



**Geoscience BC's Recommendations to BC's Select Standing
Committee on Finance and Government Services**

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1. RECOMMENDATIONS

Geoscience BC's recommendation to the Select Standing Committee on Finance and Government Services is:

- To support a commitment to a 'made-in-BC' coordinated and adequately resourced provincial approach to public geoscience¹ through a multi-organization delivery structure, including:
 - Sustainable funding for Geoscience BC to continue research that encourages innovation and responsible development of minerals, oil & gas, geothermal and water resources in the Province of British Columbia;
 - An increase in base funding for the British Columbia Geological Survey so that it can more effectively collaborate with partners to deliver its complementary mandate; and
 - Research funding for Geoscience BC and other research partners to implement the top priority recommendations arising from the independent *Scientific Review of Hydraulic Fracturing in British Columbia*.

2. BACKGROUND

Geoscience BC is an independent, not-for-profit society incorporated under the British Columbia *Societies Act* to promote, fund and support public geoscience research in the Province of British Columbia.

The need for independent, relevant, public geoscience is growing as the world transitions to a cleaner, greener economy. A corresponding increase in demand for natural resources increases the need for public geoscience to inform evidence-based decisions about mineral exploration and development, oil & gas activity, geothermal energy potential and water resources in the province that balance economic, social and environmental factors.

Established in 2005, Geoscience BC works to complement the efforts of provincial and federal geological survey agencies and government scientists. It listens to the needs of the resource sectors, academia, Indigenous groups and governments to develop relevant, applied research projects. This approach provides the people of British Columbia with an innovative and responsive made-in-BC model for public geoscience. The collaborative model is used to efficiently and cost-effectively, collect, and share technical information and geoscience data, facts and information.

Including an initial grant of \$25 million, Geoscience BC has received a total of \$76.8 million from the Province to date. Geoscience BC uses this core provincial funding to leverage further investment from partners, and to attract significant in-kind contributions such as technical expertise and access to scientific equipment.

Geoscience BC has been successful in leveraging core provincial funding, resulting in a leveraging multiplier of 1.6 for each dollar invested in earth science research by Geoscience BC. To date, it has committed almost \$56 million to support 227 mineral, oil & gas, geothermal and water research projects (185 complete and 42 underway – see Table 1). Additional

¹ *Mining Jobs Task Force Final Report*, December 2018

partner contributions of just over \$31 million mean that a total of almost \$87 million has been invested in public geoscience through Geoscience BC and its partners since 2005.

Additional partner funding is usually for specific research projects, with contributions from organizations such as the Northern Development Initiative Trust; Western Economic Diversification Canada; the Geological Survey of Canada; BC Oil & Gas Research and Innovation Society; oil & gas sector operators; and mineral exploration and development companies.

Table 1. Geoscience BC Research Projects

Strategic Focus Area	Completed Research Projects	Current Research Projects	Totals
Minerals	127	29	156
Energy – Oil & Gas	24	6	30
Energy – Geothermal	10	2	12
Water	24	5	29
Total	185	42	227

Geoscience BC has nine staff members and is supported by more than 70 volunteers contributing an estimated 1,500 volunteer hours per year. This includes a Board of Directors from diverse backgrounds, and Technical Advisory Committees comprising subject matter experts that identify, plan, develop and review earth science research projects. This organizational structure maximizes expert input and applied research investment, and minimizes administrative-related expenditures.

3. CONTEXT

Geoscience BC’s recommendations to the Select Standing Committee on Finance and Government Services are based upon:

- Recommendation 17 of the November 2018 *Report on the Budget 2019 Consultation* recommends that the provincial government: “Provide long-term, multi-year, sustainable funding for research, including for Geoscience BC...”.
- The *BC Chamber of Commerce Policy & Positions Manual 2018* recommends that “the provincial government invests a total of \$10 million per year for five years... in Geoscience BC for minerals, energy and water research projects”; and “re-establish annual base funding... (to) enhance BCGS [British Columbia Geological Survey] capacity and improve delivery infrastructure”.
- Union of British Columbia Municipalities (UBCM) 2018 resolution *B166 Public Geoscience for Investment and Decisions* recommends that “the provincial government provide Geoscience BC with funding of \$10 million per year over five years”.
- Bridge funding of \$5 million for one-year for Geoscience BC was announced by the Honourable Michelle Mungall, Minister of Energy, Mines and Petroleum Resources, on

May 9th, 2019. Geoscience BC received over 40 representative letters for funding from industry, business, Indigenous groups, academia, and local governments.

- The bridge funding meets a recommendation of the Mining Jobs Task Force in January 2019, which also recommended a review of public geoscience to inform the development of a “coordinated and adequately resourced geoscience strategy” in 2019 leading up to BC Budget 2020.
- The independent *Scientific Review of Hydraulic Fracturing in British Columbia* report², which states that:
 - “BC would benefit from a more formal partnership between university researchers, industry, and provincial regulators, for example, through a research institute on unconventional oil & gas research, to advance research on various topics related to hydraulic fracturing.” (p.198).
 - “A partnership with Geoscience BC, for example, would be especially attractive given its expertise in collecting and managing data that are of value to land- and water-use decision-making related to shale gas development. In this sense, a research partnership would add capacity to maximize the value and use of industry and government collected data to the decisions chain.” (p.200).
- The important and value-add role that Geoscience BC research can play in meeting *CleanBC* commitments such as:
 - Informing decisions regarding “using our clean energy to power our industrial economy”, and “electrifying industrial operations which up until now have depended on carbon-intensive fuels”. (p.43).
 - Informing decisions relating to how to “establish new rules to reduce methane emissions in the upstream production of natural gas”, and assessing fugitive methane releases and leaks. (p.44).
 - Informing decisions regarding underground carbon dioxide storage. (p.45).
 - Generating new data to highlight potential “key deposits of minerals used in manufacturing of clean vehicle technologies”. (p.48).

4. A COORDINATED & COLLABORATIVE MODEL

Geoscience BC works to complement and support scientific research conducted across provincial ministries including the Ministries of Energy, Mines and Petroleum Resources; Environment and Climate Change Strategy; Forests, Lands, Natural Resource Operations and Rural Development; and Jobs, Trade and Technology.

The British Columbia Geological Survey (BCGS) and Geoscience BC continue to work together to deliver a collaborative approach to public Geoscience in British Columbia. One example of a current formal collaboration agreement between Geoscience BC and the BCGS is the *Search Multiple Scale Value Added Mapping Project* in northwestern BC. Here, the BCGS is an expert collaborator supporting the University of British Columbia’s Mineral Deposit Research Unit as they follow up Geoscience BC’s 2015 *Search Phase 1* airborne

² *Scientific Review of Hydraulic Fracturing in British Columbia* section 8.2 pp 198-200.

geophysics (magnetics) project with on-the-ground geological mapping. This is an excellent example of how the two organizations collaborate without overlap or duplication.

Geoscience BC also collaborates with resource companies, academia, Indigenous groups local governments, as well as organizations such as the BC Oil and Gas Commission, BC Hydro, and the Geological Survey of Canada.

Geoscience BC's open and transparent approach to public geoscience enhances its reputation as a trusted source of data. Support for Geoscience BC from many community groups and Indigenous groups was highlighted in May 2019 with the announcement of a new Collaboration Agreement with the Tahltan Central Government.

“Being involved early in Geoscience BC research in our territory, and understanding the data from past projects, puts the Tahltan Nation at the forefront of research in our territory, especially relating to mineral exploration and development.”

Tahltan Central Government President Chad Norman Day.

5. GEOSCIENCE BC RESEARCH: EXAMPLES & BENEFITS

Geoscience BC's Scientific Project Plan outlines research projects to support the following strategic objectives set out in the *Strategic Plan 2018-2022*:

- Identifying New Natural Resource Opportunities
- Advancing Science & Innovative Technologies
- Facilitating Responsible Natural Resource Development
- Increasing Geoscience Literacy & Capacity
- Enabling Clean Energy
- Understanding Water

Geoscience BC organizes its research across the following strategic research areas: minerals, energy (oil & gas and geothermal) and water.

A. MINERALS RESEARCH

British Columbia has a number of fundamental competitive advantages, including significant deposits of critical minerals and metals that help make a clean electrified economy possible such as copper, zinc, gold, silver and molybdenum. The province also has major deposits of steelmaking (metallurgical) coal and industrial minerals that are important to our modern world.

Mineral exploration and development are vital to both regional and provincial economies, with a major portion of the mining sector's revenue generated from the sale and export of minerals and steelmaking coal. Exploration projects and mining operations benefit nearby communities, provide thousands of direct and indirect jobs and contribute billions of dollars in economic activity each year. More than half of Canada's exploration and mining companies are based in BC, which has the largest concentration of exploration companies and geoscience professionals anywhere in the world.

Geoscience BC's mineral-related research and data is useful to prospectors, mineral explorers, mine developers, governments, community leaders and Indigenous groups in making informed, evidence-based decisions. Research catalyzes mineral exploration investment and socio-economic development, as well as supporting the identification and mitigation of risks, and stimulating innovative geoscience technologies in the province.

Geoscience BC mineral research and return on investment examples:

- Geoscience BC research helps the mineral exploration sector to target its efforts and bring investment to British Columbia. Third party verification of this in recent months includes:
 - March 26, 2019: "Margaux Resources Announces Execution of Definitive Agreement to Acquire Cassiar Gold Project in Northern British Columbia"
"The Sheep Creek and Cassiar projects are two of the three regions identified in a recently published Geoscience BC report as having good upside potential for orogenic gold mineralization in BC."³ Tyler Rice, President and CEO for Margaux Resources
 - November 19, 2018: "Gold and Copper Mineralization Discovered During Phase 2 Exploration at the McBride Property"
"A coincident 500 m wide by 2000 m long linear magnetic high was outlined by Geoscience B.C.'s Quest-Northwest Airborne Magnetic Survey. This magnetic high may reflect the presence of a partially covered monzonite intrusion."⁴ HAWKEYE Gold & Diamond Inc.
- The Ministry of Energy, Mines and Petroleum Resources' Assessment Report Indexing System (ARIS) shows, conservatively, that from 2005 to 2017:
 - Geoscience BC data and projects are mentioned 2,483 times in 884 separate reports; and
 - Geoscience BC research is mentioned in reports with a total exploration spend of \$154.3 million. This is more than four times the \$32.1 million investment made by Geoscience BC in mineral-related research for the period.
- Geoscience BC's *QUEST-West* geophysical survey project directly contributed to extending the mine life of the Huckleberry copper mine, located southwest of Houston, BC. The project's survey results identified drill targets that led to an increase in the mine's mineral reserves. This meant production continued longer, provincial government revenue of \$4 million per year was realized, 224 jobs were extended and \$100 million per year in mine production continued for an additional two years.
 - Geoscience BC is still active in the area, with strong support from communities.
"We need a group like (Geoscience BC) to spur economic investment,"
Mayor Shane Brienen, Houston

³ <https://www.juniorminingnetwork.com/junior-miner-news/press-releases/1538-tsx-venture/wsk/59919-margaux-resources-announces-execution-of-definitive-agreement-to-acquire-cassiar-gold-project-in-northern-british-columbia.html>

⁴ <https://www.juniorminingnetwork.com/junior-miner-news/press-releases/2029-tsx-venture/hawk/55054-gold-and-copper-mineralization-discovered-during-phase-2-exploration-at-the-mcbride-property.html>

- Geoscience BC's *QUEST-Northwest* survey resulted in the discovery of new gold-copper mineralization and a grassroots exploration program at the Hot Bath project near Dease Lake.
- Geoscience BC's 2017 *Search Phase III* project invested \$1.8 million in a 9,600 km² aerial survey. The research project was modified following requests from Tsay Keh Dene staff and local hunting groups, and Tsay Keh Dene members were hired on the project.
 - The project included \$250,000 of funding from Northern Development Initiative Trust.
 - More than \$500,000 went directly back into the local economy.
 - In just six months, there were 64 new or expanded minerals tenures claimed in the *Search Phase III* area, covering nearly 350 km².
 - *Search Phase III* is publicly supported by communities and industry alike.

B. ENERGY RESEARCH

The oil & gas sector, including the future development of liquified natural gas export facilities, plays a vital role in BC's economy, providing essential energy products to global markets, supporting thousands of jobs and contributing billions of dollars in revenue. Critical research from Geoscience BC and others is important for the robust environmental regime, informed decisions and investor confidence required for BC to lead in the growing natural gas sector.

Nearly 40 mentions in the independent *Scientific Review of Hydraulic Fracturing in British Columbia* report highlight Geoscience BC's role in providing data that serves the public good by guiding clean, responsible energy development; identifying and mitigating risks; answering specific environmental and social questions; and attracting investment to BC.

Geothermal resources may play a significant role in BC as we transition to alternative sources of energy for electricity and heat. The concept of adding geothermal to the energy mix has been discussed for many years but its economic challenges have stifled development. Geoscience BC's geothermal research focusses on 'de-risking' development of high potential geothermal resources in the long-term (>10 years) and providing communities and decision-makers with unbiased data and information.

Geoscience BC energy research and return on investment examples:

- In 2012, the BC Oil and Gas Commission (BC OGC) released new research linking hydraulic fracturing to low-level seismicity. Geoscience BC and partners have grown the national seismic-detection network from two to thirteen stations. The enhanced network is being used by the regulator and by energy companies to monitor and mitigate seismicity caused by hydraulic fracturing activities. Additional research is being conducted to understand the mechanisms that initiate seismicity and to predict and prevent these events.

“From a regulatory perspective, Geoscience BC's activities have supported the evaluation of deep disposal applications, created a reliable seismic network with sufficient precision to allow effective regulation of induced seismicity and dovetailed with isotope data collection and

submission requirements to begin assembling a natural gas atlas. These projects are a few examples of the Geoscience BC projects which have significantly advanced the responsible and efficient recovery of BC's huge natural gas resources.” Ken Paulson, Executive Vice President, Chief Operating Officer, BC OGC

- The *GHGMap* project is developing technically-defensible, real-time, cost-effective technology to measure emissions of greenhouse gases (GHGs) such as methane, ethane and carbon dioxide. This provides independent data needed for informed decisions, as opposed to relying on computer-generated predictive models.
 - *GHGMap* is employing technology developed by NASA for its Mars missions. The highly sensitive new instrumentation is small and light enough to be mounted to a drone.
 - Geoscience BC funding for the research project has been leveraged with additional funds from Western Economic Diversification Canada.

”Geoscience BC (is) breaking new ground and demonstrating the kind of leadership that will ensure Canada’s place among the world’s technological leaders for years to come.” Jonathan Wilkinson, Minister of Fisheries, Oceans and the Canadian Coast Guard

- The oil & gas sector is involved in the research and has been providing the project team with support, including site access to test the technology and measure emissions.
- The project will create new economic opportunities by bringing a made-in-Canada solution closer to commercialization and developing a business model for the technology.
- Since 2012, Geoscience BC has been mapping BC’s geothermal resources with a long-term view to provide foundational science for potentially diversifying the province’s energy portfolio. High-level work has defined the province’s ‘hotspots’ and a ‘roadmap’ has been developed to help communities assess whether direct-use geothermal heat is a viable option.
- Geoscience BC has been researching the viability of repurposing abandoned gas fields and wells near Clarke Lake in northeastern BC to generate geothermal energy and heat. It is also working with the Geological Survey of Canada to undertake a new research project in southwestern BC’s Garibaldi Volcanic Belt in 2019. This will provide a regional assessment of one of Canada’s largest geothermal energy hotspots.

“Geoscience BC’s geothermal study was a significant stimulus for the Terrace economy,” Mayor Carol Leclerc, Terrace.

C. WATER RESEARCH

With thousands of lakes, rivers, streams and aquifers in BC, fresh water is one of the province's most essential and important natural resources, supporting our environment, economy and quality of life. Water became a Geoscience BC strategic research area in 2018 after several years of research relating to water and energy development and following significant public engagement in the development of Geoscience BC's *Strategic Plan 2018-2022*. The need for more earth science to inform our understanding of water resources and to drive evidence-based decisions across BC is also highlighted in the independent *Scientific Review of Hydraulic Fracturing in British Columbia* report.

Geoscience BC water research and return on investment examples:

- New Geoscience BC data about deep groundwater in northeastern BC has resulted in companies involved in hydraulic fracturing investing approximately \$150 million in water treatment plants in the region, thereby significantly reducing reliance on surface water for hydraulic fracturing.
- Geoscience BC has an agreement in place with Fort Nelson First Nation to manage a network of hydrometric monitoring stations in Fort Nelson territory. The data produced by the network continues to be publicly available, and is valued by the community.
“This (agreement) gives us the ability to make decisions with sound data to ensure our water is being utilized in a safe and sustainable manner.” Fort Nelson First Nation Chief Harrison Dickie
- The *Peace Project* used leading-edge airborne electro-magnetic survey mapping technology to better understand shallow groundwater and paleovalley aquifers in the Peace, an area of significant oil & gas sector development. It is the first regional-scale groundwater mapping exercise in the area, with significant support from partners.
 - The Peace Project was part-funded by Northern Development Initiative Trust.
“Studies like this are critical for providing government and industry with data needed to make informed decisions for sustainable resource development and groundwater protection.” Joel McKay, CEO, Northern Development Initiative Trust
 - Project partners included the Ministry of Forests, Lands and Natural Resource Operations and Rural Development; the Ministry of Environment and Climate Change Strategy; the BC Oil and Gas Commission; the Ministry of Energy, Mines and Petroleum Resources; Progress Energy (now Petronas) Canada Ltd.; ConocoPhillips Canada; Northern Development Initiative Trust; and the BC Oil and Gas Research and Innovation Society. Valuable input was also received from Doig River First Nation and Halfway River First Nation.
 - The project had additional support from the Peace River Regional District and the Canadian Association of Petroleum Producers (CAPP), and provides valuable input to the Northeast Water Strategy.