

Innovation

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ON THE COVER:
Aspiring geoscientists dig for "ore deposits" as they learn about mineral exploration at the 2015 APEGBC Science Games during National Engineering and Geoscience Month. Page 25. Photo: Wendy D.

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Tactile science during National Engineering Month

Celebrating Geoscience in Canada

**Dr. John Clague,
P.Geo., FGC,
FEC (Hon)**
President



president@
apeg.bc.ca

March is National Engineering and Geoscience month, and this issue of *Innovation* features some of APEGBC's geoscientists and their contributions.

Of the almost 30,000 members of APEGBC, around 2,100 are geoscientists. Although a minority, geoscientists are important contributors to the association and are strongly supported by association staff and their professional engineer colleagues. In my case, I work at the interface between geology and engineering, and I greatly value the strong relations I have with my engineering colleagues.

In my capacity as a proud geologist and president of APEGBC, I want to highlight the huge contributions that geoscientists make to Canada, and the diverse ways in which they do this. Let's look at some telling statistics. According to the Mining Association of Canada, about 380,000 people work for the mining and mineral processing industries in Canada—more than 1% of our country's population—while the Canadian Association of Petroleum Producers reports that the oil and gas industry currently supports 550,000 jobs across the country. Currently, Canada is the fifth largest producer of natural gas and crude oil. We export \$89 billion in minerals and metals, \$11.2 billion in natural gas, and \$81.8 billion in crude oil and bitumen.

In short, our mineral and energy resource industries underpin the prosperity that has made Canada the envy of the world. These industries have been built through discoveries made by geologists and geophysicists. I also strongly believe that Canada, and British Columbia specifically, have the best, most innovative geoscientists in the world.

Geoscientists also are important contributors to public safety in Canada. Engineering geologists are involved in important decisions made to ensure that development and critical infrastructure are safe from natural hazards. Hydrogeologists inform us about the potential for contamination of our precious groundwater resources. And, geologists and physical geographers provide us with information on the frequency, magnitude, and potential effects of dangerous natural processes, such as earthquakes, tsunamis, and floods. In short, engineers have built Canada, engineering geologists help to keep it safe.

Finally, geoscientists are leaders in innovation. We use state-of-the-art technologies to monitor Earth's surface, to image the subsurface, to identify and economically recover precious metals and hydrocarbons, and to document climate change with levels of detail that were unimaginable a generation ago. An example of game-changing technology now routinely employed by the resource industry is hydraulic fracturing. "Fracking" has rewritten the books on oil and gas reserves and turned global politics on its head.

After APEGBC began to register geoscientists in 1990, the association became a richer, stronger regulatory body. Let us celebrate the contributions geoscientists make to this province and country.

John J. Clague

Innovation

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Letters to the editor of 300 words or less can be e-mailed to innovation@apeg.bc.ca. While we welcome your input, due to space limitations we may be unable to publish all letters received. Opinions expressed in letters to the editor are not necessarily endorsed by APEGBC.

A Need to Re-evaluate Risk

In an *Innovation* article published in October 2012 ("Risks Associated with Tanker Transports for the Northern Gateway Project"), we outlined our concerns about the Northern Gateway Project and the proposed transportation of dilbit (diluted bitumen) by tanker from Kitimat. We considered the potential hazard of a spill in coastal BC waters. Currently, we have turned our attention towards the risk implied by Kinder Morgan's Trans Mountain Expansion (TMX) project in Vancouver. Aframax-class vessels carrying dilbit would leave their depot in Eastern Burrard Inlet, and negotiate several narrow passages including the first and second narrows before reaching the open ocean. The proposed expansion will allow for a substantial increase in the number of tanker trips to one per day, each way. As outlined in our letter of comment to the National Energy Board of October 17, 2014, the risks estimated by Kinder Morgan, with all their proposed mitigation strategies, correspond to a probability of 10% of at least one dilbit spill of 8.250 million litres over a 50-year operating life, which is unacceptable in our view. In addition, there is a need to also consider the consequences of a tanker collision with any of the existing bridges, as specified in the Canadian Highway Bridge Code S6.

We think that a comprehensive study should be carried out for alternative routes. For example, Roberts Bank, adjacent to the BC Ferry Tsawwassen Terminal, may present a significantly safer alternative because it is much closer to the open ocean and offers fewer obstacles. It could also handle larger tankers, in the VLCC class, with a capacity of 360,000 DWT tonnes, resulting in fewer required vessels.

There is no risk-free project, but there is a need to re-evaluate the risk associated with this proposal and with any probably safer alternatives.

Ricardo Foschi, P.Eng., Vancouver, BC
Peter Hatfield, P.Eng., Vancouver, BC
Chris Peter, P.Eng., Prince George, BC
Brian Gunn P.Eng., Campbell River, BC

Key Indicators of Global Warming

I read with interest J.E. Christoffersen's letter in the January issue of *Innovation* and disagree with his comments. The increase in energy absorption by the Earth does not lead directly to large increases in the atmospheric temperature. One of the major concerns and indicators has been the disappearance of the ice in the Arctic and the massive shrinkage of the world's glaciers. There is also the high increase in water vapour in the atmosphere leading to major rain and snow storms throughout the world.

One of the interesting aspects of the ice melting and largely ignored by most commentators is that when ice melts, say in a cool drink, the temperature of the fluid does not change but stays close to 0°C due to latent heat, so atmospheric temperature increase is moderated by this factor. In addition, the latent heat of water vaporisation is even greater than that of the latent heat required in melting ice.

So, if these two characteristics are considered, temperature increases are not necessary to indicate global warming. The key indicators are the massive ice melt and the increase in atmospheric water content.

For me, these are indicators that mankind and its actions are clearly affecting our weather. The increased CO₂ absorption by the oceans is changing the PH value to the detriment of the shellfish, and the movement of plants and animals to formerly too cool areas are examples.



OPUS

Timothy Phelan

Vice President - Water Treatment

Opus is pleased to announce the appointment of Timothy Phelan, P.Eng, PE., as Vice President - Water Treatment, Opus DaytonKnight. Tim is a water treatment specialist and the Manager of the Opus Kelowna branch office. Throughout his 23 year career, he has worked on large projects in British Columbia, California, Arizona and Oregon.

Tim joined Opus DaytonKnight in January, 2013 after 20 years with a US consultant. He is currently the Project Manager for Metro Vancouver's Coquitlam Water Treatment Plant Improvement Project and the District of Sicamous Mara Lake Water Treatment Plant Project.

Tim will continue acting as Branch Manager for Opus's Kelowna Office, providing municipal engineering services to the greater Okanagan and Kootenay areas, as well as leading the Drinking Water Treatment Group.

Head Office:

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Global warming will become very rapid when the major ice fields are gone and plain sensible heat will affect the atmospheric temperatures.

R.T. Martin, P.Eng., FEC
Vancouver, BC

Voting on Policy Statements

On J. E. Christoffersen's letter regarding APEGBC's Position Paper on climate change: BRAVO!

Indeed, why isn't a major policy statement such as this put to the membership for a vote? The members of our association are all strongly grounded in science and surely can be trusted to use their scientific knowledge to judge whether the Position Paper makes sense or not.

Kenneth Grace, P.Eng.
Innisfil, ON

Climate Change Position Paper Based on Best Available Science

APEGBC stands behind its Position Paper, which states that APEGBC recognizes that the climate is changing and that there are anticipated implications for the association and its members.

Members of the APEGBC Climate Change Advisory Group (CCAG) continue to monitor the state of the science on climate change and to review policy developments that may be relevant to engineers and geoscientists in British Columbia.

The CCAG acknowledges that referencing the original peer-reviewed reports from the Intergovernmental Panel on Climate Change (IPCC) would have helped members better understand just how well the science supports the need for action. Drawing extensively from the peer-reviewed literature, the IPCC's reports represent the best available science on the changing climate, its causes and its impacts. The regional reports and websites cited by the position paper serve only to add regional interpretation of the information already reviewed by the IPCC.

Following significant public and media attention on the "Climategate" email hacking incident, several independent inquiries were conducted, yet nobody was found guilty of misconduct or corruption, no science was changed, and no papers were retracted.

Multiple lines of evidence show a global warming trend over the past 100 years and that humans are contributing to it. Data from the U.S. National Oceanographic and Atmospheric Administration show that 13 of the 14 hottest years on record have occurred since the year 2000. Projections indicate that global temperatures will continue to rise, with consequent changes in precipitation, sea-level rise and extreme heat events, all of which would have direct impacts on public safety, health and welfare.

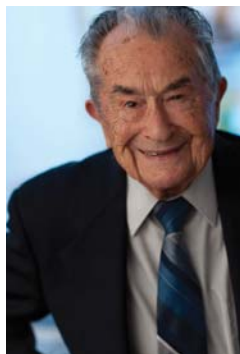
APEGBC intends to develop further tools and resources to assist members in understanding and addressing the potential impacts of a changing climate on their professional practice.

APEGBC Climate Change Advisory Group

Erratum

The letter "Flawed Climate Change Paper," which appeared in the January/February 2015 issue of Innovation was reprinted in error following resubmission. It originally appeared in the May/June 2014 issue.

newsmakers



**Daniel Lambert,
P.Eng., FEC**

Engineer and Veteran recognized with France's Highest Honour

In commemoration of the 70th anniversary of D-Day, the French government is bestowing the Legion of Honour on Canadian veterans who helped to liberate the country during the Second World War through D-Day operations. This will be carried out over two years and will involve 390 Canadians, 66 of whom are from BC.

Among them is APEGBC past president Daniel Lambert, P.Eng., FEC, for whom APEGBC's professional service award is named. Mr. Lambert enlisted in the Royal Canadian Corps of Signals in 1939 and went overseas to fight with the 4th Canadian Armoured Division in Europe. After demobilization, he graduated from UBC in 1950 with a degree in electrical engineering, and became a member of the Association of Professional Engineers of BC in 1960. Mr. Lambert has served on a variety of association committees, task forces and divisions, including Council, and in 1969 was elected president. He has also served as vice-president and president of the Canadian Council of Professional Engineers. In 1973, Mr. Lambert became Registrar and Managing Director of the Association of Professional Engineers of BC, retiring in 1984.

APEGBC extends its congratulations to Mr. Lambert, and to all recipients of this prestigious honour.

The Légion d'Honneur is France's highest distinction, and includes over 600 Canadian veterans to date. As many as 14,000 Canadian troops participated in the Battle of Normandy, which included the storming of Juno Beach, one of five beaches targeted for liberation by the Allies.

2014/2015 Project Highlights – Call for Photo Submissions

The Project Highlights pictorial feature, published annually in the July/August issue of *Innovation*, showcases the diverse activities of BC's professional engineers and geoscientists. Submissions relating to all engineering and geoscience disciplines are encouraged.

Members or companies are invited to submit photographs of projects undertaken during the past 12 months, within or outside BC, employing APEGBC members. Photographs should be submitted as high-resolution digital image files.

Before submitting your project for consideration, please view the details on submission requirements, including specifications for digital images, at apeg.bc.ca/pictorial. Photos must be accompanied by a project description of 100-150 words, identifying the owners and professionals involved where possible. Members are also encouraged to describe the innovative or sustainability aspects of their particular project.

Due to space limitations, *Innovation* is unable to print every submission received. Members working for large companies are recommended to coordinate their project submissions to avoid multiple or duplicate submissions as only one submission per company may be accepted.

The deadline for photographs, complete with captions, is **Friday, May 8, 2015**. Please direct all submissions to *Innovation* at the association office in Burnaby by mail, or by email at pictorial@apeg.bc.ca. For more information, visit: apeg.bc.ca/pictorial.



Circumotion Theatre System, Dynamic Structures

Volunteers Recognized by Engineers Canada and Geoscientists Canada

A number of APEGBC volunteers were recently recognized for their service to the professions of engineering and geoscience by Engineers Canada and Geoscientists Canada respectively. At a ceremony held on March 12, 2015, at the Coast Coal Harbour Hotel, these APEGBC members were inducted into the Fellowship of Engineers Canada and Fellowship of Geoscientists Canada. APEGBC is pleased to congratulate the following recipients:

Fellowship of Engineers Canada

Bill Alcock, P.Eng., Struct.Eng., FEC
 Randy Alexander, P.Eng., FEC
 Andrew David Boettcher, P.Eng.,
 Struct.Eng., FEC
 Renato Camporese, P.Eng.,
 Struct.Eng., FEC
 Tim Charman, P.Eng., FEC
 Rick Cheung, P.Eng., FEC
 David Chwaklinski, P.Eng., FEC
 Dr. John Clague, P.Geo., FGC, FEC
 Norman Deverney, P.Eng., FEC
 Bill Donald, P.Eng., FEC
 Glenn Gibson, P.Eng., FEC
 David Graham, P.Eng., FEC
 Andrew Harmsworth, P.Eng., FEC
 Robert Heikkila, P.Eng., FEC
 Shelley Higman, P.Eng., P.Geo., FEC
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Fellowship of Geoscientists Canada

Dr. Diana Allen, P.Geo., FGC
 Michael Bapty, P.Eng., FEC, FGC (Hon)
 Dr. Ted Hickin, P.Geo., FGC

Staff Appointment



Mr. Mark Rigolo, P.Eng.

*Associate Director,
 Engineering
 Admissions*

The Association of Professional Engineers and Geoscientists of BC is pleased to announce the appointment of Mr. Mark Rigolo, P.Eng., to the role of Associate Director, Engineering Admissions.

In this role, Mr. Rigolo will be responsible for all aspects of the engineering admissions process. His duties will include improving the efficiency of the process of intake and evaluation of applicants, ensuring the effectiveness of registration outreach programs, managing the support and training of registration volunteers and managing all facets of customer service related to the admission of members and membership status changes.

Mr. Rigolo is a registered professional engineer in BC with 25 years of engineering experience in the areas of chemical engineering, fuel cell development and manufacturing and product development. His past roles have included polymer process development at DuPont Canada, fuel cell test engineering and manufacturing process development at Ballard Power Systems and managing the operation and safety of research and undergraduate laboratories within engineering departments at UBC.

Members Consulted on Professional Development Bylaw and Act Changes

APEGBC has been undertaking consultation with members on two major initiatives under consideration by Council: a proposed professional development bylaw to be voted on by members in the fall, and proposed changes to the *Engineers and Geoscientists Act*.

Consultation events on both subjects have been hosted around the province to enable members to ask questions and share their comments directly with representatives from APEGBC Council or members of staff. Throughout February and March, consultations were offered in Prince George, Victoria, Burnaby, Fort St. John, Winfield, Kamloops and Vancouver as well as via live webcast. Presentations were also made to internal stakeholder groups including various committees, divisions and the association's past presidents.

In addition to consultation webpages, which were created to share information with members about the proposed bylaw and the proposed legislative amendments, online surveys were launched to gather further input from APEGBC members. The survey on the proposed CPD bylaw remained open from December 12, 2014 to January 16, 2015 (article on survey results on page 13). The survey on legislative amendments to the *Engineers and Geoscientists Act* was available from February 23 to March 20, 2015.

Next steps

Information from the surveys and the consultation events is being compiled and brought forward to Council for their consideration in determining next steps. Snapshots of the feedback received will be presented to members as it becomes available.

Proposed Professional Development Bylaw

April – June 2015

Council reviews and considers feedback, makes revisions to bylaw as needed.
Council votes on finalized bylaw wording for member ratification

September – October 2015

Members vote on professional development bylaw.

Proposed Amendments to *Engineers and Geoscientists Act*

April – June 2015

Council reviews and considers feedback; request for amendments formulated.
Council votes on package of amendments.

July 2015

Request formally made by APEGBC to Ministry of Advanced Education

For more information about the continuing professional development bylaw, please contact apeg.bc.ca/mcpd. For information about the proposed changes to the *Engineers and Geoscientists Act*, visit: apeg.bc.ca/legislation.



APEG Foundation Scholarships Available to BC High School Students

Do you know a student graduating from a BC secondary school in 2015? Are they entering a BC engineering or earth science program or a Canadian engineering transfer program in the fall?

Applications are now being accepted for the APEG Foundation's Post-Secondary Entrance and Post-Secondary Entrance Transfer Scholarships. The entrance scholarships, valued at \$2,500 each, are offered to BC secondary students entering engineering or geoscience programs at UBC, UNBC, UVic, BCIT or SFU. Eligible geoscience programs include geology, geophysics and earth sciences. The entrance transfer scholarships, valued at \$1,000, are offered to BC secondary students entering Canadian engineering transfer programs.

Scholarship selection is based on a combination of factors including academics, extracurricular activities, references, financial need and the student's written statement detailing why they have chosen to pursue an education in engineering or geoscience. The deadline for application submission is 5:00 pm on Friday, June 26, 2015.

For more information and application forms, visit apeg.bc.ca/students, or contact Andrea Wilson, Student Program Coordinator, at awilson@apeg.bc.ca or 604.412.4860, toll-free 1.888.430.8035 ext. 4860.



Job Postings for Engineers and Geoscientists

Are you looking to hire an engineer or a geoscientist? Are you an APEGBC member seeking employment? APEGBC offers employment advertising opportunities to companies that want to reach APEGBC members with their job postings.

Three employment advertising options are currently available: the online Career

Listings Board, the Feature Career Email, and print advertising in *Innovation* magazine.

Career Listings

Both members and non-members can post job ads on the APEGBC Career Listings site, found online at apeg.bc.ca/Careers/Careers-Listings. Jobs can be searched by title, discipline, company and location. Online ads are posted for eight weeks at a cost of \$350+ GST. Bulk rates are available at \$330+GST per ad for five ads and \$320 + GST per ad for 10 ads.

Feature Career Email

This weekly newsletter goes out to approx. 25,000 members of APEGBC, highlighting the latest job postings. This add-on to an online posting on the Career Listings costs \$90 + GST.

Print Advertising

For information about print advertising rates in *Innovation*, contact Gillian Cobban, Advertising Sales Representative at 604.929.6733.

For more information about APEGBC's Career Listings, or to get started visit apeg.bc.ca/Careers/Post-a-Job. Have questions? Contact Kim Ball, Web Communications Officer, at kball@apeg.bc.ca or 604.412.4891.

community

Technical Tour Provides Members a Unique Sea to Sky Experience

Local APEGBC branches like the Sea to Sky Branch organize regular technical tours of public and private facilities located in their communities. These tours provide opportunities for members to network while increasing their knowledge of local infrastructure. Most recently, the Sea to Sky Branch visited the Sea to Sky Gondola Summit in Squamish.

Squamish is home to many outstanding natural attractions, drawing visitors from all over the world; the Gondola links these attractions into one unique recreational experience. This past fall, the branch held its tour of the Sea to Sky Gondola Summit, led by Mamoud Bashi, P.Eng., Pierre Friele, P.Geo., and Trevor Dunn, General Manager and co-founder of the Sea to Sky Gondola.

About 45 participants—including members, friends and families—gathered at the Gondola Base Camp, located on Highway 99 between Shannon Falls Provincial Park and the iconic Stawamus Chief Provincial Park. The tour started with a 15-minute gondola ride connecting the Base Camp to the Summit Lodge, set at 885 m above sea level. The ride provided sweeping views of the Howe Sound fjord, majestic coastal forest and surrounding mountains. The gondola cabins were designed and custom-made by Doppelmayr, a well-known Austrian manufacturer, with floor to ceiling glass windows offering unobstructed views of the surrounding natural attractions.

Once at the gondola summit, presentations by Trevor Dunn and Pierre Friele enriched the tour, with Dunn sharing information about experiences and challenges during the gondola project construction phase, and Friele, President of Cordilleran Geoscience, talking about the quaternary geomorphology of the Squamish River and Howe Sound.

Participants then enjoyed lunch in the Summit Lodge restaurant before exploring a wide array of outdoor experiences including interpretive walking trails, breath taking cantilevered viewing platforms, and the Sky Pilot Suspension Bridge.

Interested in participating in upcoming branch activities in your local area? Find out more: apeg.bc.ca/branches.



Technical tour-goers experience stunning views of Squamish.

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APEGBC's Council of elected members and government representatives meets throughout the year to conduct the business of the association governance. The following are the highlights of the February 13, 2015 meeting

New Policy on Experience Submissions for Professional Engineer Licensure Applicants

APEGBC Council has approved a policy on the Transition to Competency-Based Reporting of Engineering Experience. This policy sets a formalized deadline of April 1, 2015, after which experience submissions from new professional engineer applicants must be completed in accordance with the Competency Framework approved by Council in 2011. Current applicants will be able to continue to report in the format they have been using, either the traditional report or the Competency Framework.

Committee to Have Greater Oversight of Association Awards

The Terms of Reference for the Standing Awards Committee were revised to incorporate the review and approval of existing and new awards, and of all recipients of association awards. This will bring a higher level of consistency and oversight to the awards process.

Accredited Employer Training Program Pilot Approved

Council adopted a proposed framework for the APEGBC Accredited Employer Training Program and approved the implementation of a pilot program. Under this initiative, engineering and geoscience employers will be able to create their own training programs for EITs and GITs and apply to have the programs accredited by APEGBC. Applicants who have completed their training through these accredited programs will be routed through an expedited registration review.

Endorsement of Housing Foundations and Geotechnical Guide

Council has approved APEGBC's endorsement of the *Housing Foundations and Geotechnical Challenges: Best Practices for Residential Builders in British Columbia* guide published by the Homeowner Protection Office. The guide has been prepared to promote best practices by builders with respect to geotechnical issues, both when selecting a site and when constructing single and multi-family residences.

Criteria for Honorary Membership Approved

Council approved guidelines for awarding honorary membership with APEGBC. The guidelines were proposed by the Standing Awards Committee and provide increased guidance and specificity for bestowing this honour. Honorary membership recognizes non-members who have made outstanding contributions to the professions of engineering and/or geoscience.

Branch Contributions to Member Engagement

Council received a report of local branch activities from

around the province over the last 6 months. During this reporting period, APEGBC branches engaged over 650 K-12 students, participating in classroom visits around BC and science related events. Over 200 post-secondary students were engaged through branch initiatives. Branches also continued to play a key role in member engagement, hosting 19 successful professional development events attracting nearly 700 attendees. This included presentations on traffic and transit in the Lower Mainland, liquefied natural gas, and the Bowker Creek Remediation. Included in 11 tours organized by the branches were the Louisiana Pacific Peace Valley OSB Plant Tour and a tour of Sky Train Operations.

Progress on Strategic Plan

Council received an update on the progress of milestones and Key Performance Indicators (KPI) for APEGBC's current Strategic Plan. The Council Road Map, outlining areas of focus for 2014-2015, was also reviewed. While APEGBC is still in earliest stages of implementing the strategic plan, much work has been done to date. The association is on track to achieve the outcomes we have set and most of the KPIs are indicative of this, while others are being monitored more closely at this time.

APPOINTMENTS

ABCFP/APEGBC Joint Practices Board

Bill Grainger, P.Geo., Eng.L.

Building Enclosure Committee

Brennan Vollering, P.Eng.

Climate Change Advisory Group

Mark Porter, P.Eng., Struct.

Eng. (Chair)

Brent Burton, P.Eng.

Sean Marte, P.Eng.

Dr. Brian Menounos, P.Geo.

Glen Parker, P.Eng.

Jennifer Pouliotte

Dr. Conor Reynolds, P.Eng.

Dr. Malcolm Shield, P.Eng.

Glen Shkurhan, P.Eng.

Continuing Professional Development Committee

Mark Adams, P.Eng.

Dr. Hamid Ghanbari, EIT

Editorial Board

Matthew Klippenstein, P.Eng.

(Chair)

Matthew Zieleman, EIT

Geoscience Committee

Shiloh Carlson, P.Eng.

Garth Kirkham, P.Geo., FGC

Governance Committee

Tajdin Mitha, LLB (Chair)

Organizational Quality Management Committee

Frank Dacho, P.Eng.

Registration Committee

Ross Rettie, P.Eng., FEC

Registration Fairness Panel

Paul Blanchard, P.Eng., FEC,

FGC (Hon) (Chair)

Donald Delcourt, Eng.L.

John Watson, P.Eng., FEC,

FGC (Hon)

Sustainability Committee

Kerly Acosta Salgado, P.Eng.

Geoffrey Karcher, P.Eng.

More information about APEGBC Council meetings is available online at: apeg.bc.ca/council.

Survey Captures Members' Feedback on Professional Development Bylaw

From December 12, 2014 to January 16, 2015, APEGBC members were encouraged to participate in a survey on the proposed Continuing Professional Development (CPD) bylaw. The bylaw, which will be brought forward for a vote in the fall, would establish a program requiring members to undertake a minimum amount of professional development each year and to report annually that this requirement has been met.

The goal of the survey was to determine the general level of agreement with the proposed bylaw, and identify what concerns members have with the structure of the program and what further information they might require to better understand what is being proposed.

A total of 5,168 members participated in the survey from December to January. Members were first asked to review the bylaw information, and then indicate their general level of agreement with it. Survey findings showed that 28.6% of members supported the bylaw, 42.8% were unsure, and 28.6% did not support it.

Members who responded that they were unsure if they supported the concept of mandatory professional development indicated that they were uncertain of tangible benefits, while some indicated support for doing CPD but were less convinced about reporting it, or had concerns about specific aspects of the bylaw.

Members who said they did not support the bylaw felt there was no proven value to CPD, were concerned about costs and time commitments, and the availability of courses. Members who were semi-retired or working part-time also indicated concern about being able to meet the required professional development hours prescribed by the bylaw.

Asked for their comments, members had suggestions for changes to the proposed bylaw. Common themes included exemptions for part-time or semi-retired practitioners or

those in specialized fields, more flexibility in categories of eligible professional development, and reducing the number of total hours required.

Members were also asked if they intended to vote when the final bylaw is presented in the fall. About 81% of respondents indicated they planned to cast a vote in the ballot. Those who said they were not planning to vote listed as their reasons that they were about to retire or lived out of province, felt their vote was not needed, felt they did not have enough information, or disagreed with the concept. No questions were asked about *how* members intended to vote.

The results of the survey are being brought forward to the CPD Committee and APEGBC Council for consideration. For additional information or questions about the proposed professional development bylaw, please contact cpd@apeg.bc.ca or 604.430.8035 or 1.888.430.8035.



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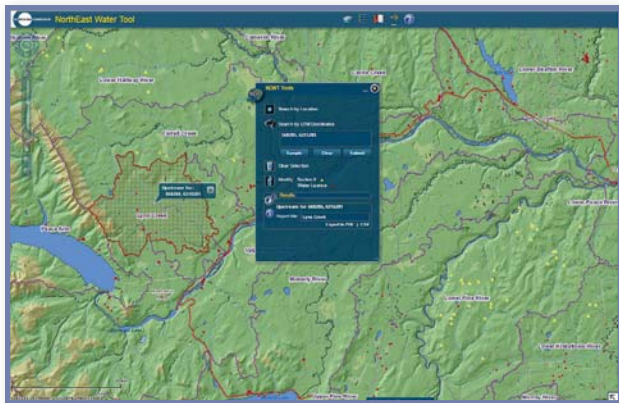
DATA DRIVEN

BC's Innovative Web-based Tools for Water Management



Peace River Valley near the Halfway River. PHOTO: ©USER:TUCHODI/WIKIMEDIA COMMONS/CC-BY-SA-2.0.

Tom Ruffen



The NorthEast Water Tool (NEWT) allows the user to view any river or lake in the region and click on a point to extract information on the flow of the river.



Allan Chapman, P.Geo., shown here with the NorthEast Water Tool, which was recognized with a BC Premier's Regional Award for Innovation in 2013.

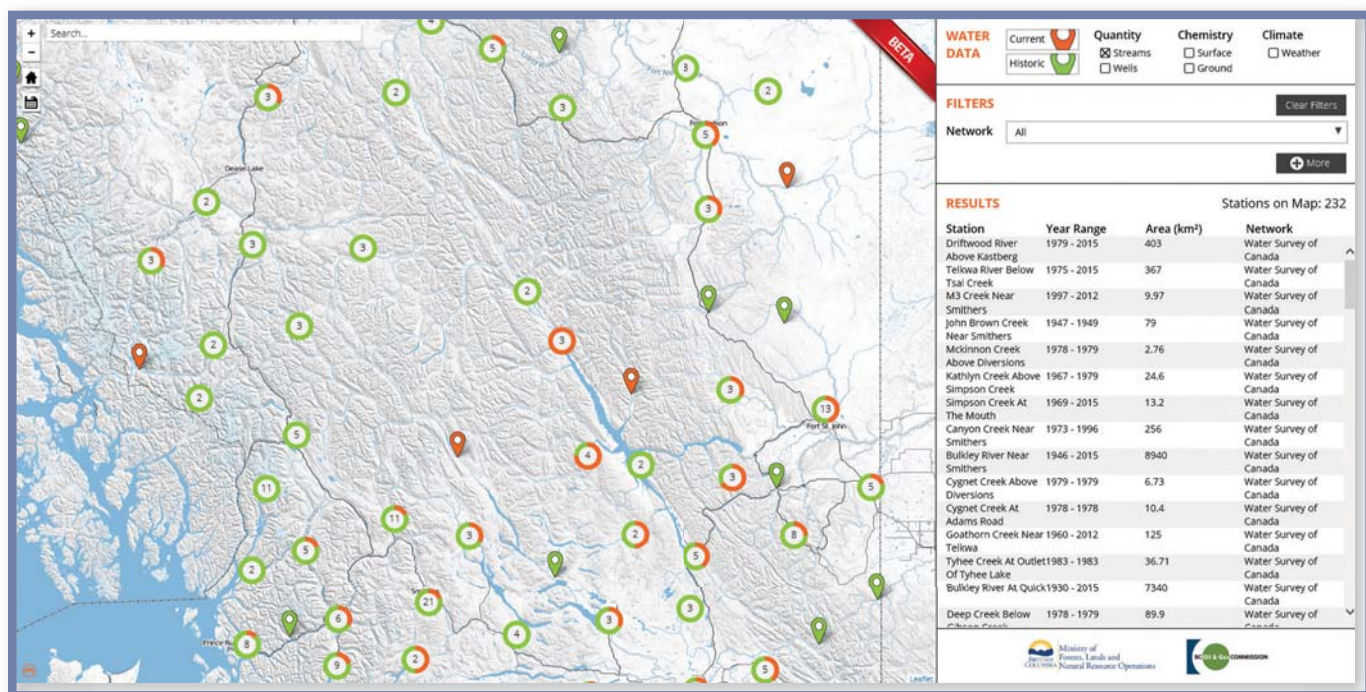
Historically the demand for water has been quite low in sparsely populated northern British Columbia, but in recent years the search for new energy sources has created the need to improve the province's water management capabilities.

"Access to water is very important for unconventional natural gas development," says hydrologist Allan Chapman, P.Geo., the Regional Water Manager for the BC Oil and Gas Commission, and the technical lead on the development of NEWT, the NorthEast Water Tool, a first-of-its-kind water information system. "The Commission has a mandate to regulate oil and gas activities in British Columbia in a manner that provides for the sound development of the oil and gas sector by fostering a healthy environment, a sound economy and social well-being."

Identifying a Need and a Solution

Over the past three years, the Commission, along with the BC Ministry of Forests, Lands, and Natural Resource Operations, has led the way in the development of NEWT and other leading-edge web-based information tools that are easily accessible to government agencies, industry, First Nations communities and the public at large. In addition to NEWT, the newly created NorthWest Water Tool (NWWT) and the Water Data Portal are freely available on the BC Oil and Gas Commission website.

"We started with the NorthEast Water Tool, which is derived from an innovative hydrology modelling approach that encompassed the entire northeast section of BC," says Chapman. "I was at an oil and gas-related conference in Calgary in early 2011 and was sitting in the back of the room with Ben Kerr of Foundry Spatial Limited. We were



The NorthWest Water Tool provides data on watersheds that included the Skeena and Stikine rivers as well as the headwaters of the Yukon River.

lamenting the lack of hydrology monitoring in northeast BC to support the booming natural gas development.”

Kerr, the founder and lead analyst of Foundry Spatial is a geographic information system (GIS) data expert. During the Calgary conference, he and Chapman decided to sketch out a framework for a new approach to modelling using spatially explicit driving data, such as ClimateBC, the Freshwater Atlas watersheds, Forest Inventory Program data and other sources. On the basis of that framework, Chapman and the BC Oil and Gas Commission contracted Victoria-based Foundry Spatial to test the modelling for the Horn River Basin gas play area. The results were so successful that the Commission then partnered with the BC Ministry of Forests, Lands and Natural Resource Operations, enabling Chapman, Kerr and their staff teams to create a model for the entire northeast corner of the province.

“A model is an attempt to run some element of the natural world, like a river, into a mathematical expression that you can then use to describe the river,” says Chapman. “I was interested in the concept of modelling for the whole landscape. Typically, a hydrological model is done for an individual river, but the need across the northeast was broader, so we did a model of the Peace and the Liard rivers and all the tributaries and lakes.”

Making Data Accessible

The modeling approach for NEWT brought together hydrology, climatology, forestry, energy and carbon-related research, says Ben Kerr. “The goal was to provide impartial information on water resources. By improving awareness and understanding, the tool ensures that transparent decisions can be made. It allows water management professionals to focus their time and efforts on improving stewardship of the resource. Previously, authorizations staff were not able to relate water licence submissions to available natural supply and existing licenced use in a watershed without

performing a one-off exercise each time. Now this kind of information is easily and publically accessible, which really raises the base level of understanding across the wide range of stakeholders with an interest in sustainable water management.”

A recipient of a Premier’s Regional Award for Innovation, NEWT is the first of its kind anywhere in the world. The tool allows the user to view any river or lake in the region and click on a point to extract information on the flow of the river—on how much water is being protected for fish and the environment, how much water has already been licenced for use, and how much water might be remaining for possible allocation. It also provides a listing of all the water licences and leases that have already been issued. The tool is used by industry to help understand water availability from different sources they may be considering. It is also used by First Nations and the general public to understand water supply and demand, and cumulative effects in specific locations.

“Before we had this tool, an analytical hydrologist could determine the potential flow of water at any point in a river system, but analytical hydrologists are far and few between” says Dr. David Wilford, P.Geo., RPF, Natural Resource Sciences Team Leader and Research Hydrologist for the BC Ministry of Forests, Lands, and Natural Resource Operations. “NEWT provides average citizens and civil servants with the information they need to make decisions or review technical work provided by proponents.”

Based in Smithers, Wilford was instrumental in helping to create BC’s new water allocation tools. “I have been a technical administrator to bring the projects to life,” he says. “I saw a need, knew what operational people needed, and made things happen at the program and financial levels.”

After NEWT, Allan Chapman and Ben Kerr developed another GIS-tool, the Water Data Portal, which provides map-based public access to an array of water-related information that has generally

been difficult for people to access, including stream flow data, surface water and ground water monitoring data, and climate data collected by a number of organizations. The portal provides information in easy-to-interpret graphical and tabular formats.

Tools for Forward-looking Decision Making

Based on the success of these tools, David Wilford initiated the development of NWWT, the NorthWest Water Tool, bringing in hydrologist Scott Jackson of Lorax Environmental Services to work with Ben Kerr on watersheds that included the Skeena and Stikine rivers as well as the headwaters of the Yukon River. The NWWT applies a climate change lens to future hydrologic conditions.

“Development pressures have increased in northwest BC with regard to metal mining and run-of-river projects,” says Vancouver-based Scott Jackson. “NWWT definitely makes it easier to quickly show a client the potential restrictions and expected changes to streamflow in a given watershed. This opens up the discussion on how to best design a project to be more robust to greater variation in the water balance that will result from a changing climate. The climate change lens in the NWWT will enable water resource managers and the public to make decisions that are informed by the projected changes to precipitation and temperature, the key drivers of streamflow.”

NWWT has been helpful in identifying the implications of climate change on long-term installations such as mine tailings ponds, notes David Wilford. “These ponds will be there for hundreds of years. Designing them for future climates is critical, not only for the site but for the downstream watersheds.”

These user-friendly water tools have attracted the attention of other jurisdictions in Canada and around the world. “We’ve developed a tool in Alberta involving the Athabasca, Peace, and North Saskatchewan rivers,” says Kerr. “We’re also involved in building a tool for the Omenica region of BC and project development activities are underway to expand the geographic coverage of the water tools to meet the demands of water managers in other regions of the province. We have also presented in Australia and the United States.”

In 2014, Allan Chapman was honoured by APEGBC as the recipient of the C.J. Westerman Memorial Award, primarily for his groundbreaking work on the NorthEast Water Tool, but Chapman is quick to point out that creating such tools is a collaborative undertaking that relies on the efforts of many people at the technical and managerial levels. “Ben Kerr, David Wilford and Scott Jackson and I all share a passion for taking complex hydraulics and hydrology data and translating that into language and formats that almost anyone could understand and learn from.” ☒

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Process Control Improvement and Management

April 13-14, 2015 – Vancouver, BC

This seminar will demonstrate how to improve control loop performance not only through tuning, but also by diagnosing valve and process problems and interaction, incorrect control strategy, and also through novel monitoring techniques. Many examples from a wide variety of industries will be presented.

Evaluation and Rehabilitation of Pavements

April 13-14, 2015 – Vancouver, BC and via Webinar

This course discusses pavement design, specification, subgrade preparation, base/subbase and surface types and function, construction details, and long term functional and structural performance considerations to ensure a long-life and effective product. It provides details on maintenance and rehabilitation procedures, how to evaluate both old and new and innovative pavement treatments using life-cycle cost analysis. Through a series of case studies, positive and negative design features and construction conditions are presented to give the participant a good understanding of what we can do better to ensure the cost effective use of transportation investments.

Builders Lien Act Seminar

April 14, 2015 – Vancouver, BC and via Webinar

If you are involved in the construction industry, a working knowledge of the *Builders Lien Act* is critical. This seminar will offer a concise, up-to-date overview of builders' liens, including a discussion on the obligations on design consultants with respect to payment certification and release of holdbacks, and practical tips to manage the risks.

Design and Construction of Mechanically Stabilized Earth Walls

April 15, 2015 – Webinar

This webinar is designed to provide participants with an understanding of design tools and practices for the cost-effective use of mechanically stabilized wall technology. Mechanically Stabilized Earth (MSE) walls continue to be developed for use in transportation applications to address problems in areas where right-of-way restrictions make the use of conventional gravity or cantilever retaining walls difficult or cost-prohibitive to use.

Innovative Design, Construction and Maintenance Techniques for Roadway Infrastructure

April 15, 2015 – Webinar

This webinar explores innovation in the design, construction and maintenance of roadway infrastructure. The U.S. Federal Highway Administration (FHWA) and Canadian Provinces such as Alberta, Ontario and Québec have embraced innovation deployment as a part of the delivery of transportation infrastructure. Other provinces such as British Columbia, Saskatchewan and New Brunswick are introducing innovation through the adoption of Public/Private/Partnership contracts. This has included techniques to reduce the impact of roadway infrastructure on the environment, reduce construction time and cost and improve safety. This webinar presents case studies of innovations from North America and around the world. Key take away information from this webinar includes an understanding of the potential

for innovation deployment and their value for roadway design, construction and maintenance.

Hydrologic and Hydraulic Design of Culverts Seminar

April 16-17, 2015 – Vancouver, BC

Today's design engineers who work with transportation agencies are asked to develop more complex and complete designs for culverts than ever before. Evolving requirements now often include aquatic organism passage and aspects of long-term channel stability. This course will provide participants the knowledge necessary to design a culvert considering issues of peak flow, aquatic organism passage, and local policies of importance.

2D River Flow Modelling – An Introduction Using River2D

April 22, 2015 – Vancouver, BC

The large number of two-dimensional (2D) depth-averaged flow models currently available (e.g., Mike 21, River2D, Telemac-2D, SRH-2D, CCHE2D, FLO-2D, RiverFLO-2D, RMA2, FESWMS, ADH, TUFLOW, Delft3D, STORM, FaSTMech, RIC-Nays, Iber, Basement, etc.) attest to the fact that 2D flow modelling is now a common and well-established practice in river engineering. Despite their apparent differences, all 2D models share some basic common features that all numerical modellers should know and understand. Unfortunately, the classical open-channel flow courses taught at undergrad level do not provide engineers with such knowledge. This seminar is intended to bridge that knowledge gap.

Industrial Maintenance Management: A Rational Approach

April 23, 2015 – Vancouver, BC

Industrial maintenance has been performed since the industrial revolution, so why is maintenance still often seen as the best place to reduce costs and improve plant performance? Here's an opportunity to stand back and look at all aspects of maintenance from a new, logical viewpoint. Based on experience in many manufacturing industries, this intensive one-day seminar covers a unique and rational approach to the core maintenance functions of work selection, planning, scheduling and materials management. The focus is on achieving high equipment reliability while minimizing administrative and other costs.

My Zero Inbox™ – Achieve Excellence and Happiness at Work

April 24, 2015 – Webinar

The challenge of keeping up with email is getting worse, not better. The average email user is spending 28% of their working day on email. That's 13 weeks of their year! Clearly, one can gain advantage from improvements that get you off email and on to work that is more valuable. My Zero Inbox is a one-hour webinar that will teach you how to overcome email overload and how to gain control of your inbox.

5 Key Steps to Successfully Implementing Change in your Organization

May 5, 2015 – Webinar

You know what needs to be changed in your company. So why is there such a huge gap between knowing what should be done and actually getting it in place and working? When the dust of

a change initiative settles, the only true measure of success is the improved performance generated by the new systems that are still running a year later. Ideas are worth nothing without implementation that sticks. So how can you maximize the results? Join this webinar to explore the five keys of successful implementation including: effective diagnosis, obtaining leadership buy-in, building support in the organization, rolling out the change and making it last.

Off-the-Cuff Presentations

May 6, 2015 – Burnaby, BC

"Sink or swim" is an appropriate saying when asked to do a presentation on short notice. You can either freak out and escalate your stress level or learn to take a planned approach and put yourself in the driver's seat. By taking Off-the-Cuff presentations you will learn to take control and be self-assured by focusing your message, adding conviction and spontaneity. This one-day workshop is ideal for individuals who are required to think on their feet and have a moderate amount of experience giving presentations.

Core Principles of Coaching

May 7, 2015 – Webinar

Great leaders build confident, self-sufficient teams. Does your team get your best? Are they challenged, inspired, and supported by your leadership style? A core competency of leadership is coaching. The coach approach is powerful because it seeks to communicate in a way that is respectful, clear and action oriented; while at the same time engages others in their own strengths and abilities. In this seminar you will learn the core principles of coaching and how to engage in more powerful conversations that lead to inspired action.

Sediment Engineering for River and Coastal Projects Seminar

May 12-14, 2015 – Vancouver, BC

The course offers fundamentals of sediment engineering for river and coastal projects with the following objectives: To determine when and how erosion and sedimentation take place in rivers and coastal regions, to estimate the magnitude of the sediment transport in river and coastal projects, to get familiar with applications of sediment transport engineering in such fields as river engineering, coastal structures, bridge pier design, dam design, stormwater management, and hydropower plants.

Call for Presenters

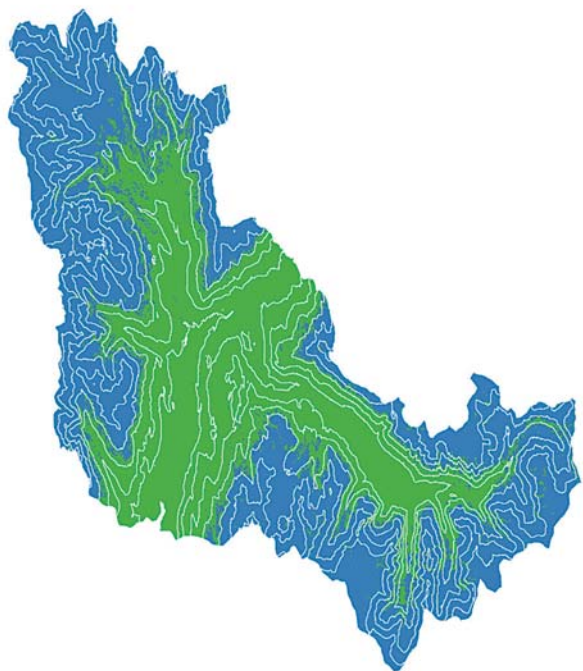
Are you an expert in your field who would like to contribute to the future of engineering and geoscience? APEGBC is actively seeking members to present on a variety of topics. For more information, please visit apeg.bc.ca/Events/Seminar.

APEGBC Online Learning Centre

The Online Learning Centre features audio recordings of previously held APEGBC seminars, synchronized with PowerPoint. New sessions will be added throughout the year. Visit apeg.bc.ca/Professional-Development/Offerings/Online-and-Distance-Education for a complete listing of sessions available.

For a complete listing of events or for more information, visit www.apeg.bc.ca/prodev/events.html or contact APEGBC Professional Development at 604.430.8035 or 1.888.430.8035.





Satellite Remote Sensing for Water Resource Applications in British Columbia

Joel W. Trubilowicz, EIT
Emma Chorlton
Dr. Stephen J. Déry
Dr. Sean W. Fleming, P.Geo.

Fantastic satellite images of the earth routinely appear on television documentaries, and even the nightly weather forecast. But how effectively can these technologies be used by water resource practitioners, particularly in the steep, forested, mountain watersheds of British Columbia? In theory, there is a market here: hydrology relies on in situ point measurements of quantities such as streamflow, precipitation and temperature, but associated logistics are such that monitoring stations are spatially sparse. Climate stations are often located in valley bottoms and thus not representative of a watershed as a whole. Quantities such as snow water equivalent (SWE) or snow covered area (SCA) over a basin are difficult to estimate exclusively using surface point measurements such as snow surveys, due to the tremendous spatial variability of snowpack. The promise of capturing such critically important features of the hydrosphere from orbit is therefore deeply alluring.

Unfortunately, the extensive cloud cover, steep terrain, and forested landscapes that dominate much of Pacific Canada often present significant problems for satellite remote sensing, and technologies that prove useful elsewhere can be problematic here. Additionally, some of these satellite remote sensing products are freely available, whereas others are proprietary and costly. Further, the array of unfamiliar terms and technologies in satellite remote sensing can form an obstacle to water resource scientists, geoscientists, engineers and managers whose technical expertise lies elsewhere.

Below, we provide a short introduction to some basic concepts and terms in satellite remote sensing, catalogue a few of the key technologies from a hydrologic standpoint, and showcase how SCA maps from MODIS satellite data are being integrated into operational river forecasting in British Columbia—as well as some of the challenges we face moving forward.

Satellite Remote Sensing: A (Very Brief) Primer

A few key concepts and terms will appear in any discussion around the use of satellite remote sensing for hydrologic applications, and we identify some of these here. Obviously, interested readers can find more thorough descriptions of these ideas, and much of what follows in this article, in textbooks (e.g., “Remote Sensing of the Cryosphere” by Marco Tedesco) and the refereed literature.

We begin by differentiating between a satellite and its instruments: any given satellite will typically have multiple remote sensing instruments, and the same or similar instrument may appear on more than one satellite. The MODIS sensors are an example: these are aboard both the Aqua and Terra satellites, each of which in turn has several remote sensing instruments other than MODIS.

Temporal and spatial resolutions are also important. Temporal resolution refers to the return time of the satellite, or the time between measurements of the same location on the earth, whereas spatial resolution is the area on the earth’s surface represented by a single pixel of the measurement instrument. There is typically a trade-off between spatial and temporal resolution.

The two basic types of orbits are central to the types of data obtainable by the sensors on any given earth-observing satellite. Geostationary satellites constantly observe the same location of the earth by matching the earth’s angular velocity, and have the advantage of continuous temporal coverage of a certain location. The trade-offs are that the high earth orbits (HEO, ~35,000 km altitude) into which they are usually inserted yield coarse spatial resolution, and that if used for visible-light observation, half of the observation time will be lost to nighttime darkness. In contrast, a sun-synchronous satellite observes different locations throughout the day; the orbital plane is fixed with respect to the poles and the satellite traces out different locations as the earth rotates. Sun-synchronous satellites are placed in low earth orbits

Sensor type	Examples: sensor (satellite)	Spatial resolution	Repeat cycles	Potential uses	Potential limitations
Visible-Infrared	AVHRR (NOAA), MODIS (Aqua & Terra), VIIRS (NPP & JPSS), ASTER (Terra), MISR (Terra), ETM+ (Landsat), GOES (GOES)	15 m–8 km	0.5–16 days	albedo, normalized-difference vegetation index, snow cover	cloud cover, forest canopy; visible requires daylight
Passive Microwave	SSM/I (DMSP), AMSR-E (Aqua/GCOM-W1)	5 km–15 km	0.5–2 days	snow cover, depth, SWE	complex terrain, deep and/or wet snow
Active Microwave	KaRIN (SWOT), TerraSar-X/TanDEM-X, RADARSAT, SIRAL (Cryosat)	0.8 m–250 m	11–369 days	water levels, snow cover, SWE, land cover, DEMs, vegetation	complex terrain, price, low heritage
Gravimetric	GRACE	400 km	30 days	groundwater storage, glacier mass balance, snow mass variations	resolution
Laser Altimetry	GLAS (IceSAT)	70 m	91 days	ice cover, snow depth, water level	closed canopy, clouds, rain

TABLE 1: Brief summary of some satellite remote sensors and a few of their possible hydrologic uses and limitations.

(LEO) of about 700 km altitude; many are in polar or near-polar orbits that provide good planetary coverage. The ribbon-like path that a sun-synchronous satellite traces out on the earth as it orbits is referred to as its swath.

Instruments are divided into active and passive sensors. Active sensors emit energy and monitor the return signal from the earth, synthetic-aperture radar (SAR) being an example. As their name implies, passive sensors instead passively monitor some characteristic of the earth; visible wavelength imagery—that is, digital photographs from space—are examples. Active sensors can be useful but tend to be more expensive.

Not all sensors use electromagnetic (EM) energy—the GRACE gravity mission, widely used to monitor changes in basin-scale water balance, is a notable exception—but most do. Any given sensor generally monitors only some portion of the EM spectrum, such as microwave bands, or the visible-near-infrared (VNIR). Each such frequency range presents capabilities and limitations: for instance, microwave sensors cut through cloud cover and operate at night, but have poor spatial resolution. The energy corresponding to very specific, narrow portions lying within the general EM range monitored by a given instrument may in turn be measured as distinct bands or channels, and the resulting spectra can provide critically useful information. For instance, MODIS primarily uses the Normalized Difference Snow Index (NDSI), developed by Dr. Jeff Dozier of UC Santa Barbara, to automatically detect snow cover on Terra (a similar but not identical index is used by the MODIS instrument on Aqua):

Differentiation between snow and cloud is the primary purpose of the NDSI. Specifically, the NDSI takes advantage of the fact that snow has a high level of reflectance in the visible range (band4) and a low level of reflectance in the near infrared (band6) when compared with clouds, which appear similar in the visible range.

A Visitor's Guide to the Satellite Zoo

A wide, and perhaps bewildering, variety of satellites and sensors exist. Additional satellites and instruments gathered large volumes of potentially still-useful data prior to reaching the end of their design lifetimes and failing, and still others are in the works. Table 1 provides a taste of some of the key technologies as might be relevant to water resource studies in British Columbia, and illustrates the wide range of hydrologic uses to which different types of satellite remote sensing might be put (see above).

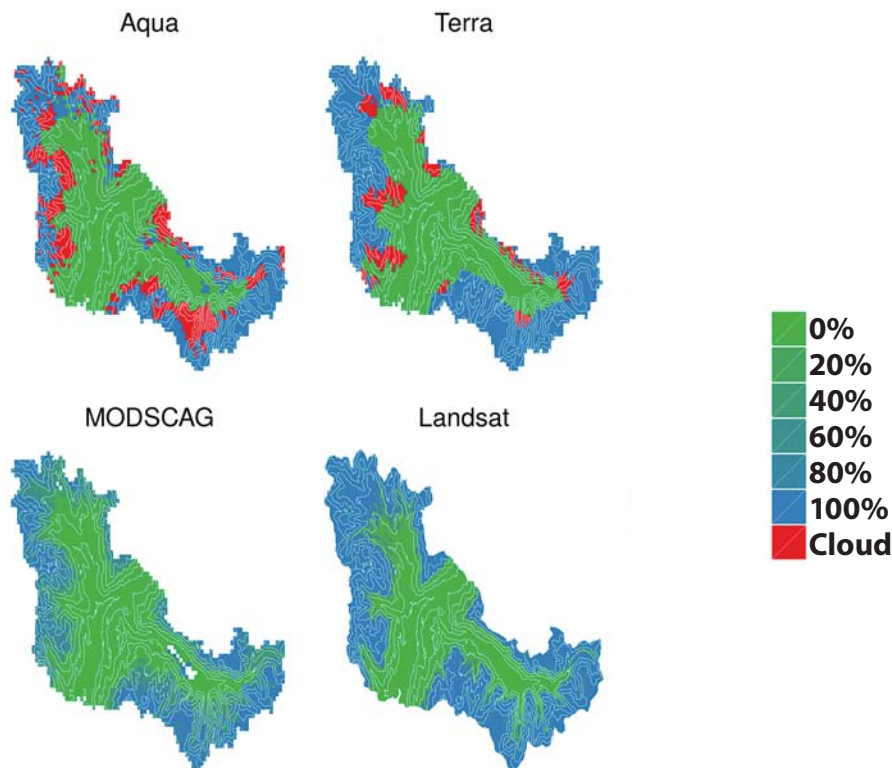
A Practical Application in British Columbia

Operational river forecasting is a central element of hydrology, yielding powerful insights in practical contexts ranging from flood hazard response to optimal hydroelectric reservoir planning. Given that snowmelt is generally a leading component of the catchment water cycle in British Columbia, we briefly present an applied example of how mountain snowpack mapping by satellite remote sensing is being used to support hydrologic forecasting.

For the past five years, BC Hydro and the BC River Forecast Centre (RFC) have used near-real-time MODIS Terra binary snow observations for monitoring SCA in selected watersheds throughout British Columbia. Automated downloading, re-projection, analysis and mapping procedures were developed by Dr. Joseph Shea of ICIMOD. These procedures produce eight-day composite snow cover maps and SCA stratified by the elevation bands of BC Hydro and RFC's respective hydrologic models, and deliver them via FTP on a daily basis for 33 operational basins.

These maps have been used qualitatively on a routine operational basis for several years by hydrologic forecasters at both RFC and BC Hydro to provide information on the amount of snow still available to melt within a watershed. This information has proven most useful in small watersheds where the snowcover has nearly disappeared in spring, and prior to an expected rain-on-snow

FIGURE 1 Snow-covered area maps for July 5, 2011 in the Cheakamus Basin, using four different satellite remote sensing methods. Elevation band contours are shown in white.



event in the fall, when the spatial coverage of snow available for melting would otherwise be unknown.

Such practical successes notwithstanding, much remains to be done. Recently, BC Hydro has moved to in-house processing of MODIS data for integration into a hydrologic modelling platform and potential direct ingestion into operational hydrologic models. However, more formal quantitative uses of MODIS-based SCA data in the hydrologic modelling chain will likely require rigorous data assimilation schemes.

SCA uncertainties also remain an issue. A visual comparison of four SCA estimation methods is provided in Figure 1 for the Cheakamus Basin, a watershed in southwestern BC where BC Hydro operates the Cheakamus hydropower project. These snow cover maps are derived from three MODIS products (Terra binary, Aqua binary, and MODSCAG from the Terra observations) plus Landsat. In these maps, the Aqua, Terra, and Landsat pixels only use a binary snow classification: either 0% or 100% snow cover (or cloud cover). In contrast, the product derived from MODIS data using the MODSCAG spectral unmixing algorithm, developed and provided by the NASA Jet Propulsion Lab, provides fractional SCA values ranging continuously from 0% to 100%, which can be beneficial for accurately tracking spatiotemporal snow ablation patterns in mountain environments using the relatively low spatial resolution MODIS data. We delineated SCA on the Landsat image using the NDSI threshold method on the higher-resolution 30 m pixels, adjusting the threshold downwards for vegetation. Overall, SCA patterns appear similar between all four data products. On closer inspection, however, the binary method from both Aqua and Terra delineated significant cloud cover on this day, whereas neither MODSCAG or Landsat did. Further, when examined on an elevation-band by elevation-band basis (not shown), there are some significant differences between the methods. Much of this variation is again associated with the ways that cloud cover and

fractional snow cover within a pixel are handled by the various methods. Because all these observations have uncertainty, it is difficult to say which is closest to the truth.

Finally, though SCA is useful, accurate SWE estimation by satellite remote sensing remains the ultimate prize. This is particularly valuable to longer-term seasonal water supply forecasting, which requires the total volume of SWE in the watershed. Such SWE monitoring methods are used elsewhere, but these have enjoyed relatively little success in Pacific Canada due to steep terrain, heavy evergreen forest cover, and annual peak SWE values that can exceed 3,000 mm with total snowpack depth much greater than that (see Table 1). Similarly, snow data modelling applications, akin to the American SNODAS system (which also provides partial coverage in southern BC), are another avenue to explore. ☒

Exciting times are ahead

Remote sensing has been used in many ways for water resources applications, and these uses will only expand in the future. As technology marches forward, we are experiencing ever-increasing resolution, greater sensor accuracy, and simplification of data delivery. The difficulties of remote sensing in a complex region such as BC are being chipped away year by year, and a wide range of industries and applications will reap the benefits.

About the authors

Joel W. Trubilowicz, EIT, is a PhD candidate with the Department of Geography at the University of British Columbia (UBC). Emma Chorlton is a student with the UBC Department of Engineering Physics. Dr. Stephen J. Déry is with the University of Northern British Columbia, Environmental Science and Engineering Program. Dr. Sean W. Fleming, P.Phys., A.C.M., P.Geo., is with the Meteorological Service of Canada, UBC, and Oregon State University. The authors can be contacted via joel.trubilowicz@geog.ubc.ca.



Provincial Energy Compliance Survey

As of December 20, 2013, large buildings (Part 3 building in the BC Building Code) constructed in British Columbia are required to comply with the energy provisions in either ASHRAE 90.1-2010 or the National Energy Code for Buildings (NECB) - 2011. As of January 21, 2014, the City of Vancouver adopted the same requirements as an amendment to Part 10 of the 2007 Vancouver Building By-Law (VBBL).

The Province of British Columbia, in partnership with BC Hydro, is conducting a province-wide formal survey of industry professionals

and building officials that design, build, or review plans for large buildings. Targeted respondent groups include architects, engineers (mechanical/electrical/building envelope), as well as municipal building officials involved with permitting and inspections. The survey is completely anonymous and will be made available online beginning in April 2015 at www.surveymonkey.com/r/BCenergycodecompliance.

The Province is encouraging industry professionals to take 15-20 minutes to complete this important survey. Your collective responses will be analyzed to identify gaps and inefficiencies in the code compliance process and may lead to development of new processes to streamline the issues. There will also be an opportunity to provide additional feedback at the end of the survey and sign up for a focus group in July 2015.

For questions regarding the survey, or to follow up on survey results, please contact Voytek Gretka at the BC Ministry of Energy and Mines at voytek.gretka@gov.bc.ca or 250.952.0626.

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DIVERSITY



The Key to Increasing Innovation

Anna Stukas, Dr. Sheryl Staub-French, P.Eng., Dr. Lesley Shannon, P.Eng.

Engineering and geoscience companies are constantly striving to be more innovative and efficient to stay competitive in today's fast-paced environment. We look to drive technology further and faster, without compromising safety or cost. But how many technological innovations would be developed by a group of like-minded people sitting in a room agreeing with each other? Innovations arise when the status quo is challenged, when people question "the way things have always been done" and look at problems from new angles.

Several studies have pointed to diversity as being a fundamental component of innovation¹; diversity inherently brings different perspectives to solving a problem.

While this may be great in principle, the practicalities of implementing or achieving diversity in professions such as engineering and geoscience are not trivial. According to the 2006 census, women comprised 47% of the Canadian workforce. By contrast, the participation rate of female professionals in the engineering field was approximately 13%.² If the engineering and geoscience professions are going to meaningfully increase their diversity, management and leadership need forums to share tangible, implementable strategies that work in the real world.

It is no longer sufficient for engineers and geoscientists to be proficient in science and mathematics alone to be successful in their chosen careers. As stated by APEGBC, professional development and life-long learning are important cornerstones in the practices of professional engineers and geoscientists. Beyond technical education, professional development includes the ability to work effectively in teams, to develop emotional intelligence, and to present and market yourself within and on behalf of your organization. These "soft skills" are increasingly becoming critical factors in building a successful professional engineering or geoscience career.

From the perspective of building a diverse workforce, it is imperative to create a positive culture to attract and retain people, and particularly those in the minority, to our professions. As the engineering and geoscience professions continue to evolve and expand, it is equally important to ensure that people entering the

professions are aware of the breadth of career options open to them. Furthermore, the conversation about the need for diversity in the STEM fields needs to be expanded to include everyone involved in the profession. ☒

Anna Stukas is an independent consultant who helps technology companies to develop and grow by bridging gaps between technology and business. Previously, Anna worked with the BIC Corporation and Angstrom Power.

Dr. Sheryl Staub-French, P.Eng., is an Associate Professor in the Department of Civil Engineering at the University of British Columbia and the Goldcorp Professor for Women in Engineering at UBC.

Dr. Lesley Shannon, P.Eng. is an Associate Professor in the School of Engineering Science at Simon Fraser University, and director of the Reconfigurable Computing Lab.

Creating Connections 4.0

The fourth installment of the Creating Connections series of conferences is being held at Simon Fraser University on May 22 and 23, 2015. Creating Connections 4.0 will bring together people of all genders and backgrounds for two days to discuss issues of personal and professional development, networking, and inspiration.

Amyn Rajan, CEO of Simba Technologies, kicks off the Friday leadership program with a keynote address on the business case for diversity, while the afternoon sessions include parallel workshops on values-guided hiring and leadership styles. CC 4.0's Friday evening keynote panel tackles the question: "Diversity in leadership: a real value driver, or just an image thing?" followed by a networking reception. On Saturday, participants will be able to choose between professional development, career development, and diversity parallel tracks. Participation can be claimed towards members' CPD hours.

More information about Creating Connections can be found at www.sfu.ca/sfuwest/cc-2015.

For resources on Gender Diverse Workplaces, visit apeg.bc.ca/diversity.

1. *Forbes Insights: Fostering Innovation Through a Diverse Workforce*; Harvard Business Review: How Diversity can Drive Innovation; 2013

2. *Engineers Canada: Heeding the Canaries in the Coal Mine*; 2010

APEGBC Moves Forward on Mount Polley Recommendations

On January 30, 2015, the BC Ministry of Energy and Mines released the report of the independent geotechnical inquiry into the Mount Polley tailings pond breach. The review panel consisted of three international geotechnical experts: Dr. Norbert Morgenstern, P.Eng., Steven Vick and Dr. Dirk van Zyl, P.Eng.

The tailings pond dam breach occurred on August 4, 2014, at Imperial Metals' Mount Polley Mine, an open pit copper/gold mine located 30 kilometres from the community of Likely, BC. On August 18, The Ministry of Energy and Mines announced an independent geotechnical inquiry into the cause of the tailings pond breach.

In their report, the Panel stated:

"The Panel concluded that the dominant contribution to the failure resides in the design. The design did not take into account the complexity of the sub-glacial and pre-glacial geological environment associated with the perimeter embankment foundation. As a result, foundation investigations and associated site characterization failed to identify a continuous glaciolacustrine layer in the vicinity of the breach and to recognize that it was susceptible to undrained failure when subject to the stresses associated with the embankment.

The specifics of the failure were triggered by construction of the downstream rockfill zone at a steep slope of 1.3 horizontal to 1.0 vertical. Had the downstream slope in recent years been flattened to 2.0 horizontal to 1.0 vertical, as proposed in the original design, failure would have been avoided. The slope was on the way to being flattened to meet its ultimate designed criteria at the time of the incident."

In an email to members immediately following the release of the report, APEGBC urged all members involved in the design and construction of dam structures to review the report findings and evaluate applicability to their own work.

In their report, the independent panel made seven recommendations that related to the use of best available technology; enhancing regulatory, operational and corporate best practices and strengthening professional practice and professional guidelines. In particular, one of the recommendations encourages APEGBC to develop guidelines that will lead to improved site characteristics for tailings dams with respect to the geological, geomorphological, hydrogeological, and possible seismotectonic characteristics.

APEGBC is taking steps to improve dam safety in BC and demonstrate the commitment of engineers and geoscientists to high standards of professional practice.

We are moving forward by:

- Developing additional practice guidelines on site characterization for dams in BC as recommended by the Independent Expert Engineering Investigation and Review Panel.
- Gathering information on the design, construction, maintenance, operation, inspection, and reporting that occurred over the life of the Mount Polley tailings pond dam relating to compliance with the *Engineers and Geoscientists Act*, Bylaws and Code of Ethics.
- Supporting the professional practice of BC engineers and geoscientists by providing resources and education regarding practice standards and professional obligations.
- Engaging with other stakeholders such as the Ministry of Energy and Mines, First Nations, other regulatory bodies, and associations to advise and resolve issues related to the breach.

The full report of the Mount Polley Independent Expert Engineering Investigation and Review Panel is available online at www.mountpolleyreviewpanel.ca/final-report. Inspections reports and third-party reviews of tailings storage facilities at other permitted mines in British Columbia, ordered by the Chief Inspector of Mines following the failure at Mount Polley, have also been released and are available through the provincial government website at www2.gov.bc.ca. ☒

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BE CURIOUS. STAY CURIOUS.

National Engineering and Geoscience Month 2015

This past March, National Engineering and Geoscience Month (NEGM) was celebrated throughout BC. The theme for NEGM this year was: “Be Curious. Stay Curious.”

Curiosity prompts us to learn and explore, and keeps us innovative. Community activities this year included the APEGBC Science Games, a drawing contest and various branch events including the popular popsicle stick bridge building contest, Engineering and Geoscience Fest and a Geo Rocks exhibit. In addition to community events, we also had fun with APEGBC members during the NEGM Challenge and the member photo search, where we asked members to send us pictures of how they stay curious in their profession. We received many fantastic photos, which will be featured in a future issue of *Innovation*.

While these events and challenges are a great way to educate kids and keep them curious about math and science, it's also important to get them thinking about careers in engineering and geoscience.

“Engineers and geoscientists make a real difference to the communities in which they live and work,” says Ann English, P.Eng., CEO and Registrar of APEGBC. “They are the explorers, problem solvers and inventors—it’s their curiosity that keeps them innovative. By sharing that enthusiasm with the public through these events, we’re really looking to spark curiosity about these professions and hope to inspire the next generation of engineering and geoscience professionals.”

To ignite that “spark” in the general public and, in particular, children across BC various forms of media were used:

Online Videos

We teamed some curious kids with some APEGBC members and created videos showcasing what some professional engineers and professional geoscientists do each day to help our community.

Print Ads

Advertisements were placed in the following newspapers throughout March:

The Alaska Highway News, Kelowna Daily, Kamloops This Week, the Prince George Citizen, The Vancouver Sun and the Victoria Times Colonist.

Television

Sponsored 10- and seven-second spots promoting APEGBC and National Engineering and Geoscience Month were featured on CTV for the duration of March. The spots aired during the morning, noon and evening news, popular daytime TV shows, popular primetime shows and late night talk shows. These spots reached members and the public in the lower mainland as well as the following regions: Victoria, Prince George, Kamloops, Terrace, Kitimat, Kelowna and Dawson Creek.

To view all the ads and videos from the campaign, please visit the NEGM page at apeg.bc.ca/NEGM.

APEGBC would like to thank all the volunteers and branches who made National Engineering and Geoscience Month 2015 such a success. ☒



BE CURIOUS. STAY CURIOUS.

Cohen exploring the tools of the trade with geoscientist Paul Quinn, P.Eng., in Port Moody.

Celebrate National Engineering and Geoscience Month this March. Find activities in your area at apeg.bc.ca.

Professional Engineers and Geoscientists of BC

National Engineering & Geoscience Month



BE CURIOUS. STAY CURIOUS.

Sasha talks to Neal Carley, P.Eng., about what he does for the City of Port Moody as an engineer.

Celebrate National Engineering and Geoscience Month this March. Find activities in your area at apeg.bc.ca.

Professional Engineers and Geoscientists of BC

National Engineering & Geoscience Month



BE CURIOUS. STAY CURIOUS.

At the Pacific Flying Club in Delta, Weston talks to Damaneh Akhavan, P.Eng., on what it takes to become an engineer like her.

Celebrate National Engineering and Geoscience Month this March. Find activities in your area at apeg.bc.ca.

Professional Engineers and Geoscientists of BC

National Engineering & Geoscience Month

Print ads featuring APEGBC members appeared in newspapers throughout the month of March.

Seismic Thrills and Egg Spills for Future Engineers and Geoscientists at the 2015 Science Games

With wide eyes, five young faces watched the gleaming white egg speed unsteadily down the steep wooden ramp in its little car. Made up of bent straws, cut-up paper cups and scraps of sponge, the tiny vehicle and its passenger hurtled bravely towards the sudden inevitable stop threatened by the upright wooden board at the base of the ramp. Cries of delighted horror accompanied the impact of the car as the egg tumbled over, shell cracked, but largely intact, immediately followed by peals of laughter and giggles from the nine- and 10-year old test engineers.

These and much more made up the sights and sounds of 2015 Science Games. Held Saturday, March 7 at the H.R. MacMillan Space Centre and Museum of Vancouver, the event welcomed around 160 enthusiastic school-aged kids to participate in hands-on science exploration through engaging activities and friendly competition. Organized by APEGBC, the Science Games is hosted annually during National Engineering and Geoscience Month with the overall goal of getting kids excited about science, and making them aware of career opportunities in geoscience and engineering.

The day was divided into Division 1 activities for younger students from grades 1 to 3, and activities for the older Division 2 students in grades 4-6. The students competed in teams of four and five, with names like Seismic Waves, Serious about Science, Ameobas, Sparkly Science Sisters, Geoquake, Electric Shocks, The Power GEMS, and the Awesome Unicorns.

Starting off the day, Division 1 teams proudly showed judges the slides they had designed and built at home with recycled items. They then moved on to two mystery activities—learning about structures and shapes by creating tall playing card towers, and motion and forces by crash testing miniature cars.

In the afternoon, Division 2 students tested homemade seismometers on shake-tables designed to simulate an earthquake. For their mystery activities, they learned about mineral exploration by examining core samples and digging for ore deposits. They also experimented with friction, simple machines, and potential and kinetic energy by creating devices to transport ping pong balls along miniature ziplines.

Following a science demonstration by GEERing Up UBC Engineering & Science for Kids, teams were applauded at

a medal ceremony, with special recognition for teamwork and creativity. In Division 1, the gold medal went to the Coquitlam Creators, with silver going to the Gravity Kidz, and bronze to the Space Cadets.

Recognition for teamwork went to the Marble Magic, and to Super Awesome Science Masters for creativity. In Division 2, the gold medal went to the Woodward Wildcats, silver to the KAAVE's and bronze to the Mad Scientists. The Future Boyz were recognized for their teamwork, and the KAAVE's for their creativity.

Throughout the Science Games, dedicated APEGBC volunteers assisted with running and judging the activities, led by the members of the volunteer Science Games Steering Committee who created the activities for the event. Support for the event was provided through the generous sponsorship of BC Hydro, Fortis BC and Kohn Crippen Berger.

Thank you to all of our teams, volunteers and sponsors for a successful and inspiring Science Games! ☒

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Keeping the advantage

Geoscience Jobs in a Resource Economy

Jean Sorensen

As the mining and exploration industries tumbled into a two-year trough causing resource companies to shed staff, for geoscientists, trying to find a job has been like a salmon fighting to swim upstream. But, glimmers of calm waters are starting to appear and that's enough reason for job-hunting geoscientists, perhaps discouraged by a lacklustre job market, to dust off their resumes and do a little prospecting.

According to Hays Canada, a specialist recruiter, its annual salary and hiring projection survey of the natural resource sector indicates 2015 is showing some signs of rebounding. "In the upcoming year, 34% of respondents expect to increase staff levels and 43% cent are expecting to remain the same. This is cautiously optimistic," says Kerris Hougardy, manager of Hays' Resources and Mining Division. "I don't think there is going to be a big rush, but we have bottomed out and in 2015 we are going to start to see some recovery."

Darcy Baker, P.Geo., President of Equity Exploration Consultants, recently back from Toronto's Prospectors and Developers Association of Canada annual conference, says there is a general feeling of optimism. "Of course, I felt like that after last year's PDAC too," but now deals are being made, mergers are happening, and there is the feeling that the larger mining companies are beginning to show interest in acquiring properties over the next couple of years.

"I think when the market turns, it is really going to turn rapidly," he says, as metal prices rebound and the industry kick-starts new properties.

Although the market squeeze has wrung some from the industry and it's still not easy sailing for those remaining, it is time to get out there again.

Cast a Wide Net

Lindsay Steele, P.Geo., is APEGBC's geoscience practice advisor. The geoscience community is tight-knit, she says, and urges job seekers to network and cast a wide net. Steele's advice is first-hand. She was laid off from a BC junior mining company in May 2014, and it would take her nine months to land another position. "It was really the nature of the commodities industry and I know a lot of people who are still unemployed. I knew it was going to be difficult to find a job,"

She attended industry events and participated in association activities. Attending industry and association events kept her connected to the industry, produced new contacts for networking, and helped source leads on industry jobs.

Steele also realized that when the job opportunities and interviews came, she would have to market herself. It had been six years since her last interview. She talked to career counsellors and recruiters who helped her update her resume. "They encouraged me to include things that I had not previously considered, such as my ability to manage a budget and its size, and the number of people on teams I had managed." It gave her a fresh perspective on what employers might be looking for.

She stayed positive the first three months of the job search. "The next three months were pretty depressing," she admits, but it's a facet of job searching that often happens.

She went to interviews that she knew she was over-qualified for or were outside her comfort zone. It honed her interview skills, and kept the door open for other possible jobs that might crop up. She scoured the various Internet job boards looking for leads as well as corporate websites. "Look at the websites of the companies where you would like to work," she advises. It was during one of these searches that she came across a job opportunity that led to her current position at APEGBC.

More Soft Skills Required Today

Recruiting firms like Hays have seen the cycles come and go, and the current situation in BC for geoscientists is no different than that in other provinces across Canada, believes Hougardy. It's a tight market.

There is a difference between mining engineers and geoscientists, she said. When it comes to job hunting, Hougardy believes that engineers have more flexibility in transferring skills from the mining sector through to other resource sectors and the industrial, commercial and institutional areas. A mechanical engineer designing the processing mills at a mine could find an opportunity to work in the pulp and paper sector. The geoscientist has a narrower focus.

"The majority of companies ideally want someone with five to 15 years experience, APEGBC designation, flexible in their choice of location and would have breadth to their experience," Hougardy relates. A geologist with 15 years of coal exploration or mining would not be as desirable as someone with experience in precious metals, commodity metals and coal. Familiarity with software programs and computer skills are also useful. Since companies are running lean on the staff side, individuals must be willing to travel to far-flung properties.

The shopping list is expanded with soft skills. “Especially for the project geologist and exploration geologist,” remarks Hougardy. “Companies want individuals with some people management experience.”

Gone are the days of the geoscientist working only the back-end, simply supplying technical data. “They want someone who can take the technical data and translate it into commercial recommendations,” she says, which can be easily understood by those outside the industry such as investors.

Business acumen is another skill in demand. “The industry is very cost conscious and interested in saving money on a project. So, a company is looking for someone who can also translate that technical information into terms that managers can base decisions on,” she says adding that some institutions, like the BC Institute of Technology, have been running business courses targeted at introducing mining engineers and geoscientists to the business management side of a mining operation. “It provides them with an idea of how what they do fits into the bigger picture.”

Hougardy advocates posting a resume with a recruiter as a start—although she is big on networking as well. Not just face-to-face but also social media sites such as LinkedIn.

Put your resume on file with a recruiter as some jobs are just not advertised, she advises. Mining and exploration companies—especially in a tight market—don’t want to be inundated with a pile of resumes, explains Hougardy. They turn to recruiters to see who is in existing databases or to handle accessing candidates and all the associated screening and background and reference checks. At the same time, the recruiter can act as an intermediary between the company and candidate and negotiate a salary and benefits package that is reflective of the market.

Create Your Job

Andy Randell, P. Geo, has been through the cycle four times. Geoscientists often refer to ups and downs as the good and bad years, but veterans become seasoned. “After the first one, you grow a thicker skin,” he says, although downturns tend to take many younger geoscientists by surprise as they emerge from university and can’t find a job.

Strategies exist for surviving the down cycles. One is creating your own job. “When companies lay off staff, it’s usually the higher paid permanent staff and that represents a budget cut,” he tells. But, companies still need the services, perhaps in a reduced form. So, they turn to consultants.

Randell was laid off in December 2012 from an exploration company. He set up a consulting practice Strata GeoData Services (SGDS) which does contractual work but a subsidiary, SGDS Workshops, also provides educational workshops, which have become popular. He admits it has not been easy as he’s worked 30-40 hours a week in the retail sector. “You have to swallow your pride and put food on the table,” he said, but he’s built up the consulting side of his business working 60-70 hours a week and is now in the position to cut back his retail hours.

Building a consulting business is a challenge, but one he has enjoyed. “They have been the best two years of my life,”

he tells, adding that it has allowed him to build expertise in areas and regions of Canada.

As an APEGBC mentor, he has advised several new geoscientists, fresh out of university, to set themselves up as consultants when they couldn’t find a full time job. It’s a move that broadens experience, keeps them in the industry, and can serve as a safety net when another industry down-cycle occurs between full time jobs.

Keenness and Flexibility Wins the Day

Individuals surviving a downturn are those who want to stay in the industry. “They are willing to do what it takes,” says Baker. It may not be the typical work they are used to, but they take it. Baker has had work and offered it—with a bit of an apology—to individuals that he has known are over-qualified and they have taken it to keep busy. “It is really about a work ethic. Some will say they have already done these lower tasks and are not going back there. But, it is a way to keep your hand in the game,” he says.

When he’s looking to hire individuals, that keenness and flexibility goes a long way in putting a candidate out front. “I’m looking for someone with a positive and keen attitude and willing to take on whatever role that is given,” he says, adding that multitasking is a workplace reality. “Even in camp, someone has to burn the garbage and its one of the less glamorous jobs but it needs to be done. That willingness to take on anything in these downturns is the kind of attitude that shines through and it’s a good time to identify the keen people wanting to stay in the industry.”

He says that while this downturn has taken many by surprise with its duration, the industry has enjoyed a long upswing and that perhaps has made expectations higher than they should be. “You talk to some of the older guys and they tell of graduating UBC and there were 60 people competing for a job and they all had lots and lots of field work before doing supervisory work. In the last upturn, people were given more responsibility earlier in their career and now there are higher expectations. You really have to do your time in the industry.”

And, get used to the cycles. They are part of the industry, Baker says. But, the good news is that perseverance will pay off. ☒

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Disciplinary Notice – Desmond Sang Ho, P.Eng., Vancouver, BC

The Investigation Committee received a file from the Practice Review Committee for Mr. Ho's failure to respond to the Practice Review Committee contrary to section 44 of the *Engineers and Geoscientists Act* (Act).

The Investigation Committee recommended to the Discipline Committee that an inquiry be held into Mr. Ho's conduct. After the Discipline Committee issued a Notice of Inquiry regarding the matter, Mr. Ho provided to the Practice Review Committee all of the information and documents that had been sought from him. In lieu of proceeding to a disciplinary inquiry, Mr. Ho signed a Consent Order dated February 4, 2015 admitting that he contravened the Act as set out in the Notice of Inquiry and agreed to the following disposition:

1. Mr. Ho will receive a reprimand; and
2. Mr. Ho will, within a reasonable time and without any delay, provide to the Practice Review Committee any further information, record, document or thing that the Practice Review Committee may request from Mr. Ho at any time in the future.

If the above-noted conditions are not met, Mr. Ho may be subject to an Order available under section 33(2) of the Act which could include further conditions, a fine, a suspension or cancellation of Mr. Ho's membership in APEGBC.

Disciplinary Notice – William (Bill) John Lund, Grand Forks, BC

On October 17, 2013, Mr. Lund agreed to a Consent Order, under which he was required to arrange for the peer review of all of his geotechnical and structural engineering services for a period of one year. Mr. Lund failed to arrange for the peer review of his work despite numerous reminders. APEGBC subsequently received information from a municipality that Mr. Lund had continued in providing structural and geotechnical engineering services.

Consequently, APEGBC made an application to a panel of the Discipline Committee, pursuant to section 34 of the *Engineers and Geoscientists Act*, for a declaration that Mr. Lund had not fully complied with the conditions set out in the Consent Order and for an Order that Mr. Lund's membership in APEGBC be cancelled. In an Order dated January 2, 2015, the panel cancelled Mr. Lund's membership in APEGBC.

Copies of Notices of Inquiry, Consent Orders and subsequent orders for the above matters, as well as information on our complaint, investigation and discipline processes, can be found on the APEGBC website (apeg.bc.ca) under "Discipline and Enforcement" or by contacting us at 604.412.4869 or toll-free 1.888.430.8035 ext. 4869 or by email at complaints@apeg.bc.ca.

Volunteer Opportunities

Wondering how you can get involved? Serve on an APEGBC Volunteer Committee or volunteer with an APEGBC branch. You can also earn professional development hours in the process.

Throughout the year, APEGBC has a variety of opportunities for members to participate by serving on an internal or external committee. Service on a committee enables you to use your expertise and experience to help guide important practice or governance issues and connect with other volunteers.

Another great way to get involved with your local community and interact with fellow professionals is to volunteer for your local APEGBC branch. There are 15 branches around the province, and each serves as a vital link back to the association.

New committee volunteer opportunities are regularly posted on the APEGBC website. Postings describe the volunteer position, the time commitment involved, as well as desired skills and experience.

For more information about volunteer opportunities with APEGBC, contact your local branch or visit the website at apeg.bc.ca/volunteer.

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Removals for Non-Payment of Membership Renewal Fee

At the direction of Council, the following members have been removed from the register and are held in arrears of membership renewal fees for 2015, (Section 21, *Engineers and Geoscientists Act*, 1996). To determine whether the member has been reinstated, please check the APEGBC Membership Directory at apeg.bc.ca/Member-Directories or call 604.430.8035 or toll-free 1.888.430.8035.

C. Aboukinane	D. Bradac	J.G. Cowan	S.K. Ezekiel	S. Hafizimoori	J. Joseph
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M. Agamy	F.D. Brannen	C.J. Crocker	D.K. Fallis	C.F. Hails	L.N. Juimo
A.A. Ahmad	S.E. Broughton	N.J. Croken	C. Fan	L.C.L. Hall	S.H. Kabir
B.A. Albrecht	N.K. Brown	O.M. Cruz	S.J. Fang	J.A. Halucha	V. Kahle
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D.M. Anderson	M.I. Brown	J.E. Cummings	M. Farid	M.D. Harstone	I. Karidio
J.L. Anderson	B.M. Brown	T.K. Curmi	D.D. Fehr	B.P. Hau	R. Katarya
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F. Balint	C. Chan	D.C. Dechka	J. Gauthier	A.P. Hough	D.M. Kusiak
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M.R. Bassett	T. Chen	K. Devlin	A. Gharapetian	J.B. Huang	M.R. Lacy
J.A. Bathory- Frota	B.W. Chen	M.S. Dhadda	M. Ghelesel	J.L. Huettner	S.C. Ladd
B.J. Bauhuis	J. Chen	A.L. Diakow	R.W. Gibson	A.J. Hunsberger	B.G. Lafaille
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E. Bedard	B.H. Chiu	C.L. Dorosh	R.A. Gotch	P.D. Huntley	P.N. Last
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M.R. Boshek	A. Estaki	M.A. Etringer	N.N. Gurvich	R.S. Johal	M. Levesque
A.J. Bosik	M.A. Etringer	D.C. Evans	W.D. Gustafson	A.W. Johnson	M. Leyderman
A.J. Bozzi	G.V. Hadjiso- phocleous			K.B. Johnson	L. Li
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				S.T. Jones	A.M. Lier
				A.R. Jonsson	R.A. Littlefair

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J.J. Logan	D.M. Mitchell	R.J. Pavey	F.U. Sengoz	K.R. Sumar	S.L. Webster
A.J. Logie	G.G. Mitchell	D.J. Peterson	K. Shahabi	K.K. Sung	M.I. Weigley
M.F. Loh	D.J. Mollen-	R.N. Pierce	L. Shaheen	D.A. Sy	J.S. Weiss
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J.K. Loughlin	B.E. Morgan	C.J.P. Plante	B.J. Shea	A.K. Szojka	P.K. Wight
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R. Lu	J.D. Morton	deski	I.A. Sheriff	F.P. Tam	J.M. Willmek
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S.K. Ma	K.G. Murphy	E.G. Pow	E. Shomali	A.P. Teasell	C.F. Wolfram
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G.T. Magnus	C. Nemes	S. Prodanuk	J.G. Simpson	W.W. Tivy	worth
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S. Makarevski	L.J. Ng	M.M. Rahman	J.M. Siu	R.J. Trembley	T.X. Xu
M.L. Malott	E.L. Nguyen	M. Raissi	J.S. Skitmore	D.K. Truong	Y. Xue
R. Manafi	M.J. Nishiyama	N. Rangsimaha-	D.W. Slack	O.A. Tsoi	H. Yang
N.L. Mani	E.M. Nobre	riwong	T.S. Small	C. Turcotte	K. Yang
N.K. Mao	M.P. Nolan	C.A. Reid	E.G. Smedley	M.J. Turner	M. Yassan
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S.J. Marlow	R.M. Norman	H.A. Rodger	T.E. Smolik	M.J. Ursel	H.E. Yuen
B.A. Martin	E.W. Norton	B.T. Rodgers	D.W. Snyder	A.J. Vachon	D.R. Zabarylo
M. Masse	N. Ocran	G.P. Rogers	S. Sok	G.W. Vail	M. Zaman
T.L. Matchim	R. Ogoniek	W.J. Rolleman	D.H.J. Sokoloff-	C.C. Valen-	N.G. Zavitz
J.F. Matheson	K.E. Okuszeko	D. Ryan	Olafson	tinuzzi	R.D. Zawada
S.M. Mathews	R.C. Olson	A.J. Sagan	F. Soleymany	Y. Vallieres	Q. Zhang
L. Matutinovic	S.K. O'Neill	H. Saiedi	Moayed	N.J. Van Allen	Z. Zhao
A.D. Maynard	D.S. Optyker	K.A. Salamon	Y. Song	W.D. van der	Y.L. Zhu
J.L. McCord	J. Ouellet	M.B. Salkeld	J.P. Sorbara	Lee	M.N. Zulkafly ☒
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J. McCreanor	S.E. Page	K.A. Salzsauler	B.A. Spiegel	heide	
J.A. McCreedy	M. Page	S.N. Sampat	A.M. Stapleton	P. Verma	
M. McDougall	V.R. Paloschi	J.S. Sandhu	R.J. Steinburg	K.C. Vidal	
P.J. McGuigan	S.S. Pangli	J. Sanghera	M. Stepanek	A.J. Wakelin	
C.R. McLean	A.A. Papian	S.S. Sanghera	M.B. Stephen-	B.R. Waldie	
M.D. McLeod	Gorji	G.T. Saretzky	son	B.R. Walhovd	
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kamp	S.S. Parsi	J.W. Schick	D. Storrow	K. Wang	

IN MEMORIAM

The Association announces with regret the passing of the following members:

- R.J. Armstrong, P.Eng.**
B.Sc. Alberta '35
- W.G. Baird, P.Eng. B.Sc.**
Strathclyde '62, M.Sc. Manchester '65
- J.L. Balmer, P.Eng.**
B.A.Sc. UBC '49
- H. Benson, P.Eng.**
B.A.Sc. UBC '51
- K.L. Blazek, P.Eng.**
Inz. Czech Tech. U. of Prague '56
- E.D. Blix, P.Eng. B.Sc.**
Leeds '54, M.Sc. Leeds '64
- G.J. Bowen, P.Eng. B.Sc.**
University of Manitoba '49
- J.R. Brown, P.Eng.**
O.N.C Essex Tech. College '53
- N.C. Bruce, P.Eng.**
B.A.Sc. UBC '42, M.A.Sc. UBC '49
- C.M. Campbell, P.Eng.**
B.A.Sc. UBC '38
- V. Cancar, P.Eng. Dipl.**
Inz. Sarajevo '79
- H. Coleopy, P.Eng.**
B.A.Sc. UBC '51
- L.G. Corsiatto, P.Eng.**
B.Sc. UBC '69
- P.T. Cote, P.Eng. B.A.Sc.**
UBC '48
- S.F. Crocker, P.Eng. B.S.**
Washington, Seattle '37
- R.O. Darling, P.Eng. B.S.**
California Inst. of Tech. '47
- R.J. Darney, P.Geo. B.Sc.**
UBC '67
- L.B. Davies, P.Eng.**
B.A.Sc. UBC '47
- G. Daykin, P.Eng.**
B.A.Sc. UBC '51
- J.L. DeLeen, P.Eng.**
B.A.Sc. UBC '43, M.A.Sc. UBC '46, E.M. California, Berkeley '50
- J.F. Douglas, P.Eng. B.Sc.**
Alberta '37
- T.S. Dybhavn, P.Eng.**
B.A.Sc. UBC '50
- A.H. Elliott, P.Eng.**
B.A.Sc. UBC '43
- J.B. Evans, P.Eng. B.E.**
Melbourne '51
- F.Y. Fang, P.Eng. B.Sc.**
Tianjin '45, M.Sc. Manitoba '61
- J.M. Ferguson, P.Eng.**
B.Sc. Saskatchewan '46
- M.A. Fillipone, P.Geo.**
B.S. New York State, '83, M.Sc. UBC '87
- R.C. Freyman, P.Eng.**
B.E. Saskatchewan '47
- J.D. Gunn, P.Eng.**
B.A.Sc. UBC '58
- T.R. Haigh, P.Eng. B.Sc.**
Calgary '74
- F.D. Hall, P.Eng. H.N.C.**
Loughborough College '43
- G.R. Harris, P.Eng.**
A.C.S.M. Exeter, inc. Camborne School of Mines '51
- S.R. Hayden, P.Eng.**
B.Sc. Alberta '47, M.Sc. Alberta '49
- P.S. Henderson, P.Eng.**
B.A.Sc. UBC '50
- N.S. Hepburn, P.Eng.**
B.A.Sc. UBC '50
- T.L. Horsley, P.Eng.**
B.A.Sc. UBC '52
- J.I. Johansson, P.Eng.**
B.Sc. Manitoba '58, M.B.A. UBC '72
- W.L. Kent, P.Eng. B.Sc.**
Alberta '31
- W.G. King, P.Eng.**
B.Eng. McGill '50
- R.S. Kwok, P.Eng. B.S.**
California, Berkeley '72, M.S. California, Berkeley '73
- J. Lang, P.Eng. M.Eng.**
Concordia '72
- D.L. McKenzie, P.Eng.**
B.Sc. Missouri, Rolla '74
- D.W. Nestor, P.Eng. B.S.**
California, Berkeley '60
- P. Pagani, P.Eng. B.A.Sc.**
UBC '70
- B.G. Pewsey, P.Eng.**
A.C.S.M. Exeter, inc. Camborne School of Mines '64
- J.R. Powell, P.Eng.**
B.A.Sc. UBC '45
- H.A. Price, P.Eng.**
B.A.Sc. UBC '50
- F.E. Rutquist, P.Eng.**
B.A.Sc. UBC '46
- K.W. Smith, P.Eng.**
B.A.Sc. UBC '49
- S.R. Stiles, P.Geo. B.Sc.**
California, Santa Cruz '91
- D.R. Taylor, P.Eng.**
B.Eng. McGill '37
- D.M. Williams, P.Eng.**
B.Sc. Alberta '50

LIFE MEMBERS

The following members have been granted Life Membership under Bylaw 10(c1)

- G.S. Anderson, P.Eng.**
B.Sc. Manitoba '63
- R.E. Anderson, P.Eng.**
B.A.Sc. Toronto '59, M.A.Sc. Toronto '71
- D.L. Anderson, P.Eng.**
B.Sc. Alberta '56, M.S. Illinois, Chicago '62, Ph.D. Stanford '65
- F.J. Astbury, P.Eng.**
B.A.Sc. UBC '66

- W.G. Bacon, P.Eng.**
B.A.Sc. UBC '67, Ph.D. UBC '79
- W.H. Barnes, P.Eng. B.S.**
Montana State, Bozeman '69
- R.A. Baturin, P.Eng.**
B.Sc. Manitoba '62
- P.W. Bell, P.Eng. B.A.Sc.**
UBC '62, M.A.Sc. UBC '66, Ph.D. Colorado State '74
- C.K. Benner, P.Eng.**
Dipl. Haileybury School of Mines '73
- F.B. Birch, P.Eng. B.Sc.**
Saskatchewan '65
- A. Black, P.Eng. B.Sc.**
Strathclyde '64
- R.D. Bradbury, P.Eng.**
B.A.Sc. UBC '68
- C.O. Brawner, P.Eng.**
B.Sc. Manitoba '53, M.Eng. TUNS '58
- C.J. Buzun, P.Eng.**
B.Sc. Alberta '65
- D.E. Campbell, P.Eng.**
B.S. Washington, Seattle '58
- R.J. Caven, P.Eng.**
B.A.Sc. Toronto '67
- W.S. Chan, P.Eng.**
B.A.Sc. UBC '71
- S.L. Chen, P.Eng. B.E.**
Melbourne '61
- D.J. Connor, P.Eng.**
B.A.Sc. UBC '63, M.A.Sc. UBC '65, Ph.D. UBC '69
- D.L. Cronin, P.Eng.**
B.Sc. New Brunswick '66, M.Sc. Alberta '68, M.B.A. McMaster '74
- W.M. Dowall, P.Eng.**
HNC Paisley Tech. College '61, APEGBC Exams '70
- R.H. Dumala, P.Eng.**
B.A.Sc. Toronto '67, M.Eng. McMaster '70
- B.W. Eastman, P.Eng.**
B.Sc. UBC '68
- E.L. Faulkner, P.Geo.**
B.Sc. City U., London '58, M.Sc. Saskatchewan '60, Ph.D. Saskatchewan '64
- J.W. Gadsby, P.Eng. M.S.**
Illinois, Chicago '61
- R.F. Gerath, P.Geo. B.A.**
Central Connecticut State '73, M.Sc. McGill, Montreal '78
- A.J. Gerrebos, P.Eng.**
Ing. Ecole Centrale Arts et Metiers, Brussels '63
- G.R. Gilchrist, P.Eng.**
B.Sc. Alberta '65, M.Sc. Alberta '67
- R.A. Gonzalez, P.Geo.**
B.S. New Mexico '65, M.S. New Mexico '68
- R.S. Goodall, P.Eng.**
B.A.Sc. Waterloo '63
- J.R. Graham, P.Eng.**
B.Sc. Queen's U. of Belfast '53
- P.J. Grange, P.Eng. B.Sc.**
Manchester '65
- D.K. Grigg, P.Eng. B.Sc.**
East London '67
- W.J. Hassard, P.Eng.**
B.A.Sc. UBC '65
- P.S. Hatfield, P.Eng.**
B.Sc. Durham '58
- G.H. Heiman, P.Eng.**
B.Eng. Saskatchewan '68
- F. Holcapek, P.Eng. B.Sc.**
UBC '69
- J.A. Jamieson, P.Eng.**
B.A.Sc. UBC '65
- J.M. Jarvis, P.Eng. B.Sc.**
Heriot Watt '71
- B. Johnson, P.Eng. B.Sc.**
London, U. College London '67
- G.L. Johnston, P.Geo.**
B.Sc. Alberta '66
- A.O. Jones, P.Eng. B.Sc.**
Queen's '66
- I.P. Kang, P.Eng. HNC**
Hong Kong Tech College '63
- D.H. King, P.Eng.**
B.A.Sc. Toronto '65, M.A.Sc. Toronto '67, Ph.D. Toronto '70
- G.R. LaRouche, P.Eng.**
B.Sc.A. Montreal, HEC Montréal '66
- D.M. Lawrie, P.Eng.**
B.A.Sc. UBC '64
- R.A. Lee, P.Eng.**
B.Eng. Royal Military College of Canada '67
- R.D. Legge, P.Eng.**
B.A.Sc. UBC '66
- B.L. Lemke, P.Eng.**
B.Sc. Alberta '61, M.Eng. UBC '77
- P.J. Leslie, P.Eng. B.Sc.**
Witwatersrand '51, M.Eng. UBC '71
- N.D. MacRitchie, P.Eng.**
B.A.Sc. UBC '51
- M. Marusic, P.Eng.**
Dipl. Inz. Ljubljana '68, Ph.D. UBC '73
- D.M. McClung, P.Eng./P.Geo. B.S.**
North Dakota State '65, A.M. Rochester '67, Ph.D. Washington State '74
- N.I. McDonald, P.Eng.**
B.Sc. Salford '68
- R.L. McKay, P.Eng.**
B.Sc. Alberta '6
- W.F. Micklethwaite, P.Eng. B.A.Sc.**
Toronto '66
- P.P. Miller, P.Eng.**
B.A.Sc. UBC '60, M.B.A. Western '64

- J.G. Naylor, P.Eng. B.Sc.**
Queen's '66
- N.R. Nicol, P.Eng.**
B.A.Sc. Toronto '57
- C.A. NicolSmith, P.Eng.**
B.Sc. Aberdeen '59
- C.S. Nishi, P.Eng.**
B.A.Sc. UBC '67
- W.E. Norquist, P.Eng.**
B.A.Sc. UBC '65
- C.R. Oakley, P.Eng.**
B.A.Sc. UBC '69, M.Eng. UBC '73
- N.R. Paget, P.Eng.**
B.A.Sc. UBC '57
- C. Pai, P.Eng. B.Sc.**
Cheng Kung National '68, M.S. Missouri, St. Louis '70, M.S. Missouri, St. Louis '72
- L.W. Pickard, P.Eng.**
B.Sc. Alberta '66
- J.O. Porter, P.Eng. B.Sc.**
Saskatchewan '62
- D.G. Robinson, P.Eng.**
B.A.Sc. UBC '62
- S.O. Russell, P.Eng. B.Sc.**
Queen's U. of Belfast '53, M.Sc. Queen's U. of Belfast '54, Ph.D. Queen's U. of Belfast '75
- R.L. Ruud, P.Eng. B.Sc.**
Calgary '74
- M.A. Ryan, P.Eng.**
B.A.Sc. UBC '67, M.A.Sc. UBC '71, Ph.D. UBC '75
- T.F. Schorn, P.Geo. Dipl.**
Haileybury School of Mines '55
- R.G. Sexsmith, P.Eng.**
B.A.Sc. UBC '61, M.S. Stanford '66, Ph.D. Stanford '67
- B. Shykora, P.Eng.**
B.A.Sc. UBC '71
- B.E. Sleeman, P.Eng.**
E.M. Colorado School of Mines '63
- W.K. Smith, P.Eng.**
B.Eng. Liverpool '56
- G.S. Smyrl, P.Eng. B.Sc.**
Alberta '66, M.Sc. Alberta '68
- P.W. Soper, P.Eng.**
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M.A. Fitch, P.Eng.
V. Gan, EIT
A.H. Gillam, P.Geo.
D.W. Graham, P.Eng.
J.V. Haddou, EIT
G.G. Hartnett, EIT
C.C. Hsieh, EIT
R.G. Idzes, EIT
G. Jarvis, P.Eng.
N.A. Jmaeff, P.Geo.
G.C. Lam, P.Eng.
D.M. Liebich, EIT
C.G. Lum, P.Eng.
N.E. MacKay, P.Eng.
M.D. McInnis, P.Eng.
A. Mir, P.Eng.
J.G. Peterson, P.Geo.
N. Pokhrel, P.Eng.
T.A.M. Purvis, P.Eng.
S.R. Ramsay, P.Eng.
J.S. Rees, EIT
J.A. Reimer, EIT
R.A. Selin, P.Eng.
K.S. Shum, EIT
A.P. Silva, P.Eng.
M. Sultan, P.Geo.
I.Y. Tang, EIT
J.P. Thompson, P.Eng.
D.A. Warren, P.Eng.
P.B. Wiggans, P.Eng.
S.B. Wilson, EIT
J.R.J. Workman, EIT
J. Yan, P.Eng.
W.Y. Yee, P.Eng. ☒

APR 13/15. APEGBC/UNBC STUDENT & INDUSTRY NIGHT.

APEGBC is hosting a Student and Industry Night on Monday, April 13 at UNBC. This event focuses on providing engineering and geoscience students with the tools to build a powerful network as well as an opportunity to interact with industry professionals. APEGBC industry professionals are invited to attend and share their experience and advice with students. Refreshments will be provided. Time: 6:00-8:00 pm. Location: UNBC Canfor Theatre, Prince George, BC. Cost: Free. *Information/registration:* apeg.bc.ca/Events/Students.

APR 13/15. ACEC-BC SPRING RECEPTION. Join ACEC-British Columbia in Victoria for an evening of discussions and networking with client groups, industry associations and senior staff from key ministries. This event will provide a unique opportunity to share your thoughts on the state of the industry with key stakeholders from a variety of backgrounds. Cost: Free to attend, light appetizers included, cash bar available at venue. *Information/registration:* call Alla Samusevich at alla@acec-bc.ca or 604.687.2811 ext. 3.

APR 20-23/15. CONFERENCE OF THE INTERNATIONAL ASSOCIATION FOR IMPACT ASSESSMENT. Conference theme: Impact assessment in the digital era. The main topics of IAIA15 include: e-Governance/big data challenges and impact assessment; exploring opportunities and risks of a globally-connected society; urbanization and smart cities; how stakeholder consultation is changing through new social participation; new technology's role in modelling and visualizing societal changes associated with major projects; how communication technology is changing the role of experts and non-experts; how instant availability of information is influencing impact assessment; and new tools for risk assessors, corporations and city managers. Location: Firenze Fiera Congress and Exhibition Centre, Florence, Italy. *Information/registration:* conferences.iaia.org/2015.

MAY 1-2/15. ITE QUAD CONFERENCE. This annual transportation conference provides a forum for transportation professionals to network, exchange ideas, discuss best practices, share research and showcase recent projects. The general focus is on land-based transportation, such as walking, cycling, transit, goods movement and vehicles. A wide variety of topics are covered, including planning, analysis, design, construction, maintenance, operations, safety, technology and financing, among others. The QUAD Conference is open to anyone who works in, is involved with or is interested in the transportation industry, including planners, engineers, contractors, operators, analysts, researchers, students, government officials and more. Location: Pan Pacific Hotel, Vancouver, BC. *Information/registration:* www.citevancouver.org/quad2015/about/.

MAY 22-23/15. CREATING CONNECTIONS 4.0. With the theme "Engaging our World," Creating Connections 4.0 will bring together people of all genders and backgrounds for two days to discuss issues of personal and professional development, networking, and inspiration. Aryn Rajan, CEO of Simba Technologies, kicks off the Friday leadership program with a keynote address on the business case for diversity, while the

afternoon sessions include parallel workshops on values-guided hiring and leadership styles. CC 4.0's Friday evening keynote panel tackles the question: "Diversity in leadership: a real value driver, or just an image thing?" followed by a networking reception. On Saturday, May 23rd, 2015, participants will be able to choose between professional development, career development, and diversity parallel tracks. Location: SFU, Burnaby, BC. *Information/registration:* www.sfu.ca/sfuwest/cc-2015/.

MAY 27/15. BC WATER AND WASTE ASSOCIATION ANNUAL CONFERENCE AND TRADE SHOW. The BCWWA Annual Conference and Trade Show is BC's premier water and wastewater industry event, featuring one of the largest trade shows of its kind in western Canada. This event is intended to facilitate professional development and networking for those working in the water industry in BC and the Yukon. The topics covered are intended to encourage discussion and knowledge sharing on current issues faced by BCWWA members and the water industry, with 75 presentations, five panels and two keynotes over two days. Connect with exhibitors; network with colleagues; engage in educational sessions; and build your skills and industry knowledge. Location: Delta Grand Okanagan Resort and Conference Centre and Prospera Place, Kelowna, BC. *Information/registration:* www.bcwwa.org/conference-registration.html. ☒



The Kamloops Pulp Mill Is Currently Recruiting For Associate Process Engineers

This is an exciting, new developmental position targeting recent graduates/E.I.T's.

Working with experienced process engineers in the Operations Department, the associate Process Engineer will receive in depth training on the complex process of pulp manufacturing as he/she applies their knowledge of chemical process operations and control towards process optimization challenges. Additionally, the associate will get an opportunity to provide process support to projects through the Engineering Department. Process troubleshooting, statistical process control, process tuning, energy efficiency, environmental improvements, and cost reduction are just a few of the many areas where this position will be adding value.

The candidate must possess:

- Desired non-technical attributes: team player, strong written and verbal communication skills; ability to work across organizational boundaries; strong organizational skills; self-starter; strong personal initiative and follow-through.
- Desired technical attributes: Bachelor or Master's degree in Chemical Engineering with emphasis in process and/or pulp and paper; or equivalent combination of education and experience.

If you think you would be an asset to our team, visit the Domtar career page or send your resume to kamloopsshr@domtar.com.

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Please note only selected candidates for an interview will be contacted. Domtar is an equal opportunity employer.

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