
To: Water Committee

From: Lucas Pitts, Director, Policy, Planning and Analysis

Date: February 14, 2022 Meeting Date: March 2, 2022

Subject: **2022 Water Sustainability Innovation Fund Applications**

RECOMMENDATION

That the Water Committee receive for information, the report dated February 14, 2022, titled “2022 Water Sustainability Innovation Fund Applications” and the list of the 2022 Water Services Sustainability Innovation Fund projects.

EXECUTIVE SUMMARY

The Climate Action Committee is responsible for overseeing the Sustainability Innovation Funds, and for making all funding recommendations to the respective Boards. This report presents six Water Services projects that were recommended for funding, totaling \$2,980,000 over the years 2022 – 2025, which will be funded through the Water Sustainability Innovation Fund. The projects cover a wide range of climate action areas including habitat protection, energy use, as well as the equity and affordability of drinking water.

PURPOSE

To present the six approved Water Services projects to the Water Committee.

BACKGROUND

The Water Sustainability Innovation Fund was created by the Board in 2004 to provide financial support to Water Services projects that contribute to the region’s sustainability. The GVWD Board adopted the *Water Sustainability Innovation Fund Policy* in 2014, with further amendments in 2016 and 2021, to guide the use and management of the Fund. The Policy describes the process of generating, submitting, evaluating and recommending proposals for funding each year.

WATER SUSTAINABILITY INNOVATION FUND POLICY

On an annual basis, proposed Water Services projects and initiatives are submitted to an internal staff Steering Committee, representing a cross-section of the organization, for evaluation based on the Fund’s evaluation criteria. As defined in the policy, projects need to fulfill the following criteria:

- be overseen by the GVWD;
- be consistent with the authority and responsibility of the GVWD;
- be consistent with the objectives of the Board Strategic Plan or other Water plans as applicable;
- consider partnerships including, but not limited to, member jurisdictions, academic institutions, non-governmental organizations, and community groups;
- result in a positive contribution, in the form of tangible results and/or measurable benefits, to the sustainability of the region; and
- demonstrate innovation or a continuous improvement approach.

2022 APPLICATION PROCESS

An internal call for proposals closed on November 5, 2021 and seven Water Services proposals were considered by the cross-departmental Sustainability Innovation Fund Steering Committee, comprised of representatives from a wide variety of departments within Metro Vancouver.

During the review of the submissions, it was determined that the following six proposals have strong alignment with promoting regional sustainability and innovation. Additional details are provided in the Executive Summaries (attached).

Recommended Allocation from the Water Sustainability Innovation Fund		
Project Title	Year	Amount Requested
10-year Salmon Enhancement Action Plan	2022-2023	\$180,000
Hydrological Models for the Capilano and Seymour Watersheds	2022-2024	\$750,000
Digital Transformation of Water Transmission System Planning & Analysis	2022-2024	\$950,000
Feasibility Study to Optimize Transmission System Energy Use	2022-2023	\$350,000
Regional Equity and Affordability of Drinking Water	2022-2025	\$550,000
New Technology for the Determination of E.coli in Recreational Water to Enhance Public Safety	2022-2023	\$200,000
Total		\$2,980,000

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

The Climate Action Committee approved the six projects for a total of \$2,980,000 that will be disbursed from the Water Sustainability Innovation Fund over the years 2022 – 2025. The Fund has sufficient capacity to support these projects.

Approved projects will be incorporated into the applicable work plans and budgets.

CONCLUSION

The Water Sustainability Innovation Fund was created by the Board in 2004 to provide financial support for Water Services projects that contribute to the region's sustainability. The *Water Sustainability Innovation Fund Policy* guides the use and management of the Fund and describes the process of generating, submitting, evaluating and recommending proposals for funding each year. The Climate Action Committee is responsible for overseeing the Fund, and for making all funding recommendations to the GVWD Board.

This report presents the following six approved projects:

- Metro Vancouver 10-year Salmon Enhancement Action Plan;
- Hydrological Models for the Capilano and Seymour Watersheds;
- Digital Transformation of Water Transmission System Planning & Analysis;

- Feasibility Study to Optimize Transmission System Energy Use;
- Regional Equity and Affordability of Drinking Water; and
- New Technology for the Determination of E.coli in Recreational Water to Enhance Public Safety.

Attachments

1. Water Services Sustainability Innovation Fund Projects – Executive Summaries (49833368)
2. Water Sustainability Innovation Fund Policy, June 27, 2014 (9668345)

Reference

<http://www.metrovancouver.org/services/air-quality/sustainability-innovation-program/Pages/default.aspx>

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Sustainability Innovation Fund: Water Services

Executive Summary

Project Name: **Metro Vancouver 10-year Salmon Enhancement Action Plan**

Amount Requested from Sustainability Innovation Fund: \$180,000 (2022)

Purpose:

This SIF project will develop a Metro Vancouver 10-year Salmon Enhancement Action Plan to coordinate and integrate corporate salmon enhancement activities to maximize salmon populations and increase salmon viability despite the impacts of development, climate change, and Metro Vancouver operations. This project will seek First Nations participation from the start to shape the scope and direction of the 10-year action plan. Metro Vancouver members and salmon-focused agencies and organizations will also be engaged.

Metro Vancouver has a number of departments/functions (Water, Regional Parks, Liquid Waste, Liquid Waste, Regional Planning and Housing) that promote or support salmon and habitat enhancements. Several departments/functions provide services or support development that may have the potential to impact salmon and salmon habitat (Liquid Waste, Water, Regional Planning and Housing, Solid Waste, Facilities, Housing, Fleet).

Project Objectives:

Enhanced salmon habitat and salmon populations through a coordinated and integrated Metro Vancouver 10-year Salmon Enhancement Action Plan with a regular reporting process (frequency and scope to be determined). Please note that Water Services currently provides annual reporting to the Water Committee on Water Services Fisheries Initiatives.

Contributions to Regional Sustainability:

A 10-year action plan will support salmon populations within Metro Vancouver's corporate operations, with a focus on increasing salmon sustainability and resilience to the impacts of development and climate change.

Innovation Element:

While great work has been implemented over decades, current salmon enhancements are conducted on a site or project basis without a coordinated and integrated corporate vision or plan. This project will coordinate, integrate and accelerate corporate salmon enhancement projects.

This project also provides an opportunity to engage First Nations within the region to help develop the scope and direction for Metro Vancouver's coordinated corporate salmon enhancement plan and have an ongoing role as the plan develops.

Tangible Benefits and Outcomes:

The primary outcome is a Metro Vancouver 10-year Salmon Enhancement Action Plan that will include:

- Assessment of the current salmon habitat, salmon-related facilities, partnerships, and “salmon productivity” (i.e. salmon populations supported) managed or directly supported by Metro Vancouver functions
- Assessment of the creeks and areas that would benefit the most from restoration for “salmon productivity” and identification of opportunities by priority
- Framework and actions, both planned and opportunistic, for Metro Vancouver to work in a coordinated and integrated manner both internally and with partners
- Recommendations on monitoring and assessing the success of enhanced salmon habitat, facilities, and programs
- Recommendations on water quality monitoring to assist with salmon habitat and population improvements

In addition, the following benefits will be realized through this project:

- Enhanced opportunities to work with the region’s First Nations on Indigenous knowledge and cultural understanding of salmon and stewardship
- Enhanced ecosystem (not just for salmon, but a wide range of species) health and resilience to the impacts of Metro Vancouver operations, development and climate change
- More opportunities to engage the public on salmon and ecosystem protection

Members and other Partners:

This project will provide opportunities to engage with First Nations within the region, Metro Vancouver member jurisdictions, provincial and federal agencies, post-secondary institutions, and salmon-focused stewardship groups.

Sustainability Innovation Fund: Water Services

Executive Summary

Project Name: **Hydrological Models for the Capilano and Seymour Watersheds.**

Amount Requested from Sustainability Innovation Fund: \$750,000 (2022 – 2024)

Purpose:

To develop, build and calibrate hydrological models, for the Capilano and Seymour watersheds, to predict reservoir inflows, ensure a reliable water source for the region, make forecasts, and effectively monitor long-term climate change scenarios.

Project Objectives:

This project builds on a previously approved two-phased SIF project utilizing LIDAR data for snowpack monitoring. This two-phased project will:

- Carry out a feasibility study to identify data and modeling gaps and opportunities, and detail the requirements (and performance specifications) for an in-house, comprehensive, integrated, and learning hydrological model. This groundwork sets up the data storage and interface layers for improving near-time forecasts of water discharges from these two source water reservoirs.
- Following option selection and recommendations for a suitable model structure, the second phase will procure, build, calibrate, test, validate and implement the necessary infrastructure and model components to full operability.

Contributions to Regional Sustainability:

The project aligns with the direction of the *Board Strategic Plan* by contributing towards our regional role in emergency response, and strengthening the drinking water system's resiliency and adaptability to climate change. Effective working relationships with key stakeholders will be enhanced as adaptation measures are integrated into regional water system planning and management.

The developed hydrological model will strengthen watershed management by identifying potential risks to source water quantity and quality in a timely fashion. This ensures the sustainable provision of clean and safe water which is a key strategy of the *Drinking Water Management Plan* and a key benefit of *Metro Vancouver's Joint Water Use Plan*.

The development of an in-house hydrological model contributes to Metro Vancouver's fiscal, social, and environmental objectives by:

- enhancing Water Services' capability to predict climate change impact assessments on inflow, available storage, and water releases from the source-water reservoirs;
- informing investment decisions on the optimization of existing facilities and the construction of new facilities.

Innovation Element:

As the 100th anniversary of GVWD nears, this will be the first time for Metro Vancouver to build in-house comprehensive hydrological models for its watersheds. The project embraces the latest in data science

and model development to advance the management of a valuable resource. These models will increase the productivity and efficiency of watershed management, and hydrological analyses functions. The in-house models enable the integration of various water source-side functionalities, operations, forecasting, and reporting requirements.

Tangible Benefits and Outcomes:

Tangible benefits and outcomes from the project reach every aspect of the water utility.

- A predictive tool that Metro Vancouver can use to make short and long-term planning decisions for source water availability and storage, water supply management, regional water conservation, and future infrastructures upgrades.
- The capability to perform hydrological simulations and projections at any time utilizing in-house resources will save procurement time and costs.
- The model will set up conditional baselines and measure, track and monitor climate changes for the future, and boost mitigation and adaptation efforts.
- Enhanced sharing and visualization capabilities enable real-time data to be efficiently and reliably utilized for regional planning and emergency management and safety programs.
- The developed and integrated data layers, and the hydrological model outputs to the existing Capilano and Seymour hydraulic models will be an integral part of the Artificial Intelligence (AI) based source water reservoir operational outflow forecasting system.

Members and other Partners:

This project relies on cross-functional and inter-departmental collaborations for success. Water Services PPA will lead this project with IT support. Other WS divisions include WEM, O&M TSS, while the Air Quality and Climate Change division are also identified as major project partners.

The project will build and grow existing external partnerships and collaborations with agencies including the provincial Climate Related Monitoring Program (CRMP), the Water Management Branch, and The National Lab for Coastal & Mountain Meteorology Prediction and Services West Division's ARkSuperStorm project. Expertise will be resourced from local academia, WRF, NSERC, and the private consulting fraternity, as well as other potential collaborators.

Member jurisdictions within the watershed zones, and First Nation communities, as well as other interest groups, could be included in determining the functional requirements through the ERL and Indigenous Relations teams at Metro Vancouver. Member jurisdictions with their own water supply sources for potable water supply such as source lakes (e.g. Eagle Lakes in District of West Vancouver) or well fields may be consulted to share their experiences regarding any hydrological model applications for annual or seasonal inflow or water yield prediction.

Sustainability Innovation Fund: Water Services

Executive Summary

Project Name: **Digital Transformation of Water System Planning & Analysis (Smart Water Network Foundations)**

Amount Requested from Sustainability Innovation Fund: \$950,000 (2022 to 2024)

Purpose:

To develop an up-to-date water transmission model using the newly adopted software, InfoWater Pro, and implement a Data Analysis Platform integrated with the model to analyze data, predict system performance, and develop patterns, KPIs and dashboards.

Project Objectives:

The project's objective is to develop an analysis and decision-making tool for water system planning and operation and to implement a data analysis platform in conjunction with the model, which will integrate and utilize historical and live data for predictive analysis, developing performance metrics, and data visualization dashboards. This project forms the foundation of the Corporation's water transmission dynamic digital twin (real-time model) that meets and exceeds current industry best practices in infrastructure planning and operation.

Contributions to Regional Sustainability:

The project aligns with several directions of the *Board Strategic Plan* including the theme of system stewardship. It embraces innovation in the delivery of Metro Vancouver services contributing to the region's resilience and prosperity. It also contributes to financial stability through data-driven decision-making for optimizing capital and operational investments in the water transmission system.

The project supports the *Drinking Water Management Plan* goals to ensure efficient, reliable and sustainable supply of drinking water. By providing reliable predictions of system performance under various future scenarios, identifying and optimizing improvement projects, and deferring non-critical upgrades, the hydraulic model enables proactive and sustainable management of the water transmission infrastructure.

Innovation Element:

The up-to-date digital representation (model) of the water transmission system provides a robust, industry-aligned and progressive analysis and decision-making tool for system planning and operation. The Data Analysis Platform, integrated with the model, will enable proactive and predictive decision making with sharable results (data, metrics and KPIs) across divisions and utility functions. This tool will also provide new opportunities for collaboration, engagement, and data sharing with member jurisdictions.

Tangible Benefits and Outcomes:

The up-to-date digital model in conjunction with the Data Analysis Platform will analyze data, predict system performance, and develop patterns, KPIs and dashboards providing new opportunities for

collaboration and data sharing with member jurisdictions. As an example and included in this project is a seasonal water consumption index that compares actual consumption against an average consumption baseline which can be reported on the Metro Vancouver dashboard. This will raise public awareness and can be combined with water conservation messaging and advertisements.

Together with the Data Analysis Platform, the digital representation of the water transmission system will form the backbone of Metro Vancouver's water system dynamic digital twin. This will be a major step towards the digital transformation of system planning and analysis.

The longer-term and wider-ranging benefits include:

- Improved conservation and management of water resources and efficiency gains in operations and construction.
- Improved water planning and analytical capabilities for faster, accurate and data-driven decisions, daily and in the long-term.
- Increased capital efficiency and optimization of capital projects' size and timing ensuring sustained long-term affordability of the regional water system.
- Increased resiliency in response to changes in climate, demographics, demands, and regulatory requirements by predicting water system performance under varying future scenarios and reducing service disruptions.

Members and other Partners:

This project is largely internal and relies on cross-functional and inter-departmental collaborations for success. Water Services PPA will lead this project and IT and WS O&M are identified as major project partners. ERL will be included for communication and media messaging. Subject matter expertise may be needed and drawn from the Water Research Foundation expert panels. Member jurisdictions will be engaged throughout the project to provide relevant water system information required for modelling, such as demand distribution.

Sustainability Innovation Fund: Water Services Executive Summary

Project Name: **Feasibility Study to Optimize Energy use in the WS Transmission System**

Amount Requested from Sustainability Innovation Fund: \$350,000 (2022-2023)

Purpose:

This project will investigate options to reduce MV's purchase of electricity from BC Hydro by optimizing operations of the transmission system and investigating alternative lower-carbon energy sources to power high-energy-demand operations.

Project Objectives:

The overall long-term objective of this project is to work towards producing drinking water more sustainably. This will be achieved by:

- Producing drinking water more efficiently by reducing the energy use intensity (GJ/ML); and
- Reducing Water Services overall energy use to meet Metro Vancouver's 2050 Climate Change Plan.

Contributions to Regional Sustainability:

This project supports the aims of the *Board Strategic Plan* for financial stability by reducing energy purchases and providing a more financially stable drinking water system.

This project also aligns with MV's *Climate 2050 Strategic Framework* by working towards the target of reducing greenhouse gas emissions by 45% of the 2010 levels, by 2030.

Finally, this work aligns with MV's *Corporate Energy Management Policy*, stating MV commits to continuously improve energy performance in its operations.

Innovation Element:

Through this project, benchmarking WS' energy use will establish a baseline for measuring continuous improvements in energy consumption across the system. New operational processes for individual facilities will be recommended as well as an analysis of the transmission system as a whole to identify operational improvements.

Through the second phase of the project, the business case for the development of innovative alternative lower-carbon energy sources to power WS' operations, including innovative solutions to use the resources already available to MV.

Tangible Benefits and Outcomes:

The following deliverables will be developed through this project:

- Recommendations for optimizing operations at high-energy demand facilities, including:
 - Operational review of high-energy-demand facilities.
 - Energy use benchmarking at the high-energy-demand facilities.
 - Operation optimization recommendations.
 - Analysis of recommendations against previous year's data to provide measurable and demonstrated improvements.
- The business case for implementing alternative energy sources, including:
 - Feasibility review of alternative energy.
 - Business Case Development including a triple bottom line analysis of the short-listed options.

The benefits include

- Identifying strategies to reduce energy costs and reliance on BC Hydro sources.
- Reducing the costs of water services contributes to affordability and the overall liveability of the region.
- Reduced greenhouse gas emissions for improved environmental conditions and air quality within the region and province.
- Developing baseline trends and energy performance metrics to support ongoing system and operational performance.

Members and other Partners:

This project will work with BC Hydro to determine the feasibility of installing low-carbon energy sources at the Coquitlam dam. Local research centers such as the Clean Energy Research Centre from UBC have been identified as possible partners. Additional expertise and guidance can be drawn as needed from the Water Research Foundation and the previous energy management work completed by the LWS Department.

Sustainability Innovation Fund: Water Services

Executive Summary

Project Name: **Regional Equity and Affordability of Drinking Water**

Amount Requested from Sustainability Innovation Fund: \$550,000 (2022-2024)

Purpose:

To ensure regional drinking water supply remains sustainable, equitable and affordable amid the challenges of rising utility and household costs, a post-pandemic recovery, and climate and demographical changes.

Project Objectives:

The project will:

- Review existing regional water rate design and structure, policies and processes, water billing and collection efficacies, affordability practices and policies, income-related demographic and household data, and identify common issues, trends and gaps and areas for improvement.
- Investigate the principles and key drivers behind rate designs and structures, affordability policies, across the utility sectors (water, wastewater, electricity, gas, telecommunications), and from selected locations.
- Identify innovations and sustainable metrics that could be beneficial to the region now and into the future.
- Determine whether the region has a water equity and/ or affordability issue and whether an assistance policy or program is needed, and make recommendations.
- Prepare a guideline on developing appropriate pricing and rate structures, building on the 2019 *Residential Water Metering in Metro Vancouver - Best Practices Guide for Local Governments*.

Contributions to Regional Sustainability:

The project supports the aims of the *Board Strategic Plan* and the *Drinking Water Management Plan*. It strengthens our region by ensuring financial sustainability and fostering collaboration and engagement. The information from the study will improve impact-driven decision-making and optimize capital and operational infrastructure spending. It helps the region prepare for changing climate and demographic conditions and by building resiliency. The project supports the initiatives to increase residential water metering and contributes towards sustainable use of drinking water. It can also guide member jurisdictions on their water rate designs and billing programs, and water conservation efforts.

Innovation Element:

The project aims to utilize the latest data science and analytics tools to process and visualize the data. It will also review tariff design and structures across utilities and geographies, identify innovative practices and make suitable recommendations for implementation within the region.

Tangible Benefits and Outcomes:

The data and results from this study will:

- Provide a post-pandemic regional review of water rate designs and structures of Metro Vancouver and member jurisdictions, identify gaps and make recommendations for improvement.
- Confirm or reveal correlations between socioeconomic and demographic realities and water billing and collections, water rates design and structure, and water consumption.
- Help to determine whether the region has water affordability and equity issues and advise whether an assistance policy or program is needed.
- Inform the development of a guideline for member jurisdictions to use when designing water rates and structures, billing and collection programs.

Members and other Partners:

There are partnering and collaboration opportunities with the Natural Sciences and Engineering Research Council (NSERC), the Social Sciences and Humanities Research Council (SSHRC) and the Water Research Foundation (WRF) to utilize their expert panels and knowledge base.

Member jurisdictions will be engaged throughout to support the project by providing data and information on water rate design, billing and collections, equity and affordability within their jurisdictions.

Internal collaborations with Metro Vancouver departments and divisions (Invest Vancouver, External Relations, Regional Planning) are critical to project success. It is also possible that Legal Services and Indigenous Relations will be engaged to improve project understanding of consumer law and water rights.

Sustainability Innovation Fund: Water Services

Executive Summary

Project Name: **New Technology for the Determination of E.coli in Recreational Water to enhance Public Safety**

Amount Requested from Sustainability Innovation Fund: \$200,000 (2022 – 2023)

Purpose:

To incorporate Quantitative Polymerase Chain Reaction (qPCR) testing into Metro Vancouver's water quality testing program.

Project Objectives:

The project studies the potential for Metro Vancouver to include the qPCR testing technique in the water quality monitoring programs. It aims to standardize the implementation of qPCR testing for monitoring recreational water quality at regional beaches.

Contributions to Regional Sustainability:

The project supports the aims of the *Board Strategic Plan* for Regional Parks Services and Liquid Waste Services. It also aligns with goals and strategies of the *Regional Parks Plan*.

By reducing the number of days that beaches are closed throughout the summer, the project promotes a well-maintained natural environment and positive visitor experiences, community engagement and well-being. This in turn improves public perception of the regional beaches and water bodies.

Through more accurate determination of the source of the contamination, a more robust approach to mitigating the contamination can be implemented to protect the natural environment in the future.

Reducing the number of days that the beaches are closed benefits businesses that rely on the beaches to attract their customers, i.e. rental companies, restaurants, and recreational groups.

Innovation Element:

The qPCR testing technique is widely used in all areas of biological science. This project studies whether it is beneficial to bring it into the water quality testing program.

The outcomes support organizational improvement and enhance public safety, while increasing collaboration within Metro Vancouver and with other agencies.

Tangible Benefits and Outcomes:

This project looks to continuously improve the beach monitoring program through reducing the turn around time between sampling and testing, beach closure and reopening. Since 2011, the average number of days of beach closures is approximately 14 days per season, mostly due to longer turn around times when using current testing and analysis methods. Existing methods require a minimum of 18 hours to provide reliable results, whereas the qPCR will shorten the turn around time to 3 hours.

The new testing procedures will improve accuracy and reduce delays when identifying the source of the contamination and will enable proactive elimination of common sources. This would assist staff to better manage the sources of contamination (and potentially identify an unknown source of concern) and limit the number of beach closures within the region.

The improved testing and monitoring program will improve cleanliness at the beaches, improve reputation of regional beaches and increase public use and wellness.

Once the qPCR testing procedures are confirmed and incorporated into the water quality testing program, appropriate training and equipment needs will be identified and procured improving regional testing services.

Members and other Partners:

Within Metro Vancouver, staff from Water Services Interagency Projects & Quality Control (IPQC) will partner with Liquid Waste Services Environment Management and Quality Control (EMQC) for this project.

Testing services for qPCR techniques and samples need to be confirmed; however, an existing partnership with the British Columbia Centre of Disease Control (BCCDC) will be used extensively for this study.

WATER SUSTAINABILITY INNOVATION FUND

Effective Date: June 27, 2014 (revised July 30, 2021, subject to Budget approval)

Approved By: GVWD Board

Policy No. FN-005

PURPOSE

The Policy is designed to ensure that the Water Sustainability Innovation Fund (Fund) is used to support projects of the water utility that contribute to the region's sustainability and that the Fund is managed in an effective, transparent, and accountable manner.

POLICY

The Water Sustainability Innovation Fund has been in place since October 29, 2004, when the GVWD Board approved the creation of a Fund that would be "dedicated to funding projects based on the principles of sustainability." Projects must contribute to the region's sustainability by reducing emissions, protecting the environment and/or advancing regional resilience.

The fund is designed to support projects that demonstrate an innovative approach that is considered less proven or beyond the level of risk tolerated through the budget process. Projects may also adopt a continuous improvement approach that would not be feasible through the regular budget process due to funding or risk tolerance constraints.

Projects are encouraged to consider partnerships that will lead to innovative solutions to Metro Vancouver's challenges, particularly through applied and/or translational research within the region's academic institutions. These solutions may be generated through a crowd-sourcing ideation process.

Projects supported by the Fund must:

- be overseen by the GVWD;
- be consistent with the authority and responsibility of the GVWD;
- be consistent with the objectives of the *Drinking Water Management Plan* and/or the *Board Strategic Plan*;
- consider partnerships including, but not limited to, member jurisdictions, academic institutions, non-governmental organizations, and community groups;
- result in a positive contribution, in the form of tangible results and/or measurable benefits, to the sustainability of the region;
- demonstrate innovation or a continuous improvement approach.

Fund Management

- Financial Services will develop and annually update a contribution schedule to ensure the fund is able to support future projects.

BOARD POLICY

- Annually, an amount no greater than 1% of GVWD's annual operating budget will be transferred to the fund.
- The fund will be set at a maximum amount of \$25 million indexed to inflation.
- Any revenues generated from projects derived from SIF investments will be taken into consideration with respect to annual contribution amounts.
- The total amount disbursed from the Fund in any year is at the discretion of the GVWD Board and will depend on the merit of the proposals submitted.
- Reporting on the balance of the Water Sustainability Innovation Fund will be carried out through the Status of Reserves report.

Annual Evaluation and Decision-Making Process

- Project proposals will be evaluated by the Sustainability Innovation Fund Inter-Departmental Steering Committee according to the criteria outlined in the Application Package.
- Staff will provide the designated Standing Committee with a report on recommendations on the proposals considered for funding and implications of these recommendations on the Fund's balance.
- The designated Standing Committee will provide its recommendations to the GVWD Board which will make the final decision on projects to be funded.

Reporting on the Fund's Contributions to Regional Sustainability

- On an annual basis, the designated Standing Committee will receive a report on the projects supported by the Fund including the deliverables, outcomes, and the measurable benefits of these projects to the region's sustainability.
- Project reports will be housed in an "e-Library" for easy access by municipalities, regions and others who are interested in learning from the experiences, and who wish to assess the transferability of certain projects to other jurisdictions.

To: Water Committee

From: Joel Melanson, Division Manager, Engineering & Construction, Water Services
Ross Richardson, Lead Senior Engineer, Engineering & Construction, Water Services

Date: February 2, 2022 Meeting Date: March 2, 2022

Subject: **Port Mann Corridor Upgrades – Completion Report**

RECOMMENDATION

That the Water Committee receive for information the report, dated February 2, 2022, titled “Port Mann Corridor Upgrades – Completion Report”.

EXECUTIVE SUMMARY

Metro Vancouver staff have successfully achieved completion on a multi-phased program to upgrade and enhance the Port Mann water supply corridor. Completion of these growth and resiliency projects are key in meeting the goals identified in *The Board Strategic Plan 2019 to 2022* for the Water Services function. By collaborating closely with staff from the Cities of Coquitlam and Surrey, impacts from construction of these large water infrastructure projects were mitigated. These projects significantly contribute to Metro Vancouver’s goals to increase the supply capacity from the Coquitlam source and also ensure that the transmission components of the water system are expanded and strengthened to allow the continued supply of safe, clean drinking water to the region’s residents and businesses.

PURPOSE

To inform the Water Committee of the completion of the Port Mann water supply corridor upgrade program and how these projects contribute to meeting the key strategic directions set out in *The Board Strategic Plan 2019 to 2022*.

BACKGROUND

In the early 2000’s, Metro Vancouver identified several key river crossings for replacement to improve the water system’s seismic resiliency and also increase supply capacity to meet the demands projected over the next 100 years.

The Port Mann water supply corridor was identified as a replacement priority due to its central geographic location within the City of Surrey as well MV’s ability to supply water to other municipalities south of the Fraser River from this supply corridor. The Port Mann system also provides Metro Vancouver with the flexibility to deliver Coquitlam source water either directly from the reservoir via gravity or to pump southward from the Cape Horn Pump Stations when required to meet increased demand.

The recent completion of a number of projects within the Port Mann corridor have contributed to Metro Vancouver meeting two of *The Board Strategic Plan 2019 to 2022* strategic goals in the implementation of the Water Long Range Plan, specifically Managing our Drinking Water and Building

Resilience. The projects completed within this corridor include the following and are highlighted in the Attachment.

1. Port Mann Water Supply Tunnel
2. Port Mann Main No. 2 (North)
3. Port Mann Main No. 2 (South)
4. Whalley Main

PORT MANN WATER SUPPLY TUNNEL

The Port Mann Water Supply Tunnel (PMWST) connection is one of the key links between Metro Vancouver's protected water supply areas and the communities south of the Fraser River. Located more than 30 metres below the Fraser River bed, the new tunnel more than doubles the capacity of the old water main crossing, provides enhanced seismic and river erosion resiliency and brings a 100-year design life to help ensure the continued delivery of drinking water to Metro Vancouver residents.

The new tunnel has replaced the existing Port Mann main crossing the Fraser River and has been designed to meet stringent seismic design criteria.

Construction commenced in May 2011 and substantial completion was achieved in August 2016. Metro Vancouver's Construction forces completed connections between the existing Port Mann Main No. 1 and the tunnel in early 2017 and the pipe was placed into service in February 2017.

PORT MANN MAIN NO. 2 (NORTH)

The project consists of the installation of approximately 2200 metres of 1500 mm diameter steel pipe in the City of Coquitlam, from the Cape Horn Pump Stations to the Fraser River.

The civil, mechanical, structural and electrical designs were completed by Water Services Engineering and Construction staff with specialist geotechnical, seismic, environmental, traffic and archaeological services provided by external consultants. In October 2015 the construction contract was awarded and substantial completion was achieved in May 2018.

The design of the water main connection at the Port Mann Water Supply Tunnel north shaft required extensive seismic modeling to optimize the alignment and configuration of the connection piping to maximize its resiliency during an earthquake. The water main connection is designed to accommodate lateral ground movement without impacting the tunnel shaft structure.

Metro Vancouver's Construction forces completed tie-ins for the 1,500 mm diameter Port Mann Main No. 2 (PMM2) in early August 2019 and the new water main is now supplying water from the Cape Horn Pump Stations to communities south of the Fraser River.

PORT MANN MAIN NO. 2 (SOUTH)

The Port Mann Main No. 2 (South) project consists of approximately 2,300 meters of 1,500 mm diameter welded steel water main between the south shaft of the Port Mann Water Supply Tunnel and the Whalley Reservoir in the City of Surrey. The new main is required to meet growth south of

the Fraser River and twins the existing Port Mann Main. Construction included a trenchless crossing of 108 Avenue.

The project construction commenced in February 2019 with substantial completion achieved in July 2020.

WHALLEY MAIN

The Whalley Main consists of approximately 2,000 meters of 1,500 mm diameter welded steel water main on 148th Street between Whalley Reservoir and 95A Avenue in the City of Surrey. The new main is required to meet growth south of the Fraser River and twins a portion of the existing Whalley Clayton Main, which connects the Whalley Reservoir to the Whalley-Kennedy Main. The project included a trenchless crossing of 104 Avenue.

To avoid environmental impacts on the Green Timbers Urban Forest, which is located to the west of the water main alignment, Metro Vancouver and the City of Surrey collaborated and decided that the new water main alignment be contained fully within the 148 Street paved roadway. This proactive decision saved approximately 120 mature trees from being cut down. To mitigate the significant traffic impacts from constructing within the roadway, construction was completed using full road closures over two separate summers (2019 and 2020).

The construction started in May 2019 and substantial completion was achieved in June 2021. Metro Vancouver worked closely with City of Surrey staff to mitigate the significant construction impacts associated with the project. Metro Vancouver's Construction Division along with support from Operations and Maintenance, Water Treatment, and Survey and Inspection completed the final connections in the fall of 2021 and Port Mann Main No. 2 (South) and Whalley Main have been in service since December 2021.

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

Table 1 summarizes the capital budget allocated to each phase and the actual costs incurred. All phases of the projects were completed within the approved budgets.

Table 1: Financial Summary by Phase

Project Phase	Budget	Actuals
Port Mann Water Supply Tunnel	\$ 242,900,000	\$ 227,357,549
Port Mann Main No. 2 (North)	\$ 30,200,000	\$ 30,019,760
Port Mann Main No. 2 (South)	\$ 36,800,000	\$ 31,471,682
Whalley Main	\$ 31,800,000	\$ 29,748,456
Total =	\$ 341,7000,000	\$ 318,597,447

CONCLUSION

The completion of the projects within the Port Mann corridor greatly improves Metro Vancouver's ability to supply water to meet growth south of the Fraser River. The new Port Mann Water Supply Tunnel, Port Mann Mains and Whalley Main are designed to withstand significant seismic events and have been sized to meet the needs of a growing region for decades to come. Through close collaboration with staff from the Cities of Coquitlam and Surrey, the construction impacts from these large infrastructure projects were mitigated and completing these projects helps Metro Vancouver meet the goals identified in *The Board Strategic Plan 2019 to 2022* for the Water Services function.

Attachment

Port Mann and Whalley Main Projects: Phases and Completion Dates

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To: Water Committee

From: Arezoo Heidarian, Lead Senior Engineer, Technical Support Services, Water Services
Terry Hui, Division Manager, Technical Support Services, Water Services

Date: February 10, 2022 Meeting Date: March 2, 2022

Subject: **GVWD Electrical Energy Use, Generation and Management**

RECOMMENDATION

That the Water Committee receive for information the report dated February 10, 2022 titled “GVWD Electrical Energy Use, Generation and Management”.

EXECUTIVE SUMMARY

The GVWD Electrical Energy Use, Generation and Management report outlines electrical usage by the water utility, as well as energy generation and energy management projects. GVWD avoids electricity purchases of between \$250,000 to \$600,000 annually by generating electrical energy at four facilities. Energy management projects completed since 2015 provide an additional estimated annual savings of 1.9 GWh or \$180,000.

PURPOSE

To provide the Water Committee with information on the water utility electrical usage, generation, and energy management.

BACKGROUND

Metro Vancouver’s water supply system includes an extensive network of reservoirs, pumping stations, and large diameter water transmission mains. Metro Vancouver delivers water from three elevated source reservoirs: Capilano, Seymour, and Coquitlam. For most of the year and for a large portion of the region, water is conveyed by gravity through transmission mains to the treatment plants, pump stations and peaking reservoirs which then supply the local distribution systems.

Even with the benefit of gravity, additional energy is needed for the treatment and transmission of drinking water. Over the last five years, approximately 99% of the total energy purchased by Water Services was electrical energy. The remaining energy purchased was for diesel fuel used for backup power generators at pump stations and water treatment plants.

ELECTRICAL ENERGY USE

In 2021, Water Services purchased approximately \$5.5 million in electricity from external producers. Metro Vancouver’s *Corporate Energy Management Policy* outlines ongoing commitments to carbon neutrality and fiscal responsibility and also highlights the importance of reducing energy use, where feasible.

ELECTRICAL ENERGY GENERATION/OFFSETS

The natural topography of the region provides opportunities to harness energy from surplus pressure available in the water system. Electricity is generated at four water facilities.

1. The Capilano Energy Recovery Facility

The Capilano Energy Recovery Facility (CERF) is the largest generation facility in the water utility. CERF receives treated water from the Seymour Capilano Filtration Plant by gravity and surplus pressure is used to drive a water-driven turbine to generate electricity. The electricity generated is used to partially offset the electrical usage requirements of the Capilano Raw Water Pump Station, the largest pumping facility in the water utility.

In 2021, CERF generated 1.1 GWh or \$95,000 in avoided electricity purchases. Less energy was generated at CERF in 2021 than in prior years due to an extended outage of the turbine and generator, initially for planned maintenance, and then due to equipment failure.

During outages of the CERF turbine Water Services incurs costs from BC Hydro's Incentive Funding Clawback. BC Hydro contributed \$2,718,645 toward the original construction of the CERF project. The funding agreement requires that the CERF generate 9,500,000 kWh per year to avoid annual incentive clawback penalties over the 20-year term of the agreement. From 2016 to 2020, approximately \$180,000 in penalties have been paid to BC Hydro because of CERF turbine outages. During this time, CERF generated 28.1 GWh or \$1.4 million in avoided electricity purchases. Water Services is undertaking an evaluation of the CERF turbine and will be making improvements to the equipment diagnostics to reduce outages and the associated penalties.

2. The Cleveland Dam Pump House

The Cleveland Dam Pump House uses gravity flow from the Capilano Mains to drive eight water-driven pumps which supply drinking water to the Districts of North Vancouver and West Vancouver. The water-driven pumps offset all electricity needed to pump this water. Installed in the 1950s this pump house has been supplying water to the region for nearly seven decades without the need to purchase electricity for pumping. In 2021, the Cleveland Dam Pump House saved the equivalent electrical energy requirement of 0.8 GWh or \$66,000 in avoided electricity purchases.

3. Cleveland Dam Turbine

The Cleveland Dam Turbine located at the Cleveland Dam Pump House, conveys water from Capilano Reservoir to the Capilano Fish Hatchery and this water is eventually discharged to Capilano River via the fish ladder. The water which has excess pressure is used to drive the turbine to generate electricity. The turbine is the primary source of electrical power at the Cleveland Dam for lighting and valve operations. In 2021, the Cleveland Dam Turbine generated 0.7 GWh and saved \$54,000 in electricity purchases.

4. Seymour Falls Turbine

The Seymour Falls Turbine was installed in the late 1950s and is located at the Seymour Falls Dam. Water from Seymour reservoir is used to drive the turbine and generate electricity. The turbine is the primary source of electricity needs at the Seymour Falls Dam for lighting and valve operations. As there is no access to other electrical power producers, the turbine also supplies electricity to the Seymour River Fish Hatchery for their operations. In 2021, the Seymour Falls Turbine generated 0.4 GWh and saved \$47,000 in avoided electricity purchases.

In 2021, the total amount of electrical energy generated by the four facilities was 3 GWh, which avoided electricity purchases of approximately \$262,000.

ENERGY MANAGEMENT PROJECTS

Since 2015, Water Services has completed a number of equipment upgrades and process automation improvements that provide ongoing annual electrical energy savings of 1.9 GWh or \$180,000.

Table 1 – WS Energy Management Projects

Year	Facility	Project	Annual Electricity Savings	
			kWh	\$
2015	Seymour Capilano Filtration Plant	EcoRay UV Lamps Phase 2	52,900	\$4,655
	Seymour Capilano Filtration Plant	Coagulant Mixing Control	69,000	\$6,072
2016	Seymour Capilano Filtration Plant	UV Revalidation	104,000	\$9,152
2017	Seymour Capilano Filtration Plant	Outdoor Lighting Upgrade	149,441	\$13,151
	Seymour Capilano Filtration Plant	HVAC Control Improvements	316,377	\$27,841
2018	Seymour Capilano Filtration Plant	Lime Mixer Blower Shutdown	152,638	\$13,432
	Coquitlam Water Treatment Plant	Ozone Optimization	121,977	\$11,100
2019	Port Mann North and South Valve Chambers	Heating Energy Reduction	183,000	\$24,705
2020	Seymour Capilano Filtration Plant	LED Interior Lighting Upgrade	800,000	\$70,400
2021	Coquitlam Water Treatment Plant	HVAC Feasibility Study	-	-
TOTAL			1,949,333	\$180,508

In 2021, a BC Hydro-funded energy efficiency feasibility study on the heating, ventilation, and air conditioning (HVAC) and lighting systems at Coquitlam Water Treatment Plant was completed. Implementation of select energy conservation measures identified in the study are expected to result in electricity savings starting in 2022. In 2022, staff will move forward with two energy management studies at the Seymour Capilano Filtration Plant (SCFP) - optimization of flocculation and filtration and increasing heat pump evaporator flow.

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

In 2021, the GVWD water utility used approximately \$5.5 million in purchased electricity and generated 3.0 GWh of electricity which resulted in avoided electricity purchases of \$262,000. Energy Management projects completed since 2015 provide estimated annual savings of 1.9 GWh or \$180,000.

CONCLUSION

The water utility is committed to the *Corporate Energy Management Policy*, ensuring targets and key performance indicators are developed and tracked. The water utility takes advantage of the region's natural topography to reduce pumping and to produce electricity when technically feasible and cost-effective. Additionally, equipment upgrades and process automation improvements throughout the utility contribute to continuous improvement and ongoing electrical energy savings.

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