December 5, 2023

TO: Park Board Chair and Commissioners

FROM: General Manager – Vancouver Board of Parks and Recreation

SUBJECT: Water Priority Action Plan 2024

RECOMMENDATION

A. THAT the Vancouver Park Board approve the proposed Water Priority Action Plan (Appendix A) to guide operational decisions related to the use of drinking water in parks, and direct staff to promote and implement the Plan in collaboration with other City of Vancouver departments whose operations also affect the use of drinking water in parks.

B. THAT the Vancouver Park Board direct staff to proceed with water feature rehabilitation for decorative fountains, ponds, and waterfalls as outlined in [insert Option 1, 2, 3, or 4] of Appendix C.

REPORT SUMMARY

This report introduces the proposed Water Priority Action Plan which is a result of collaboration between Park Board and the City of Vancouver's Engineering department. The report also responds to a recent Board motion and provides options for investment in water feature rehabilitation within the capital funding available.

The actions proposed in this draft Plan aim to respond to:

- population driven water demand,
- climate change and associated drought conditions,
- compliance with municipal by-laws and other regulations,
- changes in how the Park Board will be required to pay for water consumption, and
- ageing infrastructure.

Compared to historical conditions, these key drivers are reducing the availability of water and increasing the cost of water consumption for the Park Board.

POLICY AND PREVIOUS BOARD DECISIONS

As per the Vancouver Charter, the Park Board has exclusive jurisdiction and control over all areas designated as permanent and temporary parks in the City of Vancouver, including any structures, and improvements or major changes that occur within those parks. The objectives

of the Water Priority Action Plan are grounded in principles outlined in policy, including the following plans and strategies:

- VanPlay (2019/2020) recommendation N.2.2, to reduce potable water use in parks through service review, innovative design, new technologies and increasing the use of recirculating systems
- Climate Emergency Action Plan (2020),(City):
- Green Operations Plan 2.0 (2020), (City) commitments to reduce corporate drinking water use
- Rain City Strategy (2018)(City)
- Water Conservation Plan (2017): The Water Priority Action Plan updates this existing plan that aims to reflect new regional policies, trends and changes in water consumption, and City budget decisions
- Climate Change Adaptation Strategy (2012) (City)

An itemized list of policy alignments can be found in Appendix A.

This report considers decorative water features (fountains, waterfalls and ponds), including those identified in the Park Board's motion: "THAT staff include the estimated cost to convert these five fountains (Laurel Landbridge Park, Park Site on Jervis Street at Pacific Street, Barclay Heritage Square, Helmcken Park, and the West End Mini-Park at Bute and Haro Street) to recirculating fountains along with the Queen Elizabeth Park Dancing Waters Fountain repair costs, in the pending water features condition assessment and Water Action Plan Update Report for consideration of Board prioritization by Q4 2023."

BACKGROUND

Supply and Demand Stressors

The Vancouver Park Board is the City of Vancouver's largest civic user of drinking (potable) water. Within the park system, drinking water is employed for a variety of uses including grass field irrigation, drinking fountains, street tree watering, filling swimming pools, decorative and recreational water features, buildings, and emergency cooling measures.

Metro Vancouver's regional drinking water supply is a limited and increasingly strained resource. The City of Vancouver's water is supplied by three reservoirs (Capilano, Seymour and Coquitlam) and we share this limited supply with the 20 other growing municipalities, one Electoral Area, and one Treaty First Nation that are members of the Metro Vancouver federation. In recent years, there have been greater calls for cooling features in Vancouver parks in response to drier, longer, and hotter summers. In 2015 and 2023, regional drinking water concerns led to Stage 2 restrictions. The Park Board's estimated annual consumption (based on a 2022 estimate) is about 1.1 billion litres per year.

Asset Condition

Most of the Park Board's water features were designed and built between 1950-1970, when Vancouver's population was lower and climate impacts were not yet well-understood. Many of these assets consume drinking water at an unsustainable rate, either due to leakages and breaks, or because they were not designed with water conservation in mind. Many decorative features

within the Parks network are non-compliant with local by-laws because they are non-recirculating. Such features operate as “once-through,” meaning that water passes directly through the feature and then out into sewer systems rather than re-using water internally within the structure. Recirculation upgrades require costly and spacious additional mechanical chambers or mechanical rooms, additional electrical and plumbing infrastructure, as well as additional water treatment systems and frequent inspections and water quality testing to maintain safe water quality.

Recirculating systems also result in increased operating costs as they require additional on-going maintenance and repair over the long term beyond what is required for once-through systems.

Legal Drivers and Non-Compliant Park Board Water Features

municipal by-laws provide local requirements for water feature operation. Water features are also obliged to comply with regulations from other governments. For example, the federal Fisheries Act requires that a system cannot discharge chlorinated water into fish habitat, relevant to certain features in the Park Board system located near the shoreline. Vancouver Coastal Health also enacts requirements for chlorine concentrations and regular pathogen testing (every two calendar months of operation) in water to prevent transmission of waterborne pathogens such as legionella.

A given water feature may be considered “non-compliant” if it operates in contravention of one or more of these regulations. 25 decorative water features have been recently held out of service since 2021 due to non-compliance. Five decorative fountains (Laurel Landbridge Park, Park Site on Jervis Street at Pacific Street, Barclay Heritage Square, Helmcken Park, and the West End Mini-Park at Bute and Haro Street) were turned back on in the summer of 2023 in response to a Council-approved motion to amend By-Law 4848 to except these specific features.

Park Board Past Response Efforts

The Park Board’s first Water Conservation Action Plan was endorsed by the Board in 2017 and was intended to guide decisions until 2020. When the tenure of that plan ended in 2021, City-Engineering and Park Board staff collaborated to develop the attached draft Water Priority Action Plan that reflects the latest policy and regional developments, and City budget decisions.

Park Board staff have cooperated with the City of Vancouver’s Engineering and Real Estate and Facilities Management divisions to introduce several successful measures to improve the efficiency of our water consumption. City of Vancouver Engineering staff are also in the process of installing operational water meters at all civic buildings and facilities, which allows staff to screen more accurately for plumbing inefficiencies, leaks and high water consumption periods.

The Park Board has several in-progress and planned initiatives to further reduce drinking water consumption, most of which are implemented opportunistically, such as during park renewals. For example, the former drinking water fed stream at Tatlow and Volunteer parks is under conversion into a multi-purpose green rainwater infrastructure asset that will result in a reduction of 4,500,000 litres of water each year and provide new services such as stormwater management and habitat.

DISCUSSION

Water Priority Action Plan

The draft 2023 Water Priority Action Plan (Appendix A) presents 6 objectives and 13 corresponding actions to guide drinking water conservation and management throughout 2023-2028. Staff recommend that the Board approve the Plan to guide the work of staff in the next five years. The 6 objectives are as follows, and objectives 1, 2, and 3 can be initiated in the current capital budget:

Objective 1	Achieve regulatory compliance *(with relevant by-laws and regulations)*
Objective 2	Retrofit and upgrade facilities and features to more efficient systems
Objective 3	Employ nature-based solutions to reduce and replace drinking water use where feasible
Objective 4	Develop a Park Board preventative maintenance program
Objective 5	Be water-smart when designing new parks and park redevelopments
Objective 6	Work together *(across City and Park departments to implement this plan)*

Water Feature Rehabilitation Options

In 2022-2023, staff engaged a consultant team to assess the Park Board's existing water features. This report, called Water Features Condition Assessment and Rehabilitation Planning, examines the current condition of 64 water features including decorative features spray parks and wading pools. The report describes their maintenance and rehabilitation needs, and projects the cost associated with implementing these repairs and retrofits. A Summary of this report is available in Appendix B. This activity also responds to Objective 1 of the Water Priority Action Plan.

Staff and the consultant team also checked their level of compliance with pertinent regulations, and estimated the cost of rehabilitating features that were found deficient in terms of physical condition, regulatory compliance, or both.

The vast majority of examined features were found to be in poor (48%) or very poor (23%) condition, and 13 are inoperable. The projected cost to rehabilitate 30 decorative fountains, ponds and waterfalls identified in the Report is approximately $13 M (Table 1).

Decorative fountains (22 features)	$7,600,000
Ponds and waterfalls (8 features)	$5,400,000.
Total projected cost	**$13,000,000**

Table 1: Breakdown of projected costs to rehabilitate all decorative water features.

The Park Board's current available capital plan funding to conduct capital maintenance and upgrades on decorative water features is $2.6M. Upgrades to spray parks and wading pools can be funded through other capital plan funding programs and are not included in this Board Report. Appendix C presents options for decorative water feature reinvestments that are achievable within the available $2.6M. As upgrading only selected non-compliant decorative water features into recirculating systems is possible under current financial conditions, staff recommend that the Board select one of these options so that work can begin in 2024. All options include repair of the Queen Elizabeth Park Dancing Waters Fountain, as the construction drawings for this project are ready for issue and repairs can begin in 2024.

The draft Park Board Water Priority Action Plan proposes feature retrofits, removals, and nature-based solutions such as converting decorative pond features into green rainwater infrastructure (GRI) where possible so that they are recharged naturally through rainfall and stormwater instead of a chlorinated water feed. Staff will return at a future date with a report that identifies existing water features that could be repurposed or removed.

Financial Considerations

Drinking water use in parks has both capital and operating budget considerations. As detailed in the attached Water Priority Action Plan, the City of Vancouver is transitioning to a full civic user-pay billing system, whereby each department pays for the water it consumes. The Park Board is planning for a phased transition, targeting a 50% transition to user-pay in 2024 and the remaining 50% transitioned in 2025.

This change will result in significant new expenses for the Park Board because, up until this point, Engineering budget has been covering most of Park Board's water consumption costs, including irrigation. The City's Engineering division is offsetting with a $1.9 million (figure based on 2021 consumption and rates) budget request from the Park Board as bridge funding to support this transition. If the Park Board can reduce its water consumption expenses below $1.9 million in 2024 or 2025, then the difference could be applied to other priority projects.

In addition to the potable water consumption charges, the current annual payment to REFM (Real Estate, Environment and Facilities Management) for maintenance and repairs is $343,000. This is insufficient to properly service the ongoing maintenance, inspection, operating, and repair activities for the Park Board's portfolio of decorative and recreational water features. If more features are made recirculating, this would increase the maintenance expectations and cost. The consultant study recommends an average annual operating budget of $2.9M, plus water consumption charges, to properly maintain the 64 water features studied, if fully rehabilitated.

The consultant study estimated the capital cost to rehabilitate all decorative water features as $13M, which would need to be undertaken over multiple capital plan periods. A 2023-2026 capital plan amount of $2.6M has been identified to fund the repair of the recirculating QE Park Dancing Waters Fountain and rehabilitation and decommissioning of selected decorative water features.

The increased maintenance costs of effectively adding new recirculating features could be partially offset by both decreased water consumption and converting other features to no longer use drinking water.

Reactivation of additional decorative water features can be supported by public donations to fund repairs, upgrades, conversion to recirculating systems, and significant increased maintenance costs in cases where the Park Board has identified the reactivation of the feature as a prioritized project. Future project prioritization will be informed by staff resourcing, life cycle cost analysis, the Park Board Water Priority Action Plan, the equitable delivery of amenities and services, availability of funding and balancing against other identified priorities.

NEXT STEPS

Pending a Board decision, staff will proceed to coordinate the implementation of the Water Priority Action with the City's departments of Engineering and REFM and coordinate the implementation of the Board's recommended option for decorative water feature rehabilitation including the Queen Elizabeth Park Dancing Waters Fountain.

CONCLUSION

This Report describes the most current internal and external drivers that affect drinking water usage in parks and proposes the Water Priority Action plan to guide staff's efforts over the next five years (2023-2028) to sustainably manage financial and natural resources related to potable water consumption in parks and recreation facilities. Park Board has the opportunity to start on Objectives 1, 2, and 3 and invest in the upgrading or conversion of select existing water features through the $2.6M available in this capital budget.

ATTACHMENTS

Appendix A draft Water Priority Action Plan
Appendix B Summary of Asset Study
Appendix C Option Groups for Capital Funding Allocation

General Manager's Office
Vancouver Board of Parks and Recreation
Vancouver, BC

Prepared by:
Chad Townsend, Andrew Seeton, Jo Fitzgibbons

VANCOUVER PARK BOARD
WATER PRIORITY
ACTION PLAN

VANCOUVER BOARD OF PARKS AND RECREATION

Park Board Meeting - December 11, 2023

Seymour Reservoir *Photo credit: Metro Vancouver*

Executive Summary

Our drinking water supply is a limited and strained resource. It is obtained from reservoirs in the Capilano, Seymour and Coquitlam watersheds, and distributed to Metro Vancouver's member jurisdictions of 21 municipalities, one Electoral Area and one Treaty First Nation throughout the Lower Mainland. These reservoirs are fed by rainfall and melting snowpack from the surrounding mountains and have a limited storage capacity.

The Vancouver Park Board used approximately 1.1 billion litres in 2021, making it the City of Vancouver's largest civic user of potable water. Within the park system, drinking water is used for irrigation, water features, facilities, and emergency response. Some water features are mainly aesthetic and decorative in value, while others are essential for public health, sport, tree watering, human hydration and emergency response. Given the reality of limited water resources and increasingly frequent summer droughts, the Park Board must thoughtfully prioritize how water is used throughout the Park System.

The seven main drivers to the development of this action plan are: population driven water demand, climate change and associated drought conditions, the need to comply with municipal by-laws and regulations from other government bodies, changes in how the Park Board will be required to pay for water consumption, and ageing infrastructure. Other municipalities in Vancouver also face these drivers, and all member jurisdictions must cooperate and take initiative to conserve our shared water resources. This means that the City and Park Board will need to develop and implement long-term sustainable solutions to reduce overall water consumption at the local level.

Drinking Fountain

Demand for water is growing, but our water supplies are not. The regional population of Metro Vancouver is projected to increase by approximately 1 million by the year 2050. This will further increase demand on our limited reservoir water. Additionally, the City of Vancouver is already experiencing the effects of climate change, and we can expect greater environmental changes in years to come. Vancouver will see effects

such as: hotter and drier summers with more heat waves and water supply shortages; increasing vectors for disease; increasingly intense and frequent heavy rain events and other storms; decreased snow pack; sea level rise; and damage from storm surges. This "new normal" of extreme weather and water supply shortages obliges us to find efficiencies and adjust our water consumption habits so that we can meet growing demand for emergency response measures, such as irrigation to reduce fire risk, drinking fountains, and water-smart play features such as spray parks that can help residents stay cool and hydrated during heat waves.

Second Beach Outdoor Pool

Many of our water features are aging and in poor condition, causing them to consume water at an unsustainable rate and violate local, regional and federal regulations. The majority of Park Board water features were designed during a time when our population was smaller, and climate change and water scarcity were not well-understood. Some of our fountains, ponds and spray parks, for example, operate as "once-through" systems, meaning they do no not recycle water within the feature. Others were designed to conserve or recycle water, but are in poor condition and lose water through leaks, cracks and equipment malfunctions. Regardless of whether they waste water by design or due to breakages, such features violate the City's municipal by-laws. In addition, some water features release chlorine into marine environments or fish habitats, which contravene the federal Fisheries Act. Finally, Vancouver Coastal Health (VCH) has regulations on spay parks and other features where humans interact with water to ensure that residents are not exposed unnecessarily to waterborne pathogens.

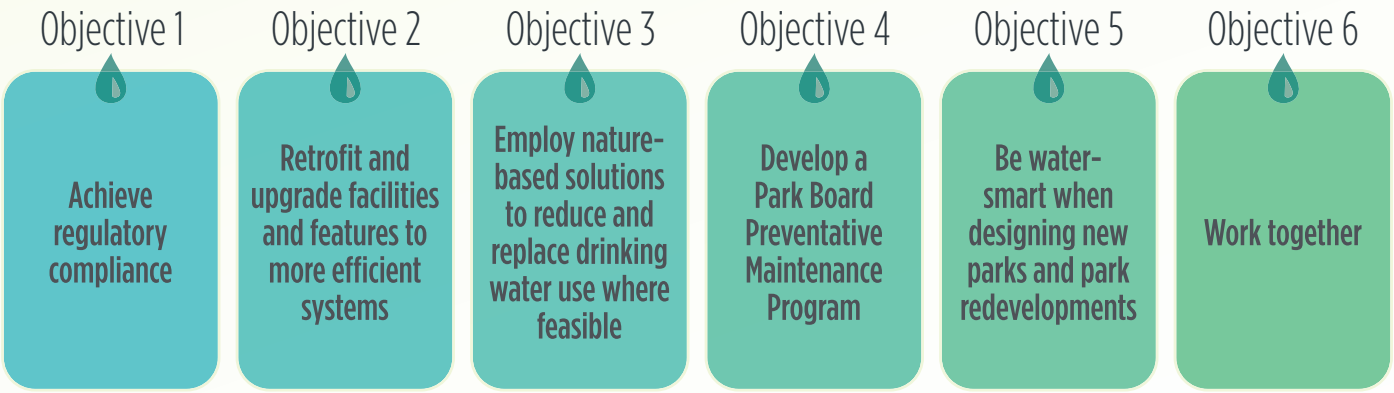
In 2023, 64 Park Board water features were assessed by contractors to determine an inventory and a condition status of each asset. Their report to the Park Board included approximate cost projections to bring these features into compliance with all relevant regulations. While retrofitting these features with re-circulation systems would bring some of them into compliance, it is also important to consider the large financial investment and increased staff maintenance requirements of recirculating features. Additionally, further investment would still be needed in most cases to repair breakages, overflows and malfunctions that cause water leakage. In some cases it may be more financially sustainable to convert them into other valued community amenities such as plantings, seasonal wetlands, green rainwater infrastructure features, or public art.

QE Park Pond

The Park Board will soon be required to pay for the water it uses. By the end of 2025, the City of Vancouver expects to have completed its transition to a full civic user-

pay billing system. Presently only a portion of Park Board facilities, mostly those that are revenue generating, are billed for their water and sewer utilities. Developing reference tools, such as a water budget, a prioritization framework, and preventative maintenance plans can inform efficient and sustainable water consumption in parks. Such tools can help to prevent future leaks and breaks that result in water loss, and can support long-term financial stewardship of our water assets. Having a preventative maintenance plan in place also allows for more accurate financial projections and overall budgeting to maintain our water features.

This 2023-2028 update to the Water Priority Action Plan strives to reduce potable water use by 10% from a 2019 baseline, in alignment with the City of Vancouver's Green Operations Plan 2.0. It presents 6 objectives and 13 embedded actions to guide drinking water conservation and management throughout a 2023-2028 timeline:



These objectives are grounded in the commitments that the Park Board has made towards conserving water, financial sustainability, and enhancing environmental quality through a series of other Park Board and City of Vancouver plans, such as: VanPlay, the Climate Emergency Action Plan, the Rain City Strategy, Climate Change Adaptation Strategy and the previously mentioned Green Operations Plan 2.0.

The actions in this WPAP emphasize an integrative management approach. If implemented, they will ensure compliance with City by-laws and federal acts, demonstrate Park Board leadership of civic water conservation, and help us to achieve a healthier, more resilient city.

Acknowledgments

The Vancouver Board of Parks and Recreation acknowledges that it is situated on the unceded traditional territories of the xʷməθkʷəy̓əm (Musqueam Indian Band), Sḵwx̱wú7mesh (Squamish Nation), and səlilwətaɬ (Tsleil-Waututh Nation).

The project team would like to extend their gratitude to all staff from various City and Park Board teams whose input has helped to shape this plan, including staff from:

City of Vancouver

Real Estate and Facilities Management

Engineering Services - Water Conservation Implementation Unit

Park Board

Planning, Policy and Environment

Park Operations

Park Development

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Coquitlam Reservoir

Introduction

Water supply and distribution

The City of Vancouver and the Vancouver Park Board's water supplies are provided by Metro Vancouver and come from three source reservoirs in the Capilano, Seymour and Coquitlam watersheds (Figure 1). Metro Vancouver is a federation comprised of 21 municipalities, 1 electoral area, and 1 Treaty First Nation, all of which share the same limited water resources. These reservoirs are fed by rainfall and melting snowpack from the surrounding mountains and have a limited storage capacity. While there is significant rainfall in the Lower Mainland during the winter months, drinking water availability and storage capacity is becoming increasingly limited due to frequent summer drought, changes in precipitation patterns, temperature increases, decreased snowpack size, increased demand from a growing population, and urbanization.

Figure 1: *Regional water supply reservoirs and their watersheds.*

The Metro Vancouver regional government manages, treats and distributes this water to member jurisdictions, and establishes policies to responsibly manage this water. As a member jurisdiction, the City of Vancouver must cooperate with regional water conservation policies and demonstrate responsible water consumption.

The Park Board is the City of Vancouver's largest civic user of potable drinking water, using an estimated 1,138,969,000 liters[1] of potable water on average per year under normal conditions. As in Figure 2, water is used within the park system for many purposes including irrigation of trees, turf and horticulture areas, decorative water features, recreation facilities, and emergency cooling measures.

Did you know?

Under average conditions, it is estimated that the Park Board uses 1,138,969,000 liters of potable water per year. That's enough water to fill about 455 Olympic-sized swimming pools!

In years where we have hotter and drier summers, consumption can exceed that amount due to increased use of cooling, hydrating and irrigating features.

Aerial view of downtown Vancouver

[1] Estimate for 2022 rate of consumption. Note that this is a projection and may under-represent actual water use in 2022 due to the heat and drought conditions experienced that summer.

Park Board potable water users


Irrigation


Drinking Fountains


Outdoor Pools


Aesthetic Water Features


Community Gardens


Spray Parks & Wading Pools


Restaurants & Concessions


Fieldhouses & Facilities


Community Centres

Figure 2: *Visual list of Park Board potable water users, both facilities and features.*

Drivers for Responsible Water Management

While demand for potable water is increasing due to a growing population, our resources are becoming increasingly strained due to climate change, urbanization, and our limited reservoir storage capacity. End-of-life infrastructure is also affecting the utilization efficiency of our distribution network through water losses in the system. Proper maintenance and stewardship of our purchased drinking water is vital to efficiently conserve our limited resource.

Population Driven Water Demand

The City of Vancouver and surrounding region has seen a steady increase in population growth over the past decade (see Figure 3). While housing density and urbanization has continued to increase, our water supply and reservoir storage capacity has not. In an effort to further manage our limited water supply, in conjunction with Metro Vancouver's own policies and regulations, the City of Vancouver has developed strategies and action plans to lessen our per capita demand on source water.

Because our source water supply serves all of Metro Vancouver, population driven water demand must be considered at the regional scale. According to Metro Vancouver population growth projections, the region's population is expected to grow by approximately one million residents between 2016 and 2050.[2]

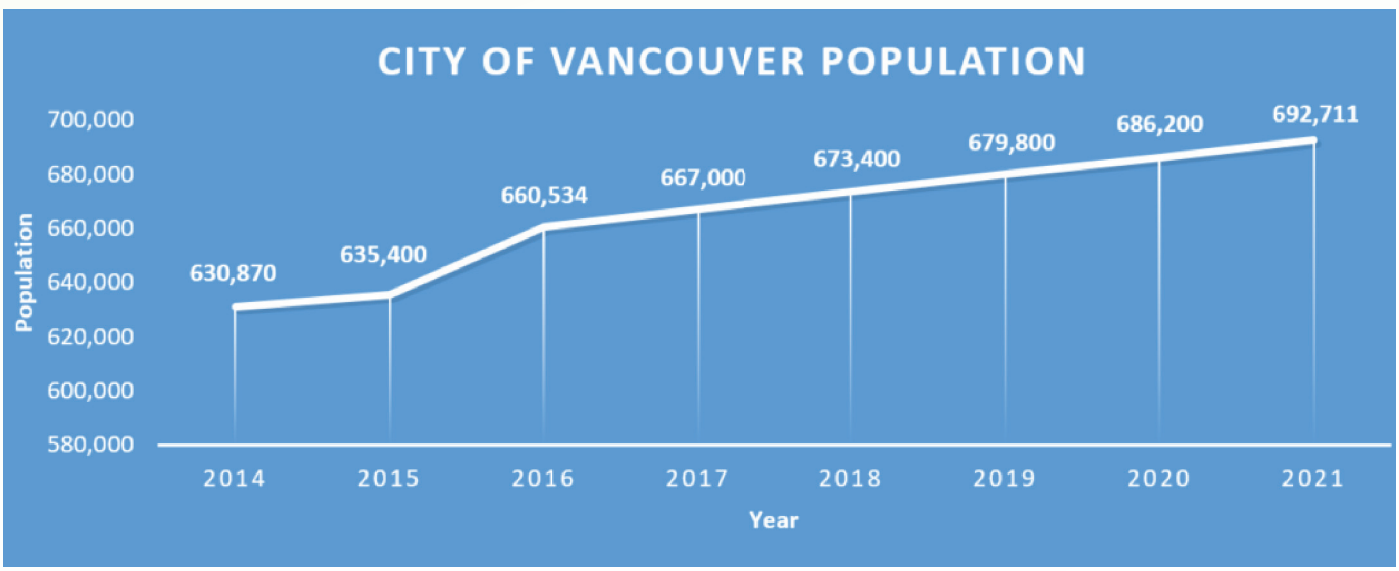


***Figure 3**: Population of the City of Vancouver, 2014-2021.*

[2] Metro Vancouver's annual growth projections assume that the existing regional growth policy framework remains in place and that external factors (i.e. climate, politics, economy and migration) remain consistent to the baseline year. In 2016 there was a baseline population of 2,570,000 people living in Metro Vancouver, which is projected to increase to 3,600,000 by the year 2050. Source: http://www.metrovancouver.org/services/regional-planning/PlanningPublications/OverviewofMetroVancouversMethodsinProjectingRegionalGrowth.pdf

Climate Change

As described in Vancouver's Climate Change Adaptation Strategy, our city is expected to experience myriad climate impacts, including hotter and drier summers with more heat waves, water supply shortages, increasing vectors for disease and respiratory illnesses resulting from rising temperatures, increasingly intense and frequent heavy rain events and other storms, and sea level rise including damage resulting from storm surge and erosion.

Vancouver residents and ecosystems are already experiencing these changes. In 2021, Vancouver saw its hottest and driest summer on record since 1958: 52 days passed without rain, and hundreds of residents, thousands of animals, and innumerable plants in our region died as a result of extreme heat events. During the week of June 25th -July 1st 2021, the BC Coroners Service reported 619 heat-related sudden deaths.[3] In 2022 and 2023, again, British Columbia experienced historic drought conditions, with parts of the Lower Mainland reaching Level 5 drought conditions in the late summer and autumn in both years. At Level 5 drought conditions, according to the Province, adverse impacts on both communities and ecosystems are almost certain.[4] In 2023, record low rainfall caused Metro Vancouver to enact Level 2 watering restrictions for the first time since 2015, and provincially, it was the most expensive and destructive wildfire season ever recorded.[5]

Did you know?

In the "heat dome" of 2021, several temporary water stations were deployed across the city in critical areas to prevent heat-related illnesses. These stations included 11 temporary handwashing stations, 10 temporary drinking fountains, and 13 temporary misting stations. These stations were attached to fire hydrants in each area and monitored daily to adhere to health and safety protocols. The City is continually evaluating water access and comparing coverage to climate and population data to identify new areas for permanent fountains.

Temporary Water Stations

[3] BC Coroners Service Report: Extreme Heat and Human Mortality: A Review of Heat-Related Deaths in B.C. in Summer 2021: https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/death-review-panel/extreme_heat_death_review_panel_report.pdf

[4] British Columbia Drought Information Portal. Retrieved from: https://www2.gov.bc.ca/gov/content/drought

[5] Watering restriction details retrieved from Vancouver.ca: https://vancouver.ca/news-calendar/vancouver-watering-restrictions-escalate-to-stage-2-on-august-4.aspx

Wildfire statistics retrieved from BC Wildfire Service: https://wildfiresituation.nrs.gov.bc.ca/currentStatistics

As a result of these changes, Vancouver is facing demand for more urban cooling features to promote improved public health outcomes during the summer months. As mentioned, however, our drinking water is a relatively finite and constrained resource. In order to meet this growing demand for spray and mist parks, water fountains and other such cooling features, the Park Board must address system inefficiencies and create space in its "water budget" for emerging needs.

Water Waste and Regulations

Metro Vancouver supplies water from the three regional reservoirs to its member jurisdictions, including the City of Vancouver. The City then manages and distributes this purchased water supply to civic users. Metro Vancouver's regional policies regarding responsible water use are incorporated into the City's municipal by-laws, notably Waterworks By-law No. 4848 and the Drinking Water Conservation By-law No. 12086. Each of these by-laws have sections outlining the maintenance requirements of piping systems, as well as prohibitions against wasting water.

The Waterworks By-Law 4848 defines what is considered "wasteful" in terms of civic water consumption, and prohibits the City and Park Board from indulging these uses. Under Section 3.7, water uses are considered to be wasteful if they:

- Freely discharge or permit flow of water from premises, on or into a sanitary sewer, watercourse, storm drain, street or adjacent premises;
- Leak water from appliances, devices, machines, equipment, systems (including irrigation systems), ponds, fountains or water features;
- Do not have a recirculation device;
- Irrigate an impervious surface; or,
- Use a water hose that is not equipped with an automatic shut-off device.

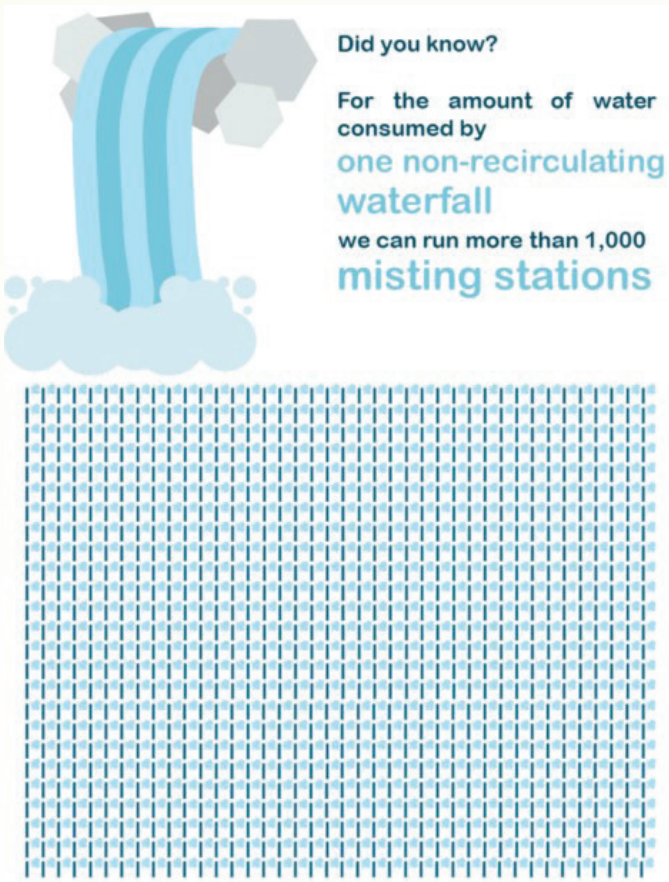


Figure 4: *An average non-recirculating waterfall consumes more water than 1,000 misting stations (see footnote for parameters).*[6]

[6] The consumption estimate for a non-recirculating waterfall was calculated based on the average water use of decorative waterfalls at Queen Elizabeth Park and Charleson Park, which are non-recirculating. Misting station consumption estimates were based on calculations involving industrialized standards, as well as our city-made emergency push-button and timer-operated misting stations. This estimate was assuming operation for 12 hours per day for the duration of 5 months. This estimate is highly conservative; misting stations are expected to be highly utilized only during extreme heat events.

Park Board's most wasteful features are primarily decorative in nature. Such decorative features may provide aesthetic value to residents, but compared to purpose-built features such as misting stations, most do not contribute substantially to urban cooling, sport, climate resilience, or ecology. When broken or once-through features continue to operate despite inefficiencies, that wasted water cannot be used to meet other community needs such as hydration, cooling, or irrigation. For example, one average non-recirculating waterfall can use as much water in a year as 1000 emergency response misting stations (Figure 4).

The Drinking Water Conservation By-law 12086 is adopted from Metro Vancouver's Drinking Water Conservation Plan, a regional strategy directed at municipalities to ensure proper management of the drinking water supply. Through activation of staged water restrictions (stages 1-4) from May 1st until October 15th each year, and in response to current weather conditions and reservoir levels, this by-law enforces use of potable water during peak season when the region experiences a 50% increase in potable water use, attributed primarily to lawn watering. The Drinking Water Conservation By-law compliments year-round policy outlined in By-law 4848 regarding water wastage and operational requirements.

Waterworks By-law 4848 applies to all water services within the City of Vancouver, both municipal and private. Private, residential and industry buildings are all billed for their water use and fined when by-laws are contravened. The Park Board has a responsibility to ensure that all of their water services are adhering to City by-laws to ensure that public facing features are conserving potable water and leading by example.

Key point:

Council amended Waterworks By-law 4848 in 2011 in response to the Water Shortage Plan to include well-defined prohibitions against "wasting water". Enforcement of By-law 4848 is becoming increasingly important due to water stressors such as population growth and climate change.

In addition to local and regional policies, some water features in the Park Board's system have operated in contravention of the federal Fisheries Act. Though our drinking water is treated with chlorine at safe concentrations for human consumption, many fish and amphibians can be harmed by the chlorine in our drinking water. As such, Subsection 36(3) of the Fisheries Act (F-14)[7] prohibits the deposit of deleterious substances into water frequented by fish, or in any place where it may enter such water.

Definitions:

- *Deleterious substances* are anything that can be harmful to fish, fish habitat, or use of fish, in short or long-term exposure. They may cause short-term effects, permanent effects, non-observable effects or death. *Chlorine is listed as a deleterious substance.*

- *Fish* are defined as: fish of all species, shellfish, crustaceans, and marine animals, at all life stages (i.e. eggs, larvae).

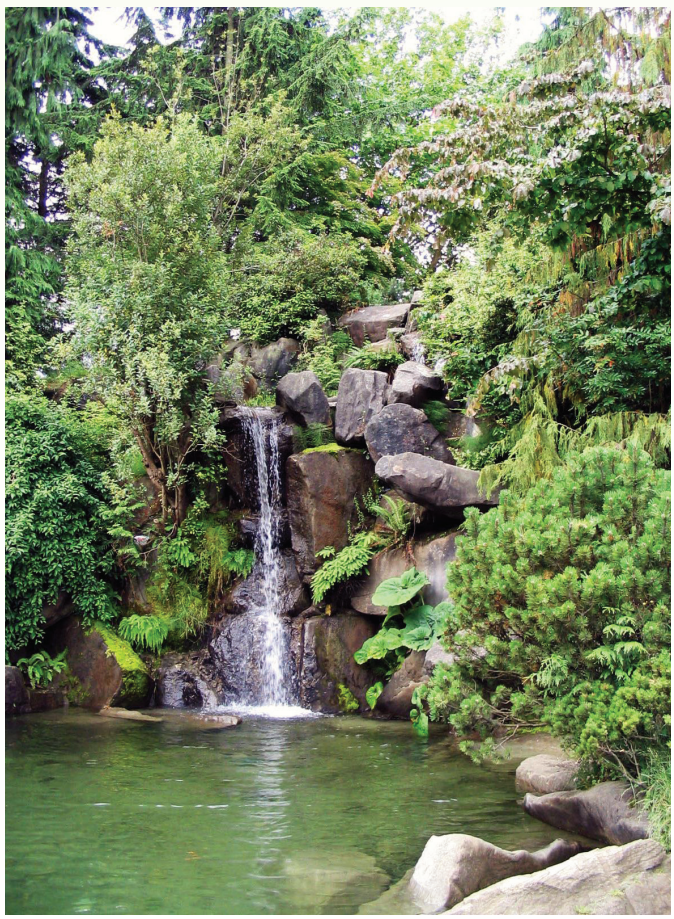
[7] Fisheries Act, R.S.C., 1985, c. F-14, website: https://laws-lois.justice.gc.ca/PDF/F-14.pdf

- *Water frequented by fish* includes: lakes, rivers, streams, small creeks, tributaries, and non-permanent waterways that dry up or freeze solid, if they are ever occupied by fish.

Non-compliant Water Features

As described in Waterworks By-law 4848, any water feature, fountain, or swimming pool which does not have a water recirculation device (or an input control device for pond systems) is not in compliance with the by-law. Other by-law contravening acts include: the free discharge of water from the premises, the use of a hose without an automatic shut off, the use of an irrigation system on an impervious surface, and running water as a form of freeze protection. A water feature that was designed in compliance with regulations may still become non-compliant if it develops breaks, system malfunctions, if it is improperly programmed, or if it is not manufactured and installed according to its design. Because of this, the list of non-compliant water features in parks is a fluid list.

In 2023, the Park Board engaged an external consultant to assess the condition of 64 water features, including fountains, ponds, waterfalls, spray parks, and wading pools. Staff and the consultant team examined the state of repair for each of these features, checked their level of compliance with pertinent regulations, and estimated the cost of rehabilitating features that were found deficient. The assessment report provides a list of rehabilitation options, cost projections to bring features into working order and compliance. The Water Features Condition Assessment and Rehabilitation report explains that it is not possible to rehabilitate and continue to operate all of the deficient water features in the Park Board system given current capital and operational budget constraints. Furthermore, there may be long-term cost savings and sustainability benefits to re-imagine or even decommission certain features that have reached the end of their design life. For example, it may be possible to repurpose some decorative ponds into seasonal wetlands or other habitat features, or to convert an aging fountain into sculptural art.



Charleson waterfall - a bylaw non-compliant (non-recirculating) water feature

Although retrofitting features can help to achieve compliance in the short term, recirculating features have higher maintenance requirements compared to non-recirculating features. Any decision to retrofit a once-through feature to make it a recirculating one must hence be made with an understanding of the increased operational

costs tied to that decision. For example, increasing the number of recirculating features could mean needing to hire additional maintenance staff to accommodate more frequent site visits to each feature, and more parts to service and replace over time.

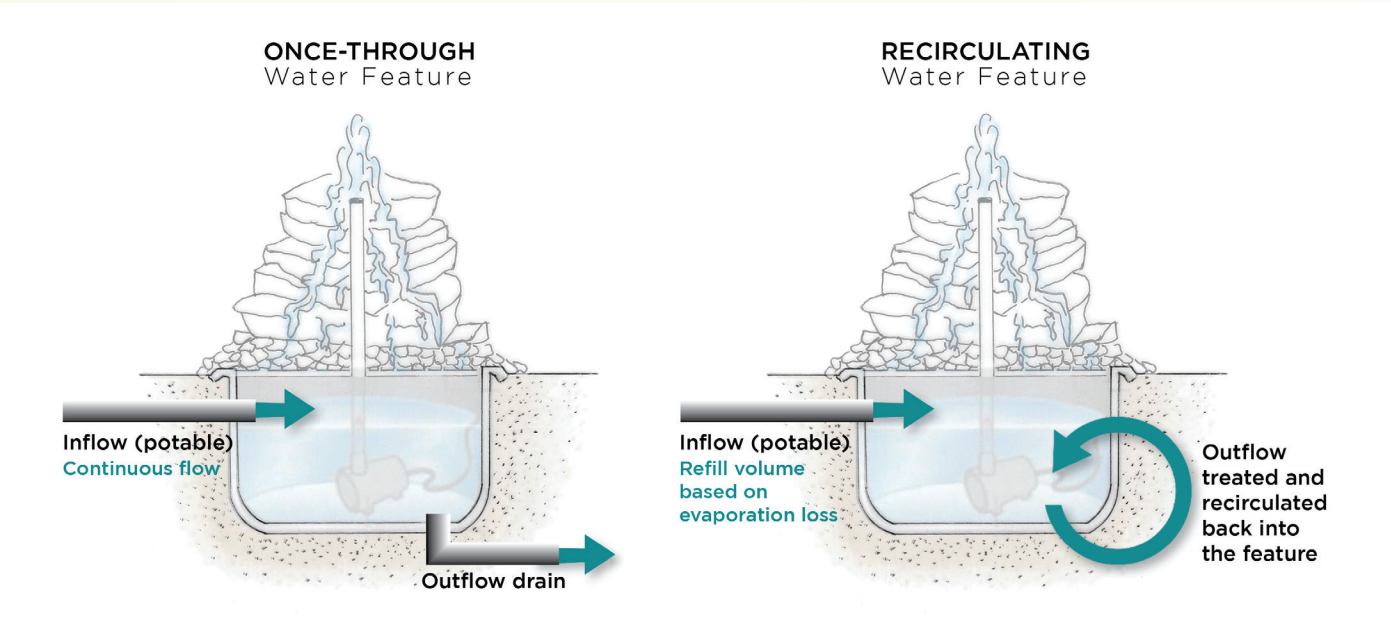


***Figure 6a**: Diagram of once-through (non compliant) and recirculating water features.*

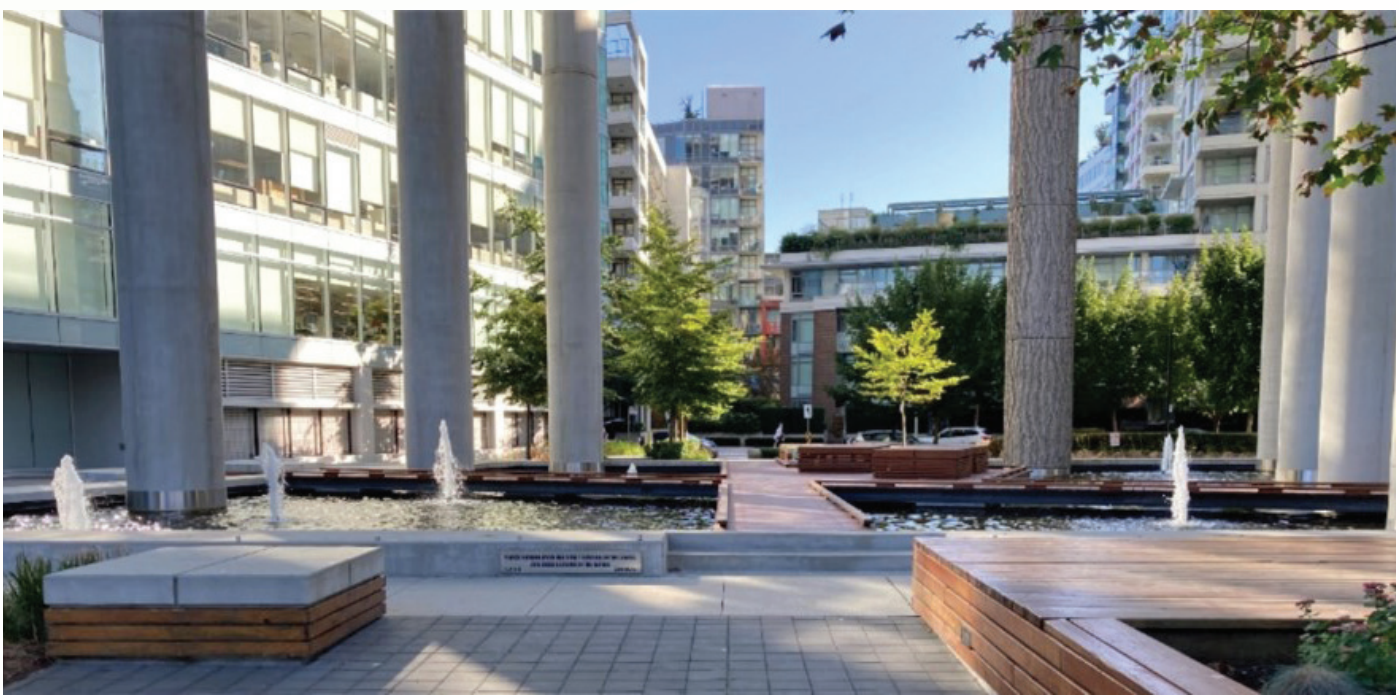


***Figure 6b**: A large private, recirculating fountain near Main Street in Vancouver.*

Case Study: Trout Lake

Trout Lake has historically been one of the largest by-law non-compliant potable water features in the Park Board system. The lake level is maintained using the addition of potable drinking water. An average of 220 million litres of water was used to top up the lake each year (2012-2014). In 2014, a sensor was installed to control the potable water top-up, which led to a water savings of 180 million litres per year.

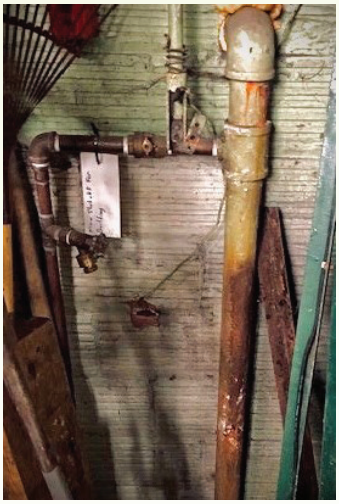
It was thought, at the time, that this retrofit made Trout Lake by-law compliant; however, this sensor was installed without any analysis to determine the appropriate water level for Trout Lake. As a result, the sensor was set to top Trout Lake up to a water level that was higher than its outlet drain, and the lake continued to lose water even with the sensor installed.

This continuous loss of water to the sewer system made the lake by-law non-compliant, as the sensor controlled top-up was filling up the lake beyond evaporative losses. In 2021, the sensor was adjusted, and Trout Lake became compliant with Bylaw 4848.

The case study of Trout Lake shares several lessons. First, it shows that small changes (like the addition of a sensor) can make a large impact on the savings of potable water. It also demonstrates that conducting a proper assessment and inventory before making these changes can maximize the effectiveness of retrofits. Action 4.1 in this WPAP is to conduct these types of analyses system-wide to support our Preventative Maintenance Program.

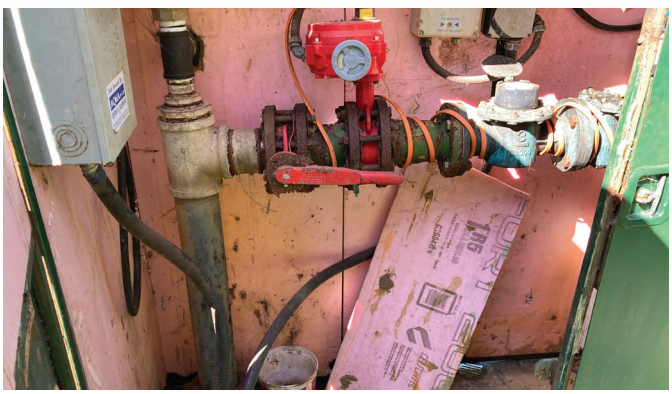
View of Trout Lake looking north

State of Infrastructure



Galvanized steel pipes

The underground infrastructure at the Park Board was largely installed within throughout the 1950s-1970s, and many sites have not undergone any kind of replacement or renewal. Because much of the Park Board's water infrastructure was installed around the same time, there is now a large amount of infrastructure reaching the end of its design life at once. For example, some Park Board facilities still use galvanized steel service lines, which leach lead into water as they degrade over time. Without a dedicated fund and schedule for infrastructure renewal, pipe replacement and other necessary upgrades have been completed opportunistically as infrastructure fails. These works are currently funded through the capital budget. A preventative program with a dedicated funding mechanism could ensure the replacement of aging infrastructure to support human health, and to prevent large-scale breaks that can be costly and damaging to the surrounding environment.



Old Park Board infrastructure in need of replacement

Forthcoming User-Pay System and the Need for a Water Budget

The Park Board consumed an estimated 1.14 billion liters of potable water in 2022. The Park Board has not historically shouldered most of the cost of its water consumption, as instead the City of Vancouver's Engineering Department has been paying these expenses, which amounted to roughly $1.9 million in unbilled water use in 2021. The City has begun to transition to a user-pay system for water and sewer disposal utility fees across all civic departments, an action that was outlined in the approved Green Operations Plan 2.0. To date, only revenue-collecting Park facilities have been paying for their utilities. This transition will bring an opportunity to assess the largest sources of drinking water consumption, and to develop a "water budget" that accurately reflects what financial resources are available to spend on water.

A ***water budget*** is a tool to account for the total amount of water that enters and leaves a system. A Park Board water budget could be calculated by quantifying the total amount of inputs (volume of water that we can reasonably purchase, which becomes the "budget") and comparing that against the outputs (volume of water that we consume). The difference between our outputs and our inputs can help highlight how much we need to reduce our water consumption in order to achieve financial and environmental sustainability goals.

If the exercise to develop a water budget reveals that we are spending beyond our means, then the Park Board is faced with challenging decisions about how to prioritize investment. Determining which features are most "valuable" and worthy of investment is challenging because every resident in the city will likely value different things; for example, some residents may highly prioritize the decorative value of a feature, while another resident might feel that cooling and recreational features are more important. Prioritization frameworks can be developed to help mitigate some of this subjectivity by considering multiple different kinds of values at once. One example of a prioritization framework was offered in the Water Features Condition Assessment and Rehabilitation report.

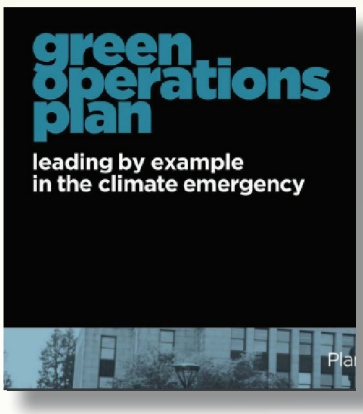
Case Study: Golf Course Water Budget Agreements

Public golf courses in the Park Board system are already using water budgets to inform their water management. Reducing overall water consumption is not exclusively about reducing the number of features that consume water, it can also be accomplished by being more precise about where and when water is being used. The McCleery, Fraserview and Langara Golf Courses have modeled leadership in this regard by prioritizing irrigation in areas where high moisture levels are required for active play, and reducing irrigation of less active areas of the course, such as naturalized meadows and golf course rough.

Since 2016, all public and private golf courses in Vancouver hold annual Water Use Agreements with the City of Vancouver Engineering Department. Each agreement is uniquely developed for each golf course and calculated based on course size, irrigation system design and other factors. They specify the allowable volume of potable water (water budget) to be used for irrigation, maintenance and facilities at each site during the irrigation months of May until October. In exchange for staying within their water budget, courses are exempted from Metro Vancouver's watering restrictions. Golf course managers are able to keep within their water budgets by using a combination of strategies including careful monitoring of weather conditions, programming of sprinkler systems, using alternative water sources such as groundwater, and increasing the amount of no-mow areas to support biodiversity.

Related Policies

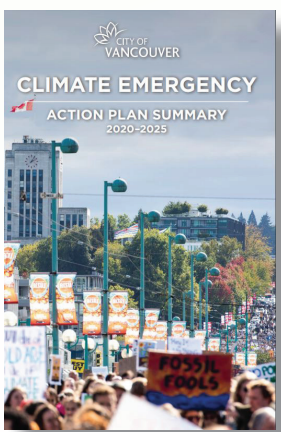
In an effort to move forward with a feasible action plan, we examined the foundation upon which other water conservation efforts have taken place throughout the city. While the Sports Field Strategy is currently in development, 5 plans have been identified (see Figure 7) within the City and Park Board that include actions and strategic direction related to water conservation. A full list of relevant actions from each plan is provided as a summary table in Figure 8.



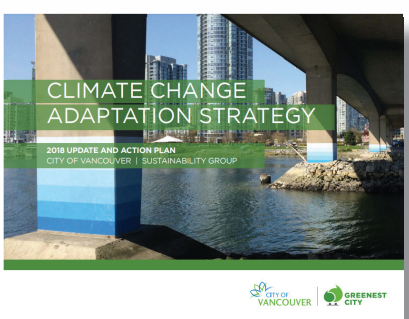
Green Operations Plan: Reduce corporate potable water use, provide healthy habitat, and demonstrate leadership in sustainable civic operations

Van Play: Enhance the resilience, quantity and quality of our natural areas, and provide access to nature for residents

Climate Emergency Action Plan: Prioritize solutions that store carbon (nature-based solutions)



Rain City Strategy: Leverage green infrastructure and rainwater capture to support biodiversity, heat resilience and access to



Climate Change Adaptation Strategy: Provide critical services such as cooling, drinking water and irrigation during (and beyond) extreme heat and drought events

***Figure 7**: Overview of existing Park Board and City of Vancouver Strategies and Action Plans that are relevant to the WCAP.*

Areas of Alignment

Green Ops 2.0 – 2020

- By 2030, reduce corporate potable water use by 10% by 2030, as compared to a 2019 baseline.
- By 2030, 40% of all city-owned lands will provide healthy habitat and contribute to healthy ecosystems.
- Install operational water meters at all City-owned or controlled buildings and facilities by 2025.
- In addition to the installation of water pressure reduction equipment at City-owned or controlled buildings and facilities, adjust water pressure to a lower setting wherever possible in an effort to conserve water and prevent leaks.
- Implement a departmental user pay system for water on all City-owned or controlled buildings and facilities.
- Park Board to develop and implement an updated Water Conservation Action Plan 2020-2025, with a focus on potable water savings.
- Restore or enhance 30ha of natural area within parks, with a view to increase the portions of parks which are 'naturally managed' (including ecological horticulture, pollinator meadows, and forest with unmown understory).
- Showcase water conservation projects in public places e.g., via signage, demonstration projects, art etc. to educate and train staff on water conservation.

VanPlay – 2019

- Protect and enhance the integrity of foreshores, waterways and beaches.
- Protect Vancouver's freshwater resources through ecological restoration, green infrastructure, and water conservation.
- Nurture, protect and connect the city's ecological network and natural areas.
- Provide access to a naturally managed area of at least 0.2 ha within a 10 minute walk of all residents.
- Incorporate environmental education and interpretive signage into the park system in collaboration with Musqueam, Squamish and Tsleil-Waututh First Nations.

Climate Emergency Action Plan - 2020

- Prioritize solutions that can sequester carbon.

Rain City Strategy - 2018

- Increase Vancouver's resilience through sustainable water management.
- Enhance Vancouver's livability by improving natural and urban ecosystems.
- Increase total green area that treats urban rainwater runoff.
- Mitigate urban heat island effect.
- Harvest and reuse water.
- Capture (infiltrate, evapotranspirate, and/or reuse) and clean (treat) a minimum of 90% of Vancouver's average annual rainfall volume.
- (Parks and Beaches Action Plan) Green Rainwater Infrastructure integration into Park Development Standards.
- (Parks and Beaches Action Plan) Protect and Enhance Park Service Levels through Green Rainwater Infrastructure Retrofits.
- (Parks and Beaches Action Plan) Non-potable Water Systems and Water Conservation & Efficiency.
- (Parks and Beaches Action Plan) Enhanced Park Biodiversity Program.

Climate Change Adaptation Strategy – 2012

- Enhance the long-term health and vigor of blue spaces, green spaces, trees and biodiversity.
- Improve water quality of local water bodies.
- Continue to provide critical services and programming that enable residents and local biodiversity to survive climate-related drought and heat events.

Figure 8: *Summary table of relevant actions from each Strategy and Action Plan.*

Capilano Reservoir *Photo credit: Metro Van*

Actions to guide water prioritization: 2023-2028

The Action Plan update herein provides a practical framework to identify and prioritize activities that can help the Park Board reduce its use of potable water. The plan recommends a variety of operational changes and investments that will help manage water and water assets in more financially and environmentally sustainable ways.

An implementation target is provided for each action. Many of our short-term actions emphasize bringing the Park Board into compliance with local by-laws and regulations as a necessary first step in reducing water waste, promoting health and safety of people and the environment, and improving the efficiency of our current system. Medium and longer term actions focus on ongoing measures that the Park Board can take to become a leader and innovator in municipal water conservation, and manage water collaboratively with other departments. In addition, we also considered the various services offered by differing categories of water features.

S	**Short-term**	1-3 year horizon. We know how to make these changes, and they should be implemented as quickly as possible to support regulatory compliance, environmental sustainability, and public health. In some cases, these actions may need to be completed first in order to proceed with mid-term and long-term actions.
M	**Mid-term**	3-5 year horizon. These actions are achievable within the tenure of the plan, but require thoughtfulness, inter-departmental collaboration, and system-building within our organization to do the work well.
L	**Long-term**	May take 5+ years or more to implement (beyond the tenure of this plan), and/or will be ongoing work. These are transformative actions that take time to implement. They come with capacity-building needs and system change.

The following 6 Objectives and corresponding Actions detail the approach we will take to achieve this Water Priority Action Plan.

Objective 1

Achieve regulatory compliance

Action 1.1
Convert, upgrade or remove by-law non-compliant facilities and features

1.1.1 Retrofit or convert once-through features

1.1.2 Oversee that fire lines at Burrard Civic Marina and Heather Civic Marina are no longer running freeze protection in the winter

Action 1.2
Prevent Fisheries Act violations

1.2.1 Redirect water line discharge from marinas into sewers

1.2.2 Clarify protocol for reporting leaks and breaks

1.2.3 Prevent discharge of potable water from aesthetic and play features

Objective 2

Retrofit and upgrade facilities and features to more efficient systems

Action 2.1
Develop and implement a Park Board Facilities Upgrade Schedule

Action 2.2
Implement maximum pressure and water use standards for park facilities

Objective 3

Employ nature-based solutions to reduce and replace drinking water use where feasible

Action 3.1
Review area and frequency of irrigation

3.1.1 Transition turf and horticulture areas to plant assemblages with reduced irrigation needs

3.1.2: Develop site-specific irrigation reduction plans

Action 3.2
Naturalize or convert pond and waterfall features that currently consume potable water

3.2.1 Identify pilot sites for pond naturaliz ation and green rainwater infrastructure implementation

Action 3.3
Transition to alternative sustainable water feeds or repurpose features

Objective 4

Develop a Park Board Preventative Maintenance Program

Action 4.1
Conduct an Inventory and Analysis of all Park Board water infrastructure

Action 4.2
Develop and Resource a Preventative Maintenance Schedule

Objective 5

Be water-smart when designing new parks and park redevelopments

Action 5.1
Develop a water budget

Objective 6

Work together

Action 6.1
Foster and maintain inter-departmental communication via a working group

Action 6.2
Support partnerships to monitor and steward transformed and naturally managed water features

Action 6.3
Develop and implement a public communications plan to share information about converted water features and water conservation

Figure 9: *Detailed list of Actions for each Objective in the WCAP.*

Objective 1: Achieve regulatory compliance

Champion Team:
Planning and Park Development, REFM and Park Operations, with support from Engineering Water Design

Several amenities and facilities managed by the Park Board do not comply with City of Vancouver by-laws, or in some cases, the federal Fisheries Act. A top priority is to bring the Park Board into total compliance within these frameworks.

Action 1.1 Convert, upgrade or remove by-law non-compliant facilities and features

Timeline: **Short term**
Contributes to goal from: **All plans**

Some facilities and features within the Park Board system consume water in ways that are "wasteful", according to the City of Vancouver Waterworks By-law 4848. In light of climate change and a transition to a user-pay system, it is both expensive and wasteful of our limited water resources to continue operating these features and facilities in this way. The following actions aim to prevent water waste and to bring the Park Board into full compliance with Waterworks By-law 4848, Drinking Water Conservation By-law 12086, the Fisheries Act, and public health guidelines.

1.1.1: Retrofit or convert once-through features

The Park Board currently maintains several water features that are "once-through", which means that water passes through the feature only one time and is not continually re-used by that feature. This type of system is prohibited by the City of Vancouver Waterworks By-law 4848. A list of identified by-law non-compliant features can be found in the Water Features Condition Assessment and Rehabilitation Planning Report (2023).

The Park Board does not possess the financial resources that would be necessary to repair and continue operating all non-compliant and degraded features. As such, the Park Board must selectively invest in repairs and recirculation systems high-priority features, while others may need to be converted into alternative structures or decommissioned.

1.1.2: Oversee that fire lines at Burrard Civic Marina and Heather Civic Marina are no longer running freeze protection in the winter

The potable water lines at Heather Civic Marina (see Appendix I) that supply the live-aboard section are left dripping throughout the evenings when the temperature drops below freezing, so that the water lines do not freeze and that the residents continue to have access to water. Running water as a form of freeze protection is against City Waterworks Bylaw 4848 and the Federal Fisheries Act.

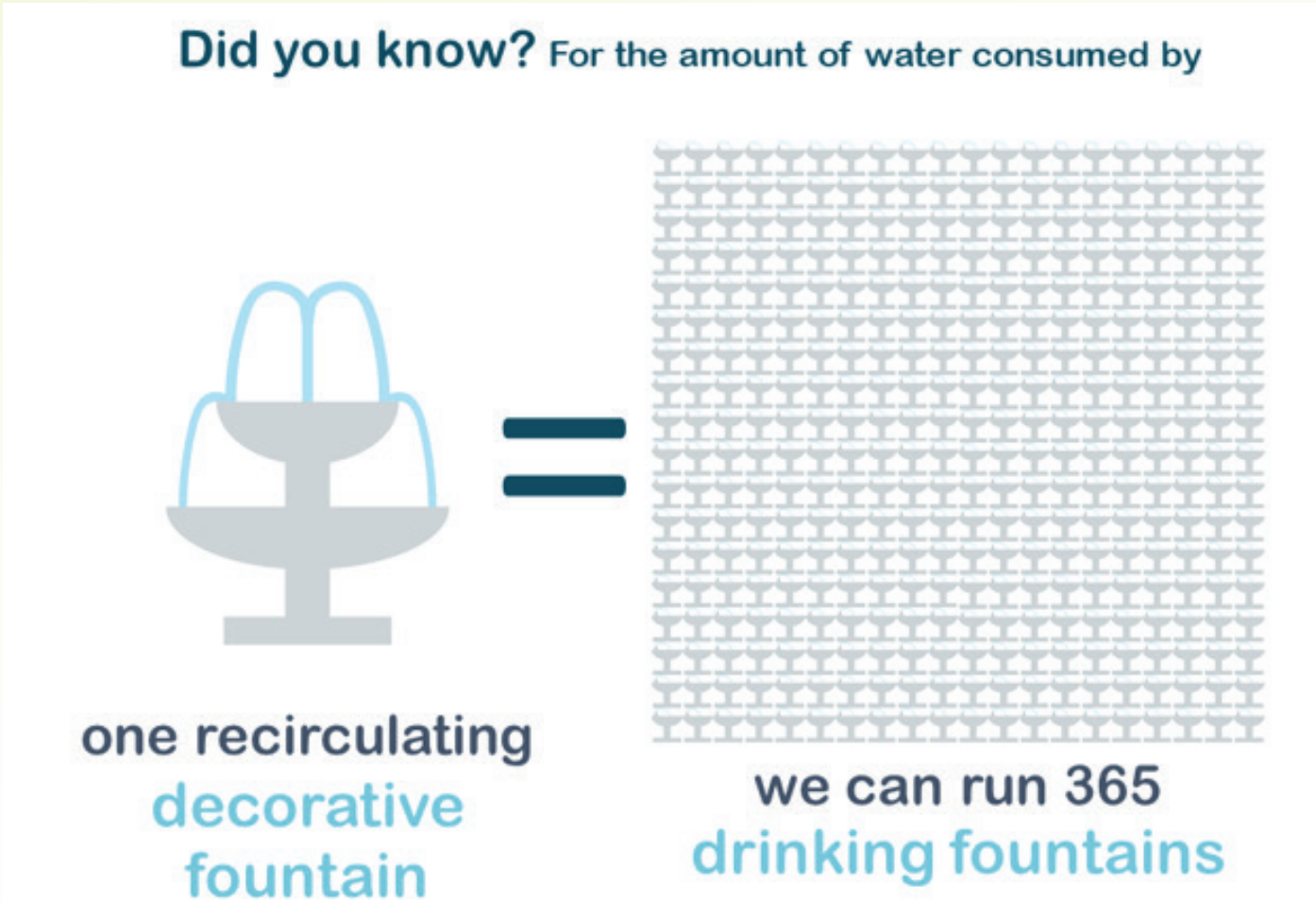


***Figure 10**: An average recirculating decorative fountain consumes as much water as 365 drinking fountains (see footnote for parameters).*[8]

Action 1.2: Prevent Fisheries Act violations

Timeline: **Short term**

Contributes to goal from: **Green Ops 2.0, VanPlay, Climate Change Adaptation Strategy**

Some Park Board managed facilities and features have discharged chlorinated drinking water into nearby waterways or the ocean.

Chlorine is considered to be toxic to fish and other aquatic wildlife. The federal Fisheries Act prohibits the discharge of deleterious substances, including chlorine, into any body of water that is ever occupied by fish. It requires that in such instances a report be sent to relevant provincial and federal authorities; and that a failure to comply, is a punishable offence under the Fisheries Act. Accordingly, the following sub-actions target scenarios and sites where the discharge of potable water into waterways is known to occur within the Park Board system.

[8] The water consumption estimate for a recirculating decorative fountain is based on limited data from metered Park Board recirculated decorative fountains; it is also assuming an average size. For drinking fountains, we have assumed average visitation frequency at a park, based on existing drinking fountains.

1.2.1: Redirect water line discharge from marinas into sewers

The Park Board owns and operates two public marinas: Heather Civic Marina and Burrard Civic Marina (see Appendix I). Neither Marina has adequate infrastructure for year-round water access due to piping that is not freeze protected. Each winter the marinas drain all fire lines on the docks to winterize the system, which is a several day draining process. The potable water is released directly into the ocean, which is a contravention of the federal Fisheries Act.

As an action, the Park Board marinas will coordinate with the City's Sewers and Drainage division as needed to re-direct potable water into a sewer line rather than into the ocean.

1.2.2: Clarify protocol for reporting leaks and breaks

Municipalities are required to report leaks and breaks that could result in the discharge of deleterious substances, including chlorinated water, into fish habitat. Official policy and standardized procedures allows for the quick action of the City to prevent further environmental damage in the case of severe leaks or breaks in the system. The Park Board does not currently have a clear protocol for reporting and remediating known water leaks. As an action, staff will develop and adhere to a reporting protocol, as required by the federal Fisheries Act.

1.2.3: Prevent discharge of potable water from aesthetic and play features

Some aesthetic and water play features discharge potable water directly into the ocean or into nearby freshwater sources. This violates the Fisheries Act and causes local environmental harm. As an action, the Park Board will identify priority features for investing in retrofits to achieve compliance, and decommission features that cannot be brought up to compliance.

Objective 2: Retrofit and upgrade facilities and features to more efficient systems

Champion Team:
REFM, Park Operations, Planning and Park Development, and Engineering Water Design

Park Board managed facilities contain sinks, showers, toilets, faucets and other equipment that dispense water. Updating our infrastructure to low-flow technologies that are durable enough to function well in a public setting can create substantial water savings.

Action 2.1: Develop and implement a Park Board Facilities Upgrade Schedule

Timeline: **Mid-term**
Contributes to goal from: **Green Operations 2.0, VanPlay, Rain City Strategy, Climate Change Adaptation Strategy**

Action 2.1 involves establishing an implementation plan, including clear timelines and budgets, for retrofitting Park Board facilities with water-use reducing technology such as low-flow and pressure reducing equipment, or grey water harvesting and reuse. This will include taking a complete inventory of our existing equipment, identifying facilities with aging or high-consumption equipment and prioritizing upgrades according to water budgets.

Completion of the inventory and schedule should take place before the next capital planning cycle, with implementation to follow shortly thereafter with consideration for available funds. The inventory process can be completed alongside or following completion of the Civic Metering Project by City of Vancouver Engineering staff in order to gain a complete picture of water usage across facilities and features.

Action 2.2: Implement maximum pressure and water use standards for park facilities

Timeline: **Mid-term**
Contributes to goal from: **Green Operations 2.0, VanPlay, Rain City Strategy, Climate Change Adaptation Strategy**

The Park Board will establish a standard maximum water pressure in its facilities (i.e. must be less than 70 psi), once the project to install pressure and flow reduction equipment at all City-owned or controlled buildings and facilities is complete. Once a threshold is identified, retrofits can be scheduled for any identified problem sites where equipment does not meet the water pressure standards.

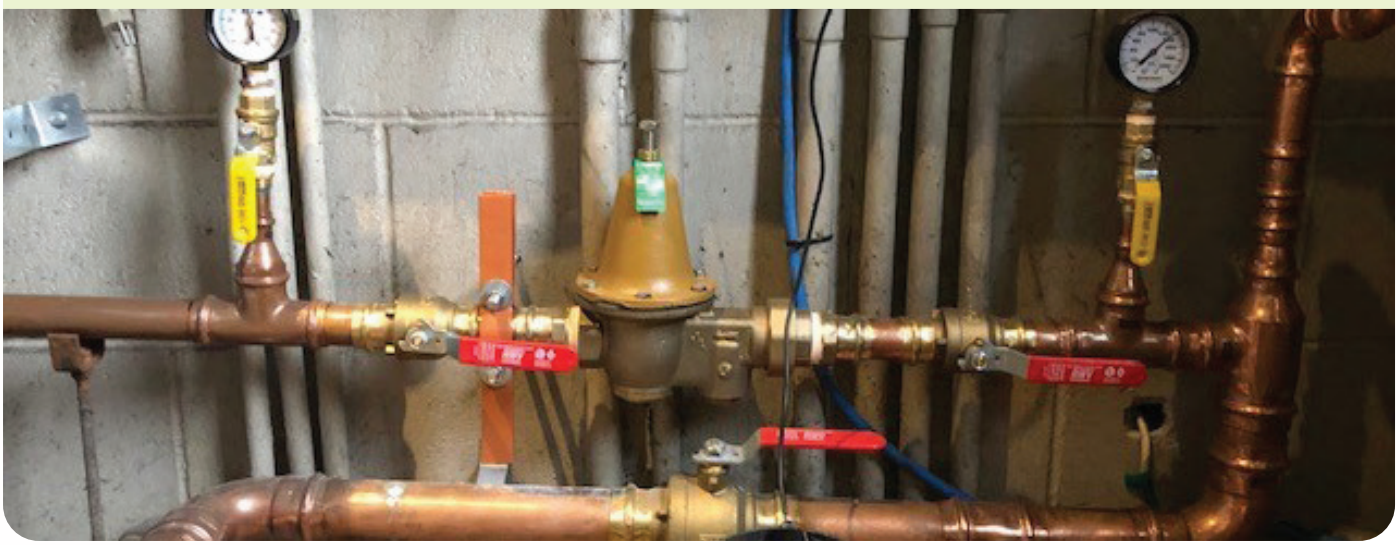
Case Study: Pressure Reducing Valves in Park Board Fieldhouses

Pressure reducing valves (PRVs) are the first water conservation valve in a water distribution system. They operate by reducing the water flow rate and result in the restriction of water pressure to the set amount indicated on the pressure gauge. PRVs are a requirement of the Vancouver Building By-law Plumbing Code (VBBL), which states that each property is required to have a PRV where the static pressure exceeds 80 PSI. Residential landscape irrigation systems are also required to have a PRV where the static pressure exceeds 60 PSI.

In some Park Board facilities and fieldhouses, the water pressure is greater than 130 PSI; as a result, all fieldhouses were inspected for the presence of PRVs and the water pressure in each location was recorded and adjusted to 50 PSI. Permits were acquired for the installation of all new PRVs in fieldhouses. In total, 67 fieldhouses required PRVs or adjustments; 40 required new PRVs to be installed, and 27 fieldhouses needed their previously installed PRVs adjusted to 50 PSI. While all fieldhouses with PRVs resulted in less water and energy consumption, 47% of the inspected fieldhouses (32 locations) resulted in a 33% measurable savings in water and sewer disposal utility costs, 11% savings in water heating costs and a reduction in carbon greenhouse gas emissions.

In addition to Park Board fieldhouses, there are a number of other Park Board facilities and irrigation systems that do not have PRVs installed and/or do not have their systems properly adjusted to an acceptable water pressure; this will be the focus of future PRV projects in the parks system.

system-wide to support our Preventative Maintenance Program.



Objective 3: Employ nature-based solutions to reduce and replace drinking water use where feasible

Champion Team:
Planning and Park Development, with engagement from Park Operations, Engineering and other teams

Many Vancouver residents appreciate spending their time beside duck ponds and waterfalls throughout the city, but few realize that these systems consume millions of litres of potable water each year. Through natural planting, green infrastructure and other interventions, it may be possible to keep some of what we love about these features and places (i.e. habitat, recreation, access to nature) while also curbing our water consumption.

Action 3.1: Review area and frequency of irrigation

Timeline:	**Long-term**
Contributes to goal from:	**All Plans**

Irrigation is necessary within the Park Board system as it keeps plants and fields alive, particularly during times of drought. There are many strategies to reduce irrigation needs while still maintaining a high level of service and good environmental conditions. For example, simply by being more targeted and precise about when and where they irrigate, the Park Board's golf courses have been able to consistently remain within their annual water budgets.

Playing fields can be of a variety of turf types and some landscaping solutions require more irrigation than others. By balancing needs of sport and lawn areas with high community use, turf requirements, landscaping design and water conservation initiatives, we can create solutions that will make our urban ecosystems more resilient to climate change and also free up more water in our water budget for other important uses such as recreation and urban cooling.

3.1.1: Transition turf and horticulture areas to plant assemblages with reduced irrigation needs

Many public spaces in the Park Board system currently have high irrigation needs. Xeriscaping is a type of landscaping that aims to reduce or eliminate the need for watering. Xeriscaping accomplishes water reductions by choosing drought-tolerant plants, and strategically arranging them to take advantage of the site's natural drainage. Implementing xeriscaping can help to reduce water consumption and thereby save money, but it also has other benefits such as increasing the summertime beauty and resilience of horticulture beds, and providing foraging habitat for pollinators.

3.1.2: Develop site-specific irrigation reduction plans

Each site in the Park Board's system has different local conditions and planning goals – some parks and facilities have a

strong emphasis on sport and recreation, while others provide tranquil experiences in nature. As such, a one-size-fits-all approach to reducing irrigation is not suitable. As an action, staff will develop irrigation reduction plans for a number of high-irrigation parks in Vancouver, and collaborate interdepartmentally to identify plans and experiments to gradually reduce irrigation dependence where possible.

Action 3.2: Naturalize or convert pond and waterfall features that currently consume potable water

Timeline: **Short to Long-term**

Contributes to goal from: **All Plans**

The Park Board currently maintains several decorative ponds and wetlands. Although these features may appear natural-looking, and do provide certain benefits including decorative value for residents, they are artificial features that have historically been filled using chlorinated water supplies. Some larger urban wildlife such as ducks, raccoons, bats and coyotes are known to use such decorative features for drinking or foraging, but other kinds of wildlife such as fish and amphibians cannot survive in pools of chlorinated water. As such, these ponds are not providing their full potential in terms of habitat value, and are also consuming unsustainable volumes of potable water.

Naturalizing these features can involve turning off the potable water feed, and then either finding alternative natural water sources to recharge the pond, or allowing ecological succession to transform it into a new and different habitat.

3.2.1 Identify pilot sites for pond naturalization and green rainwater infrastructure implementation

The Water Features Condition Assessment and Rehabilitation Planning Report offers an analysis of several ponds in the Park Board system that consume excessive water. At some sites, it may be possible to adjust or work with surrounding drainage conditions to transform these ponds into green rainwater infrastructure features such as rain gardens or constructed wetlands. Such converted features may not look exactly as they did historically, since conversion would involve removing the potable water feed and allowing the feature to recharge naturally in relation to local hydrological conditions.

Converting decorative ponds into green rainwater infrastructure can reduce water consumption and associated costs while also creating new benefits such as addressing flood and drainage issues in the neighbourhood, improving habitat for biodiversity, and enhancing downstream water quality. Such conversions require interdepartmental collaboration, notably Park Operations staff who maintain the features, the City's Engineering – Green Infrastructure Implementation Branch who provide technical expertise on green stormwater management, and Park Board's Environment and Sustainability team who develop appropriate planting plans and liaise with local environmental stewards.

Case Study: Transitioning to seasonal wetlands

In an effort to conserve water during consecutive years of intense drought, in 2022 and 2023, staff disabled the potable water feeds to several decorative ponds. Seasonal wetlands are natural ecosystems that fill with rainwater during the winter months and dry out each summer. They provide habitat for native biodiversity and are more resistant to invasive species like the American Bullfrog. All transitioned water features were City bylaw non-compliant, as they used "once-through" potable water systems with no recirculation device or input control on the water service. Transitioned sites receive updated planting and site management plans to continue to provide aesthetic value for residents, while improving the habitat value for urban wildlife including amphibians, fish, birds and pollinators. In addition to these recently transitioned features, there are other water feature in the city that have been operating as seasonal wetlands for many years, including Avalon Pond at Everett Crowley Park and the pond at Jericho Beach Park.

Charles Park Pond

Pond at McCleery golf cource

Action 3.3: Transition to alternative sustainable water feeds or repurpose features

Timeline: **Short to Mid-term**

Contributes to goal from: **Green Operations 2.0, VanPlay, Rain City Strategy, Climate Change Adaptation Strategy**

Green rainwater infrastructure may be a viable conversion approach for some decorative ponds in the Park Board system, but other features such as decorative fountains and waterfalls may require a different approach. For example, in cases where a decorative fountain is located nearby another Park Board facility, it may be possible to collect and recycle grey water for circulation in the water feature.Rainwater could be a potential (largely seasonal) source in some cases / green infrastructure features, and groundwater is already being used for irrigation at Langara Golf Course.

In other cases, it may be the case that there is no alternative water feed available and retrofitting to achieve by-law compliance may not be technically or financially feasible. In those cases, features might be transformed into other community amenities such as seating features or sculptural art.

Objective 4: Develop a Park Board Preventative Maintenance Program

Champion Team:
Park Operations, REFM and Finance

Much of the Park Board's water infrastructure is aging and in need of repair or replacement. Currently, the Park Board does not have a Preventative Maintenance Program, so these aging systems are vulnerable to severe breaks, leaks, and resource inefficiencies. Evaluating the condition of the piping systems in each park and scheduling deadlines for when these systems should be inspected, repaired, and/or replaced would help ensure that all park systems are operating properly and efficiently. It would also reduce the overall financial expenses to properly maintain systems before they reach end-of-life rather than repairing or replacing based solely on a reactionary response when a severe break occurs.

Action 4.1: Conduct an Inventory and Analysis of all Park Board water infrastructure

Timeline: **Short to Long-term**

Contributes to goal from: **Green Operations 2.0, VanPlay, Rain City Strategy, Climate Change Adaptation Strategy**

A necessary first step in developing a maintenance program is having an understanding of the current state of the water system at the Park Board.

A first step toward this analysis was completed in 2023, as the Water Features Condition Assessment and Rehabilitation Planning report explored 64 decorative and recreational features. Future assessments could focus on identifying the condition and repair needs for aging plumbing and dock infrastructure at marinas, underground water infrastructure at golf courses and parks, and plumbing condition and infrastructure at community centres and fieldhouses. A preliminary state of repair assessment (completed in 2021) for marinas is provided in Appendix I.

For example, the City of Vancouver has 24 community centres which offer recreational, cultural and social activities for residents. Some of these community centres, such as Hillcrest and Killarney, are the top users of potable water at the Park Board. A full assessment of each facility could help to identify easy-win opportunities to improve efficiency, such as shower upgrades or timers, while also identifying certain foreseeable system breaks before they happen.

Water feature at VanDusen Gardens

Case Study: Water Assets Condition Assessment and Rehabilitation Planning

The Park Board hired consultants in late 2022 to conduct condition assessments for 64 decorative and recreational features operated and maintained by the Park Board. The final report from this work, titled the Water Features Condition Assessment and Rehabilitation Planning Report, includes both short and long-term rehabilitation recommendations and financial estimates for each feature. The water assets chosen as part of this project were decorative fountains, decorative waterfalls, ponds, spray parks, wading pools and children's water play features. The results of this project will assist in the development of a broader park feature inventory, rehabilitation cost estimates, and maintenance recommendations. The findings will also will help guide Park Board prioritization of retrofits, conversions and overall water consumption.

Action 4.2: Develop and Resource a Preventative Maintenance Schedule

Timeline: **Mid to Long-term**

Contributes to goal from: **Green Operations 2.0, VanPlay, Rain City Strategy, Climate Change Adaptation Strategy**

Building on findings from the Inventory and Analysis, staff will develop a schedule to maintain and replace near or end-of-life infrastructure prior to severe system breaks. This will include identifying timelines and budgets for ongoing and urgent maintenance, and will require prioritization of short-term changes that can be made within the current capital planning term. Preventative maintenance is an operating need, and one that is not currently accommodated within the current operating budget. Having a preventative maintenance plan and schedule that spans into the future can help the Park Board to make accurate budget requests with each new budget cycle.

Objective 5: Be water-smart when designing new parks and park redevelopments

Champion Team:
Planning and Park Development, Strategic Operations and Board Relations (Facilities team), with involvement from City Engineering and Park Operations.

Complying with by-laws and fixing water inefficiencies helps the Park Board to show leadership in water conservation practises. However, for this WPAP to be successful, the Park Board must also carefully consider future water consumption when creating and redesigning parks and facilities, and when adding new features to parks.

Water feature at Marine Square

Action 5.1: Develop a water budget

Timeline: **Short term**
Contributes to goal from: **All plans**

Staff will develop a Park Board-wide water allocation budget to guide park development, re-development and operations. This action will involve forecasting future water demands, costs, supply and environmental changes, and other considerations that could influence the availability, price, and sustainability of water. This water allocation budget can help to guide the development, retrofit, replacement and decommissioning of all Park Board water assets. It should occasionally be re-visited as the knowledge about climate change, drought, and the cost of water changes with time.

Objective 6: Work together

Champion Team:
Collaborative: Planning and Park Development, REFM, Park Operations, Engineering

Many departments collaborate to provide and maintain water infrastructure in parts. Some of the main players include Engineering, Planning and Park Development, Park Operations and Real Estate and Facilities Management (REFM). Engineering owns the service line infrastructure that supplies the water to the park water features and monitors use, the Park Board owns these water feature structures, and Park Operations and REFM maintain those features. REFM operates under a service agreement with the Park Board and supplies all trades personnel; while Park Operations performs non-trade maintenance in parks.

DEPARTMENT/AGENCY	JURISDICTION OVER WATER FEATURES IN PARKS
BOARD OF PARKS AND RECREATION	Custodianship (planning, governance and strategic direction) of water features, parks and recreation facilities, and Park Board community gardens.
ENGINEERING	Supplies water to parks and features by way of engineering infrastructure (i.e. plumbing and drainage). Monitors and analyzes potable water consumption throughout the city.
REAL ESTATE AND FACILITIES MANAGEMENT	Supplies trade-specific maintenance personnel (as directed by the Park Board) to respond to maintenance requests.
PARK OPERATIONS	Supplies non-trade maintenance personnel. Responsible for monitoring asset condition and submitting maintenance requests to REFM as needed.
STREETS	Ownership (planning, governance and strategic direction) of right-of-way.
ENGINEERING - GREEN INFRASTRUCTURE	Planning and design of green rainwater infrastructure. Coordinates with the Park Board for rainwater integration in parks.
METRO VANCOUVER	Supplies water to Metro Vancouver member jurisdictions. Bills each city/municipality for their water consumption.

This division of supply, ownership, and maintenance provides challenges when managing water features, as there is not one specific person or department that is entirely accountable for overseeing all aspects of a given water feature. In the past, deficient inter-departmental communication, monitoring, maintenance, and documentation has resulted in many of the challenges addressed in this WPAP. Moving forward, improved coordination and collaboration can harmonize our efforts and enhance our successes.

Inter-departmental Collaboration Case Study: Civic Metering Project

City of Vancouver Engineering staff are currently installing operational water meters at all City-owned and controlled buildings and facilities, as per the Green Operations 2.0 Plan priority actions. Within park boundaries, this Engineering installation work is being completed alongside Park Board operations staff.

This project is known as the "Civic Metering Project". Unmetered civic facilities are continuously being re-evaluated to determine if any require the installation of additional meters. While most of the large users have now been metered, the more water meters that are installed and closely monitored, the more accurately we can analyze our systems for efficiencies and detect underground leaks. This project continues to shed light on the amount of water being consumed at a number of facilities at the

Inter-departmental Collaboration Case Study: Fieldhouse Urinal Retrofit Project

In some Park Board facilities there are continuously running urinals that waste our valuable potable drinking water. These urinals are equipped with tanks that have a continuous fill rate and flush entirely when full. Retrofits were completed by COV Engineering Water Design and REFM staff at four test sites in 2018 to investigate the water savings resulting from the installation of motion activated sensors to control urinal flushing. These retrofits were found to yield a significant water savings at each fieldhouse location, while still allowing for safe urinal hygiene.

Following the success at each of the test sites, Engineering identified an additional 23 fieldhouses in the park system that had continuously running urinal tanks.

These fieldhouse locations were retrofitted over two project phases, where 15 fieldhouse locations were retrofitted in 2021 and 8 fieldhouse locations were retrofitted in 2022, in collaboration between Engineering and REFM Electrical. These retrofits resulted in a 99% water savings (~250,000 L/ of potable water per year) for each urinal tank and the payback period for these retrofits were less than one year.

In addition to Park Board fieldhouses, there are a number of other facilities that use the same urinal system and may benefit from retrofits. Some of these facilities are: community centers, pools, ice rinks, golf courses, transfer stations, city works yards and other REFM managed properties. Many of these facilities will be investigated and urinal sensors installed in 2023.

Action 6.1: Foster and maintain inter-departmental communication via a working group

Timeline: **Short to Long-term**
Contributes to goal from: **All Plans**

Staff will create an inter-departmental working group including staff from the Planning and Park Development, Park Operations, REFM, and Engineering. Led by Planning and Park Development, the goal of this group will be to meet regularly (e.g. twice per year) to discuss the progress of water prioritization and conservation efforts in parks.

Increased interdepartmental communication has already resulted from the development of this WPAP, and semi-regular working group meetings provide a structure for staff to coordinate efforts and keep plan implementation on the radar.

Action 6.2: Support partnerships to monitor and steward transformed and naturally managed water features

Timeline: **Underway and Long-term**
Contributes to goal from: **All Plans**

The Park Board already supports many partnerships with environmental stewardship groups, urban Indigenous people, and the Musqueam, Squamish and Tsleil-Waututh nations. In many cases, stewarding transformed ponds and streams may be a natural extension of their existing work in parks, which may include removing invasive plants, monitoring biodiversity, and planting native plants.

Initial support may be required to orient existing community leaders to the transformed water features, and to explore new opportunities in parks where stewardship is not taking place. Longer-term, these partnerships may be maintained within the scope of the Environment team's regular work.

Action 6.3: Develop and implement a public communications plan to share information about converted water features and water conservation

Timeline: **Underway and Long-term**
Contributes to goal from: **All Plans**

The Park Board uses educational and interpretive signage, social media posts, web updates, events, informational videos and other public communications to share information with members of the public about our work. Under this action, we will develop a communications plan to help the public understand and interpret the changes they're seeing to water features in parks.

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APPENDIX I: Overview, state of repair and recommendations for Park Board marinas

The Vancouver Board of Parks and Recreation owns and operates two public marinas: Heather Civic Marina and Burrard Civic Marina. Heather Civic Marina is open year-round, with an option for live-aboard mooring. Burrard Civic Marina does not allow for live-aboard mooring and is not open throughout the winter months. Neither Marina has adequate infrastructure for year-round water access due to piping that is not freeze protected. Each winter the marinas drain (winterize) all fire lines on the docks, which is a several day draining process, where the potable water is released into the ocean.

The potable water lines at Heather Civic Marina that supply the live-aboard section are left dripping throughout the evenings when the temperature drops below freezing so that the water lines do not freeze and the residents continue to have access to water. When the evenings are no longer below freezing and the sailing season is about to begin, the fire lines along the docks are again primed, which is a three day filling process.

The majority of the dock and plumbing infrastructure at Heather Civic Marina is near or past end-of-life. Several hose bibs and

Wooden dock and plumbing infrastructure at Heather Civic Marina

hose attachments are leaking into the ocean. While some newer piping has been installed along the main dock, all of the old and broken pipes have been left attached to the dock system and are still open to the elements (not capped). Much of the wooden dock structure is also rotting or broken.

The plumbing and dock infrastructure at Burrard Civic Marina is in varying condition. Some of the main dock structure has been recently replaced, with the new piping laid inside the structure. There are also makeshift attachment walkways connecting the new dock structure to the old dock structure.

In an effort to stop the draining of fire lines every winter into the ocean and priming them again in the spring, it is recommended to upgrade the plumbing to insulated piping so the water lines will not freeze. This would also allow for year-round water access to the marinas for fire suppression purposes, human health and hygiene purposes, as well as to protect the ocean environment from large scale chlorinated water releases. The majority of the plumbing and dock infrastructure at the marinas is also at or near end-of-life and should be replaced. The old infrastructure also needs to be removed as some old and broken piping is hazardous. These recommendations may be expensive in cost (several million); however, they are vital to ensure regulatory compliance, protect the environment from large scale releases of chlorinated water, and to maintain the safety of users at the marinas.

APPENDIX II: Overview of the Park Board WCAP 2017-2020

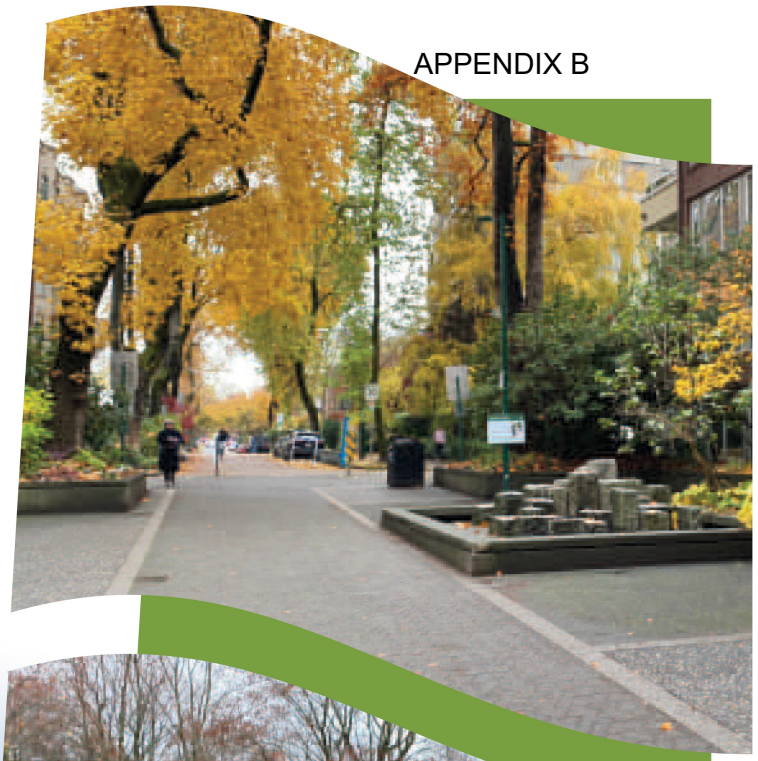
The first Park Board Water Conservation Action Plan (WCAP) was approved by the Board of Commissioners in 2017. The Action Plan made recommendations on six priority water conservation projects, as well as had an overall goal of reducing potable water use in parks by 33% from a 2006 baseline. While many of the specified actions from the previous WCAP were not implemented, the overarching goal of reducing potable water in parks by 33% from a 2006 baseline was achieved. This was a result of other projects that were completed prior to the development of the initial action plan. In fact, by the time that the 2017 goal was in place, there had already been a 21% reduction in potable water use due to actions unrelated to the 2017-2020 WCAP. Some of these actions were:

ACTIONS THAT RESULTED IN A POTABLE WATER REDUCTION OF 33%	TIMELINE
A lake level sensor control was installed at Trout Lake to control the water input. The potable water input has since been used as a controlled top-up, so the lake maintains the same visual level. (see page "Case Study: Trout Lake")	**Lake level sensor installed in 2014**
A push button was installed at Stanley Park Spray Park (Lumberman's Arch) to ensure that the spray features could operate in compliance with 2015 water use restrictions	**Activation push button installed in 2015**
The water input feed at the Stanley Park Mini Train ponds was throttled down to minimize the amount of water flowing over the waterwheel, into the ponds below.	**Water input turned down in 2015**
The waterfall input feed at Charleson Park was throttled down to minimize the amount of water flowing over the waterfall.	**Water input turned down in 2015**
A timer was installed on the potable water input at Queen Elizabeth Park Waterfall. This water input feed was throttled down to reduce the amount of water flowing over the waterfall.	**Timer installed in 2019**
The Zoo Stream in Stanley Park was turned off. When operating, this once-through water feature did not adhere to City bylaws nor to the Federal Fisheries Act, due to the continuous release of chlorinated water into Burrard Inlet.	**Stream off since 2019**

The six priority actions from the 2017-2020 Water Conservation Action Plan were:

PRIORITY ACTIONS FROM 2017-2020 PLAN	STATUS
Convey outflow water from Stanley Park's Spray Park to the Miniature Train ponds, which flow to Beaver Lake.	**NOT COMPLETED**
Recirculate the waterfall and waterwheel at the Stanley Park Miniature Train ponds.	**NOT COMPLETED**
Recirculate Charleson Park Waterfall and Pond.	**NOT COMPLETED**
Recirculate the pond system at VanDusen Botanical Garden; as well as, identify and address water losses and explore groundwater supply potential.	**NOT COMPLETED** (groundwater supply potential was explored)
Explore irrigation efficiency opportunities.	**NOT COMPLETED**
Address once-through water features.	**NOT COMPLETED**

VANCOUVER BOARD OF PARKS AND RECREATION



REPORT

Water Features Condition Assessment and Rehabilitation Planning

November 2023

Associated STRATEGIC ADVISORY SERVICES

CANADA BEST MANAGED COMPANIES Platinum member

The preparation of this project was carried out with assistance from the Government of Canada and the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

EXECUTIVE SUMMARY

1.1 Purpose

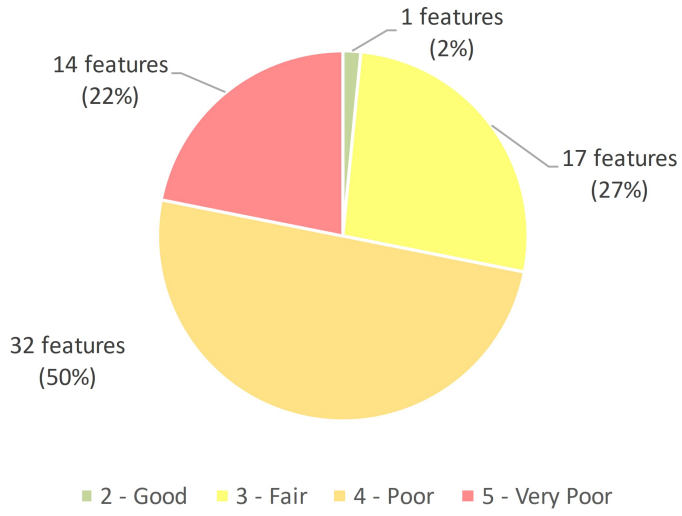
The City of Vancouver Board of Parks and Recreation (the City) engaged Associated Engineering (Associated) to conduct a condition assessment and develop a rehabilitation and maintenance plan for a selection of the water features that the City manages. The City is committed to strengthening its asset management program. Additionally, many of the water features included in this engagement have been turned off over the last several years due to compliance concerns and functional deficiencies. This has lead to increased public concern and scrutiny over time.

The purpose of this assignment is to identify the specific activities and financial needs required to get the water features operational at their designed level of service, including improvements required to achieve operational compliance with all applicable regulations. The scope included a total of 64 water features at various parks around Vancouver, comprising 22 decorative fountains, 19 spray parks, 15 wading pools, and 8 ponds and waterfalls.

1.2 Current State of Assets

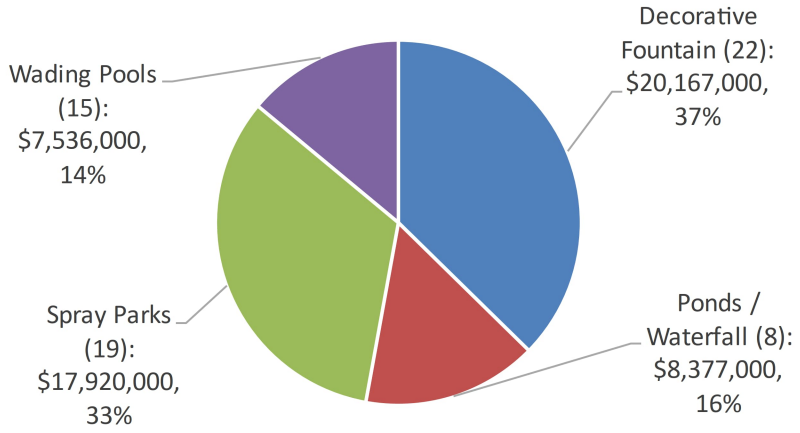
Visual condition assessments were conducted from November 2022 to January 2023 and the outcomes are summarized in **Figures ES-1** and **ES-2**. Features were componentized and overall feature condition was assigned based on the poorest component condition score received by that feature. **Figure ES-1** shows the number of features with overall condition ratings at each condition band. Most of the water features have an overall feature condition of Poor (50%). Of the 64 features inspected, only Connaught Park spray park received an overall feature condition of Good. Poor and Very Poor component condition ratings were typically driven by defects among key process mechanical and structural elements of the water features. Of the 64 water features inspected, 13 were deemed to be not operational (e.g., the feature cannot be turned on, even at a reduced level of service; doing so is not possible or would further damage the feature).

Figure ES-1 Overall Water Feature Condition: Water Feature Portfolio



Asset values were determined using the water feature asset inventory and asset replacement values developed by Associated. Modelled current replacement values (CRVs) were summarized for each feature category and reviewed by the City working group, and subsequently compared to tender information and additional reports provided by the City. **Figure ES-2** summarizes the water feature portfolio's valuation by feature category. The estimated total CRV for all features included in the scope of this assessment is approximately $54.0 million.[1]

Figure ES-2 Current Replacement Value ($): Water Feature Portfolio



1.3 Regulatory Compliance Review

Associated completed a comprehensive review of the governing documents that apply to the operation and maintenance of the water features. These governing documents set requirements that the water features need to comply with when in operation as well as design best practices. The review identified six primary regulations that the water features are required to meet while in operation. These are the City's Bylaws 4848 and 12086, the federal Fisheries Act, the BC Environmental Management Act, the City's Plumbing Bylaw, and the Pool Regulation.

Bylaws 4848 and 12086 implement the Metro-Vancouver Drinking Water Conservation Plan. The primary considerations for these bylaws are their prohibition on the wasting of potable water and the requirement for water features to have recirculating systems to conserve water. The primary considerations for the Fisheries Act and the BC Environmental Management Act are their prohibition of the introduction of chlorinated water into the environment. The Plumbing Bylaw and the Pool Regulation relate to design and operational requirements for the water features and addressing physical safety hazards.

[1] All dollar values are in 2023 dollars.

1.4 Rehabilitation Needs

Based on the deficiencies identified during the water feature inspections and identified compliance concerns, Associated developed a list of rehabilitation activities with Class D cost estimates for each water feature. These activities are limited to the repair of any major defects which prevent the feature from operating at an acceptable level of service, and to addressing any deficiencies which prevent the feature from complying with relevant regulations.

In November 2023, Board staff requested Associated re-assess the spray park features with a second rehabilitation scenario, which takes an alternative approach to the regulatory considerations. The scenarios assessed are:

Full Rehabilitation Scenario: Complete rehabilitation of all features to a fully compliant standard.

Alternate Rehabilitation Scenario: Includes the same rehabilitation activities as the Full Rehabilitation Scenario, with the exception that existing spray parks are not upgraded to be recirculating if they have user-activated push button timers for water release. As a result, these features would be in compliance with Bylaw 12086 (during Stage 1, 2, and 3 water restrictions), but would not achieve full compliance with Bylaw 4848.

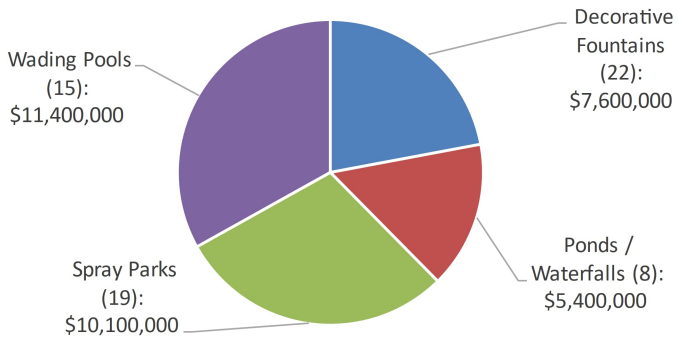
Full Rehabilitation Scenario

The total estimated cost of rehabilitating the water feature portfolio under the Full Rehabilitation Scenario is approximately $34.5 million.

Figure ES-3 summarizes the estimated rehabilitation cost by water feature category. Installing new recirculation systems in non-compliant features is the most costly rehabilitation activity, totalling approximately $13.3 million to install 47 recirculation systems.

Figure ES-3 Total Rehabilitation Cost Estimates

Full Rehabilitation Scenario (Class D)



Alternate Rehabilitation Scenario

The total estimated cost of rehabilitating the water feature portfolio under the Alternate Rehabilitation Scenario (i.e., with the costs of new recirculation systems removed for spray parks) is approximately $26.9 million, a reduction of approximately $7.6 million compared to the Full Rehabilitation Scenario.

Figure ES-4 summarizes the estimated rehabilitation cost by water feature category. Installing new recirculation systems in non-compliant features is still the most costly rehabilitation activity under this scenario, but now only totals approximately $9.3 million to install 33 recirculation systems.

Figure ES-4 Total Rehabilitation Cost Estimates

Alternate Rehabilitation Scenario (Class D)

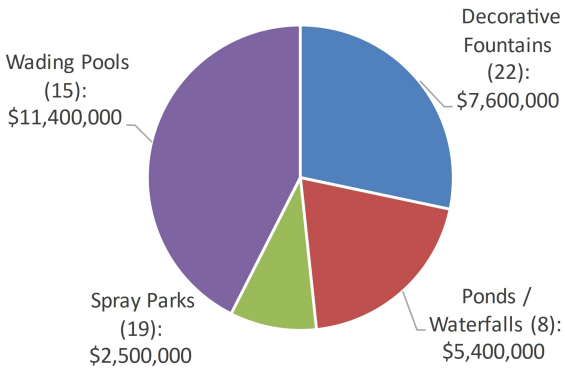


Table ES-1 summarizes the average rehabilitation cost by water feature category under each scenario.

Table ES-1 Average Rehabilitation Cost Estimates by Scenario (Class D)

Feature Category	FULL REHABILITATION SCENARIO Average Rehabilitation Cost per Feature ($)	ALTERNATE REHABILITATION SCENARIO Average Rehabilitation Cost per Feature ($)
Decorative Fountains	$345,000	$345,000
Ponds / Waterfalls	$670,000	$670,000
Spray Parks	$531,000	$129,000
Wading Pools	$760,000	$760,000
All Features	$538,000	$419,000

Overall, the data used to prepare the rehabilitation activities and costs was limited. Condition information was collected based on operator input and visual inspections of surface features only. Information on buried infrastructure along with past financial expenditures and maintenance records would improve the confidence of the rehabilitation activities and costs, as well as the subsequent planning outputs and financial expenditure estimates and forecasts.

While the charts and tables above indicate the rehabilitation needs for the select water features to achieve the defined standards for each scenario, it is clear that the social, economic and environmental benefits and costs associated with the different features vary. These additional factors have been used to support the prioritization of the water features for rehabilitation in order to develop a rehabilitation plan. This prioritization process is described below.

1.5 Prioritized Rehabilitation Plan

A rehabilitation prioritization model was developed to apply a series of criteria to rank the water feature rehabilitation activities. Several measurable criteria were developed to reflect the public's interest in amenity availability, as well as water features' capacity to serve the community and individual health and well-being. Over a number of discussions with the City, four primary technical criteria and 21 secondary criteria were selected to prioritize the rehabilitation of water features across the current and future capital planning budget periods. The primary criteria capture the current condition, functionality, cost to rehabilitate, and regulatory compliance concerns of the water feature. The secondary criteria were developed based on a thorough examination of the relevant regulatory context, of the City's governing frameworks, and publicly available environmental, social (including equity), and infrastructure data.

The prioritized rehabilitation list was then input into subsequent financial modelling to evaluate the long-term viability of the current funding model. Current capital funding levels were used as an estimate of yearly funds available for rehabilitation activities. Financial Models were developed for both the Full Rehabilitation Scenario and the Alternate Rehabilitation Scenario.

Table ES-4 at the end of this section provides details on the full list of water features, including CRV, key rehabilitation considerations (feature condition, whether the feature is operational, whether the feature has compliance concerns), and the rehabilitation costs and prioritized rank of each of the features under both the Full Rehabilitation Scenario and the Alternative Rehabilitation Scenario.

1.6 Financial Forecast

The rehabilitation forecasts output from the prioritization process and rehabilitation financial modelling were then integrated into a comprehensive 50-year forecast of financial needs for the in-scope features that included:

- Capital Expenditures (CAPEX), including:
  - **Rehabilitation costs:** The estimated rehabilitation costs, by feature, for both the Full Rehabilitation Scenario and the Alternate Rehabilitation Scenario.
  - **Renewal costs:** The estimated CRV, by asset.
- Ongoing Operating Expenditures (OPEX), including:
  - **Maintenance costs:** Estimated costs for a series of maintenance activities, by feature category.
  - **Inspection costs:** Estimated costs for a series of inspection activities, by feature category.
  - **Operations costs:** Estimated costs for a series of operations activities, by feature category.
  - **Repair costs:** Estimated reactive repair costs, as a set percentage of CRV, by asset.

The following assumptions were made in developing the financial model:

- **Rehabilitation funding limits:** Current yearly capital funding levels were used as the basis for budget availability and to develop the forecasts for rehabilitation. The modelled annual funding cap results in delaying some rehabilitation activities, in some cases beyond the 50-year window of the investment forecast.
- **Expected condition post-rehabilitation:** Given the scale of rehabilitation activities required, it is assumed that the condition of all rehabilitated water feature assets are restored to 'as new'.
- **Renewal and rehabilitation timing:** Where water features are scheduled for rehabilitation, it is assumed that no component renewal will take place prior to that rehabilitation.
- **Operating Expenditures:** All OPEX costs were applied on an average annual basis in the model. OPEX costs were estimated based on the post-rehabilitation configuration of the water feature.

The CAPEX and OPEX costs were applied to several funding periods as determined during project scoping. These "capital planning periods" included:

- **Urgent (2 years):** This period includes the current year and the next year, 2023 to 2024, which are the initial two years of the City of Vancouver's current capital planning cycle.

- **Current (2 years):** This period includes the last 2 years of the City's current capital planning cycle, 2025 to 2026.
- **Next (4 years):** This period includes the four years of the City's next capital planning cycle, 2027 to 2030.
- **Future (42 years):** This period includes all subsequent years in the program, 2031 to 2072.

Full Rehabilitation Scenario

For the Full Rehabilitation Scenario total program costs for the in-scope features over a 50-year period from 2023 to 2072 were forecast at $207.7 million.[2] This total is inclusive of all of the capital (rehabilitation costs, per the prioritized rehabilitation plan, plus renewals) and operating expenditures (operations, inspections, maintenance, and repairs costs) forecast in the financial model. A breakdown of the forecast is detailed in **Table ES-2**.

Table ES-2 Summary Financial Forecast – Full Rehabilitation Scenario

Expenditure	Capital Planning Period				Program Total	Average Annual
	Urgent	Current	Next	Future		
	2023 to 2024	2025 to 2026	2027 to 2030	2031 to 2072		
CAPEX	$1,693,000	$1,620,000	$2,310,000	$56,276,000	$61,899,000	$1,238,000
OPEX	$5,946,000	$5,755,000	$11,701,000	$122,378,000	$145,780,000	$2,916,000
TOTAL	**$7,639,000**	**$7,375,000**	**$14,010,000**	**$178,654,000**	**$207,678,000**	**$4,154,000**

Alternate Rehabilitation Scenario

For the Alternate Rehabilitation Scenario (i.e., with the costs of new recirculation systems removed for spray parks) total program costs for the in-scope features over a 50-year period from 2023 to 2072 were forecast at $184.9 million, a reduction of approximately $22.8 million compared to the Full Rehabilitation Scenario. This reduction reflects the reduced rehabilitation costs due to the removal of the recirculation systems from the spray parks, plus the impacts of that change to the renewal costs and also the operations, inspections, maintenance, and repairs costs for the spray parks over the 50-year time period. A breakdown of the forecast is detailed in **Table ES-3**.

Table ES-3 Summary Financial Forecast– Alternate Rehabilitation Scenario

Expenditure	Capital Planning Period				Program Total	Average Annual
	Urgent	Current	Next	Future		
	2023 to 2024	2025 to 2026	2027 to 2030	2031 to 2072		
CAPEX	$710,000	$1,620,000	$1,683,000	$55,003,000	$59,016,000	$1,203,000
OPEX	$5,112,000	$4,982,000	$10,094,000	$105,660,000	$125,848,000	$2,517,000
TOTAL	**$5,822,000**	**$6,602,000**	**$11,777,000**	**$160,663,000**	**$184,864,000**	**$3,720,000**

[2] All dollar values in this report and in the financial modelling are calculated in 2023 dollars. Dollar values have not been discounted.

1.7 Outcomes and Future Considerations

As a result of the funding limits in the financial model, in future years a high percentage of water features will be well beyond their expected service life and feature condition will remain as 'very poor' for many years. This will have a significant impact on the functionality and risk associated with the assets, and on the volume and cost of reactive repairs needed. These outcomes have not been evaluated.

The modelled financial scenarios should not be viewed as recommended or proposed investment plans. The scenarios represent an expected investment profile based on the City's current (capital) funding levels.

With the information provided in this report the City can now better assess the alignment of current capital and operational funding, the funding gap, and implications for levels of service.

Table ES-4 Water Feature Prioritization Summary Table

GIS ID	Site Name	Current Replacement Value ($, 2023)	Current Condition	Operational (Y/N)	Compliance Concerns? (Y/N)	Full Rehabilitation Scenario		Alternative Rehabilitation Scenario	
						Rehabilitation Cost*	Prioritization Rank**	Rehabilitation Cost*	Prioritization Rank**
DECORATIVE FOUNTAINS									
PWF0082	SP - Harding Memorial Decorative Fountain	$558,000	5 - Very Poor	N	Y	$399,500	1.00	$399,500	1.00
PWF0088	David Lam Decorative Fountain	$831,000	5 - Very Poor	N	Y	$283,100	1.02	$283,100	1.02
PWF0043	George Wainborn Park Decorative Fountain	$4,566,000	4 - Poor	Y	Y	$355,900	1.04	$355,900	1.04
PWF0090	SP - Pauline Johnson Memorial Decorative Fountain	$203,000	3 - Fair	Y	Y	$611,500	1.07	$611,500	1.05
PWF0056	Granville Loop Park Decorative Fountain	$381,000	5 - Very Poor	Y	Y	$76,500	1.08	$76,500	1.08
PWF0041	Emery Barnes Park Decorative Fountain	$1,969,000	4 - Poor	Y	Y	$64,800	1.09	$64,800	1.09
PWF0049	Marina Square Decorative Fountain	$887,000	4 Poor	Y	Y	$249,500	1.12	$249,800	1.12
PWF0081	SP - Air Force Garden Decorative Fountain	$8,000	4 - Poor	N	Y	$552,000	5.00	$552,000	5.00
PWF0085	Seaforth Peace Park Decorative Fountain	$370,000	5 - Very Poor	N	Y	$491,600	12.00	$491,600	9.00
PWF0064	Queen Elizabeth Park Decorative Fountain	$2,159,000	4 Poor	N	Y	$810,800	16.00	$810,800	13.00
PWF0035	Cardero Park Decorative Fountain	$640,000	4 - Poor	Y+	Y	$141,500	19.00	$141,500	19.00
PWF0046	Barclay Heritage Square Decorative Fountain	$126,000	5 - Very Poor	Y	Y	$467,500	22.00	$467,500	21.00
PWF0033	Andy Livingstone Park Decorative Fountain	$3,332,000	5 - Very Poor	N	N	$502,000	23.00	$502,000	22.00
PWF0087	Bute & Haro Decorative Fountain	$331,000	3 - Fair	Y	Y	$388,100	26.00	$388,100	25.00
PWF0048	Laurel St Decorative Fountain	$270,000	4 - Poor	Y	Y	$388,100	26.00	$388,100	25.00
PWF0052	SP - Rock Garden Decorative Fountain	$383,000	4 - Poor	Y	Y	$495,100	29.00	$495,100	28.00
PWF0045	Art Phillips Park Decorative Fountain	$277,000	3 - Fair	Y	Y	$327,800	32.00	$327,800	29.00
PWF0044	Jervis at Pacific Decorative Fountain	$208,000	3 - Fair	Y	Y	$450,200	42.00	$450,200	38.00
PWF0047	Helmcken Park Decorative Fountain	$300,000	3 - Fair	Y	Y	$452,800	43.00	$452,800	39.00
PWF0050	Nelson Park Decorative Fountain	$297,000	4 - Poor	Y	N	$34,800	56.00	$34,800	56.00
PWF0058	Hillcrest Park Decorative Fountain	$965,000	3 - Fair	Y	N	$-	62.00	$-	62.00
PWF0053	Cathedral Square Park Decorative Fountain	$1,107,000	3 - Fair	Y	N	$48,600	64.00	$48,600	64.00
PONDS AND WATERFALLS									
PWF0038	Charleson Park Waterfall and Pond	$1,749,000	5 - Very Poor	Y	Y	$1,336,900	1.03	$1,336,900	1.03
PWF0023	Vandusen Gardens Pond	$423,000	4 - Poor	Y	Y	$42,400	1.14	$42,400	1.14
PWF0077	Stanley Park Miniature Train Ponds B	$436,000	5 - Very Poor	N	Y	$483,300	2.00	$483,300	2.00

GIS ID	Site Name	Current Replacement Value ($, 2023)	Current Condition	Operational (Y/N)	Compliance Concerns? (Y/N)	Full Rehabilitation Scenario		Alternative Rehabilitation Scenario	
						Rehabilitation Cost*	Prioritization Rank**	Rehabilitation Cost*	Prioritization Rank**
PWF0076	Stanley Park Miniature Train Ponds A	$283,000	5 - Very Poor	N	Y	$683,000	3.00	$683,100	3.00
PWF0069	Queen Elizabeth Park Waterfall and Pond	$477,000	3 - Fair	N	Y	$343,300	4.00	$343,300	4.00
PWF0031	Memorial South Park Pond	$1,688,000	4 - Poor	Y+	Y	$810,800	7.00	$810,800	7.00
PWF0034	Dr Sun Yat Sen Pond	$2,649,000	4 - Poor	Y	Y	$1,040,300	18.00	$1,040,300	16.00
PWF0089	SP - Park Board Admin Pond	$672,000	4 - Poor	Y+	Y	$623,600	20.00	$623,600	20.00
SPRAY PARKS									
SP017	SP - Lumberman's Arch Spray Park	$506,000	4 - Poor	Y	Y	$1,293,800	1.01	$310,500	1.01
SP010	Kitsilano Beach Park Spray Park	$482,000	4 Poor	Y	Y	$597,400	1.05	$164,400	1.07
SP004	CRAB Park Spray Park	$781,000	4 - Poor	Y	Y	$744,900	1.06	$156,600	1.06
PWF0057	Harbour Green Park Spray Park and Fountain	$2,503,000	4 - Poor	Y	Y	$104,900	1.10	$104,900	1.10
SP001	Chaldecott Park Spray Park	$1,486,000	4 Poor	Y	Y	$148,700	1.11	$148,700	1.11
SP011	Maclean Park Spray Park	$2,378,000	5 - Very Poor	Y	Y	$605,600	1.13	$605,600	1.13
PWF0086	Grandview Park Spray Park B	$23,000	5 - Very Poor	N	Y	$12,100	8.00	$-	14.00
SP013	Oak Park Spray Park	$1,177,000	3 - Fair	Y+	Y	$734,900	9.00	$146,600	10.00
SP018	New Brighton Park Spray Park	$679,000	5 - Very Poor	N	Y	$477,800	11.00	$134,900	18.00
WDP012	Hastings Community Park Spray Park - East	$307,000	5 - Very Poor	N	Y	$531,300	13.00	$67,600	17.00
SP012	Norquay Park Spray Park	$938,000	3 - Fair	Y+	Y	$617,400	21.00	$141,300	27.00
SP019	Rainbow Park Spray Park	$1,002,000	3 - Fair	Y	Y	$3,100	24.00	$3,100	23.00
SP005	Garden Park Spray Park	$544,000	4 - Poor	Y	Y	$450,200	28.00	$13,800	47.00
SP009	Hastings Community Park Spray Park - West	$703,000	4 - Poor	Y	Y	$563,200	30.00	$800	46.00
SP006	Grandview Park Spray Park A	$704,000	3 - Fair	Y	Y	$571,000	47.00	$8,600	50.00
SP016	Prince Edward Park Spray Park	$953,000	3 - Fair	Y	Y	$594,300	48.00	$137,100	51.00
SP014	Oxford Spray Park	$280,000	3 - Fair	Y	Y	$720,122	50.00	$169,900	52.00
SP015	Pandora Park Spray Park	$1,140,000	3 - Fair	Y	Y	$593,400	53.00	$5,200	53.00
SP003	Connaught Park Spray Park	$1,335,000	2 - Good	Y	Y	$723,600	54.00	$135,400	54.00
WADING POOLS									
WDP007	Collingwood Park Wading Pool	$483,000	5 - Very Poor	N	Y	$818,900	14.00	$818,900	11.00

GIS ID	Site Name	Current Replacement Value ($, 2023)	Current Condition	Operational (Y/N)	Compliance Concerns? (Y/N)	Full Rehabilitation Scenario		Alternative Rehabilitation Scenario	
						Rehabilitation Cost*	Prioritization Rank**	Rehabilitation Cost*	Prioritization Rank**
WDP025	Sunrise Park Wading Pool	$544,000	4 - Poor	Y	Y	$737,800	15.00	$737,800	12.00
WDP010	Falaise Park Wading Pool	$483,000	4 - Poor	Y	Y	$711,600	33.00	$711,600	30.00
WDP002	Bobolink Park Wading Pool	$481,000	4 - Poor	Y	Y	$724,500	34.00	$724,500	31.00
WDP004	Burrard View Park Wading Pool	$527,000	4 - Poor	Y	Y	$724,500	34.00	$724,500	31.00
WDP022	Robson Park Wading Pool	$428,000	4 - Poor	Y	Y	$725,400	36.00	$725,400	33.00
WDP027	West Point Grey Park Wading Pool	$473,000	4 - Poor	Y	Y	$737,400	37.00	$737,400	34.00
WDP028	Woodland Park Wading Pool	$289,000	4 - Poor	Y	Y	$737,400	37.00	$737,400	34.00
WDP024	Slocan Park Wading Pool	$942,000	4 Poor	Y	Y	$746,000	40.00	$746,000	36.00
WDP020	Renfrew Community Park Wading Pool	$446,000	4 - Poor	Y	Y	$751,200	41.00	$751,200	37.00
WDP006	Clinton Park Wading Pool	$440,000	4 - Poor	Y	Y	$828,900	44.00	$828,900	40.00
WDP009	Douglas Park Wading Pool	$462,000	4 Poor	Y	Y	$831,500	45.00	$831,500	41.00
WDP011	Grays Park Wading Pool	$627,000	4 - Poor	Y	Y	$849,600	46.00	$849,600	42.00
WDP001	Balaclava Park Wading Pool	$453,000	3 - Fair	Y	Y	$737,400	51.00	$737,400	44.00
WDP023	Ross Park Wading Pool	$458,000	3 - Fair	Y	Y	$737,400	51.00	$737,400	44.00

[+] These features are operational, but at a reduced level of service or increased maintenance level.

* All dollar values in 2023 dollars.

** The Prioritization Rank numbers identify priority of rehabilitation works only. The ranking is based on a series of primary criteria including current condition, functionality, cost to rehabilitate, and regulatory compliance concerns. Select secondary criteria, related to other regulatory compliance concerns, were also used override initial prioritization ranks and constrain some features to a priority 1 ranking. This resulted in multiple features with a Rank of 1. Rank order for these Rank 1 items was otherwise maintained by use of decimals. This further resulted in missing rank numbers later down the list where these features were “pulled ahead” in the rank order.

APPENDIX C

Options for Capital Funding Allocation

The following pages describe 4 feasible options to allocate the $2.6M in available capital funding for rehabilitating decorative water features. Each option also includes a prioritization to execute the construction phase of the Queen Elizabeth Park Dancing Waters Fountain repair project. The detailed design for repair of this existing recirculating fountain is already completed - this project is tender-ready.

Cost Estimates
Dancing Waters Fountain cost estimates are based on the detailed design. The other project costs are estimated at a Class D level, based on limited preliminary information available as described in the consultant's report (see Appendix B for Executive Summary), and are provided solely for the purpose of budgetary planning. The cost estimates include a 15% allowance for design fees and 50% contingency which is reflective of the limited available data. Cost escalations and unforeseen conditions may cause project costs to exceed these reasonable estimates. Within each Option table, the projects are listed in the order that staff propose to execute the projects, progressing through the list until the total funding is exhausted.

Water Consumption Data
The available water consumption data contains several sources of variability. Water meters are not installed on all water features. Where meters exist, they are often measuring multiple demands such as irrigation and washroom facilities in addition to the water feature. Annual consumption rates vary due to hours of operation and throttling levels (how far the tap is opened). Leaks or system breaks can result in very high water consumption recordings.

Order of Magnitude Water Cost Savings Estimates
In the case where features are upgraded to recirculating systems and leaks are repaired, it is difficult to estimate their future water consumption with accuracy. The "savings" in water is a notional savings derived from comparing the estimated future consumption to the previous consumption when the feature was operated as a non-compliant feature.

APPENDIX C

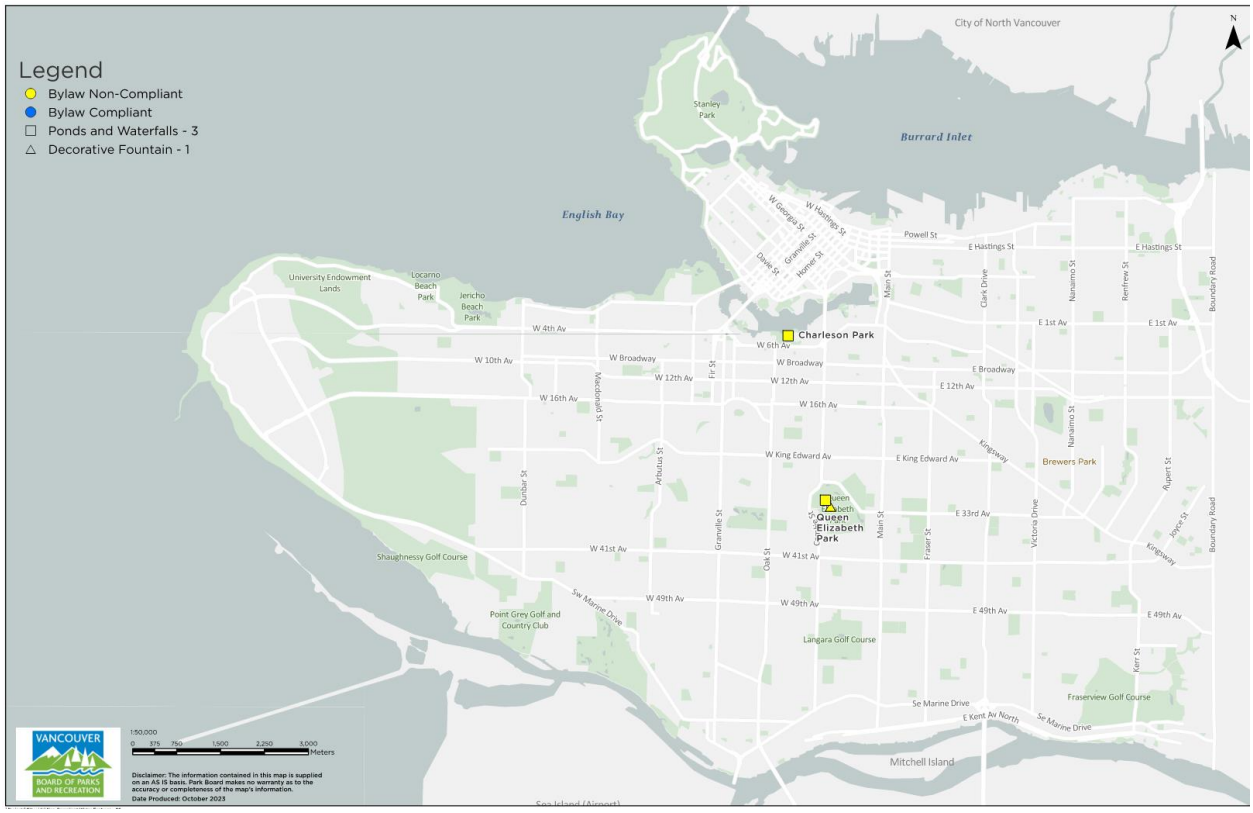
Options for Capital Funding Allocation

Option 1: Optimized Water Savings (Sustainability & Reduced Water Costs)

	Cost Est.	Feature	Rehabilitation Scope
A	$ 850,000	QE Park Dancing Waters Fountain*	Repair leaks; new membrane; mechanical & electrical repairs. Project is tender-ready.
B	$ 1,400,000	Charleson Park Pond and Waterfall*	Replace recirculating system; install water filtration & disinfection system; new underground holding tank; pond & stream liners; re-grading/ landscaping.
C	$ 350,000	QE Park Waterfall	Install recirculating system with water filtration & disinfection; inspect and repair supply line.
	$ 2,600,000	**Total**	
Order of Magnitude Water Savings: 30 – 100 Million Litres per year			
Approximate Annual Operating & Maintenance Cost: $60,000 plus water consumption charges			

Option 1 focuses on rehabilitating some of the decorative water features with the largest system leaks, which thereby caused them to consume the greatest volumes of water when operated in previous years prior to being turned off.

** denotes feature has an existing recirculation system*



Locations and present compliance status of the decorative water features addressed in Option 1.

APPENDIX C

Options for Capital Funding Allocation

Option 2: Greatest Number of Rehabilitated Features

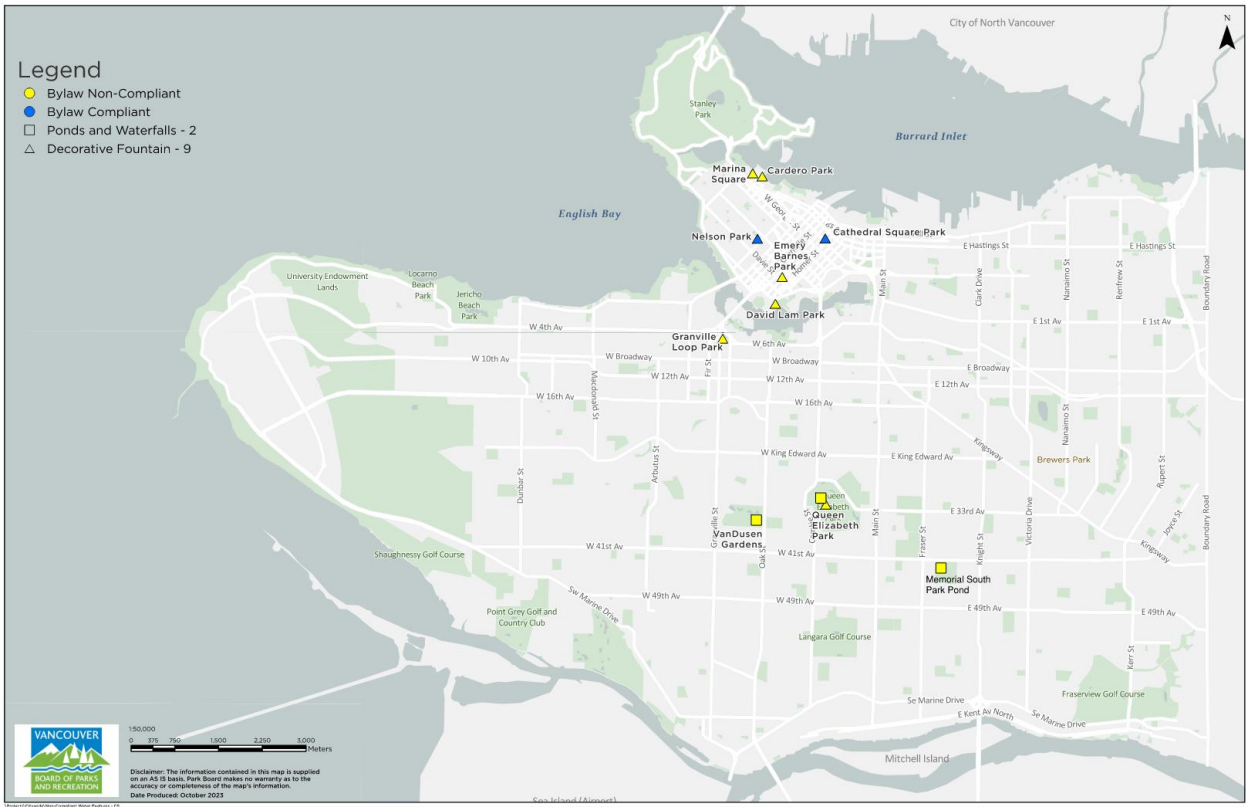
	Cost Est.	Feature	Rehabilitation Scope
A	$ 850,000	QE Park Dancing Waters Fountain*	Repair leaks; new membrane; mechanical & electrical repairs. Project is tender-ready
B	$ 350,000	QE Park Waterfall	Install recirculating system with water filtration & disinfection; inspect and repair supply line.
C	$ 400,000	Memorial South Park Pond	Install pond liner to retain water; water balance assessment; water meter repairs; water treatment program
D	$ 300,000	David Lam Fountain*	Redirect site drainage to sanitary network; replace pumps; inspect and replace waterproofing membrane; repair paving stones.
E	$ 80,000	Granville Loop Park Fountain*	Repair drainage issues; replace feature lighting; concrete repairs.
F	$ 70,000	Emery Barnes Park Fountain*	Replace filter pump motor; replace feature lighting; concrete repairs.
G	$ 260,000	Marina Square Fountain*	Redirect site drainage to sanitary network; inspect and repair leaks; replace process controls; replace feature lighting.
H	$ 45,000	VanDusen Gardens Rectangular Pond*	Replace corroded valves; detailed inspection; install level control system; install safety fence.
I	$ 150,000	Cardero Park Fountain*	Redirect site drainage to sanitary network; inspection to determine source of leaks; rebuild waterfall piping.
J	$ 40,000	Nelson Park Fountain*	Inspection of pond structure; inspect and repair gate valve; replace level control system.
K	$ 55,000	Cathedral Square Park Fountain*	Fountain structure repairs; repair facility sump and drainage systems.
	$ 2,600,000	**Total**	
Order of Magnitude Water Savings: 20 – 50 Million Litres per year			
Approximate Annual Operating & Maintenance Cost: $185,000 plus water consumption charges			

Option 2 focusses on rehabilitating the greatest number of amenities, thereby providing the greatest number of functional, compliant decorative water features. The greatest number of projects is achieved within the fixed budget by prioritizing the delivery of the lowest cost projects. Since the installation of new recirculating systems is typically quite costly, the lowest cost projects frequently relate to features where a recirculating system is already in place, but may require relatively minor enhancements or upgrades to structural or electrical components. Accordingly, 8 of the features listed in this Option are already recirculating features.

** denotes feature has an existing recirculation system*

APPENDIX C

Options for Capital Funding Allocation



Locations and present compliance status of the decorative water features addressed in Option 2.

APPENDIX C

Options for Capital Funding Allocation

Option 3: Comprehensive Asset Management

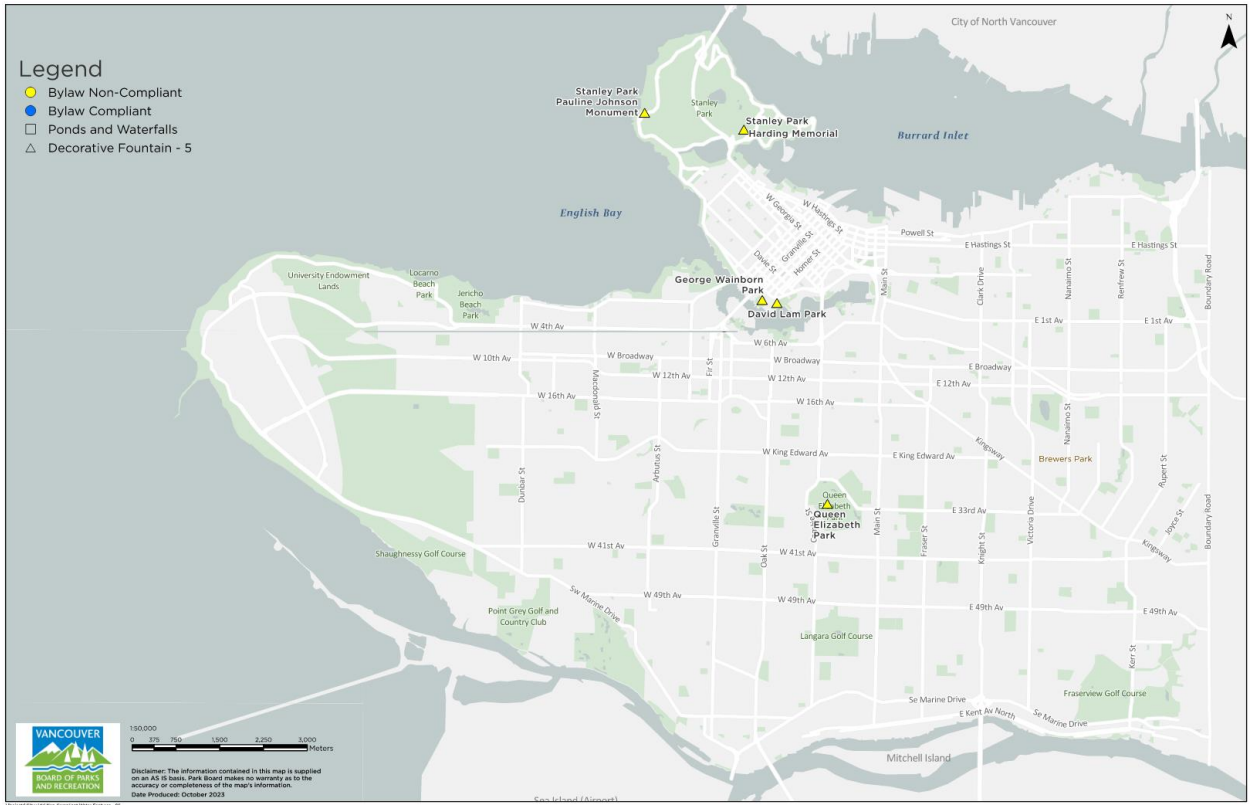
	Cost Est.	Feature	Rehabilitation Scope
A	$ 850,000	QE Park Dancing Waters Fountain*	Repair leaks; new membrane; mechanical & electrical repairs. Project is tender-ready
B	$ 450,000	Stanley Park - Harding Memorial Fountain	Install recirculation system with water treatment; concrete repairs; replace access hatches.
C	$ 300,000	David Lam Fountain*	Redirect site drainage to sanitary network; replace pumps; inspect and replace waterproofing membrane; repair paving stones.
D	$ 365,000	George Wainborn Park Fountain*	Redirect site drainage to sanitary network; structure repairs; fix leaks; retrofit flow-through waterfall to connect to existing recirculation system.
E	$ 635,000	Stanley Park - Pauline Johnson Memorial Fountain	Install recirculation system with water treatment; redirect site drainage to sanitary network; archaeological monitoring.
	$ 2,600,000	**Total**	
Order of Magnitude Water Savings: 5 – 15 Million Litres per year			
Approximate Annual Operating & Maintenance Cost: $85,000 plus water consumption charges			

Option 3 is informed by the consultant study of 64 water features and the rehabilitation prioritization rankings that were developed to guide a multi-decade rehabilitation and asset management plan. Rehabilitation rankings were based on primary technical and compliance considerations as well as secondary public interest criteria. Primary criteria included average condition of the feature, service (level of functionality), non-compliance with Bylaw 4848 (i.e. whether has leaks or breaks, once-through or re-circulating), and capital cost of the rehabilitation activities. Secondary public interest criteria were used as informational criteria or, in select cases, overrides to push rehabilitation activities into an “urgent” positions. These override criteria were related to other compliance concerns related to environmental protection (discharge of chlorinated water into the environment) and public safety (i.e. water quality and safety hazards).

** denotes feature has an existing recirculation system*

APPENDIX C

Options for Capital Funding Allocation



Locations and present compliance status of the decorative water features addressed in Option 3.

APPENDIX C

Options for Capital Funding Allocation

Option 4: Focus on Bylaw-Excepted Features

	Cost Est.	Feature	Rehabilitation Scope
A	$ 850,000	QE Park Dancing Waters Fountain*	Repair leaks; new membrane; mechanical & electrical repairs. Project is tender-ready
B	$ 475,000	Barclay Heritage Square Fountain	Install recirculation system with water treatment; replace concrete bird bath structure.
C	$ 400,000	Bute & Haro Fountain	Install recirculation system with water treatment; concrete repairs for watertightness; nozzle repairs.
D	$ 400,000	Laurel St Fountain	Install recirculation system with water treatment; concrete repairs for watertightness; replace grated enclosure in parkade; replace feature lighting.
E	$ 475,000	Park Site on Jervis St at Pacific St - Davis Fountain	Install recirculation system with water treatment; redirect site drainage to sanitary network.
	$ 2,600,000	**Total**	
Order of Magnitude Water Savings: 5 – 15 Million Litres per year			
Approximate Annual Operating & Maintenance Cost: $85,000 plus water consumption charges			

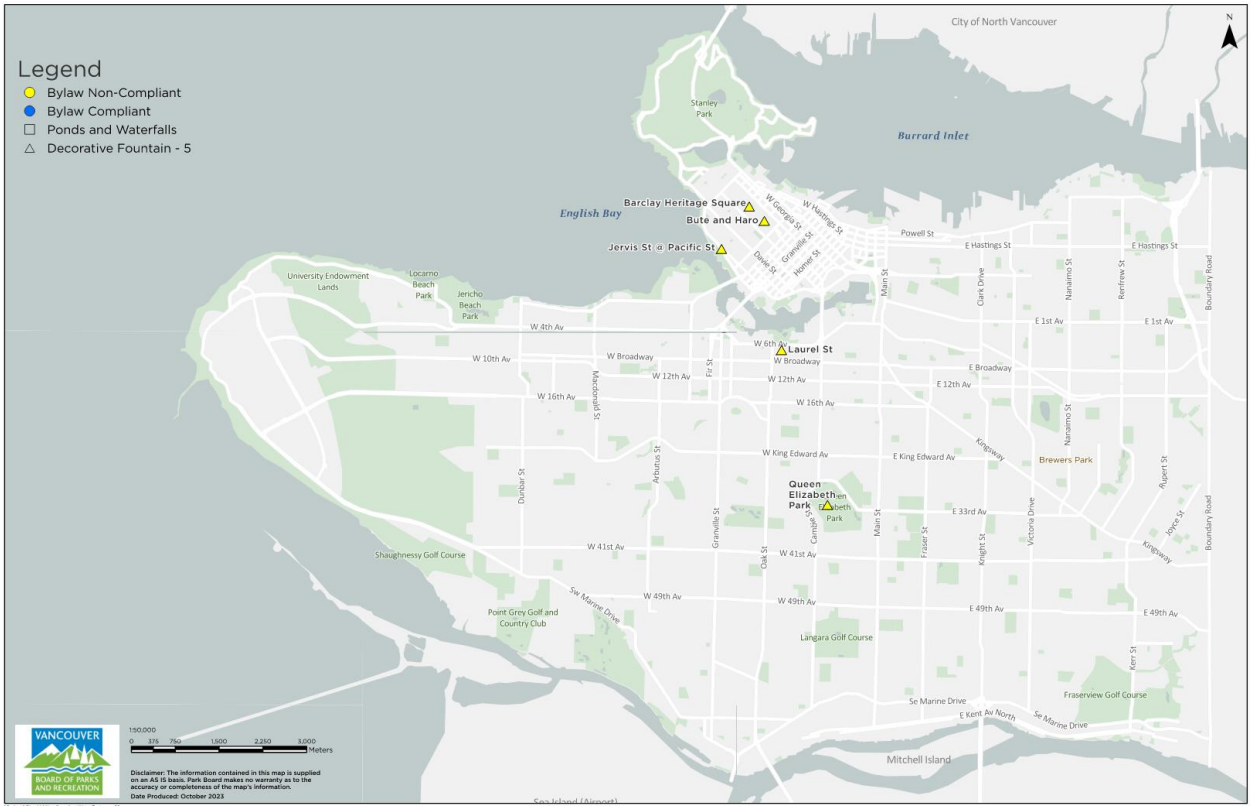
Option 4 focuses on the once-through decorative fountains that were excepted from By-Law 4848 via Council motion in summer of 2023. There were 5 such fountains included in the exception; 4 of them are included for rehabilitation in Option 4 as shown above. Helmcken Park Fountain did not make the list as its estimated repair cost of $475,000 could not be accommodated in the $2.6M budget while still including QE Park Dancing Waters Fountain.

The 5 by-law-excepted decorative fountains consume about 11M L of water per year as once-through fountains, which corresponds to about $18,000 per year in water charges under the forthcoming user-pay system. The estimated capital cost to upgrade all 5 excepted fountains is $2.25M, of which approximately $2M relates directly to the recirculating system costs, while the remainder relates to repairs of other deficiencies.

** denotes feature has an existing recirculation system*

APPENDIX C

Options for Capital Funding Allocation



Locations and present compliance status of the decorative water features addressed in Option 4.