16: Quarterly Dam Safety Report

Executive summary

The purpose of this report is to update the Operations, Planning, Safety and Information Technology Committee of the Board of Directors on key dam risk management activities during the period from January 1 to March 31, 2025 (F2025 Q4) and to provide reasonable assurance that the safety of dams operated by BC Hydro continues to be managed to the established guidelines and criteria of the Dam Safety Program. To keep the Committee as fully abreast of the Dam Safety Program as possible, some notable developments that took place after December 31, 2024, but before the completion of this report have also been included.

The key highlights from F2025 Q4 and the beginning of F2026 Q1 documented in this report are:

- Andrew Watson replaced Bob Schubak as Director, Dam Safety on April 22, 2025. See page 9.
- The temporary measures to maintain reliable operation of two spillway gates at Peace Canyon Dam were successful and have now been discontinued with warmer weather. Observations from this year will inform temporary heating through next winter and a new capital project to restore the gates' permanent heating systems to their original design intent. See page 7.
- Dam surveillance met its objectives in F2025. All formal inspections of the dams and reservoir slopes and their associated reports were completed, and 1634 of 1638 scheduled routine inspections were completed. See pages 9 and 10.
- Dam Safety and Stations Field Operations responded effectively to the February 21 earthquake near Sechelt, which had a moment magnitude of 4.7 and was widely felt throughout the Lower Mainland and Vancouver Island. By the end of the day, visual inspections and assessment of the monitoring data confirmed there was no damage or other impact to the safety of the sixteen affected dams. See page 10.
- A new Alarm Status Tracking System application was developed to support an alarm dashboard in the Dam Safety Information System, which improves the Dam Safety Program's ability to quickly and efficiently respond to alarms, to assign follow-up actions through a work management tool, and to track them to completion. See page 10.
- Maintenance and testing of dam safety assets was effectively performed through F25. Civil maintenance was completed to plan, and 936 of 942 scheduled gate tests were completed. See pages 11-14.
- Excavation for the Ruskin Dam Left Abutment Sinkhole Remediation Project uncovered a third sinkhole feature in the affected area. The discovery of this third sinkhole does not change the scope of the project but does, however, confirm its importance, having found and eliminated at least one already developing sinkhole that would have further degraded the performance of the left abutment slope. See page 18.

Presenters: Andrew Watson (Director, Dam Safety)

Dam Safety Program Dashboard

The following dashboard provides an overview of the status of the Dam Safety Program. "Traffic lights" provide a qualitative indication of the status of each of five elements of the Program and trend arrows identify whether the status is improving, deteriorating or unchanged. As referenced, these indicators are supported by more detailed metrics and narratives in the report.

16: Quarterly Dam Safety Report

Risk Profile and Issues Management	G →	• **Vulnerability Index (pp. 3-4):** The aggregated Vulnerability Index decreased by 3.0 through F2025 Q4 due to the recharacterization and re-rating of previously identified issues at WAC Bennett and Mica Dams. • **Non-Conformances (pp. 5-7):** The number of outstanding issues was further decreased. • **New and Current Issues (pp. 7-8):** Temporary heating for the spillway gates at Peace Canyon Dam was effective through the winter and is now removed until next winter. Interim measures to manage deficiencies on the Comox-Puntledge Flow Control Improvements Project remain in place.
Regulatory Compliance	G ↑	• **British Columbia Utilities Commission (p. 8):** The regulatory timetable for the remainder of the Strathcona Discharge Upgrade Project application process was established. • **Operation, Maintenance and Surveillance Manual Updates (p. 8):** BC Hydro returned to full regulatory compliance with the issue of the updated Manual for Clayton Falls Dam. • **Dam Safety Reviews (p. 8):** Reviews progressed according to plan. • **Dam Safety Program Management System (p. 9):** New sections of the Implementation Manual were issued to formalize criteria for reporting to the Board of Directors; existing sections were revised to clarify criteria for closing, transferring, and completing issues.
Surveillance	G →	• **Dam Inspections (pp. 9-10):** In F2025, all but four of 1638 routine inspections were completed as scheduled. All 71 formal dam safety inspections and reports were completed. • **Reservoir Slopes (p. 10):** All 21 scheduled reservoir slopes inspections and associated reports were completed in F2025. • **Unusual Events or Observations (p. 10):** On February 21, 2025, a magnitude 4.7 earthquake struck near Sechelt and Clowhom Dam, affecting sixteen of BC Hydro's dams. All affected dams were inspected by the end of the day, and instrumentation records were reviewed to confirm that no dams were damaged.
Maintenance and Testing	G →	• **Civil Maintenance (pp. 11-12):** Corrective and condition-based civil maintenance was essentially completed to plan through F2025. Preventive civil maintenance had a 94 percent completion rate, with 883 completed work orders representing a significant increase from the 3-year average of 773. • **Spillway Gates (pp. 12-14):** 936 of 942 (99.4%) scheduled gate tests were performed in F2025. Twelve gates failed to operate on demand through the year. The number of outstanding maintenance tasks increased from 100 to 111 through F2025, and the number of outstanding high priority tasks has decreased from twelve to six.
Projects and Investigations	G ↑	• **Capital Projects (pp. 16-18):** Civil works on the John Hart Dam Seismic Upgrade and remediation of the sinkholes at Ruskin Dam progressed well. Site preparations for construction of the Ladore Spillway Seismic Upgrade commenced. Independent reviews of the Comox-Puntledge Flow Control Improvements Project's quality plans were completed, and findings and recommendations are currently being incorporated into revised plans. • **Dam Safety Investigations (p. 19):** Safety Evaluation Floods were updated for Alouette, Buntzen, Coquitlam, Duncan, La Joie and Terzaghi Dams.

Legend:

G	All areas within the Program element are being implemented to a satisfactory level. Minor, isolated issues may exist but are not deemed to be indicative of deteriorating performance.
Y	One or more areas within the Program element exhibit or are at risk of underperformance and are being monitored.
R	One or more areas within the Program element exhibit unsatisfactory performance and require correction.
↑	Status of the Program element has improved over the quarter.
→	Status of the Program element was unchanged over the quarter.
↓	Status of the Program element deteriorated over the quarter.

Risk Profile of BC Hydro's Dams

Dam Safety Contribution to Enterprise Risk

Dam Safety is assigned a high "risk priority" within BC Hydro's Enterprise Risk report. Please refer to that report for additional details.

Vulnerability Index Update

Identified physical deficiencies in BC Hydro's dams and the degree of concern that exists with respect to their impact on the integrity and performance of the dam are characterized by the Vulnerability Index. The higher the value of the Vulnerability Index (scale of 0-10), the higher the likelihood of that deficiency leading to poor performance. The Vulnerability Index for each identified issue at each dam site is shown in Figure 1. Vulnerability Indices for the individual deficiencies are aggregated into stacked bars for each dam, and dams are sequenced from left to right in order of increasing downstream consequences per the BC Dam Safety Regulation. Changes in Vulnerability Index for actual and potential deficiencies (including those related to spillway reliability), aggregated across the entire fleet of dams, are tracked on a quarterly basis and shown in Figure 2. Notable changes in Vulnerability Index in F2025 Q4 are identified in Figure 1 and described below.

1. A ***reduction*** of 1.8 (Potential Normal deficiency) at ***WAC Bennett Dam***.
   Vertically installed instruments in the core of the dam created the potential for hydraulic fracturing and piping of the core. These instruments have since been remediated to prevent this hazard. The issue is now considered complete.

2. A ***reduction*** of 1.7 (Potential Unusual deficiency) at ***WAC Bennett Dam***.
   Two issues related to the seismic performance of the spillway and chute have been completed following updated analyses which indicate there is no seismic deficiency. A third issue for the seismic capacity of the intake operating gates and access bridge was recharacterized as a Non-Conformance of Information as no analyses on these structures have yet been performed.

3. An ***addition*** of 0.5 (Actual Unusual deficiency) at ***Mica Dam***.
   This issue was recharacterized from a Spillway deficiency to an Actual Unusual deficiency and rerated. Various components of the dam's flood discharge gate systems do not have adequate capacity to withstand the Safety Evaluation Earthquake, corresponding to ground motions having peak horizontal accelerations of 0.28 g and expected to occur once every ten thousand years, on average.

Over the last several years, new issues have added to the aggregated Vulnerability Index at a rate of approximately twelve per year. To prevent deterioration of the overall risk position, reductions in Vulnerability Index through resolved issues should occur at the same pace or faster. As evident in Table 1, below, Vulnerability Index reductions met this target pace over F2025 but lagged behind additions.

Table 1 Trends and forecasts for Vulnerability Index changes in F2025.

		Actual	Target	
Dam Safety Vulnerability Index	Reductions – Fiscal Year F2025	14.8	12	✓
	Additions – Fiscal Year F2025	22.3		

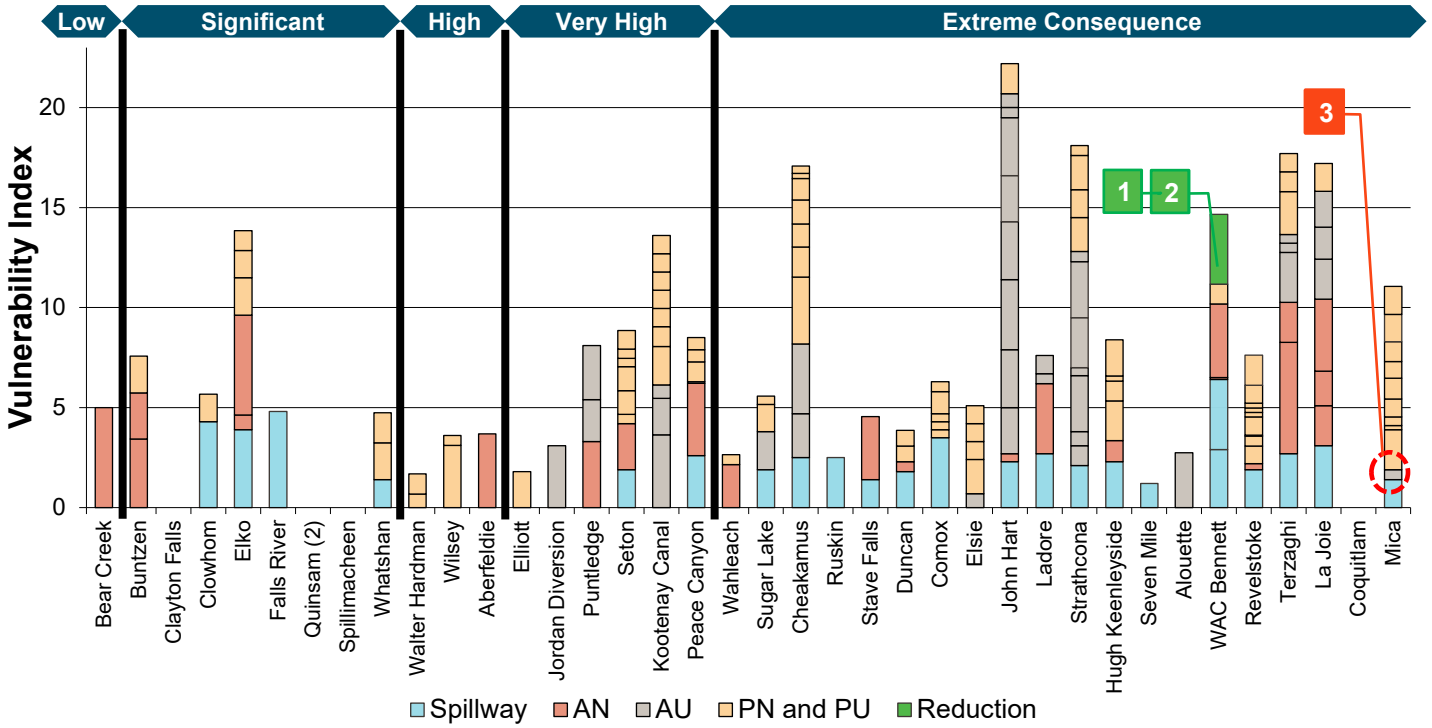

Figure 1 Dam Safety overall risk profile at the end of F2025 Q3, as represented by the Vulnerability Index. Changes this quarter are indicated by the numbered boxes.

AN	***Actual*** deficiency (demonstrated to exist) under ***normal*** load conditions.
AU	***Actual*** deficiency (demonstrated to exist) under ***unusual*** load conditions.
PN and PU	***Potential*** deficiency (requiring further investigation to demonstrate existence) under either normal or unusual conditions.
Spillway	Deficiency related to operational reliability or serviceability of the dam's spillway and/or other flood discharge systems.

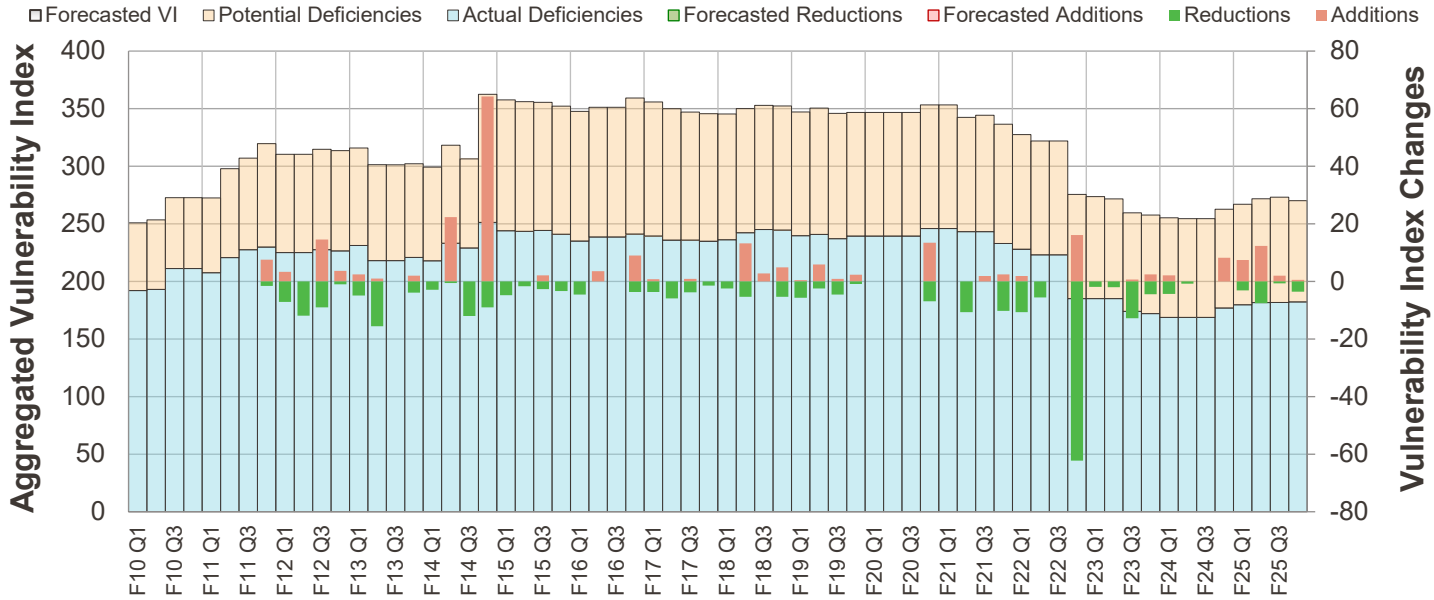

Figure 2 Historical and forecast changes and trends in the Vulnerability Index aggregated across the BC Hydro system. Note: In this chart, Spillway deficiencies are included as Actual deficiencies.

Non-Conformances in the Dam Safety Program

Non-Conformance issues arise where the established procedures, systems and instructions of the Dam Safety Program Management System are not being followed at a particular dam, or where procedures that form part of established and generally accepted good practices have not been implemented within the Management System or at a particular dam.

Activities to identity, review, resolve and close Non-Conformance issues continued through F2025 Q4. As a result, 41 Non-Conformance issues were resolved and eleven new issues were identified in Q4, leaving 195 issues outstanding. Figure 3, below, shows the continuing progress in reducing the number of Non-Conformance issues. Also evident is the progress made in ensuring that issues are rated on a timely basis after being identified; the number of unrated issues has been reduced from sixteen in F2019 Q1 and a high of 49 in F2021 Q4 to just a single unrated issue at the end of F2025.

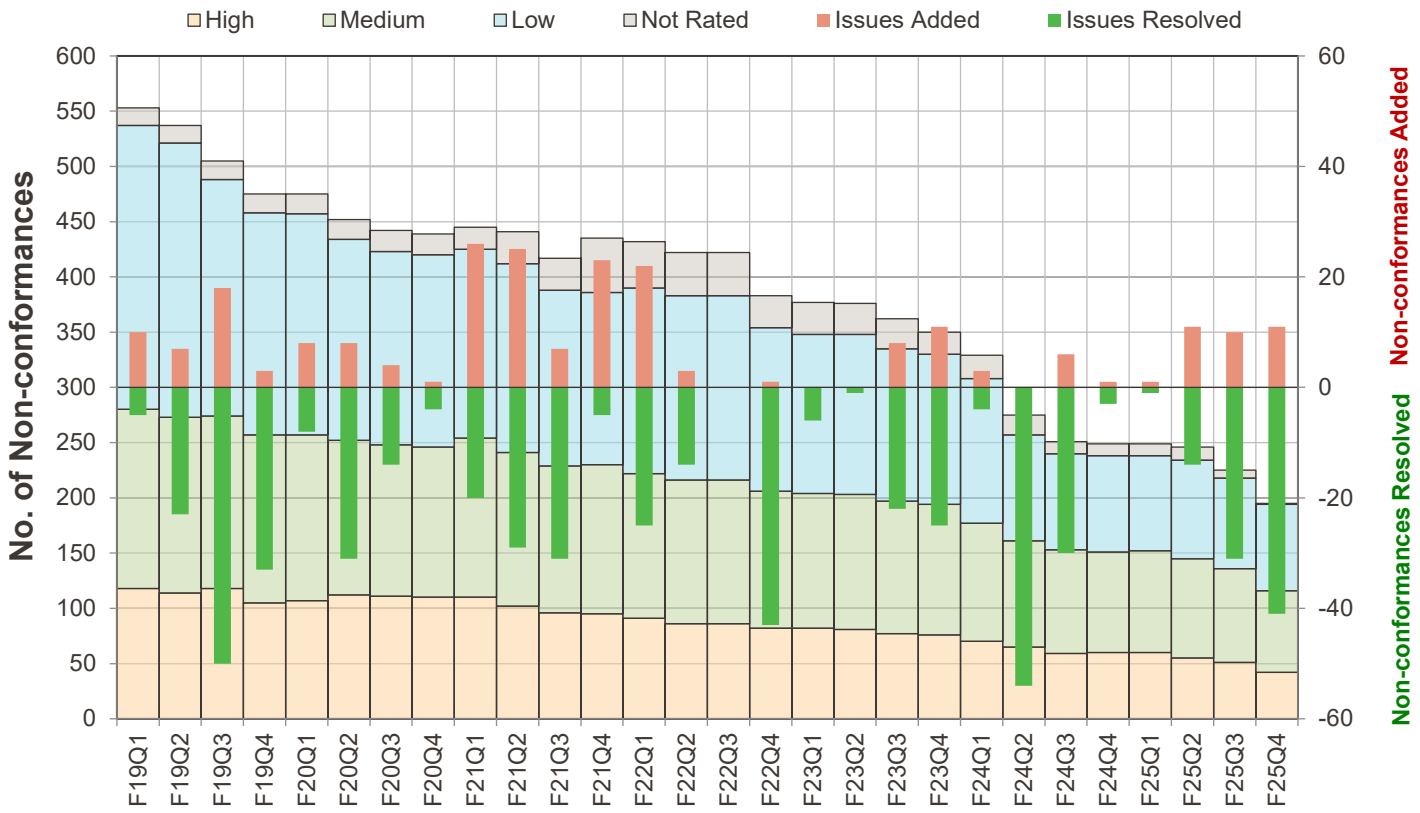

Figure 3 Changes and trends in the total number of Non-Conformance issues (characterized by level of importance).

The F2019 Q4 Quarterly Dam Safety Report, documented an ageing analysis of outstanding Non-Conformance issues that was performed at that time. Now, six years later, having put significant attention to resolving such issues, that analysis has been repeated. Figure 4 on the following page plots the percentage of non-conformances that had been closed against the year in which they were first entered into the database, both at the end of March 2025 and at the end of March 2019. Comparison of the two sets of data shows that the rate at which newly identified Non-Conformances are resolved has been greatly improved, as indicated by the much steeper slope of the blue curve in 2022-2025 versus that of the red dashed curve in 2016-2019. Comparison of the two data sets also clearly shows that Non-Conformance issues continue to be resolved, regardless of their year of entry into the database. A large majority of the Non-Conformance issues identified over time have now been resolved. Over 90 percent of all issues more than ten years old have been resolved and 75 percent of all issues identified within the last ten years have been resolved.

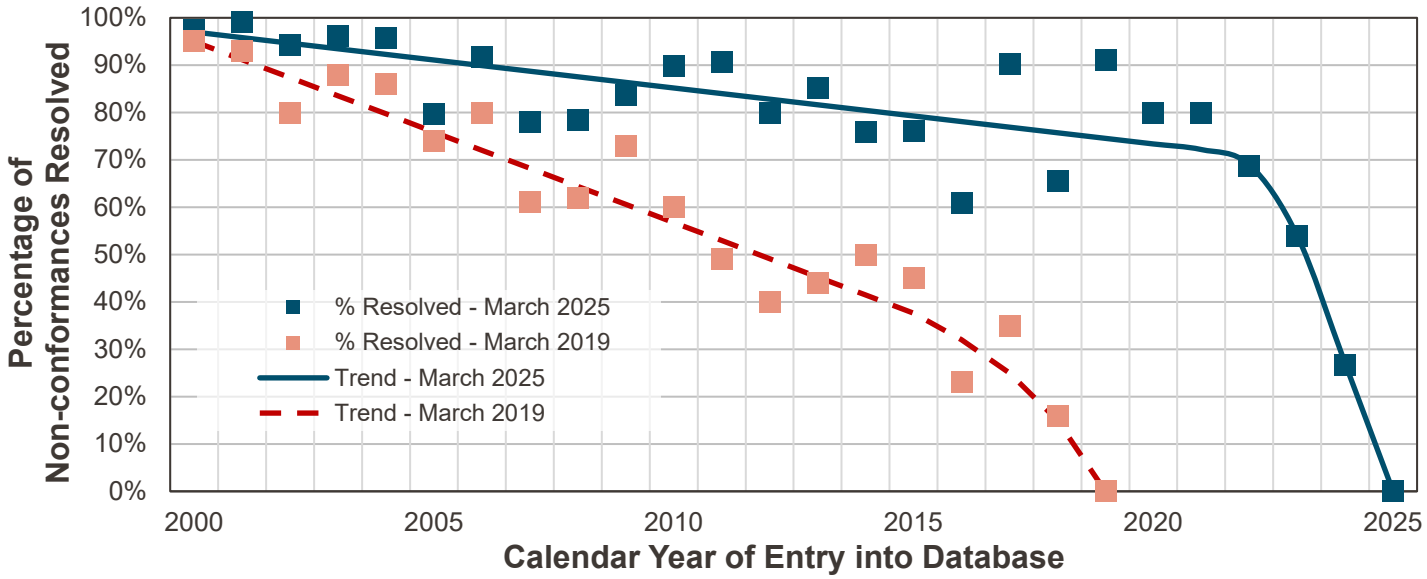

Figure 4 Percentage of non-conformances entered into the Dam Safety Issues Database in any given calendar year that have since been resolved.

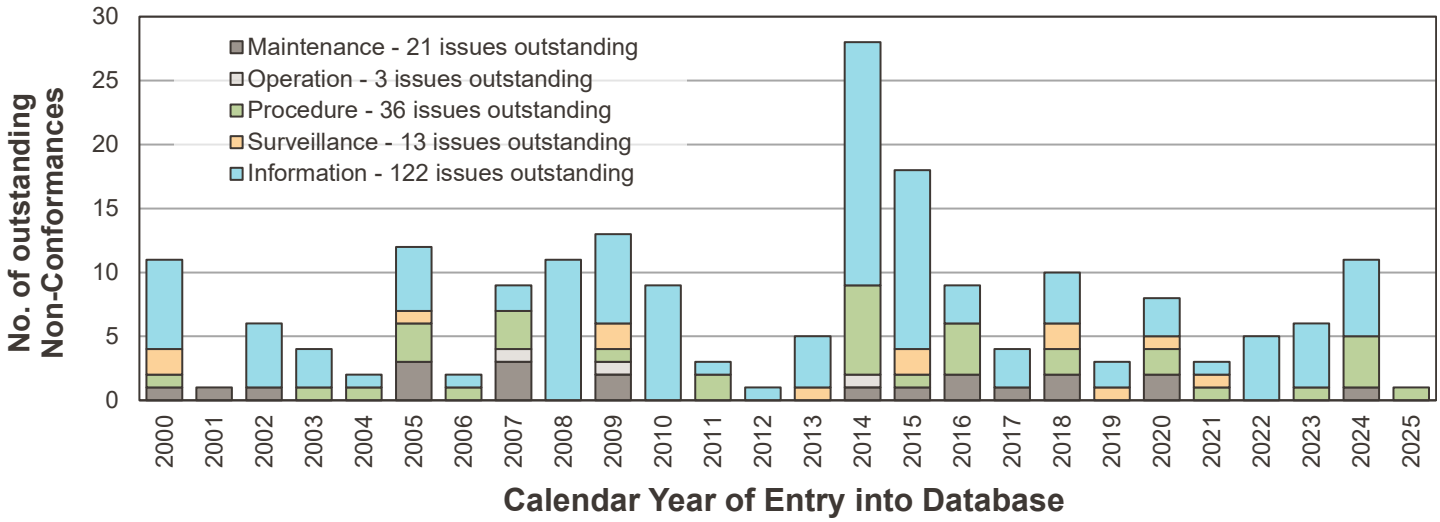

Figure 5 The number of outstanding Non-Conformance issues by type and year entered into the Dam Safety Issues Database.

Currently outstanding Non-Conformances of Operation, Maintenance, Surveillance, Procedure and Information are grouped and charted by the calendar year in which they were first identified in Figure 5. Of these:

- Three outstanding issues are “Operation” Non-Conformances. One is related to the potential for flow disruption through the penstock and generating station at Puntledge having potential to induce hazardous flow changes for recreational uses of the Puntledge River, which is being addressed by the Comox-Puntledge Flow Control Improvements Project. The second pertains to the lack of secondary access to the power intake structure at La Joie Dam in the event that the access bridge is damaged and is being addressed within the La Joie Dam Improvement Project. The last is due to missing signage at the Crest Creek Diversion Dike near Strathcona Dam, for which Dam Safety is preparing a Work Order to have rectified.

- 21 outstanding issues are for “Maintenance” Non-Conformances, of which nine are being addressed through current and/or planned projects, and the remainder have been prioritized and are being tracked and actively monitored until they have been resolved.
- 122 issues – 62 percent of all outstanding issues – are “Information” Non-Conformances, where the Dam Safety Program does not possess sufficient information on the design and construction or records of the historic operation, maintenance or surveillance of the dam. Resolving this type of Non-Conformance, where possible, typically requires a Dam Safety Investigation or other such engineering study. Presently, over one-half of these issues have been assigned to a Dam Safety Investigation or project for resolution.

Efforts to resolve and further reduce the number of outstanding Non-Conformance Issues remain a focus of the Dam Safety Program.

New Issues

No new issues arose in Q4 of F2025.

Update on Existing Issues

Winter Operability of Peace Canyon Spillway Gates

The F2025 Q3 Quarterly Dam Safety Report described that a generation outage at the Peace Canyon Generating Station had the potential to require repeated winter spilling over Peace Canyon Dam through Q4, and that some of the permanent heating systems for the dam’s spillway operating gates 3 and 4 were not functioning, impairing those gates’ ability to support multiple spills through the winter. The report further described measures that were implemented to improve the winter operability of the gates, including regular inspections and tests and the installation of temporary heating systems.

Ultimately, no operational spilling was required, but the measures were deemed to have been successful in keeping the gates operable through the winter. The temporary heating systems were operated continuously, and the temperature monitoring connected to Dam Safety’s Automated Data Acquisition System showed the gate bodies were kept above freezing for all conditions, including temperatures as cold as approximately -25 Celsius. Each week through the winter, the two gates were tested with no failures to operate, and the spillway was inspected visually by the crew and with the use of a drone, and no ice accumulation that would impair gate operation was observed.

Previously, BC Hydro had very little information on winter operation of these gates. The information collected over this past winter provides confidence that they can be opened in winter conditions. Because there was no extended operational spill, however, the rate and extent of ice formation while spilling, and therefore the ability to repeatedly open and close these gates for extraordinary operational needs in freezing conditions remains unknown.

At the end of March, the temporary heating equipment that was accessible from the dam deck was shut down and placed into storage. A small capital project is being released to restore the gates’ permanent heating systems to their original design intent but will not be complete in F2026. Therefore, the less accessible temporary heating equipment on the gates was left in place so it can be used next winter. Based on observations from this year that the temporary systems can heat the gates within a few hours, we will consider only running the heat on demand rather than continuously, saving on cost and energy.

Comox Dam Spillway Gates Backup Power and Puntledge Dam Intake Operating Gate Closure

The F2025 Q3 Quarterly Dam Safety Report described deficiencies in newly commissioned equipment that incurred operational reliability risks for the Comox Dam’s spillway gates and one of the Puntledge Dam’s intake gates. That report

also described the measures implemented and documented in Interim Dam Safety Risk Management Plans to manage those risks. Those measures remain in effect.

The deficient equipment at both dams was installed by the Comox-Puntledge Flow Control Improvements Project. The project team is working to develop long-term solutions for these issues. Simultaneously, the project is undergoing audits – both by BC Hydro and by the engineering design consultant – to identify the circumstances and actions that led to these deficiencies and to obviate their recurrence.

For additional information, please see “Comox-Puntledge Flow Control Improvements” under “Capital Projects” on page 16 of this report.

Compliance with Processes and Regulations

Regulatory Communications – British Columbia Utilities Commission

The application for acceptance of the schedule of capital expenditures for the Strathcona Discharge Upgrade Project remained adjourned through Q4. On April 4, 2025, the Commission established the regulatory timetable for the remainder of the application process. The process remains adjourned until May 30, 2025, when BC Hydro will submit an evidentiary update regarding the project cost estimate, followed by a round of Information requests in June and early July, and by final and reply arguments concluding on August 14, 2025.

Regulatory Communications – Comptroller of Water Rights

The Dam Safety Section of the Ministry of Water, Land and Resource Stewardship issued new *Guidelines for Dam Design and Construction*, providing dam owners with updated regulatory requirements for submissions and approvals to construct, alter, improve, or replace a dam licensed under the *Water Sustainability Act*.

Operation, Maintenance and Surveillance Manuals

Each dam has an Operation, Maintenance and Surveillance Manual (“Manual”) for Dam Safety that identifies responsibilities and expectations within BC Hydro for maintaining the safety of the dam. These Manuals are required by the Dam Safety Regulation and must be updated every seven to ten years, depending upon the dam’s failure consequences classification.

With the issue of the updated Manual for Clayton Falls Dam in February 2025, the Dam Safety Program returned to full regulatory compliance. The schedule of updates for calendar year 2025 is being developed but will include, at a minimum, updated Manuals for Falls River Dam, which is due this year under the regulation, and Elko Dam, which is required to reflect the changes made to the West Spillway with the permanent removal of stoplogs and piers.

Dam Safety Reviews

Dam Safety Reviews are independent, systematic reviews and evaluations of all aspects of a dam’s physical condition, design, construction, operation, maintenance, processes, and other systems affecting the safety of the dam. Performed by external consultants, they are carried out at minimum intervals of every five to ten years for dams that are classified in accordance with the Dam Safety Regulation as High, Very High, and Extreme consequence dams.

Five Dam Safety Reviews – for Alouette, Duncan, Elliott, Revelstoke, and Seven Mile Dams – are due at the end of calendar year 2025 and are currently underway. An electronic copy of the final Seven Mile Dam report was received in Q4. Second drafts of the Elliott and Revelstoke Dam reports were received and are under review as well as the first draft for Duncan Dam.

Five Dam Safety Reviews are planned for completion in calendar year 2026 and will have consultants assigned in Q1 of F2026. The upcoming Dam Safety Reviews are for Mica, Hugh Keenleyside, Buntzen, Quinsam Diversion, and Quinsam Storage Dams. The Whatshan Dam Safety Review is also planned to start this year with completion in 2028.

Dam Safety Program Management System

On April 22, 2025, Andrew Watson, P.Eng. replaced Bob Schubak, P.Eng. as Director, Dam Safety.

In Q4 of F2025, two new sections of the Dam Safety Program Management System's *Implementation Manual* were issued to formalize criteria for reporting to the Board of Directors through this report, and three existing sections were revised to clarify and document the criteria for closing, transferring, and completing issues in the Dam Safety Issues Database.

Surveillance

Key activities comprising dam safety surveillance include inspections, monitoring of instrumentation, quality control of data, and characterization of dam performance. Table 2 below provides key metrics regarding these activities, which are described in the following sub-sections of the report.

Table 2 Dam safety inspections and surveillance activities.

		Quarter Q4		Fiscal Year F2025	
		Actual	Target	Actual	Target
Routine dam inspections	Completed	378/379 = 99.7%	100%	1634/1638 = 99.8%	99.5% ✓
	Missed	1		4	
Formal (annual and semi-annual) dam inspections	Field work completed	0	0	71	71 ✓
	Reports issued	34	40	71	71 ✓
Instrumentation data checks		190/180 = 105%	97%	779/765 = 102%	99% ✓
Reservoir slopes inspections	Field work completed	0	0	21	21 ✓
	Reports issued	5	6	21	21 ✓

Routine Dam Inspections

Routine weekly and monthly inspections are a regulatory requirement. These visual inspections are carried out by trained inspectors within Dam Safety or Stations Field Operations using checklists prepared by the Dam Safety Engineer. The purpose of these inspections is to identify changing conditions at a dam, reservoir, or appurtenant structure that could threaten the safety of the dam. One routine inspection was missed at Wahleach Dam in March, due to lack of safe access from heavy snowfall at the dam. In F2025, all but four of 1638 scheduled routine inspections were completed.

Formal Dam Inspections

Formal inspections of the dams are regulatory inspections completed by Dam Safety Engineers on a semi-annual or annual frequency, as dictated by each dam's Consequence Classification. These inspections include a comprehensive

visual inspection, a review of the monitoring data through the course of the year, and an assessment of the condition of the water containment and conveyance structures. Field work is generally limited in the winter as reflected in Table 2 for F2025 Q4. All 71 formal dam safety inspections were completed in F2025.

Instrumentation and Monitoring

Dam Safety Surveillance collects, checks, and assesses about two million data points a month. A vast majority of the data is collected and checked against threshold values automatically by the Automated Data Acquisition System. Even though most of the data is checked automatically it is essential that qualified staff review the data regularly to ensure the systems are functioning as expected. The Dam Safety Technologists in each region regularly check instrumentation data plots for all dams to ensure the Automated Data Acquisition System is functioning as expected, identify any unusual trends, and ensure continued accuracy of the data for ongoing engineering assessment. They are tasked to perform three such checks per week. The 190 data checks completed in Q4 exceeded the planned number of 180, as did the 779 checks completed for F25 compared to the planned number of 765.

Reservoir Slopes

Reservoir Slopes inspections are completed on a frequency ranging from semi-annually to once every ten years, depending on the assessed hazard of the slope. They are typically carried out by the Reservoir Slopes Geologist and the Specialist Dam Safety Engineer for the Upper Columbia Region. Each inspection generally consists of a review of all monitoring data, a visual inspection completed from helicopter with boots-on-ground assessment of identified areas of concern, and documentation by a sealed engineering report. All 21 reservoir slopes inspections were completed in F2025.

Unusual Events or Observations

The Dam Safety on Call Person responded to 96 calls in Q4, which typically includes instrumentation alarms, operational inquiries, operations notifications during high inflows and earthquake notifications. This number of calls and responses is considered normal for this time of year.

On Friday February 21, at 1:30 pm, an earthquake with an epicentre 24 kilometres north-northeast of Sechelt and less than 10 kilometres from Clowhom Dam occurred. The local magnitude of the earthquake was estimated at between 4.7 and 5.1 (moment magnitude since confirmed to be 4.7), based on reports from various government agencies. The earthquake was widely felt throughout the Lower Mainland and Vancouver Island. The level of shaking was not expected to cause damage to the dams in these areas. Nevertheless, Dam Safety worked with Stations Field Operations to verify the safety of the impacted dams. By early Friday evening, visual inspections and assessment of the monitoring data was completed, confirming there was no damage or other impact to the safety of the sixteen affected dams.

Alarm Status Tracking System

Instrumentation alarms notify Dam Safety Surveillance staff when readings exceed predefined thresholds, requiring prompt assessment to ensure serious issues are not developing. Staff are alerted via auto-generated emails and phone calls. Initial responses were recorded in a spreadsheet, but tracking through resolution was not documented.

The Alarm Status Tracking System application was developed to support an alarm dashboard in the Dam Safety Information System. Initially, Surveillance managed the alarm dashboard separately from the spreadsheet, doubling the work. Recognizing the new system's potential, a team from Surveillance collaborated to define a new alarm response workflow detailing required information from notification through resolution without increasing effort. As a result:

- Alarm response can now be completed via email, with the application updating responses, eliminating the need to log into a computer after hours.

- The application links to Dam Safety's work planning tool, assigning follow-up actions to team members.
- Authorizations restrict action completion to designated staff; only a Dam Safety Engineer can close an alarm.
- Automated reports on alarms identified over the previous week and their resolution stages are sent to Dam Safety Engineers and Technologists.
- Alarm status can be checked centrally in the Alarm Status Tracking System or the Dam Safety Information System via mobile devices or computers.

Revisions to the Alarm Status Tracking System application were completed in Q3 and, after a two month evaluation period, the application was adopted as the primary alarm notification and tracking tool with full team support.

Civil Maintenance

Results for the Preventive and Condition-Based Civil Maintenance programs are summarized in Table 3, below.

Table 3 Dam Safety and Generation Civil Maintenance for F2025.

		Quarter Q4		Fiscal Year	
		Actual	Target	Actual	Target
Corrective and Condition-Based Maintenance	Spend ($k)	991	989	4023	4000
	Work Orders Completed	9	12	26	28
Preventive Maintenance	Tasks Completed	188	182	883/935 = 94%	

Preventive Maintenance

In F2025, the Civil Preventive Maintenance program achieved a completion rate of 94 percent, with Stations Field Operations and Engineering Services completing 188 out of the planned 182 work orders in the quarter. Though the 94 percent completion rate is lower than the F24 result of 97 percent, it is noteworthy that the 883 completed work orders represent a significant increase from the three-year average of 773.

Corrective and Condition-Based Maintenance

The Corrective and Condition-Based Civil Maintenance Program concluded its activities for F2025, completing 26 projects against the target of 28. The reduction of two work orders was due to reclassifying a staff gauge installation at Wahleach Dam as a capital expenditure, and deferring the low-level outlet inspection at Bear Creek Dam. The latter was postponed due to site conditions impeding inspection efforts during the original work window and environmental limitations preventing completion later in the fiscal year. This inspection has been added to the F2026 plan. The program was otherwise completed on target, maintaining a budget variance of less than 0.6 percent from the annual allocation of $4 million.

A notable project completed in Q4 was the repair of concrete in the spillway of Blind Slough Dam (Stave Falls). Previous inspections had revealed that repairs completed in the 1980s had deteriorated, with the most prominent erosion occurring immediately downstream of the gate sill beams in spillway bays 1 and 2. Continued degradation of the concrete posed a risk of further undermining the sill beams, potentially leading to their deformation. Repairs in bay 1 were prioritized, with the top third of the spillway surface being refurbished. Construction Services Vernon performed the repairs following procedures provided by BC Hydro Stations Maintenance Engineering, as shown in Figure 6.

Other noteworthy work completed in Q4 included the Clowhom dam face cleaning and the repair of the Ruskin reservoir staff gauge. Concrete repairs on the Sugar Lake overflow buttresses began in late Q4 and will be completed in early F26.

Figure 6 Stave Fall Spillway Bay 1 Concrete Repairs. Top left: Removal of deteriorated concrete downstream of the of the sill beam. Top Right: Cleaning, surface preparation and reinforcement installation. Bottom left: Curved formwork installation in preparation for concrete placement. Bottom right: Completed concrete repair.

Spillway Gate Testing and Maintenance

Spillway Gate Testing

During Q4 of F2025, all 239 scheduled gate tests were completed. This includes the annual tests of 33 gates. Table 4 provides key metrics related to spillway gate testing.

No gate tests were missed in Q4. One gate failed to operate on demand in Q4. At Revelstoke, during testing in February, one outlet works operating gate stalled at 0.9 ft while opening and could not reach the target opening of 1 ft. Investigatory testing with additional instrumentation was conducted later in the month, and the gate was successfully opened without issue. The gate was again successfully opened in March. A root cause analysis documenting the failure to operate, as well as the subsequent investigation, is being prepared.

Table 4 Spillway gate testing results for F2025.

		Quarter Q4		Fiscal Year	
		Actual	Target	Actual	Target
Monthly Tests	Completed	239/239 = 100%	100% ✓	936/942 = 99.4%	98% ✓
	Missed tests	**0**		**6**	
Gates Failing to Operate on Demand during Testing	No. of failures	**1**		**12**	
	Failure rate	1/239 = 0.4%		12/936 = 1.3%	

At Falls River Dam, issues with remote spillway gate operation from the control center persist. Errors with the gate position sensing were reported in late December and resolved in February by dispatching a technician. The gates were not able to be remotely operated during planned testing in March, but crews were able to operate the gates locally. Because these gates were operated locally, they have not been counted as failures to operate. This is a recurring issue and Dam Safety has organized a meeting with internal stakeholders to develop a plan to address reliability of remote operation.

Exemptions to gate testing scopes (*e.g.*, to exclude gate movements) are authorized in circumstances where: there would be the potential to cause harm to species at risk or other deleterious environmental consequences; there would be the potential to cause damage to the gate system or other infrastructure; or gates are locked out to support the safe performance of downstream or adjacent construction activities and returning the gate(s) to service for testing would be impracticable. Authorization for such exemptions is either provided for in Maintenance Instructions, where those circumstances occur routinely, or by the Director of Dam Safety or delegate in unusual circumstances. In Q4, gate testing scopes were reduced to exclude gate movements on 52 of the 239 tests completed.

Gates Out of Service or Under Restricted Service

The availability of flood passage devices is a key measure of our ability to pass high inflows and manage reservoir levels.

Strathcona spillway operating gate 1 is out of service until early May for the installation of temporary controls by the Strathcona Discharge Upgrade Project. An Interim Dam Safety Risk Management Plan is in place.

As described above, the two spillway gates at the Falls River Dam are only operable locally.

Spillway Gate Maintenance

Spillway gate maintenance results for F2025 Q4 are shown in Table 5, below, and the number of outstanding gate maintenance tasks is shown in the chart in Figure 7, on the following page.

Table 5 Spillway gate maintenance results for F2025.

Corrective and Condition-Based Maintenance Tasks	Quarter Q4		Fiscal Year
	Completed	Planned	
Planned Tasks	5	9	34/41 = 83%
Emergent Tasks	12		33

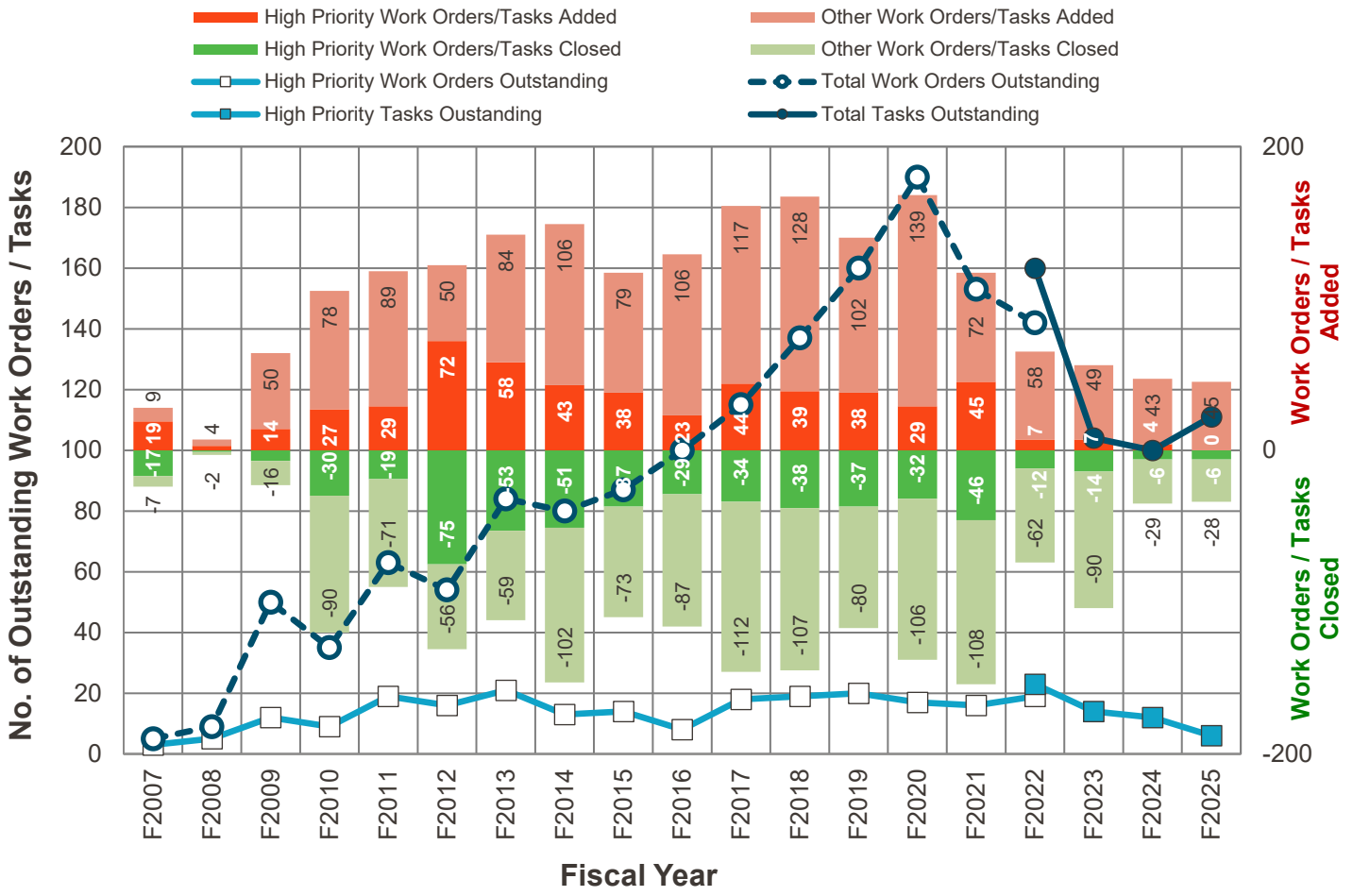

Figure 7 Number of outstanding corrective and condition-based spillway gate maintenance work orders and tasks, new work orders and tasks added, and work orders and tasks closed as at the end of each previous fiscal year.

Notes:
1. At the conclusion of F2022 moving forward into F2023, figures were restated as outstanding tasks instead of outstanding work orders to align with Operations reporting.
2. The number of tasks added and closed does not include any recategorized or cancelled tasks. As such, the net change in the number of tasks will not always equal the difference between tasks added and closed.

In Q4 two high priority tasks at Kootenay Canal were completed: replacement of gate guide heaters on canal headworks gates 1 and 2. However, some of the heaters are not functional due to deficiencies with the electrical distribution. The deficiencies are planned to be addressed by a project in the summer of 2025.

Over the course of F2025, with the addition of newly identified maintenance tasks and the completion of planned and emergent tasks (Table 5), the number of outstanding tasks has increased from 100 to 111 and the number of outstanding high priority tasks has decreased from twelve to six. The increase in the overall number is largely due to an annual review of maintenance tasks that was performed in Q2 of F2025 and identified an additional 32 existing tasks that are related to gate reliability but were not previously identified as such.

Emergency Preparedness and Public Safety

Emergency Preparedness is managed by Security & Emergency Management. Dam Safety reports on the updating of emergency plans for compliance with the Dam Safety Regulation as part of annual reporting to the Comptroller of Water Rights. Public safety near dams and reservoirs is managed by the Public Safety team in Safety Programs. Dam Safety reports on Public Safety activities related to dams during the Dam Safety Reviews. Please refer to the Quarterly Safety & Emergency Management Report, submitted to the Operations, Planning, Safety & Information Technology Committee, for updates on emergency preparedness and public safety.

Dam Safety and Security & Emergency Management have been collaborating to plan a tabletop dam safety emergency exercise for Kootenay Canal. The exercise is scheduled to be held on May 14 and will include participants from a broad range of business groups. This exercise will be the first step in progressing to a full functional exercise in 2027.

In February, Dam Safety and Security & Emergency Management jointly reviewed the Emergency Management issues in the Dam Safety Issues Database for currency and relevance. A memorandum was completed documenting the review and recharacterizing the issues as required. This is part of a larger initiative to increase collaboration between the two groups in fostering continual improvement of our preparedness in responding to dam safety emergencies.

On Friday February 21, at 1:30 pm, an earthquake with an epicentre 24 kilometres from Sechelt and less than ten kilometres from Clowhom Dam occurred. See “Unusual Events or Observations” on page 10 of this report for details.

Site C Project

Generating Units 3 and 4 were brought into service in Q4 of 2025. With these units now in service, the spillway gates have been closed and the flows over the dam’s spillway that had been continuous since reservoir filling have ceased. Work is now underway to convert the spillway’s three operating gates and six low level operating gates over to their final power supply and control systems, which will allow for their remote control, engagement of auto-spill to maintain environmental flows through the dam in the event of an unplanned full plant outage, and the handover of gate operations from the project team to Stations Field Operations. The Interim Dam Safety Risk Management Plan that covers spillway gate operation with temporary power supplies and temporary local control systems is being updated as successive gates are taken out of service for the work. Once the permanent systems are in place and gate operations are handed over to Stations Field Operations, the Interim Dam Safety Risk Management Plan will be rescinded and gate operations, including testing and maintenance, will be governed by the Site C Dam’s Operation, Maintenance and Surveillance Manual.

With warming temperatures, melting of snow, and ground thawing, aerial inspections of the reservoir slopes have resumed. During an aerial inspection on Wednesday April 9, 2025, new landslide features were noted along a section of the reservoir shoreline between Tea Creek and Wilder Creek, approximately eight kilometres upstream from the dam. Tension cracks were observed, with increasing lateral expansion and vertical offsets across the cracks observed in subsequent inspections. These areas of active landslide activity are contained within the stability impact line that was established around the reservoir in anticipation of such slope behaviour, and there is no infrastructure present within the stability impact line. Processes associated with shoreline erosion and shallower landslides elsewhere along the reservoir shoreline, which were anticipated to accelerate with the spring melt and ground thaw, are being monitored closely. To date, they remain within the stability impact line and in line with predictions as the reservoir slopes adjust to the reservoir.

The landslide activity currently being monitored is expected and poses no threat to the dam. The main risk would be from a sudden slide impacting crews who are working nearby on the reservoir and/or public accessing the reservoir. Crew operations on the reservoir are being appropriately modified in response to this hazard. In anticipation of this very type of hazard, the reservoir remains closed to public boaters with public safety communication plans in place, and the boat launches constructed by the project remain locked.

Capital Projects

Summaries of Dam Safety Capital Projects are available for reference in the Dam Safety "book" in Diligent. This section of the report describes newly launched projects and provides updates for projects where significant developments occurred, or where milestones were achieved.

Comox-Puntledge Flow Control Improvements

The objective of this project is to improve control of water conveyance at Comox and Puntledge Dams, with specific consideration to flows and risks to public safety downstream of Puntledge Dam. As was described in the F2025 Q3 Quarterly Dam Safety Report (also see "Update on Existing Issues", page 7 of this report), several deficiencies arose through the course of the project's first construction season in F2025. These include the excessive power draw of the spillway gates on the existing backup power supply at Comox Dam and the power draw and slow closure speed of a new intake operating gate at Puntledge Dam, and welding deformation of a new spillway gate at Comox Dam that prevented it from being installed as planned.

The project has now undergone independent reviews of the project-level and supporting quality plans that were enacted by BC Hydro, its design consultant and construction contractor. The review's findings and recommendations are currently being incorporated into revised plans. Welding repairs to the deformed spillway gate are being attempted in April. Design work to correct the design-related errors is continuing, and progress that can be made on this front will dictate how much of the other corrective work can be achieved in the F2026 construction season.

Ladore Spillway Seismic Upgrade

The objective of the Ladore Spillway Seismic Upgrade Project is to upgrade the spillway gate system at Ladore Dam so that the spillway gates and associated structures can resist the loads from a major earthquake and the spillway gates systems can reliably function to release water in a controlled manner afterward. General Improvements to the reliability of the systems are also included.

Construction commenced in Q4 with site clearing, installation of fences and gates, construction of site office trailers, and preparation of laydown areas. The first outage is scheduled for May 29 through June 30 for downstream spillway walkway removal and hoist deck (walkway) installation.

In early fall of 2025, upgrade work on Spillway Gate 3 will begin, and replacement of that spillway gate and its hoist system is planned for completion in 2026. Spillway Gate 2 will be replaced in 2027, and Spillway Gate 1 will be placed in 2028. All three upgraded spillway gates are planned to be in service in 2028.

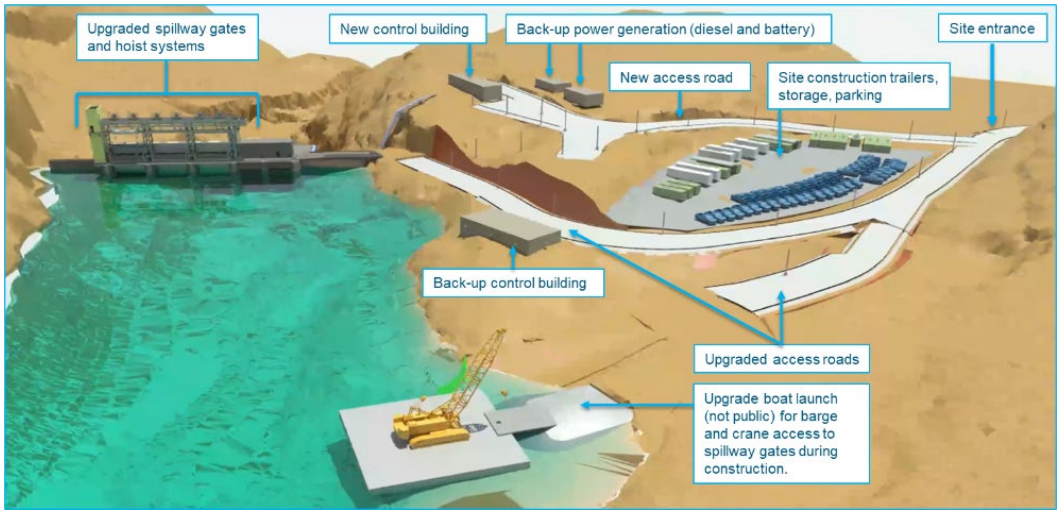

Figure 8 A computer-generated view of the site configuration for the Ladore Spillway Seismic Upgrade Project near the end of construction in 2028.

John Hart Dam Seismic Upgrade Project

Good progress continued on the main civil works portion of the project.

On the North Earthfill Dam, placement of the downstream berm continues. 22,000 cubic metres of organic material was removed, by April approximately 27,000 cubic meters of the total 40,000 cubic meters has been placed. Completion of the berm and with it the seismic upgrades to the North Earthfill Dam are planned for this summer.

Work on the downstream side of the Middle Earthfill Dam, including the anchoring of the dam's toe and placement of the downstream berm, is complete. Dredging of loose and organic materials from the reservoir upstream of the Middle Earthfill Dam is complete, and placement of rock for the new upstream berm has begun.

Work to buttress the old concrete Intake Dam by infilling the old penstock corridor with an elongated earthfill berm continues. The Bailey bridge that was downstream of the dam has been removed and the access road has been rerouted over the crest of the completed portion of the berm.

Work continues on the Concrete Main Dam to construct a new overflow spillway. As part of this work, the roadway deck is being removed, to be replaced with a new deck over the ogee of the overflow spillway once conversion is complete. As of April, the first section of the roadway deck had been removed.

These Main Civil Works of the John Hart Dam Seismic Upgrade Project will continue through 2025 and 2026, after which upgrades to the spillway gates systems will commence and continue for three more years.

Figure 9 Construction on the John Hart Dam Seismic Upgrade Project. Top: April 15 view of the Middle Earthfill Dam on the left and the North Earthfill Dam on the right. Middle: April 15 view of the work on the berm to stabilize the Intake Dam. The berm will be built up to the old dam. Bottom: April 8 view of the Concrete Main Dam, showing the removed section of roadway deck adjacent to the spillway.

Ruskin Dam Left Abutment Sinkhole Remediation

This project was released to develop and implement remedial solutions to the causes and impacts of the sinkholes that developed on the left abutment of Ruskin Dam in 2020.

The F2025 Q1 Quarterly Dam Safety Report described the discovery of a void within the bedrock above the penstock and fractured bedrock underlying the soil overburden, necessitating design modifications. Implementation of the modified design continued through F2025 and into F2026, as shown in Figure 10. Grouting is complete and ground improvements to seal off seepage from the bedrock into the proposed engineered drainage filter area are ongoing and planned for completion by the end of April. Thereafter, excavation will be completed, followed by the placement of the drainage filter.

In March, excavation uncovered a third sinkhole feature in the affected area, designated as SH25-1. Figure 11 shows this feature alongside sinkholes SH20-1 and SH20-2, the January 2020 surface expressions of which (see the F2020 Q4 Quarterly Dam Safety Report) led to this project. The discovery of this third sinkhole does not change the scope of the project, as all of the soils in this area are to be removed as part of the existing project scope in any event. It does, however, confirm the importance of this project, having found and eliminated at least one already developing sinkhole that would have further degraded the performance of the left abutment slope.

Figure 10 Work underway to grout and shore the walls of the excavation to remove loose clay deposits in the left abutment slope at Ruskin Dam.

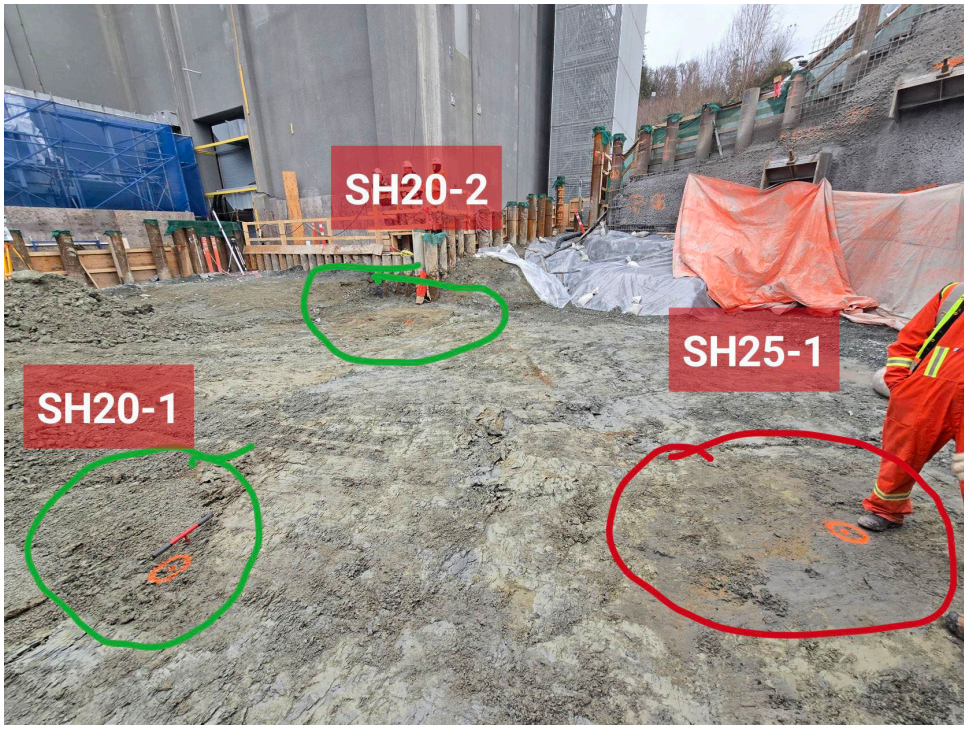

Figure 11 Excavated surface showing the three identified sinkhole features: SH20-1 and SH20-2, which resulted in the surface expressions observed in January 2020; and SH25-1, which was identified in during excavation in March 2025.

Dam Safety Investigations

Dam Safety Investigation Projects ("Investigations") are generally performed to either refine knowledge regarding potential issues or non-conformances of information recorded in the Dam Safety Issue Database or to perform precursor work for planned capital upgrade projects. This section provides descriptions of newly launched Investigations and updates for those Investigations where significant developments have occurred or where milestones were achieved.

Dam Safety currently has nine active Investigations underway to assess dam performance, investigate known issues, and collect additional information that is necessary to characterize the condition and performance of various dams in BC Hydro's fleet. Additionally, there are eight ongoing programs of work to update hydraulic, flood and inundation models, assess the effectiveness of public warning systems, develop vegetation management plans for dams and generating stations, reconcile historic and current survey datums, and improve capabilities in monitoring dams and reservoir slopes across the system. These investigations continued through Q4 of F2025.

Safety Evaluation Flood Update Program

A key parameter in the design or safety evaluation of any dam is the magnitude of inflow flood that the dam can safely pass downstream, generally through a combination of temporary surcharging of the reservoir and discharges over spillways and other controlled means. By convention, these extreme inflows are widely referred to as "Inflow Design Floods." Identifying the need to distinguish between the inflows that a dam was *designed* to safely pass – properly referred to as design floods – and the inflows that by current accepted practice a dam *should be able* to safely pass and against which its safety should be evaluated, BC Hydro Dam Safety began referring to the latter as the "Safety Evaluation Flood."[1] In practical terms, the Safety Evaluation Flood is identical to what the Inflow Design Flood would be if the dam were being designed and constructed today.

Many of the Safety Evaluation Floods for BC Hydro's dams are due for updates, so this program was initiated in F2023. Updates of the Safety Evaluation Floods for Alouette Dam, Coquitlam Dam, Buntzen Dam, La Joie Dam and Terzaghi Dam were completed in F2025. Additionally, a revision to incorporate a minor change in methodology for the analysis of Duncan Dam was completed. Summarizing the findings:

- Alouette Dam, Coquitlam Dam and Duncan Dam can all pass their Safety Evaluation Floods without overtopping.
- Buntzen Dam would be overtopped by its Safety Evaluation Flood. The Lake Buntzen 1 Flood Discharge Capability Improvement Project is planned to be released in F2026 to address this deficiency, with an in-service date in 2031.
- La Joie Dam would be overtopped by its updated Safety Evaluation Flood if it is routed from a starting reservoir elevation of 749.81 m (the Full Supply Level). Note, however, that the elevation of Downton Lake Reservoir that is impounded by La Joie Dam is currently restricted to elevation 734 m, obviating any overtopping concerns. This restriction will remain in place until completion of the ongoing La Joie Dam Improvements Project, which is making use of this updated flood information in the design of the upgrades.
- Terzaghi Dam would also be overtopped by its updated Safety Evaluation Flood. Previous stochastic event flood modelling, however, has shown that flooding of this magnitude is extremely improbable, and that flooding of sufficient magnitude to overtop the dam has an annual exceedance frequency in the order of only one in one million.
- Work on the Safety Evaluation Flood Update Program continues into F2026.

[1] This terminology has since been adopted by Engineers & Geoscientists of British Columbia in their Practice Advisory "Determining Dam Hydrologic Loading" (August 2022).