



# OVERSIGHT OF DAM SAFETY IN BRITISH COLUMBIA

An independent audit report

September 2021



The Honourable Raj Chouhan  
Speaker of the Legislative Assembly  
Province of British Columbia  
Parliament Buildings  
Victoria, British Columbia  
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Dear Mr. Speaker:

I have the honour to transmit to the Speaker of the Legislative Assembly of British Columbia the report *Oversight of Dam Safety in British Columbia*.

We conducted this audit under the authority of section 11(8) of the *Auditor General Act*. All work in this audit was performed to a reasonable level of assurance in accordance with the Canadian Standard on Assurance Engagements (CSAE) 3001—Direct Engagements, set out by the Chartered Professional Accountants of Canada (CPA Canada) in the *CPA Canada Handbook—Assurance*.

A handwritten signature in black ink, appearing to read "Michael A. Pickup". The signature is fluid and cursive.

Michael A. Pickup, FCPA, FCA  
Auditor General of British Columbia  
Victoria, B.C.  
September 2021

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The Office of the Auditor General of British Columbia would like to acknowledge with respect that we conduct our work on Coast Salish territories. Primarily, this is on the Lkwungen-speaking people's (Esquimalt and Songhees) traditional lands, now known as Victoria, and the WSÁNEĆ people's (Pauquachin, Tsartlip, Tsawout, Tseycum) traditional lands, now known as Saanich.

# AUDIT AT A GLANCE

## Why we did this audit

- There are about 1,900 regulated dams that provide electricity, irrigation and flood control for the people of B.C.
- Dams are dangerous and must be properly maintained to minimize their risk of failing.
- Failures can be disastrous for people, the environment and property.
- Owners are responsible for the safety of their dams; the ministry oversees owner compliance.

## Objective

*To determine if the Ministry of Forests, Lands, Natural Resource Operations and Rural Development has effectively overseen the safety of dams in B.C.*

**Audit period: January 2019 to December 2020**

## Conclusion

The ministry has not effectively overseen the safety of dams in B.C. While it promoted dam owner compliance with regulatory requirements, it did not adequately verify or enforce compliance.

The ministry accepted our 9 recommendations to improve its 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

## What we found

### Promoting compliance

#### **Ministry largely promoted dam owner compliance with regulatory safety requirements**

- Information available to dam owners through website and workshops
- Annual mailouts to owners of higher-consequence dams
- Periodic audits of higher-consequence dams

#### **Not all owners of lower-consequence dams understand responsibilities**

- Ministry doesn't do outreach to low-consequence dam owners
- Training is voluntary so dam owners don't always understand their safety responsibilities

[Recommendation 1](#)

### Verifying compliance

#### **Ministry information on dams had gaps and inaccuracies**

- At least 196 dams missing from records--ministry should have been regulating some of these dams
- No province-wide process to identify dams built without authorization
- 63% of dam records sampled lacked key information, such as emergency contact and dam height
- Information in records not always consistent with policies

[Recommendation 2](#), [Recommendation 3](#)

### Verifying compliance (continued)

#### Ministry did not fully verify dam owner compliance with all key regulatory requirements

- Some key safety documents not reviewed
- In audit sample, 33% of operating manuals and 27% of dam emergency plans submitted to ministry not reviewed 3 or more years after submission
- 4 of 10 dam safety officers had backlog of reports to review on whether high-consequence dams are safe. Average time to accept safety reports was 20 months; some took 8 years
- 45% of dams in sample not audited on schedule
- Downstream risk from low-consequence dams not periodically re-assessed
- Ministry expectations unclear on how and when staff should review safety documents from dam owners
- Regional staff priorities compete with dam safety oversight

[Recommendation 4](#), [Recommendation 5](#), [Recommendation 6](#)

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### Enforcing compliance

#### Ministry did not consistently enforce regulatory requirements

- Many dams didn't meet regulatory requirements, and dam owners didn't make improvements to become compliant
- 87 high-risk dams with significant deficiencies had not fixed their safety problems for 7.5 years, on average
- Inadequate ministry tracking and follow-up on deficiencies
- Ineffective mechanisms to deter non-compliance

[Recommendation 7](#), [Recommendation 8](#)

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### Monitoring program performance

#### Ministry did not adequately assess if program improved dam safety

- Inadequate measures and targets for making dams safer overall
- Lack of targets for 12 of 15 performance indicators

[Recommendation 9](#)

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#### After reading the report, you may want to ask the following questions of government:

1. What can the ministry do to further inform dam owners and the public about the importance of dam safety in their communities?
2. Why haven't compliance and enforcement activities been more effective?
3. What risks exist given that compliance and enforcement activities were not effective?

# BACKGROUND

Dams that hold back water offer significant benefits, such as electricity, irrigation, flood control, wildlife habitat and recreation. But dams must be properly maintained to minimize their risk of failing.

Failures can be caused by a single catastrophic event, such as an earthquake, or, more often, by a series of cumulative causes or events.

In B.C. the Ministry of Forests, Lands, Natural Resource Operations and Rural Development is responsible for overseeing about 1,900 regulated dams, all of which are covered in this audit.

For 1,000 of these dams, failure can kill people and damage the environment and property. For the other 900 dams, the impact of failure is lower, only damaging the owner's property.

Dam-related fatalities can be caused by structural failure or by public activities at the dam, such as swimming. Since the early 1900s, there have been two recorded fatalities in B.C. from structural dam failures (1912 and 1948).

The most recent fatal dam incident in B.C. that was not from a structural dam failure occurred in October 2020 at the Cleveland Dam. An operational failure led to an uncontrolled release of a large volume of water through the dam's spillway, flooding the Capilano River canyon in North Vancouver. Two people fishing downstream of the dam were swept away. The BC Coroners Service classified one prior fatality at a dam that resulted from public activity around the dam.

Dam failures do not normally cause fatalities, but they can cause other damage. The ministry reported, on average, three structural dam failures each year over the past five years, most of them causing minimal damage; however, larger failures have occurred in the past. For example, in 2010 the Testalinden Dam failed, destroying or damaging five homes and causing significant damage to crops and farm equipment. The debris covered 200 metres of Highway 97 and blocked several secondary roads. The estimated cost of this dam failure was in the millions of dollars.

## Safety regulation

The ministry regulates dam safety under the *Water Sustainability Act* and the Dam Safety Regulation, which aims to prevent loss of life and mitigate damage to property and the environment from a dam failure.

The ministry checks that dam owners are following the regulatory requirements and enforces the regulation, through the dam safety program and the Compliance and Enforcement Branch. Its oversight involves:

- promoting dam safety to owners
- verifying owner compliance with regulatory requirements
- enforcing compliance with requirements

Ten designated dam safety officers oversee the safety of dams across the province. However, seven of these officers have other duties and do not work full-time on dam safety. The number of dams each officer is responsible for ranges from 47 to 427.

Dams are grouped into five categories based on the significance of the losses that a dam failure could cause (see Exhibit 1). Dam owners must follow regulatory requirements based on the [failure consequence classification](#) assigned to their dam.

**EXHIBIT 1:** *Dams subject to the British Columbia Dam Safety Regulation by failure consequence classification as of December 2020*

Failure consequence classification	Number of dams*
<b>Extreme</b>	43
<b>Very high</b>	84
<b>High</b>	234
<b>Significant</b>	595
<b>Low</b>	842
<b>Unclassified</b>	102
<b>Total</b>	1,900

\*Excludes dams that were not yet built or had been removed.

Source: Data from the Ministry of Forests, Lands, Natural Resource Operations and Rural Development.

# OBJECTIVE

The objective of the audit was to determine whether the Ministry of Forests, Lands, Natural Resource Operations and Rural Development has effectively overseen the safety of dams in B.C.

## Scope

We examined the ministry's oversight of the 1,900 ground and surface water dams regulated under the *Water Sustainability Act* and Dam Safety Regulation.

We did not examine:

- dams being built, such as Site C
- dams owned by oil and gas permit holders overseen by the B.C. Oil and Gas Commission
- mining-related dams that don't store water or wastewater dams

The audit focused primarily on the period from January 1, 2019, to December 31, 2020. It included information from before 2019 as needed to assess the ministry's oversight.

[Learn more about the audit criteria.](#)

[Learn more about how we did this audit.](#)



Mark Creek Dam in the Kootenay Region (extreme-consequence dam).  
Photo credit: Ministry of Forests, Lands, Natural Resource Operations and Rural Development



# CONCLUSION

The ministry has not effectively overseen the safety of dams in B.C. While it promoted dam owner compliance with regulatory requirements, it did not adequately verify and enforce compliance.

## Promoting compliance

The ministry promoted dam safety by providing information and voluntary training for dam owners to understand their regulatory responsibilities. In addition, it conducted outreach for owners of higher-consequence dams. However, it did not conduct regular outreach for owners of low-consequence dams to help them understand their responsibilities.

## Verifying compliance

The ministry did not have complete and accurate information about dams that are subject to regulation. This means it did not have all the information it needed for effective oversight.

The ministry did not adequately verify dam owner compliance with regulatory requirements. This increased the risk that dam owners might not meet regulatory safety requirements. It also increased the risk that their dams could threaten public safety.

## Enforcing compliance

The ministry did not promptly and effectively follow up with dam owners to enforce compliance with key regulatory requirements or to correct physical deficiencies. The ministry required dam owners to take steps when it identified dams that were an immediate threat to public safety. But it did not consistently follow up with dam owners so that they fixed all significant deficiencies to reduce the risk of dam problems.

## Monitoring program performance

The ministry monitored and reported on dam safety activities for some of its program objectives, but it lacked indicators and targets to adequately monitor how well the program was doing at improving dam safety overall.

# FINDINGS AND RECOMMENDATIONS

## Promoting compliance

The Ministry of Forests, Lands, Natural Resource Operations and Rural Development, through the dam safety program, works with dam owners to educate them about the regulatory safety requirements for their dams. The ministry aims to promote voluntary compliance by educating dam owners about their responsibilities for keeping their dams safe.

## Ministry largely promoted dam owner compliance

### What we looked for

We examined if the ministry provided education to dam owners to help them understand their regulatory responsibilities.

[Learn more about the audit criteria.](#)

### What we found

The ministry provided dam owners with education to understand their regulatory responsibilities. There were areas for improvement, such as:

- doing outreach to low-consequence dam owners
- making new dam owners aware they have a dam and providing information on what they need to do to keep it safe
- encouraging more dam owners to take training

The ministry gave dam owners information through its website and linked resources as well as training workshops. The ministry increased the number of workshops in 2019. It created a dedicated position focused on training and worked on developing online training in 2020 as a result of the COVID-19 pandemic. The information is available for all owners who seek it.

The ministry communicates annually with owners of dams classified as significant failure consequence and higher. When dam safety officers visit dams for audits and checks, they educate dam owners about regulatory safety requirements. They do not do annual mailings or regular visits to low-consequence dams; therefore, there is little outreach to these dam owners.

Although the ministry makes information available to all dam owners and does outreach to



Low-consequence dam in northern B.C.

*Photo credit: Ministry of Forests, Lands, Natural Resource Operations and Rural Development*

owners of higher-consequence dams, officers often find that dam owners—especially owners of low-consequence dams—don't fully understand their regulatory responsibilities. A reason for this lack of understanding is that safety training is voluntary. Anyone can own a dam if they buy land with a dam on it.

Also, officers find that new landowners sometimes don't know their property has a dam on it for a year or more after becoming owners, until they receive a bill for the water licence. This is because dams are not on the land title, and smaller dams can look like a natural body of water.

### Why this matters

If they don't know their responsibilities, the owners of low-consequence dams may not meet requirements for keeping their dams safe.

### Recommendation

We recommend that the ministry:

- 1 inform all dam owners of their regulatory responsibilities and encourage them to take dam safety training**

[See the response from the auditee.](#)

## Collecting dam information

Dam safety officers need a complete inventory of, and reliable information about, dams to verify compliance with the Dam Safety Regulation. Reliable information on dams is important if officers are to:

- manage their portfolio of dams
- quickly access information during emergencies

Information on dams is also important for management to:

- monitor program performance
- report on the state of dams, such as dam risk levels and dam owner compliance

When people or businesses build a dam in B.C., they must apply for a water licence. Records for water licences with dams are kept separately from the dam safety database.<sup>1</sup>

## Ministry information on dams had gaps and inaccuracies

### What we looked for

We examined if the ministry had complete and accurate information to oversee dam safety. Specifically, we assessed if the ministry had:

- a complete inventory of dams that require regulation
- complete and accurate information needed to oversee the dams it regulates

[Learn more about the audit criteria.](#)

### What we found

The ministry did not have a complete inventory of dams, and the information on the dams it regulates was not always complete or accurate.

#### Dam inventory not complete

The ministry's inventory of dams was not complete because:

- water licences were issued with dams that were not entered into the dam safety database
- the ministry doesn't have a process to identify unauthorized dams

<sup>1</sup> The centralized database used by dam safety officers that houses data records for each dam is called E-Licensing.

**Water licences with dam works:** Comparing water licences with dams to the ministry's dam inventory, we found 196 dams missing from the program's records. The ministry reviewed 62 of these missing dams and found that at least 14 (23%) are significant enough to require ministry oversight of their safety. There may be even more than 196 missing; for example, because water licences could be issued with other works, such as "dugouts" or "weirs," that could qualify as dams under the regulation.

The records are missing from the inventory because the ministry's water licensing staff granted water licences without informing the dam safety program of the licence. In turn, the ministry lacked a process to compare its records with water licences issued for dams to identify these gaps.

**Unauthorized dams:** The ministry did not have a province-wide process to identify dams built without a water licence, which are therefore unauthorized. The ministry discovered, by chance, up to 24 unauthorized dams per year, depending on the region. For example, an unauthorized dam may be reported by a neighbour or a government employee who spots the dam while doing another task.

#### Dam information not always complete or accurate

Because water licences and dam records have existed for more than 50 years, some dam information is only kept in paper and electronic files and has not been updated to the database. We looked at paper, electronic and database files to assess whether the ministry had complete information on regulated dams. We examined a statistical sample of 24 dams to check the completeness and accuracy of the information.<sup>2</sup> Fifteen of 24 (63%) dams in the sample were missing information in at least one key field.

Key fields in the database included information about the dam owner (such as name and contact information), information about the dam structure (such as height, function and consequence classification), and information about regulatory compliance (such as safety plans).

The ministry's information on dams was not always accurate or consistent with policies. For example, 13 of 24 (54%) dams in the sample had information in key fields in the database that did not match the paper or electronic files, such as when the dam was last audited or whether

<sup>2</sup> Details on the statistical sample of dams we reviewed can be found in [About the audit](#). We used the same sample for each area we examined.

the owner was required to submit an operating manual. Also, dams were listed as not requiring audits when they should have been listed as requiring audits according to the policy for their consequence classification. Information quality was worse for the low-consequence dams, but higher-consequence dams also had quality problems.

Information about dams was not always complete or accurate because:

- the current database was introduced in 2010 and has expanded to include more information, but officers have not prioritized updating the database records within their already heavy workload
- officers stated the database doesn't meet their workflow needs and is inefficient to use; not all officers fully use it

### Why this matters

The ministry can't properly oversee dam owner compliance with the regulation without reliable information, nor can it adequately monitor dam safety or prioritize program resources.

### Recommendations

We recommend that the ministry:

- 2 implement risk-based processes to identify unauthorized dams and dams missing from the dam safety database**

[See the response from the auditee.](#)

- 3 improve the quality of information in the dam safety database so the ministry can efficiently monitor and enforce compliance with the regulation**

[See the response from the auditee.](#)

## Verifying compliance

A key aspect of the ministry's oversight of dam safety is checking if dam owners are following the Dam Safety Regulation. The ministry verifies dam owner compliance in two main ways:

- reviewing regulatory documents that owners submit
- visiting dam sites to carry out safety audits

All dam owners must:

- assess the consequence of dam failure and submit it to the ministry (this must be reassessed every year)
- inspect, maintain and repair their dam to keep it operating well
- exercise reasonable care to prevent the dam causing harm (to people, environment, property)

Owners of dams of significant consequence and higher must meet more regulatory requirements.

For example, they must:

- prepare an operating manual and emergency plan and submit them to the ministry for acceptance
- seek permission from the ministry for any changes to the dam (for example, fix, expand or remove)

Owners of dams of high, very high, and extreme consequence must also:

- periodically submit a Dam Safety Review report

## Ministry did not adequately verify dam owner compliance

### What we looked for

We examined if the ministry had verified dam owner compliance with key requirements in the Dam Safety Regulation—specifically, if the ministry had:

- reviewed all key dam owner regulatory documents, including Dam Safety Reviews
- performed dam safety audits according to the expected schedule and procedures
- verified dam owner compliance with all key regulatory requirements
- assessed quality and consistency of officers' activities to verify dam owner compliance

[Learn more about the audit criteria.](#)

## What we found

The ministry had not adequately verified dam owner compliance with key regulatory requirements. The ministry:

- had reviewed some, but not all, key regulatory documents
- had not conducted dam safety audits following the expected schedule and procedures
- did not have a process to verify compliance with some regulatory requirements
- had not assessed quality and consistency of officers' activities to verify dam owner compliance

### Not all dam safety documents were reviewed

We expected that the ministry would have reviewed all regulatory documents submitted by dam owners. For significant and higher-consequence dams, officers prioritized review of dam owners' plans for repair and removal,<sup>3</sup> and owners' initial consequence assessment. They reviewed some but not all documents, such as operations, maintenance and surveillance manuals (operating manuals); dam emergency plans; and Dam Safety Review reports.

We examined the sample to check for evidence of the ministry's review of the documents required by regulation. Not all dam owners had to submit all documents. What they submitted depended on the dam consequence classification and whether the owner planned to repair or remove their dam.

**Repair or removal plans:** Officers prioritized their review of dam owner plans for repair or removal. In the sample, officers promptly reviewed plans for repair or removal submitted by dam owners. In some cases, officers visited the dams during the repair or removal work for additional checks.

**Initial dam consequence classification assessment:** The dam owner or a dam safety officer had done an initial consequence assessment for most dams. Twenty of the 24 dams in the sample (83%) had documentation of the initial consequence classification.

**Operating manuals and emergency plans:** Operating manuals and emergency plans were not always reviewed and accepted. In the sample, 6 of 13 dam owners submitted the required operating manual, and 11 of 13 dam owners submitted the required emergency plan. Officers had not completed their review of some of these documents three or more years after submission:

- 2 of 6 (33%) operating manuals had not been reviewed
- 3 of 11 (27%) emergency plans had not been reviewed

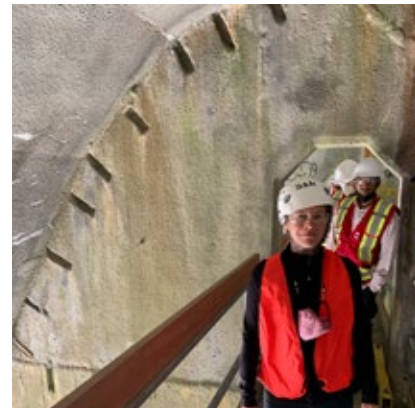
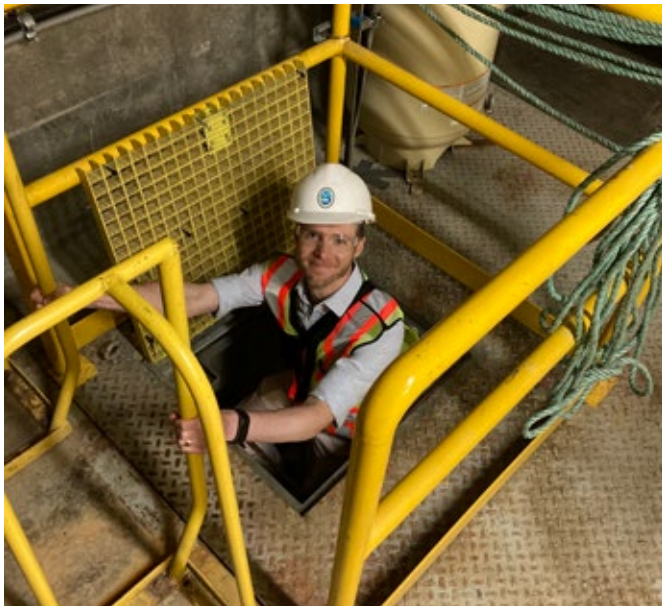
<sup>3</sup> The technical term for removal of a dam is "decommissioning."



We expected that the ministry would have defined how quickly the regulatory documents should be reviewed once dam owners submitted them. We found there were no formal expectations in ministry policy or guidance. Officers considered these documents important but found their workload required them to prioritize other more urgent aspects of their dam safety work. Estimates from program staff, and a business case, stated that they would need another five central and five regional staff to meet all aspects of the program's mandate.

**Dam Safety Review reports** (DSRs) were not always reviewed for compliance with ministry policy and guidelines.

We expected the ministry would have defined how—and how quickly—the reports should be reviewed, and that its reviews would include all elements in the legislated guidelines.



Staff from OAGBC, BC Hydro, and the ministry visit Elliott Dam and Jordan Diversion Dam on Vancouver Island (very high-consequence dams). July 2021

Photo credit: Office of the Auditor General of British Columbia (OAGBC)

The ministry did not have a defined benchmark for how quickly DSRs should be reviewed. Officers stated that an ideal turnaround time would be one to two months. The ministry did not have a DSR template that included all the elements in the legislated guidelines for professional engineers to follow. In addition, there was insufficient guidance and training for officers on how to review the reports, including gaps and lack of clarity in the DSR checklist the officers use to review whether the reports meet the guidelines.

Four of 10 officers<sup>4</sup> reported a backlog of reports to review. The average time between reports being submitted and the ministry accepting them was 20 months; some had taken 8 years.

The backlog was a result of officer workload. The officers told us their schedules rarely allowed for the uninterrupted stretch of time they needed to review these complex technical reports.

Our subject matter expert assessed three DSR reports that the ministry had accepted for compliance with guidelines for legislated dam safety reviews in B.C. Two of the reports were missing elements required by the legislated guidelines. Most importantly, they didn't contain adequate recommendations to guide dam owners on key safety issues. The third report was more complete, but it lacked a summary and recommendations to guide the dam owner.

#### Dam safety audits didn't consistently follow schedule or procedures

We found the ministry had not performed dam safety audits according to the expected schedule and procedures. Ministry policy requires officers to audit significant-consequence dams once every 10 years, and high-, very high- and extreme-consequence dams every 5 years. While officers aimed to conduct their scheduled audits each year, we found:

- audits were not always completed on schedule
- audits did not consistently follow procedures

This led to inconsistencies in the ministry's oversight of dam owners' compliance with regulatory safety requirements.

**Audit schedule:** The ministry did not consistently conduct dam safety audits according to the expected schedule. Overall, 28% of dams in the database were past their next audit date; they were overdue by 3.5 years, on average. In the sample, 5 of 11 (45%) dam audits had not been completed on time. While officers considered audits a priority, they were not always able to complete them on schedule because of their workloads and competing priorities.

<sup>4</sup> There were 13 designated dam safety officers, but only 10 officers were assigned specific dams for oversight. We interviewed the 10 officers who were assigned dams for oversight.

The minimum audit frequency was set based on staff resources, not on a risk assessment. Several officers were concerned that auditing significant-consequence dams every 10 years, as required by the current policy, is not frequent enough. Without frequent contact, they found dam owners were less likely to fix problems with their dams, and the problems could become more serious over time. When officers have time, they will visit dams they consider higher risk more frequently than the minimum required under the audit policy.

**Audit policy and procedure:** The ministry did not consistently carry out dam safety audits according to policy and procedure.

According to the Dam Safety Audit Program policy, officers should:

- complete the inspection checklist while dam owners are present
- update the database upon return to the office
- send follow-up letters to dam owners summarizing audit findings

We found the ministry:

- was not completing the audit checklist when dam owners were not present to confirm their compliance with certain requirements
- was not always updating the database with information from the audits, and their assessments of dam owners' overall compliance with the regulation were inconsistent
- was not always sending follow-up letters to dam owners, including setting a timeline for the dam owner to fix the problems identified

These problems were caused, in part, by officers receiving insufficient guidance on program expectations for follow-up if dam owners are not present for the audit, as well as a lack of guidance on what to enter into the database and what content is required for follow-up letters.

#### No process to verify some key regulatory requirements

The ministry did not have a process to fully verify dam owner compliance with two key regulatory requirements:

- annual review of consequence classification
- public safety around dams

**Annual review of consequence classification:** For 15 of 22 dams (68%) in the sample, the ministry did not assess dam owner compliance with the requirement to reassess the consequence classification annually.<sup>5</sup>

<sup>5</sup> Two dams in the sample were recently discovered and therefore had not yet been through an audit cycle.

The audit checklist did not cover the requirement for dam owners to verify the consequence classification annually.

Owners of dams classified as high, very high and extreme consequence are required to submit an annual dam status report. However, this report is not designed to fully address the regulatory requirement. The report does not directly ask dam owners if they have verified the consequence classification annually, as required by the regulation.

The ministry did not have a process to assess compliance with the requirement to annually reassess consequence classification for low-consequence dams. It did not include low-consequence dams in its audit program and did not require the owners to submit an annual dam status report. The ministry's rationale was that it prioritized higher risk dams because it did not have the staff resources to systematically assess compliance by the owners of low-consequence dams.

**Public safety around dams:** The ministry also did not have a process by which officers could assess whether owners are, within the scope of the regulation, exercising reasonable care to avoid the risk of significant harm to the public around dams. Public safety around dams was not included as an item in the audit checklist. However, dam audit notes showed that officers sometimes raised the issue—for example, they would note the need for signs to warn the public not to swim at the dam.

Officers identified a lack of clarity and guidance from the ministry on how to approach verifying and enforcing dam owners' responsibility to protect public safety around dams, within the scope of the regulation.



Spillimacheen Dam in the Kootenay Region (significant-consequence dam).  
Photo credit: Ministry of Forests, Lands, Natural Resource Operations and Rural Development

### No process to verify quality and consistency of oversight practices

We expected that the ministry would have processes to assess the quality and consistency of officers' activities to verify dam owners' compliance with the regulation, such as reviewing regulatory documents and conducting audits. However, the ministry did not have a process that would allow management to assess the quality and consistency of officers' activities to verify dam owners' compliance with the regulation. Ministry management held regular meetings with dam safety officers to promote quality and consistency, but it did not verify that policies were implemented consistently, including the:

- Dam Safety Audit Program policy
- Dam Safety Review checksheet
- Dam Safety Compliance and Enforcement policy

We also found there was inconsistency in the practices officers followed for verifying compliance with the regulation. For example, there were significant differences in how officers approached the DSR review process. Some looked only at whether the reports had all items in the checklist, while others did an in-depth review, including redoing the engineer's modelling and calculations. Some checked the engineer's qualifications against the guideline requirements, while others did not.

The ministry reported that it did not carry out quality assurance reviews because it could not hold staff accountable to meet central program expectations. Only the three Victoria-based officers are directly accountable to program management. The other seven officers are accountable to regional managers for direction, priorities and performance management. Regional managers assign dam safety officers to other duties, such as flood safety, that can compete for their attention at key times of the year. Officers reported that these assignments affect their ability to complete their dam safety workload.

### Why this matters

If the ministry does not always verify dam owners' compliance with regulatory safety requirements, it won't know if dam owners are keeping their dams safe. Nor will it know where to focus enforcement efforts.

Neither the ministry nor dam owners will know if dams are "safe," "reasonably safe" or "not safe" if the ministry does not verify that Dam Safety Review reports meet requirements and does not update the database with key information. Nor will the ministry know about problems that need attention to make dams safe. For example, an officer learned of a DSR report that had a "not safe" conclusion, but the previous officer had not flagged it for follow-up. It was two years before the officer learned the dam was not safe and took appropriate action.

The ministry's decision not to periodically assess whether owners of low-consequence dams are complying with requirements is a reasonable approach if the consequence classification is valid, because low-consequence dams should not cause significant damage if they fail. But because the ministry doesn't periodically check the classification or check that dam owners are verifying the classification each year, it does not know if the original consequence classification is still valid. For example, the classification could change if a housing development was built after the dam was built. This means some dams could have a lower classification than they should. As a result, dam owners may not be meeting the regulatory safety requirements for their dam. Officers have seen examples of this.

## Recommendations

We recommend that the ministry:

### **4 improve processes to promptly and consistently review dam owner compliance with the regulation**

[See the response from the auditee.](#)

### **5 review risks and determine:**

- the appropriate frequency for dam safety audits
- an appropriate process to periodically verify classification for low-consequence dams

[See the response from the auditee.](#)

### **6 strengthen accountability mechanisms for central staff to lead regional staff in achieving consistent and timely oversight of dam safety**

[See the response from the auditee.](#)

## Enforcing compliance

The ministry's policy is to focus compliance and enforcement resources on dams with higher-consequence classifications. It expects dam safety officers will get dam owners to comply voluntarily. But if a dam owner does not comply, dam safety officers can seek enforcement help from natural resource officers in the Compliance and Enforcement Branch.

Natural resource officers can enforce the *Water Sustainability Act* and the Dam Safety Regulation. The ministry expects natural resource officers to work with the dam safety officer. Natural resource officers have the lead role in escalating enforcement options.

The ministry's compliance and enforcement policy promotes consistency across the province to ensure that all dam owners and operators face the same compliance, monitoring and enforcement actions.

Enforcement options are administrative and prosecutorial.

- Administrative options include advisories, warnings, directives (orders) and administrative sanctions such as cancelling an authorization.
- Prosecutorial options include tickets and court prosecutions.

To guide its compliance and enforcement actions, the ministry has defined risk levels to identify at-risk dams. Dam safety officers assess the probability of a dam failing when they audit the dam or when they receive new information about the dam. They combine this rating with the consequence classification to provide a risk-level rating, as shown in Exhibit 2. Only significant- and higher-consequence dams can have the highest risk-level ratings of 1 or 2.

**EXHIBIT 2:** Dam risk-level descriptions and number of dams at each risk level as of December 2020

Risk level	Description	No. of regulated dams*
<b>1—Alert</b>	Immediate attention is required by the dam owner.	1
<b>2a—Caution (not cooperative)</b>	The dam owner has considerable work to be compliant; however, owner is not actively working on correcting deficiencies.	24
<b>2b—Caution (cooperative)</b>	The dam owner has considerable work to be compliant and is actively working on correcting deficiencies.	62
<b>3—Stable</b>	Dam safety officer may require periodic evaluations by qualified engineers.	240
<b>4—No concern</b>	Dam still to be included in regular audit program.	636
<b>5—Effectual</b>	Limited auditing oversight needed.	568
<b>6—None</b>	Dam has not yet been audited to determine risk level.	10
<b>Blank</b>	No risk-level information entered in database.	359

\*Excludes dams that were not yet built or had been removed.

Source: Data from Ministry of Forests, Lands, Natural Resource Operations and Rural Development database, analyzed by the Office of the Auditor General of British Columbia.

## Ministry did not consistently enforce dam owner compliance

### What we looked for

We examined if the ministry took consistent and prompt follow-up action with dam owners when they did not comply with regulatory requirements or fix dam deficiencies.

[Learn more about the audit criteria.](#)

### What we found

The ministry:

- had not consistently enforced dam owner compliance with regulatory requirements
- had not taken sufficient steps to get dam owners to correct all significant physical dam deficiencies
- had not implemented an effective system to track problems that could cause dams to become hazardous

### Compliance with regulatory requirements not adequately enforced

The ministry did not effectively follow up with dam owners who had not complied with key regulatory requirements.

Thirteen of the 24 dams in the sample had evidence of regulatory non-compliance that required the ministry to follow up with dam owners. Two of these were low-consequence dams, but the other 11 were significant consequence or higher.

- For 3 of these 13 dams, the ministry had not followed up on the non-compliance.
- For the other 10 dams, the ministry had taken the first step of asking dam owners to comply.

The ministry's follow-up achieved compliance for only 1 of the 13 dams, and partial compliance for two others. There was no evidence the dam owners had complied with requirements for the remaining 10 dams (77%). The time since dam owners were first non-compliant ranged from 3 to 11 years. The ministry did not take further steps, as recommended in its guidance. Those steps include visits from a natural resource officer to enforce compliance, writing a ticket or issuing an order.



### Fixing physical dam deficiencies not adequately enforced

The ministry did not take sufficient steps to get dam owners to correct physical dam deficiencies. It also lacked an effective system to track and follow up on non-compliance.

As of December 2020, 87 dams were at the highest risk levels (1, 2a and 2b—see [Exhibit 2](#)). On average, the dams had been at that high risk level for 7.5 years.

The ministry's database allows officers to enter information about dam deficiencies, including a description of the deficiency, a deadline to resolve it and a conclusion on whether it has been resolved. Only 93 deficiencies had been entered into the database since this feature was enabled more than three years ago. Only 28 of these had a deadline for the owners to resolve the deficiency. Officers can set the system to remind them to follow up on deficiencies, but if an officer left their position, the reminders did not pass on to the next officer responsible for overseeing those dams.

We looked in more detail at the ministry's compliance and enforcement activities for 3 of the 24 dams assessed at Risk Level 2a, where the owners were not actively working to correct deficiencies.

- For one of the three dams, the ministry's follow-up actions aligned with the compliance and enforcement guidance.
- For the other two dams, the deficiencies had been identified around 2013, but there was no evidence of any follow-up action taken for the next six years.
- New dam safety officers took over responsibility for the two dams in 2019. In both cases, officers restarted their compliance activities because there wasn't enough information about their predecessors' actions and decisions to build on.
- The ministry had not yet escalated its compliance and enforcement actions as outlined in its guidance. Both dams still have the originally identified deficiencies that pose safety risks.

Eleven of the 24 dams in the sample had physical deficiencies identified through Dam Safety Reviews, inspections, audits or rapid dam assessment. For six of these dams (55%), there was no evidence of ministry follow-up after the initial deficiency was identified and the dam owner informed. And there was no evidence, over periods of between 4 and 13 years, that the dam owner had fixed the deficiency.

Some causes of the ministry's insufficient enforcement activities were similar to those in previous sections:

- Dam safety database—Problems with the use and functionality of the database led to officers not effectively tracking and following up on deficiencies.

- Staff workload and prioritization—As noted above, program staff estimated an additional five central and five regional staff were needed to meet the program's mandate.

Officers reported that they are not using the compliance and enforcement mechanisms available to them. Officers saw the fines for violations as too low to deter non-compliance.<sup>6</sup> If an officer issues an order to a dam owner to fix a deficiency and the owner does not comply, the ministry would need to forward the matter to Crown Counsel, who would decide whether to take it to court.<sup>7</sup> Officers were reluctant to take this step because of the time demands and the risk that the matter would not be resolved quickly. The *Water Sustainability Act* allows for administrative monetary penalties for non-compliance, but the regulation does not include any.

### Why this matters

Dam owners are less likely to fix deficiencies that pose a risk to public safety if compliance is not enforced effectively. They are also less likely to have adequate dam management systems to prevent and respond to safety hazards. At the end of our audit period in December 2020, the ministry's database showed 557 of 926 dams (60%) of significant or higher consequence were not compliant with the regulation. They were missing one or more safety requirements, such as an operating manual, emergency plan or Dam Safety Review.

Effective enforcement is important to deter other potential violators.

### Recommendations

We recommend that the ministry:

#### **7** implement processes to efficiently monitor compliance and enforcement activities

[See the response from the auditee.](#)

#### **8** evaluate staffing needs to meet oversight objectives, and staff accordingly

[See the response from the auditee.](#)

<sup>6</sup> For example, fines for violations related to building a dam without authorization are \$230, while the water licence application fee for a dam storing less than 30,000 cu. m is \$250.

<sup>7</sup> Crown Counsel are prosecutors who work for the BC Prosecution Service under the Ministry of Attorney General. The BC Prosecution Service operates independently of government and within the justice system. They do not represent the government, the police or the victim of an offence.

## Monitoring program performance

Effective program management requires the establishment of measurable performance indicators and targets that show over time if a program is working or achieving objectives. Monitoring program effectiveness allows decision-makers to evaluate if a program is meeting its goals and objectives. This lets them effectively manage limited resources and change policy direction if needed.

The ministry publishes an annual report on the dam safety program's activities.

### Ministry did not adequately assess if program improved dam safety

#### What we looked for

We examined if the ministry had performance measures and targets to monitor and report on the effectiveness of its dam safety activities.

[Learn more about the audit criteria.](#)

#### What we found

The ministry did not have adequate performance measures and targets to monitor and report on the effectiveness of its dam safety activities.

In the dam safety program annual reports for 2018–19 and 2019–20, the ministry had 6 objectives, 15 performance indicators and 3 targets to report on its dam safety activities; 12 of 15 performance indicators didn't have targets.

These 15 performance indicators let the ministry measure performance in meeting 3 of the program's 6 objectives:

- training dam owners
- reviewing dam project plans
- supporting emergency planning and response to incidents

A fourth program objective—monitoring dam owner compliance with the Dam Safety Regulation—can be partly measured with the 15 indicators.

However, the ministry did not have performance indicators to adequately measure the achievement of two objectives that represent the overarching desired program outcomes: making dams safer and mitigating losses from dam breaches. For example, there were no indicators to measure the following outcomes:

- the number of dam deficiencies and the proportion corrected over a year
- actions taken to achieve compliance and the improvement in compliance
- changes in dams' risk level from year to year

The ministry is revising its performance indicators and targets.

### Why this matters

The ministry needs good performance monitoring to know how well the program is functioning. This would support decisions about where to focus future efforts and how to adjust activities to continue improving dam safety.

### Recommendation

We recommend that the ministry:

- 9** **develop and report on performance measures and targets that adequately show the effectiveness of the ministry's oversight of dam safety**

[See the response from the auditee.](#)



Left: Falls River Dam in the Skeena Region (significant-consequence dam).



Right: Elko Dam in the Kootenay Region—dam spillway gate opening system (significant-consequence dam).

*Photo credit: Ministry of Forests, Lands, Natural Resource Operations and Rural Development*



# ABOUT THE AUDIT

We conducted this audit under the authority of section 11(8) of the *Auditor General Act* and in accordance with the Canadian Standard on Assurance Engagements (CSAE) 3001—Direct Engagements, set out by the Chartered Professional Accountants of Canada (CPA Canada) in the *CPA Canada Handbook—Assurance*. These standards require that we comply with ethical requirements and conduct the audit to independently express a conclusion against the objective of the audit.

A direct audit involves understanding the subject matter to identify areas of significance and risk, and to identify relevant controls. This understanding is used as the basis for designing and performing audit procedures to obtain evidence on which to base the audit conclusion.

The audit procedures we conducted included analysis of data in the ministry's water licensing and dam safety databases, review of a statistical sample of dam files, review of selected files by an independent subject matter expert, analysis of key documentation, and interviews with:

- program staff and management
- dam safety officers across the province
- Compliance and Enforcement Branch management
- external stakeholders such as the BC Cattlemen's Association and Engineers and Geoscientists BC

We also consulted with our independent subject matter expert on the audit findings and report.

The statistical sample was drawn from the population of regulated dams, excluding dams that were not yet built or had been removed. The sample parameters were 90% confidence level and 10% error rate, which resulted in a sample of 24 dams. The composition of the sample by consequence classification was: Very high = 1; High = 3; Significant = 9; Low = 11.

We believe the audit evidence we have obtained is sufficient and appropriate to provide a basis for our conclusion.

Our office applies the Canadian Standard on Quality Control (CSQC 1), and we have complied with the independence and other requirements of the code of ethics issued by the Chartered Professional Accountants of British Columbia that are relevant to this audit.

**Audit report date:** August 8, 2021

A handwritten signature in black ink, appearing to read "Michael A. Pickup". The signature is written in a cursive, flowing style.

Michael A. Pickup, FCPA, FCA  
Auditor General of British Columbia  
Victoria, B.C.

# APPENDIX A: RECOMMENDATIONS AND AUDITEE RESPONSE

**RECOMMENDATION 1:** We recommend that the ministry inform all dam owners of their regulatory responsibilities and encourage them to take dam safety training.

**RECOMMENDATION 1 RESPONSE:** **The ministry agrees with this recommendation.**

The Ministry annually provides information about regulatory responsibilities and dam safety training to High, Very High, and Extreme Consequence dam owners. Going forward, the Ministry will explore options to expand this correspondence to include Low and Significant Consequence dam owners.

**RECOMMENDATION 2:** We recommend that the ministry implement risk-based processes to identify unauthorized dams and dams missing from the dam safety database.

**RECOMMENDATION 2 RESPONSE:** **The ministry agrees with this recommendation.**

The Ministry will update its procedures on how unauthorized dams are identified and review options for subsequent actions to ensure regulatory compliance.

The Ministry will develop processes to periodically review and update its dam safety database so that all regulated dams can be represented in the database.

**RECOMMENDATION 3:** We recommend that the ministry improve the quality of information in the dam safety database so the ministry can efficiently monitor and enforce compliance with the regulation.

**RECOMMENDATION 3 RESPONSE:** **The ministry agrees with this recommendation.**

The Ministry will review data fields, develop procedures around what data fields need to be captured and review communications with dam owners to ensure that required information is provided.

**RECOMMENDATION 4:** We recommend that the ministry improve processes to promptly and consistently review dam owner compliance with the regulation.

**RECOMMENDATION 4 RESPONSE: The ministry agrees with this recommendation.**

The Ministry will improve data quality and review our processes to ensure that regulatory document reviews and dam owner compliance matters are completed promptly and consistently.

**RECOMMENDATION 5:** We recommend that the ministry review risks and determine:

- the appropriate frequency for dam safety audits
- an appropriate process to periodically verify classification for low-consequence dams

**RECOMMENDATION 5 RESPONSE: The ministry agrees with this recommendation.**

The Ministry will review the appropriate frequency for dam safety audits and develop processes to verify classification for Low Consequence dams.

**RECOMMENDATION 6:** We recommend that the ministry strengthen accountability mechanisms for central staff to lead regional staff in achieving consistent and timely oversight of dam safety.

**RECOMMENDATION 6 RESPONSE: The ministry agrees with this recommendation.**

The Ministry will review the governance of its Dam Safety Program and develop options/measures to strengthen accountability mechanisms.

**RECOMMENDATION 7:** We recommend that the ministry implement processes to efficiently monitor compliance and enforcement activities.

**RECOMMENDATION 7 RESPONSE: The ministry agrees with this recommendation.**

The Ministry will conduct a review of dam related compliance and enforcement activities to develop and implement processes to help ensure dam owners are complying with the regulation.



**RECOMMENDATION 8:** We recommend that the ministry evaluate staffing needs to meet oversight objectives, and staff accordingly.

**RECOMMENDATION 8 RESPONSE:** **The ministry agrees with this recommendation.**  
The Ministry will evaluate staffing needs to meet dam safety regulatory oversight objectives.

**RECOMMENDATION 9:** We recommend that the ministry develop and report on performance measures and targets that adequately show the effectiveness of the ministry's oversight of dam safety.

**RECOMMENDATION 9 RESPONSE:** **The ministry agrees with this recommendation.**  
The Ministry will determine effective performance measures and targets that show the effectiveness of the Ministry's Dam Safety Program.

# APPENDIX B: AUDIT CRITERIA

## 1. Promoting compliance and dam information

- 1.1 The ministry has complete and accurate information about dams that are subject to regulation.
- 1.2 The ministry has provided dam owners with education and awareness to understand their regulatory responsibilities.

## 2. Verifying compliance

- 2.1 The ministry has assessed dam owner compliance with key regulatory and policy requirements:
  - a) determine failure consequence classification within 60 days for newly constructed dams and reassess consequence classification annually
  - b) submit an operational, maintenance and surveillance manual for significant-, high-, very high- or extreme-consequence dams within 60 days of dam construction
  - c) prepare and submit a dam emergency plan within 60 days of dam construction for significant-, high-, very high- or extreme-consequence dams, or provide a record of emergency contact within 60 days of dam construction for low-consequence dams
  - d) submit an annual dam status report for owners of high-, very high- and extreme-consequence classification dams that confirms compliance with requirements in Schedule 2 of the Dam Safety Regulation
  - e) take steps when becoming aware of hazardous conditions with a dam
  - f) exercise reasonable care to avoid the risk of significant harm to public safety resulting from other conditions at the dam or operations or actions at or in connection with the dam (e.g., signage, buoys, audible signals)
  - g) gain authorization and provide reports for alterations, improvements to or replacement of all or part of a dam, and for removing, decommissioning, deactivating or stopping operation of a dam
- 2.2 The ministry has carried out dam safety audits according to the schedule and procedures set under policy.
- 2.3 The ministry has adequately reviewed Dam Safety Reviews for compliance with requirements set out in program policy and guidelines.

## 3. Enforcing compliance

- 3.1 The ministry has followed up with dam owners to address regulatory non-compliance.
- 3.2 The ministry has ensured dam owners correct physical deficiencies identified in Dam Safety Reviews, audits or other inspections in a timely way.

## 4. Program and performance management

- 4.1 The ministry has ensured the quality and consistency of its dam oversight practices across the province.
- 4.2 The ministry has monitored the program's performance using measures and targets that demonstrate achievement of the program's objectives.

# APPENDIX C: FAILURE CONSEQUENCE CLASSIFICATION CATEGORIES

Classification	Definition
Extreme	Loss of life for over 100 people. Extremely high economic and critical property losses. Major damage to critical environments/species or cultural damage and impossible restoration/compensation.
Very high	Loss of life for up to 100 people. Very high economic and important property losses. Significant damage to critical environments/species or cultural damage and impractical restoration/compensation.
High	Loss of life for up to 10 people. High economic and property losses. Significant environmental or cultural damage and possible restoration/compensation.
Significant	Loss of life possible due to people passing through. Low economic and property losses. No significant environmental or cultural damage and possible restoration/compensation.
Low	No loss of life. Property damage to dam owner only. Short-term environmental or cultural damage.
Unclassified	Failure consequence has not yet been determined. Ministry stated that around half of these are newly built dams in the northeast that are currently being assessed, while the other half have not been assessed and may be of concern.



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#### Cover image:

Revelstoke Dam in the Kootenay Region  
(extreme-consequence dam).

Photo credit: Ministry of Forests, Lands, Natural  
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