

B.C. DAM SAFETY PROGRAM

ANNUAL REPORT
2021-2022



Ministry of
Forests

Table of Contents

Executive Summary	3
1.0 Introduction	4
1.1 Purpose of the Report	4
1.2 Dam Safety Program Mandate	4
2.0 Dams in B.C.	5
2.1 Why We Have Dams	5
2.2 Status of B.C. Dams	7
2.3 Failure Consequence Classification	9
2.4 Failure Probability and Risk Level	13
3.0 Role of the Dam Safety Program	14
3.1 Our Staff	15
3.2 Training Initiatives	16
3.2.1 Dam Owner Training	16
3.2.2 Staff Training	17
3.3 Ensuring Dam Owner Compliance	17
3.3.1 Self-Reporting by Owners	18
3.3.2 Orders	19
3.3.3 Audits	20
3.4 Technical Reviews and Acceptance of Dam Owner Submissions	20
3.5 Incidents, Emergency Planning and Response	21
4.0 2021-2022 Highlights	23
4.1 Office of the Auditor General’s Audit of the DSP.....	23
4.2 Program Projects	24
4.2.1 Revision of Engineers and Geoscientists BC’s (EGBC) Legislative Dam Safety Reviews in B.C. guidelines	24
4.2.2 Improved Information for Designing Dams to Manage Flood Events	24
4.2.3 Light Detection and Ranging (LiDAR) Dam Detection	24
4.3 Construction Projects	26
4.3.1 New Dam Construction—BC Hydro—Site C	26
4.3.2 Alteration, Improvement or Replacement of Dams ...	28
4.3.3 Decommissioned Dams	31
4.4 Extreme Weather	32
Appendices	33
Appendix A: Failure Probability and Risk Level Matrix.....	33
Appendix B: Annual Dam Status Questionnaire and Results ...	35



Executive Summary

The B.C. Dam Safety Program Annual Report is a commitment made under the Deputy Solicitor General's 2010 report on the Review of the Testalinden dam failure that recommended "the Ministry of Environment should publish an annual Dam Safety Program report on its public website for the information of the public."

This past year has been challenging with the continuing COVID-19 pandemic necessitating program staff to move to a virtual office environment and influencing how we interact with the public. MFOR's regulatory work continued throughout this time, adapting in a manner that ensured the safety of both staff and the public it serves.

Extreme weather events in 2021 created additional hazards for dam owners with some effects related to wildfires expected to continue into the coming years. Even with these challenges, the past year saw one of the lowest recorded numbers of dam incidents, a trend we hope will continue.



1.0 Introduction

1.1 Purpose of the Report

In response to the recommendation made by Deputy Solicitor General David Morhart following the devastating failure of the Testalinden dam failure in 2010, the Dam Safety Program has published an annual report to keep the public informed on:

- The importance of dam safety
- The state of dams in B.C.
- Program performance indicators
- Program initiatives

1.2 Dam Safety Program Mandate

British Columbia is one of only four provinces in Canada with a formalized dam safety program. The B.C. Dam Safety Program (DSP) regulates “freshwater” dams that are licenced under the Water Sustainability Act (WSA). Mining tailings dams and wastewater dams fall under the purview of the Ministry of Energy, Mines and Low-Carbon Innovation and the Ministry of Environment and Climate Change Strategy, respectively.

The purpose of the Dam Safety Program (DSP) is to confirm that owners of dams licensed under the Water Sustainability Act (WSA) operate their dams in a safe manner in accordance with the Dam Safety Regulation (Regulation).



The objective of the Regulation is to mitigate loss of life and damage to property and the environment from a dam breach by requiring dam owners to inspect their own dams, undertake proper maintenance on them, and ensure that these dams meet engineering standards to minimize associated public safety, economic, social, and environmental risks.

2.0 Dams in B.C.

2.1 Why We Have Dams

British Columbia has an abundance of fresh lakes and interconnected river systems. This has allowed for a long history of dam construction to support a variety of purposes:

- Power generation
- Municipal and domestic water supply
- Irrigation and livestock watering
- Fish and wildlife enhancement
- Industrial use
- Recreation
- Flood control

Without dams the provinces' economic and social needs would not be realized. Dams can vary significantly in size, design and material; from very large concrete hydroelectric dams (**Photo 1**) to small earth embankment dams used for irrigation purpose (**Photo 2**). In total, there are 1873 dams in B.C. that are regulated by the DSP.



Photo 1 - Revelstoke dam



Photo 2 - Lower McCuddy dam

But along with the benefits that dams bring, they can also pose a risk to the public, the environment, property and infrastructure. B.C. has experienced dam failures in the past, mostly small dams causing minimal damage, but in some instances, such as the failure of Testalinden Lake dam in 2010, they can have serious impacts (**Photo 3**). Dam owners, industry professionals and regulators, collectively play a role in ensuring that dams are designed, constructed, operated and maintained in a manner that the risks are maintained as low as reasonably practicable.



Photo 3 – Property impacted by failure of Testalinden dam, June 2010.

2.2 Status of B.C. Dams

There are currently 2104 dams identified in the DSP's registry. These dams are divided into those for which the Dam Safety Regulation (the Regulation) applies, and those that are defined as "minor" dams that are not regulated (**Figure 1**).

Owners of minor dams, that meet the following criteria are exempt from the entire regulation unless the Comptroller of Water Rights (comptroller) or water manager determines otherwise:

- Less than 7.5 metres in height, and
- Able to impound no more than 10,000 m³ of water.

Except for minor dams above, and regardless of consequence classification, dam height, or storage volume, all dam owners must comply with all parts of the regulation except Part 3. Dams meeting designated height and storage thresholds are subject to Part 3. **Figure 2** provides a graph of how dams are categorized based on dam height, storage volume and consequence classification.

Figure 1 – Regulated Status of B.C. Dams

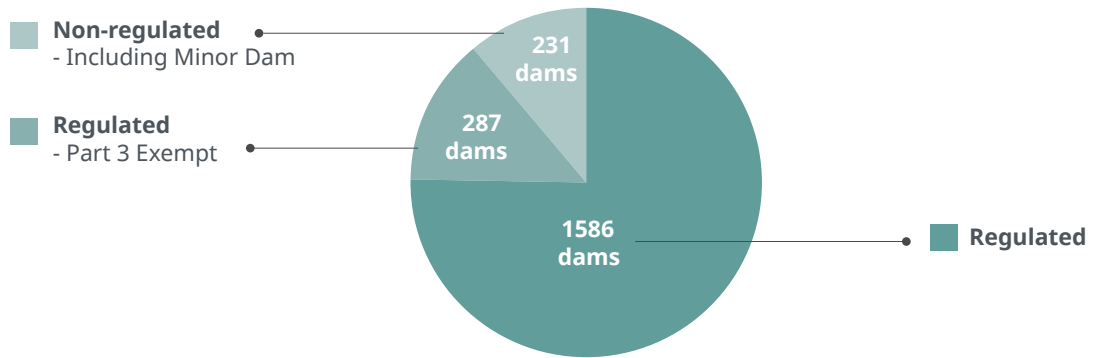
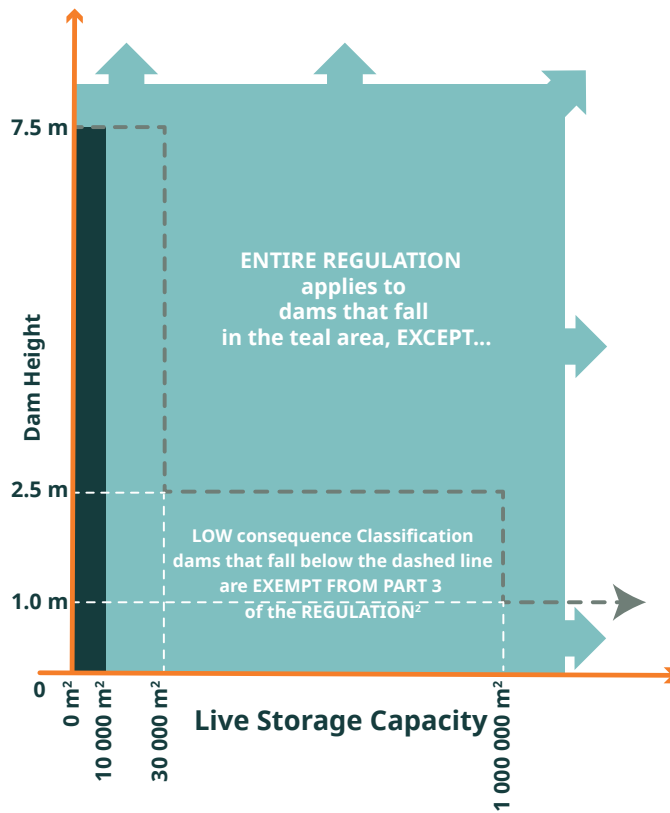


Figure 2 – Application of the Regulation to Dams in British Columbia



1. Dam Safety Regulation 40/2016, Part 1, Section 2
 2. Dam Safety Regulation 40/2016, Part 3, Section 7

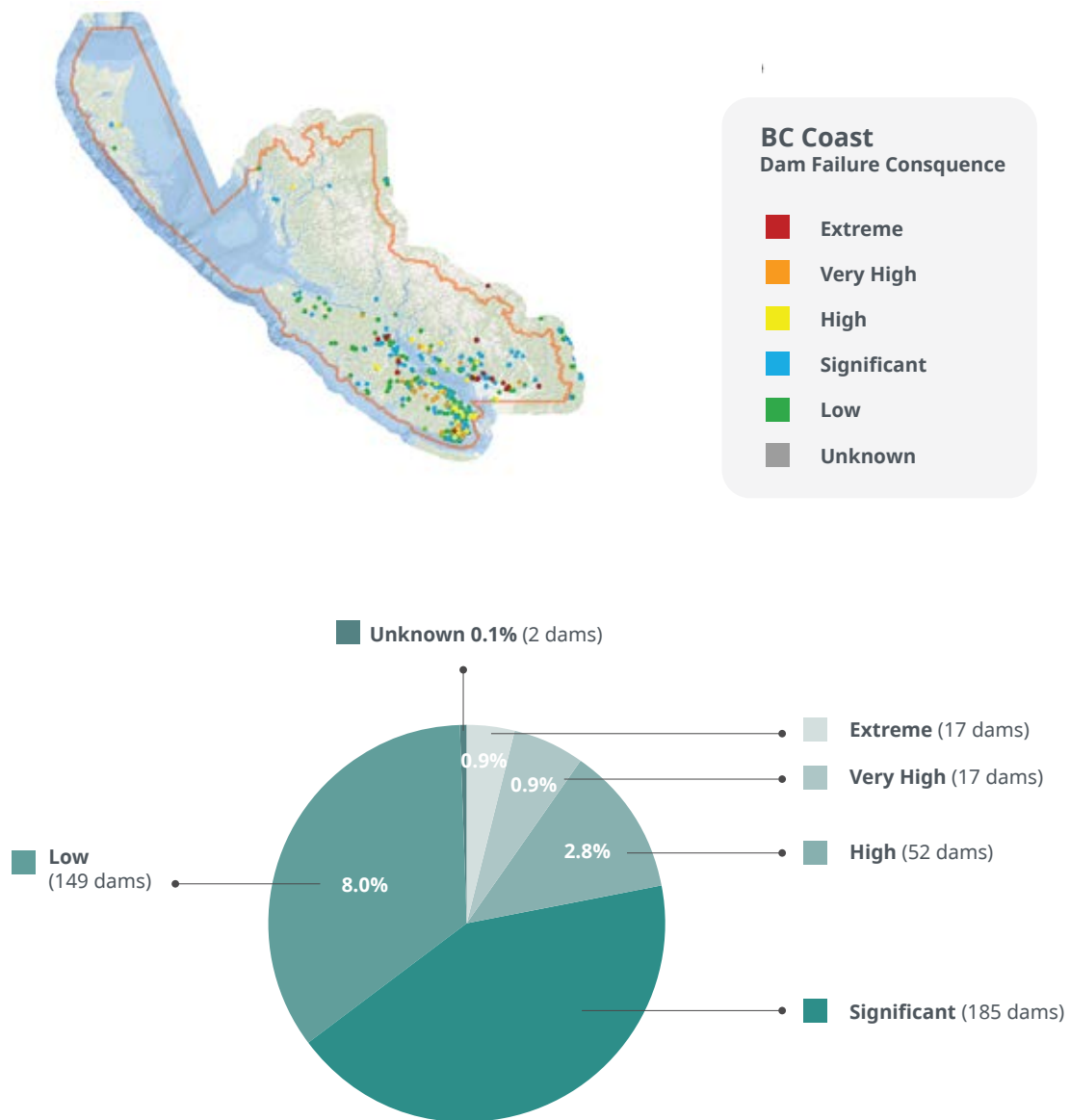


2.3 Failure Consequence Classification

Regulated dams are further characterized by their failure consequence classification. Under the Regulation, a dam failure consequence classification is given to all active freshwater storage dams based on the potential for loss of life, the deterioration of environmental and cultural values, and the losses to infrastructure and the economy should the dam fail. B.C. has adopted a 5-tier classification system ranging from Low to Extreme. Schedule 1 of the Dam Safety Regulation provides criteria for establishing the appropriate classification—https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/40_2016.

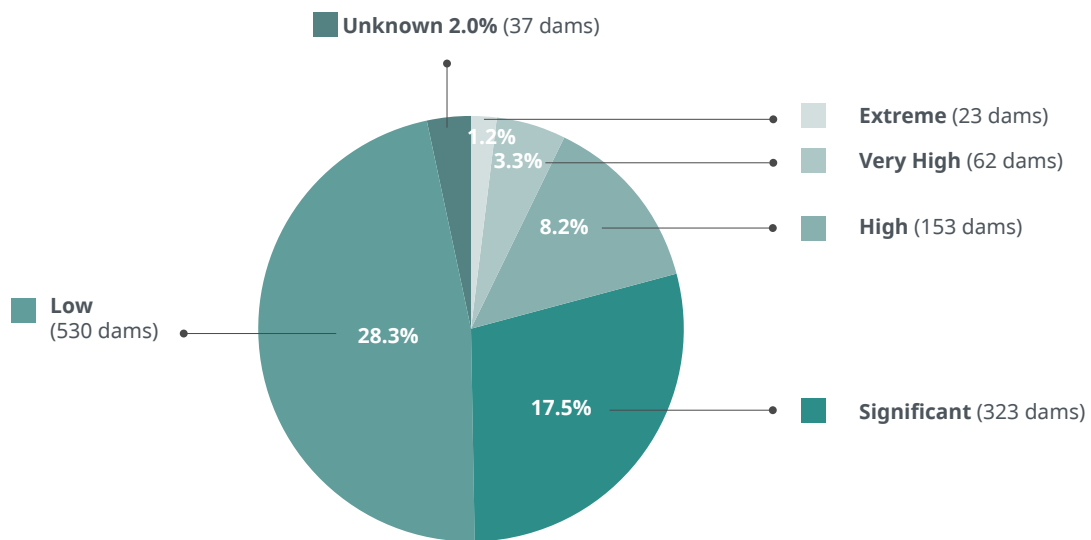
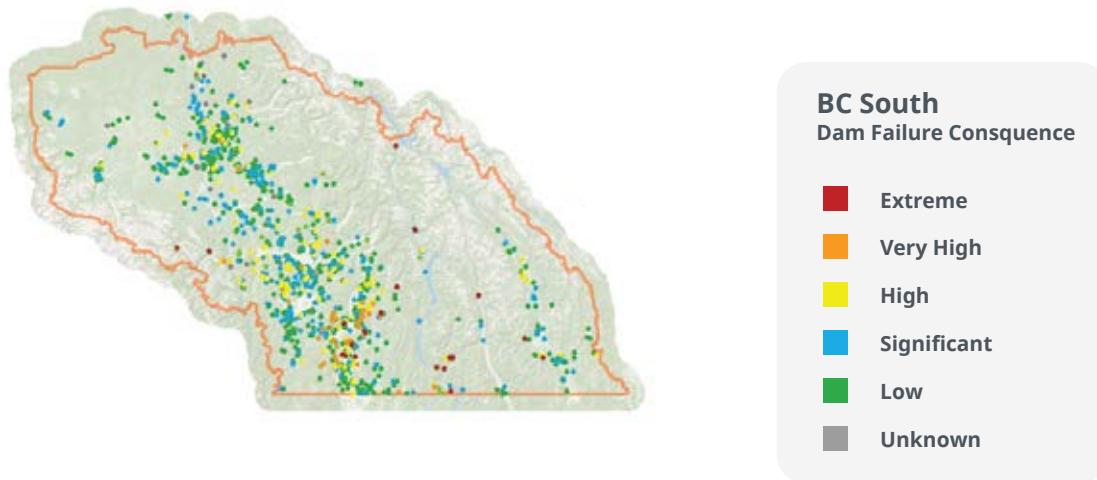
Figures 3 to 5 provide a breakdown of regulated dams by provincial Ministry of Forests natural resource areas and failure consequence classification.

Figure 3 – Coastal Distribution of Active Regulated Dams by Failure Consequence Classification (note % is of B. C. Total)



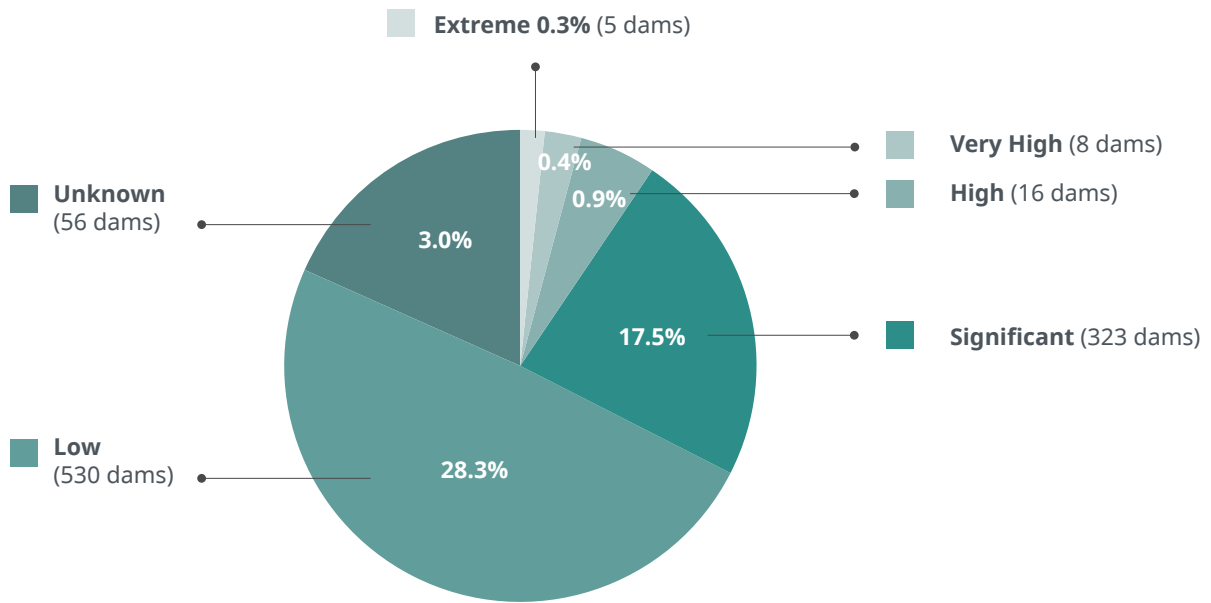
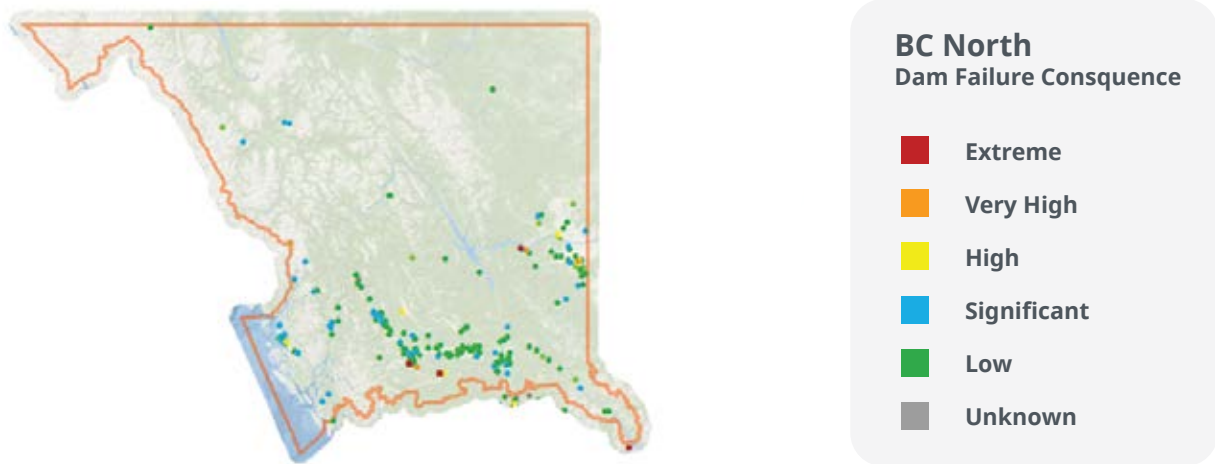
B.C. COAST AREA	
Regions	Regulated
West Coast Region	326
South Coast Region	106
Coast Area - Subtotal	432

Figure 4 – Southern Distribution of Regulated Active Dams by Failure Consequence (note % is of B.C. Total)



B.C. SOUTH AREA	
Regions	Regulated
Cariboo Region	366
Thompson – Okanagan Region	656
Kootenay - Boundary Region	110
South Area - Subtotal	1132

Figure 5 – Northern Distribution of Regulated Active Dams by Failure Consequence (note % is of B. C. Total)



B.C. NORTH AREA	
Regions	Regulated
Skeena Region	94
Omineca Region	78
North East Region	137
North Area - Subtotal	309



2.4 Failure Probability and Risk Level

The DSP uses a Risk-Based Classification system that combines the consequence of failure of a dam with the probability of failure. These two factors can be entered into a table to determine the risk level. This method of classification enables effective and efficient use of DSP resources, ensuring that dams are monitored according to the risk they pose.

The failure probability rating is influenced by several factors such as the dam's design, construction method, and level of operation, maintenance and surveillance undertaken by the dam owner. In British Columbia, the risk of dams is classified into the following five levels. Level 1–Alert and 2a–Caution, identify those dams that a Dam Safety Officer should devote additional time and regulatory effort on to address identified deficiencies and/or non-compliant dam owners. A listing of these two levels has been provided in Appendix B.

Section 25 of the Freedom of Information and Protection of Privacy Act (FIPPA), requires public bodies to proactively disclose information:

- About a risk of significant harm; or
- That is clearly in the public interest.

This applies to dams with risk levels 1 and 2a. There is currently one dam with a risk level of 1 and 16 dams in the level 2a category. These dams receive increased attention from DSP staff to ensure dam owners rectify any identified deficiencies in a timely manner. Appendix A provides a list of risk level 1 and 2 dams.



3.0 Role of the Dam Safety Program

The B.C. Dam Safety Program (DSP) within the Ministry of Forests (MFOR), and its partner the B.C. Oil and Gas Commission (BCOGC), are responsible for the regulation of 1,873 dams in B.C. and receives their authority under the *Water Sustainability Act* (WSA) and the Dam Safety Regulation (the Regulation).

The objective of the Regulation is to mitigate loss of life and damage to property and the environment from a dam breach by requiring dam owners to inspect their own dams, undertake proper maintenance on them, and ensure that these dams meet engineering standards to minimize associated public safety, economic, social, and environmental risks. The role of the DSP is to confirm that owners of dams licensed under the WSA operate their dams in a safe manner in accordance with the Regulation.

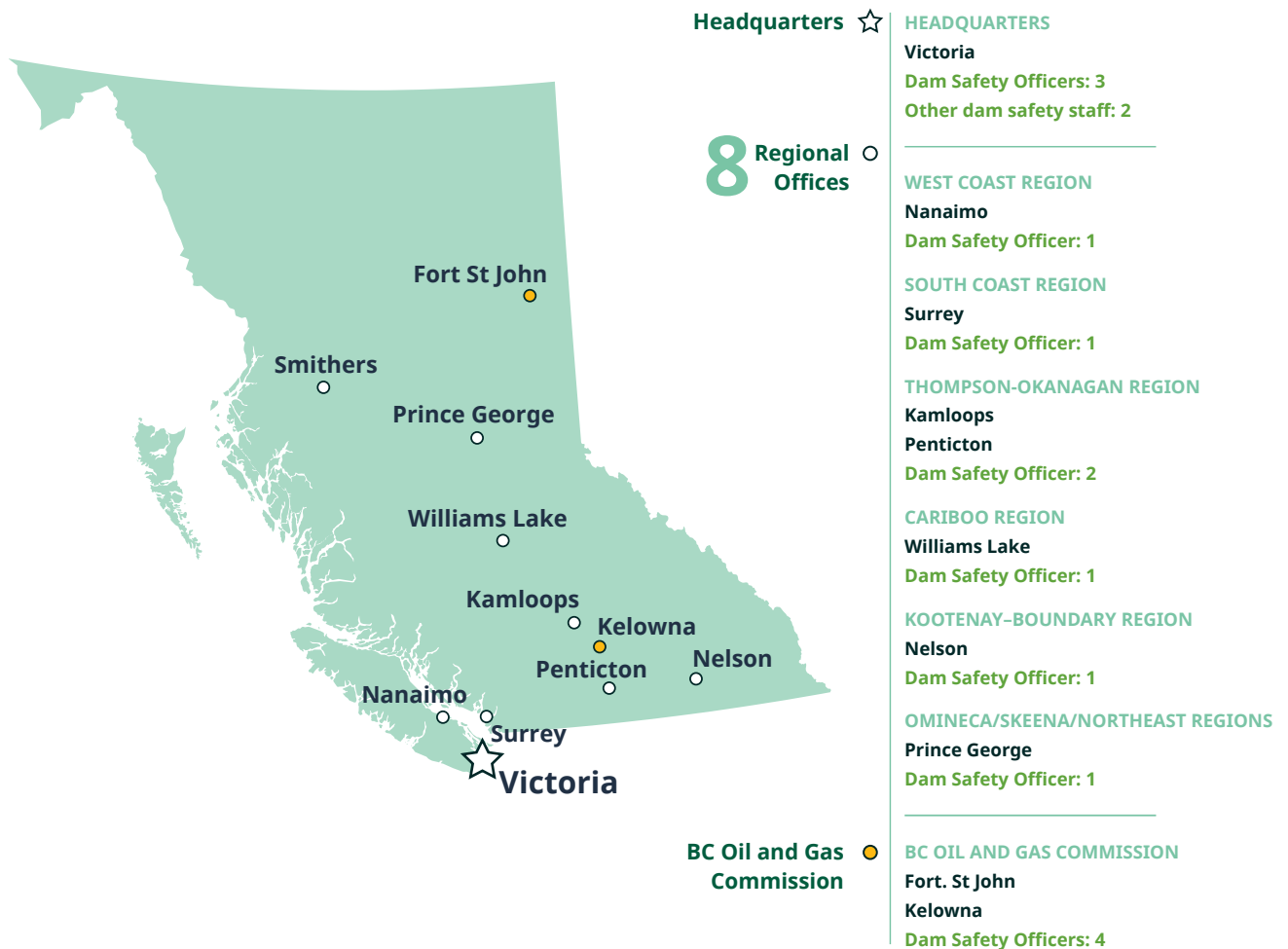
This mandate is realized through the DSP's 4 objectives:

1. Providing formal and informal training to dam owners and dam safety professionals,
2. Ensuring dam owner compliance with the Regulation,
3. Reviewing project plans for dams to ensure consistency with Canadian Dam Association (CDA) guidelines and other industry standard practices, and
4. Supporting dam safety emergency planning and response.



3.1 Our Staff

The B.C. Dam Safety Program is managed by a team of MFOR and BCOGC dedicated staff. MFOR staff are comprised of 5 Headquarters (Victoria) staff with 3 designated as Dam Safety Officers under the Water Sustainability Act that are assigned to all Major dams (over 9m in height), while the 8 Regional office staff who are also Dam Safety Officers regulate the remaining dams. The BCOGC has staff designated as Dam Safety Officers under an MOU with the Ministry of Forests, with authority for regulating freshwater dams with 3 staff located predominantly in the northeast of the province.



3.2 Training Initiatives

3.2.1 Dam Owner Training

In a continued response to the Covid-19 pandemic and public health protocols limiting public interaction, the DSP partnered with the Ministry of Agriculture and Food to utilize funding that would provide dam owners with free online webinars and free dam safety hardcopy resources that are provided by their local DSO. These hardcopy resources include the Dam Safety Management Binder and the Dam Safety Pocketbook. The DSP renewed contracting services from a qualified dam engineering consulting firm to develop dam safety educational webinars for dam owners. These webinars were delivered in the first quarter of 2022 and covered core concepts and fundamental knowledge on dam safety.

Table 1 below provides further information and links to the webinar recordings.

Table 1 – Dam Safety Webinar information

B.C. NORTH AREA		
Webinars (linked)	Description	Attendance Numbers
Webinar 1 January 29, 2022 10:00 am PST <u>DAM INSPECTION AND VEGETATION MANAGEMENT TECHNIQUES</u>	Best practices of dam inspection and vegetation management techniques, focusing on: <ul style="list-style-type: none"> • Dam Safety Regulations in B.C. • Consequence Classification • Surveillance and Inspection Frequency • Dam Features and Deficiencies • Inspection and Vegetation Management • Animal Management 	40
Webinar 2 February 2, 2022 10:00 am PST <u>DAM PERFORMANCE MONITORING, INSTRUMENTATION AND RESPONSE</u>	Best practices in performance monitoring related to instrumentation and response: <ul style="list-style-type: none"> • Monitoring Frequency Schedule • Dam Monitoring Basics • Instrumentation and Techniques for Small Earth Dams • Data Collection and Plotting • Detecting Abnormal Conditions 	43
Total Number of Webinar Trainees		83

The DSP collaborated with the Canadian Dam Association (CDA) to conduct webinars and workshop sessions at the October 2021 virtual conference. Various dam safety program staff provided facilitation, instruction, and technical moderation work for lectures provided at the CDA conference. Additionally, staff within the DSP provide similar work and expertise on CDA seminars offered beyond the annual conference. Sessions include but are not limited to:

- Estimation of Hydrologic Loading on Dams
- Emergency Management, Dam Safety
- Dam Safety 101

3.2.2 Staff Training

The DSP also conducts internal training for staff on an annual basis. Dam Safety Officers (DSO) are required to attend these sessions to maintain their designation under program requirements. These 2-day sessions include the annual Community of Practice (COP) meeting and the biennial technical training.

Community of Practice (COP)

The COP offers essential ongoing professional development for DSOs on a variety of technical and program policy topics. These sessions also allow networking and team building to be facilitated as DSOs may not interact on a regular basis. This translates into ongoing support for DSOs as they carry out their roles individually in their respective regions.

Technical Training

Similar to the annual COP, the biennial technical training offers essential ongoing professional development for DSOs with a larger focus on technical aspects related to the complex role of dam safety engineering.

The 2021 session included topics on hydroelectric generation, power optimization, public safety, drone footage technology, geotechnical engineering, UAV & GIS applications, and liability & risk.

3.3 Ensuring Dam Owner Compliance

The DSP follows a policy for compliance and enforcement (C&E) of dam that involves the co-ordination of dam safety officers, other dam safety staff and natural resource officers with the Ministry's Compliance and Enforcement Branch. The C&E strategic policy is built on the legislation and regulation which establish the requirements that regulate the dam owner. The DSP delivers services that promote compliance by the owners in various facets of the management and operation of their dams in accordance with the regulatory requirements.

Program staff verify the performances of the owners in the safe management and operation of the dams. If a dam owner is found to be noncompliant with a legislated or regulatory requirement, corrective enforcement measures can be applied by the natural resource officer until the dam owner is compliant with the regulation or legislation. A range of measures are available such as advisories, warnings, orders, water licence cancellations, tickets, and court prosecutions.

3.3.1 Self-Reporting by Owners

Every December all owners of dams that have a failure consequence classification of High, Very High or Extreme are required to submit a report on the regulatory compliance status of their dams. DSOs use the information in the report to assess compliance levels, update information in the provincial dam database, and help dam owners address any emerging dam safety issues. The following information collected from these reports is used as Key Performance Indicators (KPI) of the DSP:

- Annual dam status reports (returns/required),
- Formal inspections (completed/required),
- Site surveillance (completed/required),
- Operations, Maintenance, and Surveillance (OMS) manual (updated/required),
- Dam Emergency Plan (DEP) (updated/required),
- DEP contact information (updated/required),
- DEP information submitted to LEA (submitted/required), and
- Verification of changes to downstream land use that might affect the failure consequence classification (completed/required).

A copy of the Annual Dam Status questionnaire can be found in Appendix B along with a summary of the results.

3.3.2 Orders

The Comptroller of Water Rights, Water Managers and Engineers designated under the Water Sustainability Act have authority to issue Orders to owners of dams. These Orders can be enabling, such as providing dam owners with authorizations to undertake dam improvements, or can be used to compel dam owners in instances of non-compliance. In 2021/22 a total of 48 Orders were issued to owners of dams (see Table 2 for numbers of orders issued per administrative unit):

Table 2 – Number of WSA Orders Issued per Administrative Unit

Administrative Unit (FLNR/OGC)	No. of Orders
Dam Safety Section	16
West Coast	0
South Coast	0
Thompson	2
Cariboo	7
Kootenay	4
Okanagan	3
North	11
B.C. Oil and Gas Commission	5
B.C. Total	48

3.3.3 Audits

A large part of the DSP program to ensure dams are safe and dam owners are in compliance with the Regulation is achieved through conducting dam audits. This entails meeting with the dam owner to check their records and a site visit to the dam to identify any obvious deficiencies. Dams with a Significant Consequence Classification are audited on a 10-year cycle whereas High, Very High and Extreme dams are audited every 5 years. Low consequence classification dams are audited as required.

Table 3 – Dam audits in 2020/2021 identified by administrative unit

Administrative Unit (MFOR/OGC)	Dam Audits Completed*
Dam Safety Section	33
West Coast	16
South Coast	8
Thompson	10
Cariboo	22
Kootenay	4
Okanagan	15
North	19
B.C. Oil and Gas Commission	0
B.C. Total	127

3.4 Technical Review and Acceptance of Dam Owner Submissions

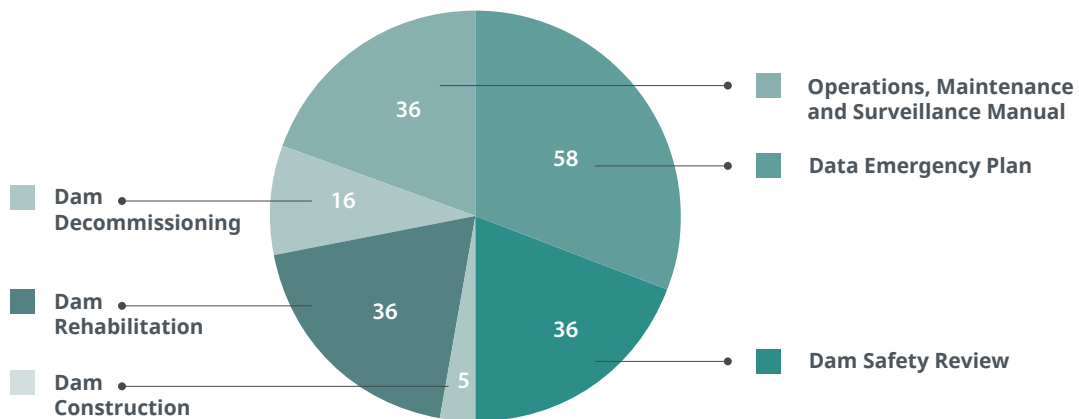
Plans review, acceptance and approval ensures the development of plan submission guidelines for owners and dam safety officers for:

- Removal, Rehabilitation, Construction of dams
- Operation, Maintenance and Surveillance (OMS) manual
- Dam Emergency Plans (DEPs)
- Dam Safety Reviews
- Invasive investigations



Trained staff provide an administrative review of submissions ensuring that they meet industry standards, best practices to including minimizing environmental disturbance, and upholding the Crown’s duty to consult with First Nations.

Figure 6 – Dam Safety Officer Technical Reviews



3.5 Incidents, Emergency Planning and Response

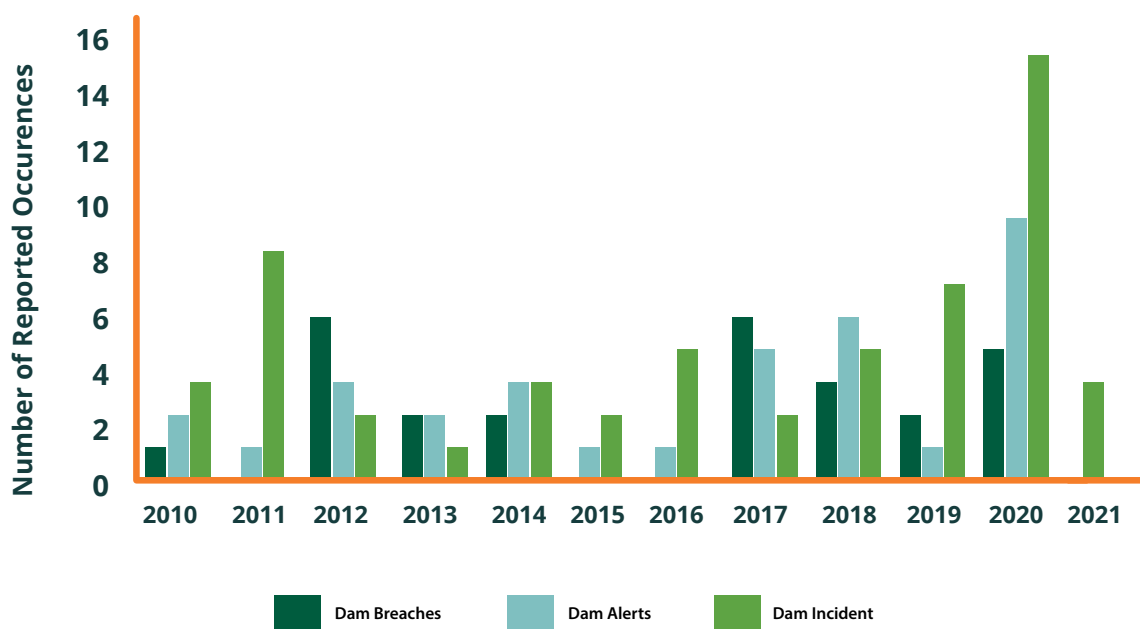
Emergency planning and response involves responding to abnormal conditions arising at a dam. Support is often provided to the dam owner by dam safety officers and, if needed, through other agencies such as Emergency Management B.C. It may involve:

- Activating an approved dam emergency plan by the owner
- A dam emergency response plan by Ministry dam safety staff
- Engaging the local government(s) emergency coordination protocols

Figure 7 details the types of incident level encountered by the parties to the dam emergency and their frequency over the last eleven years they have been reported. When a dam is about to breach, or in the process of breaching or has breached, the dam emergency plan is activated by the dam owner; a dam emergency level is declared, and EMBC is notified with possibly further actions taken. There have never been more than five dam breaches reported annually for more than a decade.

In all these situations, the dam owner keeps the dam safety officer informed of the progress resolving the incident.

Figure 7 - Number of dam incidents classified by dam incident levels over the last eleven years



Last year was very unusual in which several large atmospheric river events concentrated over parts of the province. Despite the intensity of the precipitation combined with rain on snow increasing the inflows into reservoirs, there were no dam breaches or alerts reported for the province, only three dam incidents and nine non-incidents.



4.0 2021–2022 Highlights

4.1 Office of the Auditor General’s Audit of the DSP

The Dam Safety program was audited in 2021 by the Office of the Auditor General (OAG). The objective of the audit was “to determine if the Ministry of Forests, Lands, Natural Resource Operations and Rural Development has effectively overseen the safety of dams in B.C.”. The audit concluded that:

“... while it promoted dam owner compliance with regulatory requirements, it did not adequately verify or enforce compliance.”

The full version of the report, “Oversight of Dam Safety in British Columbia,” can be found at (<https://www.bcauditor.com/pubs/2021/oversight-dam-safety-british-columbia>.)

The ministry has accepted the OAG's 9 recommendations to improve our oversight of dam safety, related to:

- informing all dam owners of their regulatory requirements
- improving processes to verify dam owner compliance
- improving monitoring of compliance and enforcement activities
- strengthening performance measures and targets

The program has been actively working on addressing the recommendations made by the OAG and has completed or started on the following actions:

- Informing dam owners of their regulatory responsibilities through bulletin mailouts
- Developing a tool to identify unauthorized dams (LiDAR project)
- Improving the dam inventory database
- A commitment to increasing staffing levels in Headquarters by 5 full-time positions

4.2 Program Projects

4.2.1 Revision of Engineers and Geoscientists BC's (EGBC) Legislative Dam Safety Reviews in B.C. guidelines

EGBC in partnership with the Ministry of Forests (MFOR) and the Ministry of Energy and Low Carbon Initiative (EMLI) have started work on the fourth revision to the Dam Safety Review guidelines which is expected to be completed by the end of 2022. Dam Safety Reviews are required for dams of High, Very High, and Extreme failure consequence and are a critical component of the MFOR Dam Safety Program. (<https://www.egbc.ca/News/Articles/Guideline-Revision-Planned-for-Legislated-Dam-Safe>)

4.2.2 Improved Information for Designing Dams to Manage Flood Events

Climate change, aging of dam infrastructure, and the continued development downstream of dams is raising the potential hazard caused by flooding events in many communities across B.C.. In 2018 the DSP started working on a series of projects to improve information available for engineering consultants to use when designing dams and estimating the magnitude of flood events in B.C.. The goal of the projects is to improve the quality of hydrotechnical reports completed for dams in B.C., and to lower the cost by making the relevant information more readily available. DSP staff have been working with EGBC and the Canadian Dam Association to provide subject practice advisories and courses to improve the state of practice in B.C.. The reports and links to relevant information can be accessed at the EGBC Climate Change Information Portal (<https://www.egbc.ca/Practice-Resources/Programs-Resources/Climate-Sustainability/Climate-Change-Information-Portal>)

4.2.3 Light Detection and Ranging (LiDAR) Dam Detection

Light Detection and Ranging (LiDAR) is a form of surveying that can develop three dimensional representations of the earth's surface. In 2021, British Columbia and the Government of Canada made a great deal of LiDAR data throughout the province freely available to the public. The Dam Safety program is using this data to develop a risk-based process to identify unauthorized dams or dams missing from the program's database.

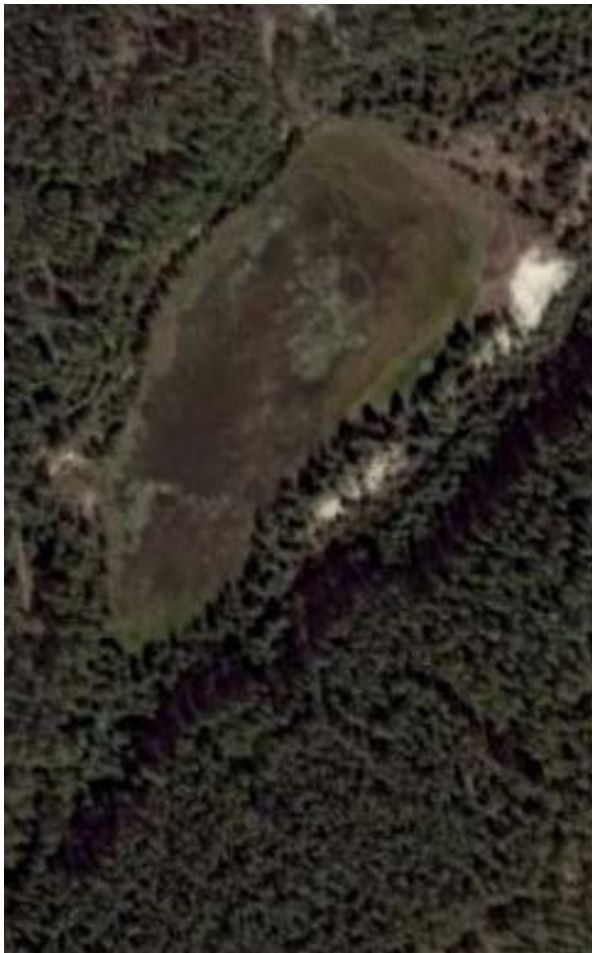


Photo 4 – Left: Google Earth Image of a dam surrounded by dense tree cover

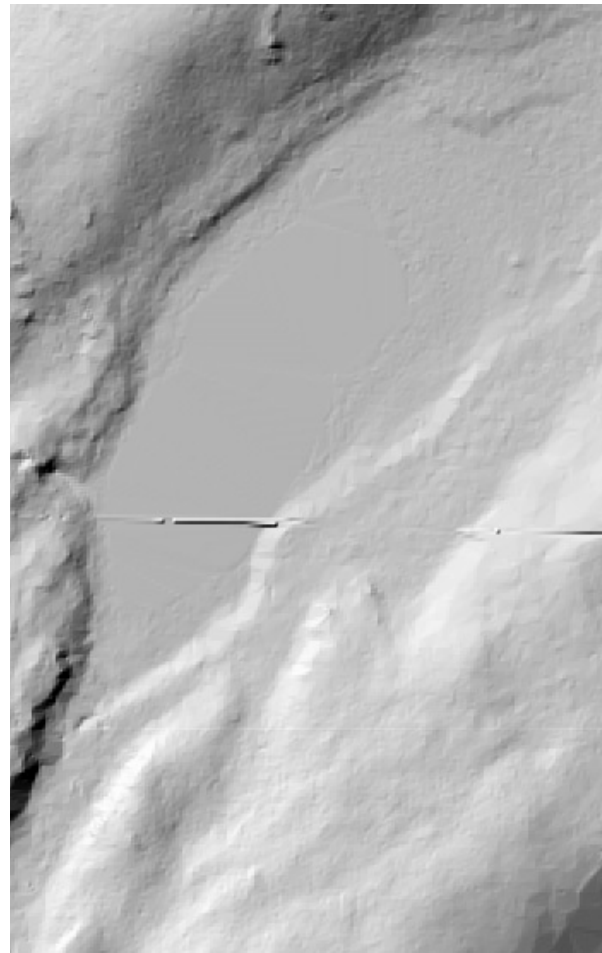


Photo 5 – Right: Digital Elevation Model (DEM) of the dam using LiDAR



4.3 Construction Projects

4.3.1 New Dam Construction—BC Hydro—Site C

Even with COVID causing labour shortages, the 2021/2022 season was busy with dam construction projects.

Construction of BC Hydro's Site C Clean Energy Project (Site C) began in 2015. Reservoir filling and "Wet Commissioning" is scheduled to take place in 2024. Upon completion, it will be the third dam and hydroelectric generating station on the Peace River in northeast B.C, providing 1,100 megawatts (MW) of capacity, and producing about 5,100 gigawatt hours (GWh) of electricity each year; enough energy to power the equivalent of about 450,000 homes per year in B.C. **Photos 6-8** are examples of the extreme size and complexity of this project.



Photo 6 – Site C – view of Main Earthfill Dam and Cofferdams, Powerhouse and RCC Buttress. (Photo: BC Hydro)

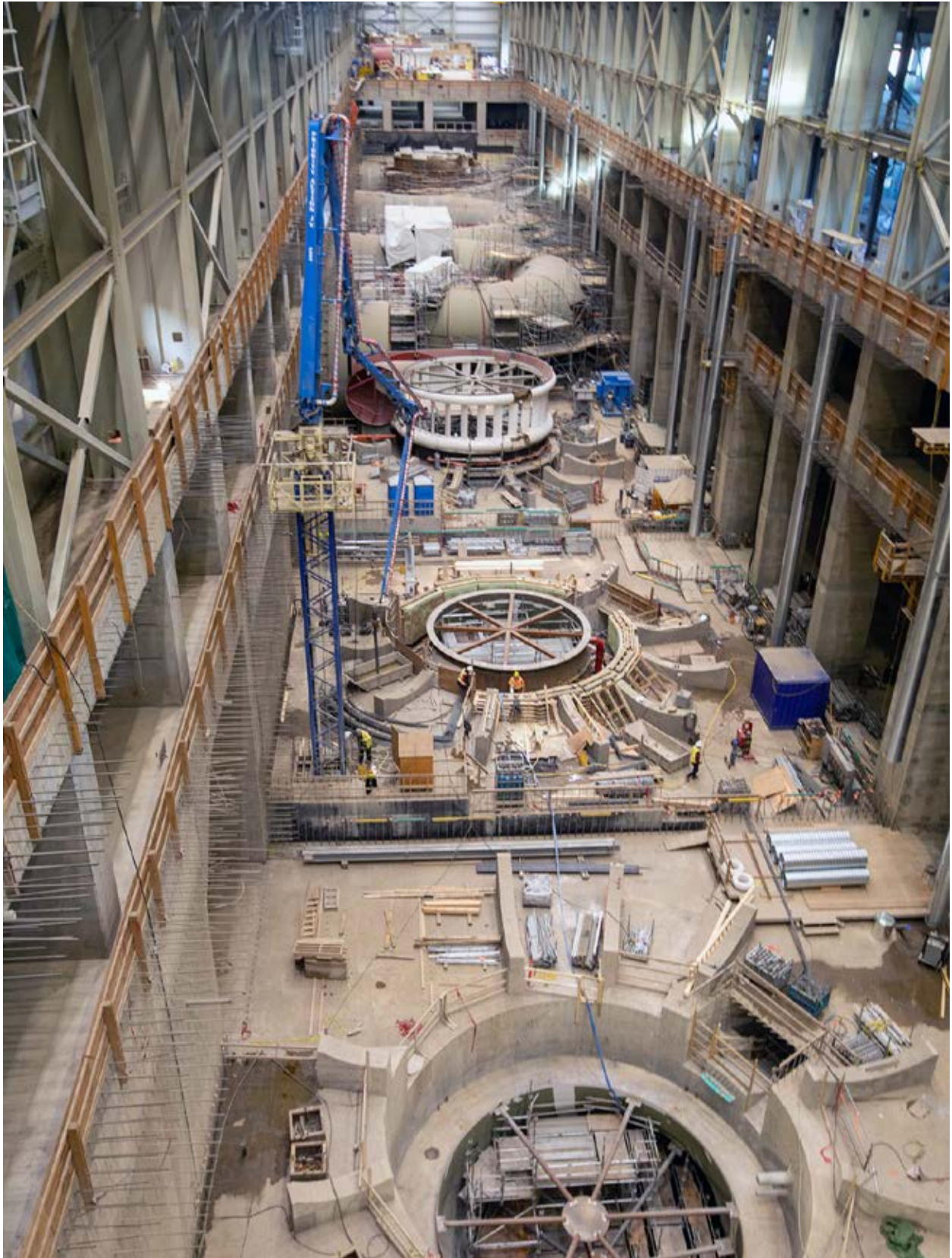


Photo 7 – Site C – Powerhouse (Photo: BC Hydro)



Photo 8 – Site C – Spillway, Powerhouse and RCC Buttress (Photo: BC Hydro)

4.3.2 Alteration, Improvement or Replacement of Dams

Like any type of infrastructure, dams require continuous maintenance and periodic upgrades which are significant construction projects. This reporting period saw 32 dams undergoing some form of improvement. An example is Isintok Lake dam owned by the District of Summerland that saw the replacement of the low-level outlet pipe. This was a major construction project as the full height of the 10 m high dam was excavated to remove and replace the pipe that had reached the end of its life expectancy.

Woodworth dam

Construction of Prince Rupert's Woodworth dam started in 2021 (**Photos 9-10**). The new dam replaces the aging Woodworth dam that was constructed in 1914 that was found to be in fair to poor condition.



Photo 9 – Original Woodworth dam

Completion is anticipated in early summer 2022 and will be followed by the decommissioning of the original dam.



Photo 10 – Construction of new dam

Isintok Lake Dam

Several dam owners in B.C. are continuously upgrading their dam infrastructure due to aging of the facilities and an increased awareness of hazards acting on the dams. Installation of a new low-level outlet pipe (**photos 11-12**) on Isintok dam, a water supply dam owned and operated by the District of Summerland, is one example of some of the dam upgrades that were initiated in 2021/2022.



Photo 11 – New pipe to be installed



Photo 12 – Isintok Lake Dam with low level outlet pipe removed



4.3.3 Decommissioned Dams

Dams are decommissioned for numerous reasons including owners no longer requiring the water or the upgrade costs being prohibitive. Dam decommissioning guidelines are available on the MFOR Dam Safety website.

In 2021, the province provide authorization for a total of 13 dam decommissionings.

A couple of decommissioning examples can be found on the City of Trail's website (https://trail.ca/en/inside-city-hall/Violin_Lake_Project.aspx) for Violin Lake and Cambridge Creek dams.

4.4 Extreme Weather

Extreme weather continued in the province over the last year resulting in a very bad forest fire season and an unusual flooding event in November 2021 caused by a multiple day atmospheric river event which caused excessive flooding in Abbotsford, Merritt, and many other communities. The storm damaged several roads, railway lines, pipelines and other infrastructure as well as damaged numerous dwellings and businesses. Several dike systems were breached causing millions of dollars of damage and vital transportation links were broken (**Photo 13**).

Large burn areas caused by wildfire causes rainfall and snowmelt water to move through watersheds and into reservoirs at a much faster rate and volume than would naturally occur resulting in higher magnitudes of hydrologic loading on dams and increased sediment to reservoirs. Dam owners who have observed changes in their reservoir's watersheds due to fire or any other causes of tree mortality or ground disturbance should discuss the potential flood impact with their engineering consultants.

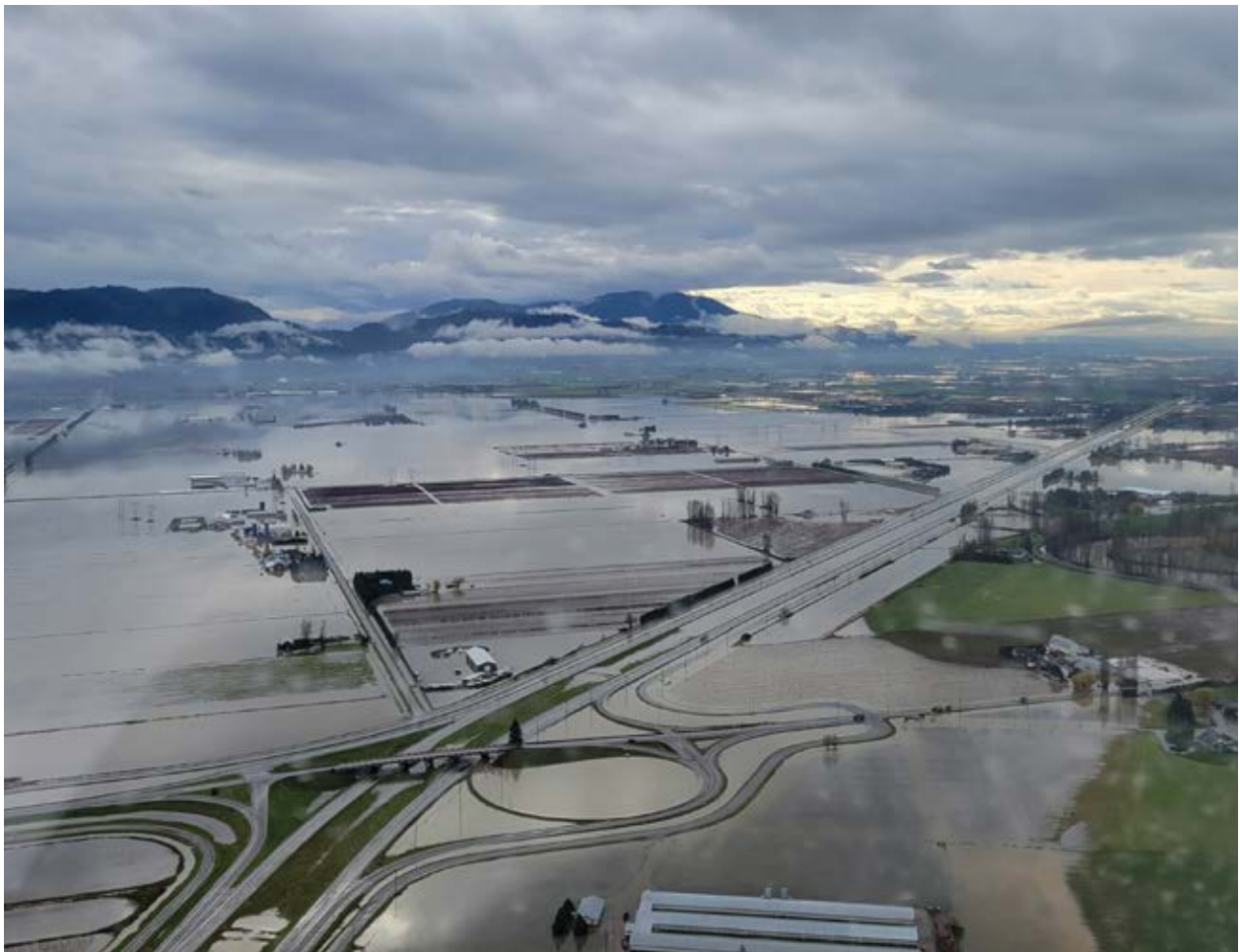


Photo 13 – Flood waters cover Highway 1 in Abbotsford, B.C.

Appendices

Appendix A

Dam Name	Risk Level	Dam Name	Risk Level
Middle Chase River Dam	1 - Alert	Glanzier Creek Dam	2b - Caution
Allan Spring Dam	2a - Caution	Headgates (Duteau Creek Intake)	2b - Caution
Allendale Lake Dam	2a - Caution	Hill Spring	2b - Caution
Bull Lake Dam	2a - Caution	Industry Brook Saddle Dam	2b - Caution
Frank Lake	2a - Caution	Isintok Lake	2b - Caution
Jackpine Lake Dam	2a - Caution	James Lake Dam	2b - Caution
Mccuddy Reservoir #2	2a - Caution	James Lake Saddle Dam	2b - Caution
Monte Lake Dam	2a - Caution	James Lake Spillway Dam	2b - Caution
Mountain Station Reservoir Dam	2a - Caution	John Hart Dam	2b - Caution
Paddy Ryan Lake Lower North	2a - Caution	La Joie Dam	2b - Caution
Pennie Lake Dam	2a - Caution	Ladore Falls Dam	2b - Caution
Pike Mountain FSR Dam	2a - Caution	Lake #7 Dam	2b - Caution
Roche Lake Dam	2a - Caution	Langill Lake Dam	2b - Caution
Silvermere Lake Dam	2a - Caution	Lena Lake Dam	2b - Caution
Spa Lake Dam	2a - Caution	Little Beverly Creek Dam	2b - Caution
Stinking Lake Dam	2a - Caution	McGarrigle Creek Dam	2b - Caution
Ussher Creek Dam	2a - Caution	McGhee Lake South Dam	2b - Caution
A-70-c/94-G-1 Reservoir	2b - Caution	Mclean Lake Dam	2b - Caution
Aberdeen Lake Dam	2b - Caution	Mclean Pond Dam	2b - Caution

Alouette Dam	2b - Caution	Money Lake 1 Dam	2b - Caution
Beaver Lake Dam 3	2b - Caution	Morningstar Golf Course Dam	2b - Caution
Big Meadow Lake Dam	2b - Caution	Naramata Lake Dam	2b - Caution
Bleeker Lake Dam	2b - Caution	Ne-aska-gila Guaw Creek Dam	2b - Caution
Boot Lake Dam	2b - Caution	Oliphant Lake Dam	2b - Caution
Brent Lake Dam	2b - Caution	Oliphant Lake Saddle Dam	2b - Caution
Cambridge Creek Dam	2b - Caution	Oliphant Lake Saddle Dam 2	2b - Caution
Carlisle Creek Dam	2b - Caution	Paddy Ryan Lake Middle	2b - Caution
Centre Star Gulch Lower Dam	2b - Caution	Paynter Lake Dam	2b - Caution
Chain Lake Dam	2b - Caution	Paynter Lake Middle Saddle Dam	2b - Caution
Chute Lake Dam	2b - Caution	Paynter Lake South Saddle Dam	2b - Caution
Coldstream Creek Reservoir Dam	2b - Caution	Prouton Lake (Upper) Dam	2b - Caution
Cotton Dam	2b - Caution	Lake Dam Rainbow	2b - Caution
Crofton Lake Saddle Dam	2b - Caution	Ross Lake Dam	2b - Caution
Crooked Lake Dam	2b - Caution	Saddle Lake Dam	2b - Caution
D-32-c/94-G-07 Reservoir	2b - Caution	Sasamat Lake Dam	2b - Caution
Diana Lake Dam	2b - Caution	Shane Lake Dam	2b - Caution
Dilworth Pond Dam	2b - Caution	Silver Lake Dam	2b - Caution
Doc English Gulch Lake #2 Dam	2b - Caution	South Lake Dam	2b - Caution
Eagle Lake East Dam	2b - Caution	Strathcona Dam	2b - Caution

Eagle Lake West Dam	2b - Caution	Tahltan Lake Creek Dam	2b - Caution
Edward Brook Upper Dam	2b - Caution	Terzaghi Dam	2b - Caution
Ellis Creek Intake	2b - Caution	Toad River Dam	2b - Caution
Ellis South (South Ellis #2)	2b - Caution	Vance Creek	2b - Caution
Farleigh Lake Dam	2b - Caution	Wilmer Creek Dam	2b - Caution
Fraser Lake Dam	2b - Caution	Yellow Lake Dam	2b - Caution
Gaspard Lake Dam	2b - Caution		

Appendix B

The following questions were the basis of the 2021 dam status report questionnaire:

1a *Has your Formal Inspection for 2021 been completed?*

1b *Did the owner conduct the 2021 Formal Inspection?*

1c *If not the owner, who conducted the Formal Inspection?*

1d *Any comments on the 2021 Formal Inspection?*

2a *Did you undertake regular Site Surveillance?*

2b *Any comments on Site Surveillance?*

3a *Have any dam safety concerns been identified in 2021?*

3b *If Yes to dam safety concerns identified in 2021, please elaborate on dam safety concerns.*

3c *If Yes to dam safety concerns identified, has a plan been prepared to address the safety concerns? (Choices: Yes, No or Not Applicable if no concerns)*

3d *If Yes to dam safety concerns identified, have the safety concerns for the dam been addressed? (Choices: Yes, No or Not Applicable if no concerns)*

3e *Any other comments on the plan to address the safety concerns?*

4a Has a Dam Safety Review, as per the Dam Safety Regulation Schedule 2 requirement, been conducted by a Qualified Professional Engineer?

4b If yes is the response to question 4a, what year was the Dam Safety Review conducted? (express as a 4 digit number. eg. 2016)

5a Is your Operations, Maintenance and Surveillance Manual current?

5b What year was the Manual last updated, or if the original Manual is still being used, what year was it created?

6a Is the dam being operated under an up-to-date Dam Emergency Plan (DEP) that was accepted by a dam safety officer?

6b What year was the DEP last updated, or if the original DEP is still being used, what year was it created?

6c Have you submitted the required DEP information to the local emergency authority?

6d Is the emergency contact information in your DEP up-to-date?

7a Has there been any land use development downstream of your dam in 2020 that might affect the failure consequence classification of your dam?

7b If Yes to downstream development, please elaborate.

8a Are there any other comments or suggestions related to dam safety?

9a Is there a change in contact information for this dam?

9b If Yes to a new contact, provide the correct dam contact information

The following table summarizes the number of reports received from the dam owners and where the questions were answered by the respondent, the dam was tallied and only the number of positive responses was collated. Only pertinent questions relating to the performance of the dam owner (that is, Key Performance Indicator) are summarized below.

Summary of the 2021 dam status report results:

Summary of Key Performance Indicators of High to Extreme Failure Consequence Dam Owners	Source	Number of dam status reports tallied	Number of Positive responses
Dam status reports submitted and received	Reports received	361	337
Annual dam inspections completed	Responses to Question 1a	336	322
Site surveillance conducted	Responses to Question 2a	336	332
Current Operations Maintenance and Surveillance manual	Responses to Question 5a	331	330
Current Dam Emergency Plan (DEP)	Responses to Question 6a	335	285
Current DEP with Local Emergency Authority	Responses to Question 6c	335	264
Current dam emergency contact information	Responses to Question 6d	334	297
Verification of land use changes downstream of dam	Responses to Question 7a	361	335



Ministry of
Forests