Association of
PROFESSIONAL ENGINEERS & GEOSCIENTISTS
of British Columbia

Council Agenda – Open Session

Friday, April 15, 2016
Whistler Room (2nd Floor Large Boardroom)
APEGBC Offices, 4010 Regent Street, Burnaby, BC
10:40 – 14:05 (estimated)

10:40 (5 min) **4. OPEN SESSION CALL TO ORDER**

Chair: Dr. Mike Wrinch, P.Eng., FEC, President

4.1. Declaration of Conflict of Interest

10:45 (15 min) **5. OPEN CONSENT AGENDA**

MOTION: That all items (5.1 to 5.10) on the Open Consent Agenda be approved.

5.1. February 12, 2016 Open Minutes — Open Minutes Feb 12, 2016

MOTION: That the February 12, 2016 Open Meeting minutes be approved as circulated.

5.2. Appointments Approval

MOTION: That Council approves the recommended appointments and re-appointments to APEGBC Volunteer Groups and to outside Organizations, as applicable.

5.3. Approval of Feedback to Geoscientists Canada Board — Approval of Feedback

MOTION: That the proposed APEGBC response to Geoscientists Canada's Board of Directors be approved.

Garth Kirkham, P.Geo., FGC, Geoscience Committee

5.4. Executive Committee

5.4.1. Agreement with NS & PEI Re: Inter-provincial Transfers — NS/PEI/BC Agmt

MOTION: That the President and CEO be authorized to sign the Agreement regarding Multiple Applications for Professional Engineer Regulation or Licence; and that APEGBC staff resources be allocated to work with other participating jurisdictions to mitigate identified operational issues prior to its implementation.

5.4.2. Approve Feedback on Engineers Canada Ends to its Linkages Task Force — EC LTF Response

MOTION: That the proposed APEGBC response to Engineers Canada's Linkages Task Force be approved.

5.4.3. Foundation Nominating Committee Terms of Reference — Foundation Nom Comm TOR

MOTION: That the amendments to the Foundation Nominating Committee Terms of Reference be approved.

5.5. Governance Committee

5.5.1. Revision to Policy on Election of Executive Committee Members — Rev Policy Re Exec Comm

MOTION: That the proposed revisions to the process for Electing Members at Large to the Executive Committee be approved.

5.6. APEGBC Position Paper on Human Induced Climate Change — Paper on Human Induced Climate Change

MOTION: That the APEGBC Council approves APEGBC's Position on Human-Induced Climate Change for final editorial and legal review before publication.

Harshan Radhakrishnan, P.Eng, Practice Advisor, Professional Practice, Standards & Development

5.7. Sustainability Guidelines (Revised) — Sustainability Guidelines

MOTION: That the APEGBC Council approve the revisions to the Sustainability Guidelines May 30, 2013 for final editorial and legal review before publication.

Harshan Radhakrishnan, P.Eng, Practice Advisor, Professional Practice, Standards & Development

5.8. Statement of Compliance Under the Pool Regulation — Statement of Compliance

MOTION: That the APEGBC Council endorse the "British Columbia Pool Regulation Statement of Compliance", pending further editorial amendments.

Peter Mitchell, P.Eng., Director of Professional Practice, Standards, & Development

5.9. APEGBC Professional Practice Guidelines – Site Characterization for Dam Foundations in British Columbia

Prof Prac Guideline – Site Charac

MOTION: That Council approve the APEGBC Professional Practice Guidelines – Site Characterization for Dam Foundations in BC for final editorial and legal review prior to publication.

Peter Mitchell, P.Eng., Director of Professional Practice, Standards & Development

5.10. Information Reports

MOTION: That Council receives the following informational reports.

5.10.1. CEO & Registrar Report

CEO & Registrar Rpt

Ann English, P.Eng., Chief Executive Officer & Registrar

5.10.2. Branch Engagement Report

Branch Engagement

Deesh Olychick

5.10.3. Engineers Canada Directors Report

Eng Can Dir Report

Russ Kinghorn, P.Eng., FEC, FGC (Hon.), APEGBC Director to Engineers Canada

Jeff Holm, P.Eng., FEC, FGC (Hon.), APEGBC Director to Engineers Canada

5.10.4. Fairness Panel Annual Report

Fairness Panel Annual Report

Garth Kirkham, P.Geo., FGC

Phil Sunderland, P.Eng., FEC, FGC (Hon.)

John Watson, P.Eng., FEC, FGC (Hon.)

5.10.5. Climate Leadership Consultation

CLC

Harshan Radhakrishnan, P.Eng, Practice Advisor, Professional Practice, Standards & Development

5.10.6. APEGBC Road Map for 2015/2016 - Update

Road Map

Ann English, P.Eng., Chief Executive Officer & Registrar

5.10.7. Committee Summary

Comm Summary

Ann English, P.Eng., CEO & Registrar

11:00 **6. OPEN REGULAR AGENDA**

MOTION: To approve the Open Regular Agenda (with any additions from the Consent Agenda).

11:00 **(40 min)**

6.1. Member Satisfaction Survey Results — Survey Results

Megan Archibald, Director of Communications & Stakeholder Engagement

11:40 **(15 min)**

6.2. Feedback on AGM Motion Regarding CPD Program — CPD Comm Recommendation

MOTION: That Council not make any changes to the current voluntary CPD program and online recording centre at this time.

CPD Committee

11:55 **(10 min)**

6.3. Council Direction on Next Steps — CPD Direction Next Steps

MOTION: That Council directs the CPD Committee to explore modifications to the CPD program.

or

MOTION: That Council directs the CPD Committee to wait until further direction from Council.

CPD Committee

12:05 **(40 min)**

6.4. 2016/17 Operating and Capital Budget — 2016/17 Budget

MOTION: That Council approve the FY2017 APEGBC operating and capital budget as presented.

MOTION: That the Professional Practice Examination Fee remain at $325.50 inclusive of GST.

Bob Stewart, P.Eng., Member of the Executive Committee

12:45 **(60 min)** **LUNCH BREAK**

13:45 **(5 min)**

6.5. February 29, 2016 Financial Results — Financial Results

MOTION: That Council receives the APEGBC financial results as at February 29, 2016.

Jennifer Cho, CPA, CGA, Director of Finance & Administration

13:50
(15 min)

6.6. Human Rights & Diversity Guideline

Human Rights & Diversity Guide

MOTION: That the APEGBC Council approve the Professional Practice Guidelines – Human Rights and Diversity, for final editorial and legal review before publication.

Peter Mitchell, P.Eng., Director of Professional Practice, Standards & Development

Laurel Buss, Communications Officer

14:05 **End of Open Session.**

MINUTES OF THE OPEN SESSION OF THE THIRD MEETING OF THE 2015/2016 COUNCIL of the Association of Professional Engineers and Geoscientists of British Columbia, held on FEBRUARY 12, 2016 in the WHISTER ROOM, APEGBC OFFICES, BURNABY, BC

Present

Council	
Dr. Mike Wrinch, P.Eng., FEC	President (Chair)
Bob Stewart, P.Eng.	Vice President
Dr. John Clague, P.Geo., FGC, FEC (Hon.)	Past President
Kathy Tarnai-Lokhorst P.Eng., FEC	Councillor
David Harvey, P.Eng., Struct.Eng., FEC	Councillor
Ana Fernandes, CIM, FCSI	Councillor
Tajdin Mitha, LLB	Councillor
Caroline Andrewes, P.Eng.	Councillor
Dan Campbell, P.Eng.	Councillor
Carol Park, P.Eng.	Councillor
Dr. Lyn Anglin, P.Geo.	Councillor
Ken Laloge, CPA, CA, TEP	Councillor
Chris Moser, P.Eng.	Councillor
Scott Martin, P.Eng.	Councillor
Cassandra Hall, P.Geo., P.Eng.	Councillor
Richard Farbridge, P.Eng.	Councillor
John Turner, P.Ag.	Councillor (via teleconference)
Staff	
Ann English, P.Eng.	Chief Executive Officer & Registrar
Tony Chong, P.Eng.	Chief Regulatory Officer & Deputy Registrar
Janet Sinclair	Chief Operating Officer
Jennifer Cho, CGA, CPA	Director - Finance & Administration
Sarah Wray	Executive Assistant to Council and to the Chief Executive Officer & Registrar
Nicole Salvian	Administrative Assistant
Deesh Olychick	Director – Member Services
Megan Archibald	Director – Communication & Stakeholder Engagement
Peter Mitchell, P.Eng.	Director – Professional Practice, Standards & Development
Gillian Pichler, P.Eng.	Director – Registration
Efrem Swartz, LLB	Director – Legislation, Ethics & Compliance
Guests	
Russ Kinghorn, P.Eng., FEC, FGC (Hon.)	APEGBC Director to Engineers Canada
Jeff Holm, P.Eng., FEC, FGC (Hon.)	APEGBC Director to Engineers Canada
Keith Trulson, EngL, AScT	ASTTBC President
Chris O'Riley, P.Eng.	BC Hydro Deputy CEO & Capital Infrastructure Project Delivery
Dr. Sarah Alloisio, P.Geo.	Executive Member, Division of Environmental Professionals
Barry Azevedo, P.Eng.	Chair, Division of Environmental Professionals

Regrets	
Garth Kirkham, P.Geo., FGC	APEGBC Director to Geoscientists Canada

OPEN SESSION – CALL TO ORDER

Dr. Mike Wrinch, President and Chair, called the meeting to order at 09:10 am. Bob Stewart acted as the Parliamentarian and Dan Campbell acted as the Membership Engagement Champion.

Guests: The Chair advised the following guests would be welcomed over the course of the meeting: Russ Kinghorn and Jeff Holm of Engineers Canada, Keith Trulson of ASTTBC (President), Dr. Sarah Alloisio and Barry Azevedo of the Division of Environmental Professionals, and Chris O'Riley of BC Hydro. The Chair also noted that Councillor John Turner is attending the meeting via teleconference.

CO-16-25 OPEN CONSENT AGENDA

MOTION: It was moved and seconded that items 5.1 to 5.2 and 5.4 to 5.7 of the Open Consent Agenda be approved.

CARRIED

Motions carried by approval of the Consent Agenda:

5.1 **MOTION** that the November 27, 2015 Open Meeting minutes be approved as circulated.

5.2 **MOTION** that Council approves the recommended appointments and reappointments to APEGBC Volunteer Groups and to outside Organizations, as applicable, as well as the extension to the Engineers Canada Director appointment.

Individual, Designation	Position	APEGBC Volunteer Group/Outside Organization	Staff Contact	Start Date	Expiry Date	New/Returning * Over 6 Years
Re-appointments (under six years)						
Matthew Cameron, P.Eng., FEC	Member	Professional Practice Committee	Peter Mitchell, P.Eng.	November 29, 2015	November 30, 2017	Returning
Mark Porter, P.Eng., Struct.Eng.	Member	Professional Practice Committee	Peter Mitchell, P.Eng.	November 29, 2015	November 30, 2017	Returning
Jeremy C.P. Araki, P.Eng.	Member	APEGBC/ABCFP Joint Practice Board	Peter Mitchell, P.Eng.	January 27, 2016	January 27, 2018	Returning
New Appointments and Re-Appointments (over six years)						
Mr. Robert Heikkila, P.Eng., FEC	Member	Consulting Practice Committee	Lindsay Steele, P.Geo.	February 12, 2016	February 12, 2018	Over 6 Years
Dr. Johanna Wolf	Member	Climate Change Advisory Group	Harshan Radhakrishnan, P.Eng., M.A.Sc.	February 12, 2016	February 12, 2018	New

Christine Bieber, P.Geo.	Member	Sustainability Committee	Harshan Radhakrishnan, P.Eng., M.A.Sc.	February 12, 2016	February 12, 2018	New
Rimon Estawro, P.Eng.	Member	Sustainability Committee	Harshan Radhakrishnan, P.Eng., M.A.Sc.	February 12, 2016	February 12, 2018	New
Mukesh Sharma, P.Eng.	Member	Sustainability Committee	Harshan Radhakrishnan, P.Eng., M.A.Sc.	February 12, 2016	February 12, 2018	New
Dana Zheng, EIT	Member	Sustainability Committee	Harshan Radhakrishnan, P.Eng., M.A.Sc.	February 12, 2016	February 12, 2018	New
Emily A. Cheung, P.Eng., FEC	Member	Professional Practice Committee	Peter Mitchell, P.Eng.	November 29, 2015	November 30, 2017	Over 6 Years
Alan Bates, P.Eng.	Member	APEGBC/ABCFP Joint Practice Board	Peter Mitchell, P.Eng.	January 1, 2016	December 31, 2018	New
Jason Olmsted, P.Eng.	Member	APEGBC/ABCFP Joint Practice Board	Peter Mitchell, P.Eng.	January 1, 2016	December 31, 2018	New
Shelly Zhao, P.Eng., Struct.Eng.	Member	APEGBC Technical Review Board	Peter Mitchell, P.Eng.	February 1, 2016	February 1, 2018	New
Adam Lubell ,P.Eng	Member	APEGBC Technical Review Board	Peter Mitchell, P.Eng.	February 1, 2016	February 1, 2018	New
Mike Currie, M.Eng., P.Eng., FEC	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
Catherine Fritter, P.Eng.	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
Andy Mill, P.Eng., Struct.Eng., FEC	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
Selena Wilson, P.Eng.	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New

Colin Smith, P.Eng., FEC, FGC (Hon.)	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
Scott Martin, P.Eng.	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
John Turner, P.Ag. (ret)	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
Timothy Kwasnicki, P.Eng.	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
Dr. Michael Davies, P.Eng., P.Geo.	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
Greg Scott, P.Eng.	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
K. Adrian Gygax, P.Eng., Struct.Eng.	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
Julius Pataky, P.Eng.	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
Susan Craig, P.Geo.	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
David Melville, P.Geo.	Member	Advisory Task Force on Corporate Practice	Peter Mitchell, P.Eng.	February 1, 2016	December 31, 2016	New
Mihajla Vitkovic, M.Eng., P.Eng., CP	Member	Building Codes Committee	Gilbert Larocque, CD, P.Eng., LLB, FEC	March 8, 2016	March 7, 2018	New
Oon-Soo Ooi, P.Eng., FACI	Member	Building Codes Committee	Gilbert Larocque, CD, P.Eng., LLB, FEC	March 8, 2016	March 7, 2018	New

5.3 **This item was moved to the Open Regular Agenda.**

5.4 **MOTION** that the changes to the Looking-to-Exempt Policy (for Engineers Applicants) with respect to low risk applicants with five or more years of experience in a Canadian Environment be approved.

5.5 **MOTION** that Council receives the Strategic Plan Progress report and Key Performance Indicators update.

5.6 **MOTION** that the Open Agenda and supporting materials be published on the APEGBC website no less than 5 days prior to the Council meeting.

5.7 **MOTION** that Council receives the following information report:

- CEO & Registrar Report
- Engineers Canada Directors Report
- Geoscientists Canada Directors Report
- APEGBC Road Map for 2015/2016 - Update

CO-16-26 OPEN REGULAR AGENDA

MOTION **It was moved and seconded to approve the Open Regular Agenda with the addition of Item 5.3 of the Open Consent Agenda.**
CARRIED

CO-16-27 INCREASE TO PROFESSIONAL PRACTICE EXAMINATION FEE

MOTION It was moved and seconded that the Professional Practice Examination Fee be increased to $310 for the June 2016 session and that the fee be reviewed and reconfirmed for future examination sessions at the April 2016 Council meeting.
CARRIED

CO-16-28 RECOMMENDATION REGARDING PUBLICATION OF SALARIES

MOTION It was moved and seconded that Council address the motion from the AGM regarding the publication of staff salaries by directing that staff publish the staff compensation policy and compliance process on the web and publish the Council rationale for its decision.
CARRIED

CO-16-29 AGM SPECIAL GUEST POLICY

MOTION It was moved and seconded that Council approve the AGM Special Guest Policy, as circulated.
CARRIED

CO-16-30 CANADIAN ENGINEERING ACCREDITATION BOARD (VERBAL REPORT)

Jeff Holm, P.Eng., FEC, FGC (Hon.), APEGBC Director to Engineers Canada gave a short report on the Canadian Engineering Accreditation Board and it's accomplishments.

CO-16-31 BC HYDRO PRESENTATION

Chris O'Riley, P.Eng., BC Hydro Deputy CEO & Capital Infrastructure Project Delivery, gave a presentation on how BC Hydro is filing a rate increase application with the BC Utilities Commission and will be briefing Council on their

plans to keep rates as low as possible while making a significant investment in BC's electricity system.

Chris answered Council's questions and was thanked for his presentation and left the meeting.

CO-16-32 DIVISION OF ENVIRONMENTAL PROFESSIONAL (DEP) PRESENTATION

Dr. Sarah Alloisio, P.Geo., Executive Member of the Division of Environmental Professionals, gave a presentation on the work the DEP has been involved with. DEP aims to advance environmental engineering and environmental geoscience, to promote education and high standards of practice in the field and to present considered opinions and recommendations to Council on issues pertaining to the fields of environmental engineering and geoscience. Also in attendance to provide insight was Barry Azevedo, P.Eng., Chair of the DEP.

Sarah and Barry answered Council's questions and were thanked for their presentation and left the meeting.

CO-16-33 QUARTERLY FINANCIAL REPORT

MOTION It was moved and seconded that Council receives the APEGBC financial results as at December 31, 2015.
CARRIED

CO-16-34 REGISTRATION ADMISSION REPORT TO COUNCIL FOR CALENDAR 2015

Gillian Pichler, P.Eng., Director of Registration, presented the registration report on the prior calendar year for budget planning purposes. There was no motion.

CO-16-35 FIRST NATIONS TERRITORIAL ACKNOWLEDGMENT

MOTION It was moved and seconded that the territorial acknowledgment be included for large public meetings and events such as the annual conference and AGM and professional member induction ceremonies.
CARRIED

CO-16-36 POLICY FOR REFUGEES WITHOUT TRADITIONAL DOCUMENTATION

MOTION It was moved and seconded that the Policy regarding Applicants who are Unable to Provide Traditionally-Required Documentation be approved.
CARRIED

CO-16-37 CHANGE TO LIMITED LICENCE

MOTION It was moved and seconded that stakeholder consultation be conducted with the following groups to consider alternate designations for Limited Licence: current Limited Licence holders, their employers, and professional engineers and professional geoscientist clients, relevant authorities having jurisdiction and a representative sample of practicing professional members.
CARRIED

END OF OPEN SESSION

The Open Session ended at 1:30 pm.

Date: March 31, 2016

Report to: **Council for Decision**

From: Garth Kirkham, P.Geo., FGC
Geoscience Committee

Subject: Feedback to Geoscientists Canada's Board and Report to Council

Linkage to Strategic Plan: Continue to implement best practices in governance.

Purpose:	To request Council's endorsement of APEGBC's response to Geoscientists Canada's Board on four strategic questions.
Motion:	That the proposed APEGBC response to Geoscientists Canada's Board of Directors be approved.

Background

On March 22nd, 2016, Geoscientists Canada held the 42nd director's meeting via conference call.

Discussion

The following is the list of action items that required input from the CA's.

1. **Action - All Directors to check with their CAs about the status of geoscience definition and report back in March.**
2. **Action - GIT program guide be reviewed by all directors with their CAs and report back in March.**
3. **Action - All Directors to talk to their respective CAs about concerns on applicability of the proposed engineering national Code of Ethics in the context of geoscience and advice Geoscientists Canada is considering adopting the AGI - Guidelines for Ethical Professional Conduct and report back in March; and Bonham to circulate his Codes of Ethics presentation to Directors.**
4. **Action - Each Director to discuss informally the issue of Board diversity with their CAs.**

These items were taken to the Geoscience Committee and presented for feedback at the March 3rd, 2016 meeting. The following feedback is proposed as APEGBC's response to Geoscientists Canada's Board of Directors.

1. *The Definition of Geoscience*

As per the discussion that occurred during our March 3rd meeting, plus the current definitions for both Geoscientists Canada[1] and APEGBC that were distributed afterwards, we have not received any comments indicating that the current Geoscientists Canada definition should be updated from its current wording. If, however there is other feedback that indicates revisions are required, it is suggested that some consideration be made towards developing a more 'inclusive' definition of geoscience that is not "geology-centric". This might involve the development of enabling statements for those practicing outside the traditional areas of Geology and Geophysics. It has been mentioned that any potential update or change to the existing definition should take into consideration equating the broad area of Earth Science to Geology, Geophysics, Geochemistry, and Environmental Geoscience.

There was consensus from the committee as a whole that any changes should be done so at a national level to ensure consistency across the nation.

2. *Draft Geoscientists-in-Training (GIT) Program Guide*

With respect to the draft GIT guideline that was distributed, one comment highlighted was that the document, in some places, seems to imply the procedures are mandatory and in others there is implied flexibility. Before this document is finalized, there needs to be clarity in it as to what is required and what is just recommended because each association enrolls GITs slightly differently.

The Geoscience Committee asked that APEGBC staff review the content of the proposed GIT guide. Overall, it meshes very well with the existing APEGBC GIT Program Guide, which is currently under revision. It is felt that if this document is formally accepted by Council, staff will be able to use the information in the guideline for its intended purpose. Moreover, it is noted that the draft guideline is very close in structure and content to that of the *Engineers Canada National Guideline for Engineer-in-Training Programs*. One comment for consideration relates to the recent acceptance of the 'Competency Profile for Geoscientists at Entry-to-Practice'. Since this document is the groundwork for an eventual competency-based assessment for geoscience applicants, it should be noted that the information in the draft guideline will need to reflect any major change in the way it is recommended that experience be assessed in the future.

3. *Concerns on applicability of the proposed Engineers Canada National Code of Ethics in the context of Geoscience*

The Geoscience Committee feels that in general, it would be good to have a Code of Ethics specific to Geoscience. It was also noted that across the country, there are associations that regulate both professions as well as ones that focus solely on geoscience. Any effort made on this front needs to involve all associations to ensure the applicability of any new code of ethics with each province's Act. The Engineers Canada Code of Ethics can be found at the following link: https://www.engineerscanada.ca/code-of-ethics.

[1] *The practice of professional geoscience means the performing of any activity that requires application of the principles of the geological sciences, and that concerns the safeguarding of public welfare, life, health, property, or economic interests, including, but not limited to:*
a) investigations, interpretations, evaluations, consultations or management aimed at discovery or development of metallic or non-metallic minerals, rocks, nuclear or fossil fuels, precious stones and water resources; b) investigations, interpretations, evaluations, consultations, or management relating to geoscientific properties, conditions or processes that may affect the well-being of the general public, including those pertaining to preservation of the natural environment.

4. *Issue of Board Diversity*

The Geoscience Committee supports Geoscientists Canada in any initiatives to increase diversity among its board in terms of gender and cultural identity.

Recommendation

MOTION: That the proposed APEGBC response to Geoscientists Canada's Board of Directors be approved.

Date: April 4, 2016

Report to: **Council for Decision**

From: Executive Committee
Michael Wrinch, PhD, P.Eng., FEC, Chair

Subject: Agreement with Engineers Nova Scotia and Engineers PEI to Facilitate of Mobility Applications

Linkage to Strategic Plan: Identify engineering and geoscience practice issues and develop strategies to address them.
Continue to implement best practices in governance.

Purpose:	To request that Council endorse the President and CEO to sign the Agreement
Motion:	That the President and CEO be authorized to sign the *Agreement regarding Multiple Applications for Professional Engineer Registration or Licence;* and that APEGBC staff resources be allocated to work with other participating jurisdictions to mitigate identified operational issues prior to its implementation.

Background

In July 2015, the Councils of Engineers Nova Scotia (ENS) and Engineers PEI (EPEI) approved an agreement whereby an applicant registered as a professional engineer in another Canadian jurisdiction could make one application for registration in both associations. The agreement applied only to professional engineers from other jurisdictions applying to ENS or EPEI under the *Agreement on Internal Trade.*

This was seen to be of significant advantage to applicants in saving them the trouble of completing multiple applications for each additional jurisdiction in which they wanted to be licensed. It also had potential for saving participating associations some administrative time , as the jurisdiction receiving the request for 2 or more applications would accept the application and verify the applicant's credentials on behalf all jurisdictions.

ENS and EPEI introduced the agreement to APEGBC's President and CEO at the October Engineers Canada meeting; following which APEGBC staff sought clarity on the its intent, and the legislative and operational issues associated with its implementation. In February 2016, APEGBC suggested modifying the agreement to address some of the identified issues; and the suggested wording was accepted by ENS and EPEI. The agreement was introduced to the CEO Group of Engineers Canada in February and attracted some interest from the other jurisdictions. It was decided that interested regulatory bodies would sign the agreement at Engineers Canada's May Annual Meeting.

Discussion

The modified agreement is attached in Appendix A. Figure 1 following the agreement sets out how it is intended to work.

This type of agreement is allowed under the *Engineers and Geoscientists Act*

There are two major operational considerations that need to be resolved as the volume of applicants treated under this agreement increases.

Operational Issues

The agreement saves applicants the time to make an application and allows participating jurisdictions to save resources confirming applicants' eligibility for registration. It may go a long way to solving the frustrations felt by professional engineers who practise in many jurisdictions. Initial consideration by other jurisdictions has begun the conversation about how to develop better tools to increase the efficiency of processing applications under the *Agreement on Internal Trade.*

The agreement itself addresses two operational issues that will grow in significance as other jurisdictions become signatories and volumes of applicants increase.

a. *Participating associations will consider modifications to their own application forms or systems, to facilitate ease of application under this agreement.*

   APEGBC's application and fee payment system (and those of others who may participate) are entirely online while ENS' and EPEI's are paper-based. Having ENS or EPEI forward an application form to APEGBC would create extra work for staff and the applicant, thereby slowing the application approval process to more than the current 3 day turnaround. We are currently in discussions with Information Systems and with other potential participants regarding options for online data sharing and confirmation.

b. *Participating associations will consider incorporating a "one processing fee" system for multiple applications, to facilitate ease of application under this agreement.*

   As implemented between ENS and EPEI, full payment by the applicant of all application and registration fees for both jurisdictions is required. As it is intended to be a one application evaluation for registration by multiple jurisdiction it is recommended that participating jurisdictions determine a cost structure that will reflect both the reduced assessment time and the convenience to the applicant, so that the value proposition makes sense and is not seen to be a 'cash grab' by participating CAs.

A final consideration is that the agreement will need to be extended to Professional Geoscientists to allow implementation between participating dual registration jurisdictions.

Recommendation

MOTION: That the President and CEO be authorized to sign the *Agreement regarding Multiple Applications for Professional Engineer Registration or Licence;* and that APEGBC staff resources be allocated to work with other participating jurisdictions to mitigate identified operational issues prior to its implementation.

Appendix A: Agreement regarding Multiple Applications for Professional Engineer Registration or Licence

Date: April 4, 2016

Report to: **Council for Decision**

From: Executive Committee
Dr. Michael Wrinch, P.Eng., FEC, Chair

Subject: Engineers Canada's Linkages Task Force Board Consultation

Linkage to Strategic Plan: Continue to implement best practices in governance.

Purpose:	To request Council's endorsement of APEGBC's response to Engineers Canada's Linkages Task Force Board Consultation with Constituent Associations
Motion:	That the proposed APEGBC response to Engineers Canada's Linkages Task Force be approved.

Background

Engineers Canada's Board, through its Linkages Task Force, and in accordance with its three year linkages plan, is conducting a consultation on the following six questions:

1. What are the major challenges facing the profession in the next five years?
    a. What is needed to overcome them?
2. What is the one need that, if met, would immediately assist your association?
3. What is the greatest opportunity to provide the engineering community with value that we're missing as Engineers Canada?
4. Are there particular needs/issues you would like Engineers Canada to address?
5. What are the most critical outcomes that Engineers Canada should seek to achieve?
6. What are the strengths (and weaknesses) of the current Ends?
    a. What's missing?

The results of this exercise will be used at the next Board workshop to plan and prioritize Engineer's Canada's strategic direction for the coming year, and the longer term.

Constituent associations have been asked to provide feedback on these items at the next available meeting of their Councils.

APEGBC staff has drafted responses to each question for consideration by the Executive Committee and Council. They are attached in Appendix A.

Discussion

APEGBC's proposed responses are attached in Appendix A. They are a compendium of staff input endorsed by the Executive Committee; and are intended to provide feedback that reflects

the challenges encountered by APEGBC and others in regulating the profession and the value that Engineers Canada can to provide meet those challenges.

Recommendation

MOTION: That the proposed APEGBC response to Engineers Canada's Linkages Task Force be approved.

Appendix A: Proposed APEGBC Response to Engineers Canada's Linkages Task Force

Date: April 1, 2016

Report to: **Council for Decision**

From: Executive Committee

Subject: Approval of Revised Foundation Nominating Committee Terms of Reference

Linkage to Strategic Plan: Effective governance and resources that enable and guide APEGBC's operations.

Purpose:	To review and approve amendments to the Foundation Nominating Committee Terms of Reference.
Motion:	That the amendments to the Foundation Nominating Committee Terms of Reference be approved.

Background

In 2013, Council established the Foundation Nominating Committee to identify candidates for appointment to the APEG Foundation Board of Directors. The APEG Foundation is a charitable entity operating at arms-length from the association under the *BC Society Act*. The Foundation operates under a Board of Directors, and its membership is comprised of the current members of Council.

Discussion

The Foundation Nominating Committee has reviewed the current TOR and proposed amendments. These amendments were approved by the Executive Committee at their meeting of March 30, and are now presented to Council for their approval.

The amendments address:

1. Grammatical and other minor updates to provide clarity and align the TOR with the current APEGBC template;
2. Clarification around the composition of the committee (section 7); and
3. An amendment to reflect that the TOR should be reviewed by the Governance Committee, like other Council committees (section 14).

A clean version of the revised TOR is included in Appendix A, and a version showing tracked changes is included in Appendix B.

Recommendation

Motion: That the amendments to the Foundation Nominating Committee Terms of Reference be approved.

Appendix A – Foundation Nominating Committee TOR – clean copy

Appendix B – Foundation Nominating Committee TOR – tracked changes

Date: March 31, 2016

Report to: **Council for Decision**

From: Governance Committee
(February 10, 2016 meeting)

Subject: Revisions to Process for Electing Members at Large to the Executive Committee

Linkage to Strategic Plan: Continue to implement best practices in governance

Purpose:	To seek Council's approval for the proposed revisions to the document setting out the process for electing Members at Large to the Executive Committee
Motion:	That the proposed revisions to the process for Electing Members at Large to the Executive Committee be approved.

Background

As part of the regular review of Council policies and processes by the Governance Committee, it was noted that some revisions to the document setting out the process for electing Members at Large to the Executive Committee would be appropriate. The last time that Council had reviewed and made revisions to this document was April 11, 2014.

Discussion

The current process for electing Members at Large to the Executive Committee is working reasonably well. The only area that has caused some confusion is the stipulated deadline for the submission of nominations. The current wording is, "…deadline is normally two weeks prior to the Inaugural Council meeting." This wording has led to some confusion and debate in the past for some members of Council. The proposed revisions to this wording as shown in the red-lined copy of this document attached will address this problem.

The other revisions to this document as shown in the red-lined copy are house-keeping in nature and are self-explanatory.

Recommendation

The Governance Committee recommends that the proposed revisions to the process for Electing Members at Large to the Executive Committee be approved by Council.

Attachments: Red-lined and final copies of the document referenced above.

Process for Electing Members at Large to the Executive Committee

1. Election Ballot and Timing

The election will be conducted each year at the Inaugural meeting of Council via letter ballots prepared in advance of the meeting.

2. Nominations for Election Prior to the Inaugural Council Meeting:

Nominations must be completed before any balloting takes place. A call for self-nominations will be issued with a deadline for any interested party to place their name on the ballot. This deadline will - be ten working days (i.e., excluding weekends and statutory holidays) prior to the Inaugural Council meeting. Council will be advised of the nominees prior to the Inaugural Council meeting via email. There are no formal candidate statements or speeches – nominees are free to contact their fellow Council members on their own prior to the Council meeting.

Unless no nominations have been received prior to the meeting, there will be no nominations from the floor at the Council meeting.

If there is a single nomination for any one of the available positions, then that position will be filled by acclamation.

3. Voting by Letter Ballot at the Council Meeting

A typed ballot will be prepared and distributed at the meeting. A “teller” and independent scrutineer will be appointed by Council to count votes and report back to the Chair.

Ballots are counted by the teller and scrutineer and a report given to the Chair. If one nominee secures more than 50% of the votes cast, the Chair will announce the winner without providing the specific count. If no nominee secures more than 50% of the votes, then a further round of voting between the two nominees with the highest votes will be held. The Chair will announce the winner without providing the specific count. In the case of a tie, the Chair casts the deciding vote. Once the winner has been announced the “teller” will destroy all of the ballots cast.

Originally Approved by Council, 1 April 2011 (CO-11-83)
Revised and approved by Council June 24, 2011 (CO-11-122)
Revised and approved by Council April 11, 2014 (CO-14-61)

Dco#77546-V7

Process for Electing Members at Large to the Executive Committee

~~Approved by Council April 11, 2014 (CO-14-61)~~

~~BACKGROUND~~

~~In 2011/12, Council approved revised Terms of Reference for the Executive Committee that increased membership on the Committee so as to include one elected Councillor and one government-appointed Councillor, each to be elected by Council as a whole. Council also approved a corresponding procedure for conducting the election. It turns out that the government-appointed Councillors have typically put forward a single name for appointment by acclamation, and it is preferable that this possibility be recognized in the procedure. Furthermore, it turns out that the elected Councillor position has been contested with multiple nominations (four in each of the last two years) for the position, and it would be preferable for the appointee to have secured more than a minimal number of votes. As well, it is now established that the election will occur at the Inaugural Meeting of Council, so that the Executive Committee is able to function immediately after the Annual General Meeting. The Governance Committee is of the view that the corresponding procedure should be updated to reflect the above considerations.~~

~~PROCESS~~

~~Voting Method~~

~~A)~~ 1. Election Ballot and Timing

The election will be conducted each year at the Inaugural meeting of Council via letter ballots prepared in advance of the meeting.

~~B)~~2. Nominations for Election Prior to the Inaugural Council Meeting:

Nominations must be completed before any balloting takes place. A call for self-nominations will be issued with a deadline for any interested party to place their name on the ballot. This deadline will ~~normally -~~ be ~~two weeks~~ ten working days (i.e., excluding weekends and statutory holidays) prior to the Inaugural Council meeting. Council will be advised of the nominees prior to the Inaugural Council meeting via email. There are no formal candidate statements or speeches – nominees are free to contact their fellow Council members on their own prior to the Council meeting.

Unless no nominations have been received prior to the meeting, there will be no nominations from the floor at the Council meeting.

If there is a single nomination for any one of the available positions, then that position will be filled by acclamation.

~~C)~~3. **Voting by Letter Ballot at the Council Meeting**

A typed ballot will be prepared and distributed at the meeting. A "teller" and independent scrutineer will be appointed by Council to count votes and report back to the Chair.

Ballots are counted by the teller and scrutineer and a report given to the Chair. If one nominee secures more than 50% of the votes cast, the Chair will announce the winner without providing the specific count. If no nominee secures more than 50% of the votes, then a further round of voting between the two nominees with the highest votes will be held. The Chair will announce the winner without providing the specific count. In the case of a tie, the Chair casts the deciding vote. Once the winner has been announced the "teller" will destroy all of the ballots cast.

Originally Approved by Council, 1 April 2011 (CO-11-83)

Revised and approved by Council June 24, 2011 (CO-11-122)

Revised and approved by Council April 11, 2014 (CO-14-61)

Date: April 4, 2016

Report to: **Council for Decision**

From: Harshan Radhakrishnan, P.Eng.
Practice Advisor, Professional Practice Standards and Development

Subject: Position Paper on Climate Change

Linkage to Strategic Plan: Members and future members: Improve resources and education as well as awareness and access to resources that help members practice to high professional and ethical standards.

Purpose:	To present the APEGBC's Position on Human-Induced Climate Change for approval by the Council.
Motion:	That the APEGBC Council approves APEGBC's Position on Human-Induced Climate Change, for final editorial and legal review before publication.

Background

The Climate Change Advisory Group (CCAG) was created by Council resolution in March of 2012. The mandate of the CCAG is:

- To define key messages from Council to members, government and communities on the subject matter based upon the duties and objects set out in the *Engineers and Geoscientists Act*.
- To advise Council on matters that would be appropriate for government policy development or policy improvement.
- To provide input for consideration where APEGBC is preparing or refining practice guidelines.
- To provide recommendations to Council on ways and means to respond to requests for association support and/or participation.
- To be available to Council for guidance in its capacity as an advisory group by identifying the risks and opportunities facing the profession.

The Council appointed members of the CCAG are:

- Mark Porter, P.Eng., Struct.Eng., Chair
- Conor Reynolds, P.Eng. PhD, Vice Chair
- Brent Burton, P.Eng.
- Sean Marte, P.Eng.
- Brian Menounos, P.Geo., PhD

- Chris Moser, P.Eng. (Council designate)
- Glen Parker, P.Eng.
- Malcolm Shield, P.Eng., PhD
- Glen Shkurhan, P.Eng.
- Johanna Wolf, PhD (Climate Action Secretariat, BC Ministry of Environment)

In their 2014/2015 Annual Report to Council on May 30, 2015, the CCAG informed Council of their work plan for the past year. One of the key initiatives on the 2014/2015 work plan was the development of a second Position Paper on Climate Change for Council's consideration. Attached to this report is the Position Paper prepared by the CCAG for Council's endorsement (Appendix A).

The attached APEGBC Position on Human-Induced Climate Change (climate change mitigation) compliments the existing APEGBC position paper on climate change adaptation which is titled *A Changing Climate in BC – Evolving responsibility for APEGBC and APBEGBC Registrants*.

Discussion

The positions that are articulated in this position paper are as follows:

A. APEGBC accepts that there is strong evidence that human activities, in particular activities that emit greenhouse gases, are contributing to global climate change.

B. APEGBC Registrants have the potential to influence greenhouse gas emissions through their professional activities, and are expected to consider the impact of their work on the climate.

The first position is based on the recognition that best available scientific evidence indicates that the global climate is changing at an unprecedented rate and that emissions of carbon dioxide and other greenhouse gases from human activities are the leading contributors to this change. The second position recognizes that engineers and geoscientists have important roles and responsibilities within their professional practice that can positively influence how energy and resources are produced and used, thus helping to reduce greenhouse gas emissions and mitigate climate change. Through the establishment of these positions, APEGBC is acknowledging the need to provide guidance to its members on practicing in a changing climate through the provision of professional practice guidelines that relate to climate change mitigation and adaptation.

As explained in the position paper, APEGBC is actively engaged in developing and enhancing all of its professional practice guidelines to ensure that they accurately reflect the standard of care that would be expected of APEGBC professionals related to climate change. The paper goes on to explain that APEGBC intends to continue to help its registrants keep their knowledge current on the topic of climate change and its implications, by providing links to relevant resources and tools on a Climate Change Information Portal on the APEGBC website.

To ensure that groups within APEGBC have been sufficiently consulted on the position paper, the CCAG has consulted the following committees and divisions within APEGBC between September 10, 2015 and March 14, 2016:

- Building Enclosure Committee
- Building Codes Committee

- Division of Environmental Professionals
- Municipal Engineers Division
- Consulting Practice Committee
- Sustainability Committee
- Geoscience Committee
- Division of Energy Efficiency and Renewable Energy
- Professional Practice Committee

A number of changes have been made to the position paper based on the feedback received from consulted committees and divisions. All of the feedback received, as well as changes made in response to the feedback, is outlined in detail in the attached "Response to consultation" document (Appendix B). The final version of the position paper, including all changes in response to the consultation process, is also attached.

At its meeting on March 29, 2016, the Professional Practice Committee made minor editorial changes and passed the following motion:

MOTION: The Professional Practice Committee has reviewed the consultation process that the Climate Change Advisory Group underwent in developing *APEGBC's Position on Human-Induced Climate Change*. In concluding that sufficient consultation has taken place the Committee is recommending that this position paper be approved by APEGBC Council for final editorial and legal review before publication.

Recommendation

It is recommended that the APEGBC Council approve the following motion:

MOTION: That the APEGBC Council approves *APEGBC's Position on Human-Induced Climate Change* for final editorial and legal review before publication.

Appendix A – APEGBC's Position on Human-Induced Climate Change

Appendix B – CCAG Response to Consultation on the Mitigation Position Paper

Date: April 4, 2016

Report to: **Council for Decision**

From: Harshan Radhakrishnan, P.Eng., M.A.Sc.
Practice Advisor, Professional Practice

Subject: Revisions to APEGBC's 2013 Sustainability Guidelines

Linkage to Strategic Plan: Members and future members: Improve resources and education as well as awareness and access to resources that help members practice to high professional and ethical standards.

Purpose:	To present the revisions to the 2013 *Sustainability Guidelines* for decision.
Motion:	That the APEGBC Council approve the revisions to the *Sustainability Guidelines*, May 30, 2013, for final editorial and legal review before publication.

Background

As outlined in APEGBC's strategic plan for 2014-2017, APEGBC is committed to improving the resources and education as well as awareness and access to resources that help members practice to high professional and ethical standards. To achieve this, APEGBC professional practice is committed to updating two existing professional practice guidelines and releasing two new professional practice guidelines per year.

The Climate Change Advisory Group engaged Summit Environmental Consultants in a review of the existing professional practice guidelines, who recommended a number of revisions to the *Sustainability Guidelines*. These recommendations can be found in the attached report *Practice Guideline Review: Climate Change*.

The Sustainability Committee has reviewed the recommended revisions and is proposing the revisions in the attached document so the *Sustainability Guidelines* better reference climate change. The Sustainability Committee has distributed the proposed revisions across the relevant APEGBC committees and divisions for internal review and the consultation process has been reviewed by the Professional Practice Committee.

Discussion

This is the second professional practice guideline (the first one being Guidelines for Professional Practice) that has been updated to better reference climate change in response to recommendations from Summit Environmental Consultant's report. The Sustainability Committee deliberated on the recommendations and accepted most of them. Where necessary the committee made editorial changes to fit with the narrative of the existing 2013 *Sustainability Guidelines*. Based on deliberations on Summit Environmental Consultant's recommendations and engagement of APEGBC committees and divisions, the following underlined statements have been incorporated into the current 2013 *Sustainability Guidelines*:

Guideline 1: Maintain a Current Knowledge of Sustainability

- By maintaining a current knowledge of sustainability, guided by sound, peer-reviewed science as they related to professional engineering and geoscience practice, APEGBC professionals provide greater long-term value by delivering smart sustainable solutions that extend across disciplinary boundaries and address the wider impacts of the project
- Additional benefits to APEGBC professionals and the public may include:
    - Proactive management of issues such as adaptation to climate change, reduction of carbon emissions, and energy/materials/waste minimization in advance of government regulation on these issues (BC's regulation of carbon, new building energy codes, etc.)

Guideline 2: Integrate Sustainability into Professional Practice

- In reviewing a project's full life cycle costs the APEGBC professional needs to consider measures to mitigate climate change, including but not limited to minimizing greenhouse gas emissions while balancing economic, social and environmental factors

Guideline 5: Assess Sustainability Performance and Identify Opportunities for Improvement

- These improvements should adopt a multi-disciplinary approach, consider risk based assessments and consider cumulative impacts, social values, economic requirements, and environmental aspects. As knowledge of sustainability evolves, updates may be required to existing codes, guidelines and standards

Additionally, the Sustainability Committee added the underlined statement within the limitations section of the guidelines:

- "An APEGBC professional is not expected to assume responsibility for incorporating sustainability in work or tasks beyond the APEGBC professional's scope of authority. For example, an APEGBC professional is not responsible for implementing sustainable solutions such as greenhouse gas mitigation efforts if the APEGBC professional's scope of authority limits him or her from doing so."

The Sustainability Committee consulted the following committees and divisions within APEGBC on the proposed revisions to the Sustainability Guidelines between 26 November, 2015 and 22 January, 2016:

- Climate Change Advisory Group
- Building Codes Committee
- Consulting Practice Committee
- Division of Environmental Professionals
- Municipal Engineers Division
- Professional Practice Committee

At its meeting of 26 November 2015, the Climate Change Advisory Group passed the following motion:

MOTION: It was moved and seconded that the Committee has reviewed the revisions to the 2013 Sustainability Guidelines and is supportive of the revisions contained therein.

At its meeting of 29 March 2016, the Professional Practice Committee passed the following motion:

MOTION: The Professional Practice Committee recommends that the APEGBC Council approve the revisions to the *Sustainability Guidelines* for final editorial and legal review before publication.

Recommendation

It is recommended that the APEGBC Council approve the following motion:

MOTION: That the APEGBC Council approve the revisions to the *Sustainability Guidelines*, May 30, 2013 for final editorial and legal review before publication.

Appendix A – Summit Report – Practice Guideline Review Climate Change

Appendix B – APEGBC Sustainability Guidelines

Date: April 4, 2016

Report to: **Council for Decision**

From: Gilbert Larocque, CD, P.Eng., LLB, FEC
Associate Director Professional Practice

Subject: Statement of Compliance under *Pool Regulation*

Linkage to Strategic Plan: Promote reliance on professionals in government legislation
Establish a common level of expectation among stakeholders regarding the practice of the professions in the public's interest.

Background

Sections 4, 5(1), 5(2) and 6(2) of the *Pool Regulation*, B.C. Reg. 296/2010 respectively state:

> **DEFINITIONS FOR THIS PART**
>
> **4** In this Part:
>
> **"architect"** means a person who is registered or licensed under the *Architects Act*;
>
> **"engineer"** means a person who is registered or licensed as a professional engineer under the *Engineers and Geoscientists Act*.
>
> **Construction permit required**
>
> **5** (1) Subject to subsection (6), a person must not construct a pool unless the person
>
> (a) holds a construction permit issued under this regulation, and
>
> (b) complies with the terms and conditions, if any, of the permit.
>
> (2) A person may apply for a construction permit by submitting to a health officer an application accompanied by the plans and specifications for the construction as prepared, sealed and certified by an engineer or architect.
>
> **Operating permit required**
>
> **6** (2) A person may apply for an operating permit by submitting to a health officer an application accompanied by the following:
>
> (a) if no operating permit has ever been issued for the pool, or the pool has undergone construction since an operating permit was last issued,
>
> (i) a signed statement from an engineer or architect that the pool has been constructed so as to substantially comply, in all material respects, with the plans and specifications submitted under section 5 (2) *[construction permit required]*

By effect of these sections, for an owner to obtain an operating permit for a pool once it has been constructed, an engineer or an architect must submit a statement that the pool has been constructed and substantially complies, in all materials respect, with the plans and specifications submitted at the time of the application for the construction permit for that pool. There currently exist no standard wording for the statement required under Section 6(2)(a)(i) of the *Regulation*.

Discussion

In the absence of standardized wording for the statement required under Section 6(2)(a)(i), some Health Authorities have created their own forms. Those forms, however, often contain language that goes beyond the requirements of Section 6(2)(a)(i) and includes wording that could potentially:

- void the insurance policy of the engineer or architect; or
- make an engineer or architect liable for conditions pertaining to the operation of the pool and over which an engineer or architect has no control once the control of the construction pool has been passed to the pool owner, or
- both.

The Pool Subcommittee brought this issue to the attention of the Associate Director, Professional Practice who, in turn, contacted the Director, Healthy Community Environments of the Ministry of Health. APEGBC and the Ministry jointly developed the enclosed form entitled "Statement of Compliance" and the Ministry sought and obtained the agreement of the six provincial health authorities as to the wording and format of the form.

It must be emphasized that the joint agreement of all six Health Authorities on this matter is, in itself, a significant achievement, as denoted by the presence of the six logos at the bottom of that form. Recent efforts to have standardized wording and forms in other areas to be agreed upon by all Health Authorities have been much less successful.

The Pool Subcommittee of the Building Codes Committee and the Building Codes Committee have both reviewed and passed motions recommending that the APEGBC Council endorse the Statement of Compliance. The Professional Practice Committee has reviewed the Statement and process that led to its development, and has, likewise, passed a motion recommending that the APEGBC Council endorse the Statement of Compliance.

The Professional Practice Staff at the Architectural Institute of British Columbia (AIBC) has reviewed and tentatively approved the Statement of Compliance, and is pursuing the endorsement of the Statement by the AIBC Council.

Recommendation

It is recommended that the APEGBC Council endorse the "British Columbia *Pool Regulation* Statement of Compliance".

Motion: To endorse the "British Columbia Pool Regulation Statement of Compliance", pending further editorial amendments.

Appendix A - British Columbia Pool Regulation Statement of Compliance

Date: April 4, 2016

Report to: **Council for Decision**

From: Peter R. Mitchell, P.Eng.
Director, Professional Practice, Standards & Development

Subject: APEGBC Professional Practice Guidelines – Site Characterization for Dam Foundation in British Columbia

Linkage to Strategic Plan: Improve resources and education as well as awareness and access to resources that help members practice to high professional and ethical standards.

Purpose:	For Decision and Action
Motion:	That Council approve the *APEGBC Professional Practice Guidelines – Site Characterization for Dam Foundations in BC* for final editorial and legal review prior to publication.

Background

APEGBC's Professional Practice, Standards and Development (PPSD) Department focuses on the proactive regulation of professional engineering and professional geoscience. One of the important ways in which PPSD delivers on the proactive regulation of the professions is through the development of APEGBC professional practice guidelines. These guidelines identify the standard of care APEGBC professionals are expected to provide in meeting the duty of care APEGBC professionals have in law when carrying out professional activities involving the practice of professional engineering and professional geoscience.

These professional practice guidelines establish a common level of expectation, for a variety of stakeholders on what constitutes good professional practice when carrying out a particular professional activity. These stakeholders include APEGBC professionals, statutory decision makers, clients, APEGBC, the public and a variety of other groups. In 2008 APEGBC Council approved the Council Policy on the Development of APEGBC Professional Practice Guidelines.

Discussion

The *Professional Practice Guidelines – Site Characterization Assessments for Dam Foundations in BC* has been developed in response to Recommendation 6 in the *Report on Mount Polley Tailings Storage Facility Breach* prepared by the Independent Expert Engineering Investigation and Review Panel (Panel Report). The Mount Polley incident occurred on August 4, 2014 and resulted in a 40 m high section of the *dam* failing along a weak soil layer in the *dam* foundation, releasing over 20 million cubic meters of tailings and process water. The Panel was appointed by the Government of British Columbia to assess the failure and provide recommendations for improved practice.

Recommendation 6 of the Panel Report reads as follows:

"6. To improve professional Practice

Encourage the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) to develop guidelines that would lead to improved site characterization for tailings dams with respect to the geological, geomorphological, hydrogeological and possibly seismotectonic characteristics."

It was also noted in the Panel Report that the development of these professional practice guidelines are one of the best applicable practices that should be implemented.

As Mount Polley demonstrated, when the *dam* foundation is not sufficiently characterized or accounted for in the design, *dam* failure can result. The nature of the tailings *dam* failure at Mount Polley is relevant to a range of other types of *dams*, such as water reservoir *dams* and other types of storage *dams* (e.g. storage facilities utilized at oil and gas exploration or production facilities and sewerage facilities). It then follows that the application of an appropriate standard of care when carrying out site characterization for foundations is equally important for all types of *dams*. Consequently, these guidelines have been developed to be applicable to all types of *dams.*

The application of the appropriate standard of care when carrying out site characterization for *dam* foundations is fun*dam*ental to the safe construction and ongoing operation of any type of *dam*. On this basis, the appropriate standard of care identified in these professional practice guidelines has been developed so they apply to all *dam* types.

In the context of improving professional practice involving *dam* related activities, these guidelines will complement the existing *APEGBC Professional Practice Guidelines – Legislated Dam Safety Reviews in BC*, which also applies to *dams* in the mining industry and water storage *dams*.

The development of these guidelines is consistent with one of the primary objectives of APEGBC which is to establish, maintain and enforce standards for the professional practice of practitioners regulated by APEGBC.

The primary authors of these guidelines included the following:

- Harvey N. McLeod, MSc., P.Eng./P.Geo., Klohn Crippen Berger Ltd.
- Andy Small, P.Eng. and Chair of the Canadian Dam Association (CDA) Committee which issued the CDA's Mining Dams Bulletin in October 2014.
- Dirk Van Zyl, P.Eng., Ph.D., Chair of Mining and Environment at the Norman B. Keevil Institute of Mining Engineering, UBC (also a member of the government's Independent Expert Engineering Investigation and Review Panel into Mount Polley)
- Brent Ward, P.Geo., Ph.D., Department Chair, Department of Earth Sciences at Simon Fraser University

The Review Task Force formed to advise and comment on the various drafts as they were developed included the following:

- Stephen Rigbey, MASc., P.Eng., BC Hydro
- Li Yan, Ph.D., P.Eng., BC Hydro
- Michael Davies, Ph.D., P.Eng., P.Geo., Mining Association of Canada - British Columbia (MAC-BC)
- Heather Narynski, P.Eng., Ministry of Energy and Mines
- Kyle Terry, P.Geo., Ministry of Environment

- Tony Fogarassy, M.Sc., LL.M., First Nations Energy and Mining Council
- Mike Noseworthy, P.Geo., Eng.L., Ministry of Forest, Lands and Natural Resources Operations
- Canadian Dam Association (CDA) – Andy Small P.Eng. and Clare Raska, P.Eng.

Drafts of the guidelines were circulated widely through MAC-BC and the CDA and input was collected by the representatives from their groups identified above.

6 drafts were prepared and there were 3 day long meetings with the members of the review task force. At their meeting on March 4, 2016 the primary authors unanimously passed a motion recommending that the APEGBC Council approve the guidelines for final editorial and legal review before publication. All members of the review group confirmed their support for APECBC to approve the guidelines.

At their meeting on March 29, 2016 the APEGBC Professional Practice Committee (PPC) unanimously approved the following motion:

> *"The PPC recommends that Council approve the APEGBC Professional Practice Guidelines – Site Characterization for Dam Foundations in BC for final editorial and legal review before publication."*

There is a related issue which continues to be worked on through a collaboration between APEGBC, the BC government, industry and the Alberta regulators. This issue relates to the role of the APEGBC professional (the Engineer of Record) having overall professional responsibility for the dam during construction, operation and transition phases (e.g. handover of responsibility as a result of transfer of ownership on change in the EOR).

A draft definition has been prepared and is currently undergoing review by the BC government, the CDA and the Albert Chamber of Resources, Dam Integrity Advisory Committee.

It is anticipated that a recommended definition of the EOR will be put before the APEGBC Council for approval at their meeting in June 2016.

The EOR concept was initially referenced in the APEGBC Professional Practice Guideline – Legislated Dam Safety Reviews in BC. Once the definition of the EOR is finalized for approval these guidelines will be revised to include the definition.

Recommendation

Council approve the *APEGBC Professional Practice Guidelines – Site Characterization for Dam Foundations in BC* for final editorial and legal review prior to publication.

Appendix A – APEGBC Professional Practice Guidelines – Site Characterization for Dam Foundations in BC

Date: March 10, 2016

Report to: **Council for Information**

From: Ann English, P.Eng.
CEO & Registrar

Subject: CEO and Registrar Report to Council

Linkage to the Strategic Plan: Continue to implement best practices in governance.

This report summarizes activities of the Leadership Team related to the policy agenda and work implementation of the Strategic Plan and ongoing Regulatory duties of the Association since the February 12, 2016 meeting of Council.

1. Regulatory Matters

1.1 Update on the Organizational Quality Management (OQM) Program

The OQM Program has now reached a total of 429 (a 23% increase to date in this fiscal year) organizations that have registered to become OQM certified and a total of 177 (a 31% increase to date in this fiscal year) that have achieved certification. Since initiation in the fall of 2012, 177 paper audits have been carried out, 45 office audits have been completed and 32 OQM training sessions have been delivered. The City of Vancouver's Engineering Department just received OQM certification. In recognition of this the city held a press conference which was attended by the Mayor and APEGBC's CEO.

1.2 Update on Accredited Employer Member in Training Program

Four companies are now offering accredited Member-in-Training programs. A meeting of the employer advisory group for the program was held in mid-March and the representatives of the accredited firms conveyed to other group members their strong satisfaction with the program. We are hoping that others in the group who were waiting for others to adopt the program will now be interested in becoming accredited.

1.3 Update on Eng.L. to P.Eng. Bridging Program

The new bridging program has garnered significant interest from Engineering Licensees since an email announcing its launch was send to them in mid-March. To date, eight applications have been received and are being shepherded by staff to ensure that the program is well-received and applicants are provided with an appropriate risk-reward path (including the ordering of their eligibility through competency assessment balanced with writing the required examinations). It is expected that, with the timing of the FE and PE examinations, the first P.Eng. from this program may be licensed in November 2016.

1.4 Nominating Committee Update

The Nominating Committee has been working on developing its slate of candidates and will make the list available on May 29, 2016 as required by Bylaw 3. This will trigger the 30 day window for members to submit nominations supported by 25 members.

1.5 Law & Ethics Online Program

Development of the new law & ethics online seminar is well underway and currently in the implementation phase. Content development, testing and modification of each of the ten modules in now complete. The development of support tools such as explainer videos and interviews from subject matter experts are also complete. Enhanced features such as videos, narration, activities and case studies are in the process of being integrated to the online platform. The content will be ready soon to allow focus groups the opportunity to provide feedback as to the overall user experience. An instructional video and self-study guide will also be developed to provide resources to introduce users to the new online platform. The target for completion is June 2016.

1.6 Interim Report on Eng.L./Geo.L. Designation Consultation

In February 2016, Council approved proceeding with consultation on the Eng.L. and Geo.L. titles to determine the viability of adding the term "professional". Communications and Registration Staff have developed a three-phase plan to bring relevant audiences into the discussion, beginning with a survey of current Eng.L. and Geo.L.s. The survey delivery is underway but not complete as of the writing of this report. A verbal update on survey results can be provided to Council on April 15.

2. Association Matters

2.1. Association of Consulting Engineering Companies British Columbia (ACEC-BC)

A Joint Executive Committee meeting of the two organizations has been planned for April 21, 2016. The meeting will discuss common issues of interest to ACEC-BC and APEGBC.

2.2. Association of BC Forest Professionals (ABCFP)

A dinner has been scheduled for Tuesday, May 17, 2016 which will include representation from members of the Executive Committees for APEGBC and ABCFP. The focus of this function will be the formal signing of the updated Memorandum of Agreement between the two associations previously approved by the two Councils.

3. Internal Operations

3.1. Compliance Statement

APEGBC has met all of its legal obligations. There are no outstanding lawsuits or other liabilities that would materially modify our financial position.

3.2. Space Update

Finalization of the renovation plans, costs and construction phasing will occur in late April. The target is to apply for a building permit in May and for construction to start summer of 2016 and for the entire project to wrap up by the fall of 2016.

4. Member and Public Affairs

4.1. Media Interactions

The following media interactions took place during this reporting period:

- February 22: Northern Miner – Inquiry regarding discipline trends for poor reporting; penalties as deterrents; understanding the relationship between APEGBC and BCSC.

- March 7: Journal of Commerce – inquiry regarding earthquake preparedness; APEGBC's role; progress of seismic upgrading to date.

4.2. National Engineering and Geoscience Month

National Engineering and Geoscience Month (NEGM) is a celebration of engineering and geoscience held every year in March. This month-long event promotes awareness of the engineering and geoscience professions, highlights career choices in these fields and reminds the public of the many ways in which engineering and geoscience touch everyday life. APEGBC is proud to encourage this initiative, this year through a theme of **Imagine the Possibilities.** A news release was circulated to BC-wide media outlets to promote NEGM, and career awareness packages were circulated to a number of elementary and high schools around the province.

Staff, branches, and volunteers contributed to making this one of the most successful NEGM initiatives ever. Events and activities included:

- 15 branch events throughout the province
- 13 advertisements in the Alaska Highway News, Kelowna Daily Courier, Prince George Citizen, Kamloops This Week, The Vancouver Sun, and the Victoria Times Colonist, as well as two digitial ads on the Vancouver Sun webpage and affiliates, and the Victoria Time colonist web page.
- Two videos produced showcasing exceptional engineers and geoscientists – these videos received over 1,000 views combined. Videos can be viewed on the APEGBC website at www.apeg.bc.ca/negm
- 2,282 hits on APEGBC's NEGM webpages, 13,962 impressions (views) and 183 engagements (hashtag use, retweets, replies, follows) on Twitter,
- 114 entries for the NEGM drawing contest
- 165 participants in the fifth-annual Science Games, held at the Telus World of Science, and engaging children in entertaining, hands-on activities involving science, math and problem-solving skills.
- Support of Dig Day at the Britannia Mining Museum.

4.3. Branding Update

APEGBC's Branding Working Group met on March 14 and reviewed the results of the brand development process. The group was presented with two concepts for APEGBC's new brand identity, and discussed each identity system along with new name treatment options. In order to best align the brand direction with the development of the association's next three-year strategic plan, both the identities and the name treatment options will be brought forward to Council for their decision at the June Planning Session. Prior to this session, a webinar will be scheduled with Council to allow each Council member to review the concepts in detail. Additional information on this will be provided in the coming weeks.

4.4. Professional Member Induction Ceremony

Staff are currently working on a securing a date for the June professional member induction ceremony. A date will be forwarded once finalized.

4.5. Past Presidents Forum

Traditionally, the Spring Past Presidents Forum is scheduled in June immediately after the June Council meeting. As this year's council meeting will take place in Kamloops, staff is looking to schedule an alternative date. We are hoping to secure a date that would allow for the forum and professional member induction ceremony to occur on the same day. Should any Councillors have topic suggestions for the forum, please forward them to John Clague at pastpresident@apeg.bc.ca.

4.6. Submission to WorkSafe BC on the Occupational Health and Safety Regulations (OH&S Regs.)

On March 30, 2016 APEGBC made a submission to WorkSafe BC on 14 changes to the OH&S Regs. proposed by WorkSafeBC.

4.7 Submission to the BC Building and Safety Standards Branch- Climate Leadership Plan Engagement– Built Environment

With extensive input from the APEGBC Building Codes Committee and the APEGBC Building Envelope Committee on February 16, 2016 APEGBC made a detailed submission to the Building and Safety Standards Branch on building and building code related issues relevant to climate change. This submission was reviewed with members of the provincial government's Climate Change Leadership Plan-Built Environment Task Force which includes representation from APEGBC.

Date: April 1, 2016

Report to: **Council for Information**

From: Deesh Olychick, Director, Member Services;
Mara Buzgar, Member Services Coordinator
Tim Verigin, Member Services Coordinator

Subject: Branch Engagement Report

Linkage to Strategic Plan: Improve resources and education as well as awareness and access to resources that help members practice to high professional and ethical standards

Purpose:	To update Council on current Branch engagement
Motion:	No motion required.

Background

Council has identified branches as playing a fundamental role in increasing member engagement. Branches currently support and drive member engagement in several different ways. All branches were asked to provide information updates for this report to Council. Information presented here is based on those branches that provided reports.

Engagement Report for November 10, 2015 – March 28, 2016

We have identified three main areas in which branches support the association through member engagement: Outreach Initiatives, Association and Member Support, and Events and Activities. Branch activities in each of these areas are reported on for the period of time since the last branch engagement report.

Outreach Activities

Elementary and High School Students

During this reporting period APEGBC branches directly engaged over 826 elementary and high school students and over 780 public fair attendees. In addition, as part of National Engineering and Geoscience Month (NEGM), through Popsicle Stick Bridge competitions and other events, approximately 2,367 students were engaged. Outreach activities included the following:

- Victoria Branch engaged 380 students by visiting four separate schools in their area.
- Vancouver Island Branch volunteered for an 8 week program held at Bayview Elementary school for 18 students.
- Vancouver Branch volunteers participated in activities with the West Coast Area Girl Guides and engaged 479 Girl Guides.
- Peace River Branch visited schools and delivered 278 kits for students to build bridges, and then hosted a competition in Fort St. John that engaged with 110 students.

- Vancouver Branch hosted its Annual EG – Fest at the Vancouver Public Library and engaged with 535 students.
- As their first event, the newly established East Kootenay Branch interacted with 200 students at a Science Fair, and then the next day 73 students competed in their bridge building competition.
- Richmond/ Delta Branch held an NEGM event that engaged with approximately 400 students via a Popsicle stick bridge competition, various booths, a geoscience display, and project showcases.
- Fraser Valley Branch engaged a total of 104 students with two NEGM events.
- South Central Branch held a Popsicle Stick Bridge competition engaging over 100 students.

University Students

With respect to University engagement, Richmond/ Delta Branch attended the Kwantlen Science Challenge. There were 380 students present at the event. The Fraser Valley Branch held a successful EIT/ GIT seminar for 75 people. The Burnaby/ New West Branch set up a booth at BCIT and spoke to over 70 interested post-secondary students.

Association and Member Support

Mentoring Program

During this reporting period, the Vancouver Branch and Sea-to-Sky Branch collaborated to host a networking night that included a presentation on the APEGBC Mentoring Program. The event drew approximately 110 attendees that participated in speed networking and regular networking opportunities. The branches continue to promote the Mentoring Program as part of their announcements at branch events such as breakfast, lunch, and dinner seminars.

Branch Governance

During this reporting period, the Chair of the Richmond/Delta branch completed his term. We would like to thank Dr. Hamid Ghanbari, P.Eng. for his term as Chair of the Richmond/ Delta Branch and we welcome Fardin Barekat, EIT as the current Chair of the Richmond/ Delta Branch.

Events and Activities

Branch hosted events are held in almost all branches, and include tours of local projects, and breakfast, lunch or dinner presentations that are eligible for professional development hours. These events help to build a sense of community amongst members and are also open to members of the public interested in connecting with the professional engineering and geoscience community.

Collectively, out of the 12 branches that submitted their member engagement forms to APEGBC for this reporting period, the branches held 40 successful events which attracted over 1,489 attendees. The events included the following:

- Sea-to-Sky Branch dinner presentation titled, “Liquefied Natural Gas – Why is this commodity suddenly in ‘demand’?” (89 attendees)
- Victoria Branch held a dinner presentation titled, “Transportation without Fossil Fuels” (40 attendees)

- Vancouver Branch recently held their VP visit and a presentation by BC Hydro Deputy CEO Chris O' Riley (55 attendees)
- Burnaby/ New Westminster Branch hosted a seminar for Foreign Trained Professionals (50 attendees)
- Vancouver Island held their Nanaimo Dinner Meeting at the new Helijet Terminal in Nanaimo, with a presentation about Helijet operations (45 attendees)
- East Kootenay Branch did a tour of the new Intensive Care Unit at the regional hospital (12 attendees)
- South Central Branch organized a tour the Moly-Cop facilities in Kamloops (13 attendees)
- Richmond/ Delta Branch held a tour of the Covanta Facility (45 attendees)

Upcoming Events

Below is a list of upcoming events. The branches encourage Council to attend these events where possible.

Organizer	Date	Event Type	Description
Peace River	April 8, 2016	NEGM	Tumbler Ridge Popsicle Stick Bridge
Tri-City	April 19, 2016	VP Dinner	VP Update and "Aviation Accident Investigations"
Sea to Sky	April 21, 2016	Dinner Presentation	Vancouver City: Action Plan as the Greenest City
Burnaby/New West	April 22, 2016	Tour	Seymour Capilano Water Plant
Richmond/Delta	April 28, 2016	Community Outreach	Delta's Trades and Technical Career Fair
Vancouver Island	April 28, 2016	Dinner Presentation	Port Alberni Water Treatment Plant
Vancouver	May 4, 2016	Breakfast Seminar	Presentation from Port Metro Vancouver about the ECHO Program
Fraser Valley	May 7, 2016	Outreach	Kwantlen Polytechnic University Science Rendezvous
Peace River	May 14, 2016	NEGM	Fort Nelson Popsicle Stick Bridge
Vancouver	May 25, 2016	Breakfast Seminar	"City Sustainability Challenge Beyond 2020"
Burnaby/New West	May 25, 2016	Tour	Tour of UBC Earthquake Labs to watch experiments on earthquakes
Victoria	June 2, 2016	VP Dinner	Open-house showcase of the benefits efficient home building
Vancouver Island	June 3, 2016	Golf Tournament	18- Hole Texas Scramble and Dinner

For more Branch Events please visit the Branch Events Calendar.

Date: April 4, 2016

Report to: **Council for Information**

From: Russ Kinghorn, P.Eng., FEC, APEGBC Director to Engineers Canada
Jeff Holm, P.Eng., FEC, APEGBC Director to Engineers Canada

Subject: Engineers Canada Update

Linkage to Strategic Plan: Continue to implement best practice in governance.

Purpose:	To update Council on Engineers Canada activities.
Motion:	No motion required.

Canadian Engineering Accreditation Board (CEAB)

The CEAB recommendation to EC addressing accreditation concerns from the National Deans is targeted for Fall 2016.

The CEO Group (CEOs of the regulators across Canada) is urging the Accreditation Board to expedite the full transition to a Graduate Attributes (outcomes-based) Assessment of engineering programs from the current assessment which includes both Academic Units (Input-based) Assessment and Graduate Attributes Assessment.

The current dual assessment criteria are resource intensive. Washington Accord members have generally moved to assessing only outcome Graduate Attributes and find it effective in maintaining quality of engineering education.

Budget

The Engineers Canada 2016 budget was approved with a $500k deficit for the year following a $336k deficit for 2015. It is planned for deficits in the range of $500k for 2017 and 2018.

The deficits not be financed with any change of assessments to the Regulators (which include APEGBC) but will be financed from reserve funds. The purpose is to reduce the $1,588k of unrestricted reserves as at December 31, 2015 (which is on top of $5,786k of restricted reserves with include Operational General Contingency, Capital and Other Internally Restricted Reserves) as these reserve levels are too high and may cause Engineers Canada to lose its Not-for-Profit status with Canada Revenue Agency which would have significant tax implications.

Ownership Linkage

Engineers Canada is owned by 12 Constituency Associations (CAs) of which one is APEGBC thus there is a need for it to engage those owners and keep them informed of its activities. Items of significance reported at this meeting included:

- The Open Forum looked at:
    - Trans-Pacific Trade Partnership – Not a lot of news but engineering services probably will not be affected any differently than under NAFTA
    - Putting in place a way of monitoring changes to regulations across Canada so that engineering is not compromised by allowing non-engineers to do engineering work
    - Practice Guidelines – Ann presented APEGBC's work in this area but there was little time for discussion
    - Having all Regulators adopt the Engineers Canada Code of Ethics as a standard.
- Big Picture Thinking focused on a "Strategic Planning" method but to eliminate confusion with the EC Strategic Plan that is approved by the regulators annually (but looks at 3 year cycles), it was suggested to call it an Aspirational Planning method. The idea is to use the Big Picture Thinking sessions to drive the setting of strategic direction toward end-states that will, in the end, drive the Strategic Plan.
- The Canadian Engineering Qualifications Board, under the direction of Paul Blanchard, P. Eng. (past president of APEGBC) is trying to focus their efforts on the most important items in order to provide timely results
- It was pointed out that bureaucracy in registration across Canada has led to workarounds in the system (e.g. APEGBC registering some people who then transfer to Alberta as Alberta's system lacks certain flexibility)
- A retiree Health and Dental Insurance program is being rolled out
- Hits on the newcomers.engineerscanada.com (one-stop portal for potential internationally trained engineers to garner information on engineering in Canada) came, in order of frequency, from Canada, Brazil, India, Spain, USA and the UK.

Date: March 30, 2016

Report to: **Council for Information**

From: Garth Kirkham, P.Geo., FGC
Phil Sunderland, P.Eng., FEC, FGC (Hon.)
John Watson, P.Eng., FEC, FGC (Hon.)

Subject: Registration Fairness Panel Annual Report to Council
March 2015 – February 2016

Linkage to the Strategic Plan: Continue to implement best practices in governance.

Purpose:	To summarize the operation and findings of the Fairness Panel over the past year.
Motion:	No motion required.

Background

The Registration Fairness Panel (the 'Panel') is an independent, non-statutory body that examines the fairness of the process of an application when an appeal of a registration decision made by an applicant is rejected by the Registration Committee (the 'Committee'). The Panel is advisory to the Committee and reports to Council. It makes recommendations to the Committee and Registration Task Force on process, policies and procedures as warranted, and provides an annual report of its activities to Council. Its last annual report covered the period March 2014 to February 2015.

The Panel is composed of three past members of council or other senior members who have served on the Registration Committee. The current Fairness Panel members are: Garth Kirkham P.Geo., John Watson, P.Eng. and Phil Sunderland, P.Eng.. A pool of Expert Reviewers in engineering and geoscience supports the work of the Panel. The Panel consults with the Expert Reviewers at its discretion, normally when it determines that the technical competence of the applicant is at issue, rather than the process followed or adherence to policy.

Discussion

Panel Activities March 2015 through February 2016

During the reporting period, the Panel held 7 meetings. The Panel will attend the Registration Committee meeting on April 27, 2016 to present a verbal report on activities for the period March 2015 through February 2016.

Appeals and Referrals to the Panel

Table 1 on page 2 sets out the history of appeals of registration decisions over the past 7 years.

The Registration Committee reviewed 21 appeals from March 2015 to February 2016. The Geoscience Committee reviewed 2 appeals from March 2015 to February 2016. Of these cases, 16 were appeals referred to the Panel by the Registration Committee and 1 case was referred to the Panel from the Geoscience Committee. There were no special referrals this period.

The Panel agreed with the Registration Committee's original decision in 8 of the 16 appeals (50%) and agreed with the Geoscience Committee original decision in 1 or 100% of the referrals. The Fairness Panel made recommendations for registration in 6 of the cases and a second interview in 1 of the cases. Table 2 on page 2 shows the distribution by applicant type, origin and Panel recommendation for the appeals referred to the Panel.

The policy on appeals calls for the Committee to refer any instances to Council where it does not follow the Panel recommendation. There were no referrals of this nature during the reporting period.

Table 1
Appeals/Referrals Reviewed by Registration Committee
March 2015- February 2016

Year	Total	Referred to Fairness Panel	
		Appeals	**Special Referrals**
2015 - 2016	**23***	**16****	**0**
2014 - 2015	36	20	0
2012 - 2013	36	20	0
2011 - 2012	36	16	2
2010 - 2011	57	26	1
2009 - 2010	48	20	2
2008 - 2009	44	21	0

**** This number includes the two appeals received for review by the Geoscience Committee.***
*****This number includes the one appeal referred to the Fairness Panel from the Geoscience Committee***

Table 2
Appeals/Referrals Reviewed by the Fairness Panel
March 2015- February 2016

Applicant for:	**Professional Engineer**		**Professional Geoscientist**	
Outcome	Training at Bachelors Level			
FP = Fairness Panel **RC = Registration Committee** **GC = Geoscience Committee**	Canadian	International	Canadian	International
FP agrees with original RC Decision	5	3		
FP agrees with original GC Decision				1
FP recommends further action		1		
FP recommends registration	6			
TOTAL	**11**	**4**		**1**

Expert Reviewers

The Panel did not call on the services of its Expert Reviewers (see Attachment A) during the reporting period.

Terms of Reference

The Terms of Reference for the Fairness Panel were reviewed in early 2015. In June of 2015, Council approved the following changes to the Terms of Reference.

- The addition of subsection 5.2 to the Function/deliverables of the Panel section. Namely, that the Panel also examine the fairness of the process followed for an application upon referral to the Panel by the Registration Committee without an appeal. ***This addition was made as this is current practice for the Panel.***
- Changes to the wording of the document to incorporate standard wording from the Governance Committee.
- Changes to the formatting to reflect the latest format approved by the Governance Committee.

Report Prepared by: Mark Rigolo, P.Eng.
Associate Director, Engineering Admissions

Attachment A

Fairness Panel Expert Reviewers		
Engineering		
Name	**Discipline**	**Area of Expertise**
John R. Morgan, P.Eng.	Agricultural	Agricultural Construction, Hydraulics, Machinery
Lynton S. Gormely, P.Eng.	Chemical	Chemical, Process Engineering (Metallurgical), Extraction Processing (Mining)
Mahmoud Mahmoud, P.Eng.	Civil	Geotechnical
Doug S. Sinclair, P.Eng.	Civil	Municipal, Construction
Marcel L. Bernier, P.Eng.	Civil	Water, Municipal, Transportation
R. Allan Dakin, P.Eng.	Civil	Hydrogeology
Rick Heuft, P.Eng.	Computer & Software	Product Development, Software
Met A. Ulker, P.Eng.	Electrical	Power, Building Systems
Tom G.H. Lam, P.Eng.	Electrical	Telecommunications
Shail Mahanti, P.Eng.	Electrical	Building Services
Vern Buchholz, P.Eng.	Electrical	Equipment, Electronics
John Holland, P.Eng.	Environmental	Air Assessment, Monitoring, Site Remediation
Mark A.M. Grindlay, P.Eng.	Industrial	Pulp & Paper Plant Operations
George E. Plant, P.Eng.	Mechanical	Machine Design
J. Paul Anderson, P.Eng.	Mechanical	HVAC
Gordon D. Apperley, P.Eng.	Mechanical	Plant/Maintenance
Bob S. Charlton, P.Eng.	Metallurgical	
Hans F. Muhlert, P.Eng.	Naval Arch. & Marine	
Surrendar P. Menrai, P.Eng.	Structural	
Richard A. Mossakowski,	Structural	
Geoscience		
George R. Cavey, P.Geo.	Geoscience	Geology, Exploration Geology
Robert F. Gerath, P.Geo.	Geoscience	Surface Geology, Engineering Geology, Environmental
Douglas F. VanDine, P.Eng./P.Geo.	Geoscience	Soil & Rock Mechanics, Forest Practices Geology, Geotechnical Engineering

Date: April 15, 2016

Report to: **Council for Information**

From: Harshan Radhakrishnan, P.Eng.
Practice Advisor, Professional Practice Standards and Development

Subject: APEGBC's Input into the Consultation on the Climate Leadership Plan

Linkage to Strategic Plan: Provide informed perspectives on engineering and geoscience practice issues affecting public safety.

Purpose:	Council for information.
Motion:	No motion required.

Background

In January 2016, the Province released the "Consultation Guide: Building B.C's Climate Leadership Plan" (Appendix C) which was informed by 32 recommendations that the Climate Leadership Team published in October 2015 (Appendix D). The Province engaged the public in a review of the Consultation Guide and will use the feedback received to finalize the Climate Leadership Plan which is due to be released in spring 2016.

Climate change will introduce significant risk to the practice of professional engineering and geoscience. To examine how APEGBC can best work with the Province to support its members in incorporating a consideration of climate risks into their professional practice, APEGBC has provided input throughout the consultation process for the development of the Climate Leadership Plan.

In addition to the Province's request for feedback on the Consultation Guide, APEGBC was contacted by Dirk Nyland, P.Eng., the Chief Engineer of the Ministry of Transportation and Infrastructure to provide feedback on the transportation related Climate Leadership Team recommendations. To provide feedback on the transportation related recommendations, Tony Chong, P.Eng organized a meeting on March 15, 2016 between President Michael Wrinch, P.Eng., PhD, FEC and Peter Mitchell, P.Eng to discuss APEGBC's response to the transportation related recommendations. APEGBC's response to these recommendations is attached in Appendix B.

Discussion

In consideration of the April 8th deadline to provide a response to the Consultation Guide, APEGBC provided a letter from the President (appendix A) on the content of the Consultation Guide with a disclaimer that the letter may be followed up with a Council-approved response. To develop the content of the letter the Climate Change Advisory Group and the Division of Energy Efficiency and Renewable Energy were consulted. Additionally, APEGBC staff including Tony Chong, P.Eng, Peter Mitchell, P.Eng. and Gilbert Larocque, P.Eng., LLB provided input into the letter.

The core messages that were communicated in the response letter are as follows:

1. The Province needs to lead climate action in British Columbia and consult APEGBC as a stakeholder in the development of the Climate Leadership Plan;

2. Additional recommendations regarding climate change adaptation

3. The Province needs to establish regulations and funding pathways for climate change mitigation and adaptation; and

4. APEGBC requests that its representative be involved in the development of guidelines that may affect its members and their professional practice.

Recommendation

It is recommended that APEGBC Council reviews the attached the letter from the APEGBC President (Appendix A) for information.

Appendix A – Consultation Guide: Building B.C's Climate Leadership Plan – Comments from the President of the Association of Professional Engineers and Geoscientists of British Columbia

Appendix B – APEGBC's Feedback to the Ministry of Transportation and Infrastructure on Transportation Recommendations

Appendix C – Consultation Guide: Building B.C's Climate Leadership Plan January 2016

Appendix D – Climate Leadership Team Recommendations to Government

Date: April 4, 2016

Report to: **Council for Information**

From: Ann English, P.Eng.
Chief Executive Officer & Registrar

Subject: APEGBC Road Map for 2015-2016 - Update

Linkage to Strategic Plan: Effective governance and resources that enable and guide APEGBC's operations

Purpose:	To update Council on the current status of the actionable items listed on the Council Road Map for 2015-2016.
Motion:	No motion required.

Background

The attached document summarizes expected agenda items that are planned to be brought forward to Council during the 2015/2016 Council year. The items are aligned with the Strategic Plan and will help Council see the progress on elements of the Plan. This road map is not exclusive and additional items may be added as required throughout the year but will serve as a focus for this year's meetings.

Kindly note the shift of the following items from the April 15, 2016 meeting to the June 17, 2016 meeting to allow for additional time for review and/or consultation (noted in red):

- 'DEERE Presentation' within the 'Members and Future Members' row
- 'Update on Law & Ethics Online Program' within the 'Member and Future Members' row
- 'Visiting Dean' within the 'Government, Public and Other Stakeholders' row
- 'Update on Engineers Canada Bylaws' within the 'Government, Public and Other Stakeholders' row

Kindly note the removal of the following items from the Council Work Plan (noted with strike-through):

- 'Brand Development Update' (not required at this time, another update has been noted for the June Council meeting).
- 'Revised 2016/17 Strategic Plan for Approval' (there were no changes noted at the previous Planning Session, approval not required).
- 'Approval in principle of housekeeping bylaws' (there are no housekeeping bylaws, approval not required).

APEGBC Road Map for 2015-2016 - for the April 15, 2016 Council Meeting

	HIGHLIGHTS	27 Nov Council mtg	11 Feb Planning Session	12 Feb Council mtg	15 April Council mtg	June 15, 16 Planning session	17 Jun Council mtg	9 Sept Council mtg	20 -22 Oct Annual Conference and AGM
Members & Future Members	BRANCHES, DIVISIONS & SOCIETIES REPORTS	Report of the October 2015 Branch Rep Meeting		Branch Engagement Report DEP Presentation			Branch Engagement Report DEERE Presentation	APEG Foundation AGM and Benevolent Fund AGM DAWEG Presentation	
	IMPROVING MEMBER SUPPORT & BRAND		Member Engagement Report	Change to Limited Licence Title	Member Satisfaction Survey Results ~~Brand Development Update~~		Brand Development Update		
	ENHANCING REGISTRATION PROCESSES	Update on Geoscience Comptencies for Registration		1. Update on Canadian Environment Experience Pilot 2. Registration Admissions Report to Council for Calendar 2015	Fairness Panel Annual Report		Update on Law & Ethics Online Program	1. Update on Canadian Environment Experience Pilot 2. Update on Eng.L. to P.Eng. Bridging Pilot 3. Registration Admissions Report to Council for Fiscal 2016	
Members, Employers, etc.	EMPLOYER ENGAGEMENT	Labour Market Study Report		Corporate Engagement Report Visit from VP of BC Hydro Update on OQM Program	Update on OQM Program		Update on EIT Accredited Employer Pilot	Update on OQM Program	
Government, Public & Other Stakeholders	INCREASING PUBLIC CONFIDENCE		Discussion on Offshoring		Human Rights and Diversity Guideline		Approval of Award Nominations	Year End Reports on (1) Investigation and Discipline and (2) Enforcement	
	ACADEMIC OUTREACH	Visiting Dean					Visiting Dean	Visiting Dean	
	ENGINEERS CANADA AND GEOSCIENTISTS CANADA	Directors Report Joint Executive Committee Dinner with Engineers Canada (December 10)		Directors Report	Directors Report		Directors Report Update on Engineers Canada Bylaws		
Enabling Goal	STRATEGIC PLAN CYCLE AND MONITORING ACTIVITIES	New KPI Metrics	Strategic plan tweak and future visioning, semi-annual progress update on plan		~~Revised 2016/17 Strategic Plan for Approval~~	Build the 2017 - 2020 Strategic Plan		AGM Rules Strategic Plan and KPI Update	
	LEGISLATION CHANGES AND BYLAW CYCLE	CPD Bylaw Review			Update on Legislative Amendment Progress ~~Approval in principle of housekeeping bylaws~~				
	IMPROVING DIVERSITY		Update on WIEG Activities Update on Volunteer Diversity	First Nations Greeting Decision				Update on Volunteer Management Activities	
	EFFECTIVE GOVERNANCE	Council Governance Training; Council Team Building Workshop; Risk Management Assessment; Approval of Nominating Committee Appointees; AGM Motion Referral		Agenda Publication Decision Salary Publication Decision				Council Evaluation	
	FINANCIAL OVERSIGHT	Quarterly financial report/ Budget Guideline approval		Quarterly Financial Report AGM Special Guest Policy	Quarterly Financial Report/ Budget approval			Audited Financial statements/Year End Review	Approval of Auditors

Activities Completed	
Activities Behind Schedule (by end of September)	
New Item	Item has been brought forward from a previous meeting
Items Advanced	

Date: April 4, 2016

Report to: **Council for Information**

From: Ann English, P.Eng.
Chief Executive Officer & Registrar

Subject: Councillor Committee Summary

Linkage to Strategic Plan: Effective governance and resources that enable and guide APEGBC's operations

Purpose:	To provide Council with a summary of committee and Council meetings that they are to attend in the form of a live trackable chart that is easy to navigate.
Motion:	No motion required.

Background

The summary has been updated and is posted on the Council website on the homepage.

Councillor Meeting Summary - 2015/2016

	Dr. Mike Wrinch, P.Eng., FEC	Bob Stewart, P.Eng.	Dr. John Clague, P.Geo., FGC, FEC (Hon.)	Ana Fernandes, CIM, FCSI	David Harvey, P.Eng., Struct.Eng., FEC	Ken Laloge, CPA, CA, TEP	Kathy Tarnai-Lokhorst, P.Eng., FEC	Taj Mitha, LLB	Caroline Andrewes, P.Eng.	Dr. Lyn Anglin, P.Geo.	Dan Campbell, P.Eng.	Carol Park, P.Eng.	Cassandra Hall, P.Geo., P.Eng.	Richard Farbridge, P.Eng.	Scott Martin, P.Eng.	Chris Moser, P.Eng.	John Turner, P.Ag.	
Oct 17, 2015 (Council)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	
Oct 28, 2015 (Orientation)	✓	✓			✓								✓	✓	✓	✓	✓	
Nov 10, 2015 (Exec Comm)	✗	✓	✓	✓					✓									
Nov 10, 2015 (Reg Comm)					✓		✓						✗	✗				
Nov 26, 2015 (Orientation)	✓	✓											✓	✓	✓	✗	✗	
Nov 26, 2015 (Eli Mina and Team-Building)	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗	✗	
Nov 27, 2015 (Council)	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	
Dec 7, 2015 (Gov Comm)			///												///	///	///	Meeting cancelled.
Dec 8, 2015 (Exec Comm)	✓	✓	✓	✓					✓									
Dec 16, 2015 (Reg Comm)					✓		✓						✓	✓				
Jan 11, 2016 (Prof Prac Comm)													✗	✓				
Jan 13, 2016 (Nom Comm)			✓															
Jan 21, 2016 (CCAG)																✓		
Jan 21, 2016 (Geo Comm)										///	///							Meeting cancelled.
Jan 25, 2016 (Gov Comm)			///					///							///	///	///	Meeting cancelled.
Jan 27, 2016 (Reg Comm)					✓		✓						✗	✓				
Feb 2, 2016 (ASTTBC/APEGBC JB)							✓											
Feb 9, 2016 (Nom Comm)			✓															
Feb 10, 2016 (Gov Comm)			✓					✓							✓	✓	✓	
Feb 11, 2016 (Planning Session)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✗	
Feb 12, 2016 (Council)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Feb 26, 2016 (Foundation Nom Comm)					✓	✓		✓										
Feb 29 - Mar 1, 2016 (Govt Lobby Receptions)	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✗	✗	✓	✗	✗	✗	Victoria
Mar 2, 2016 (Nom Comm)			✓															
Mar 3, 2016 (Geo Comm)										✓	✗		✗					
Mar 9, 2016 (Reg Comm)					✓		✓						✗	✓				
Mar 17, 2016 (Exec Comm)	///	///	///	///					///									Meeting cancelled.
Mar 17, 2016 (Foundation Nom Com)					✓	✓		✓										
Mar 22, 2016 (Gov Comm)			✓					✓							✗	✗	✓	
Mar 30, 2016 (Exec Comm)	✓	✓	✓	✓					✓									
Apr 15, 2016 (Council)																		
Apr 15, 2016 (Past Pres Forum)																		
Apr 20, 2016 (Nom Comm)																		
Apr 21, 2016 (Geo Comm)																		
Apr 27, 2016 (Reg Comm)																		
May 26, 2016 (Geo Comm)																		
May 30, 2016 (Exec Comm)																		
May 30, 2016 (Gov Comm)																		
June 13, 2016 (Reg Comm)																		
* June 15-16, 2016 (Planning Session)																		Kamloops (allow for travel time)
June 16, 2016 (Dinner & Gov)																		Kamloops (allow for travel time)
June 17, 2016 (Council)																		Kamloops (allow for travel time)
June 23, 2016 (Audit Comm)																		
July 14, 2016 (Geo Comm)																		
Aug 3, 2016 (Exec Comm)																		
Aug 3, 2016 (Gov Comm)																		
Aug 17, 2016 (Reg Comm)																		
Aug 24, 2016 (Audit Comm)																		
Aug 25, 2016 (Exec Comm)																		
Sept 8, 2016 (1/2 Day Forum)																		
Sept 9, 2016 (Council)																		
Sept 15, 2016 (Geo Comm)																		
Sept 28, 2016 (Reg Comm)																		

The following Committees have not set their schedule as of yet:
- Advisory Task Force on Corporate Practice (number of meetings required has not been determined)
- Professional Practice Committee (will meet at least four times)
- ASTTBC/APEGBC Joint Board (will meet four to six times)
- Climate Change Advisory Group (will meet at least two times)
- Foundation Nominating Committee (will meet at least three times)

☐ **Attendance Required**
■ **Attendance Not Required**
/// **Meeting Cancelled**

Date: April 4, 2015

Report to: **Council for Information**

From: Megan Archibald
Director, Communications and Stakeholder Engagement

Subject: 2016 Member Satisfaction Survey Results

Linkage to Strategic Plan: To provide a solid foundation for the sustainable delivery of the association's mission.

Purpose:	To provide Council with the results of the 2016 Member Satisfaction Survey.
Motion:	No motion required.

Background

In 2010, Council established the Member Satisfaction Survey, to be conducted every three years. The goal of this effort is to determine the alignment between APEGBC's duty, programs, and services, and members' expectations and perceptions.

The survey examines satisfaction and experiences with APEGBC's regulatory duties and member service functions across several areas. An overall satisfaction rating is established each time the survey is delivered[1]. In 2010, this measured at 67% overall, and in 2013 it measured at 76% overall. In 2016, the overall satisfaction rating measured at 65%.

Discussion

The survey was open from February 16 to March 18, 2016 and was promoted through two direct emails to members, on the APEGBC website, and in APEGBC News. The survey is delivered through a third-party system and is completely anonymous, ensuring APEGBC cannot connect responses to individuals. A total of 2,013 members participated in the survey, which is lower than the last time the survey was conducted (3,031 participants in 2013; 1,894 participants in 2010).

The survey contained 40 top-level questions, which prompted members for additional information if they met certain criteria for follow-up questions (e.g. if they indicated lower levels of satisfaction).

Members were also invited to provide optional demographic information related to their designation, discipline and industry of practice, age, branch, and for the first time, gender. Most survey participants completed this section.

To reflect current programs and services, several new questions were introduced in 2016, and some questions were revised or removed. Every effort was made to retain question formats from previous years, where possible, to enable benchmarking. The way in which satisfaction

[1] This is calculated for questions where participants are specifically asked to rank their satisfaction with a particular program or service. "I don't know" responses are excluded.

was reported was also adjusted, based on previous survey feedback. The category "very satisfied" was removed, as well as "not at all satisfied", to provide three simplified options: satisfied, somewhat satisfied, and not satisfied. Members could also indicate "I don't know" for most questions.

Areas of Success and Concern

In terms of results, almost all areas measured experienced a reduced level of satisfaction this year. While the reasons for this may vary, one comment noted throughout the survey was a sense of dissatisfaction with the CPD bylaw and Council's subsequent decision to request the authority to set bylaws in the public interest. This represents one area of misalignment between members' expectations and APEGBC's mandate of public protection.

The highest levels of satisfaction were noted for the resources available about ethics, law, and conduct (72.15%), information regarding members' obligations under the Code of Ethics (81.96%), and interactions with APEGBC staff (78.42%).

The lowest areas of satisfaction were noted for APEGBC's professional development course offerings (35.01%), information available about the Practice Review program (38.98%), and access to Council (40.76%)

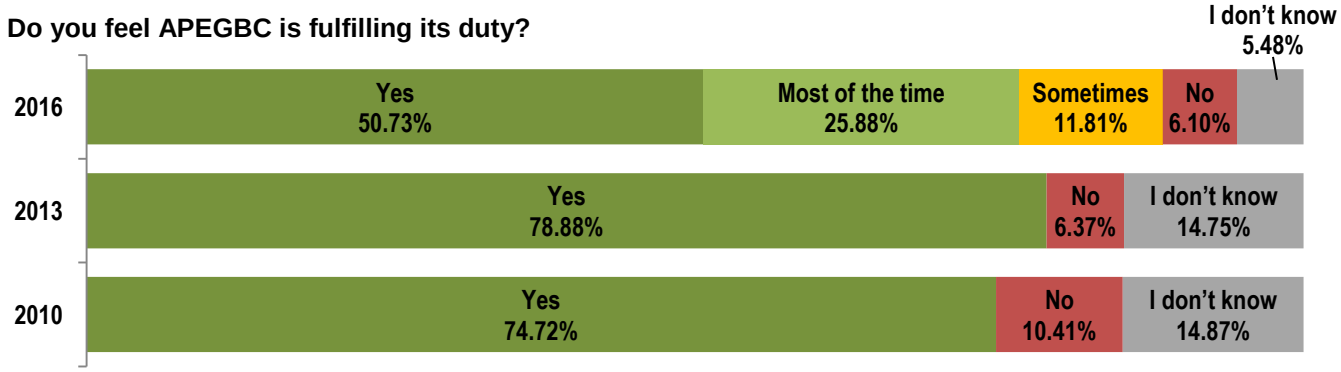
Across the survey, the number of respondents who chose to answer "I don't know" to questions also increased, going up approximately 10% overall from 2013.

Key Results by Area

The following provides key findings from the survey. More detailed information and interpretation will be provided in the associated presentation at the April 15 Council meeting.

<u>1.0 APEGBC's Duty and Governance</u>

The majority of respondents indicated they felt that APEGBC is fulfilling its duty[2].



Those who felt APEGBC is not fulfilling its duty, or only partially fulfilling it, indicated they felt APEGBC is not fulfilling its duty in the following areas:

- Protecting the interests of members and licensees (63.09%)
- Establishing, maintaining, and enforcing standards of professional and ethical practice (24.51%)
- Establishing and maintaining academic and experience standards for entry to the professions (16.16%)

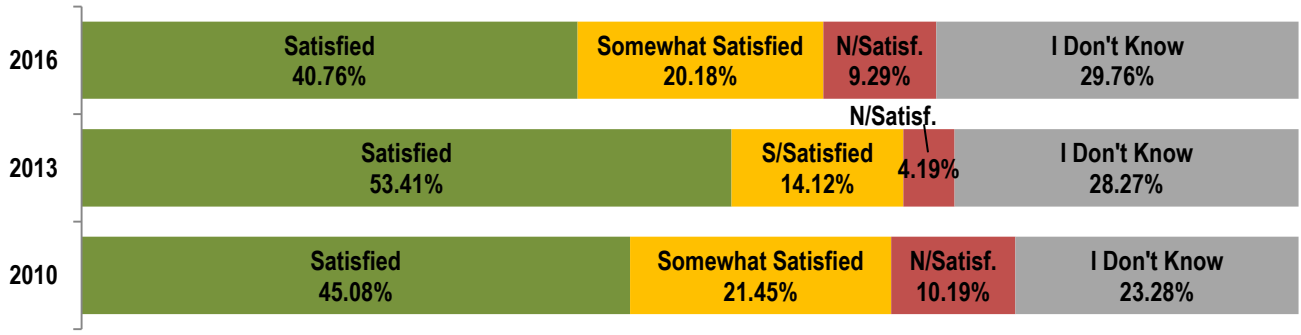
[2] Additional answer options were added in 2016: "most of the time" and "sometimes".

A total of 69.94% of respondents reported that they participate or sometimes participate in consultations related to bylaws or major association issues, and of those, 53.75% were satisfied with the consultation methods available, while 27.65% were somewhat satisfied.

A total of 55.99% of respondents were satisfied that there are processes in place to enable members to provide feedback to APEGBC, while 22.53% were somewhat satisfied, and 10.01% were not satisfied.

When asked about their satisfaction with the access they have to Council, respondents reported a lower level of satisfaction than in previous years.

How satisfied are you with the access you have to Council to voice your ideas, comments, or concerns?



In comments related to this question, members stated that access is not the issue; the issue is that Council does not listen to member concerns. Additionally, there was a desire noted for more opportunities for interaction with Council, especially outside the Lower Mainland, and for more direct communication from Council to members.

2.0 Becoming a Member

Most members who responded to the survey indicated they had been registered with APEGBC for more than 20 years (34.17%), with the second-highest response coming from those registered for less than five years (26.29%).

Members who had been registered for less than five years answered additional questions related to their experience obtaining membership in APEGBC, and 88.13% reported that they were satisfied or somewhat satisfied with the process.

Members were also asked to select what they felt were the most valuable benefits of their membership with APEGBC. Members chose “professional recognition of my designation” (65.34%) and “the ability to independently practice my profession and take responsibility for my work” (60.90%) as their top selections, and identified member benefits such as career listings and the affinity program (19.20%), and professional practice resources (18.57%) as less valuable to them.

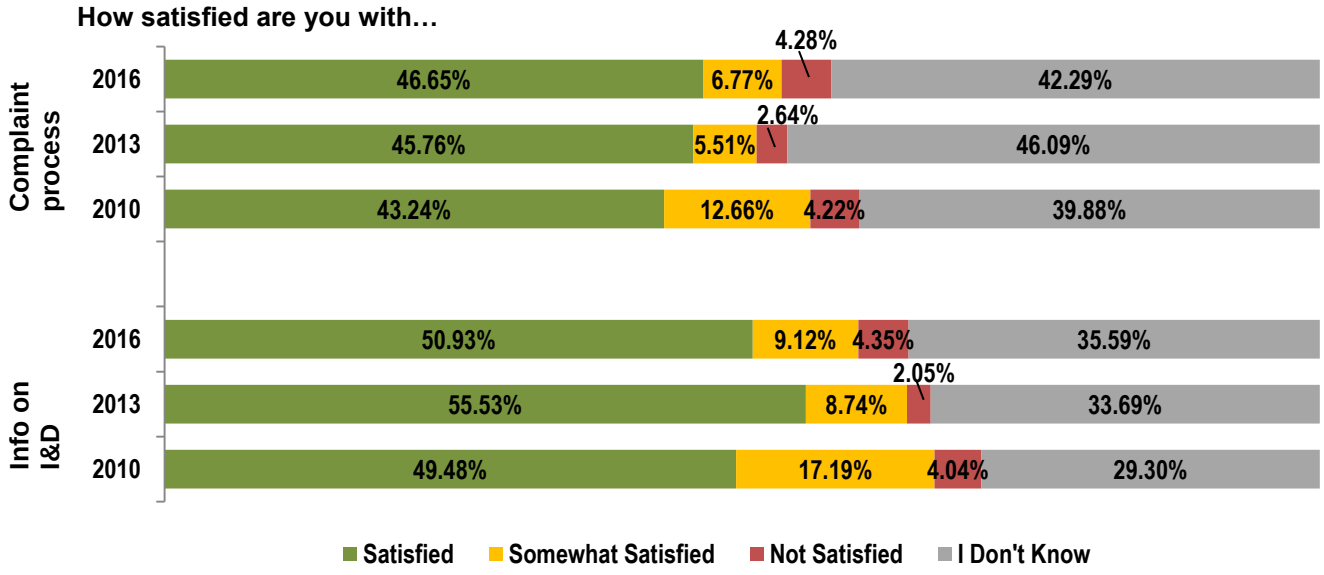
3.0 Professional Practice

Most respondents were satisfied with the current professional practice guidelines, quality management guidelines, and technical bulletins available; however, the level of satisfaction ranked lower than in previous years. Most respondents indicated they often use non-APEGBC resources specific to their industry to support their professional practice, and rely on APEGBC guidelines sometimes, as well as information on the APEGBC website and in *Innovation* or eNews.

This year, fewer respondents were satisfied with the information available about the process of Practice Review, and many more answered “I don’t know”. Follow-up questions indicated somewhat or unsatisfied respondents didn’t know where to find the information (42.12%), found it confusing (26.69%), or felt it didn’t answer their questions (31.51%).

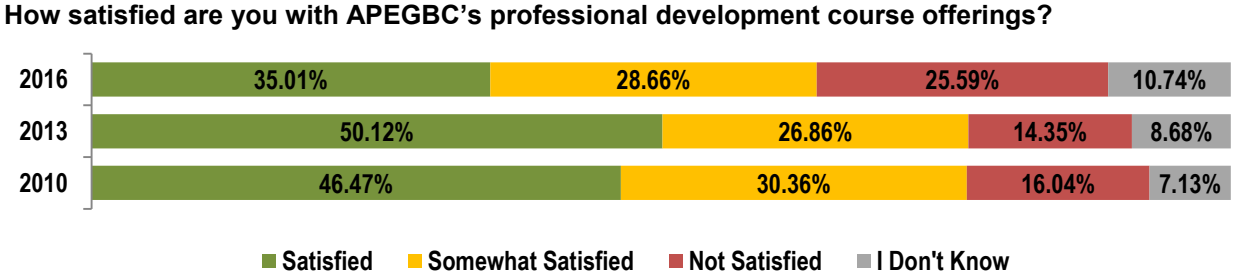
4.0 Ethics, Conduct, and Enforcement

Respondents displayed a high level of satisfaction with the resources available about ethics, law, and conduct (72.15% satisfied) and with the information relating to their obligations under the Code of Ethics (81.96% satisfied). Respondents were less satisfied with the process for initiating complaints, and the information available about investigation and discipline. As in previous years, many respondents selected "I don't know", which indicates this is an area of lower familiarity for members.



5.0 Professional Development

Respondents were less satisfied than in previous years with APEGBC's professional development course offerings.



When asked to elaborate on why they were somewhat satisfied or not satisfied with the course offerings, respondents indicated that there were no courses relevant to their practice (53.02%), the courses are too expensive (49.26%), or they were offered in locations too far to travel for them (26.44%). Some respondents also noted disagreement with the proposed CPD bylaw.

6.0 Communication and Member Services

When rating the ways in which APEGBC communicates with them, respondents ranked their satisfaction with the APEGBC website and the monthly APEGBC News e-newsletter highest, with regular emails (e.g. professional development, branch events, career listings) and social media ranking lower, or accessed less frequently.

Most respondents also indicated that they read *Innovation* every time (58.82%) or at least half the time (25.02%), and of those who read the magazine, 85.97% were satisfied or somewhat satisfied with the content.

Of those who indicated they utilize member benefit programs, most respondents (67.65%) were satisfied with APEGBC's career services (e.g. the weekly career listings email) and most (60.07%) were also satisfied with the range of products and services offered in APEGBC's affinity programs.

While awareness of APEGBC's Mentoring Program was high at 82.65%, just 10.30% of respondents indicated they had participated in the program as mentors or mentees. Those who do not participate indicated they are too busy (34.71%), already participate in another mentoring program (30.23%), or are not interested (15.20%).

Full Results

A full report of all questions and results was not included as an appendix due to length, but can be found on the Council website under Reference Documents/Additional Reference Materials. More detailed information and interpretation will also be provided in the associated presentation at the April 15 Council meeting. An article outlining the results is also planned for the May/June issue of *Innovation*.

Date: March 24, 2016

Report to: **Council for Decision**

From: CPD Committee

Subject: Council Consideration of 2015 AGM Motion regarding CPD

Linkage to Strategic Plan: To make BC professional engineers and geoscientists synonymous with the highest standards of professional and ethical behaviour.

Purpose:	To consider the motion regarding the CPD program that was presented at the 2015 AGM and determine an action.
Motion:	That Council not make any changes to the current voluntary CPD program and online recording centre at this time.

Background

At the Annual General Meeting (AGM) APEGBC members and licensees have an opportunity to put forward motions for Council consideration. These motions are not binding on Council, but rather provide input to Council on the actions that members present at the AGM would like Council to undertake.

Motions are referred for further study so that Council may receive the benefit of the expertise of relevant committees and/ or staff before making a decision on the motion. The following motion was carried at the 2015 AGM and has been reviewed by the Continuing Professional Development (CPD) Committee:

That Council consider revising the current voluntary CPD tracking guidelines and the online system to better reflect the simplified tracking as recommended by the CPD Committee.

Discussion

APEGBC has a voluntary CPD program that is modeled after the Association of Professional Engineers and Geoscientists of Alberta's program. To be in compliance with the voluntary program, members are required to complete an average of 80 hours per year (240 hours on a three-year rolling total) in at least three of the six categories and up to 50 professional development hours per year can be claimed for professional practice. To assist members in keeping track of their CPD hours, APEGBC has an online recording tool that allows members to categorize their hours based on the voluntary program requirements.

As part of the consultation process for the 2015 CPD bylaw, the program was revised to increase flexibility, streamline categories by removing minimum and maximum category requirements and by reducing the number of hours to address concerns expressed by part-time and semi-retired members.

The revised program was put to a membership vote in 2015 and the CPD bylaw was defeated. APEGBC continues to encourage members to participate in the voluntary CPD program.

The motion brought forward at the AGM asks Council to consider revising the current voluntary CPD program and the CPD online recording tool to reflect the revised program that was put forward for the bylaw vote.

The CPD Committee reviewed the AGM motion and discussed whether it would be appropriate to make changes to the voluntary program given that the bylaw was defeated. The cost, time and resources involved to change the program requirements such as updating the online recording tool and developing a new guideline document were considered. At this time, the CPD committee recommends keeping the voluntary program as is until further direction is provided by Council to the committee on how to move forward with a mandatory program.

Recommendation

The CPD Committee passed the following motion at their February 2016 meeting:

The CPD Committee recommends keeping the requirements of the current CPD program until further direction from Council.

It is recommended that Council approve the following motion:

Motion: That Council not make any changes to the current voluntary CPD program and online recording centre at this time.

Date: March 24, 2016

Report to: **Council for Decision**

From: CPD Committee

Subject: Council Direction Sought for CPD

Linkage to Strategic Plan: To make BC professional engineers and geoscientists synonymous with the highest standards of professional and ethical behaviour.

Purpose:	The CPD Committee is seeking Council direction on how to proceed with a CPD program for members
Motion:	To be determined after Council's discussion.

Background

Last year, members voted on a continuing professional development (CPD) bylaw. There was extensive consultation undertaken with members on the program requirements and based on the member feedback received, the proposed requirements were revised. However, the bylaw received only 44% support, falling short of the two-thirds requirement.

At the November 2015 Council meeting, Council discussed the failure of the CPD bylaw and possible next steps. Council discussed the *Act* and the primary duty of APEGBC to uphold and protect the public interest. After serious consideration, Council decided to request a legislative amendment from government that would enable Council to pass bylaws, without member ratification, on matters related public interest.

Given Council's request for an *Act* change, the CPD Committee is seeking direction from Council on how it should proceed with respect to a CPD program for members.

Discussion

The CPD Committee has proposed two options for Council consideration.

Option 1: Direct the CPD Committee to explore modifications to the CPD program
During the consultation process, there were several concerns raised by members regarding the proposed program. These included concerns regarding the time, cost and availability of courses, the reporting process, the structure of the program (categories are too rigid, hours are too high), compliance (how would non-compliance work), and questions around the value of the program (APEGBC should trust us and what value will this bring?).

After considering member feedback and recommendations from the CPD Committee, Council made significant changes to the program to increase flexibility, streamline categories by removing minimum and maximum category requirements and by reducing the number of hours to address concerns expressed by part-time and semi-retired members. Despite these changes, the bylaw was defeated.

The CPD Committee could again review the CPD program; explore modifications and whether there are program changes that may increase member acceptance of the CPD program. The CPD Committee has been monitoring the developments of the Professional Engineers Ontario's CPD program and will continue to do so. The Ontario program is still under development but will use a risk-based assessment to determine the number of professional development hours that are required by each member. Should Council wish the committee to take a more active role in developing or revising the current program, Council would need to provide the committee with this direction.

Option 2: Direct the CPD Committee to wait until further direction from Council
Response from government on the legislative requests would likely affect how and when APEGBC moves forward with a CPD program for members. Council may wish to wait until it receives a response from government prior to providing any further direction to the CPD Committee.

Should Council instruct the committee to wait until further direction, the CPD committee will continue to monitor the program developments in Ontario but will not actively pursue alternatives to the CPD program.

Recommendation

The CPD Committee has provided Council with two options for consideration and is asking Council to provide direction to the committee on how to proceed.

Motion:

That Council directs the CPD Committee to explore modifications to the CPD program

OR

That Council directs the CPD Committee to wait until further direction from Council

Date: February 29, 2016

Report to: **Council for Decision**

From: Executive Committee

Subject: Draft APEGBC FY2017 Budget Summary

Linkage to Strategic Plan: Continue to Implement Best Practices in governance.

Purpose:	For Council to review and approve proposed FY2017 budget.
Motion:	That Council approve the FY2017 APEGBC operating and capital budget as presented. That the Professional Practice Examination Fee remain at $325.50 inclusive of GST.

Background

At the April 11, 2014 Council meeting, Council approved the 2014/15 Budget and accepted the 2015/16 & 2016/17 proforma budget as presented. It marked the first ever APEGBC three year budget and was a budget that was fully aligned with the Association's Strategic Plan. With a three year budget, many advantages are realizable such as the following:

- Initiatives can be funded beyond fiscal years
- Enables longer term planning and more effective management of disruptions
- Greater predictability of budget and fee increases
- A directly linked three year budget to a three year strategic plan where years 2 and 3 budgets can be adjusted with updates to the plan and other minor "tweaking" as required

At the February 25, 2016 Executive Committee meeting, the Committee reviewed and provided guidance for the proposed FY2017 budget that is now presented to Council for approval. The proposed budget has been prepared in accordance with the Council approved 2016/17 Budget Guidelines (Appendix A – Status of Budget Guidelines). Details of the draft FY2017 budget are in Tab A of the budget binder.

Where We Are At Currently - FY2016 Forecast

The financial forecast for June 30, 2016 is that APEGBC will be in a surplus position of approximately $343K.

There are significant savings in salaries expenses due to unfilled positions, maternity leave replacements and delayed hiring. Amortization expenses will be lower due to less capitalization ratio of IT staff time and timing of office renovation. Other savings include unused contingency.

The following table illustrates a high level budget cost variances and the FY2016 forecast result **(in $'000):**

FY2016 budget	(50)
Plus significant budget cost variances:	
Payroll savings	221
Amortization savings	79
Unused Contingency	125
Estimated MAPS credit application expense	(32)
Estimated FY2016 Surplus	**343**

Highlights of the Draft FY2017 Budget

(in $'000):

	FY2014/2015 Budget (Year 1)	FY2015/2016 Budget (Year 2)	FY2015/2016 Forecast (Year 2)	FY2016/2017 Proposed Budget (Year 3)
Revenues	12,844	14,066	14,228	14,255
Expenses	12,989	14,226	13,995	14,474
Operating result Before External Contracts	(144)	(160)	233	(220)
External Contracts				
Revenues	1,190	1,150	1,150	1,120
Expenses	1,040	1,040	1,040	1,040
Operating Income - External Contracts	150	110	110	80
Net Operating Income/(Loss)	**5**	**(50)**	**343**	**(140)**

FY2017 vs FY2016 Budget Changes:

Revenues

Total revenue changes of $189K are mainly due to:

1. $183K - Adjusted volume increase of membership growth to 3% based on FY2016 membership collection forecast
2. $107K - Increase in professional practice exam revenue due to $25 fee increase to cover conversion to on-line costs passed on by APEGA who are the service provider
3. $45K - Increase in affinity program based on historical growth
4. ($94K) - Offset by lower Registration grants project revenue due to project timing
5. ($81K) – Offset by lower MAPS revenue due to revenue recognition accounting changes

Expenses

Total expenses increase of $248K mainly due to:

1. $55K - Increase IT costs in system maintenance and SAAS solutions
2. $66K - Increase in amortization costs due to timing of office renovation and capitalization of advanced online ethics module
3. $89K - Higher professional practice exam marking fee due to conversion to on-line costs passed on by APEGA who is the service provider
4. $80K - for hiring professional consultants and investigators to assist in investigations assigned to Investigation Committee (see tab B)
5. $356K - Salaries & Benefits adjustments. Planned as part of three year budget 3 positions ($220K) to support Registration, OQM audits and Career Awareness. Remainder adjustment due to 3% budget allocation for merit increase offset by lower vacation expenses

Offset by savings in:

1. ($38K) in distance education CD material costs by changing to online Law and Ethics program
2. ($48K) in room rentals due to online delivery of PD seminars
3. ($75K) in recruitment costs as executive recruitment not required
4. ($47K) in consulting, training and other HR costs
5. ($43K) in Council/Exec meeting, consulting and contract services due to one day planning session and minimizing consultant usage
6. ($23K) in building operation with delayed Stantec maintenance tasks
7. ($50K) in reduced contingency
8. ($30K) in Professional Practice contract services by using in-house staff and lower volume due to increased OQM members
9. ($28K) in Certified Professional Program per adjusted contracts
10. ($5K) to discontinue AGM webcast as per Governance Committee recommendation
11. ($16K) Branch rep attendance to Annual Conference reduced from 2 to 1 delegate savings as per Council decision February 12, 2016
12. ($10K) Reduced NEGM advertising
13. ($38K) Reduced credit card processing charges with projected lower membership increase

Reserves

As per budget guideline 6, a review and assessment of the appropriate level of funding for the General Operating Fund, Property, Equipment and Systems Replacement Fund and the Legal & Insurance Fund is to be done as a part of the budgeting process.

The projections of three fund balances are as per below:

	General Operating Fund ('000's)	Property, Equipment and Systems Replacement ('000's)	Legal and Insurance ('000's)	Total Funds ('000's)
June 30, 2015	5,707	1,514	500	7,721
Forecast	343	-	-	
Office renovation	750	(750)	-	
June 30, 2016 Forecast	**6,800**	**764**	**500**	**8,064**
FY2017 Budget	(140)	-	-	
Office renovation	750	(750)	-	
June 30, 2017 Budget	**7,410**	**14**	**500**	**7,924**

The reserves at June 30, 2017 are projected to be $7.9M. Council can at any point in time re-appropriate the Legal & Insurance Fund and the Property, Equipment and Systems Replacement Fund back to the General Operating Fund.

As the Property, Equipment and Systems Replacement Fund is expected to be depleted after the building renovation is complete, it will be prudent to replenish this fund for future repairs of the building. It is recommended that at fiscal year end of June 20, 2016, that the projected surplus be allocated to this fund. Future planning for the association needs in terms of office space that are beyond 10 years from now will start in the next three year budget cycle and appropriate consideration for how much in funds is needed for this project and the effect on budget should be considered at that time.

As per independent consultant MNP, Industry standard of total reserve funds is 3-6 months of operating expenses. As per the projection above, APEGBC has an appropriate and healthy level of reserves currently based on the projected surplus in the current year and taking into account the projected FY2017 budget. APEGBC will be able to maintain a minimum 6 months of operating expense (based on FY2015 actual expenses of $1.2M per month).

One important note is that a reserve is not the same as cash. A reserve is surplus that has been appropriated for a particular purpose such as property, legal and general operation. On the other hand, APEG's cash and short term investment balances have been at a healthy level. The cash and short term investment balances in last 4 years:

FY2015	FY2014	FY2013	FY2012
9.7Mill	8.5Mill	7.1Mill	8.1Mill

Recommendation

That Council approve the FY2017 APEGBC operating and capital budget as presented.

APPENDIX A - APEGBC FY2017 Budget Guidelines		
	Budget Guidelines	Status
1	The Sustainable Financial Management Policy will be the foundation for guiding budget preparation.	Achieved
2	Apply the APEGBC Strategic Plan, Council Work Plan (Roadmap) and Key Performance Indicators to budget development.	Applied
3	Strive to keep the overall budget increase to be less than 5% each year.	1.6% cost increase from FY2016 budget
4	Strive for no annual professional member fee increase for 2017	Achieved
5	Consider potential changes to prior year budget as follows: Opportunities for efficiencies by program & department; new program initiatives/ non-discretionary budget changes.	In the past on an annual budget cycle with multiple year projects, additional contingencies for projects were included. With a three year budget cycle these contingencies are now no longer needed.
6	Review and assess the requirements and appropriate level of funding for the General Operating Fund, Property, Equipment and Systems Replacement Fund and the Legal and Insurance Fund.	Achieved
7	Staffing levels be generally determined by authorized program improvements, growth and membership count.	Staffing increased from 61 to 70 assuming approvals of all program initiatives. 4 value-for-money recommended related positions and 5 positions to address current workload issues and new initiatives.
8	Review program contribution margins and strive for financial self-sustainability on a direct cost basis.	Achieved
9	Final 2016/2017 budget approval should be sought at the Council meeting in April 2016.	In Progress

APEGBC FY2017 Budget Book

Table of Contents

	C	P	Q	R	S
2	**APEGBC Program Statements**	**April 2015 Council approvaed Proforma Budget FY2017**	**Revised draft Budget FY2017**		
3					
4		**Note: Amended in June 2015 (revised amortization per Council approved capital budget increase for building renovation of $1.5M)**	**To be reviewed/approved by Council in April 2016**	**Changes**	**Notes for Changes:**
5	**REVENUE**				
6	**Fees**				
7	Deferred fees	4,707,031	4,682,898	(24,134)	
8	Non-Deferred app fees	4,988,913	4,823,385	(165,528)	
9	MAPS/SPLI/Late fee	71,120	71,120	0	
10	Annual Membership Fees	9,767,064	9,577,402	(189,662)	Decrease forecast of year to year volume growth to 3% from 5%
11	Application, Registration and Certification Fees	1,319,086	1,283,399	(35,687)	Decrease mainly due to estimated lower application volume from EIT/GIT to Professional
12	Professional and Academic Examinations	457,057	563,314	106,257	Increase mainly due to higher professional practice exam fee (increase from $230 to $310 in order to cover higher exam marking costs)
13		**11,543,207**	**11,424,116**	**(119,092)**	
14	**Other Revenue**				
15	Affinity programs	359,800	405,000	45,200	To align with FY2015 actual
16	Annual Conference	270,000	280,000	10,000	
17	Innovation Magazine and Other Advertising	480,000	480,000	0	
18	Certified Professional Program	106,763	80,563	(26,200)	to align with adjusted contracts
19	Organizational Quality Management	192,000	163,000	(29,000)	Adjusted based on FY2015 actual and FY2016 forecast
20	Investment Income	92,933	92,933	0	
21	Miscellaneous	89,300	100,800	11,500	Estimated approx. $10K of SPLI rebate from Engineers Canada
22	Professional Development	987,225	1,012,225	25,000	Increase fee of new online law & ethics course from $250 to $275
23	Registration External Projects	25,000	216,000	191,000	Increased scope of project and changes to timing
24		**2,603,021**	**2,830,521**	**227,500**	
25					
26	**Total Revenue**	**14,146,228**	**14,254,636**	**108,408**	
27					
28	**EXPENDITURES**				
29	**Registration**				
30	Applications/Registration	167,795	176,500	8,705	Increased estimated costs in postage and material costs of stamps/certificates due to higher volume growth
31	EIT/GIT Professional Certification	17,000	17,000	0	
32	Limited Licenses	4,000	4,000	0	
33	Professional and Academic Examinations	308,150	396,500	88,350	Increase mainly due to PPE marking expense. Exam marking costs increase due to CBT NPPE administration (Computer Based Testing National Professional Practice Examination)
34	Structural Qualification	7,300	9,300	2,000	
35	Registration External Projects	10,000	137,500	127,500	Increased scope of project and changes to timing
36	Non-Program Specific	15,136	24,136	9,000	Added budget for volunteer training modules
37	Salaries & Benefits	1,653,141	1,595,704	(57,437)	Savings from vacation expenses
38		**2,182,522**	**2,360,640**	**178,118**	
39	**Professional Practice, Standards & Development**				
40	Practice Review	161,600	176,600	15,000	Anticipated additional practice reviews derived from Legislation, Ethics and Compliance effort
41	Professional Practice	90,455	120,455	30,000	Additional contract services for updating/revising published guidelines to most current standards (government legislation referencing to updated guidelines)
42	Organizational Quality Management	193,064	169,064	(24,000)	Reduced funding for supporting OQM launch assist, training outside the lower mainland
43	Certified Professional Program	123,988	95,665	(28,323)	Adjusted based on estimated agreement
44	Climate Change Initiatives	30,000	20,000	(10,000)	
45	Non-Program Specific & Others	9,186	9,086	(100)	
46	Salaries & Benefits	989,361	961,406	(27,955)	Savings from benefits and vacation expenses
47		**1,597,654**	**1,552,276**	**(45,378)**	
48	**Legislation, Ethics & Compliance**				
49	Discipline	177,300	253,000	75,700	Adjusted to align with FY2015 and FY2014 actuals
50	Enforcement	30,000	30,000	0	
51	Investigations	35,000	132,775	97,775	Increase mainly due to hiring of professional consultants and investigators to assist in investigations assigned to Investigation Committee
52	Code of Ethics	30,000	0	(30,000)	Capitalized expenditure as an intangible asset
53	Non-Program Specific	140,125	130,125	(10,000)	Reduced based on plans to utilized more in-house legal staff
54	Salaries & Benefits	609,835	594,871	(14,964)	Savings from benefits and vacation expenses
55		**1,022,260**	**1,140,771**	**118,511**	
56	**Communications**				
57	Annual Report/Publications	36,391	39,391	3,000	
58	Awards	59,542	59,542	0	
59	Innovation Magazine	308,370	316,370	8,000	Anticipated higher postage cost offset by savings in printing costs
60	Employment Web Advertising	2,800	2,800	0	
61	Student Membership & Sponsorship	56,900	55,200	(1,700)	
62	Stakeholder Engagement	121,820	46,800	(75,020)	Decrease due to moving Induction Ceremony and Past President Dinner to Member Services team's budget
63	Career Awareness	62,111	50,450	(11,661)	Decrease in grant support for science games and other consulting fees
64	Public Relations	97,550	83,550	(14,000)	Reduced NEGM advertising
65	Branding Collateral Renewal and NPS	14,500	13,600	(900)	
66	Salaries & Benefits	831,235	871,015	39,780	Increase due to new positions for Co-op and Web Communication Officer
67		**1,591,219**	**1,538,718**	**(52,501)**	
68	**Member Services**				
69	Affinity Programs	1,250	1,250	0	
70	Annual Conference	332,247	357,930	25,683	Increase due to Victoria Conference Center room rental fee and adjusted catering costs
71	Professional Development	535,232	489,246	(45,986)	Decrease mainly due to savings in L&E CD material costs with the new online module
72	Salary Survey	0	0	0	
73	Mentoring	35,578	16,000	(19,578)	Savings in contract services
74	Brand Strategy	61,250	61,250	0	
75	Branches/Divisions	72,350	78,050	5,700	
76	Member CPD Requirements	1,569	2,069	500	
77	Induction Ceremony and Former Presidents Dinner		70,020	70,020	Program moved from Communication
78	Salaries & Benefits	779,093	780,038	945	
79		**1,818,568**	**1,855,852**	**37,284**	
80	**Council/Executive**				
81	Council/Executive	190,752	164,752	(26,000)	Savings from one less day of planning session and minimize usage of consultants
82	Election	15,670	17,170	1,500	
83	Legislative Consultation	10,000	0	(10,000)	Estimated savings from less bylaws planned
84	Labour Market Studies	5,000	15,000	10,000	New study on supply sources to determine impact on APEGBC
85	Government Relations	127,117	117,367	(9,750)	Estimated less travel to Victoria
86	Non-Program Specific	2,692	4,692	2,000	
87	Salaries & Benefits	886,062	871,711	(14,351)	Savings from adjusted vacation expenses, offset by increase in service awards with more employees reaching service milestones
88		**1,237,293**	**1,190,692**	**(46,601)**	
89					
90	**National Associations**				
91	Canadian Council of Professional Engineers & Geoscientists	510,567	510,567	0	
92		**510,567**	**510,567**	**0**	
93	**Finance & Administration**				
94	Annual Invoicing	46,697	46,697	0	
95	Building Operations & Renovations	376,297	349,104	(27,193)	Delay minor building maintenances during the office renovation
96	Administrative Services	22,116	26,116	4,000	
97	Non-Program Specific & Other	677,689	694,668	16,980	Increase mainly due to higher banking fees
98	Salaries & Benefits	866,164	829,320	(36,844)	Savings from adjusted vacation expenses
99		**1,988,963**	**1,945,906**	**(43,057)**	

	C	P	Q	R	S
2	**APEGBC Program Statements**	**April 2015 Council approvaed Proforma Budget FY2017**	**Revised draft Budget FY2017**		
3					
4		**Note: Amended in June 2015 (revised amortization per Council approved capital budget increase for building renovation of $1.5M)**	**To be reviewed/approved by Council in April 2016**	**Changes**	**Notes for Changes:**
100	**Information Technology**				
101	Run - Business Continuity	302,134	310,634	8,500	Increase mainly due to Envisio subscription and online conference planning
102	Telecommunications	101,024	92,490	(8,534)	Savings from internet and telephone costs
103	Grow - Systems & Development	10,000	10,000	0	
104	Non-Program Specific & Other	6,500	6,500	0	
105	Salaries & Benefits	857,114	857,274	160	
106		**1,276,772**	**1,276,898**	**126**	
107	**Human Resources Development**				
108	Staffing	46,304	26,384	(19,920)	To align with FY2015 actual
109	Training and Development	96,344	86,345	(9,999)	To align with FY2015 actual
110	Staff Recognition	41,228	41,228	0	
111	Occupational Health and Safety	4,239	1,239	(3,000)	
112	Volunteer Management	23,550	23,550	0	
113	Compensation Management	3,000	3,000	0	
114	Strategic HR and Organizational Development	10,000	5,000	(5,000)	
115	Non-Program Specific & Other	1,943	1,943	0	
116	Salaries & Benefits	245,710	238,348	(7,362)	
117		**472,318**	**427,037**	**(45,281)**	
118	**Special Programs**				
119	Benevolent Fund Society	500	500	0	
120	Foundation	3,000	3,000	0	
121	Amortization	634,559	596,360	(38,199)	Changes mainly due to reduced capitalization of IT salaries and timing of office renovation
122	Contingency	75,000	75,000	0	
123		**713,059**	**674,860**	**(38,199)**	
124					
125	Total Expenditures Before External Contracts	**14,411,195**	**14,474,216**	**63,021**	
126					
127	Contribution/(Loss) Before External Contracts	**(264,967)**	**(219,579)**	**45,388**	
128					
129	**EXTERNAL CONTRACTS**				
130	**Revenues**				
131	Seismic Risk Assessment, Flood & Other Guidelines	1,120,000	1,120,000	0	
132	Total Revenues	**1,120,000**	**1,120,000**	**0**	
133					
134	**Expenditures**				
135	Seismic Risk, Flood, & Other Guidelines	1,040,000	1,040,000	0	
136	Total Expenditures	**1,040,000**	**1,040,000**	**0**	
137					
138	External Contracts - Margin	**80,000**	**80,000**	**0**	
139					
140	**Surplus/(Deficit)**	**(184,967)**	**(139,579)**	**45,388**	
141					

Date: April 4, 2016

Report to: **Council**

From: Executive Committee

Subject: **Registration Ancillary Fee Review and Recommendations**

Purpose:	To update the Council on the status of registration ancillary (application-related) fees and to recommend a strategy for the Professional Practice Examination fee.
Motion:	That the Professional Practice Examination fee remain at $325.50 inclusive of GST.

Background

Sustainable Financial Policy & Budget Process Guidelines

Council's Sustainable Financial Policy approved by Council on January 24, 2014 states, in part:

The Applications and Registration program (the intake process) will be financially self-sustaining on a direct cost basis.

It also contemplates that an annual review of economies, efficiencies and effectiveness of current expenditures, revenue strategies and initiatives.

Registration Ancillary Fee Reductions since 2011

Since 2011 the Executive Committee has reviewed registration ancillary fees each year with an eye to reducing them wherever possible, as they had historically been raised to offset budget deficits and were higher than those of other Canadian jurisdictions.

In 2014, it was recommended to the Executive Committee *that the Ancillary Fee Revenues and the Member-in-Training Annual Fee be maintained at 2014 levels through fiscal 2017, subject to an annual review to identify extenuating circumstances that merit changes to the fees.*

In 2015, the Executive Committee recommended to Council that the application fee for professional members and licensees who are members or licensees in good standing in other Canadian jurisdictions be reduced to $250 for FY 2016, to bring the cost of a transfer closer to that charged by other jurisdictions.

Fee Review for FY 2017

A comparison of fees charged by other jurisdictions is in Appendix A. This does not include permit to practice (corporate) or permission to consult (individual) fees charged in other jurisdictions. Fee structures differ across Canada; however APEGBC's fees related to the registration process in general remain equal to or higher than those charged by other jurisdictions.

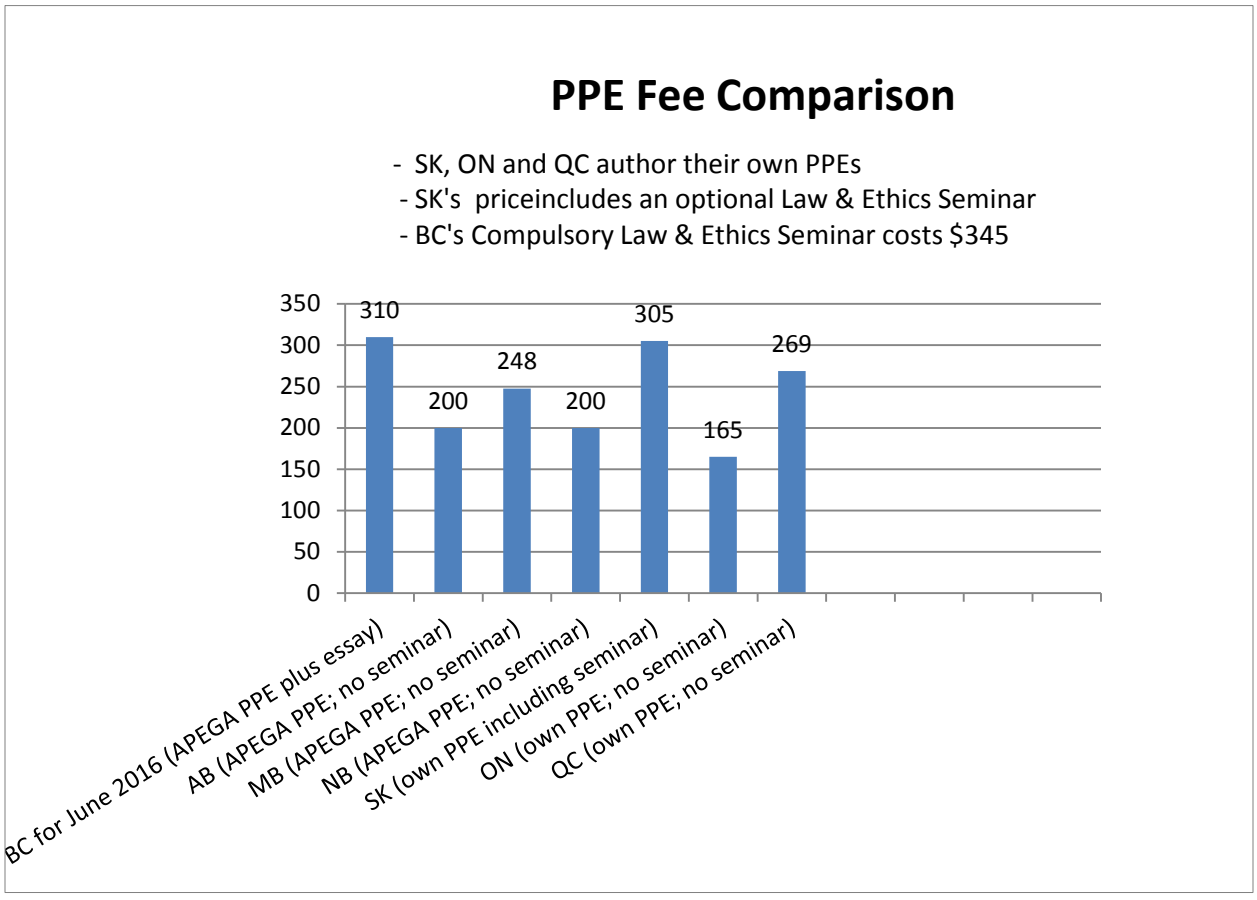
Professional Practice Examination Fee

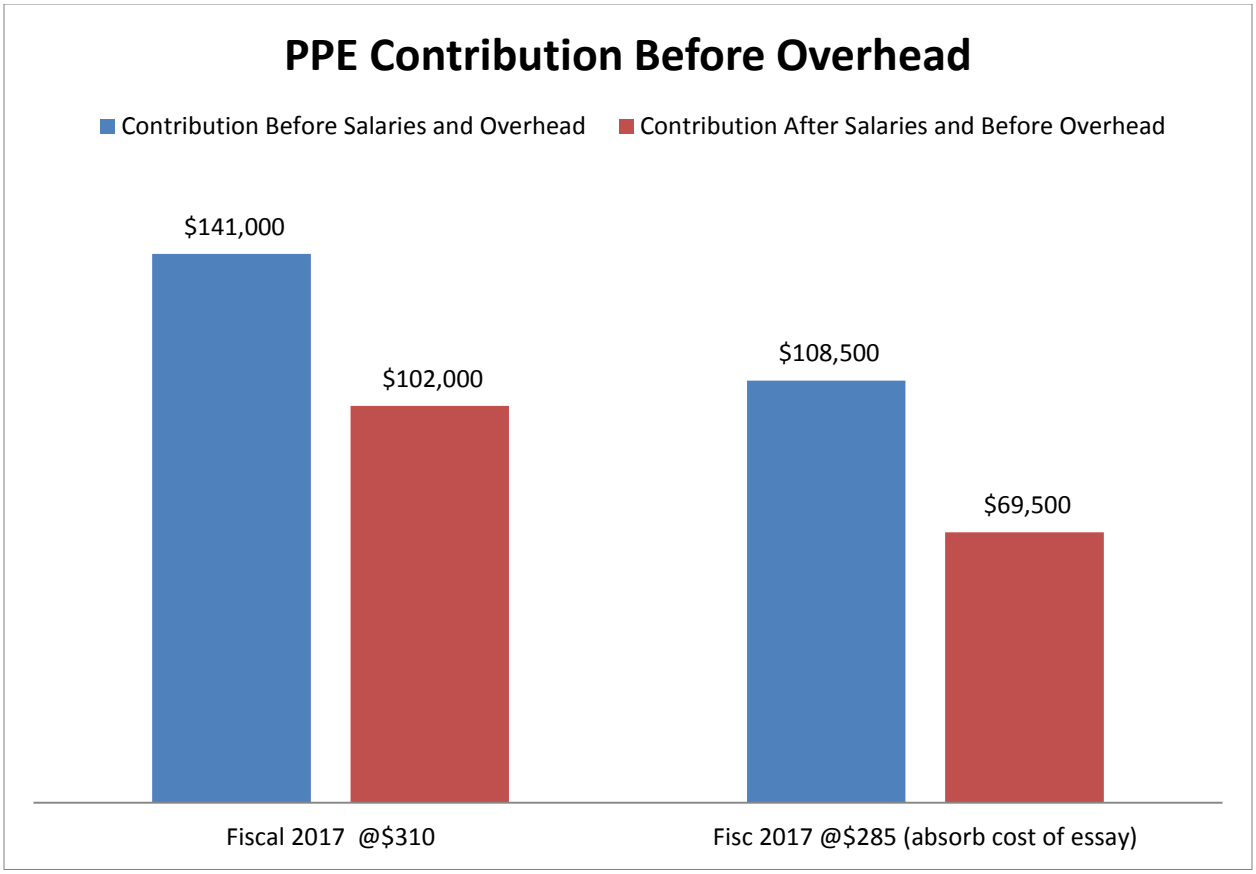
At its February 2016 meeting, Council approved a $80 increase to the Professional Practice Examination fee effective from the June 2016 session, passing on to the applicants a recent fee increase from APEGA, who provides the multiple choice 2.5 hour computer-based examination to several jurisdictions. The fee increase was comprised of $55 for the move to computer-based testing and $25 for an additional hour of examination centre services for online submission of an ethics essay required by APEGBC to test English language writing competence.

APEGBC's new fee for the Professional Practice Examination is now $310 (before GST), the highest in the country, as it built on the former fee of $230 which had risen over time to support other APEGBC costs. As a proposal had been made by staff that APEGBC raise the fee by $55, absorbing the $25 cost of the essay, Council also asked that the new fee be reviewed and reconfirmed for future examination sessions at its April 2016 meeting after the 2017 budget review.

APEGA's fee to jurisdictions that use its examination is currently $175; the fee is $200 to APEGBC because of the additional online essay fee. Other jurisdictions who use APEGA's PPE charge between $200 and $248 to their applicants, adding a small fee to the $175 to cover local administrative costs.

The fees per province and the contribution margins at the two fee levels are compared in the following charts.





Council also asked that a recommendation be brought to it in April that included consideration of APEGBC's developing and offering its own Professional Practice examination. The high comparative fee for APEGBC's Professional Practice examination is not due to APEGA's charges; rather it has built on a fee that in the past was raised to offset budget deficits.

The examination offered by APEGA relies on a significant and refreshed bank of questions that have been psychometrically analyzed to ensure quality and defensibility. It is also overseen by an advisory committee that reviews examination standards and performance and ensures that the examination meets the body of knowledge requirements of the participating jurisdictions. The cost of developing an examination equivalent in quality and defensibility to that offered by APEGA would be prohibitive.

Recommendation

Motion: that the Professional Practice Examination fee remain at $325.50 inclusive of GST.

Report prepared by:
Gillian Pichler, P.Eng.
Director, Registration

Appendix A – Ancillary Fee Comparison Other Provinces

(Fee structures differ among jurisdictions as some bundle fees or have fees for different stages of assessment. The fees reported here are those closest in structure to APEGBC fees.)

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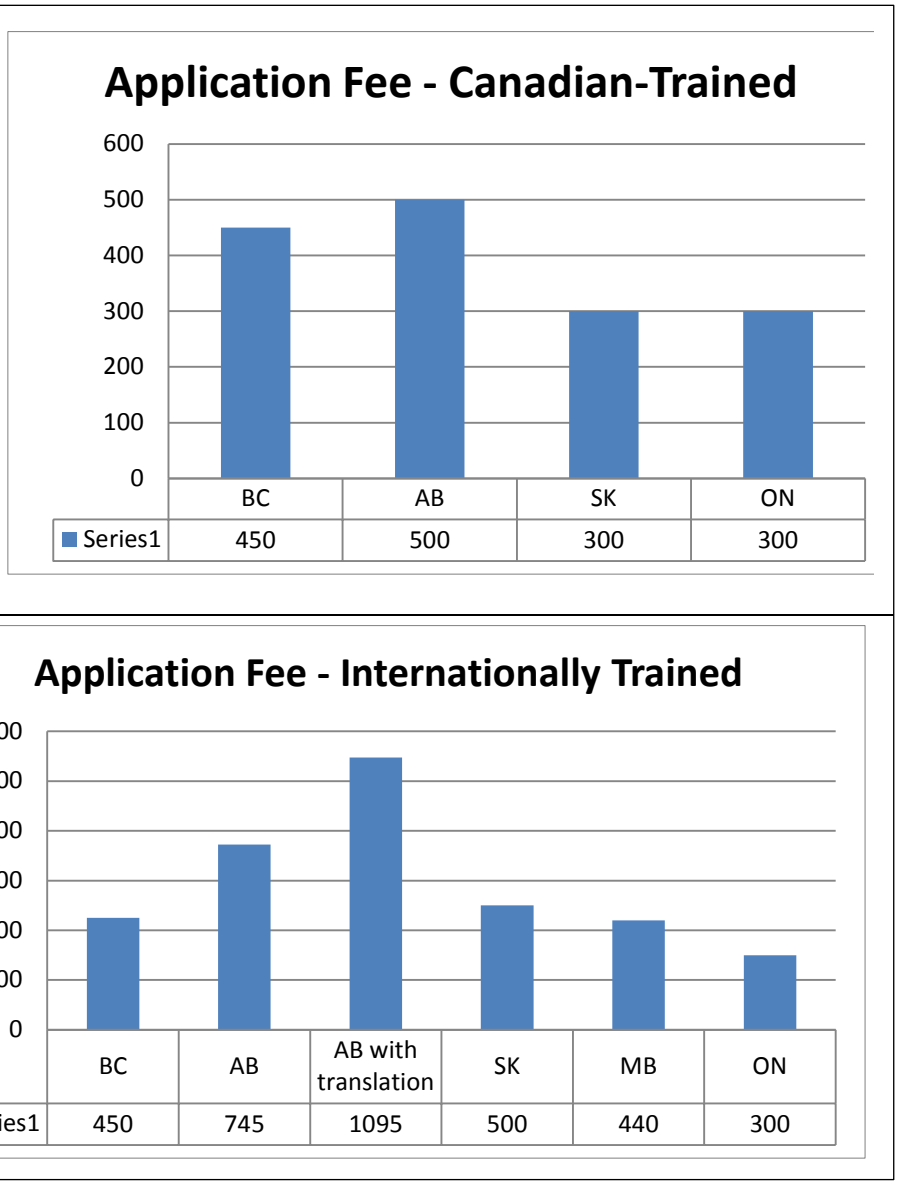
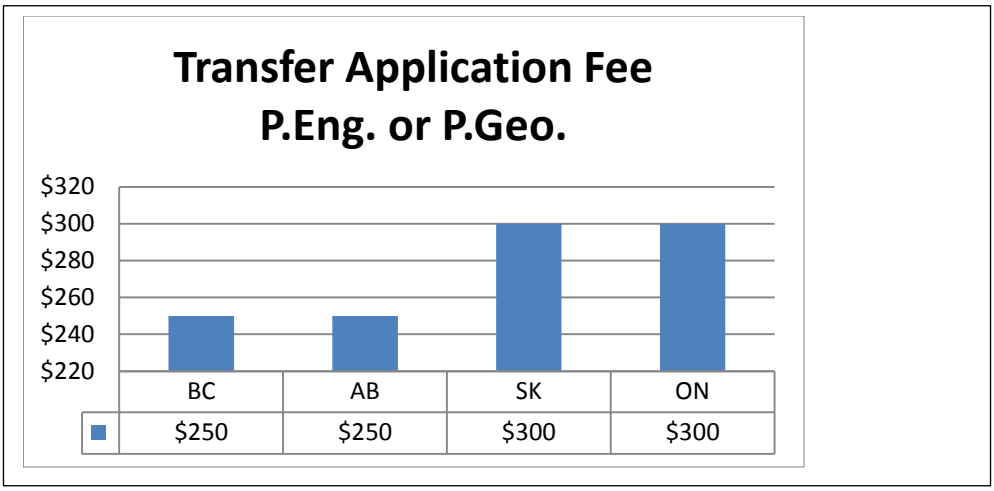
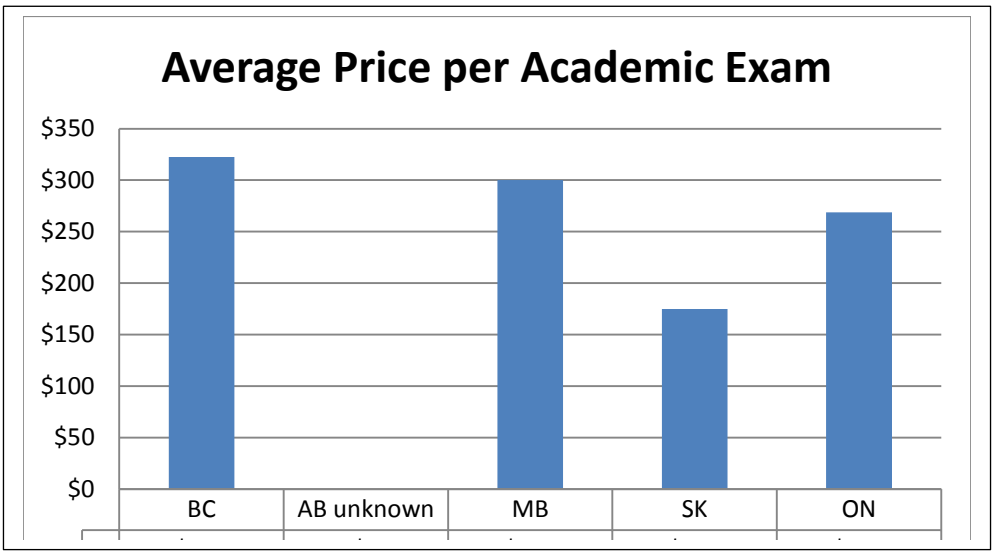
1. Application Fees – New P.Eng. and P.Geo. Applicants



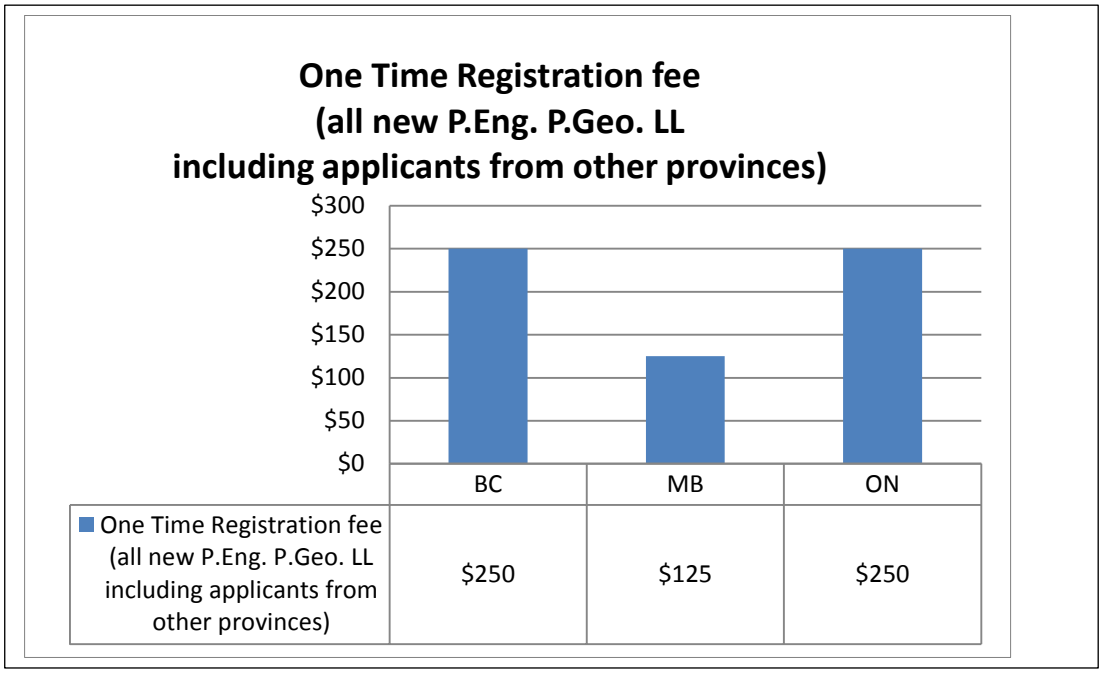
2. Application Fee – Mobility Transfers P.Eng. and P.Geo.



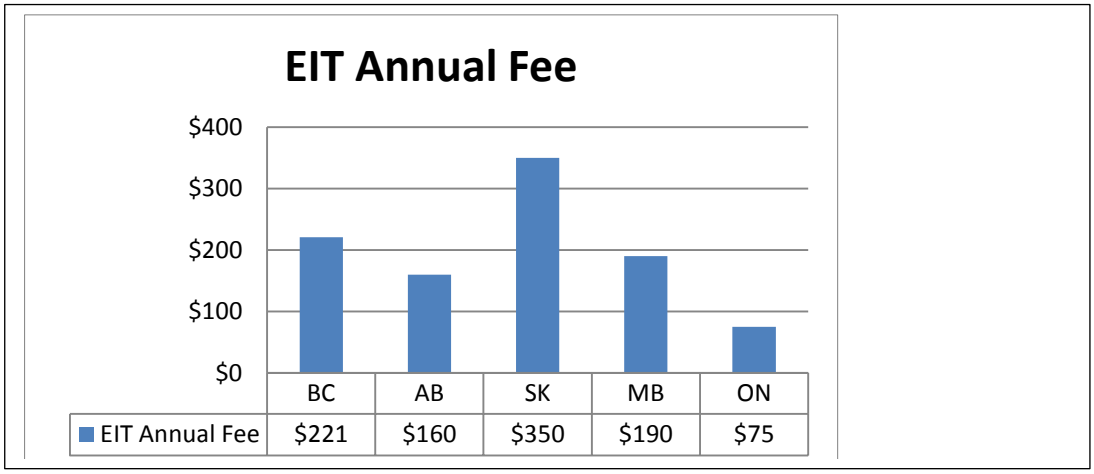
3. Academic Examination Fees



4. Registration (Stamp & Certificate) Fee



5. EIT/GIT Annual Fee



6. Cost of APEGBC Registration Process (Academically-Qualified Applicant)

APEGBC	Application Fee	Registration Fee	Professional Practice Exam	Law & Ethics Seminar	Total
Inter-Association	250	250	-	-	500
New P.Eng./P.Geo.	450	250	310	345	1355

Professional Engineers and Geoscientists of BC

Date: Updated January 15, 2016

Report to: **Executive Committee of Council for Decision**

From: Neil Nyberg, P. Eng., FEC
Chair of the Investigation Committee (the "IC")

Subject:Funding for the IC

Linkage to Strategic Plan: Develop strategies for protection from non-compliant members and unregistered practitioners

Purpose:	For Executive Committee to review the Investigation Committee requests for budget appropriation for hiring professional consultants and investigators to assist the committee.
Motion:	That Executive Committee making a budget appropriation for the hiring of professional consultants and investigators to assist some of the volunteer investigations assigned to the Investigation Committee.

Background

The number of investigation files in recent years has more than doubled. The following chart shows the number of complaints in each of the last six years along with the percentage change from the base year of 2010:

Year	No. of Files	% change since 2010
2010	31	
2011	36	+14%
2012	21	- 32% (no legal assistant in this period)
2013	39	+26%
2014	62	+100% (change of Director)
2015	64	+106%
2016	51	+64% (to date); projected at 85 (174%)

Given the increase in the number of files being sent to the IC, the number of people on the IC was increased from 9 in 2013 to 14 in 2014/2015. Nevertheless, we have lost committee members due to the heavy workload (three resignations in two years); and committee members have expressed dissatisfaction with the hours required to formulate an adequate response to some of the investigation case files.

The increase in the number of members on the IC has failed to compensate for the workload. The result is a backlog of case files with the committee members and a noticeable increase in the time required to process files. Some investigations are almost two years old.

The principle problem appears to be the time required for a volunteer committee member to carry out adequate technical analysis, especially noticeable on structural related files. The four structural engineers on the committee are very reluctant to take on any new files, especially those that require analysis of technical competency. A quote from a recent resignation letter reads:

> *I needed three full days to thoroughly review the materials, then formulate a summary opinion and recommendation, and prepare a report. To retain the File details and develop a meaningful report, it was necessary to set aside most other commitments and go completely "off the grid".*

Further, new complaints related to Structural engineering remain numerous and often complex. A modest caseload of five per year could involve almost two weeks of unpaid work. Some retired members (and the independently wealthy) may be able to contribute their time in large measure, however the IC should be representative of the working profession as well as retirees.

Discussion

While we are actively seeking new members, especially structural engineers and geotechnical engineers, it is time to consider leveraging the skills and judgment of the volunteer members with professional assistance. Committee members can better be employed as case managers in very complex or unusual cases, rather than number crunchers. Matching expertise with the case content is important, but not always possible under the present schema.

The IC has used technical experts and investigators on an *ad hoc* basis to assist the committee on difficult files. However the model of the IC doing most of the technical analyses for investigations needs to evolve, if timely and thorough response to public complaints is to be sustained. The IC committee members are proud of their volunteer work, but they need help to do it.

Recommendation

That Executive Committee consider making a budget appropriation for the hiring of professional consultants and investigators to assist some of the volunteer investigations assigned to the Investigation Committee.

Sustainable Financial Policy

Policy	Outcome
All initiatives and financial expenditures are aligned to the Strategic Plan.	All program initiatives and savings are identified and linked to at least one strategic plan objective.
There is an annual review of economies, efficiencies and effectiveness of current expenditures, revenue strategies and initiatives.	Cost management and operation efficiencies are a important part of the budget process. Significant savings had been identified and have been incorporated into the FY20106/2017 budget.
The Applications and Registration program (the intake process) will be financially self-sustaining on a direct cost basis.	For 2016/2017, a contribution margin of $473K is budgeted.
The Continuing Professional Development instructional and service delivery will be financially self-sustaining on a direct cost basis.	FY2016/2017, the budgeted contribution margin is 185K.
All other programs with direct revenues should strive to be financially self-sustaining on a direct cost basis.	Most other programs such as affinity were self-sustaining recovering all direct costs including salaries and benefits.
Membership growth is actively pursued.	Membership growth is funded in the operating budget which includes the allocation of staff time to registration outreach programs. A variety of advertising and branding initiatives are to be implemented.
The annual member fee is reviewed each year	As part of budget review and approval process.

Association of Professional Engineers and Geoscientists of BC

Contribution Margin by Program

Program	FY2017 Revenue	FY2017 Costs	FY2017 Contribution Margin
Affinity Programs	405,000	15,834	389,166
Annual Conference	280,000	470,290	(190,290)
Professional Development	1,012,225	826,795	185,430
Employment Web Advertising	305,000	28,647	276,353
Career Awareness	7,800	109,369	(101,569)
Innovation Magazine	175,000	477,048	(302,048)
Student Membership & Sponsorship	49,000	119,349	(70,349)
Certified Professional Program	80,563	131,118	(50,556)
Organizational Quality Management	163,000	442,863	(279,863)
External Grants	1,120,000	1,149,668	(29,668)
Professional and Academic Examinations	552,800	472,705	80,095
Applications/Registration	1,263,049	1,051,311	211,738
Limited Licenses	12,750	66,564	(53,814)
Structural Qualification	53,114	13,897	39,217
Registration External Projects	216,000	233,536	(17,536)
	5,695,301	5,608,995	86,305

Note: Costs include allocated salaries and benefits

APEGBC Capital Acquisition Plan

	2016/2017
Systems Disaster Recovery / Business Continuity	
Client Infrastructure	5,500
EOL Replacement	5,000
Enterprise Infrastructure (Capacity Planning)	27,500
	38,000
Systems Implementation	
IT implementation (Capitalized Staff Salaries and Benefits)	181,806
Consultants for Capital Project Work	27,000
Systm Support	-
Association-wide Business Process Improvement	-
	208,806
Advanced Online Ethics	**70,000**
Property & Building Enhancements	
New Suite Rennovations, Workstations	750,000
	750,000
Total Capital	**$ 1,066,806**

Date: March 23, 2016

Report to: **Council for Information**

From: Jennifer Cho, CPA, CGA
Director, Finance & Administration

Subject: Financial Results as at February 29, 2016

Linkage to Strategic Plan: Continue to implement best practices in governance.

Purpose:	For Council to review the financial results as at February 29, 2016.
Motion:	That Council receives the APEGBC financial results as at February 29, 2016.

Discussion

Reported below is an update on the financial status. This updated includes a comparison of year-to-date actual results to budget, with a summary on major variances.

	A	B	C	D	E	F
1		YTD			Annual	
2		Actual	Budget	Variance	Prior Year Actual	15/16 Budget
3	**REVENUE**					
4	Members	6,377	6,363	14	8,741	9,431
5	Others	2,899	3,145	(245)	4,738	4,635
6	**Total Revenue**	**9,276**	**9,507**	**(231)**	**13,479**	**14,067**
7						
8	**EXPENDITURES**					
9	Operating	8,741	9,209	(469)	12,958	14,227
10	**Operating Income Before External Contracts**	**535**	**298**	**237**	**521**	**(160)**
11						
12	**EXTERNAL CONTRACTS**					
13	Revenue	624	767	(142)	1,230	1,150
14	Expenditures	551	693	(142)	1,080	1,040
15	**Operating Income - External Contracts**	**73**	**73**	**0**	**150**	**110**
16						
17	**Net Operating Income/(Loss)**	**609**	**372**	**237**	**671**	**(50)**

Year-To-Date Review - Before External Contracts

Revenues:

Total revenues variance is $231K (cell D6) under budget, primarily due to:

- Affinity rebate revenue – timing difference in budget

Offset by:

- Strong registration/certification fee revenue

Expenditures:

Expenditures variance is $469K (cell D9) below budget primarily due to:

- Savings in salaries and benefits primarily due to unfilled positions, delayed hiring and savings in vacation expenses.
- Timing difference of consulting expenses for brand strategy and public relations
- Savings in IT system maintenance and development using in-house IT staff

Year-To-Date Review – External Contracts

The YTD contribution margin is on track towards annual budget.

FY2016 Forecast

The financial forecast for June 30, 2016 is that APEGBC will be in a surplus position of approximately $343K.

There are significant savings in salaries expenses due to unfilled positions, maternity leave replacements and delayed hiring. Amortization expenses will be lower due to less capitalization ratio of IT staff time and timing of office renovation. Other savings include unused contingency.

The following table illustrates a high level budget cost variances and the FY2016 forecast result **(in $'000):**

FY2016 budget	(50)
Plus significant budget cost variances:	
Payroll savings	221
Amortization savings	79
Unused Contingency	125
Estimated MAPS credit application expense	(32)
Estimated FY2016 Surplus	**343**

Recommendation

That Council receives the APEGBC financial results as at February 29, 2016.

Date: April 4, 2016

Report to: **Council for Decision**

From: Peter Mitchell, P.Eng., FEC
Director, Professional Practice, Standards & Development

Subject: APEGBC Professional Practice Guidelines – Human Rights and Diversity

Linkage to Strategic Plan: Improve resources and education as well as awareness and access to resources that help members practice to high professional and ethical standards.

Purpose:	To approve the draft Professional Practice Guidelines – Human Rights and Diversity
Motion:	That the APEGBC Council approve the Professional Practice Guidelines – Human Rights and Diversity, for final editorial and legal review before publication.

Background

As part of the 2014 APEGBC Conference at the Hyatt Regency in Vancouver, the Division for the Advancement of Women in Engineering (DAWEG) and other organizations held a Celebration of Women in Engineering and Geoscience on 22 October 2014. Amongst the items discussed and recommendations made, it was mentioned several times that APEGBC should provide guidance to APEGBC professionals on dealing with human rights and diversity issues in the course of their professional practice. At its meeting of 28 November 2014, the APEGBC Council instructed the Professional Practice and Standards Development staff to develop professional practice guidelines on human rights and diversity (the "Guidelines").

As outlined in APEGBC's strategic plan for 2014-2017, APEGBC is committed to improving the resources and education, as well as awareness and access to resources that help members practice to high professional and ethical standards.

Discussion

The development of the guidelines was assigned to the Associate Director, Professional Practice. The source reference for the guidelines is the Guideline for Human Rights Issues in Professional Practice, V1.1 dated November 2005 of the Association of Professional Engineers and Engineers and Geoscientists of Alberta (APEGA). After APEGA granted permission to use its guideline, it was reformatted to meet the standard of current APEGBC professional practice guidelines; the legislation references were changed to reflect the relevant British Columbia law in effect; and two of the three case studies were modified to provide examples of relevant British Columbia decisions. After an initial review by the Leadership Team, the draft Guidelines proceeded to consultation.

The consultation plan summary is included as Appendix B and provides a high level overview of the consultation process followed.

Staff from the following APEGBC departments then met to review the comments received and revise the document accordingly:

- Communications
- Legislation, Ethics and Compliance
- Professional Practice, Standards and Development

Upon review of the comments received, changes were made where they were deemed to improve the content and quality of the guidelines. Consultation comments which did not result in changes to the guidelines included:

- non-specific congratulations on the development of the guidelines;
- non-specific opposition to the development of the guidelines;
- requests for the inclusion of business advice;
- requests for the inclusion of human resources management advice;
- suggestions for improperly linking other legislation with the *Human Rights Codes*;
- suggestions of activities and events outside the scope of the guidelines; and
- suggestions for inclusion of guidance outside the scope of the guidelines.

Recommendation

It is recommended that Council approve the *Professional Practice Guidelines – Human Rights and Diversity*, for final editorial and legal review before publication.

Appendix A – Professional Practice Guidelines - Human Rights and Diversity (v. 7.0)

Appendix B – Consultation Summary: Professional Practice Guidelines – Human Rights and Diversity

Appendices

Item 5.4.1	Appendix A
Item 5.4.2	Appendix A
Item 5.4.3	Appendix A Appendix B
Item 5.6	Appendix A Appendix B
Item 5.7	Appendix A Appendix B
Item 5.8	Appendix A
Item 5.9	Appendix A
Item 5.10.5	Appendix A Appendix B Appendix C Appendix D
Item 6.6	Appendix A Appendix B

Appendix A – Agreement regarding Multiple Applications for Professional Engineer Registration or Licence

Draft #2 –February 16, 2016

Proposed Agreement regarding Multiple Applications for Professional Engineer Registration or Licence

(For consideration by Engineers Nova Scotia, Engineers PEI and APEGBC Councils)

Purpose

The purpose of this agreement is the transfer of *Agreement on Internal Trade (AIT)**, applicants only, at the Professional Engineer level.

This agreement does not override any authority and/or obligations of the participating associations within their own legislative jurisdictions.

Application for Registration in Multiple Jurisdictions

- Only one application will be required for membership or licence in all participating associations. An applicant can simply indicate on the application form, as presented to the host association, that he or she would like the application to be treated as one application for multiple associations.
- The host association will conduct a review on behalf of the other participating associations with respect to the applicant's eligibility for registration or licence under the terms of the *AIT.*
- A decision by the host association to approve an applicant's registration or licence will result in a recommendation by the host association to the other participating associations as selected by the applicant to automatically approve the applicant's registration or licence.
- Each participating association will arrange with payment of its applicable fees, approve registration or licence and issue its own acceptance letter, stamps and certificates.
- Should a participating association have information that would disqualify an applicant approved by the host association from registration or licence under the terms of the *Agreement on Internal Trade*, it will take immediate steps to advise all participating associations, including the applicant's home association.
- Participating associations will consider modifications to their own application forms or systems, to facilitate ease of application under this agreement.
- Participating associations will consider incorporating a "one processing fee" system for multiple applications, to facilitate ease of application under this agreement.

Periodic Review/Withdrawal

- The participating associations will review this agreement from time to time
- Should any party wish to withdraw from this agreement, it should provide a minimum of six months' notice to the other parties.

* The Agreement on Internal Trade (AIT) is an intergovernmental trade agreement signed in 1994 by federal, provincial, and territorial First Ministers. It is designed to reduce and eliminate barriers to the free movement of goods, services, investment and labour within Canada. Chapter 7 of the AIT is the agreement to achieve labour mobility for workers in regulated occupations (trades and professions). It states that any worker certified for an occupation by a regulatory authority of one province or territory will, upon application, be certified for that occupation by each other province and territory that regulates that occupation, without any requirements for additional training, experience, examinations or assessments.

Dated: May XX, 2016

Signatures of participating jurisdiction representatives

Table 1 – Agreement Flowchart (added by APEGBC)

WHO → / WHAT ↓	P.ENG. APPLICANT REGISTERED/LICENSED IN HOME JURISDICTION 'A'	HOST JURISDICTION 'B'	OTHER PARTICIPATING JURISDICTIONS 'C', 'D', 'E' etc.
APPLICATION TO HOST JUSRISDICTION 'B'	Applies to Jurisdiction B under AIT; Provides Jurisdiction B's with required information	Verifies registration in Jurisdiction A including character & discipline history Grants Registration, Issues Licence and Stamp	Accepts application on the basis of selection by the applicant in Jurisdiction Bs application process
APPLICATION TO PARTICIPATING JURISDICTIONS	Selects other Participating Jurisdictions (C,D,E etc)	Verifies to Jurisdictions C, D, E etc. that the check has been done, provides application information as a 'form' or as online input.	Accepts evaluation of Jurisdiction B. Relies on Jurisdiction B or applicant to input applicant data Registers, Issues Certificate and Stamp
PAYMENT OF FEES	Pays Jurisdiction B's processing and other fees to Jurisdiction B		Invoices their respective fees to the applicant, including a processing fee

Appendix A – Proposed APEGBC Responses to Engineers Canada's Linkages Task Force

1. ***What are the major challenges facing the profession in the next five years?***
    a. Relevance and challenges to regulation with respect to the engineering profession of the 21st century:
        a. Regulation of emerging disciplines:
            i. The definition of "professional engineering" is difficult to use when it comes to encompassing emerging disciplines.
            ii. Complementary activities Instead of updating the definition are possible but can the regulators legitimately lay claim to new areas of practice through developing practice guidelines and accrediting new programs?
            iii. Establishing the value-added aspect of professional registration.
        b. Relevance to upcoming generations of engineers
        c. Understanding the challenges to public and environmental safety faced by members
        d. Engineering as a commodity: as engineering grows into more shared fields and information is widely and instantly available, some engineering is becoming commodity that is being (and in some cases can be) provided by others. In order to protect the public interest and stem the gradual incursion of others into professional engineering by others who are not licensed nor qualified to do certain engineering work, the profession needs to better articulate the value proposition of innovation, value and accountability that professional engineers provide to engineering versus the more routine or prescriptive work that can be done by others,
        e. Role and Aspiration to Practice Rights for non-Alberta Professional Technologists
            i. Will the role of "professional" technologists erode the position of licensed professional engineer and endanger the public interest?
            ii. Is there a definition of 'engineering technology' that is separate from 'professional engineering'?
    b. Economic downturn affecting employment of members thus relevance/value of members to employers is critical

2. ***What is needed to overcome them?***
    a. The profession needs to establish the value-added aspect of professional engineer/geoscientist registration/licence to all practitioners in all disciplines/areas of practice.
    b. Collaboration to discuss the needs and challenges to the profession of the 21st century
    c. Recruit a blue ribbon volunteers who feel the new issues and can frame them for Engineers Canada with an outward-looking approach

3. ***What is the one need that, if met, would immediately assist your association?***
    a. Form a cross-Canada task group to evaluate the current move for technologists to gain practice rights and to make recommendations for a national approach to regulation of the 'practice of engineering technology' and the implications for public protection.

4. ***What is the greatest opportunity to provide the engineering community with value that we're missing as Engineers Canada?***
    a. Guidance to members on how to carry out professional engineering activities in a manner that meets the engineer's professional obligations under the required legislation.
    b. Relevance of action for today's engineering community and building collaboration among the provinces/territories to achieve it. Engineers Canada's greatest opportunity is to bring the profession together to discuss real issues facing the profession (the practising

profession) on a proactive basis and to share innovative practices among the regulators.

c. Identifying industry trends and issues (eg when, where, and how does outsourcing occur, how have engineering shortage predictions panned out in reality) that will enable CAs to use data to evaluate and take action as necessary

5. ***Are there particular needs/issues you would like Engineers Canada to address?***

a. Facilitate a national approach to technologists/technicians, their goals to or current rights to practice embedded in Engineering Acts or 3rd party legislation, and the overlap with the practice of professional engineering.

b. Facilitate alignment of investigation and discipline principles, procedures and understanding of staff's roles and responsibility across the country.

c. Minimize the focus on Engineers Canada governance and the perceived need for every regulator to do things the same way. We feel that this suppresses innovation. There are great ideas and great challenges in the provinces and territories - facilitate sharing them and finding solutions.

6. ***What are the most critical outcomes that Engineers Canada should seek to achieve?***

a. Coordination of research and policies for addressing regulatory issues across the constituent associations to stop the overlap of work and encourage the sharing of information. Currently, communications across the CA's on regulatory matters is sporadic.

b. Build a base of respected volunteers whose advice is of value and can be turned into practical solutions that help the profession

7. ***What are the strengths (and weaknesses) of the current Ends?***

- We suggest that they be examined for practicality and current day relevance – see below for more detail

"Ends" – that section of Board policy that states the reason for Engineers Canada's existence. Ends answer three questions: what benefits should the organization produce, for whom, and how much they are worth?"	
E-1 ~~A current framework, standards, practices and systems and a means to~~ A proactive network that builds collaboration among the members and effective~~ly~~ shares, develops and transfers knowledge and tools to facilitate ~~regulatory~~ excellence in the profession. ~~available to the constituent associations.~~ This is highest priority among Ends and shall be allocated no less than 40 percent of the operational budget.	Currently there is a perceived focus on solving a problem that may not exist trying to make each regulator the same – it is inwardly rather than outwardly focused. Supporting collaboration and developing useful and enlightened tools and systems to achieve this end as rewritten would be a better use of resources.
E-1.1 Accreditation of Canadian engineering programs promotes and encourages high standards in engineering education, meets the academic requirements for licensure and is recognized globally for the purposes of mobility of engineers. ~~maintains Washington Accord signatory status.~~	Do not restrict this to the WA Accord,
E-1.2 Information, systems and agreements to facilitate national and global mobility for ~~registered~~ engineers ~~are available and promoted.~~	Extend to all engineers – intake and output.
E-1.3 ~~Information, systems and agreements to facilitate assessment of foreign credentials are~~	

~~available and promoted.~~ Development and sharing of tools and guidance on how to carry out professional engineering activities in a manner that meets the engineer's professional obligations (under their respective legislation). E1-4 Alignment of investigation and discipline principles and procedures and provision of information and systems that promote the members' responsibility to share information towards the protection of the public.	
E-2 CONFIDENCE IN THE PROFESSION	
Stakeholders have evidence that engineers meet high standards, practise with competence and integrity, and that their work and self-regulation benefit society. This End shall be allocated between 15 and 25 percent of the operational budget.	Suggest that we identify stakeholders or replace 'stakeholders' with 'the Public' We also suggest that this category speak to maintaining the relevance of professional engineering.
E2-1 Add an end: The confidence of professional engineers/ingénieur(e)s in the self-regulation and relevance of the profession is high and their feedback on ways to improve the profession is sought and considered.	
E-2.1 Timely and relevant national positions and expertise are available to the federal government and policy makers.	OK
E-2.2 The public confidence and public expectations of the profession are sustained and improved and appropriate actions are taken by the profession to meet this end. ~~monitored and available to stakeholders~~.	Monitoring is passive– how to we achieve the sustainment of this end?
E 2.3 Relationships with others whose work and practice is aligned with professional engineering are informed, strong and support protection of the public interest	Technologists, emerging disciplines
~~E-2.3 National and international information and trends on self-regulation are available to constituent associations.~~	This needs a more practical statement of what it actually means. Are we looking at 'after the fact', evaluation of predictions?
E-3 SUSTAINABILITY OF THE PROFESSION	
E-3 ~~Stakeholders have information regarding how engineering is practiced in Canada and~~ Engineering is recognized as ~~an attractive~~ a relevant, valuable and value-added profession. This End shall be	

allocated between 15 and 25 percent of the operational budget.	
E-3.1 Sustainable membership of the profession that is reflective of Canadian demographics. EC volunteer membership that is reflective of the demographics of the profession? (age, gender, native land, province) – brings the reality of practice challenges and opportunities to EC	We need to articulate why it is important to have the Canadian demographic and also to define what that means to sustain the profession. The benefit to whom is not articulated (see ends definition at the beginning)
E-3.1.1 To ensure a supply of engineers needed to support Canada's needs, an equivalent number to the number Canadian engineering graduates for each graduating year applies for licensure in Canada. ~~Most graduates from Engineers Canada accredited programs apply for licensure in Canada.~~	The way this is stated is impractical given today's world and global mobility. Suggest restating it
~~E-3.1.2 Studies, reports, trends and information are used in decision-making by policy-makers.~~	This seems to be self-evident
E-3.2 New areas of engineering practice are identified and information and tools are proactively developed for the use of the members ~~recognized by the constituent associations and government.~~	This is a CA (member) End – not an EC End – It needs to be rewritten.
E-3.3 The professional, social and economic needs of licensed engineers are met. How – through what actions on the part of Engineers Canada?	Is this a role for Engineers Canada?
1 E-4 Protection of the Engineering Terms December 2015 rev 2 **Policy Type**: Ends	
E-4 The public is not misled by persons improperly using terms, titles, images and words that are integral to the engineering brand, including in federal corporations and trademarks or practising professional engineering without being licensed. This End shall be allocated no more than 10 percent of the operational budget.	Trademark protection is important, but does it end here? Do we measure whether it result in public protection? Is it about more than trademark protection?

Appendix A – Foundation Nominating Committee Terms of Reference (clean copy)

TERMS OF REFERENCE

1. Name: Foundation Nominating Committee

2. Type/Reporting Relationship: Advisory Committee

2.2 Reporting Relationship:
The Committee is appointed by the Council of APEGBC and reports to the Council of APEGBC.

3. Purpose:
To nominate members for the office of Director of the Foundation in accordance with the *Guidelines on Nomination Procedures* as provided in Appendix I.

4. Authorities of the Committee:
The Committee shall act on behalf of the Council of APEGBC in facilitating the selection process for Directors of the Foundation.

5. Function/Deliverables:

5.1 Establish, affirm or modify a list of relevant criteria for the evaluation of potential nominees.

5.2 Solicit names of potential nominees from members of APEGBC and current Directors of the APEG Foundation.

5.3 Develop candidate profiles of potential nominees that describe their qualifications and suitability for the position.

5.4 Evaluate potential nominees based on the approved criteria and the completed profile.

5.5 Contact intended nominees to affirm their willingness to be nominated as Foundation Directors.

5.6 If considered appropriate, select a single slate of nominees to be brought forward for ratification by the membership. The number of nominees should be equal to the number of positions available.

6. Budget:
Except as set out above, and as allocated in APEGBC's annual budget, the Committee has no budget authority beyond reasonable expenses for travel, teleconference or ancillary expenses.

7. Membership:

7.1 The Committee shall be composed of four members, and shall include the following:

- Three current members of Council, appointed by Council; and
- One member who is a Director of the APEG Foundation, selected by the Foundation Directors, and who is not eligible for re-appointment or who confirms not to be considered for re-appointment during the term he or she is a sitting-member of the

Committee. (If no such Director can be identified, then a member of current Council will instead be selected.)

8. Term of Office:

8.1 Appointments are for one year, renewable twice unless otherwise extended by Council.

8.2 The terms of office are from each September to the end of August of the subsequent year.

9. Selection of Officers:

9.1 The Chair is elected by the Committee. The Chair must be, and remain, a member of current Council.

10. Quorum:

A majority of members will constitute a quorum.

11. Frequency of Meetings:

The Committee will meet as many times as required to fulfill its duty.

12. Conduct of Meetings:

The Committee may meet in person and/or by telephone conference, webcast or other electronic communications media where all members are able to simultaneously hear each other and participate during the meeting. Generally the latest edition of Robert's Rules shall be adopted for the conduct of meetings.

13. Minutes:

Minutes, notes or recording of decisions are the responsibility of staff support.

14. Periodic Reporting and Review of Terms of Reference:

The Committee shall review its Terms of Reference on an annual basis, and bring forward any proposed changes to the Governance Committee for approval.

15. Staff Support:

Director, Communications and Stakeholder Engagement

APPROVED BY APEGBC COUNCIL: November 29, 2013 (CO-14-21)

Appendix I – Guidelines on the Nomination and Ratification of Directors

1. When a vacancy for a Foundation Director arises, either though the completion of a term, or through a resignation before the completion of a term, staff will alert the Nominating Committee; the Nominating Committee then meets to initiate the nomination process.

2. The Nominating Committee will establish, affirm, or modify the list of criteria for the evaluation of potential nominees; in the case of modification, the views of current Directors will be sought.

3. All members of the Committee and all Directors of the APEG Foundation are advised of the details of the vacancies arising, and are invited to propose potential nominees to staff or the Committee Chair by a specified deadline (without the need to obtain the endorsement of the relevant individuals); simultaneously, if eligible for re-appointment, the relevant Directors will be invited to declare their interest or not in being considered for reappointment; if they do so, their names will be added to the list of potential nominees.

4. The Nominating Committee develops nominee profiles that summarize qualifications with respect to the criteria.

5. The Nominating Committee reviews the information that has thereby been developed, and develops a draft slate of nominees.

6. Each nominee is then invited to affirm his or her concurrence with being nominated.

7. The final slate is thereby developed and brought forward to a meeting of members of the Committee for ratification. Additional nominees cannot be brought directly to the floor of the meeting, and therefore there will be no election of nominees.

Appendix B – Foundation Nominating Committee Terms of Reference (tracked changes)

TERMS OF REFERENCE

1. Name: Foundation Nominating Committee

2. Type/Reporting Relationship: Advisory Committee

2.2 Reporting Relationship:
The Committee is appointed by ~~the members of~~ the Council of APEGBC ~~Foundation (Council)~~ and reports to the Council of ~~members of the~~ APEGBC. ~~Foundation (Council)~~~~Advisory Committee reporting to Council~~.

3. Purpose:
To nominate members for the office of Director of the ~~APEG~~ Foundation in accordance with the *Guidelines on Nomination Procedures* as provided in Appendix I.

4. Authorities of the Committee:
The Committee shall act on behalf of the ~~members of the Foundation (members of~~ Council~~)~~ of APEGBC in facilitating the selection process for Directors of the Foundation.

5. Function/Deliverables:

5.1 Establish, a~~A~~ffirm or modify a list of relevant criteria for the evaluation of potential nominees.

5.2 Solicit names of potential nominees from members of APEGBC and current Directors of the APEG Foundation.

5.3 Develop candidate profiles of potential nominees that describe their qualifications and suitability for the position.

5.4 Evaluate potential nominees based on the approved~~previously identified~~ criteria and the completed profile.

5.5 Contact intended nominees to affirm their willingness to be nominated as ~~a~~ Foundation Director~~s~~.

5.6 If considered appropriate, s~~S~~elect a single slate of nominees to be brought forward for ratification by the membership. The number of nominees should be equal to the number of positions available.

6. Budget:
Except as set out above, and as allocated in APEGBC'~~Association~~'s annual budget, the ~~The~~ C~~c~~ommittee has no budget authority beyond reasonable expenses for travel, teleconference or ancillary expenses.

7. Membership:

7.1 The Committee shall be composed of f~~F~~our members~~-~~, and shall include the following ~~of which: of the Association.~~

- ~~7.2~~ Three ~~members must be~~ current members of Council, appointed~~selected~~ by Council; and
- ~~7.3~~ One member who is~~must be~~ a Director of the APEG Foundation, selected by the Foundation Directors, and who is not eligible for re-appointment or who confirms not to be considered for re-appointment during the term he or she is a sitting ~~-~~member of the C~~c~~ommittee. (If no such Director can be identified, then a member of current Council will instead be selected.)

8. Term of Office:

8.1 Appointments are for one year, renewable twice unless otherwise extended by Council.

8.2 The terms of office are from each September to the end of August of the subsequent year~~September~~.

9. Selection of Officers:

9.1 The Chair is ~~appointed~~ elected by the Committee. The Chair must be, and remain, a member of current Council.

10. Quorum:

~~Three members~~A majority of members will constitute ~~of the Committee constitute~~ a quorum.

11. Frequency of Meetings:

The C~~c~~ommittee will meet as many times as required to fulfill its duty.

12. Conduct of Meetings:

The Committee may meet in person and/or by telephone conference, webcast or other electronic communications media where all members are able to~~may~~ simultaneously hear each other and participate during the meeting. Generally the latest edition of Robert's Rules shall~~ould~~ be adopted for the conduct of meetings.

13. Minutes:

Minutes, notes or recording of decisions are the responsibility of staff support.

14. Periodic Reporting and Review of Terms of Reference:

The Committee shall review its Terms of Reference on an annual basis, and bring forward any proposed changes to the ~~Executive~~ Governance Committee for approval.

15. Staff Support:

Director, Communications and Stakeholder Engagement

APPROVED BY APEGBC COUNCIL: November 29, 2013 (CO-14-21)

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Appendix I – Guidelines on the Nomination and Ratification of Directors

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10.3. All members of the Committee and all Directors of the APEG Foundation are advised of the details of the vacancies arising, and are invited to propose potential nominees to staff or the Committee Chair by a specified deadline (without the need to obtain the endorsement of the relevant individuals); simultaneously, if eligible for re-appointment, the relevant Directors will be invited to declare their interest or not in being considered for reappointment; if they do so, their names will be added to the list of potential nominees.

11.4. The Nominating Committee develops nominee profiles that summarize qualifications with respect to the criteria.

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14.7. The final slate is thereby developed and brought forward to a meeting of members of the Committee for ratification. Additional nominees cannot be brought directly to the floor of the meeting, and therefore there will be no election of nominees.

APEGBC's Position on Human-Induced Climate Change

Final version, incorporating feedback received in response to consultation
Version date: March 29, 2016

Position

A. APEGBC accepts that there is strong evidence that human activities, in particular activities that emit greenhouse gases, are contributing to global climate change.
B. APEGBC Registrants[1] have the potential to influence greenhouse gas emissions through their professional activities, and are expected to consider the impact of their work on the climate.

Greenhouse gas emissions are changing the climate

Scientific evidence shows a global warming trend which has accelerated over the past 100 years. Further, multiple lines of evidence show that emissions of greenhouse gases (in particular carbon dioxide and methane) from human activities are the primary driver of this trend (IPCC, 2014). Data from the US National Oceanographic and Atmospheric Administration show that nine of the 10 warmest years on record have occurred since the year 2000 (NOAA, 2015). Projections based on global climate models indicate that global temperatures will continue to rise (IPCC, 2014). Climate scientists have confidence in the ability of these models to produce credible, quantitative projections of the future climate since they are based on fundamental physical principles and have consistently been shown to reproduce observed features of the current climate and past climate changes.

The scientific community has determined that in order to stabilize the climate, greenhouse gas emissions must be reduced by 40-70% from current levels by mid-century (IPCC, 2014). The Province of British Columbia has legislated a target of 33% reductions by 2020 and 80% reductions by 2050 from a 2007 baseline (Province of BC, 2007). The BC Government continues to develop and refine climate change legislation and policies in consultation with a broad range of stakeholders including local governments, professional associations such as APEGBC and the general public. Significantly, the December 2015 Paris Climate Conference achieved a legally binding and universal agreement on climate action, with over 190 countries recognizing that climate change represents an urgent and potentially irreversible threat to human societies and the planet and that deep reductions in global greenhouse gas emissions will be required.

As outlined in APEGBC's first position paper on climate change (APEGBC, 2014), a range of regional climate impacts are predicted in British Columbia, including changes in precipitation patterns (particularly the intensity, duration and frequency of precipitation events) and warmer summer and winter temperatures. As a result of these changes, there are expected to be increased risks to manage, including risks related to flooding, forest fires, air pollution events, and supply of fresh water. Adaptation measures will be required to increase infrastructure resilience and protect the public from climate change. APEGBC's first position paper describes the evolving role for APEGBC Registrants related to adapting infrastructure to a range of potential future climate patterns. Adaptation should also be combined with actions that mitigate human-induced climate change.

[1] APEGBC Registrants are: professional engineers, professional geoscientists, provisional members, licensees, limited licensees, engineers-in-training and geoscientists-in-training.

Engineers and geoscientists can contribute to mitigating human-induced climate change through their professional activities

At its core, climate change "mitigation" includes actions to reduce the quantity of greenhouse gas emissions released into the atmosphere, in particular carbon dioxide from the combustion of fossil fuels. Mitigation will require moving toward a low carbon economy and replacing fossil fuel with renewable energy where possible. Mitigation can also refer to sequestering carbon dioxide from the atmosphere, or finding ways to store carbon dioxide (or other greenhouse gases) that would otherwise be released. The work of engineers and geoscientists can positively influence how energy and resources are produced and used in their projects, thus helping to reduce greenhouse gas emissions. APEGBC Registrants work in a wide variety of different roles: as employees, employers, researchers, academics, consultants, and in regulatory and managerial positions, and they often work on teams with other specialists. Although engineers and geoscientists may not be the implementers of strategic decisions that influence energy use and greenhouse gas emissions for the projects they work on, they are encouraged to inform their clients and other decision-makers of the potential climate change implications of various courses of action. These expectations are highlighted in the Code of Ethics as well as the APEGBC Sustainability Guidelines (APEGBC, 2nd edition, 2013). In many cases, the strong links between renewable energy, energy efficiency and greenhouse gas emissions reduction means that there is a potential business case for solutions with lower associated climate impacts, especially when the full project life costs and benefits are accounted for.

As government, industry and public awareness of climate change increases, APEGBC Registrants will be increasingly expected to assess the potential climate impacts of projects that they are working on, and likely be expected to offer alternatives that could reduce project greenhouse gas emissions. In fact, many engineers and geoscientists are already influenced by Provincial regulations and guidelines related to climate change adaptation and greenhouse gas emissions mitigation (BC Ministry of Environment, 2015).

Expectations and Resources for APEGBC Registrants

Professional activities of APEGBC members are in many cases constrained by the requirements of their clients as well as the existing codes, standards, legislation and regulations that govern their areas of work. Engineers and geoscientists would not be expected to take on responsibilities or liability where they would not be reasonably expected to have the appropriate knowledge or expertise to advise clients on climate change related matters. The Association and its standing committees will continue to contribute to the development of new and existing regulatory tools, as well as to advocate for its members that may be affected.

APEGBC's Sustainability Guidelines may serve as a valuable reference for APEGBC Registrants (APEGBC, 2nd Edition, 2013). These Guidelines provide a high-level process to follow that can assist Registrants in fulfilling their responsibilities related to society and the environment and deliver more sustainable solutions. APEGBC is actively engaged in developing and enhancing all of its professional practice guidelines to ensure that they accurately reflect the standard of care that would be expected of APEGBC Professionals related to climate change. APEGBC intends to continue to help its Registrants keep their knowledge current on the topic of climate change and its implications, by providing links to relevant resources and tools on a Climate Change Information Portal on the

APEGBC website. Initially the Portal will focus on climate change adaptation issues, with content related to mitigation to be developed in due course.

Concluding Remarks

APEGBC accepts that the best available scientific evidence indicates that the global climate is changing at an unprecedented rate and that emissions of carbon dioxide and other greenhouse gases from human activities are the leading contributors to this change. APEGBC also recognizes that recently recorded climate change is associated with increased frequency of extreme weather events and other significant impacts which are predicted to accelerate over time. Any mitigation of human-induced climate change is predicted to be beneficial. Engineers and geoscientists have important roles and responsibilities in helping guide society to adapt to these changes and to reduce greenhouse gas emissions in order to mitigate climate change. APEGBC will provide guidance for its members on practicing in a changing climate through the provision of professional practice guidelines that relate to climate change mitigation and adaptation. Accelerated climate change presents new and evolving challenges, opportunities and risks that will need to be considered by APEGBC Registrants in the fulfillment of their professional responsibilities.

References

APEGBC. 2013. "Sustainability Guidelines". 2nd Edition. Available at: https://www.apeg.bc.ca/For-Members/Professional-Practice/Sustainability-Resources

APEGBC, 2014. "A Changing Climate in British Columbia: Evolving responsibilities for APEGBC and APEGBC Registrants". Available at: https://www.apeg.bc.ca/About-Us/Commitment-to-Community/Climate

BC Ministry of Environment, 2015. *Climate Change: Policy, Legislation & Programs.* Available at: http://www2.gov.bc.ca/gov/topic.page?id=9DF88AF901A14DE59BF3CF4B8A6B17EB

IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp. Available at: http://ar5-syr.ipcc.ch/

NOAA (US National Oceanographic and Atmospheric Administration), 2015. Climate Monitoring: Global Analysis - Annual 2014. Available at: http://www.ncdc.noaa.gov/sotc/global/201413

Province of British Columbia, 2007, Greenhouse Gas Emissions Targets Act. Available at: http://www.bclaws.ca/Recon/document/ID/freeside/00_07042_01#section2

CCAG Response to Consultation on Mitigation Position Paper

Comment / Suggestion	CCAG Response
Building Enclosure Committee CCAG Consultation: September 15, 2015 Additional Committee Discussion: November 11, 2015	
The Building Enclosure Committee concluded that the draft mitigation position paper was not strong enough and did not establish a leadership position for APEGBC.	The CCAG appreciates this feedback – the aim of this position paper (and its predecessor) is to establish a leadership position while acknowledging the professional roles and obligations of Engineers and Geoscientists.
Unless changes are made to the Building Codes, APEGBC Professionals would have difficulty implementing solutions that effectively deal with climate change.	It is agreed that ongoing changes and improvements to the Building Code will make it easier for related professionals to mitigate greenhouse gases (GHGs).
MOTION: It is moved and seconded (Peer|Schwartz) that the Building Codes Committee recommends that the APEGBC Professional Practice Committee request that APEGBC Council provide immediate and strong guidance on action to be taken with respect to climate change in professional practice. **CARRIED.**	The revised position paper (incorporating the feedback received during this consultation) will be taken to the Professional Practice committee, with a recommendation that they bring it to Council for adoption.
Building Codes Committee CCAG Consultation: September 15, 2015 Additional Committee Discussion: September 24, 2015	
The Building Codes Committee was generally supportive in principle of the draft position paper.	Thanks for this supportive comment.
Comment from one member that clients can strongly influence the scope and design of a project, which stresses the need for increasingly stringent codes and regulations.	Agreed that appropriately stringent codes and regulations are needed. APEGBC committees such as the Building Codes Committee play an important role in advancing codes, standards and regulations that are relevant to APEGBC. APEGBC is in the process of developing an Energy Modelling Guidelines, which is related to GHG reductions through the enabling of energy efficient buildings.
Comment from one member that the positions were not specific enough and suggestion that APEGBC take a position that fossil fuels should be left in the ground.	Thanks for this suggestion. However, the aim of this paper is to provide high-level position statements for APEGBC and its members, whereas the position proposed by this member is more specific.
Division of Environmental Professionals CCAG Consultation: September 10, 2015 Additional Committee Discussion: October 20, 2015	
The Division of Environmental Professionals supports APEGBC taking a firmer stand on climate change and in particular, mitigation.	The CCAG appreciates this supportive comment.

Support from the Division of Environmental Professionals for more clearly stating the primary driver of climate change which is that burning of fossil fuels is resulting in extreme weather and other significant impacts and that engineers and geoscientists need to consider mitigating these anthropogenic emissions to avoid acceleration of extreme weather and other significant impacts.	The first position of the paper states that: "APEGBC recognizes that human activities**, in particular activities that emit greenhouse gases,** are contributing to global climate change". Edits have been made to make it clearer that CO2 is the primary GHG of concern, and that fossil fuels combustion is the main source of CO2, as follows: • The first sentence of the section titled "Greenhouse gas emissions are changing the climate" has been edited as follows: "Multiple lines of scientific evidence show a global warming trend over the past 100 years and that anthropogenic emissions of greenhouse gases (in particular carbon dioxide and methane) are the primary driver of this trend (IPCC, 2014)." *[underlined text added]* • The first sentence of the section titled "Engineers and geoscientists can contribute to climate change mitigation" has been edited as follows: "At its core, mitigation means taking actions to reduce the quantity of greenhouse gas emissions released into the atmosphere, in particular carbon dioxide from the combustion of fossil fuels." *[underlined text added]*
The Division of Environmental Professionals commented that engineers and geoscientists also need to consider adaptation to climate change resulting from anthropogenic and natural greenhouse gas emissions.	Adaptation to the changing climate has already been explicitly addressed in APEGBC's first climate change position paper, titled: "A Changing Climate in British Columbia: Evolving responsibilities for APEGBC and APEGBC Registrants", and will continue to be addressed in new APEGBC guidelines, such as the Professional Practice Guidelines on Incorporating Climate Resilience in the Design of Highway Infrastructure in BC ("Climate Resilience Guidelines") currently under development. • The following sentence has been added to the conclusions section of the position paper: "APEGBC also recognizes that climate change is resulting in increased frequency of extreme weather event and other significant impacts which will accelerate over time if not mitigated."
The Division of Environmental Professionals commented that the development of mitigation professional practice guidelines and tools are needed as soon as possible to ensure engineers and geoscientists are providing adequate care for the environment and human health.	Thanks for this suggestion. APEGBC has been updating and revising its professional practice guidelines to take climate change into account where necessary, and is developing new Climate Resilience Guidelines in consultation with the Province and other stakeholders, including consulting engineering companies. Climate change issues will also be addressed in ethics training for new members, as part of developing their understanding of professional due diligence.
Municipal Engineers Division CCAG Consultation: October 2, 2015 Additional Committee Discussion: October 2, 2015	
The Municipal Engineers Division noted that members need clarification on the level of responsibility that they will be expected to take on for Climate Change issues.	Thanks for this comment. As mentioned in the position paper: "APEGBC is actively engaged in developing and enhancing all of its professional practice guidelines to ensure that they accurately reflect the standard of care that would be expected of APEGBC Professionals related to climate change". Climate change issues will also be addressed in ethics training for new members, as part of developing their understanding of professional due diligence.

The Municipal Engineers Division highlighted that members would benefit from a "tool kit" that could include best practices and resources, to assist members with climate change issues for our projects and activities.	We agree that members would benefit from access to practical tools. In the position paper it is stated that: "APEGBC intends to continue to help its Registrants keep their knowledge current on the topic of climate change and its implications, by providing links to relevant resources and tools on a Climate Change Information Portal. Initially the Portal will focus on climate change adaptation issues, with content related to mitigation to be developed in due course." A link will be placed on the APEGBC website when it is available.
The Municipal Engineers Division commented that members need guidance and support on how to inform non-technical decision makers (such as elected officials) about climate change implications for our projects and activities.	This is a helpful suggestion, and needs to be considered as APEGBC's professional practice guidelines are developed and updated.
The Municipal Engineers Division suggested that position paper should have specific examples of the current and expected regulations, as well as climate change implications on projects.	Thanks for this suggestion. Although it would be beyond the scope of the current position paper to include an exhaustive list of current and expected regulations, reference has been made to the Province of BC Greenhouse Gas Emissions Targets Act (2007) and the BC MOE "*Climate Change: Policy, Legislation & Programs"* webpage.
Consulting Practice Committee CCAG Consultation: September 16, 2015 Additional Committee Discussion: September 24, 2015	
Several members concluded that too much responsibility was placed on individual professionals: • The current approach to addressing climate change is resulting in too much responsibility onto the individual Engineer/Geoscientist • I do not think it is a good idea to ask the Engineers and Geoscientists to be responsible for determining how they are going to deal with climate change • I fail to see how we as individual professionals can take the responsibility of climate change on as part of a given project	We agree that it is important to recognize that individual members should be given appropriate responsibility that reflects their professional expertise and experience. The statement that "APEGBC Registrants have the potential to influence greenhouse gas emissions through their professional activities, and **are expected to consider the impact of their work on the climate**" is intentionally a high-level position that will be held by the organization. APEGBC's professional practice guidelines will provide the details of *how* members are expected to consider the impact of their work on the climate. CCAG members are actively involved in this process. The emerging aspects of climate change and sustainability are expanding the responsibility of due diligence on the engineering profession to address the issues of climate change and sustainability within engineering works. Engineers, and those who retain them for design of public facilities and infrastructure, will have to specifically accommodate climate change and sustainability into their work to ensure public health and safety. Engineers that do not exercise due diligence regarding climate change may ultimately be held personally or jointly liable for failures or damages arising from climate or sustainability impacts on engineered systems.

The Consulting Practice committee agreed that climate change needs to be taken on through codes in order to be actionable: • It has to come from the standards and regulations we are working under • Climate change and greenhouse has reduction is a large issue I agree, however this needs to be taken on through codes in order to be actionable • The document notes 33% carbon reductions has been legislated by the province of BC however I do not know where this is mandated in the code • We are responsible for complying with codes and standards and this needs to be addressed by this forum • In my opinion, the design process should be that the BC building Code sets standards, the local authorities set requirements and the Engineer/Geoscientist adheres to the standards and requirements	The CCAG appreciates this comment, which mirrors other feedback received regarding the importance of codes, standards and regulations in driving action. A number of APEGBC Committees and many individual members are involved with the development, updating and review of practice codes and standards. In addition, APEGBC is developing and updating a number of professional practice guidelines to address climate change issues.
One member highlighted that clients may not pay for design that is not required under current regulations.	Comment received and acknowledged, thank you.
One member expressed that they think the Mitigation Position Paper is too open ended to be issued as a document on our roles and responsibilities.	This position paper is intentionally written as a high-level statement of the roles and responsibilities of APEGBC and its registrants with respect to climate mitigation. However more formal guidance and expectations will be released in the form of updated and new professional practice guidelines, codes and standards.
One member expressed that the focus of the paper being on reducing the quantity of greenhouse gases as professionals go about their work is more acceptable than stating that engineers need to design to accommodate future climate change effects.	Comment received and acknowledged, thank you. Note that adaptation to the changing climate has already been explicitly addressed in APEGBC's first climate change position paper, titled: "A Changing Climate in British Columbia: Evolving responsibilities for APEGBC and APEGBC Registrants", and will continue to be addressed in new professional practice guidelines, such as the "Climate Resilience Guidelines" currently under development.
Sustainability Committee CCAG Consultation: September 17, 2015	
The Sustainability Committee is very supportive of the paper and its direction, and their comments are focused on two areas: expansion of references to the existing Sustainability Guidelines, as well as some markups on absorption of greenhouse gases from the greenhouse gas inventory specialist on the Committee. (The committee provided their suggestions in a marked up word document)	Thank you for the supportive comment. Some edits have been made to the position paper in response to the mark-ups conveyed. • Sentence added to the section titled "Engineers and geoscientists can contribute to climate change mitigation": "Mitigation can also refer to sequestering carbon dioxide from the atmosphere, or finding ways to store carbon dioxide (or other greenhouse gases) that would otherwise be released."
The chair of the Committee noted that there might be an opportunity to better align the position paper with the Sustainability Guidelines 3, 4 and 5.	Improved reference has been made to the APEGBC Sustainability Guidelines, as suggested in your comments, though it was felt that making specific reference to individual guidelines would be beyond the scope of the position paper. • Sentence added to the section titled "Engineers and geoscientists can contribute to climate change mitigation": "These expectations are highlighted in the Code of Ethics as well as the APEGBC Sustainability Guidelines (APEGBC, 2nd edition, 2013)."

One member commented that: "there is no specific link drawn between climate change and increased stress on wildlife and aquatic life. I'm not sure exactly how to work that link into the document, but it may be good to mention. Particularly in the civil engineering and geoscience fields mitigation of climate change impacts on aquatic life could be important considerations."	Thanks for this comment. The topic is important, but considered to be beyond the scope of the present brief document.
MOTION: It was moved and seconded (Lee|Kallur) that the Sustainability Committee: 1. Supports in principle the need for an APEGBC position paper on Climate Change mitigation; 2. Is in agreement with the approach taken by the Climate Change Advisory Group in preparing a draft and undergoing consultation with APEGBC Committees and Divisions; 3. Shall provide comments and feedback on the draft position paper entitled "Mitigating Anthropogenic Climate Change: The Role of BC Engineers and Geoscientists"; 4. Will provide feedback on the Mitigation position paper in their November meeting; and 5. Will work closely with the Climate Change Advisory Group. **CARRIED.**	Thank you.
Geoscience Committee CCAG Consultation: October 1, 2015 Additional Committee Discussion: November 5, 2015	

Several members of the Geoscience Committee suggested that the Mitigation Position Paper should not discuss the causality of climate change: • Leave out references to greenhouse gases as the implied only cause of climate change • APEGBC should not be making any statements that conclusively state that changes in climate are due to any factor • APEGBC should remain neutral, professional and apolitical on this issue, while recognizing that climate always changes and our purpose is to help society safely adapt to an always changing future • The main policy position of APEGBC and this paper should be that a changing climate, no matter what the cause, requires engineering and geoscience expertise to protect the public and fulfill our mandate as professionals • Not relevant to discuss underlying causes, as members may not feel qualified to make such a judgment, or disagree about those causes • APEGBC doesn't need to take a position on causality to take action to educate its members. It can act to increase awareness by offering information, ideas, and case studies of best management practices, and mitigation options. These can be applied as appropriate to the engineering and geoscience tasks undertaken • The professionals of APEGBC do not own the science of the causality of climate change • APEGBC resources would be better directed towards defining practice guidelines and developing position papers which deal with ongoing climate change as it is observed without concluding on causality • APEGBC is not the body to make definitive pronouncements on the causes of climate change • We do not need to preach causality	Thank you for this suggestion; however the CCAG is confident that the statements in the position paper regarding the role of greenhouse gases in driving climate change represents the scientific consensus, as evidenced by the body of research summarized by the Intergovernmental Panel on Climate Change (2014), referenced. This position paper does not ask APEGBC members to make a judgment call on science behind on climate change, but rather it presents to the members the best available evidence on the topic and proposes reasonable actions that should be taken in response.
A few members of the Geoscience Committee suggested that there should be acknowledgement that the climate has changed in the past: • The paper does not acknowledge that climate has changed in the past, is changing now, and will always change in the future • The non-stationarity of these climate conditions is the norm	Thanks for this comment. This has been addressed to a limited extent in the first position paper issued by APEGBC on climate change, titled: "A Changing Climate in British Columbia: Evolving responsibilities for APEGBC and APEGBC Registrants". The opening paragraph of that position paper states: "The climate in British Columbia **is continuing to change**, challenging many traditional assumptions of long-term climate stability". While the members of the CCAG recognize that on a geological timescale the climate has always changed, in the most recent millennia in which human civilization has developed it has been remarkably stable. Only in recent decades has significant change been observed once again.

Several members identified that there is a need for guidance on how to incorporate climate change into professional practice: • Appropriate for APEGBC to produce a paper recognizing the phenomenon of climate change, as the role of members in ameliorating those changes, as part of their professional duties • APEGBC's primary role should be to provide guidance to its professional members as to how they might incorporate the possible effects of climate change into their practices, draft should be rewritten to focus on this aspect • APEGBC resources would be better directed towards defining practice guidelines and developing position papers which deal with ongoing climate change as it is observed without concluding on causality • APEGBC should focus on providing guidance for its members on practicing in a changing climate through the provision of professional practice guidelines that relate to climate change mitigation and adaptation • Difficultly seeing where the average P.Eng/P.Geo can effect substantive mitigation beyond the normal application of industrial efficiencies that fall under current best practices • APEGBC needs to be perceived as providing strong leadership particularly with regard to risk management-based perspective and technical and professional solutions which respond to extreme climate events regardless of causality	This is a good point, which has also been raised by other APEGBC committees and divisions. A number of APEGBC Committees and many individual members are involved with the development, updating and review of professional practice guidelines, codes and standards for "the average P.Eng/P.Geo.", many of which are now explicitly addressing the risks and opportunities related to climate change. In the concluding paragraph of the position paper, the following sentences mentioned this work, as follows: "APEGBC will provide guidance for its members on practicing in a changing climate through the provision of professional practice guidelines that relate to climate change mitigation and adaptation." As an example of work on this emerging issue, the BC Ministry of Transportation, Infrastructure (MoTI) has released Technical Circular T -06/15 on "Climate Change and Extreme Weather Event Preparedness and Resilience in Engineering Infrastructure Design" (http://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/engineering-standards-and-guidelines/technical-circulars/2015/t06-15.pdf). This Technical Circular serves as a directive to consider climate change and extreme weather events in infrastructure design. While it provides a directive, further practice guidance is to be obtained from professional associations. APEGBC is developing the "Climate Resilience Guidelines" to support this MoTI directive.
Several members suggested revising language of certainty: • Science is never settled • Claims of absolute certainty in the position paper should be removed • Scientifically inappropriate to accept anthropogenic climate change as a fact	It is agreed that the question of uncertainty in climate science (as in all branches of science and engineering) is a critical consideration when making decisions and taking action. The 2014 IPCC Synthesis Report referenced in the position paper states that the effects of anthropogenic greenhouse gases "are *extremely likely* to have been the dominant cause of the observed warming since the mid-20th century." The term "extremely likely" in IPCC documents is used to denote a probability of 95-100%.
Several members suggested making the position paper more balanced: • One sided document • The science is not settled • The position paper's identified focus on reducing greenhouse gases fails to acknowledge other factors contributing to longer term climate change • I suggest leave out the references to greenhouse gases….with regard to the emission of GHGs as the implied only cause of climate change. Otherwise some balance would be appropriate • A position paper for diverse professionals must offer a fair and balanced set of supporting information based on solid science and written by professionals with grounding in the core of science	The CCAG believes that the position paper for APEGBC's diverse membership does indeed "offer a fair and balanced set of supporting information", and is "based on solid science and written by professionals with grounding in the core of science". Following drafting of the paper, the CCAG sought feedback from professional climate scientists to confirm that the statements made represented the best current knowledge on the topic. The group is confident that the positions are reasonable and that the science that supports them is accurate. Further information regarding climate science as it relates to our practice will be provided in the "Sustainability in Professional Engineering and Geoscience: Primer on Climate Change" that is currently being updated and will be available late 2016.

Several members commented that Professionals should reserve the right to use their professional judgment: • Position paper must preserve the right of individual practitioners to make their own technical decisions about what is needed for their practices • As a member of our self-regulating profession, I must reserve the right to make the best decisions for my clients and conduct my projects based on professional judgment as to the best application of available science and technology for the long term • The statements "adaptation must be combined with actions that mitigate anthropogenic climate change" and "taking actions to reduce the quantity of greenhouse gases" are prescriptive and seriously encroach on the responsibility of individual members to be well-informed and qualified in their areas of practice, and following the Code of Ethics to take professional and technical decisions appropriate to their work	This is an important point, and the CCAG would like to emphasize that the intention of the position paper is not to encroach on the right of individual members to conduct their professional practice using their professional judgment. However, the present position paper (and the previous one released by APEGBC, titled "A Changing Climate in British Columbia – Evolving responsibilities for APEGBC and APEGBC Registrants") does make it clear that the changing climate has potential implications for APEGBC Registrants that they should be aware of. As an example, changing national or provincial regulations related to greenhouse gas emissions might be brought into effect that could influence the design of a project, and APEGBC professionals should be aware of such changes. The emerging aspects of climate change and sustainability are expanding the responsibility of due diligence on the engineering profession to address the issues of climate change and sustainability within engineering works.
Three members of the Geoscience Committee were in favour of the draft as written: • I have no issues whatsoever with the paper as written • I think this position paper is much improved over the last one • I have no problems with both statements A and B made in the APEGBC position paper	Thank you.
Two members called for input from APEGBC members: • The issue is open to lawsuits and must be put to a vote by all APEGBC members • It should not be endorsed by APEGBC without significant changes and further input from the membership	APEGBC will ensure that a legal review of the proposed position paper will be undertaken prior to publication.
One member raised the concern that this document could alienate APEGBC from mining professionals and organizations such AMEBC.	Thanks for raising this concern – it is not intended that this document alienate any group from the Association. Every effort has been made to ensure that the statements and justification provided in this document are reasonable and supported by evidence.
One member noted that APEGBC's major efforts should be in working with the BC government to develop climate change mitigation policies.	Recognizing the impact of Provincial climate change mitigation (and adaptation) policies, APEGBC has developed strong ties with the Provincial Government over the past few years. For example, the CCAG has a standing member of the group from the BC Climate Action Secretariat.
One member identified that the liability risks and insurance premiums for each member, especially consultants, could be exceedingly high.	APEGBC will ensure that a legal review of the proposed position paper will be undertaken by APEGBC's legal counsel prior to publication, and will pay particular attention to the question of liability risks to membership.

One member asked if the document will be peer reviewed.	The position paper will undergo three rounds of review. The first is with climate scientists at the Pacific Climate Impacts Consortium at the University of Victoria, to confirm the veracity of the science-related statements. The second is the present consultation and review conducted by APEGBC's committees and divisions with an interest in climate change. The third will be a review by APEGBC's legal counsel, once the Board has given approval for the position paper to be released.
One member suggested that national and global acknowledgement of climate change could be referenced.	Thanks for this suggestion – the IPCC represents a global effort to synthesize and summarize the science of climate change, and is believed to be the most appropriate reference for this purpose.
One member suggested defining the term "Registrants", expanding on how Registrants can contribute to climate change mitigation and providing example.	The term "Registrants" was recommended by APEGBC's legal counsel, and is defined as "professional engineers, professional geoscientists, provisional members, licensees, limited licensees, engineers-in-training and geoscientists-in-training". This has been defined in the present position paper. A footnote has been added to the first page of the position paper, stating that: "APEGBC Registrants are: professional engineers, professional geoscientists, provisional members, licensees, limited licensees, engineers-in-training and geoscientists-in-training."
One member asked if there are tools other than the Sustainability Guidelines that are a good resource.	The section titled "Resources for APEGBC Registrants" in the position paper outlines APEGBC's efforts to make resources available in a variety of forms, from updated Professional Practice Guidelines to a Climate Change Information Portal on the web.
Division of Energy Efficiency and Renewable Energy (DEERE) CCAG Consultation: March 1, 2016 Feedback Provided: March 14, 2016	
DEERE Executive Team members reviewed the CCAG position paper. It's very good and provides good segue to the work DEERE is planning to undertake this year, namely the Climate Change Mitigation Action Plan. We have provided a few edits for your consideration in the Word document attached.	Thank you. The CCAG looks forward to collaborating on climate change-related activities undertaken by DEERE.
DEERE noted that they would like to contribute to the Information Portal referred to in the position paper.	The content for the Climate Change Information Portal has been drafted, and the webpages are in the process of being developed and reviewed. APEGBC staff will be coordinating the process by which material is reviewed and contributed to the portal. The intention is for the Portal to be an up-to-date "living" resource for APEGBC members, so ongoing contributions will likely be sought from Divisions such as DEERE.

It was suggested that two new position statements be added to the "Position" section of the document, as follows: B. APEGBC supports the COP21 agreement in Paris recognizing that "climate change represents an urgent and potentially irreversible threat to human societies and the planet" and that "deep reductions in global emissions will be required in order to achieve the ultimate objective of the Convention and emphasizing the need for urgency in addressing climate change". C. APEGBC understands that the agreement is calling to hold the increase in the global average temperature to below 2°C or preferably 1.5°C above pre-industrial levels.	Thank you for your suggestion to reference the COP21 agreement in the position paper. This historic agreement provides a foundation for political action on the global stage. We decided to keep the positions to the "core" two statements, namely that the Association accepts that human activities are changing the climate, and that APEGBC members have a role to play in reducing emissions. However, to highlight the significance of the COP21 global agreement, we have added the following text to the second paragraph: "Significantly, the December 2015 Paris Climate Conference achieved a legally binding and universal agreement on climate action, with over 190 countries recognizing that climate change represents an urgent and potentially irreversible threat to human societies and the planet and that deep reductions in global emissions will be required."
Suggestion to insert the sentence: "Mitigation means the drive toward a low carbon economy and replacing as much as possible fossil fuel by renewable energy."	We agree that clarifying that replacing fossil energy with renewable energy will be an important part of mitigating climate change, and have added the suggested sentence with minor edits, as follows: "Mitigation will require moving toward a low carbon economy and replacing fossil fuel with renewable energy where possible."
Suggested additional text: "Engineers strongly supports the view that climate change is a common concern of humankind, and when taking action to address climate change, will respect, promote and consider their obligations on human rights, the right to health, the rights of indigenous peoples, and local communities. This view is fully compatible with the code of Ethics of Professional Engineers and Geoscientist is BC."	Thank you for this suggestion. We have decided not to include this text as the key elements that it conveys are already raised earlier in the position paper, namely that scientific evidence demonstrates that climate change is a concern, and that APEGBC members' ethical obligations with respect to climate change are highlighted in the Code of Ethics as well as the APEGBC Sustainability Guidelines (APEGBC, 2nd edition, 2013).
Suggestion to identify renewable energy as a key way of mitigating greenhouse gas emissions.	This has been addressed in the following sentence (added text underlined): "In many cases, the strong links between <u>renewable energy,</u> energy efficiency and greenhouse gas emissions reduction means that there is a potential business case for the solution with lower climate impacts, especially when the full project life costs and benefits are accounted for."

Item 5.7 Appendix A is a password protected PDF and could not be included into this document (for technical reasons, not confidentiality reasons). If you would like to request a copy, please contact Sarah Wray at 604-412-4896 or swray@apeg.bc.ca and she will send it to you immediately.

Association of Professional Engineers and Geoscientists of British Columbia

SUSTAINABILITY GUIDELINES

Revised based on Discussion at the Sustainability Committee Meeting on 4 March 2015: Draft Revisions V3.0 (6 March 2015) to integrate references to Climate Change as recommended in the Summit Report and by the Sustainability Committee
Suggested edits by CCAG (8 April 2015)
Revised based on discussions between Chad Larson, P.Eng., Chair of Sustainability Committee and the Director of Professional Practice, Peter Mitchell, P.Eng., on 3 March 2016.
Finalized draft as seen by Professional Practice Committee on 29 March 2016.

Professional Engineers and Geoscientists of BC

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V1.0 May 30, 2013

DEFINITIONS

The following definitions are specific to these APEGBC Sustainability Guidelines ("Sustainability Guidelines").

APEGBC

Association of Professional Engineers and Geoscientists of British Columbia.

APEGBC PROFESSIONAL(S):

Professional engineers, professional geoscientists, and licensees, including limited licensees, licensed to practice by APEGBC.

SUSTAINABILITY AND APEGBC PROFESSIONALS

WHAT IS SUSTAINABILITY?

A sustainable society meets the needs of people in a resilient economy without compromising the planet's ecological integrity or the needs of future generations. Sustainability has three pillars that must be integrated in a balanced way:

(a) environmental: to stay within the biophysical carrying capacity of our region/country/planet (e.g. minimize resource use, minimize waste, protect nature from degradation);

(b) social: to maintain and protect quality of life and the values that we aspire to live by; and

(c) economic: to ensure that an adequate material standard of living is provided for all members of society.

HOW DOES IT RELATE TO PROFESSIONAL ENGINEERING AND GEOSCIENCE?

APEGBC professionals have a significant role to play in the development of a sustainable society through their professional practice. Our actions directly and indirectly shape the world we live in, including the resources we use, as well as the health, safety, environment, and wellbeing of the public. APEGBC professionals make decisions and provide leadership to our colleagues, clients, employers, decision-makers and the public in the development, implementation, operational life spans, and decommissioning of engineering and geoscience projects, products, processes, or systems.

We have a responsibility to the public, consistent with the APEGBC Code of Ethics (the "Code of Ethics"), to provide sustainable solutions that adhere to the basic pillars of sustainability (environmental, social and economic). This requires that we consider the long-term consequences that flow directly and indirectly from our actions.

APEGBC professionals must not make promises of results for sustainable solutions as this will probably negate their professional liability insurance coverage.

These APEGBC Sustainability Guidelines are an update of APEGBC's former Guideline on Sustainability, originally adopted in 1995. APEGBC professionals are encouraged to view their work through the "lens of sustainability", using these Sustainability Guidelines to assist them where appropriate. Sector-specific guidelines for sustainable engineering and geoscience practice are also available on the APEGBC website.

THE SUSTAINABILITY GUIDELINES

Within their scope of professional practice, APEGBC professionals have a responsibility to:

1. MAINTAIN A CURRENT KNOWLEDGE OF SUSTAINABILITY

Maintain a level of competence on matters of sustainability related to the APEGBC professional's area of expertise, and seek additional expertise as necessary. The knowledge, concepts and opportunities for sustainable solutions are rapidly evolving and APEGBC professionals should strive to keep skills up to date, and advance the understanding of sustainability in their field of practice.

2. INTEGRATE SUSTAINABILITY INTO PROFESSIONAL PRACTICE

Integrate sustainability considerations into professional practice, reflecting the APEGBC Code of Ethics' requirements to hold paramount the safety, health and welfare of the public and the protection of the environment. APEGBC professionals must consider the combined environmental, social and economic aspects that take into account the direct and indirect impacts over the full project life-cycle.

3. COLLABORATE WITH PEERS AND EXPERTS FROM CONCEPT TO COMPLETION

At key stages of the project life-cycle, collaborate with peers and experts across disciplines to identify appropriate alternatives and new opportunities for sustainable results.

4. DEVELOP AND PREPARE CLEAR JUSTIFICATIONS TO IMPLEMENT SUSTAINABLE SOLUTIONS

Discuss opportunities and document decisions made related to the integration of environmental, social and economic metrics. These discussions should occur early enough to enable the client or employer to make informed decisions about how to implement an appropriate level of sustainability considerations in the task or projects, products, processes, or systems.

5. ASSESS SUSTAINABILITY PERFORMANCE AND IDENTIFY OPPORTUNITIES FOR IMPROVEMENT

Identify opportunities to improve knowledge and professional practice related to sustainability, where best practice is to assess actual performance of implemented solutions against the original design goals and metrics.

An amplification of each guideline is provided in Appendix I.

APPENDIX I SUSTAINABILITY GUIDELINE AMPLIFICATIONS

SUSTAINABILITY AND APEGBC PROFESSIONALS

WHAT IS SUSTAINABILITY?

The most widely quoted definition of sustainability and sustainable development was given by the United Nations' Brundtland Commission on March 20, 1987:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Since that time, the definition and scope of sustainability has expanded to encompass all aspects of human activities.

Sustainability requires us to be smart about managing our resources and impacts, with the long term in mind. In other words, we need to think about the way we use our natural, social, and economic capital so that we don't use them up too fast or make conditions worse for others while we benefit ourselves ("others" can mean those in different places around the world or future generations).

HOW DOES IT RELATE TO PROFESSIONAL ENGINEERING AND GEOSCIENCE?

This preamble emphasizes the relevance of the Sustainability Guidelines to the scope of an APEGBC professional's task and work responsibilities. APEGBC professionals must consider these Sustainability Guidelines in their work; the application of the Sustainability Guidelines is, however, a matter of judgment.

The concept of sustainability in the practice of professional engineering and geoscience is not new. Sustainability is already a key element to our professional practice where we carry out our roles considering ethical, environmental, social and economic challenges. By continually gathering new knowledge, developing new materials and technologies, and using more sophisticated decision-making methods, we deliver economic benefits, minimize negative environmental impacts and improve societal wellbeing.

APEGBC professionals already have an explicit mandate to protect public welfare and the environment. The first principle of our Code of Ethics states:

> "Professional Engineers and Geoscientists shall hold paramount the safety, health and welfare of the public, the protection of the environment and promote health and safety within the workplace."

Two of the three components of sustainability (social and environmental) are explicitly captured by this first principle of the Code of Ethics. The third component of sustainability (providing a healthy economy) is implicit, because it lies at the core of what professional engineers and geoscientists do. Incorporating sustainability requires balancing environmental, social and economic interests.

These Sustainability Guidelines are intended to help clients, employers and stakeholders understand that sustainability considerations are a fundamental part of the proper practice of professional engineering and geoscience. By demonstrating that the task requires specialized knowledge and responsibility for life, property and the environment, these Sustainability Guidelines help reinforce the public's appreciation of APEGBC professionals as professionals who act in the public interest.

These Sustainability Guidelines serve to explain APEGBC professionals' responsibilities related to society and the environment (as listed in the Code of Ethics), and to provide advice and encouragement to APEGBC professionals in delivering more sustainable solutions.

APEGBC – A PIONEER IN SUSTAINABLE ENGINEERING AND GEOSCIENCE

In 1995, APEGBC released the first sustainability guidelines for APEGBC professionals.[1] The present document updates these original guidelines, while acknowledging and building upon the ground-breaking work that APEGBC and its Sustainability Committee did at the time.

Sustainability has become an important issue for engineers and geoscientists across Canada and internationally, not just in British Columbia.

Engineers Canada is the national organization of the 12 provincial and territorial associations that regulate engineering in Canada. Engineers Canada released the National Guideline on Environment and Sustainability [2] in 2006 which APEGBC's Council endorsed in October 2011.

LIMITATIONS

These Sustainability Guidelines are intended to inform the standard of care that a reasonable and prudent APEGBC professional would apply when carrying out a particular activity involving the practice of professional engineering or geoscience. These Sustainability Guidelines provide APEGBC professionals with a coherent set of recommendations that assist them in delivering on their professional responsibilities. The Sustainability Guidelines do not, however, remove or limit the duty of APEGBC professionals to exercise professional judgment in their practice. An APEGBC professional is not expected to assume responsibility for incorporating sustainability in work or tasks beyond the APEGBC professional's scope of authority. For example, an APEGBC professional is not responsible for implementing sustainable solutions* if the APEGBC professional's scope of authority limits him or her from doing so. To borrow from a legal saying, APEGBC professionals advise, clients instruct.

*such as greenhouse gas mitigation efforts

[1]APEGBC (1995) "Guidelines for Sustainability". Available online at: www.apeg.bc.ca [2]Engineers Canada "National Guidelines on Environment and Sustainability". Available online at: www.engineerscanada.ca

GUIDELINE 1: MAINTAIN A CURRENT KNOWLEDGE OF SUSTAINABILITY

Maintain a level of competence on matters of sustainability related to the APEGBC professional's area of expertise, and seek additional expertise as necessary. The knowledge, concepts and opportunities for sustainable solutions are rapidly evolving and APEGBC professionals should strive to keep skills up to date and advance the understanding of sustainability in their field of practice.

Sustainability is a complex concept that involves careful consideration and balancing of three pillars: environmental, economic and social. APEGBC professionals have identified "lack of knowledge of how to employ sustainability" in their practice as one of the main barriers to the integration of sustainability in their work. Guideline 1 emphasizes that ongoing and continuous professional development is an important aspect of sustainability, because the state of the art is constantly advancing. Put simply, Guideline 1 recommends that APEGBC professionals "be current", so that they are knowledgeable about up-to-date sustainability concepts, technologies and approaches to practice in their field. The requirement for APEGBC professionals to maintain a current knowledge of sustainability is embodied in the sixth principle of the Code of Ethics, which states that:

> "Members and licensees shall keep themselves informed in order to maintain their competence, strive to advance the body of knowledge within which they practice and provide opportunities for the professional development of their associates."

The APEGBC professional's understanding of sustainability will evolve as his or her appreciation and understanding of natural, economic and social systems and their interrelationships develop through practice. Currently, many APEGBC professionals have an understanding of, and support, the individual pillars of sustainability, but may not be familiar with relationships between these pillars and their own professional practice. Achieving sustainability, however, requires an appreciation of the complex relationships between each of the three pillars of sustainability.

As sustainable solutions are becoming an expectation of Canadian society, APEGBC professionals are increasingly being asked by their clients, their employers and/or the public to demonstrate competence at the most current level of sustainable practice. There is an opportunity for APEGBC professionals to be leaders at the provincial and national levels. Requirements stipulated by codes of practice are conservative by nature, so APEGBC professionals should advocate for new standards where there are clear links to demonstrated improvements in sustainable approaches and solutions. While practicing sustainable design will ultimately become the accepted standard, the best professionals seek out the next level of performance, as boundaries are continually challenged.

By maintaining a current knowledge of sustainability, APEGBC professionals provide greater long-term value by delivering smart sustainable solutions that extend across disciplinary boundaries and address the wider impacts of the project.

Additional benefits to APEGBC professionals and the public may include:

- Reductions in energy and material use, waste production, and operational costs
- Improvements in the reputation of APEGBC professionals as being proactive practitioners of sustainable professional engineering or geoscience, which is increasingly important to clients and stakeholders and is also a basis for differentiation on the value of the service provided
- Proactive management of issues such as* carbon emissions, and energy/materials/waste minimization in advance of government regulation on these issues (BC's regulation of carbon, new building energy codes, etc.)
- Public endorsement of a project through stakeholder engagement

It is recognized that individual APEGBC professionals cannot be expected to assume responsibility for incorporating sustainability in work or tasks beyond the scope of their authority. In areas within their scope of authority, however, APEGBC professionals are required to keep their knowledge current and seek appropriate expertise where required (see also Guideline 3, below).

*adaptation to climate change, reduction of (second insert)

*guided by sound, peer-reviewed science as they relate to professional engineering and geoscience practice, (first insert)

GUIDELINE 2: INTEGRATE SUSTAINABILITY INTO PROFESSIONAL PRACTICE

Integrate sustainability considerations into professional practice, reflecting the APEGBC Code of Ethics' requirement to hold paramount the safety, health and welfare of the public, the protection of the environment and promoting health and safety within the workplace.

APEGBC professionals have an important responsibility to society. This responsibility is codified in the Code of Ethics, which APEGBC professionals must uphold. The Code of Ethics explicitly compels APEGBC professionals to hold paramount the safety, health and welfare of the public, and the protection of the environment, and to promote health and safety within the workplace. Specifically, the Code of Ethics states, in part, that APEGBC professionals shall:

> "act at all times … with fidelity to the public needs" (Preamble), and
>
> "hold paramount the safety, health and welfare of the public, the protection of the environment…" (Section 14 (a) (1))

These provisions in the Code of Ethics implicitly require APEGBC professionals to have regard for sustainability in their practice, because of sustainability's inherent relationship to societal needs, the safety, health or welfare of the public, and the environment. Sustainable professional engineering and geoscience practice, as described in these Sustainability Guidelines, seeks to address these Code of Ethics responsibilities.

APEGBC professionals already have expertise in weighing economic and performance issues, such as cost and factors of safety. The application of these Sustainability Guidelines will help APEGBC professionals incorporate environmental and social issues in their practice.

Embodied in Guideline 2 is the consideration of the short and long-term, as well as direct and indirect impacts of APEGBC professional's designs and activities. It encourages APEGBC professionals to think outside traditional project boundaries and to consider the greater impacts of their designs and projects. As we learn more about the way our world works – particularly, the way that humans and ecosystems interact – we learn more about what it takes to address the well-being of current and future generations and ecosystems. These ideas steer us away from thinking in terms of "trading-off" human welfare against ecosystem wellbeing.

There is almost always more than one way to perform a task. Evaluation of options should consider the full, life-cycle costs, from project conception to final decommissioning in order to fully understand the impacts of different alternatives.* Many of the real costs of projects are commonly externalized and not considered as part of making a decision on a preferred alternative. It is important to try to consider the full costs and benefits of any proposed action.

In recommending specific options, APEGBC professionals should not limit their considerations to only technical issues. For each task, APEGBC professionals should consider other implications that are within their field of expertise. Known and reasonably foreseeable cumulative implications should also be considered. Finally, decisions for sustainability require a consideration of the consequences of not only the proposed action, but also its products and byproducts, including their final disposal.

*In reviewing a project's full life cycle costs the APEGBC professional needs to consider measures to mitigate climate change, including but not limited to minimizing greenhouse gas emissions while balancing economic, social and environmental factors

GUIDELINE 3: COLLABORATE WITH PEERS AND EXPERTS FROM CONCEPT TO COMPLETION

At key stages of the project life-cycle, collaborate with peers and experts across disciplines to identify appropriate alternatives and new opportunities for sustainable results.

The increasing complexity and innovation in providing sustainable solutions means that APEGBC professionals will increasingly work in multi-disciplinary teams with team members having diverse knowledge and skills.

It is best to collaborate at the earliest stages, if possible, where opportunities for synergy between project components can more easily be explored to increase value and sustainability.

GUIDELINE 4: DEVELOP AND PREPARE CLEAR JUSTIFICATIONS TO IMPLEMENT SUSTAINABLE SOLUTIONS

Comment: This guideline might more appropriately be written as Develop and Present (or Deliver) Clear Justifications…we were thinking that Engineers should advocate for more sustainable solutions

Discuss opportunities and document decisions made related to the integration of environmental, social and economic metrics. These discussions should occur early enough to enable the client or employer to make informed decisions about how to implement an appropriate level of sustainability considerations in the task or projects, products, processes, or systems.

Through their widely varying professional activities, APEGBC professionals contribute to the form and function of our society: they are frequently decision-makers or in a position to influence decision-makers. As the advice given by APEGBC professionals can have far-reaching consequences, APEGBC professionals should explore solutions that promote a broad concept of sustainability – across environmental, social and economic domains.

In the course of an APEGBC professional's work, there are a number of stages where opportunities exist to investigate the social, environmental and economic impacts of potential solutions to a client's problem. APEGBC professionals should carefully weigh the impacts of alternatives and may provide a comparative analysis on their environmental, social and economic impacts.

The purpose of exploring alternatives is to encourage consideration of processes or options that best promote sustainability. This will have the greatest impact at the conceptual phase, where opportunities to apply best practices can be evaluated and clear justifications can encourage a client or employer to make an informed decision regarding sustainable solutions. APEGBC professionals are not obliged to assess all concepts, designs and methodologies, only those that are deemed reasonable under the circumstances of the task. In determining what is "reasonable", APEGBC professionals are expected to exercise professional judgment.

Guideline 4 highlights the APEGBC professionals' duty to exercise their professional judgment objectively and consistently. Honest differences of technical opinion among APEGBC professionals are to be anticipated because the matters involve professional judgment and are not subject to simple analysis. Open debate between APEGBC professionals is healthy and helpful to decision-makers. Care must be taken to provide independent professional guidance and analysis, the public will be best served if APEGBC professionals maintain objectivity.

With respect to documenting decisions made, APEGBC professionals should refer to APEGBC Bylaw 14(b), which addresses quality management processes for retaining project documentation. More information on retaining project documentation is available in the APEGBC Quality Management Guideline on Retention of Project Documentation, available on the APEGBC website.

While the APEGBC professional can present the opportunities and rationale for sustainable solutions, the decision on sustainable solutions remains with the client or employer.

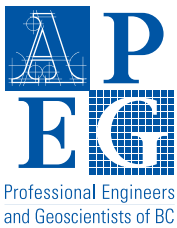
GUIDELINE 5: ASSESS SUSTAINABILITY PERFORMANCE AND IDENTIFY OPPORTUNITIES FOR IMPROVEMENT

Identify opportunities to improve knowledge and professional practice related to sustainability, where best practice is to assess actual performance of implemented solutions against the original design goals and metrics.

It is important to confirm whether designs are performing to expectations. That knowledge can be gained through both qualitative and quantitative data for the benefit of the profession and future developments. Where possible and reasonable, analysis of data should be used to improve or optimize future solutions.

The practice of professional engineering and geoscience continually improves due to technological advances, innovation and new design concepts. Assessing performance enables APEGBC professionals to identify opportunities for iterative improvements in designs, methods, processes, and technology. This information contributes to the learning process and can be utilized by other APEGBC professionals to identify and enhance future solutions. APEGBC professionals should facilitate improvements and seek to proactively anticipate future needs for sustainability.*Actively working with others as leaders in the development of new best practices and legislation will enhance the public view of APEGBC professionals as ethical professionals who provide viable, valuable knowledge-based solutions.

*These improvements should adopt a multi-disciplinary approach, consider risk based assessments and consider cumulative impacts, social values, economic requirements, and environmental aspects. As knowledge of sustainability evolves, updates may be required to existing codes, guidelines and standards.



THE ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF BRITISH COLUMBIA
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T: 604.430.8035 F: 604.430.8085 E: apeginfo@apeg.bc.ca APEG.BC.CA

British Columbia Pool Regulation

Statement of Compliance

_____
Pool Construction Permit No.

To: _____
Health Authority (print)

_____
Address of Health Authority(print)

_____
City, Province, Postal Code (print)

Re: _____
Name of Project (print)

_____
Address of Project (print)

_____
City, Province, Postal Code (print)

_____
Name of professional engineer|architect (print)

_____
Name of firm (print)

_____
Address (print)

_____
City, Province|State, Postal Code|ZIP (print)

(Professional's Seal and Signature)

_____
Date

I hereby give assurance that:

(a) the pool has been constructed so as to substantially comply, in all material respects, with the plans and specifications submitted under Section 5 (2) and with the terms and conditions, if any, of the construction permit under Section 5(1)(b) of the *British Columbia Pool Regulation* (B.C. Reg 296/2010), excluding any term or condition pertaining to the operation of the pool; and

(b) I am a engineer|architect as defined in Section 4 of the *British Columbia Pool Regulation*.

(strike off non-applicable)

Note:

1. This letter is endorsed by: Association of Professional Engineers and Geoscientists of British Columbia, Architectural Institute of British Columbia, and British Columbia Health Authorities

Professional Practice Guidelines - Site Characterization for Dam Foundations in BC

Professional Engineers and Geoscientists of BC

www.apeg.bc.ca

5th DRAFT March 100, 2016

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PREFACE

The *Professional Practice Guidelines – Site Characterization Assessments for Dam Foundations in BC* has been developed in response to Recommendation 6 in the *Report on Mount Polley Tailings Storage Facility Breach* prepared by the Independent Expert Engineering Investigation and Review Panel (Panel Report). The Mount Polley incident occurred on August 4, 2014 and resulted in a 40 m high section of the *dam* failing along a weak soil layer in the *dam* foundation, releasing over 20 million cubic meters of tailings and process water. The Panel was appointed by the Government of British Columbia to assess the failure and provide recommendations for improved practice.

Recommendation 6 of the Panel Report reads as follows:

> *"6. To improve professional Practice*
> *Encourage the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) to develop guidelines that would lead to improved site characterization for tailings dams with respect to the geological, geomorphological, hydrogeological and possibly seismotectonic characteristics."*

It was also noted in the Panel Report that the development of these professional practice guidelines are one of the best applicable practices that should be implemented.

As Mount Polley demonstrated, when the *dam* foundation is not sufficiently characterized or accounted for in the design, *dam* failure can result. The nature of the tailings *dam* failure at Mount Polley is relevant to a range of other types of *dams*, such as water reservoir *dams* and other types of storage *dams* (e.g. storage facilities utilized at oil and gas exploration or production facilities and sewerage facilities). It then follows that the application of an appropriate standard of care[1] when carrying out site characterization for foundations is equally important for all types of *dams.* Consequently, these guidelines have been developed to be applicable to all types of *dams* and, where appropriate, the differences between *dam* types have been noted.

The application of the appropriate standard of care when carrying out site characterization for *dam* foundations is fun*dam*ental to the safe construction and ongoing operation of any type of *dam*. On this basis, the appropriate standard of care identified in these professional practice guidelines has been developed so they apply to all *dam* types.

In the context of improving professional practice involving *dam* related activities, these guidelines will complement the existing *APEGBC Professional Practice Guidelines – Legislated Dam Safety Reviews in BC*, which also applies to *dams* in the mining industry and water storage *dams*.

The development of these guidelines is consistent with one of the primary objectives of *APEGBC* which is to establish, maintain and enforce standards for the professional practice of practitioners regulated by *APEGBC*.

[1] While not technical standards the APEGBC professional practice guidelines provide direction so a professional activity can be carried out within a framework of good professional practice, which is established in the guidelines. This is a key tool to establishing a standard of care in order to meet the duty of care in law. (*Canadian Professional Engineering and Geoscience Practice and Ethics 5th Edition, G.C. Andrews, pgs. 129-130*)

These professional practice guidelines are applicable for carrying out site characterization for *dam* foundations during the various *phases* of development from conceptual through to design, construction, design updates and closure.

The guidelines have been written for *APEGBC Professionals*, statutory decision makers, regulators, *dam owners* (including utilities, mining companies, municipalities, farmers and others), First Nations the public at large and a range of other stakeholders who are involved or have an interest in the carrying out of site characterization for *dam* foundations in BC. The guideline provides a common level of expectation for these various groups with respect to the level of effort, due diligence and standard of care to be followed when carrying out the site characterization.

The guidelines outline the appropriate standard of practice at the time of preparation of the guideline document; this is a living document that is to be revised and updated, as required, in the future to reflect the state of practice.

While this guidance is directed toward *dams* in BC, the guidance in this document can also be considered applicable to other jurisdictions in Canada or any other global jurisdiction.

GLOSSARY AND TERMS

The explanations of the terms are specific to these guidelines. All references in the text to these terms are italicized.

Agreement
A contract or terms of engagement, whether formal (written) or informal (verbal or implied), between the *Client* and the *APEGBC Professional*, or his/her company.

APEGBC
The Association of Professional Engineers and Geoscientists of British Columbia

APEGBC Professionals
Professional Engineers, Professional Geoscientists and Licencees.

British Columbia Dam Safety Regulation
British Columbia Regulation 44/2000 including revised amendments B.C. Reg. 108/2011 (June 2011) and B.C. Reg. 163/2011 (September 2011)

Consequence Classification
The *Dam* failure *consequence classification* of a *Dam* as determined by Schedule 1 of the *British Columbia Dam Safety Regulation* (for *water dams*), or Table 2-1 of the *CDA Dam Safety Guidelines* (for *dams* under the *Mines Act*).

Client
An individual or company who engages an *APEGBC Professional* to carry out work related to the design, inspection or review of a *dam*. The c*lient* is typically the *dam owner* or a third party who has been contracted to operate and maintain the *dam* on behalf of the *dam* owner. In this instance, the Client may be the organization acting on behalf of the *dam owner*. Multiple holders of water licenses and therefore *owners* are common for small *dams*.

***Dam* (regulated dams)**
A structure that allows storage of water or saturated solids .

Design Engineer
The *Professional Engineer* having overall responsibility for the design of the *dam* which includes responsibility for developing and overseeing the site characterization of the *dam*'s foundation. The *Design Engineer* signs the site characterization assurance statement required in support of the feasibility study (see Appendix A of these guidelines).

Engineers and Geoscientist Act
Engineers and Geoscientist Act, R.S.B.C. 1996, Chapter 116, as amended.

Geologic Strength Index (GSI)
A system for estimating the reduction in rock mass strength for different geological conditions as identified by field observations.

InSAR
A radar technique used in geodesy and remote sensing.

LiDAR
A surveying technology that measures distance by illuminating a target with a laser light.

Member(s)
Professional Engineer or *Professional Geoscientist*.

Mines Act
Mines Act R.S.B.C., 1996 c. 293 (Updated to 2007)

Owner*/Dam *Owner
Replace with dam owner from DSR

Phases
Phases of the project include: Design, Construction, Operation, Decommissioning or Closure (in the case of tailings dams)

Professional Engineer
An engineer who is a member or licensee in good standing with *APEGBC* and, in relation to *dam* foundation work, is typically registered in the disciplines of geological engineering, mining engineering or civil engineering, which are designated disciplines of professional engineering.

Professional Geoscientist
A geoscientist who is registered or licensed member in good standing with *APEGBC* and, in relation to *dam* foundation work, is typically registered in the disciplines of geology or environmental geoscience, which are designated disciplines of professional geoscience.

Regulatory Authority
The Regulatory Authority is tasked with managing the regulatory requirements of a *dam* project, as enacted by statutes and regulations of British Columbia. These may include MEM, MOE, FLNR, PCA, CNSC or IJC.

Site Characterization
The process of defining the sub-surface conditions with respect to geology, geomorphology, and hydrogeology. It involves data collection, field investigations, and interpretation.

Site Characterization Program
The combination of activities that are undertaken to define the sub-surface conditions (field mapping, borehole drilling, geophysics, testing, etc.)

Site Geologic Model
A model that includes the bedrock and surficial geology, with integration of geomorphology, geotechnical and hydrogeological conditions, and relevant seismotectonic characteristics.

Stages
Stages of the project design include: scoping, pre-feasibility, feasibility, detailed and design revisions.

***Supporting Registered Professional* (SRP)**
A Professional Engineer, Professional Geoscientist or Licencee engaged by the *Design Engineer* to carry out professional activities related to the site characterization of the *dam* foundation.

ACRONYMS

APEGBC	Association of Professional Engineers and Geoscientists of BC
ASCE	American Society of Civil Engineers
ASTM	American Society of Testing and Materials
CDA	Canadian Dam Association
CNSC	Canadian Nuclear Safety Commission
CPT	Cone Penetration Test
DSCR	Dam Site Characterization Report
FERC	USA – Federal Energy Regulatory Commission
FLNRO	BC - Forestry, Lands and Natural Resources Operation
FMEA	Failure Modes Effects Analysis
GMPE	Ground Motion Prediction Equation
GSI	Geologic Strength Index
ICOLD	International Commission of Large Dams
IJC	International Joint Commission
InSAR	Interferometric Synthetic Aperture Radar
ITRB	Independent Technical Review Board
MAC	Mining Association of Canada
LiDAR	Light Detection and Ranging
MEM	BC - Ministry of Energy and Mines
MOE	BC - Ministry of Environment
PCA	Parks Canada Agency
PSHA	Probabilistic Seismic Hazard Analysis
QA/QC	Quality Assurance/Quality Control
RFP	Request for Proposal
SGM	Site Geological Model
SPT	Standard Penetration Test
SRP	Supporting Registered Professional
SSHAC	Senior Seismic Hazard Analysis Committee

1.0 INTRODUCTION

1.1 INTRODUCTION TO THE GUIDELINES

The foundation of the *dam* is a critical structural component and requires special attention. The foundation has a twofold function: (i) structural stability (to provide stability and sufficient stiffness to limit deformations to within acceptable behavior patterns under the weight of the *dam* and the forces acting on it and to maintain this integrity under the conditions that exist and/or will develop over time); and (ii) seepage control (to control seepage with respect to flow quantity/quality, uplift pressures and erosive stresses). If one of these functions is not sufficiently addressed, the performance may be impaired to the point of being unsafe. The foundation conditions at a site are also a determining factor in the selection of the type of *dam* and consequently, appropriate characterization of these conditions is important for the design of the *dam* and its safe operation.

In the context of dam safety, the design and supporting site characterization program are important "critical controls" – elements that reduce the risks. Accordingly, the site characterization program could be considered a "critical control" for dam safety and should be treated as such.

Whereas the *dam* itself is "engineered" and quality-control can be exercised through the design and construction specifications, the foundation conditions are "natural" and are subject to the inherent heterogeneities and potentially complex conditions between investigated locations. Since a full definition of the geologic domain is impractical to achieve, the challenge is to keep the uncertainties within acceptable limits, and to balance the uncertainties with design provisions. This optimization is part of the ongoing review of benefit/cost considerations of incremental investigations. This document provides guidelines on good practice for site characterization and on the level of detail required.

An important perspective for using this document is that it should always be assumed that any given site is both geologically and geomorphologically complex. Therefore, the site characterization program should be carried out to either confirm that the site is either one of those rare locations that is not complex and that conditions/parameters are understood, or, to confirm, that the program has appropriately assesses the complexity and the variability, allowing determination of representative conditions/parameters.

Tailings dams have unique characteristics compared to water *dams* and industrial *dams*; as discussed in Section 2.1. The most significant differences are the staging of tailings *dam* construction over the life of the mine (i.e. steady state is typically only reached at mine closure or when an alternative tailings storage facility is commissioned for an operation), the impoundment of both tailings solids and mine process/contact water, and the fact that the dam will be required in perpetuity. These conditions provide for a unique set of considerations that need to be addressed where tailings *dams* are involved.

The role of the *Design Engineer*, as described in this guideline, is to develop a site characterization program that considers the geological complexity, the dam design and factors influencing the program. The *Design* Engineer is responsible for assuring that adequate site characterization has been carried out for the dam foundations.

These guidelines provide a framework for the standard of practice to be applied to characterization of foundation conditions for *dams* in British Columbia. The guidelines are intended to lead to a common level of expectation for practicing professionals, owners, regulators, First Nations, and communities of interest. For First Nations, this common level of expectation should include issues related to aboriginal title, rights, and traditional land use being reviewed with the relevant authorities/stakeholders. This review is normally undertaken by the owner(s) during the project's scoping *stage*.

Section 4.6 outlines the documentation outcomes of a site characterization. These include a *Site Characterization Report* and assurance statements that are to be submitted to the *dam* owner, and the regulator, if applicable, by the Design Engineer and Supporting Registered Professionals. The assurance statements are required at the feasibility and detailed design *stages* of a project, as described in Section 2.2.2.

The guidelines should be considered within the context of guidance provided by the Canadian Dam Association (CDA) and the Mining Association of Canada (MAC) with respect to *dams.*

1.2 PURPOSE AND OBJECTIVES OF THE GUIDELINES

These guidelines have been developed in response to Recommendation 6 in the *Report on Mount Polley Tailings Storage Facility Breach* prepared by the Independent Expert Engineering Investigation and Review Panel (Panel Report).

The Mount Polley investigation carried out by the Chief Inspector of Mines concluded that the dam's embankment failed on an unidentified weak soil layer (upper glaciolacustrine unit) in the foundation of the dam. Insufficient freeboard relative to the embankment deformation then led to a dam breach. The main findings of the Chief Inspector's Report, with respect to characterization of the dam foundation, were: (1) the spacing between deep sampled drill holes in the dam foundation were over 400 m, which was considered to be too far apart for the nature of the site's geology/geomorphology; (2) the depth of drilling (typically < 10 m) was not deep enough to characterize the foundation for the height of the dam (40 m) and the nature of the foundation materials; (3) the drilling and sampling methodology for the one deep drill hole located in the breach area was not adequate for characterization of the soils (rotary diamond drill hole with observation of cuttings); (4) the geologic model for the site did not recognize the more than three stages of glaciation and the complexity of the surficial geology. The Chief Inspector's report also indicated other factors, which although may not have contributed directly to the failure, did not appear to be adequately characterized: (1) the foundation bedrock beneath the breach included high plastic, low strength mudstone, which could influence stability at higher dam heights; (2) the undrained strength response of the foundation glaciolacustrine layers was not clearly identified in the design reports; and (3) artesian pressures in the foundation glaciofluvial soils were not explicitly recognized or accounted for in stability analyses.

The purpose of these guidelines is to identify an appropriate standard of professional practice for site characterization. If followed, this standard of practice provides a framework for ensuring adequate site characterization for dam foundations, so that dam safety will be improved and incidents such as the Mount Polley dam breach will not be repeated.

The specific objectives of these guidelines are to:

i. Describe the types of *dams* that these guidelines apply to and the *stages* of design and life *phases* of *dams*
ii. Describe the roles and responsibilities of the various participants and stakeholders including regulators that are involved in the ite characterization for *dam* foundations.
iii. Outline the professional services to be provided by *APEGBC Professionals* conducting site characterization for *dams* in BC.
iv. Describe the standard of care to be followed when an *APEGBC Professional* is providing professional services related to conducting site characterization of *dams* in BC. The standard of care is set in the context of the complexity of the site, dam design, and other factors.
v. Specify the tasks and the technical components that should be considered by the *APEGBC Professionals* so as to meet an appropriate standard of care and the intent of the guidelines while fulfilling the *APEGBC's Professionals'* obligations under the *Engineers and Geoscientists Act.* These obligations include the *APEGBC Professional's* primary duty to protect the safety, health and welfare of the public and the environment.
vi. Describe the quality management practices to be followed when carrying out site characterization so the *APEGBC Professional* is meeting their professional obligations.
vii. Provide consistency in site characterization and reporting.
viii. Describe the appropriate knowledge, skill sets and experience that *APEGBC Professionals* are to have when providing professional services related to site characterization.

These professional practice guidelines are an important tool for managing the uncertainties associated with the outcome of the site characterization program.

Appendix A-1 to these guidelines provides a *Dam* Foundation Site Characterization Assurance Statement that is to be submitted, along with a *dam Site Characterization Report (DSCR)*, to a *dam* owner and regulator. The Separate Assurance Statements are required at the feasibility and detailed design *stages* of a project (described in Section 2.2.2). The Assurance Statement provides a standardized statement confirming that the objectives of the site characterization program have been met in obtaining an appropriate understanding of the following five site characterization components and that the level of investigation carried out was sufficient in determining this:

1. bedrock & structural geology
2. surficial geology and geomorphology
3. geotechnical
4. hydrogeology
5. seismotectonic

1.3 ROLE OF APEGBC

These guidelines have been formally adopted by the Council of *APEGBC* and form part of *APEGBC's* ongoing commitment to maintaining the quality of services *APEGBC Professionals* provide to their *clients* and the general public. *APEGBC Professionals* are

professionally accountable for their work under the Engineers and Geoscientists Act, which is enforced by *APEGBC*.

An *APEGBC Professional* must exercise professional judgment when providing professional services; as such, application of these guidelines will vary depending on the circumstances. *APEGBC* supports the principle that appropriate financial, human and technical services be provided to support the *Design Engineer* responsible for carrying out the site characterization of the *dam* foundation in order to comply with the standard of care provided in these guidelines. These guidelines should be used to assist in establishing the objectives, type of *dam* site characterization , and the level of service and terms of reference of an *APEGBC Professional's* scope of work and *agreement* with the *client*.

By following these guidelines, *APEGBC Professionals* will fulfill their professional obligations, especially with regards to A*PEGBC* Code of Ethics Principle 1 (hold paramount the safety, health and welfare of the public, protection of the environment and promote health and safety in the workplace[2]). Failure of an *APEGBC Professional* to meet the intent of these guidelines could be evidence of unprofessional conduct and lead to disciplinary proceedings by *APEGBC*.

1.4 SCOPE OF THE GUIDELINES

These guidelines apply to site characterization conducted for *dam* foundations regulated under the *British Columbia Dam Safety Regulation* and/or permit conditions under the *Mines Act* and other relevant provincial or federal legislation. These guidelines apply to all *stages* of design as described in Section 2.2.

It is recognized that *dam site characterization* may be carried out for *dams* other than those regulated under the above referenced legislation. While these guidelines may not be required to address such *dam* site characterization, the information contained in these guidelines is likely relevant to the preparation of *dam* site characterization for *dams* to be constructed which are not regulated by legislation in BC.

Furthermore, *dam site characterization* methods documented in these guidelines are not intended to address any occupational health and safety requirements in relation to the site characterization activities to be carried out. However, where a serious concern is identified, it must be brought to the attention of the constructor/*dam owner/client*.

1.5 APPLICABILITY OF THE GUIDELINES AND APEGBC

This document provides guidelines of professional practice for an *APEGBC Professional* carrying out a site characterization assessment for a *dam* in British Columbia. These *dams* may be owned by diverse parties including utilities, mining companies, pulp and paper companies, companies working in the oil and gas sector, various levels of government, First Nations, or private owners. The application of these guidelines provides a consistent and comprehensive standard of professional practice being applied to site characterization for *dams* in BC.

[2] *APEGBC's* Code of Ethics is at https://www.apeg.bc.ca/APEGBC/media/APEGBC/Governance/APEGBC-Code-of-Ethics.pdf. The Code of Ethics, along with accompanying Guidelines and Commentary, are published in the current (1994) edition of *APEGBC's* "Guidelines for Professional Excellence".

In the context of being a self- regulated profession with respect to the application of these guidelines, an *APEGBC Professional's* decision not to follow one or more aspects of these guidelines does not necessarily mean that they have failed to meet their professional obligations. Such judgments and decisions depend upon considering the facts and circumstances for a specific site to determine whether another reasonable and prudent *APEGBC Professional*, in a similar situation and during the same time frame, would have conducted themselves similarly.

These guidelines are influenced by current provincial legislation, current case law, advances in knowledge, and evolution of general professional practices in British Columbia. As such, they may require updating from time to time and may, at times, be at odds with changes in those vehicles for a period of time until an update was completed.

With respect to the use of these guidelines in other jurisdictions in Canada (provinces and territories) or internationally, the practitioner wishing to apply them in another jurisdiction should confirm this with the relevant regulatory body. *APEGBC* supports the development of a common standard of care in professional practice in the carrying out of professional engineering/geoscience activities across Canada and, as practical, internationally. This includes site characterization for *dam* foundations.

1.6 ACKNOWLEDGMENTS

These guidelines were prepared on behalf of *APEGBC* by a Committee of *APEGBC Professionals* and were reviewed by several diverse individuals as members of a Review Task Force. The authors and reviewers are listed in Appendix I. The authors thank the reviewers for their constructive suggestions. A review of this document does not necessarily indicate the reviewer and/or their employer/agency/affiliated association endorses everything in the document.

APEGBC thanks the *BC Ministry of Energy and Mines and BC Ministry of Forests, Lands and Natural Resource Operations* as they provided technical support in the preparation of this guideline. APEGBC also thanks the *Canadian Dam Association, Mining Association of British Columbia,* and *First Nations Energy & Mining Council* for providing support and peer review of the guidelines.

2.0 CONTEXT FOR SITE CHARACTERIZATION FOR DAM FOUNDATIONS

2.1 TYPES OF DAMS

This guidance document is intended for *dams* that are constructed for a variety of purposes that may, for example, range from small water storage *dams* for irrigation to very high *dams* for hydroelectric power generation and mine tailings storage. In addition, dam ownership and uses can vary widely.**Error! Reference source not found.** Table 2-1 summarizes three general *dam* types and purposes, and the key differences between them.

Earth and rockfill *dams* (embankment *dams*) can be constructed for each of the types shown in Table 2-1. Concrete *dams* are often constructed for water and industrial *dams*, but rarely for tailings *dams*.

The three *dam* types perform different functions and have some unique characteristics. For example, two key difference with tailings *dams* are:

1. the progressive raising of the *dam* during the operating life of the mine, which results in ongoing changes to the stability of the *dam;* and,
2. Unlike most water retention dams that can be breached at the end of their intended life, a tailings dam is required in perpetuity though its function may change dependent upon the water retention characteristics on closure.

In addition, the storage of mine tailings and process water increases the potential environmental consequences associated with seepage, water release or *dam* failure. Industrial *dams* may also have additional environmental concerns.

Some additional considerations for tailings dams includes the following:

- Tailings *dams* are fundamentally different from other types of *dams* in that they are typically raised successively over time as a mine develops. As a result, the static loading conditions are continually changing, and in parallel, the stability and seepage considerations continue to change.
- The progressive *dam* raises typically involve additional site characterization and detailed designs for the *stages* and/or *dam* modifications over time.
- A majority, or at least a significant portion, of the *dam* is constructed over the operating life of the mine which, in some cases can be multiple decades. As a result, one could expect changes in the Design Engineer, potentially in the *Owner*ship and even in regulatory requirements over this extended time frame. The transitions between the responsible parties can represent a challenge and must be carefully planned and implemented to maintain the integrity of institutional knowledge, including the site characterization studies.
- The permitting requirements for the tailings *dam* may be tailored to the periodic raises or to a specific *dam* elevation, which may occur over the life of the facility. As a result, the regulatory review process may also be subject to changing regulatory enforcement conditions with time.
- The nature of tailings solids and process water may limit the allowable quantity of seepage water to the receiving environment, which places additional emphasis on hydrogeological assessment.
- As noted above, tailings *dams* cannot be removed upon closure. As a result, they have to be maintained into perpetuity and engineered to function as a dam in that manner or

engineered to be able to transition to performing as a natural landform whilst maintaining physical and chemical containment for the tailings.

Table 2-1 Characteristics of Water Dams, Tailings dams and Industrial Dams

Characteristic	Water Dam	Industrial Dam	Tailings *dam*
Purpose and stored material	Water supply; Hydro-electric; Flood control; Water and stream diversions; Run-of-river hydroelectric; Recreational; Land improvement	Storage of process and waste water; sludge and sediment.	Storage of tailings solids and ; process/mine contact water;
Operating Life	Typically designated as 100 years, but "as long as required by society".	As long as the industrial operation remains (can be multiple decades)	As long as the mine remains operating (can be multiple decades)
Construction Period	Usually 1 to 5 years.	Usually less than 1 year	Initial starter *dam* then *staged* over the operating life (can be multiple decades).
Closure	Facility may be decommissioned with the *dam* removed or breached.	Often decommissioned and /or covered	Commonly perpetual closure period. If there is water retention, then the *dam* may have to be treated the same way as it was during operation. Modifications to the *dam* may allow re-design to become a "landform"
Continuity of engineering	Typically one engineering firm for design and construction.	Varies and can change frequently during the operating life.	Varies: Engineering firm may change during the operating life and most certainly will over the closure period
Owner	Public utilities and municipalities, also individual land owners	Mining, forestry, and oil and gas companies and municipalities	Mining companies and government
Consequence of failure can include	Water inundation	Release of water and/or sludge that has been affected by the process	Water inundation and tailings solids debris flow
***Dam* Section**	Usually a consistent section. Upgrades including raising and downstream berms possible	Usually a consistent section.	Can vary and evolve during the development of the facility

2.2 LIFE PHASES AND DESIGN STAGES OF DAMS

2.2.1 Life Phases

For a *dam*, there can be several life *phases* as follows:

- Concept development where the general location, configuration, and type of *dam* is considered.
- Planning and site selection that involves a comprehensive review of potential sites and *dam* configurations.
- Design of the *dam*.
- Construction of the *dam*. For a tailings *dam*, this would be the starter *dam*.
- Operation. For a water or industrial *dam*, the operation would involve first filling of the reservoir and ongoing operation after that. For a tailings *dam*, the construction typically occurs in *stages* during operation of the *dam*.
- Closure for many *dams* can include breaching or removal of the *dam* (decommissioning). However, for many tailings *dams*, the *dams* may have to remain in perpetuity, unless they can be closed as a natural landform. Tailings *dams* requiring storage of water for permanent submergence of reactive tailings must function as both tailings and water retention structures in perpetuity.

Figure 2-1 shows a generalized timeline for water or industrial *dams*, which start with concept development and end with breaching or removal of the *dam*. Figure 2-2 is a similar chart for a tailings *dam* that cannot be transitioned to a "landform" after mine operations cease and may require being treated as a *dam* in perpetuity.

Figure 2-1 Life Phases of Conventional Dams

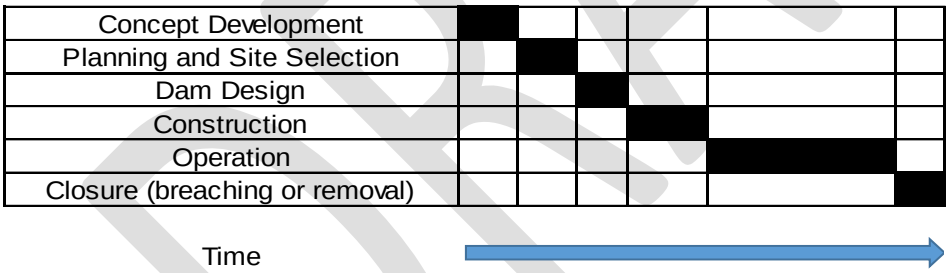
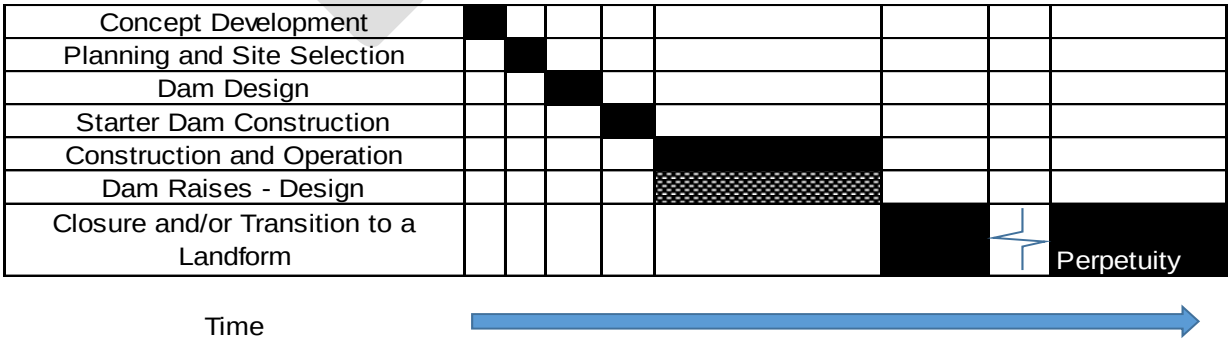


Figure 2-2 Life Phases of Tailings *Dams*



2.2.2 Stages of Design

There are typically a number of *stages* of design for a dam and different conventions are used for naming and defining the different design *stages.* Table 2-2 presents the design *stages* that are adopted for this guidance document and, for comparison, provides examples of similar terminology used by others.

For a water *dam* or an industrial *dam*, the design *stages* and life *phases* parallel each other.

Table 2-2 Typical Design Stages

Design Stages Adopted in This Guidance Document	Other Common Terms	
Scoping Level Design	Conceptual Design	Preliminary Economic Assessment
Pre-Feasibility Design	Feasibility Design	Preliminary Design
Feasibility Design	Preliminary Design	Basic Engineering Design
Detailed Design	Detailed Design	Final Engineering Design

Design *stages* for *dams* typically include:

- **Scoping Level**– This design *stage* develops the initial concept for the *dam*, including site selection, and possible options for the *dam* configuration, location, size, etc. The study typically focuses on identifying major features that could have a bearing on the siting, configuration, and operation. Major cost items and risks are identified. In some cases, the scope level may advance far enough to decide on the site and location for the *dam* Cost estimates are typically developed to an accuracy of +/- 50%, or greater, and should be consistent with the Owner's needs. The key objective of this *stage* is to determine if the project should move forward.
- **Pre-Feasibility Design** – This *stage* typically considers multiple options for the *dam* and possibly multiple sites for the *dam*. The preferred site and location for the *dam* will typically be defined during this *stage*. The site characterization program is undertaken to provide information for the advancement of the *dam* concepts and be able to identify the preferred configuration of the *dam*. Cost estimates for the *dam* construction are typically at an accuracy of +/- 25% to 35% and should be consistent with the Owner's needs.
- **Feasibility Design** – This *stage* advances the design to support a +/- 15% to 25% cost estimate, consistent with the Owner's needs. The feasibility design for the *dam* may also be required to support financing, environmental assessments, and other regulatory requirements for approval for the project to proceed.
- **Detailed Design** (Tender Stage) – This *stage* is just prior to construction when the scope of work, specifications, and construction drawings are prepared and is typically used to support a +/- 10% to 15% cost estimate, consistent with the Owner's needs. Additional regulatory approvals may be required after the detailed design is completed and prior to construction commencing. It may also be necessary to conduct additional site characterization to support aspects of the detailed design.

For smaller projects, the design stages are often combined (for example scoping and pre-feasibility are combined, followed by detailed design).

Section 4.1 provides information on the typical site characterization activities for each design *stage*. During construction and operation, conditions may develop that had not been anticipated during the feasibility and detailed design *stages*, and additional site investigations and/or modifications to the design and construction plans may be required.

For a new tailings *dam*, the design *stages* are similar. However, the *dam* design and site characterization at the feasibility stage should be based on the planned ultimate configuration of the *dam*, with consideration of the future construction sequencing and raises. A detailed design will typically be prepared for the starter *dam* and/or the permitted *dam* elevation. Additional detailed design updates throughout the operation life *phase* are typically required for each successive raise of the tailings *dam* for construction control and in some cases, to meet permit requirements. To support the design of the raises, additional site characterization may be required.

For many mining projects, as the mine develops, there is an increase in the tailings quantity above the original planned amount which requires an increase in the size of the facility and the *dams*. There may also be modifications to the mine plan that require a reduction to the size of the facility or other modifications, such as a new spillway. Such design components may move directly into the feasibility *stage* that would be required to support amendments to the regulatory approvals that were previously granted. These design modifications would be followed by detailed design to support additional permitting and the construction. In support of these design modifications, there will typically be additional site characterization activities.

The design of a dam depends on site characterization at any *phase* of the *dam's* life. Therefore, this guidance on site characterization is organized, in large part, by the design *stage.*

3.0 ROLES AND RESPONSIBILITIES

This section describes the roles and responsibilities of the parties that are involved in a site characterization program.

3.1 OWNER

The Owner is responsible for assigning a *Design Engineer* who will take responsibility for the dam site characterization. On rare occasions, the *Owner* may have an internal team with a *Design Engineer* as part of the team. However, in many cases and almost always for *Tailings dams*, the *Owner* requires the services of an external professional (consulting firm) to carry out the design, which includes the site characterization. The use of external professionals (consultants) typically starts during the scoping or pre-feasibility study and a contractual arrangement may be established that is used throughout the design *stages*. The arrangement is most often established through a request for proposal (RFP) process that allows an *Owner* to assess the relative merits and core competencies of candidate and, as appropriate, their proposed *Supporting Registered Professionals*. Typically, the request for proposal would be for some portion of the design, of which the site characterization program would be a component.

The following indicates other typical roles and responsibilities of the *Owner*:

- Provides safe work guidelines.
- Establishes the general objectives for the project.
- Documents who is the Design Engineer.
- Instructs the Design Engineer to develop a work plan specific to the envisioned investigation works.
- Interacts with Community(s) of Interest and First Nations as required to communicate the extent of the site characterization program.
- Obtains authorization for investigations to proceed on the property.
- Finances the investigations.
- Obtains (or assigns responsibility to the Design Engineer to do so) clearances for underground infrastructure, road closures, working near power lines, etc.
- Participates in the development of the site characterization scope and monitoring during the execution of the program.
- Provides relevant documentation to the Design Engineer.
- Obtains (or assigns responsibility to the Design Engineer to do so) regulatory approvals for site characterization activities that require such approvals.
- In the event of a change in Ownership provides for an effective transfer of information related to the investigation program, including previous investigations.
- Establishes contracts with firms undertaking the site characterization programs directly or instructs the Design Engineer to act in this contracting capacity.
- Reviews changes that the Design Engineer recommends for consideration during the site characterization program and acts accordingly.

For tailings *dams*, where construction and design services are often required over decades, changes in the *Design Engineer* often occurs. During the engagement process, provision to ensure full transference of salient information from previous design and investigation work needs to be ensured and the transfer should be formally documented. Furthermore, through all stages of the project, the Owner should document the identity of the *Design Engineer* for the relevant regulatory agencies and communities of interest.

3.2 DESIGN ENGINEER

A *Design Engineer* should be identified who will be responsible for the design of the *dam* and for overall oversight, development, and execution of the site characterization program. The design engineer is typically an external professional (consultant) but may also be with the *Owner*'s organization.

The *Design Engineer*, through interaction with the *Owner*, will establish the overall objectives and scope of the site characterization program. The *Design Engineer* will either lead the program (actively in the field) and/or provide oversight of the program to determine if the objectives of the investigation with respect to the design requirements are being met. The Design Engineer is responsible for assuring the site investigation program is sufficient to support the design stage for the *dam*(s). However, portions of that responsibility may be officially transferred to a supporting professional (described in Section 3.2.3).

The fieldwork for the site characterization program might be supervised by the *Design Engineer* or it may be undertaken by an individual(s) that has(ve) sufficient experience as a qualified engineer, geologist, or technician. Such individuals would work under the direction and guidance of the *Design Engineer*. *Supporting Registered Professionals* may also be used to provide specialist support in key technical areas.

The contracted entities that conduct the site characterization activities (reconnaissance, pitting, soundings, drilling, geophysics, surveying, etc.) may be contracted to the *Owner* or, as directed by the Owner, directly to the *Design Engineer*.

The *Design Engineer* must be a *Professional Engineer*, experienced with *dam* design and site investigation programs. It is expected that the *Design Engineer* will understand the benefits, limitations, and risks of each of the investigation methods being considered for the program. The education and training requirements are addressed further in Section 6.2.

The *Design Engineer* must meet the requirements outlined in these guidelines (Section 6.0) and should be approved by the *Owner*.

The following indicates other typical roles and responsibilities of the *Design Engineer*:

- In consultation with the Owner, develops the site characterization program consistent with project objectives.
- Takes on responsibility for the site characterization program
- As requested by the Owner, takes on specific roles that may normally carried out by the Owner
- Develops a safe work plan that is submitted to the Owner for approval.
- Develops scope of work and methodology for the site characterization program that is submitted to the Owner for approval.
- Leads and/or monitors the implementation of the program.
- Reports to the Owner on progress and deviations from the plan.
- Supervises the Supporting Registered Professionals that may be involved in support of the program.
- If required by the Owner, establishes contracts with firms undertaking the site characterization program.
- Confirms with the Owner that regulatory approvals and clearances for powerlines, roads, etc. have been obtained.
- Reviews the results as they are obtained from the field and identifies modifications that may be required to meet the objectives of the program.

- Documents limitations on site access due to regulatory, land ownership, or other factors.
- Prepares reports describing the site characterization program results and implications on the design of the dam.
- With the Owner, develops a database and document control system that will allow the results of site characterizations programs to be properly catalogued.
- Prepares the assurance statement(s).

3.3 SUPPORTING REGISTERED PROFESSIONAL

A *Design Engineer* may require supplementary supporting professional engineering or professional geoscience services for a particular professional activity, component or sub-component of a professional activity related to the site characterization program in support of the design and construction of the *dam*. This would be provided by a Supporting Registered Professional (*SRP)*. The SRP carries out duties for the site characterization as assigned by the Design Engineer (geological, geophysical, geotechnical, geochemical, hydrogeological, hydrological studies, etc,).

In instances where supporting professional engineering or professional geoscience services are required, assurances should be obtained by the *Design Engineer* from the *SRP* (who should be engaged by the *Design Engineer* or the *Owner*). All of the *SRPs* engaged to carry out professional activities related to the site characterization of the *dam* foundation are to submit assurance statements that the professional activity that they are responsible for has been carried out in a manner which meets the intent of these guidelines and good professional practice.

The concept of the SRP is appropriate for the site characterization program as the *Design Engineer* should draw on the experience and knowledge of professionals that specialize in the required disciplines when undertaking a site characterization program. Examples of SRPs include:

- Geologists
- Geomorphologists
- Geophysicists
- Geotechnical engineers
- Geochemists
- Hydrogeologists
- Hydrologists
- Seismologists

For a small program without complexity, the *Design Engineer* may draw on published information that has been prepared by such specialists. For a large program or a complex site with specific specialty professional requirements, the *Design Engineer* should contract with such specialists as required. Additional specialists may also be required to support land and water use aspects, such as anthropologists, archaeologists, biologists, and others.

3.4 REVIEWERS

Both internal and external reviewers may be used on a site characterization program as addressed in Section 5.3 and 5.4 of these guidelines. Specialist technical experts may be used in areas where the *Design Engineer* requires a higher level of investigation and assessment to support the design. An *Owner* might also request that an external review of the designs be conducted, or the Regulator may have requirements regarding external review.

A site characterization program should include a review process as part of their quality assurance program. This review process is often provided by another *APEGBC Professional* within the firm that employs the *Design Engineer*. In addition to this review, there can be different types of external review of the site characterization program undertaken such as:

- External Peer Review – Where a specialist, external to the *Owner*'s company and the *Design Engineer*'s company is invited by the *Owner* to conduct a review of the program. Such a review may be done during the development of the site characterization program, after it is completed, or as part of a review of the overall *dam* design. The review would consider the appropriateness of the investigation tools and methods, location, quality control programs during the work, findings, interpretations, etc. This would typically occur in the Feasibility Level Design *stage* or beyond.
- Review Boards can be established by the Owner, for example for tailings dams and large water dams. Typically, the Review Board will review the design and performance of a *dam* and the review of the site characterization program should be included in their scope.

3.5 REGULATOR

Regulators may be involved in the Site Characterization to review applications for permits to support the site characterization program (such as water crossings, working near water, working near sensitive habitat). As required, the Regulator can work with the *Design Engineer* and *Owner* to address constraints with respect to obtaining adequate site access for specified site investigation contractors and associated equipment that may be raised and to manage potential environmental effects due to the work.

3.6 OTHER PARTIES

Table 3-1 provides the roles of other parties that may be involved in a site characterization program.

Table 3-1 Roles of Other Parties Involved in a Site Characterization Program

Party	Role
Field team supervising the site characterization program	• Reports to the *Design Engineer* on progress and deviations from the plan. • Prepares documents describing the site characterization program that can be used in the reports being prepared by the *Design Engineer*.
Site Investigation Contractors/Firms (drilling, geophysics, laboratory, etc.)	• Undertakes work in accordance with the work plan developed by the *Design Engineer*. • Advises the *Design Engineer* of potential challenges that may be encountered as well as opportunities to obtain information in a more effective manner.
Community of interest	• Participate in Community meetings or similar communication vehicles and in the permitting review process.
First Nations	• Participation in consultation for potential site investigation on traditional lands.

4.0 GUIDELINES FOR PROFESSIONAL PRACTICE

This section provides guidance on the standard of care and due diligence associated with carrying out a site characterization for a *dam* given the complexity of the site, the scale of the project, the life *phase* of the project, and the design *stage* (see 2.2). This section reinforces that a systematic assessment is to be carried out and what is involved in doing so from a professional practice perspective.

Sub-section 4.1 provides an overview of a site characterization program, a general description of the activities that should be undertaken for each design stage. Section 4.2 describes the elements that should be considered in a work plan for the site characterization program. Section 4.3 introduces the statement of assurance that is further described in Section 5. Section 4.3 provides details on the items that should be considered during the site characterization program. This section describes "what" should be done, not so much "how" it should be done. References are provided for the reader to consult about the "how." Sections 4.5 to 4.7 describe other aspects including reporting.

The *Design Engineer* has the overall responsibility for the site characterization program, which includes integration of the components described in this section.

4.1 OVERVIEW OF SITE CHARACTERIZATION

4.1.1 Site Characterization Activities

Characterization of the *dam* foundation most commonly starts during the scoping level site selection studies. Figure 4-1 shows the typical activities that are undertaken during the site characterization.

During the scoping level, the concept for the *dam* may be partially or completely developed and some level of site characterization work is required. The concept for the *dam* could require changes as a result of the site characterization and these developments are often iterative processes. The questions that are asked about the site geological, geomorphological, geotechnical, hydrogeological, and environmental characteristics are a function of the concept for the *dam* and the anticipated foundation conditions.

As the *dam* design develops through the pre-feasibility, feasibility, and detailed design *stages*, the site characterization will typically become increasingly detailed. It is typical to have ongoing site characterization work associated with each of these project *stages* that is more intensive as the project proceeds.

Site characterization is not a static process (as shown in Figure 4-1) and, in fact, continues from design into construction, operation and closure. In addition, technologies for site characterization continue to evolve over time. Monitoring during the construction and operation is used to confirm expected conditions and, if changes are observed then additional site characterization and design may be required.

For a water-retaining dam, the site characterization activities are most active during planning and design; however, additional site characterization should take place when surveillance and monitoring indicate changing conditions or better knowledge. For tailings dams, the site

characterization will continue through the years of construction and operation as the dam is raised.

Figure 4-1 Typical Site Characterization Activities to Support Design

A range of professionals may participate in a *dam* foundation site characterization. These may include technical specialists such as structural geologists, quaternary geologists and geomorphologists. The requirements for various professionals would be determined by the

scale and complexity of the *dam*. Other specialists may be required to support land and water use aspects, such as anthropologists, archaeologists and others.

Section 2.2.2 described the design stages for a dam and how the site characterization program fits into those design stages. Table 4-1 outlines the typical site characterization activities for each of the design stages.

Table 4-1 Typical Site Characterization Activities by Design Stages

Design Stages	General Objectives of Design Stage	Typical Site Characterization Activities
Scoping Level Design	Options for siting and dam configuration.	Work primarily based on existing information and table top evaluations; typically a site visit for general reconnaissance of site conditions and mapping. Site geologic and other public information is used to develop an initial characterization of the potential site foundation conditions.
Pre-Feasibility Design	Option comparison to select the preferred site and option for the dam.	Work typically includes terrain and bedrock, mapping, some site specific intrusive investigations, LiDAR, test pits and geophysics.
Feasibility Design	Support financing, environmental assessments estimates.	Work includes a wide range of investigation methods including intrusive investigations, in-situ testing, geophysics, laboratory testing, etc. Extent of site investigations is increased to the level required for the site complexity.
Detailed Design	Issued for construction drawings and specifications. Permitting requirements.	It may be necessary to conduct additional site characterization to support aspects of the detailed design.

For a new tailings *dam*, the design *stages* and site characterization activities will be similar to those shown in Table 4-1. For a tailings *dam* that is being raised in accordance with an existing approved design, additional site characterization may be required to check that the design basis that was used during the feasibility design *stage* remains valid and whether or not modifications need to be made to the design to accommodate information gained during the construction and operation. For a tailings *dam* that is being raised beyond an existing approved design, then depending on the extent of the raise, the site characterization activities would be similar to those described above for the pre-feasibility, feasibility, and detailed design *stages*.

As far as practical, it may be possible to integrate geotechnical investigations with the exploration holes that are being advanced for the mine although that is only when the potential tailings facility is near areas of exploration interest. Irrespective, any tailings facility should have some economic geological evaluation to confirm mineral value condemnation. If mineral exploration work can potentially be integrated into the dam site investigation for dams to be built at the site, then it is essential for the Design Engineer to ensure that the exploration personnel

are sufficient trained to obtain the information expected to come from that program. Permitting of fieldwork locations and access to sensitive areas can be a challenge. As the *dam* design advances through successively detailed *stages* from prefeasibility to detailed design the need for more intensive site characterization typically increases. Permitting requirements (permits: to clear a site of archaeology; to cut a tree to work in and about a stream; etc.) affect timelines, budgets, access to critical sites, etc., and impact the quality of site characterization. Good site investigations cannot be conducted if impeded by competing constraints such as limited access versus requirements for more intensive site investigations. For example, if it is impractical to get appropriate drilling equipment into a site until construction is underway, then one cannot gain an appropriately detailed stratigraphic record, to detect potentially thin, isolated, and shear strength deficient stratigraphic units. Planning, foresight and early permit applications can minimize the potential for this to occur. If the regulatory process is at odds with sufficient site characterization, the *Design Engineer* has the responsibility to make that clear and accordingly modify endorsement of the supporting investigation work for the design stage involved. Further, it is important for the regulator(s) to understand their role in the site investigation process and how that role can impact an effective program.

4.1.2 Site Geological Model

The general objective of the *dam* foundation site characterization is to develop a clear three dimensional understanding of the foundation. As noted above, it begins with a broad appreciation of the site with respect to the overall landscape and geology in the region and then progresses with more site-specific information and details until a sufficient three-dimensional picture of the foundation conditions has been developed. The degree of refinement of the three-dimensional picture is to be commensurate with the nature of the dam envisioned be constructed. This three-dimensional picture with an understanding of the geological and geomorphological processes is referred to as the Site Geological Model in this document. The three-dimensional picture can vary depending on the nature of the dam that is being designed, from basic plan views and cross sections to a fully integrated three-dimensional model with the available information integrated into the model.

The input to the Site Geologic Model has several components as follows:

- bedrock & structural geology
- surficial geology and geomorphology
- geotechnical
- hydrogeology
- seismotectonic

4.2 WORK PLAN FOR SITE CHARACTERIZATION PROGRAM

For each design stage, the *Design Engineer* should develop a work plan that describes the information that is available, the objectives of the site characterization program, and the methodology to be undertaken to meet those objectives (including the activities noted in Figure 4-1). The work plan for the program developed by the *Design Engineer* is to be reviewed according to the *Design Engineers* applicable quality control procedures.

The work plan should take into account the considerations listed below:

General:

- The general planned configuration of the dam or modification, including the areal extent, height, seepage control requirements, etc. These aspects set the context for the

investigation program. At the early design stages, this will be in general terms, but in later design stages, it will become better defined.
- Purpose of the dam (water control, tailings disposal etc.)
- Anticipated design loads during construction and operation.
- Design basis and design criteria. In the early design stages, this will be general, but be better defined in later stages.
- Background to the site characterization investigation program, including known existing information and nature of such information, to set the context of the program and the objectives of the program.
- Documentation that is expected to be produced.
- Budget and schedule.
- Health, safety, and environmental protection plan.
- Potential risks associated with the program.
- How the results are to be integrated into the Site Geological Model.

Investigation Programs:

- Description of locations for the site characterization investigations (field mapping, geophysics, subsurface exploration, etc.) including the reasoning for establishing the locations. This should also include anticipated depths for subsurface explorations and instrumentation.
- Plans for access to the required locations.
- Description of investigation methodologies to be employed.
- Quality control program.
- Permitting requirements.
- Location of underground utilities and infrastructure that needs to be protected from damage during an intrusive investigation
- Location of above ground power lines that could limit access for some drilling and excavation equipment
- Method of soil classification (such as unified soil classification system) and technical standards and/or guidelines to be used for investigation and testing (such as ASTM)
- Method for logging the investigations
- Method for naming the investigation locations so that they can be easily tracked in a database over many years
- Laboratory testing plan (which may be modified as the investigation program proceeds)
- Plan to survey the investigation locations in terms of laying them out and then locating them after completed

Data worth is an important consideration in developing the work plan for site characterization (Freeze et al, 1992). “Data worth is established by comparing the cost of data collection and interpretation against the expected value that the data provides.” This can also be considered the value of risk reduction. The decision to collect further data must therefore be weighed against the cost of the data collection and the value of that data to improve the performance of a *dam*, including improved stability of a structure, improved control of seepage losses, etc. The value of the information can also be evaluated by comparing the risks prior to the data collection with the remaining risks after incorporating the expected value of the additional data in the analyses. Reducing the uncertainties through data collection will add value to a project.

4.3 SITE CHARACTERIZATION ASSURANCE STATEMENTS

The *Design Engineer* provides assurance statements as outcomes from the dam site characterization stating that the site characterization was completed in accordance with this guidance document. The assurance statements are necessary to support the Feasibility Design *stage* and the detail design *stages*. Leading up to the Feasibility Design *stage*, there are a wide range of variables, configurations, sites, etc., that are considered when undertaking a site characterization program. It is the professional engineer's judgement, in concert with the *Owner*'s requirements, regulator's requirements, and the community's and/or First Nations input, to determine the requirements for these earlier design *stages*.

However, for the Feasibility Design *stage*, where the design has to be advanced sufficiently to demonstrate that the *dam* can be safely constructed and to support regulatory requirements for permitting, the site characterization has to be thorough enough to support the design. This guidance document provides information that is applicable to all design *stages*, but the assurance statements are only required for the Feasibility Design *stage* and Detail Design *stages.*

As noted in Section 3.2.3, the *Design Engineer* may require supplementary supporting professional engineering or professional geoscience services for a particular professional activity; or component related to the site characterization program. This would be provided by an *SRP*.

All of the *SRP's* engaged to carry out professional activities related to the site characterization of the *dam* foundation are to submit separate assurance statements (see Appendix A-2) that the professional activity that he/she is responsible for has been carried out in a manner which meets the objectives of these guidelines and good professional practice. The Design Engineer shall review the SRP assurance statements as part of his(her) acceptance and signoff on the Assurance Statement

4.4 SITE CHARACTERIZATION

A preliminary Site Geologic Model is developed based on published reports, airphotos/LiDAR, site reconnaissance, etc., informs planning of the site investigation. Much of the larger scale information, such as satellite images, air photos, regional and smaller scale geological and topographical maps, is publically available. There may also be published papers about the area as well as research reports. If there are any other development projects or mines in the area, it is possible that other site characterization reports in the area may be available. The Site Geologic Model should focus not just on the *dam* and the impoundment but on the surrounding region. The preliminary Site Geologic Model should also provide some initial idea as to the degree of variability expected, which then informs the conduct and sequence of the site investigation. An iterative process ensues.

4.4.1 Bedrock Geology

Bedrock in British Columbia varies from strong massive intrusive rocks to weak hydrothermally altered volcanic rocks and fissile sedimentary sequences. Weak rock can adversely affect siting conditions, and landslides could affect the *dam* or the impoundment. Existing bedrock geologic information will provide valuable input to the initial Site Geologic Model that can then be used for siting considerations, such as drilling density. Publications relating to the bedrock geology are

available from the Geological Survey of Canada and the BC Geological survey and are provided in the Bibliography (Appendix B). Table 4-22 contains documents that are particularly relevant. Maps of bedrock are easily accessible, both on the BC Geological Survey site and at the Geological Survey of Canada (Table 4-22). This data may be too limited for siting considerations but vital for regional overview. For tailings and mine related *dams*, more detailed local bedrock geology should be available from the mining company, the result of extensive drilling and ground traverses that would have also identified outcrop locations. However, the objectives of these data would have been more focused on proving the ore deposit and not necessarily geotechnical characteristics. At least some fieldwork will be required to proof the bedrock map and the SGM.

Table 4-2 Bedrock Geology Key Information Sources

References	Items of Interest
http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/geoscan_e.web	Geological Survey of Canada publications
http://webmap.em.gov.bc.ca/mapplace/minpot/searchcat.htm	British Columbia Geological Survey publications
http://www.mapplace.ca	Geologic Maps of BC
http://geogratis.gc.ca/geogratis/AdvancedSearch?lang=en&pt1=f&pt2=t&pt3=f&pt4=f&pt5=f&pt6=f&q=bedrock%20geology&minx=-180.0&miny=-90.0&maxx=180.0&maxy=90.0	Geological Survey of Canada maps

A bedrock mapping program should emphasize features that affect the geotechnical properties of the rocks: faults, fractures, joints, and types of weathering. A competent bedrock mapper with experience with structural geology should do the mapping and evaluation, likely in conjunction with a geotechnical specialist. Having a firm understanding of the regional tectonic history of the area from previous studies will assist in the mapping of structural features. Faults are problematic because rocks adjacent to the fault can be highly fractured and the fault itself could contain fault gouge (finely crushed rock), both of which serve to lower the Geologic Strength Index *(GSI)*. Other potential planes of weakness, such as joints and bedding, should be measured and evaluated with respect to continuity, daylighting, general foundation conditions, and overall joint fabric orientations of major joint sets. Stress relief from isostatic rebound after glaciation causes unloading and can also affect jointing patterns. Glaciotectonic considerations are discussed in Section 4.2.2.

Although remote sensing is generally of less utility in bedrock mapping compared to surficial mapping, satellite images, aerial photographs, and especially LiDAR images are useful for structural elements such as liniments. Ground based LiDAR and photogrammetry can be useful for discontinuity analysis if suitable outcrops exist.

To support the Site Geologic Model, geophysics and drilling should be considered. The drilling program and ongoing site observations should be used to improve the Site Geologic Model in an iterative manner. Surface geophysics, as discussed in the next section, may be useful. The selection of appropriate drilling equipment, such as triple tube diamond drilling with oriented core should be considered.

Groundwater well databases should also be consulted to provide input to the hydrogeological component of the Site Geologic Model (discussed further in Section 4.2.5).

Special care is required in areas of calcareous rocks because of the possibility of karst features. Dis-solution can cause cavities that provide conduits for groundwater and may collapse. Although carbonate rocks occur throughout British Columbia, they are most common on Vancouver Island and in the Rocky Mountains. Geophysical surveys may be considered to determine if larger cavities exist in the area. A related issue is old underground workings that can have similar issues of collapse and groundwater diversion.

For a mining project, the mining company will have an understanding of the local bedrock geology gained from their exploration drilling and mapping. However, geological work associated with mine development is typically more focused on identifying and confirming the orebody characteristics, with potentially limited information gathered about the geotechnical characteristics of the bedrock and surficial (non-consolidated) material. There is often little information on the stratigraphy of the surficial material. Thus, once the initial Site Geologic Model has been created, the drilling program and, mapping programs should be used to improve the Site Geologic Model in an iterative manner.

For a green-fields non-mining *dam* project, there may be little borehole information available prior to commencing the study, but records of nearby ground water wells and examination of rock exposures in the area can assist with the development of the preliminary Site Geologic Model.

4.4.2 Surficial Geology

Glacial stratigraphy and history of an area can have important implications to the terrain mapping and the presence of subsurface and rare sediment types[3]. British Columbia has a glacial history that spans the Quaternary (Clague and Ward, 2011). The Pleistocene is characterized by periods of cooler temperatures where glaciers covered large portions of the northern hemisphere. These periods are termed glaciations and periods as warm or warmer that the present are termed interglaciations. Due to differential preservation caused by erosion and burial, sediments from the last glacial cycle dominate the record. However, care must be taken as sediments from older glaciations and interglaciations can exist in the subsurface in areas of BC, and these can affect siting considerations and the design of the site characterization program. Of particular concern are buried organic bearing soils (paleosols), advance or retreat glaciolacustrine sediments, and glaciomarine sediments.

The availability of information on the Quaternary history and terrain maps is variable across the Province. Some publications discuss BC as a whole, while most are more regional and local in nature. See Appendix B and Table 4-3 for a list of relevant publications. It could be that there is no local surficial geologic history developed and, thus, it must be constructed for the local area. This work should be done by someone with experience and training in Quaternary Geology and terrain analysis.

It is important to be able to view the surface expression of the area for the Quaternary history and for the terrain and geomorphic analysis. There are three main choices: aerial photographs, satellite imagery, and LiDAR; InSAR also has potential for certain applications. Another relatively inexpensive possibility is the use of unmanned aerial vehicles or drones, to create a

[3] The Mount Polley incident highlighted the importance of understanding the glacial stratigraphy and carrying out site characterization studies commensurate with the complexity of the site.

3D image of a small area using photogrammetry software. Aerial photograph flight lines can be viewed through GoogleEarth™ and then ordered through the internet.

Table 4-3 Surficial Geology Key Information Sources

References	Items of Interest
Clague, J.J. and Ward, B.C. 2011. Pleistocene Glaciation of British Columbia. In J. Ehlers, P.L. Gibbard and P.D. Hughes, editors: Developments in Quaternary Science, Vol. 15, Amsterdam, The Netherlands, pp. 563-573.	Overview of Quaternary History of BC. Contains numerous references.
Fulton, R. J. 1991. A conceptual model for the growth and decay of the Cordilleran Ice Sheet. Géographie physique et Quaternaire, vol. 45, p. 281-286.	Summary of the style of glaciation and deglaciation in the Canadian Cordillera.
Peter Fookes, Geoff Pettifer and Tony Waltham. Geomodels in Engineering Geology – An Introduction, 2015	Engineering geology, geologic environments, geophysics, ground investigations

LiDAR, satellite data and InSAR are usually only available from private companies. Aerial photographs are black and white or colour images taken from an airplane. Satellite data can be useful for recent changes/events (roads, landslides etc.) but cannot be viewed in stereo. As well, resolution can be lacking on satellite images for the type of detailed work being done. LiDAR, if available, is the best option. Processing allows the stripping off of the vegetation to get a “bare earth” image. The detail is the best of the three options, but the acquisition and processing can be expensive. There are both ground based and aerial based systems.

Developing a regional glacial history through examination and interpretation of the glacial and non-glacial sediments and the literature is a priority. An understanding of the nature of glaciation and deglaciation of the Cordilleran Ice Sheet (Fulton, 1991), the regional stratigraphic framework (e.g., Ryder et al. 1991), the potential antiquity of sediments (e.g. Nichol et al. 2015), and the potential complexity of sediments (Ward and Thomson, 2004) is vital to anticipating the types and ranges of sediments that could be present. This knowledge, combined with examining natural exposures and drilling should enable the local glacial history to be accurately determined. Although there may be insufficient exposures at the actual site, the Quaternary history can be reconstructed by examining exposures in the vicinity of the *dam* site. These can be identified through air photos, LiDAR, etc., and then combined with the site drilling information.

A drilling method that results in undisturbed samples and continuous core that can be examined for sedimentary structures is preferred. Obviously, sediment types that are susceptible to lateral shearing are of concern: fine grained alluvial, lacustrine, glaciolacustrine, glaciomarine, marine, peat, and organic rich paleosols. An understanding of the lateral variability of these environments is vital. A good example is glaciolacustrine, which although commonly thought to just be rhythmically bedded clay and silt, may contain ice-contact glaciolacustrine sediments that can have sand, gravel, and diamicton (that can look like a till) interstratified at various scales and expressing rapid lateral variability. If the site is close to the present coastline, or historic coastlines, care must be taken if glaciomarine sediments are possible based on the

geologic history and elevation of marine limit (*cf.* McCuaig, and Roberts, 2006), as quick clays may be present. Quick clays, or sensitive clays, are prone to landslides if disturbed (e.g. Gertsema and Torrance, 2005).

As glaciers move over the landscape they not only erode and deposit sediments, but they can also shear, fold and fracture sediments and bedrock. This glaciotectonism can form thrust sheets that could repeat units, complicating the stratigraphy recorded in drill holes. The faults themselves can also form planes of weakness and/or conduits for groundwater.

Geomorphology is the study of the physical features of the surface of the earth and their origin. Geomorphological processes include geohazards such as landslides, gullying, piping and flooding that can have implications for the siting of *dams*.

Terrain mapping should be carried out for all sites. It is a way of portraying the landscape of surficial materials, surface expression and geomorphological processes, such as landslides, snow avalanches, gullying, etc. Terrain mapping provides information on topography and slope steepness, texture, porosity, permeability, moisture content, thickness and present day geomorphic processes. It portrays the landscape as a mosaic of irregularly shaped areas that are referred to as terrain units or polygons. It has a flexible (open) legend in contrast to the closed legend of a surficial geology map. An open legend provides the most information as the mapper selects the symbols that most represent the particular conditions in a given polygon. Thus, each polygon ends up with unique polygon descriptors; however, it can be difficult to interpret for untrained users.

Production of applied terrain maps such as terrain stability, terrain hazard and risk, sediment erosion potential and delivery and earthquake hazard maps, may be required for siting. These maps all have a specialized terrain base where the polygons are subdivided on the basis of the end product. These polygons are then interpreted for the final objective of the map. i.e. terrain stability classes are added. A general terrain map base cannot be used for creating applied maps, and the mappers doing this work require specialized training.

In areas of steep relief, especially in close association with glaciers, avalanches and all types of landslides need to be considered. These geohazards need to be recognized and mitigated as part of the design and development plan. Recognition should be part of the terrain mapping portion of the assessment. For example, snow avalanches are common in areas of high relief and significant snowfall and could be recognized by vertical swaths with no conifers containing low trees such as alder, birch and willow below steep terrain with few if any trees.

Permafrost is ground that stays below 0° C year round. It occurs in many alpine areas and in NE BC (Smith, 2011). Disturbance of the surficial organic layer in permafrost terrain results in melting and degradation of the terrain. If there is a high content of frozen soil and ice, the potential for degradation (melting) can be significant. If permafrost is suspected in the area, the objectives of the drilling program must include its characterization and distribution.

Surface geophysics (also referred to as geophysical surveys) can play an important role in defining the surficial geology and the bedrock geology and in identifying anomalies and spatial continuity of foundation materials.

Geophysical surveys having the following benefits:

- Non-intrusive and have limited impact on the site conditions
- Provides a continual spatial quantification of potential ground conditions

- Can identify anomalous areas that can be targeted with the drilling program
- Can identify bedrock contacts and support better definition of the extent of the site investigation program, e.g. depth and spacing of holes.

Typical geophysical surveys include, for example:

- Seismic refraction/reflection which measures velocity and can be used to identify bedrock, groundwater levels and indicate the density of materials
- Electrical and electromagnetic surveys - measures resistivity/conductance which can be used to identify saturated and/or clay rich materials
- Ground-probing radar – which can be used to identify permafrost or anomalies in layering and materials, useful in shallow investigations
- Magnetic and gravity surveys may be useful in identifying low-strength rock or natural or man-made cavities.

Geophysical surveys, however, do not necessarily provide quantitative information in all situations and, therefore, they should be used in conjunction with ground proofing and calibration with known information.

4.4.3 Geotechnical

The objective of the geotechnical component of the characterization program is to develop parameters which can be used in the analysis of the dam design. The analyses may include, for example, stability, deformation, settlement, seismic response, seepage, piping potential, etc.

Geotechnical characterization of the bedrock foundations should assess the spatial distribution of the lithological rock units as well as the orientation and distribution of the main joint sets within each lithological unit. Additionally, it is important to identify major geological structural features such as faults, shears and intrusive dykes. The strength of bedrock will be influenced by its structure (e.g. unfavourable dipping sedimentary rock), degree of weathering, degree of fracturing (rock quality designation, joints and faults), rock hardness and the GSI. The hydraulic conductivity of bedrock is typically controlled by the degree of fracturing and rock quality. The stress state of the rock should consider the potential for valley rebound and regional stresses. For high dams, the deformation properties of the rock may be determined with geophysical methods and correlations with rock strength and rock properties.

Geotechnical characterization of the foundation soils should delineate representative geotechnical units. The geotechnical units would consider, for example, the surficial geologic history, geotechnical properties, etc. Index testing of soils is used for general characterization and generally include, for example: moisture contents, grain size, Atterberg limits, density and pocket penetration shear strength index. Undisturbed samples of cohesive soils are required for strength and consolidation testing. Strength testing should consider drained and undrained strength response and peak and residual/large strain strength, as well as the stress state of the soils and the stress conditions that will be imposed by the *dam.* Deformation properties of the materials should consider the stress history, pre-consolidation stress state, degree of over consolidation, coefficient of compression, recompression and consolidation. The potential for liquefaction of the materials during static or dynamic loading should consider the degree of saturation, density, stress state, and drainage properties.

In consideration of the SGM, the site investigation program would be focussed on obtaining representative geotechnical properties for each of the identified geotechnical units in the dam

foundation. A range of methods is available for conducting intrusive investigations such as test pits, boreholes, standard penetration tests (SPT), cone penetration tests (CPT), etc. These methods include obtaining disturbed and undisturbed samples, conducting in situ testing, downhole examination, and instrument installation. These methods are described in many sources, with some references included in Appendix B and particularly relevant references in Table 4-4. It is the responsibility of the *Design Engineer* to determine the most appropriate methods for the *dam* and site being considered.

Table 4-4 References for Key Geotechnical Field and Laboratory Work

Reference	Items of Interest
Fell, MacGregor, Stapledon, Bell, Geotechnical Engineering of Dams	Chapters 1 to 7 covering Geology, site investigations, geotechnical properties and clay properties
ICOLD Bulletin 129, Dam Foundations	Foundation investigations and case histories
US Department of Interior, Bureau of Reclamation, Embankment Dams:	Chapter 12 - Foundation and Earth Materials Investigation
Federal Energy Regulatory Commission	Chapter V, Geotechnical Investigations and Studies
US Army Corps of Engineers, EM 1110-2-2300, General Design and Construction Considerations for Earth and Rock-Fill Dams	Chapter 3, Field and Laboratory Testing
US Army Corps of Engineers, EM 1110-2-1802,	Geophysical Exploration for Engineering and Environmental Investigations Geophysical surveys
US Army Corps of Engineers, EM 1110-1-1804,	Geotechnical investigations
Design Standards No. 13, Embankment Dams.	Chapter 12: Foundations and Earth Materials Investigation Phase 4.
US Department of the Interior, Bureau of Reclamation, Design of Small Dams, 1974	Chapter V Foundations and Construction Materials

For the feasibility design *stage* and the detailed design *stage*, a detailed work plan should be developed for the geotechnical site investigation program that clearly describes the basis for the work plan, the drill hole spacing, depth, etc. This work plan should be included in the *dam site characterization report* to document how the geotechnical site investigation program was developed. Site characterization programs (including the lab testing and instrumentation aspects) are typically modified during the execution of the program to address conditions that are encountered in the field that are different from what was expected (access challenges, poor weather, unexpected results, etc.).

Other considerations with respect to developing the geotechnical parameters include, for example:

- Clay mineralogy and potential for dispersive soils
- Potential effects of glacial rebound/drag – damage to fabric, reduction of strength, change or orientation
- Hydrogeological properties as discussed in the following section
- Permafrost and ground temperatures and the potential for thermal influences from the dam and reservoir/impoundment

- For *dams* in the mining industry: the mine plan (underground workings below a *dam* or an open pit near a *dam*)
- Effect of other sub-surface activities that could affect a *dam* design

As noted in Section 4.2.2, surficial geophysical methods (or geophysical surveys) can be utilized to provide spatial coverage that, in concert with intrusive investigations, can supplement the SGM. These surveys might precede the geotechnical investigation or additional surveys may be done to address specific areas in parallel with the geotechnical site investigation. Downhole geophysics may also be employed to obtain additional information on the properties of the soil and rock units.

Some general "minimum guidance" for intrusive geotechnical site investigation includes, for example, the following:

- The depth of the geotechnical investigation should be to at least the expected height of the final *dam* or to a depth sufficient to confirm competent strata (e.g. competent bedrock) for the proposed *dam*. Deeper investigations may often be required if conditions at depth could influence the design and function of the *dam.*
- The spacing between investigative locations along the dam axis should be determined within the context of the variability of the foundation conditions and height of the dam and could, for example, range from a few meters apart for complex foundation conditions to a spacing on the order of a hundred metres apart for sites with simple foundation conditions.
- The investigations should be strategically located to cover the aerial extent of the structure and the anticipated stratigraphy.
- The number of investigative locations should be sufficient to support representative profiles along the *dam* axis and at representative design cross section (upstream to downstream) locations along the *dam* alignment. The number of investigative locations should be sufficient to adequately characterize all the different soil and bedrock units that are present in the dam foundation.
- Undisturbed sampling of cohesive soils should be conducted to obtain samples for laboratory testing.
- Appropriate in situ testing should be considered to establish/confirm in situ properties.

Laboratory testing is assigned based on field observations while the results of lab work can be an important input in the design of further field investigations. This interaction is an important part of the refinement of the site characterization throughout the development of increasingly more detailed site understanding and refinements of the *dam* design.

Instrumentation is an important component of a site characterization program (standpipes, piezometers, slope indicators, thermistors, etc.). Instrumentation will often be installed during the foundation site characterization program and also during the construction of the dam.

Site characterization programs (including the lab testing and instrumentation aspects) are typically modified during the execution of the program to address conditions that are encountered in the field that are different from what was expected (access challenges, poor weather, unexpected results, etc.). The work plan of the site characterization program should include a process for managing these uncertainties that will allow for response during the execution of the program. The *Owner* should set aside a contingency allowance in their

budgeting to be able to respond effectively to these changes (typically 20 to 50%). The contingency allowance will vary by design stage.

4.4.4 Hydrogeology

Hydrogeological assessments are carried out to support both the engineering design and environmental permitting of *dams*. The understanding of the bedrock and surficial geology and the geotechnical conditions is intimately related and complimentary to the development of the hydrogeological component of the Site Geologic Model. Hydrogeological assessments are, therefore, commonly integrated with the bedrock, surficial geology, and geotechnical investigations.

The hydrogeological assessment is used to develop a conceptual hydrogeological model, which would be developed within the framework of, and complimentary to, the Site Geologic Model. The model, however, typically extends within the reservoir/impoundment to downstream of the *dam*. The interpretation of site data defines the foundation conditions and associated groundwater occurrence. Factors influencing groundwater levels, quality, flows and seepage are also described in the model. Prediction of seepage through the *dam* foundation and from the impoundment are used to support design of seepage control, conveyance, collection and mitigation systems, and the assessment of potential downstream impacts to the receiving environment. Prediction of seepage is also used to support design of filters, piping controls and and to assess the potential for artesian uplift pressures within the *dam* foundation.

Appendix B contains references for hydrogeological investigations and Table 4-5 lists references that are particularly relevant

Table 4-5 Hydrogeology Key Information Sources

References	Items of Interest
BCMOE (2012). Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. BC MOE, Water Protection & Sustainability Branch.	Modelling for contaminant transport assessment.
BCMOE (2012). Water and Air Baseline Monitoring Guidance Document For Mine Proponents and Operators. Technical Guidance 6 Environmental Management Act Applications. Version 1.0, October 2012.	Monitoring guidelines
BC Government (2014). Water Sustainability Act. BILL 18 — 2014	
BC Government (2004). Water Act - GROUND WATER PROTECTION REGULATION. B.C. Reg. 299/2004 O.C. 664/2004.	

The hydrogeological components of site characterization typically include the following:

- Distribution and significance of hydrogeologic units (aquifers, aquitards and aquicludes) associated with bedrock and overburden.
- Hydraulic characteristics (hydraulic conductivity, anisotropy, transmissivity, storage characteristics) of bedrock and overburden, including structural features (e.g. faults).

- Groundwater levels, flow directions and gradients. Groundwater quality and factors that may influence. Temporal and seasonal variability (e.g. in response to freshet).
- Groundwater quality with respect to baseline quality and geochemistry of groundwater water types
- Groundwater-surface water interconnectivity (e.g. baseflow), recharge and discharge mechanisms and locations.
- Location and characteristics of nearby groundwater receptors (e.g. groundwater-fed wetlands/springs), users (e.g. existing wells) and existing infrastructure that may influence groundwater (e.g. sources of contamination).
- Hydraulic gradients indicating flow direction

Investigatory methods used as part of hydrogeological characterizations typically include some or all of the following:

- Site walk/fly overs and mapping.
- Overburden/bedrock drilling and logging (the methodology should be selected with consideration to site conditions, testing requirements and access).
- Installation of monitoring and pumping wells, and monitoring instrumentation.
- 'Point' hydraulic tests (e.g. packer and slug tests).
- Pumping tests (which measure aquifer response to pumping).
- Unsaturated zone testing (e.g. double ring infiltrometer and permeameter testing).
- Groundwater level measurement (including instrumented), surface water flow gauging and groundwater/surface water quality sampling.
- Geophysical surveys (downhole and regional).

Hydrogeological site investigations are often performed in conjunction with exploration, geological, geotechnical and other investigations (e.g. surface water) to reduce costs and maximize data acquisition.

The conceptual hydrogeological sub-model of the Site Geologic Model should include:

- Details of the model extents/boundaries, and how these were selected.
- If groundwater quality is a potential issue, the model should include baseline geochemical conditions.
- A simple visual representation of the groundwater system (e.g. cross sections, 'cartoon' type figures, zone maps for recharge/discharge).
- A description of key hydrostratigraphic units and processes influencing groundwater.
- Quantitative components – a groundwater flow balance, ranges of hydraulic data for key overburden/bedrock units.
- Details of how *dam* development may impact the groundwater system.

Baseline hydrogeological conditions are established for comparison as the dam project proceeds into construction and operation. The hydrogeology information is used in seepage analyses, in concert with assumptions made about the dam materials, to develop estimates of the seepage patterns through the dam and foundation when it is in operation.

4.4.5 Site Characterization of Seismotectonic Conditions

The objective of the seismotectonic assessment is to develop an understanding of the regional tectonic conditions and to carry out site characterization studies to develop parameters that can

be used to support a seismic hazard assessment for the site, i.e. the design ground motion events/parameters and the foundation response parameters that will be used for the seismic response assessment for the *dam*, foundations and reservoir or impoundment slopes.

Appendix B contains references for hydrogeological investigations and Table 4-6 lists references that are particularly relevant

Table 4-6 Seismotectonic Key Information Sources

References	Items of Interest
Natural Resources Canada Seismic Hazard Maps and Seismic Hazard Calculator	ADD LINK
Seismic Hazard Considerations for Dam Safety (CDA, 2007)	Overview of seismic hazard assessment
Evaluation of Earthquake Ground Motions, Idriss et al, 2007) Division of Dam Safety and Inspections Office of Hydropower Licencing, Federal Energy Regulatory Commission	Section 3 Geologic and Seismologic Considerations
Maximum Design Loads for Building and other Structures, ASCE 7-05, Chapters 20, 21	Ch. 20 – Site Classification Procedures for Seismic Design Ch. 21 – Site Specific Ground Motion Procedures for Seismic Design

Seismic hazard analysis considers two approaches, the probabilistic (determines events for various annual exceedance probabilites), and deterministic (determines seismic hazard due to identified faults) and consideration of both may be important for *dam* design. Additional details on the probabilisitic and deterministic seismic hazard analyses are included in Appendix D.

Assessment of the seismotectonic setting should consider the regional area (up to 500 km radius) and include the following considerations:

- Plate tectonic setting with respect to potential subduction zones and tectonostratigraphic terranes which may have associated active faults
- Regional faults identified in geologic and seismic hazard maps and from air photo, satellite and Lidar imagery
- Evidence of potential Holocene fault movements, e.g. scarps displacing glacial or recent soil deposits
- Human induced seismicity (hydrofracking, gas/oil extraction subsidence, mine operational blasting, etc.)

Seismic hazard evaluation in Canada continues to be developed in support of the National Building Code of Canada, with a new update currently in progress (2015). Improvements to the seismic hazard assessment incorporate ongoing refinement of our understanding of the seismic source zones and developments in both probabilistic and deterministic influences on the hazard classification. Seismic hazard maps and a seismic hazard calculator (for the specific location) are available from the Natural Resources Canada (Pacific Geoscience Center). The use of these sources provides a preliminary estimate of the seismic hazard *up to the 1:2500 ground motion Annual Exceedance level* and is appropriate to use in cases of firm ground conditions (e.g. non liquefiable or non-strain softening) *for low, medium or high consequence dams.* For *very high and extreme consequence dams* and *for* sites with complex geological conditions, it is

appropriate to carry out site specific probabilistic *and/or* deterministic hazard evaluations. The probabilistic evaluations allow for determination of parameters for various *exceedance probabilities*, whereas the deterministic assessment is typically used in *simple, but rare* cases *where the concept of a* maximum credible earthquake that could be generated by a known fault(s) *can be used*.

The determination of earthquake ground motions generally assume “firm ground” or “rock” conditions, which would be an input to the analytical model for the *dam* that would consider the foundation soil-rock conditions. Consequently, an understanding of the foundation conditions is an important consideration in the analysis and the determination of the depth of soils under the *dam* and the shear wave velocity of the soils are important inputs. Low-strain shear wave (reference Chapter 21, ASCE) velocities can be determined from field measurements using down-hole or linear seismic surveys or from similar soils in the site vicinity. Nonlinear or linear shear stress-strain relationships and unit weights can be selected on the basis of laboratory tests or published relationships for similar soils. The uncertainties in the soil properties shall be estimated. Where very deep soil profiles make the determination of the model impractical, adjustments to the seismic hazard assessment need to be made to accommodate the uncertainty.

The seismotectonic components of the site characterization study are typically used to support a more detailed seismic hazard assessment, which include both the probabilistic and deterministic hazard assessment

4.5 EVOLVING UNDERSTANDING OF PROJECT AND SITE CONDITIONS

Site characterization of a *dam* foundation is a “continual” process, which develops and improves as the project proceeds to ongoing *Stages.* This evolving of the understanding of the site characterization can develop with additional site investigations, observations from construction and monitoring, and additional studies, e.g. geohazard assessment, refined quaternary geology assessment. In addition, as the design of the *dam* proceeds, the relative influence and importance of specific site conditions to different *dam* components will evolve, e.g. influence of foundation soil behaviour under dynamic loading conditions, changes in allowable seepage release, evolving site characterization technologies, etc.

Changes may also occur that influence the requirements for understanding of the site conditions. These could arise, for example, with an increase in land or water use downstream of the *dam* which may increase the consequence of failure or impose limitations on seepage or *dam* footprint in the case of expanding *dam* height or requirements for flatter slopes. Natural geohazard events, such as landslides or debris flows could influence the *dam* foundation or the *dam*.

At ongoing *stages* of the project the *Design Engineer* should continue to exercise a duty of care in assimilating the ongoing information and understanding of the site characterization. As the additional site investigations, observations and monitoring results continue to inform the *Design Engineer*, and data collected from ongoing recommended site investigations or studies are completed, they need to be incorporated into ongoing updates to the *DSCRs*.

For tailings *dams* which are developed over a long period of time consideration should be given to updating the Design Record Report at appropriate intervals to ensure that the evolving site characterization is integrated into the evolving design of the *dam*.

4.6 DAM SITE CHARACTERIZATION AND DATA RECORD REPORTS

4.6.1 Dam Site Characterization Report

The structure and composition of the report is largely the *Design Engineer*'s responsibility, however there is some documentation that is required to be included in a report to allow the *Design Engineer*'s work to be replicable and made transparent for report reviewers to understand how the *APEGBC Professional* arrived at their conclusions.

Reports will be prepared to document the site characterization data (Data Record Report, discussed below) and the interpretation of the data (*Dam Site Characterization Report*).

The *Dam Site Characterization Report* DSCR) may be a stand-alone report or form part of a *Dam* Design Report. There may be several DSCRs issued for a dam design project as the design and site characterization evolves.

The purpose of the DSCR is to provide and document the interpretation of the data and relevant supporting information, e.g. empirical correlation, reference reports, etc. Representative geological and hydrogeological plans and cross sections should be developed to communicate the extent of site investigation data, geological and geotechnical units, and groundwater conditions. Although not covered by these guidelines, the report should include also summaries of physiographic, climatic and hydrological conditions that provide context to the site characterization. The interpretation of the data is intimately integrated with the design of the project and therefore the report needs to be considered within the context of the design.

The DSCR should summarize the objectives of the site investigation plan and documents the outcomes. All data and reports should be documented and kept on file as per *APEGBC* documentation requirements.

Internal peer review should be carried out as per *APEGBC* requirements. External Peer review specialists should be considered for specialist technical areas where the *Design Engineer* or the SRP may not have the appropriate level of experience. The use of ITRB's should be considered for projects with higher potential consequences and/or complexity.

4.6.2 Data Record Report

The "Data Record Report" may be a separate document or an Appendix to the *DSCR* or the Dam Design Report. The report should include all relevant data, e.g. mapping, results of site investigations and laboratory testing. The report should summarize the extent of the site characterization studies, with appropriate summaries to guide the reviewer. Interpretation of data should be kept at a "high Level" with a focus on aspects relevant to the data collection and veracity of data.

4.6.3 Limitations and Qualifications

The DSCR shall include a section on limitations and qualifications. The nature of site investigations and site characterizations is that they provide a snapshot in time at various *stages* of the project. There is a degree of professional judgement required to understand site conditions and some natural events, such as ancient landslides may not be readily interpreted. As the project matures additional information and understanding of the site conditions evolves

with ongoing studies, construction observations, monitoring observations, etc. Additionally, the project design can change in response to site characterization results, economic conditions, *dam* height changes, and other factors. Consequently, it is important that the *Design Engineer* document the limitations and qualifications of the DSCR as described in Section 4.7. The *Design Engineer*'s signing of the Assurance Statement is limited to the Stage of the Project (time variable) and should include reference to limitations and qualifications relevant to the report.

The *DSCR* should identify limitations or qualifications relevant to the assessment, e.g. areas of uncertainty and requirements for further studies, context with respect to spatial limitations and *dam* height, etc. Qualifications with respect to assumptions and reliance on existing or third party reports should be documented.

The DSCR should clearly document the minimum requirements for additional site investigation and/or site characterization studies. As the project proceeds, the *Owner* should clearly document that the recommended work has been carried out or provide written assurance that the recommendations have been amended or that their implementation can be appropriately delayed, as approved by the *Design Engineer*. When transitioning from one *Design Engineer* to another, the new *Design Engineer* would be required to provide that assurance.

The Data Record Report should identify significant limitations or qualifications relevant to data collection, e.g. access to project area and drill pads, drilling or sampling problems, equipment reliability, budget or scope limitations, laboratory data quality, etc.

4.6.4 Review and Updating Dam Site Characterization Report

Follow up to the DSCR will normally be required at various *stages* of the project. Follow up could be required in response to execution of recommendations, an assurance statement that indicates that the level of site characterization is not appropriate, or areas with identified risk. It would also likely be triggered by advancement to the next *stage* of the project, or in recognition of other factors discussed in Section 4.8. A review of the *DSCR* could also be triggered by an unusual event, such as excessive slope deformation, response during a major earthquake, etc.

Advancement to the next *Stage* of the project could require more detailed investigations or the execution of additional laboratory testing to confirm empirical relationships that may have been used previously. Areas of identified risk could also warrant additional appropriate site characterization to reduce the risk level. The *Design Engineer* should review the *DSCR* at each project *Stage* and at appropriate intervals during construction and operations. Site visits and review of construction and monitoring data are important components of these ongoing updates.

The Data Record Report record and the Site Geologic Model should continue to be populated with new data. This may take the form of a database or electronic files that contain all site characterization data and associated reports. This should include during construction of the dam when the foundation conditions are exposed during construction or additional information is gathered through instrumentation and performance.

The *DSCR* could be updated either with revisions to the original report or with report amendment reports. Updates to the report will include an assurance statement that documents the areas of change and the current status of the professional reliance.

4.7 OTHER CONSIDERATIONS WITH SITE CHARACTERIZATION

4.7.1 First Nations and Communities of Interest

Site characterization activities may be initiated in the early *stages* of the potential development of a project and consequently, the interests and involvement of First Nations and communities of interest may be at an early *stage* of evolution with the *Owner*. Potential interests in the site characterization program may include, for example, the following considerations:

- Disturbance of potential archaeological sites and culturally significant components
- Disturbance or ingress onto lands owned by individuals or communities
- Disturbance of potentially significant biological components, such as wetlands, rare plants, etc.

The *Design Engineer* will coordinate with the *Owner* to ensure that the site characterization activities are carried out with the knowledge of First Nations and communities of interest, as appropriate.

4.7.2 Hydrology and Climate

From a dam foundation site characterization perspective, assessment and characterization of the hydrology and climate is not required. However, both hydrology and climate influence the surficial geology, hydrogeology and geotechnical conditions in the *dam* foundation, and the sizing and design requirements for the dam. For example, their influences are apparent in the geological deposition of materials, as well as on groundwater conditions. Precipitation can lead to erosional deposition of soils and infiltration of precipitation can lead to slope instability and colluvial processes. Freeze/thaw cycles over time can lead to physical erosion and colluvial processes. Historic extreme hydrological events in mountainous terrain may lead to deposition of significant debris flow deposits over time and, depending on the energy of the debris flows and the origin of the soils, the deposits may vary considerably from loose silty soils to dense granular soils. Hydrology is a key component of the hydrogeology site characterization as the amount of precipitation and the climatic cycle influence the infiltration rate into the ground and, additionally, could introduce artesian pressures in both confined and unconfined pervious layers in the foundation of the *dam*.

The presence of permafrost and permafrost influenced soils and bedrock are directly influenced by the temperature, both historically and, into the future. Thermal induced influences on the foundation can lead to changes in the permafrost state of the foundation soils and bedrock.

4.7.3 Risk Management and Uncertainty in Site Characterization

As noted in Section 1.1, the site characterization program is a “critical control” for the safe design and operation of the dam. With respect to the site characterization, risk and uncertainty identification is an important component and directly influences the degree of site investigations and level of detail required in understanding the site conditions. The key risk items that need to be considered when undertaking a site characterization program are as follows:

- Complexity of the site conditions, e.g. multiple periods of glaciation and interglacial depositions, clay origin and strength variability, spatially diverse conditions, artesian pressures, etc. The Design Engineer should start with the assumption that the geologic conditions are complex and could present risks to the dam project.

- The consequence classification of the dam and the consequences to the Owner of not properly characterizing the different geologic units.
- Access can be more problematic than anticipated (high water levels, land owner issues, etc.)
- Unanticipated weather conditions (climate change) that were not planned for in the development of the program
- Equipment challenges such as breakdowns or improper tools to address findings as they develop.

These factors, as well as others defined by the *Design Engineer* and *Owner*, need to be considered throughout all of the design stages and each step of the site characterization program.

Risk assessments are routinely carried out at numerous *stages* of a project. For example for mining *dams* it is recommended in the Mining Association of Canada (MAC) Guidelines to carry out risk assessment at all *phases* of a mining project. The failure modes effects analysis (FMEA) is an industry accepted methodology for identifying risks and developing risk management plans. The FMEA is a semi-quantitative, practical tool for identifying potential risks and the risk workshop would typically include specialists from the key disciplines involved in the site characterization and *dam* design. An FMEA carried out for the feasibility study *stage* could identify potential risks associated with the foundation and the risk assessment should be updated throughout the life of the project to reflect any ongoing changes.

The risk assessment can be integrated within the framework of the site characterization assessment with, for example, identification of critical failure modes that include the foundation soils or rock. Such potential failure modes can then be examined with respect to the adequacy of the information being collected to appropriately assess the risk.

Upon completion of the site characterization program, there will still be uncertainty associated with the foundation conditions. The *Design Engineer* needs to identify where those uncertainties are and the plan to deal with them in the design, construction, and operation of the dam (i.e., additional investigations, instrumentation, contingency plans, etc.).

5.0 PROFFESIONAL PRACTICE - QUALITY ASSURANCE/QUALITY CONTROL

An *APEGBC Professional* must carry out quality assurance/quality control (QA/QC) during all *phases* of a *site characterization for a dam foundation* which includes the preparation of a Data Record Report and *DSCR*. The Assurance Statement in Appendix A includes confirmation that in preparing these documents, the intent of *APEGBC's* quality management bylaws have been met.

5.1 APEGBC QUALITY MANAGEMENT REQUIREMENTS

APEGBC Professionals are obligated to abide by the quality management requirements under the *Engineers and Geoscientists Act and Bylaws*. In order to meet the intent of the requirements, *APEGBC Professionals* shall establish and maintain documented quality management processes for their practices which shall include as a minimum;

- The application of the relevant *APEGBC* Professional Practice Guidelines
    - *Engineers and Geoscientists Act*, s. 4(1) and Bylaw 11(e)(4)(h)
    - When carrying out *site characterization for dam* foundations, an *APEGBC Professional* must have sufficient broad based knowledge of and competence in, these guidelines.
- Retention of complete project documentation – Bylaw 14(b)(1)
    - When carrying out *site characterization for dam foundations*, the *APEGBC Professional* must meet the intent of the *APEGBC Quality Management Guidelines – Retention of Project Documentation*
- Regular, documented checks using a written quality control process – Bylaw 14(b)(2)
    - When carrying out - *site characterization for dam foundations*, the *APEGBC Professional* must meet the intent of the *APEGBC Quality Management Guidelines – Documented Checks of Engineering and Geoscience Work*
- Documented field reviews of engineering/geoscience designs/recommendations during implementation or construction – Bylaw 14(b)(3)
    - When carrying out *dam site characterization for dam foundations*, the *APEGBC Professional* must meet the intent of the *APEGBC Quality Management Guidelines – Documented Field Reviews During Implementation or Construction*. For example, if the *Design Engineer* makes specific technical recommendations related to the *site characterization of* the *dam*'s foundation, which can include the carrying out of engineering/geoscience investigations, the *Design Engineer* must ensure that they carry out field reviews or that field reviews are carried out under their direct supervision. Field reviews are required to ensure that the documentation prepared by the *Design Engineer* supporting his/her technical recommendations are followed in a matter which is consistent with his/her recommendations
- Authentication of professional documents by the application of the *APEGBC Professional's* professional seal – *Engineers and Geoscientists Act*, s.20(9)

- The *Design Engineer* must apply their professional seal to the Data Record Report and the *DSCR* prepared in their professional capacity or under their direct supervision and the *Design Engineer* must apply his/her seal to the *Dam Site Characterization Assurance Statement*. The *APEGBC Professional* must meet the intent of the *APEGBC Quality Management Guidelines – Use of the APEGBC Seal*

- Professional engineering/geoscience activities can only be delegated to subordinates under direct supervision – *Engineers and Geoscientists Act* s. 1(1) and 20(9)
    - If certain aspects of the dam site characterization , such as field work, are delegated to non-professionals or other subordinate engineers/geoscientists, they must be carried out under direct supervision of the *APEGBC Professional*. Where such delegation occurs it must be carried out in a fashion which meets the intent of the APEGBC Quality Management Guidelines – Use of the APEGBC Seal. The *APEGBC Professional* assumes full responsibility for all work delegated.

5.2 DIRECT SUPERVISION

The *Engineers and Geoscientists Act* s. 1(1), states that direct supervision means taking responsibility for the control and conduct of the engineering or geoscience work of a subordinate. With regard to direct supervision of delegated responsibilities, the *APEGBC Professional* having overall responsibility should consider:

- The complex nature of the dam site characterization for the *dam* foundation being carried out and the nature of the values/elements at risk;
- Which aspects of the dam site characterization can be delegated and how much of those aspects, may be delegated;
- Training and experience of individuals to whom work is delegated; and
- Amount of instruction, supervision and review of the subordinate is required.

Field work is one of the most critical aspects of a dam site characterization . This is especially the case in the geotechnical investigations being carried out and laboratory work and analysis resulting from the geotechnical investigation. Therefore, careful consideration must be given to delegating field work. Due to the complexities and subtleties of dam site characterization , direct supervision of field work is difficult and care must be taken to see that delegated work meets the standard expected of the *APEGBC professional*. Such direct supervision could typically take the form of specific instructions on what to observe, check, confirm, test, record and report back to the *APEGBC professional*. The *APEGBC professional* should exercise judgment when relying on delegated field observations by conducting a sufficient level of review to be satisfied with the quality and accuracy of those field observations.

5.3 INTERNAL CHECKING AND REVIEW

As referenced in Section 4.1 of these guidelines and consistent with the requirements of *APEGBC* Quality Management Bylaw 14(b)(2), as a minimum, a *DSCR* must undergo a documented checking and review process before being finalized and delivered to the *client* and/or the *regulatory authority*. This documented checking and review process would normally involve an internal review by another *APEGBC Professional* within the same firm. Where an appropriate internal reviewer is not available, an external reviewer may be engaged. Where an internal/external review has been carried out this must be

clearly documented in the *DSCR*. *The level of review* is to be based on the professional judgment of the *APEGBC Professional*. Considerations should include the complexity of the site and the underlying geological conditions, the nature of the *dam*, loading conditions, elements at risk, availability, quality and reliability of background information and geotechnical data, the degree of judgment, on which the *dam site characterization* is based, and the *APEGBC professional's* training and experience.

5.4 EXTERNAL REVIEW

An external review is an additional level of review beyond the minimum requirements of Bylaw 14(b)(2) that may be undertaken for a variety of reasons by an independent *APEGBC Professional* not previously involved in the project. At the discretion of the *APEGBC Professional*, in consultation with the reviewer(s) involved in the regular checking/review process outlined above, such an additional level of review may be deemed appropriate. Alternatively, a local government other approving authority or the *owner* may request an independent external review to support project approval. Such an external review may be undertaken by another *APEGBC Professional* employed by another firm independent from the firm which carried out the initial *DSCR* for the *dam*'s foundation.

The independent peer review process should be more formal than the checking/review process carried out under Bylaw 14(b)(2). An independent peer reviewer should submit a signed, sealed and dated letter or report, to be either included with the *DSCR* or put on file, which includes the following:

- Limitations and qualifications with regard to the independent peer review; and
- Results of the independent peer review.

When an independent peer review is carried out, the *APEGBC Professional* who sealed the *DSCR* remains the Designer of Record (*Design Engineer*) for the *dam site characterization.*

The independent peer review discussed above is not the same as an independent review or advisory service provided by an *APEGBC Professional* who is retained by the *regulatory authority*, or sometimes a *client*.

6.0 PROFESSIONAL REGISTRATION; EDUCATION, TRAINING AND EXPERIENCE

6.1 PROFESSIONAL REGISTRATION

The *Design Engineer* must be registered and in good standing with *APEGBC* as a *professional engineer* under the *Engineers and Geoscientists Act*.

A *professional engineer* acting as a *Design Engineer* for *dams* in British Columbia is typically registered with *APEGBC* within the discipline of civil, geological or mining engineering. It is the responsibility of the *professional engineer* to determine whether he/she is qualified by training or experience to accept responsibility as the *Design Engineer* for a *dam* in BC (*APEGBC* Code of Ethics Principle 2), which meet the intent of the requirements that follow.

The *Design Engineer* can only take professional responsibility for design and field review activities related to the design and construction of the *dam* which are consistent with his/her training and experience. This would include responsibility for development and oversite of the site characterization of the *dam*'s foundation. As such, a *Design Engineer* may require supplementary supporting professional engineering and/or professional geoscience services for a particular professional activity, component or sub-component of a professional activity related to the design and construction of the *dam* which can include aspects related to the development and *oversite of the* dam site characterization. *The APEGBC Professional* acting in such a supporting capacity is engaged as a Supporting Registered Professional (*SRP*). It is the responsibility of the *Professional Engineer acting as the Design Engineer* to determine which professional activities he/she can take personal responsibility for as well as those professional activities that will require the services of a *SRP* having the relevant training and experience.

A *professional geoscientist* as described above is typically registered with *APEGBC* in the discipline of geology, environmental geoscience, or geophysics.

It is the responsibility of the *Professional Engineer* or *Professional Geoscientist* to determine whether he/she is qualified by training or experience to undertake and accept responsibility for the carrying out of site characterization for *dams* in British Columbia (*APEGBC* Code of Ethics Principle 2).

With regards to the distinction between professional engineering and professional geoscience, following is an excerpt under Principle 2 of the Code of Ethics guidelines (*APEGBC* 1994; amended in 1997):

> "The professions are distinct and registration in one does not give a *member* the right to practice in the other; however, the Association recognizes that there is some overlap of the practices of engineering and geoscience.
>
> Nothing in this principle authorizes a *professional engineer* to carry on an activity within the area of professional geoscience which goes beyond the practice of professional engineering and nothing in this principle authorizes a *professional geoscientist* to carry on an activity within the area of professional engineering which goes beyond the practice of professional geoscience."

On this basis, the *APEGBC Professional* who leads a site characterization for a dam requires registration with *APEGBC* as a *Professional Engineer*. The *APEGBC Professional* who investigates or interprets complex geological conditions, geomorphic processes and geochronology in support of *dam site characterization* is typically registered with *APEGBC* as a *Professional Geoscientist* in the discipline of geology or environmental geoscience, or as a *Professional Engineer* in the discipline of geological or geotechnical engineering.

6.2 EDUCATION, TRAINING AND EXPERIENCE

The Professional Engineer acting as the *Design Engineer* having overall responsibility for the design of the *dam* which includes responsibility for developing and overseeing the site characterization of the *dam*'s foundation, as described in these guidelines, requires minimum levels of education, training and experience in many overlapping areas of engineering and geoscience. The *Design Engineer* must adhere to *APEGBC* Code of Ethics Principle 2 (to undertake and accept responsibility for professional assignments only when qualified by training or experience), and, therefore, must evaluate his/her qualifications and possess appropriate education, training and experience consistent with the services provided.

When applying the guidance provided in this section the level of education, training and experience required of a Professional engineer acting as a *Design Engineer* should be commensurate with the complexity of the *dam*, the *dam*'s site, and the *dam*'s *consequence classification*.

Obtaining the appropriate level of experience identified below in order to act as the *Design Engineer* can only be gained by working under the direct supervision of a suitably knowledgeable and experienced *professional engineer.*

Prior to acting in the capacity as the *Design Engineer*, the recommended minimum qualifications include the following:

- Be currently registered as a *Professional Engineer* with *APEGBC*.
- Have previous extensive involvement with the design of at least 2 *dams* of similar nature and complexity (e.g. if a concrete dam, then of that nature, at tailings dam etc.).
- Have at least 10 years of experience related to the design of *dams* including responsibility for developing and overseeing the site characterization assessment of *dam* foundations.
- In the case of *water dams*, current knowledge of industry best practices in the assessment design and construction of *dam* foundations for water reservoir *dams*, as well the *British Columbia Dam Safety Regulation*, *CDA Dam Safety Guidelines* and other international *dam* safety guidelines.
- In the case of *tailings dams,* current knowledge of industry best practices in the assessment design and construction of *dam* foundations for *tailings dams* as well as the regulations applicable to the *Mines Act* and the *Health, Safety and Reclamation Code for Mines in British Columbia*, the Guidelines provided by the Mining Association of Canada (list them) and, if relevant, portions of the *CDA Dam Safety Guidelines* that can be applicable to tailings dams..

- When a multi-disciplinary team approach is utilized, the *Design Engineer* would also be required to have extensive experience in coordinating the work of a variety of *SRP*'s. In such instances the *Design Engineer* would be required to identify;
    - All the types of professional activities for which SRP's need to be engaged; and
    - The nature of the engineering/geoscience and other disciplines the *SRP*'s would come from as well as the background, experience and expertise an individual *SRP* should have in order to carry out a particular professional activity (e.g., ensure each *SRP* has the appropriate skills and competencies required to complete the activity they are engaged to carry out).
- Be knowledgeable in the site characterization for *dams* and their design, construction, and operation.
- In the case of water *dams*, be knowledgeable about the *British Columbia Dam Safety Regulation* and applicable legislation as well as having specific industry experience with these types of *dams*.
- In the case of *dams* in the mining industry, be knowledgeable about the regulations applicable to the *Mines Act* and the *Health, Safety and Reclamation Code for Mines in British Columbia as well as having experience in the mining industry and with tailings specific knowledge where relevant.*
- Confirm that he/she has the appropriate training and experience to oversee the *dam site characterization assessment* for the particular type of *dam*, complexity of the site and associated overall *dam* system of containment of the reservoir. If not, involve the required specialists to provide assistance in the relevant areas.

As previously noted, as the complexity of the *dam* and site conditions increases, and depending on the *dam*'s *consequence classification*, the minimum qualifications should be supplemented by training and experience in additional subject areas, as required.

SRP's acting as specialists in a particular field of practice offering specialized services (e.g., seismic determination and response) often require specific education, training and experience in addition to that, discussed above.

The academic training for the above skill sets can be acquired through formal university or college courses, or through continuing professional development. There may be some overlap in courses and specific courses may not correlate to specific skill sets.

An *APEGBC Professional* acting in the capacity of a *Design Engineer* or an *SRP* must also remain current, through continuing professional development; with evolving topics related to their field of practice as it relates to the design of *dams* (refer to *APEGBC* Code of Ethics Principle 6). Continuing professional development can include taking formal courses; attending conferences, workshops, seminars and technical talks; reading new texts and periodicals; searching the web; and participating in field trips.

APPENDIX A-1: SITE CHARACTERIZATION ASSURANCE STATEMENT

To: The *Owner* Date: _____

_____
Name

_____

_____
Address

For the *dam*:

UTM (Location): _____

Located at (Description): _____

Name of *dam* or description: _____

Dam function: _____

Owned by: _____

(the "*Dam*")

Current Project Stage is:

Check one

- □ Feasibility
- □ Detail Design
- □ Construction/Operations

The undersigned hereby gives assurance that he/she is a qualified *APEGBC Professional* and is a *Professional Engineer* and is the *Design Engineer* for the dam project identified above.

I have signed, sealed and dated the attached *dam Site Characterization Report* for the Dam in accordance with the *APEGBC Guidelines*. The report must be read in conjunction with this Assurance Statement.

In preparing the report, I have completed the following activities:

Check the applicable items:

Completed by the Design Engineer	Activity
	Collected and reviewed available and relevant background information, documentation and data
	Visited the site and reviewed the conditions in the field that may be relevant to the site characterization
	Developed and executed a site characterization program that provides information to support the design of the *dam* , subject to the qualifications noted
	Reviewed previous site characterization studies and data and updated the *dam site characterization assessment report t* o include all data and, where appropriate, revised interpretations of data
	Assessed potential areas of risk associated with the site characterization and, as far as practical addressed the risks
	Evaluated the level of complexity of the site and documented how it was assessed and supported by the site characterization program
	Reviewed and accepted all assurance statements submitted by the SRPs.
	Prepared a Data Record Report
	Prepared the dam site characterization assessment report which interprets the site conditions

In preparing the report, I have completed the following activities or reviewed and accepted such activities that were completed by the SRP:

Check the applicable items:

Completed by the Design Engineer	Completed by the SRP, and reviewed and accepted by the Design Engineer	Activity
		Assessed the surficial and bedrock geological models to adequately support the understanding of the spatial variability of the geotechnical properties of the foundation materials
		Carried out sufficient in situ and laboratory testing to quantify the geotechnical properties of the foundation materials
		Assessed the strength properties of the foundation materials with consideration of stress state and response to loadings
		Assessed the hydrogeological properties of the foundation materials with consideration of potential hydraulic gradients, artesian pressures, and seepage flow paths
		Assessed the seismotectonic conditions to provide a basis for the seismic hazard analysis of the *dam*

I hereby give my assurance that, based on the attached *dam site characterization assessment report,* at this point in time:

Check one

□ The D*am Site Characterization Report* is reasonably comprehensive and supports the design of the dam.

□ The *dam Site Characterization Report* is not sufficiently comprehensive to support the design of the dam, in that the *dam Site Characterization Report identified* areas of potential concern that require additional investigation as set out in section(s) _____ of the attached D*am Site Characterization Report*

_____ _____

Name Date

_____

Signature

_____

Address

_____ (Affix Professional Seal here)

_____

Telephone

If the *APEGBC Professional* is a member of a firm, complete the following:

I am a member of the firm _____

and I sign this letter on behalf of the firm. (Print name of firm)

APPENDIX A-2: SUPPORTING REGISTERED PROFESSIONAL ASSURANCE STATEMENT OF PROFESSIONAL SERVICES

Schedule S

SUPPORTING REGISTERED PROFESSIONAL ASSURANCE OF PROFESSIONAL SERVICES

Note: 1. This letter is endorsed by: Association of Professional Engineers and Geoscientists of B.C.

To: The Design Engineer Date: _____

_____
Name (Print)

_____
Address (Print)

_____

Re:

_____
Name of Project (Print)

_____
Address of Project (Print)

This is to advise that the undersigned is a *Supporting Registered Professional* retained by _____to carry out supporting professional services for the captioned project.

I undertook activities in the following:

Check applicable sections

- □ Bedrock/Structural geology
- □ Surficial geology
- □ Geotechnical
- □ Hydrogeology
- □ Seismotectonic
- □ Other

The undersigned hereby gives assurance that the_____

_____

_____ [Insert here the specific professional activity carried out] and the supporting documents prepared by this *Supporting Registered Professional* for the project have been carried out in a manner which meets the intent of these guidelines and good professional practice.

These professional services are addressed in the documents prepared by me, or under my direct supervision, which bear my professional seal.

(With respect to field reviews, initial or cross out the following statements as applicable)

___ ***Field review(s)* are not applicable**

___ ***Field review(s)* are applicable:**

___ I have performed *field review(s)* for the services identified above

___ *Field review(s)* have been performed by _____.

I confirm that I have liaised as required with the appropriate *APEGBC Professionals* for the purposes of my services.

Schedule S (continued)

Project Address

I hereby give my assurance that I am a*n APEGBC Professional*.

Name (Print)

Signed

Date

Address (Print)

Phone

(PROFESSIONAL SEAL)

(If the *Supporting Registered Professional* is a member of a firm, complete the following.)

I am a member of the firm _____

(Print name of firm)

and I sign this letter on behalf of the firm.

APPENDIX B: BIBLIOGRAPHY

General references

A Guide to the Management of Tailings Facilities, MAC, 2011

Freeze, R.A., James, B., Massman, J., Sperling, T. and Smith, L. (1992) Hydrological decision analysis: 4. The concept of data with and its use in the development of site investigation strategies, Ground Water, Vol. 30, No. 4, pp 574-588.

Bedrock Geology references

Geological Survey of Canada publications:
http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/geoscan_e.web

British Columbia Geological Survey publications:
http://webmap.em.gov.bc.ca/mapplace/minpot/searchcat.htm

Geologic Maps of BC:
http://www.mapplace.ca

Geological Survey of Canada Maps:
http://geogratis.gc.ca/geogratis/AdvancedSearch?lang=en&pt1=f&pt2=t&pt3=f&pt4=f&pt5=f&pt6=f&q=bedrock%20geology&minx=-180.0&miny=-90.0&maxx=180.0&maxy=90.0

Surficial geology References

Aerial Photograph flight lines:
http://geobc.gov.bc.ca/base-mapping/imagery/airphoto-viewer.html

GEOSCAN: Natural Resources Canada (Earth Sciences Sector) publications database – includes maps as well:
http://geoscan.ess.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/geoscan_e.web

CanGeoRef: bibliographic database covering Canadian geoscience literature:
http://www.americangeosciences.org/georef/cangeoref-database

BC Geological Survey Surficial Geology Map Index of British Columbia – Terrain and soils maps organized by NTS number but only up until 1991 or so
http://www.empr.gov.bc.ca/MINING/GEOSCIENCE/PUBLICATIONSCATALOGUE/OPENFILES/1992/Pages/1992-13.aspx

Add more on maps in BC

Will add some other high level stratigraphic and glacial history references. Plus practical links in the body of the text.

Clague, J.J. and Ward, B.C. 2011. Pleistocene Glaciation of British Columbia. In J. Ehlers, P.L. Gibbard and P.D. Hughes, editors: Developments in Quaternary Science, Vol. 15, Amster*dam*, The Netherlands, pp. 563-573. And references inside

Fulton, R. J. 1991. A conceptual model for the growth and decay of the Cordilleran Ice Sheet. Géographie physique et Quaternaire, vol. 45, p. 281-286.

Ryder, J.M., Fulton, R.J. and ClagueJ.J. 1991. The Cordilleran Ice Sheet and the Glacial Geomorpholgy of Southern and Central British Columbia. Géographie physique et Quaternaire, vol. 45, 1991, p. 365-377.

Clague, J.J. and James, T.S, 2002. History and isostatic effects of the last ice sheet in southern British Columbia. Quaternary Science Reviews v. 21 p. 71–87

McCuaig, S. J. and Roberts, M. C. 2006. Nass River on the move: radar facies analysis of glaciofluvial sedimentation and its response to sea-level change in northwestern British Columbia. Canadian Journal of Earth Sciences, v. 43, p. 1733-1746

Clague, J.J. 1984. Deglaciation of the Prince Rupert - Kitimat area, British Columbia. Canadian Journal of Earth Sciences, v. 22, p. 256-265

Geertsema, M., and Torrance, J.K. 2005. Quick clay from the Mink Creek landslide near Terrace, British Columbia: Geotechnical properties, mineralogy, and geochemistry. Canadian Geotechnical Journal, v. 42(3), p. 907-918.

Smith, S. 2011. Trends in permafrost conditions and ecology in northern Canada. Canadian Biodiversity: Ecosystem Status and Trends 2010, Technical Thematic Report No. 9. Canadian Councils of Resource Ministers. Ottawa, ON. iii + 22 p.

http://www.biodivcanada.ca/default.asp?lang=En&n=137E1147-1

To get an idea of the potential variability in glacial sediments I will add reference to several papers.

Ward, B.C. and Thomson, B. 2004. Late Pleistocene stratigraphy and chronology of lower Chehalis River Valley, southwestern British Columbia: evidence for a restricted Coquitlam Stade. Canadian Journal of Earth Science, v. 41, 881-895.

Craig Nichol, Patrick Monahan, Robert Fulton, Jianhua Ping, Xioahua Wei, and Skye Thomson. 2015. Quaternary stratigraphy and evidence for multiple glacial episodes in the north Okanagan Valley, British Columbia. Canadian Journal of Earth Sciences. V. 52, p. 338-356,

Geotechnical References

ICOLD Bulletin 129, Dam Foundations

US Department of Interior, Bureau of Reclamation, Embankment Dams: Chapter 12 - Foundation and Earth Materials Investigation

FERC Chapter V, Geotechnical Investigations and Studies

US Army Corps of Engineers, EM 1110-1-1804, Geotechnical Investigations

US Army Corps of Engineers, EM 1110-2-1906, Laboratory Soils Testing

Design Standards No. 13, Embankment Dams. Chapter 12: Foundations and Earth Materials Investigation Phase 4.

Design of Small Dams. US Bureau of Reclamation

Rock Quality Designation (Deere, 1964, 1989)

Rock Mass Rating (Bieniawski, 1976 and 1989)

Ground Support Index (Hoek et. al., 1995)

Q system (Barton, N. R., Lien, R. and Lunde, J., (1974)

ADD IN REFERENCES FOR INSTRUMENTATION

ADD IN REFERENCES FOR DOWNHOLE GEOPHYSICAL INVESTIGATIONS

Hydrogeological References

SKM and NCGRT (2012). Australian Groundwater Modelling Guidelines. Waterlines Report Series No. 82, June 2012

MDBC (2000). GROUNDWATER FLOW MODELLING GUIDELINE. Project No. 125 Final Guideline – Issue I 16 January 2001

BCMOE WELLS Registration Database: http://www.env.gov.bc.ca/wsd/data_searches/wells/

Anderson, M.P., & Woessner, W.W. (1992). Applied Groundwater Modelling: Simulation of Flow and Advective Transport. San Diego, CA: Academic Press, Inc.

“Groundwater Model Audit Guidelines” - Ministry for the Environment, NZ (NZMoE, 2001)

“Guidelines for Evaluating Groundwater Flow Models” - US Geological Survey (USGS, 2004)

American Society for Testing and Materials (ASTM) guidelines on groundwater modelling:

“Standard Guide for Selecting a Groundwater Modelling Code” ASTM D6170 - 97 (ASTM, 2010a)

“Standard Guide for Application of a Groundwater Flow Model to a Site-specific Problem” ASTM D5447 - 04 (ASTM, 2010b)

“Standard Guide for Developing Conceptual Site Models for Contaminated Sites” ASTM E1689 - 95 (ASTM, 2008a)

“Standard Guide for Defining Boundary Conditions in Groundwater Flow Modelling” ASTM D5609 - 94 (ASTM, 2008b)

"Standard Guide for Defining Initial Conditions in Groundwater Flow Modelling" ASTM D5610 - 94 (ASTM, 2008dc

"Standard Guide for Conducting a Sensitivity Analysis for a Groundwater Flow Model Application" ASTM D5611 - 94 (ASTM, 2008d)

"Standard Guide for Comparing Groundwater Flow Model Simulations to Site-specific Information" ASTM D5490 - 93 (ASTM, 2008e)

"Standard Guide for Calibrating a Groundwater Flow Model Application" ASTM D5981 - 96 (ASTM, 2008f)

"Standard Guide for Documenting a Groundwater Flow Model Application" ASTM D5718 - 95 (ASTM, 2006a)

"Standard Guide for Subsurface Flow and Transport Modelling" ASTM D5880 - 95 (ASTM, 2006b)

Seismotectonic References

Natural Resources Canada Seismic Hazard Maps and Seismic Hazard Calculator

Seismic Hazard Considerations for Dam Safety (CDA, 2007)

Evaluation of Earthquake Ground Motions, Idriss et al, 2007) Division of Dam Safety and Inspections Office of Hydropower Licencing, Federal Energy Regulatory Commission

Implementation of the SSHAC Guidelines for Level 3 and Level 4 PSHAs – Experience Gained from Actual Applications

Dam Safety Probabilistic Seismic Hazard Analysis (PSHA) Model, BC Hydro, 2012

Maximum Design Loads for Building and other Structures, ASCE 7-05, Chapters 20, 21

ASCE Chapter 21 - Considerations for shear wave velocity determination

Neotectonics and Dams, Guidelines and Case Histories. Bulletin 112, International Commission of Large Dams, 1998

Guidelines for Use of the Consequence-Hazard Matrix and Selection of Ground Motion Parameters, William A. Fraser, Jeffrey k. Howard, The Resources Agency Department of Water Resources Division of Safety of Dam, October 4, 2002

APPENDIX C: AUTHORS AND REVIEWERS

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Kyle Terry, P.Geo., Ministry of Environment

Tony Fogarassy, M.Sc., LL.M., First Nations Energy and Mining Council

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Canadian Dam Association – via Andy Small

EDITORIAL AND LEGAL REVIEW

Robert W. Hunter, LLB, Bull Houser

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March 30, 2016

Via Email: climateleadershipplan@gov.bc.ca

Climate Leadership Consultation
Ministry of Environment
Climate Action Secretariat
P.O. Box 9486, Stn Prov Govt
Victoria, B.C. V8W 9W6

Dear Sir/Madam:

Re: Consultation Guide: Building B.C's Climate Leadership Plan– Comments from the President of the Association of Professional Engineers and Geoscientists of British Columbia

The Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) is pleased to provide input into the Climate Leadership Plan (CLP) consultation process.

APEGBC has the mandated responsibility under the *Engineers and Geoscientists Act* to uphold and protect the public interest with respect to the practice of professional engineering and geoscience, and therefore has undertaken a range of initiatives to assist its members and licensees in adapting their practices in consideration of a changing climate. APEGBC expects that the forthcoming Climate Leadership Plan will have impacts on its membership, and requests the opportunity to comment on the draft plan prior to its adoption. We look forward to engaging with the Province as it continues to advance mitigation and adaptation efforts in BC as the Climate Leadership Plan is implemented.

As requested in the *Consultation Guide: Building B.C's Climate Leadership Plan*, APEGBC's feedback at this point in the consultation process is organized under the headings What We Value, The Way We Live, The Way We Travel and the Way We Work as follows:

What We Value

Carbon Pricing and Targets

APEGBC recognizes that there is a need to put a price on the emission of carbon pollution. That price, the way it is applied, must be established to drive the change which achieves climate benefits and adheres to the “polluter pays” principle.

APEGBC is supportive of the GHG reduction targets established by the Province. APEGBC suggests that the Climate Leadership Plan outline what regulations will be required to support the GHG reduction targets. APEGBC consultation with members reinforces the need for regulations to ensure implementation of the targets and recommendations. However, it will be important that APEGBC will have an opportunity to contribute to the development of any regulations that are expected to significantly affect its members. APEGBC recognizes that there may be an increase in the demand for professional practice guidelines related to reducing GHG emissions in the building, industrial and infrastructure sectors and APEGBC commits to working with the Provincial Ministries to enable the development of professional practice guidelines related to mitigation and energy efficiency.

Adaptation

We would like to note that the Consultation Guide appears to make insufficient commitments regarding helping communities with adaptation to the changing climate. APEGBC supports updates to hazard maps for all climate-related hazards, and would suggest that these hazard maps show the range in projections for the different emissions scenarios (e.g. RCP 8.5). In addition to providing updated hazard maps, APEGBC recommends that the Province develops guidance on the assessment of risks due to the various natural hazards impacted by climate change e.g., floods, and landslides. This will facilitate APEGBC professionals in conducting assessments on a range of natural hazards impacting developments in BC and empower the owners of public infrastructure to evaluate the risks and determine their risk tolerance. APEGBC suggests that the province should provide an ongoing commitment to further research into regional level projections that are based on the best available science. It is noted that reports such as the Indicators of Climate Change for British Columbia 2015 update are valuable resources for APEGBC's members and, therefore, APEGBC requests that they be kept updated by the Climate Action Secretariat or other government body.

APEGBC further suggests that the Climate Leadership Plan address the need to invest in resilient infrastructure, and discuss protection of communities in flood hazard areas. It is requested that APEGBC representatives be involved in decision making and the development related to adaptation information, guidelines and regulations that may affect its members and their professional practice.

The Way We Live

Buildings and Development

APEGBC has been actively involved in the Climate Leadership Plan engagement sessions on the Built Environment, held by the Building and Safety Standards Branch. APEGBC is supportive of "stretch codes" and revisions to the *BC Building Code* that would allow local governments to facilitate the development of buildings that are both climate resilient and low in emissions.

APEGBC supports the development of standards that transition the market to high-efficiency heating equipment, building components and appliances, but stresses the need for legislated national standards.

APEGBC supports the Province in promoting sustainable community planning and development. This would include addressing such matters as increasing urban density, reducing the need for single occupancy vehicles, and protecting industrial/commercial activities while ensuring that they are adequately served by public transportation.

The Way We Travel

APEGBC supports the establishment of more clean, coordinated transportation such as public transit, shared travel and expanded regulations and incentives to encourage use of cleaner vehicles and fuels. APEGBC recommends that the climate leadership plan details how support to low-carbon vehicles and associated technology will continue to be provided. As the population of the Province is projected to increase, APEGBC professionals will play a key role in the design and maintenance of the transportation infrastructure in BC.

In ensuring that zero-emission vehicle targets are achieved, infrastructure must be developed to support the charging of these vehicles. Evolutions in the "stretch code" and in the *BC Building Code* will be necessary to address how charging stations for zero-emission vehicles will be incorporated into the built infrastructure.

Other transportation demand management considerations worth noting include:

- Tolling of all bridges to reduce vehicle emissions;
- Restricting commercial trucks to certain times of the day in certain areas;
- Providing infrastructure that supports truck routes electrification (E-Highways);
- Providing commitment to broader transit systems, particularly expanding rapid transit to suburban areas
- Enforcing a policy on idling vehicles; and
- More funding for public transportation, pedestrian/bicycle friendly pathways and disincentives for the use of single occupancy vehicles (e.g., new light rail rapid transit lines).

The Way We Work

Natural Gas

APEGBC is supportive of the goal to reduce fugitive and vented methane emissions but stresses that these efforts be aligned with the commitments agreed upon by the US and Canada to reduce methane emissions by 40-45 percent below 2012 levels by 2025 from the oil and gas sector.

Electricity

With regards to the proposed amendments to the *Clean Energy Act*, APEGBC suggests that the Climate Leadership Plan must further define the exception to the target of when fossil fuel capacity is required for back-up or reliability and to further define how the amendments to the *Clean Energy Act* relate to work done by emissions-intensive, trade-exposed sectors (e.g., pulp and paper, mining, metal processing).

APEGBC is supportive of the establishment of a strategy to replace diesel generation in remote communities but would highlight the time-sensitivity of this issue if the phase out is set to be completed by 2025. APEGBC recognizes the constructive role its members and licensees can play in supporting communities transitioning from diesel generation to reliable, low-GHG electricity service.

Teleconferencing

As a mitigation effort related to the way we work, APEGBC is supportive of increasing the availability, capacity and quality of wireless communications/data transmission in remote communities within BC as this will result in reducing the need for work related travel. APEGBC professionals can play a key role in achieving this.

APEGBC's Climate Leadership Initiatives

APEGBC is developing several Professional Practice Guidelines to address climate change adaptation and mitigation as it relates to professional engineering and geoscience in BC.

In-line with the Climate Leadership Team's Recommendation 24 to update hazard maps by 2020, APEGBC is currently working with Emergency Management BC to develop Professional Practice Guidelines to provide guidance on developing flood hazard maps.

APEGBC is also working with the Ministry of Transportation and Infrastructure to develop Professional Practice Guidelines to provide guidance to engineers to incorporate climate resilience in the design of highway infrastructure. These guidelines will be accompanied by APEGBC's Climate Change Information Portal, a web resource with links to adaptation tools and resources for professional engineers and geoscientists.

APEGBC's Division of Energy Efficiency and Renewable Energy (DEERE) is engaged in developing a Climate Change Action Plan for its members with a focus on energy production and use. The plan will provide a framework guiding the work of professional engineers involved in that field and help them in their contribution to reduce GHG emissions to a level consistent with COP-21 and future BC legislated targets.

In collaboration with the Homeowner Protection Office, the City of Vancouver and BC Hydro, APEGBC is developing Professional Practice Guidelines to provide guidance on energy modelling for buildings.

In BC in response to updates made to the Flood Hazard Area Land Use Management Guidelines, APEGBC is currently revising and updating the *Professional Practice Guidelines – Legislated Flood Hazard Assessments in a Changing Climate.*

APEGBC is working with other Professional Associations' Adaptation Working Group in sharing the tools and resources and APEGBC's experience in developing Professional Practice Guidelines that address climate change adaptation.

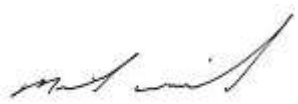
Clear communication of the risks posed by climate change and the opportunities it brings to the public of BC is of vital importance to successful adaptation and mitigation efforts, APEGBC strongly encourages the Province to clearly communicate:

1. the policies, programs, legislations, regulations and codes with sufficient reaction time to ensure that the APEGBC membership is aware of the direction of the senior government; and
2. the funding pathways to empower professionals to explore climate change adaptation and mitigation options within their organizations and with their clients.

Please note that these comments from APEGBC's President have not been reviewed by APEGBC Council due to the time constraints presented. APEGBC Council intends to review the Climate Leadership Consultation Guide and this response letter at their future meeting, and may provide additional comments at that point.

Should you have any comments or queries, please do not hesitate to contact Harshan Radhakrishnan, P.Eng., M.A.Sc., APEGBC Practice Advisor, Professional Practice, Standards and Development directly at 604-412-6054 or hrad@apeg.bc.ca.

Yours truly,



Dr. Mike Wrinch, P.Eng.
President

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March 15, 2016

Mr. Dirk Nyland, P.Eng.
BC Ministry of Transportation and Infrastructure
PO Box 9850, Stn Prov Govt
Victoria, BC V8W 9T5

Dear Mr. Nyland:

Thank you for providing APEGBC with the opportunity to provide a summary response to your email of March 4, 2016 requesting feedback on the Climate Leadership Recommendations. **Please note that these are our preliminary comments in response to your request and that we did not have the benefit of discussing or confirming these comments with APEGBC Council due to the time constraints presented.**

With respect to the specific recommendations (19(d) and 24) from the Climate Leadership Team referenced in your email, following is the association's feedback provided in a form that responds to each of the 4 questions which you requested that our response focus on:

Recommendation 19(d)

"Enhancing incentives and infrastructure necessary to support both increased commercial transportation efficiency (size of vehicles) and natural gas/propane conversions in the commercial transport sector (including marine)"

1. *How do these specific transportation related recommendations affect members of your association and their business? Do you support them?*

   APEGC professionals would be engaged to design and implement infrastructure to support fueling/charging of long combination vehicles, medium-duty CNG trucks, heavy-duty LNG trucks and a new generation of high fuel efficiency trucks. This would involve hydrogen fueling stations, electric vehicle charging stations and CNG/LNG fueling stations. In addition, APEGBC professionals would be engaged to design natural gas/propane conversions in the commercial transport sector.

   APEGBC is supportive of enhancing incentives and infrastructure necessary to support both increased commercial transportation efficiency and natural gas/propane conversions in the commercial sector. APEGBC is actively involved in the consultation on the Climate Leadership Plan through the Building and Safety Standards Branch's Built Environment stakeholder engagement sessions and commits to discuss these issues identified by the ministry during these engagement sessions.

2. *If not, what would you change about the recommendations so you could support them?*

   The association supports them.

3. *Do you have comments on any of the other Climate Leadership Recommendations?*

   The association's summary of the feedback provided on other Climate Leadership Recommendations is attached to this letter. As requested in the Climate Leadership Plan Consultation Guide, APEGBC's feedback is organized under the headings What We Value, The Way We Live, The Way We Travel and the Way We Work.

4. *Do you or your association have any other ideas about reducing GHGs?*

   The association's summary of other ideas about reducing GHGs is also included in the attachment to this letter.

Recommendation 24

"Undertake the following actions regarding climate change adaptation and mitigation:

a) Update by 2020 hazard maps for all climate related hazards;
b) Invest in sufficient monitoring systems, especially in the areas with monitoring information gaps, to ensure the change can be managed effectively;
c) Develop a policy framework to guide the provincial government's management of the risks associated with a changing climate; and
d) Increase communications to public."

a) Update by 2020 hazard maps for all climate related hazards;

1. *How do these specific transportation related recommendations affect members of your association and their business? Do you support them?*

   APEGBC has received funding from the provincial government and will be pursuing the development of Professional Practice Guidelines on developing flood hazard maps that reflect hazards for a changing climate. These flood hazard maps may facilitate the development of transportation infrastructure that accommodates climate related hazards. As landslides are also impacted by climate change, the APEGBC *Professional Practice Guidelines – Legislated Flood Hazard Assessments in a Changing Climate* may also need to be updated to take climate change into account. With the development of such Professional Practice Guidelines, the due diligence and standard of care to be applied when carrying out this type of professional activity will be standardized.

   APEGBC is supportive of updating hazard maps for all climate related hazards by 2020.

Note: For Recommendation 24 a) The association's response to questions 2, 3 and 4 in your email of March 4, 2016 are the same as those provided under Items 2, 3 and 4 for Recommendation 19(d) provided above.

b) Invest in sufficient monitoring systems, especially in the areas with monitoring information gaps, to ensure the change can be managed effectively;

1. *How do these specific transportation related recommendations affect members of your association and their business? Do you support them?*

   Investment in sufficient monitoring systems will provide APEGBC professionals with more accurate and complete regional, local and localized climate data for use in design of built infrastructure. This will provide APEGBC professionals with climate data for use in designing transportation infrastructure that is adaptable to future climate conditions to ensure public safety.

   APEGBC is supportive of investments in sufficient monitoring systems.

Note: For Recommendation 24 b) The association's response to questions 2, 3 and 4 in your email of March 4, 2016 are the same as those provided under Items 2, 3 and 4 for Recommendation 19(d) provided above.

c) Develop a policy framework to guide the provincial government's management of the risks associated with a changing climate;

1. *How do these specific transportation related recommendations affect members of your association and their business? Do you support them?*

   APEGBC professionals could provide technical input into the development of a policy framework to guide the provincial government's management of the risks associated with a changing climate. APEGBC suggests that this policy framework could establish acceptable levels of risk and consequence that APEGBC professionals could design for.

   APEGBC is supportive of the development of a policy framework to guide the provincial government's management of the risks associated with a changing climate.

Note: For Recommendation 24 c) The association's response to questions 2, 3 and 4 in your email of March 4, 2016 are the same as those provided under Items 2, 3 and 4 for Recommendation 19(d) provided above.

d) Increase communications to public.

1. *How do these specific transportation related recommendations affect members of your association and their business? Do you support them?*

   APEGBC professionals may look to guidance and support from the provincial government on adapting to and mitigating climate change. APEGBC requests that the province establishes provincial level adaptation and mitigation objectives and provides support and guidance on implementation of these objectives at the municipal scale.

   APEGBC is supportive of increased communications to the public regarding climate change adaptation and mitigation.

Note: For Recommendation 24 d) The association's response to questions 2, 3 and 4 in your email of March 4, 2016 are the same as those provided under Items 2, 3 and 4 for Recommendation 19(d) provided above.

Should you have any comments or queries, please do not hesitate to contact Harshan Radhakrishnan, P.Eng., M.A.Sc., APEGBC Practice Advisor, Professional Practice, Standards and Development directly at 604-412-6054 or hrad@apeg.bc.ca.

Sincerely,

Dr. Mike Wrinch, P.Eng., FEC | President
Association of Professional Engineers & Geoscientists of BC

Attachment

Consultation Guide

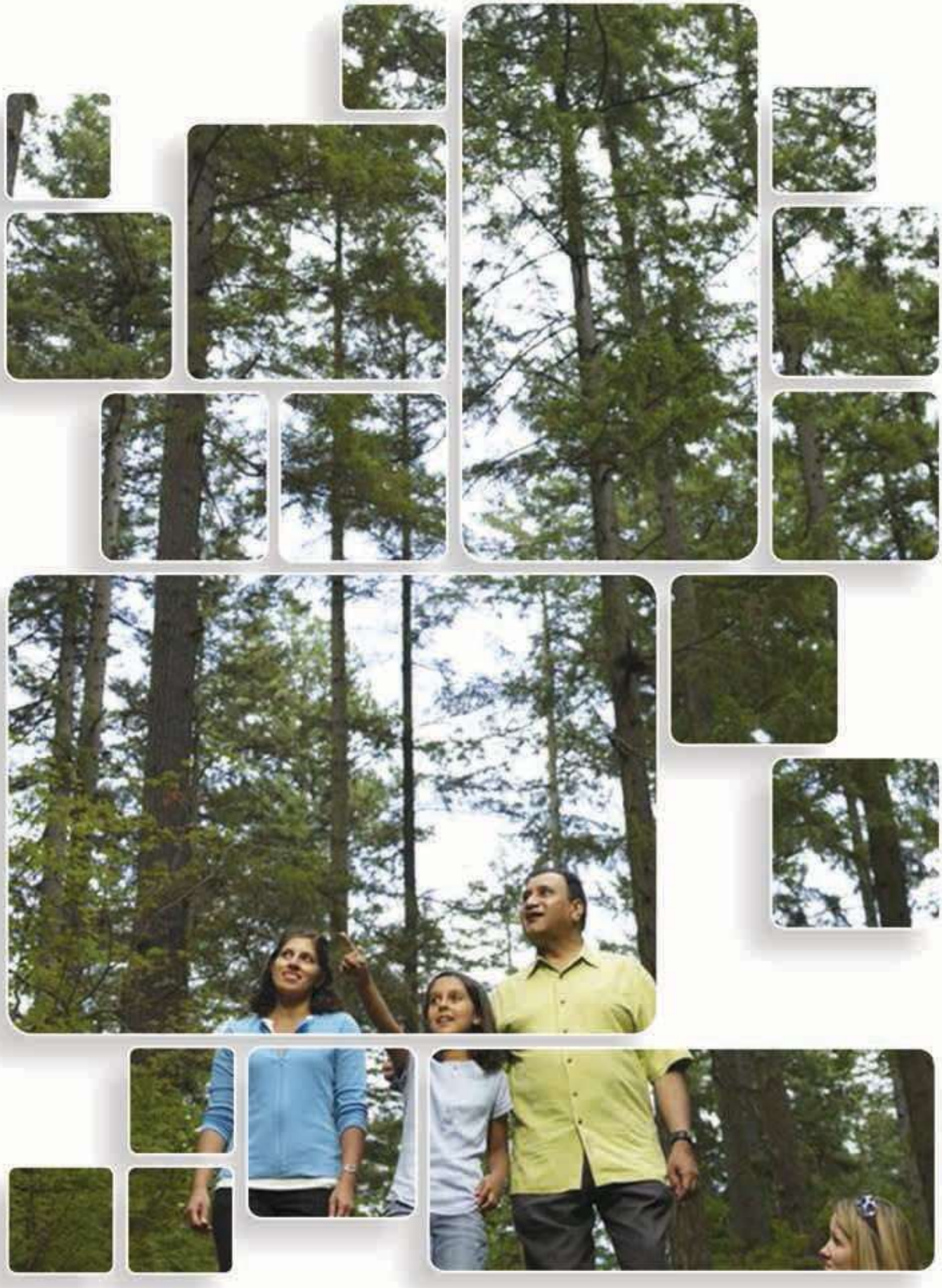
BUILDING B.C.'S

CLIMATE LEADERSHIP PLAN

JANUARY 2016

BRITISH COLUMBIA

Table of Contents



Message from the Minister of Environment

Since the introduction of our first Climate Action Plan, British Columbia has been recognized as a world leader in addressing climate change. This is thanks in no small part to previous leaders who had the foresight to recognize the climate imperative, and begin charting our path to lower greenhouse gas emissions.

Today, the momentum for taking climate action is building globally. The world is clearly moving in a new direction, one marked by a lower carbon future. Nowhere is this more apparent than in the large and growing economies in Asia such as China and India.

British Columbia is perfectly positioned to continue to be at the forefront of this movement. We can strengthen B.C.'s economy and create jobs by becoming a key supplier of cleaner energy solutions like clean tech, innovation and liquefied natural gas, to help Asian economies reduce emissions.

In December 2015, I joined Premier Christy Clark as part of Canada's team at the 21st United Nations Climate Change Conference in Paris, where leaders from around the world signed an historic agreement aimed at holding the increase in global average temperature to "well below" 2°C above pre-industrial levels.

Here in B.C., our approach is not only about reducing emissions. It's designed to benefit both the environment and the economy. It is vitally important that we continue down this path, transforming the way we live, work and travel to create a cleaner planet and strong economy for decades to come.

I sincerely thank the thousands of British Columbians who -- over the past several months – shared their opinions, which are key to the development of our new Climate Leadership Plan. Now we're asking you to join in this next phase by reviewing this consultation guide for the first Climate Leadership Plan, and participating in the engagement process through the website: engage.gov.bc.ca/climateleadership.

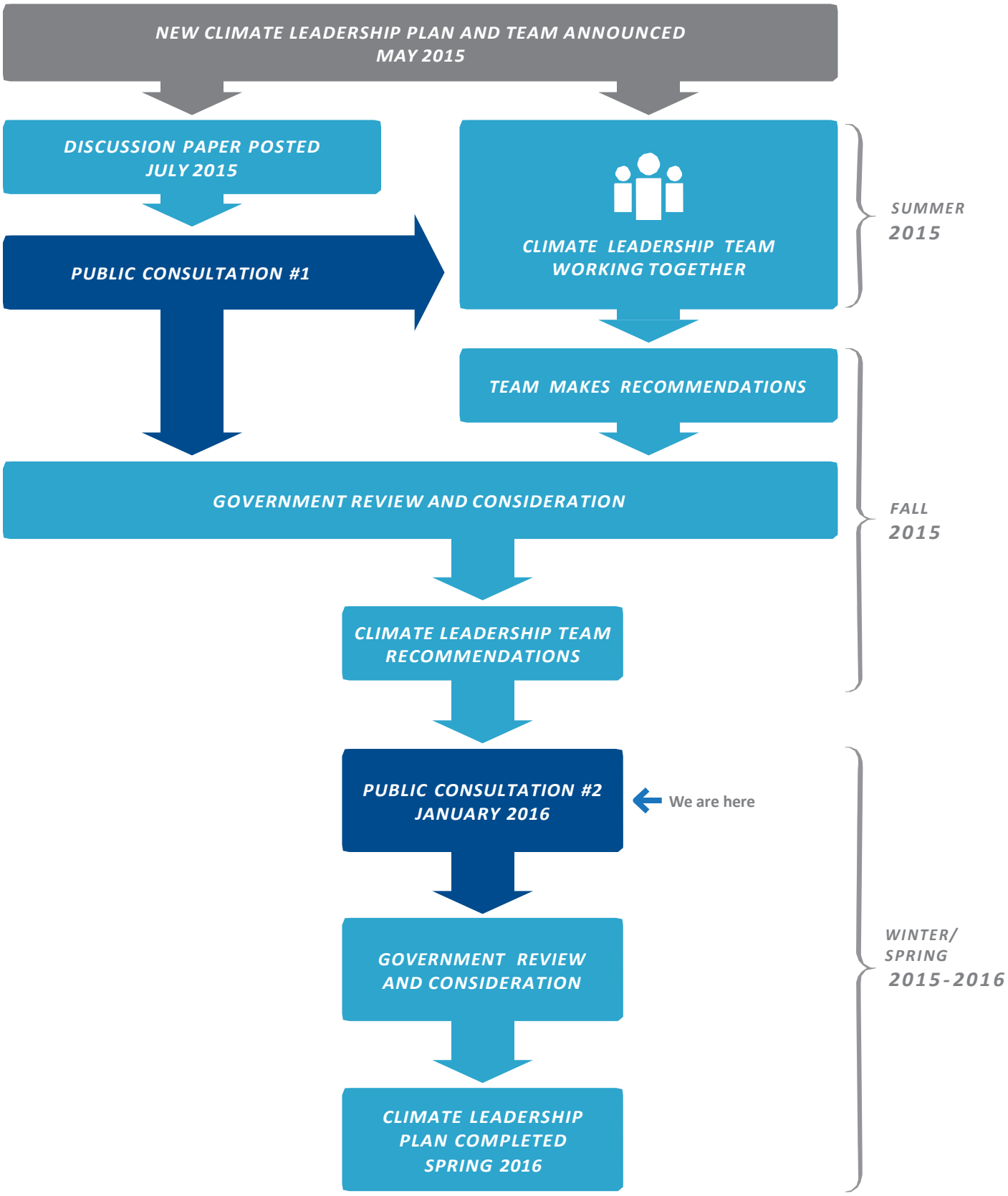
We will review your comments and input, and use them to help fine the Climate Leadership Plan, which will be released in the spring of 2016.

A strong Climate Leadership Plan will help us take advantage of the low-carbon economy of the future, and the thousands of green jobs that goes with it, while keeping us on track to our long term greenhouse gas reduction targets for 2050.

HONOURABLE MARY POLAK
MINISTER OF ENVIRONMENT

THE CLIMATE LEADERSHIP PLAN PROCESS

This process will help determine the actions needed to reach our climate goals.



NEXT PHASE OF CONSULTATION

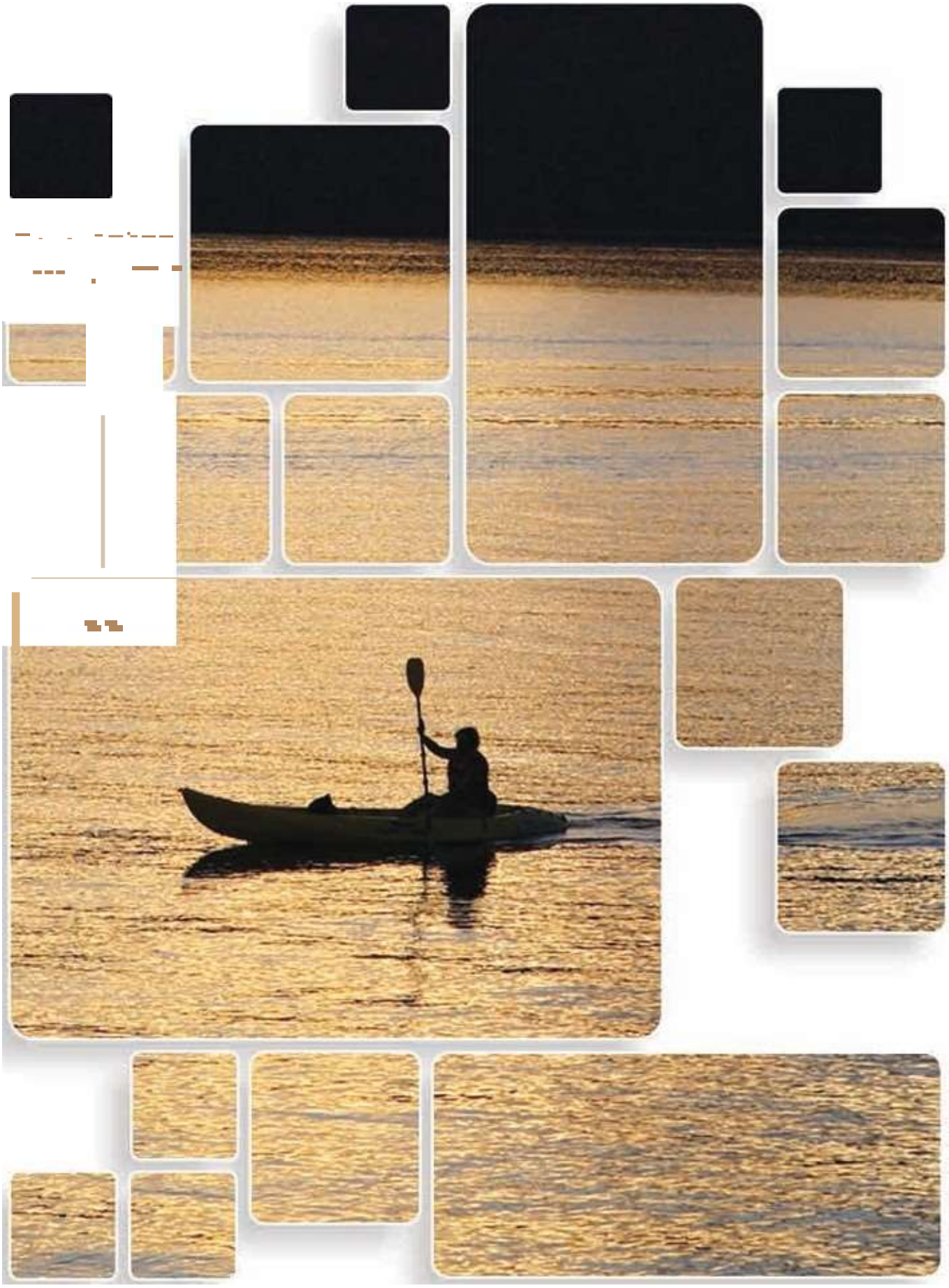
During our first phase of consultation, many British Columbians provided their ideas and priorities for climate action – through nearly 6,000 completed surveys, 300 template letters and over 200 individual submissions. Your input helped inform this consultation guide for the first plan, together with recommendations from the Climate Leadership Team (CLT). You can find the results of the first phase at engage.gov.bc.ca/climateleadership.

The province recently received the Climate Leadership Team Recommendations Report, including 32 recommendations to reduce greenhouse gas emissions while maintaining a focus on economic opportunities. This group of diverse B.C. leaders suggests renewed action beginning in the 2016/17 fiscal year.

The recommendations address:

- greenhouse gas reduction targets and progress reviews;
- carbon pricing and fiscal policy;
- climate action across industry, communities, buildings and transportation sectors; and
- intergovernmental and First Nations relations.

The wealth of input received to date – from the public survey, the CLT recommendations and ongoing internal government review – will now inform our next round of climate change work. Concurrent review will continue as government conducts sector-specific consultations, does further analysis of options, including the CLT recommendations, and ties all of this activity and information in with developing federal government initiatives.



BUILDING ON B.C.'S STRONG FOUNDATION

Our understanding of climate change continues to improve. Recently, scientists have released predictions of how climate change will affect our ecosystems, infrastructure and livelihoods well into the future. For example, in less than one lifetime, B.C. is projected to lose almost three-quarters of its glaciers. We've witnessed a summer of extreme events with forest fi es and water shortages. While some amount of climate change is unavoidable, by acting now the world can limit irreparable harm and prepare for changes already underway.

In B.C. we are doing our part and our experience shows that we can address climate change while still creating a strong economy and vibrant communities.

The actions of other nations also refl t a growing understanding that climate change is a threat to the quality of life of people globally. For example, at the recent Paris conference, for the fi time ever, nations acknowledged collective responsibility for addressing the problem. Additionally, for the fi time, 195 nations fully agreed on the science of climate change and that we must limit human-caused global warming to no more than 2°C and, preferably, 1.5°C.

Clean Tech and Clean Energy

Globally, the demand for clean energy and climate solutions continues to grow. As countries look for cleaner energy alternatives, particularly in Asia, B.C. is positioned to ensure our liquefi natural gas (LNG) plays an important role in decreasing global emissions.

B.C.'s Clean Economy

- The province has 68,165 clean economy jobs, a 12.5 per cent increase since 2010.*
- British Columbia's clean economy GDP rose to $6.31 billion by 2014, a 19.3 per cent increase from 2010.*

**West Coast Clean Economy 2010-2014 Jobs Update, Delphi Group 2015*

B.C. has over 200 clean tech companies that generate an estimated $1.7 billion in revenues annually.[1]

They are important contributors to B.C.'s growing technology industry. These forward-thinking companies represent incredible opportunities for our province to create new jobs and provide economic benefits for all British Columbians.

While Canada's clean tech industry grew last year, it currently captures just one per cent of the $1 trillion clean tech global market.[2] By encouraging local development of technology to address our own challenges, government can ensure B.C. companies are positioned to take advantage of emerging export opportunities. The U.S. has signifi growth opportunities for companies in renewable energy, wastewater management, clean transportation and green building.[3] In fast-growing economies like China and India, clean technology and cleaner fuels are in higher demand than ever.

As our buildings, facilities and vehicles transition to clean tech and fuels, our abundant natural resources, including hydro-electricity, biomass and wind, will provide a stable supply of clean, renewable energy.

1 B.C. Technology Report Card for B.C., KPMG, 2014
2 Canadian Clean Technology Industry Report, Analytica Advisors, 2015
3 https://www.britishcolumbia.ca/export/key-markets/united-states/

Efficiency Improvements

Improved energy effi y in our buildings and vehicles is saving British Columbians energy and carbon costs. Case studies from Climate Smart businesses show total annual operating cost savings of over $2.2 million and 13,500 tonnes of greenhouse gas emissions reduced.[4] Another study found that high energy effi y standards in the residential, commercial/institutional and industrial sectors will return about $3 in savings for every program $1 invested, increase Canada's annual GDP by over $47 billion and create over 300,000 jobs per year.[5]

Competitive Industries

Using the best new technologies here in B.C. means our foundational industries are gaining a competitive edge, while continuing to export their innovations to help businesses save money and reduce their impact on the environment.

Many of our lumber mills have improved thermal effi y through boiler upgrades, and reduced their energy and carbon costs by switching to biomass as a fuel source. Natural gas facilities' emission reduction strategies are also reducing carbon costs. These strategies include electrifi eliminating routine fl ing and preventing methane venting and leaks.

Our abundant natural resources position B.C. well in the new low carbon economy. Our forests present us with enormous carbon sequestration opportunities. Collaboration with First Nations, industry and other governments has led to several hallmark carbon projects in B.C.'s Great Bear rainforest. These projects not only protect existing carbon stocks but also support the area's distinctive biodiversity and economic opportunities for local communities, including First Nations.

Strong Climate Action Offers Many Benefi

- A healthier environment with lower air pollution and resilient ecosystems
- A place for B.C. as a global innovator in business solutions to environmental problems
- improved human health and safety
- Reduced exposure to risks and costs of climate impacts
- improved choices for families and businesses taking action, reducing emissions and saving energy costs
- Compact and effi t communities that encourage social interconnection

Healthy and Resilient Communities

More attention is being turned to the critical role of climate action in building healthy and resilient communities. Strategies to reduce emissions and invest in resilient infrastructure are also helping to prevent adverse health impacts and promote active lifestyles.

Increased risk of asthma, respiratory ailments, and injuries are examples of potential health impacts from climate events such as heat stress, extreme fl , storms or ongoing city congestion.

Diverse approaches are important, for example ensuring buildings and roads are designed and built with evolving climate risks in mind. Integrating natural systems into infrastructure to reduce the impacts of extreme events, such as heat or heavy rainfall, is another example. Additionally, designing cities that are more walkable and liveable reduces energy use and costs, improves air quality, saves commuting time and helps instil active lifestyles.

4 Are Small to Mid-Sized Businesses the Catalyst to a Low Carbon Economy in B.C.? Pacifi Institute for Climate Solutions, 2013

5 Energy Effi y: Engine of Economic Growth in Canada, Acadia Centre, 2014

Strong Ecosystems

As the climate changes, the best way to maintain resilience and the related ecosystem services is to allow organisms to adapt, evolve and move as necessary. A healthy core protected area network that is connected and representative of the ecosystems in the province will allow this adaptation.

Mitigating climate risks to the natural resources that sustain us – fishing, agriculture, forestry and water systems – is critical for improving long-term outcomes and preventing future costs. B.C.'s natural resource economy has already been hard hit by impacts of climate change. Climate change will significantly increase producer-business risk and management complexity, while bringing some opportunities for the agriculture, fisheries and aquaculture sectors. To reduce the risks and to take advantage of the opportunities, each industry will need support to adapt and build resilience.

Leadership and Collaboration

Tackling climate change requires countries and communities around the world to collaborate. Organizations such as the World Bank and the United Nations have identifi B.C.'s revenue-neutral carbon tax as a model to follow. The carbon tax is a "text-book" example of how to get carbon pricing right, says the Organization for Economic Cooperation and Development.

B.C.'s public sector is also leading by example, and in 2015, it achieved carbon neutrality for the fi th year in a row. Government buildings showcase examples of clean energy solutions for hundreds of thousands of British Columbians when they access government services, go to work or attend school.

WHAT WE HEARD FROM YOU

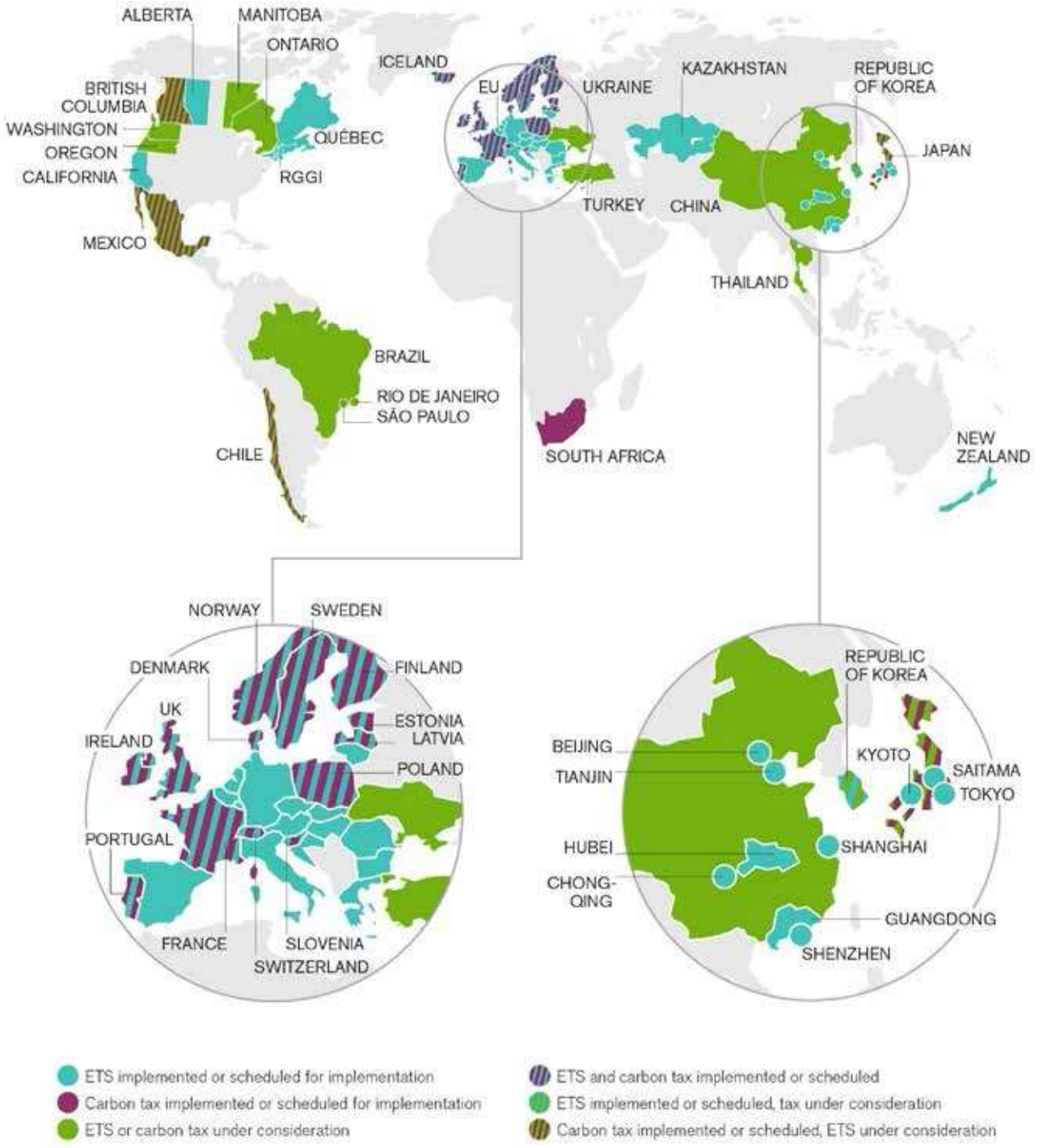
"WHAT WE VALUE" IS TOP PRIORITY FOR SURVEY RESPONDENTS

Public survey respondents to the B.C.'s government's 2015 Climate Leadership Discussion Paper clearly identifi "What We Value" as the top priority for cutting emissions – both in the short and long term. The goal was described as "the cost of climate change for society is considered whenever British Columbians make important decisions," for example, through carbon pricing or adapting to climate change.

Priority actions under this topic led with *aff dability of solutions for business and consumers* (32 per cent of respondents' preference), followed close behind by *expanding carbon pricing, driving organizations and people to consider costs of adaptation in their decisions, and setting targets for types of emissions* (about 23 per cent preference for each).

Over 90 per cent of survey respondents feel that climate change is a serious issue.

Results from the fi consultation activities in the development of B.C.'s Climate Leadership Plan can be viewed at engage.gov.bc.ca/climateleadership



B.C. A WORLD LEADER ON CARBON PRICING

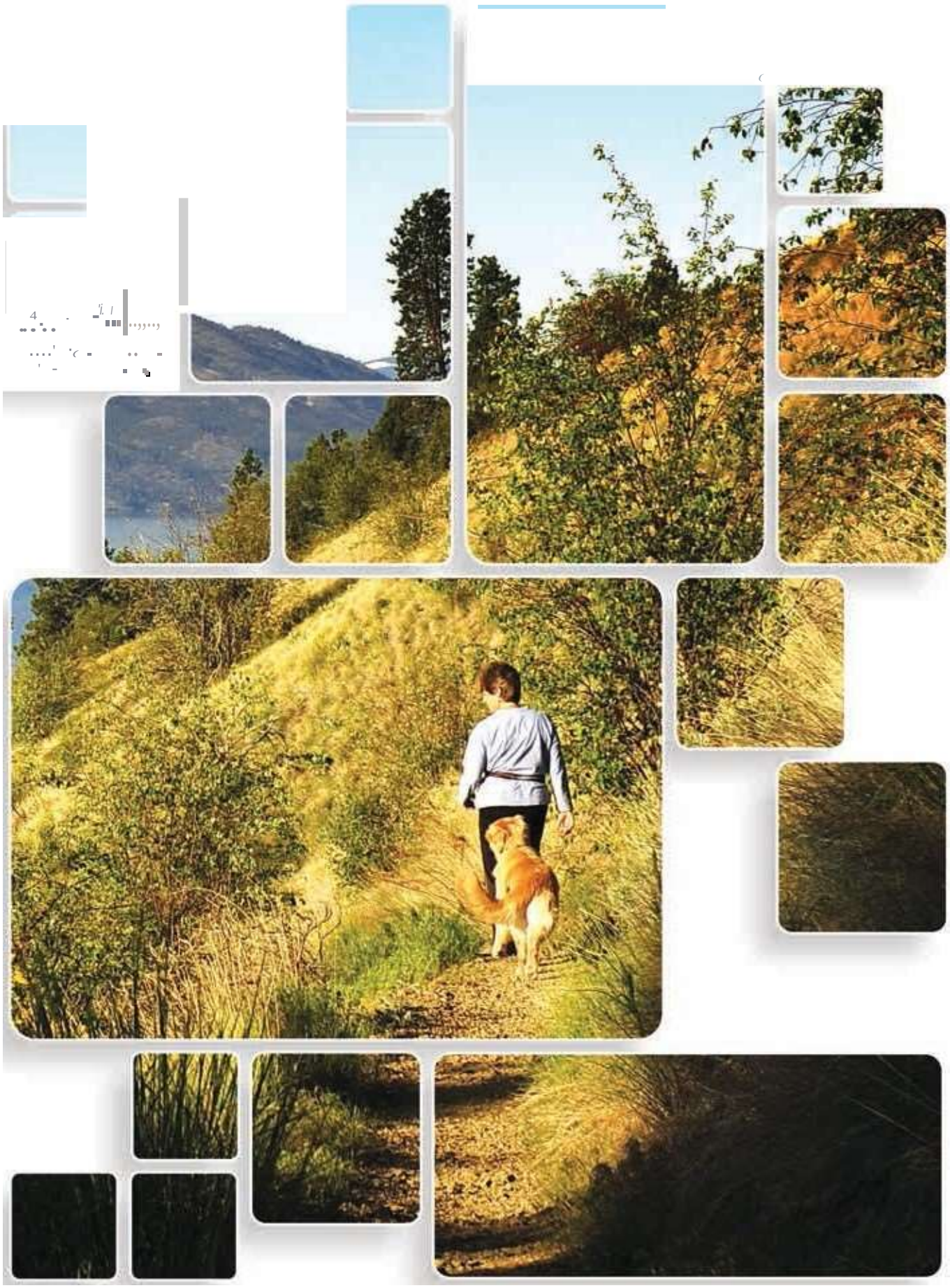
B.C. established a revenue-neutral carbon tax in 2008 to encourage individuals and organizations to reduce fossil fuel use. The policy has been successful and continues to be a world-leading example of how to build a strong economy in a carbon-constrained world. In 2015, about 40 national and over 20 subnational jurisdictions, representing almost a quarter of global greenhouse gas emissions, are putting a price on carbon, as illustrated in the map. This includes carbon taxes, emissions trading systems or other levies.*

ETS – Emissions Trading System
**Carbon Pricing Watch 2015; developed by World Bank and Ecofys.*
Source: © 2015 International Bank for Reconstruction and Development/ The World Bank

The following principles, fi introduced in our July 2015 discussion paper, guide development of the Climate Leadership Plan.

Our Principles

1. GOVERNMENT TAKES ACTIONS NOW THAT WILL RESULT IN BOTH SHORT- AND LONG-TERM EMISSION REDUCTIONS.
2. ACTIONS BALANCE OUTCOMES ACROSS ECONOMIC, ENVIRONMENTAL, AND SOCIAL OBJECTIVES.
3. THE APPROACH RECOGNIZES WE ALL HAVE RESPONSIBILITY — IN B.C. AND GLOBALLY.
4. DECISION MAKING AND REPORTING ON PROGRESS ARE TRANSPARENT.
5. THE APPROACH ADDRESSES THE NEEDS OF THOSE INDIVIDUALS AND FAMILIES LEAST ABLE TO RESPOND.
6. COLLABORATION AND PARTNERSHIPS ARE CRITICAL TO LONG-TERM SUCCESS.



Our Pathway Forward

Setting the Stage

EMISSIONS AND THE ECONOMY

B.C. has a diverse economy including natural resources, clean technology, renewable energy, tourism, forestry and agriculture, service sector, and creative and high-tech industries. Our economy has grown, even as B.C. reduced emissions from 2007-2012.

> *"The example of British Columbia is one of the most powerful. Its carbon price mechanism is neutral to the tax payer – it's not an increase in tax."*
>
> *World Bank President, Jim Yong Kim, Dec 2014*

We have done this with a strong foundation of climate action – a revenue-neutral carbon tax, clean energy requirements, a low carbon fuel standard, local government leadership and a carbon neutral public sector.

Independent research at the University of Ottawa has found that since the implementation of the carbon tax, per capita petroleum fuel use in B.C. has dropped, while it rose in the rest of Canada. At the same time, its economy has kept pace with the rest of Canada.[6] This success is built upon the principle of balancing economic prosperity and environmental sustainability so both can advance.

Our carbon tax is resulting in meaningful climate action progress, while allowing our business sector to pay among the lowest corporate income tax rates in the country. The revenue-neutral carbon tax is designed to maintain this balance, as the rate changes. Every dollar raised through the carbon tax is given back to people and business through tax reductions.

Achieving economic and environmental outcomes is important and requires ongoing attention. Recently, emissions began to rise again, and B.C. is revitalizing its plan to address these challenges.

B.C.'s Carbon Tax

The carbon tax, introduced in 2008 at $10 per tonne of CO_2e, was increased gradually by $5/tonne annually until it reached $30/tonne in 2012. B.C. has committed to keep the rate at $30/tonne until 2018.

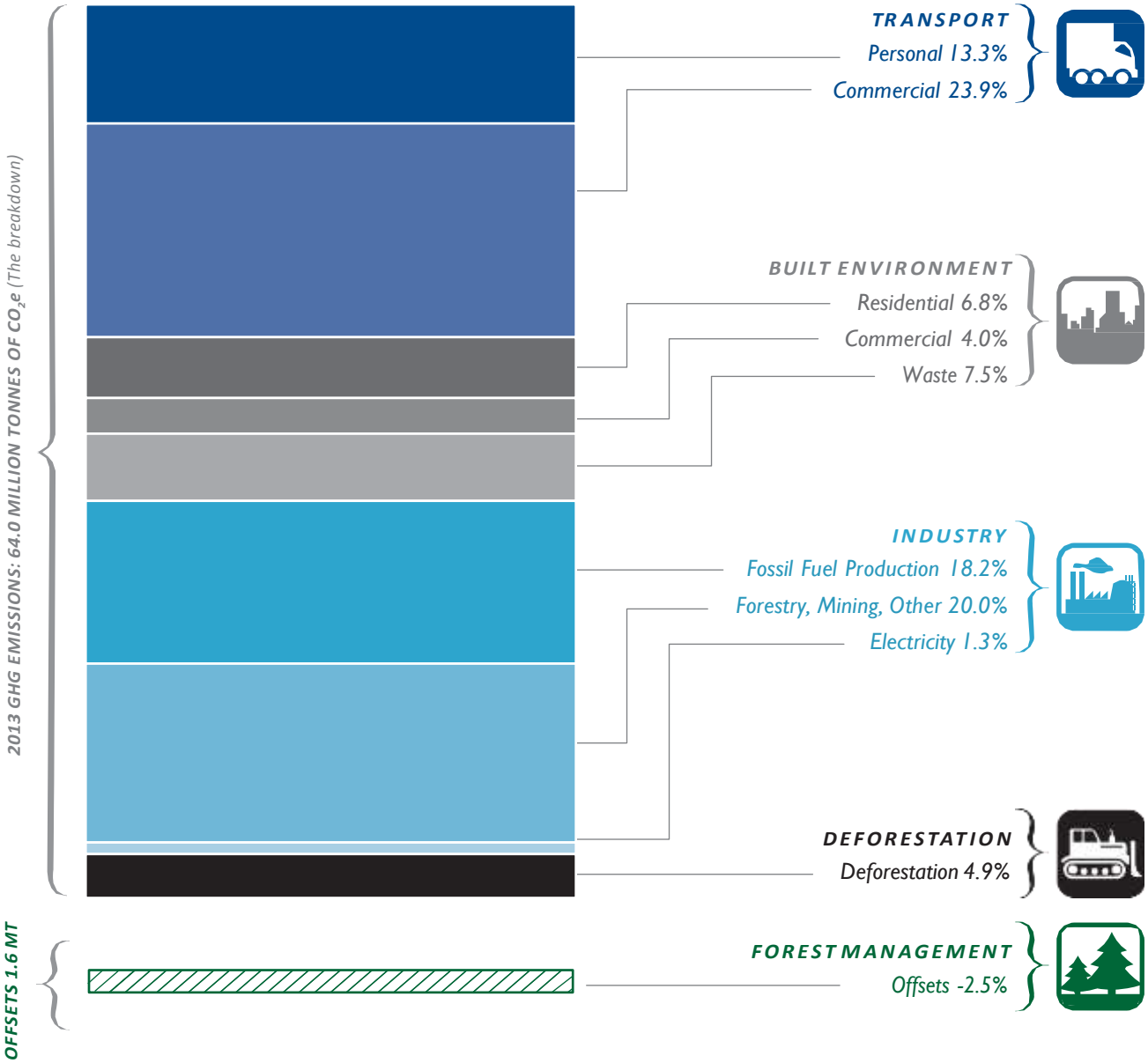
A 'revenue-neutral carbon tax' means that all carbon tax revenues collected by government are returned to British Columbians in the form of personal and business tax measures:

- Low income climate action tax credit
- Five per cent reduction in fi two personal income tax rates
- Northern and rural home owner benefi of $200
- General corporate income tax rate reduction
- Small business corporate income tax rate reduction
- industrial property tax credit

6 Elgie, Stewart, and Jessica McClay. 2013. "BC's Carbon Tax Shift Is Working Well after Four Years (Attention Ottawa)." *Canadian Public Policy* 39(2):1–10.

B.C.'S GREENHOUSE GAS EMISSIONS

In 2013, British Columbia's emissions were 62 million tonnes (mt) of CO_2e net after off . Most emissions fall into three categories: transportation, the built environment and industry. Each off opportunities for reductions. B.C. can also store or sequester carbon, for example, in forests or underground.



Building Our Climate Leadership Plan

All of B.C.'s greenhouse gas emission sources fall into one of the following areas of action. This document outlines measures in each of these areas to reduce emissions or adapt to changes underway and set us on a confi path forward towards our 2050 goals.

AREA OF ACTION	THE FOCUS	THE GOAL
 What We Value	How we consider the cost of climate change to society when making decisions.	The cost of climate change for society is considered whenever British Columbians make important decisions.
 The Way We Live	Buildings, community design, and waste.	Communities are thriving and resilient in the face of climate change.
 The Way We Travel	Movement of people and goods.	People and goods move effi tly and reliably, using clean transportation.
 The Way We Work	Business, industry, products and services.	B.C.'s economy remains strong, and jobs continue to be created, while greenhouse gas emissions fall.

For more information on current climate action, please visit
http://www2.gov.bc.ca/gov/content/environment/climate-change

WHAT WE VALUE

Goal: The cost of climate change for society is considered whenever British Columbians make important decisions.

Current State

PUTTING A PRICE ON CARBON

In 2008, British Columbia introduced its broad-based carbon tax to encourage people to reduce fossil fuel use. The current carbon tax rate is $30 per tonne of carbon dioxide equivalent (CO_2e) emissions. Because the tax is revenue neutral, all revenues are returned to British Columbians through personal and business tax reductions.

At the same time, B.C. implemented further carbon pricing through its Carbon Neutral Government leadership commitment. This was achieved through measuring, reducing and reporting on public sector emissions, and through the purchase of carbon offsets that fund provincial climate action projects to achieve carbon neutrality.

British Columbia met its first interim target of reducing emissions by six per cent below 2007 levels by 2012, while the economy grew, proving that the environment and economy can advance together.

Climate Action Highlights:

- B.C.'s carbon tax is serving as an example worldwide for carbon pricing. It applies to combustion of fossil fuels and is the most comprehensive of its kind, covering over 70 per cent of provincial emissions. The tax revenue is used for low-income tax credits and broad-based tax cuts.
- B.C. was the fi jurisdiction in North America to commit to carbon neutrality in its public sector operations, providing leadership for clean technology and emission reduction.

ENVIRONMENTAL CHANGE IN BRITISH COLUMBIA

TEMPERATURE: *Average temperature has increased over all of B.C. since 1900 (1.4°C per century).*

PRECIPITATION: *Average precipitation increased over most of southern B.C. (1900–2013).*

GLACIERS: *All glaciers in B.C. retreated from 1985 to 2005.*

SEA LEVEL: *Average sea level has risen along most of the B.C. coast over the past 95 years.*

MANAGING CLIMATE RISKS

In 2010, we released our fi adaptation strategy – identifying high-level priorities for action. Since then, across the province we have been taking action to identify risks, monitor changes and develop adaptation strategies.

Climate Action Highlights:

- B.C. has assessed risks in several key sectors including agriculture, forestry, mining, oil and gas, transportation, fl protection and hydroelectricity.
- Government has developed guidance on sea dike design and coastal development, enabling local governments and qualifi professionals to better protect people, buildings and infrastructure from sea-level rise.
- We have created a suite of tools to help local governments manage climate-related risk in water and watershed planning, land use planning, infrastructure development and urban forests.

Adaptation to reduce risks from changing conditions and extreme events is most effective when it involves a portfolio of actions, mechanisms and strategies. In many cases, we already see the impacts of climate change and know what we need to do. We also need to explore further the potential risks across the province and implement plans that will reduce these risks and improve our resilience.

WHAT WE HEARD FROM YOU

Climate Leadership Discussion Paper survey respondents identifi "What We Value" as the top priority in the short- and long-term. The goal envisions that *the cost of climate change for society is considered whenever British Columbians make important decisions.*

In particular, respondents supported:

- Improving the affordability of solutions for consumers and businesses to address climate change
- Expanding the use of carbon pricing to stimulate decisions that reduce emissions
- Using regulations and incentives to encourage considering the cost of climate risks in important decisions
- Setting targets by emission types (e.g. industry, transportation)

CLT RECOMMENDATIONS SNAPSHOT: TARGETS, REVIEWS, INTERGOVERNMENTAL RELATIONS

- Re-affi m 2050 GHG reduction target of 80 per cent below 2007 levels **(#1)**
- Set new 2030 target of 40 per cent below 2007 levels **(#2)**
- Set 2030 sectoral targets for transportation, industry and the built environment **(#3)**
- Review the Climate Leadership Plan and policies at least every 5 years **(#32)**
- Review integration of carbon tax with a cap and trade framework for the B.C. context if majority of provinces opt for carbon pricing via emissions trading **(#29)**
- Work with federal, provincial and other North American governments to achieve parity with B.C's climate policies **(#30)**

For the CLT's report with the full text of each recommendation, go to: engage.gov.bc.ca/climateleadership

CLT RECOMMENDATIONS SNAPSHOT: FISCAL POLICY

- Lower PST and eliminate PST on electricity, supported by incremental carbon tax **(#4 and #7a)**
- Increase the carbon tax in 2018 by $10/yr, maintain certain current tax reductions, and target tax credits and other mechanisms to emissions-intensive, trade exposed sectors and vulnerable groups **(#5)**
- Expand carbon tax coverage to all GHG emission sources in B.C. after 5 years **(#6)**
- Use incremental tax revenue for technology and innovation and local government projects resulting in reductions **(#7b and #7c)**

For the CLT's report with the full text of each recommendation, go to: engage.gov.bc.ca/climateleadership

CLT RECOMMENDATIONS SNAPSHOT: ADAPTATION

- Amend the *Environmental Assessment Act* to include the social cost of carbon **(#11)**
- Update forest and agriculture policy, regulation and protected areas strategies to account for climate change impacts **(#16)**
- Update by 2020 hazard maps for all climate related hazards **(#24a)**
- Invest in suffi monitoring systems to ensure the change in climate can be managed effectively **(#24b)**
- Develop a policy framework to guide government's management of the risks associated with a changing climate **(#24c)**
- Increase communications to public **(#24d)**
- Use First Nations traditional knowledge when appropriate as part of hazard mapping information **(#25a)**
- Resource the research of climate change impacts on the inherent and treaty rights of indigenous people **(#25b)**

For the CLT's report with the full text of each recommendation, go to: engage.gov.bc.ca/climateleadership

THE WAY WE LIVE

Goal: Communities are thriving and resilient in the face of climate change.

Current State

Emissions from the built environment (buildings, deforestation and waste) represent 23 per cent of total emissions, down 8.5 per cent since 2007. Deforestation is the permanent change from forest to non-forest land, often the result of urban sprawl.

COMMUNITY PLANNING

Eighty-eight per cent of British Columbians live in urban settings and 12 per cent live in rural areas and communities. We often face similar issues, yet solutions have differed by region. Regardless of where we live, decisions made at the community level play a critical role in keeping the province on track to meet its targets.

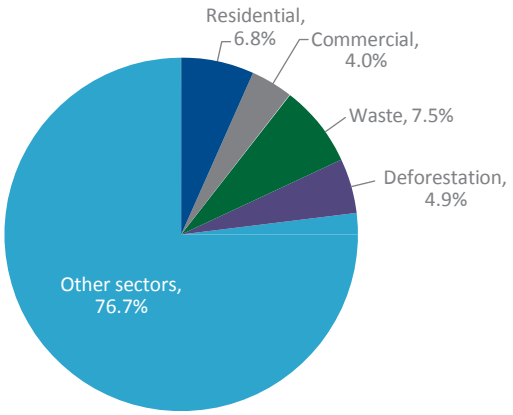
Climate Action Highlights:

Three provincial policies are helping to support climate action innovation at the community level:

- the requirement for greenhouse gas reduction targets in local government Offi Community Plans and Regional Growth Strategies
- the commitments made under the voluntary Climate Action Charter to work towards carbon neutral operations, measure community-wide emissions, and create complete compact, energy-efficient communities
- the Climate Action Revenue Incentive Program, which returns carbon tax to communities for greenhouse gas reduction projects.

2013 BUILDINGS, DEFORESTATION, AND WASTE EMISSIONS

- COMPRISE 23.3 PER CENT OF B.C.'S EMISSIONS
- DECREASED BY 8.5 PER CENT SINCE 2007



With these policies in place in B.C. since 2008, we have seen the development of more energy-efficient buildings, district energy systems, improved forestry and landfill management practices, and organic waste diversion. Communities have made good progress and are demonstrating the possibilities of what is achievable.

New efforts need to accelerate the transition to compact communities, zero emission buildings, improved waste diversion and conversion of waste to biogas. The CLT recommends reinvigorating the relationship between the B.C. government and municipalities to make further progress on shared goals.

BUILDINGS

In 2013, greenhouse gas emissions from buildings totalled 6.9 million tonnes (10.8 per cent of B.C.'s total).

Climate Action Highlights:

- The *Building Code* and *Energy Effi y Act* are improving standards for residential and commercial buildings, and for equipment such as heating systems, water heaters, boilers and appliances.
- Energy effi y programs like LiveSmart and the Home Energy Retrofi Offer encourage effi y upgrades.
- Government, through its carbon neutral commitment and LEED Gold standards for new buildings, helps drive energy conservation, innovation and leadership across government, schools, hospitals, universities and colleges.

Accelerating the uptake of district energy systems and technologies to support energy efficiency and increased use of renewables will transform this sector.

WASTE

British Columbians produced 4.8 million tonnes of greenhouse gas from waste in 2013 (7.5 per cent of B.C.'s total).

Climate Action Highlights:

- The Landfi Gas Management Regulation requires large landfi operators to increase the amount of landfi gas capture (methane) by 2016. Relevant operators are on pace to install systems that meet the requirement and reduce methane emissions.
- About 60 per cent of communities have implemented curbside organic diversion programs.

We need to reduce organic waste across the entire value chain – from less food waste to more diversion of organics to more effi landfi to the conversion of waste into renewable fuels.

WHAT WE HEARD FROM YOU

Climate Leadership Discussion Paper survey respondents identified "The Way We Live" as a key priority for our 2050 target. This goal envisions *thriving and resilient communities in the face of climate change.*

In particular, respondents supported:

- Regulations and incentives for greener buildings
- Support for local food production and low carbon businesses
- Less travel and energy use to be a priority in community planning

CLT RECOMMENDATIONS SNAPSHOT: COMMUNITIES

- Update the Climate Action Charter to align provincial and community goals **(#21)**
- Create a waste-to-resource strategy that reduces GHG emissions from organic waste and landfi **(#22)**

For the CLT's report with the full text of each recommendation, go to: engage.gov.bc.ca/climateleadership

CLT RECOMMENDATIONS SNAPSHOT: BUILDINGS

- Require new public sector buildings to use more materials that sequester carbon and meet most of its annual energy needs by on-site renewable energy starting in 2016 **(#20a)**
- Require new buildings to use more materials that sequester carbon and meet most of their annual energy needs by on-site renewable energy, through the building code **(#20b)**
- Encourage retrofi that reduce GHG emissions in existing buildings through programs (e.g. on-bill fi **(#20c)**
- Implement standards that support high-effi y building equipment and appliances **(#20d)**

For the CLT's report with the full text of each recommendation, go to: engage.gov.bc.ca/climateleadership

THE WAY WE TRAVEL

Goal: People and goods move effi tly and reliably, using clean transportation.

Current State

Transportation contributes 37 per cent of B.C.'s emissions, down 1.5 per cent since 2007.

Climate Action Highlights:

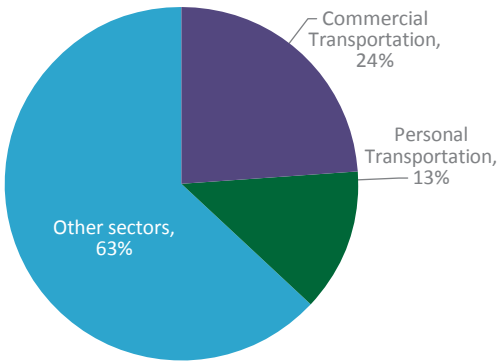
» The low carbon fuel requirement mandates a 10 per cent reduction in the carbon content of fuels by 2020, and 5 per cent renewable content in gasoline (4 per cent in diesel). This encourages innovation and a growing diversity of commercially available low carbon fuels. In 2012, this led to nearly 1 million tonnes of greenhouse gas emissions reductions.

» Partnerships such as the Pacific Coast Collaborative can address competitiveness across jurisdictions while accelerating adoption of clean technologies through zero emission vehicle commitments and low carbon fuel standards.

Almost all vehicles will eventually need to run on clean fuels to reduce transportation emissions to near zero by 2050.

2013 TRANSPORTATIONS EMISSIONS

- COMPRISE 37.2 PER CENT OF B.C.'S EMISSIONS
- DECREASED BY 1.5 PER CENT SINCE 2007



PERSONAL TRANSPORTATION

Personal transportation makes up 13 per cent of B.C.'s emissions.

Climate Action Highlights:

» An incentive program for clean energy vehicles (CEV) fuelled by electricity, natural gas or hydrogen was introduced in 2011. Renewed in 2015, the CEV program has been highly successful, keeping B.C. among leading provinces in clean energy vehicle sales per capita.

» The BC SCRAP-IT program removes thousands of polluting vehicles from the road through incentives for transit, car sharing, bikes, and most recently, the purchase of zero emission electric vehicles.

» Through a cost-sharing program with local governments, over 100 cycling infrastructure projects have been completed. Between 2015 and 2017, the B.C. government has committed $18 million to the BikeBC program.

» As part of the expansion of transit infrastructure in the Lower Mainland, the Canada Line opened in 2009 and the Evergreen Line is due to open in fall 2016.

For personal vehicles, reducing per capita vehicle kilometres traveled, improving vehicle fuel effi y and lowering the carbon intensity of transportation fuels are critical.

COMMERCIAL AND HEAVY DUTY TRANSPORTATION

Twenty-four per cent of B.C.'s emissions come from this sector. On-road heavy duty vehicles are among the largest and fastest growing sources of greenhouse gas, comprising about 11 per cent of B.C.'s total. These emissions are expected to increase as freight and new industrial projects grow. Other commercial transportation emission sources include domestic aviation, marine and railways.

Climate Action Highlights:

- B.C.'s low carbon fuel standard is driving down emissions in this sector.
- Conversion of heavy duty vehicles and buses to compressed natural gas (CNG) and liquefi natural gas (LNG) have decreased emissions in commercial fl .
- BC Ferries is building three new vessels that will have dual fuel propulsion systems (LNG and diesel), and is retrofi its two Spirit Class ferries to have dual fuel propulsion.
- Clean electric shore power reduces greenhouse gas emissions at the ports of Prince Rupert and Vancouver.

As our economy grows, so too will our transportation needs. It will be important to maximize the effi y of the entire goods movement chain and support this sector to move quickly to low carbon fuels.

WHAT WE HEARD FROM YOU

Climate Leadership Discussion Paper survey respondents identifi "The Way We Travel" as an important priority in the near term. This goal envisions *people and goods moving effi and reliably, using clean transportation.*

In particular, respondents supported:

- More clean, coordinated transportation such as public transit and shared travel
- Expanded regulations and incentives to encourage use of cleaner vehicles and fuels

CLT RECOMMENDATIONS SNAPSHOT: TRANSPORTATION

- Establish Zero Emission Vehicle targets for the sale of new light duty vehicles for 2020, 2025 and 2030 **(#19a)**
- Increase the Low Carbon Fuel Standard (LCFS) to 20 per cent by 2030 **(#19b)**
- Broaden the LCFS coverage to include all vehicle fuel use with the exception of aviation fuel **(#19c)**
- Support increased commercial transport effi y (size of vehicles) and natural gas/propane conversions **(#19d)**
- Establish revenue neutral PST for all vehicles based on grams of CO_2 per km **(#19e)**
- Support increased use of public transit and other mobility options that reduce GHG emissions **(#23)**

For the CLT's report with the full text of each recommendation, go to: engage.gov.bc.ca/climateleadership

THE WAY WE WORK

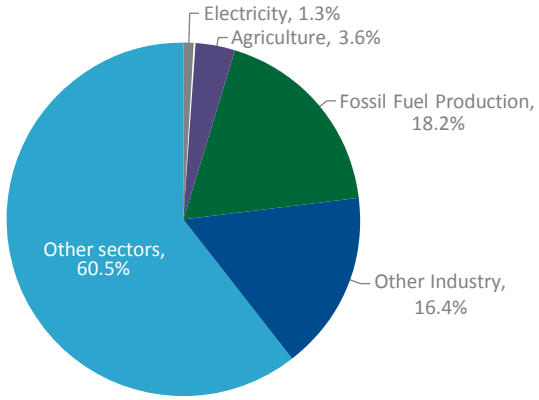
Goal: B.C.'s economy remains strong and jobs continue to be created, while greenhouse gas emissions fall.

Current State

Almost 40 per cent of B.C.'s greenhouse gas emissions come from the way we work. Since 2007, B.C. has been successful in stabilizing emissions in the industrial sector. Government has also encouraged increased sequestration of carbon in our forests. The challenge is to reduce emissions even further as we look to meet our emission reduction targets, while developing the LNG industry and maintaining B.C.'s competitiveness.

2013 INDUSTRY, FORESTRY AND AGRICULTURAL EMISSIONS

- COMPRISE 39.5 PER CENT OF B.C.'S EMISSIONS
- DECREASED BY 0.4 PER CENT SINCE 2007



FOSSIL FUEL PRODUCTION

Emissions from fossil fuel production make up about 18.2 per cent of B.C.'s total. Natural gas dominates the sector. Emissions depend on production levels, the source of the natural gas, fuel choice for processing, energy effi y and level of fugitive emissions.

Since 2008, B.C.'s natural gas production has grown by about 40 per cent. Over the same period, global competition has increased and government has introduced strong climate policies. B.C.'s experience continues to demonstrate that climate leadership can be upheld without compromising competitiveness and economic growth.

Climate Action Highlights:

- B.C. has eliminated all routine fl ing at oil and gas wells and production facilities.
- The carbon tax covers about 64 per cent of oil and gas sector emissions, encouraging industry to pursue emission reduction opportunities. Several new gas plants have already opted to electrify with clean grid electricity.
- To meet the commitment to have the cleanest LNG facilities in the world, B.C. has legislated that LNG operations meet a world-leading greenhouse gas emissions intensity benchmark of 0.16 metric tonnes of CO_2e per metric tonne of LNG produced.

The challenge is to deliver fuels to growing markets while meeting B.C.'s emission reduction targets. The Venting and Flaring Guideline, improved energy effi y processes such as waste heat recovery, methane leak reductions, and electrifi of natural gas facilities are all helping to curb emissions as the industry grows. Further work in these areas, together with innovations such as carbon capture and storage, will be needed to make deeper emission cuts.

OTHER INDUSTRY

Cement production, mining, smelting, forestry and manufacturing are responsible for 16.4 per cent of B.C.'s emissions. B.C. has historically strived to ensure B.C. remains competitive as the province pursues its climate goals.

Climate Action Highlights:

- In 2015, government announced a five-year incentive program that enables B.C. cement manufacturers to further displace coal with low carbon fuels, and strive for a 2019 emissions intensity benchmark that will make B.C.'s cement among the cleanest in the world. Currently, two of B.C.'s three plants are in the top quartile Canada-wide for energy efficiency.
- Developing offset projects to meet B.C.'s carbon neutral government commitment has stimulated investments in greener industrial processes, such as fuel switching from coal to waste products and biomass, and equipment efficiency upgrades in the production of lumber, pulp and paper, and cement.
- In 2013, forestry offset projects removed over 1.5 million tonnes of CO_2e from the atmosphere, creating jobs and unlocking new revenue streams for government, First Nations, communities, forest companies and private land owners.
- Roughly half of the total emissions from these sectors are covered by the carbon tax.

B.C. wants to pursue policies that both achieve reduction goals and lead to companies' cost savings through improved efficiency and technology adoption.

AGRICULTURE

Agriculture emissions account for almost 4 per cent of provincial emissions, arising from manure management, agricultural soils, and enteric fermentation (methane from normal digestion in animals such as cattle and sheep).

Climate Action Highlights:

- Many of B.C.'s greenhouses have taken steps to reduce their use of fossil fuels (e.g. through biomass boilers, thermal curtains and heat storage systems), supported by provincial offset standards and carbon pricing.
- Numerous farmers in B.C. are reducing emissions through implementation of nutrient and manure management plans and conservation tillage.
- Many emission reduction opportunities in agriculture also result in additional new business opportunities, including the development and implementation of innovative systems to recover nutrients and maximize the value of agricultural byproducts.

ELECTRICITY

Only 1.3 per cent of our emissions come from electricity generation because of B.C.'s abundant clean power resources. Electricity sector emissions come mainly from co-generation plants, remote communities' diesel generators, and thermal power used mainly for peak demand periods.

Climate Action Highlights:

- The portion of BC Hydro's power generation portfolio that comes from clean or renewable resources currently exceeds 96 per cent, above the 93 per cent requirement in the *Clean Energy Act*. The Act also requires that, by 2020, at least 66 per cent of BC Hydro's incremental power demand be met through conservation and efficiency improvements.
- The Innovative Clean Energy (ICE) Fund supports new sources of clean energy and technologies.

B.C.'s abundant supply of low-carbon electricity ensures that clean and renewable resources will continue to provide the vast majority of B.C.'s future electricity needs and support the electrification of energy intensive industries.

WHAT WE HEARD FROM YOU

Climate Leadership Discussion Paper survey respondents identifi "The Way We Work" as an important priority over both the short and long term. This goal focuses on business, industry, products and services, and envisions *a strong economy creating jobs while greenhouse gas emissions fall.*

In particular, respondents supported:

» Regulations and incentives to drive innovation and cut emissions

» Aligning new sources of emissions with the climate plan

» Accelerating development of a workforce that excels in a low carbon economy

CLT RECOMMENDATIONS SNAPSHOT: INDUSTRY, ELECTRICITY, LOW CARBON ECONOMY

Natural gas and LNG

» Instruct BC Hydro to develop a strategy to supply clean electricity required for electrification of upstream natural gas, LNG, and associated infrastructure **(#14)**

» Set a goal to reduce fugitive and vented methane emissions by 40% within fi e years, through regulating best practice leak reduction and repair practices and developing methane reduction and reporting best practices. After fi e years, determine if more ambitious action is necessary **(#15)**

Forestry and Agriculture

» Update forest policy to use more forest residue for energy and increase carbon sequestration **(#17)**

» Create a task force to review and update carbon management best practices for the agriculture sector **(#18)**

Electricity

» Change the target for clean energy on the integrated grid to 100% by 2025 **(#12)**

» Establish a strategy to replace diesel generation in remote communities with reliable, low GHG electricity **(#13)**

» Work with First Nations communities and federal agencies to ensure transition to reliable, low GHG electricity service in communities currently dependent on diesel generation **(#26)**

Low-Carbon Economy

» Create a task force with expertise to research growth potential in low carbon economy **(#10)**

» Ensure the First Nations clean energy business fund effectively enables new business opportunities **(#27)**

» Review current offset policy to determine if changes are required to support the Climate Leadership Plan **(#28)**

For the CLT's report with the full text of each recommendation, go to: engage.gov.bc.ca/climateleadership

Summary

Now it's your chance to provide input once again. Our decisions today affect how we will live tomorrow. That's why it is very important that we all have a voice in shaping that future. This document is posted for a two-month consultation period, ending March 25, 2016. Please read it and provide your say.

A fi Climate Leadership Plan will be released in Spring 2016.

How to Participate

To share your views by March 25, 2016:

- Go to engage.gov.bc.ca/climateleadership to participate.
- Individuals and organizations who wish to send additional information can email: climateleadershipplan@gov.bc.ca. If possible, please use the following headings to organize your feedback comments:
  - What We Value
    – Carbon pricing and general fi mechanisms
    – Climate risk management and adaptation
  - The Way We Live – Community and built environment
  - The Way We Travel – Transportation
  - The Way We Work – Industry, business and natural resources
- Respond by post to: Climate Leadership Consultation, Ministry of Environment Climate Action Secretariat P.O. Box 9486, Stn Prov Govt, Victoria, B.C. V8W 9W6

Please note that all separate attachments submitted will be posted publicly on the government website.

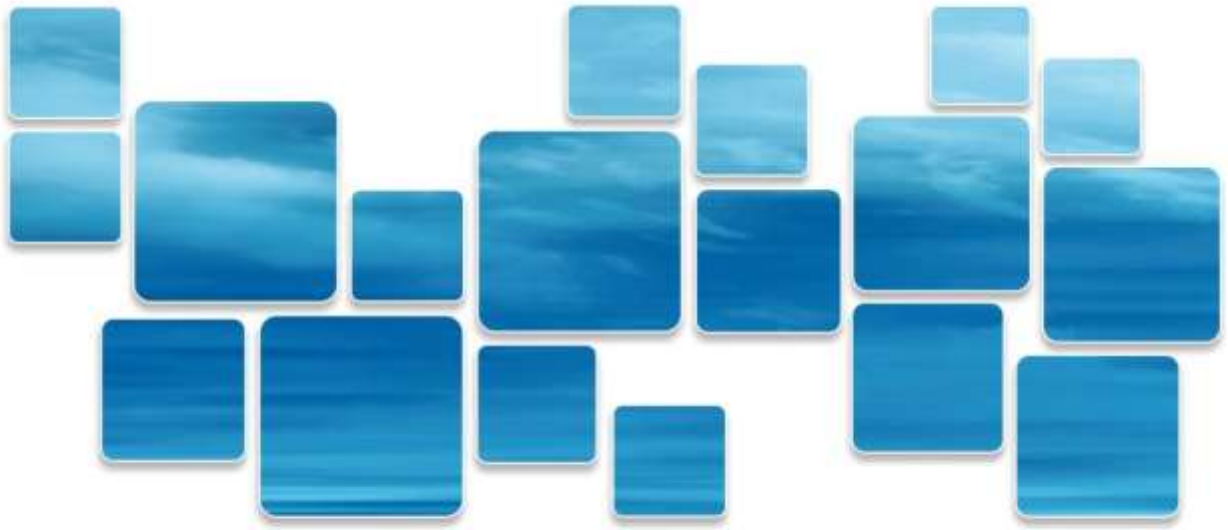
GOVERNMENT WELCOMES YOUR FEEDBACK ON THIS DOCUMENT "BUILDING B.C.'s CLIMATE LEADERSHIP PLAN" FOR A TWO-MONTH CONSULTATION PERIOD, ENDING MARCH 25, 2016 AT NOON.

To share your views please submit your feedback by email to: ***climateleadershipplan@gov.bc.ca***

Also, visit ***engage.gov.bc.ca/climateleadership*** *for more ways to participate online.*

FOR MORE INFORMATION VISIT THE WEBSITE:
ENGAGE. GOV. BC. C A/ CLIMATELEADERSHIP/

BRITISH COLUMBIA



CLIMATE **LEADERSHIP** TEAM

Recommendations to Government

October 31, 2015

British Columbia

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BACKGROUND

On April 13, 2015, Premier Christy Clark announced a challenge to jurisdictions around the world - to meet or exceed the world-leading standard B.C. has set for climate action. She also announced that work was underway to build on B.C.'s successful Climate Action Plan, to move the Province's climate agenda forward, ensuring B.C. remains a global climate leader.

On April 21, 2015, Mike Bernier, Parliamentary Secretary for Energy Literacy and the Environment, was announced as the chair of a new Climate Leadership Team of leaders from B.C. businesses, First Nations, local governments, academia, and the environmental sector to provide advice and recommendations to government on a new Climate Action Plan. Vice Chair Jordan Sturdy, Parliamentary Secretary for Energy Literacy and the Environment for the Minister of Environment, took over as Chair of the Climate Leadership Team on July 30, 2015.

On May 12, 2015, Climate Leadership Team members were announced and the Climate Leadership Team's mandate was established, to provide advice and recommendations on:

- how to maintain B.C.'s climate leadership;
- updates to the current Climate Action Plan as well as new programs and policies required to achieve British Columbia's greenhouse gas (GHG) reduction targets within the context of economic growth, B.C.'s LNG Strategy and the B.C. Jobs Plan;
- actions to achieve GHG reductions required across the industrial sector, transportation sector and built environment;
- how to further the Province's government-to-government relationships with First Nations while constructively finding climate solutions; and
- how to further the Province's collaboration with local governments within the context of mutually-beneficial climate actions.

The Climate Leadership Team had nine face-to-face meetings, some of which were two day meetings. There were also four dedicated sessions concerning natural gas and LNG issues and a number of teleconference meetings. The background information on past action and effectiveness was provided by government staff. The emission and economic modelling supporting the Climate Leadership Team recommendations was provided by Navius Research Inc., a private consulting firm specializing in climate and energy modelling. Extensive policy information was provided by government staff based on the work done by five cross-government working groups on carbon pricing, transportation, industry, built environment and adaptation. A number of stakeholders were also invited to provide information and feedback to inform Climate Leadership Team recommendations.

VISION AND CONTEXT

The latest climate science shows that unprecedented climate changes are already upon us. Without significant new climate policies to reduce carbon pollution we will increase the warming of the climate system by +4 Celsius or more, unleashing "severe, widespread, and irreversible impacts globally."[1]

The US Council of Economic Advisors reports that "An analysis of research on the cost of delay for hitting a specified climate target (typically, a given concentration of greenhouse gases) suggests that net mitigation costs increase, on average, by approximately 40 percent for each decade of delay. These costs are higher for more aggressive climate goals: each year of delay means more CO2 emissions, so it becomes increasingly difficult, or even infeasible, to hit a climate target that is likely to yield only moderate temperature increases."[2]

The costs of inaction are real. British Columbia, in common with the rest of the North America, is already experiencing a dramatic increase in the severity and frequency of violent storms. The Canadian insurance industry warns that the cost of extreme weather events is skyrocketing, costing Canadians over $3.2 billion dollars last year alone. By taking decisive action now to reduce our carbon pollution and stimulate innovation B.C. will be sending consistent, credible long term policy signals to the marketplace, protecting our economy and our health, and working to ensure a stable climate.

The good news is that numerous studies have now shown us that reducing emissions can be done while maintaining economic growth and in fact, can be cheaper in the long term than delaying action to address climate change.

Heading into the next major climate conference, Paris 2015, the majority of world leaders (representing more than two thirds of the world's GHG & GDP) have made public commitments to peak and lower emissions. For the first time, many major developing nations are committed. Joining these major nation states is a rapidly growing list of global financial, religious and civil society groups.

Evidence of this global momentum abounds. Within the past year and a half, a variety of developments have set the stage for new and renewed climate leadership:

- Leading large economies have agreed to collaborate, set goals, and share expertise on climate and clean energy. A new spirit of problem solving has replaced a once-adversarial diplomatic atmosphere.
- Carbon pricing is spreading around the world and is emerging as the new normal. The share of global carbon pollution being priced has tripled since B.C. implemented its carbon tax.
- Eighty-one companies with a combined market capitalization of more than $5 trillion USD have pledged to cut their carbon pollution, invest in clean energy, and support a strong global agreement at Paris 2015.

All of these efforts—from national governments, large industries, states and provinces, cities and individual citizens—are starting to have a collective impact. This past year, global carbon pollution from fossil fuels levelled off, even as GDP continued to grow. It was the first time in nearly half a century that

[1] IPCC 2014 Synthesis Report: http://www.ipcc.ch/report/ar5/syr/

[2] The Cost Of Delaying Action To Stem Climate Change 2014: https://www.whitehouse.gov/sites/default/files/docs/the_cost_of_delaying_action_to_stem_climate_change.pdf

carbon pollution decoupled from GDP globally. The International Energy Agency, which reported the finding, cited policy action on energy efficiency and renewable energy as the main factor driving the change.

It was a remarkable signal and—as the impacts of climate change become increasingly visible and acute—it telegraphed a clear message to governments: Your efforts are essential, and you are making a difference. Keep going.

In B.C., the province's existing suite of climate policies is already globally renowned. The carbon tax currently prices pollution from combustion sources at $30 per tonne. The province cancelled two coal-fired power plants and required BC Hydro to source almost all of its electricity from clean and renewable sources. Meanwhile, a low-carbon fuel standard has averted the release of millions of tonnes of carbon pollution from tailpipes across the province.

Independent studies have verified that these climate policies are working. Carbon pollution fell in the province while the economy grew. B.C.'s businesses now enjoy one the lowest general corporate income tax rates in North America and the G7 nations. The province is home to an industry of clean power producers that has attracted billions in investment and provides renewable electricity to 1.5 million homes.

B.C.'s climate leadership policies have telegraphed a signal to investors that the province is open for business in the growing global low-carbon economy. A modest but thriving clean tech sector is creating jobs and innovation in zero-emission transportation, renewable energy manufacturing, high-efficiency building materials, energy intelligence software, and much more.

All of this success is heartening. But carbon pollution levels have started creeping up again and are projected to continue rising. As the province has acknowledged, stronger climate policies will be required to change those projections so that they align with the province's climate targets. The need for stronger policies introduces a second challenge for B.C. in that the competiveness of key sectors such as forestry, mining and natural gas could be negatively affected if B.C.'s climate policies are significantly stronger than other jurisdictions. Focusing on reducing emissions or maintaining competiveness in isolation will lead to failure. It is critical that both challenges be addressed in an integrated manner.

The task of the Climate Leadership Team is to address these two challenges by recommending policy actions that would ensure British Columbia meets its climate targets while maintaining a strong economy. Given the new wave of positive action sweeping the globe in the lead-up to the United Nations Paris climate summit—and the increasing need to act urgently and decisively—the government's timing is fortuitous.

With the opportunity to work collaboratively with a new federal government, now is the time to leverage past successes and renew our commitment to lead. By embracing the actions recommended within this document, British Columbia can build on its experience, significantly bending the curve on carbon pollution while keeping the economy strong.

The Climate Leadership Team understands its mandate to develop recommendations that concurrently achieve to the greatest extent possible the following Cornerstone Objectives:

a) Achieving B.C.'s legislated GHG emission reduction targets;
b) Maintaining a strong economy (including consideration of B.C.'s LNG Strategy and the B.C. Jobs Plan);
c) Mitigating negative impacts on vulnerable populations; and
d) Maintaining B.C.'s reputation for world-leading climate policies.

Considerable research informs our recommendations. While the Climate Leadership Team reviewed options other than those included in our package of recommendations, none were as effective in concurrently achieving the Cornerstone Objectives as those described below.

Given what is at stake, and on behalf of all of our children and their children, we urge the government to adopt the integrated and interdependent package of recommendations we present. A piecemeal approach will not prove effective economically or environmentally.

On behalf of our entire team we thank you for this opportunity. It has been an honour to serve in this important endeavour.

Sincerely, All Members of the Climate Leadership Team

Parliamentary Secretary Jordan Sturdy (MLA), Chair
Tzeporah Berman
Ian Campbell
Michelle Edwards
James Gorman
Linda Hepner
Matt Horne
Paul Ives
David Keane
Susanna Laaksonen-Craig, Ex-officio
Tim Newton
Dr. Nancy Olewiler
Zach Parker
Dr. Thomas Pedersen
Merran Smith
Luke Strimbold
Dr. James Tansey

OVERARCHING FRAMEWORK

Based on a review of its mandate, and a discussion of its mandate with the Minister and the Chair, the Climate Leadership Team focussed its work on developing recommendations for the B.C. government that would concurrently achieve to the greatest extent possible the previously mentioned Cornerstone Objectives. If any one of the Cornerstone Objectives were to be deemed not a priority, the substance of the recommendations of the Climate Leadership Team may well be different.

The recommendations of the Climate Leadership Team are to be considered as a package. Except where otherwise noted, there is consensus on the overall package of recommendations, but it is not to be assumed that there is consensus on individual items within the overall package.

Generally speaking, the Climate Leadership Team has focussed on strategic-level recommendations. It is recognized that successful implementation will require much more in the way of detailed specifics at the policy and program level.

With the assistance of Navius, the Climate Leadership Team undertook extensive modelling of different pathways for concurrently achieving to the greatest extent possible the four Cornerstone Objectives. On the basis of this modelling, and robust discussion of options, the Climate Leadership Team concludes that any pathway that concurrently achieves these four objectives will require the following four elements:

a) An increasing and expanded carbon tax;
b) Adjustment mechanisms within the carbon pricing framework to address both competitiveness impacts on emissions-intensive, trade-exposed industries (with such adjustments being designed in a manner that does not undermine the incentive to reduce emissions) and vulnerable populations;
c) Complementary polices that either enhance the effect of the carbon pricing regime and/or target emissions not effectively reached through carbon pricing; and
d) Periodic review of the foregoing three elements over time.

RECOMMENDATIONS

These recommendations, if implemented in their entirety, will best concurrently achieve to the greatest extent possible the Cornerstone Objectives. Except as otherwise noted, the following represent a consensus of the Climate Leadership Team. The recommendations in this report, and the associated rationale, reflect the opinion of Climate Leadership Members as individuals and do not necessarily represent the views of their employers or any organizations that they belong to. It is important that these recommendations are read and understood within the context of the background and rationale provided for each of them.

GHG REDUCTION TARGETS

Context and Rationale

Targets are an important tool to signal how ambitious a jurisdiction intends to be in tackling climate change. Evidence from many jurisdictions (UK, Sweden, German and the EU as a whole) suggests that setting ambitious targets for GHG reductions, coupled with policies aligned with the target, is an effective way to ensure goal-oriented public policy.

As part of the original Climate Action Plan, B.C. set ambitious greenhouse gas reduction targets. The *Greenhouse Gas Reduction Targets Act* (GGRTA) set B.C.'s GHG emissions to be reduced by at least 33 per cent below 2007 levels by 2020, and at least 80 per cent below 2007 levels by 2050. Interim reduction targets of six per cent by 2012 and 18 per cent by 2016 were also set to guide and measure progress.

B.C.'s 2020 target was ambitious when it was established in 2007 and the original Climate Action Plan included a set of policies that were an important step on the way to that target. Those policies are one of the main reasons why B.C. was able to meet its first interim target in 2012. New policies have not been added to the original policies, which plateaued in 2012. The 2020 target is extremely difficult to meet at this point. Because of these challenges, the Climate Leadership Team's recommendations will not enable the province to meet its 2020 targets.

The 2050 target is within reach with ambitious actions. We also recommend a new 2030 target that is achievable and would put the province on a credible pathway to its 2050 targets. Our recommendations are focused on getting the province on this pathway quickly and remaining on the pathway over time.

In addition, we recommend new 2030 sector-specific targets for industry, transportation, and buildings. These are based on the economic modelling done for the Climate Leadership Team, and in combination they equal the recommended province-wide 2030 target. We believe they will help foster a renewed sense of excitement for B.C., and provide guidance to the government on the more detailed policy development work that will be needed to complement our recommendations.

Recommendation 1
Reaffirm British Columbia's legislated 2050 target of achieving a reduction in GHG emissions of 80 per cent below 2007 levels.

Recommendation 2
Establish a legislated 2030 target of 40 per cent GHG reduction below 2007 levels.

Recommendation 3
Establish the following sectoral GHG reduction goals (below 2015) for 2030

a) *30 per cent for the transportation sector totalling* 6.3 *MT of CO2;*
b) *30 per cent for the industrial sector totalling* 8.4 *MT of CO2; and*
c) *50 per cent for the built environment totalling* 3.4 *MT of CO2.*

FISCAL POLICY

Context and Rationale

Fiscal policy is one of the strongest tools a government can use to encourage or discourage behaviours. Such policies can be helpful tools to encourage investment and reduce carbon pollution. They can also provide flexibility to address specific challenges within a jurisdiction, such as equity and competitiveness challenges for specific sectors. Modelling the Climate Leadership Team's recommendations shows that this suite of fiscal policy recommendations will maintain provincial GDP growth, ensure industry competitiveness and support families and jobs in the province.

Pricing carbon explicitly is an essential policy tool for reducing carbon pollution and building more resilient, low-carbon economies. Currently more than 60 countries, cities, states and provinces use carbon pricing or are planning to implement it. The value of these systems was estimated to be just under $50 billion USD in 2015. These carbon-pricing instruments include carbon taxes, emissions trading systems, and combined systems. The Climate Leadership Team reviewed these various mechanisms and recommends continuing to use a carbon tax as the pricing mechanism in British Columbia.

B.C.'s revenue-neutral carbon tax is the foundation of the province's current climate plan and it applies the same price ($30 per tonne) to almost all fossil fuel combustion in the province. Since its establishment in 2008, the carbon tax has set a price signal to encourage the market's transition to a low-carbon economy. A carbon tax doesn't require specific technologies or behaviours, but by making all renewable energy and energy efficiency options more affordable relative to fossil fuels, it drives a broader adoption of solutions.

Two important aspects of the first phase of the carbon tax were the steady schedule of increases and revenue neutrality. The low starting price that increased gradually on a transparent schedule provided certainty for businesses and investors, and gave them time to make informed decisions. The revenue neutral requirements that were established by the government mean that every dollar collected in carbon taxes is returned to businesses and households via cuts to corporate and personal income taxes. Revenue is also returned through transfers to people with low incomes and in rural and northern communities.

A significant body of evidence points to the conclusion that B.C.'s carbon tax is working both economically and environmentally. Independent research has found that since the implementation of the tax, fuel use in B.C. has dropped by 16 per cent per capita, while it has risen three per cent per capita in the rest of Canada. Within the same timeframe, between 2007 and 2013, B.C.'s real GDP grew 9.2 per cent (more than the Canadian average). The province's fiscal transfers have also assisted low-income households to adjust to a carbon price. Based on this evidence and the economic modelling from Navius, the Climate Leadership Team is recommending that B.C. continue to use our strongest tool to reduce emissions, and recommence the annual increases in the carbon tax starting in 2018, when the

carbon tax freeze ends. The Climate Leadership Team further recommends that the annual increases in the carbon tax are reviewed in five years, however, the modelling indicates that increases in the range of $10 per tonne per year will be required through to 2050 in order to achieve B.C.'s 2050 targets.

We also recommend expanding the carbon tax to include non-combustion sources of carbon pollution that can be accurately measured. Expanding the coverage will allow B.C. to meet its climate targets as cost-effectively as possible as the carbon tax currently covers only the combustion emissions that account for about 70 per cent of B.C.'s emissions. We recommend that this expansion begin in five years to continue improving data quality, and to give the sectors with significant fugitive or process emissions, such as natural gas, coal mining, and cement and metal production, time to plan and make investments to reduce their emissions where possible.

These carbon tax recommendations should not be viewed in isolation because they are just one element of fiscal policy. They should be viewed alongside the accompanying measures we are recommending to maintain B.C.'s economic competitiveness. On an economy-wide basis, and to continue B.C.'s strong support for families and businesses through revenue recycling, we recommend using a major share of the revenue from the carbon tax to reduce the PST by one basis point supported by incremental carbon tax.

Beyond the economy-wide measures, we recommend several targeted measures to maintain or enhance competitiveness – particularly for emissions-intensive, trade-exposed sectors if B.C. moves ahead of the carbon pricing and regulatory policies in place in competing jurisdictions. The government must develop clear policies that protect emissions-intensive, trade-exposed industries because there is a real risk that their competiveness will be materially impacted if the increases in B.C.'s carbon tax exceed the rate at which carbon pricing and regulatory policies are strengthened in competing jurisdictions. Government policies need to avoid an outcome where economic activity shifts from B.C. to another jurisdiction because of B.C.'s carbon tax. We believe that this objective can be accomplished through the targeted use of carbon tax revenue and that this is a preferable approach to waiting for other jurisdictions to strengthen their climate policies first. Doing so will allow B.C. to reduce carbon pollution and maintain the competiveness of the economy – including emissions-intensive, trade-exposed sectors.

The recommendations include the elimination of PST on business and industry electricity rates (residential customers are already exempt). They also include an innovation fund to help establish and grow companies with the clean energy solutions needed globally, including the potential to work in partnership with other funds such as Sustainable Development Technology Canada (SDTC) and Climate Change and Emissions Management Corporation (CCEMC), and support for targeted industries to assist them in remaining competitive.

The impacts of carbon pricing on households – especially low-income households – have also been an important consideration in our deliberations. To help vulnerable communities sustain their disposable income when the carbon tax rate rises, we recommend adjusting the existing low-income and northern/rural tax credits. These adjustments should be based on the best available data to ensure that tax credits are providing an adequate level of support. We also recommend using a portion of the incremental carbon tax revenue to assist communities in making local investments that will help their residents and businesses make lower carbon choices. This could include projects such as district heating systems, car pooling, transit, walking and cycling infrastructure.

The summary of the modelling results supporting these recommendations is in the appendix. The summary results also show that external factors, such as stringency of climate policies in other jurisdictions, have a significant impact on the level of reductions the province will be able to achieve in certain sectors (e.g., if other jurisdictions fail to implement transportation policies as strong as we have recommended, the availability of zero-emission vehicles may be limited). The scale of the LNG development that will unfold in B.C. and the technologies available will also influence the level and timing of achieving the emissions reduction targets and goals.

Recommendation 4
Lower PST from 7 per cent to 6 per cent, supported by incremental carbon tax.

Recommendation 5[3]
Increase the carbon tax by $10/yr commencing in July 2018 and, also supported by incremental carbon tax revenue, concurrently:

a) Maintain those current tax reductions achieved through the existing carbon tax that are broad based, provide support to vulnerable populations, or promote GHG reductions;
b) Adjust the current low income and rural and northern tax credits to ensure the most vulnerable individuals and families are not adversely impacted; and
c) Establish targeted and transparent mechanisms for emission-intensive, trade-exposed sectors that mitigate the competitiveness issues created for those sectors if B.C.'s carbon pricing is materially greater than jurisdictions with which they compete, provided that such mechanisms are structured in a manner that does not adversely impact the price signal to reduce emissions. These adjustments should remain in place until such time that carbon pricing and regulatory policy equivalency with other jurisdictions is achieved.

Recommendation 6
Expand coverage of the current carbon tax to apply to all greenhouse gas emission sources in B.C. after five years, starting with measurable GHG emissions covered by the current reporting regulation.

Recommendation 7
Use the other incremental revenues generated from the increase in the carbon tax to:

a) Eliminate PST on all electricity rates;
b) Establish mechanisms to facilitate investments in technology and innovation that reduce GHG emissions; and
c) Establish mechanisms to provide local governments with funding for projects that will result in demonstrable reductions in GHG emissions.

[3] One CLT member is not in a position to support recommendation 5.

Recommendation 8
The scheduled annual increases in the carbon tax and the competitiveness adjustments for emission-intensive, trade-exposed sectors should be reviewed by the Province, with the support of a Climate Leadership Team, every five years, or more often where warranted, taking into consideration GHG reductions, economic competitiveness, carbon pricing and regulatory policy in other jurisdictions, and impacts on vulnerable communities.

Recommendation 9
The fiscal policies described in these recommendations should be included in the 2016 budget where applicable.

INDUSTRY POLICY

Emerging economic opportunities

The Fiscal Policy recommendations will reduce emissions and are intended to stimulate innovation and jobs within B.C.'s existing industries. There are also new economic opportunities that could become important parts of B.C.'s economy over time – particularly as the global demand for clean energy solutions grows. While some of those opportunities may develop organically over time, we think it is important for B.C. to give more thorough consideration to the province's strengths and how they match with emerging needs and opportunities. This will allow the province to determine if there need to be any additional strategies to target specific economic opportunities.

Recommendation 10
Create a task force with appropriate expertise (e.g. economics, global markets, clean innovation, environment-economy policy) to research B.C.'s competitive advantages and potential growth areas in a low-carbon economy, both within and across sectors, and to develop recommendations on stimulating these areas.

Environmental assessment

New industrial projects typically have lifespans of 30 to 50 years and the environmental assessment process is intended to examine the full project life. In the same way that B.C. is beginning to require project proponents to explore how climate change could impact their project in the future (e.g., changing precipitation patterns impacting a hydro-electricity project), it is important that the Environmental Assessment process also considers how an increasing value on reducing carbon will impact projects over the next 30 to 50 years. B.C. requires a transparent and rigorous environmental assessment process that measures the economic prospects of new development along with the GHG impacts of any project. Adding in the value of carbon treats GHG emissions as any other cost that a proponent of a project must account for in its assessment of viability of the project.

Recommendation 11
Amend the *Environmental Assessment Act* to include the social cost of carbon[4] in the Environmental Assessment process and ensure consistency with the climate action plan and carbon pricing signals.

ELECTRICITY

Under the *Clean Energy Act*, electricity generation is required to be at least 93 per cent renewable. B.C.'s clean electricity supply provides a significant advantage as the province works to reduce emissions by providing businesses and families with a low-emission alternative to fossil fuels. B.C. can build on the existing *Clean Energy Act* and move to a target of 100 per cent renewable electricity by 2025, joining the many cities, states, and nations that have made this leadership commitment.

In the near term, the role of natural gas generation on the integrated grid should be limited to providing backup and ensuring reliable service to customers. In the longer term, the fossil fuel uses should also be phased out as soon as is practicable, as renewable energy technologies mature and costs continue to decline.

There are approximately 60 remote communities — including many First Nations — in B.C. that are not connected to the integrated electricity grid. Most of these communities rely on diesel generation for power supply. While 100 per cent renewable energy alternatives are not always technically feasible, a joint effort of communities, the province, BC Hydro, and federal government agencies will help these communities displace diesel generation with a mix of renewable sources complemented with the efficient use of fossil fuels where necessary.

Recommendation 12
Amend the *Clean Energy Act* to increase the target for clean energy on the integrated grid from 93 per cent to 100 per cent by 2025 (except where fossil fuel capacity is required for back-up or reliability).

Recommendation 13
Establish a strategy (including funding) to phase out, by 2025, diesel generation in remote communities and replace it with reliable, low-GHG electricity service.

NATURAL GAS AND LNG

Natural gas production accounts for 16 per cent of the province's greenhouse gas emissions and is the largest industrial sector. In addition to being a significant provincial source of emissions, it is also the most uncertain due to market forces that affect the potential for LNG development and the accompanying upstream operations, and increased competition from U.S. natural gas for North American markets.

Natural gas production also offers some of the most significant emission reduction opportunities. The modelling and stakeholder information demonstrates the potential for substantial improvements by increasing the use of existing technologies and practices such as electric drive technologies, energy efficiency improvements, carbon capture and storage, and reduced methane leaks. All of these solutions have been used with success in B.C.'s gas sector, but they are not yet commonplace.

[4] The cost of impacts associated with an additional unit of greenhouse gas emissions.

LNG plants offer a similar set of technical opportunities to reduce emissions. The plants can rely on clean electricity instead of natural gas for both the liquefaction process and their auxiliary demands. These technologies are included to varying degrees in the different LNG proposals in B.C., but like upstream gas, they are not yet commonplace across proposals.

In considering the opportunities to reduce emissions from LNG and natural gas in B.C., there are some important positives. As mentioned, most of the technologies are well established and have been used in B.C. in some existing operations and proposed for new ones. Alberta, the province's closest competitor, has recently strengthened its carbon pricing policy and is in the process of a larger update, which is expected to include further progress on carbon pricing. And there is a broader momentum to reduce methane emissions from the oil and gas sector, which has resulted in stronger policies in states like Wyoming, Colorado and Pennsylvania. The U.S. Environmental Protection Agency is in the process of developing similar regulations.

The sector also faces some important challenges that we have accounted for in designing our recommendations. North America now has abundant supplies of relatively low cost natural gas, so B.C. is competing with a number of new suppliers for a limited market. Our recommendations to reduce the PST (generally by 1 basis point and entirely on electricity rates) and make available transitional support for emissions-intensive, trade-exposed sectors are intended to address this reality – particularly if B.C.'s climate policy materially exceeds the stringency of our competitors.

The availability of electricity transmission is also a challenge more specific to the gas and LNG sector. If a proponent wants to use clean electricity instead of gas, they need to be confident that the electricity transmission and supply will be available on the timelines they are advancing their project. Our recommendation for BC Hydro to be able to make supply commitments is intended to address this challenge. One aspect of providing electricity in a competitive, timely manner is ensuring that BC Hydro is able to commit to supply contracts that provide, on reasonable commercial terms used in other jurisdictions in similar circumstances, for damages in the event of failure to deliver new supply within agreed upon time frames and, in the case of LNG, for liquidated damages in the event of interrupted supply. In the event of any damages being payable by BC Hydro, the ratepayers should not bear the burden.

In the event that B.C.'s carbon tax is implemented in a manner recommended, and BC Hydro successfully develops and implements the recommended strategy to develop the competitive, timely supply of electricity to support electrification, an inevitable economic consequence is that within a decade, future LNG projects will take place by way of e-drives or other zero emission technology.

Our recommendations to restart annual increases in the carbon tax in 2018 and broaden the base of the carbon tax in five years are intended to be the main drivers of change in the gas sector. The carbon tax has already worked to improve the business case for electrification and increased energy efficiency, and we are confident that building on this approach will yield results in a way that gives the sector an opportunity to innovate and gives government an opportunity to manage concerns related to competiveness. A potential exception is fugitive and vented methane emissions. While we think the default approach should be to expand the carbon tax coverage, we recognize that methane regulations for the oil and gas sector are evolving rapidly in Canada and the U.S. As a result, it will be important to evaluate the environmental- and cost-effectiveness of those regulations, along with the learning from

B.C.'s five-year effort to reduce methane emissions by 40 per cent, and the anticipated effectiveness of expanding carbon tax coverage.

The five-year window before the carbon tax coverage is expanded to non-combustion sources within the natural gas sector is intended to give the industry an opportunity to make progress reducing GHG emissions. This is particularly true for methane emissions where, based on analysis from Navius, ICF, and B.C.'s natural gas producers, we believe a 40 per cent cut is possible over the five years. This will be a challenging objective to achieve, but the opportunity to take advantage of existing incentives such as offsets and the forthcoming green infrastructure tax credit make it feasible.

We believe that our package of recommendations can help the gas sector contribute to the province's climate goals while also maintaining its competiveness. These efforts will also allow B.C. to contribute to broader efforts in the US and Canada aimed at reducing methane from the oil and gas sector. B.C. can become the preferred jurisdiction when it comes to developing natural gas with near zero emissions.

Recommendation 14
Instruct BC Hydro to develop a strategy (generation and transmission) to supply in a competitive, timely manner the clean electricity required to facilitate electrification of upstream natural gas, LNG, and associated infrastructure. Amongst other things, the strategy should enable BC Hydro to commit to supplying new industrial projects with clean electricity by project start up, if necessary through the use of temporary natural gas generation until transmission infrastructure is available.

Recommendation 15
Reduce fugitive and vented methane emissions by:

a) Establishing a goal of 40 per cent reduction for fugitive and vented methane within five years;
b) Requiring industry through regulation to implement leak detection and repair (LDAR) programs in line with best practices in North America;
c) Developing best practices for methane reduction, including transparent reporting, through a collaborative initiative involving the provincial government, industry, and other stakeholders with expertise in this area (in a manner similar to Colorado and Pennsylvania) and seek alignment with Canada and other provincial jurisdictions in this regard; and
d) Providing that at the time of the first five year review of the Climate Leadership Plan, a new reduction goal for fugitive and vented methane emissions should be established and a determination made whether future reductions in fugitive and venting methane emissions are best achieved through expanding the coverage of the carbon tax to such emissions as provided for in recommendation 6 (the default), a continuation on a voluntary basis of the best practices developed above for methane reduction (provided the industry has reached the 40 per cent methane reduction goal within five years), or such best practices developed for methane being mandated by regulation at that time (with such regulations to be reviewed every five years thereafter).

FORESTRY AND AGRICULTURE

Forestry and the forest sector play a significant role in both climate adaptation and mitigation. Managing B.C.'s forests for improved climate resilience through enhanced silviculture activities and adapting protected areas strategies to address climate adaptation would increase carbon storage, resiliency and future timber supply. The consideration should cover all aspects of climate change resilience from species selection and pest resistance to growing more trees. These outcomes would generate increased economic activity and jobs in the forest sector, as well as in the tourism sector and across B.C.'s economy as a whole.

Programs like "Wood First" encourage the forest industry, government and other stakeholders to advance innovation in B.C.'s forest manufacturing, new products and the built environment through value-added wood products. This helps spur further innovation in other jurisdictions and expand local and global markets for new and existing products, while promoting climate-friendly construction and supporting B.C.'s forest-dependent communities.

Improving the utilization of wood can increase available fibre for all forest products. Improved utilization of lower-quality wood and wood residue provides a fibre source particularly suitable for energy purposes, including bioenergy and new products such as biofuels. There is also an opportunity to improve energy efficiency through fibre-based products used, for example, in insulation. Given the increase in lower quality fibre in B.C. due to the mountain beetle infestation, increased utilization and use of these fibre sources is particularly important.

Climate change will significantly increase the agriculture sector's business risk and management complexity, but will also bring opportunities for the agriculture sector. To reduce the risks and to take advantage of the opportunities, the sector will need to adapt and build climate resilient farm practices in the face of issues such as increasing frequency and magnitude of drought and extreme weather events.

Recommendation 16
Update current forest and agriculture policy, regulation and protected areas strategies to account for climate change impacts.

Recommendation 17
Update current forest policy and regulation to increase utilization of forest residue for energy purposes and increase carbon sequestration.

Recommendation 18
Create a task force with appropriate expertise to review and update carbon management best practices for the agriculture sector.

TRANSPORTATION

Context and Rationale

Transportation is responsible for 37 per cent of emissions in B.C. We now have the technologies – such as biofuels and hybrid-electric vehicles – to enable a transition to zero and low-emission transportation options. Our recommendations focus on making these technologies and fuels available to individuals and industry across the province.

The existing acts, regulations and standards provide a solid foundation for further action. The Low Carbon Fuel Standard is among B.C.'s most successful policies for reducing greenhouse gas emissions — takes the equivalent of 190,000 cars off the road every year. Keeping that success going requires increasing and expanding the standard.

The Greenhouse Gas Reduction (Clean Energy) Regulation, announced in May 2012 and enabled under the *Clean Energy Act*, allows utilities to offer incentives for natural gas vehicles and to build natural gas vehicle fuelling infrastructure. The Regulation also allows utilities to make time-limited investments with spending caps on expenditures, in total up to $102 million over five years, in order to "kick-start" the natural gas vehicle market.

B.C. also has legislation for a zero-emission vehicle standard, but has yet to implement it. Since cars and trucks account for 13 per cent of B.C.'s total emissions, it is necessary for car buyers to have cleaner options. This standard would increase zero-emission vehicle choices for consumers in the province by mandating sales targets for electric vehicles. Leading jurisdictions, such as California, have used this standard to successfully drive electric vehicle adoption. Canadian research also shows that a zero-emission vehicle standard is the optimal policy for increasing zero-emission vehicle sales[5].

This combination of policies would work to give B.C. businesses and individuals access to the affordable vehicles and fuels necessary to run B.C.'s economy while meeting its climate targets.

Building on expertise already in B.C. and on the availability of natural gas and propane in the province also creates opportunities to reduce transportation emissions. Supporting both the vehicle and fuelling infrastructure simultaneously is important to maximize the impact of the policies. Improved commercial transportation efficiency can also be achieved through, for example, larger vehicle size, which reduces both the number of vehicles on the road and the total fuel used and GHG emissions produced to transport a given payload.

Recommendation 19

Develop a low-carbon transportation strategy for transitioning the transportation sector to emit 30 per cent fewer GHGs by 2030 including the following key elements:

a) Establishing the following Zero Emission Vehicle targets for the sale of new light duty vehicles:
   i) 10 per cent of sales by 2020;
   ii) 22.5 per cent of sales by 2025; and
   iii) 30 per cent of sales by 2030;
b) Increasing the Low Carbon Fuel Standard to 20 per cent by 2030;
c) Broadening the LCFS coverage to include all vehicle fuel use with the exception of aviation fuel;
d) Enhancing incentives and infrastructure necessary to support both increased commercial transportation efficiency (size of vehicles) and natural gas/propane conversions in the commercial transport sector (including marine); and
e) Establishing revenue neutral PST for all vehicles based on grams of CO2 per km, similar to many European vehicle registration systems.

[5] Axsen, Jonn. (2015) Electrifying Vehicles: Insights from the Canadian Plug-in Electric Vehicle Study. http://www.rem.sfu.ca/people/faculty/jaxsen/cpevs/

BUILDINGS

Context and Rationale

Buildings represent 11 per cent of B.C.'s total greenhouse gas emissions. The province has significant opportunities to reduce the amount of energy that buildings need, meet those needs with clean electricity instead of fossil fuels, and increasingly rely on materials that store carbon (e.g. wood) to build them. By acting on these three opportunities, B.C. can reduce carbon pollution, cut energy and carbon costs, and improve comfort and indoor air quality. The province's building sector has the skills and experience to help with this transition.

Modelling of our recommendations finds that B.C can reduce emissions by 50 per cent by 2030, which is the target we have consequently recommended for the sector. To achieve that outcome, we have highlighted four buildings-specific recommendations that are designed to complement the fiscal policy recommendations: accelerate improvements in the building code's energy efficiency requirements, provide further public sector leadership for government's own buildings, target programs for existing buildings, and enhance standards for heating equipment and appliances.

B.C. can maximize the benefits from these recommendations if their objectives and implementation are aligned over the next 10 years. Doing so will provide a longer planning horizon for the province, local governments, and industry that can set up bigger gains that wouldn't be possible with less foresight and leadership now. Experiences such as Brussels', which saw energy efficiency requirements in new construction transform from amongst the worst in Europe to amongst the best over an eight-year period, give us confidence that B.C. can achieve these benefits over the next decade. Doing so will require the province to start quickly and develop and commit to a long-term roadmap.

Affordability for building owners, occupants, builders, developers, and the provincial government is a critical consideration. As a first step, constructing higher performance buildings and upgrading existing ones will reduce energy and carbon costs, and help offset the costs of making those investments. We also recommend financing programs to help British Columbians and B.C. businesses access the capital needed. Support for training, more efficient permitting, increased building code compliance and a simplified code will also support better results and help to manage costs. And where possible, we recommend working in partnership with leading jurisdictions such as California and the Pacific Coast Collaborative to achieve and maximize economies of scale.

The buildings sector also represents an important economic export opportunity to the province, particularly as it relates to new buildings. Our recommendations would see increasing use of wood products and a rapid transition to buildings that are energy efficient enough to be able to meet most of their energy needs with on-site renewable energy (e.g., equivalent to net zero ready or Passive House standards). In taking a leadership role in moving towards these higher levels of performance, B.C. will be well positioned to supply the design and construction expertise, and building materials to other jurisdictions.

Recommendation 20

Establish by 2016 a buildings strategy that by 2030 reduces greenhouse gas emissions from the sector by 50 per cent, and includes the following core elements:

a) Commencing in 2016, require that all new public sector buildings increase the use of materials that sequester carbon, and have the capacity of meeting most of their annual energy needs by on-site renewable energy;
b) Revisions to the building code that require new buildings to (i) increase use of materials that sequester carbon and (ii) have the capacity of meeting most of their annual energy needs by on-site renewable energy within 10 years;
c) Programs (such as on-bill financing) that encourage retrofits that reduce GHG emissions and encourage energy efficiency in existing building stock; and
d) Standards that transition the market to high-efficiency electric heating equipment, building components and appliances.

COMMUNITIES

Context and Rationale

Communities have influence over approximately 40 per cent of greenhouse gas emissions in British Columbia and are a key partner in reducing greenhouse gas emissions. The B.C. Climate Action Charter has been a successful approach to encourage communities to take action, and 96 per cent of all local governments have signed the Charter. By signing on, local governments commit to measure and report on their community's greenhouse gas emissions profile. They will also work to create compact, more energy efficient communities and accelerate the uptake of district energy systems, renewable energy, and green and resilient infrastructure. The Climate Action Revenue Incentive program offsets the carbon tax for local governments who have signed the B.C. Climate Action Charter.

We recommend that the B.C. government and municipalities reinvigorate their relationship around the Climate Action Charter and focus on taking it to the next level.

A significant share of all food is wasted. About half occurs at the household level and the rest through production, processing, transportation and retail of food. Reducing waste would save businesses and consumers money, and reduce waste disposal costs. Improved organic waste diversion would prevent the loss of organic waste as a resource.

While the analysis shows only modest greenhouse gas emissions reductions from mode shifting in the long-run, in the short-run a variety of measures can facilitate emissions reductions, including improved transit access, reliability and frequency, as well as the creation of communities more conducive to transit, walking and biking.

Communities have also been dealing with climate variability and extreme weather events for decades, and have developed forecasting and preparedness tools and processes to cope. As the frequency and severity of weather events increase, communities will need new information as well as new resources and strategies to empower them to apply their existing knowledge, and to continue to offer their residents a stable environment in which to live, grow and work.

Communities are not unique in their need to adapt to climate disruption. Broad action is required across the economy and land base. However, the adaptation recommendations are captured in this section as many of the impacts are experienced by communities and their residents.

Risk management begins with clearly assessing the sources of risk. Adequate protections can then be resourced and put in place over time. Monitoring the sources of risk, the level of preparedness and the success of solutions when they are deployed will allow communities to ensure they are sufficiently protected from the potential economic and ecological impacts future climate change may bring.

Recommendation 21
Undertake a collaborative review and update of the Climate Action Charter to align provincial and community goals.

Recommendation 22
Create a waste-to-resource strategy that reduces GHG emissions associated with food waste, organic waste, and landfills.

Recommendation 23
Support increased use of public transit and other mobility options that reduce GHG emissions.

Adaptation

Recommendation 24
Undertake the following actions regarding climate change adaptation and mitigation:

a) Update by 2020 hazard maps for all climate related hazards;
b) Invest in sufficient monitoring systems, especially in the areas with monitoring information gaps, to ensure the change can be managed effectively;
c) Develop a policy framework to guide the provincial government's management of the risks associated with a changing climate; and
d) Increase communications to public.

FIRST NATIONS

Context and Rationale

First Nations communities are an important part of the cultural and economic fabric of British Columbia. As with new resource development, infrastructure programs and revenue generation in the province, First Nations governments and the provincial government will need to collaborate and partner. This will help ensure that already vulnerable and under-resourced First Nations communities are not excluded from the benefits of a climate resilient strategy. It will also include them in the potential future economic benefits of adopting innovative approaches to reduce emissions and energy consumption. First Nations have strong potential to champion clean economic growth that respects the values they hold for nature and their communities.

Over hundreds of years, First Nations have developed a deep understanding of the land and hold extensive traditional knowledge that can benefit the existing data, information and knowledge regarding B.C.'s land base. First Nations are also uniquely positioned to implement adaptation on the land base.

Climate change pays no attention to cultural or economic differences, but access to adequate solutions is often limited by these differences. All British Columbians should have access to similar programs to ensure their families and communities are prepared and resilient.

Recommendation 25
Adaptation

a) Traditional knowledge should be used when appropriate and available as part of the hazard mapping information.
b) Allocate appropriate resources for research and modelling of the impacts of climate change on the inherent and treaty rights of indigenous people.

Recommendation 26
Work with First Nations communities and federal agencies to ensure transition to reliable, low GHG electricity service in communities currently dependent on diesel generation.

Recommendation 27
Ensure the First Nations clean energy business fund effectively enables new business opportunities.

OFFSETS

Context and Rationale

Greenhouse gas offsets have played a vital role in the development of international climate agreements and are an important vehicle to convey technology and financial assistance to developing countries. Many jurisdictions—including B.C., California, Canada and the European Union—have used offset programs to make it possible to adopt stronger reduction targets while managing the economic impact on their economies and stimulating innovation. As offsets allow for one unit of carbon pollution in exchange for one unit of reduction, offsets must be credible, additional, and conform with stringent international standards and jurisdictional regulations.

B.C. has an offset program operated under legislation. The province could expand the use of offsets beyond the Carbon Neutral Government Program to specific industrial sectors, or use them to help meet provincial carbon reduction targets. The amount of offsets permitted and the timeline for using them should be limited in B.C. to ensure they don't become a barrier to reducing carbon pollution directly.

Limited use of high-quality, credible greenhouse gas offsets from other jurisdictions could make additional funds available to invest in higher-cost innovative reduction technologies in B.C., and those technologies could be exported once developed and proven. Like taking out a loan to allow a business to invest in the equipment it needs to generate revenue, offsets can provide a short-term financial bridge to lower-cost, larger-volume reductions. However, given concerns about the credibility of offsets from some jurisdictions outside of B.C. and their ability to ensure greenhouse gas reductions, any external offsets considered should meet or exceed the standards set in B.C.

Recommendation 28
Undertake a review of the current offset policy to determine if changes are required to support the new Climate Leadership Plan.

INTERGOVERNMENTAL RELATIONS

Context and Rationale

Major jurisdictions around the world are currently moving aggressively with new greenhouse gas reduction strategies and commitments, including the United States, China and the European Union. In Canada, there is significant effort underway in a number of jurisdictions to develop and implement policies that address climate change at multiple levels. Currently, Quebec is pricing carbon through an emissions trading system with California under the Western Climate Initiative and Ontario has announced it intends to join this cap and trade system. Furthermore, carbon policy in Alberta is also under review.

Recommendation 29
If the majority of Canadian provinces opt for carbon pricing via emissions trading to cover greenhouse gases from large final emitters, a review should be undertaken of mechanisms to integrate a carbon tax with a cap and trade framework for the B.C. context.

Recommendation 30
British Columbia should work closely with the federal government and the other provinces, as well as with the other jurisdictions in North America to achieve parity with B.C.'s climate action policies.

Recommendation 31
British Columbia should take leadership in seeking alignment with Canada and other provincial jurisdictions regarding best practices for methane reduction from the oil and gas sector, including transparent reporting and carbon pricing and regulatory policies.

PERIODIC REVIEW

Context and Rationale

Once targets are set, they must be reviewed periodically to ensure they remain relevant and B.C. makes progress toward meeting them. This periodic review is critical to maintaining momentum in transitioning away from fossil fuels to low-carbon targets for 2050. Emissions levels, economic impacts, costs to households and quality of life, business conditions, and actions taken by other jurisdictions are all factors that will shift over time. As such, they require monitoring and adjustments in the focus and degree of effort expected from specific policies, programs, communities and technologies. Regular review and monitoring will allow B.C. to intentionally adjust its strategy and tactics as needed to ensure success.

A changing climate will bring new challenges for generations. The sooner a jurisdiction can adopt approaches to monitor climate change and its impacts, the sooner a dynamic platform can be established to support a vibrant low-carbon economy and a resilient environment.

A five-year review cycle will allow time for new policies to take hold and demonstrate their effectiveness. A five-year cycle is also likely to be needed to cull or revise underperforming or ineffective policies and programs, to allow for timely and efficient redeployment of climate action resources.

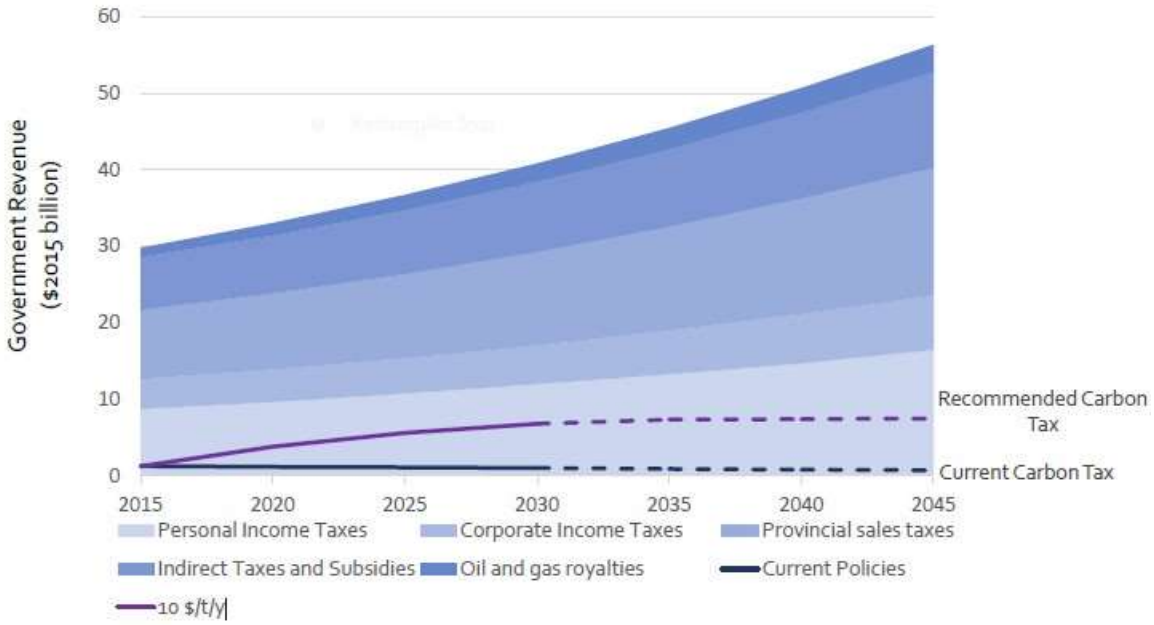
As the climate changes, B.C.'s critical economic, ecological and food supply sectors—such as agriculture, energy, forestry and fisheries—will need closer management attention. This will help ensure they are sustainable under long-term climate scenarios and have adequate assistance surviving short-term extreme climate events. Reviewing B.C.'s climate targets and progress every five years balances timeliness and cost-management considerations appropriately, in recognition of B.C.'s size and complexity.

Recommendation 32
Government should undertake a review of its Climate Leadership Plan and policies at least every five years supported by a Climate Leadership Team.

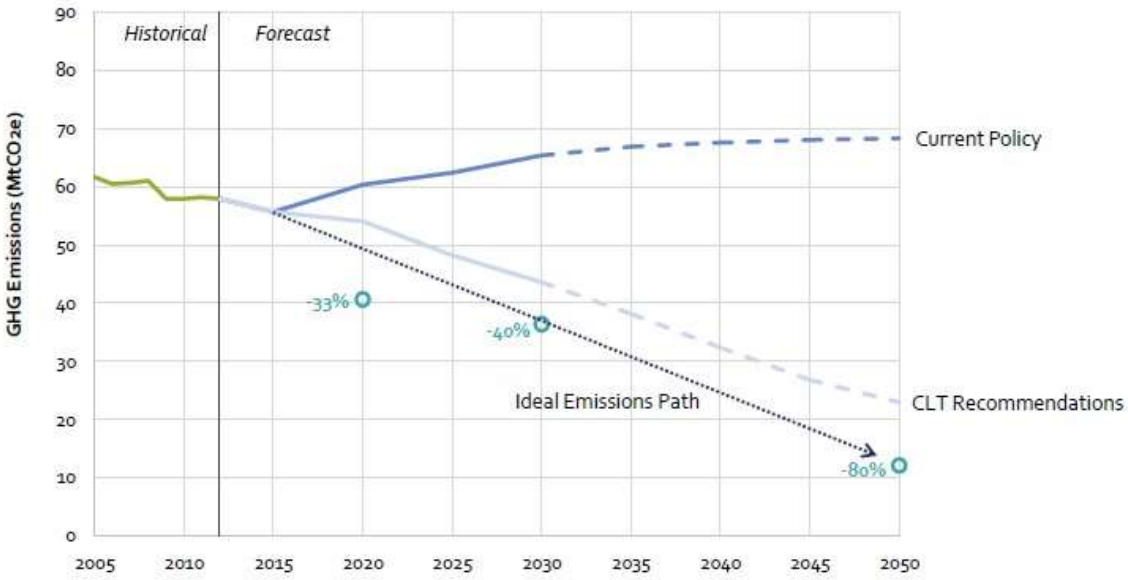
Appendix

Summary of Modelling Results

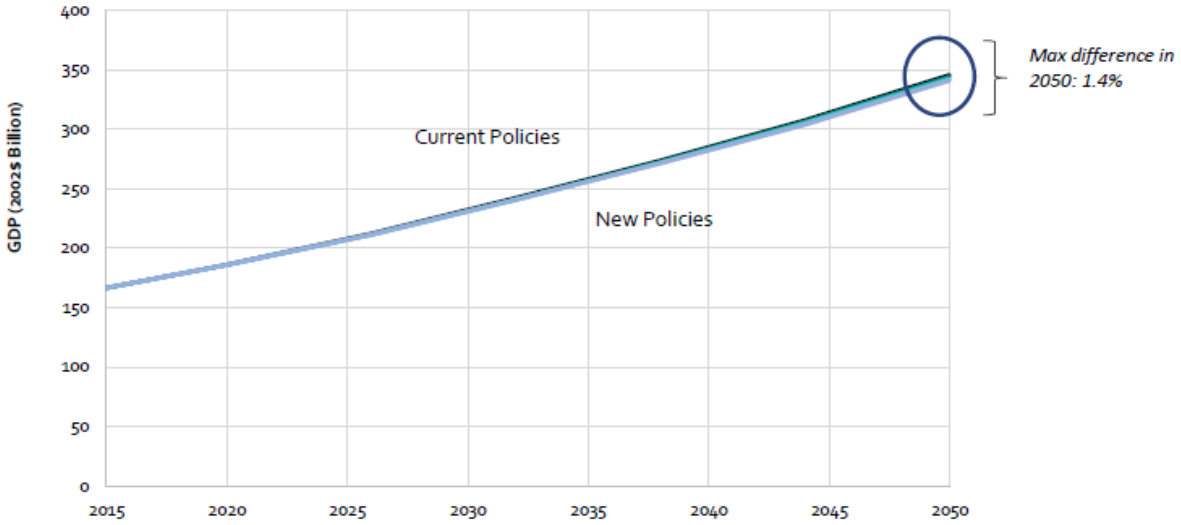
Carbon tax revenue forecast



Greenhouse gas emissions forecast



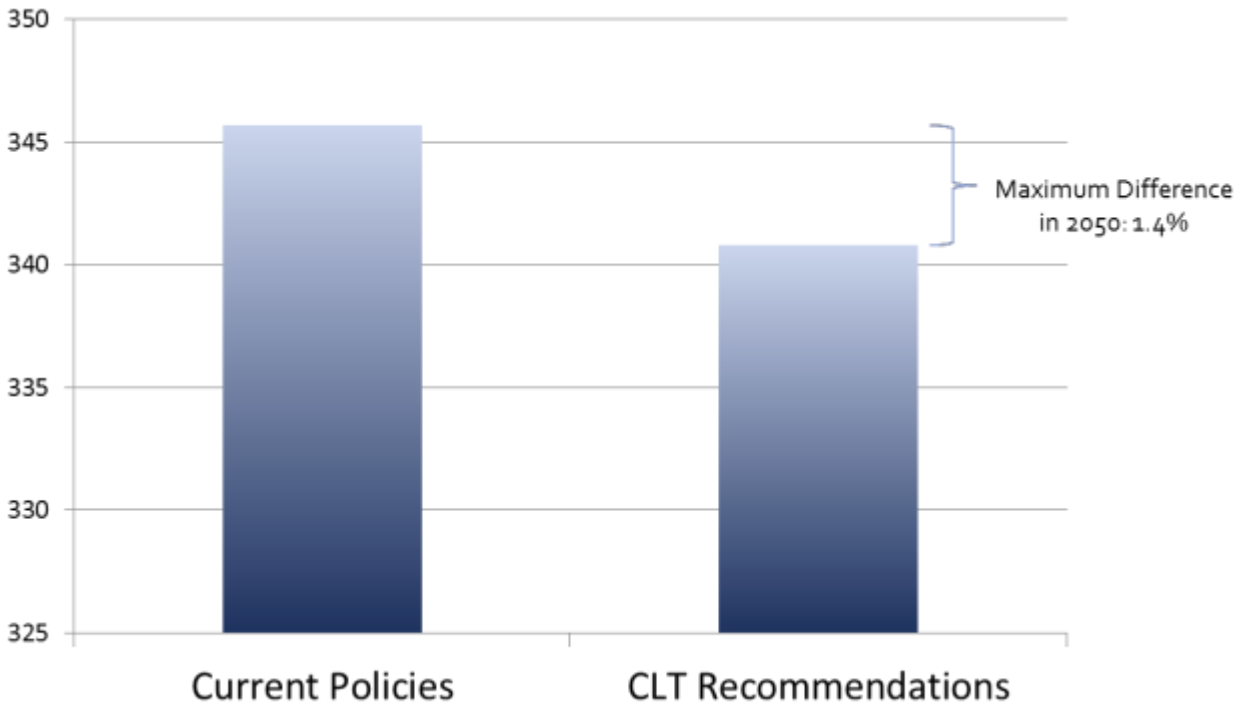
Provincial GDP forecast



Economy continues to grow - Average annual growth in GDP, 2015-2050

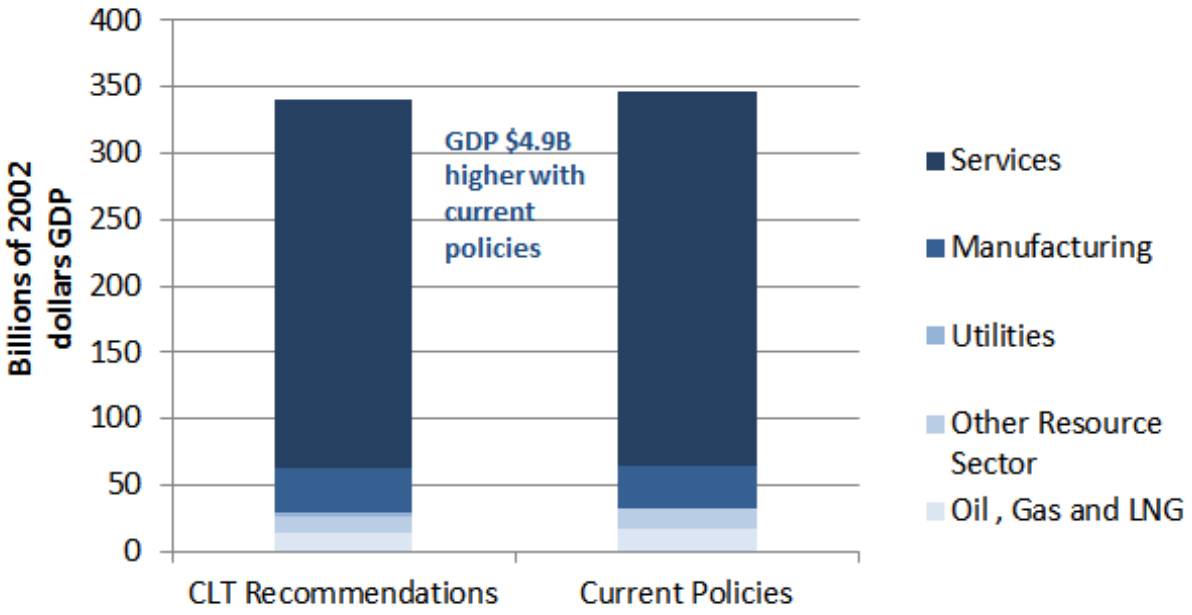
- Current Policy: 2.11%
- CLT Recommendations: 2.07%

Provincial GDP forecast for 2050

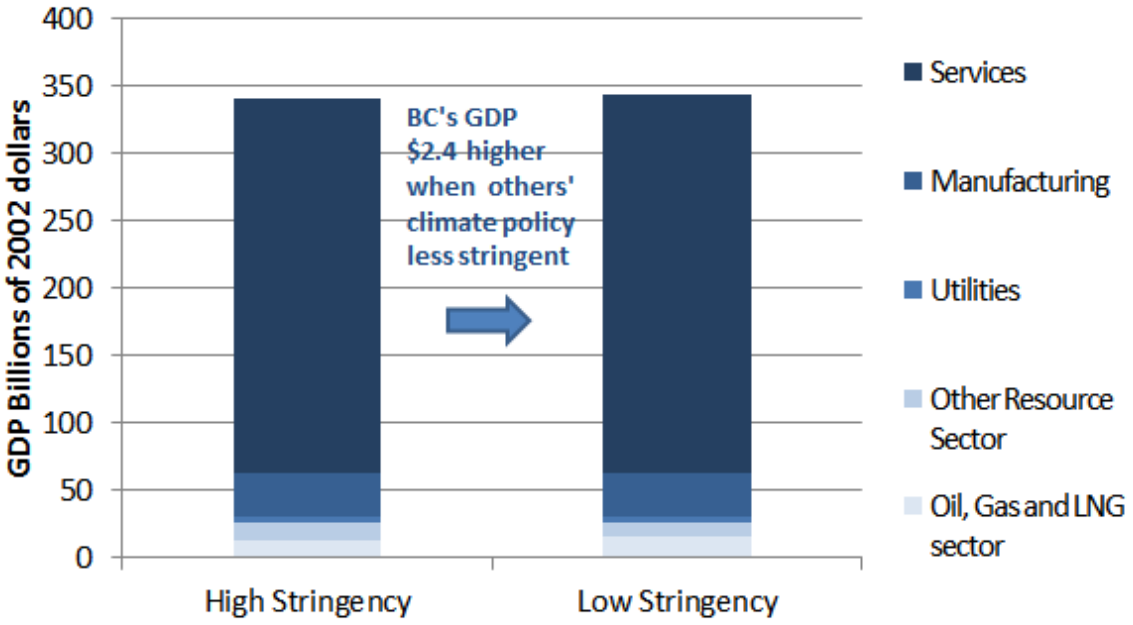


Economy continues to grow – The forecasted maximum difference is small

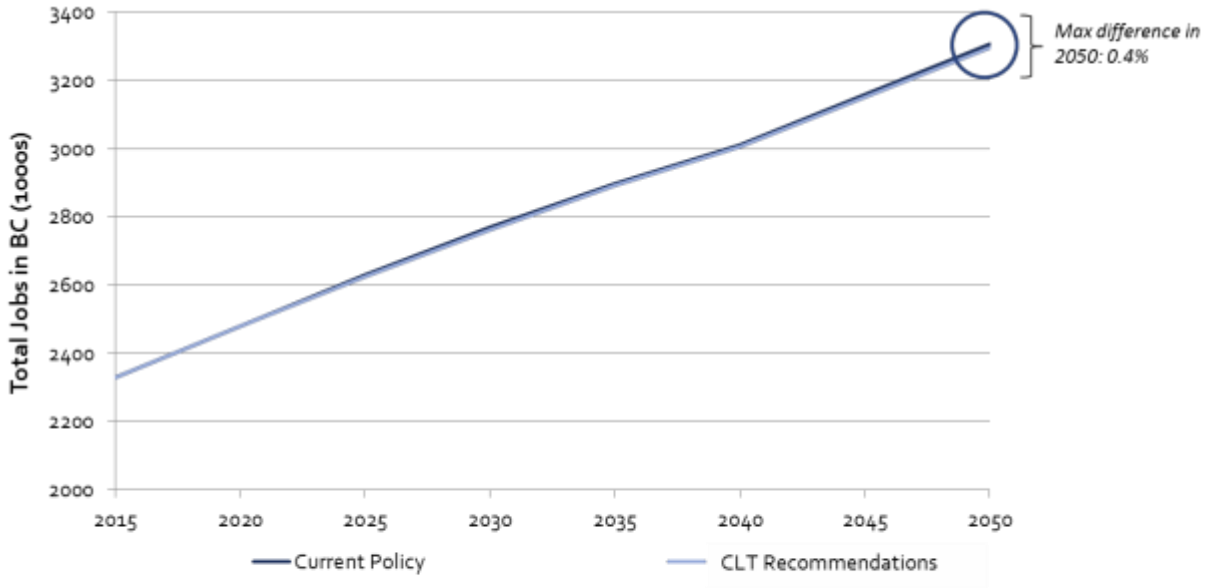
Provincial GDP forecast for 2050 by sector



2050 GDP forecast – effect of other jurisdictions

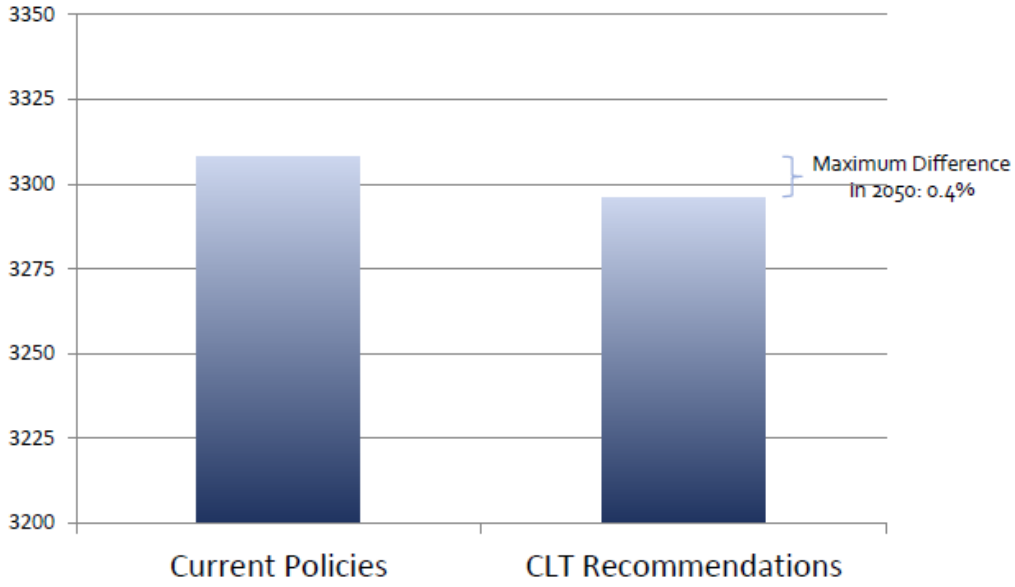


Provincial jobs forecast



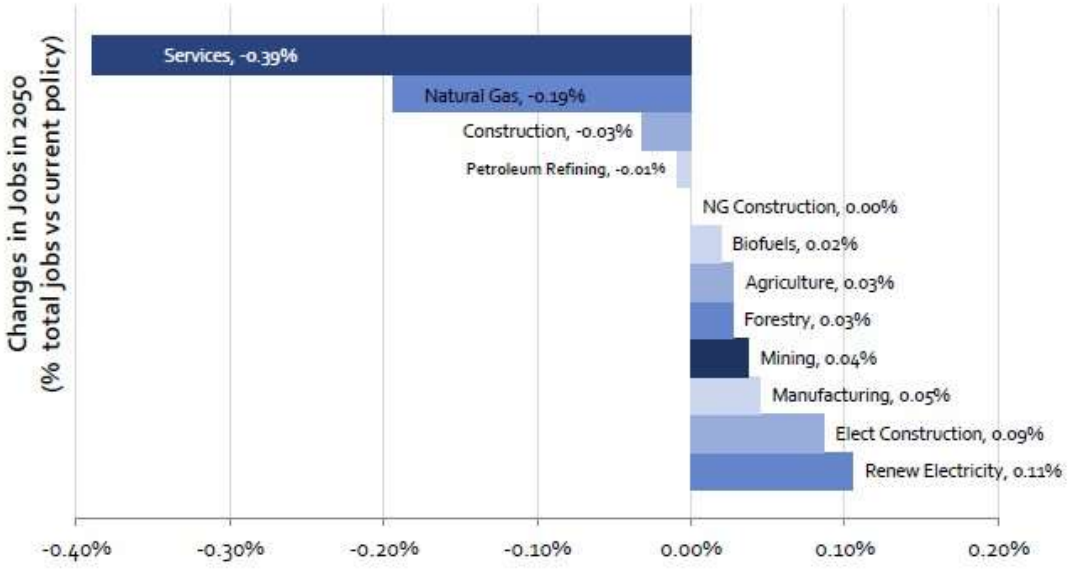
Climate policy will not have a large impact on jobs. Total jobs in BC will be in the millions, whereas the impact of climate policies will be in the thousands

Provincial jobs forecast for 2050



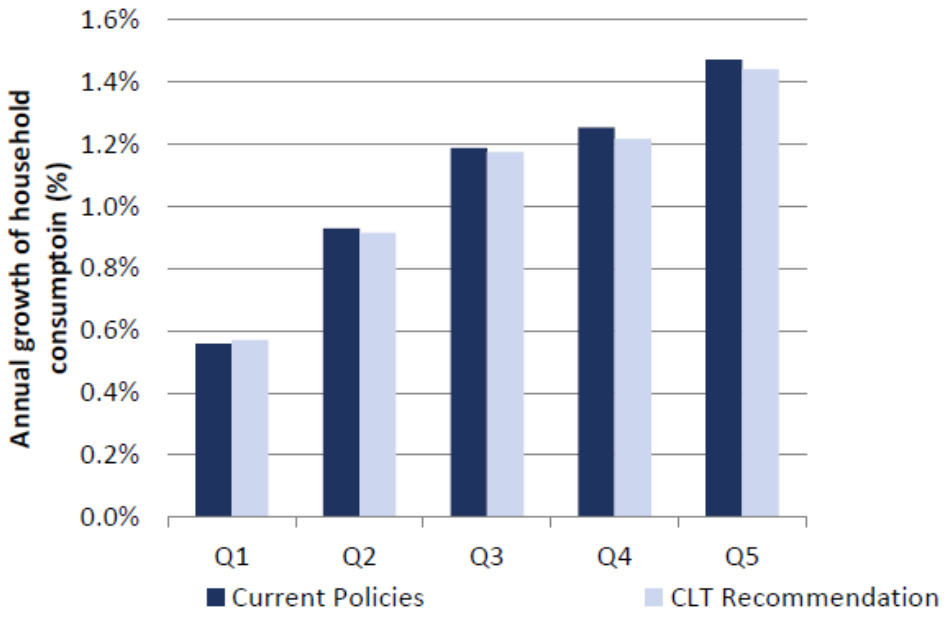
The jobs continue to increase – The forecasted maximum difference is small

Provincial jobs forecast for 2050 by sector



Like with GDP, the job outcomes of different sectors vary.

Potential distributional impacts



Household consumption continues to grow in each quintile. In general, the impact of the policies are felt most by the wealthiest households (i.e., households in the top two quintiles).

Summary of forecasted fiscal impacts

The estimated fiscal impacts are based on the policy assumptions used in the Navius modelling. As such, they need to be considered illustrative, order of magnitude estimates. A diligent analysis will need to be conducted by the Finance Ministry to fully examine the fiscal impacts. The Climate Leadership Team is not suggesting to have revenue and expenditure to be out of balance and has not, for example, explicitly recommended a PST 1% cut in 2018 in their recommendation 4. The Climate Leadership Team suggests that government consider phasing in the tax reductions, tax credits, targeted measures for emissions-intensive, trade-exposed sectors, and other fiscal expenditures at a rate that more closely matches incremental revenue.

Estimated Fiscal Implications of the Recommendations										
($bn unless otherwise mentioned)										
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Rate ($/t)	30	30	40	50	60	70	80	90	100	110
Scope (Mt) - illustrative, no emissions resp	44	44	44	44	44	44	44	60	60	60
Revenues existing ($bn)	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Revenues new ($bn)			0.28	0.56	0.84	1.12	1.4	2.86	3.22	3.58
Revenues total ($bn)	1.2	1.3	1.58	1.86	2.14	2.42	2.70	4.16	4.52	4.88
Existing tax cut package:										
corporate $bn	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
personal $bn	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Low income and rural and Northern $bn	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
New Tax Cut Package										
PST 1% cut			0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Low income household adjustment total			0.27	0.31	0.35	0.39	0.43	0.79	0.85	0.91
Low income/households adjustment new			0.04	0.08	0.12	0.16	0.2	0.56	0.62	0.68
Targeted EITE measures %			31.40%	31.40%	31.40%	31.40%	31.40%	41.00%	41.00%	41.00%
Targeted EITE measures $bn			0.50	0.58	0.67	0.76	0.85	1.71	1.85	2.00
PST elimination for electricity			0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Total Tax Cuts	1	1	2	2	3	3	3	4	4	4
Net Revenues	0	1	-0.7	-0.5	-0.4	-0.2	-0.1	0.2	0.3	0.5
Technology Fund								0.08	0.15	0.23
Local Government								0.08	0.15	0.23

Professional Engineers and Geoscientists of BC

PROFESSIONAL PRACTICE GUIDELINES

HUMAN RIGHTS AND DIVERSITY

TABLE OF CONTENTS

GUIDELINES UPDATES

Version	Effective Date	Remarks
1.0	day|month 2016	Original version Approved by APEGBC Council on day|month 2016 (CO 2016-xx)

1.0 FOREWORD

The Professional Practice Guidelines published by the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) provide guidance on professional practice and conduct for APEGBC members.

2.0 DEFINITIONS

For the purposes of these Guidelines, the following terms and definitions apply.

APEGBC professional
A member or a licensee of the *Association*.

Association
The Association of Professional Engineers and Geoscientists of British Columbia (APEGBC).

Discrimination
Treating people differently because of some personal particular attribute such as race, gender, religion or disability.

Diversity
The inclusion of different types of people - such as people of different genders, sexual orientations, races, cultures, religions, physical or mental ability - in a group or organization.

Harassment
A particular type of *discriminatio*n which occurs when a person is subjected to any unwanted behaviour that offends, demeans or humiliates. See also *sexual harassment*.

Prejudice
An opinion formed without taking time and care to judge fairly, often based on incomplete and stereotyped information.

Reasonable accommodation
A legal duty requiring that, in some cases, policies, rules, conditions or agreements that impact on work must be altered when a person requires accommodation in order to obtain work or maintain employment.

Sexual harassment
Unwanted sexual advances, unwanted requests for sexual favours and other unwanted verbal or physical conduct of a sexual nature that offends, demeans or humiliates an individual on the basis of sex. See also *harassment*.

Unprofessional conduct

Conduct that does not meet the standard expected through the application of the APEGBC Code of Ethics or is a marked departure from the standard to be expected of an APEGBC professional; it does not include minor or inadvertent failure to comply with professional standards.

Workplace environment
All of the objects, people, circumstances and atmosphere – mental, moral or physical – surrounding a person in the performance of the job.

3.0 INTRODUCTION

3.1 Purpose

The purpose of these Guidelines is to provide education to APEGBC professionals regarding human rights and *diversity* issues that are relevant in professional practice.

The failure of an *APEGBC professional* to follow one or more aspects of these Guidelines does not necessarily mean a failure to meet required professional obligations. Such judgments and decisions depend upon weighing facts and circumstances to determine whether a reasonable and prudent *APEGBC professional*, in a similar situation, would have conducted himself or herself similarly.

3.2 Role of the Association

APEGBC recognizes the importance of fostering a *workplace environment* that welcomes all of the increasingly diverse members of our society and enables them to contribute to their full potential. APEGBC encourages its members and licensees to be proactive in improving the *workplace environment* for all employees, clients, and associates and in addressing issues such as *discrimination* and *harassment*.

3.3 Scope

The dynamics involved in a professional's relationships with other professionals, clients, employees and other associates can include power, authority, control and trust. These integral characteristics require a heightened awareness and understanding of the issues associated with such relationships. *APEGBC professionals* are expected to behave in a manner that exemplifies and supports the fair and courteous treatment of others, as required by Principle 7 of the APEGBC Code of Ethics.

These Guidelines:

- set forth APEGBC's human rights statement policy and encourage *APEGBC professionals* to be proactive towards protection of human rights and the fostering of *diversity* in the *workplace environment;* and
- are not intended as legal advice, but as a concise summarization of contemporary human rights issues that are relevant to professional practice.

3.4 Acknowledgements

These Guidelines have been prepared by Gilbert Larocque, CD, PEng, LLB, FEC, Associate Director, Professional Practice of the Association of Professional Engineers and Geoscientists of British Columbia, based on materials gratefully received from the Association of Professional Engineers and Geoscientists of Alberta.

The Guidelines were reviewed by;

- the APEGBC Leadership Team; and
- (*organizations and prominent reviewers to be added following the consultation process*).

4.0 GUIDANCE FOR PROFESSIONAL PRACTICE

4.1 Human Rights Legislation

Governments throughout Canada have enacted legislation that seeks to eliminate *discrimination*, particularly within the workplace. In British Columbia, all employers (including corporations, unions, professional organizations and the Crown) are governed either by the *Canadian Human Rights Act, RSC 1985, c. H-6* or the British Columbia *Human Rights Code,* RSBC 1996, c. 210. Employers may be held liable for the actions of their employees.

The *Canadian Human Rights Act* and the British Columbia *Human Rights Code* are distinct pieces of legislation, each independent of the other with neither taking precedence over the other. Each act has its own area of jurisprudence. Employers whose businesses are registered in provinces across Canada (e.g. airlines, banks) to serve a national interest are under the jurisdiction of the Canadian *Act*. Those employers with businesses in British Columbia are subject to British Columbia's *Code*. Each of the human rights legislation is administered

by a human rights commission or tribunal that has authority to act in its own area of jurisprudence.

Within their own jurisdictions both human rights acts have primacy, meaning that the enacted human rights act supersedes all other laws of that jurisdiction, unless expressly declared by an act of Legislature or Parliament. The acts are similar, but not identical, and both title and contents change from time-to-time as each jurisdiction reviews its legislation. Members of APEGBC should determine which statute is applicable to them and familiarize themselves with their content.

4.2 APEGBC Human Rights Statement

APEGBC affirms the fundamental principle that all persons have the intrinsic human right to be treated fairly and with dignity. The Association expects *APEGBC professionals* to conduct themselves in a manner that promotes and encourages recognition of this right. Any *discrimination*, *harassment* or intimidation that violates the human rights of others is improper and offensive. Any such action perpetrated or condoned by an *APEGBC professional* is unacceptable and may constitute *unprofessional conduct* or a breach of the APEGBC Code of Ethics.

As such, all *APEGBC professionals* are encouraged to respect the human rights of others, and to:

- be proactive in understanding human rights issues;
- be familiar with applicable laws;
- take action where appropriate to protect human rights; and
- be vigilant against *discrimination* and *harassment*.

Furthermore, all *APEGBC professionals* who are responsible for establishing organizational policies, or who can influence those policies, should take action to:

- provide a *workplace environment* that fosters mutual respect and good interpersonal relations;
- establish human rights policies within their organizations;
- establish policies to prohibit *discrimination* and *harassment*;
- establish effective procedures to deal with incidents;
- foster *diversity* in the *workplace environment*; and
- provide effective education programs for all employees.

Human rights commission offices can be contacted for assistance with creating and implementing effective human rights policies. *APEGBC professionals* are encouraged to take advantage of this source of information.

4.3 *Discrimination*

Discrimination occurs in the workplace when people are treated differently because of some particular attribute such as race, gender, age, disability, culture or other attribute including those listed in the human rights codes. Within the *workplace environment*, *discrimination* may occur in many forms, some blatant, others subtle. A simple test for *discrimination* asks: "Would an individual be treated in this manner if he or she were not <e.g. First Nation, female>?"

4.3.1 Grounds for *Discrimination*

The *Canadian Human Rights Act* and the British Columbia *Human Rights Code* each list prohibited ground of *discrimination*. As of April 2016 [check and update immediately prior to APEGBC Council approval], the listed prohibited grounds of *discrimination* with respect to employment practices, job advertisements and applications, and membership in trade unions, or employers' organizations were:

Prohibited Grounds	British Columbia	Federal
Race or Colour	Yes	Yes
Religion	Yes	Yes
Sex (male, female, transgender including pregnancy or childbirth	Yes	Yes
Physical or Mental Disability (including drug and alcohol dependencies)	Yes	Yes
Age	Yes	Yes
Ancestry or Place of Origin	Yes	No
National or Ethnic Origin (including linguistic background)	No	Yes
Marital Status	Yes	Yes
Family Status	Yes	Yes
Sexual Orientation	Yes	Yes

Pardoned Conviction	No	Yes

4.3.2 Types of *Discrimination*

Human rights acts prohibit *discrimination* on specific grounds. Human rights commissions have moreover recognized and defined three types of *discrimination* that may invade the *workplace environment*. They are:

- direct *discrimination*;
- adverse effect *discrimination*; and
- systemic *discrimination*.

These types of *discrimination* are discussed below.

4.3.3 Direct Discrimination

Direct *discrimination* occurs, with intent, because a person possesses some attribute against which there is *prejudice*. Weak excuses may be invented to justify the *discrimination*, but under scrutiny, these "rationalizations" usually prove secondary to the actual reason(s) motivating the position or actions taken.

Example 1 – Direct *Discrimination* (Physical Disability)

After being diagnosed with cataracts, the employee went on disability leave. Three years later, her prognosis improved and she was found able to return to work. The employer refused. The British Columbia Human Rights Tribunal, the BC Supreme Court and the BC Court of Appeal successively held that the employer's refusal to return the employee to work was adverse treatment and that the disability was a factor in the refusal.

Boehringer Ingelheim (Canada) Ltd. v. *Kerr,* 2011 BCCA 266.

4.3.4 Adverse Effect *Discrimination*

Adverse effect *discrimination* occurs when policies, rules, conditions or union agreements are applied to all employees. Usually there is no intent to

discriminate against anyone; however, as every employee is expected to comply regardless of individual circumstances, *discrimination* may occur.

Example 2 – Adverse Effect *Discrimination* (Employer Policies)

Every crew person working in a fast-food restaurant was expected to meet the employer's hand-washing policies which called, amongst other requirements, for crew persons to wash their hands at least once an hour. The employee developed a form of hand dermatitis that was aggravated by the frequent hand-washing, to the point where the employee could no longer work and went on long-term disability. The employer failed to inform itself of the nature and extent of the disability of the employee, and to perform and evaluation into accommodation for a possible return to work. The British Columbia Human Rights Tribunal found that the employee's complaint was justified and that she was entitled to monetary compensation to cover various costs arising from the loss of employment.

Datt v. *McDonald's Restaurants of Canada Ltd. (No. 3)*, 2007 BCHRT 324.

4.3.5 Systemic *Discrimination*

Systemic *discrimination* is based on principles or practices that are inherent in a system. The system may be a business, a profession, or any other organized way of behaving in society. The *discrimination* is not casual or random; it is based on established and often-widely accepted behavioural norms. These established norms might become obstacles that keep some people from participating fully in the system or group, and limit their ability to contribute. In business, some practices – such as recruitment, hiring and promotion policies – are so entrenched and accepted as part of the norm that the employer may not realize the practices tend to block, limit, or prevent the economic well-being or career advancement of a certain group of people within the business system.

Example 3 – Systemic *Discrimination* (Employment Opportunities)

Action Travail des Femmes lodged a complaint of systemic *discrimination* practiced against an identifiable group. A few women worked as dispatchers for CN, but there were no women employed in the "yard", which was the path to better pay and career advancement. Women were not encouraged to apply for yard work, and if they did, their applications were not seriously considered.

A Canadian Human Rights Tribunal ruled that CN Rail has discriminated against women who were seeking employment in traditional blue-collar jobs. The

Tribunal found that CN Rail's recruitment, hiring and promotion policies prevented and discouraged women from working in blue-collar jobs. The Tribunal ordered CN Rail to hire one woman in every four new hires into blue-collar positions until the representation of women reached 13%, which is the national percentage for women working in equivalent jobs.

CN Rail appealed this decision to the Federal Court of Appeal, which ruled the Tribunal did not have authority to impose a hiring quota. When the matter was placed before the Supreme Court of Canada, the decision of the Federal Court was overturned. The Supreme Court ruled the Tribunal may order adoption of a special program designed to prevent the same or similar (discriminatory) practice occurring in the future. The measures ordered by the Tribunal were designed to break a continuing cycle of systemic discrimination against women. An employment equity program, such as the one ordered by the Tribunal, is an attempt to ensure that future applicants and workers from the affected group will not face the same barriers that blocked their forbearers.

Action Travail des Femmes v. *Canadian National Railway Company* [1987] 1 SCR 1114.

4.4 *Harassment*

Harassment is a particular type of *discrimination*. It occurs when a person is subjected to any unwanted behaviour that offends, demeans or humiliates. It includes, but is not limited to, verbal abuse and intimidation, as well as the displaying of racist, sexist or other offensive materials.

Harassment also can take many forms, such as sexually suggestive comments or gestures or unwanted physical contact, including physical or sexual assault. *Sexual harassment* is particularly offensive when submission to such conduct is made either explicitly or implicitly a term or condition of an individual's employment or when submission to or rejection of such conduct by an individual affects the individual's employment.

Harassment can involve a single serious incident, but more often consists of a series of unwanted incidents over a period of time. In the *workplace environment*, *harassment* creates a hostile or poisoned work atmosphere. It interferes with the quality of work and can affect an individual's personal life. Many individuals live with the threat of being forced out of a job, fired, or being denied promotions or other work-related benefits. Even jokes that cause awkwardness or embarrassment can undermine a person's self-esteem and can lead to a wide range of stress-related illnesses. Individuals often feel intimidated, humiliated and degraded. *Harassment* is not harmless, funny or trivial. It is the responsibility of all *APEGBC professionals* to be aware of how their behaviour affects others.

Behaviour that is unwelcome and unwanted or makes others feel uncomfortable may result in *harassment* allegations.

In addition, employers may be held responsible for the behaviour of their employees, particularly if they have not taken adequate steps to provide a *discrimination*-free *workplace environment*. Under the principle of vicarious liability, the Supreme Court of Canada has found that the employer may be responsible for the actions of its employees.[1] Lack of awareness may not eliminate this potential liability. Employers are responsible for providing a *harassment*-free work environment for all employees, clients and other associates. An effective policy regarding *harassment* can significantly reduce an employer's or association's liability, should a complaint ever be made or filed. Prompt and appropriate response to such a complaint can further reduce liability.

4.5 *DIVERSITY*

4.5.1 *Diversity* Considerations

People entering the workforce today come from many different demographic groups. This variety brings opportunity for our businesses and professions. The diverse points of view thus available bring added creativity and innovation, improve decision-making, and create a competitive advantage. Society's increasing *diversity* will influence the professions, workplaces, and relationships with associates. Members should seek to understand the viewpoints of others and develop joint ways of dealing with issues. New behavioural norms that welcome diverse groups are required in the *workplace environment* in order to allow all individuals to contribute to the best of their abilities within their organizations.

APEGBC professionals are encouraged to work to improve the *workplace environment* and eliminate barriers to acceptance and advancement while maintaining fair and just treatment for all.[2] Many *APEGBC professionals* and their organizations have already taken significant action and made substantial improvements. Eliminating these barriers and improving the *workplace environment* is, however, an area where continuous improvement is in order and where the professions have an opportunity to demonstrate leadership.

The following sections illustrate the issues facing several of the diverse groups in our society.

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[1] *Bazley* v *Curry* [1999] 2 SCR 534.

[2] Engineers Canada, Welcoming Workplaces: Diversity in the Engineering* Profession, undated

4.5.2 *Diversity* Considerations Related to Women

Women are under-represented in the engineering and geoscience professions, especially at the senior levels. Societal expectations and stereotypes have kept many women from even attempting to enter the professions. Within some of our professional workplaces, barriers to the acceptance and advancement of women still exist. Among these are:

- Direct *discrimination*: Some women have been denied the opportunity to practice, even though fully qualified. The rationalizations given for such treatment have ranged from a presumed inability to be effective in field work to concern over their ability to effectively balance home and work responsibilities.
- Systemic *discrimination*: Our professions have been dominated by men, and so the role models and understood norms for successful professionals have been largely masculine. Many women entering the profession have had to adapt to these masculine standards to be successful or risk isolation from their male colleagues.
- *Harassment*: Women can be subjected to harassment, both deliberate and inadvertent, which impacts the likelihood of them staying in our professions. Harassment based on gender reduces women's ability to progress through their careers, and harms the reputation and credibility of the professions.

4.5.3 *Diversity* Considerations related to Sexual Orientation and Gender Identity

With the coming into effect of the *Canadian Charter of Rights and Freedom*[3] in 1985 as section 15 of the *Constitution Act*, *1982*, the legal situation related to sexual orientation changed substantially. Although it does not specify sexual orientation as a prohibited ground of *discrimination*, the courts interpreted the *Charter* broadly and considered sexual orientation as an analogous ground to the personal characteristics listed in section 15(1), namely race, national or ethnic origin, colour, religion, sex, age and mental or physical disability. The enactment of *An Act to amend the Canadian Human Rights Act*[4] in 1996 officially made sexual orientation a prohibited ground of *discrimination*. The early recognition of *discrimination* that was of greatest significance to gay and lesbian individuals gradually widened to include bisexual and transgender persons. Related issues include the denial of accommodations and housing; the denial of services by both public bodies and private sector organizations (such as food services and retail

[3] *Canadian Charter of Rights and Freedom, s. 15 of the Constitution Act, 1982.*
[4] *An Act to amend the Canadian Human Rights Act,* SC 1996, c. 14.

services); harassment in the workplace; loss of employment; denial of permits and licenses; denial of training and denial of promotion.

4.5.4 *Diversity* Considerations Related to First Nations People

The culture and history of First Nations people in Canada are distinct. Existing aboriginal and treaty rights of the First Nations in Canada are recognized and affirmed in the *Constitution Act*, *1982*. In working with First Nations, it is important to appreciate that different processes and ways of conducting business may apply and that customs may vary from community to community. Respect is an integral part of aboriginal culture, and developing mutual respect and understanding takes time. Listening with patience and honouring community elders are also important cultural norms.

4.5.5 *Diversity* Considerations Related to Persons with Disabilities

Persons with disabilities have faced significant barriers to employment and fair treatment. These barriers can be attitudinal or physical. Attitudinal barriers exist because of the assumptions made about what persons with disabilities can and cannot do. Many are uncomfortable with individuals who have some form of disability and are unsure how to behave around them. The physical and attitudinal barriers often can be removed or eased by some kind of accommodation or education. There are agencies and associations that can provide more information on overcoming the range of barriers which may exist in the workplace.

The Supreme Court of Canada has ruled that an employer must take "reasonable steps" in making accommodations so that people do not suffer *discrimination*. Such a ruling empowers human rights commissions to impose the legal duty of *reasonable accommodation* in the work place.[5]

4.5.6 *Diversity* Considerations Related to Newcomers

Newcomers to our country arrive with a wide variety of expectations, abilities and needs. A significant number of them come from cultures which have significantly different behavioural norms from those in Canada. In addition, their ability in the use of English may be quite limited. While these factors may make it more difficult to communicate, or to develop understanding, it is important that these people be treated fairly and with dignity. Where appropriate, *APEGBC professionals* should take steps to facilitate their participation in their workplaces and to ensure that their human rights are not violated.

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[5] *Hydro-Québec* v. *Syndicat des employé-e-s de techniques professionnelles et de bureau d'Hydro-Québec, section locale 2000 (SCFP-FTQ)*, 2008 SCC 43.

4.6 Complaint Procedure

Dealing with *harassment* and *discrimination*

If you are *harassed* or *discriminated* against, do not ignore it. The following steps are recommended for dealing with *discrimination* and *harassment*:
1. Make it clear to the person that his or her actions are not welcome.
2. Document your concerns. Keep a written record of incidents including dates, time, place, and witnesses.
3. If you feel you have been *discriminated* against or *harassed* at work, notify the person identified in your firm's *discrimination* and *harassment* policy. In the absence of a policy, you should talk to that person's supervisor or another senior person in the company.
4. If your complaints to the individual or the employer do not yield satisfactory results, you may wish to file a complaint with the appropriate human rights commission.
5. If you feel you have been *discriminated* against or *harassed* by an *APEGBC professional*, you may file a complaint with APEGBC at any time.

APEGBC has a process for taking complaints against APEGBC professionals in relation to allegations that any APEGBC professional has not practiced professional engineering or professional geoscience in accordance with the standards of the professions, including aspects of practice related to human rights and respect of others which could constitute *unprofessional conduct* or a breach of the APEGBC Code of Ethics.

Rule 1 of the *Code of Ethics* require members to hold paramount the safety, health and welfare of the public, and to promote health and safety within the workplace. Rule 7 of the *Code of Ethics* requires *APEGBC professionals* to conduct themselves with fairness, courtesy and good faith towards clients, colleagues and others.

A complaint may be submitted by a complainant to APEGBC, whether or not the matter of the complaint has already been examined by an employer's internal complaint review process or by a human rights commission. Complainants should be aware that, unlike the decisions they generate, the results of a human rights commission's investigations are not matters of public record. Similarly, the results of internal company or agency investigations are not likely to be available. If the APEGBC Investigation Committee recommends a formal hearing by the APEGBC Discipline Committee, the Discipline Committee may hear witnesses at a public hearing.

Complainants should also be aware that frivolous or malicious complaints could themselves be considered forms of *harassment*. After making a finding of *unprofessional conduct*, the APEGBC Discipline Committee may order a reprimand, require the investigated person to take counselling, and|or suspend or cancel the person's registration, or issue other appropriate orders.

5.0 REFERENCES

Legislation

An Act to amend the Canadian Human Rights Act, SC 1996, c. 14.

Canadian Charter of Rights and Freedom, s. 15 of the *Constitution Act,* 1982 - http://laws-lois.justice.gc.ca/eng/const/page-15.html

Engineers and Geoscientists Act, RSBC 1996 *c. 116* - *http://www.bclaws.ca/civix/document/id/complete/statreg/96116_01*

Human Rights Code, RSBC 1996, c. 210 – http://www.bclaws.ca/Recon/document/ID/freeside/00_96210_01

Canadian Human Rights Act, RSC 1985, c. H-6 – http://laws-lois.justice.gc.ca/eng/acts/H-6/

Code of Ethics of the Association of Professional Engineers and Geoscientists of British Columbia - https://www.apeg.bc.ca/About-Us/Governance/The-Act,-Bylaws-and-Code-of-Ethics

Case Law

Supreme Court of Canada

Action Travail des Femmes v. *Canadian National Railway Company,* [1987] 1 SCR 1114.

Bazley v *Curry* [1999] 2 SCR 534.

Hydro-Québec v. *Syndicat des employé-e-s de techniques professionnelles et de bureau d'Hydro-Québec, section locale 2000 (SCFP-FTQ)*, 2008 SCC 43.

British Columbia Court of Appeal

Boehringer Ingelheim (Canada) Ltd. v. *Kerr,* 2011 BCCA 266.

British Columbia Human Rights Tribunal

Datt v. *McDonald's Restaurants of Canada Ltd. (No. 3)*, 2007 BCHRT 324.

Documents from Other Regulators|Associations

Association of Professional Engineers and Geoscientists of Alberta (APEGA), Guidelines for Human Rights Issues in Professional Practice, v 1.1, November 2005 -https://www.apega.ca/pdf/Guidelines/HumanRightsIssues.pdf

Engineers Canada, Welcoming Workplaces: Diversity in the Engineering* Profession, undated - http://www.engineerscanada.ca/sites/default/files/Diversity%20Vision%E2%80%94English.pdf

Professional Engineers Ontario, Guidelines on Human Rights in Professional Practice, June 2009 - http://peo.on.ca/index.php/ci_id/22097/la_id/1.htm

Compilations

Braha, W.A., Annotated British Human Rights Code Updated to December 2014. Canada Law Books, Thomson Reuters Canada, 2014.

McHardy, C and Humphreys, J. Human Rights in MacLean, M et al. Annual Review of Law & Practice, Continuing Legal Education Society of British Columbia, 2012, pp. 275-311.

Continuing Legal Education Society of British Columbia (publisher). Labour Law Conference 2009. June 2009.

Continuing Legal Education Society of British Columbia (publisher). Employment Law Conference 2003. April 2003.

Continuing Legal Education Society of British Columbia (publisher). Human Rights 2000 Update. November 2000.

Continuing Legal Education Society of British Columbia (publisher). Human Rights Conference 2013. November 2013.

Books

Hurley, Mary. Sexual Orientation and Legal Rights, 92-1E. Library of Parliament, 10 September 2002. 37 p.

Sappideen, C and Vines, P (editors). Fleming's The Law of Torts, 10th ed. Lawbook, 2011. 844 p.

MacKillop *et al*. Employment Law Solutions. LexisNexis, 2010. 292 p.

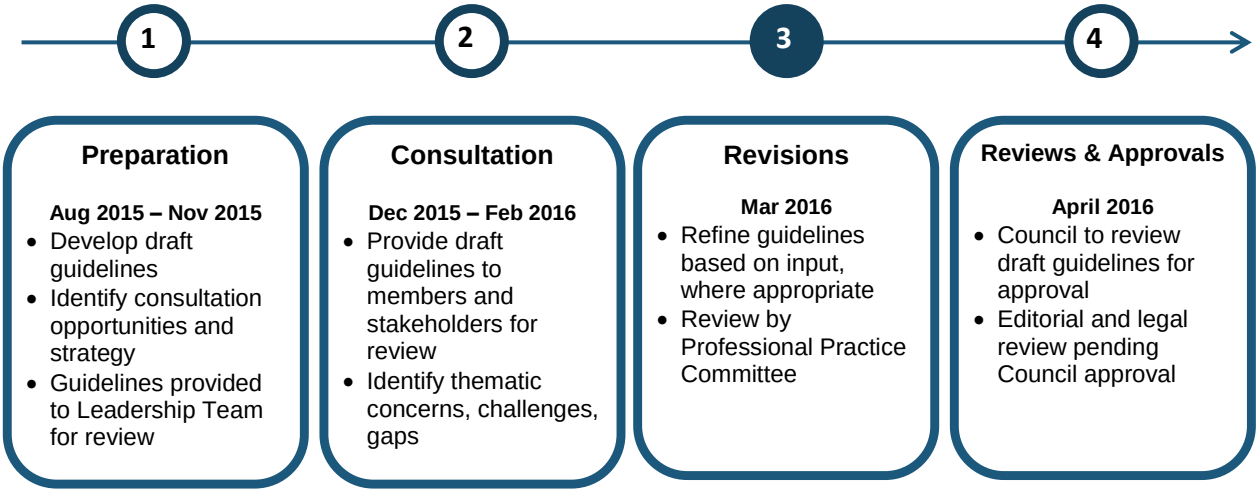
Appendix B: Consultation Summary - Professional Practice Guidelines – Human Rights and Diversity

Background

A comprehensive consultation plan was developed to seek feedback from the membership and key stakeholders on the proposed Professional Practice Guidelines - Human Rights and Diversity. The primary method of consultation was via email. The consultation process ran from December 2015 to February 2016, inclusive.

This practice supports stronger member participation and enables the association to be responsive to any issues, challenges, or gaps identified by members. The results of the consultation helped to provide guidance in determining the final content of the guidelines.

Guideline Development and Consultation Process



Consultation Methods and Communication Channels

During the consultation period, the following information was provided to members and stakeholders:

- History and reasons why a guideline is being drafted
- The detailed draft guideline document
- How member feedback will shape the guideline
- A high-level overview of the consultation process
- Opportunities for comment, feedback, and dialogue
- Information on next steps

Consultation Methods

Member and industry consultation was undertaken through a dedicated consultation webpage on APEGBC's website and a consultation specific email address.

- 30 email responses were received from members and industry with over 100 individual comments received.

- Personalized memos were sent via email to key APEGBC member volunteer groups and external stakeholders, inviting them to comment:
    - DAWEG
    - DEERE
    - DEP
    - MED
    - Past Members of the Women in Engineering and Geoscience Task Force
    - Branch Chairs
    - Mentoring Committee
    - Registration Committee
    - Sustainability Committee
    - Climate Change Advisory Group
    - Professional Practice Committee
    - Building Enclosure Committee
    - Building Codes Committee
    - Consulting Practice Committee
    - ACEC-BC
    - ASTTBC
    - AMEBC
    - Engineers Canada
    - Geoscientists Canada
    - IEBCA (Iranian Engineers of BC Association)
    - SITEBC (Society of Internationally Trained Engineers of BC)
    - SPETBC (Society of Punjabi Engineers and Technologists of BC)
    - Bangladeshi Engineers in BC
    - Tetra Society
    - AMEC Foster Wheeler
    - BC Hydro
    - Metro Vancouver
    - Teck
    - BCIT
    - UVIC
    - SFU
    - UBC
    - UBCO
    - UNBC

- Meetings with members and APEGBC volunteer groups
    - Branch Representatives Meeting at 2015 AGM (brief introduction of topic only)
    - Richmond/Delta Branch VP Visit (brief introduction of topic only)
    - Branch Representatives Teleconference
    - Building Codes Committee
    - Building Envelope Committee

Communications Channels and Consultation Groups

The following communications channels provided information on the guidelines and opportunities to provide feedback during the consultation:

- APEGBC website (news item for guideline consultation placed on front page/carousel)
- APEGBC eNews (3 articles)
- *Innovation* (1 article)
- Social media
    - Twitter (3 tweets, average of 550-1100 views each)
    - Linked In (1 discussion, 1 response, and 2 likes)

Members

A webpage and dedicated email was developed to collect feedback and input on the guidelines. Members received communications about the consultation through eNews, Innovation, and social media channels, as well as at VP branch presentations during the consultation period. 30 emails were received during the consultation period. Generally, support for the bylaw was positive.

Those who were strongly opposed to the guideline focused on the fact that the association already has a Code of Ethics. Others questioned the initiative and its relevance to professional practice.

Volunteer Groups

A total of 15 distinct volunteer groups were invited to provide feedback on the guidelines. These were comprised of branch representatives, and key committees, and divisions that would have a unique perspective on the guideline. A total of 8 groups provided feedback.

In general, the volunteer groups that were consulted shared the view that a Human Rights and Diversity Guideline is a good thing, and that it is overdue.

Members of the volunteer groups that were consulted had many individual observations and comments that were captured as part of the consultation process. Overall, the groups were satisfied with providing feedback at this level and did not pass motions or otherwise formalize their support for the guidelines.

External Stakeholders

A total of 20 external stakeholder groups were invited to provide feedback on the guidelines via email. We received written comments and feedback from 7 of the groups. In general, reception to the guidelines was positive in nature.

Key Concerns Raised

When examining member and stakeholder feedback as a whole, a number of key concerns were raised, and are summarized below:

1. Format and Structure

Members and industry stakeholders had suggestions related to the structure and presentation of the guideline content. Primarily, members were concerned with the appendix section and suggested it would make more sense to include it in the body of the guideline document.

2. Definitions

A number of comments were received from members and industry stakeholders relating to the definitions, and the need to expand them to be more inclusive. In particular, there were concerns with the definitions of diversity and discrimination. These will be addressed in the legal and editorial review.

3. Consistency with APEGBC Guidelines and the Code of Ethics/Investigation and Discipline Process

Concerns were raised regarding some specific text in the guideline which was inconsistent with other APEGBC guidelines. Some comments indicated that clarification was needed regarding the requirements in the existing Code of Ethics and APEGBC's investigation and discipline process.

4. Courses/Educational Resources

A few members noted that more education resources would be beneficial for members and organizations relating to diversity and human rights. It was also suggested that APEGBC offer professional development sessions on the guidelines themselves to help build awareness. These suggestions fall outside of the scope of the document, but will be reviewed and considered by the Member Services department through APEGBC's diversity initiatives.

Staff from Professional Practice, Standards and Development; Legislation, Ethics and Compliance; and Communications met to review the feedback received to ensure all issues were reviewed and addressed. Comments that fell outside of the scope of the guidelines (e.g. additional educational resources) will be reviewed and considered by the Member Services department through APEGBC's diversity initiatives.

Consultation Summary and Metrics

Date	Communication	Metric (as of April 1, 2015)
2-Dec	Guidelines consultation webpage	364 page views
2-Dec	E-News article on guidelines consultation	328 clicks
17-Dec	LinkedIn discussion post - Promotion of consultation	1 comment
17-Dec	Tweet promoting consultation with link to webpage	1,084 views / 2 clicks
14-Jan	eNews article on guidelines consultation	38 clicks
23-Jan	Tweet promoting consultation with link to webpage	1,028 views / 2 clicks
5-Feb	eNews article on guidelines consultation	71 clicks
9-Feb	Article in *Innovation* on guidelines consultation	n/a
20-Feb	Tweet promoting consultation with link to webpage	599 views / 5 clicks

Email Consultation with Members and Stakeholders

Personalized memos were circulated by APEGBC staff to the following internal and external groups in January 2016, inviting them to provide feedback on the guidelines via email. The memos also offered the opportunity for APEGBC staff to attend an in-person consultation meeting, should the group wish to do so.

Group: Internal Stakeholders

Date	Group Consulted	Feedback Received
Jan 2016	DAWEG	Yes (Chair only)
Jan 2016	DEERE	No
Jan 2016	DEP	No
Jan 2016	DEGIRS	No
Jan 2016	MED	Yes
Jan 2016	Branch Chairs	Yes
Jan 2016	Building Enclosure Committee	Yes
Jan 2016	Building Codes Committee	Yes
Jan 2016	Sustainability Committee	No
Jan 2016	Consulting Practice Committee	No
Jan 2016	Climate Change Advisory Group	No
Jan 2016	Mentoring Committee	Yes
Jan 2016	Registration Committee	No
Jan 2016	Women In Engineering & Geoscience Task Force Past Members	Yes
Mar 2016	Professional Practice Committee	Yes

Group: External Stakeholders

Date	Group Consulted	Feedback Received
Jan 2016	ACEC-BC	No
Jan 2016	ASTTBC	Yes
Jan 2016	AMEBC	No
Jan 2016	Engineers Canada	Yes
Jan 2016	Geoscientists Canada	No
Jan 2016	IEBCA (Iranian Engineers of BC Association)	No
Jan 2016	SITEBC (Society of Internationally Trained Engineers of BC)	No
Jan 2016	SPETBC (Society of Punjabi Engineers and Technologists of BC)	No
Jan 2016	Bangladeshi Engineers in BC	No
Jan 2016	Tetra Society	No
Jan 2016	AMEC Foster Wheeler	Yes
Jan 2016	BC Hydro	No
Jan 2016	Metro Vancouver	Yes
Jan 2016	Teck	No
Jan 2016	BCIT	No
Jan 2016	UVic	Yes (Through WIEGTF)
Jan 2016	SFU	Yes
Jan 2016	UBC	Yes
Jan 2016	UBCO	No
Jan 2016	UNBC	No

Meetings with Members and Stakeholders

Group: Members and APEGBC Volunteer Groups

Date	Event	Attendance
25-Oct	AGM Branch Representatives Meeting	29 attendees
21-Jan	Richmond/Delta Branch VP Visit	28 attendees
10-Feb	Branch Representatives Teleconference	21 attendees
8-Mar	Building Codes Committee	12 attendees
8-Mar	Building Enclosure Committee	19 attendees