North Saskatchewan River and wetlands up to 30 km away. The wetlands within the Project area are recharge wetlands, located less than 5 km away from the North Saskatchewan River. These recharge wetlands and other wetlands up to 30 km away account for a monthly groundwater contribution of 0.775 x 10^6 m^3 to the North Saskatchewan River (Ameli and Creed 2017). Surface connectivity between wetlands in the Project area and the North Saskatchewan River was observed during the period of April 1 to August 1, 2013, when the largest net surface water fluxes occurred since the year 2000. During this time, surface connections between wetlands the North Saskatchewan River range from 50 m to 8 km from the banks of the river (Ameli and Creed 2017). Impacts to fish and fish habitat through hydrologic connectivity between wetlands, the North Saskatchewan River, and tributaries of the North Saskatchewan River are not expected, as surface connectivity is low in most conditions and recharge mainly occurs through shallow groundwater infiltration.

Most surface water connectivity will actually occur through low shallow groundwater transmission with very limited surface flow to waterbodies outside of the Project area. No impacts to fish and fish habitat as a result of surface runoff is anticipated as runoff water collected in the wetlands and stormwater management facilities for the Project site is expected to stay on the Project site. No runoff will be released to the environment until it has met the AEP parameter/concentration limits. Typical parameters for industrial runoff are pH, oil and grease, total suspended solids,

chemical oxygen demand, ammonia nitrogen, and chloride. Runoff that does not meet these parameters or concentration limits will be stored on site and disposed of at a licensed facility.

The general direction of surface drainage in the area surrounding the Project is to the northeast, toward Astotin Creek. Within the Project area approximately 87.7 hectares of the surrounding topography drains into the onsite wetland (W3; Associated Engineering 2020). Water directed to the wetland is generally surface drainage after snowmelt or a precipitation event. Water will enter the wetland through the vegetated fringe surrounding the wetland, slowing the introduction of suspended solids in wetland W3 during a runoff event.

Due to the large amount of storage available in the wetland, it is expected to be isolated most of the time and connection of the wetland to the northwest of the Project area (refer to Figure 2) is expected to be very infrequent or not happen at all. The typical mechanism of drawdown of the wetland is infiltration and evaporation. In the unlikely event that enough runoff accumulates during a major precipitation event (i.e. greater than 1 in 100-year volumes) to connect the on-site wetland with the wetland to the north of the Project site, flows would eventually make their way north to Astotin Creek through a series of wetlands (Stantec 2014a). AES monitors wetland W3 levels as part of its existing operations and has the ability and authorization to divert water from the wetland prior to any potential for impact from high water levels to prevent any flows from wetland W3.

Introduction of contaminants to wetland W3 is not anticipated. All process wastes will be stored in appropriate containers and potential contaminants from accidental releases will be prevented by installing appropriate primary and secondary containment. This includes grading the product handling facility site to an onsite catchment basin and primary and secondary containment for hydraulic sumps on pumps. The proposed liquid hydrocarbon cavern well will be located on a well pad designed with primary and secondary containment for both accidental liquid spills and stormwater runoff. Runoff from the pad will not be released unless it meets AEP parameters/concentration limits. In the event any of these preventive measures failed resulting in an accidental release into wetland W3, the area of impact would be limited and contained to W3 and AES would immediately begin clean-up activities to restore the wetland to its original condition. AES' existing ground water monitoring program on the Project site would ensure that any infiltration of contaminants into the shallow groundwater would be detected and could be remediated immediately and without impact outside the Project site.

The potential for chloride contamination from the brine pond is limited by both design measures and monitoring processes. The brine pond will be installed with a double liner and leak detection system to detect leaks from the primary liner, which would be contained by the secondary liner. A series of groundwater monitoring wells and a groundwater recovery system will also be in place. AES has well established groundwater, wetland and soil monitoring programs that were approved by the AER as per the existing brine pond EPEA approval. Baselines were developed before the operation of the facility (2014) and monitoring continues spring and fall for groundwater and wetland quality monitoring. The soil monitoring program is conducted once every 5 years. To date, the AER has had no concerns with the established monitoring programs. AES expects that these existing programs would be reviewed and modified to accommodate the facility expansion and operation.

Stormwater in SW 34-55-21-W4M is currently diverted to the existing onsite wetland (W3), and stormwater in NW 27-55-21-W4M will be diverted to a new stormwater management system. A Stormwater Management Plan will be created during detailed design and engineering and approved for the development that is planned on NW 27-55-21-W4M. A substantial portion of NW 27-55-21-W4M is in the catchment area of wetland W3 (Associated Engineering 2020), however due to infrastructure placement, wetland W3 may not be suitable to support drainage in NW 27-55-21-W4M. It is anticipated that drainage in NW 27-55-21-W4M will be managed through the construction of a stormwater management pond and grading of the site. No water will be released from the stormwater pond until it has met AEP parameters/concentration limits. Discharge from the wetland (W3) in SW 34-55-21-W4M is not expected to occur as it is large enough to contain the 100-year 24-hour rainfall event, even when the water level is at the wetland boundary.

Two pipelines will extend approximately 4 km outside of the Project area to convey product to and from customers. The pipelines will parallel existing pipeline routes extending to the west and south of the Project area. The pipelines will cross Astotin Creek and a number of wetlands, including ephemeral waterbodies, marshes, shallow open water, and swamp wetlands. AES plans to Horizontally Directionally Drill (HDD) below Astotin Creek and any Crown claimed wetlands to prevent potential damage to the bed and banks of the watercourse and wetlands. Trenching will be conducted in accordance with the requirements of the Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body (AEP 2013). AES will engage a qualified wetland specialist to complete a Wetland Assessment Impact Form (WAIF) prior to submission of a Code of Practice Notification when trenching pipelines through a wetland.

No overflow of the brine pond which could impact surface or groundwater runoff would be generated by a rainfall event. The existing brine pond for the Strathcona Salt Cavern Storage Facility is operated in accordance with the requirements of the existing EPEA Approval, Water Act (Dam Safety) Approval and *Dam and Canal Safety Directive* (AER 2018) and the proposed brine pond would be designed, constructed and operated to ensure continued compliance and integrity. The brine pond will be built to a capacity in excess of the maximum amount of brine it would be required to contain. In the event that excess brine is generated, it would be pumped from the pond to the disposal wells to manage the brine level in the pond.

Based on the lack of permanent or fish bearing water bodies in the Project area, combined with the low surface hydrological connectivity of wetland W3 to other wetlands in the area and the planned facility design, containment and monitoring measures described, the Project is not expected to interact with fish and fish habitats and no impacts to water quality in wetland W3 are anticipated. Because the Project is not expected to interact with fish and fish habitat, the Project is not expected to adversely affect fish or fish habitat, as defined in the *Fisheries Act*. No impacts from the introduction of contaminants into the watershed are anticipated. As a result, no impacts to fish or aquatic species are expected. As no impacts to water quality in wetland W3 are anticipated, the proposed Project is not anticipated to adversely affect migratory birds or terrestrial animals who utilize wetland W3.

Aquatic Species

There were no aquatic species, as defined under SARA, observed on the Project site during the wetland assessments conducted in 2013 and 2020. Additionally, there is no high suitability habitat for aquatic species as defined under SARA

in the Project area, given that the land is currently used for industrial purposes. There have been no sensitive aquatic plants observed in wetland W3.

Although no sensitive species have been identified in the Project area or in Astotin Creek, Astotin Creek drains into the North Saskatchewan River. The North Saskatchewan River supports habitat for lake sturgeon (*Acipenser fulvescens*), a species that is designated as Threatened under Alberta's Wildlife Act and recommended by COSEWIC to be designated Endangered under the *Species at Risk Act* (SARA). The designation of Endangered status under SARA is pending (GoA 2021). The lake sturgeon is considered At-Risk by DFO (DFO 2021).

AES will follow the mitigation measures described above relating to Fish and Fish Habitat. Water withdrawals from the North Saskatchewan River will be conducted using AES's existing water intake system and no additional disturbance to the bed, banks, or riparian vegetation of the North Saskatchewan River is anticipated. Due to the distance from the North Saskatchewan River and lake of surface connectivity between surface water in the Project area and the North Saskatchewan, no impacts to lake sturgeon spawning or feeding grounds are anticipated. Because the Project is not expected to interact with aquatic life, the Project is not expected to adversely affect aquatic species at risk, as defined under SARA.

Migratory Birds

The Project is not expected to adversely affect migratory birds, as defined in the Migratory Birds Convention Act. No high suitability bird habitat has been identified within the Project area. Four bird species, black-throated green warbler (*Dendroica virens*), Clark's nutcracker (*Nucifraga columbiana*), sora (*Porzana Carolina*), and white-winged scoter (*Melanitta fusca*), have been reported in the Project area during previous wildlife inventories (FWMIS 2021). All four species are considered sensitive in Alberta (GoA 2015). None of the species observed on the site have been assessed by COSEWIC, nor are they listed as Extirpated, Endangered, Threatened, or Special Concern under SARA.

A wetland survey was conducted in the summer of 2020, and no federally (i.e., *Species at Risk Act*) or provincially protected species (i.e., Alberta *Wildlife Act*) species were observed in the Project area during the survey, or in a previous survey conducted in 2013. Given that most of the Project area is developed or cultivated with annual crops, there is limited potential for sensitive species to use the Project area (Golder 2020). Given the proximity to the North Saskatchewan River, it is expected that migratory birds and terrestrial wildlife will preferentially use natural habitats outside of the proposed Project area.

The Project will remove approximately 13 hectares of low suitability wildlife habitat (i.e. cultivated land and disturbed wetland). In the event that site clearing is scheduled to occur within the breeding bird window, nest sweeps will be conducted by a qualified biologist to identify active nests protected under the *Migratory Birds Convention Act* and the *Migratory Birds Regulation*. If any development is required in the KWBZ, AES will endeavor to undertake clearing and grading activities outside the KWBZ restricted period (January 15 to April 30). If Project activities are required within this restricted period, a wildlife management plan will be developed and wildlife surveys (e.g. a winter mammal tracking survey) will be performed prior to their undertaking (ESRD 2015).

AES will develop an Environmental Protection Plan (EPP) prior to beginning construction of the Project. The EPP is intended to identify key environmental information and requirements, field instructions, and mitigation measures specific to the construction, post-construction cleanup and remediation of the proposed Project. The purpose of an EPP is to provide guidance to employees and contractors for responsible environmental working procedures and standards during construction. The EPP will also provide contingency plans or instructions to workers in the event that an unexpected event occurs.

The primary mitigation measure to limit potential adverse environmental effects on wildlife and to ensure compliance with the *Migratory Birds Convention Act* will be to conduct vegetation clearing outside the migratory bird restricted activity periods (May 1 to August 20 in upland areas and April 20 to August 25 in wetlands).

In the event that occupied nests or migratory birds are encountered during construction, AES or its contractors will stop work around the nest or feature, flag the area, and notify a Resource Specialist and/or regulatory agencies as needed. If it is possible to relocate a nest, the nest will be relocated and will be monitored until the end of the post-construction phase. If the nests were relocated from an area that is to be remediated, appropriate plant species to maintain habitat quality will be revegetated or encouraged to grow along the recontoured area.

Limited sensory impacts to migratory birds are anticipated due to the limited emissions and noise sources associated with operation of the proposed Project. Flaring is expected to be infrequent and limited. To date, flaring at the existing AES facility has been infrequent, and no bird mortality or injury has been reported. Noise sources from the proposed Project during operation are expected to be limited to pumps, the dehydration process heater if installed, and vehicular traffic.

Noise during construction will arise from drilling, the use of heavy equipment, and increased human activity on the site. This increase in noise during the construction period may discourage migratory birds from nesting in the vegetated fringe surrounding wetland W3. It is anticipated that during this period, migratory birds may prefer nesting in the extensive wetlands associated with Astotin Creek, located approximately 200 m to the northwest of the Project area, or along the banks of the North Saskatchewan River, resulting in minimal impact to migratory birds. The noise disturbance is expected to last the duration of construction.

There is potential that increased vehicle traffic to the Project site could result in increased mortality due to vehicle strikes. AES presently has speed limit signs posted on site and all employees, contractors, and visitors are required to abide by these limits. Where practicable, sites will be graded or an appropriate temporary road reinforcement material (e.g. swamp mats or corduroy) will be in place to discourage potential take of ground nesting species.

During planning for the existing Strathcona Salt Cavern Storage Facility, AES consulted with Alberta Environment and Sustainable Development (now AEP) and Canadian Wildlife Service on the potential for brine ponds to affect wildlife (Stantec 2014b). Potential concerns for birds are effects to feathers from brine, either to their insulation properties or to the ability of landed birds to take flight, and potential toxicity from the salt by ingestion. AES has not observed any instances of impacts to birds or bird mortality due to the operation of its existing brine pond. Further, over the years of operation of AES' existing brine pond, birds have not been observed near the brine pond, likely as a result of lack of vegetation for sustenance and the proximity of the nearby wetland W3 which offers more suitable vegetation. There are

no concerns for petroleum hydrocarbons or oil-based products from the storage caverns reaching the brine pond because as brine is displaced into the pond from the caverns, it will flow through a de-gasifier to remove all NGL (i.e. hydrocarbon) products.

The brine pond will be constructed and operated in compliance with approvals issued by the AER under the Environmental Protection and Enhancement Act and Water Act and AES has demonstrated its commitment to compliance during the four-year operating history of the existing salt cavern facility. The brine pond will be designed with measures that will minimize impacts to wildlife and deter birds from using the pond for roosting, nesting, foraging or resting. AES will implement lessons learned from construction and operation of the existing brine pond for the Strathcona Salt Cavern Storage Facility. The pond will be fenced around the perimeter to limit access to terrestrial animals. The brine pond will be lined with double high-density polyethylene (HDPE) liners that will extend from the interior of the pond to the top of the pond berm. The pond berm top will have gravel surfacing suitable for pedestrian and light vehicle access. The lack of a vegetated margin on the edge of the pond and on top of the pond berm will deter nesting and feeding activity by waterfowl.

It is anticipated that during operation when the brine pond is full, birds will be preferentially attracted to the more suitable habitat provided by either wetland W3, or the wetlands associated with Astotin Creek. AES has operated its existing brine pond for four years with no impacts to migratory birds and will implement the same mitigation measures (e.g. perimeter fencing) on the new brine pond.

Due to the proximity of preferential habitat, the lack of vegetated margin, and the positive experience of other brine pond operators in the area, in addition to the small surface area of the Project, the existing level of industrial development in the area, and the removal of hydrocarbons from the brine prior to storage in the pond as discussed in Section 9.1, the brine pond is not expected to adversely affect migratory birds, as defined under the *Migratory Birds Convention Act*. AES regularly monitors its existing brine pond to confirm that migratory birds are not impacted and to ensure mitigations remain effective. No impacts on migratory birds have been identified to date. Should any indication of an adverse effect on migratory birds arise, AES will consider the installation of further deterrents, such as effigies, at the perimeter of the pond.

20. POTENTIAL EXTRA-PROVINCIAL AND FEDERAL IMPACTS

A list of any changes to the environment that, as a result of the carrying out of the project, may occur on federal lands, in a province other than the province in which the project is proposed to be carried out or outside Canada.

The proposed Project is not expected to result in any changes to lands outside of the province of Alberta, to reserve lands, or to federal lands.

No portion of the proposed Project will be developed on reserve lands or federal lands. The proposed Project footprint will be contained wholly within the Alberta Industrial Heartland. With the exception of two pipelines that would extend off-lease to serve customers of the proposed expansion, the proposed Project infrastructure will entirely be located on lands privately owned by AES.

The proposed Project is not expected to result in any changes to air quality inside or outside of Alberta. The emissions directly associated with the proposed Project are minimal, as discussed in Section 23.

Water will be sourced from the North Saskatchewan River through AES's existing Alberta Heartland River Water System and using AES' existing Water Act licences. No increases to existing withdrawal limits are required. Water diversion for the proposed Project will be completed in accordance with AES's *Water Act* Approvals and Licences and no impacts to downstream flows in the North Saskatchewan River watershed are expected as a result of the proposed Project.

21. IMPACTS TO INDIGENOUS GROUPS INCLUDING TRADITIONAL LAND USE, PHYSICAL AND CULTURAL HERITAGE, AND HISTORICAL, ARCHAEOLOGICAL AND PALAEONTOLOGICAL RESOURCES

With respect to the Indigenous peoples of Canada, a brief description of the impact — that, as a result of the carrying out of the project, may occur in Canada and result from any change to the environment — on physical and cultural heritage, the current use of lands and resources for traditional purposes and any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, based on information that is available to the public or derived from any engagement undertaken with Indigenous peoples of Canada.

The proposed Project is located approximately 5 km from the banks of the North Saskatchewan River. The North Saskatchewan River contributes to Canada's cultural and geological history and has been an important source of fish, shoreline resources, and for freshwater use stretching back to before contact with European explorers (NSRBC 2017). Post-contact, the North Saskatchewan River has been an important route for commercial transportation and for transportation of explorers and settlers prior to the construction of the Canadian Pacific Railway (NSRBC 2017). The lands in and around the Project area have been in use for thousands of years and have more recently been cultivated and developed in the last hundred years (NSRBC 2017).

The Project area has been cultivated for many years and previous archaeological surveys conducted in the area have not identified any evidence of historical structures, camps, or spiritual sites (ATCO Power 2013). Refer to Figure 8 for a map of archaeological sites identified in the proposed Project area and surrounding area. The Project lands are privately owned and no traditional uses of the proposed Project site by Indigenous groups or peoples have been identified in previous regional studies for the area (Stantec 2010; Stantec 2013).

The closest First Nation or Métis Settlement to the proposed Project is the Alexander Cree First Nation, located approximately 50 km from the Project site. The proposed Project is located on land that is zoned for heavy industrial development. ATCO Energy Solutions has engaged 33 First Nations, Metis Settlements and Metis Regions as part of the initial engagement activities and is committed to ensuring the Indigenous Peoples of Canada have the opportunity to discuss any potential concerns. Specific Project discussions have taken place with six of these Indigenous Communities (identified in Section 4) to ensure any potential impacts of the Project are identified.

As the land is privately held, has existing development, and is located within an industrial area, the potential for traditional land use is low. The existing Strathcona Salt Cavern Storage facility is located at SW-34-55-21-W4M and the

additional lands required for the proposed expansion are within NW-27-55-21-W4M and are cultivated and hold low potential for traditional uses including hunting, fishing, plant gathering, or spiritual use. Limited to no impacts to Treaty Rights and Traditional Land Use, and Métis Harvesting Rights are expected. The Project is not anticipated to impact water quality or quantity, wildlife habitat, traditional and medicinal plants, or spiritual use sites due to the extensive history of cultivation and development in the area. AES acknowledges that many of the Indigenous Communities engaged as part of the project have harvested, fished, or hunted in the AIH area in pre- or post-contact eras and have ancestral connections to the land. Although the landscape has changed through cultivation and later development, members of Indigenous communities may still feel connections to the area.

ATCO Energy Solutions received Historic Resources Clearance for SW 34-55-21-W4M in 2014 in support of the existing Strathcona Salt Cavern Storage Facility and will obtain Historic Resources Clearance for NW-27-55-34-W4M prior to any clearing activities in the quarter section. The lands in NW-27-55-23-W4M were previously held by ATCO Power Canada Ltd. and historic resources clearance was submitted and obtained in 2014 in support of the Heartland Generating Station Project, which ultimately was not constructed. AES will obtain appropriate clearance for the proposed Project footprint and will follow all guidance from Alberta Culture prior to commencing construction.

During construction of the proposed Project, if any structures, sites, or items of historical, archaeological, palaeontological, or spiritual significance to Indigenous groups are identified, ATCO Energy Solutions and its contractors will stop work and flag the area to prevent any further disturbance. Workers will notify AES who will contact a Resource Specialist. No potential archaeological or palaeontological sites will be further disturbed or impacted until the Resource Specialist has indicated that appropriate mitigation measures have been met. This contingency plan will be included in the Environmental Protection Plan for the Project.

22. IMPACTS TO INDIGENOUS HEALTH, SOCIAL, AND ECONOMIC CONDITIONS

A brief description of any change that, as a result of the carrying out of the project, may occur in Canada to the health, social or economic conditions of Indigenous peoples of Canada, based on information that is available to the public or derived from any engagement undertaken with Indigenous peoples of Canada.

ATCO has long demonstrated that building respectful and mutually beneficial relationships defines how we do business. Along with our Indigenous and community partners, we are continually exploring new ways to collaborate. We recognize the need to continue to work to understand unique perspectives of neighboring communities and Indigenous Peoples and take a long-term approach to building relationships based on trust. As of the end of 2019, we maintain 50 formal joint-venture partnerships, Memorandums of Understanding, and other relationships with Indigenous communities, including some that have lasted decades. In 2019, they generated over $220 million of economic benefits for our Indigenous partners.

Potential Health Impacts

No impacts to Indigenous health are expected due to the low air emissions and limited opportunity and low likelihood for potential contaminants to enter the watershed or food chain. The Project area is located in close proximity to the North Saskatchewan River, which has historically served as a travel route and source of resources (Stantec 2013).

Projectile points from a variety of periods have been recovered in archaeological surveys of the Fort Saskatchewan area, indicative of a long history of human occupation back to pre-contact times (Stantec 2013).

The proposed Project is located on privately owned land that is used for industrial and agricultural purposes and is zoned for Heavy Industrial (Heartland) use. AES does not anticipate any impacts to Indigenous health through use of these lands for traditional purposes, as the lands are no longer suitable for subsistence hunting or gathering of traditional or medicinal plants. Any effects that the proposed Project may have are expected to be localized in extent.

The proposed Project will make use of the existing river water intake system owned and operated by AES and will utilize existing diversion licences held for the purposes of cavern washing. No alterations to the existing intake or additional draws on the river will be required and as such, there will be no impacts to the bed or banks of the North Saskatchewan River, to fish, fish spawning or feeding grounds, or to aquatic species as a result of the proposed Project.

The caverns will be developed approximately 1,800 m below surface (top of cavern) and approximately 1,500 m below shallow groundwater. Excess brine generated during the solution mining process will be disposed of downhole into the Nisku formation, approximately 1,000 m below surface and approximately 700 m below the base of groundwater protection. For all wells, surface casing will be set below the base of groundwater protection to protect groundwater during drilling and through the life of the well. The disposal well will be completed with an inner tubing string to act as a secondary containment to isolate the brine from the cemented well casing. Integrity of the cement isolating the well from the surrounding rock will be tested prior to putting the well into service. Due to the depths of the salt cavern and disposal formations and isolation of wellbores from the groundwater zone, no impacts to groundwater quantity or quality are expected.

No process wastewater from the proposed Project is planned to be returned to the watershed. Any wastewater generated by the proposed Project will be minimal and will be stored on site until it is removed and disposed of in a licensed facility.

It is expected that most of the personnel engaged during the proposed Project will be local to the Edmonton Capital Region. Any increase in workers in the area are expected to be minimal and temporary in nature. Access to health care is not expected to be impacted. Acute care access could potentially be impacted in the event of an incident or off-site traffic accident involving personnel employed in construction of the proposed Project.

Potential Social Impacts

Limited social impacts to Indigenous Communities are expected as a result of the proposed Project. The proposed Project is located approximately 50 km away from the closest First Nation Reserve. The proposed Project is in a developed area zoned for heavy Industrial use.

The proposed Project is bound by existing Range and Township roads and is located a short distance away from secondary Highway 15. The proposed Project is located on private land and is adjacent to other privately-owned parcels. Access constructed for the proposed Project will connect AES's land to an existing Range Road within Strathcona County and will not impact any Crown land. No increased access to Crown land which may be used for traditional purposes will result from the Project. Further, the proposed Project will not create additional disturbances that could increase the likelihood of non-Indigenous use of land and resources on Crown lands.

The proposed Project is located approximately 50 km away from the closest First Nations reserve and 90 km from the nearest Métis Settlement. No impacts to traffic, or access to community resources as a result of the Project are anticipated in these communities. During construction, labour is expected to be largely sourced from the Edmonton Capital Region. Construction and operation of the proposed Project is not expected to significantly increase the temporary or long-term population of Strathcona County or the Edmonton Capital Region. Construction and operation of the proposed Project will not result in an increased transient workforce. It is anticipated that interaction between Indigenous Communities and the construction and operation activities associated with the proposed Project will largely be through procurement and vendor services as described below (refer to Potential Economic Impacts).

Potential Economic Impacts

Limited economic impact to Indigenous communities is expected. Most of the jobs generated by the proposed Project will be temporary jobs during construction of surface facilities with approximately four permanent operator jobs anticipated. No community benefits agreements are anticipated due to the location and previous land use of the proposed Project.

As discussed in Section 4, AES has initiated engagement with 33 Indigenous Communities across Alberta. Several of the communities contacted have expressed interest in participating in Project construction or procurement in some manner. AES will endeavour to work with interested and qualified Indigenous Communities or members of Indigenous Communities who wish to partake in the procurement process for the proposed Project. AES will evaluate opportunities to meet short and long-term labour force needs through the employment of Indigenous peoples with relevant qualifications or required equipment and/or services. AES will continue to engage with interested Indigenous communities during the procurement process and coordinate with any selected vendors who reside outside of the region. The number of personnel on site at any time will fluctuate depending on the stage of construction. Few contractors or vendors will be required during cavern washing. Most personnel will be on site during construction of the product handling facility and brine pond. Given the relatively short durations for any contractors on site during construction and the addition of only approximately four permanent operators during operation of the project, limited economic impact to Indigenous Communities is anticipated.

23. GREENHOUSE GAS EMISSIONS ASSOCIATED WITH THE PROJECT

An estimate of any greenhouse gas emissions associated with the project.

The proposed Project will release GHG emissions to the atmosphere during the construction and operation phases of the Project. The GHGs that would be released during the construction and operation phases of the proposed Project are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The GHG assessment evaluated the contribution of GHGs released during Project construction and operation activities in the context of federal and provincial GHG emissions. The GHG emissions associated with construction, operation, and upstream emissions are summarized below:

- During the construction phase, there will be emissions from off-road equipment, on-road equipment, and other construction and space heating equipment onsite. The direct GHG emissions from the entire construction period is estimated to be 6,074 tonnes of carbon dioxide equivalent (tCO_2e), of which the emission from off-road

equipment accounts for about 92% (i.e. 5,574 tCO_2e) of the total construction emissions. Using the 2018 GHG emission totals for Canada (729,000 $ktCO_2e$) and Alberta (273,000 $ktCO_2e$) as a baseline, the direct emissions during the construction phase represents 0.0008% and 0.002% of Canada's and Alberta's total annual GHG emissions. In addition to this, during construction, it is estimated that there will 17,012 tCO_2e of indirect emissions associated with imported electricity from the Alberta electrical grid. The Project is located within an existing industrial facility so there will be no emissions associated with land use change.

- During the operation phase of the Project, there will be emissions from stationary combustion sources, flaring and fugitive emission sources. The direct GHG emissions from Project operation are estimated to be 12,232 tCO_2e per year, of which the emissions from stationary combustion equipment accounts for about 87% (i.e., 10,638 tCO_2e per year) of the annual operation emissions. Using the 2018 GHG emission totals for Canada and Alberta as a baseline, the direct emissions during the operational phase is equal to 0.002% and 0.004% of Canada's and Alberta's total annual GHG emissions. In addition to this, the indirect emissions associated with imported electricity during operation is estimated to be 59,568 tCO_2e per year. The project does not capture and store CO_2 and there are no avoided emissions as a result of this Project.

- A screening level estimate of upstream GHG emissions indicates that the upstream emissions associated with the Project are approximately 13 $ktCO_2e$ per year and are less than 500 $ktCO_2e$ per year.

The above GHG emission estimates incorporated several conservative assumptions such as:

- the Project would use a hot oil heater during operation;
- the hot oil heater would be operating at design capacity continuously;
- the flare pilot and purge would be operating continuously;
- the Project would use a gas chromatograph and it would run continuously;
- the annual electricity use is conservatively based upon equipment electrical ratings; and
- the electrical grid GHG intensity is based upon 2018 intensity although it is forecast to decline in future years.

Overall, the GHG emissions associated with Project construction and operation are low in magnitude when compared to provincial and national emission totals.

24. WASTE AND EMISSIONS GENERATED BY THE PROJECT

A list of the types of waste and emissions that are likely to be generated — in the air, in or on water and in or on land — during any phase of the project.

Solid Wastes

Solid wastes will be generated during construction and decommissioning. Very low quantities of solid waste are expected to be generated through the ongoing operation of the storage caverns.

Waste oil will be stored in secure containers with secondary containment. Containers will be stored in well-ventilated, shaded areas wherever possible. Any waste that has a potential to be released to the environment will have secondary containment. Suitable containment will be used to contain waste and incompatible wastes will not be stored together.

All wastes will be disposed of according to the applicable provisions of AER *Directive 058*: Oilfield Waste Management Requirements for the Upstream Petroleum Industry (AER 2006), the Waste Control Regulation and the requirements for each waste classification outlined in the Alberta Waste Users Guide for Waste Managers (AEP 1996). Solid wastes will be either recycled or disposed of through licensed waste disposal companies at licensed facilities. A waste management plan will be developed for the Project as part of its construction and operating procedures. Wastes are identified in Table 7.

Table 7: Solid Wastes Generated by the Project

Waste Stream	Management Method
Domestic and Shop waste	Contracted waste disposal
Recyclables (wood, paper, metal)	Contracted recycling
Hazardous waste	Licensed disposal facility
Waste oil	Licensed recycler

Water

Water for the proposed Project will be sourced from the North Saskatchewan River through existing infrastructure and under existing water diversion licenses. Liquid discharges from the Project will consist of brine, small amounts of process wastewater, and domestic sewage.

Brine will be generated during the development of the caverns and will include high concentrations of dissolved sodium chloride from the salt formation as well as hydrocarbon residue from the control fluid (diesel) used during washing. Brine will be disposed through one existing licensed disposal well owned and operated by AES and through one disposal well to be developed as part of the Project.

Small amounts of process wastewater will be periodically generated by the NGL process dehydrators. All process wastewater will be temporarily stored on site in a small above ground tank (approximately 65 m^3) which will be installed

with secondary containment. The contents will be disposed of at a licensed disposal facility as required. A similar tank for process wastewater is in place at AES' existing salt cavern facility and to-date, has not been required to be utilized because no process water has been produced.

Domestic sewage from an office located on site will be collected in a septic holding tank. The contents of the tank will be pumped out and disposed at a licensed disposal facility.

ATCO Energy Solutions has a storm water management plan for the existing Strathcona Salt Cavern Storage Facility to allow for surface water and high-level ground water beneath the existing brine pond to be collected and managed in accordance with the EPEA approval conditions. This stormwater management plan will be updated to include the additional surface facilities and drainage associated with the proposed Project as part of the EPEA Approval required for the proposed Project.

Air

Emissions that are likely to be generated during the Project include carbon dioxide (CO_2) and nitrous oxide (NO_2). In addition, minimal volumes of methane (CH_4) may also be released. Project emissions will be released during construction as a result of vehicle and equipment use, and during operation as a result of use of certain equipment, periodic flaring and fugitive emissions. As discussed in Section 23 and detailed in Appendix B, the GHG emissions associated with Project construction and operation are low in magnitude when compared to provincial and national emission totals.

Air emissions as a result of the Project will consist of products of combustion and will be minor and limited to the following sources:

- Small volumes of hydrocarbons, de-gassed from the brine prior to storage in the brine pond. Recovery of hydrocarbons from the brine will be required infrequently. Hydrocarbon volumes will be small and will be flared on site. Flaring of de-gassed hydrocarbons will follow AER *Directive 60 Upstream Petroleum Industry Flaring, Incinerating and Venting* (AER 2020);

- Intermittent emissions from the plant flare stack during any upset conditions or operation of the gas chromatograph being considered in the design of the Project; and

- Intermittent emissions from process heaters used as part of the dehydration system, pending final design

Dust during construction is also expected to be minimal. AES will implement dust management processes during construction and operation of the proposed Project. No dust would be released in a volume sufficient to cause acute or chronic reactions in human or wildlife health receptors.

Noise

Project activities will contribute to noise levels in the area during the construction and operation phases.

Noise sources during construction will be primarily from drilling and construction equipment, including excavation equipment for the brine pond. The proposed Project is located in an area zoned for Heavy Industrial. Construction is anticipated to occur during daytime hours (i.e., 07:00 to 19:00), with the exception of drilling which will occur on a continuous (24 hours per day seven days a week) basis while the wells are being drilled. The total duration of drilling activities is expected to be 40 weeks, with some downtime and reduction in noise levels between each of the six wells. AES demonstrated its ability to work with area residents during drilling activity associated with the existing Strathcona Salt Cavern Storage facility and mitigate noise concerns associated with drilling and construction. AES will comply with AER *Directive 038: Noise Control*, Section 3.11 Construction Noise (AER 2007) during construction of the Project.

Noise sources during operation will be minimal and will come primarily from pumps for product injection and withdrawal and from the dehydration process heater if installed. A noise impact assessment for the Project will be completed in accordance with *Directive 038: Noise Control* (AER 2007) prior to submission of the AER applications for the surface facilities to ensure noise from facility operation is below allowable limits.

All noise emissions from the Project will comply with *Directive 038*. Compliance with *Directive 038* will be demonstrated through conformance with the Regional Noise Model developed though the Northeast Capital Industrial Association (NCIA), in collaboration with the AER. The Project will comply with noise level requirements of the NCIA Regional Noise Management Plan, Strathcona County noise bylaws, and any potential conditions within the Development Permit issued by the County for the Project.

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APPENDIX A - LAND TITLES

M000065

CERTIFIED COPY OF
Certificate of Title

M

LINC 0024 385 685

SHORT LEGAL 4;21;55;27;NW

TITLE NUMBER: 142 118 161
TRANSFER OF LAND
DATE: 25/04/2014

AT THE TIME OF THIS CERTIFICATION

ATCO ENERGY SOLUTIONS LTD.
OF 200, 919 - 11 AVENUE SW
CALGARY
ALBERTA T2R 1P3

IS THE OWNER OF AN ESTATE IN FEE SIMPLE
OF AND IN

*ALL MINES AND MINERALS WITHIN, UPON OR UNDER:

MERIDIAN 4 RANGE 21 TOWNSHIP 55
SECTION 27
QUARTER NORTH WEST

SUBJECT TO THE ENCUMBRANCES,LIENS AND INTERESTS NOTIFIED BY MEMORANDUM UNDER-WRITTEN OR ENDORSED HEREON,OR WHICH MAY HEREAFTER BE MADE IN THE REGISTER.

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
2848HT	15/12/1950	CAVEAT CAVEATOR - COMPUTERSHARE TRUST COMPANY OF CANADA. 700,530 8 AVE SW CALGARY ALBERTA T2P3S8 AGENT - S MARY HAMMER "(M & M AS DESC.) DATA UPDATED BY CHANGE OF ADDRESS FOR SERVICE NO. 882008602" (DATA UPDATED BY: TRANSFER OF CAVEAT 972106683) (DATA UPDATED BY: TRANSFER OF CAVEAT 032054248)
122 034 239	01/02/2012	CAVEAT RE : ROYALTY AGREEMENT CAVEATOR - AUDREY LORRAINE SCHNEIDER 9412-99 ST FORT SASKATCHEWAN ALBERTA T8L1T4 M & M AS DESCRIBED.

(CONTINUED)

Certificate of Title

TITLE NUMBER: 142 118 161

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 25 DAY OF APRIL ,2014

REGISTRAR OF LAND TITLES

SUPPLEMENTARY INFORMATION

VALUE: $75,000
CONSIDERATION: $75,000
MUNICIPALITY: STRATHCONA COUNTY
REFERENCE NUMBER:
872 076 888
AREA:
64.7 HECTARES (160 ACRES) MORE OR LESS
TOTAL INSTRUMENTS: 002

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0018 585 374	4;21;55;34;SW	122 423 202

LEGAL DESCRIPTION
MERIDIAN 4 RANGE 21 TOWNSHIP 55
SECTION 34
QUARTER SOUTH WEST
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 64.7 HECTARES (160 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE

MUNICIPALITY: STRATHCONA COUNTY

REFERENCE NUMBER: 012 009 693 +10

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
122 423 202	28/12/2012	TRANSFER OF LAND	$3,680,000	SEE INSTRUMENT

OWNERS

ATCO ENERGY SOLUTIONS LTD.
OF 800, 909-11 AVENUE SW
CALGARY
ALBERTA T2R 1L8

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
752 119 421	05/09/1975	UTILITY RIGHT OF WAY GRANTEE - LAMCO GAS CO-OP LTD.
072 052 641	27/01/2007	UTILITY RIGHT OF WAY GRANTEE - ATCO GAS AND PIPELINES LTD. AS TO PORTION OR PLAN:8420450
072 069 561	05/02/2007	UTILITY RIGHT OF WAY GRANTEE - ATCO GAS AND PIPELINES LTD. AS TO PORTION OR PLAN:0224801

(CONTINUED)

REGISTRATION
NUMBER DATE (D/M/Y) PARTICULARS

112 044 399 15/02/2011 UTILITY RIGHT OF WAY
GRANTEE - ATCO GAS AND PIPELINES LTD.
AS TO PORTION OR PLAN:0927538

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 15 DAY OF APRIL, 2014 AT 08:07 A.M.

ORDER NUMBER: 25737521

CUSTOMER FILE NUMBER: SEC 34

END OF CERTIFICATE

APPENDIX B - ATCO SALT CAVERN STORAGE EXPANSION PROJECT GREENHOUSE GAS TECHNICAL DATA REPORT

ATCO Salt Cavern Storage Expansion Project

Greenhouse Gas Technical Data Report

Final

January 05, 2021

Prepared for:

ATCO Energy Solutions Ltd.
5302 Forand St SW
Calgary, AB, Canada T3E 8B4

Prepared by:

Stantec Consulting Ltd.
200-325 25 Street SE
Calgary AB T2A 7H8

123513639

ATCO SALT CAVERN STORAGE EXPANSION PROJECT

This document entitled ATCO Salt Cavern Storage Expansion Project Greenhouse Gas Technical Data Report was prepared by Stantec Consulting Ltd. (“Stantec”) for ATCO Energy Solutions Ltd. (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify the information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by _____
(signature)
Rengarajan Vaiyapuri

Reviewed by _____
(signature)
Michelle Xue

Approved by _____
(signature)
Reid Person

Table of Contents

LIST OF TABLES

Abbreviations

AEP	Alberta Environment and Parks
AES	ATCO Energy Solutions Ltd.
AHEC	ATCO Heartland Energy Centre
AIH	Alberta Industrial Heartland
AQM	Alberta Greenhouse Gas Quantification Methodologies
bbl	barrel
BC	British Columbia
C	carbon
C3	propane
C3+	propane plus
C5	pentane
C5+	Pentane plus
CER	Canada Energy Regulator
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent

d	day
e^3m^3	thousand cubic meters
ECCC	Environment and Climate Change Canada
Existing Facility	Existing Strathcona Salt Cavern Storage Facility
g	gram
GC	Gas Chromatograph
GHG	greenhouse gas
GJ	gigajoule
GWP	global warming potential
ha	hectare
HDD	Horizontal Directional Drilling
HFCs	hydrofluorocarbons
HHV	higher heating value
hr	hour
IAA	Impact Assessment Act
IAAC	Impact Assessment Agency of Canada
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram

kL	kiloliter
km	kilometer
kt	kilotonnes
KWh	kilowatt-hour
L	liter
m^3	cubic meter
M	Meridian
MMcf	One million cubic feet
MWh	Megawatt-hour
N_2O	nitrous oxide
NF_3	nitrogen trifluoride
NGL	natural gas liquids
NIR	National Inventory Report
NRCAN	Natural Resources Canada
NW	Northwest
PD	Project Description
PFCs	perfluorocarbons
Project	ATCO Salt Cavern Storage Expansion Project

QM	Quantification Methodology or Quantification Methods
SACC	Strategic Assessment of Climate Change
Stantec	Stantec Consulting Ltd.
SF_6	sulphur hexafluoride
SW	Southwest
t	tonnes
TDR	Technical Data Report
W	West
WCI	Western Climate Initiative

1.0 INTRODUCTION

ATCO Energy Solutions Ltd. (AES) is planning to expand their existing Strathcona Salt Cavern Storage Facility (the Existing Facility) capacity with four additional 100,000 m^3 salt caverns to store natural gas liquids (NGL) and their associated surface facilities including a product handling facility and a brine pond. The proposed project is called the ATCO Salt Cavern Storage Expansion Project (Project). Stantec Consulting Ltd. (Stantec) was retained by AES to complete a quantitative assessment of the greenhouse gas (GHG) emissions from this Project to support AES Initial Project Description (PD) to the Impact Assessment Agency of Canada (IAAC). This technical data report (TDR) has been prepared to detail the GHG emission calculations for the Project.

The Project will be located approximately 14 km northeast of the City of Fort Saskatchewan and approximately 30 km northeast of the City of Edmonton, within Strathcona County, Alberta. The Project will be located within the existing SW 34-55-21-W4M site and extend onto NW 27-55-21-W4M, both on private land owned by AES within the Alberta Industrial Heartland (AIH) near Fort Saskatchewan, Alberta. The Existing Facility has four NGL storage caverns each with a capacity of 100,000 m^3 and has a footprint of approximately 13 hectare (ha). The Project would add approximately 15 ha of additional development.

The Strategic Assessment of Climate Change (SACC) complements the other policy and guidance documents that support the impact assessment process. SACC is applicable to designated projects under the Impact Assessment Act (IAA) and for projects regulated by the Canada Energy Regulator (CER) (Government of Canada 2020). A key factor for consideration in the SACC is the extent to which the effects of a project contribute or hinder the Government of Canada's ability to meet its climate change commitments.

The SACC requires quantification of GHG emissions from a project, assessment of upstream emissions if upstream emissions exceed 500 kt CO_2e (with a declining threshold in future years), and development of a credible plan to achieve net-zero emissions by 2050. This TDR presents technical details related to GHG emissions from the Project and the Project's upstream emissions. The information has been generated from existing literature, published technical data sources, engineering calculations, and from the Project engineers. The following information is presented within this report:

The following information is presented within this report:

- Substances of interest, i.e., the specific GHGs from this Project (Section 2)
- Description of the methods for estimating the quantities of GHGs (Section 3.0)
- Summary of estimated GHG emissions by Project phase, including construction (Section 4.1) and operation (Section 4.2), as well as third-party emissions (Section 4.3) and an upstream GHG screening assessment (Section 4.4)
- Conclusions (Section 5.0).

2.0 SUBSTANCES OF INTEREST

A GHG can be any atmospheric gas that absorbs and re-emits infrared radiation, thereby acting as a thermal blanket for the planet that warms the lower levels of the atmosphere. The GHGs are released to the atmosphere from both natural and anthropogenic (human activity) sources (IPCC 2013).

Greenhouse gases are tracked provincially and federally and are reported annually in the National Inventory Report (NIR) (ECCC 2020). The national GHG inventory includes the following gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3) (ECCC 2020).

For this TDR, the GHGs that may be released during Project activities are CO_2, CH_4, and N_2O and are included in this assessment. The GHGs that are not expected to be emitted by the Project are PFC, HFC, SF_6, and NF_3 as these are not used or present in any activities and are therefore excluded from further consideration in this assessment.

Emissions of each of the included GHGs are multiplied by their 100-year global warming potential (GWP) and are reported as carbon dioxide equivalent (CO_2e). The GWP of these GHGs are from Environment and Climate Change Canada (ECCC) and align with the ones applied in the NIR (ECCC 2019, 2020):

- CO_2 = 1
- CH_4 = 25
- N_2O = 298

The total mass of carbon dioxide equivalent (CO_2e) for the Project is calculated as:

$$CO_2e = (mass\ CO_2 * 1) + (mass\ CH_4 * 25) + (mass\ N_20 * 298)$$

3.0 GREENHOUSE GAS CALCULATION METHODS

The methods used to estimate the GHG emissions from the Project are based on accounting and reporting principles of the GHG Protocol developed by the World Resource Institute and the World Business Council for Sustainable Development (2015). The GHG Protocol is an internationally accepted accounting and reporting standard for quantifying and reporting GHG emissions. The guiding principles of the Protocol are relevance, completeness, consistency, transparency, and accuracy. In the few cases where uncertainty is high, conservative assumptions were applied, and this is expected to provide a small overestimate of the GHG emissions (WCI 2011, 2013).

The GHG emissions that will be released as a result of the construction and operation of the Project have been calculated. These include emissions released during construction as a result of vehicle and equipment use, and those released during operation as a result of equipment use, flaring, and fugitive emissions. Methods described in the following sections are expected to yield conservative results as they are based on engineering estimates. The Project will be added to an existing industrial land therefore there will be no emissions associated with the land clearing. The project does not capture and store CO_2 and there are no avoided emissions as a result of this Project. Finally, the upstream emissions associated with the Project were calculated.

The sections below describe the methods for estimating GHGs from each emission source and for each phase of the Project: construction, operation, and upstream.

3.1 CONSTRUCTION PHASE

3.1.1 Off-Road Construction Equipment

Off-road equipment and vehicles used for the construction of the Project include diesel-fuelled heavy-duty equipment such as drilling rig, tractor, crawler, excavator, scraper, backhoes, articulated truck, graders, dozers, compactors, horizontal directional drilling (HDD) rig as well as cranes. Off-road equipment and vehicles are not typically allowed on highways or public roads. The diesel fuel consumption for off-road equipment and vehicles was estimated and provided by AES. The off-road engines for this assessment are assumed to be larger than 19 kW and are compliant with the ECCC Tier 4 emission standards. The off-road construction equipment list and their fuel consumption are provided in Table 3-1.

Table 3-1 Off-Road Construction Equipment

Emission Source	Fuel Type	Fuel Consumption (L)
Caterpillar D6N Crawler Tractor	Diesel	111,408.00
Caterpillar PL87 Crawler Pipe Layer	Diesel	50,256.00
Caterpillar 12M Motor Grader	Diesel	40,936.00
Caterpillar 336E H Hydraulic Excavator	Diesel	215,250.00
Caterpillar 631G Motor Scraper	Diesel	19,400.00
Caterpillar 430D Loader Backhoe	Diesel	12,768.00
Caterpillar 735 Articulated Dump Truck	Diesel	286,350.00
Caterpillar 814F Wheel Dozer	Diesel	24,000.00
Caterpillar 825H Compactor	Diesel	8,364.00
HDD Maxi Rig	Diesel	33,118.75
Crane	Diesel	24,000.00
Drilling Rig	Diesel	1,200,000.00
SOURCE: Provided by AES		

Emissions are calculated as:

$$Emission\ (tonnes) = Fuel\ Consumption\ (L) * Unit\ Conversion\ (\frac{kL}{10^3 L}) *\ Emission\ Factor\ \left(\frac{t}{kL}\right)$$

Emission factors for CO_2, CH_4, and N_2O are from the Alberta Greenhouse Gas Quantification Methodologies (AQM, AEP 2020). These emission factors are used to convert fuel consumption totals to GHG emissions. The emission factors used for this activity are summarized in Table 3-2.

Table 3-2 Emission Factors for Off-Road Engines

Emission Source	Emission Factor (t/kL Fuel)		
	CO_2	**CH_4**	**N_2O**
Off-Road – Diesel ≥19 kW (Tier 4)	2.68	7.30E-05	2.30E-04
SOURCE: AQM Table 1-1 and Table 5-1 (AEP 2020).			

3.1.2 On-Road Construction Equipment

On-road construction equipment and vehicles used for the construction of the Project include diesel-fuelled equipment such as pick-up trucks, crew cabs, welder trucks, gravel trucks, fuel trucks, hydro-vac trucks, and freight trucks. On-road vehicles and equipment are typically approved to travel on highways and public roads. The diesel fuel consumption for on-road equipment and vehicles was estimated and provided by AES. On-road engines for this assessment are assumed to be heavy-duty with advanced emission control technology to be conservative. The on-road construction equipment list and their fuel consumption are provided in Table 3-3.

Table 3-3 On-Road Construction Equipment

Emission Source	Fuel Type	Fuel Consumption (L)
Ford Ranger Pickup	Diesel	19,986.40
Ford F-150 Crew Cab	Diesel	23,983.68
Welder Truck	Diesel	8,928.00
Gravel Truck	Diesel	237.00
Fuel Truck	Diesel	5,996.10
Hydrovac Truck	Diesel	13,392.00
Freight Truck	Diesel	5,498.40
SOURCE: Provided by AES		

Emissions are calculated as:

$$Emission\ (tonnes) = Fuel\ Consumption\ (L) * Unit\ Conversion\ (\frac{kL}{10^3 L}) * Emission\ Factor\ \left(\frac{t}{kL}\right)$$

Emission factors for CO_2, CH_4, and N_2O are from the AQM (AEP 2020). These emission factors are used to convert fuel consumption totals to GHG emissions. The emission factors used for this activity are summarized in Table 3-4.

Table 3-4 Emission Factors for On-Road Engines

Emissions Source	Emission Factor (t/kL Fuel)		
	CO_2	CH_4	N_2O
On-Road Heavy-Duty Diesel Vehicles (advanced control)	2.68	1.10E-04	1.50E-04
SOURCE: AQM Table 1-1 and Table 5-1 (AEP 2020).			

3.1.3 Other Construction Equipment

Other construction equipment used for the construction of the Project include propane fuelled heaters as well as diesel fuelled light towers. The fuel consumption for these equipment were estimated and provided by AES. The fuel consumption associated with these equipment is provided in Table 3-5.

Table 3-5 Other Construction Equipment

Emission Source	Fuel Type	Fuel Consumption (L)
Heaters	Propane	47,565.49
Light Towers	Diesel	79,380.00
SOURCE: Provided by AES		

Emissions are calculated as:

$$Emission\ (tonnes) = Fuel\ Consumption\ (L) * Unit\ Conversion\ (\frac{kL}{10^3 L}) * Emission\ Factor\ \left(\frac{t}{kL}\right)$$

Emission factors for CO_2, CH_4, and N_2O are from the AQM (AEP 2020). These emission factors are used to convert fuel consumption totals to GHG emissions. The emission factors used for this activity are summarized in Table 3-6

Table 3-6 Emission Factors for Other Equipment

Emission Source	Emission Factor (t/kL Fuel)		
	CO_2	CH_4	N_2O
Heaters (Propane fuelled)	1.52	2.40E-05	1.08E-04
Light Towers (Diesel fuelled)	2.68	7.80E-05	2.00E-05
SOURCE: AQM Table 1-1 (AEP 2020).			

3.2 OPERATION PHASE

3.2.1 Stationary Combustion Emissions

The only stationary combustion equipment that might be used during the operation of the Project is a hot oil heater which is being evaluated against alternatives. The fuel consumption for the hot oil heater is estimated using the input power rating, operating hours, and the higher heating value of the fuel gas. For this assessment, the hot oil heater is conservatively assumed to be used during the Project as a worst-case scenario. Also, it was assumed that the hot oil heater is a NO_X uncontrolled heater and would be operating throughout the year. The fuel gas consumed by the hot oil heater is assumed to be the same natural gas used for flare pilot and purge. The composition associated with this fuel gas can be found in Table 3-9. The input rating associated with the hot oil heater and the estimated fuel consumption is provided in Table 3-7.

Fuel consumption for the hot oil heater is estimated using the below equation:

$$Fuel\ consumption\ (e^3m^3/year) = Input\ Raing\ \left(\frac{GJ}{hr}\right) * Operating\ hours\ (hr/year)/Higher\ Heating\ Value\ \left(\frac{GJ}{e^3m^3}\right)$$

Table 3-7 Stationary Combustion Equipment Parameters

Emission Source	Input Rating	Operating Hours	Higher Heating Value	Fuel Consumption
	GJ/hr	hr/year	GJ/e^3m^3	e^3m^3/year
Hot Oil Heater	23.76	8760	41.21	5,051.13

Emissions are calculated as:

$$CO_2\ Emission\ (tonnes/year) = Fuel\ Consumption\ (e^3m^3/year) * Carbon\ Content\ \left(\frac{kg\ of\ C}{e^3m^3}\right) * 3.664\left(\frac{kg\ of\ CO_2}{kg\ of\ C}\right) * Unit\ Conversion\ \left(\frac{tonnes}{10^3 kg}\right)$$

$$CH_4\ or\ N_2O\ Emission\ (tonnes/year) = Fuel\ Consumption\ (e^3m^3/year) * Higher\ Heating\ Value\ \left(\frac{GJ}{e^3m^3}\right) * Emission\ Factor\ \left(\frac{tonnes}{GJ}\right)$$

Emission factors for CH_4 and N_2O are from the AQM (AEP 2020). These emission factors are used to convert fuel consumption totals to GHG emissions. The emission factors used for this activity are summarized in Table 3-8.

Table 3-8 Emission Factors for Stationary Combustion Equipment

Emission Source	Emission Factor (t/GJ)	
	CH_4	N_2O
Natural Gas Fired Hot Oil Heater (NO_x Uncontrolled)	9.70E-07	9.30E-07
SOURCE: AQM Table 1-3 (AEP 2020).		

3.2.2 Flaring Emissions

The Project is equipped with a flare system to dispose of small amount of hydrocarbon from the brine gas and also to dispose of gas during upset conditions. In addition to this, the Project may have one gas chromatograph (GC) which vents gas and this GC vent gas will be diverted to the flare stack.

For this assessment, the flare pilot and purge gas as well as the GC vent gas are conservatively assumed to be operating throughout the year as a worst-case scenario. The estimated amount of flare gas volume for each scenario except GC vent gas and their respective gas composition was provided by AES. GC vent gas volumes were estimated based on the AQM generic vent rate (AEP 2020). AES stated that the GC vent gas will be mainly propane or butane. For this assessment, we conservatively assumed that the GC vent gas is 100% butane. A default combustion efficiency of 98% was used for this assessment (WCI 2011). The flare gas volume for each scenario and their gas compositions are summarized in Table 3-9.

Table 3-9 Flare Gas Volume and Compositions

Unit Name/Description		Flare - Pilot and Purge Gas	PSV lift	Brine Flare	GC Vent Gas
Event (Normal/Upset)		Normal	Upset	Normal	Normal
Frequency		Continuous	six times a year	daily	Continuous
Duration		-	1 day	hour	-
Flow Rate	e^3m^3/d	1.5	2	0.05	0.002 [a]
Flare Volume	$e^3m^3/year$	547.50	12.00	18.25	0.84 [a]
Hydrogen	Mole Fraction	0.00	0.00	0.00	0.00
Helium		0.00	0.00	0.00	0.00
Nitrogen		0.00	0.00	0.00	0.00
Carbon dioxide		0.00	0.00	0.00	0.00
Hydrogen Sulphide		0.00	0.00	0.00	0.00
Methane		0.95	0.05	0.00	0.00
Ethane		0.00	0.00	0.00	0.00
Propane		0.03	0.48	0.50	0.00
Isobutane		0.03	0.48	0.50	1.00
n-butane		0.00	0.00	0.00	0.00
Isopentane		0.00	0.00	0.00	0.00
n-pentane		0.00	0.00	0.00	0.00
Hexane		0.00	0.00	0.00	0.00
Heptane		0.00	0.00	0.00	0.00
Octane Plus		0.00	0.00	0.00	0.00
Total		**1.00**	**1.00**	**1.00**	**1.00**

NOTE:
[a] Estimated using the AQM generic vent rate (AEP 2020)

SOURCE: Provided by AES

Emissions are calculated as:

$$Combusted\ CO_2\ Emission\ (tonnes/year)$$
$$= Flare\ Volume\ (e^3m^3/year) * Mole\ Fraction\ of\ flare\ gas\ excluding\ CO_2$$
$$* carbon\ number\ for\ hydrocarbon\ compounds\ in\ flare\ gas * Combustion\ Efficiency * CO_2\ Density\ (1.861\frac{kg}{m^3})$$
$$* \text{Unit Conversion } (\frac{tonnes}{10^3 kg})$$

$$Non - Combusted\ CO_2\ Emission\ (tonnes/year)$$
$$= Flare\ Volume\ (e^3m^3/year) * CO_2\ Mole\ Fraction\ of\ flare\ gas\ * carbon\ number\ of\ CO_2$$
$$* CO_2\ Density\ (1.861\frac{kg}{m^3}) * \text{Unit Conversion } (\frac{tonnes}{10^3 kg})$$

$$Total\ CO_2\ Emission\ (tonnes/year) = Combusted\ CO_2\ Emission\ +\ Non-Combusted\ CO_2\ Emission\ (tonnes)$$

$$CH_4\ (tonnes) = Flare\ Volume\ (e^3m^3/year) * (1 - Combustion\ Efficiency) * Mole\ Fraction\ of\ CH_4 * CH_4\ Density\ (0.6785\frac{kg}{m^3}) * \text{Unit Conversion}\ (\frac{tonnes}{10^3 kg})$$

$$N_2O\ Emission\ (tonnes/year) = Flare\ Volume\ (e^3m^3/year) * Higher\ Heating\ Value\ \left(\frac{GJ}{e^3m^3}\right) * Emission\ Factor\ \left(\frac{kg}{GJ}\right) * Unit\ Conversion\ (\frac{tonnes}{10^3 kg})$$

Emission factor for N_2O is taken from the Western Climate Initiative (WCI) QM (WCI 2011). This emission factor is used to convert flare volume to GHG emissions. The emission factor used for this activity is summarized in Table 3-10

Table 3-10 Flare N_2O Emission Factors

Emission Source	N_2O Emission Factor (kg/GJ)
Flare	9.52 E-05
SOURCE: WCI QM (WCI 2011).	

3.2.3 Fugitive Emissions

Fugitive emissions are from unintentional releases of GHG's to the atmosphere from the equipment component that leaks as a result of wear, damage, etc. The sources of fugitive emissions include but are not limited to connectors, valves, pressure relief valves, flanges, pumps, etc. The Existing Facility's 2020 fugitive leak rate was provided by AES as 0.40 ft³/min (i.e., 5,953.33 m³/year). The same leak rate was used for the Project fugitive emission calculation as the Existing Facility is of the same size of the Project. The gas leaked from the Project is conservatively assumed to be natural gas. The natural gas (i.e., flare pilot and purge gas) composition can be found in Table 3-9.

Emissions are calculated as:

$$CO_2\ Emission\ (tonnes/year) = Leak\ Rate\ (m^3/year) * CO_2\ Mole\ Fraction * CO_2\ Density\ (1.861\frac{kg}{m^3}) * Unit\ Conversion\ (\frac{tonnes}{10^3 kg})$$

$$CH_4\ Emission\ (tonnes/year) = Leak\ Rate\ (m^3/year) * CH_4\ Mole\ Fraction * CH_4\ Density\ (0.6785\frac{kg}{m^3}) * Unit\ Conversion\ (\frac{tonnes}{10^3 kg})$$

3.3 THIRD-PARTY (INDIRECT) EMISSIONS

This assessment includes indirect emissions from the purchased electricity. The purchased electricity is used during the construction and operation phase of the Project. The purchased electricity will be used in wash pumps, and other auxiliary utilities during the construction phase. During the operation phase, the purchased electricity will be used in brine pumps, NGL pumps, processing equipment as well as auxiliary utilities. Electricity consumption for the construction and operation phase were estimated and provided by AES (Table 3-11). The GHG emissions associated with third-party electricity generation are calculated using the 2018 ECCC NIR electricity consumption intensity factor for Alberta (ECCC 2020) as summarized in Table 3-12. The electricity consumption intensity factor for Alberta is expected to decline in to 270 g/KWh by 2032 as per Natural Resources Canada (NRCAN) Carbon Offset Emission Factor (NRCAN, 2020). Therefore, the indirect emissions estimated from the Project using the 2018 ECCC NIR electricity consumption intensity factor is conservative.

Table 3-11 Imported Electricity Consumption

Activity	Electricity Consumption
Construction Phase	25,018.00 MWh
Operation Phase	87,600.00 MWh/year
SOURCE: Provided by AES	

Indirect GHG emissions are calculated as:

$$Emissions\ (t\ CO_2e\ ) = Electricity\ Consumption\ (MWh) * Unit\ Conversion\ \left(\frac{10^3\ KWh}{MWh}\right) * Emission\ Factor\ \left(\frac{gCO_2e}{KWh}\right) * Unit\ Conversion\ \left(\frac{tonnes}{10^6 g}\right)$$

Table 3-12 Emission Factors for Third-Party (Indirect) Emissions

Emission Source	Consumption Intensity (g CO_2e/KWh electricity consumed)
Purchased Electricity – Alberta	680.00
SOURCE: National Inventory Report Table A13-10 (ECCC 2020)	

3.4 UPSTREAM EMISSIONS

Upstream GHG emission sources include activities from the point of extraction of the resource until it reaches the Project. Specifically, these sources may emit GHG emissions during production, gathering, and processing of the volume of product corresponding to the total Project system capacity (Government of Canada 2016). Product throughput of the Project is estimated to be 50,000 barrels per day of NGLs (C3+) and 10,000 barrels (bbl) per day of condensate (C5+). This results in a volume of 3,481,717 cubic meter (m^3) per year, using a conversion of 6.29 bbl/m^3 and 365 days per year. There are no publicly available upstream emission factors to calculate upstream emissions from C3+ and C5+ products but the upstream emission factors are available for natural gas. Hence, Stantec estimated the amount of natural gas required to produce the Project throughput volume using the typical natural gas composition in Canada. The typical natural gas in Canada contains about 8.1% of C3+ and 3% of C5+ (Pennstate,

2020). Stantec used these composition data and estimated that 55,163.01 e^3m^3 of natural gas is required to produce 3,481,717 m^3 of the product (i.e. C3+ and C5+). The estimated natural gas volumes is then used to calculate the upstream emissions.

Upstream emissions are estimated using the ECCC published GHG emission factors from the Nova Gas Transmission Ltd. Towerbirch Expansion Project (ECCC 2017). For screening calculation purposes, it was assumed that the source of the natural gas for the Project would originate from the same upstream sources as the Towerbirch Expansion Project. Therefore, gas specifications used in the Towerbirch Expansion Project are representable and emission factors for upstream natural gas production can be used in a screening approach to making the estimate. Emission factors for the upstream screening assessment are provided in Table 3-13. Note that the emission factors are shown in Table 3-13 was taken from the Towerbirch Expansion Project (ECCC 2017) and have been adjusted to account for a conversion correction. The upstream emissions factors are only provided until 2030 in the Towerbirch Expansion Project document (ECCC 2017).

Table 3-13 Annual Upstream GHG Emission Factors

Year	Production		Gathering		Processing	
	t CO_2e/ e^3m^3 [a]	t CO_2e/MMcf	t CO_2e/ e^3m^3 [a]	t CO_2e/MMcf	t CO_2e/ e^3m^3 [a]	t CO_2e/MMcf
2024	0.1088	3.08	0.0013	0.038	0.1190	3.37
2025	0.1088	3.08	0.0013	0.037	0.1190	3.37
2026	0.1088	3.08	0.0013	0.038	0.1190	3.37
2027	0.1088	3.08	0.0013	0.038	0.1190	3.37
2028	0.1088	3.08	0.0013	0.038	0.1180	3.34
2029	0.1088	3.08	0.0013	0.038	0.1165	3.3
2030	0.1088	3.08	0.0013	0.038	0.1151	3.26
NOTE: [a] Emission factors include a correction of t CO_2e/MMcf to t CO_2e/e^3m^3 conversion provided in ECCC 2017.						
SOURCE: ECCC (2017)						

Estimated upstream GHG emissions are based on the following equation:

$$Upstream\ GHG\ Emissions\ (t\ CO_2e) = Throughput\ Volume\ (e^3m^3\ of\ natural\ gas) \times Emission\ Factor\ \left(\frac{t\ CO_{2e}}{e^3\ m^3}\right)$$

4.0 ESTIMATED GREENHOUSE GAS EMISSIONS

4.1 CONSTRUCTION PHASE

The direct GHG emissions from the construction phase are presented in Table 4-1. The sources of GHGs include fuel combustion by on-road, off-road, and other construction equipment. Construction emissions are mainly from off-road equipment (92%).

Table 4-1 Total Greenhouse Gas Emissions - Construction

Emission Source	Total Construction Emissions (tonnes)[a, b]				Percent of Total Construction Emissions
	CO_2	CH_4	N_2O	CO_2e	
Off-road construction equipment	5,431.31	0.15	0.47	5,573.85	92%
On-road construction equipment	209.18	0.01	0.012	212.88	4%
Other construction equipment	284.88	0.01	0.01	287.07	5%
Totals	5,925.36	0.16	0.48	6,073.80	100%

NOTE:
[a] Totals may not sum due to rounding
[b] Construction emissions are for the entire construction period

4.2 OPERATION PHASE

The direct GHG emissions during operation are presented in Table 4-2. The emission source categories associated with the operation phase are stationary combustion, flaring, and fugitive sources. Operation emissions are mainly from stationary combustion sources (87%) followed by flaring (12%).

Table 4-2 Total Greenhouse Gas Emissions - Operation

Emission Source	Total Operation Emissions (tonnes) [a, b]				Percent of Total Operation Emissions
	CO_2	CH_4	N_2O	CO_2e	
Stationary Combustion	10,575.48	0.20	0.19	10,638.21	87%
Flaring	1,319.99	7.07	0.002	1,497.37	12%
Fugitive	0.00	3.84	0.00	95.93	1%
Totals	11,895.47	11.11	0.20	12,231.52	100%

NOTE:
[a] Totals may not sum due to rounding
[b] Operation emissions are on an annual basis

4.3 THIRD-PARTY (INDIRECT) EMISSIONS

The indirect GHG emissions from electricity consumption during construction and operation phase are presented in Table 4-3.

Table 4-3 Total Greenhouse Gas Emissions - Indirect Emissions

Emission Source	**Total Emissions (t CO_2e) [a]**
Construction Phase	17,012.24
Operation Phase	59,568.00
Total	**76,580.24**
NOTE: [a] Totals may not sum due to rounding	

4.4 UPSTREAM SCREENING ASSESSMENT

The Project throughput may not be directly linked to increased upstream development. Upstream development has most likely already occurred with regards to exploration and readiness for production. However, the upstream assessment conservatively assumes the throughput for the Project is directly attributed to an increase in upstream development. Using the emission factors provided in the ECCC Assessment of Upstream Emissions related to the Towerbirch Expansion Project (ECCC 2017), the annual upstream GHG emissions from 2024 to 2030 are estimated for the Project by prorating them to the Project throughput volume; the results are presented in

Table 4-4. The upstream emissions for the Project are estimated to be approximately 13 kilotonnes (kt) CO_2e per year between 2024 to 2030.

Based on the screening assessment, the annual upstream GHG emissions are estimated to be less than the 500 kt CO_2e/y threshold. As per the CER Filing Manual (CER 2020), no further assessment of upstream GHG emissions is required for the Project.

The upstream emissions factors in the Towerbirch Expansion Project document are only provided until 2030 (ECCC 2017). The operational phase of this Project is expected to last beyond 2030. Given that the estimated annual upstream emissions are well below the 500 kt CO_2e/y threshold for 2020-2029, or the more stringent thresholds of 300 kt CO2e/year for the period of 2030-2039 or 200 kt CO_2e/year for the period of 2040-2049, or 100 kt CO_2e/year for 2050 and beyond (Government of Canada 2020), it is unlikely that the upstream emissions beyond 2030 would trigger the threshold. Therefore, upstream emissions are estimated out to 2030.

Table 4-4 Upstream Greenhouse Gas Emissions for 2024 to 2030

Year	Annual Upstream Emissions (kt CO_2e)			
	Production	Gathering	Processing	Total
2024	6.00	0.07	6.56	12.64
2025	6.00	0.07	6.56	12.64
2026	6.00	0.07	6.56	12.64
2027	6.00	0.07	6.56	12.64
2028	6.00	0.07	6.51	12.58
2029	6.00	0.07	6.43	12.50
2030	6.00	0.07	6.35	12.42

5.0 SUMMARY OF FINDINGS AND CONCLUSIONS

Key findings of the GHG calculations in this TDR are:

- The direct GHG emissions from the entire Project construction period is estimated to be 6,073.80 tCO_2e, of which the emission from off-road equipment accounts for about 92% of the total construction emissions. In addition to this, the indirect GHG emission associated with imported electricity during construction is 17,012.24 tCO_2e. The Project is located within an existing industrial facility so there will be no emissions associated with land-use change.

- The direct GHG emissions from Project operation is estimated to be 12,231.52 tCO_2e/year, of which the emission from stationary combustion equipment accounts for about 87% of the annual operation emissions. In addition to this, the indirect GHG emission associated with imported electricity during operation is 59,568.00 tCO_2e/year. The project does not capture and store CO_2 and there are no avoided emissions as a result of this Project.

- A screening level estimate of upstream GHG emissions indicates that the upstream emissions associated with the Project are less than 500 kt CO_2e per year.

The above GHG emission estimates incorporated several conservative assumptions such as:

- the Project would use a hot oil heater during operation;
- the hot oil heater would be operating at design capacity continuously;
- the flare pilot and purge would be operating continuously;
- the Project would use a gas chromatograph and it would run continuously;
- the annual electricity use is conservatively based upon equipment electrical ratings; and
- the electrical grid GHG intensity is based upon 2018 intensity although it is forecast to decline in future years.

Overall, the GHG emissions associated with Project construction and operation are low in magnitude when compared to provincial and national emission totals.

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