

October 2021 – CSUR Technical Webinar

Petro-Lithium and Helium Resources of the Western Canada Sedimentary Basin



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**PETRO-LITHIUM AND HELIUM RESOURCES OF
THE WESTERN CANADA SEDIMENTARY BASIN**

PRESENTED BY

**W. STEVE DONALDSON, P.GEOL., SENIOR EXPLORATION &
DEVELOPMENT GEOLOGIST | SEQUENCE STRATIGRAPHER
CANADIAN DISCOVERY**

The concept of “**Energy Transition**” has been receiving significant press and attention of late, including within CSUR & its initiatives. Concurrently, the Canadian Oil & Gas industry, and certainly the local energy industry, is working hard to remain relevant & also transform its business strategy to remain consistent and in line with Canada’s goal of a lower carbon future. At the same time, the energy industry in Canada is also trying to leverage its expertise and existing knowledge to make the evolution to a low-carbon economy a more seamless undertaking.

The guest speaker for our first technical session in October 2021 was Steve Donaldson, a Senior Exploration & Development Geologist with Canadian Discovery Limited. Steve was on hand to elaborate on some of the existing opportunities with respect to critical or strategic minerals within the Western Canadian Sedimentary Basin (WCSB). Specifically, Lithium and Helium, which are prevalent throughout the basin, are naturally occurring minerals and whose demand has been growing globally.

As mentioned by the speaker, Lithium exists in various forms in nature all over the world, including in oilfield brines (also referred to as Petro-Lithium) and can be extracted directly via one of several existing proprietary processes. However, operators do need to secure the appropriate mineral

rights in order to be able to develop this resource in Western Canada. Lithium’s primary demand is for industrial and high-tech applications, including an ever-increasing demand in lithium-ion rechargeable batteries (mostly for consumer electronics, power storage & transportation sectors).

Similarly, Helium is also an integral component in many high-tech and industrial processes, including in medical, semi-conductor and fibre optic applications. With supply dynamics shifting to outside of North America, the speaker identified a potential future shortfall for Canada & North America as production of this resource shifts to parts of the world which are considered geopolitically riskier. However, with significant and abundant deposits of this resource in Western Canada, there are several operators who have active Helium development programs in the basin already.

In his concluding remarks, Steve reiterated that significant opportunities exist in the WCSB for Canadian operators for these minerals, which have been identified & are part of Canada’s Critical Minerals List. In addition, an immense public database of previous & current oil and gas exploration already exists that can be utilized to advance this transition.

SUMMARY

Introduction

The Western Canada Sedimentary Basin (WCSB) has been an oil and gas exploration and development area since the early 20th century and has generated and continues to generate immense wealth for all Canadians. Recently there has been a pivot to new types of subsurface resources, which include what are called critical or strategic minerals. Among these are lithium (from oilfield brines) and helium (found trapped within deep strata overlying Precambrian structural highs). Lithium demand is rising worldwide and is expected to increase significantly by 2030 from current levels. This is primarily because of increased demand for energy storage applications using rechargeable lithium-ion batteries. Concurrently, the imminent closure of the United States Federal Helium Reserve in Texas in late 2021 requires the identification of new and secure sources of helium, which is used in cryogenic applications for MRI scanners, during the manufacture of semiconductor chips and to purge and pressurize the propulsion systems of missiles and rockets. The pivot to lithium is driven by forecasted steadily-increasing demand, whereas the search for helium is driven by a risk of decreasing supply in the future. Western Canada is well positioned to become a secure source for both of these elements, not only because of its favorable geology, but because exploration for and development of both lithium and helium in the subsurface leverages the knowledge, expertise and infrastructure that currently exists for oil and gas in the WCSB.

Fairways and Operators

Lithium

During the 1990s and into the 2000s, the Alberta Geological Survey, as well as the Saskatchewan Geological Survey identified elevated levels of lithium and other elements in saline brine (formation water) associated with oil and gas reservoirs deep in the subsurface. An examination of lithium concentration in formation waters reveals some marked geographic and stratigraphic trends. The highest lithium concentrations have been historically documented by both government and industry to occur in Devonian-age units, specifically the Beaverhill Lake (Swan Hills), Woodbend (Leduc), Winterburn (Nisku) and Wabamun groups/formations. Devonian production is mature (some of these units have been producing petroleum for over 70 years) and consequently, most wells now produce far more brine than petroleum.

In Western Canada, a handful of larger operators are currently developing lithium resources within the areas where this element is enriched in Devonian reservoirs. Over the past few years, E3 Metals, Prism Diversified, Prairie Lithium and LithiumBank have acquired metallic and industrial mineral rights in Alberta, Saskatchewan and northeastern BC and are at different stages of project development. In March 2021, Highwood Asset Management (previously Highwood Oil) acquired significant acreage with lithium rights. A number of smaller operators and individuals have also staked lithium rights.

Helium

The dominant isotope of helium (4He) is radiogenically sourced from the decay of uranium (U) and thorium (Th) in the Earth's crust. Basement rocks and cratons of Proterozoic- and Archean-age are predominantly metamorphic or granitic and contain crustal average or higher concentrations of U and Th. Younger Phanerozoic sediments with crustal average U and Th contents have an equal capacity to produce helium; however the greater age of Precambrian rocks has allowed

more time for its production and accumulation through radioactive decay. Once generated, the helium migrates out these source rocks into overlying reservoirs overlain by tight sealing caprocks, often draping Precambrian structural closures.

Helium exploration and the development of helium resources is most advanced in Saskatchewan, where four operators are now active in multiple areas across the southern part of the province. These are North American Helium, Royal Helium, Canadian Helium and the Weil Group. North American is the most active driller (almost 30 wells) and has the largest helium land position in Canada. The company also started up its first helium production facility at its Cypress Field in July 2020. The City of Medicine Hat was active in Saskatchewan helium exploration, but has stepped away because of perceived exploration risk.

In Alberta, three operators dominate the helium industry. Thor Resources is active at Knappen in the southeast, First Helium is exploring along the northern flank of the Peace River Arch and Imperial Helium recently acquired land in the Princess area of south-central Alberta.

References

Donaldson (2021). Prairie Lithium Poised to Advance Petro-Lithium Development. Accessed August, 2021. <https://digest.canadiandiscovery.com/article/8457>
Donaldson (2018). Nowhere to Go But Up: The Rising Helium Potential of Western Canada. Accessed August, 2021. <https://digest.canadiandiscovery.com/article/5336>
Donaldson (2018). Can Lithium Fuel Alberta's Future? Petro-Lithium in Alberta. Accessed August, 2021. <https://digest.canadiandiscovery.com/article/5343>

PRESENTER: W.Steve Donaldson, P.Geol., Senior Exploration & Development Geologist | Sequence Stratigrapher - Canadian Discovery

W. Steven Donaldson is a professional geologist (P.Geol.) with 22 years of experience and is currently an Exploration Analyst with Canadian Discovery Limited (CDL). Here he writes articles for the Discovery Digest publication with a recent emphasis on low carbon opportunities and clean technology. At CDL he has also provided geological expertise to evaluate the potential of saline reservoirs for carbon capture and storage (CCS) consulting projects. Steve earned his Ph.D. and B.Sc. Honours degrees in Geology from Western University in London, Ontario. He has consulted with/worked for Partners Energy Development Corp., Cenovus Energy (and its legacy companies EnCana and Alberta Energy Corporation), as well as Graham Davies Geological Consultants (GDGC). The early part of his professional career was spent working on a wide range of regional geological evaluation projects in NE BC, Northern Canada and International settings. He has planned and drilled development, infill, and pool delineation wells in the Cretaceous of SE Alberta and has conducted technical evaluations of properties for acquisition, potential divestment or farm-out in Alberta and Saskatchewan.



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presented by W. Steven Donaldson, P.Geol. - Canadian Discovery

Tuesday, October 12, 2021 | 10:00am MT
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