

**A REGULAR MEETING
OF THE TOWN OF LADYSMITH COUNCIL
AGENDA
6:00 P.M.**

**Tuesday, February 6, 2024
Ladysmith Seniors Centre
630 2nd Avenue**

Pages

1. CALL TO ORDER (6:00 P.M.)

Call to Order 6:00 p.m. in Open Session, in order to retire immediately into Closed Session.

Members of the public are welcome to attend all Open Meetings of Council, but may not attend Closed Meetings.

2. CLOSED SESSION

Recommendation

That, in accordance with section 90(1) of the *Community Charter*, Council retire into closed session in order to consider items related to the following:

- (e) the acquisition, disposition or expropriation of land or improvements, if the council considers that disclosure could reasonably be expected to harm the interests of the municipality; and
- (k) negotiations and related discussions respecting the proposed provision of a municipal service that are at their preliminary stages and that, in the view of the council, could reasonably be expected to harm the interests of the municipality if they were held in public.

3. OPEN MEETING AND ACKNOWLEDGEMENT (7:00 P.M.)

The Town of Ladysmith acknowledges with gratitude that this meeting takes place on the unceded territory of the Stz'uminus First Nation.

Members of the public may attend meetings in person at the Ladysmith Seniors Centre or view the livestream on YouTube:

<https://www.youtube.com/channel/UCH3qHAExLiW8YrSuJk5R3uA/featured>.

4. AGENDA APPROVAL

Recommendation

That Council approve the agenda for this Regular Meeting of Council for February 6, 2024.

5. RISE AND REPORT- Items from Closed Session

6. MINUTES

6.1 Minutes of the Regular Meeting of Council held January 23, 2024

5

Recommendation

That Council approve the minutes of the Regular Meeting of Council held January 23, 2024.

7. COMMITTEE MINUTES

7.1 Poverty Reduction Task Group - November 29, 2023

10

Recommendation

That Council receive the minutes of the Poverty Reduction Task Group meeting held November 29, 2023.

8. REPORTS

8.1 Buller Street Revitalization Project-Construction Contract & Lease Agreement

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Recommendation

That Council:

1. Authorize sole-source procurement pursuant to purchasing policy 5-1790-D with Catalyst Developments for the non-residential component of the Buller Street Revitalization Project described in the February 6, 2024 report to Council; and
2. Direct staff to finalize:
 - a. a construction contract with Catalyst Developments for the non-residential component of the Buller Street Revitalization Project;
 - b. a long-term lease agreement with Catalyst Developments for the provision of the housing component of the Buller Street Revitalization Project; and
 - c. bring back the proposed contracts for Council's consideration.

8.2 2024 Financial Plan Bylaw

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Recommendation

That Council direct staff to prepare the 2024-2028 Financial Plan Bylaw with \$8,398,228 to come from municipal taxation and \$1,793,324 to come from police taxation as described in the staff report from the Director of Financial Services dated February 6, 2024.

8.3 Holland Lake Dam Capacity and Climate Resiliency Improvements Consultant

85

Recommendation

That Council direct staff to:

1. Award Request for Proposal 2023-IS-07 to Ecora Engineering & Resource Group Ltd. in the amount of \$1,081,046, excluding GST; and
2. Enter into a contract for the services outlined in Ecora's proposal.

9. BYLAWS

9.1 Bylaw Status Sheet

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10. NEW BUSINESS

11. QUESTION PERIOD

- A maximum of 15 minutes is allotted for questions.
- Persons wishing to address Council during "Question Period" must be Town of Ladysmith residents, non-resident property owners, or operators of a business.
- Individuals must state their name and address for identification purposes.
- Questions put forth must be related to items on the agenda.
- Questions must be brief and to the point.
- Questions shall be addressed through the Chair and answers given likewise. Debates with or by individual Council members or staff members are not allowed.
- No commitments shall be made by the Chair in replying to a question. Matters which may require action of the Council shall be referred to a future meeting of the Council.

12. ADJOURNMENT



MINUTES OF A REGULAR MEETING OF COUNCIL

Tuesday, January 23, 2024
7:01 P.M.
Ladysmith Seniors Centre
630 2nd Avenue

Council Members Present:

Mayor Aaron Stone
Councillor Ray Gourlay
Councillor Amanda Jacobson

Councillor Tricia McKay
Councillor Duck Paterson
Councillor Jeff Virtanen

Council Members Absent:

Councillor Marsh Stevens

Staff Present:

Allison McCarrick
Erin Anderson
Chris Barfoot
Jake Belobaba

Ryan Bouma
Sue Bouma
Andrea Hainrich

1. CALL TO ORDER AND ACKNOWLEDGEMENT

Mayor Stone called this Regular Meeting of Council to order at 7:01 p.m., recognizing with gratitude that it was taking place on the unceded territory of the Stz'uminus First Nation.

2. AGENDA APPROVAL

CS 2024-012

That Council approve the agenda for this Regular Meeting of Council for January 23, 2024.

Motion Carried

3. RISE AND REPORT- Items from Closed Session

Council rose with report on the following items from previous Closed Council meetings:

Item from the Closed Meeting of Council held October 3, 2023

CE 2023-069

That Council direct staff to:

3. Terminate the existing contract for design services [Artist Studio] through Checkwitch Poiron Architects Inc.

Item from the Closed Meeting of Council held December 5, 2023

CE 2023-089

1. That Council authorize staff to enter into annual moorage agreements for slips at the Oyster Bay Marina shown on the map provided at the December 5th in-camera Meeting of Council for the following purposes:
 - a. 46 feet of moorage for the Ladysmith Dragon Boat Society's Dragon Boat;
 - b. Building #1 for the Ladysmith Maritime Society to operate the Maritime Museum;
 - c. Building #3 for an interpretation centre and moorage for Maritime vessels owned by the Ladysmith Maritime Society;
 - d. 20 feet of moorage space near Building #3 for moorage of vessels owned by the Ladysmith Maritime Society.
2. That the moorage agreements be subject to the "standard" moorage terms offered by the Oyster Bay Marina, provided at the December 5th, 2023 in camera meeting of Council.
3. That Council direct staff to include funding for these moorage agreements in the Town's proposed annual budget until the earlier of:
 - a. December 31, 2029; or
 - b. The Oyster Bay Marina cancels the agreements; or
 - c. In the case of the Ladysmith Maritime Society, cease to use the slips or cease to use the slips for the uses under recommendation 1, in which case the moorage space reserved for them would be cancelled;
 - d. In the case of the Dragon Boat Society, cease to use the slips or cease to use the slips for the uses under recommendation 1, in which case the moorage space reserved for them would be cancelled.
4. That, following agreement with Oyster Bay Marina, staff and the Town's lawyer be authorized to:

- a. Notify the Ladysmith Dragon Boat Society that the moorage referred to in recommendation 1(a) will be available to the Society for their dragon boat, subject to the terms in recommendations 2 and 3 and that the Town has budgeted to pay the annual moorage fee; and
 - b. Notify legal Counsel for the Ladysmith Maritime Society that the items referred to in recommendations 1(b), 1(c), and 1(d) will be available to the Society, and that the Town has budgeted to pay the annual moorage fee, subject to the following conditions:
 - i. The terms in recommendations 2 and 3;
 - ii. Use shall be limited to mooring Maritime boats owned by the Society or to provide community programs such as Maritime interpretation and harbour tours;
 - iii. Annual moorage payments are subject to annual budget approval and may be withdrawn at the sole discretion of the Town.
5. Rise and report once an agreement with the Oyster Bay Marina has been reached and the Ladysmith Maritime Society and Ladysmith Dragon Boat Society have been notified.

4. MINUTES

4.1 Minutes of the Regular Meeting of Council held January 9, 2024

CS 2024-013

That Council approve the minutes of the Regular Meeting of Council held January 9, 2024, as amended to include Councillor Stevens' opposition to the following:

- Item 8.2, "Alternative Approval Process – Buller Street Revitalization Project".

Motion Carried

5. DELEGATIONS

5.1 Andrea Rosato-Taylor and Kathy Holmes, Arts Council of Ladysmith & District

Andrea Rosato-Taylor, President of the Arts Council of Ladysmith & District, thanked Council and the Town for their support over the past year.

Ms. Rosato-Taylor provided an overview of the Arts Council's membership, staffing, funding resources and budget, as well as their work in the community and with community groups. She also reviewed their

programs, marketing, and community engagement and discussed plans for a future Arts Station.

Mayor Stone and Council thanked the Arts Council of Ladysmith & District for their work in the community, and for their collaboration with other organizations.

6. Committee Minutes

6.1 Committee of the Whole - January 16, 2024

CS 2024-014

That Council direct staff to:

1. Prepare a report for a future Committee of the Whole meeting regarding the possibility of dedicating 1200 Christie Road, and road allowances at King Road and Gill Road as parkland.
2. Prepare a report for a future meeting of Council on requiring subdivisions to allocate active transportation space.

Motion Carried

7. REPORTS

7.1 Buller Street Revitalization Project

CS 2024-015

That Council receive for information the report dated January 23, 2024, regarding the Buller Street Revitalization Project.

Motion Carried

8. BYLAWS

8.1 Bylaws for Introduction

8.1.1 "Town of Ladysmith City Hall Loan Authorization Bylaw 2024, No. 2166"

CS 2024-016

That Council:

1. Give first, second and third readings to "Town of Ladysmith City Hall Loan Authorization Bylaw 2024, No. 2166"; and
2. Direct staff to refer Bylaw No. 2166 to the Inspector of Municipalities for approval.

Motion Carried

8.2 Bylaws for Adoption

8.2.1 "Town of Ladysmith Zoning Bylaw 2014, No. 1860, Amendment Bylaw 2023, No. 2163"

CS 2024-017

That Council adopt "Town of Ladysmith Zoning Bylaw 2014, No. 1860, Amendment Bylaw 2023, No. 2163."

Motion Carried

8.3 Bylaw Status Sheet

9. QUESTION PERIOD

A member of the public expressed appreciation for the Arts Council of Ladysmith & District's presentation and praised staff's response to the recent snow event.

He also enquired about budget and consultation information related to the December 5th rise and report item, as well as the financial details of the Buller St Revitalization Project, the impact on taxes, and whether there would be an open house/information meeting regarding this project.

10. ADJOURNMENT

CS 2024-018

That this Regular Meeting of Council be adjourned at 8:00 p.m.

Motion Carried

CERTIFIED CORRECT

Mayor (A. Stone)

Corporate Officer (S. Bouma)

Minutes of the Poverty Reduction Task Group

November 29, 2023, 1:30pm

Hybrid – [Frank Jameson Community Centre](#), Lower Program Room & Zoom

COMMITTEE MEMBERS PRESENT:

Jacqueline Neligan, Ladysmith Family and Friends (Laff)
Stephen Cochrane, Stz'uminus First Nation
Griffin Russell, Island Health
Shannon Crowards, Ladysmith Resource Centre Association (LRCA)
Sandra Thomson, Social Planning Cowichan (SPC)

STAFF/COUNCIL PRESENT:

Councillor Tricia McKay

REGRETS:

Rosalie Sawrie, Social Planning Cowichan (SPC)
Sue Glenn, Supervisor – Community Programs & Services (staff)
Roberta Bowman, Ladysmith Chamber of Commerce
Cindy Lise, Our Cowichan Health Network
Gerry Busch, Community Member

CALL TO ORDER AND ACKNOWLEDGEMENT

The facilitator acknowledged with gratitude that this meeting was taking place on the unceded territory of the Stz'uminus First Nation.

AGENDA

That the Poverty Reduction Task Group approve the agenda for the meeting.
Motion carried.

MINUTES

That the Poverty Reduction Task Group approve the Minutes from November 1, 2023 as presented.
Motion carried.

CURRENT BUSINESS

Welcome

- The group introduced themselves

Updates on 2022-2023 poverty reduction activities:

- The final report for the UBCM Intake 1 of Stream 2 Poverty Reductions Planning & Actions grant funds has been completed and submitted to UBCM.

2023/2024 Grant Activities:

- Dinner & Dialogue #1 scheduled for December 14, 2023 starting at 5:30pm at Aggie Hall

- A review of the event outline and discussion took place in preparation for the event.
- Dinner & Dialogue #2 was scheduled for Wednesday, January 31, 2024 at 5:30pm at Aggie Hall
- Hoping to have following Dinner & Dialogues on Stz'uminus territory but seeking permission first.
- The Food Equity Sub-Committee met earlier in November members from participating organizations shared an update.

PRTG membership

- A discussion took place about potential new members and a request was made for a description that is shareable for recruiting others.

Action Items

- Prepare for and host December 14, 2023 Dinner and Dialogue.
 - PRTG members to meet informally on December 20, 2023 to debrief following the first Dinner & Dialogue.
- Connect with the Ladysmith Chamber of Commerce on Employer Seminar Series dates.
- Begin preparation for Dinner & Dialogue #2 scheduled for Wednesday, January 31, 2024.

Meeting adjourned at 3:11pm

Next Meeting scheduled for January 17, 2024 at 1:30pm.

Facilitator (Rosalie Sawrie)

RECEIVED:

Corporate Officer (S. Bouma)

STAFF REPORT TO COUNCIL

Report Prepared By: Jake Belobaba, Director of Development Services
 Erin Anderson, Director of Financial Services

Reviewed By: Allison McCarrick, CAO

Meeting Date: February 6, 2024

File No: 0760-20/4200-20

Re: **Buller Street Revitalization Project-Construction Contract and Lease Agreement**

RECOMMENDATION:

That Council:

1. Authorize sole-source procurement pursuant to purchasing policy 5-1790-D with Catalyst Developments for the non-residential component of the Buller Street Revitalization Project described in the February 6, 2024 report to Council; and
2. Direct staff to finalize:
 - a. a construction contract with Catalyst Developments for the non-residential component of the Buller Street Revitalization Project;
 - b. a long-term lease agreement with Catalyst Developments for the provision of the housing component of the Buller Street Revitalization Project; and
 - c. bring back the proposed contracts for Council’s consideration.

EXECUTIVE SUMMARY:

This report seeks direction from Council to finalize contractual agreements necessary to commence work on the Buller Street Revitalization Project and make the project eligible for BC Builds Funding. Advancing project planning and design work will support the Alternative Approval Process, by providing the public with more information about the project.

PREVIOUS COUNCIL DIRECTION:

Resolution	Meeting Date	Resolution
CS 2024-015	2024-01-23	That Council receive for information the report dated January 23, 2024, regarding the Buller Street Revitalization Project.
CS 2024-005	2024-01-09	That Council direct staff to prepare a borrowing bylaw in the amount of \$13,500,000 for the Buller Street revitalization project located on Town owned lands at 1st Avenue and Buller Street and proceed with the Alternative Approval Process to obtain elector assent.
CS 2015-249	2015-07-06	That Council:



Resolution	Meeting Date	Resolution
		<ol style="list-style-type: none"> 1. Enter into a loan agreement with the Municipal Finance Authority for an amount up to \$920,000 for a maximum period of 5 years, ending in July 2020, to purchase the properties located at 721 First Avenue, 12 Buller Street, 20 Buller Street, and 26 Buller Street, Ladysmith, as authorised by section 175 of the Community Charter; 2. Acknowledge that, in accordance with section 175 of the Community Charter, the term of this loan may not be extended without the approval of the electors; and, 3. Amend the Financial Plan accordingly.

INTRODUCTION/BACKGROUND:

The Buller Street Properties:

In 2015, the Town purchased the Buller Street properties from the Ladysmith & District Credit Union with the intention of developing a new city hall. The site is currently comprised of four separate parcels (one of which hosts the Museum) totaling 0.27ha. The site is zoned Downtown Commercial (C-2), and allows a six storey, mixed-use building and Floor Space Ratio (FSR) of 3.3. A variety of non-residential uses are permitted on the site and residential is permitted above the first storey fronting 1st Avenue and/or at grade along Buller Street.

Project Planning to date:

In 2016, the Town commissioned a report from Process Four (Attachment A)¹ to support “strategic decisions about the redevelopment of City Hall and the proposed inclusion of a Library” on the Buller Street properties. A supplementary report from Urban Systems (Attachment B) was commissioned in 2020 to update parameters of the Process Four Report, examine alternative sites and explore the option of adding housing to the project. These reports were preliminary, and drafted with the expectation that the report parameters would be reevaluated and updated over time and as the project progressed. Should the Buller Street Revitalization Project proceed, a number of recommendations and parameters of the reports will need to be disregarded or reexamined including:

- Preliminary estimates: Both reports are based on a broad range of point-in-time assumptions such as population growth, interest rates, construction costs, staffing, etc. Even since 2020, many of these parameters have changed, in some cases significantly (e.g. construction costs and interest rates).
- Assumptions on organizational makeup: The reports predate the Town bringing IT support in-house² and assume engineering will be relocated to City Hall. Engineering works closely with both Public Works and Development Services and these relationships have changed significantly due to organizational and technological

¹ The Process Four report has been redacted to remove confidential HR information.
² Until 2021, the Town contracted with the District of North Cowichan for IT support.

change. Engineering's role in essential service delivery and recovery following a disaster is also a consideration for their place of work (see below).

- Post-disaster construction: The Process Four report assumes City Hall will be constructed to a post-disaster standard³. This has significant implications for construction costs, especially if residential development is included in the project as proposed, because both components would likely need to be built to a post-disaster standard⁴. Because emergency preparedness and workplace technology has evolved significantly, business continuity requirements need to be reexamined before deciding on post-disaster construction.
- Zoning: As noted below, zoning for the Buller Street site has recently changed to align with the new OCP. In both reports, zoning parameters (e.g. floor space ratio, lot coverage, setbacks, height) are out of date.
- Parking: Parking requirements referenced in both reports are out of date. Parking standards were recently changed to reflect the new OCP. On the Buller Site, no parking spaces are required for non-residential uses and cash-in-lieu for up to 50% of required residential parking is allowed. There are also new parking requirements for bike parking and end of trip facilities. Additionally, neither report examines the availability of street parking in the area. The Downtown parking utilization study under Policy 2.33 of the OCP is expected to be complete later this year and will provide useful information in this regard. Parking requirements will need to be reexamined when design work commences.
- Inclusion of residential: The Process Four report does not examine the possibility of residential in conjunction with City Hall. Subsequently, the various building configurations described in the report are largely inapplicable.
- Existing City Hall Building: The Process Four report predates upgrades to the Building Envelope and HVAC system in the existing City Hall building. These renovations have addressed most of the issues noted in the report related to the condition of the building. Additionally, the Urban Systems report considered the option to sell the current City Hall. Currently, other options are being explored for this site and staff expect to report back to Council on these efforts by the end of March.

³ Generally speaking, a post-disaster building is designed to function, and be safe for reoccupation, immediately following an earthquake.

⁴ Under the BC Building code, neither City Halls nor apartment buildings are required to be built to a post-disaster standard. Generally speaking, these buildings need only be designed to allow occupants to safely evacuate, with no requirement for immediate reoccupation and reuse. It follows that if City Hall is built to a post-disaster standard, structurally integrated residential units would need to be designed so as to not jeopardize City Hall following an earthquake (e.g. by collapsing on City Hall during an aftershock.)

- Process improvements: The Process Four Report explores a number of operational changes at City Hall to improve efficiencies. Staff incorporated many of the streamlining process and worked with the Town auditors to ensure the suggested improvements meet PSAB standards.
- Library: Both reports explore the possibility of a Library in conjunction with City Hall. As noted below, this remains a possibility under the current proposal, however VIRL is not a confirmed project partner at this time.
- Machine Shop and Public Works Locations: The Urban Systems report considers these locations as options for inclusion with a new City Hall. Housing proposals in these locations would be more challenging, and these sites present significant opportunity cost (i.e. they are needed for other tenants/uses which are likely to expand in the future). Subsequently, these locations are not being considered under the current proposal.

Provincial Housing Programs:

The Premier and Minister of Housing have spoken publicly about a new provincial program coming called BC Builds which will be “dedicated to delivering more homes for middle-income households.” The details of the program are expected to be announced in early 2024.

A key piece of the program is for local governments to provide land; either in the form of vacant or underutilized sites or through partnerships where housing is built in conjunction with municipal facilities and to work together to start the construction of rental housing quickly.

Catalyst:

Catalyst is a not-for-profit development group that develops, owns, and operates affordable rental housing across BC. They specialize in partnerships with municipalities, non-profits, charities and other institutional and private owners. Catalyst has the capacity to manage all aspects of development as either a partner or consultant. Catalyst reinvests projects’ revenues to increase rental affordability, typically offering rents that are 10-40% below market. More information on Catalyst is available at: <https://catalystcommdev.org/>

The Town has been working with the Province and Catalyst to be prepared and ready to participate in the the BC Builds program when it is implemented.

PROPOSAL:

The proposed project would include approximately 95 rental housing units atop approximately 25,000 ft², of non-residential space containing a new City Hall. Under this scenario, non-residential space not needed for City Hall can be provided to one or more other tenants selected by the Town at a later date. This could be a library or another institutional use or a commercial use chosen by the Town. The project is expected to fit within most (if not all) zoning parameters. The current zoning (which was recently changed to align with the new OCP) allows a gross total floor area of 8,850m² (95,230 ft²).

Staff are seeking direction to finalize lease and construction agreements with Catalyst so as to prepare the residential portion of the project in anticipation of the announcement of BC Builds. Exact details of the agreements still need to be finalized. However, generally speaking they are expected to operate as follows:

1. Catalyst would be responsible for constructing the entire facility, including design and construction management, and subject to Town approvals at key project milestones.
2. Construction and design costs would be apportioned based on the separate components of the project (i.e. the Town would cover costs attributable to the non-residential component and Catalyst would cover costs attributable to the residential component).
3. Catalyst will be eligible for provincial financing for the housing portion of the development and enter agreements with the province for this purpose.
4. The Town would grant a long-term lease or similar arrangement to Catalyst for the residential component of the project. The non-residential and residential components would be operated and maintained separately, as separate real-estate entities or through contractual arrangements.

Staff are working with Catalyst, the Province and the Town's lawyer to draft the necessary agreements, which will be brought back to Council for approval. Agreements would be contingent on the Town obtaining the necessary approvals (e.g. a successful Alternative Approval Process).

ANALYSIS

Concentrating growth in the Downtown and housing are top priorities of the Town's Official Community Plan and pressing issues in Ladysmith.

For housing, the Town does not have the financial capacity to provide housing without support from the province, and the partnership with Catalyst and the Province provides an opportunity to leverage existing and future assets to provide housing at no additional cost to the Town. Catalyst has had a number of successful projects throughout BC and it is reasonable to expect that these homes will be provided to those in need of them at rents that are affordable to middle income working people in Ladysmith.

Redeveloping the Buller Street site and maximizing the mix of uses and density on the site will contribute to the redevelopment of the Downtown. Staff, customers and residents of the facilities will contribute significantly to the Downtown economy which will further drive growth and redevelopment of the Downtown.

The Town is in urgent need of both a new City Hall and housing. Moving quickly to secure partnerships to capitalize on BC Builds funding will extend the benefits of this project, without requiring the Town to take on additional debt, risk or project costs.

ALTERNATIVES:

Council can choose to:

1. Seek other partners for the Buller Street Revitalization Project.
2. Terminate the Buller Street Revitalization Project.
3. Specify another course of action.

FINANCIAL IMPLICATIONS:

Financial Implications of the project are discussed in the January 9, 2024, report seeking authorization to initiate the Alternative Approval Process (AAP).

LEGAL IMPLICATIONS:

The Town’s solicitor will be involved in drafting the necessary contracts.

CITIZEN/PUBLIC RELATIONS IMPLICATIONS:

Community engagement will occur as part of the AAP. By endorsing the above recommendation, design and project planning work can advance prior to the conclusion of the AAP, providing residents with greater detail as to the features and design of the proposed project.

INTERDEPARTMENTAL INVOLVEMENT/IMPLICATIONS:

Development Services, Facilities, Finance and Communications are working jointly on the Buller Street Revitalization Project.

ALIGNMENT WITH STRATEGIC PRIORITIES:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Core Infrastructure | <input checked="" type="checkbox"/> Economy |
| <input checked="" type="checkbox"/> Official Community Plan Implementation | <input type="checkbox"/> Leadership |
| <input type="checkbox"/> Waterfront Area Plan | <input type="checkbox"/> Not Applicable |

I approve the report and recommendations.

Allison McCarrick, Chief Administrative Officer

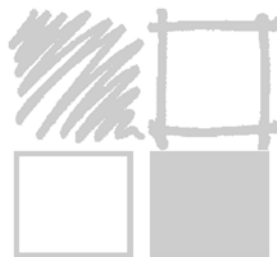
ATTACHMENTS:

- A. Process Four Report
- B. Urban Systems Report

City Hall Optimization Project

Summary Document

Attachment A



PROCESS FOUR...

APRIL 2016

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INTRODUCTION

This document has been prepared in order to consolidate information generated to date, in planning for the redevelopment of Ladysmith City Hall. This document is organized into 5 main parts, comprising this INTRODUCTION and

- **SUMMARY OF PARAMETERS:** extracts key information from the body of the document. This portion of the document is intended for the reader seeking a broad understanding of the parameters, or limits, within which this project is being proposed.
- **PARAMETERS- DETAIL:** for those who wish to understand the rationale and more detailed assumptions from which the parameters are derived. Decision-makers should at least be aware of the kind of information contained in this portion of the document.
- **SPACE LIST:** a space-by-space listing, along with area allocations for each space, quantifies the facilities being proposed at a detailed level.
- **STREAMLINING-**

The information in this document is intended for use in making strategic decisions about the redevelopment of City Hall and the proposed inclusion of a Library. Key assumptions should be reviewed and verified at each point in the decision-making process



SUMMARY OF PARAMETERS

As a planning tool, this document and associated decision support model establish a number of parameters within which this project will proceed. Any changes significantly affecting these outlined parameters must be examined for their impacts on other parameters, including costs. Decisions about modifying assumptions and/or parameters should be made before proceeding to subsequent steps in planning and design.

DEMAND

There are a range of drivers of service demand

PARTICIPANTS

There are 2 participant organizations planned for inclusion in the project. They are

- City Hall; and
- Library.

CITY HALL

Service delivery is significantly compromised, as staff are forced to work in substandard conditions. In compensating for facility age, inadequate infrastructure, and lack of space, staff spend unnecessary time and effort in conducting their work. Lack of space has also forced Development Services to be located in leased space several blocks away from City Hall. Engineering services are located at the Works Yard, which means people must often travel among three locations in securing the services they need.

The project, as proposed, will offer

- One Stop Shopping- will expedite the delivery of services for people coming to City Hall;
- Retail- space for a small ‘coffee kiosk’ type of operation has been included as an informal complement to City Hall and the Library;
- Post Disaster- residents will look to City Hall for support and leadership in coping with disasters;
- Streamlining- staff continue to reduce elapsed time, redundant steps, and staff time required to meet the range of requests for service;
- Repatriate Departments- current planning assumes the repatriation of Development Services and Engineering with the rest of City Hall departments; and

LIBRARY

- VIRL (Vancouver Island Regional Library) is anticipating development of a new library on the same site.

SUMMARY

TARGET YEARS

The concept of 'Target Years' is used in planning for the future. The specific year is of less importance than calculated demand and capacities.

	Baseline	Mid-term	Long Term
Target Year	2014	2020	2035
Target Year for Construction	2017		
Target Year for Costs	2015		

POPULATION

The primary driver of demand is population. The following table outlines assumptions about Ladysmith population over the mid- to long-term.

	Baseline	Mid-term	Long Term
Target Year	2014	2020	2035
Population- LHA	18,332	19,679	22,442
Ladysmith Municipal	8,167	9,337	11,149
% of LHA	45%	48%	50%

STAFFING

Facility requirements for City Hall are organized into *Components*. Components are the building blocks for facility planning, and are defined as

Component: *a group of people and/or spaces that must be kept together when locating them within a building.*

They reflect a functional organization of people and space, and often are the same as organizational units. The following table outlines the distribution of Ladysmith staff and space into planning components. Not all components listed below are included in City Hall planning, but are listed as part of overall staffing projections.

Component: Included Staff	2014	2020	2035	Excluded
Front of House	2	2.29	2.73	-
Council Chambers	-	-	-	-
Administration	6	6.88	8.20	-
Financial Services	7	8.03	9.57	-
Engineering	4	4.57	5.46	-
Staff Support	-	-	-	-
Building Support	-	-	-	-
Finance Storage	-	-	-	-
Administration Storage	-	-	-	-
Development Services	6	6.90	8.20	-
Public Works- Subtotals	24	22.86	27.29	-
Recreation- Subtotals	7	8.01	9.57	37
Parks- Subtotals	2	2.29	2.73	-
	58	61.83	73.74	37



SUMMARY

STAFFING- continued

Head Count- the following table lists staff to be included in the proposed facility, as well as Mayor and Council.

Component: Workplace HC	2014	2020	2035	EmpList
Front of House	2	2.3	2.7	2.0
Council Chambers	-	-	-	-
Administration	13	13.9	15.2	6.0
Financial Services	7	8.0	9.6	7.0
Engineering	3	4.6	5.5	4.0
Development Services	6	6.9	8.2	6.0
Staff Support	-	-	-	-
Building Support	-	-	-	-
Finance Storage	-	-	-	-
Administration Storage	-	-	-	-
	31	35.7	41.2	25.0
Note 1: HC- Head Count				
Note 2: Administration incl Mayor & Councillors				

FACILITIES

COMPONENT AREAS

Area Allocations for each of the participant organizations are summarized in the table following. It should be noted that VIRT area allocations differ very little between ‘NASF’ and ‘BGSF’. This reflects differences in approach to area allocations at this stage of planning. Facilities will be planned for calculated 2020 capacities.

Component Areas	NASF- 2020	BGSF- 2020	NASF- 2035	BGSF- 2035
<u>City Hall Components</u>				
Front of House	1,815	2,832	1,845	2,878
Council Chambers	1,172	1,829	1,172	1,828
Administration	1,896	2,958	2,054	3,204
Development Services	1,124	1,753	1,642	2,561
Financial Services	1,142	1,782	1,303	2,033
Engineering	639	997	877	1,368
Staff Support	681	1,062	681	1,062
Building Support	950	1,482	950	1,482
Finance Storage	900	1,404	900	1,404
Administration Storage	1,112	1,735	1,112	1,735
Retail	500	780	500	780
Subtotal City Hall	11,931	18,614	13,035	20,335
<u>Library Components</u>				
Library- Public Use	7,665	7,895	7,665	7,895
Library-Entry/Circulation	705	726	705	726
Library- Processing	1,803	1,857	1,803	1,857
Subtotal Library	10,173	10,478	10,173	10,478
NASF- Net Assignable Square Feet: excludes all circulation, walls and service space.				
BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.				



SUMMARY

FACILITIES- COMPONENT AREAS- continued

There is little difference between City Hall area allocations for 2020 and 2035, as current assumptions anticipate staffing to increase by 6 people. There is minimal impact on overall support space from such a small staff increase.

There is no difference between Library area allocations for 2020 and 2036.

STANDARDS

Space and corresponding area allocations will be based on standardized *Workplace* and *Ancillary* spaces. The workplace allocations for Ladysmith staff have been established in consideration of provincial standards (GOSS- Government Office Space Standards), but are generally smaller in area for corresponding position types. The following table outlines proposed allocations, rationale, and furnishing capacities for each workplace type.

Enclosed/Open- ft ²	Remarks
Enclosed 150	150 Mayor and City Manager. Same as EA- 13.9, despite functional similarities to Assistant Deputy Minister (EA- 22.5) <i>6' desk, credenza + 4 ancillary</i>
Enclosed 140	140 Director (or equivalent). Lower than GOSS allocation for this position type at EA- 13.9 <i>3 worksurfaces + 6 ancillary</i>
Enclosed 120	120 Functional justification for privacy needs <i>2 worksurfaces + 5 ancillary</i>
Enclosed 100	100 Functional justification for privacy needs <i>2 worksurfaces + 3 ancillary</i>
Open 70	70 Supervisor or Clerical <i>2 worksurfaces + .5 ancillary</i>
Homebase	40 Inspectors and other staff who spend the majority of their time in the field. <i>1 worksurface</i>



SUMMARY

PARKING

Current assumptions about the site and parking are theoretical and must be ‘tested’ through the preparation of concept drawings, but it is anticipated that some 26 stalls will need to be provided off-site. The cost of surface parking on additional property purchased nearby is significantly more economical than structured parking on-site.

City Hall- it is assumed that 23stalls are provided off-site based on preliminary site capacity calculations described later in this document.

<u>Parking Assumptions- City Hall</u>		2020
Struct Pkg	No	
Staff Parking	64% of staff	0 stalls
Staff- Structured		0 stalls
Visitor Parking		6 stalls
Visitor- Structured		0 stalls
Loading Stalls		1 stalls
Pay in Lieu	50% of stalls	29 stalls
Parking- Offsite- City Hall		23 stalls
#Parking Spaces (By-law)		58 stalls

Library- it may be possible to provide 3 stalls for staff parking off-site, but visitor stalls will all need to be located on-site for easy access.

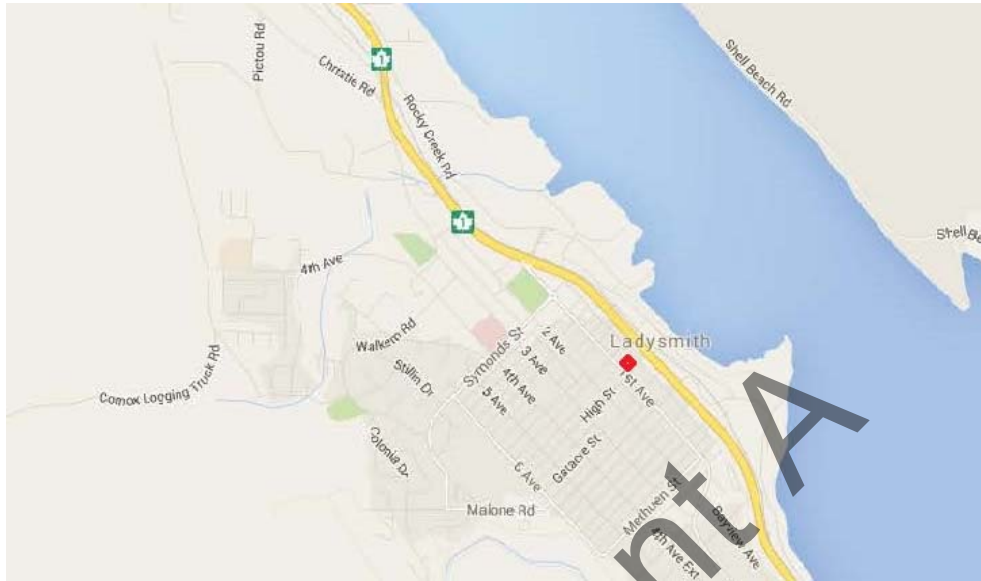
<u>Parking Assumptions- Library</u>		2020
Struct Pkg	No	
Staff Parking	100% of staff	0 stalls
Staff- Structured		0 stalls
Visitor Parking		13 stalls
Visitor- Structured		0 stalls
Loading Stalls		1 stalls
Pay in Lieu	50% of stalls	17 stalls
Parking- Offsite- Library		3 stalls
#Parking Spaces (By-law)		33 stalls



SUMMARY

SITE

The proposed site is located at First Avenue and Buller Street in Ladysmith.



DESCRIPTION

There are 4 adjacent lots, 721 First Avenue, 12, 20, and 26 Buller Street, aligned as shown in the following diagram with total site dimensions of 120 feet by 240 feet.



SUMMARY

SITE- DESCRIPTION- continued

The proposed site slopes away from 1st Avenue, downwards along Buller away from the intersection at 1st towards the Island Highway. Access from Buller is about one storey below the elevation along 1st Avenue near the last of the four lots that make up the site.

- Level 1 defined as the level of 1st Avenue;
- Level 0 is then accessible directly from Buller; and
- Level 2 is the second storey above Level 1.

In addition

- **Individual lot sizes-** each of the four lots is 60' x 120'
- **Zoning-** the site is zoned C-2 Downtown Commercial
- **Existing Buildings-** there are buildings on the properties requiring demolition
- **Natural Light-** as the site slopes away from First Avenue, any space on Level 0 along the first half or more of the distance along Buller would not have access to natural light.

STACKING

For the purposes of this document, three 'Stacking Scenarios' are outlined. They serve to provide a sense of the capacity of the proposed site, as well as to raise some key issues that must be resolved. These and other scenarios must be explored through concept layouts before subsequent planning and design proceed.

In all scenarios:

- The floor space ratio of 1.00 allows up to 28,800 sq ft of building space, and current allocations are calculated at just over 29,000 sq ft, which may require a variance, depending upon efficiency of building design;
- Any on-site parking would be accommodated at the lower portion of the site at Level 0;
- Elevator access will likely be required to and from Level 0
- The site is too small to accommodate required parking, so off-site parking on a nearby location is assumed; and
- Structured parking would add significantly to project costs.



SUMMARY

SITE- STACKING- continued

Scenario One

Scenario One locates the Library on Level 1, along with the Front of House, Council Chambers, and Retail components of City Hall. This provides these components with pedestrian access from First Avenue. City Hall storage and building support spaces are located on Level 0, with the balance of City Hall components on Level 2.

Building Stack	Stack 1		BGSF	
Total Stacked (BGSF)			29,092	
Facility Program- Stacked				
<u>Level 0</u>			4,621	16%
<u>Level 1</u>			15,919	55%
<u>Level 2</u>			8,552	30%

BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.

This raises a number of points to consider

- Level 1 area exceeds Level 0 by more than 11,000 sq ft which, with the sloping site, is not an appropriate distribution of space among building levels
- City Hall storage components are on a different level than the components they support.

Scenario Two

This scenario locates the Library on Level 0, with the balance of City Hall components on Level 1.

- Level 0 and Level 1 areas are about the same;
- Library access from visitor parking is at the same level
- Front of House would be on the same level as the components which support the majority of requests for service

Building Stack	Stack 2		BGSF	
Total Stacked (BGSF)			29,092	
Facility Program- Stacked				
<u>Level 0</u>			15,099	52%
<u>Level 1</u>			13,993	49%

BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.



SUMMARY

SITE- STACKING- continued

Scenario Three

Similar to Scenario One, the Library, Retail, Front of House, and Council Chambers components of City Hall are all on Level 1. The balance of City Hall components are on Level 0.

Building Stack	Stack 3		BGSF	
Total Stacked (BGSF)			29,092	
Facility Program- Stacked				
Level 0			17,834	62%
Level 1			11,258	39%

BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.

Point to consider include

- Calculated areas indicate the count of on-site visitor parking stalls may not fit
- There may not be sufficient building perimeter above grade to provide natural light for staffed workplaces.

RELATIVE COSTS

In addition to building area and site parameters, the relative costs of partial and overall portions of the outlined project are outlined for consideration.

Building Area Summary	Combined	City Hall	Library
NASF	22,104	11,931	10,173
BGSF	29,092	18,614	10,478
Building Construction	\$ 8,631,665	\$ 5,398,034	\$ 3,233,631
Parking Construction	\$ 260,258	\$ 142,081	\$ 118,177
Site Construction	\$ 933,324	\$ 618,984	\$ 314,340
Other Construction	\$ 1,277,282	\$ 800,683	\$ 476,599
Subtotal Construction Costs	\$ 11,102,529	\$ 6,959,782	\$ 4,142,747
Project Cost in 2015		\$ 9,882,369	\$ 5,882,390
Escalation		\$ 642,354	\$ 382,355
Project Cost in 2019	\$ 16,789,468	\$ 10,524,723	\$ 6,264,745

NASF- Net Assignable Square Feet: excludes all circulation, walls and service space.

BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.



PARAMETERS- DETAIL

This portion of the document provides more detailed information about the proposed parameters for the project. Parameters are described in terms of

- DEMAND- is based on assumptions about the participant organizations to be included and the factors affecting service demands on each;
- FACILITIES- the spaces and areas required to accommodate calculated demand;
- SITE- the land required for facilities and supporting site elements; and
- RELATIVE COSTS- a summary of costs to inform decisions about the project and its parts. As relative costs, they allow decision-makers to understand the impacts of changes to key assumptions.

All calculations for this project are extracted from a '*decision support model*', a spreadsheet-based tool which allows decision-makers to test changes in key assumptions. This provides a broader base from which to make decisions, in understanding the impacts of change. It also simplifies incorporating operational and facility changes that take place over time.

DEMAND

This portion of the document identifies the participant organizations and describes the factors affecting space and area allocations for each, including

- PARTICIPANTS;
- TARGET YEARS;
- POPULATION; and
- STAFFING.

PARTICIPANTS

There are 2 participant organizations planned for inclusion in the project. They are

- City Hall; and
- Library.

PARAMETERS

CITY HALL

The existing City Hall falls far short of meeting current needs. People looking for services must find their way among three different locations. There is insufficient space for effectively serving customers, and workplaces are overcrowded. The shortages in space as well as how they are organized require staff to expend unnecessary time to accomplish their work. Wiring, both electrical and communications, are at the limits of what patchwork measures can do for a building constructed in a different era. They also represent risks not acceptable in a modern city hall. The workplace environment, including air quality, also falls far short of current standards.

Current assumptions include a range of direct and indirect provisions for service demands, including

- One Stop Shopping- municipalities are increasingly working to reduce the number of stops required by people coming to city hall. Current facilities require people to go to multiple locations as well as make multiple trips;
- Retail- space for a small 'coffee kiosk' type of operation has been included as an informal complement to City Hall and the Library;
- Post Disaster- residents will look to City Hall for support and leadership in coping with disasters;
- Streamlining- staff continue to reduce elapsed time, redundant steps, and staff time required to meet the range of requests for service. These 'Streamlining' initiatives will free up staff time, which is then reallocated to new or improved services; and
- Repatriate Departments- current planning assumes the repatriation of Development Services and Engineering with the rest of City Hall departments. Efficiencies achieved through proximity, better facilities, staff communication and teamwork will translate to better service.

LIBRARY

The Vancouver Island Regional Library (VIRL) is anticipating redevelopment of the existing library in Ladysmith. It is currently anticipated that Library and City Hall space will be co-located. Ownership/financial arrangements as well as organization of building elements have yet to be established. Preliminary assumptions about size and budget are based on population projections, and will be revisited in subsequent stages of planning and design.

PARAMETERS

TARGET YEARS

The concept of ‘Target Years’ is used in planning for the future. The specific year is of less importance than calculated demand and capacities. Population is the primary driver of calculated demand, and while there is uncertainty about the exact year population targets will be reached, they represent reasonable milestones. Five ‘Target Years’ have been identified for this project.

	Baseline	Mid-term	Long Term
Target Year	2014	2020	2035
Target Year for Construction	2017		
Target Year for Costs	2015		

Baseline- a current context in terms of staff and facilities serves as a comparative context for future demand. As indicated in the preceding table, 2014 is the baseline year. If significant time passes or changes are implemented prior to subsequent stages in planning and design, baseline data should be reviewed and updated.

Mid-term- 2020 has been selected as the target year for which staff and facilities are calculated. It is important to emphasize that 2020 simply sets a theoretical capacity for the facility. Actual growth and operational changes will determine when the facility reaches its true capacity. Part of that process will likely involve ‘crowding’ as found in current conditions.

Long Term- population projections to the year 2035 are used to provide an understanding about the degree of growth anticipated over the long term. At current per capita staffing levels, growth beyond the facility capacity in 2020 should be readily accommodated without expansion.

Target Year for Construction/Target Year for Costs- these are used to establish an understanding of the impact of escalation on project costs.



PARAMETERS

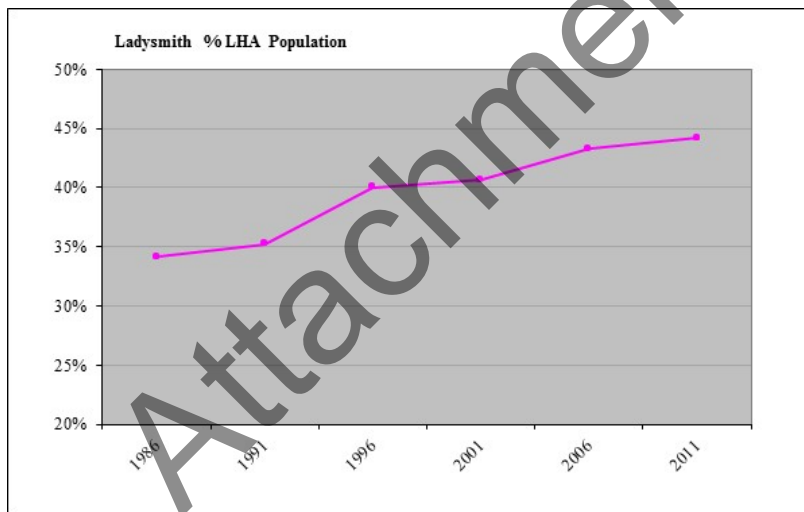
POPULATION

The primary driver of demand is population. The following table outlines assumptions about Ladysmith population over the mid- to long-term.

	Baseline	Mid-term	Long Term
Target Year	2014	2020	2035
Population- LHA	18,332	19,679	22,442
Ladysmith Municipal	8,167	9,337	11,149
% of LHA	45%	48%	50%

Projections are based upon P.E.O.P.L.E. 14¹, the 2014 version of a projection model prepared by StatsBC. As the level of detail only extends to the Local Health Area (LHA); census data is used to establish Ladysmith population as a % of LHA population. The following table and chart illustrate the growth in Ladysmith population in terms of people as well as percent of LHA population.

<u>Population- Historical</u>						
Census Year		1991	1996	2001	2006	2011
	Ladysmith Municipal	13,838	16,145	16,200	17,432	17,930
	% of LHA	35%	40%	41%	43%	44%



Current assumptions are that % of LHA population will continue to increase to

- 48% by 2020; and
- 50% by 2036.

As noted earlier, as this information is integrated into a decision support model, assumptions can be modified to understand the impacts of change. For example, the base population model can be updated with the latest version of the PEOPLE model, or assumptions about & of LHA can be modified.



¹ P.E.O.P.L.E. 14 (Population Extrapolation for Organizational Planning with Less Error; StatsBC

PARAMETERS

STAFFING

In calculating staff required to meet future service demand, existing staff were organized in terms of ‘departmental groups’. These groupings tend to reflect a community’s emphases in service delivery. The following table summarizes existing and future staffing.

Staffing	Included			Excluded
Departmental Groups- Included	2014	2020	2035	2014
Management, Support & Elected	15	17.2	20.5	-
Planning & Development	6	6.9	8.2	-
Parks, Recreation, & Culture	9	10.3	12.3	37
Works & Utilities	28	32.0	38.2	-
Subtotal Staff	58	66.4	79.2	37

*Excluded staff are those who work at venues such as pools, community centres, etc.

A comparison of staffing across communities appears to show relatively consistent patterns, when some ‘mandate areas’ are excluded

- Venues such as pools, community centres, et cetera are excluded as there are significant variations in the range and type of facilities supported, as well as differences in how they are operated. For example, societies and non-profit groups operate many community facilities;
- Utilities- the degree to which individual municipalities operate utilities such as wastewater, electrical, and gas precludes comparisons; and
- Police and Fire- funding mechanisms, regional responsibilities, and use of volunteer firefighters varies significantly across jurisdictions.

While demographics and changing community expectations will also affect service delivery decisions, it is assumed that such changes will be made within per capita rates of staffing similar to current rates. The following table outlines current and future per capita staffing by departmental group and the pro-rated distribution of staff by Department.

Departmental Group- Included Staffing per thousand population	2014	2020	2035	Excluded
Management, Support & Elected	1.84	1.84	1.84	-
Planning & Development	0.74	0.74	0.74	-
Parks, Recreation, & Culture	1.10	1.10	1.10	4.53
Works & Utilities	3.43	3.43	3.43	-
Per Capita Staffing- Included	7.10	7.10	7.10	4.53
Department	2014	2020	2035	Excluded
Administration	15	17.20	20.50	-
Development Services	6	6.90	8.20	-
Public Works	28	32.00	38.20	-
Recreation	7	8.01	9.57	37
Parks	2	2.29	2.73	-
	58	66.40	79.20	37



PARAMETERS

STAFFING BY COMPONENT

Facility requirements for City Hall are organized into *Components*. Components are the building blocks for facility planning, and are defined as

Component: *a group of people and/or spaces that must be kept together when locating them within a building.*

They reflect a functional organization of people and space, and often are the same as organizational units. The following table outlines the distribution of Ladysmith staff and space into planning components, prorated to future totals. Not all components listed below are included in City Hall planning, but are listed as part of overall staffing projections.

Component: Included Staff	2014	2020	2035	Excluded
Front of House	2	2.29	2.73	-
Council Chambers	-	-	-	-
Administration	6	6.88	8.20	-
Financial Services	7	8.03	9.57	-
Engineering	4	4.57	5.46	-
Staff Support	-	-	-	-
Building Support	-	-	-	-
Finance Storage	-	-	-	-
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Head Count- the following table lists staff to be included in the proposed facility, as well as Mayor and Council.

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Administration	13	13.9	15.2	6.0
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Engineering	3	4.6	5.5	4.0
Development Services	6	6.9	8.2	6.0
Staff Support	-	-	-	-
Building Support	-	-	-	-
Finance Storage	-	-	-	-
Administration Storage	-	-	-	-
	31	35.7	41.2	25.0
Note 1: HC- Head Count				
Note 2: Administration incl Mayor & Councillors				



PARAMETERS

FACILITIES

Facility parameters set the limits within which planning will address

- COMPONENT AREAS;
- STANDARDS; and
- PARKING.

COMPONENT AREAS

Area Allocations for each of the participant organizations are summarized in the table following. It should be noted that VIRT area allocations differ very little between ‘NASF’ and ‘BGSF’. This reflects differences in approach to area allocations at this stage of planning.

Component Areas	NASF- 2020	BGSF- 2020	NASF- 2035	BGSF- 2035
<u>City Hall Components</u>				
Front of House	1,815	2,832	1,845	2,878
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Subtotal Library	10,173	10,478	10,173	10,478
NASF- Net Assignable Square Feet: excludes all circulation, walls and service space.				
BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.				

There is little difference between City Hall area allocations for 2020 and 2035, as current assumptions anticipate staffing to increase by 6 people. There is minimal impact on overall support space from such a small staff increase.

There is no difference between Library area allocations for 2020 and 2036.



PARAMETERS

STANDARDS

Space and corresponding area allocations will be based on standardized *Workplace* and *Ancillary* spaces. Position types for Ladysmith staff were compared for functional similarities against provincial government standards (GOSS- Government Office Space Standards) in arriving at proposed standards for Ladysmith.

Workplace- a *Workplace* may be an enclosed office or an open workstation, and includes one or more worksurfaces and may also include a number of ancillary furniture items. Within a workplace, ancillary furniture includes items such as chairs, tables, filing cabinets and bookcases. For planning purposes, these items will not be identified specifically until the design process is initiated.

Ancillary- despite the redundancy, the term *Ancillary* is also used for *shared furnishings*, equipment, and spaces *outside* of individual workplaces. These include not only the same kind of furnishings such as filing cabinets and bookcases, et cetera that are found in workplaces, but also include spaces like meeting rooms, storage, and other spaces shared by two or more people.

In planning for flexibility and improved functionality, it is important to identify and accommodate *shared* furniture and equipment separately from workplaces. Comparing area allocations to existing workplaces must take into consideration that bookcases and file cabinets might be more effectively used if kept in a location where others can easily access the material contained.

Area allocations are in *NASF- Net Assignable Square Feet*, which accounts for functional area only and excludes walls and circulation.

Workplace- GOSS

The acronym GOSS- Government Office Space Standards, describes provincial government standards for workplace allocations. They are used as a benchmark in generating appropriate area allocations for Ladysmith staff. The following descriptions summarize comparable positions and their workplace allocations:

Enclosed/Open- m ²	ft ²	Function
EA- 22.5	242	Assistant Deputy Minister
EA- 13.9	150	Director (or equivalent)
EA- 11.15	120	<i>Manager*</i>
OA- 9.3	100	Accounting Officer, <i>Administrative Officer*</i> , <i>Clerk*</i> , <i>Communications Officer*</i> , Manager, Executive Coordinator, <i>Executive Secretary*</i> , <i>Financial Officer*</i> , <i>Information Systems Analyst*</i> , Planning Officer, <i>Research Officer*</i> , Social Program Officer, <i>Systems Analyst*</i>
OA- 6.5	70	Administrative Officer, Clerk, Communications Officer, Executive Secretary, Financial Officer, Information System Analyst, Inspector, Office Assistant, Research Officer, Systems Analyst
OA- 4.5	50	Building Maintenance Worker, Shipper/Stockworker, Youth Employment Program

Note- italicized and asterisked position names require Deputy Approval or functional justification for larger area allocation*



PARAMETERS

Workplace- Ladysmith

The workplace allocations for Ladysmith staff have been established in consideration of GOSS allocations, but are generally smaller in area for corresponding position types. The following table outlines proposed allocations, rationale, and furnishing capacities for each workplace type.

Enclosed/Open- ft ²	Remarks
Enclosed 150	150 Mayor and City Manager. Same as EA- 13.9, despite functional similarities to Assistant Deputy Minister (EA- 22.5) <i>6' desk, credenza + 4 ancillary</i>
Enclosed 140	140 Director (or equivalent). Lower than GOSS allocation for this position type at EA- 13.9 <i>3 worksurfaces + 6 ancillary</i>
Enclosed 120	120 Functional justification for privacy needs <i>2 worksurfaces + 5 ancillary</i>
Enclosed 100	100 Functional justification for privacy needs <i>2 worksurfaces + 3 ancillary</i>
Open 70	70 Supervisor or Clerical <i>2 worksurfaces + 5 ancillary</i>
Homebase	40 Inspectors and other staff who spend the majority of their time in the field. <i>1 worksurface</i>
Transaction	60 Reception. May or may not be primary workplace for designated staff <i>2 worksurfaces</i>



PARAMETERS

PARKING

The following tables summarize parking assumptions for

- City Hall; and
- Library.

Both take full advantage of ‘Pay in Lieu’ provisions which reduce required parking by 50%.

Current assumptions about the site and parking are theoretical and must be ‘tested’ through the preparation of concept drawings, but it is anticipated that some 26 stalls will need to be provided off-site. The cost of surface parking on additional property purchased nearby is significantly more economical than structured parking on-site.

While it is the stated preference of VIRL is for the Library to be located on ‘Level 1’ with pedestrian access from 1st Avenue, any on-site parking would be at ‘Level 0’ and accessed from Buller at the end of the site away from 1st Avenue. The ‘Stacking’ description later in this document describes this issue in more detail.

City Hall- it is assumed that 20 stalls are provided off-site based on preliminary site capacity calculations described later in this document.

Parking Assumptions- City Hall		2020
Struct Pkg	No	
Staff Parking	64% of staff	0 stalls
Staff- Structured		0 stalls
Visitor Parking		6 stalls
Visitor- Structured		0 stalls
Loading Stalls		1 stalls
Pay in Lieu	50% of stalls	29 stalls
Parking- Offsite- City Hall		23 stalls
#Parking Spaces (By-law)		58 stalls

Library- it may be possible to provide 3stalls for staff parking off-site, but visitor stalls will all need to be located on-site for easy access.

Parking Assumptions- Library		2020
Struct Pkg	No	
Staff Parking	100% of staff	0 stalls
Staff- Structured		0 stalls
Visitor Parking		13 stalls
Visitor- Structured		0 stalls
Loading Stalls		1 stalls
Pay in Lieu	50% of stalls	17 stalls
Parking- Offsite- Library		3 stalls
#Parking Spaces (By-law)		33 stalls



PARAMETERS

SITE

The proposed site is located at First Avenue and Buller Street in Ladysmith.



DESCRIPTION

There are 4 adjacent lots, 721 First Avenue, 12, 20, and 26 Buller Street, aligned as shown in the following diagram with total site dimensions of 120 feet by 240 feet.



PARAMETERS

SITE- DESCRIPTION- continued

The proposed site slopes away from 1st Avenue, downwards along Buller away from the intersection at 1st towards the Island Highway. Access from Buller is about one storey below the elevation along 1st Avenue near the last of the four lots that make up the site.

- Level 1 defined as the level of 1st Avenue;
- Level 0 is then accessible directly from Buller; and
- Level 2 is the second storey above Level 1.

In addition

- **Individual lot sizes-** each of the four lots is 60' x 120'
- **Zoning-** the site is zoned C-2 Downtown Commercial
- **Existing Buildings-** there are buildings on the properties requiring demolition
- **Natural Light-** as the site slopes away from First Avenue, any space on Level 0 along the first half or more of the distance along Buller would not have access to natural light.

STACKING

For the purposes of this document, three 'Stacking Scenarios' are outlined. They serve to provide a sense of the capacity of the proposed site, as well as to raise some key issues that must be resolved. These and other scenarios must be explored through concept layouts before subsequent planning and design proceed.

In all scenarios:

- The floor space ratio of 1.00 allows up to 28,800 sq ft of building space, and current allocations are calculated at just over 29,000 sq ft, which may require a variance, depending upon efficiency of building design;
- Any on-site parking would be accommodated at the lower portion of the site at Level 0;
- Elevator access will likely be required to and from Level 0
- The site is too small to accommodate required parking, so off-site parking on a nearby location is assumed; and
- Structured parking would add significantly to project costs.



PARAMETERS

SITE- STACKING- continued

Scenario One

Scenario One locates the Library on Level 1, along with the Front of House, Council Chambers, and Retail components of City Hall. This provides these components with pedestrian access from First Avenue. City Hall storage and building support spaces are located on Level 0, with the balance of City Hall components on Level 2.

Building Stack	Stack 1		BGSF	
Total Stacked (BGSF)			29,092	
Facility Program- Stacked				
<u>Level 0</u>			4,621	16%
<u>Level 1</u>			15,919	55%
<u>Level 2</u>			8,552	30%

BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.

This raises a number of points to consider

- Level 1 area exceeds Level 0 by more than 11,000 sq ft which, with the sloping site, is not an appropriate distribution of space among building levels
- City Hall storage components are on a different level than the components they support.

Scenario Two

This scenario locates the Library on Level 0, with the balance of City Hall components on Level 1.

- Level 0 and Level 1 areas are about the same;
- Library access from visitor parking is at the same level
- Front of House would be on the same level as the components which support the majority of requests for service

Building Stack	Stack 2		BGSF	
Total Stacked (BGSF)			29,092	
Facility Program- Stacked				
<u>Level 0</u>			15,099	52%
<u>Level 1</u>			13,993	49%

BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.



PARAMETERS

SITE- STACKING- continued

Scenario Three

Similar to Scenario One, the Library, Retail, Front of House, and Council Chambers components of City Hall are all on Level 1. The balance of City Hall components are on Level 0.

Building Stack	Stack 3	BGSF	
Total Stacked (BGSF)		29,092	
Facility Program- Stacked			
Level 0		17,834	62%
Level 1		11,258	39%

BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.

Point to consider include

- Calculated areas indicate the count of on-site visitor parking stalls may not fit
- There may not be sufficient building perimeter above grade to provide natural light for staffed workplaces.

Detail- Scenario One

Building Stack		Facility Program- Stacked		
Components	FP	NASF	BGSF	Staff
Location	2020	2020		
City Hall	Stack 1			
Front of House	Level 1	1,815	2,832	2
Council Chambers	Level 1	1,172	1,829	-
Financial Services	Level 2	1,142	1,782	8
Administration	Level 2	1,896	2,958	14
Development Services	Level 2	1,124	1,753	7
Engineering	Level 2	639	997	5
Staff Support	Level 2	681	1,062	-
Building Support	Level 0	950	1,482	-
Finance Storage	Level 0	900	1,404	-
Administration Storage	Level 0	1,112	1,735	-
Retail	Level 1	500	780	-
Subtotal City Hall		11,931	18,614	36
Library				
Library- Public Use	Level 1	7,665	7,895	-
Library-Entry/Circulation	Level 1	705	726	-
Library- Processing	Level 1	1,803	1,857	3
Subtotal Library		10,173	10,478	3

NASF- Net Assignable Square Feet: excludes all circulation, walls and service space.

BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.



PARAMETERS

Detail- Scenario Two

Building Stack		Facility Program- Stacked		
Components	FP	NASF	BGSF	Staff
Location	2020	2020		
City Hall	Stack 2			
Front of House	Level 1	1,815	2,832	2
Council Chambers	Level 1	1,172	1,829	-
Financial Services	Level 1	1,142	1,782	8
Administration	Level 1	1,896	2,958	14
Development Services	Level 1	1,124	1,753	7
Engineering	Level 1	639	997	5
Staff Support	Level 1	681	1,062	-
Building Support	Level 0	950	1,482	-
Finance Storage	Level 0	900	1,404	-
Administration Storage	Level 0	1,112	1,735	-
Retail	Level 1	500	780	-
Subtotal City Hall		11,931	18,614	36
Library				
Library- Public Use	Level 0	7,665	7,895	-
Library-Entry/Circulation	Level 0	705	726	-
Library- Processing	Level 0	1,803	1,857	3
Subtotal Library		10,173	10,478	3

Detail- Scenario Three

Building Stack		Facility Program- Stacked		
Components	FP	NASF	BGSF	Staff
Location	2020	2020		
City Hall	Stack 3			
Front of House	Level 0	1,815	2,832	2
Council Chambers	Level 0	1,172	1,829	-
Financial Services	Level 0	1,142	1,782	8
Administration	Level 0	1,896	2,958	14
Development Services	Level 0	1,124	1,753	7
Engineering	Level 0	639	997	5
Staff Support	Level 0	681	1,062	-
Building Support	Level 0	950	1,482	-
Finance Storage	Level 0	900	1,404	-
Administration Storage	Level 0	1,112	1,735	-
Retail	Level 1	500	780	-
Subtotal City Hall		11,931	18,614	36
Library				
Library- Public Use	Level 1	7,665	7,895	-
Library-Entry/Circulation	Level 1	705	726	-
Library- Processing	Level 1	1,803	1,857	3
Subtotal Library		10,173	10,478	3



PARAMETERS

Parking and Outdoor Space

The cost of structured parking solutions are significantly higher than for surface parking. The cost of land in the Ladysmith is low enough to warrant consideration of purchasing additional property to accommodate required parking. The following table outlines assumptions about parking and other outdoor space for City Hall.

Parking Assumptions- City Hall				
By-law Parking Requirement by Establishment Type				
GSM per Stall			FP- BGSF	
Assembly, Civic		30.00	17,834	
Commercial- Office, Retail		30.00	780	
			Calculated	
#Parking Spaces (By-law)		GSM per Stall	58 stalls	
Loading Stalls		3000 cgsM	1 stalls	
			Allocated	Sq Ft
Staffing- Peak Shift	Shell Type		36 staff	
Staff Parking	Surface Parking	64% of staff	0 stalls	-
Staff- Structured	Struct Pkg- PD		0 stalls	-
Visitor Parking	Surface Parking		6 stalls	2,340
Visitor- Structured	Struct Pkg- PD		0 stalls	-
Loading Stalls	Surface Parking		1 stalls	615
Pay in Lieu	Surface Parking	50% of stalls	29 stalls	11,310
Parking- Offsite- City Hall			23 stalls	
Savings on Parking				
Other Outdoor Spaces-City Hall				
	Location		Sq Ft	1,000
Outdoor Patio	Walks/Patios-at C	435	435	
Emergency Generator	Surface Parking	360	360	
Garbage & Recycle Outdoor	Surface Parking	205	205	
Additional Landscaping	General Landscaping		-	
Roadways- City Hall				
	Surface Parking	30' w	800	800
		25%		
			27 lin ft	



PARAMETERS

Parking and Outdoor Space- continued

Similar assumptions are outlined for the Library

<u>Parking Assumptions- Library</u>				
By-law Parking Requirement by Establishment Type				
GSM per Stall			FP- BGSF	
Assembly, Civic		30.00	10,478	
Other Commercial, Institutional		40.00	-	
			Calculated	
#Parking Spaces (By-law)			33 stalls	
Loading Stalls		3000 cgsm	1 stalls	
			Allocated	Sq Ft
Staffing- Peak Shift	Shell Type		3 staff	
Staff Parking	Surface Parking	100% of staff	0 stalls	-
Staff- Structured	Struct Pkg- PD		0 stalls	-
Visitor Parking	Surface Parking		13 stalls	5,070
Visitor- Structured	Struct Pkg- PD		0 stalls	-
Loading Stalls	Surface Parking		1 stalls	615
Pay in Lieu	Surface Parking	50% of stalls	17 stalls	6,630
<u>Parking- Offsite- Library</u>			3 stalls	
Savings on Parking				
Other Outdoor Spaces- Library			Sq Ft	-
Outdoor Patio	Walks/Patios-at C	-	-	
Emergency Generator	Surface Parking	-	-	
Garbage & Recycle Outdoor	Surface Parking	-	-	
Additional Landscaping	General Landscap	-	-	
Roadways- Library				
	Surface Parking	30' w	1,500	1,500
		25%		
			50 lin ft	



PARAMETERS

RELATIVE COSTS

In addition to building area and site parameters, the relative costs of partial and overall portions of the outlined project are outlined for consideration.

Building Area Summary	Combined	City Hall	Library
NASF	22,104	11,931	10,173
BGSF	29,092	18,614	10,478
Building Construction	\$ 8,631,665	\$ 5,398,034	\$ 3,233,631
Parking Construction	\$ 260,258	\$ 142,081	\$ 118,177
Site Construction	\$ 933,324	\$ 618,984	\$ 314,340
Other Construction	\$ 1,277,282	\$ 800,683	\$ 476,599
Subtotal Construction Costs	\$ 11,102,529	\$ 6,959,782	\$ 4,142,747
Project Cost in 2015		\$ 9,882,369	\$ 5,882,390
Escalation		\$ 642,354	\$ 382,355
Project Cost in 2019	\$ 16,789,468	\$ 10,524,723	\$ 6,264,745

NASF- Net Assignable Square Feet: excludes all circulation, walls and service space.

BGSF- Building Gross Square Feet: includes all area within outside surface of exterior walls.

Cost assumptions in the model have been reviewed by a Cost Consultant². As minor changes have been made to the space list and assumptions about parking, the final figures in this document vary from those prepared by the Cost Consultant, but are sufficiently accurate for the purposes of strategic facility planning.

All assumptions in this document and the model should be reviewed and updated prior to subsequent stages of planning and design.



² Town of Ladysmith, New City Hall, Order of Magnitude Estimate; Hanscomb Limited; January 07, 2016

PARAMETERS

CONSTRUCTION TO PROJECT COST- CITY HALL

In calculating a project cost, a number of assumptions have been made. The following table outlines assumptions for the City Hall portion of the project.

<u>Building Construction</u>				\$	5,398,034	
Average Shell Cost				\$	194.96	
Average Fit-out Cost				\$	95.04	
Average Shell+Fit-out				\$	290.00	
<u>Parking Summary</u>						
Struct Pkg- PD					0 spaces	
Sheltered					0 spaces	
Surface Parking					7 spaces	
<u>Parking Construction</u>				\$	142,081	
Struct Pkg- PD				\$	-	
Sheltered				\$	-	
Surface Parking				\$	142,081	
<u>Site Construction</u>				\$	618,984	
On Site Development		\$ 25.00	\$	465,350	per BGSF	
Demolition		\$ 12.00	\$	60,564	per BGSF	
Landscaping		\$ 5.00	\$	93,070	per BGSF	
<u>Building & Site Construction</u>				\$	6,159,099	
<u>Other Construction</u>				\$	800,683	
G.C. Management Fee		3.0%	\$	184,773	% of Subtotal Const'n	
Div 1 General Conditions		10.0%	\$	615,910	% of Subtotal Const'n	
Subtotal Construction Costs				\$	6,959,782	
<u>Soft Costs</u>				\$	1,983,538	
Consultant Design Team		10.0%	\$	695,978	% of Const'n Total	
Disbursements		2.5%	\$	173,995	% of Const'n Total	
Design Construction Contingency		5.0%	\$	347,989	% of Const'n Total	
FF&E		5.0%	\$	347,989	% of Const'n Total	
Offsite Development		5.0%	\$	347,989	% of Const'n Total	
Permits & Licenses		1.0%	\$	69,598	% of Const'n Total	
Ladysmith DCC		\$ 7.95	\$	-	\$ per bgsf	
Regional District DCC		\$ 0.811	\$	-	\$ per bgsf	
<u>Other Costs</u>				\$	939,049	
Project Manager- Civic Building		2.0%	\$	178,866	% of Combined Total	
General Overhead Rate		5.0%	\$	447,166	% of Combined Total	
Taxes		3.5%	\$	313,016	% of Combined Total	
Project Cost in 2015				\$	9,882,369	



PARAMETERS

CONSTRUCTION TO PROJECT COST- LIBRARY

Similar assumptions are outlined for the Library portion of the project.

<u>Building Construction</u>				\$	3,233,631	
Average Shell Cost				\$	202.49	
Average Fit-out Cost				\$	106.12	
Average Shell+Fit-out				\$	308.61	
<u>Parking Summary</u>						
Struct Pkg- PD					0 spaces	
Sheltered					0 spaces	
Surface Parking					14 spaces	
<u>Parking Construction</u>				\$	118,177	
Struct Pkg- PD				\$	-	
Sheltered				\$	-	
Surface Parking				\$	118,177	
<u>Site Construction</u>				\$	314,340	
On Site Development		\$	25.00	\$	261,950	per BGsf
Demolition						
Landscaping		\$	5.00	\$	52,390	per BGsf
<u>Building & Site Construction</u>				\$	3,666,148	
<u>Other Construction</u>				\$	476,599	
G.C. Management Fee			3.0%	\$	109,984	% of Subtotal Const'n
Div 1 General Conditions			10.0%	\$	366,615	% of Subtotal Const'n
Subtotal Construction Costs				\$	4,142,747	
<u>Soft Costs</u>				\$	1,180,683	
Consultant Design Team			10.0%	\$	414,275	% of Const'n Total
Disbursements			2.5%	\$	103,569	% of Const'n Total
Design Construction Contingency			5.0%	\$	207,137	% of Const'n Total
FF&E			5.0%	\$	207,137	% of Const'n Total
Offsite Development			5.0%	\$	207,137	% of Const'n Total
Permits & Licenses			1.0%	\$	41,427	% of Const'n Total
Ladysmith DCC		\$	7.95	\$	-	\$ per bgsf
Regional District DCC		\$	0.811	\$	-	\$ per bgsf
<u>Other Costs</u>				\$	558,960	
Project Manager- Civic Building			2.0%	\$	106,469	% of Combined Total
General Overhead Rate			5.0%	\$	266,171	% of Combined Total
Taxes			3.5%	\$	186,320	% of Combined Total
Project Cost in 2015				\$	5,882,390	



PARAMETERS

ESCALATION

It is important to acknowledge the impact of escalation on the costs of a project. This portion of the document outlines the assumptions and impacts for City Hall and the Library.

Escalation Assumptions		
From beginning	To beginning	% Escalation/Yr
Year 2015	Year 2016	0%
Year 2016	Year 2017	3%
Year 2017	Year 2018	3%
Year 2018	Year 2019	3%
Year 2019	Year 2020	3%
Year 2020	Year 2021	3%
Year 2021	Year 2022	3%
Year 2022	Year 2023	3%
Year 2023	Year 2024	3%
Year 2024	Year 2025	3%
Year 2025	Year 2026	3%

ESCALATION ASSUMPTIONS- CITY HALL

Project Cost in 2015		\$ 9,882,369
Duration of Construction	14 months	
Target Year for Construction		Year 2017
Escalation of Construction Costs		\$ 208,793
Escalation Other		
Construction Period		\$ 243,592
Portion of const period	50%	
Rate	0.50%/mo	
Soft Cost Multiplier	1.42	
<u>Escalation</u>		\$ 642,354
Escalation in Percent	7%	
Project Cost in 2019		\$ 10,524,723

ESCALATION ASSUMPTIONS- LIBRARY

Project Cost in 2015		\$ 5,882,390
Duration of Construction	14 months	
Target Year for Construction		Year 2017
Escalation of Construction Costs		\$ 124,282
Escalation Other		
Construction Period		\$ 144,996
Portion of const period	50%	
Rate	0.50%/mo	
Soft Cost Multiplier	1.42	
<u>Escalation</u>		\$ 382,355
Escalation in Percent	6%	
Project Cost in 2019		\$ 6,264,745



PARAMETERS

SPACE LIST

A detailed space list for all components is shown on the following pages.

SPACELIST	2014	2020	Unit	FP	Remarks	
	HC	HC	#Unit	NASF	NASF	
Front of House	2.00	2.29			1,815	
<i>Workplace</i>	HC	HC	#Unit	NASF	NASF	
CUSTOMER SERVICE COORDINATOR	1.00	1.00	1	70	70	LEBLANC, JENNIFER-JO
CUSTOMER SERVICE REP	1.00	1.00	1	70	70	ECK, SAMANTHA
<i>Prorated HC & Workplace</i>		0.29			21	
<i>Ancillary</i>						
Public Area			1	600	600	
Gathering Place			1	600		
Visitor Side of Reception			1	405	405	
Entry Vestibule			10 lin ft	5		
Waiting, per person			6	15		
Floor Storage 48d			8 lin ft	8	Childrens' Play	
Desk- Computer 48			1	18	Self-help Terminal	
Floor Storage 24d			12 lin ft	4	Brochures/Pamphlets	
Floor Storage 24d			8 lin ft	4	Displays/Memorabilia	
Surge Space			15	7	Overflow queueing- 15 p	
Transaction Counter			3	63	189	15 lin ft counter, incl w/c stn
Meeting- 8p			2	160	320	
Staff Side of Reception			1	140	140	
Coats/Outerwear			4 lin ft	5		
Plotter/Scanner			1	38		
Counter 24d /lin ft			8 lin ft	5	Collating/peripherals	
Shelving 4w x 1.5d			2	20	Storage/holding	
Council Chambers	-	-			1,172	
<i>Ancillary</i>						
Entry Vestibule			1	5	5	
Surge Space			12	7	84	
Washroom- Accessible			2	45	90	
Council Chamber			1	835	835	
Council Table			1	450	12 p	
Desk 72			1	47	Recording Secretary	
Council Viewing			1	265	20 p	
Counter 24d /lin ft			15 lin ft	5		
Beverage Counter			1	40	40	
Floor Storage 36d			13 lin ft	6	78	Room setup storage
Copy/Print- Sm			1	40	40	



PARAMETERS

- continued

SPACELIST	2014	2020	Unit	FP	Remarks	
	HC	HC	#Unit	NASF	NASF	
Administration	13.00	13.88			1,896	
<i>Workplace</i>	HC	HC	#Unit	NASF	NASF	
CITY MANAGER	1.00	1.00	1	150	150	MALLI, RUTH E
ADMIN COORDINATOR (Corp Svcs)	1.00	1.00	1	100	100	BOUMA, SUSAN
DIRECTOR OF CORPORATE SERVICES	1.00	1.00	1	140	140	BOWDEN, SANDY
MANAGER OF ADMINISTRATIVE SERVICES	1.00	1.00	1	120	120	WINTER, JOANNA
ADMINISTRATIVE ASSISTANT - HR	1.00	1.00	1	70	70	OGDEN, JOAN
MANAGER OF HUMAN RESOURCES	1.00	1.00	1	140	140	COUSINS, KAREN
Mayor's Office	1.00	1.00	1	150	150	
Councillors' Office	6.00	6.00	2	100	200	Shared among 6 p
<i>Prorated HC & Workplace</i>		0.88			106	
<i>Ancillary- Corporate Services</i>						
Shelving 4w x 1.5d			1	20	20	Mail Cubbies
Corporate Records			1	210	210	
Shelving- Records			10	10		Rationalize with bsmt storage
Cabinet 36			1	14		
Counter 24d /lin ft			4 lin ft	5		Staging area
Floor Storage 36d			10 lin ft	6		
Utility Cart			1	18		
Print/Copy/Mail			1	260	260	Main print/copy
Copy/Print- Med			1	80		Doc disposal/recycle under
Counter 24d /lin ft			8 lin ft	5		Mail
Shelving 4w x 1d			6	15		Paper & forms storage
Floor Storage 36d			8 lin ft	6		Staging/storage
Information Technology			1	230	230	Server Room
Desk 60			1	38		
File Cab- Lateral 42			2	14		
Server/Network Racks			3	27		
Primary HVAC			1	42		
Backup HVAC			1	24		
Fire Suppression Tank			1	18		

- continued

SPACELIST	2014	2020	Unit	FP	Remarks
	HC	HC	#Unit	NASF	NASF



PARAMETERS

Financial Services		7.00	8.03			1,142	
Workplace		HC	HC	#Unit	NASF	NASF	
DIRECTOR OF FINANCIAL SERVICES		1.00	1.00	1	140	140	ANDERSON, ERIN
MANAGER OF ACCOUNTING SERVICES		1.00	1.00	1	120	120	FUKAKUSA, GERALD
REVENUE ACCOUNTANT		1.00	1.00	1	100	100	KIRKLAND, BETH
PAYROLL SPECIALIST		1.00	1.00	1	70	70	FRAME, DOREEN
FINANCIAL SERVICES COORDINATOR		1.00	1.00	1	100	100	COPP, CAMELIA
ACCOUNTING TECHNICIAN		1.00	1.00	1	100	100	MCLENNAN, KARI-ANNE
ACCOUNTS PAYABLE COORDINATOR		1.00	1.00	1	100	100	SCHNEIDER, JOANNE
<i>Prorated HC & Workplace</i>			1.03			107	
Ancillary							
Document Centre				1	27	27	
Plotter/Scanner				1	38	38	
Counter 24d /lin ft				6 lin ft	5	30	Collating/peripherals
Cabinet 30				1	10	10	Payroll
Bookcase 32				1	10	10	Payroll
Vault				1	190	190	
	Shelving- Records			12	10		Rationalize with bsmt storage
	File Cab- Vertical Legal			2	9		
	Bookcase 36			2	12		
	Counter 24d /lin ft			6 lin ft	5		
Development Services		6.00	6.90			1,124	
Workplace		HC	HC	#Unit	NASF	NASF	
DIRECTOR OF DEVELOPMENT SERVICES		1.00	1.00	1	140	140	ADAMS, FELICITY
SR PLANNER/DEV. APPROVALS SUPER		1.00	1.00	1	100	100	BRINKMAN, LISA
SR BUILDING INSP/BYLAW COMPLIANCE		1.00	1.00	1	70	70	BOLLINGER, COLIN
PLANNER		1.00	1.00	1	70	70	DAVIES, ANGELA
ADMINISTRATIVE ASSISTANT - DEV SERVICES		1.00	1.00	1	70	70	WEBBER, DIANE J
BYLAW COMPLIANCE		1.00	1.00	-	70	-	HAYDEN, MARK
<i>Prorated HC & Workplace</i>			0.90			81	
Ancillary- Development Svcs							
Document Centre				1	27	27	
Plotter/Scanner				1	38	38	
Cabinet 48				1	24	24	o/s FA office
Bookcase 32				2	10	20	i/s FA office
File Cab- Lateral 30				2	10	20	i/s FA office
File Cab- Lateral 42				1	14	14	Reception; fire resistant?
Ancillary- Bldg Inspection							
Building Reference				1	450	450	
	File Cab- Vertical Legal			1	9		Tom's office
	Counter 24d /lin ft			6 lin ft	5		Tom's office- reference manuals over
	Counter 24d /lin ft			5 lin ft	5		Tom's office- tools, storage under
	Plan Files			1	37		In Lunch room
	File Cab- Vertical Legal			15	9		Tom's 'Dungeon'
	File Cab- Lateral 42			1	14		Tom's 'Dungeon'
	Plan Files			2	37		Tom's 'Dungeon'
	Rolled Drawing Holder			2	7		Tom's 'Dungeon'
	Table- 72			1	43		Tom's 'Dungeon'
	File Box			10	7		Tom's 'Dungeon'



PARAMETERS

- continued

SPACELIST	2014	2020		Unit	FP	Remarks
	HC	HC	#Unit	NASF	NASF	
Engineering	3.00	4.57			639	
<i>Workplace</i>	HC	HC	#Unit	NASF	NASF	
DIRECTOR OF INFRASTRUCTURE	1.00	1.00	1	140	140	MANSON, JOHN
SENIOR ENGINEERING TECHNOLOGIST	1.00	1.00	1	100	100	SLATER, PHIL
ENGINEERING ASSISTANT	1.00	1.00	1	70	70	PINNINGTON, CHRIS
GIS/Asset Management Technician		1.00	1	70	70	New Position 1
<i>Prorated HC & Workplace</i>		0.57			54	
<i>Ancillary</i>						
Engineering Reference			1	205	205	
File Cab- Vertical Legal			1	9		Phil's office
File Cab- Lateral Fire Resist			1	14		John's office
Rolled Drawing Holder			3	7		2 John, 1 Phil
Plotter/Scanner			2	38		1 plotter, 1 scanner
Plan Files Fire Resist			1	26		w/plotter
Bookcase 36			2	12		Equip 1- John, 1- Phil
Counter 36d /lin ft			6 lin ft	6		Reference manuals over
Staff Support	-	-			681	
<i>Workplace</i>	HC	HC	#Unit	NASF	NASF	
<i>Ancillary</i>						
Lker/Shwr Rm <6, ace'ble			1	196	196	End-of-Trip w/5 lockers
Staff Room			1	365	365	
Counter 24d /lin ft			18 lin ft	5		Counter w/sink, fridge, microwave
Table- 96			1	58		
Side Chair			10	12		
Sofa Seating			4	18		
Table- Side			2	13		
Outdoor Patio				435	-	Sheltered, orient to sun and outlook
Counter 24d /lin ft			12 lin ft	5		
Table- 72			2	43		
Side Chair			12	12		
Floor Storage 96d			12 lin ft	12		
Bicycle Storage- Staff			1	120	120	Secure, sheltered, near staff entry
Floor Storage 24d			30 lin ft	4		



PARAMETERS

- continued

SPACELIST	2014	2020		Unit	FP	Remarks
	HC	HC	#Unit	NASF	NASF	
Building Support	-	-			950	
<i>Workplace</i>	HC	HC	#Unit	NASF	NASF	
<i>Ancillary</i>						
Loading Dock			1	145	145	
Floor Storage 96d			10 lin ft	12	120	Staging area; fenced
Housekeeping Closet			3	30	90	Distributed
First Aid Room			1	100	100	
Communication Closet			2	95	190	Stacked vertically
Maintenance Storage			1	170	170	
Counter 36d /lin ft			8 lin ft	6		Work bench
Floor Storage 24d			12 lin ft	4		Bulk boxed
Floor Storage 36d			12 lin ft	6		Cleaning equipment
Garbage & Recycle			1	135	135	
Wall Mount			8 lin ft	2		Brooms/shovels
Counter 36d /lin ft			8 lin ft	6		Recycle Staging
Totes			8	9		
Floor Storage 36d			8 lin ft	6		
Garbage & Recycle- Outdoor				205	-	
120 litre cart			4	13		
4 yd Dumpster			2	76		
Finance Storage	-	-			900	
<i>Workplace</i>	HC	HC	#Unit	NASF	NASF	
<i>Ancillary</i>						
Finance- 7 Years' Storage			1	515	515	South end of Basement
Shelving 4w x 1.5d			18	20		
File Cab- Vertical Legal			2	9		
Floor Storage 36d			8 lin ft	6		
Counter 24d /lin ft			5 lin ft	5		Staging Area
Floor Storage 48d			8 lin ft	8		Staging Area
Finance- Older Records			1	385	385	Middle of Basement
Shelving 4w x 1.5d			10	20		
Shelving 4w x 2d			5	23		
Floor Storage 36d			12 lin ft	6		
Administration Storage	-	-			1,112	North end of Basement
<i>Workplace</i>	HC	HC	#Unit	NASF	NASF	
<i>Ancillary</i>						
File Cab- Vertical Legal			5	9	45	
Shelving 4w x 1.5d			5	20	100	90 file box capacity
Shelving 4w x 1.5d			40	20	800	720 file box capacity- Corp Svcs
Shelving 4w x 2d			2	23	46	
Floor Storage 24d			8 lin ft	4	32	
Counter 24d /lin ft			5 lin ft	5	25	Staging Area
Floor Storage 48d			8 lin ft	8	64	Staging Area
Retail	-	-			500	
<i>Ancillary</i>						
Net Rentable 1			1	500	500	



PARAMETERS

SPACELIST	2014	2020		Unit	FP	Remarks
	HC	HC	#Unit	NASF	NASF	
Library-Entry/Circulation	-	-			705	
<i>Ancillary</i>						
Entry Vestibule			1	180	180	
Floor Storage 96d			15 lin ft	12		
Circulation Desk			1	250	250	
Transaction Counter			3	63		
Bookcase 36			2	12		
Utility Cart			2	18		
Reference Desk			1	100	100	
Desk 72			1	47		
Bookcase 36			2	12		
File Cab- Lateral 42			2	14		
Literacy/OPAC/Self Check/Print Release			1	175	175	
Computer-VIRL			2	25		Literacy
Computer-VIRL			2	25		OPAC
Computer-VIRL			2	25		Self Check
Computer-VIRL			1	25		Print Release
Library- Public Use	-	-			7,665	
<i>Ancillary</i>						
Collection Area			1	3,770	3,770	
Shelving Library			290	13		
Childrens			1	1,250	1,250	
Shelving Library			96	13		
Teen			1	520	520	
Shelving Library			40	13		
Use & Study			1	970	970	
Seating-VIRL			12	30		Study Seating
Seating-VIRL			12	30		Lounge Seating
Computer-VIRL			10	25		Self Check
Meeting			1	960	960	
Meeting- 12p			2	255		Study Rooms
Multipurpose-VIRL			1	450		Multipurpose
Washroom-VIRL			2	40	80	
Washroom, Family-VIRL			1	100	100	
Balance of Space			1	15	15	
Library- Back of House	3.00	3.00			1,803	
<i>Workplace</i>						
Offices	3.00	3.00	3	100	300	
<i>Ancillary</i>						
Workroom			1	1,153	1,153	
Staff Breakroom			1	350	350	
Counter 24d /lin ft			14 lin ft	5		
Table- 72			1	43		
Side Chair			6	12		
Locker			6	11		
Table- Side			2	13		
Sofa Seating			4	18		



STREAMLINING

Improvements to customer service processes are an integral part of the culture of Ladysmith civic staff. In parallel with the planning process for the redevelopment of City Hall, a 'Streamlining'³ initiative was implemented. The application of 'lean systems' theory to customer service processes was used to demonstrate, on a 'pilot project' basis, the potential for improving staff effectiveness.

At a general level, information was generated in terms of:

- DEMAND-
- DESIGN FOR DEMAND- generating more effective ways to deliver customer service to satisfy *high volume, predictable* demands.
- IMPLEMENTATION- the ongoing process of *continuous improvement*.

This initiative was focused on beginning to establish a baseline understanding of 'Demand' for Ladysmith, as well as to identify several candidates for consideration in subsequent, more detailed work.

BLIND SPOTS

An important element of this process was the identification and correction of *blind spots*. We are often 'blind' to the way we do things- they're simply how they've always been done, or an extension of what was already in place to satisfy another demand. As the term implies, we are often unable to *see* our own blind spots, so we can help others in this process by beginning to notice how they go about satisfying demand.

CUSTOMERS

In beginning to understand demand in 'lean service' terms, it is important to identify the generators of demand, the 'customers'. Each part of the organization serves a variety of customers, each of whom generates demand.

A number of lists were generated in work sessions and included information about:

- *Who*- types of customers;
- How they might be *grouped*; and
- '*Key Groups/Customers*' in terms of those who generate high volumes of predictable demand.

The focus of the early part of the process was to expand staff understanding about several key demands that were identified, in order to select one or more *initiatives* for more detailed development.



³ Streamline Customer Processes- Lean Systems; May 2012; Process Four...

LEAN SYSTEMS THINKING

There are a number of concepts to consider, in analyzing customer processes from a *lean systems thinking* point of view, which emphasizes process flow and waste issues. They include:

- Work is what we do to satisfy demand
- Design for predictable, high volume demands
- Work involving multiple steps and processes can be described in terms of *value streams*
- Always look at work and demand from the *customer* point of view
 - What matters to them?
 - Design a system that helps customers extract value
- In identifying work processes or value streams to streamline, there are a number of things to look for, including:
 - Wait times
 - Multiple approvals
 - Duplication
 - Bottlenecks
 - Hand-offs
 - More information than required
 - Multiple locations
 - Rework

Many of the concepts, as well as much of the language, were drawn from ‘Systems Thinking in the Public Sector’⁴, as well as from the writings of Taichi Ohno⁵, who created the foundations for ‘lean systems’ design. For a more detailed understanding and description of underlying objectives, please refer to the literature.

FINANCIAL SERVICES

A number of processes were identified for several departments in the organization, including:

- Corporate Services;
- Financial Services; and
- Parks, Recreation & Culture.

⁴ Systems Thinking in the Public Sector, John Seddon; 2008; Triarchy Press, UK

⁵ Toyota Production System; Taichi Ohno, 1988; Productivity Press, NY, NY



FINANCIAL SERVICES- continued

Several processes in each department were detailed and examined at a relatively general level of detail. In consideration of the constraints of time and resources, processes for Financial Services were selected for a more detailed level of analysis to assess viability for implementation.

- Purchase Orders
- Inventory System
- A Primer for GL Codes

Two others, 'Tax Certificates' and 'Water Consumption Inquiry' were also being examined but then set aside at the time as relatively 'effective' in terms of complexity and resource requirements.

PURCHASE ORDERS

Current procedures required the same process be followed for all purchases, regardless of cost. This meant an item costing a few dollars was subject to the same scrutiny as one costing thousands. The procedure involved many separate steps and the involvement of several staff multiple times before completion. A cursory examination of the process clearly illustrated the end cost of inexpensive items becomes exorbitant when staff time is considered. There were also significant time delays, which invite staff to circumvent protocols in seeking to expedite project work.

GENERAL DESCRIPTION

This initiative was intended to streamline the purchasing process. The proposed changes are described in terms of:

- Eliminate significant documentation and processing costs by setting thresholds below which
 - Purchase orders will *not* be required; and
 - Invoices will *not* be required.
- Develop policies and protocols to govern purchases that fall below these two thresholds.
- Standardize pre-approval thresholds by position type.
- Reduce the number of cycles and people required to complete documentation.
 - Departmental *administrative* staff will create Vadim entries and coordinate information
 - Documentation including quotes and details to be retained in originating Department
 - Upon receipt of invoice, Finance will forward a scanned copy to the Department
 - Department administrative staff will review and confirm invoice details, including receipt of item
 - Approval of invoice emailed by Department Manager
 - Finance to 'attach' emailed approval to Vadim entry
 - Invoice amount entered into upcoming batch and processed for payment



INVENTORY SYSTEM

The existing inventory system is unwieldy and consumes significant time and resources in order to maintain an acceptable standard of accuracy. As a result the current system is not only time consuming and frustrating to all, but significantly increases per item cost to Ladysmith.

- The current system operates as follows:
 - Staff order inventory items
 - Items get put into shed
 - Invoice comes to AP and gets scanned to PW Admin
 - Items are entered as 'received' into Vadim
 - When workers need items, they take from inventory
 - They are *supposed* to mark down whatever they take on their timesheets, regardless of item cost
 - Timesheets get scanned into PW Admin
 - At this point, items are to be entered as 'sold' into Vadim
 - If all items that are taken are accounted for and all items that are received are entered immediately, inventory *should* always balance
 - Inventory *does not* balance and significant effort is required each year to correct information gaps
- Challenges
 - No one 'owns' inventory; no accountability
 - Too many hands can take from inventory; no internal control
 - When items need to be counted, PW has to call on whoever they can to count, usually resulting in miscounting and counters not knowing items
 - Not all items kept in one place; some inside, some outside
 - Some duplicates in list
 - Lack of manpower to maintain system tightly and efficiently
 - Lack of knowledge in how system must run and importance of its accuracy

STREAMLINING

GENERAL DESCRIPTION

This initiative was intended to streamline the inventory control system and make it easier for people to get the items they need. Proposed characteristics include:

- One or two people permitted to give out items
- Person that manages it should care about its accuracy more than Finance
- Invoices and timesheet information to be entered upon receipt
- Need to set a threshold and define
 - Items below threshold defined as ‘*stock*’
 - Items above threshold defined as ‘*inventory*’
- All *inventory* tracked from ‘received’ through ‘sold’ status
- Only carry emergency items
- *Inventory* list needs to be cleaned up, such as:
 - Duplicates purged
 - Inactive items deleted
 - Items under threshold deleted and expensed from current lists
 - Descriptions need to be modified to be true and accurate
 - *Inventory* items need to be labeled with item# and description
- Smaller items need to be in
- Inventory needs to be counted and balanced quarterly

A PRIMER FOR GL CODES

Staff can often be uncertain about which GL codes should be used. Telephone calls, email enquiries, and direct consultation are all ways for staff to attempt to identify the correct code. Responding to queries, as well as reviewing and correcting codes is time consuming and redundant. Delays in completing transactions are frustrating to end-users.

GENERAL DESCRIPTION

This initiative was intended to improve the ability of internal customers of Financial Services to extract the information they need. Code descriptions will be ‘translated’ into lay terms and made available electronically.



IMPLEMENTATION

After soliciting review and comments through a discussion paper, initiatives were developed in greater detail. They were be described in terms of ‘value stream mapping’.

The past few years have seen the implementation of a number of initiatives.

Attachment A



MEMORANDUM

Date: May 8, 2020
To: Guillermo Ferrero, Ladysmith Chief Administration Officer
cc:
From: J.P. Raulot-Lapointe – Land Economics Senior Consultant
Justin Barer – Land Economics Lead
File: 1616.0020.01
Subject: New Town Hall Development – Scenario Financial Analysis

1.0 INTRODUCTION

This brief report provides a review of the financial implications of building a new Town Hall for the Town of Ladysmith, reviewing multiple concept scenarios at three locations.

The current Town Hall no longer fits the needs of the community, and Town Hall employees are now working out of multiple locations in off-site leased office space as the existing Town Hall building is too small.

However, building a new Town Hall is expensive, and Ladysmith is considering a range of options including adding commercial space, and / or rental residential, to a new build in a bid to offset costs (both capital and operating). This has been done successfully in other jurisdictions, including on Vancouver Island. The Town is also considering opportunities to sell current municipal assets – including the existing Town Hall – to raise equity for development of a new structure.

Each of the development options is defined and the financial implications reviewed. The scenarios considered in this analysis are as follows:

- Buller Street Site:
 - Developing a new Town Hall on the Buller Street site (i.e. a stand-alone Town Hall, without ancillary civic, commercial or residential space)
 - Developing a new Town Hall on the Buller Street site, with equity from the sale of the existing Town Hall site used for this development
 - Developing a new Town Hall with integrated Library on the Buller Street site, incorporating equity from selling the old Town Hall site
 - Including a small retail component with the development of a new Town Hall and Library on the Buller Street site, plus incorporating equity from selling the old Town Hall site
 - Including rental residential, with the development of a new Town Hall, Library, and retail space on the Buller Street site, incorporating equity from selling the old Town Hall site

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- Works Yard or Machine Shop:
 - Developing a new Town Hall at either the Town Works Yard or within the Machine Shop structure in the Waterfront Area Plan (WAP) area, incorporating the equity from selling the old Town Hall site *and* the Buller Street site to fund the works
 - Including a new library with the development of a new Town Hall on either the Works Yard or within the Machine shop, incorporating the equity from selling the old Town Hall site and the Buller Street site
 - Including retail space within the development of a new Town Hall and Library on either the Works Yard or within the Machine shop, incorporating the equity from selling the old Town Hall site and the Buller Street site

When the first draft of this report was completed in early March 2020, the COVID-19 pandemic was only on the periphery of our collective radar in British Columbia. Since then, it has become apparent that the pandemic is significantly affecting, and will continue to, affect the economy of British Columbia, both this year and likely for the coming 2+ years at least. It will significantly impact a number of sectors, including tourism, retail and real estate sales. Impacts on these sectors will likely influence some of the assumptions presented in this document which were used to inform financial analyses, but at this point the degree of impact is unknown.

Commentary regarding the potential impacts and implications of COVID-19 are presented in these callout boxes at points throughout the document.

2.0 TOWN HALL DEVELOPMENT ASSUMPTIONS

2.1. BASE ASSUMPTIONS

Some of the basic parameters for developing a new Town Hall in Ladysmith come from the “City Hall Optimization Project” study prepared by *Process Four* in 2016. That report assumed that the new Town Hall would be developed on the Town-owned lands at the intersection of First Avenue and Buller Street (i.e. the Buller Street site). That site is comprised of four adjacent lots with a total site area of approximately 28,800 square feet.

To control costs, it was assumed that all parking would be surface parking, and therefore much of the staff parking would have to be located off-site. The costs for this off-site parking was not included in the overall cost estimate.

Some key assumptions that come from this study, adopted in this analysis, are: (1) Town Hall size requirements, and (2) on-site parking assumptions:

- New Town Hall will be approximately 20,000 square feet in all scenarios
- If a new library is included in the development, it is assumed to occupy 10,000 square feet
 - The Vancouver Island Regional Library would add \$3.5 million of equity to the development if it was part of the project.

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- Onsite parking would be limited to the minimum number of stalls required for visitors. All staff parking is assumed to be located off-site to reduce development costs.
 - In the financial analyses, 7 on-site parking stalls are assumed for Town Hall, with another 26 parking stalls for staff to be located off-site
 - For the library, 14 parking stalls are assumed for visitors to be located on-site. All library staff parking would be located off-site.

All on-site parking stalls are outdoor surface parking stalls, as underground stalls are cost prohibitive.

2.2. ADDITIONAL ASSUMPTIONS

2.2.1. Construction Costs (Hard Costs)

The construction costs used in these analyses are sourced from the 2020 *Altus Construction Cost Guide*. The cost guide estimates that Municipal Office buildings would range between \$295 and \$415 per square foot, for a development in Vancouver. For this analysis we begin with the highest cost of \$415 per square foot (deemed a ‘worst case’ scenario) but have made a downward adjustment of 15% to account for generally lower construction costs on the mid-island compared to Vancouver.

Construction costs for the library are estimated to be between \$320 and \$475 per square foot, with the lower range applicable where a library is located within a shared building. As we anticipate that inclusion of a library as part of a future Town Hall would see that library function incorporated within the Town Hall structure, a cost of \$320 per square foot for the library was assumed in this analysis.

The following table highlights the different construction costs used for various development components considered. It should be noted that only hard costs are included below, and the areas are approximate to those used in the financial analyses.

Table 1: Construction Cost Assumptions

Construction Cost Comparison			
	Cost per sq. ft.	Area (Sq. Ft.)	Total Hard Cost
Town Hall	\$350	20,000	\$7,000,000
Library	\$320	10,000	\$3,200,000
Retail	\$200	3,500	\$700,000
Residential	\$211	40,000	\$8,440,000

Note: Only hard costs included. Does not include soft costs

Surface parking construction costs were assumed to be \$7,000 per stall.

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2.2.2. Borrowing Costs

All scenarios include debt financing to pay for the development of Town Hall, and other components (library, etc.). The borrowing assumptions used include:

- Borrowing interest rate of 2.26%¹
- Amortization period of 35 years

Beyond the goal of building a new Town Hall, the Town of Ladysmith has \$2.2 million of debt servicing as of 2018, and other priorities that should be kept in mind which will also require borrowing.

Additional borrowing may also be required to provide sewer, water and other infrastructure for the Waterfront Area Plan.

3.0 VARIABLES INFLUENCING DEVELOPMENT SCENARIOS

There are a few variables that have been considered in establishing the different scenarios for development:

Inclusion of a New Library

Including a new library in any scenario will add approximately 10,000 square feet to the development, as well as the requirement for 14 parking stalls.

Including a new library would also bring \$3.5 million in equity to the development.

Inclusion of Commercial Space

If commercial space is included, it is assumed that this component would be retained by the Town (i.e. not sold as a strata parcel), and leased at \$20 per square foot.² While different sites are considered for Town Hall development, commercial lease rates are held constant across scenarios. This assumes that a location adjacent to / embedded within a Town Hall (and potentially a library), would be attractive for a coffee shop, a small restaurant, or other personal / professional service providers. It is assumed that commercial space would add approximately 3,500 square feet to the development.

Inclusion of Residential space for Rent

It was assumed that any residential space added to a Town Hall development would be comprised of units for rent (versus condominium units for sale). It was considered that strata residential units above Town Hall could create a number of conflicts between the Town of Ladysmith and the strata unit owners, so strata units were not included as a potential scenario.

While rental units would not provide an immediate financial benefit to the project (i.e. they do not generate an up-front infusion of equity), rental residential units would generate annual cashflow, supporting mortgage payments. Alternately, these units could be sold to an

¹ Municipal Finance Authority, long term lending rate

² Note that an alternate scenario, not tested in this analysis, would see the Town sell strata parcels within the new development.

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investor / operator, who would own and operate the units long-term. This is likely not the ideal scenario, as the Town would not retain control over a component of the project.

Sale of Existing Town Hall site

The existing Town Hall site could be sold to help provide equity to pay for the development of a new Town Hall. Residual valuations for this site were prepared assuming it were re-zoned prior to sale to allow for a 4-storey residential development, with no requirements for affordable housing units, and assuming that all units were sold as condos at market rates. Current zoning is C-2. By re-zoning prior to sale, the Town would be able to capture more value.

An FSR of 3.0 was assumed for the site under new zoning, which entails a total buildable area of approximately 30,000 square feet. This size of building could house 22 apartment units averaging close to 1,200 square feet in size. It was assumed the units would sell for \$415 per square foot. The construction cost estimate used has a significant impact on land value. The estimate used (\$211 per square foot), assumes some structured parking, which reduces land value. The residual value of the site, given these assumptions, is close to \$335,000. The land is currently assessed at \$235,000. If we were to assume 100% surface parking, the residual land value would climb to over \$1 million.

Unit sale prices are based on research conducted in the early part of 2020, and do not account for potential market implications from COVID-19. The pace of real estate sales has been negatively affected by the pandemic. Significant job losses and other economic headwinds are likely to lead to lower unit prices in the near-term, which would in turn reduce the price that a prospective developer would be willing to pay for a development site.

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Sale of Town-owned Buller Street site

The Town-owned Buller Street site could be sold to provide equity for the development of a new Town Hall. The residual valuation of the Buller site assumes zoning for a 4-storey residential development, with no requirements for affordable housing units.

An FSR of 3.0 was assumed for the site, which results in a total buildable area of approximately 86,000 square feet. This size of building could house 63 apartment units averaging close to 1,200 square feet. It was assumed the units would sell for \$415 per square foot. The construction cost estimate used has a significant impact on land value.

The estimate used, \$211 per square foot, assumes some structured parking, which reduces land value. The residual value of the Buller site, given these assumptions, was close to \$1.2 million. The assessed value of the land, not including improvements, of the Buller site is \$706,000.

As with the Town Hall site, unit sale prices are based on research conducted pre-COVID-19. Uncertainty around unit price demand and absorption would likely lead to lower land prices for a prospective buyer today.

Developing on the Town-owned Works Yard or in the Machine Shop Building

The other options are to (a) develop atop the Works Yard building, or (b) build Town Hall within the Machine Shop Building in the Waterfront Plan Area. Developing on either site may introduce the following complexities:

- Speaking with developers, it was suggested that adding a single floor to an existing building (as contemplated at the Works Yard) is not commonly done. It was suggested that most developers would typically choose to demolish the existing building and start from scratch.
- Also, estimating the costs of developing Town Hall within the Machine Shop building was difficult without having an experienced developer or cost consultant visit the building with engineers. Developers that were interviewed suggested that developing within similar heritage building shells often created construction costs that were similar to a new build.

Both scenarios were considered with similar parking assumptions, where only a minimum of parking stalls were included on-site and in the cost assumptions. The original parking assumption does leave the question of where the balance of staff would park. It is possible that either the Works Yard or Machine Shop scenarios may be better able to address the question of where staff will park, through provision of surface parking on nearby lands.

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4.0 TOWN HALL DEVELOPMENT SCENARIOS – DEVELOPING ON BULLER SITE

Different combinations of the variables discussed in section 3.0 produced a variety of scenarios that are summarized below. For each financial scenario, the key variable to note is the size of the annual debt payment that would need to be serviced.

4.1. DEVELOPING TOWN HALL ON BULLER SITE – NO ANCILLARY USES

No Equity (100% Financing)

The first scenario considers the development of only Town Hall on the Buller site. This scenario assumes a building of approximately 20,000 square feet, housing only Town Hall functions.

Key findings:

- Construction costs: \$8.6 million (assuming \$350 per square foot construction costs and including financing costs)
 - This includes 7 surface parking stalls as per the Process Four report.
- Equity: assumes \$0 in equity available
- Annual Payment: approximately **\$350,000**

Selling Current Town Hall site (Equity Transfer)

This scenario assumes that the current Town Hall site is sold, at highest-and-best-use, with equity used to help pay for the development of a new Town Hall on Buller site. All costs assumptions are the same as above.

Under this scenario, the annual mortgage payments would be reduced to approximately **\$330,000**.³

COVID-19 uncertainty will almost certainly reduce the price that the current Town Hall site would sell for, thus reducing equity and increasing debt. The Town would likely be in a better position to postpone sale of this asset until such time as economic growth returns and there is stability in the market.

4.2. DEVELOPING TOWN HALL WITH LIBRARY ON BULLER SITE

The second scenario looks at including the library within the new Town Hall development on Buller Street. Including the library adds 10,000 square feet of built space (at a lower per square foot cost) as well as \$3.5 million in equity contribution.

This scenario also assumes that the current Town Hall site would be sold to help fund the project, with assumptions as previously outlined.

Key findings:

³ Note that if development costs for a new condominium building at the Buller Street site are reduced (e.g. through provision of all parking at-grade), the residual land value would be considerably higher, with a resultant additional infusion of equity (and thus lower mortgage payment) for the new Town Hall.

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- Construction costs: \$12.5 million assuming \$350 per square foot construction costs for Town Hall and \$320 per square foot for the Library component of the building. This includes financing costs.
 - This cost estimate includes 7 surface parking stalls for Town Hall and an additional 14 surface parking stalls for the Library, as per the Process Four report.
- If it was assumed that \$3.75 million in equity was invested in the development, including \$335,000 from the sale of the Town Hall site, and \$3.5 million from the Library, the \$12.5 million in capital costs would require an annual mortgage payment of approximately **\$350,000**.

4.3. DEVELOPING TOWN HALL WITH LIBRARY AND RETAIL ON BULLER SITE

This scenario looks at adding a small retail component to the development of a new Town Hall with the Library. A Town Hall and Library project would attract many visitors, so the retail space in the project would likely be sought after. In this scenario 3,500 square feet for retail space was added. It is assumed that retail space could command a lease rate of \$20 per square foot. Further, it is assumed the Town would retain ownership of the retail space and the revenue would be direct towards debt payment.

This scenario also assumes that the current Town Hall site would be sold to help fund the project, under terms previously outlined.

Key findings:

- Construction costs: \$13.7 million assuming \$350 per square foot construction costs for Town Hall and \$320 per square foot for the Library component of the building and \$250 per square foot for the retail space. This includes financing costs.
 - This cost estimate includes 7 surface parking stalls for Town Hall and 14 surface parking stalls for the Library, as per the Process Four report. An additional 10 parking stalls were added to accommodate clients of the retail businesses.
- If it was assumed that \$3.75 million in equity was invested in the development, including \$335,000 from the sale of the Town Hall site, and \$3.5 million from the Library, the \$13.7 million in capital costs would require an annual mortgage payment of approximately **\$400,000**.
- The retail space would generate an average annual revenue of \$70,000 over the 35-year life of the mortgage, which would reduce the average mortgage payment to **\$330,000** per year.

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4.4. DEVELOPING TOWN HALL WITH LIBRARY, RETAIL AND RENTAL RESIDENTIAL ON BULLER SITE

This scenario looks at building a four-storey building on the Buller site, with the top two storeys comprising rental residential units. An FSR of 3.0 was assumed, which would allow for 40 residential units averaging 1,000 square feet per unit. The average 1,000 square foot unit was assumed to rent for \$1,500 per month, or a \$1.50 per square foot. Similar rates were found for newer units in Ladysmith online.

Similar to the retail space, it is assumed the Town would retain ownership of the residential space and the revenue would be used to help pay the mortgage.

This scenario also assumes that the current Town Hall site would be sold to help fund the project.

Key findings:

- Construction costs: \$29.5 million assuming similar construction costs as the previous scenario, as well as, \$211 per square foot for the residential space. This includes financing costs and the assumption of structured / semi-underground parking stalls on the sloping site.
 - This cost estimate includes 7 parking stalls for Town Hall, 14 parking stalls for the Library, 10 for retail space, and 50 stalls for the residential tenants. Reducing the parking ratio for the residential spaces will cut costs and likely simplify the development design.
- \$3.8 million in equity is assumed, including \$335,000 from the sale of the Town Hall site, and \$3.5 million from the Library, the \$29.5 million in capital costs would require an annual mortgage payment of approximately **\$1 million**.
- The retail space would generate an average annual revenue of \$70,000 over the 35-year life of the mortgage, while the residential units would generate an average annual revenue of approximately \$800,000. These sources of revenue would reduce the average mortgage payment to **\$200,000** per year.

Adding both retail and residential to the development brings the annual mortgage payment to the lowest rate compared to all other scenarios considered, but this larger development also includes the highest capital costs and the most risk.

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5.0 DEVELOPING ON WORKS YARD / IN MACHINE SHOP

The options of developing on the Works Yard site or within the existing Machine Shop building are both intriguing options, mostly because both options permit the sale of the Buller site to allow for that equity to be invested in the development.

Note again that we do not recommend pursuing sale of the Buller Street site at this time, given COVID-19 related market uncertainty and the likely discount that would be commanded by any prospective buyer.

There is also the potential that developing on the Works Yard or within the Machine Shop will reduce construction costs; however, both these scenarios present important unknowns. For this reason, developing on both sites assume the construction costs associated with a new build.

Regarding the Works Yard, developers interviewed suggested it is unusual to build additional storeys on an existing one storey building. There would be significant unknowns regarding the structure of the existing building that developers would typically prefer to demolish the existing building and start fresh.

Regarding the Machine Shop, renovating a historic building can present a number of challenges, including rebuilding the foundation and refurbishing the shell of the building. Refurbishing the 'Salt Building' in Vancouver's Olympic Village was a very expensive project, in part because of the costs of rebuilding the foundation. For these reasons, and the unknown quality of the existing building, it was recommended by developers to assume the costs of refurbishing the Machine Shop would be similar to a new build.

Given the above, the Works Yard and Machine Shop scenarios were assumed to have similar construction costs.

Three scenarios for the Works Yard / Machine Shop were considered, including developing only a new Town Hall, a Town Hall with a Library, as well as incorporating retail space in the development. Residential was considered inappropriate for both locations.

5.1. TOWN HALL ONLY ON WORKS YARD / MACHINE SHOP

This scenario considers only a new Town Hall constructed at either the Works Yard or Machine Shop. The construction costs are assumed to be \$8.6 million, including financing costs, the same as scenario 4.1.

The equity assumed in this scenario includes the proceeds from sale of the existing Town Hall site and the Buller site. Taken together, the sale of these properties would raise an estimated \$1.5 million based on residual valuations. Note again that this figure could be increased if construction costs are reduced through elimination of structured parking.

Also note however, that COVID-19 market uncertainty could significantly reduce the valuation of these parcels in the near-term.

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Assuming that \$1.5 million in equity were invested in the development, the \$8.6 million in capital costs would require an annual mortgage payment of approximately **\$290,000**.

5.2. DEVELOPING TOWN HALL WITH LIBRARY ON THE WORKS YARD / MACHINE SHOP

This scenario looks at including the library with the new Town Hall development on either the Works Yard or within the Machine Shop. Including the library adds 10,000 square feet of built space (at a lower per square foot cost) as well as \$3.5 million in equity.

This scenario also assumes that the current Town Hall site and the Buller site would be sold to help fund the project, bringing the total equity available to \$5 million.

Key findings:

- Construction costs: \$12.5 million including financing costs.
 - This cost estimate includes 7 surface parking stalls for Town Hall and an additional 14 surface parking stalls for the Library, as per the Process Four report.
- If \$5 million in equity were invested in the development, the \$12.5 million in capital costs would require an annual mortgage payment of approximately **\$300,000**.

5.3. DEVELOPING TOWN HALL WITH LIBRARY AND RETAIL ON WORKS YARD / MACHINE SHOP

This scenario looks at adding a small retail component to the development of a new Town Hall and the Library either on the Works Yard or within the Machine Shop. This scenario also involves selling both the existing Town Hall site as well as the Buller site.

Key findings:

- Construction costs for this scenario would equal \$13.7 million including financing costs.
 - This cost estimate includes 7 surface parking stalls for Town Hall and 14 surface parking stalls for the Library, as per the Process Four report. An additional 10 parking stalls were added to accommodate clients of the retail businesses.
- If \$5 million in equity were invested in the development, the \$13.7 million in capital costs would require an annual mortgage payment of approximately \$350,000.
- The retail space would generate an average annual revenue of \$70,000 over the 35-year life of the mortgage, which would reduce the average mortgage payment to approximately **\$280,000** per year.

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6.0 SCENARIO COMPARISON

The primary basis for comparing the various scenarios is the required annual mortgage payment. This payment varies based on total capital costs, assumed equity availability, revenue opportunities (e.g. rental residential, commercial), and overall project size.

Table 2 below provides comparative statistics for development, under varying scenarios, at the Buller Street Site.

Table 2: Buller Street Site - Comparative Figures for Town Hall Development Scenarios

Scenario - Develop on Buller Site	Equity Inputs	Construction Cost	Annual Mortgage Payment	Average Annual Revenue (over 35 years)	Effective Annual Mortgage Payment
Town Hall *	\$0	\$8,440,000	-\$350,000	\$0	-\$350,000
Town Hall **	\$340,000	\$8,440,000	-\$330,000	\$0	-\$330,000
Town Hall + Library ***	\$3,840,000	\$12,320,000	-\$350,000	\$0	-\$350,000
Town Hall, Library, Retail	\$3,840,000	\$13,480,000	-\$400,000	\$70,000	-\$330,000
Town Hall, Library, Retail, Residential	\$3,840,000	\$28,330,000	-\$1,010,000	\$810,000	-\$200,000
* No equity					
** Using equity from selling existing Town Hall Site					
*** Using equity from selling existing Town Hall Site & Library investment					

Looking at the scenarios presented above, the project that includes both retail and residential has the opportunity to bring the annual mortgage costs down the most, but as mentioned previously, this scenario also involves the most risk.

Note again that equity inputs would likely be reduced if sale of the current Town Hall site is pursued amidst COVID-19 market uncertainty. This would bring the debt requirement up in all scenarios.

Table 3 presents costs and mortgage payments required for each development scenario on either the Works Yard or within the Machine Shop.

Given the extra equity that is assumed from sale of the Buller site, the effective annual mortgage payment is expected to be lower if developing on the Works Yard or within the Machine Shop.

Achievable sale prices of either or both of the Town Hall and Buller sites will likely be hampered by COVID-19 market uncertainty in the near-term.

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Table 3: Machine Shop or Works Yard – Comparative Figures for Town Hall Development Scenarios

Scenario - Develop in Machine Shop or Works Yard	Equity Inputs	Construction Cost	Annual Mortgage Payment	Average Annual Revenue (over 35 years)	Effective Annual Mortgage Payment
Town Hall *	\$1,510,000	\$8,440,000	-\$290,000	\$0	-\$290,000
Town Hall + Library **	\$5,010,000	\$12,320,000	-\$300,000	\$0	-\$300,000
Town Hall, Library, Retail	\$5,010,000	\$13,480,000	-\$350,000	\$70,000	-\$280,000
* Using equity from selling existing Town Hall site & Buller site					
** Using equity from selling existing Town Hall Site & Buller Site, and Library investment					

However, the ultimate construction costs involved with either of these scenarios remain an unknown. It is possible that developing within the Machine Shop could be less expensive than a new build, in which case the annual mortgage payments would be lower.

- An analysis of the foundation and the structure of the Machine Shop could provide more certainty of the potential costs involved with refurbishing the building.

7.0 DISCUSSION

There are several outstanding questions and considerations that should be taken into account when considering the next steps for the Town Hall development project: What level of risk is the Town of Ladysmith willing to accept with this development?

- Would Ladysmith consider selling the retail or residential components of a new Town Hall mixed-use project as strata parcels?
- Are there means to increase the residual valuation of the Buller Street and current Town Hall site through either decreased construction costs, increased revenues, or both?
- What are the construction costs involved with redeveloping the Machine Shop or potentially adding on to the existing Works Yard building?
- Would the Vancouver Island Regional Library pay rent to help reduce mortgage costs?
- What amount of borrowing is Ladysmith willing or able to accept, particularly given other capital commitments and needs which will require borrowing?

The Town of Ladysmith has several significant projects ongoing, including a priority intent for remediation, servicing, and subsequent lease or sale of development parcels in the Waterfront Area Plan. It also intends to invest in renovation of the Machine Shop. Given these commitments and priorities, there is a rationale to invest in this effort by locating a new Town Hall within the Machine Shop.

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- Significant investments in the Machine Shop will be required before the structural upgrades to the building are complete. It is understood that project costs have increased \$450,000 beyond the budgeted \$1.752 million. It is also understood there have been questions regarding the future uses within the Machine Shop building once renovations are complete. By placing a new Town Hall in the building (along with other users), the Town would be leveraging its investments in this asset.
- Locating City Hall in the Machine Shop would also be a direct investment in catalysing waterfront investment and development. Waterfront development is a clear priority for the Town, and one that will require important decisions around infrastructure investment strategies. If Town Hall (and other uses) were located in a refurbished Machine Shop, this would send a strong message to the market around the Town's priorities and commitment to achieving waterfront development.
- Locating Town Hall in the Machine Shop would bring significant traffic to the waterfront lands and highlight the attractiveness of one of the Town's most important assets. A new Town Hall in the Machine Shop would be expected to bolster the land values of the waterfront lands.

The realities of COVID-19 and its impact on real estate, retail, and tourism should be a consideration regarding the strategy taken to develop a new City Hall in Ladysmith.

Given the uncertainties in the real estate sector, it is likely not prudent to sell developable land in the near-term, particularly in scenarios where the developer would be considering a commercial component. The scenarios considered in the financial modelling include potential equity from sale of the Buller Street and / or existing City Hall site. Sale of these parcels should be postponed until there is a return of market stability.

The analyses presented here are premised on important assumptions, including parking stalls required, construction costs, rental rates, and levels of equity that all have significant impacts on the final cost of the project. Urban Systems will be happy to review all the assumptions used with the Town of Ladysmith to refine our estimates at a future date, as required.

URBAN SYSTEMS LTD.

J.P. Raulot-Lapointe, MBA
Senior Consultant – Land Economics



Justin M. Barer, M.Pl., MCIP, RPP
Lead – Land Economics

STAFF REPORT TO COUNCIL

Report Prepared By: Erin Anderson, Director of Financial Services
Reviewed By: Allison McCarrick, CAO
Meeting Date: February 6, 2024
File No:
Re: **2024 Financial Plan Bylaw**

RECOMMENDATION:

That Council direct staff to prepare the 2024-2028 Financial Plan Bylaw with \$8,398,228 to come from municipal taxation and \$1,793,324 to come from police taxation as described in the staff report from the Director of Financial Services dated February 6, 2024.

EXECUTIVE SUMMARY:

Last fall, staff presented a series of budget presentations to Council. Staff are requesting direction to summarize the information and prepare the necessary bylaws.

PREVIOUS COUNCIL DIRECTION:

CS 2023- 274	2023- 11-21	That Council allocate an additional \$5000 in the Council Training and Conference Budget to allow greater flexibility with Council conference participation. Motion Carried
CS 2023- 219	2023- 09-26	That Council approve the 2024 budget for the Frank Jameson Community Centre as presented in the staff report dated September 26, 2023 and direct staff to submit it to the Cowichan Valley Regional District.
CS 2023- 300	2023- 12-19	That Council: 1. Endorse the Town’s application of \$50,000 to the Island Health Resilience and Safety Program to support the YOUth Bloom project; and 2. Direct staff to include in the 2024-2028 Financial Plan \$50,000 for the YOUth Bloom project with funds to come from the Island Health Resilience and Safety Program. Motion Carried
CS 2023- 286	2023- 12-05	That Council direct staff to include the projects presented in the report dated December 5, 2023, from the Director of Financial Services for inclusion in the 2024 – 2028 Financial Plan. Motion Carried



INTRODUCTION/BACKGROUND:

The 2024 budget deliberations started in September with the introduction of the FJCC budget for Regional Recreation purposes. In November, the water and sewer utility operations and capital budgets were presented, and the corresponding bylaws were adopted. General operations and capital projects were presented in November and December as well as for higher level of services requests.

The last presentation for general municipal taxes included an increase of 6.3%, or \$494,933. Council approved four additional staffing requests and a Council professional development budget increase totaling \$53,696, for an overall municipal budget increase of 6.96%. With the police taxation increase, the overall increase is 7.9%.

Since the last budget meeting in December, additional items have surfaced, resulting in requested changes to the capital plan. This includes \$50,000 for three HVAC replacements at the RCMP detachment due to their failure. It is proposed that this additional cost be funded from the Policing reserve, resulting in no additional impact to taxation. This project work must be done as soon as possible to ensure the detachment continues to operate.

Additional monies are also expected to be received from the Province to assist with implementing the Province’s legislative changes supporting housing initiatives. The Town will receive approximately \$192,000. It is proposed that \$71,995 be included in the Development Services budget for contracted services and legal review and that \$120,000 be reserved for 2025 operations as much of the changes in municipal legislation must be completed by Dec 31, 2025. As this is one-time funding, it is not recommended to use the \$120k to reduce taxation in 2024 as there would be an automatic 1.43% increase to 2025 before other contract obligations and inflationary amounts are factored into the budget.

Also, since the last budget meeting, staff presented a borrowing bylaw for Council approval. This borrowing has been in previous financial plans just under a different fiscal year. Much of the debt servicing costs have been factored into the presented tax increase as they were budgeted as part of the asset renewal costs.

Staff are in the process of closing the 2023 fiscal year and rolling forward the continuing projects’ funding. The capital plan is valued at over \$52 million, which includes developer driven projects, grant dependent projects, as well as the new City Hall. The funding for these projects is comprised of:

Taxation (10% allocation)	785,147
Water Utility	575,000
Sewer Utility	530,000
Carry forward	6,063,917
DCC (Developer Driven)	3,046,065
Developer’s Contribution	3,580,830

Canada Community Building (Gas tax)	374,371
Reserves	1,873,756
Grants (pending & confirmed)	17,048,294
Borrowing	17,588,725
Regional Recreation Funding	268,333
Other	318,775

The Reserve funding includes:

General Reserves	93,862
Policing	110,000
Water Capital	75,000
Sewer Capital	249,500
Real Property Reserve	234,812
Vehicle/Equip Reserve	608,307
Fire Hall Building	20,000
Safe Start (COVID)	235,000
Growing Communities	267,275

Council may recall that an update to the Financial Plan Policy and Objectives was provided in July of 2023. This update allows staff to present the Financial Plan bylaw earlier in the year (i.e. February versus April/May). The changes to the policy included:

- Updating the language in the funding sources and confirming minimum amounts are allocated to capital and replacement reserves.
- Setting tax rates and ratios among the property classes, specifically:
 - o *Set tax rates and ratios that maintain tax stability between property classes while factoring in non-market growth within classes.*
 - o *Ensure the Class 4 (Major Industry) percentage is lower than the previous year with a target percentage of 10% of the total taxation.*
 - o *Ensure the Class 6 (Business/Other) percentage is lower than the previous year with a target percentage of 12% of the total taxation.*
 - o *Ensure the Class 5 (Light Industry) tax rate is not less than the Class 6 (Business/Other) rate.*
 - o *Set Class 8 (Recreation/non-profit) rate equal to the Class 1 (Residential) rate.*

ALTERNATIVES:

Council can choose to:

1. Increase or decrease the taxation amounts, though adjustments to service levels must be identified prior to making this change.
2. Defer providing direction at this time, though capital projects will be delayed until the budget is approved.

FINANCIAL IMPLICATIONS:

Property Taxes are levied based on the Revised Assessment Roll which is expected to be received by April 1. The following is based on the 2024 Completed Roll received from BC Assessment January 1.

	2023 Budget	Additions	2024 Budget	% change
Municipal	7,851,469	546,759	8,398,228	6.96%
Police	1,593,713	199,611	1,793,324	12.52%
	9,445,182	746,370	10,191,552	7.9%

In 2023, there were a few supplemental assessments which impacted taxation. Overall, there was an increase of \$4,200 in taxes levied after the bylaw was adopted. Additionally, non-market change accounts for approximately \$92,000. In other words, the \$746,370 budget increase is actually a \$644,130 increase or 6.75% tax increase.

Due to some shifting between the property classes, either by policy or by legislation, it is estimated that the Residential property class is approximately a 6.98% increase.

When the Financial Plan bylaw is presented, there is a requirement to show how the taxes are spread among the classes. Below is a comparison between 2023 actual and 2024 proposed percentages by class:

	2023 Actuals	2024 Proposed
1 Residential	73.797	73.725
2 Utilities	0.481	0.485
3 Supportive Housing	-	-
4 Major Industry	11.373	11.371
5 Light Industry	0.996	0.997
6 Business/Other	13.098	13.094
7 Managed Forest Land	0.002	0.002
8 Rec/Non-Profit	0.246	0.316
9 Farm Land	0.008	0.010

The largest change is within the Class 8 – Recreation/Non-profit class, due to the Policy change. This amounts to \$7,143 shifting to Class 8 from Class 1. Some other shifting includes moving approximately \$13,000 from Business/Other and \$2,100 from Major Industry to Residential. There’s also a legislative requirement to move approximately \$7,000 from Class 2- Utilities (to be picked up in Class 1 – Residential) due to the regulatory cap on the Utility Class.

Staff will present the 2024 Tax Rate bylaw in April after the Revised Roll is released.

LEGAL IMPLICATIONS:

The annual Financial Plan bylaw is required to be adopted prior to May 15, 2024.

CITIZEN/PUBLIC RELATIONS IMPLICATIONS:

The budget impacts every property owner through property taxes.

INTERDEPARTMENTAL INVOLVEMENT/IMPLICATIONS:

All departments contributed to the development of the Financial Plan.

ALIGNMENT WITH STRATEGIC PRIORITIES:

- | | |
|---|--|
| <input type="checkbox"/> Core Infrastructure | <input type="checkbox"/> Economy |
| <input type="checkbox"/> Official Community Plan Implementation | <input type="checkbox"/> Leadership |
| <input type="checkbox"/> Waterfront Area Plan | <input checked="" type="checkbox"/> Not Applicable |

I approve the report and recommendation.

Allison McCarrick, Chief Administrative Officer

ATTACHMENTS:

- A. RCMP HVAC Capital Sheet
- B. Provincial Planning monies

ATTACHMENT A

Parks & Rec

Facility Maintenance

Project Name **RCMP - HAVC repairs**

Description Currently RCMP detachment, which is a TOL building, has 3 of the 8 heatpumps broken. Need to fix and prepare future plans

Purpose Repair 3 failed heat pumps at RCMP

Consequence of not funding no Heat/cooling in RCMP building could close the detachment.

Priority Immediate *Risk Level* High Risk

Focus Area Asset Management

Asset Type Replacement *Early Budget Approval*

Useful life 5 years

YEAR 2024
Amounts **\$50,000**

Funding Sources:

Taxation	0
Water Utility	0
Sewer Utility	0
Reserve	50,000
	<i>Policing</i>
DCC	0
Gas Tax	0
Carry-forward	0
Borrow	0
Donation/Other	0
Grant-confirmed	0
Grant - TBD	0

ANNUAL TOTAL \$50,000

Taxation	0	DCC	0	Grant - TBD	0
Water Utility	0	Reserve	50,000	Borrow	0
Sewer Utility	0	Gas Tax	0	Donation/Other	0
C/F	0	Grant-confirmed	0		



VIA EMAIL

Ref: 63760

December 21, 2023

Allison McCarrick
Chief Administrative Officer
Town of Ladysmith
Email: amccarrick@ladysmith.ca

Dear Allison McCarrick:

I am writing to notify you of the funding allocation for the Town of Ladysmith from the \$51 million capacity funding for local government implementation of the legislative changes to support housing initiatives, including small-scale multi-unit housing and proactive planning, development finance, and transit-oriented development.

The Town of Ladysmith will receive \$191,995 by the end of January 2024.

The funding formula reflects the different legislative requirements for municipalities and regional districts, and that smaller communities may need more financial assistance because they have fewer resources.

The funding formula includes a base amount and a per-capita amount (based on BC Stats 2023 estimates).

- For municipalities, the base amount is \$150,000, and the per-capita amount is \$4.39.
- For regional districts, the base amount is \$80,000 and the per capita amount is \$5.80.

This funding is intended to support activities or projects local governments must undertake to meet the new legislative requirements. Examples include updates to an existing zoning bylaw, parking bylaw, Official Community Plan (OCP), Official Development Plan (ODP), Development Cost Charge (DCC) bylaw, Development Cost Levy (DCL) or

.../2

Housing Needs Report (HNR), as well as the development of a new zoning bylaw, OCP, ODP, DCC, DCL or new amenity cost charge (ACC) bylaw. This funding can also be used to hire staff and/or consultants in support of these activities. More specific information on eligible projects, eligible project costs as well as the reporting requirements will be provided in the funding guidelines when the funding is distributed.

If you have any questions regarding the legislative changes or funding program, please contact Ministry of Housing staff at PLUM@gov.bc.ca or 250-387-3394.

Yours truly,



Bindi Sawchuk
Assistant Deputy Minister
Housing and Land Use Policy Division
Ministry of Housing

pc: Teri Collins, Deputy Minister, Ministry of Housing
Tracy Campbell, Executive Financial Officer, Ministry of Housing
Kaye Krishna, Deputy Minister, Ministry of Transportation and Infrastructure
Okenge Yuma Morisho, Deputy Minister, Ministry of Municipal Affairs
Tara Faganello, Assistant Deputy Minister, Ministry of Municipal Affairs
Kevin Volk, Assistant Deputy Minister, Ministry of Transportation and Infrastructure
Jessica Brooks, Executive Director, Ministry of Housing
Rebecca Penz, Director, Ministry of Housing

STAFF REPORT TO COUNCIL

Report Prepared By: Ryan Bouma, Director of Infrastructure Services
Reviewed By: Allison McCarrick, CAO
Meeting Date: February 6, 2024
File No:
Re: **Holland Lake Dam Capacity and Climate Resiliency Improvements Consultant**

RECOMMENDATION:

That Council direct staff to:

1. Award Request for Proposal 2023-IS-07 to Ecora Engineering & Resource Group Ltd. in the amount of \$1,081,046, excluding GST; and
2. Enter into a contract for the services outlined in Ecora’s proposal.

EXECUTIVE SUMMARY:

Staff prepared and issued a Request for Proposals (RFP) to BC Bid and received four similar and competitive proposals. A panel of four staff members reviewed and deliberated the proposals, then interviewed two short-listed proponents. Ecora Engineering & Resource Group Ltd. was selected by the panel for recommendation to Council.

PREVIOUS COUNCIL DIRECTION:

N/A

INTRODUCTION/BACKGROUND:

Request for Proposal 2023-IS-07 closed December 14, 2023. A summary of the results are included in the table below. Submissions were reviewed by a four- person staff panel. Following shortlisting and interviews with two proponents, the panel selected Ecora as the preferred proponent.

Consultant	Estimate (CAD \$ plus GST)
Midgard Consulting	\$1,359,619
Ecora Engineering & Resource Group Ltd.	\$1,003,025 to \$1,081,046
Stantec Consulting Ltd.	\$902,100
WSP Canada Inc.	\$1,200,000



Ecora's proposal is attached to this report and includes a complete scope of services, project management, past work examples, staff resumes, schedule, and cost estimates. Although proponents were asked to include scope of services and cost estimates for the entire project, a project of this size and nature will evolve as staff and the consultant learn more about the site, receive feedback from regulators, and assess potential solutions to increasing lake capacity. The later stages of the work are more conceptual than earlier stages.

Included in the scope of services is field work and a Dam Safety Review (DSR). A DSR is due every 10 years for dams of very high consequence. The Holland Lake Dams are past due for a DSR and the area Dam Safety Officer has requested a DSR report as soon as possible.

Per the Town's purchasing policy, staff are seeking Council's support for the selected proponent. Staff followed the policy and best practices when drafting the RFP, reviewing proposals, and making a final selection.

ALTERNATIVES:

Council can choose to:

1. Not proceed with a consultant at this time and cancel the RFP; or
2. Ask staff to revisit the four proposals received.

FINANCIAL IMPLICATIONS:

The proposal being awarded is for \$1,081,046, including optional work; however, as mentioned above, the later scope of services is only estimated for now. The proposal has many steps including the site work and Dam Safety Review for a total of \$274,018. The Town may end Ecora's services if the project were cancelled for some unforeseen circumstance. The funding for this project was included in the Water Capital plan.

LEGAL IMPLICATIONS:

Staff will draft a contract between Ecora and the Town of Ladysmith, which may be reviewed by the Town's solicitor.

CITIZEN/PUBLIC RELATIONS IMPLICATIONS:

Town residents have an interest in the Town's water supply. This is the first step towards increased water security and supports ongoing relations with Stz'uminus First Nations and the Diamond Improvement District, with whom we have water servicing agreements.

INTERDEPARTMENTAL INVOLVEMENT/IMPLICATIONS:

Infrastructure Services has worked with the Chief Administrative Officer and Financial Services to issue the RFP and select a proponent.

ALIGNMENT WITH STRATEGIC PRIORITIES:

- | | |
|---|---|
| <input checked="" type="checkbox"/> Core Infrastructure | <input checked="" type="checkbox"/> Economy |
| <input type="checkbox"/> Official Community Plan Implementation | <input type="checkbox"/> Leadership |
| <input type="checkbox"/> Waterfront Area Plan | <input type="checkbox"/> Not Applicable |

I approve the report and recommendations.

Allison McCarrick, Chief Administrative Officer

ATTACHMENT:

- A. Ecora Proposal



December 14, 2023

Ecora File No.: 230852

Town of Ladysmith
410 Esplanade – PO Box 220
Ladysmith, BC V9G 1A2

Attention: Sue Bouma | Town Ladysmith

Reference: Request for Proposals No. 2023-IS-07, Holland Lake Dam Capacity and Climate Resiliency Improvements Consultant

Ecora Engineering and Resource Group Ltd. (Ecora) is pleased to submit this proposal to the Town of Ladysmith (the ToL) in response to the Request for Proposal No. 2023-IS-07 – Holland Lake Dam Capacity and Climate Resiliency Improvements Consultant. Ecora has assembled a strong team with extensive experience relevant to this assignment including completing dam safety reviews, dam engineering assessments, dam remediation design, hydrotechnical engineering, geotechnical engineering, and construction administering.

The price provided in this response will be guaranteed for a period of 60 days following the submission date. Please do not hesitate to call or email Michael J. Laws at 250.470.8808 or michael.laws@ecora.ca with any questions.

Sincerely

Ecora Engineering & Resource Group Ltd.

A handwritten signature in blue ink, appearing to read "Michael J. Laws".

Michael J. Laws, P.Eng.
Principal Dams & Geotechnics
Direct Line: 250.470.8808
michael.laws@ecora.ca



Response to RFP: No. 2023-IS-07 Holland Lake Dam Capacity and Climate Resiliency Improvements

Presented To:



Dated: December 2023
Ecora File No.: 230852

Company Information: Ecora Engineering & Resource Group Ltd.
200 – 2045 Enterprise Way, Kelowna, BC V1Y 9T5

Proponent Contact: Michael J. Laws, P.Eng.
Office Phone: 250.469.9757 x1045
Cell Phone: 250.470.8808
Email: michael.laws@ecora.ca

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1. Introduction

Ecora Engineering & Resource Group Ltd. (Ecora) is pleased to respond to the Town of Ladysmith (the “Town”) Holland Lake Dam Capacity and Climate Resiliency Improvements Consultant Request for Proposals (RFP No. 2023-IS-07). The proposed project is to complete preliminary and detailed design for the increase of storage capabilities at the Holland Lake reservoir, the completion of Comprehensive Dam Safety Reviews (DSR) for the Holland Lake West Dam (D720122-01) and the Holland Lake East Saddle Dam (D720112-02), infrastructure upgrades to the intake, outlet, and controls, and to explore provisions for a future interconnection between Holland Lake and Stocking Lake. It is understood that Holland Lake reservoir, which is Ladysmith’s primary water source, requires additional capacity capabilities due to anticipated increases in water demand and supply impacts due to climate change.

Holland Lake is bounded by two active earthfill embankment dams, the Holland Lake West Dam (D720112-01) to the west and the Holland Lake East Saddle Dam (D720112-02) to the east. The lake is located approximately 6 km southwest of downtown Ladysmith and the dams were constructed to create a water reservoir for the Town. Information on the dams is available through the BC Ministry of Land, Water, and Resource Stewardship (MLWRS) dam safety database. Based on information from the database, along with a provided Instrumentation Analysis performed by the Ministry of Environment Dam Inspection Section from 1985, construction of the dams occurred circa 1980, with test pitting occurring prior to October 1978. Based on information from the database, The Holland Lake West Dam is approximately 6 m high and 460 m in length while the Holland Lake East Saddle Dam is approximately 7.6 m high and 915 m in length.

It is understood that Mosaic Forest Management Corp. (Mosaic) owns the majority land around the Holland Lake Dam and reservoir and that coordination with Mosaic will be critical the advancement of any proposed works.

Both dams have been assigned a “Very High” failure consequence classification by the BC Ministry of Forests (MoF) Dam Safety branch, and both also require DSRs. Ecora performed Dam Safety Inspections on both Holland Lake Dams in 2020. The CDA Dam Safety Guidelines states that the Review Engineer of the previous Dam Safety Review should not be involved in the subsequent DSR to ensure objective review and remove potential conflict of interests. The Review Engineer should also not have been previously involved in the design, construction, operation, and regular maintenance checks of the dams. Ecora meets these criteria as we have not been involved in either the previous DSR or the original design.

The scope of work presented in Appendix A – Scope of Services, Section 3 of the RFP identifies the following tasks to be completed as part of this project:

1. Assess the lake, existing dams, inlet and outlets, and spillway structures including subsurface sampling of soil conditions;
2. Complete a Dam Safety Review that the Town can submit to BC Dam Safety;
3. Prepare a report that provides preliminary options to increase lake storage with high level design requirements and cost analysis;
4. Engage with Town staff on the findings of the preliminary options report to makes design decisions;
5. Complete a preliminary design based on preliminary decisions to be used for permitting, updating the Town’s water license, construction sequencing, and cost estimating;
6. Complete detailed design to be used in a construction tender and provide detailed cost estimating;
7. Prepare and administer a construction tender with the Town including award. The Town’s lawyer may assist as required;

8. Contract administrate the project upon successful award to a contractor(s); and
9. Close the project and provide detailed record drawings to the Town.

In addition, the following major tasks have been identified in the RFP:

1. Project Management
2. Review of Background Information
3. Site Assessment
4. Decision Matrix
5. Preliminary Design
6. Regulatory Permitting
7. Detailed Design
8. Tender and Contract Administration
9. Project Close Out

After reviewing the above required scope of services, Ecora is proposing the following workplan to meet the Town's specified requirements.

In order to successfully complete the requested deliverables, a site investigation and a number of supporting analyses will need to be completed, including hydrotechnical, geotechnical, structural, and environmental investigations and analyses completed over multiple design phases, as well as topographic and bathymetric surveying. These analyses will be completed to provide updated information on for the DSRs and to enable the advancement of the proposed work plan. A detailed description of the methodology and the specifics required are provided in Section 2 below.

Mr. Adam Kerk-Hecker, P.Eng., has been selected as Project Manager for this project. Mr. Kerk-Hecker has over 8 years of consulting experience in civil/hydrotechnical engineering and has successfully worked with the Town on dam engineering assignments since 2018.

Mr. Michael J. Laws, P.Eng., will serve as the project sponsor and an alternative point of contact for the ToL.

Ecora has a current 2023 business license for the Town of Ladysmith (#1614) which is in the process of being renewed for 2024.

2. Proposed Work Plan

2.1 Phase 1 – Investigations

2.1.1 Background Review

Ecora will undertake a review of all available documentation for both dams. It is anticipated that this will also include a review of the BC MoF Dam Safety Branch Dam Files. The intent will be to get an overview of the facilities, review as much background material as possible, then develop a list of missing information and specific issues to be reviewed in the field.

Several documents were shared and thoroughly reviewed for relevant information to assist in the writing of this proposal. They included:

- “Plan of Test Pit Locations”, Thurber Consultants Ltd. October 1978;
- “Instrumentation Analysis of Holland Lake Dam”, Ministry of Environment Dam Inspection Section, February 1985;
- “Holland Lake Dams 2003 Annual Inspection”, EBA Engineering Consultants Ltd. August 2003;
- “Holland Lake Dam Potential Dam Raising” Technical Memo, EBA Engineering Consultants Ltd. December 2007;
- “Stocking Lake Dam Hydrotechnical Analysis”, EBA Engineering Consultants Ltd. February 2008;
- “Dam Safety Review Holland Lake Dams”, EBA, A Tetra Tech Company, January 2011;
- “Holland Lake Dams 2012 Annual Inspection”, EBA, A Tetra Tech Company, November 2012;
- “Holland Lake and Stocking Lake Hydrology Update”, Tetra Tech EBA Inc. September 2014;
- “Holland Lake Dams – Dam Safety Audit” Memo, Ministry of Forests, Lands, and Natural Resources Operations, May 2017;
- “Dam Emergency Plan (DEP) Holland Lake Dams”, Austin Engineering Ltd. Updated February 2019;
- “Operation, Maintenance, and Surveillance Manual”, Austin Engineering Ltd. February 2019;
- “Raising of the Holland Lake Dams”, Koers & Associates Engineering Ltd. January 2020;
- “2021 Dam Safety Audit – Holland Lake Dams” Memo, Ministry of Forests, Lands, Natural Resource Operations and Rural Development, May 2021;
- “Holland Lake Dams – Dam Safety Inspection”, Ecora Engineering & Resource Group Ltd. December 2022;
- Related water licenses; and
- Photos from original construction, circa 1980.

Ecora anticipates that additional data will be collected after authorization to proceed and may include but is not limited to;

- Any dam design reports;
- Any additional dam design and/or record drawings;
- Any dam construction records;
- The current and any previous additional dam operation, maintenance, & surveillance manuals;
- The current and any previous additional dam emergency plans;
- Any surveillance reports and memoranda;
- Any additional annual formal inspection reports;
- Any additional dam geotechnical inspection reports;

- Any hydrological and flow records;
- Any correspondence with regulatory agencies;
- Any additional past inspection and dam safety review reports;
- Any monitoring data;
- Any incident and/or repairs undertaken; and
- Documentation of operating problems noted by the owner or Dam Safety Officer.

The environmental team will compile relevant publicly available and online sources of information, in addition to previous assessment reports or findings that may be provided by the client. The information will be used to focus and refine the objectives of the field assessment program and provide important context to the project with regards to environmental sensitivities, such as, wildlife species and ecosystems at risk occurrence records, designated conservation areas or Critical Habitat, wildlife and riparian corridors, fish presence and spawning habitats, and other potential triggers to regulatory permits or approvals.

2.1.2 Site Reconnaissance & Staff Interviews

Staff interviews are typically undertaken as part of a DSR, however, will be undertaken during the site reconnaissance for efficiency and will be conducted by an Ecora engineer. The scheduling of this task will involve the presence of the staff responsible for carrying out the regular surveillance, operation, and maintenance of the facilities to establish baseline operation conditions. These meetings are anticipated to occur on site during the site reconnaissance, however due to the number of stakeholders in a project of this scope, can be done virtually if needed.

Typical inquiries made during the staff interviews include:

- A list of individuals responsible for the operation, maintenance, inspections, and instrumentation management of the dams;
- A list of procedures used by the owner for operation of the reservoir, such as:
 - How is the reservoir controlled?
 - What is the anticipated reservoir level for any given time of year/when are the drawdown and filling periods and what is the rate of drawdown/filling?
 - What are the operation procedures during floods?
 - Have there been any historical issues with the dam performance?

As part of the staff interviews, Ecora will provide an operator's questionnaire to fill in that will include questions on how the dam is operated. The completed form will be used as part of the review to verify how the dams are being managed, as well as to collect information from the operators to be used as part of the Dam Safety Review. Interviews will provide an understanding of the dam's historic performance beyond the publicly available documents and the provided background references for this RFP. The interview between the Dam Safety Engineer and the operator is anticipated to take place during the site reconnaissance.

Ecora's objectives during the site inspection will be to undertake a visual assessment of both dams and, where practical, obtain any information that may be required for engineering analysis. This will include a visual assessment of the dam features, such as dam crest, upstream and downstream slopes/walls, abutments, downstream toe, spillway and outlet channels, and any other appurtenances and areas of interest. A video survey of the Banon Creek diversion pipe is anticipated to also be performed. Ground and drone photographs/videos will

be taken to assist in reporting and analysis. A detailed photographic record of various key features inspected during the site reconnaissance will be prepared at the conclusion of the site reconnaissance.

An inspection of the existing spillway control structure and outlet works will need to be completed. To facilitate greater storage capacity in the reservoir, the spillway control structure will need to be modified to raise the spilling elevation of the structure. Ecora's structural team will inspect the current reinforced concrete structure and provide guidance on methodologies for modifications. Note that the current BC Dam Safety Minimum Design Standards for Dams states that "*no pipes are to be used as spillways*". Since the primary spillway at Holland Lake is a piped system, discussions with BC Dam Safety will be had at this stage to determine if they are likely to enforce this standard. If enforced, options will be developed for an open channel spillway. One such option is the current emergency spillway could be upgraded to be able to safety pass 100% of the Inflow Design Flood (IDF). If necessary, this option, amongst others, will be considered at this time.

Ecora will inspect the area downstream of the dams to confirm the general areas of risk of inundation in the event of an uncontrolled discharge (dam breach) in support of the DSR consequence classification review. The general economic, societal, and environmental losses will be considered in addition to the potential for loss of life. This information will be used to confirm the current Consequence Classifications for the dams are appropriate.

Downstream inspections will also be performed to gather the required information to be used during the conceptual design development phase to investigate possible other design options beyond dredging and lake level raising via dam heightening.

While performing the site inspection, Ecora will confirm the necessary documents and records are available and properly stored on site. Should any change in scope be required as a result of this phase, Ecora will reach out to the necessary officials, including the Town, to discuss at this time.

The environmental team will plan and coordinate a comprehensive field investigation led by appropriately qualified environmental professionals. The field surveys will be scheduled to optimize the timing conducive to plant and ecosystem characterization, as well as during important wildlife stages that improve detectability, such as breeding birds and amphibians. As required, the assessment will be divided into multiple visits to capture a broad scope of plants, wildlife, and ecological features that may factor into the project planning and design. This investigation will focus on areas adjacent to the dam and reservoir that are anticipated to be disturbed as part of this project.

2.1.3 Geotechnical Investigation

2.1.3.1 General

Ecora proposes to complete a geotechnical site investigation program to categorize the in-situ embankment and foundation conditions at several locations. It appears, based on the information available, that the dams were constructed using native materials excavated during construction of the reservoir and from surrounding areas. Based on the provided photos taken during construction of the foundations of the Holland Lake East Saddle Dam, it appears the dams are homogenous and constructed from glacial till, or a till-like deposit. A previous DSR report indicates that the main body of the dams are filled with silty, gravelly sand up to the 2H:1V downstream slope, and the dams are further flattened to 4H:1V with a wedge of silty, sandy gravel, which essentially acts as a toe filter.

Ecora proposes to advance up to five deep boreholes (>15 m depth) through the crest of the embankments and at least 6 m into foundation materials (3 at the East dam, 2 at the West dam). Since it appears the cores of the embankments are homogeneous, the proposed number of boreholes should be sufficient to classify the embankment material.

If feasible, Ecora also proposes to advance up to three shallow boreholes (<5 m depth) close to the downstream toe of the dam, to categorize the wedge of higher permeability material that was used to build the downstream slope up from 2H:1V to 4H:1V. If the drilling rig is not able to access this area due to possible downstream slope damage, then Ecora proposes to still investigate this material by using hand auguring and a Scala penetrometer.

A plan showing these proposed borehole locations is included in Figure 2.1a. These locations are preliminary and can be changed in consultation with the Town to better categorize specific areas of the dam if deemed necessary.

Based on reviewed photos the native soils contain cobbles and large boulders. Ecora therefore proposes to utilize a continually cased sonic drilling technique to complete the investigation. Ecora expects to subcontract Drillwell Drilling Ltd. (Drillwell) of Duncan, BC, to complete the work, subject to their availability. Drillwell has experience drilling through similar dams and is based in Duncan, relatively close to the project site.

As geotechnical parameter determination could have a significant cost impact on modified embankment geometry, Ecora is proposing to undertake in-situ Standard Penetration Testing (SPT) to accurately determine the energy transfer ratio and direct shear testing on existing embankment fill material and potential borrow sources. SPT will be undertaken at 1.5 m intervals to assess the consistency of the encountered soil conditions and obtain representative samples within the embankment. A SPT analyzer will be used for one test hole. The analyzer will be used to determine the energy transferred by the SPT hammer, using force and velocity measurements to normalize the measured N-values, in accordance with ASTM D4633. Due to the expected presence of large boulders within the embankment foundation materials, SPT intervals are expected to be variable within the foundation soils. The boreholes will be drilled to such a depth that a competent foundation stratum is identified such as till or bedrock. Ecora will attempt to investigate at least 6 m into native soils to well-categorize the foundation materials.

The investigation will support any geotechnical analyses associated with the DSRs as well as any future design work, and will offer an opportunity to install new instrumentation, as is outlined in Section 2.1.3.3.

The proposed borehole drilling and casing installation will be undertaken by a registered well driller (TBD) under the BC Water Sustainability Act (WSA), as the investigation will be in proximity to a drinking water source. Special care will be taken to avoid spills from the drill rig or support vehicles that could potentially affect the water supply. Boreholes will be backfilled using Bentonite grout, in accordance with Provincial regulations.

After the completion of the invasive investigation the location and elevation of the boreholes will be established utilizing a topographical survey technique.

A physical investigation for a dredging program off a barge is likely infeasible since Holland Lake is the primary water supply for the Town and therefore cannot be shut down for a long period of time. A physical investigation would induce significant turbidity in Holland Lake. The investigation for mid-reservoir dredging potential can be much more easily completed using bathymetric surveying, as outlined in Section 2.1.4. Shoreline/Hand dredging will be reviewed and checked for feasibility during low-water elevation periods. It may be possible to conduct underwater investigation from the shore in areas of shallow water where measures can be put in place to mitigate the spread of disbursed sediments.

Ecora is open to discussion with the Town on the scale of the proposed drilling program – if the Town would rather have a more expensive investigation that would better categorize the dams and any potential issues then the drilling scope can be easily expanded. More instrumentation could be installed if additional boreholes were added to the scope.

Ecora also proposes to advance several test pits along the Holland Lake perimeter to examine and test material of potential borrow sites for potential dam crest heightening.

2.1.3.2 Laboratory Testing

Samples of the embankment fill and foundation materials collected during the investigation will undergo index and engineering property testing at Ecora's geotechnical laboratory. The laboratory testing may include some or all of the following;

- Standard Proctor;
- Washed sieve analyses (or hydrometers);
- Moisture content determination; and
- Direct shear tests.

The results of the direct shear tests will inform the design strength parameters for slope stability analyses.

Upon completion of the geotechnical laboratory testing program completed borehole/well logs will be submitted to the MFLNRO Dam Safety Section in accordance with the requirements of the BC Dam Regulations.

2.1.3.3 Instrumentation Installation

Current on-site instrumentation for the Holland Lake Dams includes pneumatic piezometers and settlement gauges. There are 15 pneumatic piezometers located within the dams that were installed during the original construction circa 1980. These piezometers have likely exceeded their lifespan and there is currently no information on their operational status. It is therefore necessary to upgrade the piezometers as part of the proposed site investigation. It is unknown when the last time the settlement gauges were surveyed, however they appear to be in good working condition.

Ecora proposes to install a series of vibrating wire piezometers (VWPs) within each borehole, fully grouted, in order to gather piezometric data on the internal conditions of the dams. The vibrating wire piezometers can be read using either a direct readout or telemetry/SCADA system. Readouts will be direct, fast, and obvious, unlike pneumatic piezometers. VWP locations will be connected by trenching and backfilling a small PVC casing with internal wires (0.3 m deep) along the crest of the dam between the boreholes and the readout box or telemetry/SCADA. A general schematic of fully grouted vibrating wire piezometers is provided in Figure 2.1b.

Seismic casing will be used to support the VWPs in each borehole so that Ecora can carry out down-hole shear wave velocity testing of the embankment and foundation material to categorize the material strength and liquefaction potential. Any of the seismic casings could be replaced with inclinometer casings at an increased cost – this has been outlined as an optional item in the cost breakdown in Appendix E because the inclination of the dam is not a current design concern, however the inclinometers and/or extensometers could be used during the potential dam raising phase to assess any dam movements during construction. Installing additional inclinometers at a later date would be significantly more expensive.

Ecora proposes that we could install thermistors (type of temperature sensor) within the toe of the north abutment of the East dam and around the low-level outlet of the West dam as a method of determining seepage before it is even observed. With increasing saturation a given soil will change temperature – the actual soil grains do not easily trap or convey heat, however replacing the air between grains with water will increase the thermal conductivity of the soil-air-water system, which can be measured. Existing seepage was already noted at these locations, and this is a relatively inexpensive method to consistently monitor for seepage potential outside of the timing of regular site inspections. This system, like the VWPs, can be read using either a direct readout or telemetry/SCADA system.

A distributed temperature sensing (DTS) fibre-optic system could be utilized instead of the relatively inexpensive thermistor system to assess seepage potential across the entire length of the dams. The DTS system is typically installed in a shallow trench and provides a continuous linear temperature profile across the length of the

embedded fibre. The system can provide continuous temperature readings every 0.25 m over a couple kilometers. This system would be more expensive than a thermistor-based system but could easily extend across the entire length of the dams compared to thermistors which only categorize a specific, limited area, and at a much sparser spacing between readings. Although seepage is only currently observed at a few locations, a seepage issue could feasibly start anywhere along the dam in the future. A DTS system could inform the Town of the precise location of new potential seepage before it causes any problems.

The improved instrumentation is currently envisioned to be powered via solar arrays and connected to the Town's current SCADA system. Ecora reached out to a number of local SCADA subcontractors, however due to the scope of the project no subcontractors were able to provide a quote in time for proposal submission. Therefore, within the attached Fee and Disbursement Breakdown, Ecora used an estimate based on previous projects involved SCADA subcontractors. Ecora has experience with several subcontractors in the design and installation of remote data transmission services powered by solar panels during previous dam construction projects.

Ecora proposes to continue using the existing survey monuments, with a new baseline reading established during the initial phases of the DSRs. There is nothing wrong with these monuments or their locations, and these monitoring points will provide incredibly useful information during any potential dam raising activities. These survey monuments should be monitored by a licensed surveyor (BCLC) during each yearly dam inspection, at a minimum.

These survey monuments could be set up to be regularly monitored using a Total station, which could provide daily data through the SCADA system on the displacement of the monitoring points and give an early warning of a failure.

It should be considered that there is significant uncertainty in both the type and total number of instrumentation devices that should be installed at this stage of the project – this will be refined during detailed investigation planning. We have outlined any instrumentation installations deemed necessary or clearly very cost effective as a disbursement under the geotechnical investigation line item and have included any additional instrumentation that could be contemplated as an optional line item. Additional instrumentation could also form part of the dam upgrade works.

A plan showing the proposed approximate locations of the boreholes and new instrumentation is included in Figure 2.1a.

2.1.4 Topographic/Bathymetric Survey

It is proposed that a topographic survey be completed by a local subcontractor to confirm critical information regarding the elevations and geometric profiles of the two dams. Turner & Associates Land Surveying Inc. has provided an estimate for completion of these works.

The scope of the survey will include:

- Conduct a topographical survey of the dam crests, spillway channel, upstream and downstream slopes where possible;
- Survey of all structures associated with the dam including the spillway, emergency spillway, low level outlet structure, valve house, Banon Creek intake;
- Potential dredging areas that cannot be captured by the bathymetric survey;
- The present natural boundary surrounding the reservoir; and
- Any other areas that will be considered during the design development.

The inputs from this survey will be used to update geotechnical analysis completed during the DSR's and be used during drafting and designing. The topographic survey of existing site conditions will be completed in UTM NAD 83. A Base Plan will be completed by compiling the obtained topographic survey data and legal survey information.

Ecora is also proposing a bathymetric survey to have updated lake bottom terrain information. Shared during the RFP process, several EBA and Tetra Tech documents referenced Stantec bathymetric information of Holland Lake. The bathymetric data was not provided but it is at least two decades old, and sedimentation has likely changed the current storage volume.

The survey would be conducted using either Sub-Bottom Survey (SBS) or Side Scan Sonar (SSS). This will provide Ecora and the Town updated storage volume measurements, as well as possibly providing information including the depth of sedimentation and lake bottom properties. Survey results would assist in the conceptual design development phase to determine the feasibility of multiple design options.

The costs are included in Appendix E as separate tasks in the Site Investigation and Background section.

2.1.5 Environmental Assessment

Ecora's Qualified Environmental Professionals (QEP's) will perform environmental assessments to investigate and catalog the environmental assets at the dam sites and in the surrounding areas. The assessments will include the upstream and downstream areas that may be impacted by the storage increase.

- Due to the scope of this project, Ecora will work in-house with the environmental team at multiple stages to ensure the strict adherence to all necessary environmental rules and regulations during every phase of this project. Ecora will maintain communication with project stakeholders, including regulatory authorities, resource managers, and applicable community groups or local conservation organisations throughout the preliminary consultation process to ensure the project meets the requirements of all parties;
- A biophysical inventory and background review, including the inventory of notable vegetation, ecosystems, and other biophysical resources that may be impacted by this project will be performed by Ecora to assist in the approval of any works by the Ministry of Environment and Mosaic Forest Management Corp. The identification of species-at-risk that could be affected and the planned and potential impacts to species and habitats will be performed;
- A guide to the preparation of a detailed site restoration and enhancement plan to be implemented post-construction to mitigate and offset any negative project impacts; and

The environmental team will include a summary on any sensitive areas or protected ecosystems that must be considered during the conceptual design development phase.

2.1.6 LiDAR Survey (Optional)

As part of the Site Investigation and Background phase, Ecora proposes an optional LiDAR survey of Holland Lake dams and surrounding area. LidarBC currently does not have LiDAR data available for the Holland Lake area. Ecora has investigated the potential of utilizing a fixed-wing aircraft to capture LiDAR of an area of around 78 km², centered around Holland Lake and expanded to include the Stocking Lake/Stocking Creek watershed, Upper Banon Creek watershed, and the Holland Creek watershed. Figure 2.1c shows the proposed area to have LiDAR scanned.

The LiDAR would assist in hydrotechnical modelling as having detailed LiDAR scans of the watershed and surrounding geography would enable more accurate inundation mapping. The LiDAR can also be used to identify

possible locations for reservoir expansion or additional reservoirs as part of the conceptual design development and decision matrix phases. The Town can also use the 3-dimensional data to assist in any future construction projects in the area. The point density is estimated to be 8-10 points per square meter. LidarBC usually provides a point density of 7 or 8 points per square meter currently. Several companies that provide LiDAR services were contacted and provided fee estimates. LiDAR surveying was included as a separate line in the cost estimate attached to this document as an optional task.

2.1.7 Investigation Reporting

As part of the investigation reporting, Ecora will;

- Create a detailed photographic record;
- Create a base plan using the topographic survey;
- Present the results of the geotechnical investigation;
- Calculate accurate storage volumes and provide bathymetric survey results;
- Environmental Assessment Summary;
- Factual report describing the findings; and
- Processed LiDAR data (Optional).

Ecora will use the results and observations from this phase during the DSRs, Conceptual Design Development, and decision matrix stages.

2.2 Phase 2 – Dam Safety Reviews

2.2.1 General

The purpose of the DSRs will be to confirm that the design, construction, and operation of the dam meets current criteria, and if not, to identify areas that require improvement. The extent and breadth of the reviews will demonstrate that:

- The dam is safe, operated safely, and maintained in safe conditions;
- Surveillance is adequate to detect any developing safety problems; and
- The review will be completed based on the Engineers and Geoscientist (EGBC) “Professional Practice Guidelines– Legislated Dam Safety Reviews in BC” V4.0 (September 2023), Canadian Dam Safety Guidelines (Canadian Dam Association (CDA), 2007, 2013 Edition), the BC Dam Safety Regulation (BC Reg. 40/2016, February 29, 2016), and the BC Water Sustainability Act.

The reviews will encompass the review elements as defined in Section 5 – Dam Safety Review of the 2007 CDA Guidelines (2013 Edition). These elements, as defined in Section 5.4: Scope and Content of Review in the 2007 CDA Guidelines are as follows:

- Site Inspection and Staff Interviews;
- Data and Records;
- Consequences of Dam Failure;

- Dam Safety Analysis;
- Operation, Maintenance, and Surveillance;
- Emergency Preparedness;
- Public Safety and Security; and
- Dam Safety Management System.

The background review, site inspection, and staff interview tasks have been outlined in the preceding Section 2.1.

A Dam Safety Review is considered a “snapshot in time” and the observations, conclusions, and recommendations developed during the review are deemed to be valid until the next scheduled DSR. However, if any conditions (e.g. loading, reservoir level, etc.) change, the results of the DSR may no longer be considered valid and/or current and a reassessment may be required.

As a comprehensive dam safety review is required as part of the Request for Proposal (RFP), several engineering analyses will be undertaken as part of the scope of this dam safety review, including but not limited to:

- Background review of available documentation;
- Site reconnaissance and staff interviews not conducted during the investigations phase;
- Hydrotechnical analysis to determine the Inflow Design Flood (IDF);
- Breach analysis and inundation mapping;
- A review of the consequence classification;
- Failure modes and hazard analysis;
- Geotechnical analysis to characterize the geology of the area, identify performance to determine if the dam meets the minimum factors of safety for slope stability under various static and seismic loading conditions; and
- Review of last DSR conducted for both dams, which based on available data, conducted by EBA, A Tetra Tech Company in 2011.

Ecora will complete a draft Hazards and Failure Modes Matrix (HFMM) for the dam. The HFMM will provide reasoning for the selection of specified hazards and modes of failures, as well as those that were determined to be not applicable. The completed version will be included as an appendix within the DSR report. Ecora will schedule a meeting with the necessary officials, including the Town, to discuss the outcomes of the HFMM analysis. Should any information, or lack thereof, lead to any changes in the scope resulting from the DSR and HFMM, it will be discussed at this time.

2.2.2 Dam Break Analysis/Inundation Mapping

The dam break analysis will include the characterization of hypothetical dam breaches, flood wave routing, inundation mapping, and evaluation of the impacts. Both a flood induced failure (a dam failure resulting from a natural flood of a magnitude that is greater than the dam can safely pass), and a ‘sunny day’ failure will be considered. The latter refers to a breach resulting from a piping failure or seismic event. The breach parameters such as location, shape, width, depth, and rate of formation will be determined based on previous studies and other references.

The dam breach hydrographs will be developed using the US National Weather Service BREACH program, which simulates the geometry of potential dam breaches and produces the corresponding hydrographs.

The characterization of the dam breach scenarios and outflow hydrographs will be carried out using FLO-2D, a two-dimensional model that computes peak discharges, velocities, and maximum flood depths resulting downstream of a breached dam. This software now incorporates the US National Weather Service BREACH program, which simulates the geometry of potential dam breaches and the resulting outflow hydrographs. The results of the breach will inevitably be approximate; however, they should serve to identify risks and hazard areas in the downstream area. Note that, for the modeled breach events, it is the incremental consequences of the dam breach failure compared to the event consequences if the dam had not failed, that are to be considered in determining the consequences classification.

Inundation maps will be prepared and used as the basis for estimating the potential consequences of the dam breaches and establishing or confirming the consequence classification rating for the dams. The generated inundation maps can also be provided as ESRI shape files for incorporation into a GIS database.

The results will be presented as contours of flood depths and times at various points, which will be presented on maps and figures for easier interpretation. The maps will identify the inundation zone and warning times for the area downstream of the dams, which will help to assess potential hazards to persons downstream and damage to infrastructure and the environment. Flood hazard intensity maps will be prepared using the method of Garcia et al. (2003 and 2005) as defined in Table 2.3.1 and will provide inputs into the consequence classification reviews.

Table 2.3.1 Definition of Water Flood Intensity

Flood Intensity	Potential Damages	Maximum depth h (m)		Product of maximum depth h times maximum velocity v (m^2/s)
High	Persons are in danger both inside and outside of buildings. Structures are at risk of being destroyed.	$h > 1.5$	OR	$v h > 1.5$
Medium	Persons are in danger outside of buildings. Structures may suffer damage and possible destruction depending on construction characteristics,	$0.5 < h < 1.5$	OR	$0.5 < v h < 1.5$
Low	Danger to persons is low or non-existent. Buildings may suffer little structural damage, however, may undergo significant non-structural damage to interiors.	$h < 0.5$	AND	$v h < 0.5$

2.2.3 Consequence Classification Review

As part of the dam safety reviews being completed, Ecora will need to confirm that the current consequence classifications are appropriate for the dams as the classifications have major impacts on design parameters used in the review.

Both dams are noted to have a “Very High” consequence classification, meaning that they must be able to pass a flood that is 2/3 between the 1 in 1,000-year and the Probable Maximum Flood (PMF) and withstand an earthquake that is halfway between the 1 in 2,475-year event and the 1 in 10,000-year event (or Maximum Credible Earthquake).

The checks will be conducted in accordance with the 2007 CDA Guidelines (2013 Edition), the Federal Energy Regulatory Commission (FERC) Engineering Guidelines (2015), the BC Dam Safety Regulation (B.C. Reg. 40/2016, February 5, 2021), and the Engineers and Geoscientists of BC (EGBC) Professional Practice Guidelines – Legislated Dam Safety Reviews in BC V4.0 (September 2023).

2.2.4 Hydrotechnical Analysis

The outcome of the consequence classification review will dictate the appropriate Inflow Design Flood (IDF) for the hydrotechnical assessment of the dam. Ecora uses two methods for determination of the IDF. Firstly, regional hydrological methods will be applied using Water Survey of Canada hydrometric records of peak flows on regional rivers and creeks. Standard frequency analysis techniques are applied, and the results transposed to the subject catchment to estimate flood flows of various return periods. Secondly, a hydrological catchment model is developed using HEC-HMS or similar software to simulate peak runoff resulting from extreme precipitation and snowmelt events. The Probable Maximum Flood (PMF) will need to be calculated in order to derive the Inflow Design Flood. This will be done using the probable maximum precipitation, which is estimated using data from the Rainfall Frequency Atlas of BC or from information that resulted from the British Columbia Extreme Flood Project, in combination with an appropriate rate of snowmelt.

Any mechanical components of the dams will be assessed, and a review will be undertaken of all information available on the equipment, and may include:

- review of the original design calculations;
- identifying appropriate loading conditions; and
- analysis to determine safety factors under these loading conditions.

The hydraulics of the spillway will be analyzed to assess the capacity to pass the required IDF. This will include hydraulic calculations to assess the outflow capacity of the dam.

The freeboard available during the IDF will also be reviewed by carrying out a wind/wave analysis. The wind/wave analysis will seek to estimate the reservoir setup and wave runup on the dam crests during storm events. Any information for design freeboard in the background information (if any) will be reviewed to check that it is appropriate for the structure.

Finally, operational issues that impact the operation of the dams, such as debris management, will be reviewed.

2.2.5 Geotechnical Analysis

Geotechnical engineering analyses will be undertaken on both Holland Lake dams as part of the Dam Safety Reviews (and during later design phases). The following engineering analyses may be performed, as applicable, as part of the dam safety reviews and incorporated into the review report:

- Condition assessment of concrete structures;
- Seepage analysis of embankments and foundations;
- Static and seismic stability of the embankments;
- Liquefaction assessment and/or seismic deformation; and
- Embankment and foundation piping failure assessment for embankment dams.

Any information gaps and non-conformances and/or deficiencies will be assessed prior to starting any analysis.

The external condition of any concrete structures will be assessed during a field reconnaissance by visual inspection. Any cracks or other notable concerns as well as feasible remediation options will be outlined in the DSR report.

Seepage analysis of each embankment will be completed using software such as RocScience RS2, and any available hydrogeological information for the dams determined during the site investigation. Ecora does not

propose installing a standpipe piezometer suitable for slug testing, as the hydraulic conductivity of the embankment fill is expected to be very heterogenous due to the nature of the material and method of construction. Determining the hydraulic conductivity at just one discrete location is not particularly useful compared to installing a seismic casing with VWP in that borehole. Ecora will assume conservative hydraulic conductivities for the fill materials based on classification testing results, and will use those assumptions along with any available data from the VWPs to categorize the seepage potential.

For the assessment of the earthen embankments, the acceptance criteria provided in Tables 6-2 & 6-3 of the CDA Dam Safety Guidelines for factors of safety for static and seismic slope stability will be utilized in the dam safety review. Geotechnical static and seismic stability assessment of the embankments will be completed using software such as RocScience Slide2, and any available geotechnical information for the dams.

Liquefaction assessment and seismic deformation will be analyzed using GeoLogismiki LiqSVs, utilizing the shear wave velocity soundings and the SPT N values. Seismic deformation of the embankment slopes will be checked first using RocScience Slide2 and then using the equations outlined in the EGBC guidelines on seismic analysis.

For seismic analysis, Ecora will utilize inputs from Earthquakes Canada 6th Generation seismic hazard model that came into effect in 2020 and forms the seismic design basis for any technical submissions to the regulator. It is noteworthy that the 6th generation model has generally resulted in an increase in the estimated hazard in southwestern BC as summarized in Halchuk et. al (2019). The principal changes to the seismicity model and increases in the seismic hazard are primarily due to the following source changes:

- Updated recurrence of large Cascadia earthquakes from an inter-event period of 532 to 432 years;
- Three independent sources for GTP to better reflect the dip of the inslab source; and
- Inclusion of the Leech River Valley – Devil’s Mountain fault system near southern Vancouver Island.

A potential internal erosion failure mode screening assessment of embankment dams will be undertaken in accordance with the International Commission on Large Dams (2017), Technical Bulletin 164. Internal Erosion of Existing Dams, Levees and Dikes, and Their Foundations.

If the geotechnical analyses completed for the DSR uncover any issues, then more detailed analyses of those issues will be required for the conceptual, preliminary, and final designs. It is difficult to assess precisely what those analyses would be at this stage, however the activities completed will be generally similar to those outlined above.

2.2.6 Dam Safety Principles Review

The core of a DSR is a review of the Dam Safety Management System according to the Dam Safety Principles presented in the CDA Guidelines. This is a high-level assessment, which focuses on what can be called the four pillars of a dam safety management system:

- Owner commitment to Dam Safety;
- Regular Dam Safety Reviews and Inspections;
- Effective Operation, Maintenance, and Surveillance (OMS) protocols; and
- Effective Dam Emergency Plan (DEP).

The Dam Safety Principles used in this assessment are presented in the CDA Guidelines (CDA, 2007). In general, there are five categories of dam safety principle listed as follows:

- Dam Safety management system (four principles);
- Operations, Maintenance, and Surveillance (five principles);
- Emergency Preparedness (four principles);
- Dam Safety Review (two principles); and
- Analysis and Assessment (four principles).

Areas of conformance, non-conformance, potential deficiency, and actual deficiency will be identified according to the Dam Safety Audit system proposed by BC Hydro in a Dam Safety Review workshop at the Canadian Dam Association Conference in Victoria (CDA, 2002) and since adopted by the BC MoF Dam Safety Branch, which forms the basis of the Dam Safety Expectations check sheet.

2.2.7 Dam Safety Review Reporting

As part of completion of the project, Ecora will:

- Make a verbal presentation that summarizes the findings of the review to the Town's staff;
- Provide the preliminary (90%) draft report to the Town for review and comment; and
- Provide the final version of the DSR report complete with a Dam Safety Assurance Statement within four weeks of receiving comments from the Town.

The Dam Safety Review reports will contain the results of all the tasks described in the previous sections. A series of photographs selected to illustrate the findings of the site inspection will be included in the reports for future reference. Figures showing the location of the dams, downstream facilities/structures and the route taken during the site reconnaissance will be presented along with any relevant graphical information such as available construction drawings or other key information. The Dam Safety Review reports will be prepared so that it becomes a reference document for the dams that contains or references all information reviewed by Ecora.

Ecora's approach to writing professional reports is one where plain language is used to facilitate the quick understanding of the observations, conclusions, and recommendations presented in our reports. Avoiding the use of jargon or high-level technical language ensures that the report is understandable at all levels of the ownership and management structure.

Ecora will clearly identify gaps in information for the dams and any inconsistencies found between the DSR and the current OMS and DEP reports, which may affect the safe operation of each dam. Conclusions from each area of review will be clearly summarized and recommendations to address deficiencies or non-conformances will be identified for each area of review in a summary table. Where recommendations are made for engineering studies and/or repair work, priorities for addressing these will be provided in terms of Low (within five years), Medium (within three years), High (within one year) and Very High (within six months). Recommended approximate timelines will be provided for each ranking in the Dam Safety Review reports. The priority criteria are summarized in Table 2.6.1 below. Priority is based on a combination of severity of the deficiency and how complex it would be to implement a solution. A higher severity rating will increase the priority while a higher complexity rating would decrease the priority as certain complex problems may require additional time to complete than higher priority ratings would allow.

Table 2.6.1 Priority Rating System

Priority	Severity	Complexity	Description
Very High	Significant	Simple	Severity is significant for continued dam safety. Solution is simple to implement.
High		Modest	Either severity is significant and requires additional study before implementation or is of moderate importance and is simple to implement.
Medium	Moderate		
Low	Minor	Difficult	Considered to be minor in severity with a modest amount of complexity, or modest in severity with a difficult amount of complexity.

2.2.8 DEP Revisions (Optional)

As part of the DSR, Ecora can undertake an update of the current Dam Emergency Plan (DEP). The objective of a DEP is to establish a formal document that operators of the dams should follow in the event of an emergency at either dam. The DEP will outline the key emergency response roles and responsibilities, in order of priority, as well as the required notifications and contact information. The DEP also provides guidance in terms of the type of response that would be required given the identification of unsafe conditions at the dam. Further, the plan will provide the basic information that allows for the planning and coordination by municipalities, Royal Canadian Mounted Police, provincial agencies, utility owners, transportation companies, and other parties that would be affected by major flood. The development of the DEP will be completed in accordance with the requirements of the CDA Dam Safety Guidelines. It is also anticipated that the DSR will produce new material that could be incorporated into the DEP, such as updated flood inundation mapping.

Austin Engineering Ltd. (AEL) last updated the Dam Emergency Plan (DEP) in 2019. Both Holland Lake dams have “Very High” consequence classifications, which require a DEP review every 7 years.

2.2.9 OMS Revisions (Optional)

As part of the DSR, Ecora can undertake an update of the current Operation, Maintenance, & Surveillance Manual (OMS). The OMS Manual will contain suitable and sufficient information to allow operators to operate and maintain the dams in a safe manner and monitor the performance well enough to provide early signs of any distress. It will also help the Town to develop maintenance policies, procedures, record keeping requirements and responsibilities to ensure that the dam is maintained in a safe and fully operable condition.

The surveillance portion of the OMS Manual will include recommendations for routine and engineering inspections. As significant instrumentation upgrades are included in the RFP scope, Ecora recommends the inclusion of OMS Manual revisions as the OMS outlines the monitoring procedures and frequency checks for the instrumentation. The development of the OMS Manual will be completed in accordance with the requirements of the CDA Dam Safety Guidelines and BC Dam Regulations. The OMS Manual will also incorporate the results of the hydrologic assessment into the OMS Manual. Information included will be in the form of operations criteria.

Austin Engineering Ltd. (AEL) last updated the OMS Manual for both dams in 2019. Both Holland Lake dams have “Very High” consequence classifications, which require an OMS Manual review every 7 years.

2.3 Phases 3 - 5 – Preliminary Design Development

2.3.1 Conceptual Design Development

2.3.1.1 Hydrotechnical Analysis/Water Balance

As part of the Conceptual Design Development phase, updated hydrologic analysis will be performed on the Banon Creek and Holland Creek watersheds. Hydrology updates have been performed for Holland Lake and Stocking Lake (Tetra Tech EBA, 2014). This analysis will be undertaken to understand the storage requirements at Holland Lake and provide a water balance for the Town's water supply. Provided background documents included water demand forecasting for the Town and other surrounding communities. These values will be analyzed, and if necessary, updated based on more recent information and to include climate change variables. This will assist in determining the needed storage increase of Holland Lake.

Future climate change impact projections indicate higher than historic precipitation in the fall and winter, with less precipitation falling as snow. In addition, prolonged periods of drought are predicted during the summer months. All relevant recent climate change prediction tools, such as the Pacific Consortium for Climate Change's (PCIC's) Plan2Adapt and the Western University's IDF_CC ungauged catchment IDF will be utilized to model future climate change impacts to the Holland Lake system.

2.3.1.2 Conceptual Design/Option Analysis

Following the DSRs and investigation works, Ecora will begin work on conceptual design development. The designs will be influenced based on the scope of the RFP, Ecora's environmental assessments, any issues identified in the DSR and site investigation that require attention, and recommendations and comments from the Town staff.

The conceptual design phase is anticipated to include the following:

- Conceptual design drawings will be completed that convey the general idea of proposed solutions. Enough detail will be developed to understand each option without overdevelopment;
- Investigation into the feasibility of overwater dredging compared to alternatives including shore-based dredging and excavation. Figure 2.3 shows the preliminary areas Ecora will investigate for dredging based on available data and satellite imagery;
- Stocking Lake connection concepts;
- Feasibility study of raising the dams including potential borrow areas;
- Options for improvements to the Banon Creek intake;
- Instrumentation schematics for proposed power source, telemetry, and interconnectivity;
- Spillway analysis and conceptual solutions for raising the control structure or constructing a new spillway;
- A 2D HEC-RAS model will be developed to analyze erosion potential and capacity for determining recommendations. A detailed hydrotechnical analysis will be completed which will result in recommendations on spillway design during the passage of the IDF, while ensuring that the dam has sufficient freeboard during the design event;
- If applicable, Ecora will identify preliminary property requirements and rights-of-way needed to accommodate the project works;
- An update to the dam embankment stability analysis will be required to incorporate any dam upgrades (e.g., heightened dam crest). The updated analysis will be based on the information obtained from the geotechnical investigations done prior to the conceptual design, as well as continued geotechnical investigations as needed. This will include:

- Safety factors will be determined using the methods outlined in the CDA Technical Bulletin, Geotechnical Considerations for Dam Safety.
- 2-D Limit State Equilibrium analysis of both Holland Lake Dams using RocScience Slide2.
- The conceptual design phase will conclude with the submission of one PDF copy (with no security settings) of the conceptual design report. The report will include at minimum the following;
 - Results of any engineering analysis undertaken to support concepts;
 - Design criteria;
 - Conceptual design drawings;
 - Multiple Criteria Analysis (MCA)/Decision Matrix; and
 - Class D cost estimates.

2.3.1.3 Class D Cost Estimate

A Class D Cost Estimate for identified options will be produced based on the findings of the Conceptual Design Development phase. The cost estimate will assist in the MCA and provide the Town an updated estimate for the project cost based on the chosen solution.

2.3.1.4 Presentation/Meeting

As per the RFP, Ecora will organize meetings with the Town staff at the completion of each phase to present and discuss the key findings and draft documents. Ecora will produce a conceptual design report and provide recommendations for staff to comment/discuss. This report will include preliminary options for increasing lake storage. It is expected that within 30 days of this meeting, Ecora and the Town will come to an agreement on a solution to allow for the progression of further design development phases.

2.3.1.5 Instrumentation Conceptual Design (Provisional)

Some of the instrumentation will need to be installed during the earlier drilling phase. These include the VVPs Ecora proposes that are required to be installed within the boreholes. Therefore, this phase will explore the installation of other instrumentation, such as a flow meter on the Banon Creek intake, and the design of the remote data transmission system. Ecora currently envisions the instrumentation to be powered via solar arrays and connected to the current Town SCADA system. Ecora contacted several subcontractors for a quote to include in this report. However, none were able to provide a quote in time for proposal submission. An estimate was used based on previous experienced and is included in the cost estimate attached to this report. The quote is an estimate as the scope of the instrumentation will depend on DSR findings and from discussions with the Town.

2.3.2 Multiple Criteria Analysis/Decision Matrix

As per the RFP, Ecora will perform a Multiple Criteria Analysis (MCA) for assistance in determining the solutions to advance to subsequent design phases. An MCA is used to assist in the decision-making process by comparing multiple criteria, some of which may be conflicting, in a systematic methodology to find the best solution.

Ecora will consider the following variables in the MCA and confirm these with the ToL the applicable weighting prior to the presentation;

- Cost estimates;
- Water storage increase;
- Constructability;
- Life expectancy; and
- Environmental impact.

Ecora will provide the MCA during a meeting with Town staff, and make recommendations based on the MCA findings, the DSRs, site investigation, and background review. Ecora also has extensive experience with projects of similar scope and can bring expertise to assist in the making of recommendations and decision-making process.

2.3.3 Preliminary Design

2.3.3.1 Option Development / 60% Design

Following the Town's review of the submitted conceptual designs, Ecora will proceed with the development of preliminary designs. The preliminary design will incorporate the results of site reconnaissance, hydrotechnical analysis, geotechnical analysis, and any additional requests or requirements found during earlier project stages. The preliminary design phase will advance options selected during the previous phase of this project. Preliminary designs will be provided to the Town for comment/discussion prior to advancing to the detailed design phase.

2.3.3.2 Geotechnical Analysis

The following geotechnical engineering analyses may be performed, as applicable, as part of the preliminary design development:

- Seepage analysis of proposed new embankments and foundations;
- Static and seismic stability of the proposed new embankments;
- Liquefaction assessment and/or seismic deformation analyses; and
- Embankment and foundation piping failure assessment for the new geometry of the embankment dams.

Note that this list is not exhaustive. Details on these analyses will be similar to the analyses completed for the DSR, as outlined in Section 2.2.5. The main difference will be that the continued analyses will focus mainly on the specific issues found during preparation of the DSR reports and the impacts of any new aspects of the design, as opposed to simply analyzing the overall stability of the existing structure like was done previously.

2.3.3.3 Class B Cost Estimate

A Class B Cost Estimate will be produced based on the preliminary design of all major elements. This will update the Class D cost estimate to provide the Town with an updated estimate for the chosen solution.

2.3.3.4 Presentation/Meeting

As per the RFP, Ecora will organize meetings with the Town staff at the completion of each phase to present and discuss the key findings and draft documents. Ecora will produce an interim package which will include the following:

- Updated cost estimates;
- Summarization of any additional geotechnical analysis performed as a requirement of preliminary design development; and
- Drawing package including plan, profiles, and sections completed to a 60% design level.

2.3.3.5 Reporting

The conceptual design phase will include the submission of one PDF copy (with no security settings) of the preliminary design report. The report will include at minimum the following;

- AutoCAD Civil3D 60% design development drawings;
- Results of all required engineering analyses performed for design progression;
- Calculations; and
- Class B Cost Estimate.

2.3.3.6 Instrumentation Design (Provisional)

Ecora will continue the design the instrumentation and telemetry system through all design phases. All instrumentation will need to be designed to allow for future dam construction projects, including possible dam crest raising. Instrumentation will be included in the 60% design development drawings.

2.4 Phase 6 – Detailed Design Development

2.4.1 Supplementary Geotechnical Investigations (Provisional)

An supplementary geotechnical investigation may be required during the detailed design phase to better categorize specific areas of the dam if determined necessary through the DSR reporting and previous phases of design. It may also be required to source material for potential dam crest heightening. This investigation would likely be completed with similar equipment to the original geotechnical investigation as the dams are constructed of native material. However, a mud rotary drilling system could also be feasible for investigation outside of the dam area (since hydraulic fracturing would not be a concern). The scope of this investigation cannot be determined with much certainty at this time. Ecora expects to refine this investigation scope during meetings with Town after the DSRs are completed.

2.4.2 Detailed Design

The detailed design will incorporate the results of site reconnaissance, hydrotechnical analysis, and geotechnical analysis. Preliminary designs will have been reviewed by the Town for comment/discussion prior to advancing to the detailed design phase. The detailed design will serve to elevate the preliminary design to a tender-ready design for construction and include more detailed cost estimates to assist in the final budgeting processes. This phase will also include the preparation and submittal of any required permits for construction. This phase will also include an application for amendments to the Town's water licence(s) as applicable.

Ecora will produce detailed engineered drawings for the proposed design as determined through the preliminary design process. The detailed design drawings will include a level of detail sufficient to construct the proposed works and may include but may not be limited to:

- Site maps displaying plan and cross-section views of key areas pre and post decommissioning;
- Construction material specifications and volumes (e.g., riprap, geosynthetic, hydroseed areas);
- Possible temporary dewatering or diversion works;
- Access areas, staging areas, soil disposal areas;
- Re-vegetation plan(s);
- Constructability notes and details; and
- Reporting/Permitting/Licensing.

Ecora will complete a Plan Submission Report in accordance with Plan Submission Requirements for the Construction and Rehabilitation of Small Dams (Version 14a – July 2018). The Plan Submission Report serves as the primary permitting requirements to be submitted to the Dam Safety Officer (DSO) for the works. The Plan Submission Report will detail the results of the tasks listed above.

Ecora's environmental team will support the permitting tasks by providing the information required to address provincial Section 11 expectations for works in and about a stream, as well as coordination with DFO to determine if a notification or request for review and authorizations are required, depending on the nature of the design and construction plans.

The environmental assessment will identify potential adverse biophysical effects and options for avoiding and/or mitigating them. The identification of construction methods for reducing and avoiding adverse impacts will be performed and considered during the construction bidding phase. Information regarding potential actions that can be included within the engineering design to reduce any impacts to sensitise local habitats. As mentioned by the RFP, Banon Intake is active from November 1 to May 31 each year in accordance with the water license No. 112813. Construction scheduling will be performed to identify periods for construction that pose decreased risk to the water supply and local environment. A Construction Environmental Management Plan (CEMP) will be prepared and used by the selected contractor for the construction of all works to mitigate environmental risks. Ecora will complete an environmental management and monitoring plan that will be included in the Plan Submission Report.

The Plan Submission Report will include, but is not limited to:

- Based on any improvements or upgrades to either spillway or Banon intake, a sediment management plan that will be based on the sediment characterization results completed in the preliminary design phase and will consider the future channel stability and possible ecological impacts. Sediment management options explored may include taking no action, engineered rapid release, mechanized removal, in-situ stabilization, or a combination of options. The reconstruction of a stable channel through the reservoir and dam will also be considered in conjunction with the sediment management plan;
- Construction Supervision Plan: Ecora will complete this to supplement the detailed design drawings which will include a comprehensive plan on the sequencing and execution of the proposed works and details of planned inspection efforts;
- Site and Channel Rehabilitation Plan: Ecora will develop a site rehabilitation design for the re-contouring of the site. Considerations will be made for wildlife, aquatic habitat potential, sediment and erosion control, suitability for species at risk, and restoration/enhancement with suitable native vegetation. Stabilization of slopes, grass seeding, and other measures for the prevention of encroachment of non-native and invasive species will also be developed;

- Environmental Management Plan: Ecora will develop an Environmental Management Plan (EMP) which will describe the final work plan and provide a summary of environmental sensitivities and other considerations/restrictions that pertain to the construction works. Reporting will be pursuant to the guidelines, including summary of the assessment results, impact analysis, and recommendations to mitigate environmental impacts. Reporting will include a detailed EMP to incorporate Best Management Practices and other regional and provincial policies into construction plans and activities. Details regarding the anticipated site cleanup and restoration efforts will be outlined, including the design and construction of the site rehabilitation; and
- Long-Term Monitoring Plan: Commentary on the long-term management of the detailed design. It is assumed that a high-level plan will be acceptable at this stage, however, should the background review and environmental site assessment identify any unforeseen important issues, a more detailed monitoring and adaptive management plan may be required that is outside the scope of this proposal.

2.4.3 Class A Cost Estimate

This phase will support the tendering/procurement of construction services and will include:

- A schedule of tender items and a Class A cost estimate will be produced. The cost estimate will be provided under seal of a Professional Engineer. It is noted that the documents will be sealed after they have been reviewed and accepted; and
- A costing report that includes the summary of the cost estimate recommendations and priorities for carrying out the work within a fixed budget.

2.4.4 Presentation/Meeting

As per the RFP, Ecora will organize meetings with the Town staff at the completion of each phase to present and discuss the key findings and draft documents. Ecora will produce a detailed design report which will document the technical aspects of the improvements. Detailed design drawings will be attached and sealed by a professional engineer.

2.4.5 Instrumentation Design (Provisional)

The detailed design phase will include the detailed design of all instrumentation and the required telemetry system for remote data transmission. Ecora will contract a subconsultant for the design and installation of the required equipment.

2.5 Phase 7 – Pre-Construction

2.5.1 Tender Preparation/Documentation

Ecora has reviewed the Town's anticipated construction schedule and planned construction to begin in the spring/summer of 2027, with completion in fall of 2027. Ecora anticipates the construction period to be six (6) months or twenty-four (24) weeks. This is subject to change based on subcontractor availability and selected design choices.

Ecora will assist as requested by Town in the tendering and contract administration phase. This phase will include but is not limited to:

- Provide the Town with contractor procurement options;
- Prepare a tender package that the Town can post to BC Bid and the Town's website;
- Review bids for compliance and suitability to complete the work and work with the Town's solicitor if needed;
- Host a pre-construction meeting, progress meetings with the contractor, and other relevant construction meetings as required;

2.5.2 Bid Questions/Analysis

Ecora will assist in the analysis of bid proposals and awarding of contract(s) as requested by the Town within the RFP. This process will include;

- Answer bidder questions; and
- Prepare and issue addendums.

2.5.3 Pre-Construction Meeting

Ecora will organize and attend a pre-construction meeting with the Town and the selected Contractor to confirm the following information;

- Contact Information;
- Permit Requirements;
- Transportation to Site and any Vehicle/Foot Traffic Management Plans;
- Communications;
- Scope of Work;
- Optimum Construction Staging;
- Materials Testing; and
- Roles and Procedures.

2.6 Phase 8 – Construction

2.6.1 Contract Administration/Site Instruction

Ecora will handle the contract administration, approving progress reports and payments.

2.6.2 Environmental Monitoring

The Environmental team will provide support during construction phases of the project by developing environmental management and mitigation plans for contractors, providing environmental oversight on behalf of the client/owner, directing the implementation and effectiveness of mitigation measures, and documentation compliance with permit terms and conditions for the duration of the works. The environmental team will also manage the restoration and compensation requirements, to ensure all permit conditions are satisfied, which may include a maintenance period. This will be completed by Ecora's biologists and will include details on how the impacts to the environment will be

monitored during construction. Ecora will oversee the implementation of the terms and conditions described in the environmental permits.

Ecora's environmental team will undertake an environmental impact evaluation of the required vegetation removal and identifying other environmental issues that will need to be addressed during the construction of dam upgrades and the increase of Holland Lake storage capabilities. This will begin during the detailed design phase but may bleed into the construction phase.

Monitoring plans will be developed to ensure the environmental impact be minimized. A description of potential enhancement opportunities will be developed and provided.

2.6.3 Construction Inspection

During the construction phase, Ecora will have a representative on site every day creating field inspection reports, quality assurance materials testing, and ensuring the construction is completed to design.

Ecora will provide the daily field inspection reports to the Town at reoccurring intervals. Memos will be issued as required during the construction. We have assumed that the construction layout survey, as built survey and quality control materials testing will be provided by the contractor.

2.7 Phase 9 – Post-Construction

2.7.1 Record Drawings

The record drawing package Ecora will provide to the Town will include:

- Submission of one unlocked PDF copy of draft “record drawings” for review by the Town’s Project Manager within 45 days from issuing the substantial performance certificate. The record drawings will:
 - Be the copies of the original AutoCAD design drawings provided during the detailed design phase, amended to reflect the actual constructed works, retaining the original drawing numbers. “Record drawings” will be stand-alone documents and contain as much of the original information as possible, plus all of the information concerning changes due to construction revisions. This shall include the removal and abandonment of underground utilities and reflect all work performed as such; and
 - Be prepared using the same format and drafting standards as the original design drawings. All the contract drawings will be included as separate “record drawings”.
- Submission of signed and sealed “record drawings”. Ecora will provide, within five (5) days of approval by the City, an AutoCAD drawing set and a scanned, PDF (with no security settings) of the signed and sealed copy.

2.7.2 Post-Construction Reporting

The contractor will complete the post-construction survey. Survey data will be provided to Ecora for use in the record drawings.

Ecora will provide post-construction reports as required by the BC Dam Safety Regulation and will include a summary of the construction process and any deviations from the design.

3. Deliverables

As work progresses on this project Ecora's Project Manager will provide the following:

- Provide brief monthly updates, more frequent meetings during phases on the critical path, to the Town on work status, schedule, and budget; and
- Meeting Minutes of any meetings with opportunity to comment.

The final deliverables will include the following;

- Factual Investigations Report;
- Material Testing Results;
- Borehole Logs;
- Topographic/Bathymetric Survey Drawings;
- Dam Safety Reviews;
- Hazards and Failure Modes Matrix (HFMM);
- Conceptual Design Report and Drawings;
- MCA and related documentation;
- Environmental Assessment Report;
- Preliminary Design Report and 60% Drawings;
- Detailed Design Report/Plan Submission Report;
- Material Specifications;
- Construction Supervision Plan;
- Environmental Management Plan;
- IFT/IFC Drawings;
- Cost Estimates;
- All necessary permitting and licensing applications;
- Complete Tender documents;
- Bid Analysis and Contractor Recommendations;
- Contract Administration;
- Field Reports during construction,
- Post Construction Reporting; and
- Record Drawings.

All documents will be provided electronically via email. These will include all necessary figures, drawings, and appendices. Electronic copies will be signed and sealed.

If the Town wishes to have any of the documents provided in hard copy format, Ecora will provide the documents via courier. This will be discussed at the time of the request(s).

3.1 Stakeholder Engagement

Ecora will undertake the required stakeholder engagement activities at the request of the Town, such as a design charrette. These may include hosting an open house for the community to view proposed designs and communicate technical portions to stakeholders. A thorough stakeholder identification process will take place early on in the site investigation and background project phase. Some of the identified stakeholders include BC Dam Safety, the BC Ministry of Forests, the BC Ministry of Water, Land and Resource Stewardship, Fisheries and Oceans Canada, Mosaic, and First Nations.

4. Ecora Personnel

4.1 Key Personnel

The Ecora team will comprise of senior engineer Michael J. Laws, P.Eng., and intermediate engineer Adam Kerk-Hecker, P.Eng. They will be supported by intermediate and junior engineers as required. The senior biologist, Adam Patterson, R.P.Bio., will be supported by intermediate and junior biologists as required. Dr. Adrian Chantler, Ph.D, P.Eng., will support Ecora during this project as a senior/independent hydrotechnical reviewer. Dr. John Sully, Ph.D, C.Eng., P.Eng., will support Ecora during this project as a senior/independent geotechnical reviewer. This project will be led from our Kelowna office, with resources drawn from other offices, including Ecora's Vancouver office, as necessary.

The proposed Dam Safety Engineer has an excellent working relationship with the MoF Dam Safety Officers through his continued dam safety work experience across the province. A short description of the proposed team members and their abilities and duties follows, with detailed resumes of key personnel attached in Appendix B.

An organization chart is provided in Appendix C.

Michael J. Laws, P.Eng., Senior Dam Safety Engineer (Lead Qualified Professional) — Michael J. Laws has over 24 years of broad geotechnical, hydrological and dam engineering experience, including analysis and design of soil and rock slopes, rock fall assessments, geotechnical design of shallow and deep foundations, seismic and liquefaction analyses, specialized analysis of existing dams, structural stability of concrete gravity dams, dam break analysis, flood routing including inundation and flood mapping, design and rehabilitation of dams and the design of geostructures. He previously worked for New Zealand's second largest dam owner where he ran the dam safety program. He has worked on numerous run-of-river hydro projects, designed and undertaken engineering assessments on dams and completed over 20 comprehensive dam safety reviews as the lead qualified professional over the last 5 years including the Okanagan Lake Regulatory System dams for the Ministry of Forests. As stated, Michael will be leading this dam safety review and will be the engineer of record. He will be responsible for completing the dam safety review within the context of the guidelines and legislation.

Adam Kerk-Hecker, P.Eng., Civil/Hydrotechnical Engineer (Project Manager) — Mr. Kerk-Hecker is a hydrotechnical engineer with previous experience on dam engineering assessments and remediation design. Adam has been involved in over 15 dam remediation projects in the last 5 years. Adam will be managing this assignment and has experience working on projects on Vancouver Island and is familiar with the local geography. Adam will be responsible for managing deliverables and project milestones. Adam has over 8 years of consulting experience working as a civil/hydrotechnical engineer. His experience includes hydrology, hydraulics, numerical hydraulic modelling, and hydrological assessments of dam watersheds. Adam is well versed in both the BC Dam

Safety Regulation and the Canadian Dam Association (CDA) Dam Safety Guidelines. Adam has experience using specialized hydrotechnical software such as HEC-RAS and HEC-HMS.

Adrian Chantler, Ph.D., P.Eng., Senior Hydrotechnical Engineer — Dr. Chantler is a hydrotechnical and civil Engineer with over 40 years of experience in the areas of hydrology, hydraulics, and physical and numerical hydraulic modelling. Adrian is a senior/independent reviewer. He has been engaged in floodplain studies and hydrotechnical engineering for dams and water resource projects throughout western and northern Canada. Dr. Chantler's experience encompasses river engineering, dam engineering, stormwater and watershed management, floodplain management, mine water management and dam safety reviews in North America and overseas. He has been involved with over 50 dam safety reviews in the last 10 years. He is an independent consulting engineer under contract to Ecora and will provide senior hydrotechnical review for this assignment.

Adam Patterson, R.P.Bio., Senior Biologist — Mr. Patterson is a Senior Biologist with 18 years of relevant consulting experience. His experience includes conducting and overseeing the implementation of environmental assessment and management for large infrastructure projects throughout BC. He has expertise in terrestrial and aquatic environments as they relate to fish and wildlife ecology, impact assessment, land development, and conservation. His experience includes various terrestrial wildlife and vegetation surveys and habitat assessments, species at risk assessments, habitat restoration and design, and environmental permitting, compliance monitoring, and auditing. Adam has provided environmental management support for dam safety reviews and inspections for Lind Creek, Holland Lake Dam, Stocking Lake Dam, Cannell Lake Dam, Dickson Lake Dam, and a series of dams for the Ministry of Forests near Okanagan Lake.

Glen McCrae, P.Eng., Senior Civil/Municipal Engineer — Glen McCrae is a senior civil/municipal engineer with over 38 years of civil and municipal engineering experience. Glen is experienced in construction administration, providing consulting support to a wide range of clients including Federal, Provincial, Municipal, First Nation, and private sectors. These projects include City of Vernon, 43rd Street Bridge Replacement, Frazer Lake Dam Remediation Contract Administration, and Chapman Street RoW Options Analysis. Mr. McCrae also has experience in a number of dam projects, providing support with civil engineering design input, and contract administration.

John Sully, Ph.D., C.Eng., P.Eng. — Dr. John Sully has over 30 years' experience in geotechnical engineering and is based out of Vancouver, Canada. Dr. Sully specializes in the design, construction, and remedial treatment of water storage facilities. His experience is global with projects including Stability Investigation of Slimes Dam Complex in South Africa, Centrifuge Modeling of Dyke/Dam Behavior on Liquefiable Foundation in Venezuela, and the Richmond Dyke Upgrade Program in BC, Canada. Dr. Sully has also published over 25 technical papers related to various geotechnical engineering fields. He is an independent consulting engineer under contract to Ecora and will provide senior geotechnical review for this assignment.

Matt Roche, P.Eng., Structural Engineer — Mr. Roche is a Structural Engineer with 10 years of relevant consulting experience. Matt has previously worked on several hydro-geotechnical projects and dam assessments ranging from small structures such as the Chain Lake dam assessment and replacement to the very large such as the Hells gate arch wall dam assessment. He specialises in structural finite element modelling and dynamic analysis of structures. He is also the recipient of the 2009 Sean Du Courcy reward from the Concrete society of Ireland for his research into the durability of concrete with the addition of Carbon multiwalled nanotubes. He will be providing input and review on structural factors with context to the dams.

4.2 Supporting Personnel

Prajakta Jadhav, Ph.D., E.I.T., Geotechnical Consultant — Ms. Jadhav is a geotechnical consultant based in Ecora's Vancouver office. Her background is in civil engineering with a specialization in geotechnical engineering with experience in static and seismic design of geotechnical structures and numerical modeling of soil-structure interactions. She is proficient in a number of modeling and simulation software packages including: OpenQuake,

OpenSees, ABAQUS, GEO-STUDIO, GEO-5, and MSEW. Ms. Jadhav has published multiple papers on seismic loading and will assist Ecora in the liquefaction analysis during the DSRs.

Graham Birds, ASct., Senior Civil Engineering Technologist — Mr. Birds has over 21 years of experience as a Civil Engineering Technologist. Graham's areas of expertise include project management, field supervision, quality control, and municipal design/drafting. Mr. Birds project experience includes RDOS Naramata Water System Upgrade and Argiculture and Agri-foods Canada irrigation upgrades in Summerland, BC. Graham will assist in reviewing AutoCAD drawings and providing stakeholder and client quality management measures.

Donna M. Butler, MCIP, Senior Planner — Ms. Butler is a Senior Planner with Ecora and has over 35 years of planning experience, including 27 years in municipal government. Donna has extensive experience in Community Plan and Zoning Bylaw preparation and processing of land use development applications. Ms. Butler will assist by providing expertise in stakeholder engagement and consultation.

Melony Catana, ASct, Environmental Technologist — Melony Catana is a registered Applied Science Technologist that has been consulting in BC for 18 years. She specializes in environmental assessment and mitigation for infrastructure and land development projects. She is experienced with conducting terrestrial and aquatic wildlife and vegetation surveys, habitat assessments, impact assessments, environmental management, project design, regulatory liaison, permitting and compliance monitoring. She has developed and implemented project-specific management plans for mitigating impacts to Species at Risk (SAR), including wildlife exclusion and salvages. She has extensive experience working as part multidisciplinary project teams for the remediation of dams, culverts, and bridges, including fish and wildlife salvages and monitoring watercourse diversions. Her design experience includes fish and wildlife habitat restoration and compensation. She has worked extensively in permit acquisitions. Melony has provided environmental management support for dam remediations for Frazer Lake Dam, Yellow Lake Dam, Rose Lake dam and Star Gulch Dam.

Adam Tieman, E.I.T., Junior Hydrotechnical Engineer — Mr. Tieman is a Hydrotechnical Engineer-In-Training with 3 years of relevant consultant experience. Adam has experience using specialized hydrotechnical software such as FLO-2D with QGIS and HY-8. He is familiar with dam inundation mapping through his experience being involved in several ongoing safety reviews being completed for Mamit Lake, Becher, Toosey, and Botanie Lake dams.

Daniel Tamas, G.I.T., Junior Geoscientist — Mr. Tamas is a Geoscientist-in-Training (G.I.T.) with 6 years of experience with Ecora. Daniel's experience is split between the environmental and geotechnical sectors. Daniel has been coordinating geotechnical drilling programs and assessment reporting for major highway and pipeline projects across the interior. Daniel's area of expertise is in safety coordination, contractor communications, procurement of subcontractors and machinery support, field report development, terrain and geohazard mapping, and Standard Penetration Test (SPT) analysis and data processing. Mr. Tamas has experience communicating with First Nation stakeholders on a number of projects.

Abbas Rahman, PMP, Hydrotechnical Consultant — Mr. Rahman is an experienced Civil and Hydrotechnical engineer with Ecora. Abbas has over 11 years of experience. A chartered professional engineer in New Zealand, Abbas is currently a candidate for his P.Eng. with EGBC. Mr. Rahman is based out of Vancouver, BC, and has experience in hydrotechnical assessments. Abbas has worked on multiple culverts, runoff treatment, and bridge assessments. His work includes updating Botanie Lake, Toosey, and Becher dam OMS manuals and DEPs.

Stephen Renner, E.I.T., Geotechnical Engineer — Stephen Renner has over 12 years of geotechnical engineering experience across Western Canada. Mr. Renner specializes in the areas of seismic design, foundation design, slope stabilization design, and settlement analysis. Stephen has experience working in geotechnical laboratories performing materials testing. Mr. Renner has worked on multiple DSRs including Becher, Toosey, and Nicklen Lake.

Bram Samuels, M.Eng., E.I.T., Junior Geotechnical & Hydrotechnical Engineer — Mr. Samuels has 4 years of industry experience in geotechnical and hydrotechnical engineering sectors. Bram is based out of Vancouver, BC and is experienced in modeling software including LiqSVs, HEC-RAS, HEC-HMS, FLO-2D, and MODFLOW. Bram has worked on projects including Seton Portage Debris Flow Mitigation, Nunns Creek Culvert Replacement, and Fairbanks Road Landslide Remediation. Bram is experienced with soil conditions on Vancouver Island, designing monitoring wells and piezometers.

Tomos Edmonds, Civil/Hydrotechnical Engineering Assistant — Mr. Edmonds 1.5 years of total experience in Ecora's civil and hydrotechnical departments. Tomos specializes in 2D/3D AutoCAD Civil3D drafting. Tomos has worked on projects in the Ladysmith area on Vancouver Island including the Holland Creek Dam Safety Inspections & Decommissioning. Tomos is set to become a registered Engineer-in-Training (E.I.T.) in January 2024.

5. Achievements on Projects

5.1 Project Experience

Within the past ten years, Ecora has undertaken numerous dam projects throughout British Columbia. The scopes and scales of the projects vary and includes dam safety inspections, dam safety reviews, engineering assessments and designs, decommissioning plans, and dam construction and administering.

Ecora has experience working on a number of dams on Vancouver Island and in the Ladysmith area. These projects include the Holland Creek Dams Assessment and Decommissioning, Stocking Lake Dam Preliminary Design, Holland Lake Dam Safety Inspections, and Cowichan Valley Regional District DSRs for Stocking Lake Dam, Youbou Creek Dam, Ashburnham Creek Dam, and Shawnigan Lake Weir

The Ecora team is experienced in undertaking dam safety reviews, engineering assessments of dams, conceptual, preliminary, and detailed dam design, and engineering services related to construction, with a successful reputation for completing similar types of assignments and acceptance of their reports by regulator(s). A list of dam projects that Ecora has completed is listed below. Full project profiles including detailed descriptions, client name and contact, scope, and scheduled/actual completion date(s) for selected recent dam projects are provided in Appendix D. See Table 5.1.1 below for a summary of projects Ecora has conducted since 2015.

Table 5.1.1 Past Dam Projects Completed by Ecora

Client	Province/ Territory	Dam	Services	Year
Ministry of Forests	BC	Nicklen Lake Dam	Comprehensive Dam Safety Review incorporating dam break analysis and inundation mapping, consequence classification review, geotechnical stability analysis, hydrotechnical assessments, reporting. Conceptual design of improvements to Nicklen Lake Dam.	2021-2023
City of Kelowna	BC	Frazer Lake Dam	Detailed design and construction services for the remediation of Frazer Lake Dam including design of a hybrid sheet pile embankment dam, LLO, and spillway, and procurement and contract administration services.	2019-2023
City of Prince George	BC	Shane Lake Dam	Detailed design, procurement, contract administration, and construction services for the	2021-2022

Client	Province/ Territory	Dam	Services	Year
			remediation of Shane Lake Dam. Includes design of remediation works, including spillway upgrades, to address deficiencies identified during a Dam Safety Review.	
ISL Engineering	BC	Centre Star Gulch Dam	Detailed design and construction services for the remediation of Centre Star Gulch Dam. Includes design of remediation works, including spillway upgrades, to address deficiencies identified during a Dam Safety Review.	2020-2022
Town of Ladysmith	BC	Stocking Lake Dam	Preliminary Design (60%) services for a replacement dam structure at Stocking Lake. Included the design of a hybrid sheet pile embankment dam, primary spillway structure with stilling basin, and low-level outlet works.	2021-2022
City of Abbotsford	BC	Cannell Lake Dam	Detailed design, procurement, contract administration, and construction services for the remediation of Cannell Lake Dam including re-design of a spillway, spillway control structure, and filter berm.	2020-2022
City of Powell River	BC	Haslam Lake Dam	Comprehensive Dam Safety Review incorporating dam break analysis and inundation mapping, consequence classification review, geotechnical stability analysis, hydrotechnical assessments, reporting.	2021
City of Penticton	BC	Ellis #4 Dam, Greyback Dam, Penticton #2 Dam	Comprehensive Dam Safety Review incorporating dam break analysis and inundation mapping, consequence classification review, geotechnical stability analysis, hydrotechnical assessments, reporting. Project was completed jointly with Austin Engineering Ltd.	2021
Ministry of Forests	BC	Yellow Lake Dam	Detailed design, procurement, contract administration, and construction services for the remediation of Yellow Lake Dam. Includes design of remediation works, including spillway upgrades, to address deficiencies identified during a Dam Safety Review.	2020-2021
Yukon Energy Corporation	YT	Aishihik Generating Station, Whitehorse Rapids Generating Station, Mayo Generating Station	Completion of audit style dam safety reviews on three generating stations owned and operated by Yukon Energy Corporation. DSR include review of eight structures of a variety of dam types including concrete, rockfill and earthen embankments.	2020-2021
City of Prince George	BC	Shane Lake Dam	Comprehensive Dam Safety Review including geotechnical stability and piping assessments of embankment dam. Consequence Classification Review including dam break analysis and inundation mapping. Preparation of Dam Emergency Plan and Operation, Maintenance & Surveillance Manual.	2020
City of Trail	BC	Violin Lake Dam	Consequence Classification Review including dam break analysis and inundation mapping. Recommended spillway improvements. Preparation	2019-2020

Client	Province/ Territory	Dam	Services	Year
			of Dam Emergency Plan and Operation, Maintenance & Surveillance Manual.	
Ministry of Forests	BC	Minton Lake Dam	Owner's Engineer during construction of new dam.	2017-2019
Ministry of Forests	BC	Okanagan Lake Dam, Skaha Lake Dam, McIntyre Dam	Comprehensive Dam Safety Review incorporating dam break analysis and inundation mapping, consequence classification review, structural stability analysis of concrete gravity dams, reporting. Includes condition assessment of vertical drop structures, drainage and dike works. Preparation of Dam Emergency Plan and Operation, Maintenance & Surveillance Manual.	2018-2019
City of Abbotsford	BC	Cannell Lake & Dickson Lake Dams	Engineering Assessment, incorporating dam geotechnical investigation, geotechnical stability assessment of embankment dam, reporting. Includes predesign of rehabilitation works.	2018-2019
Ministry of Forests	BC	Swan Lake Dam	Dam operations plan that provides guidance on outflow.	2019
Cowichan Valley Regional District	BC	Stocking Lake Dam, Youbou Creek Dam, Ashburnham Creek Dam, Shawnigan Lake Weir	Dam Safety Review incorporating dam break analysis and inundation mapping, consequence classification review, structural stability analysis of concrete gravity dams, geotechnical stability and piping assessments of embankment dam, reporting. Preparation of Dam Emergency Plan and Operation, Maintenance & Surveillance Manual.	2018-2019
City of Trail	BC	Cambridge Reservoir Dam	Consequence Classification Review including dam break analysis and inundation mapping. Preparation of Dam Emergency Plan and Operation, Maintenance & Surveillance Manual.	2018-2019
Regional District of Okanagan-Similkameen	BC	Chain Lake Dam	Consequence Classification Review of Chain Lake Dam including dam break analysis and inundation mapping.	2018
No. 21 Great Projects Ltd. (The Ponds)	BC	Hill Spring Dam	Completion of plan submission report for the rehabilitation of Hill Spring Dam. Includes design of new embankment and spillway weir. Preparation of Dam Emergency Plan and Operation, Maintenance & Surveillance Manual.	2016-2018
Xaxli'p First Nation / Neskonlith Indian Band / Cook's Ferry Indian Band / Indigenous Services Canada	BC	Kwotlenemo Lake Dam / Neskonlith Lake Dam / Calling Lake Dam	Dam Safety Reviews incorporating dam break analysis and inundation mapping, consequences classification review, geotechnical stability and piping assessments of embankment dams, reporting. Preparation of Dam Emergency Plan and Operation, Maintenance & Surveillance Manual.	2016-2017
Ministry of Forests	BC	Yellow Lake Dam	Engineering Assessment, incorporating dam break analysis and inundation study, geotechnical investigation, geotechnical stability assessment of embankment dam, reporting.	2016-2017
Regional District of North Okanagan	BC	Goose Lake Dam	Engineering Assessment, incorporating dam break analysis and inundation study, geotechnical investigation, geotechnical stability assessment of embankment dam, reporting.	2016
The City of Abbotsford	BC	Cannell Lake & Dickson Lake Dams	Dam Safety Review incorporating dam break analysis and inundation mapping, consequence classification review, geotechnical stability and	2015-2016

Client	Province/ Territory	Dam	Services	Year
			piping assessments of embankment dams, reporting.	
Xat’sull First Nation / Indigenous Services Canada	BC	Rose Lake Dam	Dam Safety Review incorporating dam break analysis and inundation mapping, consequence classification review, geotechnical stability and piping assessments of embankment dam, reporting.	2015-2016
Ministry of Forests	BC	Swan Lake Dam	Engineering Assessment, incorporating dam break analysis and inundation study, geotechnical investigation, geotechnical and structural stability assessment of gravity dam, reporting.	2015-2016
Allendale Water Users Community	BC	Allendale Lake and Clark Meadows Lake Dams	Dam Safety Review incorporating dam break analysis and inundation mapping, consequence classification review, geotechnical stability and piping assessments of embankment dams, reporting.	2015
City of Rossland	BC	Centre Star Gulch Dams	Dam Safety Review incorporating dam break analysis and inundation mapping, consequence classification review, geotechnical stability and piping assessments of embankment dams, reporting.	2015

5.2 Client References

Table 5.2.1 below provides two references and corresponding projects that Ecora has completed where the Michael J. Laws, P.Eng. was the Lead Qualified Professional (LQP).

Table 5.2.1 List of References for Recent Dam Projects Where Michael J. Laws, P.Eng. was the LQP

Project	Project Date /Duration	Tasks	Client	Client Contact	Client Contact Position	Contact
Shane Lake Dam Remediation	2020-2021	<ul style="list-style-type: none"> ▪ Detailed Design ▪ Plan Submission Report ▪ Construction Administration ▪ Procurement ▪ Construction Services 	City of Prince George	Alan Clark, P.Eng.	Infrastructure Engineer	250-614-7826 Alan.Clark@princegeorge.ca
Centre Star Gulch Dam Remediation	2021-2022	<ul style="list-style-type: none"> ▪ Detailed Design ▪ Plan Submission Report ▪ Construction Services 	ISL Engineering and Land Services Ltd.	Sean Annan, P.Eng.	Project Engineer	250-362-2229 Sannan@islengineering.com

6. Project & Quality Management

6.1 Project Management

For this assignment Ecora's Project Manager will be Mr. Adam Kerk-Hecker, P.Eng. who will work closely with the Dam Safety Engineer to ensure all engineering aspects of the review, design, and construction are carried out effectively and efficiently. He will also be responsible for undertaking many of the hydrotechnical aspects of the project. Mr. Kerk-Hecker has worked on previous projects on Vancouver Island including the Stocking Lake Dam Remediation and Holland Creek Dam Assessment and Decommissioning. Mr. Kerk-Hecker is a professional engineer with strong communication skills and has managed many similar projects. It is anticipated that the project manager shall:

- Liaise with the Town, licensees, and the BC MoF DSO to access available information and verify DSO requirements for review, inspection, and reporting;
- Provide brief monthly updates, more frequent meetings during phases on the critical path, to the Town on work status, schedule, and budget. Meetings are expected to be virtual unless an in-person meeting is required;
- Identify potential risks to scope, schedule, and budget as early as possible and take appropriate steps to mitigate such risks by working collaboratively with the Town;
- Coordinate with all internal and external disciplines and sub-contractors/consultants to ensure project efficiency; and
- Plan arrangements for meetings, recording of meeting minutes, and tracking of action items.

The meetings will be conducted whenever possible remotely to mitigate costs. Meeting minutes shall be circulated to all participants for comment and confirmation and copied to the respective project officials as soon as possible.

Ecora has created a comprehensive Professional Practice Management Plan (PPMP) for the entire company to manage the quality and ethical aspects of the professional services we provide. Ecora's PPMP constitutes one of the requirements under the Professional Governance Act to maintain our Permit to Practice from the Engineers and Geoscientists of British Columbia (EGBC) and other Provincial and Territorial jurisdictions. The PPMP is reviewed by EGBC, and the company is audited internally and by EGBC to ensure compliance with our PPMP at reoccurring intervals. A detailed outline of Ecora's PPMP is attached in Appendix F.

6.2 Quality Management

Ecora's quality control processes are contained within our Professional Practice Management Plan (PPMP). This is a living document that is updated as required for policy changes and is signed off by all Responsible Registrants. This document is made available on the company Project Management and Delivery SharePoint site.

All projects begin with a Project Start-up meeting that includes all team members. Roles and Responsibilities of each team member are clearly defined and any barriers to project delivery are discussed and addressed. Project Objectives, Deliverables and Critical Success Factors are documented and a review schedule is determined.

All team members are required to sign off on the completed Project Start-up form and this form is filed on the network in the Project Folder. If new team members are brought on to the team, they are required to review the project start-up form and sign off their understanding. During the scheduled review as defined in the project start-up form, success milestones are assessed and any deficiencies are discussed amongst team members to drive performance improvements.

Additionally, small, office-based discipline team meetings are held on a weekly basis. During these meetings, lessons learned from on-going or completed projects are discussed. While topics may be broad and include lessons learned on professional development, client relations, technical subjects, and safety, the discussion of all aspects of project delivery helps to ensure performance improvement in the long-term.

A copy of our PPMP has been attached as Appendix F.

6.3 Document Control

Ecora's record and document management are split into three categories; setting up project filing, preparing documents, and filing documents. These three categories are detailed below:

Setting up Project Filing

A standard project directory is created for each project and tagged with the internal project number.

Preparing Documents

Standard templates are used to facilitate consistent quality, and Ecora uses validated and approved software & media for creating and maintaining documents. Standard file naming conventions to save document files are used and include document identifiers (project name, project number, filename, file directory) in the document, as appropriate, or in document properties or metadata stored with each electronic file.

The project name, project number, purchase order number, and topic are included in the subject line of project or work-related e-mail containing information. Peer review, spellcheck and check documents are applied before submittal.

Filing Documents

All documents and email communications are filed in their appropriate directory, with correct revisions in the name of the document. Periodically, files are converted and saved to a portfolio PDF and saved to the project filing. Printed documents are converted to digital documents and saved to files. A check-in/check-out system is in place where multiple users have access to working documents. Included is a revision record indicating revision number, what was revised and by whom on documents where version control is required (drawings, reports, etc.). Revisions are clearly identified and documented with version control.

Issuing Documents

An issue record is included, indicating purpose for issuing and when issued, on documents where version control is required (drawings, reports, etc.). The revision and issue records may be combined into one record. When issuing electronic documents, providing and retaining the file in PDF/A exactly as issued. A formal transmittal form or informal transmittal (form, e-mail or other) may be used as a record of what was sent to whom, when and how.

Receiving Documents

All documents received from the client are stored in the project file, designated as 'received documents'. If receiving physical documents, the document gets coded and filed in the digital document project file structure. On an as-needed basis, actions taken will be recorded based on received documents.

7. Safety

Ecora is committed to compliance with all government agencies, regulators and regulations, and industry best practices. Our Health and Safety Program follows a safety-first philosophy for best practices utilizing

companywide policies, rules, procedures, and continued on-going training. Our safety program is externally audited and certified by the BC Forest Safety Council. We provide our employees with ongoing training, and information on company policies, safe work, and emergency procedures.

Prior to undertaking fieldwork, Ecora staff are required to complete a Job Hazard Assessment (JHA) and an Emergency Response Plan (ERP) for review and approval by the Ecora project manager. The JHA summarizes any potential and known hazards associated with the work site and type of work to be undertaken, the personal protective requirements, training requirements, and work procedures and mitigation methods to be followed by Ecora staff. Additionally, the JHA lists the required external personnel such as flaggers and utility locators. The ERP further highlights the risks associated with field work and must be signed by all Ecora employees who visit the site.

Ecora is Safety Accord Forestry Certified (SAFE).

Ecora's WorkSafeBC Registration number is 954444 and is currently in good standing with WorkSafeBC.

8. Schedule

For this assignment, Ecora proposes the following schedule. The proposed schedule would see project construction performed in 2027, with a target project completion in December of 2027. Project initiation will begin in early 2024 assuming contract awarded in December 2023. A Gantt Chart is provided in Appendix A. The Gantt chart includes review periods for the Town and key deliverables. It should be noted that the schedule is based on estimates and the scope of the RFP. Each task is subject to changes in timeline based on updates to scope during each phase and comments from stakeholders and the Town. Anticipating that construction will be complete in October 2027, the warranty period is expected to be from October 2027 to October 2028.

9. Cost Estimate

Our cost estimate to undertake the all the required scope of work described above for the Holland Lake Dams is \$1,053,176 (including GST) based on the estimated number of hours and disbursements required to complete the assignment. Our cost estimate to undertake all the required and optional tasks is \$1,135,098 (including GST). This is just an estimate, not a guarantee, and is based on the identified scope in the RFP. This is not a proposed lump sum fee. The project timeline and scope is subject to change due to the complexity of this project, based on findings of the DSR and conceptual design phase, as well as from stakeholder discussions and comments from the Town. The price is also subject to change based on yearly rate increases for services. This project requires several assumptions as findings of each phase will possibly alter the scope of the following phases. Construction fees are time and materials but estimated based on six (6) months of construction, full time inspection, part time EM, and renting of temporary housing in Ladysmith for Ecora representatives. A cost breakdown with fees and disbursements is provided in Appendix D.

10. Closure

We trust this proposal meets your present requirements. Do not hesitate to call with any questions. Ecora has assembled a strong team, so we can deliver a successful project on time and on budget. We look forward to the opportunity of working with you on this project.

Sincerely
Ecora Engineering & Resource Group Ltd.

Prepared by:



Trevor Nikodym, E.I.T.
Junior Hydrotechnical Engineer
Direct Line: 250.469.9757 x1082
trevor.nikodym@ecora.ca

Reviewed by:



Adam Kerk-Hecker, P.Eng.
Hydrotechnical Engineer
Direct Line: 250.469.9757 x1073
adam.kerkhecker@ecora.ca

Reviewed by:

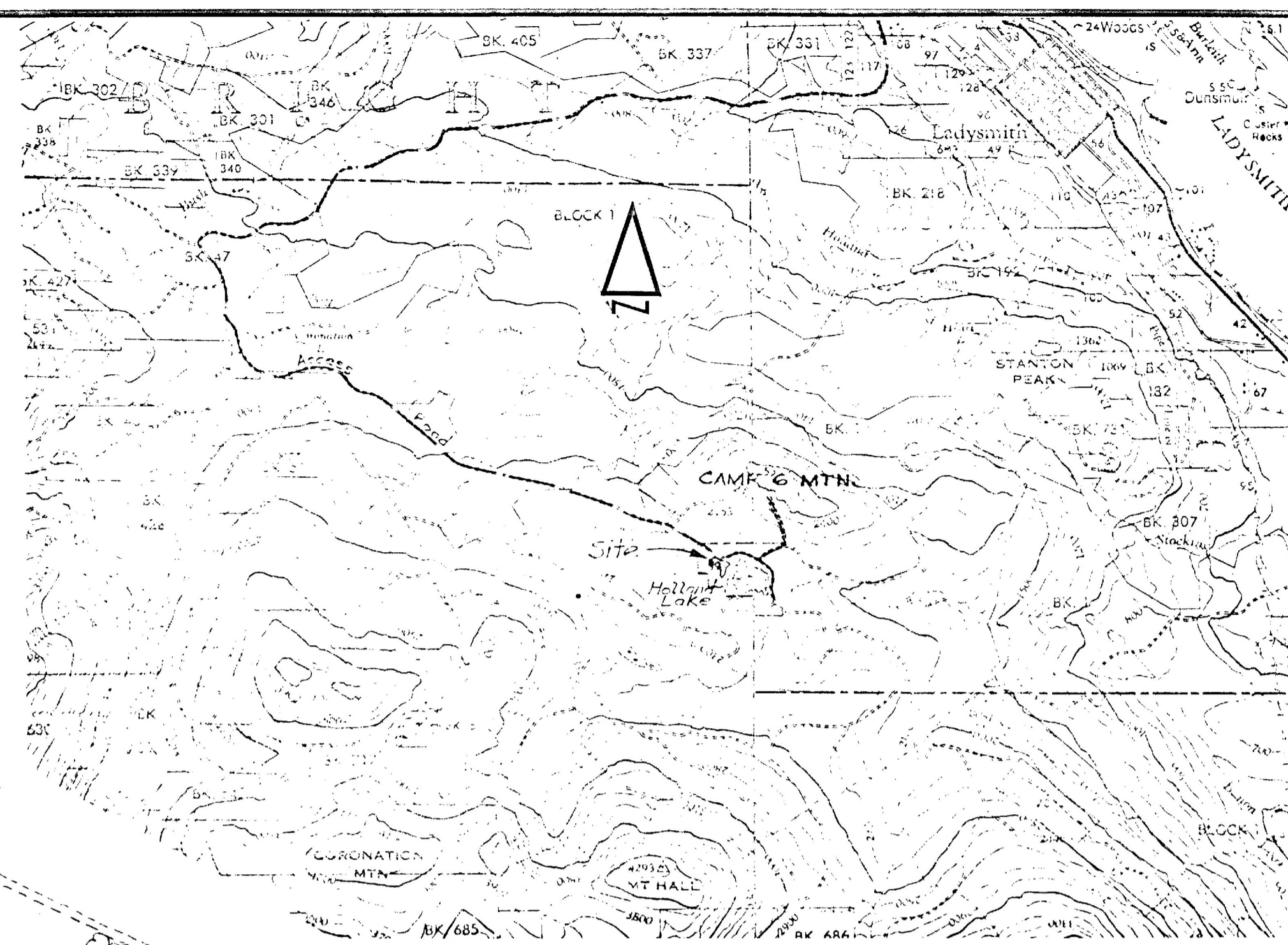


Michael J. Laws, P.Eng.
Principal Dams and Geotechnics
Direct Line: 250.469.9757 x1045
michael.laws@ecora.ca

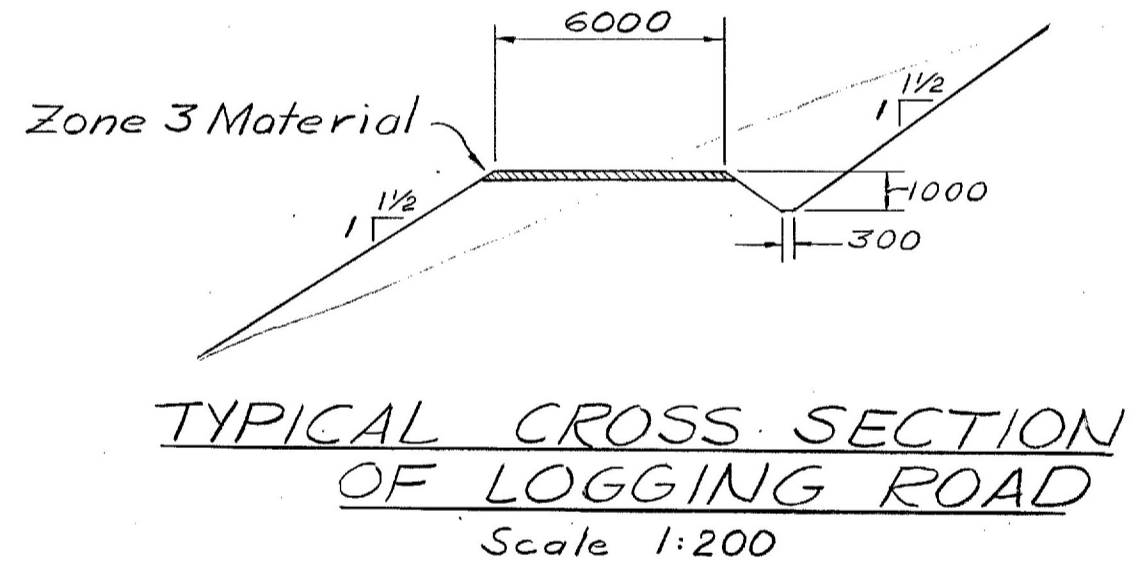
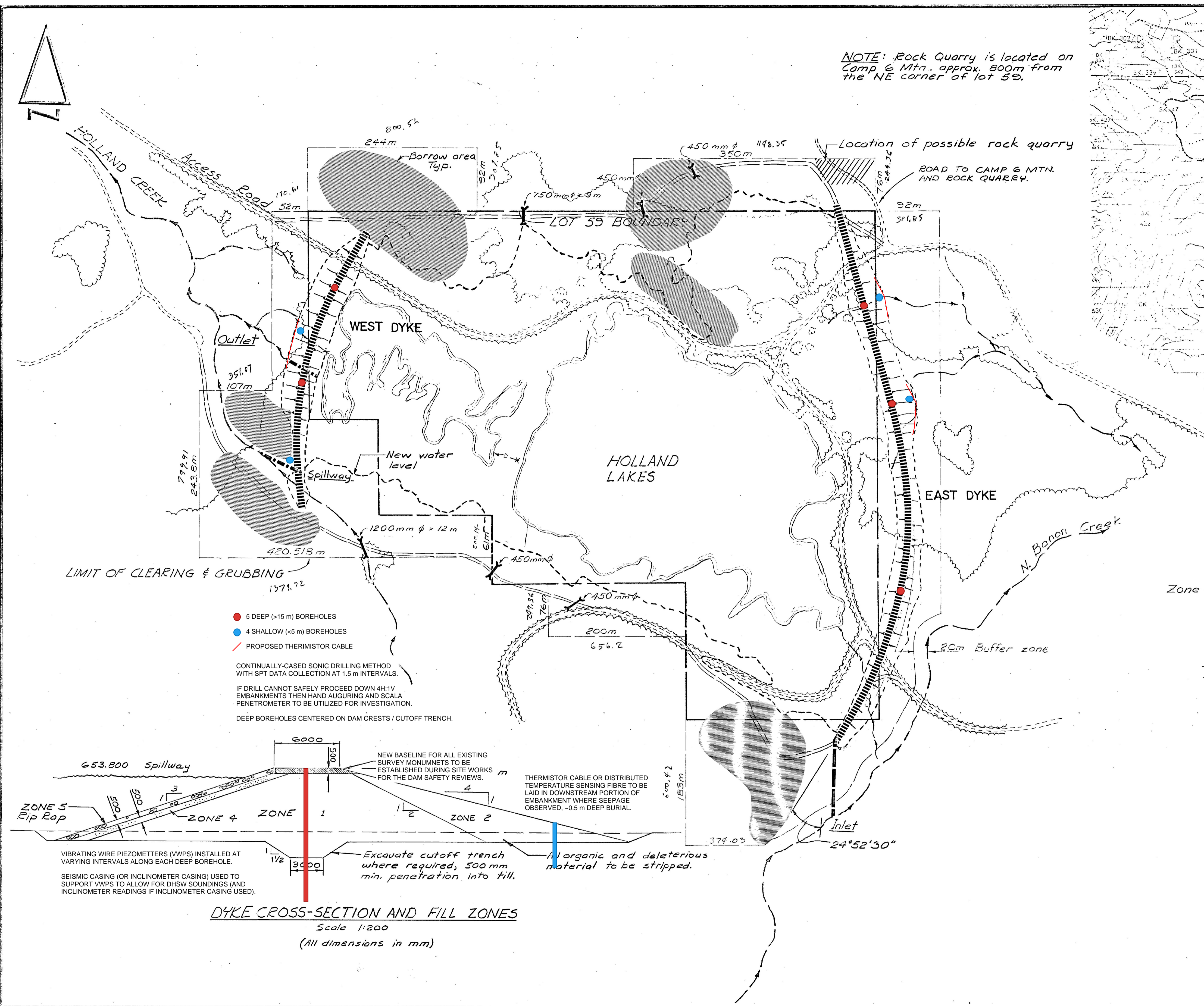
Figures

Figure 2.1a	Proposed Borehole Locations
Figure 2.1b	Fully Grouted Vibrating Wired Piezometers Schematic
Figure 2.1c	Proposed LiDAR Area
Figure 2.3	Preliminary Dredging Investigation Areas and Other Areas of Interest

NOTE: Rock Quarry is located on Camp & Mtn. approx. 800m from the NE corner of lot 5B.

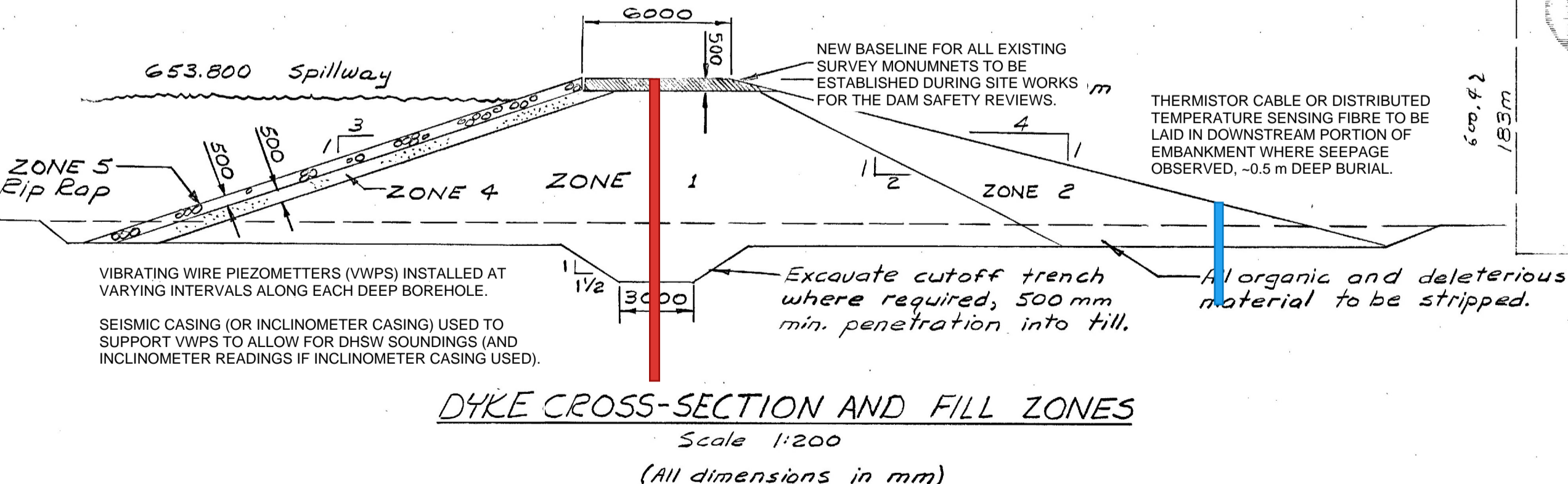


SITE PLAN
Approx. Scale = 1:50,000



Note: - Min. cover over culverts 1/2 diam. of pipe
- Length of proposed logging roads 2020m (1.25 miles)
- All dimensions in mm.

- 5 DEEP (>15 m) BOREHOLES
 - 4 SHALLOW (<5 m) BOREHOLES
 - PROPOSED THERMISTOR CABLE
- CONTINUALLY-CASED SONIC DRILLING METHOD WITH SPT DATA COLLECTION AT 1.5 m INTERVALS.
- IF DRILL CANNOT SAFELY PROCEED DOWN 4H:1V EMBANKMENTS THEN HAND AUGURING AND SCALA PENETROMETER TO BE UTILIZED FOR INVESTIGATION.
- DEEP BOREHOLES CENTERED ON DAM CRESTS / CUTOFF TRENCH.

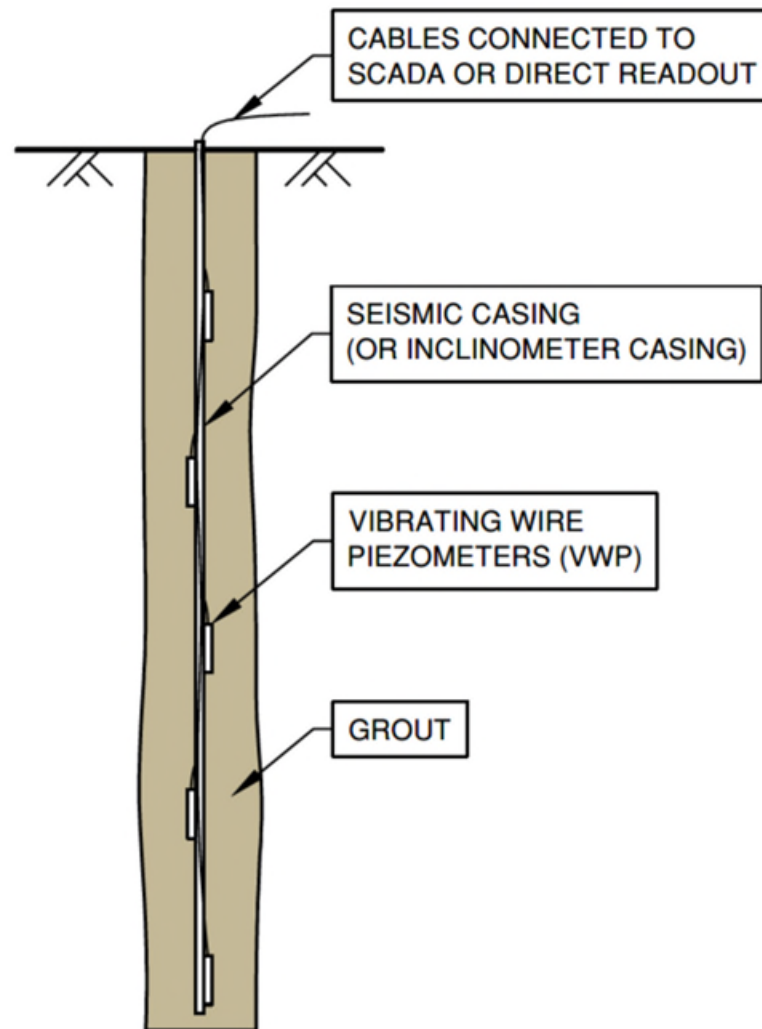


EXISTING	LEGEND	DESIGN	Existing	Legend	Design
---	Dirt roads			Borrow Area	
-o-	Ditch				
X	Culvert				
x	Valve				
mm	Forested Area				
	Dyke				

No.	REVISION	DESCRIPTION	DATE	BY
3	Added Logging Road		8-12-80	L.B.
2	As Constructed		5-10-80	CEB
1	Revise title		28-9-79	JV

DESIGN G.A.T.	
DRAWN J.V.	
CHECKED J.V.	
APPROVED J.V.	
DATE 22-3-79	
SCALE 1:3000	
FIELD BOOK No. 1243	
Ladysmith Waterworks	

TOWN OF LADYSMITH		SHEET No.
HOLLAND LAKE RESERVOIR		1
SITE PLAN: & TYPICAL X-SECTION OF DYKE		OF 8 REV. 3
		DRAWING No. NA 6240-3-1



Notes:

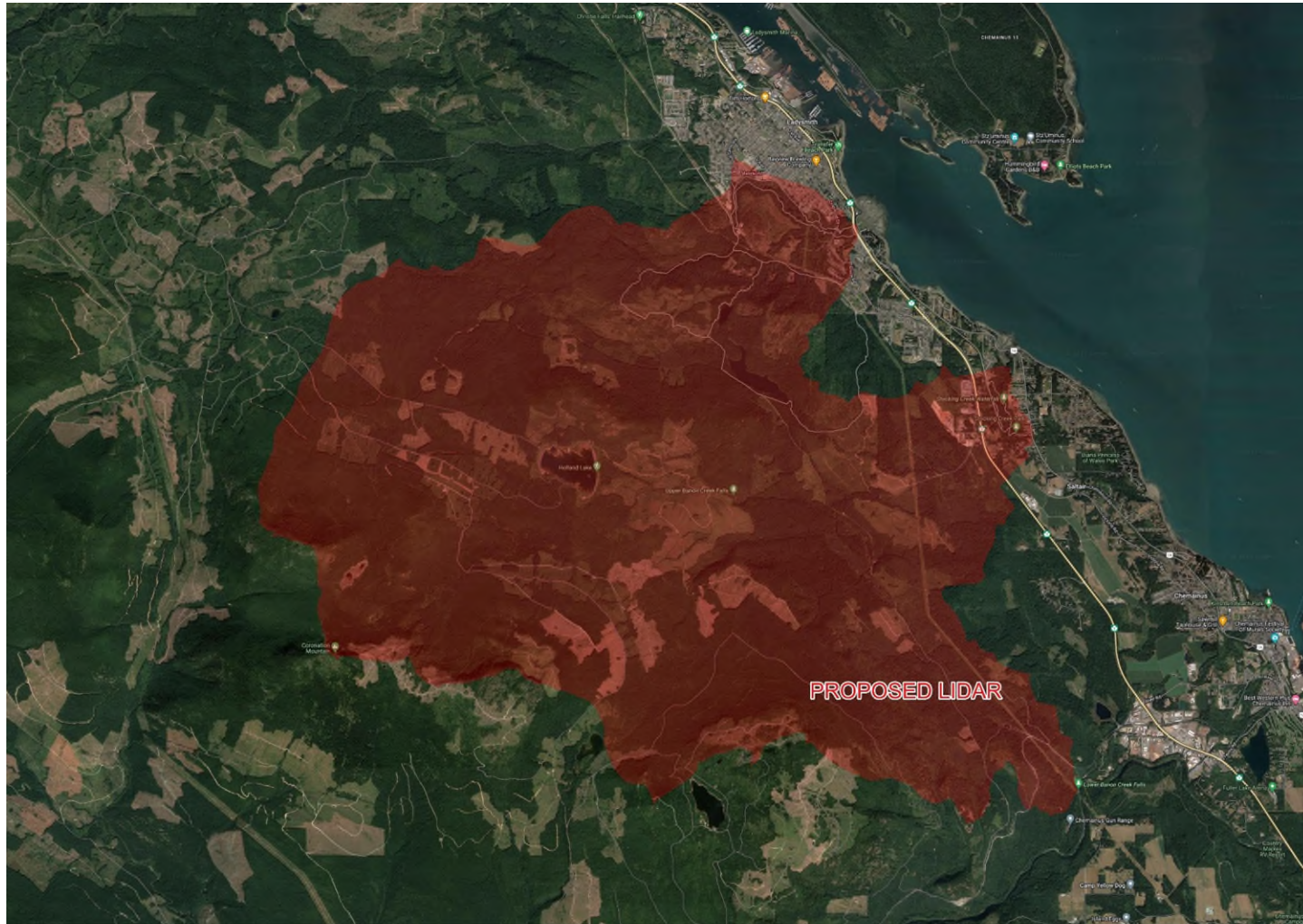
**RFP No. 2023-IS-07 Holland Lake Dam
Capacity and Climate Resiliency
Improvements Consultant**

Fully Grouted Vibrating Wired Piezometers Schematic

Project No. 230852
 Client: Town of Ladysmith
 Office: Kelowna
 Date: 2023-12-09
 DWN: BS CHK: AK



Figure 2.1b



Notes:

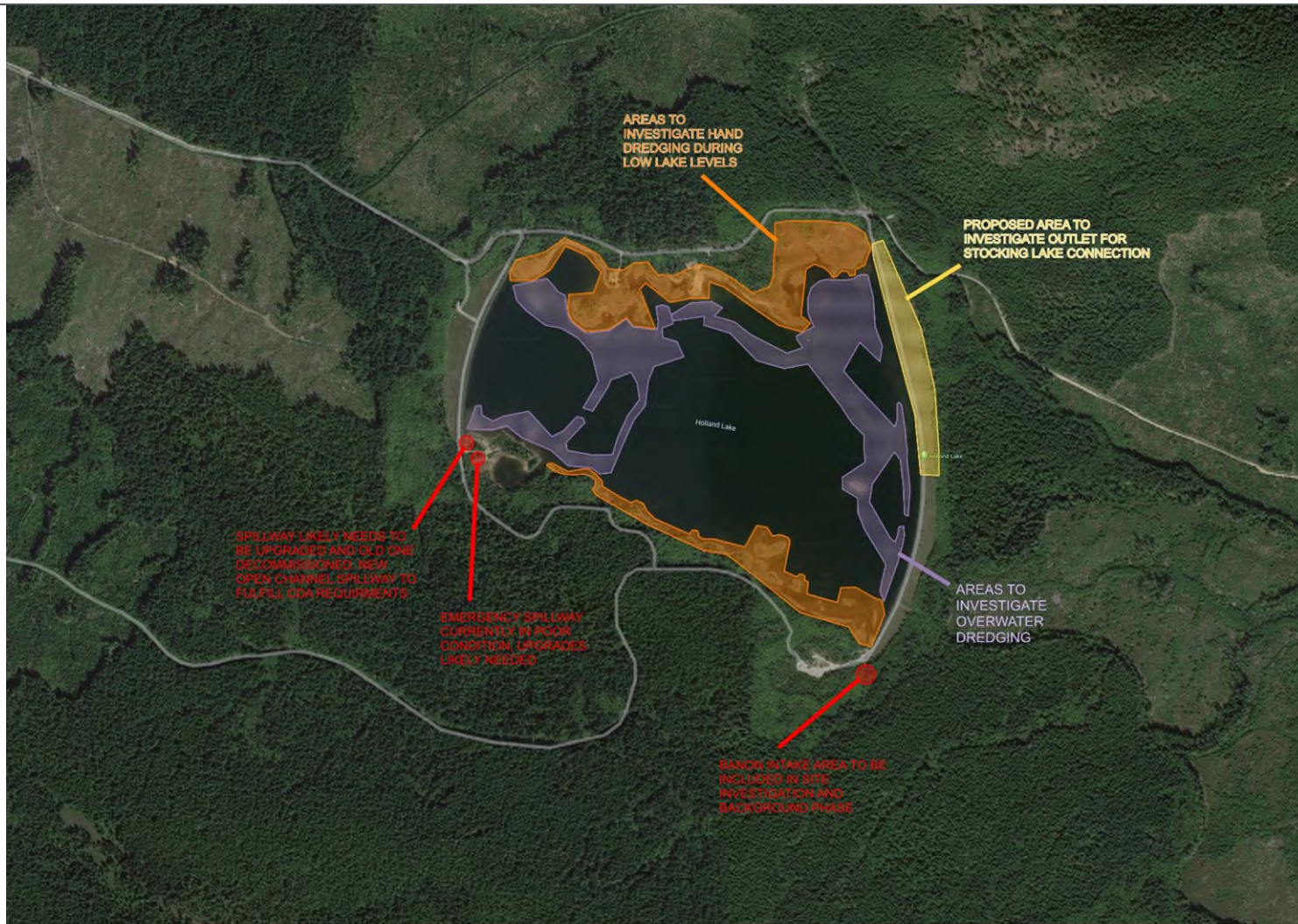
**RFP No. 2023-IS-07 Holland Lake Dam
Capacity and Climate Resiliency
Improvements Consultant**

Proposed LiDAR Area

Project No. 230852
 Client: Town of Ladysmith
 Map: NAD 1983 UTM Zone 10N
 Scale: 1:110000
 Date: 2023-12-09
 DWN: TN CHK: AK



Figure 2.1c



Notes:

RFP No. 2023-IS-07 Holland Lake Dam Capacity and Climate Resiliency Improvements Consultant

Preliminary Dredging Areas and Other Areas of Interest

Project No. 230852
 Client: Town of Ladysmith
 Map: NAD 1983 UTM Zone 10N
 Scale: 1:13000
 Date: 2023-12-09
 DWN: TN CHK: AK

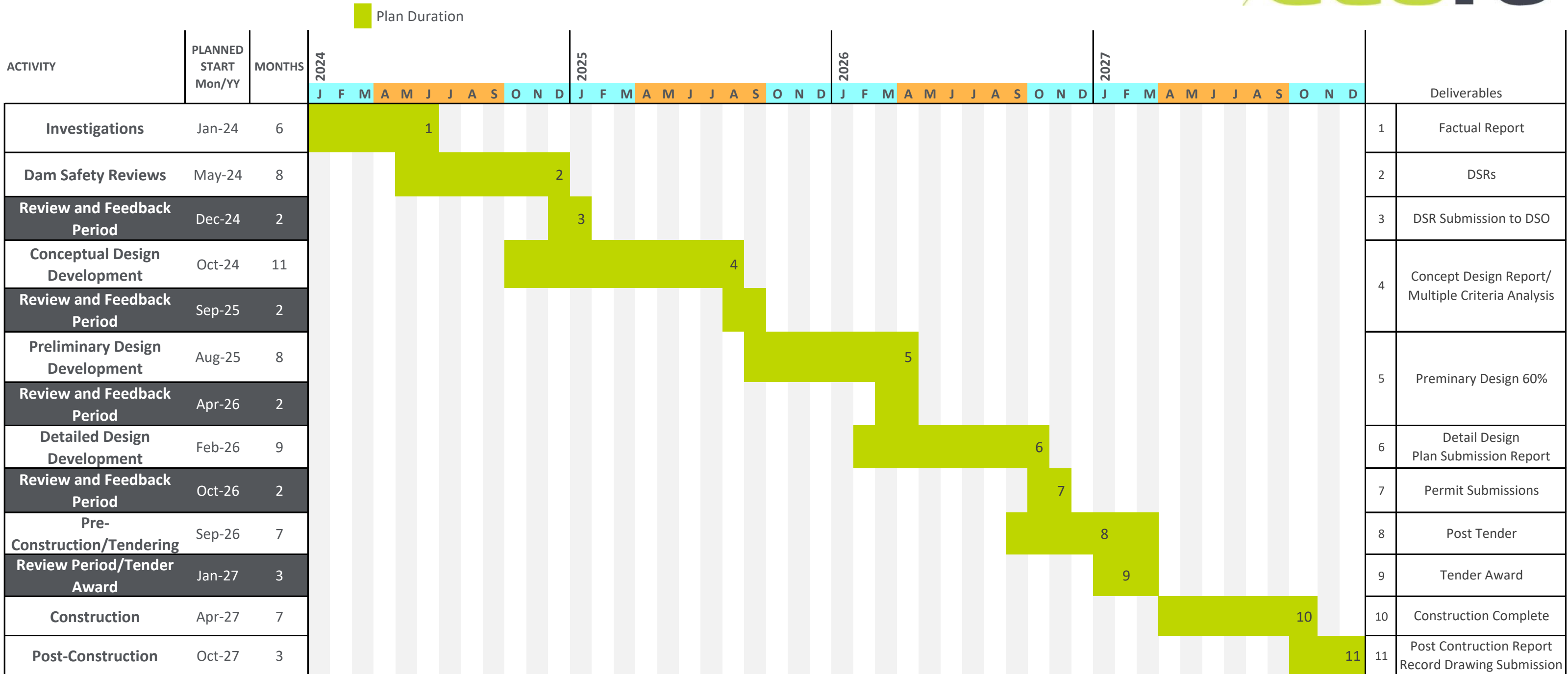


Figure 2.3

Appendix A

Gnatt Chart

Holland Lake RFP No. 2023-IS-07 Gantt Chart



* Warranty period expected to be from October 2027 to October 2028

** Durations are estimates. Accurate timelines can not be determined due to the possibility of scope changes based on previous phase findings.

Appendix B

Resume

Michael J. Laws, P.Eng. Senior Geotechnical & Dam Engineer

Summary of Experience

Mr. Laws is a Senior Geotechnical and Dam Safety Engineer with over 18 years' experience in dam engineering, including undertaking dam safety reviews of existing dams, geotechnical investigations, design and construction supervision of new dams and specialized analysis of existing dams and appurtenant structures. He has successfully completed comprehensive dam safety reviews, design and engineering assessments of over 30 dams in the past 5 years and is very familiar with the requirements of the Canadian Dam Association, Dam Safety Guidelines 2007 (2013 edition) and the BC Dam Safety Regulation. He is experienced with specialized geotechnical, structural stability and hydrotechnical modelling software for modelling embankment stability, seismic performance, seepage, settlement, dam breach and inundation such as Geostudio Suite, Slide, Plaxis 2D & 3D, CADAM, L-Pile, Shake, BREACH, and FLO—2D.

Areas of Experience

- Embankment Dam Engineering and Dam Safety Reviews
- Structural Stability of Concrete Gravity Dams
- Deep and Shallow Foundation Design
- Geotechnical Site Investigation and Design
- Numerical Modelling with Specialization in Finite Element Analysis
- Retaining Wall Design
- Seismic Hazard Assessments and Analysis
- Stability of Soil/Rock Slopes and Landslide/Rock Fall Remediation
- Landslide Runout and Impulse Wave Analysis
- Dam Breach Analysis
- 2D Hydraulic Modelling for Flood Plains and Open Channels

Relevant Experience

- Yukon Energy Dam Safety Reviews, Yukon, YT (2020) – Project Manager and Lead Qualified Professional Engineer for the completion of audit style dam safety reviews for seven structures at Whitehorse Rapids Generating Station (GS), Aishihik GS, and Mayo GS. Review involved reviewing past documentation to confirm that the dams are being operated in accordance with the CDA Dam Safety Guidelines.
- Shane Lake Dam Safety Review, Prince George, BC (2020) – Lead Qualified Professional Engineer for the completion of a comprehensive dam safety review. Included dam inspections, dam breach and 2D flood routing analyses, consequences classification review, static and dynamic stability analyses, piping assessment, preparation of Dam Emergency Plans and Operation, Maintenance & Surveillance manuals and preparation of DSR reports
- Minton Lake Dam Rehabilitation, Williams Lake, BC (2018—2019) – Owners Engineer for the rehabilitation of Minton Lake Dam, including review of existing background information, development of the technical scope of work for the RFP, assistance in evaluation of the bids, and review of technical deliverables



Contact Information

michael.laws@ecora.ca

Education

Bachelor of Engineering (Civil),
University of Auckland, New Zealand
Bachelor of Science (Geology),
University of Auckland, New Zealand

Years of Experience

24

Years with Firm

8

Office

Kelowna, BC

Associations

Canadian Dam Association (CDA)
Canadian Geotechnical Society
Member Association of Professional
Engineers and Geoscientists of
Alberta (APEGA)
Member Association of Professional
Engineers and Geoscientists of
British Columbia (APEGBC)
Member Association of Professional
Engineers and Geoscientists of
Saskatchewan (APEGS)

Michael J. Laws, P.Eng. Senior Geotechnical & Dam Engineer

for the Ministry of Forests, Lands, Natural Resource Operations and Rural Development.

- Dam Safety Reviews of the Okanagan Lake, Skaha Lake and McIntyre Dams, Okanagan Valley, BC (2018—2019) – Project Manager and Lead Qualified Professional Engineer for the comprehensive dam safety reviews of three concrete gravity dams in accordance with the Canadian Dam Association Dam Safety Guidelines 2007 (2013 Edition) and the BC Dam Safety Regulation. Included dam inspections, dam breach and 2D flood routing analyses, consequences classification review, structural stability analysis, preparation of Dam Emergency Plans and Operation, Maintenance & Surveillance manuals, and preparation of DSR reports for the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development.
- Cannell & Dickson Lake Dams Engineering Assessment, Mission, BC (2018—2019) – Lead Engineer for the engineering assessment of two existing embankment dams, including undertaking an intrusive geotechnical investigations and vibrating wire piezometer installation, updated liquefaction triggering analysis, piping assessment, seepage and stability analysis, conceptual design of remedial works and reporting for the City of Abbotsford.
- Dam Safety Reviews and Risk Assessment of the Stocking Lake, Ashburnham Creek, Youbou and Shawinigan Lake Dams, Vancouver Island, BC (2018—2019) – Project Manager and Lead Qualified Professional Engineer for the comprehensive dam safety reviews in accordance with the Canadian Dam Association Dam Safety Guidelines 2007 (2013 Edition) and the BC Dam Safety Regulation. Stocking Lake Dam is an earthen embankment, while, Ashburnham Creek, Youbou and Shawinigan Lake Dams are concrete gravity dams. As part of the scope of the DSR an intrusive geotechnical investigation including installation of piezometers of Stocking Lake Dam was undertaken. Included undertaking dam inspections, dam breach and 2D flood routing analyses, consequences classification review, static and dynamic geotechnical stability analyses, structural stability analysis, preparation of Dam Emergency Plans and Operation, Maintenance & Surveillance manuals, risk assessments in accordance with the National Disaster Mitigation Program framework and preparation of DSR reports for the Cowichan Valley Regional District.
- Dam Safety Reviews of Calling Lake, Neskonlith Lake and K'wotlenemo Lake Dams, Southern Interior, BC (2017) – Project Manager and Lead Qualified Professional Engineer for the comprehensive dam safety reviews of the three earthen embankment dams in accordance with the Canadian Dam Association Dam Safety Guidelines 2007 (2013 Edition) and BC Dam Safety Regulation, including dam inspections, dam breach and 2D flood routing analyses, consequences classification review, static and dynamic stability analyses, piping assessment, preparation of Dam Emergency Plans and Operation, Maintenance & Surveillance manuals and preparation of DSR reports for Indigenous and Northern Affairs Canada.

Training

- APEGBC Technical Seminar on Methods for Predicting Metal Leaching and Acid Rock Drainage (ARD) Potential , Vancouver, Canada - December 2015
- PLAXIS Advanced Course on Computational Geotechnics & Dynamics – Berkeley, USA – May 2013
- PLAXIS Advanced Course on Computational Geotechnics – New York, USA – May 2012
- PLAXIS Short Course on Computational Geotechnics & Dynamics – Portland, USA – August 2011
- Professor Harry Polous Piling Short Course, Canterbury University, Christchurch, NZ – September 2006.
- Geo-Slope International Geotechnical Modelling Workshop (including Slope/W, Seep/W and Sigma/W) Monash University, Melbourne, Australia – July 2003

Adam Kerk-Hecker, P.Eng. Hydrotechnical Engineer

Summary of Experience

Adam Kerk-Hecker is a Hydrotechnical Engineer based out of Ecora's Kelowna office. He has over ten (10) years of experience in civil and hydrotechnical engineering design and analysis. His experience has been focused on small to medium embankment dam systems design, hydraulic structure design, watershed hydrological assessments, 1D/2D hydraulic modelling, culvert and open channel drainage design, streambank/lakeshore erosion protection design, and minor road design. Adam is proficient in hydrologic modelling and streamflow prediction in gauged or ungauged watersheds including using the latest projected data and industry standards to account for potential climate change impacts. He is familiar with various hydrologic/hydraulic software tools (1D/2D HEC-RAS, HEC-HMS, HY-8), project management, topographical and construction survey, contract administration, cost estimating, and reporting. He also has extensive experience with AutoCAD Civil3D modelling and design. Adam is well versed with various MoTI standards including the BC Supplement to TAC, Standard Specifications, tender documents, and C3D Terms of Reference as well as other regulatory guidelines such as the Water Sustainability Act, BC Dam Safety Regulations (BC Reg 40/2016) and 2007 Canadian Dam Association (CDA) Dam Safety Guidelines (2013 Edition).

Relevant Recent Experience (*see project profiles for project details)

- *Analysis/design for 43rd Street Crossing Upgrade, Vernon (2022-2023) - EoR
- *Analysis/design for Hwy 33 Daves Creek Crossing, Kelowna (2021 – Ongoing) - EoR
- Analysis/design for Chain Lake Dam Upgrades, Princeton (2021-Ongoing) - EoR
- *Review/inspection for Sumac Road Erosion Mitigation, Chopaka (2021 – 2023) – Construction EoR
- *Review/inspection for Bromley Rock Slope Repair, Princeton (2022 - 2023) – Construction EoR
- Analysis, design, contract administration, and inspection for Shane Lake Dam Improvements, Prince George (2021 – 2022) - EoR
- Analysis/design/contract administration/inspection for Yellow Lake Dam Upgrades, Kaleden (2020 – 2022)
- Analysis/design for Goudie Road Culvert Replacement, Kelowna (2019-2021)
- Analysis/design/contract administration/inspection for Cannell Lake Dam Rehab, Abbotsford (2019 – 2020)
- Analysis/design for Coteay Creek Culvert Replacement, Oliver (2019)
- Analysis/design for Secrest Hill Road Culvert Replacement, Oliver (2019)



Contact Information

adam.kerkhecker@ecora.ca

Office

Kelowna, BC

Education

B.Eng. in Civil Engineering from the British Columbia Institute of Technology – 2017

Diploma in Civil Engineering Technology from the British Columbia Institute of Technology – 2014

Associations / Memberships

Engineers and Geoscientists of British Columbia (EGBC)

Years of Experience

8+

Years with Firm

6

Areas of Expertise / Specializations

Hydrotechnical engineering design
 Hydrological analysis and modelling
 1D/2D Hydraulic Modelling (HEC-RAS, HEC-HMS, HY-8)
 2D/3D CAD drafting and modelling
 Contract administration
 Project management
 Cost estimating/Reporting

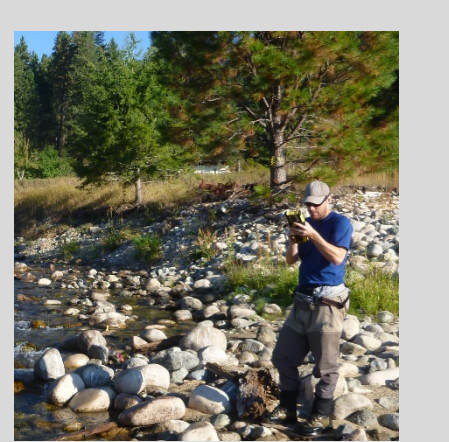
Adam Patterson, R.P.Bio
Environmental Impact Assessment Team Lead – Senior Biologist

Summary of Experience

Adam Patterson is a Registered Professional Biologist who has been conducting wildlife and fisheries fieldwork since 2000 and working in environmental consulting since 2005. His interests are focused on terrestrial and aquatic environments as they relate to fish and wildlife ecology, impact assessment, land development, and conservation. His experience includes various terrestrial wildlife and vegetation surveys and habitat assessments, species at risk assessments, ecosystem mapping and classification, and environmental permitting for a wide variety of small to large land development projects throughout BC. Adam manages many multi-disciplinary projects at Ecora, generally including environmental services such as biophysical inventory, impact assessment, and mitigation planning. Adam works closely with First Nations partners on many projects, including training and coordination of field crews, collaboration and sharing of Traditional and Cultural information, and attendance at engagement meetings and workshops.

Relevant Experience

- **BC Hydro Bridge River Transmission Project (B RTP) Environmental Services** – Adam has been the Principal Biologist and project manager of the environmental scope of services for the BC Hydro B RTP since early 2021. The project includes development of a Valued Components (VC) Table and workplan to conduct surveys for identified environmental values such as wildlife and species at risk, important habitat features and ecosystems, stream crossings and fish presence. Adam is part of the Szumin'ts project team, which is an Indigenous business and partnership between Ecora and St'at'imc First Nation communities. Adam's role includes coordination and planning with the archaeology and heritage team, as well as the overseeing the environmental services.
- **Fortis Interior Gas Upgrade (IGU)** – Adam is the project manager and technical lead providing environmental services and regulatory support for various projects related to the Fortis IGU program. To date these include drilling investigations, restoration programs, and contributing to project planning and mitigation strategies to avoid or reduce risks to aquatic and other sensitive habitats.
- **Westbank First Nation (WFN) Foreshore Inventory Update and Analysis** – Adam was the project manager and technical lead for the WFN foreshore mapping and update project. The project was initiated in 2022 and included a workplan to review existing Okanagan Lake FIM and WFN shoreline information, collect current and additional foreshore, shoreline, and riparian biophysical data, and provide spatial data results, including statistical analyses. Spatial data tools were developed to facilitate use and interpretation of the data during WFN review of development applications, referrals, and other shoreline and foreshore planning efforts.
- **Tsal'ah Indigenous Guardians Program** – Adam is the lead biologist and project manager in support of the Tsal'ah Indigenous Guardians program, in the Lillooet region of BC. Adam led the program proposal and helped secure federal funding to support the Tsal'ah mule deer population study initiative,



Education

Bachelor of Science in Wildlife and Fisheries (2005); University of Northern British Columbia
 Applied Science Diploma in Recreation Fish, and Wildlife Technology (1998); Selkirk College

Associations

College of Applied Biology:
 Registered Professional Biologist

Training and Certificates

- Project Management (PSMJ)
- Certified Erosion and Sediment Control Lead (CESCL)
- Occupational First Aid Level 1
- Electrofishing Crew Lead
- Riparian Areas Protection Regulation Assessment Course
- Power Systems Safety Program (PSSP)
- BC Hydro Heritage Awareness & Helicopter Safety Awareness
- Small Vessel Operator Proficiency (SVOP) & Marine Emergency Duty (MEDA3)
- Amphibian and Reptile Salvage Methods
- Ungulate Field Survey Methods
- Experimental Design in Ecology

Adam Patterson, R.P.Bio
Environmental Impact Assessment Team Lead – Senior Biologist

which includes development of a workplan and methodology to inventory and assess deer populations within the Tsal’alh Traditional Territory using Traditional Knowledge and Elder interviews. This project is being delivered through the Szumin’ts Indigenous Business and includes capacity building for the Tsal’alh Guardians, including GIS licensing and training, developing fieldwork data collection methods, and other technical support.

- **Conuma Willow Creek Expansion (WCE) Baseline Wildlife Inventory –** Adam is the project manager and technical wildlife lead for the WCE project in northern BC. The project includes determination of Valued Components in collaboration with First Nations, development of Wildlife Habitat Ratings (WHR) tables and wildlife inventory, as well as the coordination and completion of fieldwork. Adam will also lead the reporting, mapping, and data analysis for the project, expected to continue through 2023.
- **BC Hydro Site C Fish Stranding Monitoring Program (Mon-12) –** Adam was the project manager and technical lead for the BC Hydro Fish Stranding Monitoring Program (MON-12) along the Peace River near Fort St. John. The project was conducted over a four-year period, which included complex field and safety planning and coordination, conducting fish stranding monitoring surveys, data management and analysis, summary reporting, and mapping. The program is intended to determine the change in magnitude of fish stranding associated with the dam construction and focussed on baseline data collection.
- **Conuma Hermann Mine Site Reptile and Amphibian Salvage –** Adam was the project manager, senior biologist, and field coordinator for the amphibian and reptile salvage works for the Hermann Mine Test Sample project in northern BC. The project included a review of site conditions and footprint to determine risks to wildlife. Ecora developed a salvage plan and acquired Wildlife Act permits for the collection, handling, and translocation of identified species of concern, including frogs, toads, and snakes. Initial fieldwork and inventory was completed in fall of 2020 with additional monitoring efforts to be completed in spring 2021.
- **City of Kelowna Frazer Lake Environmental Assessment –** Adam is the project manager and technical lead for the environmental impact assessment and mitigation planning for proposed dam remediation works at Frazer Lake in Kelowna. Adam planned and completed biodiversity inventory surveys, including plant and ecosystem inventory, songbird point counts, owl call-playback and amphibian aural surveys, bat detection, and shoreline surveys. The inventory results were used to develop mitigation strategies which became part of an Environmental Management Plan for the project, which required review of potential dam safety improvement scenarios. Adam also oversaw the environmental permitting associated with the proposed works.

Workshops and Conferences

- College of Applied Biologists Conference (2023)
- Wetlands Institute – Wetland Restoration Techniques (2020)
- Qualified Environmental Professional Workshop - Species and Ecosystems at Risk (2020)
- Designing Avoidance and Mitigation for Migratory Birds and Species at Risk Critical Habitat Workshop (2019)
- Critical Habitat Screening Workshop (2019)
- Foreshore Plant Species At Risk Workshop (2018)
- Professional Practice Guidelines: Legislated Riparian Area Assessments in BC (2017)
- Riparian Areas Regulation Workshop, West Kelowna (2015)
- Wetlands, not wastelands Panel Discussion and Wetland Tour, Kelowna (2015)
- Wetland Keepers Workshop, Kelowna (2015)
- Wetland Working Group Workshop, Grand Forks (2014)
- Map Our Marshes Workshop, Peachland (2013)
- WildResearch Nighthawk surveys, Penticton and Kelowna (2012-2014)

Years of Experience

>20

Years with Firm

7

Office

Kelowna, BC

Contact Information

adam.patterson@ecora.ca

Adrian Chantler, Ph.D., P.Eng. Senior Hydrotechnical Engineer

Summary of Experience

Dr. Chantler is a Civil Engineer with over 40 years of experience in the areas of hydrology, hydraulics, and physical and numerical hydraulic modelling. He has been engaged in floodplain studies and hydrotechnical engineering for dams and water resource projects throughout western and northern Canada. Dr. Chantler's experience encompasses river engineering, dam engineering, stormwater and watershed management, floodplain management, mine water management and dam safety reviews in North America and overseas. He has been involved with over 60 dam safety reviews in the last 10 years. He is an independent consulting engineer under contract to Ecora.

Areas of Experience

- Dam safety reviews
- Floodplain mapping
- Bridge and culvert hydraulic design
- Mine water management
- Protection of pipeline river crossings
- Hydrological studies
- River engineering
- Physical model studies of hydraulic structures
- Research on hydraulic geometry of tidal watercourses

Relevant Experience

- Hydrotechnical and senior review for the Haslam Lake Dam safety review (City of Powell River, 2021-Ongoing)
- Hydrotechnical and senior review for the Haslam Lake Dam safety review (City of Powell River, 2021)
- Senior review for dam safety reviews for seven Yukon Energy Corporation dams (Yukon Energy Corporation, 2020-2021)
- Hydrotechnical and senior review for the Shane Lake Dam safety review (City of Prince George, 2020)
- Hydrotechnical review for dam safety reviews and risk assessments for Stocking Lake, Ashburnham and Youbou Dams and Shawnigan Lake Weir (Cowichan Valley Regional District, 2018-2019)
- Hydrotechnical review for dam safety reviews for three Okanagan Lake Regulation System dams (Ministry of Forests, Lands, Natural Resource Operations and Rural Development, 2018-2019)
- Development of mitigation options for dam breach scenarios at Sooke, Saddle and Deception Dams (Capital Regional District, 2018)
- Hydrotechnical component of Clayton Falls Dam safety review (BC Hydro, 2018)
- Senior review of Niskonlith Lake Dam safety review (Neskonlith Indian Band, 2017)



Contact

adrian.chantler@ecora.ca

Education

Ph.D., Civil Engineering Hydraulics,
University of Strathclyde, Scotland,
1973

B.Sc. (Hons.), Civil Engineering,
University of Dundee, Scotland, 1970

Years of Experience

40 +

Associations

Canadian Dam Association

Member Association of Professional
Engineers and Geoscientists of
British Columbia (APEGBC)

Member, Canadian Water Resources
Association (CWRA) (BC President
1996/7)

Work History

Independent Consulting
Hydrotechnical Engineer, under
contract to several consulting firms
2014 to present

Tetra Tech EBA/EBA Engineering
Consultants Ltd.

Manager of the Water and Marine
Engineering Group, then Principal
Specialist 2004–2014

Adrian Chantler, Ph.D., P.Eng.

Senior Hydrotechnical Engineer

- Senior review of dam breach inundation study for Tabor Lake Weir (Regional District of Fraser-Fort George, 2017)
- Senior review of Kwotlenemo Lake Dam safety review (Xaxli'p Indian Band, 2017)
- Senior review of Calling Lake Dam safety review (Cook's Ferry Indian Band, 2017)
- Senior review of Yellow Lake Dam engineering assessment (MFLNRO, 2016)
- Hydrotechnical component of Sooke Lake Dam safety review (Capital Regional District, 2016)
- Senior review of Goose Lake dam engineering assessment (Regional District of North Okanagan, 2015)
- Senior review of Dickson and Cannell Lake dam safety reviews (Abbotsford Mission Water Commission, 2015)
- Senior Review of Rose Lake dam safety review (Xa'isúll First Nation, 2015)
- Senior review of Swan Lake dam safety review (North Okanagan Regional District, 2015)
- Senior review of Allendale and Clark Meadows dam safety reviews (Blue Mountain Vineyards, 2015)
- Senior review of Arrowsmith Dam inundation study (Arrowsmith Water Service, 2014)
- Senior reviewer for Cumberland Creek dam's inundation study (Village of Cumberland, 2014)
- Member of technical committee on removal of Fortymile Creek Dam (Town of Banff, 2014)
- Senior reviewer for hydrotechnical aspects of Brent and Farleigh Dam Safety Reviews (Aboriginal Affairs and Northern Development, 2014)
- Senior reviewer for hydrotechnical aspects of Nickel Plate Tailings Facility Dam Safety Review (Barrick Gold Inc., 2014)
- Senior reviewer for hydrotechnical aspects of Saddle Lake Dam Safety Review (Regional District of Kootenay Boundary, 2013)
- Senior reviewer for hydrotechnical aspects of HB Tailings Storage Facility Dam Safety Review and remedial design of spillway chute and energy dissipator (RD of Central Kootenay, 2013/14)
- Review of dam breach analyses and inundation maps for Postill, Bulman, South and McKinley Dams, (Glenmore Ellison Improvement District, 2012/13)
- Senior reviewer for hydrotechnical aspects of Lacey Lake No.1 Dam Safety Review (Cherry Creek Water District, 2012)
- Hydrotechnical aspects of dam safety audits for Battle River Dam and Sheerness Cooling Pond Dyke, (ATCO Power, AB, 2012)
- Dam Safety Review project management for Lund and Thulin Lake Dams, (Lund Waterworks Improvement District, 2012)

Hay & Company Consultants Ltd., Principal, later President, of a specialist water resources consulting company that was acquired by EBA 1997–2004

Steffen Robertson and Kirsten, Principal in Hydrotechnical Engineering, 1988–1997

Crippen Consultants, Hydraulic Design Engineer then Head of the Hydrotechnical Department 1975–1988

Crouch and Hogg in Glasgow, Scotland, Assistant Engineer 1973–1975

Glen S. McCrae, P.L.Eng. Senior Civil Engineer

Biography

Glen McCrae is a senior civil engineer with over 38 years' experience providing civil engineering services across Western Canada. Glen has utilized his skills to provide consulting engineering services to a wide range of clients including Federal, Provincial, First Nation and private sectors. He was successful in being granted a license to practice engineering in British Columbia in 2014 and in Alberta in 2010.

Summary of Experience

Project Management – responsible for the successful achievement of project objectives by effectively managing the project life cycle, beginning to end. This generally includes gaining clarity and agreement on project objectives, scope, and terms of reference, defining tasks, estimates, resource requirements, schedule, methodologies and in turn budgets. It also includes identifying and minimizing risk, progress management, monitoring and reporting, client / stakeholder management.

Construction Administration – including tender preparation, contract documentation and specifications, and contract administration.

Quality Management – preparation of quality management systems, QA & QC to ensure compliance with the QMS, training and assurance of compliance with regulations.

Design – preliminary and detailed design of civil infrastructure projects encompassing roads, water, sanitary and stormwater systems, ranging from greenfield projects to annual capital works programs for municipalities.

Recent Project Experience

City of Merritt – Chapman Street RoW Options Analysis (2023 ongoing)

City of Vernon – 43rd Street Bridge Replacement (2023 ongoing)

City of Kelowna – Parks Contract Administration, City Park Promenade, Ballou and Tallgrass Neighbourhood Parks (2022-2023)

City of Kelowna – Frazer Lake Dam Remediation, Contract Admin (2022-2023)

City of Kelowna – Lawson Avenue, Sanitary Sewer replacement (ongoing)

City of Kelowna – Lynrick Road Culvert Replacement (2021-2022)

City of Kelowna – Gopher Creek (2021-2022)

City of Kelowna – South Pandosy, Sanitary Sewer replacement (ongoing)

City of Kelowna – Saucier Avenue, Water/Sewer replacement

City of Kelowna – Ethel ATC, Preliminary design, detailed design and construction services Phases 1 & 3

City of Kelowna – Sutherland ATC, Preliminary design Pandosy St to Burtch Rd



Contact Information

glen.mccrae@ecora.ca

Office

Kelowna, BC

Education

Civil Engineering Technology – Diploma of Technology, 1985, British Columbia Institute of Technology

Associations

Engineers and Geoscientists of British Columbia – Member

Years of Experience

38 +

Career History

- Ecora, 2020–Present, Government & Municipal Sector Lead
- Allnorth, 2017–2020, Senior Municipal Manager / Engineering Group Lead
- TRUE, 2014–2017, Senior Project Manager / Partner
- Allnorth, 2010–2014, Municipal Group Lead
- EXH / Genivar, 1998–2010, Project Manager / Designer / Inspector
- Watson Engineering, 1995–1997, Inspector / Surveyor
- B.H. Levelton, 1990–1995, Civil Technologist
- WS Barlow, 1988–1989, Surveyor
- MoTH, 1985–1987, Surveyor

John P. Sully, Ph.D., C. Eng., P.Eng. Principal Geotechnical Engineer

Summary of Experience

Dr. John Sully has over 30 years of experience in geotechnical engineering. He has been involved in the design, construction and remedial treatment tailings dams and water storage facilities, design and construction of offshore and onshore petroleum installations, shallow and deep foundation problems, including ground improvement specification and control and dynamic analyses for geotechnical earthquake problems. Recently, he has been involved in large design–build transportation projects involving static and seismic design for shallow and deep bridge foundations, embankments, and ground improvement. Since graduation, he has obtained experience both as a geotechnical engineer and later as a contracts manager. He has gained valuable experience on international projects that include Middle East, South Africa, Zimbabwe, Namibia, Chile, Bolivia, Peru, Venezuela, Mexico, USA and Canada.

Dr. Sully's experience relates to the geotechnical design and construction control for major onshore and offshore petroleum installations including petroleum and LNG tank farms, pipeline route assessment, cyclic and dynamic loading for onshore and offshore platforms, shallow and deep foundation assessments, slope stability analyses, design of earth retaining structures and in situ and laboratory testing. Dr. Sully has published over 25 technical papers related to various fields of geotechnical engineering.

Relevant Experience

Water Storage & Tailings Dams

- Stability Investigation of Slimes Dam Complex, Loraine Gold Mines Ltd., South Africa. Seepage investigation for existing dam and stability analyses for both present and possible future profiles carried out. A slope failure occurred and further investigations were performed. Finite element modeling of seepage for possible future profiles was performed. Remedial measures proposed for re-establishing penstocks, buttressing side slopes, step-back berm for continued deposition and elevated drains around top surface to control phreatic surface in slimes.
- Virginia Canal Dam, Geustyn, Forsyth and Joubert, South Africa. Seepage from water retention dam was causing downstream problems. Two piezometers were installed in the main dam wall and six auger holes drilled around the area of the dam and where seepage was evident. Electrical analogue method used to draw flow net and evaluate seepage.
- Stability of Paper Mill Sludge Storage Ponds, SAPPI-KRAFT, South Africa. Investigation of failure and recommendations regarding future stability of paper mill sludge storage ponds. Determination of in situ sludge properties by field vane tests and laboratory consolidation tests.
- Stability and Life of Tailings Dam – Post Failure, Dorowa Minerals Ltd., Zimbabwe. Slope failure and static liquefaction of tailings resulted after continued problems with dam construction. Short-term measures were

Contact Information

John.Sully@ecora.ca

Office

Vancouver, BC

Education

Ph.D., Civil Engineering, University of British Columbia, Canada, 1987–1991

M.Sc. and D.I.C., Civil Engineering, University of London & Imperial College, UK, 1980–1981

B.Sc. (Hons), Engineering Geology & Geotechnics, Univ. of Portsmouth, UK, 1975–1978

Associations

Engineers and Geoscientists of B.C./Alberta (EGBC), P.Eng.

Institution of Civil Engineers, London, UK (MICE) & Engineering Council, UK (C.Eng.)

Vancouver Geotechnical Society/Canadian Geotechnical Society

Years of Experience

30 +

John P. Sully, Ph.D., C. Eng., P.Eng. Principal Geotechnical Engineer

presented to repair failure breach and permit continued sliming. Long-term measures included construction modifications to improve stability and extend life of structure.

- Centrifuge Modeling of Dyke/Dam Behavior on Liquefiable Foundation, MARAVEN, S.A., Venezuela. Bulk samples of foundation soils taken to Cambridge University, U.K., to perform centrifuge tests to evaluate failure mechanisms for dykes on silty sand foundations.
- Water Storage Reservoir, Unisel Gold Mine, South Africa. Piezocone tests with pore pressure dissipation monitoring for evaluation of in situ drainage for construction of mine water storage reservoir on compressible soils.
- La Mariposa Dam, Puerto La Cruz, Venezuela. Initial investigation and preliminary design for zoned earthfill dam for INOS.
- Design of New Tailings Facility for COMSA El Porco Mine, Potosi, Bolivia. Geotechnical investigation for design of new tailings impoundment after slope failure occurred in existing dam.
- Tailings Dam Site, Lobo/Marte Project, TECK Corporation, Chile. Preliminary assessment of site conditions for location of tailings dam for Lobo/Marte project in Chilean Andes. Evaluation of several preliminary sites for dam construction with consideration of construction techniques and local conditions, i.e. environmental factors, seismicity, etc.
- Review and Design of Existing Tailings Deposits, Mantos de Oro, Chile. Review of stability of two vacuum-filtered tailings deposits: one constructed by conveyor/stacker and compacted by dozer, the other by sub-aerial deposition. Short-term deposition plan produced for increased tonnages and possible options for long-term deposition and correction of ground water contaminant infiltration presented.
- Numerous projects for the design and construction of coastal and river dikes under static and seismic loading conditions in the Lower Mainland of BC.

Linear Structures (Transportation/Pipeline/Dikes, etc)

- 2017 and 2018 Richmond Dike Upgrade Program, Richmond, BC, 2017–2018 – Opus International. Ground evaluation and geotechnical design recommendations for the dike upgrade works including ground remediation options for static and seismic loading conditions.
- No. 2 Road Pump Station Upgrade, Richmond, BC, 2015–2016 – Opus DaytonKnight. Geotechnical investigation for the pump station upgrade and evaluation of the geotechnical foundation stability and design, including ground improvement measures.
- Extension to Dike between No. 2 Road and Lynas, Richmond, BC, 2015–2016 – Opus DaytonKnight. Geotechnical investigation to assess dike stability (static and seismic) for proposed raise along section between No. 2 road pump station and Lynas Lane.

Matthew Roche, P.Eng.
Structural Engineer

Summary of Experience

Matthew Roche is a structural engineer with the Ecora Team. Based in Kelowna, he is part of the Structural Team to support the group with project management and the design of commercial and multi-story buildings, supporting clients in the North and South Okanagan.

Matthew has worked on various high-profile projects worldwide, including as the Lead Design and Project Engineer on the Microsoft European Headquarters in Dublin, Ireland, and the SIT Gymnasium in Southland New Zealand. He has also worked on multi-million-dollar housing projects and large data storage facilities throughout Europe.

His expertise includes FEA modelling, lightweight serviceability analysis of buildings and bridges, structural assessment of buildings, and design of small and large-scale commercial, residential, and industrial buildings.

He has experience with design of various materials including reinforced concrete, structural steel both mild and stainless, timber, masonry both unreinforced and reinforced and composite materials such as composite steel and concrete.

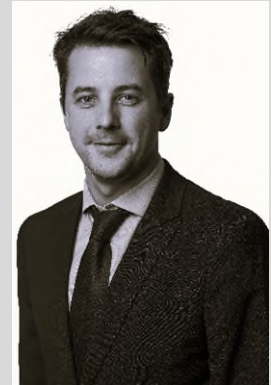
Matthew has also lectured in Advanced Engineering Design for the Master of Engineering program at the Dublin Institute of Technology.

Areas of Experience

- Large scale and small scale Commercial and Industrial buildings.
- Tilt up concrete building design.
- Steel, Concrete and Timber building design to Canadian and European design code standards.
- Seismic design and analysis of buildings in Canada and New Zealand.
- Timber framed residential design.
- Human induced vibrational analysis of lightweight structures.
- Insurance and building condition assessment

Awards

- 32nd Sean DeCourcy Award, from the Irish Concrete institute
- 2019 ACEI Winner Category Structures Large (Team) -One Microsoft Place



Contact Information

matt.roche@ecora.ca

Education

BE (Hons) Structural Engineering, Dublin Institute of Technology – 2013
MSc., Structural Engineering & Mechanics, University of Edinburgh – 2014

Associations

- Engineers and Geoscientists British Columbia
- Institute of Structural Engineers (Graduate Member)
- Structural Engineers Association of British Columbia

Specializations

- FEA modelling and analysis
- Vibration serviceability analysis
- Dynamic earthquake analysis and design.
- Large and small scale Industrial, Commercial and Infrastructure Building design.

Years of Experience

9

Years with Firm

2-3

Office

Kelowna, BC

Relevant Experience

Commercial and Industrial Sector

- Vantage Way Delta BC, Mixed use tilt up concrete framed mixed-use building: Engineer of record for the 207,000 sqft mixed use commercial building. The walls were comprised with tilt-up concrete insulated panels, which acted as both gravity supporting and lateral load resisting systems. The roof structure was a steel deck with ballast supported with open web steel joists spanning onto steel gerber beams.
- YVR Site Works, Underground Structures, Vancouver, BC: Structural Engineer for the underground structures at Vancouver International Airport. Structural design of 7 m deep filter reinforced concrete filter chamber. Matthew designed many above and underground structures including external steel staircases, elevated generator pads and access ramps.
- City West Storage Facility, Dublin, Ireland: Project involved a detailed structural investigation into the structural suitability for change of use from industrial storage to large scale data centre. Matthew conducted a detailed review of the existing structure, analysed where strengthening works were required and specified renovation work to retrofit the building for a data centre.

Residential Sector

- Hillcrest Avenue 71 unit 6 story apartment building located in Abbotsford, BC. This building comprised of wood framed floors and walls, laterally supported by Simpson strong rod system to a suspended concrete slab. There are three levels of underground parking below, with reinforced concrete walls, and a continuous sloping ramp slab throughout.
- Ledgerwood 120-unit timber framed residential units, Nanaimo, BC. This project included two 4 story timber buildings supported by a reinforced concrete underground parkade. The parkade comprised of a 13in thick flat slab supported by reinforced concrete columns at two parking bay widths. The suspended slab additionally supports an access road and landscaping for the residential buildings.

Education & Recreation Sector

- Cottenwood Island Pedestrian Bridge, Prince George, BC: Role as project engineer for a new 30m long pedestrian walkway into the cottonwood island park above the Nechako river in Prince George. Structure comprised of Steel plate girders with a lightweight timber deck and balustrade. The structure was supported on 327mm diameter screw pile abutments.

Insurance Sector

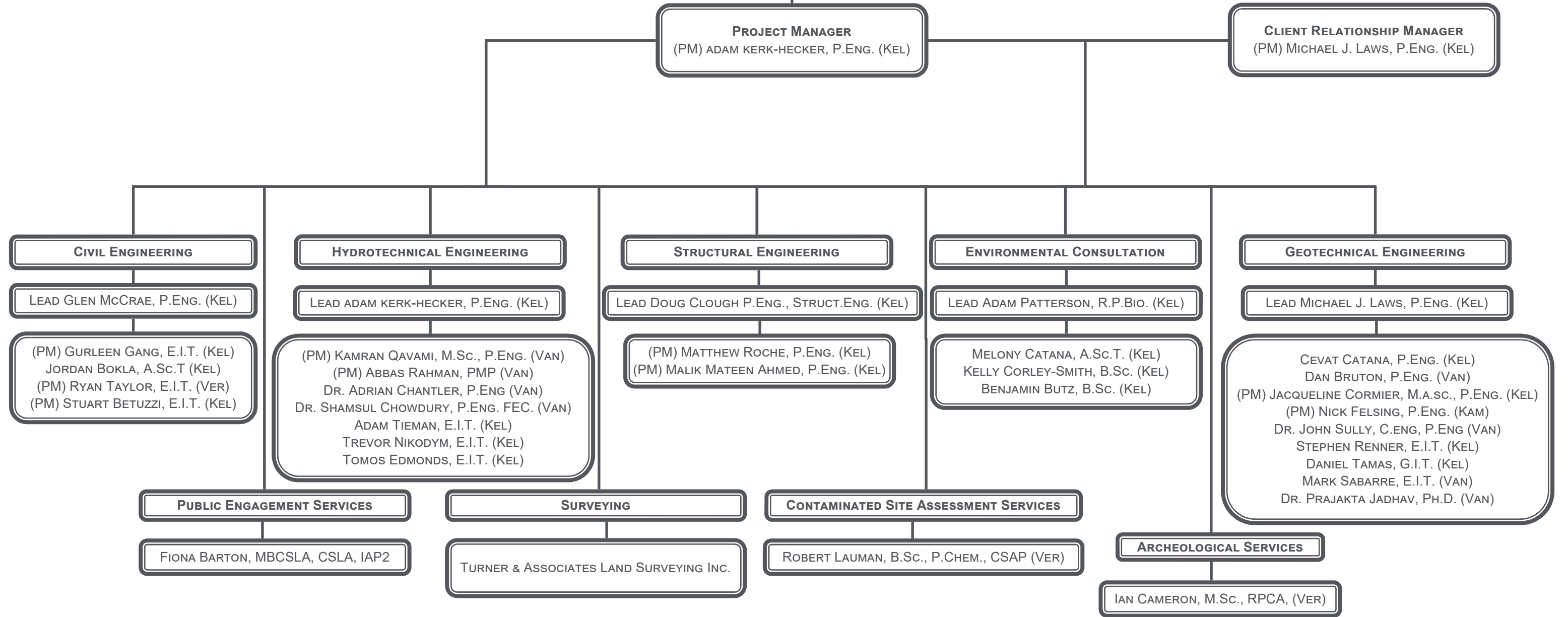
- Muncho Lake Park Bridge Condition Assessment, Muncho Lake, BC: Conducted a detailed structural assessment for a road bridge for the Ministry of Environment, Parks and Protected Area Division in Liard Area British Columbia. The bridge is a 71 m long, 1960's Bailey bridge. Recommended three different repair approaches with a corresponding service life and monetary cost for each.

Infrastructure Sector

- Powell River Wastewater treatment facility: This \$70 million project included the construction of three new buildings, including an administration building, large process mechanical building and the 6 exterior tanks in a Bioreactor building. Matthew was the lead design engineer for the process mechanical building which stored and treated the wastewater prior to transporting it for further treatment in the bio-reactor. The building was 2 storeys which were comprised of reinforced concrete walls, internal masonry walls, a concrete two-way spanning slab, and a steel deck roof.

Appendix C

Organization Chart



LEGEND
 ECORA CERTIFIED PROJECT MANAGER = (PM)
OFFICE LOCATION
 KAMLOOPS = (KAM)
 KELOWNA = (KEL)
 PENTICTON = (PEN)
 VANCOUVER = (VAN)
 VERNON = (VER)

Appendix D

Case Studies

City of Abbotsford - Dam Consulting Services



PROJECT DESCRIPTION

Since 2016 Ecora has been providing dam consulting service to the City of Abbotsford (The City), BC. The City operates two potable water reservoirs, Cannell Lake Dam and Dickson Lake Dam jointly with the City of Mission through the Abbotsford Mission Water & Sewer Commission (AMWSC). Cannell Lake is impounded by a homogeneous earthen embankment dam with a maximum height of 7.7 m, while Dickson Lake is impounded by a homogeneous earthen embankment dam with a maximum height of 8.7 m. Engineering consulting services that Ecora has completed for the City include;

- Completed the 2016 comprehensive Dam Safety Review (DSR) of the Cannell Lake Dam and Dickson Lake Dam.
- In 2018 completed investigations and undertook conceptual design of a remedial works at Cannell Lake to address the deficiencies identified in the 2018 DSR;
- In 2019 completed detailed design and tendering of remedial work at Cannell Lake Dam.
- In June 2020, Ecora completed a Construction Environmental Management Plan (CEMP) for works to upgrade the structure and channel of the existing Cannell Lake Dam. All environmental works adhered to relevant provincial and regional regulations, policies, guidelines, and Best Management Practices, including the retention of an environmental monitor. Some environmental works include BC Conservation data analysis, evaluation of species and ecosystems at risk and environmental impact assessment.
- Responded to the 2020 Level 1 Emergency at Cannell Lake Dam, and,
- Completed the 2021 formal annual Dam Safety Inspection (DSI) of Cannell Lake Dam and Dickson Lake Dam.

Client

City of Abbotsford

Locations

Abbotsford, BC

Duration

February 2016 to ongoing

Project Team

Michael J. Laws, P.Eng.
 Adrian Chantler, Ph.D., P.Eng
 Adam Kerk-Hecker, P.Eng.
 Adam Patterson, R.P.Bio

Key Features

- Dam Safety Review.
- Dam breach analysis, inundation mapping and consequence classification review.
- Determination of Inflow Design Flood and hydraulic assessments of spillways.
- Engineered conceptual design of remediation options for the dam structure and spillway.
- Preliminary and detailed design for the preferred option.
- Construction Environmental Management Plan (CEMP).
- Tendering and construction services.

Fees

\$480,000

Client Contact

Kristi Alexander, P.Eng.
 kalexander@abbotsford.ca
 778.549.1247

City of Abbotsford - Dam Consulting Services

All aspects of the 2016 dam safety review of Cannell Lake Dam and Dickson Lake Dam were completed in accordance with the requirements of the BC Dam Safety Regulations (BC Reg. 44/2016) and the Canadian Dam Association 2007 Dam Safety Guidelines (2013 Edition).

At the commence of the DSR project Ecora initiated a project kickoff meeting with the dam owner to confirm the requirements for the project including safety, the available background material, deliverables, and the schedule.

As part of the consequences classification review the 2016 DSR of Cannell Lake Dam and Dickson Lake Dam included dam breach analyses and inundation mapping produced. The inundation mapping was produced using a 2-dimensional hydraulic model in FLO-2D. Maps produced included maximum flow depth, flood hazard and time of inundation. A consequences classification assessment was completed based on impacts of the flood hazard maps, including an assessment of economic losses, loss of life, environmental and cultural losses.

The geotechnical assessment conducted as part of the 2016 DSR of Cannell Lake Dam and Dickson Lake Dam included, seepage, static and seismic embankment stability, piping failure and liquefaction triggering and deformation analysis.

Hydrological and hydraulic analysis completed as part of the 2016 Stocking Lake Dam included calculation of the Inflow Design Flood (IDF), spillway routing and freeboard assessment during passage of the IDF.

Following deficiencies identified in the 2016 DSR including undersized spillways at both Cannell Lake Dam and Dickson Lake Dam along with poor geotechnical performances. This included intrusive geotechnical investigations of both dams, installation of vibrating wire piezometers to monitoring piezometric pressure in the dam, topographical surveys, materials testing, hydrotechnical analyses that included determining the Inflow Design Flood's (IDF), hydraulic assessments of the spillway structures including 1D and 2D modelling (HECRAS) and undertook a series of geotechnical assessments for potential embankment failure modes, including embankment overtopping, piping through the embankment, piping through the foundation, static and seismic downstream and upstream stability and liquefaction based on the results of the investigations.

Following the engineering assessment, Ecora proceeded with conceptual engineering designs and prepared a design report, recommendations, and budgetary construction cost estimates for remedial work at both Cannell Lake Dam and Dickson Lake Dam.

Contract administration and construction supervision was also completed as part of the project.



Frazer Lake Dam Rehabilitation



CLIENT

City of Kelowna

LOCATION

Kelowna, BC

DURATION

July 2019 to Nov 2022

PROJECT TEAM

Michael J. Laws, P.Eng.

Adrian Chantler, Ph.D., P.Eng

Adam Kerk-Hecker, E.I.T.

Andrew Gain, E.I.T.

Glen McCrae, P.L.Eng.

Jordan Bokla, Int. Tech.

Adam Patterson, R.P.Bio., QEP

Melony Catana, AScT, Env. Tech.

PROJECT DESCRIPTION

Ecora provided engineering services to the City of Kelowna for the rehabilitation of Frazer Lake Dam, located in the Upper Mission neighbourhood of Kelowna, BC.

The preliminary design included review of existing documentation, conducting site reconnaissance including a geotechnical subsurface investigation, geotechnical analyses, hydrotechnical analysis, development of design alternatives, evaluation of design alternatives and a class C cost estimate. At the completion of the preliminary design the project proceeded to detailed design and completion of tender ready IFC drawings and schedule of quantities.

Environmental impact assessments were completed by the Ecora team which included several surveys of wildlife in the area. A construction environmental management plan was completed as part of the BC Dam Safety Regulation Plan Submission Requirements.

Details of the dam remediation design included:

- Removal of existing earthen embankment, concrete headwall, and outlet works;
- Temporary cofferdam design;
- Steel sheet pile cut-off wall;
- Rock ramp spillway channel;
- Cast-in-place concrete level control structure; and
- Low-level outlet and gate works;

KEY FEATURES

- Site reconnaissance including geotechnical subsurface investigation.
- Hydrotechnical analysis including rainfall analysis, dam breach analysis and flood routing.
- Environmental services including wildlife survey, impact assessment, and CEMP.
- Development of rehabilitation alternatives up to and including a class C cost estimate and evaluating benefits of each option.
- Detailed design of preferred option including a Class A cost estimate.
- Completion of Plan Submission Requirements for MFLNRORD approval.
- Procurement and Contract Administration services
- Construction and Environmental Monitoring services

Frazer Lake Dam Rehabilitation



FEES

\$140,000

CONSTRUCTION VALUE

\$761,000

CLIENT CONTACT

Robinson Puche

250.469.8480

rpuche@kelowna.ca

Brian Beach

250.469.8726

bbeach@kelowna.ca

This project had challenging construction issues with environmental requirements for preservation of amphibians, terrestrials, and groundwater seepage within the existing dam. Ecora prepared Request for Proposal documents for construction and participated in the selection process for the successful contractor. The project was constructed in 2022. The contractor chose to install a temporary sheet pile dam to isolate the dam removal and reconstruction works. Ecora is provided construction environmental monitoring services including nesting surveys, aquatic and terrestrial sweeps, contract administration, engineering oversight and field reviews.

Shane Lake Dam Remediation



PROJECT DESCRIPTION

Shane Lake Dam is a zoned earthen embankment dam with the function of providing redundancy to existing beaver dams at the south end of Shane Lake in the event one of the beaver dams fail. The dam is maintained and operated by the City of Prince George (the City) and has been assigned a consequences classification of “Very High”, as defined in the BC Dam Safety Regulations (BC Reg. 40/2016) and the 2007 Canadian Dam Association (CDA) Dam Safety Guidelines (2013 Edition).

Ecora conducted a Dam Safety Review (DSR) for the structure in 2020, and based on the findings, Ecora was asked to provide engineering and environmental services related to remediation design and construction. The required improvements included:

- Improvements to the access road that leads to the dam; and.
- Replacement of the existing piped overflow system with a new auxiliary open channel spillway.

The open channel spillway was cut into the right abutment of the dam embankment and featured a control section constructed of articulated concrete block mats and 70 meters of riprap lined channel with a berm constructed for the left bank. The channel then discharged into a fish-bearing stream (Shane Creek). To facilitate these improvements to the dam, Ecora provided the City with the engineering and environmental services necessary to complete site investigation, detailed design and implementation plan, tender preparation and support, construction services and post construction services.

Client

The City of Prince George

Location

Prince George, BC

Duration

March 2020 — October 2022

Project Team

Michael J. Laws, P.Eng.
 Adrian Chantler, Ph.D., P.Eng.
 Adam Kerk-Hecker, P.Eng.
 Glen McCrae, P.L.Eng.
 Adam Patterson, R.P.Bio

Key Features

- Dam safety review.
- Background review.
- Stakeholder engagement.
- Site investigation.
- Hydrotechnical analysis for upgrade design.
- Detailed design package preparation.
- Environmental assessment.
- Completion of design reports and construction cost estimates.
- Tender package preparation.
- Contract administration.
- Construction and post construction services.

Fees

\$154,000

Client Contact

Alan Clark, P.Eng.
 250.614.7826
 Alan.clark@princegeorge.ca

Yellow Lake Dam Upgrades



PROJECT DESCRIPTION

An engineering assessment of the Yellow Lake Dam was completed in 2017 by Ecora. This assessment indicated that the dam was not in compliance with the Provincial Dam Safety regulations or the Canadian Dam Safety Association Review Guidelines. The assessment report recommended that several action items be met to bring the dam into compliance. The recommendations included:

- Complete works to ensure the dam has freeboard to handle wind and wave effects and is capable of handling the Inflow Design Flood (IDF);
- Remove blockages of the low-level outlet and ensure proper function of the outflow pipe and gate; and
- Increase channel capacity, to prevent overtopping of banks along Highway 97. Reduce the potential for highway overflow and erosion.

Based on the findings of the engineering assessment, in 2021 Ecora completed engineering and environmental services to prepare and submit construction ready engineered designs and acquire all necessary authorizations for the required dam structural and operational upgrades as described above. This work also included the preparation of a detailed tender ready documents, Class 1 cost estimates and corresponding costing reports, contract administration, inspection services, environmental monitoring during the construction, production of record drawings and delivery of a final construction report.

Client

Ministry of Forests, Lands, Natural Resource Operations and Rural Development

Location

Penticton, BC

Duration

July 2016 — October 2021

Project Team

Michael J. Laws, P.Eng.
 Adrian Chantler, Ph.D., P.Eng.
 Jeff Redwood, P.Eng.
 Pete Wittstock, P.Eng.
 Adam Kerk-hecker, P.Eng.
 Andrew Gain E.I.T.

Key Features

- Background review and site reconnaissance of the dams
- Geotechnical investigation.
- Geotechnical assessment including, seepage, static and seismic embankment stability, piping failure and liquefaction.
- Determination of Inflow Design Flood (IDF) and hydraulic assessment of spillway structures.
- Engineered conceptual design of remediation options for the dam structure and spillway.
- Completion of design reports and budgetary construction cost estimates.
- Preliminary and detailed design for the preferred option.
- Tendering and construction services.

Fees

\$114,000

Client Contact

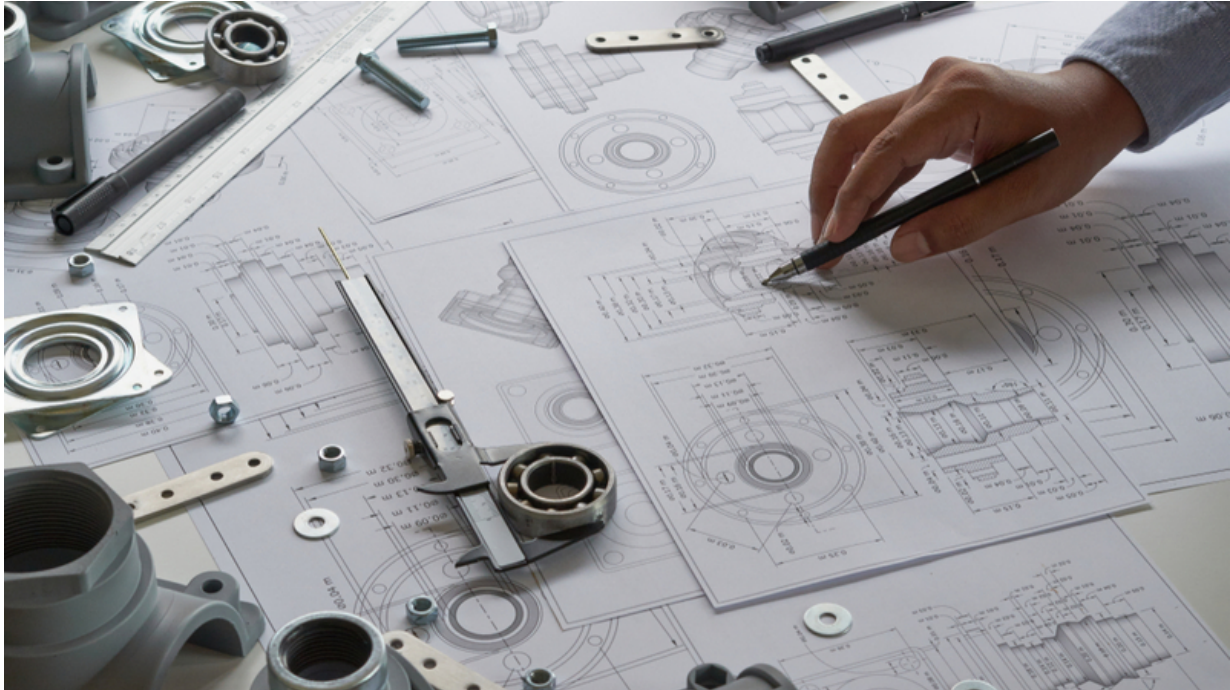
Tara White, R.P.Bio
 778.622.6839
 Tara.white@gov.bc.ca

Appendix E

Fee and Disbursement Breakdown

Appendix E

Ecora PPMP



Professional Practice Management Plan (PPMP) for Ecora Engineering & Resource Group Ltd.





Dated: March 2023

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PPMP Review and Revision Record

This Professional Practice Management Plan (PPMP) must be reviewed annually and updated as required to document evolving business practices of Ecora Engineering & Resources Group Ltd.

Annual PPMP Review Record				
Date	Reason	RO	RR	Comments
2022/08/12	First Issue			
2023/05/01	New RO	Mike Young		Revised Areas of Practice, Mechanical, RR updates
				
			Doug Clough	
				
			M. Lunn	
				
			Ken McCrae	
				
			Adam Hammond	

When this PPMP is revised, the PPMP Version Table below must be updated to reflect the changes. Previous versions must be retained for a minimum of 10 years.

PPMP Version Table			
Version #	Date	By	Description
V. 0	2022/08/04	GW	Initial Release for Use
V. 1	2023/05/01	GW/MJL	Replace Registered Officer, Remove Mechanical, Revise RRs

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Appendix Sections

Appendix A Checklists

1. Introduction

This Professional Practice Management Plan (PPMP) documents Ecora Engineering & Resource Group Ltd. (Ecora) policies and procedures required to deliver Civil, Geotechnical and Materials, Structural Engineering, Natural Resource and Environmental Consulting services in British Columbia, Alberta, Saskatchewan, Manitoba, the Yukon Territories and anywhere else we provide Engineering Services. The PPMP has been developed to meet the requirements set out in Section 7.7.3 of the [Bylaws of Engineers and Geoscientists BC](#).

As the Bylaw mandates, this PPMP includes the following sections or elements:

- Firm organizational structure
- Name of the Responsible Officer
- Names of the Responsible Registrants and the department for which they are responsible.
- Areas of Practice
- Code of Conduct and policies regarding ethical behaviour with specific references to how these documents align and reinforce behaviours in keeping with:
 - Engineers and Geoscientists BC Code of Ethics.
 - Engineers and Geoscientists BC guidelines on human rights, equity, diversity and inclusion.
 - Ethical business practices addressing corruption, conflict of interest, and contractual matters.
- Continuing education and professional development policies and procedures including how they align with the Engineers and Geoscientists BC Continuing Education Program and help employees particularly professionals remain competent in their roles and practice areas.
- Quality Management policies and procedures covering the following required areas:
 - Professional Practice Guidelines
 - Retaining Project Documentation
 - Checking Engineering and Geoscience Work
 - Independent Review of Structural Design
 - Independent Review of High-Risk Activities or Work
 - Authenticating Documents
 - Direct Supervision
 - Field Review During Construction or Implementation

This PPMP will undergo an annual review and revision, as needed, to incorporate input from root cause analysis of nonconformances, internal audit findings, client feedback, user suggestions and management reviews.

All revisions made to this PPMP must be reviewed and approved in writing by the Responsible Officer and Responsible Registrant(s). Refer to the Issue/Revision Record at the front of this PPMP for the status.

Sections in this PPMP have been prepared as follows:

- Introduction and Purpose are Engineers and Geoscientists BC explanations and use Engineers and Geoscientists BC terminology. They are provided to help educate those using this PPMP.
- Policy, Guidelines for Detailed Procedures and Standard Operating Procedures are Ecora Engineering & Resource Group Ltd.'s and use Ecora Engineering & Resource Group Ltd.'s terminology. They are provided for use by all employees.

2. Ecora Corporation Information

Ecora Engineering & Resource Group Ltd. (Ecora) is a British Columbia (BC) based employee-owned Civil, Geotechnical and Materials, Structural Engineering, Natural Resource and Environmental Consulting company. Ecora was established in 2010 and has offices in Kelowna, Penticton, Vernon, Vancouver, Surrey, Chilliwack, Prince George, and Kamloops, with staff also based in Logan Lake, Nelson, and Victoria. Ecora currently has over 170 employees including numerous associates and subcontractors. Staff include 25 Registered Professionals (P.Eng./P.Geo.) and 17 Engineers-in-Training (EIT/GIT) based in the Kelowna, Penticton, Chilliwack, Surrey, Vancouver Kamloops offices.

We are committed to delivering quality services to our valued clients. Our incredible team of engineers, environmental scientists and resource professionals work together to provide clients with a synergistic offering of services unique to the industry. We are built on the foundation of our core values; commitment to our People, our Environment, our Relationships and our Community (PERC).

The Responsible Officer/Responsible Registrant is accountable for ensuring Ecora meets its obligations under the [Professional Governance Act \(PGA\)](#) and the Bylaws, including reviewing and approving the PPMP.

For British Columbia:

Responsible Officer:

- Mike Young P.Eng., Director of Civil Engineering

Responsible Registrants:

- Michael J Laws, P.Eng., Director of Geotechnical Engineering
- Mike Young, P.Eng., Director of Civil Engineering
- Mehmet (Cevat) Catana, P.Eng., Geotechnical Engineering Lead
- Doug Clough, P.Eng., Director of Structural Engineering
- Glen McCrae, P.L.Eng., Municipal Engineering Lead
- Adam Hammoud, P.Eng., Senior Civil Engineer
- Dan Bruton, P.Eng., Geotechnical Engineering Lead

For Alberta:

- Responsible Member: Michael J Laws, P.Eng., Director of Geotechnical Engineering
- Permit Number: P14036

For Saskatchewan:

- Official Rep: Michael J Laws, P.Eng., Senior Geotechnical and Dam Safety Engineer
- Permit Number:

For Manitoba:

- Administrative Contact: Doug Clough
- Responsible Member: Doug Clough, P.Eng., Director of Structural Engineering Lead
-

For Yukon Territories:

Responsible Officer:

Responsible Registrant:

Permit Number: PP706

Ecora Practices in the following Industries:

CONSULTING ENGINEERING:

- | | | |
|-----------------------|--------------------|-------------------|
| • Agricultural | • Civil | • Environmental |
| • Forestry | • Geological | • Geotechnical |
| • Groundwater | • Land Development | • Structural |
| • Surveying/Geomatics | • Transportation | • Water Resources |

CONSULTING GEOSCIENCE:

- | | |
|-----------------|----------------|
| ▪ Environmental | ▪ Geochemistry |
| ▪ Geology | ▪ Hydrogeology |
| ▪ Hydrology | |

Ecora provides services in the following Areas of Practice:

ENGINEERING:		
Civil:	▪ Foundations/Soils/Geotechnical	Hydraulics and Hydrotechnical
	▪ Hydroelectricity/Dams	Hydrology
	▪ Municipal/Urban/Town Planning	▪ River Engineering
	▪ Roads, Rails, Airports	▪ Transportation
	▪ Water Resources	▪ Water/Sanitary
Environmental:	▪ Audits/Site Remediation	▪ Emergency Preparedness/Response
	▪ Environmental Training	▪ Fisheries/Aquaculture
	▪ Hazard and Mitigation Assessments	▪ Impact Assessment
	▪ Regulatory Process Management	▪ Soils/Groundwater Management
	▪ Sustainability	▪ Waste Management
Structural	▪	▪
	▪	▪

GEOSCIENCE:		
Geochemistry:	▪ Environmental Chemistry	
Geology:	▪ Engineering Geology	▪ Geomorphology

Refer to Ecora Engineering Organization Charts on Ecora Connect

Ecora provides services to Government agencies, First Nations, Utility Companies, Private Developers and Forestry Companies.

2.1 Engineering and Geoscience Group

Civil Engineering:

Provides civil engineering services for Public and Private Clients delivering Planning, Roads, Site Grading, Water Resources, Wastewater and Stormwater systems, Irrigation, Project Management, Procurement, and Contract Administration.

There are five Registered Professionals (4 P.Eng. and 1 P.L.Eng.) in this department.

See Civil Engineering Organizational Chart here:

Structural Engineering:

Provides structural design of concrete, wood and steel structures for commercial, industrial, and residential construction and seismic retrofits to existing buildings.

There are six Registered Professionals in this department (5 P.Eng. and 1 P.Eng./ Struct Eng)

[See Structural Engineering Organizational Chart here:](#)

Hydro/Geotechnical Engineering:

Provides professional engineering services including geohazard assessment, foundation design, slope stability in addition to Hydraulics analysis and Hydrotechnical assessment.

There are twelve Registered Professionals in this group (11 P.Eng. and 1 P.Geo.).

[See Hydro/Geo Organizational Chart here:](#)

2.1.1 Engineers Roster

Ecora Engineering & Resource Group Engineering Roster			
<u>NAME</u>		<u>DESIGNATION</u>	<u>DISCIPLINE</u>
Ali	Ahmadi	E.I.T	Civil
Stuart	Betuzzi	E.I.T.	Civil
Brett	Dionne	E.I.T.	Civil
Gurleen	Gang	E.I.T.	Civil
Michael	Panidisz	E.I.T.	Civil
Abel	Rensburg	P.Eng.	Civil
Adam	Tieman	E.I.T.	Civil
Daniel	Diaconu	P.Eng.	Civil
Hoa	Ha	P.Eng.	Civil
Adam	Hammoud	P.Eng.	Civil
Michael	Young	P.Eng.	Civil
Glen	McCrae	P.L.Eng	Civil
Shubham	Pundir	E.I.T.	Civil
Han	Zhou	E.I.T.	Environmental
Arvind	Chowdhari	P.Eng.	Environmental
Daniel	Tamas	P.Eng.	Environmental
Narang	Umaakant	P.Eng.	Environmental
Mark	Berthiaume	E.I.T G.I.T.	Geotechnical
Leah	Ethier	E.I.T.	Geotechnical
Mark	Sabarre	E.I.T.	Geotechnical

Bram	Samuels	E.I.T.	Geotechnical
Meghan	Sherwood	E.I.T.	Geotechnical
Nick	Felsing	P.Eng.	Geotechnical
Michael	Laws	P.Eng.	Geotechnical
Teri	Brito	P.Eng.	Geotechnical
Daniel	Bruton	P.Eng.	Geotechnical
Mehmet	Catana	P.Eng.	Geotechnical
Jacqueline	Cormier	P.Eng.	Geotechnical
Brittany	Linnett	P.Eng.	Geotechnical
Mo'oud	Nasr	P.Eng.	Geotechnical
Jeffrey	Redwood	P.Eng.	Geotechnical
Naomi	Mason-Herrtage	P.Geo.	Geotechnical
Mike	Park	E.I.T.	Structural
Malik	Ahmed	P.Eng.	Structural
Jorge	Castillo	P.Eng.	Structural
Kelvin	Chand	P.Eng.	Structural
Matthew	Learn	P.Eng.	Structural
David	Seida	P.Eng.	Structural
Douglas	Clough	P.Eng., Struct.Eng.	Structural
Sayla	Williams	E.I.T	Structural
Matt	McDermid	E.I.T.	Survey
Andrew	Gain	P.Eng.	Hydrotechnical
Adam	Kerk-Hecker	P.Eng.	Hydrotechnical

2.2 Code of Conduct

2.2.1 Introduction and Purpose

Ecora's Code of Conduct sets out the behaviour and actions required of individuals employed by or under contract with Ecora. It applies to all employees and contractors working for Ecora.

- Ecora is committed to practice in accordance with the Code of Ethics and to abide by the 13 principles identified by Engineers and Geoscientists BC (EGBC).
- Ecora is committed to practice in accordance with the Code of Ethics and to abide by the 9 principles identified by the Association of British Columbia Forest Professionals (ABCFP), the Standards of Professional Conduct and Practice of the British Columbia Society of Landscape Architects

(BCSLA), the College of Applied Biology, ASTTBC, the BC Institute of Agrologists (BCIA) and all other professional bodies that govern our professional activities.

- Furthermore, we will operate with knowledge of local standards, human rights codes, safety and environmental codes, sensitivities and practices including cultural and linguistic. Staff will be retrained on an annual basis and documented sign-off will be required. Any unprofessional conduct will be reported to EGBC.
- Ecora's core values are: Commitment to our People, our Environment, our Relationships and our Community.
- Ecora prides itself on the great relationships that we have with our Indigenous partners, not only as working relationships but also as personal relationships, growing and fostering from Trust, Honesty, and Transparency. Ecora has had the honor of working with 40+ First Nation communities and is affiliated or partnered with several Indigenous groups and businesses throughout British Columbia. We work closely with each community we partner with to ensure that all values are heard, understood and incorporated into our work. Ecora commits to continued relationship building with existing and new Indigenous partners.
- Ecora supports the internal and external statement that Ecora recognizes and respects the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), however in respect and honor of our strong relationships, we have gone further by developing an UNDRIP Action Plan, supported by internal policies that clearly define Ecora's commitments connected to UNDRIP.
- Awareness, listening, and learning is a core action that will benefit everyone. All of Ecora's existing Team Members have received Indigenous awareness training, and all future Team Members will receive Indigenous awareness training as part of the onboarding process. All training material will also be available externally to enable other companies and the public to increase their awareness.

2.2.2 Policy

All employees and contractors working for Ecora must understand and comply with Ecora's Code of Conduct.

Act in the Public Interest:

- Ecora Team Members will act in the public interest and hold paramount the safety, health and welfare of the public, protection of the environment and safety in the workplace.

Know Your Limits:

- Ecora Team Members will only pursue work that is in the areas of practice where they have expertise and are competent to carry out the work.

Follow the Law:

- Ecora Team Members will make themselves aware of and comply with the laws and regulations in the jurisdiction where work is undertaken.

Follow the Standards of Government, EGBC and other Professional Associations:

- Ecora Team Members will make themselves aware of and will comply with all applicable standards and documented policies and procedures established by the government or regulatory bodies having jurisdiction.

Maintain Your Competence:

- Ecora Team Members will meet requirements for professional development required by their professional association and as required by their immediate supervisor.
- Ecora will support Team Members in obtaining training opportunities and will assist with financial support and work scheduling to allow for professional development hours.

State Qualifications Accurately:

- Ecora Team Members will be truthful and accurate when stating Firm or team member qualifications and experience.

Distinguish Facts from Assumptions and Opinions:

- Registrants will provide professional opinions that distinguish between facts, assumptions and opinions.
- Facts will be represented as something that is known to be true and can be proven to be true.
- Assumptions will be represented as an opinion that is accepted as true based on known facts and the expertise of the person making the assumption.
- Opinions are judgements or viewpoints that cannot be proven or justified by facts.
- When making a statement, Team Members will clearly define if the statement is a fact, an assumption or an opinion.
- Registrants will only state opinions when the Registrant stating the opinion has the knowledge and honest belief in the opinion.

No Conflict of Interest:

- Ecora Team Members will, at all times, act in the interest of the public and the client and hold these interests paramount.

- Team Members will assess and identify situations where they could derive a personal benefit from actions or decisions made in their official capacity. This is considered a real conflict of interest and must be brought to the attention of the client and the Team Members direct supervisor. Team Members finding themselves in this situation should remove themselves from the project or task as directed by their supervisor.
- Team Members will assess and identify situations where it may be perceived that they are in a position to derive personal benefit from actions or decisions made in their official capacity. This is considered a perceived conflict of interest and must be brought to the attention of the client and the team member's direct supervisor. Team Members finding themselves in this situation should take steps to mitigate the perception of conflict and/or remove themselves from the project or task as directed by their supervisor.
- Team Members will not accept gifts or favours in any form where it could be perceived as an exchange for actions or services or to influence the team member's actions or decisions. Any accepted gifts should be assumed to be gifts to the company and Team Members should always notify their direct supervisor.

Duty to Report:

- Ecora Team Members have the ethical and legal duty to report activities if they believe, on reasonable and probable grounds;
 - that the continued practice of a regulated practice, another registrant, staff member, firm or employer might pose a significant harm to the environment or the health and safety of the public or a group of people
 - or a registrant or other individual has made decisions or engaged in practice which may be illegal or unethical.
- Reporting will be made to EGBC and any other appropriate authority as applicable.

Stand Your Ground:

- Ecora will support professional opinions and judgements made by Professional Registrants that meet the requirements and expectations of this Code. (see Distinguish Facts from Assumptions and Opinions)
- At no time should a Professional feel pressured into altering or revising a decision or opinion based on pressure from the client, employer or any other source.
- Ecora will clearly communicate the possible consequences of professional decisions or judgements being overruled or disregarded.

Each Professional is Responsible:

- All Professional work, recommendations, reports, statements or opinions will clearly identify all Professionals taking Professional responsibility for the work.
- All documents will be appropriately Authenticated prior to being issued to others.
- Team Members will not take credit for other's work, credit must be given where credit is due.
- Team Members will respect and honour copyright and trademarks owned by others.

Work Diligently and Follow Standards of Documentation:

- Ecora Team Members will perform skillfully and enhance the honor, dignity, and reputation of our profession. All work will be undertaken with due diligence and in accordance with any guidance developed to standardize professional documentation.
- Ecora Team Members will produce work of a consistently high quality and maintain complete and accurate records of such.

Fairness, Courtesy and Good Faith:

- Ecora Team Members will conduct themselves with fairness, courtesy and good faith towards clients, colleagues and others.
- Ecora maintains a workplace that respects diversity and inclusion and is free of harassment.
- All Team Members will be aware of, and abide by, the procedures and policies outlined on the [Policies and Procedures Site](#).

ENGINEERS AND GEOSCIENTISTS BC CODE OF ETHICS

The Engineers and Geoscientists BC Code of Ethics has been established to support and inform professional registrants in fulfilling their duty to the public, clients, the professions, and their fellow professional registrants. The Code of Ethics is not intended to, nor does it define conduct for all situations that a professional registrant may encounter. Instead, it provides guidance to inform the behaviour, decisions, and professional judgment of professional registrants that Engineers and Geoscientists BC regulates. A professional registrant should incorporate ethics into their daily decision-making.

The Engineers and Geoscientists BC Code of Ethics serves several purposes. It designates the standard of conduct expected of professional registrants in easily understandable terms. It distinguishes appropriate professional conduct from that which fails to meet a required standard. The Code of Ethics also provides a basis on which allegations of unprofessional conduct are adjudicated by the Discipline Committee or other groups charged with responsibilities related to the conduct of professional registrants.

The Code of Ethics, Schedule A of the Bylaws of Engineers and Geoscientists BC, applies to all registrants.

Refer to the [Engineers and Geoscientists BC Code of Ethics](#) for more details about the Principles on which it is based.

All professionals registered to practice by, or in training to be registered with, Engineers and Geoscientists BC, or other employees working on engineering and/or geoscience projects for Ecora must comply with the Engineers and Geoscientists BC Code of Ethics.

All employees and contractors must comply with Ecora's policies and Code of Conduct with respect to human rights, equity, diversity, or inclusivity.

FOREST PROFESSIONAL BC CODE OF ETHICS

The Professional Governance Act (PGA) replaced the Foresters Act on Feb. 5, 2021. Regulations to fully implement the PGA also came into effect on Friday, Feb. 5, 2021. The PGA primarily impacts the way the ABCFP conducts its work. It also created some new obligations for forest professionals directly, namely the Code of Ethical and Professional Conduct.

All registrants of the ABCFP are bound by the Code of Ethical and Professional Conduct. Registrants with the Association of BC Forest Professionals (ABCFP) are responsible to hold paramount the safety, health, and welfare of the public and the protection of the environment.

Ecora's policies and Code of Conduct will be periodically reviewed to confirm that they comply with the Engineers and Geoscientists BC and the ABCFP requirements and any related professional practice guidelines that have been published by Engineers and Geoscientists BC and the ABCFP.

BRITISH COLUMBIA INSTITUTE OF AGROLOGISTS

The practice of agrology in British Columbia is regulated by the BC Institute of Agrologists under the Professional Governance Act (PGA) and the accompanying Schedule Agrologist Regulation.

BCIA is mandated under Section 22(h) and Section 57(2) to establish, monitor and enforce standards of professional ethics of all registrants as they fulfill their responsibilities to the public, the employer or client, the profession and courts or tribunals.

BCIA Registrants must exercise integrity, competence and objectivity in their professional conduct at all times and must adhere to BCIA's code of ethics.

THE COLLEGE OF APPLIED BIOLOGY

The practice of biology and biology-related technologists in British Columbia is regulated by the College of Applied Biologists (CAB) under the Professional Governance Act. The CAB's main agenda is to ensure that public interests are protected by establishing that its registrants meet education, training, and experience requirements. Once registered, the CAB requires its members to adhere to the Code of Ethics and Professional Conduct, the Principles of Stewardship, Professional Practice Competencies and Competence, and Indigenous Awareness training.

2.2.3 References

- Ecora's Code of Conduct
- [Engineers and Geoscientists BC's Code of Ethics](#)

- Engineers and Geoscientists BC's [Guide to the Code of Ethics](#)
- Engineers and Geoscientists BC's [Code of Ethics FAQ's](#)
- Engineers and Geoscientists BC's [Equity, Diversity, and Inclusion \(2021\)](#)
- ABCFP [Code of Ethical and Professional Conduct](#)
- BCIA's [Code of Ethics](#)
- College of Applied Biology [Code of Ethics and Professional Conduct](#)
- ASTTBC [Standards of Competence & Code of Ethics](#)
- [United Nations Declaration on the Rights of Indigenous Peoples](#)

2.3 Continuing Education Program

2.3.1 Introduction

Registrant firms play an important role in supporting professionals they employ in the maintenance of their competency and meeting their requirements under the Engineers and Geoscientists BC's Continuing Education Program. Employers can set standards that empower professionals to undertake appropriate and adequate continuing education activities.

Under the Professional Governance Act and the Continuing Education Program by Registrant Firms requirements as set out in Section 7.6.16 of the Bylaws of Engineers and Geoscientists BC, all registrant firms must develop, maintain, and follow documented procedures to support professionals they employ in meeting their Continuing Education Program requirements and maintaining their competency with respect to their role and practice areas. The continuing education requirements are further explained in the Guide to the Continuing Education Program.

Career Development of team members will be reviewed annually to ensure that previous goals have been achieved and to set new development goals for the coming year. These goals will be decided between the Discipline Lead and the team member.

2.3.2 Purpose

Professionals are required under the Engineers and Geoscientists BC Code of Ethics to “maintain competence in relevant specializations, including advances in the regulated practice and relevant science”. To support this important principle of professional practice, professionals are required under the Professional Governance Act and the Bylaws of Engineers and Geoscientists BC to create continuing education plans and meet mandated levels of continuing education.

This section describes Ecora's documented procedure to be followed by its professionals to meet the required standard for continuing education and competence.

2.3.3 Policy

Maintaining our collective competence in Engineering and Geoscience:

- Helps to protect public safety and the environment.

- Fosters excellence.
- Maintains and advances our knowledge and expertise.
- Enhances and expands our domains of practice.
- Enhances our image.
- Improves the quality and value of services we provide.
- Improves marketability.

Managers must conduct and document annual performance reviews with all their direct reports that will include assessment of performance from the previous year, review of goals set from the previous review and identify learning goals for the upcoming year and formulate a plan to assist the team member in achieving these goals.

For professionals registered with Engineers and Geoscientists BC, performance reviews and learning plans will align with the Engineers and Geoscientists BC Continuing Education Program.

- Learning plans will be supported through:
 - Paid time off for professional development.
 - Tuition or participation fees approved for programs, courses, or training.
 - Registrations fees for approved conferences.
 - In-house webinars, seminars, training, and workshops.
 - Mentoring program.
 - Career coaching.

2.3.4 Detailed Procedures and References

[See Ecora's Annual Review and CEP Policy](#)

2.4 Professional Practice Guidelines and Practice Advisories

2.4.1 Introduction

A professional practice guideline sets the minimum standards of competence, conduct and practice expected from a professional engaged in the activities it addresses. Professionals must have regard for applicable standards, policies, plans, and practices established by the government or by Engineers and Geoscientists BC, including Engineers and Geoscientists BC professional practice guidelines.

Professionals must establish, maintain, and follow documented procedures to:

- Stay informed of, knowledgeable about, and meet the intent of all applicable standards, policies, plans, and practices established by the government or by Engineers and Geoscientists BC, including professional practice guidelines relevant to their practice.
- Document in writing the reason(s) for a departure from any relevant portion of a professional practice guideline.

Engineers and Geoscientists BC publishes professional practice guidelines on specific professional services or activities where additional guidance is deemed necessary. Professional practice guidelines are written by subject matter experts and reviewed by stakeholders before publication. Engineers and Geoscientists BC's preparation of professional practice guidelines is informed by a risk-based analysis of the professional activity or service that falls under regulated practice.

The use of professional practice guidelines is mandated by Section 7.3.1 of the Bylaws of Engineers and Geoscientists BC and is supported by the Engineers and Geoscientists BC's [Guide to the Standard for the Use of Professional Practice Guidelines](#).

During compliance audits, auditors will be confirming professionals are knowledgeable of, competent in, and meet the intent of professional practice guidelines relevant to their work.

2.4.2 Purpose

Each professional practice guideline establishes the standards of competence, conduct and practice that all professionals are expected to meet when engaged in the relevant professional engineering or professional geoscience work. Professional practice guidelines may also assist in interpreting the standards of professional and ethical conduct established by the Bylaws of Engineers and Geoscientists BC.

Engineers and Geoscientists BC chooses professional practice guideline topics with a risk-based analysis, prioritizing professional practice guidelines that address practice activities involving increased risk to the safety, health and welfare of the public, including the protection of the environment and the promotion of health and safety in the workplace.

This section describes Ecora's documented procedure to be followed by its professionals to meet the standard for the use of Engineers and Geoscientists BC professional practice guidelines.

2.4.3 Policy

Projects undertaken will meet all regulatory and statutory requirements, and applicable professional practice guidelines and standards including meeting the intent of relevant Engineers and Geoscientists BC professional practice guidelines and practice advisories.

All Professionals will stay informed of, knowledgeable about, and meet the intent of all applicable standards, codes, policies, plans, and practices established by the government or by Engineers and Geoscientists BC, including professional practice guidelines relevant to their practice.

Professionals will document in writing the reason(s) for a departure from any relevant portion of a professional practice guideline.

2.4.4 Guiding Principles for Detailed Practice Area Procedures

This high-level procedure applies across Ecora and will inform any detailed procedures, if required, for use of professional practice guidelines in each department.

Ecora and all professionals employed or under contract with Ecora must have regard for applicable standards, policies, plans, and practices established by the government or by Engineers and Geoscientists BC, including professional practice guidelines by:

- Establishing, maintaining, and following documented procedures that describe how they will stay informed of, knowledgeable about, and meet the intent of all applicable standards, policies, plans, and practices established by the government or by Engineers and Geoscientists BC including:
 - Monitoring communications about changes to regulations, guidelines and standards including those from Engineers and Geoscientists BC.
 - Reviewing related websites including the Engineers and Geoscientists BC website to retrieve the current versions and to find out about updates to regulations, guidelines and standards.
 - Determining what impact these changes will have on Ecora’s related practices and work.
 - Supporting related professional development to reinforce the use of professional practice guidelines.
- Before starting work on any project, professionals of record will identify, confirm and document regulatory and statutory requirements or advice including those found in:
 - Engineers and Geoscientists BC professional practice guidelines and practice advisories.
 - BC Building Code
 - Professional standards such as CSA, ASME, etc.
 - Master Municipal Construction Documents
 - Municipal Bylaws
 - Other applicable legislation or standards.
- During the work, professionals of record will:
 - Have the work designed or developed to meet all regulatory and statutory requirements including those found in professional practice guidelines and practice advisories.
 - Carry out or have carried out reviews to confirm that all requirements have been met.
 - Document in writing the reasons for any departure from any relevant portion of a professional practice guideline or practice advisory.

2.4.5 References

Refer to any detailed procedures for engineering/geoscience groups.

Ecora refers to several resources to ensure all project work meets all regulatory and statutory requirements. These resources include but are not limited to:

[Engineers and Geoscientists BC Professional Practice Guidelines and Practice Advisories](#)

2.5 Document and Records Management

2.5.1 Introduction

Retaining project documentation means retaining any document that is evidence of regulated practice activities, events or transactions, or is evidence that professionals have met their professional and contractual obligations, or that has been prepared and delivered for the project or work, regardless of the media used to create or store the records.

A professional must establish, maintain, and follow documented procedures for the retention and preservation of complete project documentation related to the regulated practice engaged in by the professional. Retaining complete project documentation is mandated by Section 7.3.2 of the Bylaws of Engineers and Geoscientists BC and described in the [Guide to the Standard for Retention of Project Documentation](#).

During compliance audits, auditors will be confirming registrants are complying with Ecora's records management policies and procedures to ensure retention and preservation of complete project documentation for at least 10 years after the completion of the project or 10 years after the documentation is no longer used.

2.5.2 Purpose

Retaining complete and easily retrievable documentation is critical to professional practice and helps professionals demonstrate that they are holding public safety paramount and serving the public interest as required by the Professional Governance Act and Code of Ethics.

Documentation or records, such as correspondence, email, minutes of meeting, reports, drawings, specifications, test reports, input data, and other records, may also:

- Provide accurate records of the basis for engineering and geoscience work and decision-making.
- Allow another qualified professional engineer, professional geoscientist, professional licensee engineering or professional licensee geoscience, unfamiliar with the work or service, to review the file and effectively carry on with the work.
- Facilitate well-run projects or work that meet objectives and professional standards.
- Allow a firm to demonstrate that it, and its professionals, have met required professional standards.
- Be useful in resolving issues and defending claims.
- Meet legal and regulatory requirements.

This section describes how project documents and records will be retained by Ecora's engineers and geoscientists.

2.5.3 Policy

All Ecora's project financial records are classified and retained in the Vantagepoint Project Management system.

Records will be preserved and retained for the longer of 10 years after the end of a project or 10 years after the records are no longer in use.

Documents and records must be filed and stored electronically in the project folder. Physical documents are to be scanned to the documents folder and the original copies stored in a secure cabinet in the office.

Refer to Project PPMP Document Requirements here:

<https://ecora.sharepoint.com/sites/Connect/SitePages/Project-Management-and-Project-Delivery.aspx>

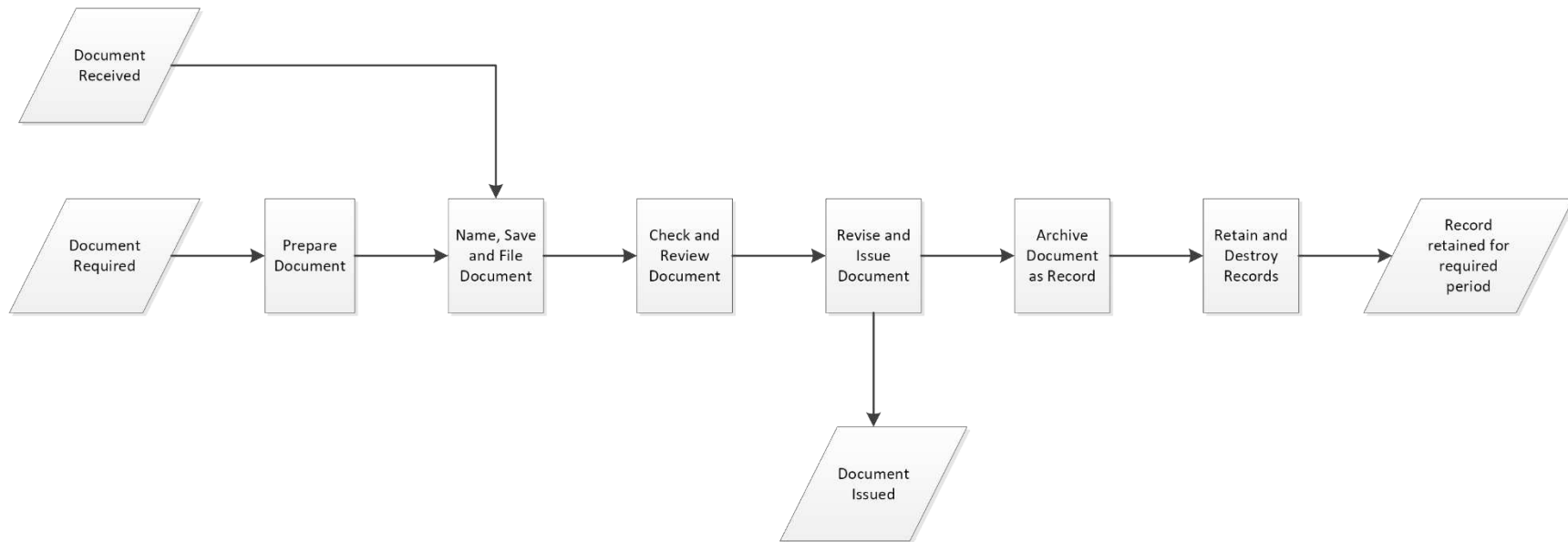
Electronic records will be backed up daily and stored securely offsite.

2.5.4 Guiding Principles for Detailed Practice Area Procedures

This high-level procedure applies across Ecora and will inform any detailed procedures, if required, for use of professional practice guidelines in each department.

Document and Record Life Cycle Flow Chart

The flowchart is a generic and basic example of the document and record life cycle. The guiding principles for a documents and records control procedure included here follow this flow. Firms may have a more complex process.



2.5.5 Guiding Principles for Document and Records Management

Setting up Project Filing

- Project Startup confirms the project number.
- IT creates a standard project directory on the server and Admin creates a file folder for the paper documents.

Preparing Documents

- Use Ecora's document standards for consistent, professional appearance.
- Use standard templates and forms, where available.
- Use validated and approved software and media for creating and maintaining documents.
- Use standard file naming conventions to save document files.
- Include document identifiers (project name, project number, filename, file directory) in the document, as appropriate, or in document properties or metadata stored with each electronic file.
- Include project name, project number and topic in the subject line of project or work-related e-mail containing information that must be retained.
- Review, spellcheck and check documents to confirm they are correct, complete and ready to issue.

Filing Documents

- File documents in their appropriate directory or file folder in the standard project file structure.
- File all project or work e-mail messages that must be retained in the appropriate folder of their related project or work file structure. Email may be filed in any of several ways so that email records are with the retained project records by the time of closeout:
 - Saved to the project filing when sent or received.
 - Periodically, converted and saved to a portfolio PDF and saved to the project filing.
 - Printed and save to physical document project files.
 - Other means to assure that project records retained at closeout include email records.
- File issued electronic documents in PDF/A exactly as issued.
- Set up a check-in/check-out system wherever multiple users have access to working documents.
- Train users and document managers in how to file and store documents.

Revising Documents

- Include a revision record indicating revision number, what was revised and by whom, on documents where version control is required (drawings, reports, etc.).
- Clearly identify what was revised for documents subject to version control.
- Create and/or use a standard checking process for all revisions.
- Train users in document revision procedures.

Issuing Documents

- Include an issue record, indicating purpose for issuing and when issued, on documents where version control is required (drawings, reports, etc.). The revision and issue records may be combined into one record. When issuing electronic documents, providing and retaining the file in PDF/A exactly as issued.
- Use some form of transmittal (form, e-mail or other) as a record of what was sent to whom, when and how.
- Create an audit trail to record who receives which document revisions and when.
- Make sure the most recent or current revisions of documents are issued to those who require them.
- Train users and document managers in how to issue documents.

Receiving Documents

- Determine whether the document is a record to be retained or a document that is kept for convenience until no longer needed.
- Store documents in the project file to record when documents are received.
- If receiving physical documents, code and file in physical document project file structure, or scan, name and file in electronic file structure, or code and store in the physical document file.
- If receiving electronic documents, name, as appropriate or leave with originator's filename and file in electronic file structure or print and file in the physical document system.
- As needed, set up a standard distribution indicating expectation of those receiving the document (e.g., approve, action by, information only, etc.).
- As needed, record actions taken based on received documents.
- Train users and document managers in procedures for documents they receive.

Archiving Records

- If not already developed, create a records management system that specifies the required retention period and media for retention of various categories of records.
- Specify how the integrity of the archived records is protected (e.g., separate, read-only directory).
- Cull non-records and convenience copies from files.
- For physical records, group, label and log records with their date of destruction.
- Indicate media and location (onsite, offsite, cloud, etc.) for archiving and storing electronic files (separate server, cloud drive, etc.).
- On closeout, transfer records to their storage medium and location.
- Secure access so only those with permission can access files.
- Limit access to confidential and personal information.
- Provide or arrange for storage with environmental controls to preserve records (protection from moisture, fire, etc.).
- Migrate records to current media or maintain hardware and software able to access them for the duration of their retention period.
- Train document managers about archiving and storage procedures.

Destroying Records (record destruction is not an Engineers and Geoscientists BC requirement)

Unless records are permanently retained:

- Destroy all records that have met all retention requirements and that are not under a legal hold for pending litigation or a regulatory requirement.
- Keep a record of what was destroyed, when and by whom.

2.5.6 References

Refer to any detailed procedures for engineering/geoscience groups.

2.6 Checking Engineering and Geoscience Work

2.6.1 Introduction

Checking is a documented quality control processes to confirm that the engineering or geoscience work is complete, correct, meets all input requirements, and is suited for its intended use or purpose. Checks, as defined by Engineers and Geoscientists BC, encompass all the various checks and reviews that occur or ought to occur

throughout the development, presentation, production and performance of any professional engineering or professional geoscience work in any sector.

Prior to checking, a risk assessment must be completed to determine the extent of checking required and whether an independent review is required; refer to section titled Independent Review of High-Risk Professional Activities or Work, of this PPMP.

Depending on the risk, checking may be carried out by a qualified individual independent of, or associated with, the work being checked, or by the professional, who prepared the work. Checking engineering and geoscience work is mandated by Section 7.3.4 of the Bylaws of Engineers and Geoscientists BC and described in the [Engineers and Geoscientists BC Guide to the Standard for Documented Checks of Engineering and Geoscience Work](#).

Where work involves structural design, refer to the next section of this PPMP, Independent Review of Structural Designs.

During compliance audits, auditors will be confirming professionals are carrying out documented checks of engineering and geoscience work using a documented process appropriate to the risk associated with the work and retaining records of those checks according to the procedures below.

2.6.2 Purpose

Professionals are required to have documented checks of their engineering and geoscience work conducted, using a written quality control process that is appropriate to the level of risk associated with the work. Checks are used by professionals to confirm that work they have prepared meets all input requirements and is suitable for its intended purpose.

This section describes how checks of professional engineering or geoscience work will be carried out and documented at Ecora.

2.6.3 Policy

Checks and reviews must be carried out to confirm that the work is complete, correct, meets all input requirements and is suitable for its intended purpose.

The responsibility for carrying out, or arranging to have carried out, required checks of professional engineering or geoscience work rests with the professional of record.

Those preparing professional engineering or geoscience work are required to check their work before providing it to others for documented checking and not rely solely on the checker(s) to find errors and omissions.

Self-checking as the only check for professional engineering and geoscience work, prior to issuance, will not be allowed.

2.6.4 Guiding Principles for Detailed Practice Area Procedures

This high-level procedure applies across the firm and will inform the detailed procedures for checking and reviewing professional engineering or geoscience work in each department.

Before proceeding with the work:

- Assess the competencies required to confirm that qualified professionals are available to perform the work. Only proceed with work, where qualified professionals are available.

- Assess the risk using the Project Risk Assessment form and refer to EGBC Guide to the Standard for Independent Review of High-Risk Professional Activities or Work to determine the extent and levels of checking required.
- Identify qualified checkers and reviewers to carry out the project checks and reviews.
- Include adequate time for all checks in the project plan and budget.
- Identify, confirm and document all input requirements to reference and use for the work and required checks.
- Identify, collect and conduct documented checks of all input data to confirm it is complete, correct, current and suitable prior to relying on it.
- Validate spreadsheets and software before using them in analysis or calculations. (validation of commercial engineering/geoscience software is often done centrally for a firm prior to it being installed on users computers, these validations should be documented and available to users and auditors) Store to template folder with validation.
- Check spreadsheet and software output using hand calculations, site measures, seasoned reviews of the output or other means suitable to the work being undertaken.
- Plan when, how, by whom and to what extent checks will occur during the work.
- Plan for independent review of activities or work assessed as high-risk or that involves structural design.
- Check all work, including calculations, as planned.
- Always self-check work before handing work off for others to check.
- Arrange for or review all final design or development work to confirm that it is complete, meets all input requirements and is suitable for its intended purpose.
- When checking one discipline or practice area in a document that includes other disciplines or practice areas, qualify the check to indicate what the check covers.
- Have all deliverables and professional documents, such as drawings, specifications and reports checked to confirm that they are correct, complete and consistent.
- Review, authenticate and have the permit to practice number applied to all professional documents before they are delivered to others who will rely on them.

- Keep a record of all checks legibly indicating the purpose, date of check or review, professional of record, checker's name, issues of significance found and how the issues were addressed or the rationale for not addressing them.

Ecora requires checks to be documented using the following process/procedure:

At each stage of review as identified in the Project Start-up Meeting Drawing Review Plan, Physical or digital redlining of reviewed drawings using PDF editor or Autodesk Design Review. These are to be stored in the DRAWING folder under DESIGN COMMENTS (scan physical mark-ups).

Completed Drawing Checklists Drawing Checklist_Ecora (Fill-in Form) 2021-11-02.pdf

Completion of appropriate Engineering Quality Review Form App C1 - Engineering Quality Review Forms - Geotech.pdf , App C2 - Engineering Quality Review Forms - Civil.pdf , App D - Independent Review of Engineering Deliverables - Struc.pdf

Completion of Calculation Check sheets Appendix C7_Ecora Calculation Check Sheet.xlsx

2.6.5 References

Refer to any detailed procedures for engineering/geoscience groups.

2.7 Independent Review of Structural Designs

2.7.1 Introduction

Independent review of structural design is a documented evaluation of the design concept, details, and documentation, based on a qualitative examination of the substantially complete structural design documents that occurs before those documents are issued for construction.

The independent reviewer must be a professional engineer or professional licensee engineering with appropriate qualifications and experience involving the type of structure being reviewed. The level of experience required for a specific structure will depend on the risk and complexity of the structure. The independent reviewer's experience must be sufficient to critique concepts and identify deficiencies in structures with complexity equal to or greater than the structure being reviewed. Having a minimum of six years of experience with a particular structural system is considered to be appropriate to act as an independent reviewer.

Risk assessments must be conducted to confirm the level and extent of independent review required. There are two types of independent review:

Type 1 Independent Review is an independent review carried out by an appropriately qualified and experienced professional engineer who was not involved in preparing the design but may be employed at the same firm as the professional of record who is responsible for the design.

Type 2 Independent Review is an independent review carried out by an appropriately qualified and experienced professional engineer who was not involved in preparing the design and is not employed at the same firm as the professional of record who is responsible for the design.

Independent reviews are mandated for virtually all structural designs carried out in BC by section 7.3.5 in the Bylaws of Engineers and Geoscientists BC and described in the Engineers and Geoscientists BC's [Guide to the Standard for Documented Independent Review of Structural Designs](#).

During compliance audits, auditors will be confirming that professionals who are carrying out structural design are arranging to have documented independent reviews carried out for structural designs they prepare or directly supervise, and that appropriate records documenting the reviews are being retained.

Repetitive structural designs will be independently reviewed initially and periodically to confirm their continued adequacy.

Where the structural design of a one- or two-family dwelling is based on Part 9 of the BC Building Code, the Vancouver Building By-law, or the National Building Code of Canada, and includes a design for lateral resistance, which conforms to the prescriptive requirements in the latest edition of the Canadian Wood Council (CWC) Engineering Guide for Wood Frame Construction, an independent review of the design is not required.

2.7.2 Purpose

Independent reviews are carried out because virtually all structural designs present some risk to the public. The independent review provides an objective, independent reassessment of the adequacy of the structural design approach, execution, and documentation, to reduce the potential for severe consequences from a structural failure that could harm to the public.

This section describes how independent review of structural designs will be carried out and documented at Ecora.

2.7.3 Policy

Independent reviews are carried out because virtually all structural designs present some risk to the public. The independent review provides an objective, independent reassessment of the adequacy of the structural design approach, execution, and documentation, to reduce the potential for severe consequences from a structural failure that could harm to the public.

This section describes how independent review of structural designs will be carried out and documented at Ecora.

2.7.4 Guiding Principles for Detailed Practice Area Procedures

Although prescriptive, this high-level procedure applies across Ecora and will inform the detailed procedures for independent review of structural designs in each department where structural designs are prepared.

To avoid surprises later in the design evolution, arrangements should be made to have independent reviews carried out periodically throughout the design.

Arrange to have the work checked to confirm that the work and documents meet all requirements and are suitable for their intended purpose.

The final review must be based on the substantially complete structural design documents. The focus of the review should be the initial assumptions, design criteria, appropriateness of the proposed concept, and the final design solution.

Conduct a documented risk assessment. The extent and detail of independent review of structural designs will vary depending on the:

- Severity and likelihood of consequences a structural failure.
- Complexity of the design or structure.
- Use of innovative technology.

- Departure from established practices.
- Level of assessed risk associated with the structure.
- Experience of the professional of record and reviewer.

Select an independent reviewer who:

- Is a registered professional engineer or professional licensee engineering in BC,
- Has appropriate experience with the type of structure being reviewed,
- Has sufficient experience to critique concepts and identify deficiencies in structures with a complexity equal to or greater than that being reviewed,
- If possible, has a minimum of 6 years of experience with the structural system being reviewed, and
- Has not been involved in preparing the design.
- Where Ecora does not have experience with the type and scale of the work, or the work is innovative and complex, involves emerging technology or does not have well-defined solutions, identify and engage a qualified external resource to carry out the independent review.

The engineer of record for the structural design will provide the following documents to the independent reviewer:

- Structural plans and supporting documents, plus plans and supporting documents of other disciplines that may be necessary to review the structural design, or as otherwise requested by the reviewer.
- The structural specifications, plus specifications of other disciplines that may be necessary to review the structure, or as otherwise requested by the reviewer.
- If applicable, all geotechnical reports and any follow-up documentation between the engineer of record and the geotechnical engineer.
- If it is not incorporated in the drawings and specifications, a summary sheet documenting:
 - The structural system and design approach, in sufficient detail to identify the lateral and vertical load resisting systems, including any special or unconventional aspects.
 - Site-specific design data including climatic and seismic criteria.
 - Project or work-specific design data, including seismic parameters, soil bearing capacity, lateral soil pressure, pile capacity, etc.
 - The design loads from use and traffic, snow, rain, wind, superimposed dead loads, and equipment.

- Any special loading conditions or performance criteria.
- Structural design notes and calculations, when requested by the reviewer.

The engineer of record, responsible for the primary structural system, will confirm that any specialty components designed by others are in general conformance with the design of the primary structural system. The engineer designing the specialty components will be responsible for having the design for those components independently reviewed.

The engineer of record will review the independent reviewer's comments, address them, or provide rationale for not doing so, and retain the reviewer's report and any follow up communication or documentation as a record in the project files.

The independent reviewer will carry out the independent review as follows:

- Review the design criteria, loads, including loads imposed by components designed by other disciplines and loads from adjacent structures, and performance requirements.
- Review geotechnical requirements and material properties.
- Review the concept and integrity of the gravity and lateral load-resisting systems.
- Review the continuity of load paths for both gravity and lateral loads.
- Review the structural plans and supporting documents to determine whether they are sufficient to identify the essential components of the structural system and provide sufficient information to guide the construction of the structure.
- Where appropriate, perform design calculations on a representative sample of structural elements, to determine whether the analysis, design and detailing generally comply with the appropriate codes and standards.
- Discuss any concerns with the engineer of record. It is the responsibility of the engineer of record to adequately resolve concerns noted in the independent review.
- Provide and authenticate a formal record of the independent review to the engineer of record, highlighting any concerns (Refer to the *Checklist and Signoff for Independent Review of Structural Design* at end of this section or in Appendix A).
- If significant concerns are noted, request that the design be revised and resubmitted.

The engineer of record remains responsible for the structural design despite it being independently reviewed. The independent reviewer is responsible for the quality of the review.

Retained records include:

- Mark-ups of drawings,
- Email exchanges,

- Completed *Checklist and Signoff for Independent Review of Structural Design* authenticated by the independent reviewer, and/or
- Record of actions taken by the engineer of record to address the independent reviewer's comments or the rationale for not addressing a comment.

2.7.5 References

Refer to any standard operating procedures in groups or departments if needed or delete if procedure above is sufficient.

- Checklist and Signoff for Independent Review of Structural Designs
- [Guide to the Standard for Documented Independent Review of Structural Designs](#)

2.8 Independent Review of High Risk Professional Activities or Work

2.8.1 Introduction

Independent review of high-risk professional activities or work is a documented evaluation of the design concept, details, and documentation, based on a qualitative examination of the substantially complete documents for high-risk professional activity or work that occurs before those documents are issued to those who will rely on them, such as for construction or implementation.

Independent review of high-risk professional activity or work must be carried out by a professional engineer, professional geoscientist, professional licensee engineering or professional licensee geoscience with appropriate experience in the type and scale of the professional activity or work subject to the documented independent review. The level of experience required for a specific high-risk professional activity or work will depend on the risk and complexity of the work. The independent reviewer's experience must be sufficient to critique concepts and identify deficiencies in professional activities or work with complexity equal to or greater than the high-risk professional activity or work being reviewed.

Independent reviews may be one of two types:

Type 1 Independent Review, an independent review carried out by an appropriately qualified and experienced professional who has not been previously involved in the high-risk professional activities or work and is employed at the same firm as the professional of record.

Type 2 Independent Review, an independent review carried out by an appropriately qualified and experienced Professional who has not been previously involved in the high-risk professional activities or work and is not employed at the same firm as the professional of record.

Before starting professional activities or work, professionals must conduct a risk assessment to determine whether the activities or work are high-risk and, if so, whether a Type 1 independent review or Type 2 independent review is required.

Independent reviews of high-risk professional activities or work are mandated by Section 7.3.6 of the Bylaws of Engineers and Geoscientists BC and described in the Engineers and Geoscientists BC's [Guide to the Standard for Documented Independent Review of High-Risk Professional Activities or Work](#).

During compliance audits, auditors will be confirming that professionals who are carrying out high-risk activities or work are arranging to have documented independent reviews carried out for the high-risk activities or work they prepare or directly supervise, and that appropriate records documenting the reviews are being retained.

2.8.2 Purpose

Professionals have an obligation to assess the risk of work they carry out and complete their work in a manner that appropriately mitigates the risk to the public and the environment. Independent reviews are required when the professional activity or work they have assessed is deemed to be high risk because it involves the potential for severe consequences that could harm the public or damage the environment.

Professional practice guidelines may specify professional activities or work that must undergo an independent review despite not being assessed as high-risk by the professional. A professional may choose to conduct an independent review even though their work is not deemed to be high-risk.

This section describes how independent review of high-risk professional activities or work will be carried out and documented at Ecora.

2.8.3 Policy

Risk assessments including completion and review of Ecora's Go-No-Go procedure will be conducted for all professional work and activities as follows:

- For low-risk work, risk assessments will be carried out, documented, retained as a record, and updated annually. The initial low risk assessments and subsequent annual assessments must be filed in a location where professionals relying on those assessments have access to them and can reference them.
- For medium and high-risk work assess the risk before preparing a proposal or accepting a contract.

Where work is deemed to be high-risk or where mandated by regulation, an independent review will be carried out.

Where Ecora does not have experience with the type and scale of the professional activities or work, or the work is innovative and complex, involves emerging technology or does not have well-defined solutions, a qualified independent reviewer will be sourced externally. Otherwise, the reviewer will be a qualified engineering or geoscience professional, employed by Ecora, who has not been involved in the design.

2.8.4 Guiding Principles for Detailed Practice Area Procedures

This high-level procedure applies across the firm and will inform any more detailed procedures for assessing project risk and carrying out independent reviews of high-risk professional activities or work in each department.

Professionals of records must:

- Conduct a risk assessment that considers:
 - Hazards associated with the work.
 - Severity and likelihood of consequences.
 - Complexity of the work.

- Effect of errors or omissions on hazards during construction or implementation.
- Nature of the assumptions made during the work.
- Innovation or departure from previous practice.
- Regulations or authorities requiring independent review of the work.
- For work deemed high-risk due to the severity of consequences resulting from errors or omissions, plan the work to allow for an independent review.
- Where Ecora does not have experience with the type and scale of the work, or the work is innovative and complex, involves emerging technology or does not have well-defined solutions, identify and engage a qualified external resource to carry out the independent review.
- To avoid surprises and significant rework, confirm the various stages, from concept to construction or implementation documents, when the work will be independently reviewed.
- Arrange to have the work checked to confirm that the work and documents meet all requirements and are suitable for their intended purpose.

Risk assessment is conducted via the Project Risk Assessment form prior to Project Initiation.

For Work Involving Design and Construction

The independent reviewer must:

- Determine the extent of independent review required and record the rationale for this determination.
- Review the design criteria, sources of risk identified in the risk assessment (including risks imposed by components designed by other disciplines and risks from external sources), and performance requirements.
- Review statutory and regulatory requirements.
- Review geographical and/or environmental requirements.
- Review material properties.
- Review appropriateness and implementation of mitigation measures.
- Review the concept and integrity of the design.
- Where applicable, review the integration of third-party components and artifacts into the work.
- Examine representative samples of the assumptions in the work, components, and detailing.

- Review supporting documents to determine whether they are sufficient to identify the essential components of the work and provide sufficient information to guide the construction or implementation.
- Evaluate documents related to the work to ensure they are complete, consistent, coordinated and in general compliance with the appropriate codes, standards, and other requirements.
- Perform calculations on a representative sample of components to determine whether the analysis, design and detailing generally comply with the appropriate codes, standards, and other requirements.
- Document additional steps taken as well as steps which were deemed not applicable to the work and discuss with the professional of record.
- Discuss any concerns with the professional of record. The professional of record must adequately resolve concerns noted in the independent review.
- Provide a formal record of the independent review to the professional of record highlighting any concerns (see Appendix A: Checklist and Signoff for an Independent Review of High-Risk Professional Activities or Work). If significant concerns are noted, the professional of record must revise the work and resubmit the revised work for an independent review.
- If requested, provide the record of the independent review to any authority charged with approving the work.
- Retain and preserve the record of the independent review for a minimum of 10 years.

For Work Involving Assessments, Investigations, Reviews, or Reports

The independent reviewer must:

- Determine the extent of review required and record the rationale for this determination.
- Review hazards identified in the risk assessment (including risks imposed by the work of other professionals and risks from external sources).
- Review the context or situation, available data, and performance criteria for the work.
- Where applicable, review geographical and/or environmental requirements and conditions.
- Where applicable, review test/experimental procedures and results.
- Where applicable, review the integration of third-party components and artifacts into the work.
- Review appropriateness and implementation of mitigation measures.
- Review the assumptions made by the professional of record for the work.

- Review the concept and integrity of the result of the work.
- Review supporting documents to determine whether they are sufficient to identify the result of the work, and, where applicable, provide sufficient information to guide the construction or implementation.
- Review statutory and regulatory requirements.
- Evaluate documents related to the work to ensure they are complete, consistent, coordinated and in general compliance with the appropriate codes, standards, and other requirements.
- Document additional steps taken as well as steps which were deemed not applicable to the work and discuss with the professional of record.
- Discuss any concerns with the professional of record. The professional of record must adequately resolve concerns noted in the independent review.
- Provide a formal record of the independent review to the professional of record highlighting any concerns (see Appendix A: Checklist and Signoff for an Independent Review of High-Risk Professional Activities or Work). If significant concerns are noted, the professional of record must revise the work and resubmit it for an independent review.
- The independent reviewer must provide the review record to any authority charged with approving the work upon request.
- Retain and preserve the record of the independent review for a minimum of 10 years.

2.8.5 References

Refer to any standard operating procedures in groups or departments if needed or delete if procedure above is sufficient.

- Checklist and Signoff for an Independent Review of High-Risk Professional Activities or Work {add link and include form in Appendix}

2.9 Authenticating Documents

2.9.1 Introduction

Section 7.3.7 of the Bylaws of Engineers and Geoscientists BC mandates that professionals authenticate documents, containing information related to regulated practice, that they prepare or are prepared under their direct supervision, before those documents are delivered to others who will rely on the information contained in them. This professional obligation is further described in the Engineers and Geoscientists BC's [Guide to the Standard for the Authentication of Documents](#).

Section 7.3.7 of the Bylaws of Engineers and Geoscientists BC also mandates that all authenticated documents display the registrant firm's permit to practice number. To satisfy the requirements set out in this Bylaw, only a Responsible Registrant or individuals authorized by the Responsible Registrant may apply the permit to practice number. Professionals authenticating a document are responsible for confirming that all permit to practice requirements have been met prior to authenticating the document.

The seal may be a manual seal which is an ink stamp, or a digital image of a seal accompanied by an approved digital certificate. A document is authenticated when the manual seal is applied, signed, and dated with the date the seal is applied, by the professional whose name is on the seal, or when the approved digital certificate is applied to the digital version of the seal, by the professional whose name is on the seal.

During compliance audits, auditors will be confirming policies and procedures for the appropriate authentication of professional documents are being adhered to and that all professional documents are being appropriately authenticated prior to them being delivered to parties who will be relying upon them.

2.9.2 Purpose

The Engineers and Geoscientists BC seal is used to authenticate documents related to regulated practice. When signed and dated, or when an approved digital certificate is applied, a professional's seal indicates to the user of the document that the document has been prepared and delivered in the professional capacity of, or directly supervised by, a qualified professional, who is taking responsibility for the contents of the document for its intended use.

The professional's seal indicates that the document has not been altered, and that it contains the original information for which the professional accepted responsibility. The seal is a mark of reliance, an indication that others can rely on the fact that the opinions, judgments, or designs in the sealed documents were provided by a professional held to high standards of knowledge, skill, and ethical conduct. It is not a warranty.

The application of the permit to practice number is a confirmation that all permit to practice requirements have been met.

Legal liability is different from professional responsibility. Whether or not professionals authenticate documents they prepare or directly supervise, they are liable for the content. However, if they issue an unauthenticated professional document to others who will be relying on the engineering or geoscience content, they will be in breach of the Bylaws of Engineers and Geoscientists BC.

This section describes how professional documents will be authenticated at Ecora.

2.9.3 Policy

Any professional document that a professional prepares or directly supervises must be authenticated before it is issued to others who will rely on its engineering or geoscience content.

Ecora's permit to practice number must appear on all authenticated documents. The Responsible Registrant(s) is responsible for, and the only individual who can authorize the application of the permit to practice number on professional documents issued by Ecora. The Responsible Registrant must set or agree to policies regarding the application of the permit to practice number in professional documents for the area(s) of practice for which they are responsible.

The seal must remain in the care and control of the professional to whom it was issued and may only be signed and dated, or digitally certified, by that individual.

2.9.4 Guiding Principles for Detailed Practice Area Procedures

This high-level procedure applies across the firm and will inform any more detailed procedures for authenticating documents in each department.

Professionals of record will:

- Maintain the care and control of their professional seal.
- Review all professional documents to the extent they deem necessary to take professional responsibility for the engineering/geoscience content.
- Confirm that all permit to practice requirements have been met and that the permit to practice number is included on all authenticated documents.
- Decide when and whether a professional document is ready to be authenticated.
- Use a signed and dated manual seal or apply a digital seal with digital certification approved by Engineers and Geoscientists BC to authenticate all professional documents that they prepare or directly supervise before those documents are delivered to others who will rely on them.
- For manual seals, the date must be the date the seal was applied.
- Authenticate all professional documents that:
 - the professional has prepared in their professional capacity or has been prepared under their direct supervision,
 - contain content related to the regulated practice, and
 - will be relied on by others.
- Authenticate all record drawings that contain changes to the engineering/geoscience content not previously issued in an authenticated document.
- If authenticating record drawings that include information provided by others not under the professionals direct supervision, the following declaration must be included on the drawing:

“The seal and signature of the undersigned on this drawing certifies that the design information contained in these drawings accurately reflects the original design and the material design changes made during construction that were brought to the undersigned’s attention. These drawings are intended to incorporate addenda, change orders, and other material design changes, but not necessarily all site instructions.

The undersigned does not warrant or guarantee, nor accept any responsibility for the accuracy or completeness of the as-constructed information supplied by others contained in these drawings, but does, by sealing and signing, certify that the as-constructed information, if accurate and complete, provides an as-constructed system which substantially complies in all material respects with the original design intent.”

- Any email correspondence which contains professional engineering or geoscience advice, or decisions issued in a professional capacity will be followed up with an appropriately authenticated document.
- Retain a record copy of all authenticated documents in the project file. These will either be originally authenticated documents, photocopies or scans of authenticated or digitally sealed and certified PDF files.

2.9.5 References

Refer to any detailed procedures for engineering/geoscience groups.

2.10 Direct Supervision

2.10.1 Introduction

As required by section 7.3.8 of the Bylaws of Engineers and Geoscientists BC, professionals must meet the requirement of Direct Supervision in all areas of regulated practice where there is delegation to subordinates. This professional obligation is further described in the Engineers and Geoscientists BC's [Guide to the Standard for Direct Supervision](#).

Delegating means to undertake certain activities, work, or decisions related to the regulated practice on behalf of a professional who takes professional responsibility for the work of the subordinate. To directly supervise work delegated to a subordinate means to control and conduct the activities, work, or decisions related to the regulated practice that have been delegated to a subordinate. A subordinate may be any individual who engages in the regulated Practice under the direct supervision of a professional. Typically, these individuals are engineers or geoscientists -in-training, technologists, another non-professional or less experienced professionals.

During compliance audits, auditors will be confirming professionals are directly supervising any engineering or geoscience work that they delegate to subordinates who are non-professionals or professionals whose level of experience is insufficient for the activity or work.

2.10.2 Purpose

When professionals authenticate documents, or otherwise take professional responsibility for professional engineering or geoscience work, they are exposing themselves to personal liability for the work. When they delegate engineering or geoscience work, they remain responsible for that work. Adequate and appropriate direct supervision mitigates their risk and ensures that professionals retain appropriate control of that work. Direct supervision also allows more experienced professionals to assist in the professional development of those less experienced.

This section describes the delegation and direct supervision of engineering and geoscience work at Ecora.

2.10.3 Policy

Professionals must directly supervise any engineering or geoscience work that they delegate to a subordinate. When doing so, professionals must retain appropriate control of and take professional responsibility for that work.

A subordinate may be an engineer-in-training (EIT) or a geoscientist-in-training (GIT), technologist, a non-professional, or a less experienced professional to whom a professional delegates engineering or geoscience work.

2.10.4 Guiding Principles for Detailed Practice Area Procedures

This high-level procedure applies across the firm and will inform any more detailed procedures for direct supervision in each department.

To delegate work to a subordinate, professionals of record will:

- Assess the work that may be delegated to confirm the knowledge, experience and capabilities required, and any tools or resources (e.g., standards, codes, etc.) that can be used to successfully implement the work.
- Assess the subordinates to confirm that they have the required knowledge, capability and experience and to identify any gaps that must be addressed.
- Make required tools and resources available and address any gaps in them, including identifying subject matter experts to be consulted during the work.
- Address gaps in the subordinate's knowledge, skills and experience by setting up a monitored learning experience.
- Establish the subordinate's scope of work, duties, responsibilities, authorities, and limits on acting alone.
- Create a plan defining when and how the subordinate's work will be reviewed.
- Delegate the work to the subordinate and communicate the scope of work, duties, responsibilities, authorities, limits on acting alone, and the timing and process for required reviews.
- Be available to answer questions.
- Be involved in all engineering or geoscience decisions.
- Review the subordinate's work, as planned.
- Retain documentation to demonstrate that professional reviews of the subordinate's work took place.

2.10.5 References

Refer to any detailed procedures for engineering/geoscience groups.

2.11 Field Reviews

2.11.1 Introduction

Field reviews are a professional obligation mandated in section 7.3.3 of the Bylaws of Engineers and Geoscientists BC and further described in the Engineers and Geoscientists BC's [Guide to the Standard for Documented Field Reviews During Implementation or Construction](#).

Field reviews must be completed during the construction, manufacturing, fabrication, implementation, testing, or commissioning of work related to the regulated practice by a professional, or a subordinate under the professional's direct supervision, in a manner that is appropriate to the level of risk that has been assessed through a documented risk assessment.

Field reviews are used to determine whether the construction, manufacturing, fabrication, implementation, testing, or commissioning of work related to the regulated practice substantially complies with the concepts or intent reflected in the documents prepared for the work related to the regulated practice.

Decisions about the number and extent of field reviews must always remain at the professional's discretion. Consequently, professionals may not, in their agreements with employers, clients, owners, or anyone else, agree in advance to limit the number or extent of field reviews. Professionals can provide estimates of the number of anticipated field reviews or the costs per field review to employers, clients, or owners. The professional must always have the discretion to increase the number or extent of reviews should circumstances warrant it.

Where possible, the professional of record responsible for preparing documents developed for implementation or construction should be responsible for field reviews.

Field reviews are a professional practice and are not the same as site or quality control inspections carried out by an owner's representative to confirm that the owner's requirements or contractual obligations have been met.

2.11.2 Purpose

Field reviews are periodic reviews conducted at the site of the implementation or construction of professional engineering or professional geoscience work, that professionals in their professional discretion consider necessary to ascertain whether the implementation or construction of work substantially complies in all material respects with professional engineering or professional geoscience concepts, or intent reflected in the documents prepared for such work.

Field reviews also help professionals keep employers, clients, owners and other relevant professionals informed about the quality of the implementation or construction work as it pertains to compliance with the documents prepared for the work.

This section describes how field reviews during construction or implementation will be carried out at Ecora.

2.11.3 Policy

Professionals of record for a discipline or practice area must carry out or directly supervise field reviews during construction, manufacturing, fabrication, implementation, testing, or commissioning of professional engineering or geoscience work that they have prepared or directly supervised.

Field reviews determine whether the construction, manufacturing, fabrication, implementation, testing, or commissioning of work substantially complies with the engineering or geoscience documents prepared for the work.

Where a project has multiple professionals of record, a coordinating professional may be assigned to coordinate the activities of the various professionals of record for the project.

2.11.4 Guiding Principles for Detailed Practice Area Procedures

This high-level procedure applies across the firm and will inform any more detailed procedures for field reviews in each department.

The timing of field reviews must take into consideration and reflect the following:

- The number of field reviews that are deemed necessary, based on a professional exercising reasonable professional judgment, to ascertain whether the implementation or construction of work substantially complies in all material respects with the professional engineering or professional geoscience concepts, or intent reflected in the documents prepared for the work.
- The level and nature of risk, complexity, unknown conditions, and duration of the implementation or construction.
- The standard of practice for the type and nature of work to be reviewed.
- The requirements of related Engineers and Geoscientists BC professional practice guidelines and/or practice advisories.
- The legislation, codes, standards, or other regulatory requirements that may be relevant and applicable to the nature of the field review to be carried out.
- The level of detail provided in the documentation prepared for the project or work.
- The experience, reputation, and method of selection (that is, public tender, prequalified bidders, or negotiated) of those implementing or constructing the work.
- The number of deficiencies found early in the project or work.
- The experience of the professional of record.

For Construction

The professional of record will:

- Assess and record the nature and risk of the engineering or geoscience work involved, and the complexity of the engineering or geoscience services to be completed, during the construction phase.
- Determine the number, timing and focus of field reviews required to meet the standard of care for the work and adjust the extent of reviews as needed during construction.
- Determine whether field reviews are suitable for delegation and determine whether qualified subordinates are available.
- Based on the risk assessment, document, and agree on the extent and scope of required field reviews, including any requirements for testing or surveying.

- Communicate to the contractor or party responsible for the construction before construction begins the specific aspects of construction activities that must be reviewed and requirements for providing notice of when they will be ready to observe, test or survey.
- Where field reviews will be delegated to a subordinate, provide direction about the required efforts, reporting detail, specific aspects of construction activities to be observed, tested or surveyed, and limits of acting alone.
- Prepare and authenticate any required certificates or letters of assurance.

The field reviewer will:

- Carry out field reviews as required and planned.
- If any equipment is used during the field review, ensure the equipment is maintained and calibrated as per the manufacturer's recommendations, and maintain a record of the maintenance and calibrations.
- If not the professional of record, as directed by the professional of record, adjust the extent of field reviews required based on the number of issues observed.
- Document all field reviews, including date, time, location, work reviewed, observations and directions given.
- Where critical work is or will be covered before it can be reviewed, require that it be uncovered or require photos, as appropriate.
- Where appropriate, take photographs or videos to capture and document observations made during field reviews and create an audit trail for any photographic or video records by:
 - Checking the equipment, date and time settings before taking photographs.
 - Including a description of what was photographed along with the date, time, location and photographer.
 - Enhancing, cropping or otherwise editing photographs only for clarity, and retaining the original, unaltered photo along with the edited photo.
 - Downloading and storing all photographs taken to their appropriate subdirectory in their respective project directory.
 - Creating a non-editable back-up of all photographs.
- Provide directions about nonconforming work and required resolution to the contractor or party responsible for the construction in writing.

- Leave the means and methods for correcting nonconforming work to the contractor or party responsible for the construction.
- If not the professional of record, notify the professional of record of any required or proposed revisions to the work that will result in changes in the cost, schedule, or function to seek and receive approval to proceed before proceeding to have the work revised.
- If not the professional of record, involve the professional of record in engineering or geoscience decisions resulting from field reviews.
- Continue to report nonconforming work observed in field reviews until it is rectified.
- Confirm and document how the contractor or party responsible for the construction has addressed any nonconforming work observed in field reviews.
- Retain all field review records in the project folder under the subfolder: \01-07 construction\07-01_field_review_(internal).

For Fabrication or Manufacturing of Engineered Products

The professional of record will:

- Assess and record the nature and risk of the engineering work involved, and the complexity of the engineering services to be completed, during the fabrication or manufacturing phase.
- Review the quality control processes and procedures for the fabrication or manufacturing shop.
- Review quality control records of inspections and tests.
- Review shop or fabrication drawings and specifications for the work.
- Based on the risk assessment, determine the number, timing and focus of fabrication or manufacturing inspections required to meet the standard of care for the work and adjust the extent of reviews needed.
- Determine whether inspections are suitable for delegation and determine whether qualified subordinates are available.
- Where inspections will be delegated to a subordinate, provide direction about the required efforts, reporting detail, and specific aspects, that must be observed, tested, measured or surveyed.

The field reviewer will:

- Carry out shop inspections and testing as required and planned.

- As directed by the professional of record, adjust the extent of inspections required based on the number of issues observed.
- Document all inspections, including date, time, location, work reviewed, observations and directions given.
- Involve the professional of record in engineering decisions resulting from inspections.
- Have nonconforming work corrected and document how the work has been corrected.
- Retain all inspection records in their appropriate directory.

For Out of Province Engineered and Supplied Equipment

Where professionals are specifying equipment, products, or components that are designed and manufactured or fabricated out of province for use on projects, the professional must:

- Prepare and authenticate a performance specification for the equipment.
- Indicate that the manufacturer or fabricator must certify that the equipment meets the performance specifications. This will relieve the professional of any requirement to carry out field reviews at the place of fabrication.
- Check the quality of equipment when received.
- If BC occupational health and safety legislation imposes any requirements for guards and safety switches, check that the equipment meets those requirements.
- Confirm that the equipment meets any Technical Safety BC requirements.
- Carry out or directly supervise field reviews of electrical, gas, or water feeds to the equipment.

2.11.5 References

Refer to any detailed procedures for engineering/geoscience groups.

Appendix A

Checklists

Checklist and Signoff for Independent Review of Structural Designs

Checklist and Signoff for Independent Review of High-Risk Activities and Work

Checklist and Signoff for an Independent Review of Structural Designs

[Print clearly and legibly]

ENGINEER OF RECORD

RE:

Name of project or work

P.Eng. or P.L.Eng. name

Address of project or work

Firm name

Permit to Practice number

Address of firm

ITEM	REVIEWED (initials)	REMARKS
1. Design code loadings and serviceability limits		
2. Material specifications and geotechnical recommendations		
3. Concept and integrity of the gravity load resisting system		
4. Concept and integrity of the lateral load resisting system (e.g., wind, seismic)		
5. Drawing completeness and continuity of load paths		
6. Design check of representative structural elements		
7. Review of representative structural details		
8. Concerns discussed with the Engineer of record		

INDEPENDENT REVIEWER

P.Eng. or P.L.Eng. name

Firm name

Permit to Practice number

Address of firm

Date: (yy/mm/dd)

Signature

Checklist and Signoff for an Independent Review of Structural Designs

[Print clearly and legibly]

TO: **ENGINEER OF RECORD** DATE: _____

P.Eng. or P.L.Eng. name

Firm name

Permit to Practice number

Address

RE: Project name

Address of project

The undersigned hereby records that an Independent Review of the project or work, based on the attached list of the structural plans and supporting documents prepared by the Engineer of record for the structural components, has been completed by this Independent Reviewer.

I am a member of the firm _____
(Name of Firm)

with the Permit to Practice number _____
(Permit to Practice Number)

and I sign this letter on behalf of the firm.

I certify that I am a Professional Registrant as defined below.

DATE: _____

Name

Signed

Address

Telephone

(Affix PROFESSIONAL SEAL here)

NOTE:

The above letter must be signed by a Professional Registrant (professional engineer or professional licensee engineering, licensed to practice by Engineers and Geoscientists BC) qualified to conduct an Independent Review of the structural design being reviewed.

This letter is endorsed by Engineers and Geoscientists BC.

Checklist and Signoff for an Independent Review of High-Risk Professional Activities or Work *[Print clearly and legibly]*

RE:		PROFESSIONAL OF RECORD	
	Name of project, activity, or work		Name of professional and designation (P.Eng., P.Geo., P.L.Eng. or P.L.Geo.)
	Address of project, activity, or work		Firm name
			Permit to Practice number
			Address of firm

ITEM	REVIEWED (initials)	REMARKS
1. Assumptions for Professional Activities or Work		
2. Concept for Professional Activities or Work		
3. Criteria for carrying out Professional Activities or Work		
4. Calculations or Analysis		
5. Representation or Output (e.g., drawings, reports, spreadsheets, models, etc.)		
6. Design check of representative elements		
7. Review of representative details		
8. Applicable codes, standards, and regulations		
9. Review of Risk Assessment		
10. Qualifications of Reviewer for Type 2 Review		
11. Concerns discussed with the Engineer of record		

INDEPENDENT REVIEWER

Name of professional and designation

(P.Eng., P.Geo., P.L.Eng. or P.L.Geo.)

Firm name

Permit to Practice number

Address of firm

Date: (yy/mm/dd)

Signature

Checklist and Signoff for an Independent Review of High-Risk Professional Activities or Work *[Print clearly and legibly]*

TO: ENGINEER OF RECORD

DATE

Name of professional and designation

(P.Eng., P.Geo., P.L.Eng. or P.L.Geo.)

Firm name

Permit to Practice number

Address of firm

RE: Name of project, activity, or work

Address of project, activity, or work

The undersigned hereby records that an Independent Review of the professional activity or work, based on the Documentation prepared by the Engineer of record for the professional activity or work, has been completed by this Independent Reviewer.

I am a member of the firm _____
(Name of Firm)

with the Permit to Practice number _____
(Permit to Practice Number)

and I sign this letter on behalf of the firm.

I certify that I am a Professional Registrant as defined below.

DATE (yy/mm/dd): _____

Name of professional and designation
(P.Eng., P.Geo., P.L.Eng. or P.L.Geo.)

Signed

Address

(Affix PROFESSIONAL SEAL here)

Telephone

NOTE:

1. The above letter must be signed by a Professional Registrant (professional engineer, professional geoscientist, professional licensee engineering or professional licensee geoscience, licensed to practice by Engineers and Geoscientists BC) qualified to conduct an Independent Review of the professional activity or work being reviewed.

Documented Risk Assessment Templates (Page 1 of 3)

[Print clearly and legibly]

RE:

Name of project, activity, or work

Address of project, activity, or work

PROFESSIONAL OF RECORD

Name of professional and designation
(P.Eng., P.Geo., P.L.Eng., or P.L.Geo.)

Firm name

Permit to Practice number

Address of firm

Table A: Type of Risk Assessment

TYPE OF RISK ASSESSMENT		
Global	Repetitive/Iterative	Project-Specific

Table B: Considerations for Risk Assessment

CONSIDERATIONS FOR RISK ASSESSMENT	REMARKS (INITIAL CONDITION)
Expertise of Professional of Record	
Experience of subordinates	
Previous experience with similar projects	
Level of complexity	
Innovative features	
Departures from previous practice	
Applicable codes, standards, and regulations that define Risk tolerance	
Formal Hazard identification techniques used (i.e., FMEA, FTA, ETA, HAZOP, STPA, SWIFT)	

Documented Risk Assessment (Page 2 of 3)

Table C: Hazard Identification

HAZARD NUMBER	HAZARD IDENTIFICATION	CONSEQUENCE	SEVERITY OF CONSEQUENCE ^a	LIKELIHOOD OF CONSEQUENCE ^b	LEVEL OF RISK ^c
1					
2					
3					
4					
5					
6					

^a See Appendix B, Section B2 of the Guide to the Standard for Independent Review of High-Risk Professional Activities or Work (Guide), and Table D of this Risk Assessment.

^b See Appendix B, Section B3 of the Guide and Table D of this Risk Assessment.

^c See Appendix B, Section B4 of the Guide and Table D of this Risk Assessment.

Table D: Individual Hazard and Overall Risk Assessment

INDIVIDUAL HAZARD AND OVERALL RISK ASSESSMENT					
Severity of Consequence ^a	Insignificant	Minor	Moderate	Critical	Catastrophic
Likelihood of Consequence ^a	Improbable	Remote	Occasional	Probable	Frequent
Level of Risk ^a	Minimal	Low	Moderate	High	Extreme

^a As described in Appendix B of the *Guide to the Standard for Independent Review of High-Risk Professional Activities or Work*, and the tables and Risk matrix set out there, or based on another procedure developed by the Professional Registrant or Firm.

Table E: Type of Independent Review Required

TYPE OF INDEPENDENT REVIEW REQUIRED ^a		
None	Type 1	Type 2

^a The type of Independent Review must be determined after the initial Risk Assessment, thereby allowing any mitigation measures applied to the Professional Activity or Work to be part of the scope of the Independent Review.

Documented Risk Assessment (Page 3 of 3)

Table F: Applying Mitigation Measures

HAZARD NUMBER ^a	MITIGATION MEASURES PROPOSED/IMPLEMENTED	REMARKS/JUSTIFICATION	REVISED LEVEL OF RISK ^b
1			
2			
3			
4			
5			
6			

^a See Table B of this Risk Assessment.

^b See Appendix B, Section B4 of the *Guide to the Standard for Independent Review of High-Risk Professional Activities or Work* and Table C of this Risk Assessment.

Table G: Final Remarks

FINAL REMARKS

(For example, recommended timing and/or intervals for Independent Review; reference supporting documents used for Hazard identification or Risk Assessment)

Date: (yy/mm/dd)

Signature

Geotechnical Engineering Report/Design Checklist and Signoff for Review

Engineer of Record

RE:

Name of Project or Work (print)

P.Eng. or Licensee Name (print)

Address of Project or Work (print)

Project Number (print)

Legal Description of Project or Work (print)

Address (print)

N/A – Not Applicable

Yes – Complete

No – Not Complete

RES - Resolved

Item	N/A	Yes	No	RES	Comments
1. Is the location of the investigation/design described and/or a site location map provided?					
2. Is the scope and purpose of the investigation/design summarized?					
3. Has a summary of the site geological setting and topography of the area been provided?					
4. Have the results of the site investigation and/or laboratory tests been summarized and provided?					
5. Has a summary of the encountered subsurface conditions been provided?					
6. Has a plan of the testing locations been provided?					
7. Have the results of site investigation lab testing been reviewed?					
8. Has sufficient site investigation been undertaken to assess site subsurface conditions?					
9. Have the soil/rock parameters utilized in analysis and/or design been summarized and any references utilized provided?					
10. Have the design criteria utilized in analysis and/or design been summarized and any references provided?					
11. Have suitable recommendations for shallow and/or deep foundations been made, including bearing, serviceability and frost protection?					
12. Have suitable recommendations for soil and/or rock cuts and fill been made, including erosion protection, usage of excavated materials, blasting, the effects of blast induced vibrations, and the needs for rock/soil stabilization measures?					

13. Has the potential for liquefiable soils been assessed and seismic site classification provided?					
14. Have recommendations for site storm water management/disposal been provided?					
15. Have recommendations for pavement design, construction and any references been provided?					
16. Have the effects of soil consolidation been considered, the need for ground improvement assessed and recommendations provided?					
17. Have recommendations for construction considerations and temporary works been provided, such as disposal of material, temporary excavations, sub-excavation and fill replacement, and dewatering?					
18. Has a review of design drawings for completeness, continuity and standards been undertaken?					
19. Has a design check of representative engineered elements been undertaken?					
20. Have all reviewer concerns been addressed?					

Reviewer

 P.Eng. or Licensee Name (print)

 Address (print)

 Signature

 Date: (yy/mm/dd)

BYLAW STATUS SHEET February 6, 2024

Bylaw #	Description	Status
2131	“Town of Ladysmith Zoning Bylaw 2014, No. 1860, Amendment Bylaw (No. 54) 2022, No. 2131” (10940 Westdowne Rd.) Changes zoning from Rural Residential (RU-1) to Manufactured Home Park (MHP-1).	First and second readings, December 20, 2022. Public Hearing and third reading December 19, 2023. MOTI approval required.
2133	“Town of Ladysmith Zoning Bylaw 2014, No. 1860, Amendment Bylaw (No. 56) 2023, No. 2133”. Allows convenience store at 1132-1142 Rocky Creek Rd.	First and second readings, January 10, 2023. Public Hearing required. MOTI approval required.
2161	“Official Community Plan Bylaw 2022, No. 2200, Amendment Bylaw 2023, No. 2161”. To expand the mobile home park at 10940 Westdowne Road.	First and second readings, November 21, 2023. Second reading rescinded, second reading as amended, December 5, 2023. Public Hearing and third reading December 19, 2023.
2166	“Town of Ladysmith City Hall Loan Authorization Bylaw 2024, No. 2166”. To enable the Town to borrow up to \$13.5 million dollars over a term of 30 years to fund the construction of a new City Hall.	First, second and third readings, January 23, 2024. Inspector of Municipalities approval required. Approval of the electors required through an Alternative Approval Process.