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Grants Awarded to Promote Mineral Exploration

Nineteen prospector grants totalling \$184,250 and three shared-funding grants totaling \$140,000 (see map on p. 2) were announced in July to help find and develop mineral deposits in Nova Scotia. “These grants, from the Nova Scotia Mineral Incentive Program, play an important role in encouraging exploration that ultimately leads to new mines and creates new jobs in rural Nova Scotia,” said Natural Resources Minister Lloyd Hines. “This year the grants will support projects that will explore for several minerals across Nova Scotia including gold, zinc and lithium.”

Prospector grants of up to \$15,000 fund activities by prospectors on grassroots exploration to find economically viable mineral resources in the province. Shared-funding grants provide up to 50% of eligible costs and are a cost-shared initiative between industry and government designed to fund advanced exploration and evaluation activities beyond the grassroots level. “Based on \$30,000 of prospector grant funding, I have put in place agreements that could lead to more than \$7 million in exploration projects in Yarmouth County over the next four years,” said prospector John Wightman. “This is just one example of how the Nova Scotia Mineral Incentive Program is helping prospectors and exploration companies attract new investment in the province’s mineral industry.” “The mineral incentive program supports mineral exploration that can lead to new mines, providing good jobs and economic development in rural Nova Scotia,” said Sean Kirby, executive director of the Mining Association of Nova Scotia. “It is an important tool for encouraging exploration and attracting investment, and we are very pleased that the government is continuing the program.”

Applications were evaluated by a panel of three from DNR’s Geoscience and Mines Branch. Evaluations were based on the quality and merit of the work proposal and the potential that the project could lead to a new mineral discovery or significantly advance a project. Further information about the Mineral Incentive Program is available at <http://novascotia.ca/natr/meb/nsmip/nsmip1.asp>.

First Mineral Incentive Program Research Grants Awarded

A new initiative of the Mineral Incentive Program was launched this year: research grants are available to help fund research that supports and encourages mineral exploration and development in Nova Scotia. The research must be undertaken in Nova Scotia by university-based researchers. The scope of research that will be considered for funding ranges from local to regional deposit modelling, to the development or improvement of mining or mineral processing methods.

Research grant applications will be accepted throughout the year and evaluated based on budget, feasibility and applicability to the exploration industry. The maximum grant available for the 2016-2017 fiscal year is \$15,000. Proposals should be limited to one page and summarize the relevance of the research to supporting mineral exploration and development in Nova Scotia. Important factors in a proposal will include the budget, project duration, deliverables and principal researcher(s). Expected deliverables will depend on the nature and scope of the research, but would include work such as a contribution to a Geoscience and Mines

Branch publication, a contribution published in a scientific journal, presentation of results at relevant conferences and workshops, or completion of a university thesis.

To date, the review committee has approved grants for the following research projects:

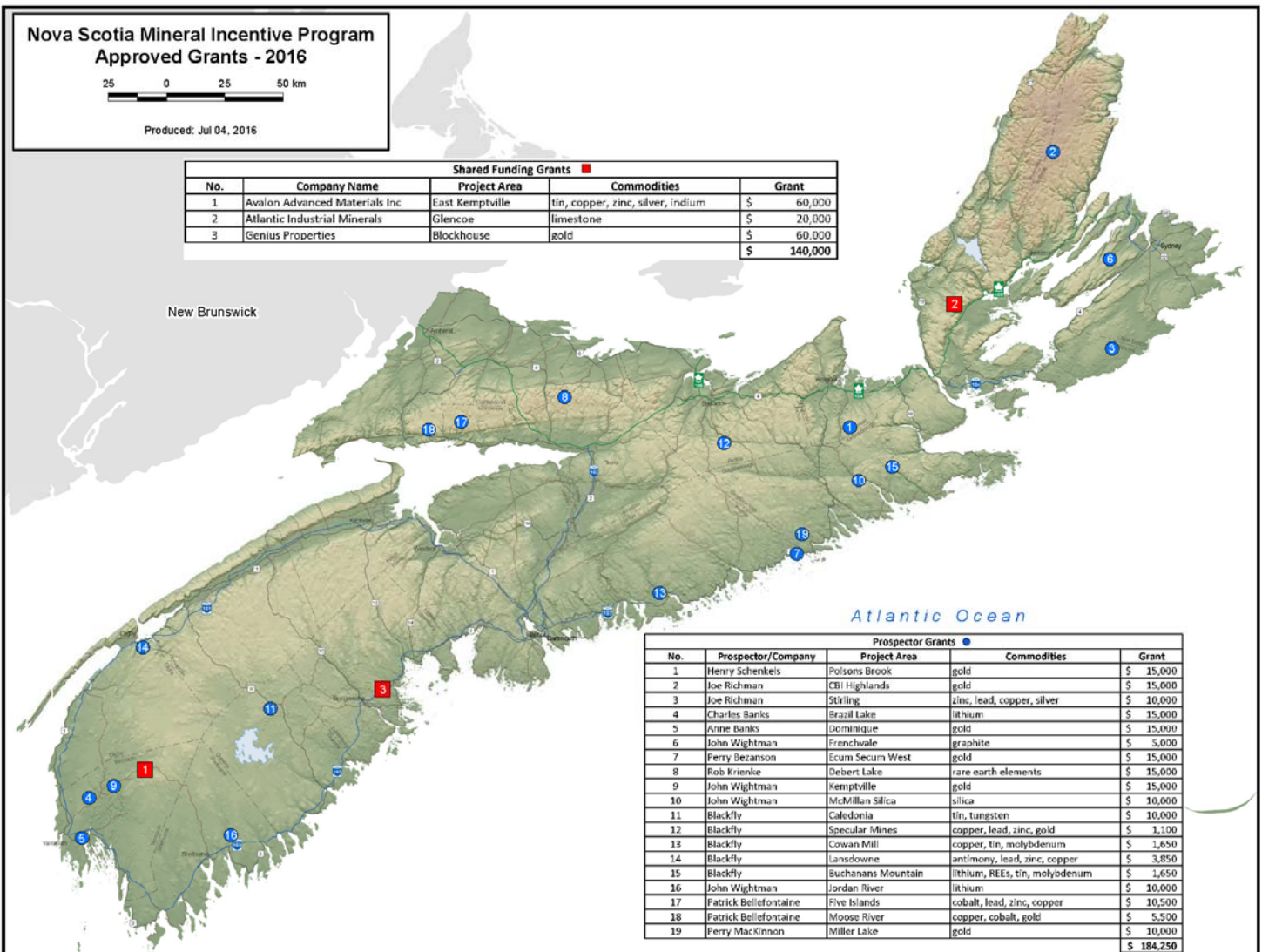
- The origin and evolution of rare-earth-element-enriched peralkaline rocks in the Cobequid Highlands, Nova Scotia; Dr. Alan Anderson, St. Francis Xavier University; \$15,000.
- The geological setting of Au-Cu-Fe-Ni occurrences in the Second Gold Brook area, western Cape

Breton Island, Nova Scotia; Dr. Sandra Barr, Acadia University; \$4800.

- Litho geochemistry of the Dominique Sn-Zn-Cu-Pb-Ag vein prospect, Yarmouth County; Dr. Cliff Stanley, Acadia University; \$15,000.

Applications can be sent to Diane Webber (Diane.Webber@novascotia.ca or phone 902-424-3053). For more information about the Mineral Incentive Program's research grants, please visit the Geoscience and Mines Branch website <http://novascotia.ca/natr/meb/>.

Mick O'Neill and Diane Webber



Avard Dinsmore Hudgins

Avard Hudgins, a true giant of Nova Scotia's mineral industry, passed away on June 8, 2016. I had the honour to write a letter of support last year for Avard for the Canadian Mining Hall of Fame award. The following is an extract of my letter of recommendation. For more details on Avard's professional achievements please visit: <http://www.canadianminingjournal.com/features/nova-scotia-treasure-finder/>.

I am sure that others will write in support of Avard's contributions as an explorationist and mine developer. I have decided to concentrate on Avard Hudgins the mentor and teacher. In addition to his discoveries, such as Gays River Pb-Zn, Loch Lomond celestite and East Kemptville tin, Avard also contributed immensely to the development and education of many young Maritime geologists who worked for him and with him, or followed in his footsteps.

As a young geology student at Acadia University some forty years ago, I was first introduced to the name "Avard Hudgins." Even in the early years after

his graduation he had already developed a reputation in Eastern Canada as an example of how geology graduates could make major contributions to the exploration and mining industry. Avard hired many young geologists to work on his varied projects, and amongst this group were many of my friends. The experiences that these students and young geologists received from working with Avard were always described as "career boosting and an exceptional learning experience." He was always willing to explain his reasoning to young geologists and to answer their multitude of questions, something many of us fail to take the time to do.

Over the last 30 years Avard has acted as my mentor. Whenever I had a new idea or model I could always call him up and bounce the idea off of him. Sometimes my ideas were met with enthusiasm. If not, he had a way of letting me see other ways of looking at the problem without deflating my ego or dampening my enthusiasm. He

always had useful suggestions, questions and comments, which challenged me to become a better geologist.

Avard was a major contributor to the local geological community by virtue of his involvement in many professional associations and societies. Avard was always willing to take time out of his busy schedule to share his thoughts and experiences with fellow geologists.

Avard was a consummate researcher with an encyclopedic memory. The amount of time he put into literature research to find mineral deposit analogues was often overlooked. In my role as Manager of Mineral Resource Evaluation for the Province of Nova Scotia, I was pleased to be part of the group that put his name forward for the first Provincial Award for Achievement in the Mineral Industry, an honour he received from the Minister of Natural Resources of Nova Scotia.

Avard Hudgins will be missed by many in Nova Scotia. I am one of them.

Bob Ryan

Strong Community Backing Launches the Fundy Shore Global Geopark Initiative

'Town hall' meetings, organized by the Cumberland Geological Society, have been held in communities along the Parrsboro shore to gauge public interest in a UNESCO Global Geopark, with unanimous support from those in attendance. Global Geoparks are a 'bottom up,' community-driven enterprise, and so local support such as these meetings have shown is a prerequisite to moving forward. Dr. John Calder, Senior Geologist with NSDNR and member of the Canadian National Committee for Geoparks (see photo at the right), gave a presentation describing the Global Geopark program and the exceptional potential of the Parrsboro shore. The meetings in Economy, Advocate Harbour, Port Greville and Parrsboro drew well over 100 residents, with small business owners being the



largest group represented. Those present see a Global Geopark as an important marketing opportunity for this region of the province, and

expressed hope that it might also serve to turn the tide on a declining population.

John Calder

Geological Services Division Welcomes Denise Brushett

Denise Brushett joined the Geoscience and Mines Branch of DNR in May as the successful candidate for a geologist position in the Geological Services Division. Denise earned a B.Sc. from Dalhousie University in 2005 and an M.Sc. from Memorial University of Newfoundland in 2008. She comes to DNR from the Geological Survey of Newfoundland and Labrador where she worked for seven years on projects involving surficial geological mapping, geohazard mapping and assessment, geochemistry, coastal geology and prospecting in glaciated terrain. Denise is currently working on the surficial geology of southwestern Nova Scotia, which is itself a highly prospective area in glaciated terrain (see the article by G. A. O'Reilly, p. 5).

I am very pleased to welcome Denise to DNR and back to Halifax. Her skills will be a great addition to the department's geoscience programs.

Brian Fisher



Denise Brushett.

Jim Graham, Gypsum King of Cape Breton

On June 12, 2016, the province lost an important figure in the mineral industry. Jim Graham was a fixture in the gypsum industry for many years and recognized world-wide for his expertise in gypsum mining. He was instrumental in the development of both the Sugarcamp and Melford gypsum deposits in southern Cape Breton Island. Jim was always willing to share his knowledge and experience with geologists of the Nova Scotia Department of Natural Resources while he was employed by Georgia Pacific as Manager of Operations, and even after his retirement. He promoted the gypsum-mining industry in Nova Scotia and through his efforts provided jobs for many of his fellow Nova Scotians. He will be greatly missed.

Bob Ryan

Radon Workshop in Halifax

Radon is a naturally occurring radioactive gas that is formed when uranium decays in soil and rock. It is the second leading cause of lung cancer after smoking. In Nova Scotia it is estimated that 11% of the population lives in homes that exceed the indoor air radon guideline, compared to the national average of 7%. There are approximately 710 lung cancer deaths each year in Nova Scotia, and more than 100 of these deaths are expected to be caused by radon.

A workshop entitled "Radon Exposure in Nova Scotia: Challenges and Solutions" was held in Halifax on May 26, 2016, to discuss the radon problem. It was co-hosted by DNR, Nova Scotia Environment, CAREX Canada, Health Canada, the Canadian Association of Radon Scientists and Technologists (CARST) and the Canadian National Radon Proficiency Program (C-NRPP). The workshop was an opportunity for attendees to connect with others interested in radon across multiple jurisdictions and to discuss strategies for reducing exposures in Nova Scotia.

The event was attended by approximately 50 people, including geoscientists, radon contractors, researchers, public health practitioners, occupational health and safety officers, epidemiologists, building engineers, home inspectors, NGOs and educators. The agenda included 12 speakers followed by a panel discussion. A broad range of topics were covered, including federal radon regulations and guidelines, results from cross-Canada and provincial radon-testing programs, mapping radon in Nova Scotia, and workplace exposures. Attendees also discussed home inspections and real estate transactions, professional training programs, and education and outreach strategies.

The workshop report and selected presentations can be accessed from the CAREX Canada webpage: http://www.carexcanada.ca/en/announcements/CAREX_hosts_radon_exposure_in_nova_scotia/.

For further information about radon in Nova Scotia, please visit DNR's interactive radon map, which includes links to information on how to purchase test kits and how to find certified radon contractors for radon mitigation work: <https://fletcher.novascotia.ca/DNRViewer/?viewer=Radon>.

John Drage

From the Mineral Inventory Files

The Southwest Nova Scotia Tin Domain is a New Kid on the Block

In 1976, noted Maritime prospector Merton Stewart discovered boulders rich in tin (Sn) and base metals in the Wedgeport area near Yarmouth. Follow-up exploration by Shell Canada Resources Ltd. in 1977 led to the discovery of numerous granite- and metasediment-hosted Sn and base metal occurrences, most notably the Dominique Sn-Zn-Cu-In prospect (see *Minerals Update*, v. 22, no. 2). In addition, regional prospecting and till geochemical programs carried out by Shell Canada throughout southwest Nova Scotia revealed several other areas with anomalous Sn, most notably in the westernmost portions of the South Mountain Batholith (Fig. 1).

By the end of 1978 the verdict was in: there was something special going on in southwest Nova Scotia. Exploration had led to the discovery of one substantial greisen-hosted mineral deposit (East Kemptville Sn-Cu-Zn-Ag deposit; *Minerals Update*, v. 29, no. 4) and dozens of smaller, granite-hosted greisen deposits and metasediment-hosted shear- and replacement-style Sn-Cu-Zn-Pb-In deposits (Fig. 1). These mineralization styles were previously unknown in North America; better analogies are found in the Sn-W producing regions of Eastern Europe (Erzgebirge) and Cornwall (UK).

From 1979-1983, exploration in the southwest region, as well as throughout the province's central and eastern mainland granites, turned up even more interesting Sn-W prospects. Several of these received significant exploration, for example the Duck Pond and Pearl Lake Sn-Cu-Zn-In prospects, the Caledonia Sn-W prospect (*The Geological Record*, v. 2, no. 2), the Long Lake Mo-W-Cu prospect (*Minerals Update*, v. 28, no. 2) and Cowan Mill Pond W-Mo-Cu prospect (*Minerals Update*, v. 30, no. 1). To top it off, the East Kemptville deposit was purchased by Rio Algom and mined from 1985-1992. In 1983, A. K. Chatterjee of the former Nova Scotia Department of Mines and Energy assigned the tin

deposits of the Yarmouth area to the Southwest Nova Scotia Tin Domain on his Metallogenic Map of Nova Scotia (NSDME Map 83-5). In fact, there is justification to expand the tin domain to include the Sn-W deposits in the Caledonia area and perhaps even those farther to the east around Long Lake and within the Musquodoboit Batholith, east of Halifax (Fig. 1).

It seemed that the Sn-W potential of the province was going to reach lofty heights, exploration would continue to boom, and the infant tin domain would take its place among the world's major Sn regions. A complication arose, however, in the form of the mid-1980s dissolution of the Association of Tin Producing Countries, the global Sn cartel. The price of tin plummeted. Within a couple of months of the 1985 opening of the East Kemptville Mine, the price of Sn had dropped from \$9 to under \$3/pound, where it hovered for the entire life of the mine, resulting in its closure in 1992. By 1984 Sn-W exploration ceased. From the initial discovery in 1977 to curtailment of all

meaningful exploration in 1984, the record shows that the Southwest Nova Scotia Tin Domain had undergone a mere 6-7 years of exploration. Contrast this with the rest of world's tin domains, which have undergone many centuries to millennia of concerted exploration and mining. The Erzgebirge ('Ore Mountains') of the Germany-Czech Republic border region has evidence of Sn mining dating back to 2500 BC; mining in the Bolivian Tin Belt dates to 1000 AD; underground Sn mining in Cornwall dates to the Middle Ages, with placer mining of cassiterite known there since Roman times.

One can only wonder what would be found in the Southwest Nova Scotia Tin Domain had it received the same level of exploration. Perhaps we will find out. The recent rebound of Sn and W prices, and their bright economic outlook, means that once again these deposits are attracting exploration attention. The new kid on the block is back.

G. A. O'Reilly

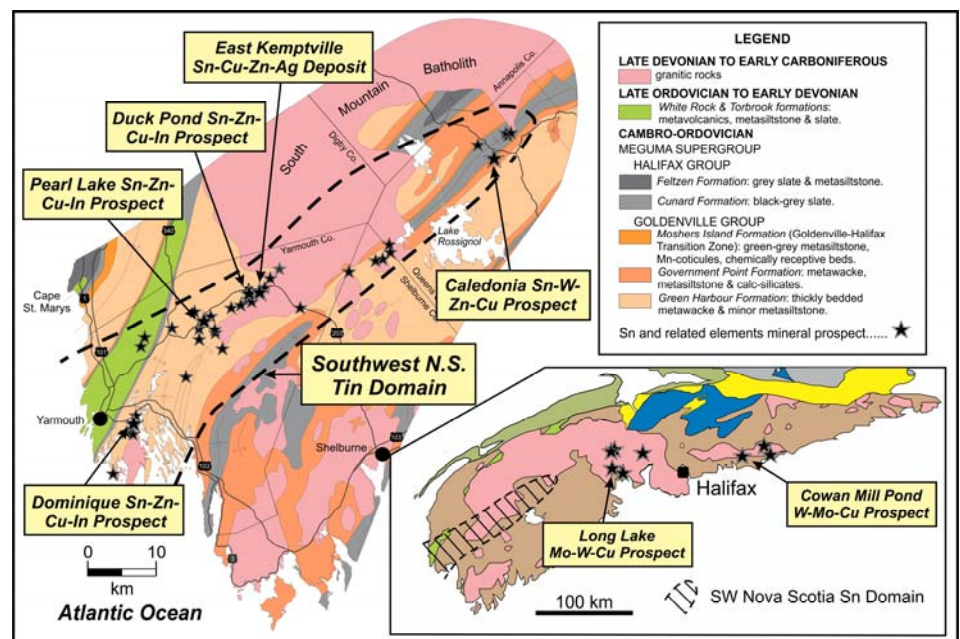


Figure 1. Geology and occurrences of tin and related elements that constitute the Southwest Nova Scotia Tin Domain.

Mine Development Activity Highlighted at the Mining Society of Nova Scotia 129th Annual Meeting

Mine development activity in Nova Scotia was high on the agenda of the 129th Annual General Meeting of the Mining Society of Nova Scotia, which was held at the Marriott in Halifax, June 9-10, 2016. Some of the highlights, as viewed by the DNR staff in attendance, are summarized as follows.

Donkin Coal Project

Ed Griffith, Vice President of Human Resources for Kameron Collieries, said in his presentation entitled “Kameron Coal—Donkin Mine Progress,” that his company is planning to commence coal production in late 2016 from one underground room-and-pillar section and that they plan to add a second section later. The company intends to extract 500 000 tonnes of coal in the first year and 1 million tonnes in the second year. There are presently 46 full-time employees on the site and the company expects there will be 135 at full production. In the first room-and-pillar section the company plans to use two remote-control continuous miners, six battery-powered haulers, one feeder breaker and two roof-bolting machines. To the end of May 2016 there have been no lost-time accidents, Griffith said.

On June 7, 2016, the Assembly of Nova Scotia Mi'kmaq Chiefs announced they had signed an agreement with the company for an undisclosed royalty on future coal production from the mine.

Touquoy Gold Project

John Thomas, Vice President of Projects for Atlantic Gold Corporation and Project Manager of the Touquoy project at Moose River, said in his presentation “Atlantic Gold Corp.—Moose River Gold Project: Progress” that the company hopes to start processing ore through the mill in September 2017. He said Atlantic Gold is hoping to recover 95-96% of the gold contained in the ore: 70-75% by gravity methods and the remainder via cyanide carbon-in-pulp leaching.

Atlantic Gold has sold most of its planned gold production forward at C\$1,600 per ounce and expects ‘all-in’ costs to be C\$700 per ounce. The company intends to have the \$130 million capital cost of the project paid back in two years, at which point Moose River Resources Inc. will be entitled to 40% of the profits. On April 28, 2016, the company announced it has an option with Moose River Resources to buy the minority partners out (see the company press release: <http://bit.ly/28LI0aN>).

What’s new in terms of technology, Mr. Thomas said, is that the company plans to add cyanide (CN) to the milling circuit using an automated system. This will minimize the amount of CN used, minimize the amount to be destroyed in the CN destruction circuit and minimize the amount going to the tailings management facility.

East Kemptville Tin Project

Dave Marsh, Vice President, Metallurgy and Technology Development for Avalon Advanced Materials, said in his presentation “East Kemptville Update” that his company is presently generating an in-house Preliminary Economic Assessment based on the following scaled-back production scenario: processing material from the low-grade stockpile (totaling 5.87 million tonnes grading 0.112% Sn, 0.100% Zn and 0.061% Cu) in a small, modular gravity plant (rated at 2 400 tonnes per day (tpd), instead of the 10 000 tpd envisioned for a larger project proposed earlier) that would produce just one concentrate (instead of three) and cost \$20-25 million (compared with \$250 million). “We think we can make a project out of this that could be operating by 2017-18 (instead of 2019),” Marsh said. Such a project could run for 8 to 10 years.

Avalon’s plan would use no chemical reagents (just gravity equipment such as spirals and Falcon concentrators) and would be inexpensive and simple to operate. The Preliminary Economic Assessment could be released in August, costs would be firmed up and a bench-scale test run later in 2016, and the project definition finalized in the first or second quarter of 2017, followed by financing, according to Marsh.

Patrick Whiteway

Review of Arsenic in Nova Scotia Well Water

Since 1976, when a patient living in Waverley showed symptoms of arsenic poisoning and arsenic was found in the patient's well water, the province has been involved in assessing and mitigating arsenic exposure from well water supplies. An open file report titled 'A Review of Activities Related to the Occurrence of Arsenic in Nova Scotia Well Water' was recently released by the Geoscience and Mines Branch (http://novascotia.ca/natr/meb/data/pubs/16ofr06/OFR_ME_2016-006). The report provides a summary of the state of knowledge and activities of the province over the past four decades related to arsenic in well water. Some of the information summarized in the report has not previously been made publicly available. In addition, several original reports by the Provincial Arsenic Task Force, which was formed in 1976, have been digitized and will be available on the Geoscience and Mines Branch website through its NovaScan database.

Exceedance rates of the Health Canada maximum acceptable concentration of 10 micrograms of arsenic per litre in water are generally around 10% for drilled wells (bedrock aquifers) across Nova Scotia, although much higher exceedance rates (>50%) have been reported in selected communities using private wells, especially those underlain by Goldenville Group bedrock between Dartmouth and Lake Echo.

Future efforts by the Geoscience and Mines Branch will be directed toward the development of a refined risk map and web-mapping application to better communicate the risk of arsenic in drinking water to private well users. Highlighting arsenic in well water concerns and encouraging well owners to regularly test their water and implement appropriate treatment remains a key objective of the province's activities related to this issue. Recommendations for well owners for the testing and treatment of arsenic can be found here:

http://www.novascotia.ca/nse/water/docs/droponwaterFAQ_Arsenic.pdf.

Gavin Kennedy

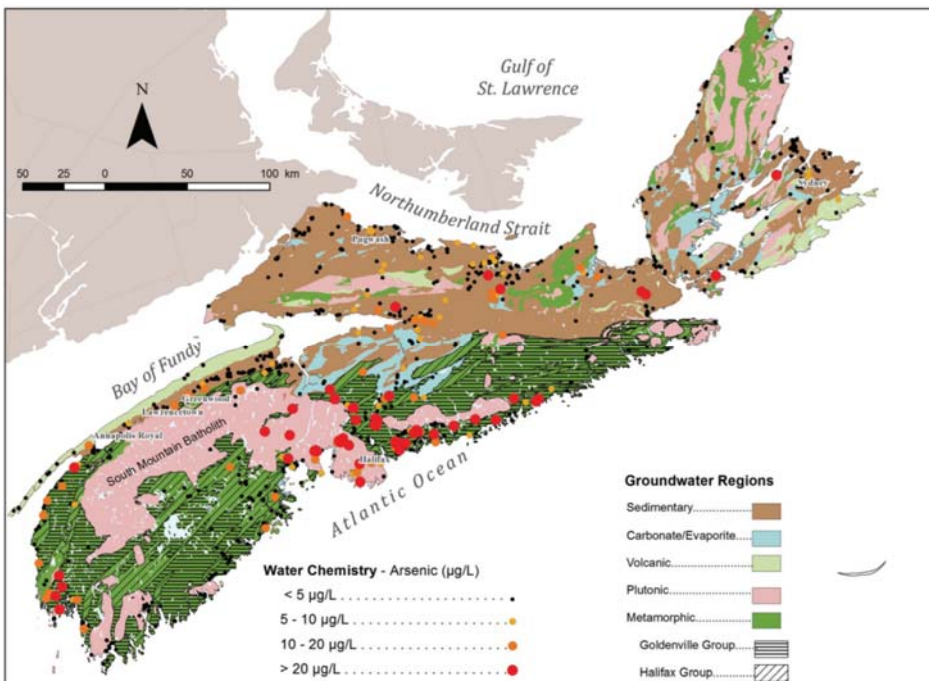


Figure 1. Distribution of arsenic concentrations in well water (Nova Scotia Groundwater Chemistry database) layered over a map of Nova Scotia's bedrock groundwater regions.

Special Note

E-mail Notification

If you would like to receive an e-mail notice (with hot links) when new maps, digital products and publications are released, or when a new issue of *The Geological Record* is released, please send your e-mail address to DNR.Library.List@novascotia.ca.

Dates to Remember

August 19-21, 2016

Nova Scotia Gem and Mineral Show and Sale, Parrsboro, NS. For more information please visit <https://fundygeological.novascotia.ca/gemshow>.

October 15-20, 2016

Canadian Dam Association Conference and Exhibition, Marriott Harbourfront Hotel, Halifax, NS. Pre-conference workshops on tailings dams. For more information please visit <http://bit.ly/29IPora>.

October 27-29, 2016

Atlantic Universities Geoscience Conference, Acadia University, Wolfville, NS. For more information please visit <https://scienceatlantic.ca/ocs/index.php/augc/augc2016>.

November 2-5, 2016

Mineral Resources Review, Delta St. John's Hotel and Convention Centre, St. John's, NL. For more information please visit <http://www.nr.gov.nl.ca/nr/mines/mineral.html>.

November 6-8, 2016

Exploration, Mining and Petroleum in New Brunswick Conference, Fredericton Convention Centre, Fredericton, NB. For more information please visit http://www2.gnb.ca/content/gnb/en/departments/energy/conference/Conf_home.html.