



**Written Submission for the Pre-Budget Consultations in Advance  
of the Upcoming Federal Budget**

**By: Geoscience BC**

## Recommendations:

**Recommendation 1:** That the Government of Canada work with Geoscience BC and the Province of British Columbia (BC) to implement a collaborative long-term funding model for Geoscience BC, with contributions from federal and provincial governments, industry, trusts and others.

**Recommendation 2:** That the Government of Canada contributes funding to a collaborative funding model for Geoscience BC to ensure a minimum of \$5 million research funding per year for five years.

## ABOUT US

Geoscience BC is a not-for-profit society providing public, independent and peer-reviewed research that makes valuable contributions to identifying deposits of critical minerals and metals, geological carbon capture utilization and storage (CCUS) opportunities, generating cleaner energy (including geothermal, hydrogen and low carbon intensity natural gas) and monitoring and mitigating greenhouse gas (GHG) emissions. Established in 2005, our research and data are public, incorporate robust engagement strategies and support supply chain security, reconciliation with Indigenous peoples, mitigating climate change, attracting investment and creating diverse job opportunities.

Our research aligns with Government of Canada objectives, including those outlined in the Minister of Natural Resources mandate letter:

- Canadian Minerals & Metals Plan; Canada's Critical Minerals List; Pan-Canadian Geoscience Strategy.
- Canada–US Joint Action Plan on Critical Minerals Collaboration.
- Hydrogen Strategy for Canada.
- CCUS.
- A Healthy Environment and a Healthy Economy / Pan-Canadian Framework on Clean Growth & Climate Change.

Geoscience BC is part of a successful and coordinated approach to public geoscience. We augment and have agreements in place with NRCan-Geological Survey of Canada (GSC) and British Columbia Geological Survey (BCGS).

Historically, 80%<sup>1</sup> of funding has been provided by the province of BC. The last substantial provincial funding was \$5 million in 2019. Since then, crisis priorities such as the COVID pandemic, floods and wildfires have precluded further significant funding. We are pursuing a more flexible and collaborative funding model by partnering with the

*“Working collaboratively has been the hallmark of Geoscience BC’s success, and will continue to be so in the coming years.”*

**Lana Eagle, Reconciliation Specialist;  
Geoscience BC Vice Chair;  
AME and PDAC Director**



*“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.”*

**Honourable Jonathan Wilkinson**

<https://www.newswire.ca/news-releases/vancouvers-clean-technology-sector-receives-a-boost-677020153.html>

<sup>1</sup> Figures in document to June 30, 2022

federal and provincial governments and industry, including the launch of new membership classes in January 2022. We already have more than 115 members from industry, business, communities, Indigenous groups and academia – with many interested in contributing to future research. The model has policy support from the [BC Chamber of Commerce](#), the [Union of BC Municipalities](#) and [BC's Select Standing Committee on Finance and Government Services](#).

Our model puts 80% of net funding directly into project research and management and 20% to supporting strong governance, community engagement and public research access. Guided by our volunteer Board of Directors and Technical Advisory Committees, we have completed over 200 research projects that demonstrate:

- Every \$1 invested by Geoscience BC in minerals research results in \$6.60 of mineral exploration investment. The Prospectors and Developers Association of Canada estimates every \$1 invested in public geoscience attracts >\$5 of mineral exploration investment<sup>2</sup>.
- Our research has informed >\$50 million industry investment in water infrastructure in northeast BC.
- It has informed investment decisions in geothermal energy: [Fort Nelson First Nation's Tu Deh-Kah Geothermal](#) plant; [Meager Creek Development Corporation's geothermal and hydrogen project](#) at Mount Meager.

We have leveraged every \$1 of funding into \$1.72 of research investment since 2005 (\$57.7 M funding; \$41.7 M partner contributions; total \$99.4 M research investment). Contributors include industry, Western Economic Diversification and Northern Development. We do not pay academic institutions' typical 20-25% overhead fees.

*"We are grateful for this unique opportunity to pursue clean, renewable energy that can provide us with food security, energy independence and diverse economic opportunities in our territory... the possibilities are endless!!!"*

**Chief Sharleen Gale, Fort Nelson First Nation and First Nations Major Projects Coalition**

### Building Capacity

Each year, the [Geoscience BC Scholarship Program](#) supports up to 10 earth science students' research projects.

More than 140 students have been awarded scholarships, boosting the next generation of Canadian geoscientists.



<sup>2</sup> PDAC analysis: every \$1 invested in public geoscience results in \$5 of mineral exploration investment (<https://www.pdac.ca/priorities/advocacy/federal-budget/budget-2014/geoscience-investments>). Analysis of Geoscience BC research mentions in Assessment Reports shows every \$1 invested results in \$6.60 of investment.

PROPOSED RESEARCH

*“The development of the hydrogen sector in British Columbia will be greatly aided by the work of Geoscience BC on the potential of mineral carbonization, geothermal energy and CCUS.”*

**Colin Armstrong, Chair, Hydrogen BC  
and Ivette Vera-Perez, President & CEO,  
Canadian Hydrogen & Fuel Cell Association**



We are working with partners and members to develop Project Concepts designed for a collaborative funding model with contributions from federal and provincial governments, industry, trusts and others. Note that Indigenous groups are offering support and private sector companies continue to state their commitment to fund future research.

■ Critical Minerals and Metals

<u>Critical Minerals and Metals in BC Mine Tailings and Waste Rock Facilities</u>	
Concept	<ul style="list-style-type: none"><li>■ Tailings and waste rock from current and past BC mining operations may host economic concentrations of critical minerals and metals.</li><li>■ Research program to identify high-priority sites for investigation; characterize and monitor sites; develop new technical approaches; assess feasibility.</li><li>■ Network of interest and contributors is growing: industry, governments, academia, communities and Indigenous groups.</li></ul>
Value	<ul style="list-style-type: none"><li>■ Assess potential for domestic brown-field critical minerals and metals sources.</li><li>■ Address environmental issues associated with waste; improve ESG.</li><li>■ Early community and Indigenous group engagement.</li></ul>
Investment	\$3.5 M over 4 years (\$3.5 M)



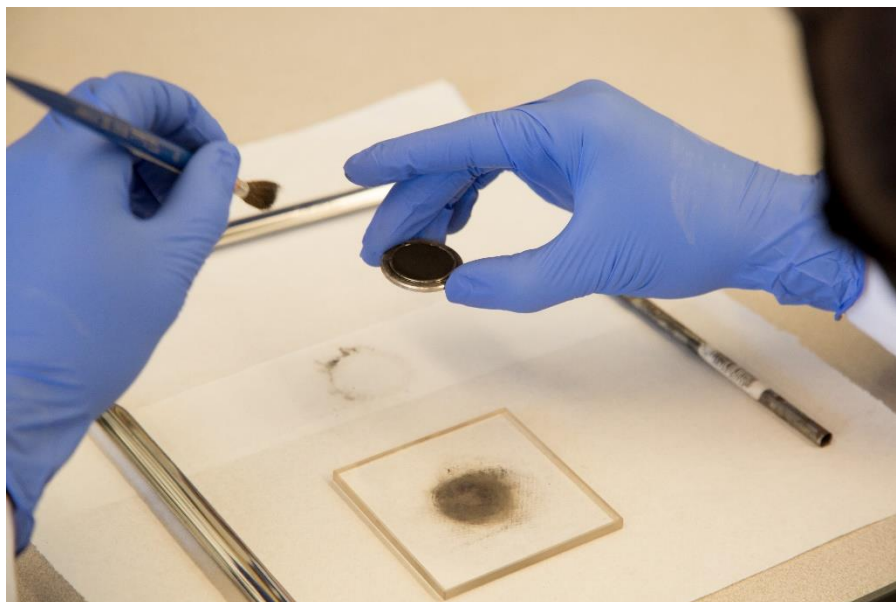


<b>Regional-Scale Geophysical and Geochemical Surveys</b>	
<b>Concept</b>	<ul style="list-style-type: none"> <li>Work with partners and technical experts to identify regional geophysical surveys (e.g. airborne magnetic surveys) and/or geochemical sampling to focus critical mineral and metal exploration.</li> <li>Further analysis would include interpretive work and modeling.</li> </ul>
<b>Value</b>	<ul style="list-style-type: none"> <li>Public datasets are proven to attract mineral exploration investment.</li> <li>Datasets paired with robust engagement attracts significant investment; inform decisions; involve communities and Indigenous groups from an early stage.</li> </ul>
<b>Investment</b>	\$2 M per year over 5 years (\$10 M)



## - Geological CCUS Opportunities**

<b><u>Development of a Pilot-scale CO<sub>2</sub> Capture and Storage in Ultramafic Rocks in BC</u></b>	
<b>Concept</b>	<ul style="list-style-type: none"> <li>Ultramafic rocks can sequester CO<sub>2</sub> (and host critical minerals and metals, e.g. nickel). Many ultramafic rocks are near emissions sites/infrastructure.</li> <li>Research to support pilot injection project to include feasibility assessment; technoeconomic assessment; Indigenous group and stakeholder engagement.</li> <li>Builds on current research, including <a href="#">Carbon Mineralization Potential Assessment for BC</a> partnership with UBC researchers.</li> <li>Building national network of partners and research investors.</li> </ul>
<b>Value</b>	<ul style="list-style-type: none"> <li>Public datasets and knowledge for geological CCUS potential.</li> <li>Develops innovative method for storing carbon in addition to geological storage in basins.</li> <li>Supports lower carbon intensity mining opportunities.</li> </ul>
<b>Investment</b>	\$1 M per year for 3 years (\$3 M)



<u><i>North Central Nechako Basin and Southwest BC Geological CCUS Atlases</i></u>	
<b>Concept</b>	<ul style="list-style-type: none"> <li>■ Preliminary assessments and targeted in-field follow-up of carbon sequestration capacity and locations:</li> <li>■ <b>North Central BC:</b> Nechako Basin – large (~75,000 km<sup>2</sup>) area west southwest of Prince George. <ul style="list-style-type: none"> <li>○ Compile existing data and data gap identification, including repurposing past project data.</li> <li>○ Limited previous drilling provides opportunity for additional information gathering, including targeted in-field research and evaluation.</li> <li>○ Limited knowledge of carbon storage potential in basin, despite good reservoir characteristics identified in Jurassic and Cretaceous sections. Carbon mineralization potential may also exist in region.</li> </ul> </li> <li>■ <b>Southwest BC:</b> Georgia Basin. <ul style="list-style-type: none"> <li>○ Finding and technically assessing feasible CO<sub>2</sub> sequestration targets in the region would provide information for informed decision-making by governments, communities, Indigenous groups and industry.</li> <li>○ Region hosts thick, deep, sandstone formations. Research needed to understand CO<sub>2</sub> sequestration potential.</li> </ul> </li> </ul>
<b>Value</b>	<ul style="list-style-type: none"> <li>■ Significant regional carbon emissions. Research can inform industrial emission-reduction and support hydrogen hubs.</li> <li>■ Meets demand for public geoscience data to inform net-zero pathways, future research; economic diversification decisions.</li> </ul>
<b>Investment</b>	<p>North Central: \$1.8 M over 2 years (\$1.8 M)</p> <p>Southwest: \$3.2 M over 4 years (\$3.2 M)</p>

## ■ Generating Cleaner Energy

<b><i>Northwest and Southeast BC Geothermal Energy Potential Assessments</i></b>	
<b>Concept</b>	<ul style="list-style-type: none"> <li>■ Potential clean baseload power option.</li> <li>■ Regions have mining and electrical infrastructure.</li> <li>■ <b>Northwest:</b> <ul style="list-style-type: none"> <li>○ Large area with high geothermal potential (recent volcanic activity; hot springs).</li> <li>○ Undertake compilation of existing regional technical data to assess for geothermal potential and data gaps.</li> </ul> </li> <li>■ <b>Southeast:</b> <ul style="list-style-type: none"> <li>○ Geothermal potential – hot fluid flow systems associated with crustal faults.</li> <li>○ Build on limited existing knowledge of geothermal potential in a region known for hot springs.</li> </ul> </li> </ul>
<b>Value</b>	<ul style="list-style-type: none"> <li>■ Proven partnership model provides research proven to inform decisions and drive investment.</li> <li>■ Known geothermal energy generation interest in regions (e.g. Kitselas Geothermal).</li> <li>■ Apply assessment methodology from <a href="#">Garibaldi Volcanic Belt</a> study co-funded with GSC.</li> </ul>
<b>Investment</b>	<p>Northwest: \$900,000 over 4 years (\$900,000)</p> <p>Southeast: \$1.2 M over 5 years (\$1.2 M)</p>





■ **Monitoring & Mitigating GHG Emissions**

<u><a href="#">HazNet Pacific</a></u>	
<b>Concept</b>	<ul style="list-style-type: none"> <li>■ HazNet-Pacific ('Hazard Network') - multi-year program to address regional environmental hazards using ultra-high density, strategically placed sensors.</li> <li>■ Pilot project proposed for Metro Vancouver and Capital Regional District; potential for expansion.</li> <li>■ State-of-the-art micro-sensors to be installed on a 1 km node network of cellular infrastructure.</li> </ul>
<b>Value</b>	<ul style="list-style-type: none"> <li>■ Made-in-Canada innovation; commercialization potential.</li> <li>■ Will increase prediction and early warning capabilities, e.g. earthquakes and air quality alerts. Will measure local and regional GHG levels, providing sophisticated and unparalleled ability to track, model and manage emissions.</li> <li>■ Partner discussions underway, including interest from Squamish Nation and Telus.</li> </ul>
<b>Investment</b>	\$5 M over 5 years (\$5 M)

## ONGOING AND COMPLETED EXAMPLES OF SUCCESS



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

**President Chad Norman Day,  
Tahltan Central Government**

### ■ Critical Minerals and Metals

<b>Ongoing Example:</b> <a href="#">NE BC Lithium – Formation Water Database</a>	<ul style="list-style-type: none"> <li>First public lithium concentration dataset for northeastern BC.</li> <li>De-risking exploration for critical metal lithium in Western Canadian Sedimentary Basin brines; opportunity to diversify a rural economy.</li> <li>Partnership: Geoscience BC, NRCan, LithiumBank and Northern Development.</li> <li>Industry support: access to natural gas wells for sampling.</li> </ul>
<b>Completed Example:</b> <a href="#">QUEST</a>	<ul style="list-style-type: none"> <li>Regional geochemical and geophysical program attracted mineral exploration investment between Williams Lake and Mackenzie.</li> <li>Included working with GSC and BCGS to add value to historical samples using modern reanalyses.</li> <li>15 years after research began, public datasets still used by mineral exploration sector to target mineral exploration and inform decisions.</li> </ul>

### ■ Geological CCUS

<b>Ongoing Example:</b> <a href="#">Northeast BC Geological Carbon Capture and Storage Atlas</a>	<ul style="list-style-type: none"> <li>First public data project to map geological carbon storage potential in BC’s Western Canadian Sedimentary Basin.</li> <li>Key to energy transition – enabling carbon storage and hydrogen production.</li> <li>Partnership with BC Centre for Innovation and Clean Energy and the BC Hydrogen Office.</li> <li>Extensive engagement; Indigenous involvement in governance.</li> <li>Announced June 2022; results expected late 2022.</li> </ul>
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## ■ Generating Cleaner Energy

<b>Ongoing Example:</b> <a href="#">Garibaldi Geothermal Volcanic Belt Assessment Project</a>	<ul style="list-style-type: none"> <li>Co-funded with GSC to de-risk geothermal energy development at Mount Meager and Mount Cayley. Seven university partners. Indigenous environmental monitors.</li> <li>Phase 1 (2020) involved Lil'wat Nation; instrumental in Meager Creek Development Corporation investment.</li> <li>Phase 2 involving Squamish Nation – results due Spring 2023.</li> </ul>
<b>Ongoing Examples:</b> <a href="#">Understanding and Predicting Induced Seismicity</a>	<ul style="list-style-type: none"> <li>BC Seismic Research Consortium formed 2012 to monitor and increase understanding of induced seismicity associated with natural gas operations.</li> <li>Geoscience BC, industry, provincial government, NRCan and regulator involvement.</li> <li>Expansion of northeast BC seismic monitoring network from two to 37 stations.</li> <li>Critical to responsible production of low-carbon intensity natural gas.</li> </ul>

## ■ Monitoring and Mitigating GHG Emissions

<b>Ongoing Example:</b> <a href="#">GHGMap</a>	<ul style="list-style-type: none"> <li>Cost-effective, accurate, real-time detection of GHG concentrations and fluxes using drone-mounted, NASA developed sensors.</li> <li>Geoscience BC and WD funding with input from industry.</li> <li>Measures – and helps reduce – GHG emissions.</li> <li>Supports BC's <a href="#">Methane Emissions Research Collaborative</a>.</li> <li>Made-in-Canada innovation developing towards commercialization.</li> </ul>
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