

B.C. DAM SAFETY PROGRAM ANNUAL REPORT 2016/2017

SUMMARY

This annual report summarizes the achievements, challenges and ongoing improvements to the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) dam safety program. In 2016/2017, the program regulated approximately 1,814¹ dams in British Columbia that divert and/or store surface water or groundwater. These structures include dams associated with hydro-electric power generation, agricultural irrigation, industrial use, municipal water supply and domestic use, and structures that regulate lake or river levels for flood control. They also include dams associated with dugouts. Since the *Water Sustainability Act* and updated Dam Safety Regulation came into force early in 2016, much effort has been expended in raising awareness of the new Regulation and supporting its compliance in 2016/17. Highlights of the 2016/2017 dam safety program include:

Operations

Program Indicators	Number/Percentage completed
Dam construction, rehabilitation or removal plans reviewed	53
Dam construction, rehabilitation, upgrading or decommissioning monitored	31
Dam Operations, Maintenance and Surveillance manuals reviewed	43
Dam Emergency Plans reviewed	23
Dam failure consequence classifications reviewed	13
Number of newly trained people in dam inspection and maintenance	52
Number of FLNRORD Natural Resource Officers trained to assist in compliance and enforcement investigations	11
Dams audited	119
Percentage of 2016 annual reports received from owners of 350 high, very high and extreme failure consequence dams	98%
Percentage of dams inspected, as reported by dam owners in the 2016 annual dam status reports	91%
Percentage of all water supply dams registered with the Dam Safety Program whose location can be viewed on Google Earth or through DataBC	82%
Dam alert responses	1
Dam incident response	4
Dam non-incident response	1
Dam failure response	0

¹ It is anticipated that the number of regulated dams will increase as more groundwater-filled structures and existing water supply dams and dugouts, associated with oil and gas activities in the Northeast region of B.C., are assessed and regulated under the *Water Sustainability Act* and Dam Safety Regulation.

Program Accomplishments

- The dam safety program notified known dam owners by mail of changes to the Regulation that came into effect on February 29, 2016.
- Dam safety staff regularly updated the dam database over the past year to improve performance.
- Dam safety staff provided education to other provincial government staff to assist in dam safety monitoring.
- Dam safety staff participated in professional development provided internally by FLNRORD and externally by other jurisdictions and professional associations.
- Dam safety staff, together with the Ministry of Environment and Climate Change Strategy, participated in policy development advancing the Dam Safety Regulation. They also developed guidance documents to assist dam owners with meeting their regulatory obligations.
- FLNRORD and the Oil and Gas Commission (OGC) collaborated to establish a dam safety program within the OGC, as part of its water authorization function under the *Water Sustainability Act*.

The dam safety program has been successful in a number of areas this year and continues to work toward addressing challenges, including:

Low consequence dams: Dam safety officers (DSOs) currently address issues with low consequence dams on a reactive or complaint-driven basis. The program is exploring opportunities for additional capacity to proactively engage with owners of low consequence dams.

Information system: The current dam database does not contain a workflow system to support DSO activities. The program is pursuing funding through the Water Information Services Project to enhance the database and improve the quality of information captured.

Succession Planning: A number of the current DSOs are nearing retirement. The program will undertake succession planning for key positions to reduce the risk of vacancies that could impact program delivery.

Unauthorized dams: The proliferation of dams and dugouts as a result of the oil and gas activities in the Northeast region of B.C. is being carefully handled by FLNRORD and OGC to ensure that unauthorized and unregulated water structures are brought into compliance with the *Water Sustainability Act* and the Regulation.

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INTRODUCTION

This annual report summarizes the achievements, challenges and ongoing improvements to the Ministry of Forests, Lands, Natural Resource Operations and Rural Development's (FLNRORD) dam safety program for the period April 1, 2016 to March 31, 2017. The publication of an annual *Dam Safety Program Report* meets a key public accountability commitment made by the B.C. Government following the 2010 Testalinden Dam failure.

B.C.'s Dam Safety Program

The aim of the Dam Safety Program is to promote the safety of water storage dams in B.C. by:

- Providing education to dam owners and dam safety professionals.
- Monitoring dam owner compliance with the Dam Safety Regulation.
- Reviewing project plans for consistency with Canadian Dam Association Guidelines and other industry standard practices.
- Supporting emergency planning and response for dam safety incidents.

History and Regulatory Framework

B.C.'s dam safety program began in 1967 in response to the rapid development of large hydroelectric dams in B.C. At that time, dams greater than 15 metres in height were inspected by government engineers under the authority of the *Water Act*. Over time, the program expanded to include smaller dams. Inspections focused on ensuring the dams were designed, constructed, operated and maintained to acceptable standards for public safety.

The first B.C. Dam Safety Regulation under the *Water Act* was brought into force in 2000 based on recommendations of an independent program review of the 1995 Cannon Creek Dam failure. The regulation placed legal responsibility for the safety of dams on dam owners, requiring owners to operate, maintain and inspect dams to minimize risk to the public, the environment and the economy. In addition to the new regulation, the program review recommended enhancements to the dam safety program to improve rigour, consistency and accountability, and to ensure adequate resources to deliver the program across the province. The review also recommended that the program follow the standards and guidelines of the Canadian Dam Association (CDA).

Further improvements were made to the regulation and the program in response to recommendations of the Deputy Solicitor General following the 2010 Testalinden Dam failure. These included developing a

comprehensive database of dams in the province, requiring signage at dams, updating failure consequence classifications and making dam-owner education a cornerstone of the program.

On February 29, 2016, the *Water Sustainability Act* (WSA) and Dam Safety Regulation (Regulation) came into force replacing the former *Water Act* and B.C. Dam Safety Regulation. The WSA maintains the system of water rights in B.C. for streams and brings groundwater into the water rights scheme. The Regulation therefore now applies to dams in B.C. that impound stream water and/or groundwater under the WSA.

Program Delivery and Operations

The Dam Safety Program is delivered through a distributed model administered jointly between the Dam Safety Section in Victoria and designated dam safety officers (DSOs) based in eight FLNRORD regional offices throughout the province, and the B.C. Oil and Gas Commission (OGC). The Dam Safety Section in Victoria is responsible for overall administration of the program, in close collaboration with regional and OGC DSOs. This includes leading development of legislation, policies and procedures, coordinating delivery of dam-owner education, reporting progress on program objectives, meeting the program's information systems needs, and leading the dam safety community of practice. DSOs in the Dam Safety Section are also responsible for regulating most water supply dams greater than nine metres in height (also known as major dams). Dam safety officers based in FLNRORD regional offices are generally responsible for dams that are less than nine metres high within their regions. Dam safety officers in the OGC are responsible for dams that are owned by oil and gas permit holders, including major dams. The program also receives significant support from FLNRORD's compliance and enforcement branch and partner agencies such as Emergency Management BC.

Dam safety officers undertake the following activities in the course of administering the dam safety program.

- Conduct periodic audits of dam owners' dam safety management systems to ensure that dam owners are compliant with the regulation and dam safety management systems are consistent with government and CDA guidelines.
- Review annual dam status reports submitted by dam owners summarizing their dam safety activities, as required by the regulation.
- Review formal dam safety reviews completed by an engineer on behalf of the dam owner every 7 to 10 years.
- Monitor dam owners' progress on addressing any potentially hazardous conditions at their dams, as identified through dam safety reviews, audits, regular inspections or any other means.
- Review plans for dam construction, rehabilitation, replacement and decommissioning to ensure consistency with CDA guidelines.
- Review new and modified Dam Emergency Plans, and Operation, Maintenance and Surveillance Manuals for consistency with government and CDA guidelines.
- Review failure consequence classifications for new dams or changes to failure consequence classification for existing dams. Failure consequence classification determines the regulatory requirements that apply to a dam. Higher classification dams are subject to higher levels of regulation and oversight.

- Educate dam owners about regulatory requirements, government and industry guidelines, and best practices in dam safety.
- Respond to dam safety emergencies. This can involve a range of activities from overseeing a dam owner's response to hazardous conditions at a dam or, if a dam owner does not respond, undertaking the work necessary to mitigate the hazard.

Regulated Dams in B.C.

A wide range of dams are authorized under the WSA and subject to the Regulation. These include some of the largest dams in Canada associated with hydro-electric power generation (e.g. the Mica Dam), as well as dams used for agricultural irrigation, industrial use, municipal water supply, domestic use and flood control. In 2016/17, there were a total of 1814 active regulated dams in B.C. (Table 1). A further 447 dams are not subject to the Regulation but are known to the dam safety program. The number of regulated dams changes over time as dams are decommissioned or built, previously unauthorized dams are brought into compliance, and previously unregulated dams become operational.

Table 1: Number of regulated and unregulated dams in British Columbia under the *Water Sustainability Act* and the *Dam Safety Regulation*, classified by failure consequence classification, as of January 27, 2017.

Failure Consequence Class	Regulated Dams Subtotal	Unregulated Dams Subtotal	Dams Total
Extreme	41	0	41
Very High	72	0	72
High	232	6	238
Significant	563	27	590
Low	767	287	1054
Unclassified	139	127	266
Dam Totals	1814	447	2261

For the purposes of this report, unregulated dams includes those that are less than 7.5m in height and impound less than 10,000 cubic metres of water as specified in section 2(1) of the Regulation. These unregulated dams, also referred to as "minor dams," can be made subject to the Regulation by order of the comptroller of water rights, or a water manager if that person determines the dam is or may become hazardous to public safety, the environment, land or other property.

Other unregulated dams include those that are not active such as those in the application stage, under construction and/or rehabilitation, temporarily drained or filled with sediment. Similarly, dams which have been fully breached or failed, decommissioned or removed are also unregulated. While these dams are not subject to the Regulation, they may still have oversight by a DSO or be subject to orders under the WSA or water licence terms and conditions. The dam safety program also responds to issues at unregulated dams when necessary to ensure public safety and protect the environment and property.

2016/17 PROGRAM ACTIVITIES

The activities of the dam safety program in 2016/17 are grouped into the following areas:

- Dam owner compliance
- Dam safety plans review, construction and approval
- Program management
- Dam emergency planning and response

DAM OWNER COMPLIANCE

Education and Awareness

The dam safety program conducts a range of education and awareness activities for dam owners. These include informal training provided by DSOs while on site-visits at dams (e.g., during dam safety audits). More formal workshops for dam owners and operators on inspection and maintenance of dams are delivered by program staff in partnership with the B.C. Water and Waste Association and the Water Supply Association of B.C. In 2016/17 a total of 52 individuals participated in three formal workshops held in the Capital Regional District, West Vancouver and Penticton.

The dam safety program also provides education to government staff who have responsibility for water authorizations, and compliance and enforcement. In 2016/17, regional DSOs delivered dam safety presentations to FLNRORD staff in the West Coast Region, North Area and Thomson Okanagan Region. Program staff also provided training to 11 compliance and enforcement staff at a customized one-day course on inspection and maintenance of dams.

In 2016/17 FLNRORD staff supported development of the Agriculture Knowledge Transfer Resource, a dam safety education program targeted specifically at owners of agricultural dams. The project was made possible with support from the BC Agriculture & Food Climate Action Initiative, Ministry of Agriculture, Agriculture Canada and the Cariboo Cattlemen's Association. Eighty-five owners of agricultural dams participated in workshops held in 100 Mile House, Williams Lake, Kamloops and Kelowna. Feedback from the sessions was positive and incorporated into the final workshop presentation and resource binder. The Dam Safety Section is currently working to add this new resource into the dam safety education program.

To provide broader opportunities for education of dam owners, consultants and regulators, dam safety staff participated on the planning committee for the Canadian Dam Association's 2017 annual general meeting.

Communications and Engagement

In addition to formal and informal education, the dam safety program communicates regularly with dam owners and communities of interest. Dam safety staff participated in the following communications and engagement activities in 2016/17:

- Delivered dam safety presentations at the Canadian Geotechnical Society's October 2016 annual conference and the Emergency Preparedness and Business Continuity conference in Vancouver in November 2016.
- Met with BC Hydro and Rio Tinto representatives for annual and semi-annual dam safety meetings, respectively.
- Sent emails to owners of high, very high and extreme failure consequence dams in early April reminding them to ensure their dams are operating properly and maintained to allow the safe discharge of possible flood flows during spring freshet.

Annual Dam Status Report – Self-Reporting by Owners

By order of the comptroller of water rights, under the WSA, owners of high, very high and extreme failure consequence classification dams are required to report annually on dam safety activities, including their compliance with regulatory requirements. The annual report form is mailed and emailed to dam owners in November each year. Owners are required to complete the form and respond to questions on the following requirements by the following January.

- Formal inspection(s) and regular site surveillance
- Dam safety review completed by a qualified professional engineer
- Operations, maintenance and surveillance manual
- Dam emergency plan and emergency contact information
- Submission of dam emergency plan information to local emergency authority
- Changes to downstream land-use that might affect the failure consequence classification of the dam
- New dam safety concerns that have not previously been reported

The annual reports submitted by dam owners are used by DSOs as an important source of information to assess compliance between audits, and to prioritize dams where additional audits or site visits might be beneficial. Since 2006, annual reporting by dam owners has improved substantially. If a dam owner does not submit a report for three consecutive years, an enforcement action may be initiated.

Table 2 provides a summary of the number of dam status report forms submitted by dam owners each year over the last six years. In 2016/17, reports were returned for 98% of dams.

Table 2: Summary of percentages of annual dam status report forms completed and returned by owners of high, very high and extreme failure consequence dams since 2011

Dam Status Report Year	Total Number of Dams Reported	Percent Completed Report Forms Returned by Dam Owner
2016	350	98
2015	354	99
2014	354	95
2013	345	97
2012	339	98
2011	313	96

In 2016, 91% of dam owners reported completing formal dam safety inspections. A more detailed presentation of annual dam status report results is available in The Appendix.

Periodic audits by DSOs also indicate that not all owners who self-report as having conducted a formal annual inspection actually carry out the work. Where dam owners are not meeting their reporting and inspection obligations, DSOs follow up throughout the year to ensure the dam owners and their staff understand the regulatory requirements and the importance of public safety. Failure to comply with the Regulation can result in enforcement action.

Under the new Dam Safety Regulation owners of significant, high, very high and extreme failure consequence classification dams are required to provide local emergency authorities with dam emergency plan information. Owners of existing dams were given until March 31, 2017 to meet this requirement. In 2016, 57% of dam owners reported that they had complied with this new requirement (Figure 1). DSOs will continue to work with dam owners and local authorities to ensure that all parties are aware of the new requirement.

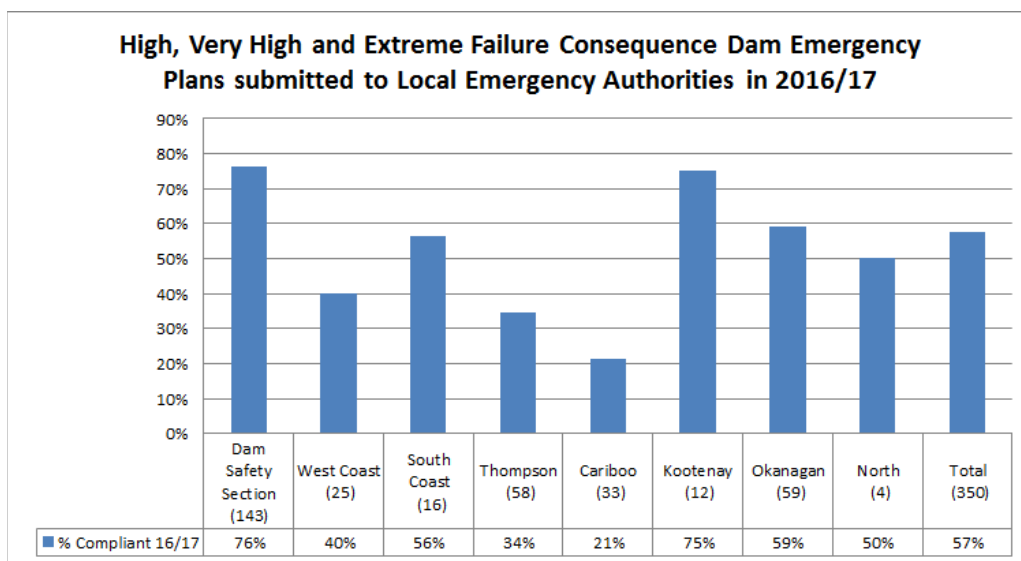


Figure 1: Percentage of dam owners self-reporting submission of dam emergency plans to local emergency authorities. Numbers in brackets are the number of dams in each administrative unit.

Dam Safety Reviews

Under the Regulation, owners of high, very high and extreme failure consequence classification dams are required to retain a qualified engineer to conduct a dam safety review every seven or 10 years, depending on the dam's classification. The engineer evaluates the safety of a dam and the dam owner's safety management system and prepares a report, which is provided to the dam owner and the DSO. The dam owner is then responsible for addressing deficiencies identified in the review.

In 2016/17, DSOs considered and accepted 31 dam safety reviews (Table 4). An additional 84 dam safety reviews were in progress. Of these, 37 were initiated, 34 were submitted to the DSO and are in review, and 13 were reviewed by DSOs and returned to the owner with requirements for additional information. Dam safety reviews for 19 dams are “due” but have not yet been initiated by the owner.

Table 4: Status of dam safety reviews in progress, as reported by dam safety officers for 2016/17 (as of March 31, 2017).

	FLNRORD Administrative Areas								
	Dam Safety Section	West Coast	South Coast	Thompson	Cariboo	Kootenay	Okanagan	North	Total
Not started	5	0	4	2	0	0	8	0	19
Dams with Dam Safety Reviews in progress									
Started, with work in progress	0	8	1	15	10	2	0	1	37
Submitted to and being reviewed by dam safety officer	26	0	0	5	0	2	1	0	34
Reviewed but not accepted by dam safety officer. Returned to owner because more work is needed.	5	0	0	0	1	0	7	0	13
Total: Dam Safety Reviews in progress or not started as of March 31, 2017	36	8	5	22	11	4	16	1	103
Dam Safety Reviews accepted in 2016/2017	20	0	2	2	4	0	3	0	31
Total:	56	8	7	24	15	4	19	1	134

Audits of Owner Dam Safety Management Systems

Dam safety officers meet with dam owners and conduct audits of their dam safety management systems at least once every five years for all high, very high and extreme failure consequence classification dams, and at least once every 10 years for significant failure consequence classification dams. Each DSO has an annual target of audits to ensure that all dam audits are completed within the required time frame. The audits are an opportunity for DSOs to meet with dam owners to review records and conduct site visits. These audits help confirm whether the dam owner is aware of and is carrying out the requirements of the Regulation. If deficiencies are found, DSOs provide information to help dam owners understand requirements and resolve issues. When necessary, DSOs follow up with owners to ensure that any identified deficiencies are corrected.

In 2016/17, DSOs completed a total of 119 audits. More detailed information about dam audits is available in The Appendix.

The West Coast, Cariboo, Okanagan and North administrative units met or exceeded their targets. Other administrative units such as the South Coast, Thompson, Kootenay and the Dam Safety Section did not meet their targets (Table 6). This was the result of temporary staffing issues.

Table 6: Number of audits conducted by dam safety officers in 2016/17 by region

FLNRORD Administrative Unit	Dam Audit Target for 2016/17	Dam Audits Completed
Dam Safety Section	35	24
West Coast	14	16
South Coast	6	5
Thompson	26	17
Cariboo	17	20
Kootenay	5	0
Okanagan	18	19
North	9	18
Total	132	119

In years when targets are not met, the shortfall is usually addressed in a subsequent year. On average, over the past five years, the program has conducted approximately 138 audits per year, exceeding the current annual audit target.

Dam Safety Database

Accurate information about B.C. dams is important for DSOs to manage their portfolio of dams, report on the state of dams and for quick access to information during emergencies. The dam safety database is comprised of two separate but linked digital information systems: eLicensing houses textual data records about each dam and the BC Dams geographic dataset provides geospatial data. ELicensing is the interface used by DSOs and is available to authorized internal users. Key information from eLicensing for each dam is available to the public in a geospatial layer that can be viewed with [Google Earth](#) or on [DataBC's iMap service](#).

Audits of the dam safety database are carried out annually to assess the integrity of the data and identify data gaps. Feedback on the audit results are provided to DSOs and procedures are developed or adjusted to ensure that information on dams is entered correctly, and missing information is obtained and entered.

In general, records in the dam safety database have improved since 2011, with information on more dams and more complete information. Audit results for 2016/17 show a slight drop in the number of dams that have information on height and consequence classification (Figure 2). This can be attributed to several new dams with incomplete information being added to the database, and regulatory changes that brought some previously unregulated dams under regulation. Consistency and accuracy of data entered into the database and ensuring the information is current is a top priority for staff in the dam safety program.

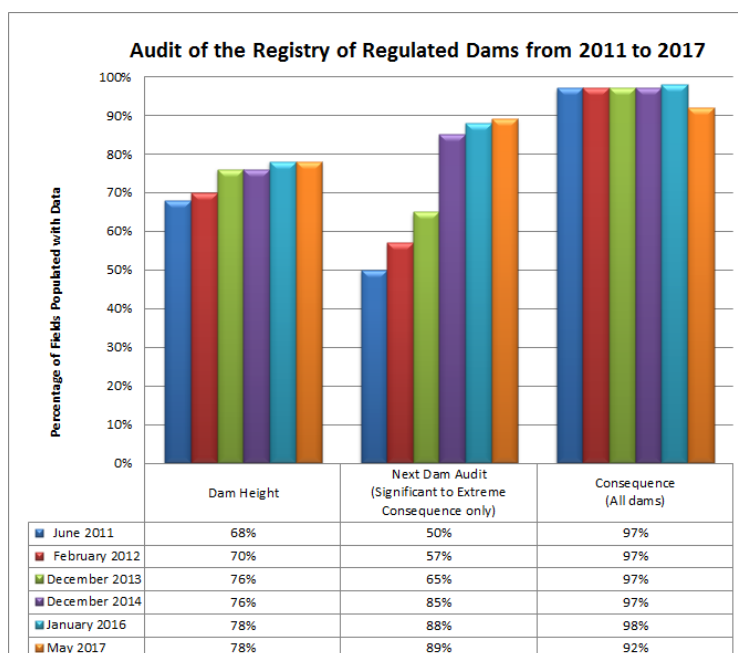


Figure 2: Audit of the dam safety database

In 2016/17, some improvements were made to the dam safety database to ensure that data captured is consistent with the Regulation. These included updating codes to identify dam operational conditions and failure consequence classifications. Work with eLicensing and the data warehouse is ongoing to further improve the management of dam information and make the databases more useful for dam safety program staff.

Recording the location parameters of a dam is required for spatial representation in mapping applications. Of the total number of dams in the dam registry, 87% have associated spatial information, a reduction of 1% from 2015/16. There are 286 dams in the database missing the required geospatial coordinates. Of these, 42% are identified as active dams which are regulated. DSOs will update spatial data for these dams during routine site visits conducted as part of dam safety audits or other opportunities.

REVIEW OF PLANS AND MONITORING OF WORK

Reviewing Plans and Monitoring Work in Progress

The Regulation requires dam owners to submit plans for construction, alteration or decommissioning of a regulated dam. The DSO must accept the plans before the dam owner can commence work. DSOs review these plans for consistency with the Regulation and CDA guidelines, and may conduct periodic site visits to monitor construction while the work is underway. DSOs also provide professional advice to other statutory decision makers to coordinate requirements under WSA authorizations (e.g., issuing a leave to commence construction under a water licence), and when a statutory decision maker is issuing an order under the WSA for work related to a dam. In 2016/17, DSOs reviewed a total of 14 project plans for new dams, 25 for dam rehabilitations, and 14 for dam removals. DSOs monitored 12 construction projects for new dams, 12 dam rehabilitation projects, and seven dam decommissioning projects.

Operational Reviews

The Regulation requires owners of dams, other than those with a low failure consequence classification, to periodically review, and revise if necessary, their Operations Maintenance and Surveillance (OMS) manuals and their Dam Emergency Plans (DEP), and submit any revisions to the DSO. This is required at least every 10 years for significant and high failure consequence dams, and every seven years for very high and extreme failure consequence dams. The annual dam status report includes questions on the status of the OMS and DEP, and serves as a reminder to dam owners of their obligation to maintain these documents. In 2016/17, DSOs reviewed 43 new or revised OMS manuals and 23 new or revised DEPs.

The Regulation also requires owners of dams to review downstream conditions and notify a DSO of any changes that may impact a dam's failure consequence classification. These reviews help ensure that dams are subject to appropriate regulatory requirements and oversight. In 2016/17, DSOs reviewed 13 requests for changes to failure consequence classifications.

PROGRAM MANAGEMENT

Outreach and Professional Development

In 2016/17, dam safety staff continued to collaborate with their counterparts in other jurisdictions, agencies, industry and professional associations on developing and improving dam safety best practices. Staff represented B.C. at the 2016 CDA Annual General Meeting and Conference in Halifax and participated on the CDA Committee on the Regulation of Dams, and CDA working groups focused on design and construction guidance and emergency management.

Dam safety officers participated in various technical webinars provided by the Association of State Dam Safety Officials, the Association of Professional Engineers and Geoscientists of B.C., and Natural Resources Canada.

Dam safety officers from the Dam Safety Section, Regions and the OGC participated in the 32nd annual Dam Safety Program Community of Practice held in Prince Rupert in March 2017. The program focused on reviewing and finalizing policies and guidelines related to the delivery of the dam safety program under the WSA and the Dam Safety Regulation. Field trips to several local dams within the vicinity of Kaien Island focused further discussion on fish ladders, transfers of ownership and other issues related to dam safety.

In 2016, dam safety officer training was offered to one new staff person in Kootenay Region and three staff from the Oil and Gas Commission. All new dam safety program staff are required to receive a basic program orientation and overview, and undertake audits under the supervision of an experienced DSO, before receiving designation. This, along with monthly conference calls, the annual community of practice meeting and biennial technical training helps ensure that staff have the skills necessary to fulfill their role as DSOs. It also promotes consistency in the application of the program and Regulation across the province.

Other Dam Safety Program Highlights

Other notable accomplishments in the past year include:

1. *Program Staffing:* In 2016/17, the dam safety program had 7.9 full-time equivalent (FTE) DSOs and 1.5 FTE program specialists for a total of 9.4 FTEs. This includes three senior DSOs, a resource specialist and a part time program support specialist (4.5 FTE) in the Dam Safety Section, Water Management Branch and 4.9 DSO FTEs reporting through FLNRORD regions.
2. *Dam Safety Regulation:* In 2016, dam safety program staff notified by mail the owners of more than 2,200 dams of the new *Water Sustainability Act* and Dam Safety Regulation, including the new requirements for dam owners.
3. *Policy development:* Development of regulatory and operational policy under the WSA is led by the Ministry of Environment and Climate Change Strategy in collaboration with program staff in FLNRORD. All dam safety policies underwent review in 2016/17 to identify changes needed to be consistent with the new Regulation. An interim dam safety policy on the abandonment of dams or storage licences was approved. Policies under development or revision in 2016/17 included authorization requirements for dugouts, dam owner exemptions, dam audits and minor dams.
4. *Updates of guidelines:* Updates were made to the dam emergency plan template and the inspection and maintenance of dams guidelines to ensure consistency with the new Regulation. A draft of the dam decommissioning guidelines is under revision and will be finalized in 2017/18.
5. *Citizen-centric website:* Information on the [dam safety program website](#) is regularly updated to ensure dam owners have access to current information on the Regulation, policies and other guidance and best practice documents on dam safety.
6. *Environmental Assessment:* Dam safety staff continued to review dam safety issues related to the KGHM Ajax mine development proposal, as part of the environmental assessment working group.
7. *Northeast B.C. unauthorized dams:* In recent years, there has been a proliferation of dams and dugouts in the Northeast, mainly used as water storage reservoirs for oil and gas activities. Many of these structures were developed without appropriate authorization and regulatory oversight. FLNRORD, in collaboration with OGC, have developed a strategy to assess these structures and determine actions required to bring them into compliance. Both agencies are in the process of putting resources and systems in place to manage the workload.

DAM INCIDENTS

When an incident relating to a dam is reported to the ministry, a DSO or other staff person will immediately respond, sometimes with support from regional compliance and enforcement staff. The dam owner is contacted and depending on the seriousness of the situation other agencies, including Emergency Management BC, may be engaged. These investigations are recorded in incident reports. Not all reported incidents are an emergency or even an issue related to a dam. Regardless, each one is followed up and recorded. The following is a summary of the dam incidents reported in 2016/17.

Dam Failures

There were no dam failures reported in 2016/17.

Dam Alerts

There was one dam alert reported in 2016/17. A dam alert occurs when an abnormal condition is observed at a dam or a dam performs abnormally and, without swift and effective intervention, failure may occur.

1. Agur Lake (Simen Creek) Dam (D230100-00) – On April 21, 2016, FLNRORD staff reported potential overtopping of a section of the Teepee Lake Road, a private road north of Bankier. A culvert with a control gate in this section of the road was acting like a dam, impounding water on the upstream side of the road. The DSO assessed the structure and determined that it has a low failure consequence classification. FLNRORD staff are working with the road owner to lower the culvert so less water is impounded. This is not a dam under the Dam Safety Regulation and does not require authorization. The DSO recorded the incident and created a record in the dam registry to track any future issues.

Dam Incidents

There were four dam incidents reported in 2016/17. A dam incident occurs when an abnormal condition is observed at a dam, or the dam performs abnormally, but the condition is not expected to lead to a failure of the dam.

1. Baird Lake – On April 5, 2016, FLNRORD staff reported a possible overtopping of an old beaver dam blocking the natural outlet of Baird Lake (Photo 1), east of Enderby. A breach of the dam would cause an uncontrolled release of 80,000 cubic metres of water that could cause significant scour to the downstream channel, and possibly trigger a debris flow or flood that would affect a wetland complex at the outlet of Hidden Lake.



Photo 1: Heavily vegetated beaver dam on north end of Baird Lake

Because of the high gradients of some of the reaches of the creek, a property located further downstream on the fan of the creek near the confluence with the Shuswap River could also be at risk of flooding. The site visit revealed minor erosion of the dam, as well as overtopping at several other locations of the lake due to the spring freshet. The DSO recommended that the natural outlet of the lake be cleared of the beaver dam.

2. Aeneas Lake Dam (D220101-00) – On April 7, 2016, FLNRORD staff was contacted by the dam owner regarding possible new seepage occurring on the downstream, left abutment area of the dam (Photo 2). The dam was reconstructed in 2014 and has a very high failure consequence classification. The DSO advised the owner to retain the services of a qualified professional engineer to assess the situation. An engineering consultant assessed the dam which continues to be monitored.



Photo 2: Seepage track on the downstream side of the left abutment of Aeneas Lake Dam

3. Lake #7 Dam (D420005-00) – On January 17, 2017, the owner’s representative contacted FLNRORD staff about sudden excessive seepage flowing from Lake #7 Dam (Photo 3). This is a high failure consequence classification dam located on the Rainy River, upstream of the Howe Sound Pulp and Paper mill near Port Mellon. This seepage event was preceded by another event in 2007 which resulted in the owner undertaking emergency repairs. The seepage flow rate reported between September and December of 2016 ranged between 80 and 122 litres per second. A reading of 115 litres per second was taken on February 14, 2017. At the request of the DSO, under Section 15 of the Regulation, the dam owner retained a consultant engineering firm to inspect the dam and prepare a report outlining options for its rehabilitation.



Photo 3: Lake #7 Dam and reservoir

4. Tie Lake Dam (D320133-00) – On March 29, 2017, staff of the dam owner, the Regional District of East Kootenay, contacted FLNRORD about the loss of freeboard on Tie Lake Dam (Photo 4). This is a low failure consequence classification dam, located near Jaffray. Early spring brought considerable runoff and high groundwater recharge resulting in a high lake water level.



Photo 4: High lake level at Tie Lake Dam, resulting in loss of freeboard

As an interim measure, the dam owner installed sandbags at the low point of the earth embankment near the left wing wall to protect the dam crest against erosion to protect the structure should the lake level rise. In addition, riprap was placed around the spillway. The dam owner submitted a dam rehabilitation plan for work to commence in fall 2017 but this work was postponed until archaeological assessments were complete.

No Dam Incidents

This term is used for reports that are initially received as dam incidents but do not impact the safety of a dam. It could refer to an erroneous report, or a report about an abnormal condition that could be interpreted as a threat to a dam. There was one report classified as a “no dam incident” in 2016/17.

1. Breaks Brook unregulated dam – In 2016, FLNRORD staff were contacted by a south Surrey property owner about turbid flow coming from a pond on their property, flowing downstream into an adjacent property. The driveway between the two properties served as a dam, with a culvert conveying water under the driveway. On January 17, 2017, the owner of the adjacent property also contacted FLNRORD on the same issue due to concerns about impacts on fish in Breaks Brook. Fisheries and Oceans Canada also contacted the owner of the dam regarding the concerns about impacts to fish. Following a site visit, FLNRORD staff advised the dam owner on next steps. Although it was determined that the dam was a minor dam under the Regulation, the dam owner is applying for necessary amendments to their existing water licence to authorize the structure, and for Section 11 approval under the WSA to conduct work to halt the flow.

PROGRAM CHALLENGES AND OPPORTUNITIES

The Provincial Dam Safety Program continues to make progress in addressing the recommendations of the 2010 Deputy Solicitor General’s report on the Testalinden Dam failure. Program staff is working to address a number of challenges:

Low consequence dams: DSOs currently address issues with low consequence dams on a reactive or complaint-driven basis. The program is exploring opportunities, such as co-op and internship positions, for additional capacity to focus on low consequence dams.

Information system: The dam database does not allow for business processes to be carried out within the system, requiring DSO to manually enter data to update dam records as an additional administrative activity. This can result in incomplete information about the current status of a dam. The program is pursuing funding for a system enhancement to better support DSO activities and improve the quality of dam safety records.

Succession Planning: A number of the current DSOs are nearing retirement. The program will undertake succession planning for key positions to reduce risks of lengthy vacancies and any resulting impact to program delivery.

Unauthorized dams: The proliferation of dams and dugouts, as a result of oil and gas activity in the Northeast region of B.C., is being carefully handled by FLNRORD and OGC to ensure that any unauthorized and unregulated water structures are brought into compliance with the *Water Sustainability Act* and the Regulation. Similarly, dams that store water from a groundwater source will be brought into compliance through the transition period for groundwater authorization under the *Water Sustainability Act*.

B.C. Dam Safety Program
Ministry of Forests, Lands and Natural Resource Operations and Rural Development
July 2018

Appendix

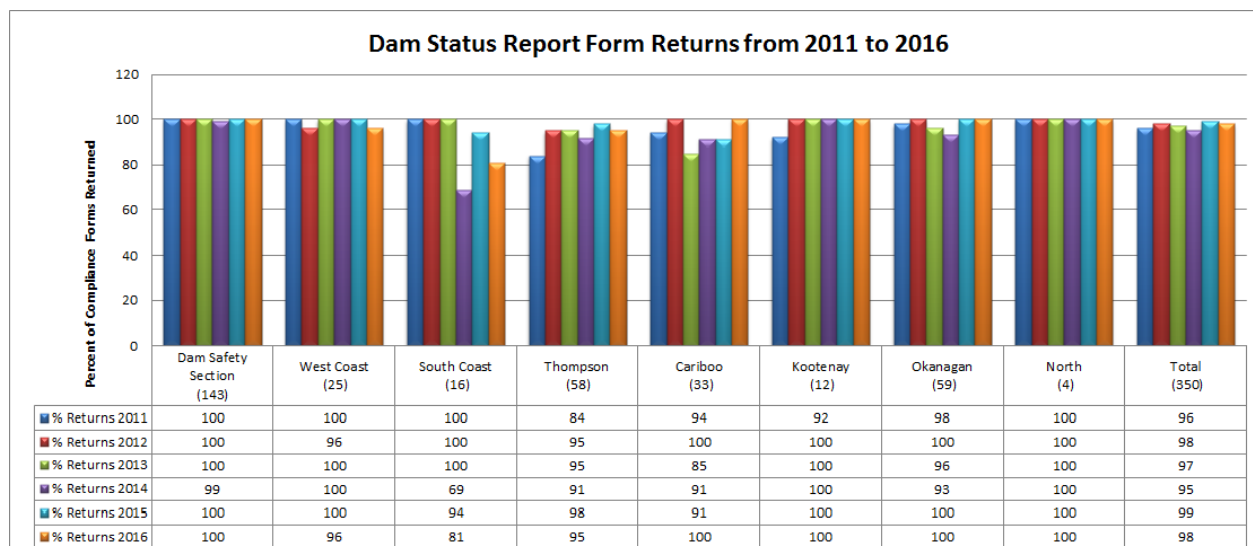


Figure A: Percentage of dam owners returning completed Dam Status Report forms. (Numbers in brackets are the actual number of dams in each administrative unit that required dam status report forms be completed in 2016/17.)

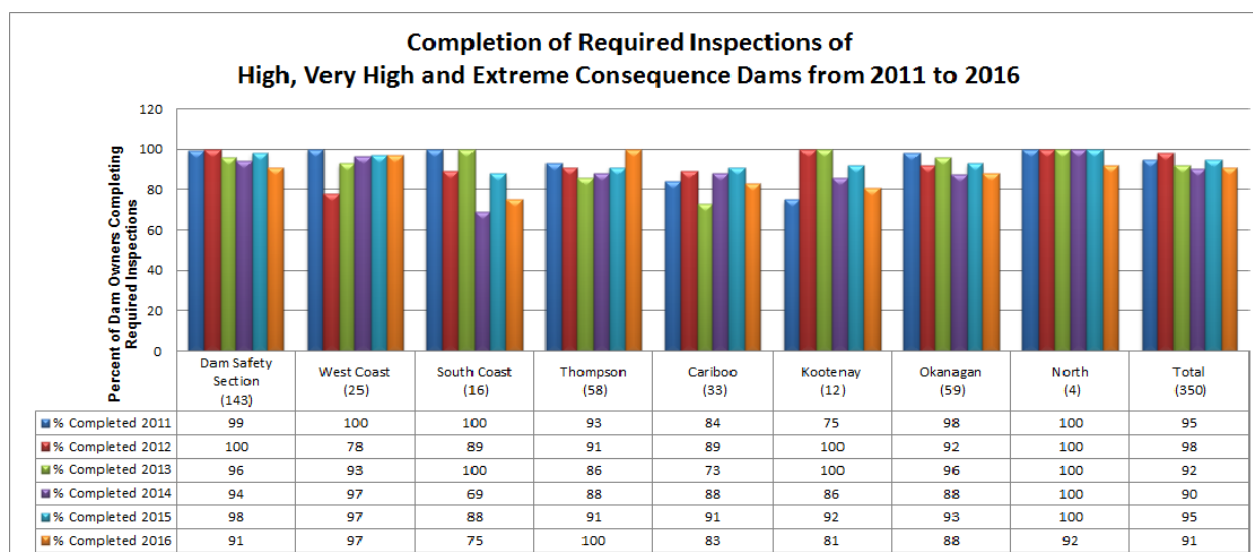


Figure B: Percentage of dam owners self-reporting they completed the required annual formal inspections. (Numbers in brackets are the number of dams in each administrative unit that required formal annual inspections in 2016/17.)

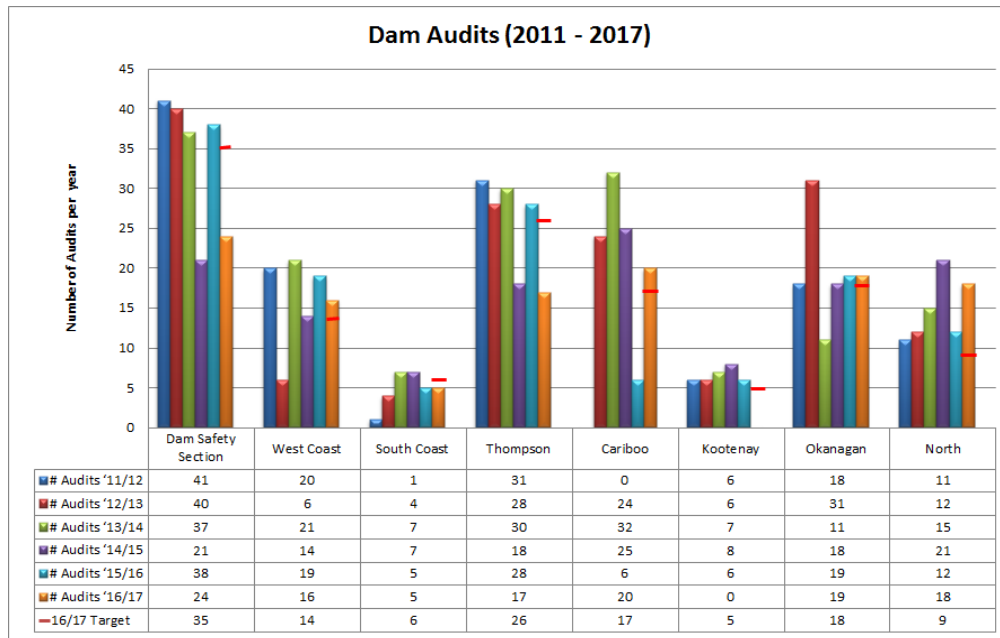


Figure C: Number of audits completed by dam safety officers compared to their 2016/17 target over the last six years.