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Drinking Water Management Plan Update Discussion Paper

Priority Area: Resilient Water System

August 2025

About Metro Vancouver

Metro Vancouver is a diverse organization that plans for and delivers regional utility services, including water, sewers and wastewater treatment, and solid waste management. It also regulates air quality, plans for urban growth, manages a regional parks system, provides affordable housing, and serves as a regional federation. The organization is a federation of 21 municipalities, one electoral area, and one treaty First Nation located in the region of the same name. The organization is governed by a Board of Directors of elected officials from each member jurisdiction.

Metro Vancouver acknowledges that the region's residents live, work, and learn on the shared territories of many Indigenous peoples, including 10 local First Nations: q̓ićəy̓ (Katzie), q̓ʷɑ:ƛ̓əƛ̓ (Kwantlen), kʷikʷəƛ̓əm (Kwikwetlem), máthxwi (Matsqui), xʷməθkʷəy̓əm (Musqueam), qiqéyt (Qayqayt), Semiahmoo, Sḵwx̱wú7mesh Úxwumixw (Squamish), scəw̓ aθən məsteyəxʷ (Tsawwassen) and səlilwətaɬ (Tsleil-Waututh).

Metro Vancouver respects the diverse and distinct histories, languages, and cultures of First Nations, Métis, and Inuit, which collectively enrich our lives and the region.

Drinking Water Management Plan Update
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Discussion Paper

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Cover: Barnston Pump Station

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Aerial View of the Metro Vancouver Region

Overview

Metro Vancouver is updating the Drinking Water Management Plan (DWMP), the overarching guiding document for Metro Vancouver's water utility, to establish priorities and set the strategic direction for drinking water initiatives over the next 10 years. The plan was first developed in 2005, with minor updates made in 2007 and 2011. The current plan describes operational work and capital projects and considers many of the emerging and critical challenges Metro Vancouver and the region face in managing the supply, operations, and maintenance of the drinking water system.

Since the current plan's publication, Metro Vancouver has continued with its programs to expand the drinking water system and complete seismic upgrades. Metro Vancouver now needs to explore how the upgraded system will meet future challenges impacting regional water management. These challenges include the impacts of climate change on water quality, supply, and infrastructure, and risks from seismic events, aging water infrastructure, and population growth.

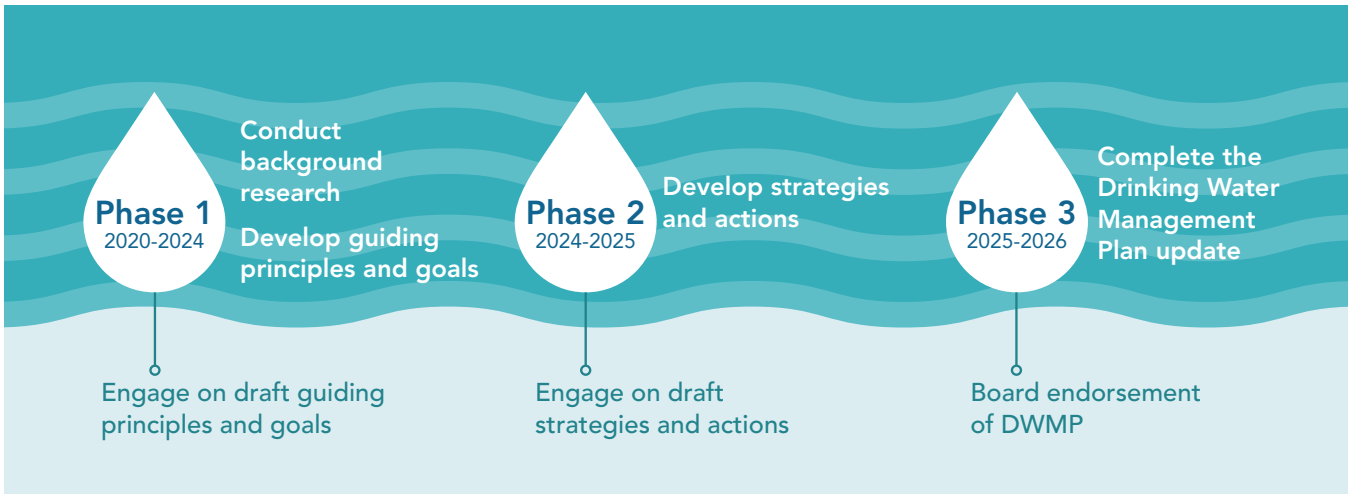
The purpose of updating the DWMP is to:

- Establish goals, strategies, and actions to ensure Metro Vancouver can continue to supply high-quality drinking water in the face of changes such as climate change, population growth, and seismic events
- Outline how Metro Vancouver and its members will plan to work together to align priorities and implement actions
- Incorporate First Nations' interests and values
- Provide a strong rationale to support decision-making

Drinking Water Management Plan Update Process

There are three phases of engagement to the DWMP update. The first phase sets the stage by conducting background research and a gap analysis on the 2011 DWMP, as well as developing the guiding principles and goals.

We are currently in Phase 2 of the DWMP update, which entails the development of strategies and actions that align with the guiding principles and goals. In Phase 3, the DWMP update team will complete the plan and seek the Board's endorsement.



Vision

The Water Services department vision that guides the DWMP update is to:

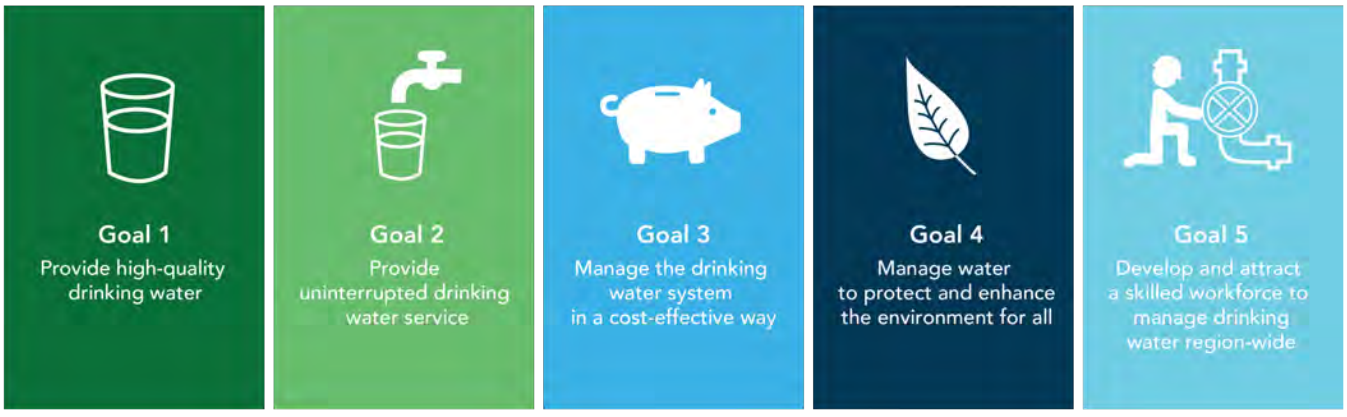
Deliver world class drinking water in a reliable and environmentally sensitive manner to meet the needs of a growing region.

Guiding Principles

The DWMP will be framed by the following 10 guiding principles that describe the fundamental values which will guide plan development and implementation.

Plan Goals

The DWMP update will cover the following five goals established during Phase 1.



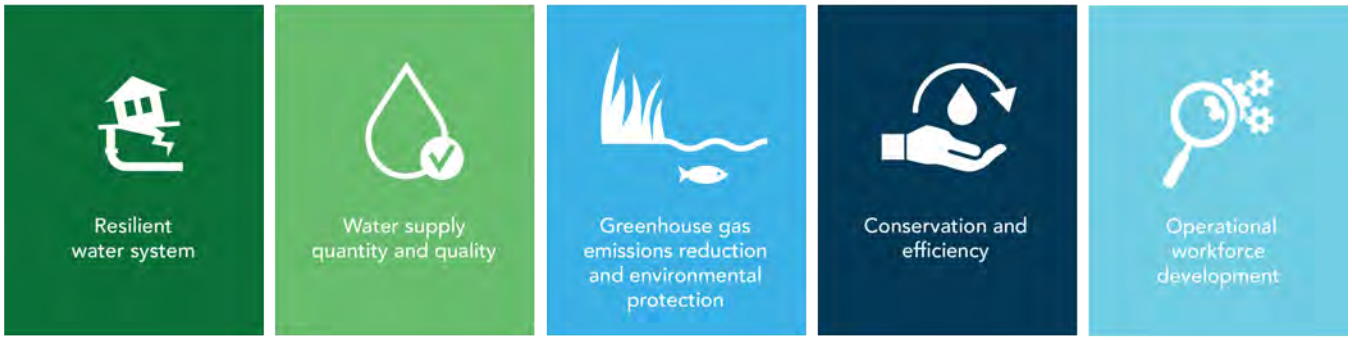
Priority Areas

In the development of strategies in Phase 2, we have found that strategies often address multiple goals. As a way of creating structure to the DWMP update, the DWMP team identified five priority areas that impact the management of Metro Vancouver's drinking water system.

A series of discussion papers on each of these priority areas has been developed in Phase 2. Once Phase 2 of the DWMP update is complete, the DWMP update team will review all the strategies that are developed and identify which goal(s) each strategy addresses.

Discussion Paper Development Process

Strategies and actions have been developed through workshops with the Metro Vancouver Internal Working Group (IWG), which includes representatives from each division of Metro Vancouver's water utility and from other Metro Vancouver departments. Further input has been gathered through small group discussions with subject matter experts of the IWG to develop a series of discussion papers addressing the priority areas below. Feedback was also gathered from the Regional Engineers Advisory Committee - Water Subcommittee (REAC-WSC), key stakeholders, and First Nations through several engagement opportunities.



Public engagement in the community

Context

Metro Vancouver provides bulk water storage, treatment, and drinking water transmission services through an extensive and complex network of natural and built assets, including five dams, two water treatment plants, 28 in-system storage reservoirs, 19 pump stations, eight disinfection facilities and over 520 km of transmission mains. The infrastructure ranges from being newly constructed to nearing the end of service life, and includes infrastructure that pre-dates the creation of the Greater Vancouver Water District (GVWD) in 1924.

Member jurisdictions depend on Metro Vancouver to consistently deliver high-quality drinking water and maintain the regional drinking water system to be resilient to natural hazards, and extreme weather events. Together, Metro Vancouver and its member jurisdictions work to supply high-quality drinking water to more than 3 million people in the region.

Key Challenges

Some of the identified key challenges that the water utility faces with respect to maintaining a resilient water system include:

- **Impacts of climate change and natural hazards on infrastructure.** Over the past several years, Metro Vancouver has continually assessed the climate impacts on the drinking water system. We are now certain that each year will likely present new, unprecedented challenges for which we must be prepared. Climate change, extreme weather, earthquakes, and other natural hazards can expose the drinking water system to conditions that exceed the design parameters in place at the time the infrastructure was constructed or had subsequent upgrades. Potential impacts to the drinking water system could include limited access and damage due to flooding, earthquakes and landslides, and prolonged power outages.
- **Heavy rainfall events, and landslides caused by such events, can impact water supply infrastructure in several ways.** They can impact source water quality, increasing turbidity and natural organic matter in the source reservoirs. Landslides can block access to and expose or damage water supply infrastructure in its path, posing a risk to the raw water supply mains. In an extreme case, a significant landslide event may overwhelm the debris booms protecting the reservoir dams, damaging gates, racks protecting the intake, or other equipment. Such damage could potentially reduce flows to the treatment plant and dam spillway conveyance, which in turn may compromise the safety and integrity of the dam and downstream areas. A large landslide may also generate a flood wave directly into a reservoir, which could result in water levels increasing to the point where water flows over the top of the dam (overtopping), compromising dam safety. Catastrophic events such as these would result in the loss of a sizable part of the Metro Vancouver water supply storage volume.
- **Aging infrastructure.** Aging infrastructure increases the risk of asset failures, service interruptions, reduced accuracy of instrumentation, and compromised safety. Assets fail for a variety of reasons and is not necessarily driven by infrastructure age. Exercising valves and maintaining existing assets, conducting routine inspections and performing timely asset replacement before the end of service life are key to managing aging infrastructure.
- **Protecting assets from ongoing construction work.** Metro Vancouver and third-party construction work in close proximity to the drinking water system could potentially damage this infrastructure. As the region densifies, construction work is often becoming more complex, more frequent, higher risk, and in closer proximity to water system components. Construction near drinking water infrastructure is also competing for scheduling as construction windows are limited to the low demand period (winter), when more infrastructure can be offline.
- **Gaps in system redundancy.** Some of the region's infrastructure lacks redundancy, which contributes to a higher risk of service interruption. Redundancy throughout the drinking water system is necessary to support Metro Vancouver's maintenance and emergency work on the transmission system. Where there is insufficient redundancy, members may be challenged to continue delivering drinking water during outages within the regional system. This can add operational complexity and cost to the work and may impact the reliability of the overall system.
- **Public expectations.** While the public accepts the occasional power outage as a minor inconvenience, drinking water has a performance target of 100% - without any interruptions to quantity or quality. Member jurisdictions have a similar expectation to provision of water by Metro Vancouver; however, like all utilities, water service can also suffer from interruptions due to unexpected events. As such, we need to plan and build infrastructure that allows us to meet these high expectations.

Progress to Date

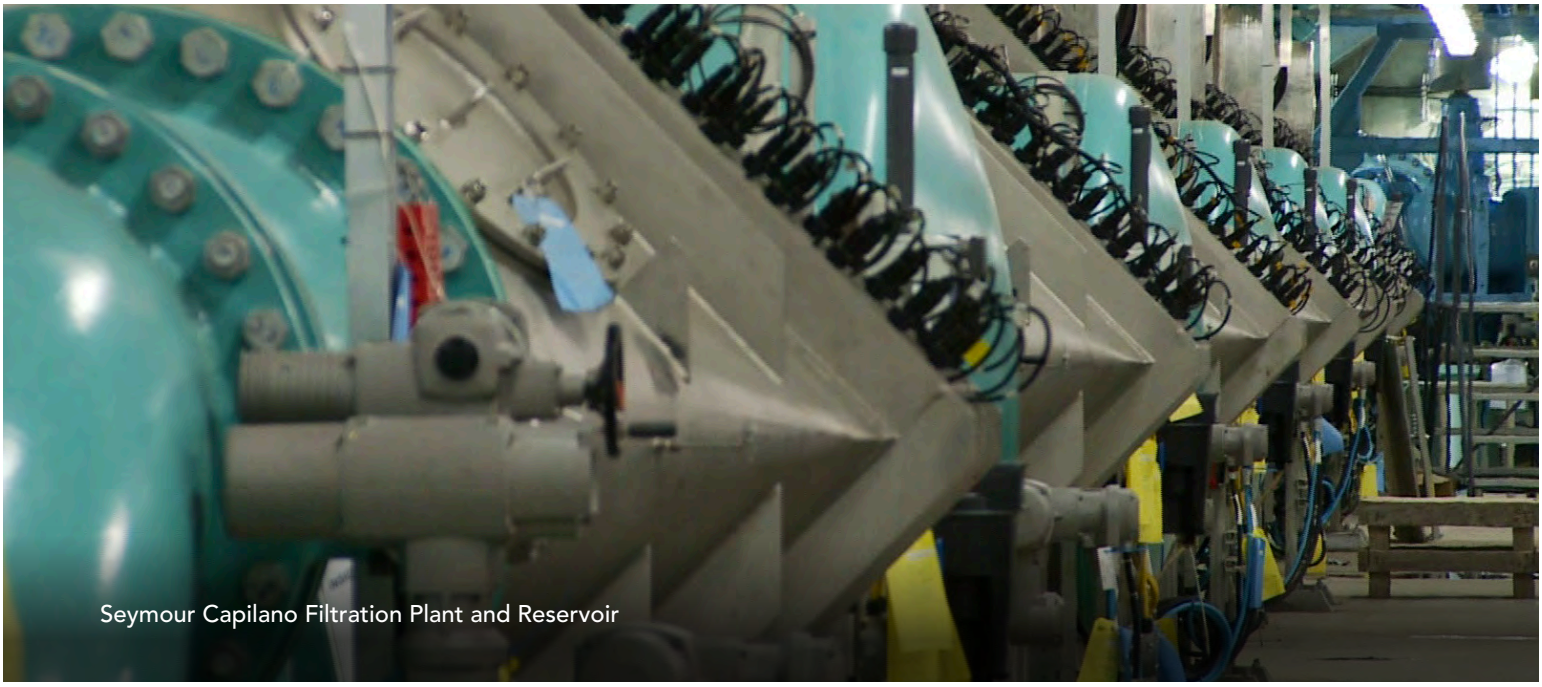
Uninterrupted drinking water service relies on infrastructure that is resilient to climate change, natural hazards, and power outages, as well as maintenance of existing infrastructure. Metro Vancouver is working to enhance drinking water system resilience to support the uninterrupted delivery of water to the region in the face of these challenges.

Metro Vancouver is currently undertaking significant work to increase the resiliency of the water system:

- **Planning for resiliency improvements.** Metro Vancouver has studied the vulnerability of critical components of the drinking water system. The most recent climate change and power vulnerability studies were completed in 2019 and an updated seismic vulnerability study, the *Regional Water Supply System Lifeline Study: Seismic Vulnerability Assessment,* was completed in February 2022.
  - *Regional Water Supply System Lifeline Study: Seismic Vulnerability Assessment* - The water mains and facilities were evaluated for earthquakes with a 1:2,475-year and 1:10,000-year return period, respectively, per Metro Vancouver's Seismic Design Criteria and draft 2020 National Building Code of Canada requirements. This study recommends additional site-specific assessments and structural analysis for facilities to improve the predictions of seismic damage. The study also provides recommendations on other seismic resiliency measures.
  - ***Water Supply Outlook 2120*** - Long-term modelling predicts declining snowpack due to warming temperatures and reduced summer rainfall. To manage the predicted supply shortfall, additional water supply sources were reviewed, both within and outside the Metro Vancouver region.
- **Improving resilience.** Metro Vancouver is undertaking a program to improve the seismic resilience of the water supply system by building five major crossings deep under the Burrard Inlet and Fraser River. Based on the findings of the ***Water Supply Outlook 2120***, Metro Vancouver has made significant investments to improve the resilience of the drinking water system including seismic upgrades for five major marine crossings and installation of backup power at strategically selected pump stations and water treatment facilities. Building water system resilience accounted for $793,200,000 for the 2025 to 2029 Capital Plan, which is 17% of the ***Water Services 2025–2029 Capital Plan***.
- **Asset management planning.** The Metro Vancouver Board of Directors approved the *Asset Management for Water Services Policy* in 2019. Metro Vancouver is continuing to develop its asset management program in alignment with this policy and industry best practices. It also brought the first *State of the Assets Report* to the Board in May 2022. The report rated the overall condition of water assets as "Good" and found that current funding levels are sufficient to adequately maintain existing assets. In 2025, Water Service's maintenance budget was $1,083,250,000 for the 2025 to 2029 capital plan, which is 24 per cent of the ***Water Services 2025-2029 Capital Plan***.
- Metro Vancouver is also working on acquiring rights-of-way for land where major underground infrastructure is built. This improves system maintenance access and allows for improved asset management planning. Gaining rights-of-way above Metro Vancouver infrastructure allows for increased authority over the above ground activities, guaranteeing better protection of the below ground infrastructure.

Coquitlam Water Treatment Plant and Rechlorination Station

- **Upgrading instrumentation.** As technology advances, Metro Vancouver is working to maintain industry-leading instrumentation. This includes updating water meters to the most current technology, which increases the accuracy of meter readings.
- **Maintaining and assessing asset conditions.** Long-standing approaches taken by Metro Vancouver to maintain the reliability of the drinking water system include inspection, maintenance, and condition assessments. Drinking water facilities, including pump stations, reservoirs and treatment plants, follow a structured maintenance program. Less accessible infrastructure such as buried transmission mains, have cathodic protection systems and are monitored based on risk, with repairs completed in a timely manner. Metro Vancouver has also started collecting information on the drinking water system's asset condition using a new standardized asset condition assessment framework.
- **Defining requirements for work near the drinking water system.** Discussions have been initiated with several utility and infrastructure agencies to develop agreements on requirements for working around each respective agency's infrastructure. The requirements are outlined in Metro Vancouver's *Proximal Work Requirements*.
- **Planning for emergencies and disasters.** Metro Vancouver is part of the Integrated Partnership for Regional Emergency Management, collaborating with other regional and provincial partners to plan for future emergencies and disasters which are likely to cross jurisdictional boundaries. Metro Vancouver is working with member jurisdictions on strategies related to the temporary provision of water in case of a regional emergency. Specifically, Metro Vancouver will endeavour to provide access points at select reservoirs in case of a regional emergency and is currently working with members to increase the number of supply points for increased operational flexibility. Metro Vancouver is also developing and implementing an earthquake early warning system to better secure its people and assets, to minimize damage, and to enhance repairs.



Seymour Capilano Filtration Plant and Reservoir

Proposed Strategies

The following draft strategies have been developed for consideration:

- **Strategy 1: Advance planning and designing for resilience to natural hazards and climate change impacts.** Build on the recommendations that were made in the *Regional Water System Climate Change Risk Assessment* and the *2022 Regional Water Supply System Lifeline Study: Seismic Vulnerability Assessment* to improve the resiliency of existing infrastructure.
- **Strategy 2: Respond and recover from emergencies.** Develop or improve plans related to resilience, emergency response, and flood management. This also includes tools to improve the resilience of future infrastructure.
- **Strategy 3: Proactively manage existing infrastructure for longevity.** Build on existing practices, enhance inspection, maintenance, renewal, and replacement programs, and formalize practices for work near Metro Vancouver infrastructure.

Low water levels at the Cleveland Dam during the warm, dry fall in 2022

Planning and Designing for Resiliency

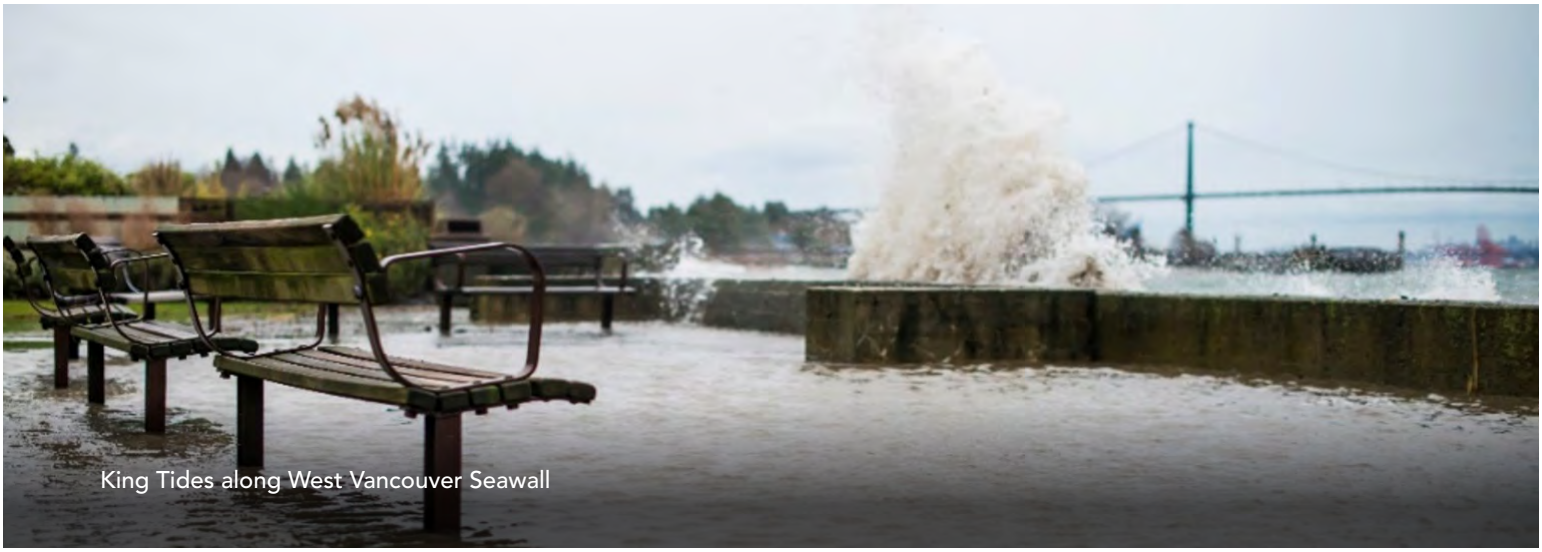
Metro Vancouver's commitment to strive to providing an uninterrupted supply of drinking water to its member jurisdictions underscores the growing importance of water system resilience, particularly in a region vulnerable to natural hazards and the impacts of climate change. Intensifying storms, longer droughts, changing regional weather patterns, and natural hazards such as earthquakes and landslides can cause infrastructure failures and disruptions to the water system. This strategy considers how Metro Vancouver can build resilience against these risks and ensure that drinking water can continue to be delivered across the region.

Metro Vancouver will continue building on the resiliency assessment by planning infrastructure improvements and completing the remaining assessments and studies, such as those identified as necessary by the *2022 Regional Water Supply System Lifeline Study: Seismic Vulnerability Assessment.*

Seismic assessments and improvements have also been performed, as well as assessments and implementation of backup power in various facilities.

Draft Strategy: Advance Planning and Designing for Resilience to Natural Hazards and Climate Change Impacts

Potential Actions	Potential Initiatives
Increase the resilience of the water system to the impacts of natural hazards, extreme temperatures, and other emerging hazards	• Coordinate with member jurisdictions to identify points of failure due to seismic activity in the transmission and distribution systems to support the planning of upgrades and redundancy • Assess infrastructure vulnerabilities to extreme heat, wildfires, floods, landslides, seismic activity, winter storms, and other emerging hazards to support the development and implementation of an infrastructure resiliency framework and inform infrastructure upgrades • Protect infrastructure and access to the infrastructure from the impacts of increasingly frequent and severe flooding and winter storms • Continue to perform structural analysis and evaluations to estimate seismic vulnerabilities and inform and prioritize critical upgrades • Implement, where feasible and appropriate, automated actions arising from the earthquake early warning system to shut off / throttle valves/equipment in order to save water and mitigate equipment damage • Implement automated building damage assessment from earthquake shaking at critical water facilities
Advance water system redundancies to prepare for the possibility of infrastructure failures	• Identify system redundancy requirements • Assess critical infrastructure and develop a redundancy strategy to include in the infrastructure resiliency framework • Develop greater interconnectivity between the Seymour-Capilano and Coquitlam water systems to allow greater operational flexibility
Improve power resilience through a diverse portfolio of energy sources, energy efficiency, and capacity management opportunities, including potential storage options	• Develop and implement an energy optimization and resiliency strategy • Assess and plan for alternative primary and secondary energy sources for critical infrastructure, including consideration of other renewable sources such as recovered energy from the water system, solar, or wind energy • Collaborate with BC Hydro and other organizations to develop a plan for temporary provision of power in the event that critical power infrastructure and service are compromised • Coordinate capacity related capital planning with BC Hydro to ensure they can continue to meet the energy needs of growing system • Study and implement energy conservation and demand response projects to increase efficiency in electricity consumption and reduce peak demand to support service and grid resilience
Define supply commitments and identify system redundancy requirements	• Members to develop a post disaster target minimum level of service • Metro Vancouver to develop supply targets to be applied in the event of an emergency
Advance design requirements such that new infrastructure is resilient to climate change	• Establish climate (e.g. rainfall and temperature) design guidance based on the latest climate change projections that will be carried forward as a basis of design and reviewed during Project Definition • Include risk assessments of natural hazards and climate change in any new infrastructure projects • Conduct a high-level analysis to identify how infrastructure designs could be future-proofed by incorporating flexibility for variable future conditions into designs • Establish a working group with other similarly sized utilities on design standards



King Tides along West Vancouver Seawall

Emergency Management and Response

The Metro Vancouver region is susceptible to a variety of emergencies that Metro Vancouver needs to be able to address promptly and efficiently to continue providing the region with high-quality drinking water. Closely connected to the first strategy, emergency management and preparedness are foundational elements to ensuring that drinking water can be supplied to critical areas after a natural hazard, major infrastructure failure, or other emergency situations. Drinking water is an essential service, crucial to the management of an emergency and to the region's recovery.

Emergency management and response plans are in place to meet the requirements of the ***Drinking Water Protection Act*** and ***Regulations***. In the case of an emergency, Metro Vancouver will endeavour to maintain the delivery of drinking water to member jurisdictions, with priorities to:

- Deliver potable water whenever possible to member jurisdictions for consumption and/or firefighting
- Protect the integrity of water in our system for public health

In meeting these priorities, Metro Vancouver follows BC Emergency Management System goals[1], which are as follows, in order of priority:

1. Ensure the safety and health of all responders and Metro Vancouver staff
2. Save lives
3. Reduce suffering
4. Protect public health
5. Protect critical infrastructure
6. Protect property
7. Protect the environment
8. Reduce economic and social loss

1 ***BC Emergency Management System [2016]***

Draft Strategy: Respond and Recover from Emergencies

Potential Actions	Potential Initiatives
Support access to drinking water at critical locations in the region for essential uses in the event of an emergency	• Collaborate with member jurisdictions to implement the Regional Temporary Provision of Drinking Water Guideline
Prepare to execute an adaptive emergency response plan	• Refine scenario-driven emergency response plans through continued participation in the Integrated Partnership for Regional Emergency Management in Metro Vancouver • Maintain with annual updates, the Water Services Emergency Management Plan, the ancillary Emergency Response Plans for various components of the water supply system, including Dam Emergency Plans for the affected dams, and associated training and table-top exercises • Continue expanding the earthquake early warning system, structural health monitoring and related automation to critical infrastructure, and develop communication protocols in the event of a warning • Develop and implement business continuity plans for security breaches, natural hazards, and climate-related emergencies • Establish laydown areas and an equipment list required to respond to various emergencies, including a testing and maintenance plan
Coordinate emergency response with member jurisdictions	• Conduct tabletop emergency response scenarios with member jurisdictions • Share and coordinate emergency response procedures with the Fraser Valley Regional District • Develop and host an integrated regional forum and centralized repository for emergency management planning and response that invites participation and houses emergency management documents from both internal divisions and external organizations
Promote disaster preparation with respect to drinking water (for residents and businesses)	• Develop and implement a communication strategy to support residents with disaster preparation, with additional consideration to the impacts of disasters on vulnerable populations

Second Narrows Water Supply Tunnel construction

Managing Infrastructure

Metro Vancouver's regional water system is expansive, including, but not limited to over 520 km of transmission mains, five dams, 19 pump stations, 28 in-system storage reservoirs, two treatment systems and eight re-chlorination facilities. The replacement value of the regional water system built assets is estimated at over $20 billion (2022).

The water system infrastructure is built for multiple generations and, with proper maintenance, can last over 100 years. Maintenance and renewal of the system, regardless of its age, through an asset management program is crucial to providing an uninterrupted supply of drinking water to residents and businesses in the region. Metro Vancouver is continuing to develop its asset management program in alignment with the Board policy and industry best practices.

Ongoing pressures of regional affordability and cost escalations amid unprecedented growth pose a challenge in ensuring adequate investment and resourcing for maintenance and renewal.

However, deferring maintenance and renewal on existing infrastructure in order to meet current priorities is a trade-off, increasing the risk of larger, more complex, and higher consequence maintenance or failures in the future. The *State of the Assets* report released in 2022 found that Metro Vancouver's annual investment into asset renewal and maintenance was adequate, with an estimated annual investment of $263 million needed over the next 30 years.

Long-standing approaches taken by Metro Vancouver to maintain the reliability of the drinking water system include a system of inspection, maintenance, and condition assessments. The *State of the Assets* report found that while the overall condition of water supply assets was good, a small portion of the asset portfolio is in poor condition. Factors that may have contributed to this include challenges related to accessibility for inspection and repair, documentation gaps, competing priorities, and availability of spare parts. These challenges are addressed in the proposed actions below.

Draft Strategy: Proactively Manage Existing Infrastructure for Longevity

Potential Actions	Potential Initiatives
Ensure assets remain in good condition to deliver water reliably throughout the region	• Continue development and implementation of the Water Services Asset Management Plan in accordance with international standards and industry best practices • Determine asset risk and vulnerability to inform prioritization of assets and identification of critical infrastructure • Establish asset renewal criteria and targets • Evaluate the capacities of the dams to safely pass flows associated with extreme weather events and upstream landslides and identify capital work to implement remedial measures identified • Assess the suitability of current debris management practices to handle an extreme landslide event • Use water main condition assessment tools to identify leaks, pipe thickness, lining integrity and to help inform capital replacement program • Explore options to use more robust/reliable valves that will enhance system operational reliability and reduce routine maintenance • Improve user experience (utility, ease of use and access, efficiency, reliability) with asset documentation including drawings, enterprise asset management software, and digital field applications for data collection
Continue incorporating asset management into resource planning	• Develop in-house Maintenance Task Analysis capabilities • Establish a dedicated operational team for day-to-day operations and maintenance, separate from capital project support • Develop a planned inspection and maintenance program with separate budgets for each asset class • Provide in-house training for pipe condition assessments and valve exercising programs for staff (moved from efficiency) • Include resource planning during the capital project planning process and operations budget preparations to ensure capacity exists to support the operation and maintenance of newly built assets
Ensure spare parts for critical infrastructure are readily available when needed	• Establish a spare parts management system, centralized hubs and expand spare part inventory for critical infrastructure • Develop replacement plans for assets that no longer have manufacturer support for spare parts
Further reduce risks to Metro Vancouver infrastructure from third-party proximal works	• Continue to work with member jurisdictions, First Nations, and external agencies to improve coordination and mutual understanding of permitting requirements for proximal work • Convene a task force with member jurisdictions and utilities in the region to address increasing congestion in rights-of-way

Performance Metrics

Measuring the increased resiliency of the drinking water system as a result of planning and design, is difficult to do until a seismic or climate related event has occurred. As such, the increase in resiliency will be measured in terms of projects completed.

This will include the number of backup power installations completed, the number of possible points of failure that have been addressed, and the increased capacity to move water west to east in the system.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