NI 43-101 TECHNICAL REPORT

LITHIUM RESOURCE ESTIMATE
for the
CENTRAL CLEARWATER PROPERTY
SOUTH-CENTRAL ALBERTA, CANADA

Prepared for

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1 Summary

E3 Metals Corp (TSXV: ETMC | FSE: OU7A | OTC: EEMMF) is a public lithium exploration company with a corporate office located in Vancouver, BC. Raymond P. Spanjers, P.G. QP, was retained by E3 Metals Corp to prepare a technical report on the inferred resource on the Alberta Petro-Lithium Project leases in conformity to National Instrument 43-101 (NI 43-101) standards. Other contributors include Gordon MacMillan, P.Geo. QP and Wayne Monnery, P.Eng. QP.

The Alberta Petro-Lithium Project (oil and gas related formation brines) consists of 71 Metallic and Industrial Mineral Permits that overlie the Leduc Reservoir in Southern Alberta (Figure 3). All permits are held 100% by 1975293 Alberta Ltd (Alberta Co), a wholly owned subsidiary of E3 Metals Corp. The property in its entirety contains 560,828 hectares (Ha) and is subdivided into 5 Sub-Project areas: Clearwater, Rocky, Exshaw, Drumheller and Sunbreaker. The Inferred Resource Estimate in this report refers to a specific permit area called the Central Clearwater Resource Area (CCRA).

The CCRA is located in the southwestern part of the Western Canada Sedimentary Basin (WCSB). In this area, the Upper Devonian (Frasnian) sediments of the Woodbend Group were deposited in a shallow inland sea bounded by the emergent Peace River Arch to the North West and the West Alberta Ridge to the south-west creating a barrier between the sea and the open ancestral Pacific to the west (Potma, et al. 2001). It is here that the flooded carbonate platform of the Cooking Lake provided structural highs and a favorable environment for the prolific reefal buildups of the Leduc formation. The Clearwater area covers a portion of the Wimborne-Bashaw complex just east of the Meadowbrook-Rimbey Leduc. The Duvernay and Ireton basinal shales and carbonate muds conformably encase and overlay the Leduc buildups creating traps for hydrocarbon pools and form the aquitard for the Leduc and Cooking lake aquifer system.

The Leduc and Cooking Lake limestone deposits are partially to completely replaced by dolomite, a process that enhanced the porosity and permeability of the reservoir. The main oil, gas and Li-brine mineralization (formation water associated with oil and gas production) accumulations in E3 Metals properties occur in dolomitized reefs of Devonian Leduc age at true vertical depths greater than 2200 meters in the subsurface. Many of the wells in this area in their early history started out at hundreds to thousands of barrels per day of petroleum products and required little active pumping to extract. However, at present most of the wells produce excessive amounts of formation water in comparison to petroleum products. Formation water production in the CCRA averaged approximately 1,800 m3/day over the last 5 years (GeoSCOUT^{TM}).

E3 Metals exploration activities consisted of brine sampling from existing oil production wells. Samples were collected from existing Leduc Formation producing oil and gas wells by field technicians contracted from Maxxam Analytics in Red Deer, Alberta. All wells producing solely from the Leduc Formation, without any additional concurrent zone production (commingling), were earmarked for sampling, and were accessed based on availability. Oil and gas operators generally cycle wells, so several field programs were completed to collect samples. Samples were either collected directly at the wellhead, or at test separators, by Maxxam employees wearing self-breathing apparatuses due to the presence of H_2S (hydrogen sulfide) gas. A documented sampling procedure ensured that samples were collected, sealed and labeled to avoid contamination and tampering.

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Laboratory analyses consisted of a round robin of a synthetic Li-standard, created by the University of Alberta, which was sent to 5 laboratories. Based on the accuracy of the results and logistical considerations, AGAT and Maxxam laboratories were chosen as the Project labs. 47 brine samples taken throughout the Project area were analyzed by the two labs in duplicate. AGAT and Maxxam were selected as the primary and check labs, respectively, based on the merits of their respective precisions (slope intercept and R^2 values).

Three aquifers (Leduc Reef Margin, Leduc Platform Interior and Cooking Lake Interior) and seven hydrostratigraphic subdivisions (Innisfail Margin, Innisfail Lagoon, Clearwater Interior, Wimborne Margin) were defined for the resource model. The aquifers and their properties were determined by facies geometry, well logs, core, well drill stem test data and isopach maps.

The inferred resource estimate was developed in three stages: 3-D modeling to calculate the available producible brine, particle tracking to estimate the drainage area of each recovery well network and variography and simple kriging to assess lithium concentration distribution.

Particle tracking (FEFLOW), a modelling technique that tracks the movement of hypothetical particles over time, provides a physically-based estimate of advective transport (bulk movement of a fluid) to estimate the drainage area of each recovery well network. Results show that groundwater from the CCRA can be produced at rates of 20,000 m^3/d with production well networks of one production well and two to three injection wells. The production well networks are predicted to have a life of 3,600 to 16,000 days (10 to 44 years) before injected water reaches the production well.

Geostatistical software was used to determine the variography of 47 points and assess the manner in which Li concentrations vary spatially. Simple kriging of data points in the CCRA area predicted the lithium concentration distribution. The mean Li concentration the CCRA was 77.4 mg/L.

An optimized production well network design, the schedule of production from the well networks and the dispersion of low-concentration lithium injected water have not yet been determined. For the purposes of this work the inferred lithium production volumes, 50% production factor has been applied to estimate a total mass of lithium that could be produced. The selection of a 50% production factor is considered conservative as it represents the proportion of lithium that would be produced at the time the advective front arrives at the production well. Prior to that time, the lithium concentrations will decrease gradually from 100% formation water as the relative proportion of injected water increases. The production factor may increase as the area is assessed further.

The mineral resource estimate for the CCRA is 4.6 billion m^3 at an average grade of 77.4 mg/L, which equates to 1,900,000 tons lithium carbonate equivalent (LCE). This resource estimate is classified as inferred because the geological evidence is sufficient to imply but not verify geological, grade or quality continuity. It is reasonably expected that the majority of the Inferred Mineral Resource Estimate could be upgraded to Indicated Mineral Reserves with continued exploration. A production rate of 20,000 m^3/d with individual production well network life spans of 10 years to 44 years is expected before the injected water reaches the production well.

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The reservoir model used a significant amount of existing data from existing oil and gas production activity but relatively few Li-brine analyses. Additional well samples are needed, where possible, to confirm brine chemistry through time and build the larger dataset. The cost of collecting and analyzing additional samples is estimated at $100,000.

The existing samples from wellhead and separators do not give a vertical profile of the sampled wells or the Li-brines within each of the identified aquifers. Vertical profile sampling of Li concentrations within the reservoir at one or more locations per resource area is recommended at an estimated cost of $200,000 each. E3 Metals should consider permitting the installation of a lithium brine treatment system to develop logistics, recovery and economics for a future Preliminary Economic Assessment (PEA).

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2 Introduction

E3 Metals Corp (TSXV: ETMC | FSE: OU7A | OTC: EEMMF) is a publicly listed lithium exploration company with corporate offices in Vancouver, BC., and exploration and operations offices located in Calgary, AB. ETMC is listed on the TSX Venture Exchange (TSXV: ETMC), the Frankfurt Stock Exchange (OU7A) and OTC Market Exchange (EEMMF).

2.1 Terms of Reference

Raymond P. Spanjers, P.G., was retained by E3 Metals Corp to prepare a technical report on the inferred resource on the Alberta Petro-Lithium Project leases in conformity to National Instrument 43-101 (NI 43-101) standards. Other contributors include Gordon MacMillan, P.Geo. (Section 14), and Wayne Monnery, P.Eng. (Section 13), Qualified Persons under NI 43-101 Reporting standards. This report has been prepared and is to be used by E3 Metals Corp. for the purpose of supporting the TSX Venture Exchange regulatory requirements and/or financing.

2.2 Sources of Data

The report is based upon information and data collected by E3 Metals Corp, and data collected, compiled and validated by the authors. Mineral rights and land ownership information was provided by E3 Metals Corp. The majority of the information contained within the report was derived from the following:

- E3 Metals Corp-supplied exploration maps, logs, laboratory analyses, third-party reports and field test data;
- Original bench tests on collected brine samples;
- Published literature (see Section 27 for references).

Sources of information are listed in Section 27 and are acknowledged where referenced in the report text.

2.3 Site Visit

A site visit during field sampling was performed by Raymond Spanjers on September 28, 2017. See Section 12 of this report for a description of the site visit.

A site visit was not required by Gordon MacMillan because the geoscience data utilized in the report was not sourced by E3 Metals, and is instead sourced from the Alberta Energy Regulator database, collected from decades of oilfield development by various operators. Sampling data utilized in this report was addressed in the site visit by Raymond Spanjers (above).

A site visit and lab tour was conducted by Wayne Monnery, PhD on September 12, 2017. Mr. Monnery toured the University of Alberta Alessi laboratory where the treatment described in Section 13 was conducted.

3 Reliance on Other Experts

No other experts were used in the preparation of this report.

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4 Property Description and Location

4.1 Location

The E3 Metals Corp Alberta Petro-Lithium project is located in south-central Alberta between Edmonton to the north and Calgary to the south (Figure 1). The project overlies the Leduc Reef, an oil producer and source of lithium brines.
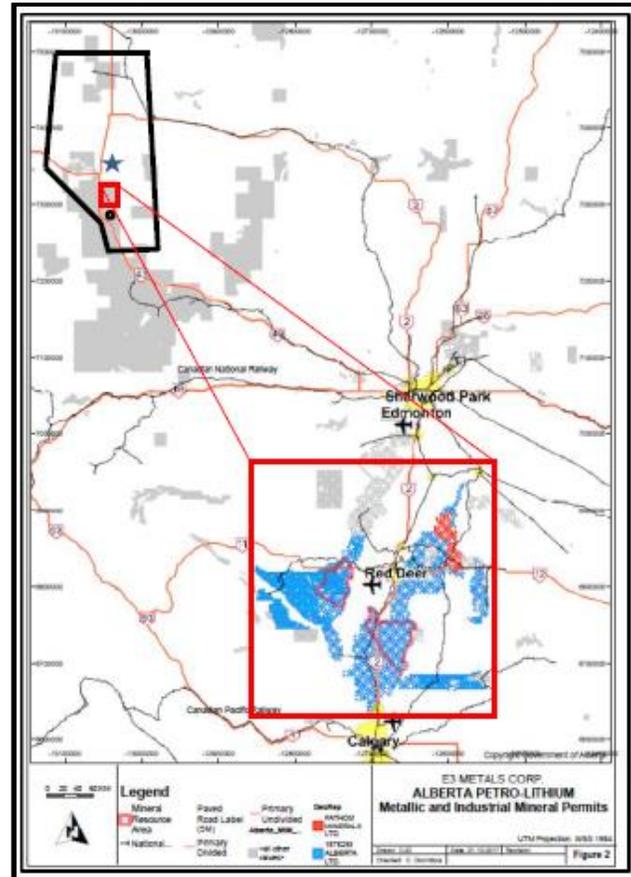
Figure 1. Location of Alberta Petro-Lithium Project in south-central Alberta (E3 Metals, 2017)

Alberta Petro-Lithium Project, Alberta, Canada
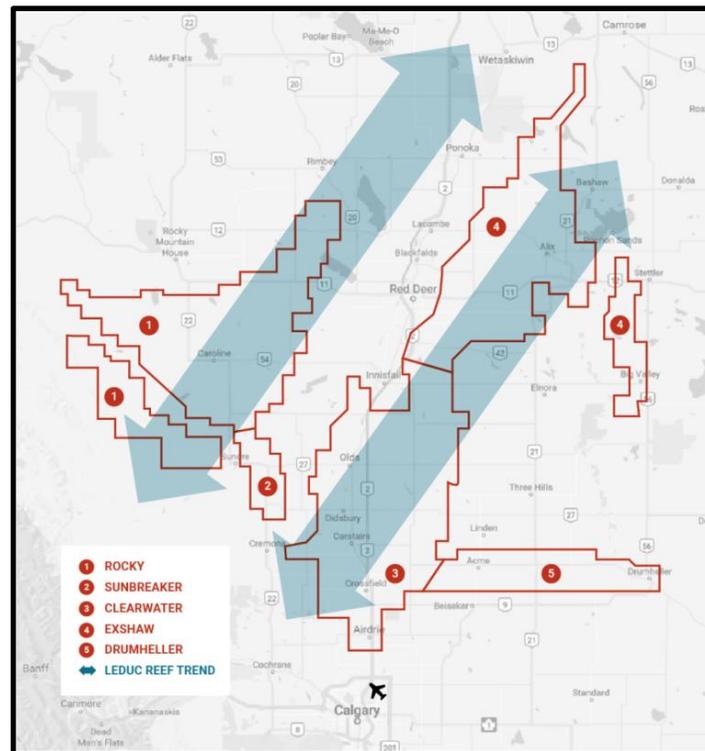
Figure 2. General trend of Leduc Reef underlying the Alberta Petro-Lithium Project lease holdings (E3 Metals, 2017)

4.2 Property Description

The Alberta Petro-Lithium Project consists of 75 Metallic and Industrial Mineral Permits (the Permit Area) that cover the Leduc Reservoir in Southern Alberta (Figure 2). All permits are held 100% by 1975293 Alberta Ltd (Alberta Co), a wholly owned subsidiary of E3 Metals Corp. The property is subdivided into 5 Sub-Project areas (Table 1) outlined on Figure 2 and the areas of the resource study are summarized in Appendix A and Appendix B. The total area of the permits is 560,828 hectares.

The Central Clearwater Resource Area, a sub-area of the Tract 3 Clearwater claims in Table 5, consists of 62,458 hectares covered in 8 Metallic and Industrial Mineral (MIM) Permits. Of the 8 permits, which completely or partially intersect the CCRA boundary, 48,186 ha fall within the CCRA boundary. The claims are interspersed with privately owned (Freehold) land.

Table 1: Summary of the Alberta Petro-Lithium Project lease holdings (E3 Metals, 2017).

Tract	Area	Total Ha	# of Applications
1	Rocky	243,751	30
2	Sunbreaker	15,678	2
3	Clearwater	138,990	17
4	Exshaw	106,898	14
5	Drumheller	55,511	8
	Total	**560,828**	**71**

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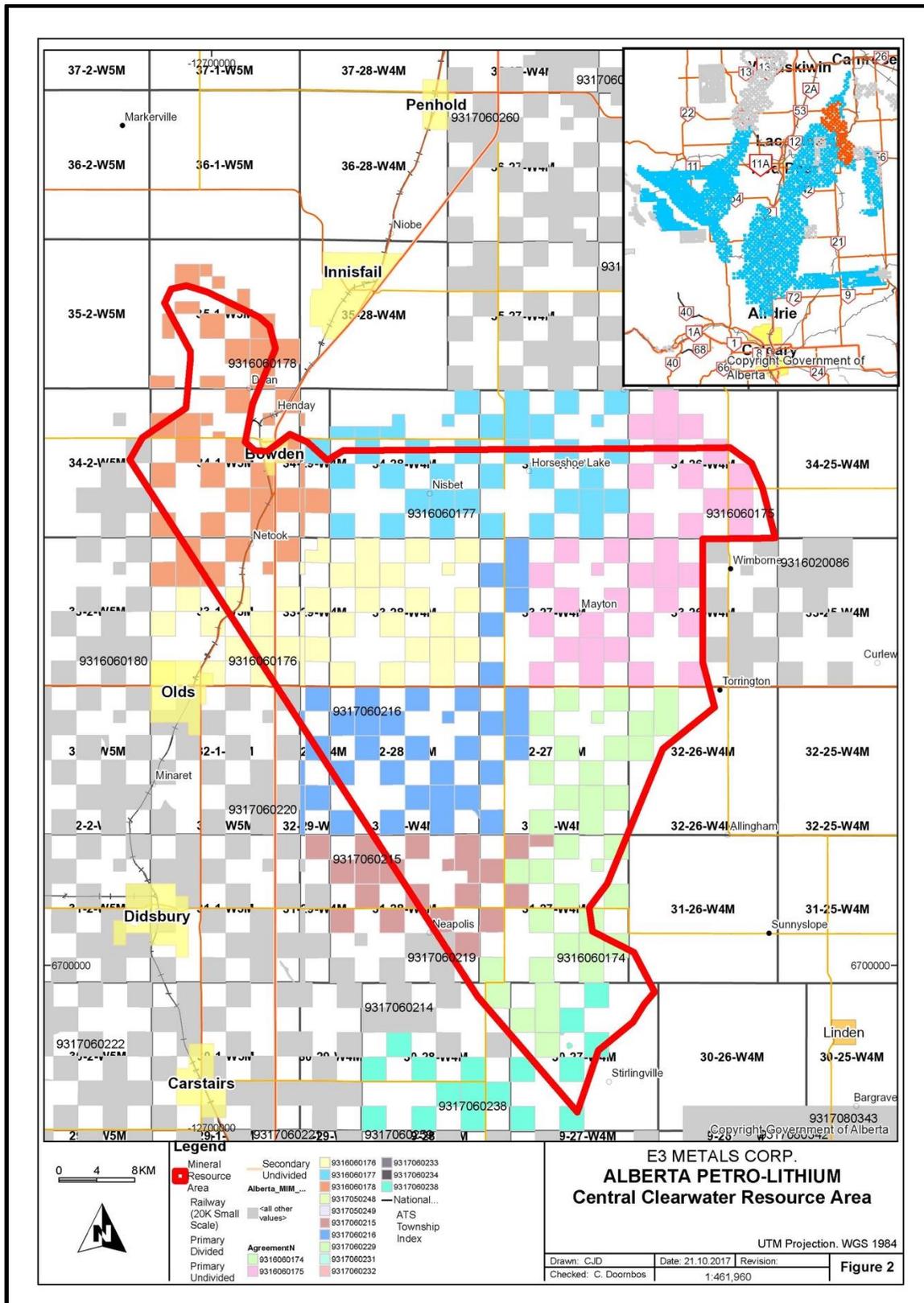
Figure 3: Location of Central Clearwater Resource Area and permits held within the Alberta Lithium Project, Alberta, Canada (E3 Metals, 2017). The center of the permit holdings is at 51.83 N 113.83 E in the NAD83 datum. The blue lands (subset map) are held by 1975293 Ab Ltd, a wholly owned subsidiary of E3 Metals Corp.

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Alberta Metallic and Industrial Mineral Permits grant the explorer the exclusive right to explore for metallic and industrial minerals for seven consecutive two-year terms (total of fourteen years), subject to traditional biannual assessment work. Work requirements for maintenance of permits in good standing are $5.00/ha for the first two-year term, $10.00/ha for each of the second and third terms, and $15.00/ha for each the fourth, fifth, sixth and seventh terms.

The statutes also provide for conversion of Permits to Metallic Minerals Leases once a mineral deposit has been identified. Leases are granted for a renewable term of 15 years, and require annual payments of $3.50/ha for rent to maintain them in good standing. There are no work requirements for the maintenance of leases and they confer rights to minerals. Complete terms and conditions for mineral exploration permitting and work can be found in the Alberta Mines and Minerals Act and Regulations (Metallic and Industrial Minerals Tenure Regulation 145/2005, Metallic and Industrial Minerals Exploration Regulation 213/98). These and other acts and regulations, with respect to mineral exploration and mining, can be found in the Laws Online section of the Government of Alberta Queen's Printer website (www.qp.alberta.ca/Laws_Online.cfm).

The mineral permits are interspersed with privately owned (Freehold) land, where the surface and/or minerals rights are owned by private individuals and/or companies and not the crown (the white areas interspersed within the E3 Metals Permit Area in Figure 1). The Freehold lands do not pose an obstacle to initial brine assay and mineral processing test work within the mineral permits owned by E3 Metals. Given a favorable distribution of contiguous Permit coverage and completion of advanced characterization studies focused on the drawdown effect of the liquid resource (particularly laterally), it is possible that E3 Metals does not have to acquire Freehold Land in order to produce Li-brine from aquifers within the properties.

The inferred resource estimate outlined within this report has been completed on the central portion of the Clearwater Property (See Figure 3). The Central Clearwater Resource Area (CCRA) consists of 48,186 ha across 8 Metallic and Industrial Mineral (MIM) Permits that completely or partially intersect the NRRA. The 8 MIM permits have a total of 64,458 ha with a first 2-year in-ground expenditure commitment of $312,886.90 (Appendix A).

4.3 Royalties

On July 10, 2017, the Company signed a Royalty Agreement pursuant to which it has agreed to pay to the royalty owner a perpetual production royalty equal to 2.25% (the "Royalty") of the gross proceeds from all products that are mined or extracted from seven specific Clearwater MIM permits.

The Company has the option, at any time before September 30, 2020, to purchase all or a portion of the royalty at a price of:

- $600,000 for the entire 2.25% of the Royalty, or

- $75,000 for each 0.25% of the Royalty, provided that the maximum amount to purchase the entire 2.25% of the Royalty will be $600,000.

The permit numbers are 9316060174, 9316060175, 9316060176, 9316060177, 9316060178, 9316060179 and 9316060180.

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4.4 Environmental Issues

At the current stage of the project, there are no environmental liabilities to E3 Metals. Environmental considerations and permitting for this project at a later stage are outlined in Section 20.

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Accessibility

The Clearwater property is readily accessible by air and ground transportation (Figure 4). There are international airports in Calgary (YYC) and Edmonton (YEG). Red Deer hosts a regional airport (YQF).
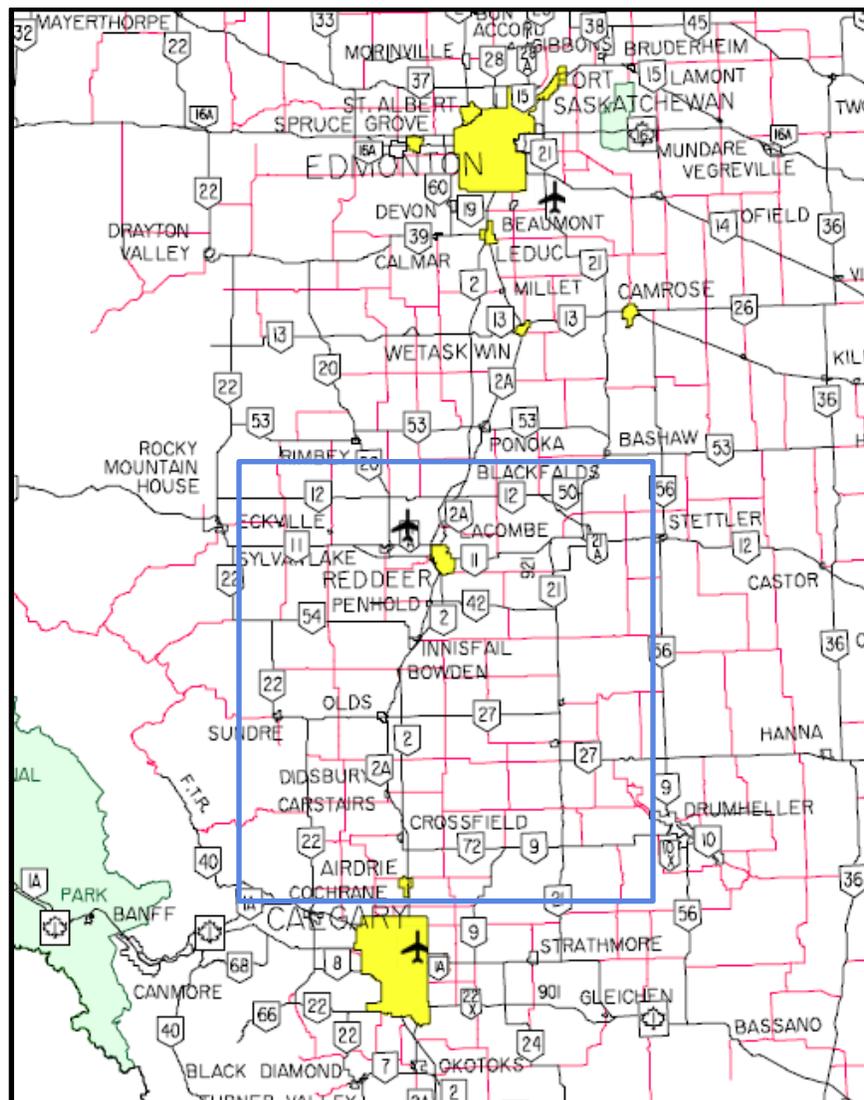
Figure 4: Primary roads, secondary roads and air access to Project area (blue rectangle) (www.transportation.alberta.cacialNetworkMap)

Major and secondary provincial highways, and all-weather roads developed to support oil/gas infrastructure, occur throughout the permit areas. The City of Red Deer (population of 100,400) is located at the junction of Alberta Provincial Highway 2 ("Hwy 2") and Highway 11; Hwy 2 is the main

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corridor between Edmonton and Calgary and runs North-South directly through the Clearwater Property. Further access to the properties is provided by secondary one- or two-lane all-weather roads, and numerous all weather and dry weather gravel roads. The resource area can be accessed year-round, ensuring mineral test work and extraction is not limited to certain months of the year. Two rail lines (Canadian Pacific Railway and the Canadian National Railway) are present throughout the area and connect to the major centers of Edmonton and Calgary which occur north and south of the resource area and then all of North America.

5.2 Climate

Calgary, Alberta has a humid continental climate with severe winters, no dry season, warm summers and strong seasonality (Köppen-Geiger classification: Dfb).
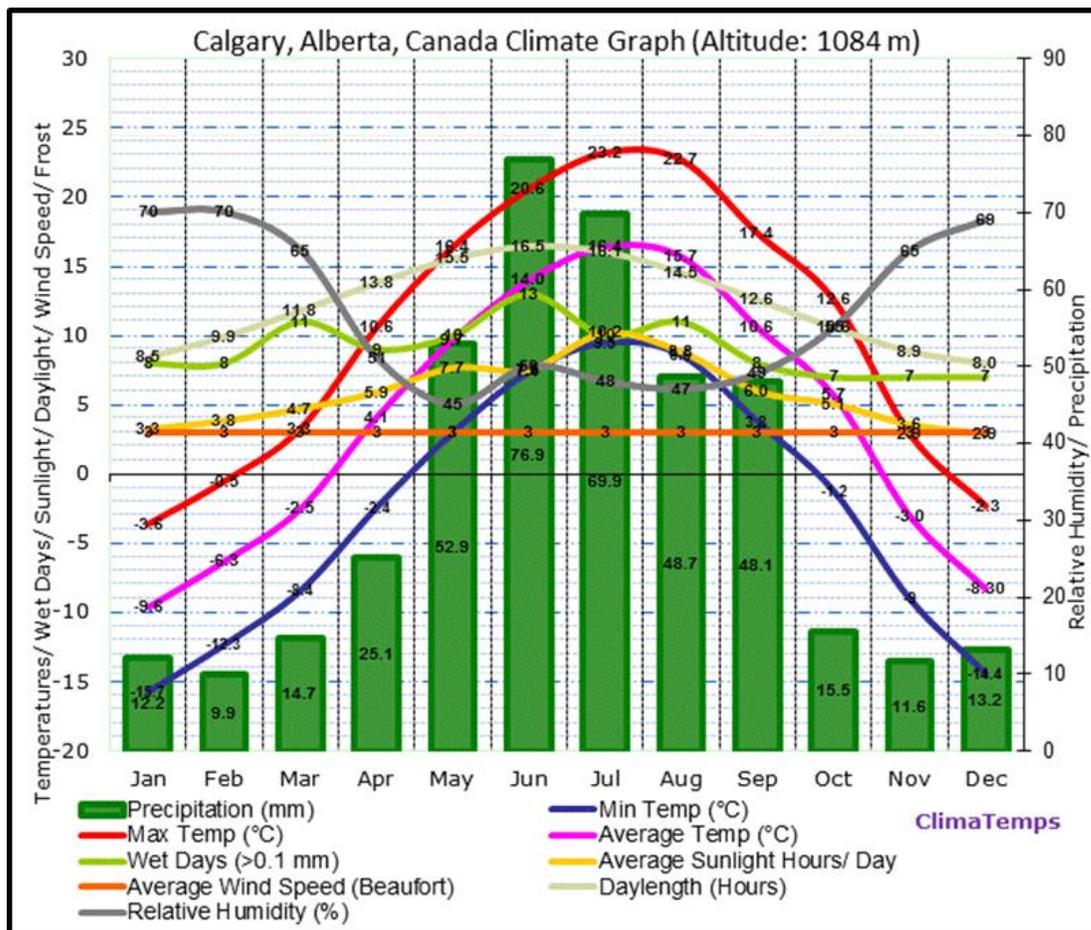
Figure 5. Summary of monthly annual climate data for Calgary, BC.
(http://www.calgary.climatemps.com/)

Alberta Petro-Lithium Project, Alberta, Canada
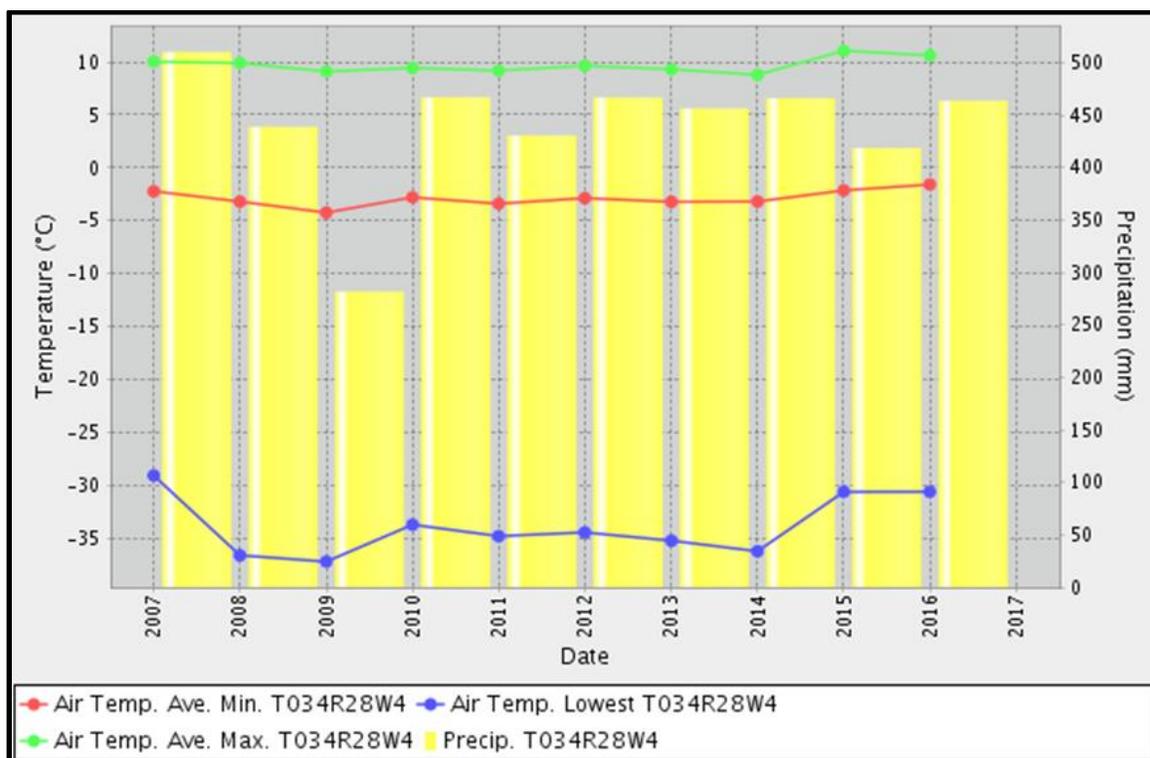
Figure 6. 10-year temperature and precipitation ranges for T34N R28W, the center of the Clearwater claims (ACIS, 2017).

During summer, average high temperatures are 22.2°C (71.9°F) and average low temperatures are 8.5°C (47.3°F). Fall temperatures have average highs of 11°C (51.7°F) during the day and lows of -2.1°C (28.2°F) generally shortly after sunrise. Total annual Precipitation averages 398.7 mm (15.7 inches). A summary of Calgary climate data by month is shown in Figure 5. A 10-year summary of high-low-mean air temperature and mean precipitation for T34N R28W, the center of the Clearwater claims, is shown in Figure 6.

5.3 Local Resources
Accommodation, food, fuel, and supplies are readily obtained in the City of Red Deer (pop. 100,418 (2016)) and the towns of Olds, Sylvan Lake and Innisfail. Internet and phone coverage is available throughout the permit areas. Many trained workers live in the area and work in the oil and gas sector. These workers have the skills and expertise required to develop lithium from their related experience in oil and gas. Service companies, including those providing wireline services, testing, workovers and drilling all operate locally and will be capable of meeting the company's needs relating to drilling, production and construction.

5.4 Infrastructure
There is a significant amount of infrastructure in the area to support over 70 years of oil and gas development operations. Oil and gas is typically produced in the area using pump jacks. Hydrocarbons and water produced from the wells are delivered to separation facilities (either on site or at a satellite location) via underground pipelines. After separation, the various fluids and phases enter into a network of pipelines designed for the transportation of gas, oil and water to specific destinations for upgrading, processing, to market, or for disposal. Pipelines specific to water are designed mainly to transport

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wastewater for disposal and/or injection purposes. These water pipeline networks are specifically located in the areas developed for oil and gas.

Main highways are properly maintained and upgraded, and secondary gravel roads are well maintained. Grid electrical distribution and transmission infrastructure is available throughout the resource area and many of the locations sampled for this resource have power accessible directly at the lease.

There is adequate land for the location of process plants and related required future infrastructure.

5.5 Physiography

The project area lies within the Southern Alberta uplands and Western Alberta plains (Figure 4). The dominant landform is undulating glacial till plains, with about 30 percent as hummocky, rolling and undulating uplands. The average elevation is 750 m, but ranges from 500 m near the Alberta–Saskatchewan border to 1250 m near Calgary. The Red Deer River is the dominant topographic feature; it runs northwards and is situated between the Exshaw East and Exshaw West sub properties. The region is dominantly farmland with numerous creeks and wetlands occurring throughout the property. Clusters of forested terrain are dominated by aspen, balsam poplar, lodge pole pine and white spruce. Vegetation in the wetland areas is characterized by black spruce, tamarack and mosses. The area is generally composed of farmland and prairie grasses.

6 History

In the Permit area, there have been no drilling exploration programs to target lithium enriched brine specifically. Historical testing of lithium in water was conducted as part of routine chemistry analysis by oil and gas operators in the area. This data was compiled in a comprehensive overview of the mineral potential of formation waters from across Alberta by the Government of Alberta (Hitchon et al., 1993, 1995). Subsequent collection of brine water from actively producing oil and gas wells was conducted by the AGS by Eccles and Jean (2010) and was analyzed for lithium. A summary of the petroleum exploration and production and the lithium brine related geological data sourced from the petroleum industry are summarized below.

6.1 Oil Drilling History

Existing wells in this area were drilled for petroleum and natural gas. Early operators for oil and gas fields in the area included such companies as Husky Oil & Refining Ltd, Shell Oil Company of Canada, Hudson's Bay Oil & Gas Co., and British American Oil Co. Ltd. (Gulf Canada). These companies were active in the resource areas as early as 1951 and some remain active to date.

The Leduc #1 well, drilled by Imperial Oil, was one of the first oil wells in Alberta drilled into the Late Devonian Leduc formation in 1947. Some of the most prolific formations produced historically are the Devonian formations, which includes the Swan Hills, Beaverhill Lake, Leduc, Nisku, and Wabuman Formations. The Leduc reefs were a prevalent target for hydrocarbons from the mid to late century due to their size and very high porosity and permeability. Currently there is resurgence in drilling activity in the Devonian with the improvement of technology allowing for the development of unconventional oil reservoirs such as the Duvernay formation. A significant volume of petroleum-related fluid has been produced from the Devonian as well as from some of the younger zones above in the Mississippian and

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Cretaceous. It is the Leduc formation and the underlying Cooking Lake aquifer that is of significance with respect to this assessment for mineral brine potential in the CCRA.

The Clearwater area contains two major Leduc oil pools of note, namely the Innisfail oil field on the western edge, discovered in 1956 by Canadian Oils Ltd., and the Wimborne field on the Eastern side, discovered by Seaboard Oil Company in 1954. These two pools form the eastern and western defining edges of the resource area and roughly correspond to the Leduc Platform Margin. A total of 1,846 wells have been drilled within the CCRA, 158 wells have intercepted the Leduc Formation. A total of 152 wells are classified as having produced, currently producing or injecting into the Leduc Formation.

6.2 Well Logs

Open hole wireline logging technology is the predominant method for evaluating reservoir properties. Wireline logs are a standard tool employed by the petroleum industry when drilling for and developing oil and gas pools. They provide physics-derived information about rock properties and fluid dynamics in the subsurface. This information is used to interpret the depths, lithology and fluid composition of subsurface rock formations. Interpretations from well logs are used in the reservoir model discussed in Section 14.

A rich database of well log information exists in the area due to oil and gas development dating back to the 1950's, and this well log data can be leveraged for the purposes of Petro-Lithium exploration. Wireline tool technology has advanced considerably over the last few decades, and data resolution and quality tended to improve significantly after the 1980's. Due to the variety of well vintage and depth, a wide range of type and quality of well log data exists. Only well logs with sufficient depth and quality were used in the analysis of this resource.

The well logs available in the area are as follows:

- o Gamma Ray Log: measures the radioactivity of rocks and helps determine lithology (http://petrowiki.org/Gamma_ray_logs, 2017)
- o Induction Log: measures rock conductivity, and helps determine lithology and fluid composition (http://petrowiki.org/PEH:Resistivity_and_SP_Logging, 2017; Archie, 1942).
- o Density and Neutron logs: measures hydrogen concentration and electron density (American Association of Petroleum Geologists, 2017), and helps determine lithology and pore space in the rock
- o Photoelectric logs: measures atomic weight of the rocks, and helps determine lithology

Well logs penetrating through both the Leduc and the Cooking Lake Formation were used to determine the top and bottom of the formations and, the lateral extent of the Leduc over top of the Cooking Lake Platform. After formation tops were selected, well logs were then used to determine fluid contacts and reservoir parameters within the Leduc and Cooking Lake reservoirs.

6.3 Drill Stem Tests

A Drill Stem Test (DST) is an oilfield test that isolates a particular range of depths in a wellbore to measure the reservoir pressure, permeability (ability to flow fluid) and fluid types present at specified depths. DSTs have been run in the vicinity of the resource areas since the 1950's. Data collected during DSTs are compiled by the Government of Alberta and were accessed through third party software

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(GeoSCOUT 2017). DST data was reviewed to determine reservoir pressure and permeability in the resource areas.

Prior to adopting DST-derived pressure estimates as representative of the reservoir, a quality assurance (QA) program was followed that eliminated suspect or erroneous data. The QA program reduced the pressure data set to 327 DSTs with extrapolated pressure measurements. The resulting data set consisted of 324 pressure measurements in the Leduc Formation and 3 pressure measurements in the Cooking Lake Formation.

Within the CCRA there were 33 DST pressure measurements considered representative of the reservoir pressure. These measurements were distributed throughout the resource area and were measured between 1957 and 1980. These pressure measurements were used to estimate the current day reservoir pressure and to contribute to the characterization of the hydraulic continuity of the reservoir.

6.4 Production, Injection and Disposal

Historical production volumes for the Cooking Lake and Leduc formations were exported from Divestco's GeoCarta software (Divestco 2017). The reported production was queried for both resource areas and a buffer area around the resource areas, in order to include production from outside of the resource areas that may directly affect pressures in the resource areas.

For the CCRA, historical production was queried from contiguous Leduc reef, including 45-kms surrounding area to the southwest and a 70-kms to the northeast. There is a total of 99,273 months of reported production volumes in the greater CCRA from 430 wells. The wells were distributed across 23 townships with much of the production occurring north of the resource area. Within the resource area, most of the production was in the Wimborne Margin and the Innisfail Margin areas. The first year of reported production was 1961. Approximately 99.7% of the production in the CCRA was from the Leduc Formation.

Total reported fluid volumes in the CCRA are:

- 15,984,368 x 103 m^3 of gas produced;
- 89,063 m^3 of condensate produced;
- 28,139,801 m^3 of oil produced;
- 79,672,861 m^3 of water produced;
- 453,125 x 103 m^3 of gas injected; and
- 96,023,125 m^3 of water injected.

The total fluid produced from the reef in the vicinity of the resource area peaked in the 1970s and has decreased considerably since then as hydrocarbons have been depleted. The current net production hydrocarbon volumes in the vicinity of both resource areas has decreased significantly over the last decade, though the reservoir still contains sufficient pressure to produce formation water.

6.5 Historical Lithium Data

Section 6.5 was extracted from Eccles (2017) technical report for E3 Metals.

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The first comprehensive overview of the mineral potential of formation waters from across Alberta was compiled by the Government of Alberta (Hitchon et al., 1993, 1995). 'Formation water' is used as a generic term to describe all water that naturally occurs in pores of a rock and if the rock is permeable (has the capacity to flow fluids through it) it could represent an aquifer. Hitchon et al. (1993, 1995) compiled nearly 130,000 analyses of formation water from various stratigraphic ages across Alberta. The data was derived from numerous sources including Alberta Energy Regulator ("AER") submissions for drilling conducted by the petroleum industry and various Government of Alberta reports (e.g., Hitchon et al., 1971; 1989; Connolly et al., 1990a, b and unpublished analytical data collected by the Government of Alberta).

The method for defining geographic areas with elements of possible economic interest in formation water was defined by Hitchon (1984) and Hitchon et al. (1995). For each element studied (e.g., calcium, magnesium, potassium, lithium, bromine and iodine), a 'detailed exploration threshold value' was determined by studying the concentrations in economically producing fields as defined in Hitchon (1984) and Hitchon et al. (1995). Additionally, a lower 'regional exploration threshold value' was defined to allow for contouring and extrapolation of data to undrilled areas. For example, the regional exploration threshold value for Li was considered to be 50 ppm and the detailed exploration threshold value was defined as 75 ppm (Hitchon et al., 1995). At the provincial scale, Hitchon et al. (1995) showed that lithium was analyzed and reported in 708 formation water analyses (out of the 130,000 total analyses examined). Of the 708 analyses: 96 analyses yielded Li concentrations above the 'regional threshold value' (greater than 50 ppm); and 47 analyses yielded Li concentrations above the 'detailed threshold value' of 75 ppm. Significantly, Hitchon et al. (1993, 1995) showed the highest concentrations of Li in formation water – up to 140 mg/L Li – occurred within Middle to Late Devonian aquifers associated with the Beaverhill Lake Group (Swan Hills Formation), Woodbend Group (Leduc Formation), Winterburn Group (Nisku Formation) and Wabamun Formation aquifers.

More recently, Eccles and Jean (2010) modelled 1,511 lithium-bearing formation water analyses from throughout Alberta; this compilation supported the previous government author's conclusions that aquifers associated with Devonian strata comprise elevated concentrations of lithium in reef systems throughout Alberta. Of the 1,511 analyses, 19 analyses/wells contained >100 mg/L Li (up to 140 mg/L), all of which were sampled from within the Middle to Late Devonian carbonate complexes.

7 Geological Setting and Mineralization

7.1 Geological Setting
The E3 Metals Resource Areas are located in the southwestern part of the Western Canada Sedimentary Basin (WCSB). In this area, the Upper Devonian (Frasnian) sediments of the Woodbend Group were deposited in a shallow inland sea. The sea was bounded by the emergent Peace River Arch to the northwest and by the West Alberta Ridge to the southwest, creating a barrier between the sea and the open ancestral Pacific to the west (Potma et al. 2001). It is here that the flooded carbonate platform of the Cooking Lake provided relative structural highs and a favorable environment for the growth of the prolific reefal buildups of the Leduc Formation.

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The Clearwater area covers a portion of the Wimborne-Bashaw complex to the east of the Meadowbrook Rimbey trend. The basinal shales and carbonate muds of the Duvernay and Ireton conformably encase and overlay the Leduc buildups, creating traps for hydrocarbon pools. These low-permeability shales also form the aquitard, a formation of much lower water permeability than an aquifer, for the Leduc and Cooking lake aquifer systems.

The Leduc and Cooking Lake limestone deposits were, at some post burial stage, partially to completely replaced by dolomite. Dolomitization is the chemical process by which limestone ($CaCO_3$) is converted to dolostone ($CaMg(CO_3)_2$) through the dissolution of calcium carbonate and the precipitation of dolomite (American Association of Petroleum Geologists, 2017). Dolomite crystals are larger than limestone, and larger crystals typically improve permeability (Lucia, 1995).

There are many possible mechanisms theorized as to the source of dolomitizing Mg-rich fluids and the method for their transport into the Leduc system (Atchley et al. 2006; Amthor et al., 1993; Machel et. al., 2002). Dolomitization of the Leduc and Cooking Lake in this area generally enhances the porosity and permeability of the reservoir, except in some localized cases where secondary cementation has occurred to reduce the porosity. It is likely partly due to this process that the Leduc and Cooking Lake are hydraulically in communication and both contribute fluids as part of the overall system.

The Leduc and Cooking Lake aquifer system contains lithium-enriched brine associated with reefal carbonates of the Woodbend and Winterburn Group (Hitchon et. al., 1995; Eccles and Jean, 2010). Speculation exists as to the source of the lithium but the source is ultimately unknown (Eccles et. al, 2012). For the Leduc and Nisku system in southern Alberta, Huff (2016) proposed a source involving lithium concentrated Devonian evaporates to the west and upward movement of Li-enriched brine into the Leduc and Nisku carbonates during later mountain building.

Formation water is currently being produced as a waste byproduct associated with petroleum and natural gas from existing wells. Pressure loss in the aquifer is being mitigated through re-injection of fluid from produced wells and possibly has included waters from other pools and other zones, as well as fresh water.

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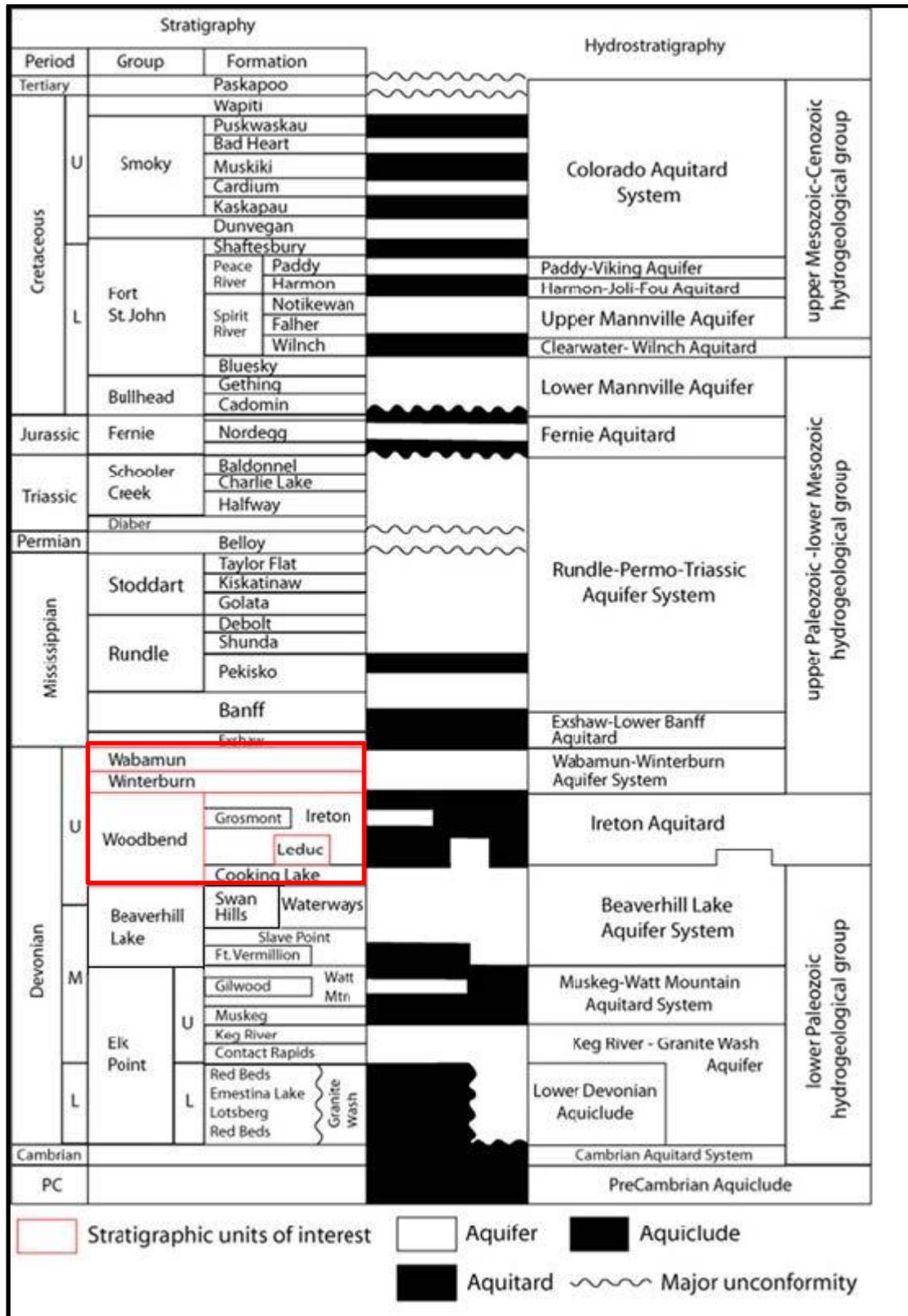
Figure 7: Regional stratigraphy/hydrostratigraphy of Alberta (adapted from Hitchon et al., 1990). The stratigraphic units of interest are denoted in red.

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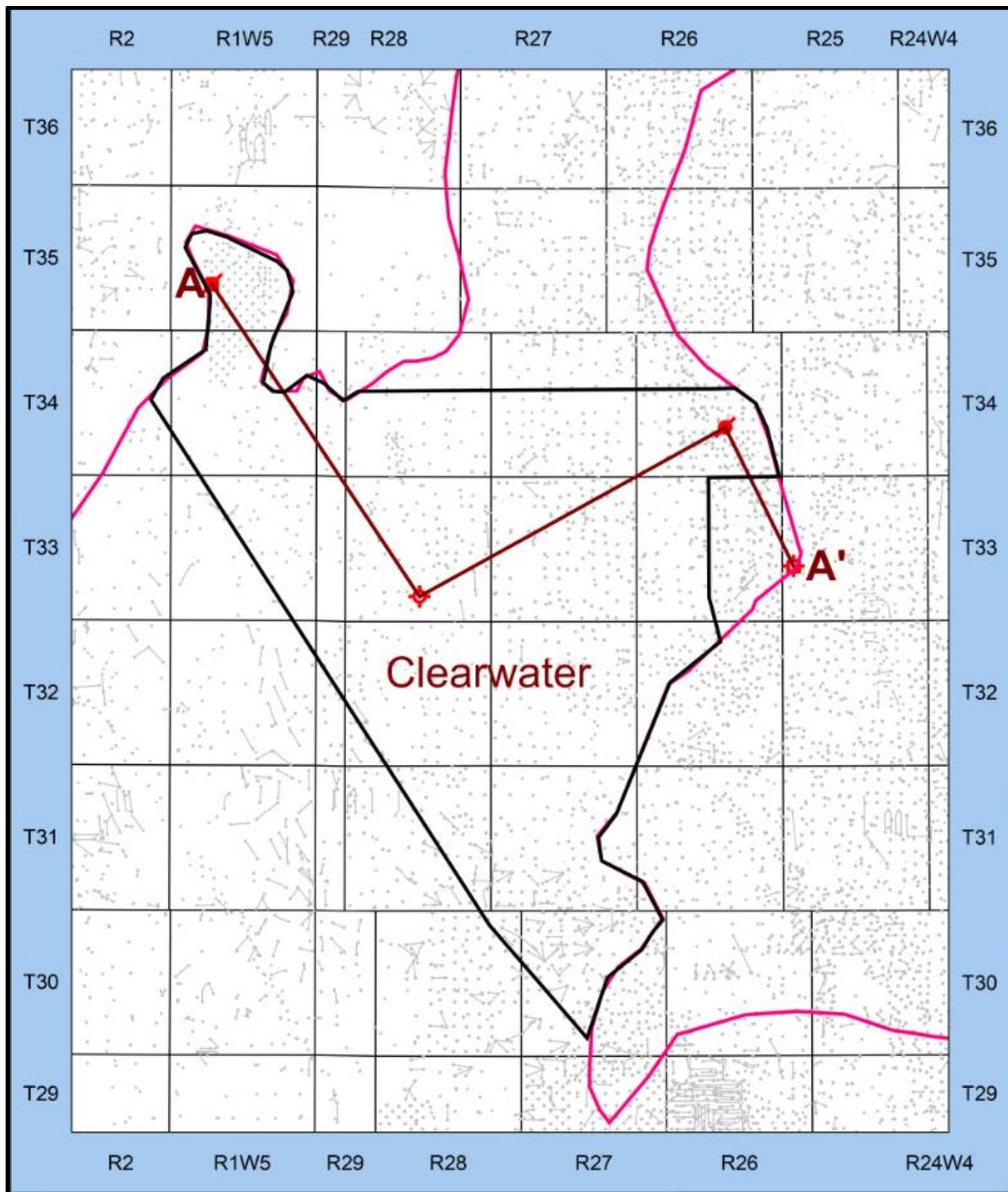
Figure 8: Area map (GeoLOGIC Systems) of the CCRA (black), the regional Leduc edge (Pink) and cross section reference lines (burgundy) for Figures 9 and 10 (E3 Metals Corp, 2017).

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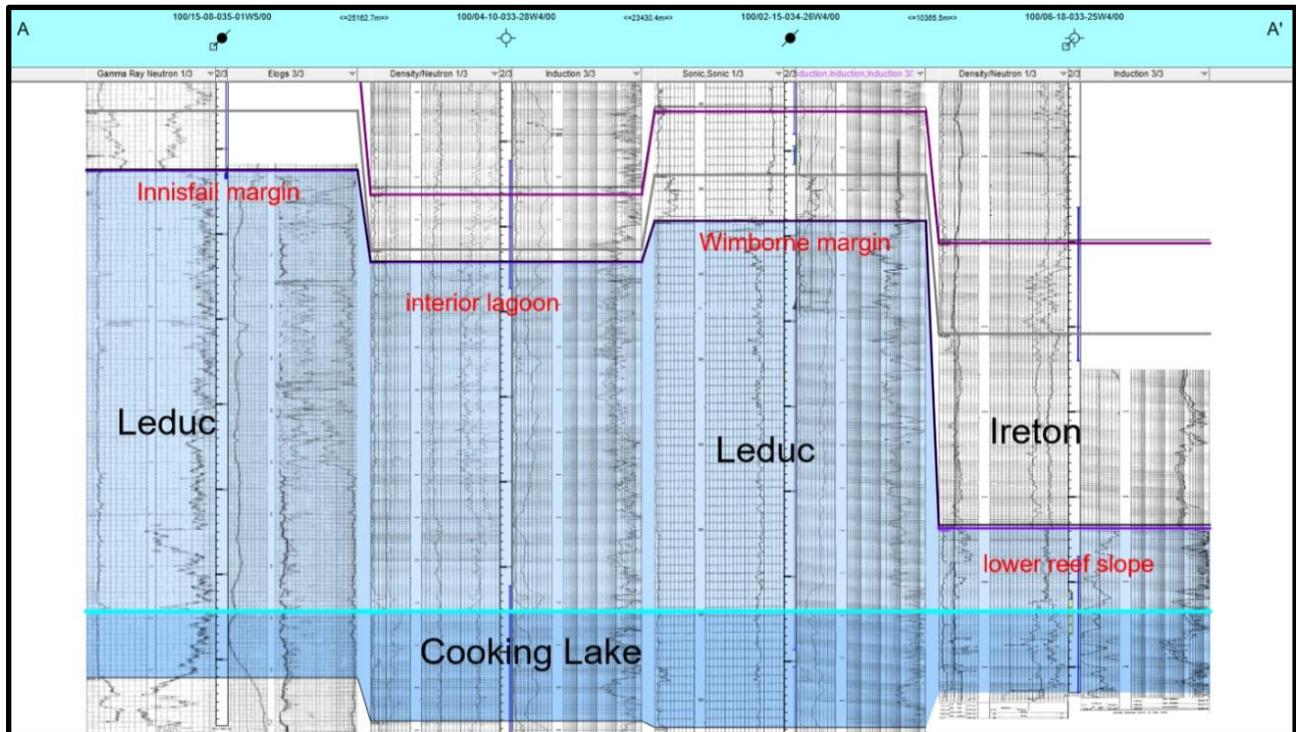
Figure 9: Geological stratigraphic cross section of the CCRA, line A-A' (Fig. 8) using a Cooking Lake Datum (E3 Metals Corp. using GeoLOGIC Systems). This cross section demonstrates the reservoir continuity across the Clearwater area Leduc platform. It highlights the relative thickness of the Leduc reef margins at Innisfail and Wimborne to the thinner interior platform lagoon and the lower reef slope towards the basin on the east side.

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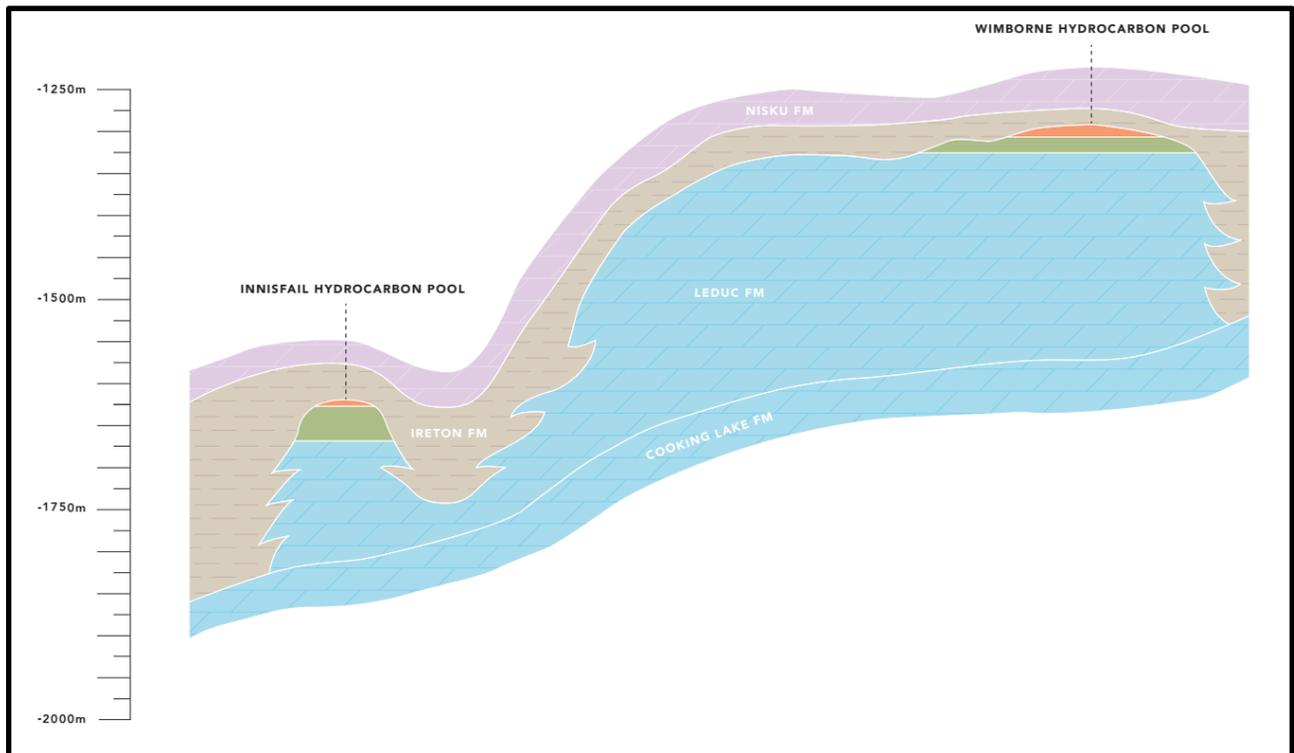
Figure 10: Schematic representation of the CCRA (to scale with vertical exaggeration) highlighting the current relationships of the geology, structure, and hydrocarbon pools. (E3 Metals, 2017)

7.2 Precambrian Basement

Section 7.2 was modified from E3 Metals Technical Report (Eccles, 2017).

The Clearwater property lies in the southern portion of the WCSB, which forms a wedge of Phanerozoic strata overlying the Precambrian basement. The basement underlying the Clearwater property is predominantly Lacombe Domain with the southeastern portion of the property on the Hearn Terrane (Panǎ, 2003). The Hearn Terrane is part of the Churchill Province and formed at approximately 2.6 to 2.8 Ga (Ross et al., 1991, 1998).

7.3 Phanerozoic Strata

Section 7.3 was modified from E3 Metals Technical Report (Eccles, 2017).

A thick sequence of Tertiary and Cretaceous clastic rocks and Mississippian to Devonian carbonate, sandstone and salt overlie the basement (e.g., Green et al., 1970; Glass, 1990; Mossop and Shetson, 1994). At the base of the Beaverhill Lake Group, the Elk Point Group is comprised of restricted marine carbonate and evaporite that gradationally overlies the Watt Mountain Formation (Mossop and Shetson, 1994). The Upper Elk Point, including the Ft. Vermillion, Muskeg and Watt Mountain formations represent an aquitard layer (Figure 8; Hitchon et al., 1990).

The Upper Devonian Woodbend Group conformably overlies the Beaverhill Lake Group (Figure 8). The Woodbend Group is dominated by basin siltstone, shale and carbonate of the Majeau Lake, Cooking Lake, Duvernay and Ireton formations, which surround and cap the Leduc reef complexes. The Leduc reefs are characterized by multiple cycles of reef growth including backstepping reef complexes and isolated reefs (Mossop and Shetson, 1994). The Leduc Formation (Woodbend Group) is the major host

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to prolific reserves of oil and gas in Alberta and contains elevated concentrations of Li (Hitchon et al., 1995). The Duvernay Formation is composed of dark bituminous shale and limestone which contain and preserve a large accumulation of organic carbon thought to be the source for most of the conventional hydrocarbons in the upper Devonian in Alberta. The Ireton Formation caps the Leduc reefs and was formed by an extremely voluminous influx of shale into the region (Mossop and Shetson, 1994). The Ireton Formation is an aquitard that forms an impermeable cap rock over the Leduc reefs (Hitchon et al., 1995). The Camrose Member represents the only significant carbonate deposition during the Ireton cycles of basin-filling shale (Stoakes, 1980).

The Woodbend Group is conformably overlain by the Winterburn and Wabamun Groups of upper Devonian age (Figure 8). In the area of the E3 Metals properties, the Winterburn thickness in south-central Alberta is available from the logs of holes drilled for petroleum and is composed of shale and argillaceous limestone. The Wabamun Group is composed of buff to brown massive limestone interbedded with finely crystalline dolomite at the base. These two Groups comprise the Wabamun-Winterburn Aquifer system from which a few anomalous Li analyses have been obtained (Hitchon et al., 1995).

The Wabamun Group is unconformably overlain by the Lower Carboniferous Exshaw shale, an aquitard. The Exshaw shale is overlain by the Banff Group, which is composed of a medium to light olive grey limestone with subordinate fine-grained siliciclastics, marlstone and dolostone overlying a basal shale, siltstone and sandstone unit (Mossop and Shetsen, 1994). The Rundle Group conformably overlies the Banff Group and is composed of cyclic dolostone and limestone with subordinate shale. Permian strata in the area are thin. The Permian Belloy Group unconformably overlies the Rundle Group and is unconformably overlain by the Triassic Montney Formation. It is composed of shelf sand and carbonate (Mossop and Shetson, 1994).

The overlying Mesozoic strata (mainly Cretaceous) are composed of alternating units of marine and nonmarine sandstone, shale, siltstone and mudstone. The Triassic includes fine-grained argillaceous siltstone and sandstone. The overlying Jurassic Fernie Group is composed of limestone of the Nordegg Formation that is overlain by interbedded sandstone, siltstone and shale (Mossop and Shetson, 1994). The Lower Cretaceous strata are represented by the Bullhead, Fort St. John and Shaftesbury Groups which comprise a major clastic wedge on the Foreland basin (Figure 8).

Bedrock units underlying the Resource Areas include the late Cretaceous Horseshoe Canyon and Scollard formations and Tertiary Paskapoo Formation (Figure 8). Horseshoe Canyon strata consist of interbedded sandstone, siltstone, mudstone, carbonaceous shale and coal seams. The Scollard Formation consists primarily of sandstone and siltstone that is interbedded with mudstone. Coal seams in the upper portion of the Scollard are economically significant, particularly in western Alberta. Finally, the Paskapoo Formation underlies the CCRA, and much of southwestern Alberta. It consists of sandstone, siltstone and mudstone.

7.4 Quaternary Geology

Section 7.4 was modified from E3 Metals Technical Report (Eccles 2017).

During the Pleistocene, multiple southerly glacial advances of the Laurentide Ice Sheet across the region resulted in the deposition of ground moraine and associated sediments in south-central Alberta

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(Dufresne et al., 1996). The majority of the CCRA is covered by drift of variable thickness, ranging from a discontinuous veneer to just over 15 m (Pawlowicz and Fenton, 1995a, b). Bedrock may be exposed locally, in areas of higher topographic relief or in river and stream cuts. The advance of glacial ice may have resulted in the erosion of the underlying substrate and modification of bedrock topography. Limited general information regarding bedrock topography and drift thickness in south-central Alberta is available from the logs of holes drilled for petroleum, coal or groundwater exploration and from regional government compilations (Mossop and Shetson, 1994; Pawlowicz and Fenton, 1995a, b). Glacial ice is believed to have receded from the area between 15,000 and 10,000 years ago.

7.5 Structural History

Section 7.5 was modified from E3 Metals Technical Report (Eccles 2017).

The Clearwater permits are situated northeast of the Rocky Mountains. An extensive study by Edwards et. al. (1998) utilizing aeromagnetic data, gravity data, and lineament analysis indicates that faulting related to the Precambrian basement and the Snowbird Tectonic Zone appear to have at least partial control on the distribution of reefs and some of the oil fields in the area. Many of the Devonian reef complexes in the permit area are underlain by, or are proximal to, basement faults.

There are numerous reef complexes in the Clearwater properties (e.g., Bashaw, Innisfail, Medicine River – Woodbend Group; Nisku carbonate bank–Winterburn Group). These reef complexes promoted growth over long periods of time, and in the permit areas reach thicknesses of 300m in places. In such places, thick Leduc buildups are prominent structural features in the stratigraphic column.

7.6 Mineralization

Section 7.6.1 was modified from E3 Metals Technical Report (Eccles 2017).

7.6.1 Occurrence

The potential for lithium-enriched brine in the Devonian petroleum system of Alberta was initially identified by Hitchon et al. (1995). Potential aquifers were located in reef complexes of the Woodbend and Winterburn groups. Subsequent work by Eccles and Jean (2010), Huff et al. (2011, 2012) and Huff (2016) confirmed the presence of elevated Li (e.g., >75 mg/L Li) in aquifers associated with the Devonian reef complexes.

The main oil and gas accumulations in E3 Metals properties occur in dolomitized reefs of Devonian Leduc age, with a secondary accumulation occurring at a higher elevation in the biostromal development in the Nisku Formation of the Devonian Winterburn Group. Consequently, Li-brine mineralization in the Project area consists of Li-enriched Na-Ca brines that are hosted in porous and permeable aquifers associated with the Devonian carbonate reef complexes.

Li-brine wastewater is associated with oil and gas production. The Devonian petroleum system region represents a mature petroleum field and today, most, if not all of the wells produce far more water than petroleum products. Many of the wells in this area in their early history started out at hundreds to thousands of barrels per day of petroleum products and required little active pumping to extract. However, at present most of the wells produce excessive amounts of formation water in comparison to petroleum products. Formation water production in the CCRA averaged approximately 1,800 m3/day over the last 5 years (GeoSCOUT[TM]).

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8 Deposit Types

Lithium brine deposits are accumulations of saline groundwater that are enriched in dissolved lithium and other elements. All present producing lithium brine deposits are referred to as Solars and share a number of first-order characteristics: (1) arid climate; (2) closed basin contained in a playa or salar; (3) tectonically driven subsidence; (4) associated igneous or geothermal activity; (5) suitable lithium source-rocks; (6) one or more adequate aquifers; and (7) sufficient time to concentrate a brine (Bradley et al., 2013). However, according to Eccles and Berhane (2011) "The source of lithium in oil-field waters remains subject to debate. Most explanations generally conform with models proposed for Li-rich brine solutions that include recycling of earlier deposits/salars, mixing with pre-existing subsurface brines, weathering of volcanic and/or basement rocks, and mobilizing fluids associated with hydrothermal volcanic activity (e.g., Garret, 2004). However, none of these hypotheses has identified the ultimate source for the anomalous values of Li in oil-field waters". In a comprehensive investigation of Li-isotope and elemental data from Li-rich oil-field brines in Israel, Chan et al. (2002) suggested that these brines evolved from seawater through a process of mineral reactions, evaporation and dilution. In this case, brines that were isotopically lighter than seawater were associated with lithium mobilized from sediment." Huff (2016) suggests that Li-brine in the Nisku and Leduc Formations are the result of "preferential dissolution of Li-enriched late-stage evaporite minerals, likely from the middle Devonian Prairie Evaporite Formation, into evapoconcentrated late Devonian seawater", followed by downward brine migration into the Devonian Winnipegosis Formation and westward migration caused by Jurassic tilting. Finally, during the Laramide tectonics, the brine was diluted by meteoric water driven into the Devonian of the southwestern Alberta Basin by hydraulic gradients.

Lithium brines associated with oil wells have been known for some time, but are typically lower in grade when compared to the major lithium deposits of the world; Salar de Atacama, Chile (site of production facilities of the two major producers Albemarle and SQM), Salar de Hombre Muerto in Argentina (home of the third major producer FMC) and Clayton Valley, USA (Owned by Albemarle, and the only lithium production facility in North America). These existing sites use surface evaporation pools as part of the lithium concentration process. The recent advent of new dissolved metal recovery technologies and methods has made lower grade brines economically viable.

9 Exploration

Hydrocarbon production by oil and gas operators in E3 Metals' permit area is very often associated with co-produced brine water from the formation. Significant volumes of hydrocarbons and brine have been produced from the Leduc reservoir across the Resource Area since the 1960's, and this has resulted in a rich database of reservoir and production data. Over time, the relative amount of water produced from the Leduc has increased in comparison to hydrocarbons. Water in some cases represents an excess of 98% of the total volume arriving at surface. Various oil and gas operators have allowed E3 Metals access to oil and gas infrastructure for brine collection across the permit areas and this has enabled E3 Metals to execute an exploration program without the costly requirement of drilling a well.

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9.1 Sample Wells

Exploration activities undertaken other than the sampling program (Section 9.2) included a full geological and hydrological review of the Leduc Reservoir and formation water sampling from existing oil and gas production wells. Samples were collected for E3 Metals from existing Leduc Formation producing oil and gas wells by field crews contracted from Maxxam Analytics and AGAT Laboratories in Red Deer, Alberta. Wells were selected based on their status as an active Leduc producer, without any additional concurrent zone production (commingling), and their availability. Oil and gas operators generally cycle wells, so several field programs were completed to collect samples.

9.2 Field Sampling

Samples were either collected directly at the wellhead, or at test separators. Where sampling was conducted at the wellhead, a 4L jug was used to collect the production fluid at the pump jack. This fluid typically formed an emulsion of oil, water and gas, which readily separated out into phases in the bottle within seconds to minutes. Once the separation was complete, a small hole was created in the bottom of the bottle to allow only water to flow out of the 4L bottle and into a 1L opaque amber glass bottle. See Figure 11 below.

Samples were also collected at test separators. Test separators are used in the oil field to measure the flow rates of various wells and collect water and hydrocarbon samples from one or more wells at a satellite location (Figure 12). Test separators for this resource sampling program were either 2-phase or 3-phase. 2-phase means that oil and water are separated from gas, whereas 3-phase means that oil, water and gas are each separated. For both 3-phase and 2-phase, there is a valve on the tank that can be opened to produce a fluid sample. In all cases, the company ensured that the wells used went "into test" at least 24 hours prior to sample collection to flush the lines and ensure no risk of contamination from other wells.

Figure 11: Sample collection at wellhead. Left: Maxxam employee sampling from access port into 4 L plastic container. Right: Decanting brine sample from bottom of 4 L container.

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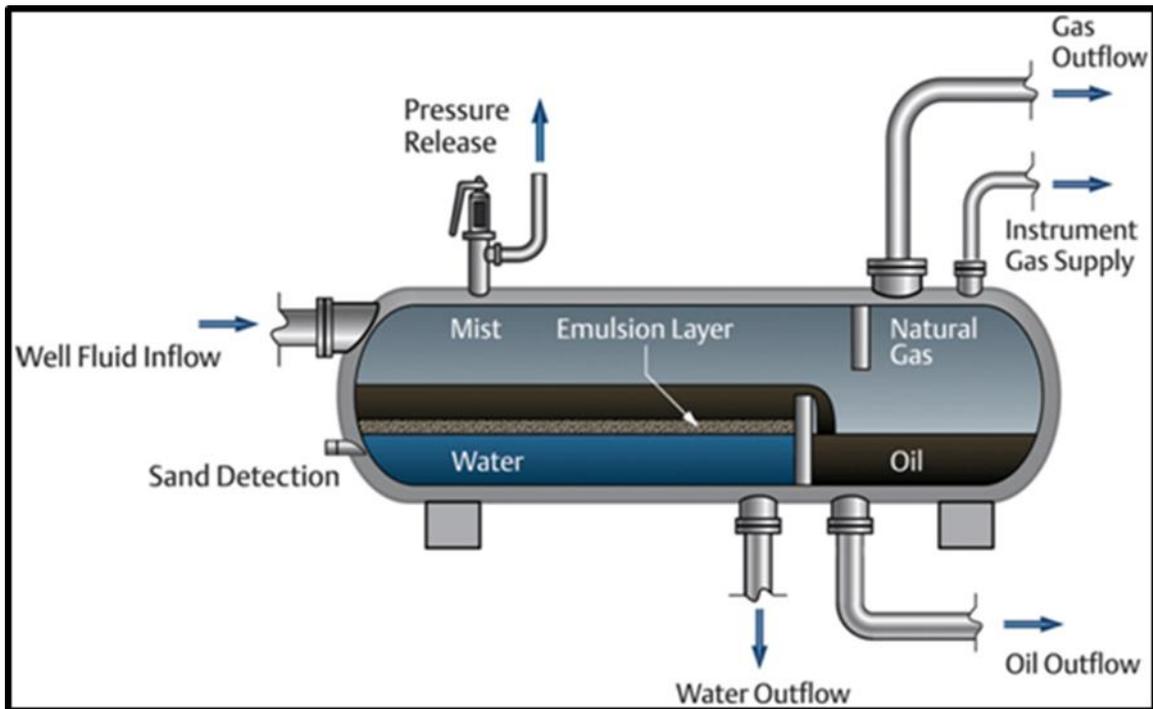
Figure 12: Schematic of Test Separator (Emerson website, 2017).

Figure 13: Sample collection at test separator. Left: Maxxam employee collecting sample from test separator access port. Right: Sealed well samples.

On 2-phase separators, the valve was opened and water was discharged into a test bottle to assess how much oil was in the separator before collecting directly into the opaque amber bottles. If there was a high volume of oil, sometimes the operator of the well was able to make adjustments on site to improve the amount of water flow. After adjustments were made, a mixture of oil and water was discharged into the 1L opaque amber bottles (Figure 13).

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On 3-phase separators, a bottle of water can be collected with very little gas or oil. In this case, the valve was opened and water was discharged directly into the opaque amber 1L bottles.

In all cases, two 1L opaque amber bottles of sample were collected on each well. The bottles were filled up to the very top with aquifer water to ensure no air could get trapped in the top. A cap was then screwed on, and the cap was sealed with electrical tape. An E3 Metals custody seal was affixed to the bottle and cap to ensure no sample tampering (Figure 13). These bottles were kept in a cooler with their chain of custody documents, and delivered to the laboratory for testing once the sampling program was complete.

Sour gas (H_2S – hydrogen sulfide) was present at all the sites sampled. For this reason, safety precautions were taken by field samplers, including wearing H_2S sensors, and always having two personnel on site for sample collection. Where the H_2S content was high (above 10ppm), masks were worn over the face with an oxygen tank to ensure the field samplers were safe.

A list of well additives, such as demulsifier, corrosion inhibitor and paraffin inhibitor was obtained for each wellsite to rule out potential lithium contamination. No sources of lithium contamination were identified.

A total of 47 samples from different UWI's were collected for analysis in the Clearwater, Rocky and Exshaw Sub-Properties. 6 wells are located within or near the CCRA, and 13 wells are located within the NRRA. The results of the sampling program are discussed in Section 11.

10 Drilling

There has been no drilling completed by E3 Metals Corp. on the project.

11 Sample Preparation, Analyses and Security

11.1 Sample Preparation and Security

Samples were collected from oil and gas infrastructure into 1L opaque amber bottles (for detail see Section 9.1). The bottles were filled to the top to ensure no air was trapped at the top. The cap was screwed on and then sealed with electrical tape. Each bottle was labeled with the Unique Well Identifier (UWI) and date, and an E3 Metals custody seal was applied for security. These samples were kept secure in a cooler with their chain of custody information, and delivered either to Maxxam Laboratories Edmonton or AGAT Laboratories Calgary for processing. Both AGAT and Maxxam are accredited by the Canadian Association of Laboratory Accreditation Inc.

In the laboratory, samples from the same UWI were combined into a large beaker in a fume hood for H_2S degassing. A reference beaker of water was placed beside each sample to measure the degree of evaporation over the degassing period. This evaporation was found to be <0.1% for all samples, and is reported along with the lithium result. After H2S removal the larger sample was stirred using a stir-bar for at least 1 minute prior to subsampling to ensure sample homogeneity. 100ml or 125ml of sample was discharged into two opaque amber glass or high density poly ethylene bottles for trace metal testing at AGAT Laboratories in Calgary, AB (assay lab) and Maxxam Laboratories in Burnaby, BC (check

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lab). The samples were preserved with 2% by weight nitric acid, and then they were well packed and transported to their respective destinations with their chain of custody documents.

Samples received at the individual labs were mixed vigorously and a subset of sample was placed in a digestion tube. The samples were first digested with hydrogen peroxide, and then digested again with a mixture of nitric acid and hydrochloric acid. The purpose of the hydrogen peroxide digestion is to break down humic acid and various organics in the sample that are believed to interfere with the lithium measurement. Samples are then diluted to 20:1 and run through an ICP-OES machine for trace metals analysis.

11.2 Analyses

11.2.1 Standards and Blanks

A standard solution was created at the University of Alberta Alessi Laboratory by Dr. Salman Safari on June 26, 2017. The standard was comprised of a standard Li solution from Fisher Scientific that was diluted to 120 mg/L with de-ionized water. To assess standard quality and suitability for QA/QC purposes, E3 Metals sent a single 120 mg/L lithium liquid sample to each of five industry accredited analysis laboratories: AGAT, Maxxam, ALS, Wetlab and Core Labs. The results are shown in Figure 14. The samples ranged between 0.8% and 2.5% of the 120 mg/L standard solution.
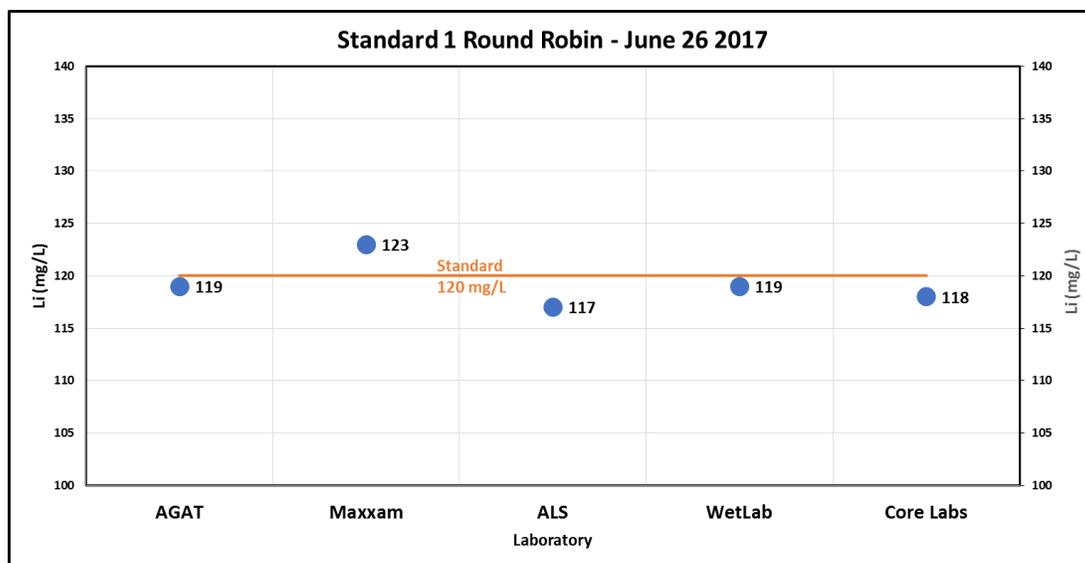
Figure 14. Results of lithium standard analyses from five laboratories.

Standards and blanks were inserted into ICP-OES analysis runs every 15-20 samples to ensure precision and accuracy.

11.2.2 Duplicate Analysis

Duplicate well brine samples from E3 Metals sub-properties (Clearwater, Rocky and Exshaw) were analyzed by both AGAT and Maxxam. The resultant scatter plots of the duplicate samples for each lab indicate that AGAT had a higher correlation coefficient (R^2 = 0.8976, 1 being perfect correlation) and a lower y-intercept value (1.9507) (Figures 15 and 16). Based on the accuracy of the results, and logistical concerns, AGAT and Maxxam laboratories were chosen as the primary and check labs, respectively.

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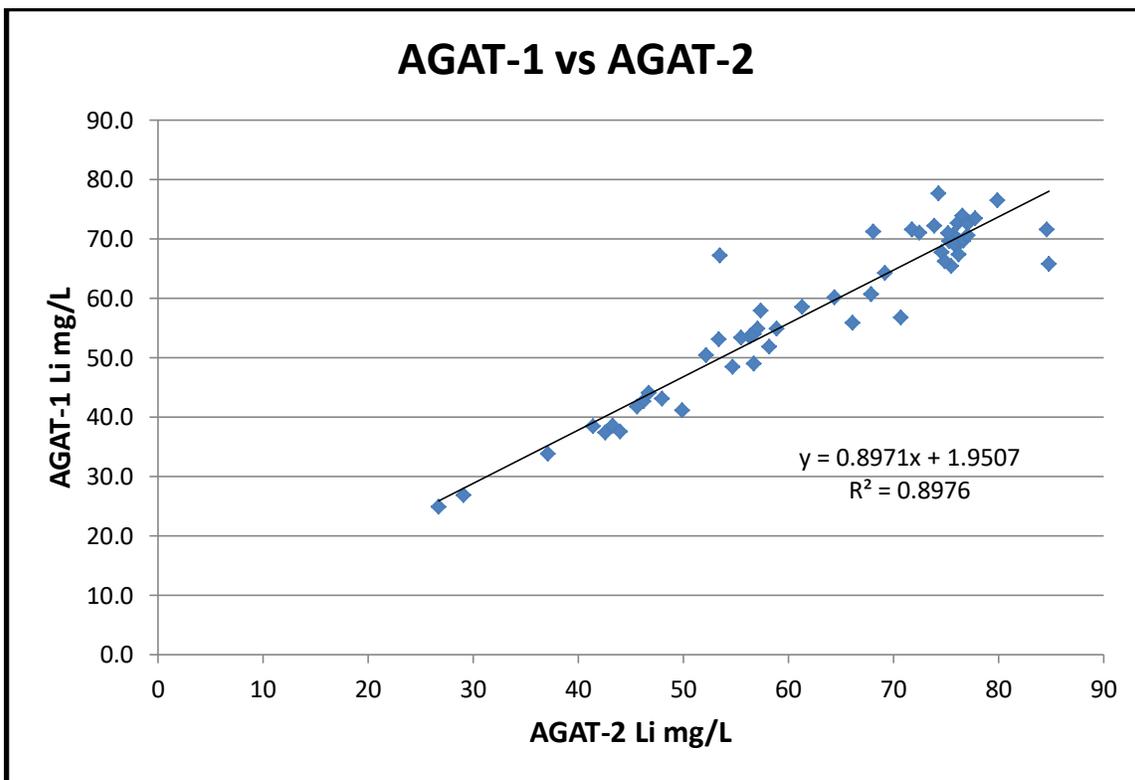
Figure 15. Scatter plot of duplicate Li-brine well sample analyses from AGAT laboratory.
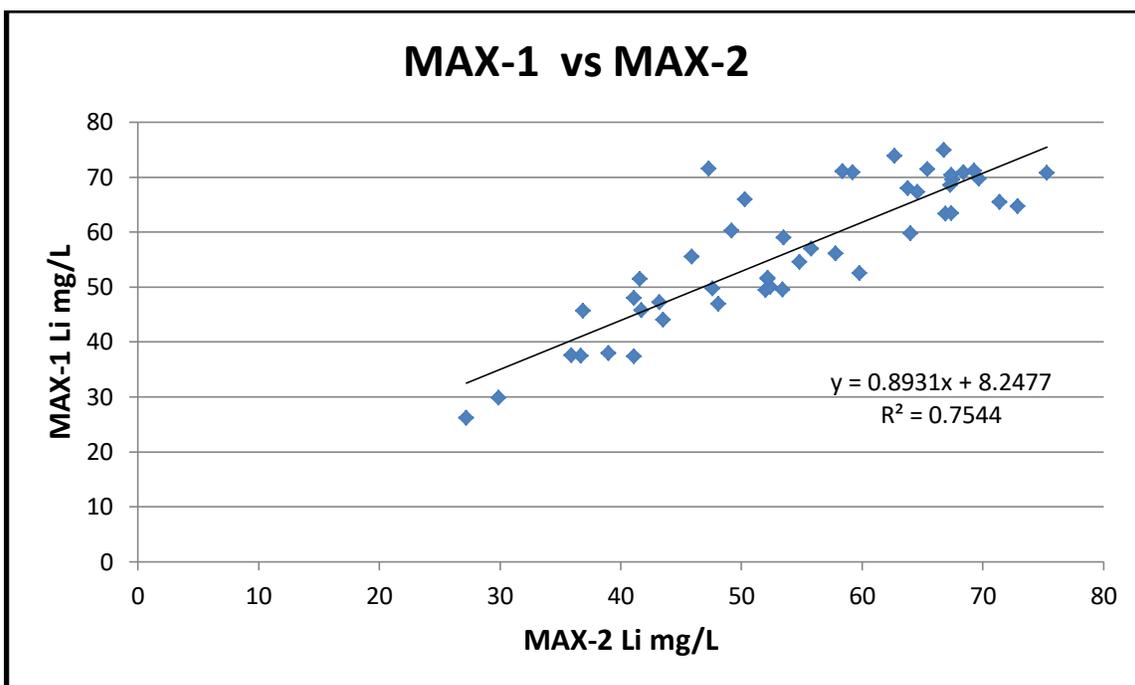
Figure 16. Scatter plot of duplicate Li-brine well brine sample analyses from Maxxam laboratory.

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11.2.3 Sampling Program Results

Sampling results from across the Permit Areas are presented in Table 2 and Figure 17. A total of 47 samples were collected, each from a different location. It is the author's opinion that the data presented in this section has resulted from adequate sample preparation, security and analytical procedures.

Table 2. Aggregate sampling results from E3 Metals' 47 well sampling program.

E3 Metals project area	Min Li (mg/L)	Average Li (mg/L)	Max Li (mg/L)	Number of wells sampled
Clearwater	76.2	78.7	84.6	6
Exshaw West	46.7	73.6	84.8	17
Exshaw East	29.1	52.6	70.7	11
Rocky	26.7	54.2	61.3	13
Total				47

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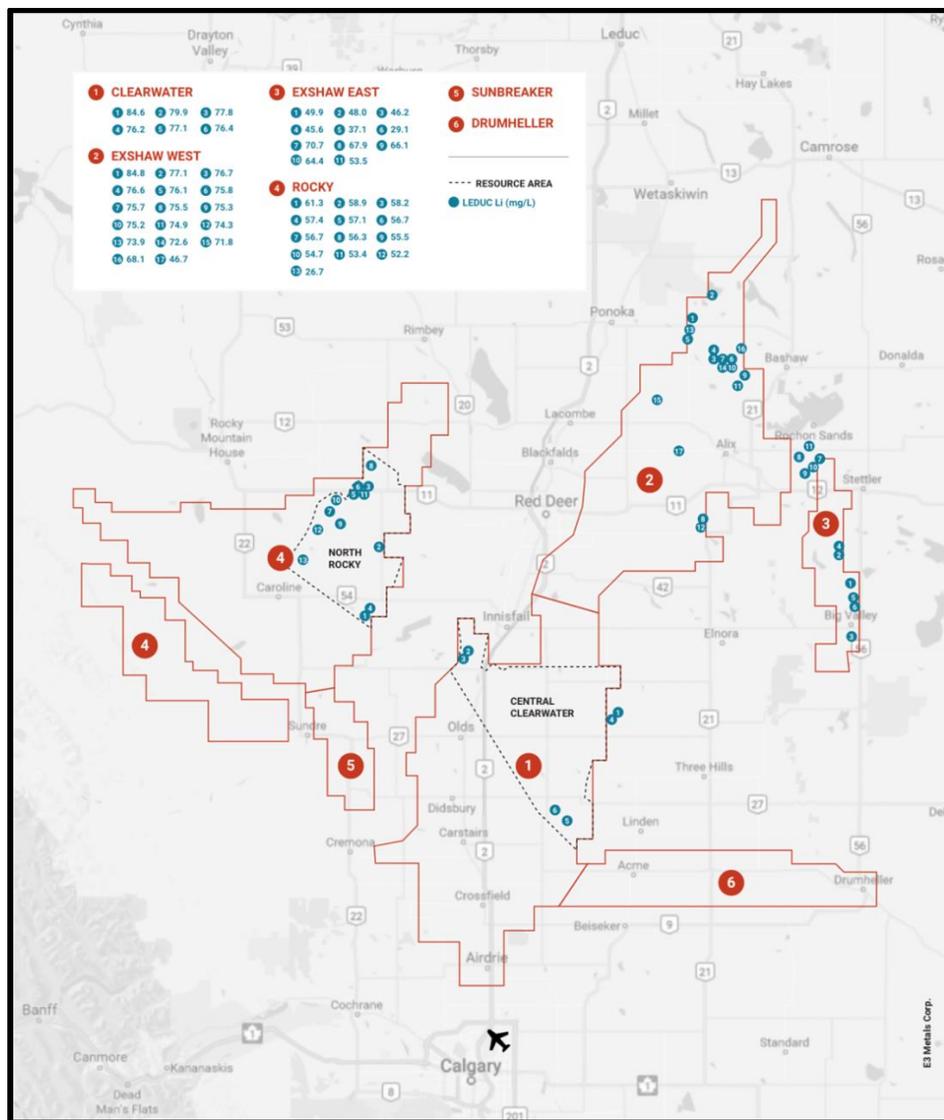
Figure 17. Lithium assay results for the Resource Areas and locations outside the Resource Areas. The Leduc is enriched in lithium across the tested areas, and the data demonstrates consistency throughout sub-properties.

Average brine chemistries from routine and trace metals scan analysis is presented in Tables 3 and 4.

Table 3. Average chemical analyses of major cations and anions of all samples collected across the entire Alberta Petro-Lithium project.

Routine Analysis Parameter	Units	AVERAGE
Dissolved Iron (Fe)	mg/L	0.1
Dissolved Magnesium (Mg)	mg/L	2816.9
Dissolved Potassium (K)	mg/L	4733.7
Dissolved Sodium (Na)	mg/L	43563.5
Dissolved Strontium (Sr)	mg/L	800.6
Dissolved Barium (Ba)	mg/L	2.3
Dissolved Calcium (Ca)	mg/L	18761.2
Dissolved Chloride (Cl)	mg/L	125184.6
Dissolved Sulphate (SO4)	mg/L	551.7
Dissolved Hydroxide (OH)	mg/L	0.0
Calculated Total Dissolved Solids	mg/L	196028.8
pH	N/A	7.0

Table 4. Average chemical analyses of trace metals for only the CCRA.

Parameter	Unit	Clearwater Average
Total Aluminum	mg/L	<2
Total Antimony	mg/L	<2
Total Arsenic	mg/L	2.3
Total Barium	mg/L	3.0
Total Beryllium	mg/L	<0.02
Total Bismuth	mg/L	<0.8
Total Boron	mg/L	297.3
Total Cadmium	mg/L	<0.20
Total Chromium	mg/L	<0.2
Total Cobalt	mg/L	<0.2
Total Copper	mg/L	<0.2
Total Iron	mg/L	1.5
Total Lead	mg/L	<1.6
Total Lithium	mg/L	78.7
Total Manganese	mg/L	0.2
Total Molybdenum	mg/L	<1
Total Nickel	mg/L	<1.0
Total Selenium	mg/L	<2
Total Silicon	mg/L	13.0
Total Silver	mg/L	<0.2
Total Strontium	mg/L	1078.5
Total Thallium	mg/L	<1.0
Total Tin	mg/L	<0.2
Total Titanium	mg/L	<1.0
Total Uranium	mg/L	2.1
Total Vanadium	mg/L	<0.2
Total Zinc	mg/L	<0.2
Total Calcium	mg/L	23900.0
Total Magnesium	mg/L	2988.3
Total Sodium	mg/L	47333.3
Total Potassium	mg/L	7423.3

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12 Data Verification

The author has reviewed the field sampling Standard Operating Procedure (SOP) and the Laboratory Testing SOP developed by E3 Metals to ensure consistent and accurate sample collection and analysis. The author has additionally reviewed the QA/QC results provided by E3 Metals and is satisfied that data presented in this report is adequate for the purposes of calculating an Inferred Resource.

During the author's September 18, 2017 site visit, he observed Maxxam employees collect samples as described in Section 9.2 from two 3-phase test separator facilities. During the observation, Maxxam employees demonstrated a competency of the E3 Metals SOP and executed sampling accordingly. The site was located on the Clearwater Sub-Property within the CCRA. Samples were delivered to the laboratory for degassing by Maxxam field staff upon the completion of the sampling program.

Figure 18. The author inspecting separator test samples collected during the site inspection.

There are a series of historical sampling results scattered throughout the E3 Metals Permit Area. This historical data is available through the Alberta Geological Survey (http://ags.aer.ca/lithium). The specific circumstances under which the samples were taken are unknown and accordingly this data has not been included in the Resource calculation. As expected, the historical data for across the trend are relatively consistent with the data presented in this report, aside from several outliers over 100 mg/L lithium. E3 Metals was unable to return to these exact locations for resampling because they have since been suspended or abandoned. It is possible that these higher concentration lithium results are accurate, and oilfield injection of lithium-void water has diluted lithium concentrations locally in actively producing areas. E3 Metals plans to pursue this potential upside by testing brines outside of actively producing areas.

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13 Mineral Processing and Metallurgical Testing

13.1 Metallurgical Testing

13.1.1 Extraction Technology Summary

Technology for the direct extraction of lithium from brines is currently under development by a variety of companies and research agencies. Most processes involve the removal of impurities in the brine before creating a final product. Current technology developed by Tenova Bateman Technologies (Tenova) and Nemaska Lithium Inc. (Nemaska) outline a staged process flow sheet where the lithium in solution undergoes two stages of impurity removal followed by electrolysis to create lithium hydroxide (LiOH) or lithium hydroxide (LiOH)/lithium carbonate (Li_2CO_3), respectively. Evaporative crystallization can then be used to create lithium hydroxide monohydrate ($LiOH-H_2O$).

These products are used directly by chemical companies and manufacturers to develop cathode material as part of the construction of lithium-ion batteries. Purity of greater than 99% for both materials is required for the efficiency of the battery material. The product supplied to battery cathode manufactures will require certification to ensure consistent chemistry and purity by an eventual purchaser of a lithium product. The electrolysis process is very effective at generating high purity products if the brine is pre-treated for impurity removal. Lithium is also used in ceramics and glass, greases and polymers and as lithium metal. Generally, lithium chloride (LiCl) is purchased by lithium metal manufacturers.

E3 Metals has commenced test work for the extraction of lithium from the formation water enriched with lithium contained within the Leduc Reservoir. There is no one technology that works for every brine as each methodology has specific efficiency for treating varying amounts of impurities. The company has focused the majority of its efforts to date on testing the applicability of various new and existing technologies through the partnership with the University of Alberta. This work was completed on the bench scale level.

The first phase of the U of A research program has been completed and outlined several methodologies that have the potential to provide either direct extraction or a specific stage in the extraction flow sheet. The application and efficiency of the technologies are dependent on the brine chemistry; particularly the contaminant monovalent and divalent cations' presence. Further work is required to define the specific development pathway and process extraction flow sheet.

E3 Metals is confident that lithium can be extracted from Petro-Lithium brines as demonstrated from the various bench-scale test work completed thus far. This work is still ongoing and includes intellectual property developed by the University of Alberta not yet properly protected by patents. From the test work completed to date, E3 Metals has defined that a three-stage process will likely be necessary to efficiently extract lithium from the Leduc Reservoir formation water. Generally, this will involve a concentration step combined with a monovalent and divalent cation purification step. Once these first two steps are completed, the product would then be put through conventional electrolysis or CO_2 treatment to generate either LiOH or $LiCO_3$.

13.2 Na2CO3 Pre-Treatment

Although E3 plans to ultimately develop its own complete flow sheet from available technology, preliminary testing has indicated that E3 Metals could pre-treat and utilize current Tenova or similar technology. E3 Metals, with the assistance of the Alessi Laboratory at the University of Alberta, tested the addition of Na_2CO_3 (sodium carbonate), followed by filtration, to identify if the brine could deliver a similar head grade as demonstrated by Tenova outlined in Pure Energy Minerals Limited (Pure Energy) PEA (Pure Energy, 2017). The focus of this work was to demonstrate the removal of Mg and Ca; two cations known to behave chemically very similar to lithium and cause the majority of the issues in the extraction process and lower efficiency.

The pre-treatment procedure is as follows:

1. To precipitate out divalent ions, i.e. Mg, Ca, and Sr from E3 Metals brine, 19.1 g solid anhydrous sodium carbonate was added to 120 ml of the brine sample (A00040) at room temperature (1.5 M Na_2CO_3).
2. The resulting slurry was stirred at 600 rpm for 15 min followed by vacuum assisted filtration using a 450 nm (0.45 μm) pore size nylon membrane.
3. Inductively-coupled plasma mass spectroscopy (ICP-MS) was used to analyze the brine chemistry before and after the treatment.
4. The final pH of the brine was 9.7 ± 0.1.

Analysis results are shown below in Table 5.

Table 5. Chemical Composition of E3 Brine Before and After Treatment

	Li (mg/L)	B (mg/L)	Na (mg/L)	Mg (mg/L)	K (mg/L)	Ca (mg/L)	Sr (mg/L)
E3 Sample A00040	70	247	50,300	2894	4198	16,021	857
E3 Na_2CO_3 Treated A00040	49	120	119,350	187	5857	35	2.2

Table 5 Notes:

1. ICP-MS typically underestimates lithium concentration. The lithium concentration measured by another lab using the ICP-OES (Optical Emission Spectroscopy) technique showed 78 and 57 mg/L for the pre- and post-treatment concentrations, respectively.
2. The concentration of sodium is a calculated value due to difficulty measuring the high concentration of sodium.

The Pure Energy Clayton Valley feed brine (LiP) to the Tenova technology is shown in Table 6 below.

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Table 6. Pure Energy Minerals Limited - Clayton Valley Feed Brine

	Li (mg/L)	B (mg/L)	Na (mg/L)	Mg (mg/L)	K (mg/L)	Ca (mg/L)	Sr (mg/L)
LiP Feed	200	23	39,100	395	3880	850	33

It has been observed that formation water from the Leduc Reservoir, pre-treated with the addition of Na_2CO_3 and filtration, was successful at removing a large percentage of the Mg and Ca. Comparing the two compositions, both Ca and Mg were reduced below the head grade being fed into the Tenova pilot plant utilized to test the Pure Energy Clayton Valley Project brine. It is the opinion of the qualified person that the resulting product has the potential of being successfully processed utilizing the Tenova plant design.

13.3 Summary of the Tenova Process

The Tenova process utilized by Pure Energy is comprised of four distinct parts (Pure Energy, 2017):

1. Pre-treatment – LiP
2. Solvent Extraction – LiSX
3. Electrolysis – LiEL
4. Evaporation & Crystallization

The LiP pre-treatment step uses a membrane potentially followed by addition of caustic soda and soda ash and precipitation to remove about 99% of the calcium, magnesium and strontium.

The LiSX solvent extraction step is a regenerative process that utilizes a selective solvent that is regenerated by sulphuric acid. This step enriches the lithium and results in a product with greater than 99.9% concentration going to the electrolysis step.

The LiEL electrolysis step converts high purity lithium sulphate into a high purity lithium hydroxide solution using an electrolytic membrane. This electrochemical process produces a 3 M lithium hydroxide solution at the cathode and a sulphuric acid solution at the anode that is recycled back to the extraction step.

The final stage of the Tenova process concentrates the lithium hydroxide solution to saturation producing monohydrate crystals, which are subsequently separated and washed.

The process is shown in the following flow diagram and recovers 85-90% of the lithium.

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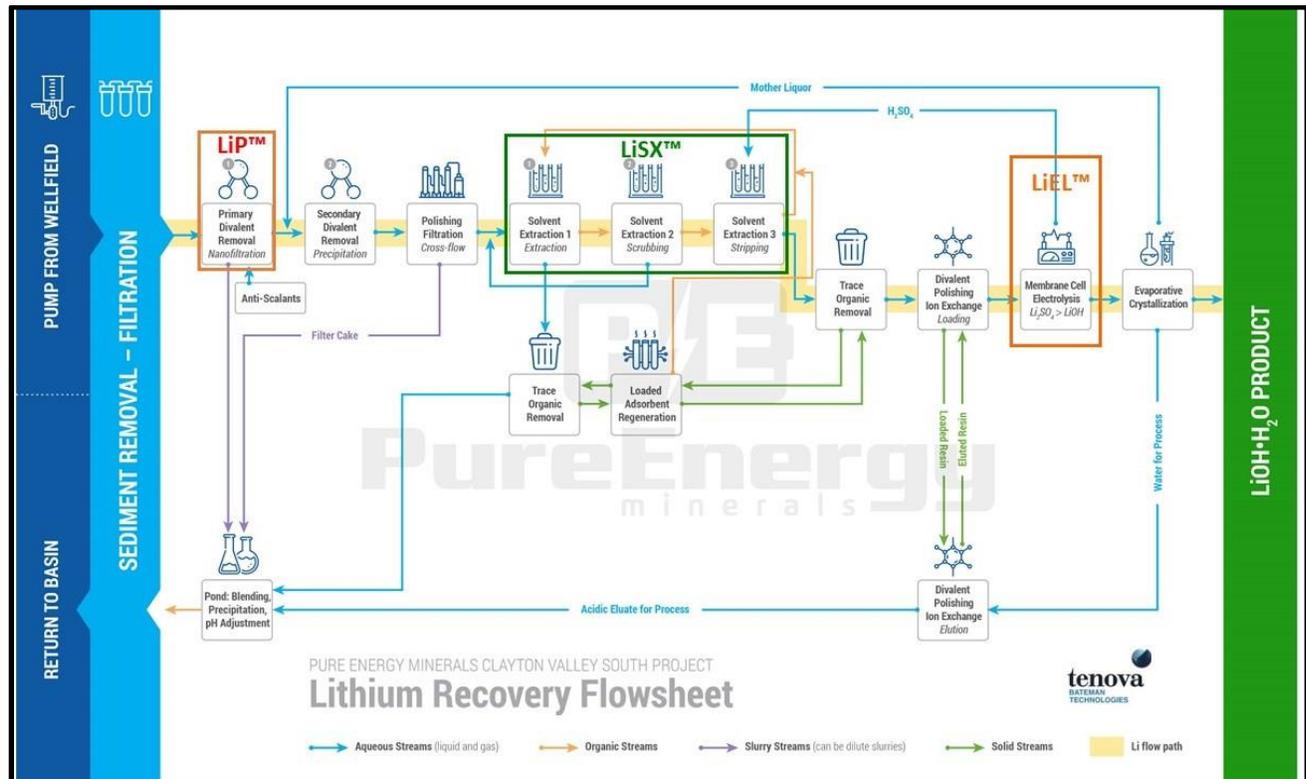
Figure 19. Flow Diagram outlining the Tenova extraction process from Pure Energy (2017).

13.4 Assumptions and Risks

E3 plans to develop its own complete extraction process flow sheet from available technology. Preliminary testing has indicated that E3 Metals Leduc formation water can be pre-treated and has the potential to utilize current Tenova or similar technology.

With any extraction test work, scalability is a significant risk in developing a process from bench scale to pilot plant to commercial operations. Generally, this includes the physical parameters of upscaling and the costs associated with commercialization. The intent of the information presented in Section 13 is to demonstrate that the lithium-enriched brine in the Leduc Reservoir over E3 Metals' Resource area is a reasonable prospect for economic extraction. The resultant product from the test work completed by E3 Metals would need to be tested through the Tenova and/or Nemaska processes to determine if any additional complications are present. There is no guarantee that the process outlined above will be economically viable. Further test work in required to refine the concentration step, work that is ongoing with both the U of A and external contractors. The efficiency of the concertation step will likely have the largest impact on the economic efficiency of the final lithium extraction process flow sheet being developed by E3 Metals for the company's Alberta Petro-Lithium Project.

14 Mineral Resource Estimate

The mineral resource estimate was completed by a multi-disciplinary team lead by Fluid Domains Inc. with Gordon MacMillan acting as the QP. The estimate was completed using a three-dimensional numerical model of groundwater flow. The model incorporates reservoir geometry, porosity, permeability, specific storage, pressure, and lithium concentrations. The mineral resource estimate

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benefited from a considerable amount of data compiled by the oil and gas industry and made public by the Government of Alberta.

14.1 Reservoir Geology

14.1.1 Reservoir Geometry

Petroleum drill well data, described in Section 6, was used to define the shape and extent of the Leduc and Cooking Lake Formations. Defining the geometry of the Leduc and Cooking Lake reservoirs is an iterative process which involves analysis of existing wells drilled for the exploration and production of hydrocarbons in the resource area. This geological mapping process using well data has been in practice in Alberta's petroleum industry in Alberta for over 70 years to define geological formations.

A total of 50 wells in and around the resource areas penetrate the full stratigraphic section of the Leduc and the Cooking Lake formations. 243 wells penetrate the top of the Leduc Formation and were not drilled deep enough to intersect the lower Cooking Lake Formation. This is typical of wells drilled for the purpose of hydrocarbon production in the Leduc specifically.

The Leduc reef edge is defined as the point at which the Leduc Reef Margin slope is no longer distinguishable (zero-edge). This edge differentiates the high porosity reefal buildups of the Leduc from the surrounding low porosity carbonate muds and shales of the deep-water basin sediments occurring in the Ireton and Duvernay Formations. The zero-edge was defined primarily using well data. In the absence of well data, existing industry-standard Leduc edge interpretations were consulted (Mossop et. al., 1994; GeoScout Devonian Subcrop, 2017). The local and regional geological context was also taken into consideration when making interpretations.

The Leduc sits atop the limestones and dolomites of the regionally extensive Cooking Lake Formation, which is differentiated from the Leduc by the presence of a regional argillaceous (shale) zone. This argillaceous zone is not present in all wells, and in those cases the top of the Cooking Lake was defined based on offsetting wells using relative thicknesses and geological context. Generally, the Cooking Lake has a slightly lower gamma ray response than the Leduc. The base of the Cooking Lake was chosen where the more argillaceous Beaverhill Lake Group became evident.

The Leduc reef built upwards from the Cooking Lake platform and occurs today as a prominent feature in the stratigraphic column. These reefs, some of which reached heights of over 300m, are overlain and encased laterally by the shales of the Ireton and Duvernay formations.

The Ireton shale drapes over top of the Duvernay, Leduc and Cooking Lake formations and forms the primary hydrocarbon trap and formation water aquitard of the Leduc system. It is generally identified using the Gamma Ray well log. The presence of clays and associated minerals generally increases the radioactivity of rocks, and the Ireton can be distinguished from the Leduc by its higher radioactive signature on the Gamma Ray well log. The Ireton and Duvernay may be distinguished by subtleties in the radioactive gamma ray signature (Ireton has a higher gamma signature than the Duvernay). Duvernay and Ireton may also be distinguished from each other using the induction well log. At the molecular level, the Ireton most often contains water, whereas the Duvernay most often contains hydrocarbons, which decreases its conductivity.

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14.1.2 Hydrostratigraphic Units

Hydrostratigraphic (flow unit) definitions were determined based on their hydraulic properties and their potential to contribute to regional groundwater flow. The flow units were defined and subdivided as follows:

- *Leduc Reef Margin*: Outer edge of the Leduc Reef
  - Wimborne Margin
  - Innisfail Margin
- *Leduc Platform Interior*: Area Bounded by Reef Margins
  - Clearwater Interior
  - Innisfail Lagoon
- *Cooking Lake Platform*: Present throughout Resource Area

The hydrostratigraphic units were based on trends of porosity (pore space in the rock) and permeability (ability for fluid to flow in the rock). Trends of porosity and permeability occur spatially and relate to depositional environments. These trends (also called facies models) are established in the literature for the Leduc reservoir (Hearn, 1996; Potma et al., 2001; Atchley et al., 2006) and formed the basis for hydrostratigraphic definitions.

The reef margin is defined based on its position on the platform and forms the edge of the reef buildup. These facies (rock types) are typical of high energy environments where most of the aggradation and reef growth occurred, and therefore is typically the best part of the primary reservoir with the highest porosity and permeability.

Comparisons of modern and Triassic aged reefs indicate slopes along the reef margin range from approximately 20 degrees to up to 35 degrees (Schlager & Reijmer, 2009). This is expected to be consistent with Devonian-aged reefs, and an average of 25-degree slope was selected for the Leduc in the region.

The width of the margin over the Bashaw complex has been mapped with widths ranging from 10's of meters to approximately 5 km (Atchley et. al., 2006; Hearn, 1996). The margin width is dependent on several factors, including reef topography, prevailing wind direction, and spatial reef geometry. Thinner margins are expected where the reef is locally protected or drowned, whereas thicker margins are expected where the reef is located in a windward position. An average width for the margin of 1.0 km was selected based on the literature, and adjustments in specific areas were made where the data indicated a wider margin (e.g. 2.5 km wide at Wimborne field).

The platform interior is a lagoonal setting on the back side of the reef margin and is dominated by facies common in low energy environments. These interiors (or lagoons) are bounded by the margin facies. These depositional environments consist of carbonate muds, storm washover debris, shoals, and occasional patch reefs.

Based on the aggrading (vertical upwards growth) and in some cases backstepping (vertical backwards growth) nature of the Devonian Leduc reef buildups (Stoakes, 1992), the facies were assumed to be vertically continuous throughout the reef thickness.

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The Cooking Lake Formation is a carbonate platform that sits beneath the Leduc. This formation encompasses the flow unit below the Leduc Formation and above the Beaverhill Lake Group, and is continuous beneath and in-between both resource areas.

14.1.3 Structure and Thickness

Geological mapping was completed by E3 Metals and formation tops were provided to Fluid Domains for construction of geologic surfaces and isopachs (thickness maps). The geologic data set used to construct the model is comprised of 837 wells with Leduc structure tops, 220 wells with Cooking Lake structure tops, and 201 wells with Beaverhill Lake structure tops.
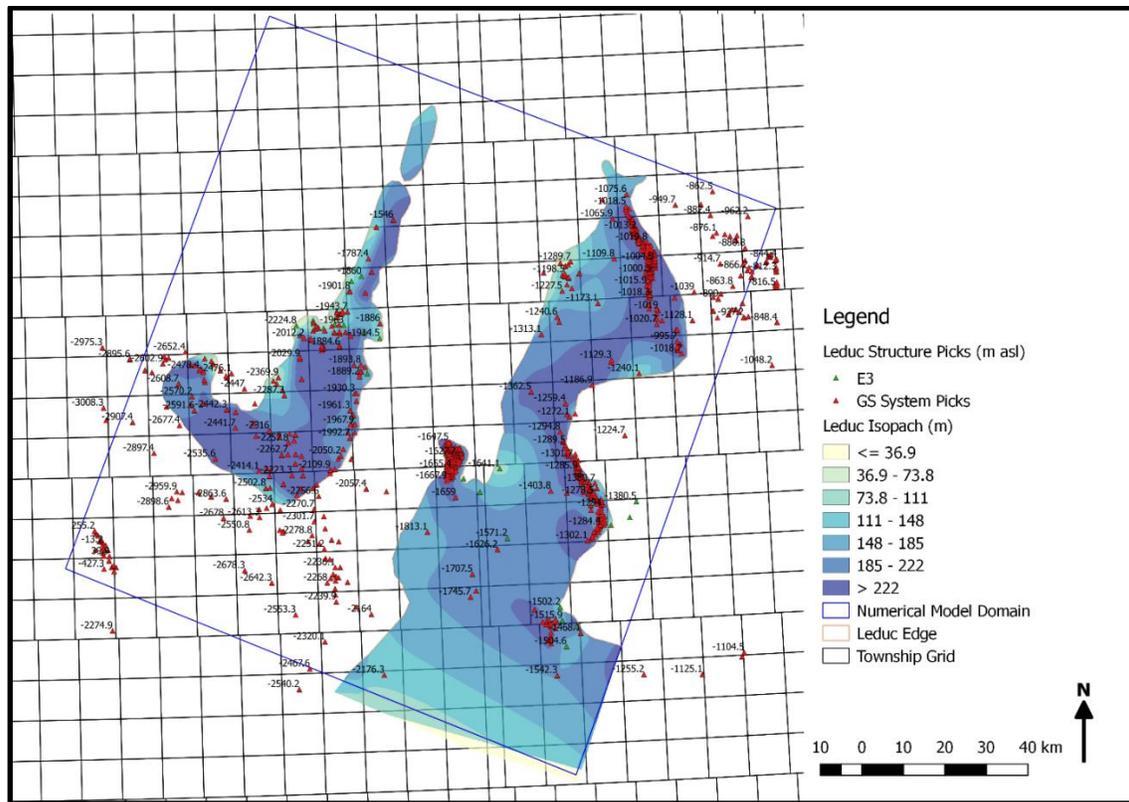
Figure 20. Isopach map of the Leduc Formation

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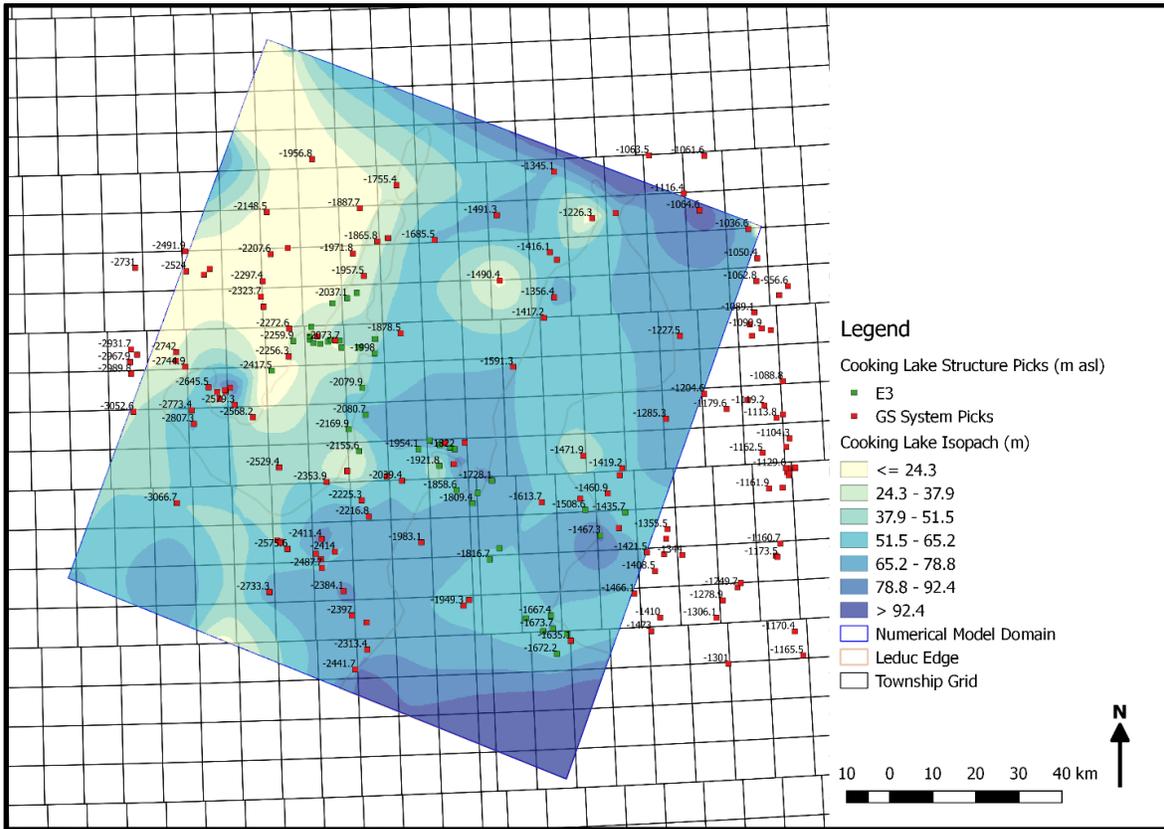
Figure 21. Isopach map of the Cooking Lake Formation
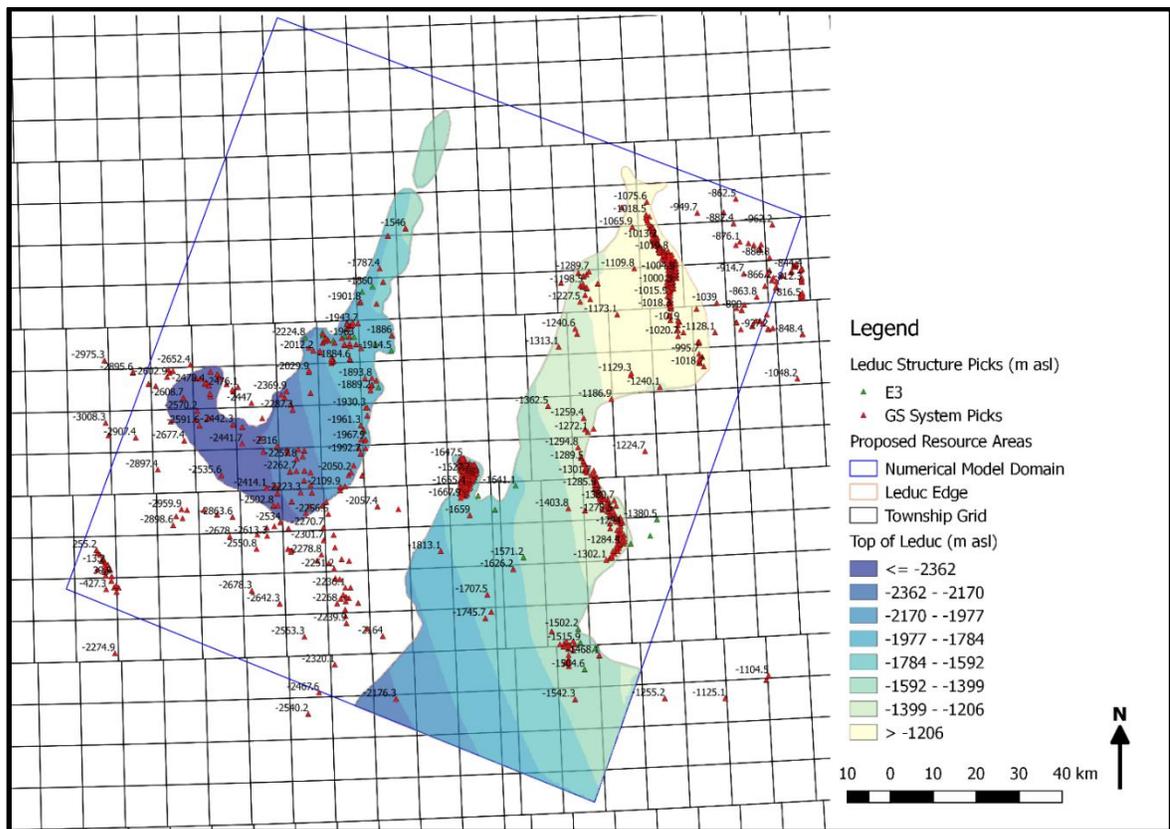
Figure 22. Top of the Leduc Formation where present.

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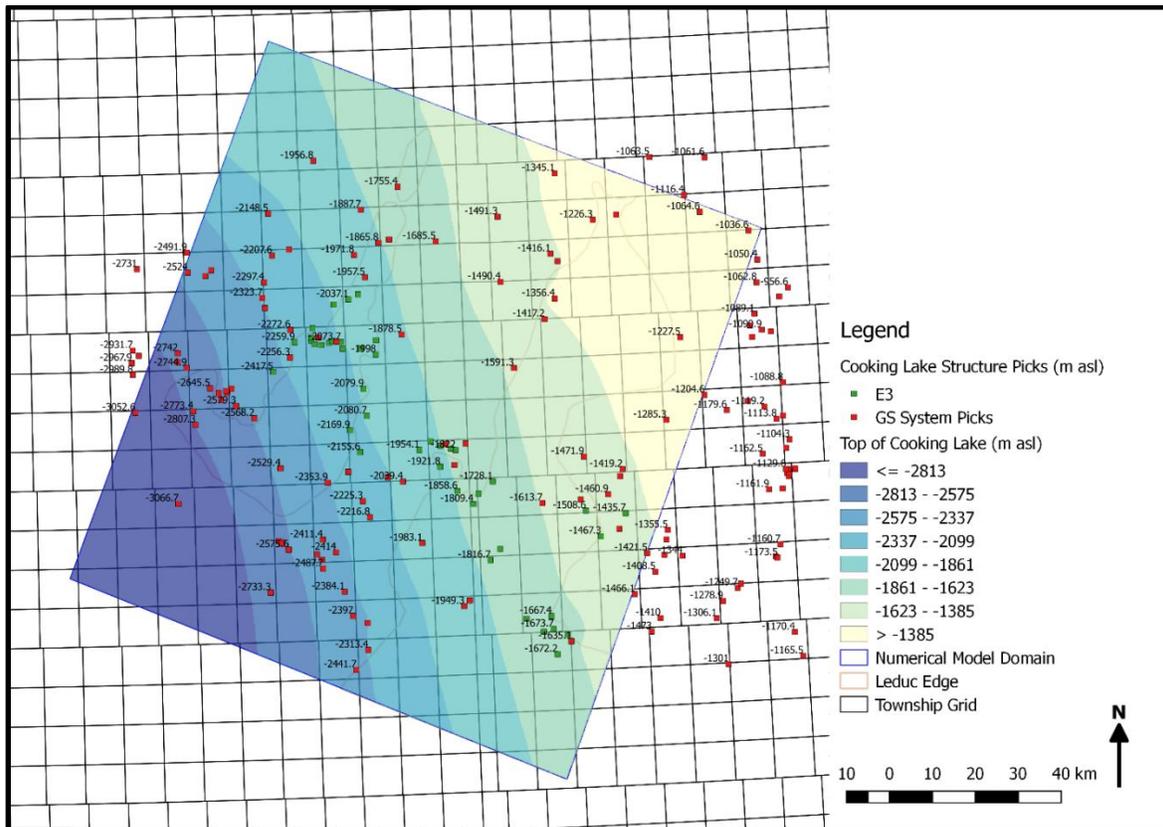
Figure 23. Top of the Cooking Lake Formation
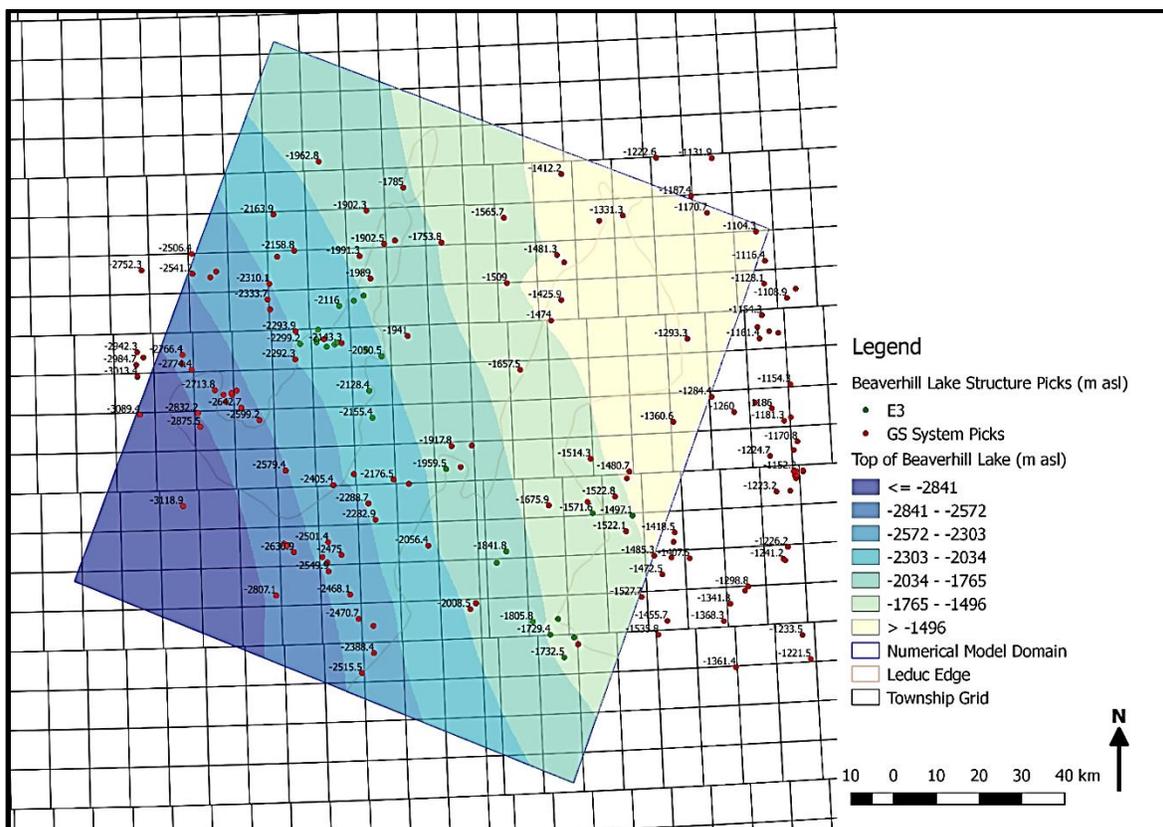
Figure 24. Top of the Beaverhill Lake Group

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Isopach maps of the Leduc and Cooking Lake formations (Figures 21 and 22) and maps depicting the top of the Leduc Formation (Figure 23), Cooking Lake Formation (Figure 24) and Beaverhill Lake Group (Figure 25) were created by Fluid Domains.

The top of the Beaverhill Lake Group reflects a regional dip to the southwest of approximately 1.6% (Figure 25).

14.2 Reservoir Properties

The work described in this report benefited from a considerable amount of data compiled by the oil and gas industry and made public by the Government of Alberta. The data was accessed through third party software providers (geoLOGIC 2017 and Divestco 2017).

Key data sets used to determine reservoir parameters in the resource area are described in Section 6 and include drill stem tests (pressure, water quality, and permeability), core plug analyses (porosity and permeability), downhole wireline logs (lithology, porosity, effective porosity and permeability), and historical production volumes of hydrocarbons and water (context for reservoir pressure and reservoir continuity).

Hydrocarbon production has taken place in the vicinity of the resource area since 1961 resulting in a considerable amount of data to constrain reservoir parameters: 59 drill stem tests (DSTs) with pressure build-ups and extrapolated pressures; 7701 core plug analyses; and 99,273 wells with historical production volumes between January 1961 and July 31, 2017.

14.2.1 Reservoir Pressure

Drill Stem Test data from 406 wells with Leduc or Cooking Lake formation extrapolated pressures was obtained by Fluid Domains in an area surrounding and including the resource area. DSTs are downhole tests that can yield pressure and permeability (flow capability) measurements from a specific depth interval. Equivalent freshwater hydraulic head was determined from the DST pressures, and is calculated to normalize pressure data for comparative analysis. This measurement is calculated in "metres above sea level" (masl). The equivalent freshwater hydraulic head was observed to decrease over time in response to the historical production of fluids and gases throughout the region. Considering that the pressure data was measured in wells that are distributed throughout the region, the trends in each resource area suggest the Leduc Formation is hydraulically connected across the margin and interior portions of each reef.

Distinctly different trends, however, were observed in CCRA in comparison to other areas of the Leduc (Figure 26). Given the long period of available data and the apparent persistence of separate pressure trends, this suggests that non-contiguous areas of the Leduc are not well connected to each other hydraulically. The Cooking Lake Formation is present below the Leduc regionally, and is assumed to connect non-contiguous areas. The persistence of separate pressure trends in non-contiguous areas suggests the Cooking Lake Formation has low permeability.

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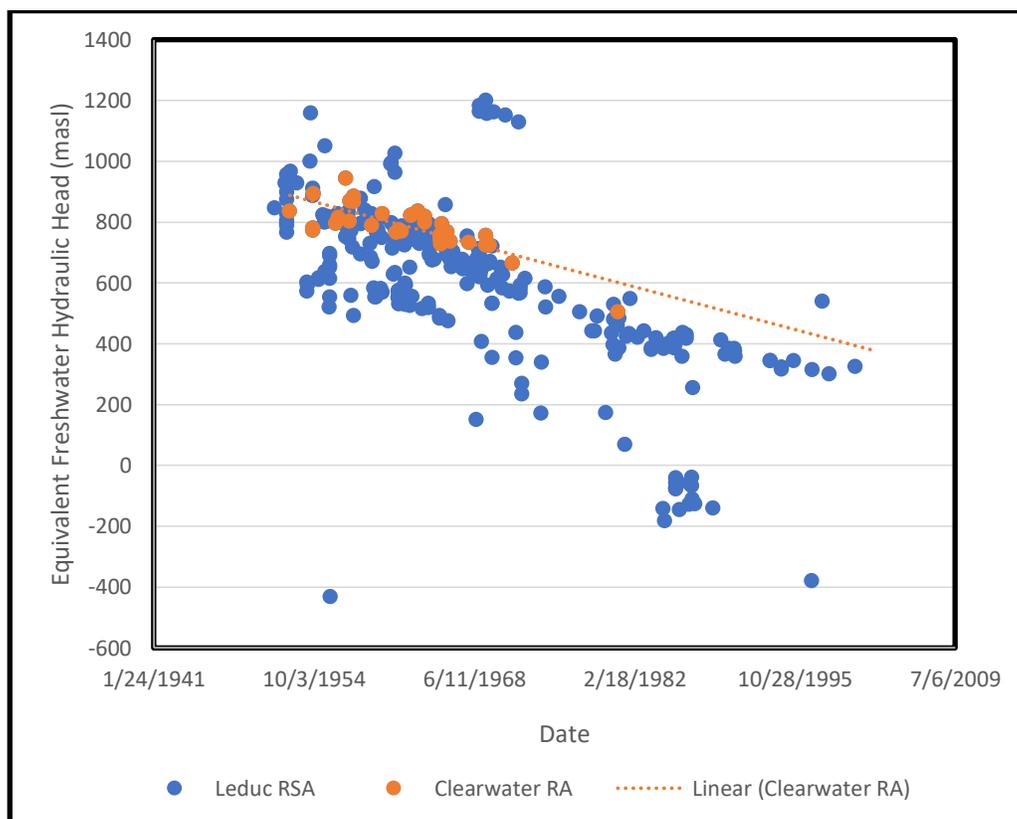
Figure 25. CCRA DST derived hydraulic heads over time as compared to regional data.

Pressures throughout the CCRA are observed to have decreased in response to historical fluid production. Equivalent freshwater hydraulic heads are estimated to have decreased from 850 masl in 1961 to 300 masl in 2017. Based on a top of Leduc elevation in this area calculated at -1,500 masl there is an estimated 1,800 m of available head in the Leduc.

14.2.2 Reservoir Permeability

Multiple techniques were used to determine the permeability of the reservoirs. In addition to published permeability estimates of the Leduc and Cooking Lake formations, the permeability of hydrostratigraphic units in the resource area were further informed through two measurement techniques: core plug test analysis and DST analysis.

A DST analysis was completed by Melange Geoscience Inc. on a subset of what was considered high-quality DST data. Pressure build-up curves were analyzed on 5 DSTs in the CCRA DSTs were selected for analysis from both the reef margin and reef interior (Table 7).

The core plug permeabilities reflect high quality estimates of permeability on a small-scale (cm-scale) and the DST derived permeabilities reflect high quality estimates of permeability on a local-scale (m-scale to 10s of m-scale). Given the larger scale of the DST permeability estimates, these were preferred for the characterization of the hydrostratigraphic units. Table 7 provides a summary of the permeability data.

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Table 7. Summary of measured reservoir permeability and porosity values.

Formation	Hydrostratigraphic Unit	E3 Core Analysis			E3 Log and Core Analysis		Melange DST Analysis			
		Count	Geomean Permeability (mD)	Estimated kv/kh	Porosity of Net Interval	Ratio of Net/Gross	Count	Min Permeability (mD)	Max Permeability (mD)	Geomean Permeability (mD)
Leduc	Innisfail Margin	2206	37	0.62	6.3%	1.00	0	---	---	---
	Innisfail Lagoon	1893	45	0.46	6.3%	0.58	0	---	---	---
	Clearwater Interior	153	17	0.06	6.0%	0.58	3	19	77	46
	Wimborne Margin	3449	45	0.30	7.8%	1.00	2	1721	4646	2828
	South Clearwater	---	---	---	---	---	---	---	---	---
Cooking Lake	Regional	0	---	---	---	---	---	---	---	---
	Below 'Clearwater' reef	0	---	---	2.0%	0.00	---	---	---	---

The best estimates of representative horizontal permeability were selected to be equal to the geometric mean of the DST data where DST data was available (Table 7). For hydrostratigraphic units where DST data was not available, the representative horizontal permeability was assumed to be a function of the DST derived permeability of an analogous hydrostratigraphic unit and the representative permeability was scaled based on core data (Table 7).

Table 8: Summary of reservoir parameter values used in the model construction.

Formation	Hydrostratigraphic Unit	Model Construction					
		Horizontal Permeability (mD)	Vertical Permeability (mD)	Horizontal Hydraulic Conductivity (m/s)	Vertical Hydraulic Conductivity (m/s)	Specific Storage (m^{-1})	Effective Porosity
Leduc	Innisfail Margin	2319	1443	6.45E-05	4.02E-05	1E-06	0.06
	Innisfail Lagoon	124	57	3.45E-06	1.59E-06	1E-06	0.04
	Clearwater Interior	46	3	1.28E-06	8.35E-08	1E-06	0.03
	Wimborne Margin	2828	858	7.87E-05	2.39E-05	1E-06	0.08
	South Clearwater	3	0.3	2.78E-08	2.78E-09	1E-06	0.02
Cooking Lake	Regional	1	0.1	2.78E-08	2.78E-09	1E-06	0.02
	Below 'Clearwater' reef	1	0.1	2.78E-08	2.78E-09	1E-06	0.02

Vertical permeability (k_v) is a measure of how easily fluid will flow vertically within the reservoir, and was estimated and entered into the flow model. Typically, fluids will move more easily in a horizontal direction in sedimentary rocks. Vertical permeability is not captured by DST analysis and was therefore determined using core plug analysis.

Table 8 summarizes the vertical anisotropy based on core data. The vertical anisotropy was calculated by dividing the arithmetic average vertical permeability by the arithmetic average value of horizontal permeability (k_h). The vertical anisotropy of each hydrostratigraphic unit was multiplied by the estimated horizontal permeability to determine a representative vertical permeability for the flow model. Overall, the permeability in the horizontal direction is greater than the vertical direction in the Leduc reservoir.

Hydraulic conductivity of the reservoir was determined from the reservoir permeability and the properties of the water (viscosity of 4 x 10^{-4} Pa s and a density of 1,150 kg/m^3). Transmissivity of the

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reservoir was determined by multiplying the mapped reservoir thickness (Section 14.1) by the hydraulic conductivity.

14.2.3 Reservoir Porosity

Multiple techniques were used to determine the porosity of the reservoirs. Porosity estimates of hydrostratigraphic units in the CCRA were informed by facies-based porosity estimates published by Atchley et al. (2006) and further constrained by core plug measurements and wireline data.

Reservoir porosity was determined using several sources of geology and wireline data depending on the location and data availability. Wireline Photoelectric (PE) curve data was used to determine lithology, specifically in this case between limestone and dolomite (Kennedy M.C., 2002). This distinction is important to the characterization of porosity as dolomite typically has a higher porosity than limestone.

The Leduc Formation has undergone extensive dolomitization in the both resource areas. Dolomitization generally increases towards the top of the Leduc reservoir.

In the CCRA, the Cooking Lake Formation beneath the Leduc reef is predominantly limestone and has relatively low porosity.

Average porosity for each flow unit was determined using good quality porosity log data, discussed in Section 6.2. The majority of the porosity measurements were determined using petroleum industry standard neutron/density open hole logs, which measure hydrogen concentration and electron density, respectively (American Association of Petroleum Geologists, 2017). Where available, porosity measurements from core and core plugs were also used to estimate porosity.

The Leduc reef margins in both areas typically have more available data due to the drilling density from oil and gas development. Core data (rock property measurements from drill core) is used to extrapolate a reasonable porosity in certain areas where such data exists in each depositional setting and where porosity log data is limited. Average porosities for the Innisfail and Wimborne margin flow units range between 6-8% (Table 7), using both arithmetic mean and geospatial-mean averages, for all wells drilled in the defined reef margins. Porosity data is supplemented with wireline open hole neutron/density log data where available.

Porosity log data is preferentially used in the absence of core data where wells penetrate the full depth and when each individual log is of good enough quality to derive porosities. Assignments of rock properties for areas of poor well control such as the Innisfail Lagoon and Clearwater Interior flow units rely on well control from analogous areas with good well control. In addition, regional context is applied to interpret porosity, including depositional setting, cross sections and general knowledge of platform architecture. Each of these elements contribute to the estimation of average porosity for the interior platform units (Table 7).

Net porosity thickness is the total thickness of the reservoir with porosity above a 3% porosity cut-off. A net porosity thickness map represents the rock thickness with measured porosity above 3% and that is expected to contribute to fluid flow. A net to gross ratio is then calculated by dividing the net porosity thickness by the gross thickness of the reservoir. This value represents the relative proportion of the reservoir above the porosity cut-off. Rock with porosity below the cut-off is expected to contribute to

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the overall system but is not included in the net isopach of the flow unit. Hydrocarbon pore space within the oil and gas fields in the CCRA were excluded from the calculations and a net porosity was not calculated within the oil leg of those areas. The net to gross ratio for the CCRA ranges from 0.6-1.0.

In the CCRA, the Cooking Lake is lower-porosity (tight) limestone. Average porosity in the Cooking Lake at the CCRA is approximately 2% and there were no intervals mapped to have porosity above 3% resulting in a net/gross ratio of zero (Table 7). Few wells penetrate to the top of the underlying Beaverhill Lake Group. Wells that did not tag the Beaverhill Lake Group were not used because the thickness of the Cooking Lake could not be determined and net/gross numbers could not be calculated. Instead, wells in the greater surrounding area, including those in the area of interest were used to estimate the average value for porosity for the Cooking Lake. Although the rock properties of the Cooking Lake fall below the porosity cut-off, and therefore do not have a net flow unit value, the Cooking Lake is considered a low flow unit in this area and as it still holds some water in the available pore space and has some developed permeability.

The effective porosity is a value that can be applied to the total thickness of the hydrostratigraphic unit and represents an upscaling porosity value of the net interval (the proportion of the aquifer that contributes most to the migration of formation water and injected water). The effective porosity was calculated by multiplying the porosity of the net interval by the ratio of net to gross. Effective porosity in an important parameter when estimating the groundwater flow velocity and the rate of solute migration.

Estimates of representative porosity based on core data and wireline logs are summarized for each hydrostratigraphic unit in Table 8. Leduc Formation effective porosity values in the CCRA range from 3% in Clearwater Interior to 8% in Wimborne Margin (Table 8). Three porosity related values were provided for each hydrostratigraphic unit: the porosity of the net interval (Table 7), the ratio of net to gross intervals, and the effective porosity (Table 8).

14.2.4 Storage Estimates of Reservoir

The specific storage of the Leduc and Cooking Lake formations in the resource areas were estimated based on the compressibility of water and the compressibility of the rock. The relationship between specific storage (S_s) and compressibility is described by Domenico and Schwartz (1990, page 113).

$$S_s = \rho_w \, g \, (\beta_p + n\beta_w)$$

Where:

ρ_w = density of water (M/L^3)
g = acceleration due to gravity (L/t^2)
β_p = bulk compressibility (L^2/Force)
n = porosity
β_w = compressibility of water (L^2/Force)

Based on the effective porosities presented in Table 7, a water density of 1,150 kg/m^3, a rock compressibility of 3.3 x 10^{-10} m^2/N, and a water compressibility of 4.8 x 10^{-10} m^2/N, the specific storage in each hydrostratigraphic unit is estimated to be approximately 4 x 10^{-6} m^{-1}. These values are similar to

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but slightly greater than Fluid Domains' experience completing regional scale modelling in the WCSB. For the purposes of the Mineral Resource Estimate, a slightly more conservative regional value of 1×10^{-6} m^{-1} was deemed to be representative of Cooking Lake and Leduc formations.

Storativity of the reservoir was determined by multiplying the mapped reservoir thickness (Section 14.1) by the specific storage.

14.3 Estimate of Water Production

14.3.1 Water Production Methodology

The CCRA has an areal extent 943 km^2 and reservoir thicknesses of greater than 220 m in the Leduc and greater than 90 m in the Cooking Lake. Based on the effective porosities in Table 8 there are approximately 9.2 km^3 of formation water contained in high permeability zones.

In order to produce lithium, the formation water will be pumped to surface from a production well (produced water). The produced water will need to be processed at surface in order to remove the lithium and approximately the same volume of water as was pumped to surface will be injected into the reservoir (injected water).

The rate at which groundwater can be produced is a function of the aquifer properties (hydraulic conductivity, thickness, specific storage, and available head) and of the production well network design (number of wells and well spacing).

The duration that a production well would pump is expected to be limited by the arrival of injected water with low concentrations of lithium (injected water) at the production well. The arrival time of injected water at a production well and the degree of mixing between injected water and formation water will be a function of well network design and hydrodynamic dispersion. Hydrodynamic dispersion refers to the spread of solute concentrations as they migrate through an aquifer due to variability in pore space and large scale preferential flow paths.

Key considerations in the design of a production well network for each hydrostratigraphic unit include:

- Well trajectory; wells were assumed to be vertical and fully penetrate the Leduc and Cooking Lake formations.
- Production-injection well spacing; there is a preference for the injection wells to be distal to the production wells to maximize the life of the production well network before the arrival of low concentrations of lithium in the injected water.
- Permeability-based well configurations; a close spacing of producing and injecting wells for hydrostratigraphic units with low long-term potential yield in order to increase the production rates.
- Optimized production-injection volumes; a preference for more injection wells than production wells to facilitate the maximum recovery of formation water production, and strategically distributing the injected water.
- Geologically-based production-injection geometry; a consideration of the geometry of the hydrostratigraphic unit and the properties of the adjacent hydrostratigraphic units.

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14.3.2 Estimate of Drainage Areas

The drainage area represents an area around the production well from which all of the formation water would be recovered by the production well if there was no hydrodynamic dispersion. Particle tracking is a modelling technique that tracks the movement of theoretical particles placed in the flow model over time based on the numerical modelling outputs of transient hydraulic head (pressure) and Darcy flux (magnitude of flow rate). Particle tracking provides a physically based estimate of advective transport (fluid movement) and effectively estimates the movement of the advancing injected water front as it moves from the injection well to the production well. As such, it was used to estimate the drainage area of each recovery well network. Groundwater flow and particle tracking was completed in the commercially available finite element software FEFLOW (DHI 2017). The FEFLOW interface was used to simulate particle tracking between the production and injection wells using the following steps:

1) When pumping was initiated, 120 particles were released at different elevations throughout the Leduc and Cooking Lake intervals.
2) The particle locations were followed over time until a particle reached the adjacent wells in the well network.
3) The time of travel between the production and injection well was recorded and interpreted to represent the time that the advective front of the injected water would reach the production well.
4) The extent of all particle migration was used to delineate a drainage area.

14.3.3 Potential Production Well Network Design

Because of the net-zero groundwater withdrawal strategy (same volume of water produced is injected), a large rate of groundwater withdrawal could be sustained from a low permeability unit by placing the injection well in close proximity to the production well. While this could sustain high production rates, it would be undesirable for lithium recovery because the injected water (with low concentrations of lithium) would be withdrawn from the production well after a short period of time. This means the effective lifespan of the production well would be reduced.

In order to optimize the trade-off between production rates and the life-span of production wells, a production well network was designed for each hydrostratigraphic unit and was optimized based on the permeability and geometry of that hydrostratigraphic unit.

For units with a relatively large permeability such as the Innisfail and Wimborne margins, pressure mounding from the injection wells was not required to sustain large pumping rates. As such, only one injection well was used in the production well network design and it was spaced relatively distal from the producing well to increase the production life of the well.

An optimized production well network was determined for each hydrostratigraphic unit by iterating through the design process in the numerical model in a heuristic manner.

Multiple production well networks will ultimately be required to produce as much lithium as possible from each hydrostratigraphic unit. The production well networks will be distributed across each resource area. The operations of the well networks can be operated in parallel or in series depending on the desired production timelines.

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The drawdown associated with large pumping rates from the production well networks is reasonable given the reservoir properties of each hydrostratigraphic unit. In practice, the design and operation of production wells will need to consider the effects of well loss (skin) or pump capacity (ability for the pump and associated infrastructure to move the large water production rates). These factors were not considered to have a substantial impact on the project due to the ability to mitigate these effects by installing additional production wells in close proximity to the simulated production well and due to the preliminary nature of this inferred mineral resource estimate.

14.3.4 Estimated Production from Resource Area

Based on the large amount of available head in the resource area and the flexibility in the well network design, it is expected that large volumes of water can be produced with a relatively small number of wells.

Table 9: Production well network designs and estimates of production well network drainage areas.

Hydrostratigraphic Unit	Resource Area		Reservoir Pressure				Production Well Network Design						
	Volume (km^3)	Area (km^2)	Hydraulic Head in 1961 (masl)	Hydraulic Head in 2017 (masl)	Top of Leduc (masl)	Available Head in 2017 (m)	Producer Count	Injector Count	Geometry	Spacing (m)	Drainage Area (km^2)	Pumping Rate (m^3/d)	Life of Production Well Network (days)
Innisfail Margin	9.7E+00	3.7E+01	850	300	-1500	1800	1	2	line	3,000	5.1	20,000	3,600
Innisfail Lagoon	6.6E+00	2.3E+01					1	1	line	3,000	15	20,000	6,200
Clearwater Interior	2.3E+02	8.4E+02					1	3	triangle	2,000	18	20,000	3,700
Wimborne Margin	2.1E+01	8.0E+01					1	2	line	5,000	18	20,000	16,000

Groundwater from the CCRA can be produced at a rate of 20,000 m^3/d with production well networks of one production well and between one and three injection wells. The production well networks are predicted to have a life of 10 to 44 years before the injected water reaches the production well (Table 9).

14.4 Estimate of Lithium Production

14.4.1 Resource Estimate Methodology

The inferred mineral resource estimate has been prepared to be consistent with the NI 43-101 Standards of Disclosure for Mineral Projects (National Instrument, 2016); Form 43-101F1 (National Instrument, 2011); CIM Definition Standards (CIM 2014); and the CIM Best Practice Guidelines for Reporting of Lithium Brine Resource and Reserves (CIM 2012).

The technical guidance provided in CIM (2012) is focused on the production of lithium brines in salars which is a very different hydrogeologic setting than the deep, confined, clastic reservoirs in the CCRA.

Examples of the CIM (2012) technical guidance that are not applicable to the CCRA includes:

- A focus on draining the basin (salar) infill which can be unconfined, semi-confined, or confined. Much of the guidance is focused on water released from pore spaces when a water table is lowered (specific yield and specific retention). The reservoir in the CCRA is approximately - 1,500 masl, and is confined with approximately 1,800 m of hydraulic head above the top of the

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reservoir. Because of the depth and the high pressure, the reservoirs will not be drained during the recovery of lithium.

- As described in the guideline (CIM 2012, page 2) salars "tend to be deposited in a typical concentric shell-like sequence from gravel outside, through sand, silt, clay, followed by carbonate, gypsum, and finally halite in the center." The setting results in: "a relatively rapid gradient from near-fresh water to brine" (CIM 2012, page 2); the potential for density driven convection currents; and brine chemistry that can be variable over time based on the water balance. By comparison, the reservoir in the CCRA has a very low salinity gradient, and the water in the reservoir is stagnant (very little flow in or out of the reservoir) because it is approximately 3,000 m below ground surface where the dynamic forces of precipitation, and evapotranspiration at surface do not influence flow in the reservoir.
- "Salar brines are contained within a matrix in which the porosity, permeability, brine composition, and hydrostratigraphic characteristics such as conductivity, transmissivity, anisotropy, and resistance may vary with the passage of time." (CIM 2012, page 4). The hydrogeologic properties of hydraulic conductivity, transmissivity, anisotropy and hydraulic resistance of confining layers, however, are not time variant in CCRA. This is because the water density and the aquifer saturation will not change during lithium recovery.

Although parts of the CIM (2012) guidelines are not applicable to the CCRA, the spirit and intent of the guidelines were applied.

Because of the low lithium concentration gradients and the confined nature of the reservoir, there will be little to no change in brine chemistry over time due to "external (catchment basin) effects" (CIM 2012, page 6). There will, however, be temporal changes due to "internal (extraction induced) effects" (CIM 2012, page 6). Lithium rich water will be pumped to surface with production well networks comprised of production wells and injection wells. The injected water will be void, or nearly void, of lithium. This will mix with the formation water still in the reservoir as it propagates towards the production well. Over time the production wells will begin to pump some of the injected water. This is a key consideration in this inferred resource estimate.

If the production well network was operated indefinitely, the lithium concentration (C) of water pumped from the production well would transition from the initial lithium concentration (C_o) to a concentration that is nearly void of lithium. This is illustrated in Figure 27.

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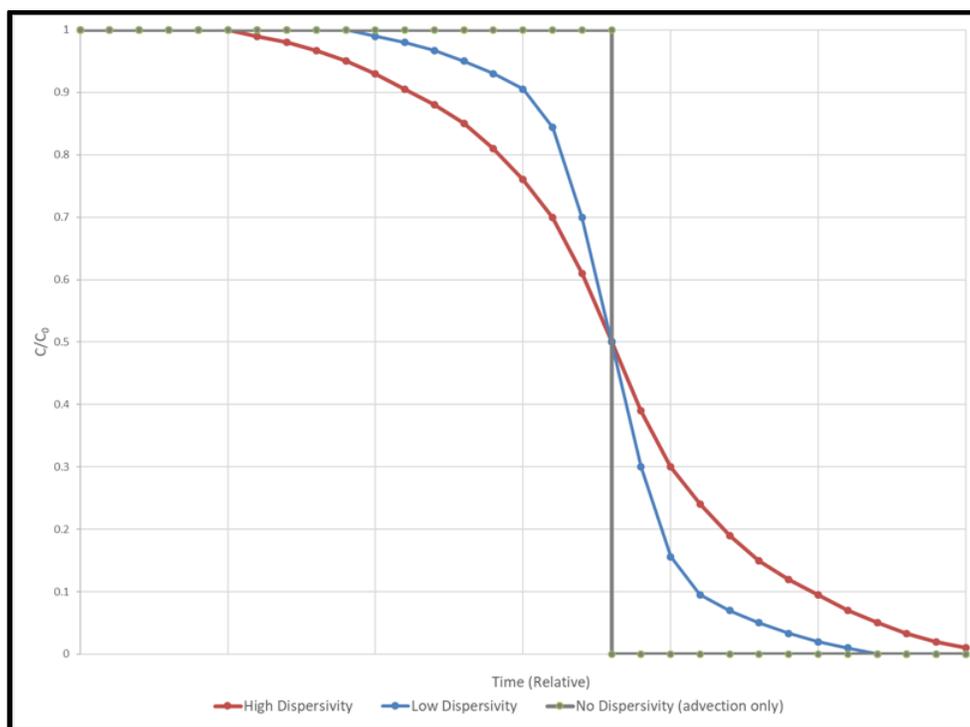
Figure 26. Schematic demonstrating the potential relative change in lithium concentration over time at the production well with no dispersivity (gray), low dispersivity (blue), and high dispersivity (red).

The magnitude of hydrodynamic dispersion is a product of the flow velocity (rate of groundwater movement in the reservoir) and the dispersivity (a property of the reservoir). The dispersivity is commonly considered to be a function of scale (Zheng and Bennett, 2002) and aquifer homogeneity (Huang et al., 2012). Predicting the migration of injected water and the change in lithium concentration over time due to hydrodynamic dispersion, requires a high degree of characterization and computational effort considered to be beyond the scope of an inferred resource estimate.

The guidelines (CIM 2012, page 8) state "It is recommended that total porosity and effective porosity are not used for resource estimation since not only is the ratio of total (and effective) porosity to specific yield different for different aquifer materials, but the use of these parameters lead to unrealistic production expectations." As previously stated, specific yield does not come into consideration for confined reservoirs that aren't being dewatered. As such, in order to honor the spirit and intent of not using the effective porosity in the resource estimation, a production factor cut-off is applied based on the hydrogeologic setting and the expected operation of the production well networks. The production factor cut-off is discussed further in Section 14.4.3.

14.4.2 Lithium Grade
Based on the geologic setting (Section 14.1) and the observed long-term response across the resource area to historical production of fluids (Section 14.2), the Leduc Formation is judged to be hydraulically continuous within each resource area. Based on this and the consistency of the lithium assay results obtained from sampling (Section 11), it is reasonable that the lithium concentrations are continuous across each resource area.

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As described in Section 11, Leduc Formation lithium concentrations were measured at 47 data points in the vicinity of the CCRA. Figure 17 shows the location of Li data points with respect to the proposed CCRA. Assuming similar geological environment for all data recorded in the Leduc Formation, all 47 data points were used to build the variogram needed to perform kriging. The variogram is a mathematical representation of the spatial structure identified from the initial data, and is used to perform the estimation. A two-structure variogram was identified; including a small-scale spherical variogram (range of 4,000 m and sill of 15 $(mg/L)^2$) and a large-scale Gaussian variogram (range of 25,000 m and sill of 85 $(mg/L)^2$). A nugget effect corresponding to 1% of the sill was added to reduce numerical instabilities.

Lithium concentration data provided by E3 Metals were obtained from the sampling program outlined in Sections 9 and 11. A total of 6 samples were in the Leduc Reservoir in and around the CCRA (Figures 17 and 28). Lithium concentration was kriged using the variogram described above and the Li data points located in the NRRA. Simple kriging was performed, using the mean Li concentration of 77.4 mg/L (6 samples) for the CCRA as the kriging mean.

The interpolated lithium concentrations in the CCRA range from 76 to 81 mg/L and have a volume-weighted average of 77.4 mg/L. The interpolated lithium concentrations are relatively consistent throughout the CCRA (Figure 28).
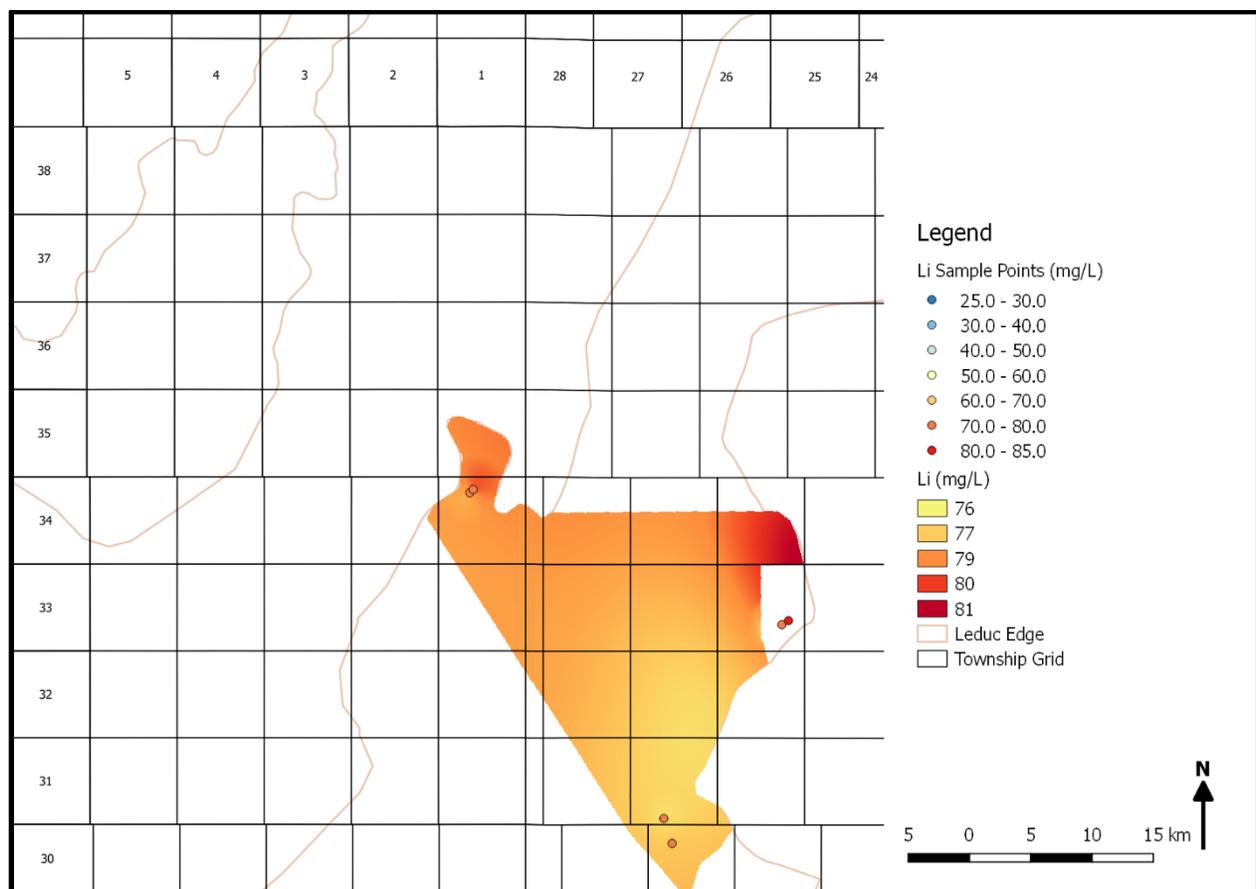
Figure 27. Kriged lithium concentrations in the CCRA. The color ramp scale was chosen in order to see trends across the resource area. Interpolated lithium in the CCRA range from 76 mg/L to 81 mg/L.

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14.4.3 Temporal Effects During Production

The mass of lithium in the CCRA was calculated using the kriged concentrations, the thickness of the formations and the effective porosities of each hydrostratigraphic unit. In order to convert the mass of lithium in-place into an estimate of the mass of lithium that can be produced, there are two factors that needed to be considered:

1. Hydrodynamic dispersion. The injected water placed back into the reservoir from the processing and lithium extraction will be void, or nearly void, of lithium. This will mix with the formation water as it propagates towards the production well at the time interval outlined in Table 9. The mixing results in decreased concentrations of lithium pumped from the production well even before particles (representing the advective front) are predicted to arrive at the production well (compare early time concentrations in Figure 27 between the low and high dispersivity curves).
2. When producing formation water from each hydrostratigraphic unit, more than one production well network will be required. The proportion of water that can be produced before the arrival of injected water (low lithium concentration water) will be dependent on the timing of operations of the multiple production well networks and the distribution of the injected water from previously operated production well networks.

The final production well network design, the timing of production well networks, and the hydrodynamic dispersion of low-concentration lithium injected water have not yet been determined. For the purposes of this inferred resource estimate it is assumed that once the concentration of lithium in the produced water drops below the operating cost of the production well network, the production well will be shut-in. As such, some lithium mass will be left in the reservoir, however the lithium concentration near the injection wells and throughout most of the drainage area will be nearly void of lithium.

Multiple production well networks will be required to produce lithium from the resource areas. Because the shape of their drainage areas will be sensitive to heterogeneity, it is recognized that some lithium will not be captured by any of the production well networks. The amount of lithium that will remain in the reservoir is difficult to estimate, particularly at this early stage of the project because it will be influenced by design and operation of the production well networks and by reservoir heterogeneities.

Based on the two factors discussed above, the mass of lithium in-place was multiplied by production factor cut-offs between 30% and 100%. A production factor cut-off of 50% was selected based on professional judgement as a conservative value. With further characterization of the reservoir and optimization of the production well networks, the lithium recovery (and production factor cut-off) may be increased.

14.4.4 Inferred Resource Estimate

This data sources used for the mineral resource include well data from historical oil and gas operations and brine samples collected from currently operating Leduc wells by E3 Metals. This resource estimate is classified as inferred because geological evidence is sufficient to imply but not verify geological, grade or quality continuity. It is reasonably expected that the majority of the Inferred Mineral Resource Estimate could be upgraded to Indicated Mineral Reserves with continued exploration, enhanced reservoir

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resolution and sampling. Further exploration may include seismic evaluation and a more detailed geological model.

Table 10: Summary of the mass of lithium that can be produced in the CCRA for a variety of production factor cut-offs. Lithium mass represents the combined mass of the Cooking Lake and Leduc formations.

Resource Area	Volume of Water in Effective Porosity (m³)	Lithium Grade (mg/L)	Production Factor Cut-off	Production Volume (m³)	Inferred Lithium Resource Estimate (tonnes)
	9,234,158,174	77.4	1	9,234,158,174	710,000
	9,234,158,174	77.4	0.9	8,310,742,357	640,000
Central Clearwater Resource Area	9,234,158,174	77.4	0.8	7,387,326,539	570,000
	9,234,158,174	77.4	0.7	6,463,910,722	500,000
	9,234,158,174	77.4	0.6	5,540,494,904	430,000
	9,234,158,174	**77.4**	**0.5**	**4,617,079,087**	**360,000**
	9,234,158,174	77.4	0.4	3,693,663,270	290,000
	9,234,158,174	77.4	0.3	2,770,247,452	210,000

The data in Table 10 can be converted from Lithium metal (tonnes) to Lithium Carbonate Equivalent in tonnes. As a producer of raw materials, E3 Metals will not be able to sell Lithium directly to an off-taker. It is useful for the company to convert lithium to lithium carbonate equivalent using the following equation:

$$\text{Lithium Carbonate Equivalent (LCE), tons} = \text{Lithium (tons)} \times 5.323$$

The Inferred Lithium Resource Estimate of 360,000 tonnes equates to 1.9 million tonnes of Lithium Carbonate Equivalent (LCE).

14.5 Resource Statement

The two key findings of the mineral resource evaluation include the determination that high-lithium concentration formation water could be produced, and an estimation of the mass of lithium in the net porosity intervals.

The evaluation of the Leduc and Cooking Lake formations to produce large volumes of formation water was done with a three-dimensional numerical model of groundwater flow. The model incorporated reservoir geometry, porosity, permeability, specific storage and pressure. The preliminary design of production well networks was tailored to each hydrostratigraphic unit and resulted in large production rates with relatively few wells. In addition, the life spans of the production well networks were estimated using the numerical model's ability to do particle tracking. Based on the modeling results, the production rates and life spans of the production well networks is 20,000 m³/d with individual production well network life spans of 10 years to 44 years before the injected water reaches the production well.

Over time, a proportion of injected water void of lithium will be produced at the production well. When the concentration of lithium at the production well drops below the economic threshold, it is expected that the production wells will be shut-in. Due to the hydrodynamic dispersion of injected water and the

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expectation that the multiple drainage areas (each associated with a production well network) won't perfectly capture the entire resource area, it is expected that the total mass of lithium in-place cannot be produced. As such, a conservative 50% production factor cut-off was applied to the total mass of lithium in-place to calculate the inferred resource estimate.

The Inferred Mineral Resource estimate for the CCRA is based on the total volume of water in the effective porosity, the interpolated lithium concentration, and the 50% production factor cut-off. The inferred mineral resource estimate, expressed as a mass of lithium carbonate equivalent, is 4.6 billion m^3 at 77.4 mg/L, totaling 1.9 Mt LCE.

The resource is classified as inferred because geological evidence is sufficient to imply but not verify geological, grade or quality continuity. It is reasonably expected that the majority of the Inferred Mineral Resource Estimate could be upgraded to Indicated Mineral Reserves with continued exploration.

15 Mineral Reserve Estimates

The Project is in an early stage and this section is not applicable.

16 Mining Methods

The Project is in an early stage and this section is not applicable.

17 Recovery Methods

The Project is in an early stage and this section is not applicable.

18 Project Infrastructure

The Project is in an early stage and this section is not applicable.

19 Market Studies and Contracts

The Project is in an early stage and this section is not applicable.

20 Environmental Studies, Permitting and Social or Community Impact

20.1 Environmental Studies

Drilling wells in Alberta have an impact on the surface of the land in the form of transportation, lease construction, pipelines, and wellheads. Certain "protected" areas require environmental assessments prior to construction for drilling a well. Similarly, some areas fall under the federal government jurisdiction of wildlife protection and also require studies to ensure minimal disruption to species at risk. Such areas often have more stringent guidelines as to the drilling of wells and may require

additional surveys and may have restrictions as to the placement of wells and/or the timing in which wells may be drilled.

20.2 Permitting

In Alberta, the regulation and permitting of water wells is determined by the salinity of the water being produced from the reservoir. Wells drilled for the purpose of producing water with salinity greater than 4000 mg/L fall outside the Water Act. These wells follow standard oil and gas regulation through the Alberta Energy Regulator (AER). Because the Leduc brine salinity typically averages 200,000 mg/L, the company's permitting process will fall within the standard oil and gas AER regulations.

The permitting process for a production and injection water well pair with salinity greater than 4000 mg/L, such as those designed to produce from the Leduc Formation in E3 Metals' permit area, is well defined. The process will involve obtaining a license with the Alberta Energy Regulator for a Water Source Well and a Water Injection Well under AER Directive 56: Energy Development Applications and Schedules (http://www.aer.ca/documents/directives/Directive056.pdf). The company will be required to consult with various stakeholders and gain authorization from mineral rights owners, including First Nations, trappers and surface land owners under a Participant Involvement Program, and obtain an AER business associate (BA) code from the Petroleum Registry of Alberta.

A Lahee classification is a "pre-spud" (pre-drilling) assignment given to each well based on the geological complexities relating to oil and gas exploration. The Lahee classification applicable to wells drilled for brine production and water disposal is "OTH", and may be licensed under Regulation Section 2.020 or 2.040 of the Oil and Gas Conservation Regulations (OGCR). This regulation section is indicated in the Well License Application. The Well License Application can be found in Schedule 4 of Directive 56.

Because the water will likely contain various amounts of dissolved H_2S, schedule 4.3 of Directive 56 will be required for the license application. An emergency planning zone (EPZ) will need to be identified and a mitigation strategy outlined to ensure safe operations. A setback from permanent dwellings, public facilities, etc. will be required based upon the wells H_2S release rate, similar to that applied to the existing development in the area.

Injection and disposal requirements will also be met as per AER Directive 51: https://www.aer.ca/documents/directives/Directive051.pdf. The injection wells will be categorized as Class II for injection of produced water (brine) or brine equivalent fluids. The directive outlines the cementing requirements, testing to ensure zone isolation and monitoring parameters.

20.3 Social or Community Impact

Oil and gas development has occurred in the resource areas over the last 70 years, primarily for Nisku and Leduc targets, in addition to some Cretaceous, Mississippian and deeper Devonian targets. This has resulted in the evolution of many communities who sustain themselves economically on a foundation of oil and gas activity. Many of the oil and gas fields in the resource area, while still producing, are well beyond peak production and produce only at marginal rates. A majority of oil and gas wells targeting the Leduc in the area have been shut in, and it is uncertain whether they will produce again. Lithium production in Alberta will be closely tied to oil and gas operations, and could support oil and gas

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development through strategic pressure support and liability transfer. This activity could revitalize the area and provide jobs to an underutilized workforce.

Production of a lithium product in Alberta could spur economic activity and growth related to the use of lithium in the energy storage supply chain. Companies like Volvo, Tesla and Volkswagen are driving huge demand for lithium as they commit to electric vehicle fleets. Lithium production in Alberta could attract battery manufacturers, electric vehicle manufacturers and other industries along the EV and energy storage supply chain to the Alberta economy. The availability of raw materials in Alberta will support and facilitate the growth of these industries.

Geothermal potential southwest of the CCRA has been demonstrated by Banks (2016) in the University of Alberta's "Deep Dive Study". A portion of the geothermal study overlaps E3 Metals' permits (in the Rocky Sub-Property), where it is indicated that 80 Megawatts of electric power could be produced from the Leduc reservoir around the municipality of Caroline. A Petro-Lithium operation in this area would require the production of large volumes of water. At certain temperatures, the heat from lithium-enriched brine could also be used to produce geothermal power. It is possible that this geothermal energy could supply green electricity to the extraction plant as well as supply neighboring communities with renewable power and heat.

In addition to improving the standard of living for Albertans through economic prosperity, producing lithium will also help Alberta meet its goals related to climate change. Electric vehicles, powered by lithium-ion batteries, help reduce greenhouse gas emissions in comparison to internal combustion engines. Lithium is also used in industry-grade battery storage and could support an economic, non-fossil fuel related source of electricity stability for intermittent renewable energy sources. As it is anticipated that most of the development of renewable energy sources over that time frame will be in the form of wind or solar power, energy storage, supported by large scale Li-ion batteries, could be a vital component of grid stability and energy security.

21 Capital and Operating Costs

The Project is in an early stage and a mineral reserve estimate is not applicable.

22 Economic Analysis

The Project is in an early stage and a mineral reserve estimate is not applicable.

23 Adjacent Properties

An adjacent property is defined as a reasonably proximate property in which the issuer does not have an interest and has similar geological characteristics to those of the subject of this Technical Report. Alberta is currently experiencing a high level of industry interest in its oilfield Li-brine potential. A variety of exploration companies have staked permits throughout Alberta; these properties have essentially staked all historical instances of lithium-in-brine enrichment. E3 Metals properties are bounded in a handful of areas by other exploration companies that are also exploring the Devonian petroleum system for Li-brine (Figure 29).

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The Clearwater claim blocks are bounded by a small adjacent permit to the east owned by Nicholas Richard Rodway, which was staked in 2016. All claims owned by Nicholas Richard Rodway are currently under option by MGX Minerals Inc. as part of the Red Deer group of permits (Eccles, 2016).

The Clearwater claims are interspersed in a checkerboard configuration with privately owned land called Freehold. On Freehold lands, metallic and industrial minerals are owned by private individuals, companies or corporations. The Freehold land will not inhibit E3 Metals from developing the area, though surface land owners will need to be consulted prior to development.

Outside of the permit areas (large white areas on Figure 29), the lands are held by a combination of Freehold and Crown ownership.

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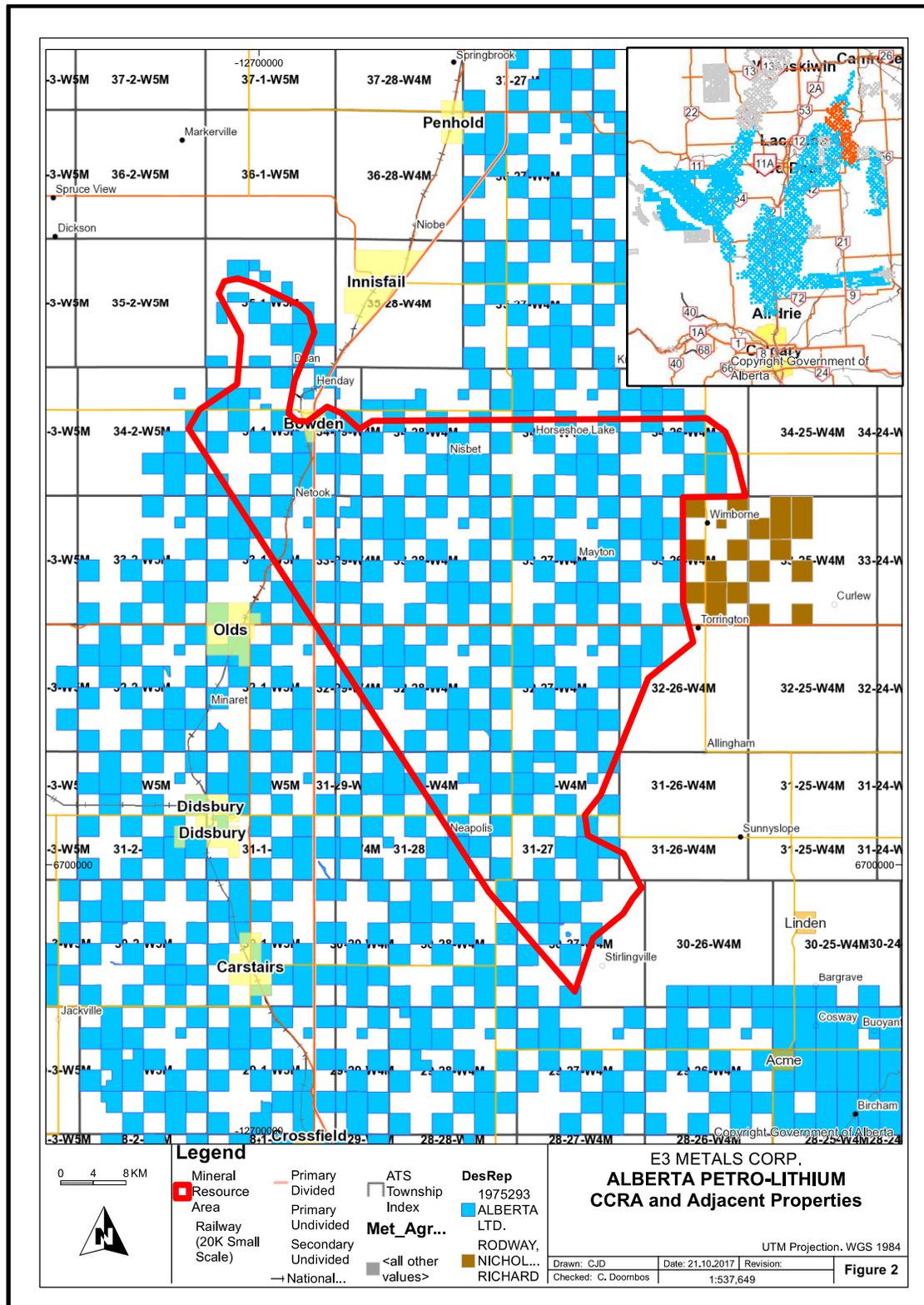
Figure 28. Area map showing the location of E3 Permits and surrounding permits. Permits in blue are held by 1975293 AB Ltd. a wholly owned subsidiary of E3 Metals. Permits in brown are held by Rodway Nicholas Richard. White squares interspersed among the blue permits indicate Freehold (individual or corporation) interest.

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24 Other Relevant Data and Information

The current policy regulation for the production of lithium in Alberta being defined. E3 Metals assumes that current oil and gas regulations would be applicable and may potentially guide the operational aspects of lithium resource production.

According to Alberta regulation, water is a resource owned wholly by the Crown. A water source well licensed under Directive 56 would allow for the production of water under the regulations for the purpose of extracting lithium. While offset rules normally do not apply in a mining context, E3 expects that offset rules would apply for the extraction of lithium as they do for oil and gas under the Oil and Gas Conservation Act (https://www.aer.ca/documents/actregs/ogc_reg_151_71_ogcr.pdf) because the lithium occurs dissolved in the brine and must be produced as a fluid. It is also expected that designated drill spacing units (DSU) would exist as they do for oil and gas, and that competitive drainage would be regulated through the use of buffers and well spacing. In this circumstance, E3 would apply under Directive 65 (https://www.aer.ca/documents/directives/Directive065.pdf) to accommodate possible amendments to the spacing of well configurations and/or well placement that may be required to produce water at volumes required to extract lithium.

Existing synergies between Petro-brine production and oil and gas, including the re-injection of lithium disposal water for strategic pressure support beneath oil and gas fields, could provide a mutual benefit for both lithium extraction and oil and gas production. Co-located operations could evolve in a symbiotic approach that ideally would contribute to each industry's success. This may involve the limitation of re-injection or disposal of oilfield wastewater in an area near to E3's unproduced mineral permit area to limit the dilution of the lithium resource. It is expected that MRLs (maximum rate limitations), designed to optimize oil production, could be avoided or negotiated through collaborative effort and industry partnerships.

25 Interpretation and Conclusions

The E3 Metals Corp CCRA overlies Devonian reef formations where Li-brines are produced as a wastewater from oil production. Wastewater production over the last 5 years has been averaged 1,800 m^3/d (GeoSCOUT^{TM}). The weighted average lithium concentration from the kriging estimation completed within the CCRA resource model was 77.4 mg/L.

Drill Stem Test (DST) data across the region through time suggest that the Leduc Formation is hydraulically connected across the margins and interiors of the CCRA reef. However, separate pressure trends in non-contiguous areas of the Leduc indicate that reefs in different geological trends outside the CCRA are not well connected hydraulically and that the Cooking Lake Formation has low permeability.

The Fluid Domains reservoir and particle tracking models-based findings suggest the following:

- o   Inferred Resource of 1.9 M tonnes LCE at a conservative 50% production factor.
- o   Potential production rate of 20,000 m^3/d.
- o   Individual production well network life spans of 10 years to 44 years before the injected water reaches the production well.

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26 Recommendations

The reservoir model used a host of existing well data but relatively few Li-brine analyses. Additional well water samples are needed, where possible, to confirm brine chemistry through time and build the dataset. The cost of collecting and analyzing approximately 100 additional samples is estimated at $100,000. This would include samples collected at locations previously sampled (repeat samples) and samples collected from other producing locations not previously sampled.

The existing samples from well head and separators do not give a vertical profile of the sampled wells or the Li-brines within each of the 8 identified aquifers. Vertical profile sampling of Li concentrations within the reservoir at one or more locations per resource area is recommended at an estimated cost of $200,000 each. The completion of these recommendations will firm up the resource.

E3 Metals should consider permitting the installation of a lithium brine treatment system in association with operating petroleum wells to develop logistics, recovery and economics for a future Preliminary Economic Assessment (PEA).

27 References

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APPENDIX A

Central Clearwater Resource Area (CCRA) Claims

Agreement No	Property	Representative	Zone description (Mer-Rge-Twp)	Sections Included	Term date	Expiry date	Area (ha)	2 Year Expenditure Commitment
9316060174	Clearwater	1975293 Alberta Ltd.	4-27-030:	20; 29; 30; 32	20-Jun-16	20-Jun-30	9088	$45,440.00
			4-27-031:	2; 4; 6; 10-12; 14; 16; 22; 24; 26NE; 28; 29; 34; 36				
			4-27-032:	2; 4; 10-12; 14; 16; 22; 24; 26NE; 28; 34; 36				
			4-28-030:	36				
9316060175	Clearwater	1975293 Alberta Ltd.	4-26-033:	4; 6; 16; 18; 20; 28-30; 32	20-Jun-16	20-Jun-30	9024	$45,120.00
			4-26-034:	2; 4; 6; 10; 11; 14; 16; 18; 20; 22; 28-30; 32				
			4-27-033:	2; 4; 10-12; 14; 16; 22; 24; 26NE; 28; 34; 36				
9316060176	Clearwater	1975293 Alberta Ltd.	4-28-033:	2; 4; 6; 10-12; 14; 16; 18; 20; 22; 24; 26NE; 28-30; 32; 34; 36	20-Jun-16	20-Jun-30	8618.3	$43,091.48
			4-29-033:	2EF; 11EF; 12; 14EF; 24; 26NEF; 36S,NE				
			5-01-033:	2; 4; 6; 10-12; 14; 16; 18; 20; 22; 24				
9316060177	Clearwater	1975293 Alberta Ltd.	4-27-034:	2; 4; 6; 10-12; 14; 16; 18; 20; 22; 24; 26NE; 27SWP; 28-30;	20-Jun-16	20-Jun-30	8768.2	$43,841.00
			4-28-034:	2; 4; 6; 10-12; 14; 16; 18; 20; 22; 24; 26NE; 28S,NE; 29S; 30S;				
			4-29-034:	24				
9316060178	Clearwater	1975293 Alberta Ltd.	4-29-034:	2EF; 11EF; 12; 14EF; 26NEF	20-Jun-16	20-Jun-30	8904.8	$45,120.00
			5-01-033:	26NE; 28-30; 32; 34; 36				
			5-01-034:	2; 4; 6; 10-12; 14; 16; 18; 20; 22; 24; 26NE; 28NW,L1,L2; 29;				
			5-01-035:	2; 4S; 6S; 10-12; 14; 16; 18E; 20S; 22S,NE; 28SE,NW; 29				
9317060215	Clearwater	1975293 Alberta Ltd.	4-27-031:	18; 20; 30; 32; 33N	20-Jun-17	20-Jun-19	4992	$24,960.00
			4-28-031:	12; 14; 16; 18; 20; 22; 24; 25N,SE; 26NE				
			4-29-031:	36				
9317060238	Clearwater	1975293 Alberta Ltd.	4-27-030:	4; 6; 16; 18; 21SP,NWP; 22; 28; 34	20-Jun-17	20-Jun-19	4367.48	$21,837.40
			4-28-030:	2; 4; 6; 10-12; 14; 16; 18; 20				
9317060216	Clearwater	1975293 Alberta Ltd.	4-27-032:	6; 18; 20; 29; 30; 32	20-Jun-17	20-Jun-19	8695.404	$43,477.02
			4-27-033:	6; 18; 20; 29; 30; 32				
			4-28-032:	1NEP; 2; 4; 6; 10-12; 14; 16; 18; 20; 22; 24; 26NE; 28-30; 32; 34; 36				

Alberta Petro-Lithium Project, Alberta, Canada

APPENDIX B

Abbreviations Used in this Report

AER	Alberta Energy Regulator	masl	mean above sea level (elevation)
C^O	degrees Centigradae	mg/L	milligrams per liter
DST	Drill Stem Test	mi	mile
DSU	drill spacing unit	ml	milliliter
EPZ	Emergency Planning Zone	mm	millimeter
et al.	and others	Mt	million tons
F^O	Degrees Fahrenheit	mt	metric ton
Ga	billion years	mt/yr	metric tons per year
H_2S	hydrogen sulfide	Nb	niobium
ICP-OES	Induced Coupled Plasma	OGCR	Oil & Gas Conservation Regulations
kg	kilograms	OSC	Ontario Securities Commision
kg/m^3	kilograms per cubic meter	ppm	parts per million
km	kilometer	QA	Quality Assurance
km^2	square kilometer	QP	Qualified Person
kt	kiloton	R__W	Range West of meridian
LCE	Lithium Carbonate Equivalent	RA	Resource Area
LCE	Lithium Carbonate Equivalent (Li_2CO_3)	SME	Society for Mining, Metallurgy and Exploration
Li	lithium	T__N	Township North of meridian
m	meter	USD	US Dollar
M.S.	Master of Science	UWI	Unique Well Identifier
m3/day	cubic meters per day		

Alberta Petro-Lithium Project, Alberta, Canada

Qualified Person (QP) Certificates

CERTIFICATE OF AUTHOR

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 CERTIFICATE of AUTHOR

I, **Raymond P. Spanjers**, do hereby certify that:

1.   I am currently engaged as a Geological Consultant.
2.   I am a graduate of the University of Wisconsin – Parkside with a Bachelor of Science in Earth Science (1977),   and a Master of Science degree in Geology from North Carolina State University (1983).
3.   I am a Registered Professional Geologist through the Society for Mining, Metallurgy & Exploration (SME), Number 3041730RM.
4.   I have practiced by profession in geology since 1980 and have 37 years of experience in mineral   exploration, mining and mineral processing of industrial minerals and lithium brines. I have performed   computer 3D modeling of deposits and worked with teams that developed aquifer models and resources.
5.   I have read the definition of "qualified person" set out in NI 43-101 ("NI 43-101") and certify that by reason, I   fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6.   I am responsible for the preparation of the report titled "NI 43-101 Technical Report LITHIUM RESOURCE ESTIMATE for the CENTRAL CLEARWATER PROPERTY SOUTH-CENTRAL ALBERTA, CANADA".
7.   I visited the E3 Metals Corporation property on September 15, 2017.
8   As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information for disclosure, and is not misleading.
9.   I do not hold, nor do I expect to receive, any securities or any other interest in any corporate entity,   private   or public, with interests in the properties that are the subject of this report or in the properties   themselves, nor do I have any business relationship with any such entity apart from a professional   consulting relationship with the issuer, nor to the best of my knowledge do I have any interest in any securities of any corporate entity with property within a two (2) kilometer distance of any of the subject properties.
10. I am independent of E3 Metals Corporation according to the criteria stated in Section 1.5 of NI 43¬101.
11. I have read NI 43-101 and Form NI 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.
12. I consent to the public filing of the technical report titled "NI 43-101 Inferred Lithium Resource Estimate for   the Alberta Petro-Lithium Project, Alberta, Canada" and dated November 15, 2017 (the "Technical Report") by   E3 Metals Corp. I also consent to any extracts from or a summary of the Technical Report in any type of   disclosure document with any stock exchanges or other regulatory authority and any publication by them,   including electronic publication in the public company files on the websites accessible by the public, of the   Technical Report of E3 Metals Corp.

Dated this 27TH day October, 2017.

Raymond P. Spanjers
Signature of Qualified Person
    "Raymond P. Spanjers"
 Print name of Qualified Person

Alberta Petro-Lithium Project, Alberta, Canada

CERTIFICATE of AUTHOR

GORDON MACMILLAN
CONSULTING HYDROGEOLOGIST
PO Box 1835
Cochrane Alberta, T4C 1B7
Telephone: 403-462-2007 Email: gmacmillan@fluid-domains.com

I, **Gordon MacMillan**, do hereby certify that:

1. I am currently engaged as a Hydrogeological Consultant.
2. I am a graduate of the University of Calgary with a Bachelor of Science in Applied and Environmental Geology (1998).
3. I am a Registered Professional Geologist through the Association of Professional Engineers and Geoscientists of Alberta, Membership Number 63537.
4. I have practiced by profession in hydrogeology since 2000 and have 17 years of experience in mining, water supply, water injection, and solute migration. I have performed computer 3D modeling of groundwater flow, solute transport and heat flow. I have worked with multi-discipline teams to develop and model detailed models of large-scale solute migration.
5. I have read the definition of "qualified person" set out in NI 43-101 ("NI 43-101") and certify that by reason, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for the preparation of Section 14 of the report titled "NI 43-101 Technical Report LITHIUM RESOURCE ESTIMATE for the CENTRAL CLEARWATER PROPERTY SOUTH-CENTRAL ALBERTA, CANADA"
7. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information for disclosure, and is not misleading.
8. I do not hold, nor do I expect to receive, any securities or any other interest in any corporate entity, private or public, with interests in the properties that are the subject of this report or in the properties themselves, nor do I have any business relationship with any such entity apart from a professional consulting relationship with the issuer, nor to the best of my knowledge do I have any interest in any securities of any corporate entity with property within a two (2) kilometer distance of any of the subject properties.
9. I am independent of E3 Metals Corporation according to the criteria stated in Section 1.5 of NI 43¬101.
10. I have read NI 43-101 and Form NI 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.
11. I consent to the public filing of the technical report titled "NI 43-101 Inferred Lithium Resource Estimate for the Alberta Petro-Lithium Project, South-Central Alberta, Canada" and dated October 25, 2017 (the "Technical Report") by E3 Metals Corp. I also consent to any extracts from or a summary of the Technical Report in any type of disclosure document with any stock exchanges or other regulatory authority and any publication by them, including electronic publication in the public company files on the websites accessible by the public, of the Technical Report of E3 Metals Corp.

Dated this 25th day October 2017.

Gordon MacMillan

Signature of Qualified Person

    "*Gordon MacMillan*"

Print name of Qualified Person

Alberta Petro-Lithium Project, Alberta, Canada

CERTIFICATE of AUTHOR

WAYNE MONNERY
PROCESS ENGINEERING CONSULTANT
Telephone: 403-804-3266 Email: wayne@e3metalscorp.com

I, **Wayne D. Monnery**, do hereby certify that:

1. I am currently engaged as Process Engineering Consultant and President of Chem-Pet Process Technology Ltd., 240 Hawkwood Drive NW, Calgary, Alberta, Canada.
2. This certificate applies to the technical report titled "NI 43-101 Technical Report LITHIUM RESOURCE ESTIMATE for the CENTRAL CLEARWATER PROPERTY SOUTH-CENTRAL ALBERTA, CANADA" with effective date, 25th October 2017 (the "Technical Report").
3. I am a graduate of the University of Calgary, Calgary, Alberta, Canada and have a Bachelor of Science in Chemical Engineering (1986), Master of Science in Chemical Engineering (1988) and a Doctor of Philosophy in Chemical Engineering (1996).
4. I am a registered professional engineer licensed by the Association of Professional Engineers and Geoscientists of Alberta (APEGA), member 46103.
5. I have practiced my profession in engineering since 1986 and have 32 years of experience in research and process engineering in the chemical and petroleum industries.
6. I have read the definition of "qualified person" set out in NI 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
7. I am responsible for authoring Section 13 (part).
8. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information for disclosure, and is not misleading.
9. I am independent of E3 Metals Corporation according to the criteria stated in Section 1.5 of NI 43101.
10. I do not hold, nor do I expect to receive, any securities or any other interest in any corporate entity, private or public, with interests in the properties that are the subject of this report or in the properties themselves, nor do I have any business relationship with any such entity apart from a professional consulting relationship with the issuer, nor to the best of my knowledge do I have any interest in any securities of any corporate entity with property within a two (2) kilometer distance of any of the subject properties.
11. I consent to the public filing of the technical by E3 Metals Corp. I also consent to any extracts from or a summary of the Technical Report in any type of disclosure document with any stock exchanges or other regulatory authority, and any publication by them, including electronic publication in the public company files on the websites accessible by the public, of the Technical Report of E3 Metals Corp.

Dated this 24th day of October, 2017.

Wayne D. Monnery

Signature of Qualified Person

 "Wayne D. Monnery"

Print name of Qualified Person

Alberta Petro-Lithium Project, Alberta, Canada