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North Shore Wastewater Treatment Plant Project

Background Paper

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

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

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

Front cover: Architectural rendering of North Shore Wastewater Treatment Plant

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1.0 About Metro Vancouver

Metro Vancouver is a diverse organization that plans for and delivers regional-scale utility services, including water, sewer and drainage, and solid waste management. It also regulates air quality, plans for urban growth, manages a regional parks system, provides affordable housing, and serves as a regional federation.

The governance framework under which Metro Vancouver operates consists of four separate legal entities, each with specific legislation. These include:

- The Metro Vancouver Regional District (MVRD)
- The Greater Vancouver Water District (GVWD)
- The Greater Vancouver Sewerage and Drainage District (GVS&DD)
- Metro Vancouver Housing Corporation (MVHC)

The GVS&DD Board oversees the planning and management of the region's wastewater collection and treatment, including wastewater treatment plant upgrades and expansions.

Throughout this document, the GVS&DD is referred to by the operating name of Metro Vancouver.

What is Wastewater?

Wastewater includes a number of waste products collected from homes and businesses primarily through the sewer system. Wastewater treatment is the process of removing contaminants from the collected wastewater. Treatment processes are designed to remove total suspended solids (the solid particles present in wastewater) as well as other contaminants and reduce the biological oxygen demand (the amount of oxygen consumed by organic materials in water as they biodegrade) of the treated wastewater, or effluent, released to the marine environment.

Vision

Metro Vancouver embraces collaboration and innovation in providing sustainable regional services that contribute to a livable and resilient region and a healthy natural environment for current and future generations.

Mission

Metro Vancouver's mission is framed around three broad roles:

1. Serve as a Regional Federation

Serve as the main political forum for discussion of significant community issues at the regional level and facilitate the collaboration of members in delivering the services best provided at the regional level.

2. Deliver Core Services

Provide regional utility services related to drinking water, liquid waste and solid waste to members. Provide regional services, including parks and affordable housing, directly to residents and act as the local government for Electoral Area A.

3. Plan for the Region

Carry out planning and regulatory responsibilities related to the three utility services as well as air quality and climate change, regional planning, regional parks, Electoral Area A, affordable housing, labour relations, regional economic prosperity, and regional emergency management.

2.0 Introduction

The Lions Gate Wastewater Treatment Plant was commissioned in 1961, and remains one of the last plants on the west coast of North America to provide only primary level wastewater treatment.

Metro Vancouver's 2011 *Liquid Waste Management Plan* (approved by the provincial Minister of Environment) and the federal Wastewater Systems Effluent Regulations, legislated in 2012, require that the existing primary Lions Gate Wastewater Treatment Plant be upgraded to secondary treatment by December 31, 2020.

Decommissioning of the Lions Gate Plant and associated remediation of the site will occur when construction of the new plant is complete. The Lions Gate Plant is located on lands leased from the Province. When decommissioning and remediation is finished, the land will be returned to the Province, who intend to transfer it to Sḵwx̱wú7mesh Úxwumixw (Squamish Nation), in accordance with Provincial objectives.

The new plant will be built on a 3.5-hectare site on former BC Rail lands in the District of North Vancouver, 2 kilometres east of the exiting plant. Metro Vancouver evaluated several location options for the new plant, and concluded that this site was the best value site with the least impacts. The plant is being designed to meet provincial and federal regulatory requirements for secondary treatment and will provide tertiary filtration to better protect the environment. It has a stacked design, and several design considerations that support climate action, resilience, and community goals.

Architectural rendering of North Shore Wastewater Treatment Plant

3.0 Background

North Shore Wastewater Treatment Plant

The North Shore Wastewater Treatment Plant is a new treatment facility being built to serve over 300,000 residents and businesses in the North Shore Sewerage Area. It will provide treatment up to the tertiary filtration level, and replace the Lions Gate Wastewater Treatment Plant, which has provided primary level treatment for the past 60 years. Tertiary filtration will ensure the plant meets regulatory requirements while reducing the release of potentially harmful contaminants and helping protect keystone species such as orca and salmon.

Once the North Shore Wastewater Treatment Plant is operational, the Lions Gate Plant will be decommissioned and deconstructed. The Lions Gate Plant is located on lands leased from the Province. When decommissioning and remediation is finished, the land will be returned to the Province, who intend to transfer it to Sḵwx̱wú7mesh Úxwumixw (Squamish Nation), in accordance with Provincial objectives.

North Shore Sewerage Area: The North Shore Sewerage Area treats wastewater from West Vancouver, the City of North Vancouver, the District of North Vancouver, Sḵwx̱wú7mesh Úxwumixw (Squamish Nation), and səlilwətaɬ (Tsleil-Waututh Nation).

Project Benefits

The new plant will:

- Improve the quality of the treated wastewater released into the Burrard Inlet
- Provide tertiary filtration to better protect the environment
- Feature a modern, enclosed design and robust odour control system to prevent odour from reaching neighbouring residents and businesses
- Recover heat for use as an alternative energy source
- Be constructed to Leadership in Energy and Environmental Design (LEED) Gold and ENVISION Gold certification standards
- Include a public plaza and community meeting spaces

North Shore Wastewater Treatment Plant Program

The overall North Shore Wastewater Treatment Plant Program comprises three components:

- The new treatment plant (under construction)
- The conveyance infrastructure, including the First Narrows Pump Station (complete) and conveyance pipes (partially complete)
- Preliminary design for decommissioning of the existing Lions Gate Wastewater Treatment Plant (to occur when the new plant is complete)

History

The Lions Gate Wastewater Treatment Plant was commissioned in 1961, and remains one of the last plants on the west coast of North America to provide only primary level wastewater treatment. In general, primary treatment removes about 50 to 60 per cent of total suspended solids and about 30 to 50 per cent of biochemical oxygen demand.

Regulatory Requirements

Metro Vancouver's 2011 *Liquid Waste Management Plan* (approved by the provincial Minister of Environment) and federal Wastewater Systems Effluent Regulation, legislated in 2012, require that the existing primary Lions Gate Wastewater Treatment Plant be upgraded to secondary treatment by December 31, 2020.

In the interest of better protecting the environment, and in response to community feedback, Metro Vancouver is upgrading the North Shore Wastewater Treatment Plant to provide tertiary filtration, surpassing the secondary treatment level. This will reduce the release of potentially harmful contaminants into the sensitive marine environment, and mitigate and future-proof the plant against subsequent regulatory changes. The cost to achieve tertiary filtration is a small portion of the overall project cost.

While the new plant is being built, the Lions Gate Wastewater Treatment Plant is providing seasonal, chemically enhanced primary treatment in order to meet provincial and federal regulatory limits for effluent quality. Metro Vancouver has been working closely with Environment and Climate Change Canada and has been providing regular updates on the project, including submission of a Regulatory Compliance Plan.

Lions Gate Wastewater Treatment Plant

Place

The North Shore Wastewater Treatment Plant site is approximately 2 kilometres east of the Lions Gate Bridge and the existing Lions Gate Wastewater Treatment Plant. It is a 3.5-hectare site in the District of North Vancouver, bounded on the north by West 1st Street and on the south by CN Rail tracks.

While the land uses immediately surrounding the treatment plant site are classified as industrial under current zoning, the character of the neighbourhood beyond the site varies widely. Adjacent streets are home to a variety of businesses and light industry, as well as a regional cycling and a pedestrian route, and the Norgate residential community is 150 metres to the north. Heavier industrial uses are located to the south of the project site, including CN Rail operations and the Seaspan Shipyards.

The new treatment plant will discharge treated effluent to the Burrard Inlet through the existing outfall, underneath the Lions Gate Bridge.

North Shore Wastewater Treatment Plant site and surrounding industrial and residential areas

North Shore Wastewater Treatment Plant Conveyance Project

A new pump station and pipes are needed to move wastewater from West Vancouver to the North Shore Wastewater Treatment Plant, and to move treated wastewater from the new plant to the existing outfall pipe, which will remain in service. Construction of the new First Narrows Pump Station and a large portion of the conveyance piping was completed in September 2022.

North Shore Conveyance Partners completed the project on time and on budget, under a design-build-finance model.

The conveyance project received the 2022 Award of Excellence from the VRCA (Vancouver Regional Construction Association) and a 2023 Award of Merit from ACEC (Association of Consulting Engineering Companies).

There will be a future phase of construction to install the final sewer pipes needed to connect the new treatment plant to the North Shore's sewer collection systems. This work will be undertaken when construction of the treatment plant is nearing completion.

First Narrows Pump Station

4.0 How We Got Here

- A comprehensive study in 2005 assessed options for upgrading the treatment level of the existing Lions Gate Wastewater Treatment Plant. In 2007, Metro Vancouver evaluated several alternative location options for the new plant, and concluded that the 3.5-hectare site on former BC Rail lands in the District of North Vancouver, 2 kilometres east of the exiting plant, was the best value site with the least impacts.
- Metro Vancouver's 2011 *Liquid Waste Management Plan* and the 2012 federal Wastewater Systems Effluent Regulation set a December 31, 2020 deadline for upgrading the Lions Gate Wastewater Treatment Plant to secondary treatment.
- In 2012, the Lions Gate Public Advisory Committee was struck to represent the interests of the new plant's adjacent community, businesses on the North Shore, and environmental interests of the Metro Vancouver region. In the same year, extensive engagement was also initiated with other stakeholders and the wider community. Discussions and feedback during this engagement process helped Metro Vancouver shape the project's design concept.
- In 2014, the GVS&DD Board endorsed the project definition report and design concept for a new secondary treatment plant, and approved proceeding with a design-build-finance procurement strategy.

Digesters under construction at west end of treatment plant site

- In early 2017, after receiving joint federal and provincial funding of $405 million towards construction of the new plant, Metro Vancouver awarded the design-build-finance contract to Acciona Wastewater Solutions LP (Acciona), a multi-national contractor with extensive experience building major water infrastructure projects. Under this project delivery model, Acciona was responsible for the design, construction, commissioning, and process performance for the plant. Following completion of ground improvements, construction of the plant began in August 2018.
- In early 2019, Acciona had contractual issues with its original partners and they went their separate ways. Acciona approached Metro Vancouver claiming it was impossible to complete the project on budget and on schedule. After considering the cost of alternative options, Metro Vancouver entered into negotiations with Acciona which resulted in increased costs and an additional 2.5 years to complete the project. At this time, with support from member jurisdictions and First Nations, the GVS&DD Board approved the addition of tertiary filtration to the new plant. Then, in 2020, Acciona and Metro Vancouver negotiated a further 3-month schedule extension in part due to the COVID-19 pandemic.
- The details of Metro Vancouver's position are set out in its pleadings in the BC Supreme Court, in sum:
    - Acciona was not meeting its obligations under the project agreement, including with respect to project scheduling. In June 2021, Metro Vancouver received a claim from Acciona that the treatment plant construction would take an additional 26 months to complete, at an additional cost almost double the original contract price. Metro Vancouver determined that under the terms of the project agreement, Acciona had no basis on which to claim additional cost or time to complete the project. The independent certifier also rejected Acciona's claim for payment at that time.
    - In September 2021, Metro Vancouver learned that Acciona had, without notice, laid off the majority of its staff working on the project. Taking into consideration Acciona's actions, including the significant layoffs, Metro Vancouver lost confidence in Acciona's abilities to deliver the project.
    - In October 2021, the GVS&DD Board directed staff to issue Acciona a notice of default and intent to terminate the project agreement, and to begin taking steps to make safe the project site and prepare to complete the project.
- In spring 2022, PCL Constructors Westcoast Inc. (PCL) was hired as the new construction manager for certain works to move the project forward, took over the treatment plant site. AECOM Canada Ltd. (AECOM) took over the role of design consultant for the project around the same time. Since April 2022, Metro Vancouver has been working with PCL and AECOM to progress the project. This has included:
    - undertaking early works construction in specific areas of the plant
    - advancing the plant design
    - developing a project execution plan, schedule, and cost estimate to complete the project

  To develop the updated cost estimate, Metro Vancouver had three separate cost estimates developed that took into account market conditions, inflation, interest rates, and hiring a new contractor.
- In September 2023, Metro Vancouver's Board Chair struck a task force to conduct a review of various options to complete the North Shore Wastewater Treatment Plant program. In March 2024, Metro Vancouver announced that the updated cost estimate to deliver the program in 2030 is $3.86 billion.
- In October 2024, Metro Vancouver signed the contract with PCL to complete construction of the treatment plant.

5.0 First Nations Engagement

Working closely with Sḵwx̱wú7mesh Úxwumixw (Squamish Nation) and other First Nations is an integral part of the North Shore Wastewater Treatment Plant Program.

The land on which the Lions Gate Wastewater Treatment Plant is located will be returned to the Province, who intend to transfer it to Sḵwx̱wú7mesh Úxwumixw (Squamish Nation), in accordance with Provincial objectives.

A large portion of the North Shore Wastewater Treatment Plant Conveyance Project is located on Sḵwx̱wú7mesh Úxwumixw (Squamish Nation) lands. On this project, Metro Vancouver worked closely with Sḵwx̱wú7mesh Úxwumixw (Squamish Nation) and the contractor, North Shore Conveyance Partners, to keep the community updated, mitigate construction impacts, and develop mutually beneficial opportunities for procurement, employment, training, and education. The North Shore Wastewater Treatment Plant site is also in close proximity to Sḵwx̱wú7mesh Úxwumixw (Squamish Nation's) Capilano community.

As we move forward on completing the new treatment plant, we are committed to continuing to work with Sḵwx̱wú7mesh Úxwumixw (Squamish Nation) and other First Nations throughout all phases of the project, and the larger North Shore Wastewater Treatment Plant Program.

The façade of the First Narrows Pump Station features original artwork by Sḵwx̱wú7mesh Úxwumixw (Squamish Nation) artist, James Harry. The artwork was commissioned by North Shore Conveyance Partners and Metro Vancouver.

6.0 Public and Stakeholder Engagement

Consultation and engagement on the North Shore Wastewater Treatment Plant Project has been underway since 2012. A key goal of the project is to work closely with residents, businesses, other stakeholders, and First Nations to build a facility that meets the needs of both the local community and the region.

Engagement has included North Shore member jurisdictions, Skwxwú7mesh Úxwumixw (Squamish Nation) and other First Nations, environmental and special interest groups, local businesses, Norgate community members, and other members of the public. Many of these groups were represented by the Lions Gate Public Advisory Committee, which helped shape the design of the new plant by sharing key issues, values, concerns, and the community's goals for the project.

Engagement occurred over three phases:

- 2012 to 2014 – Project definition phase
- 2014 to 2017 – Indicative design phase
- 2017 to present – Preliminary and detailed design and construction phase

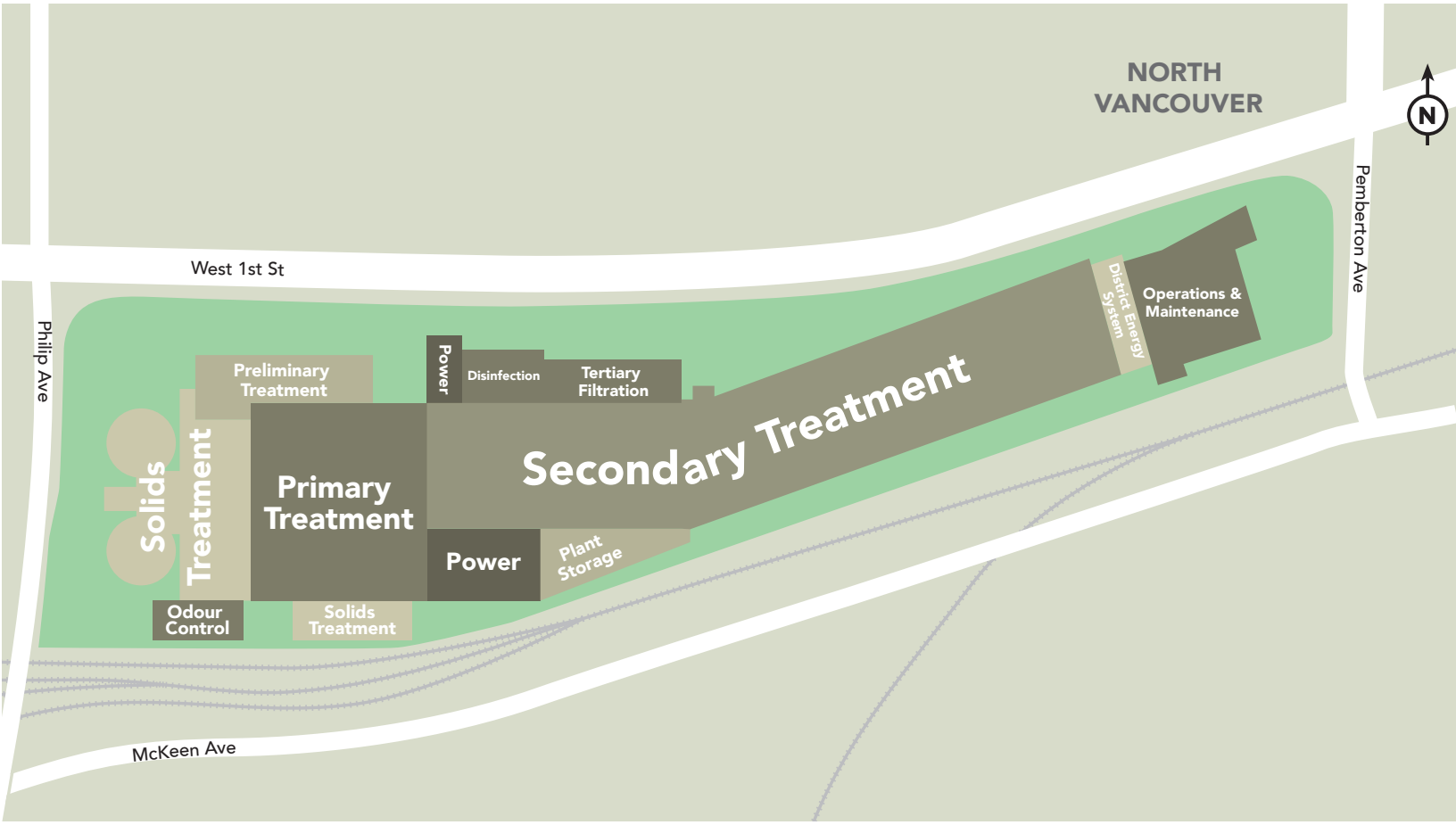
Metro Vancouver is working to ensure that commitments made to the community during project planning are maintained and impacts of construction on local businesses, residents, and traffic are minimized.

7.0 Project Description – Key Components

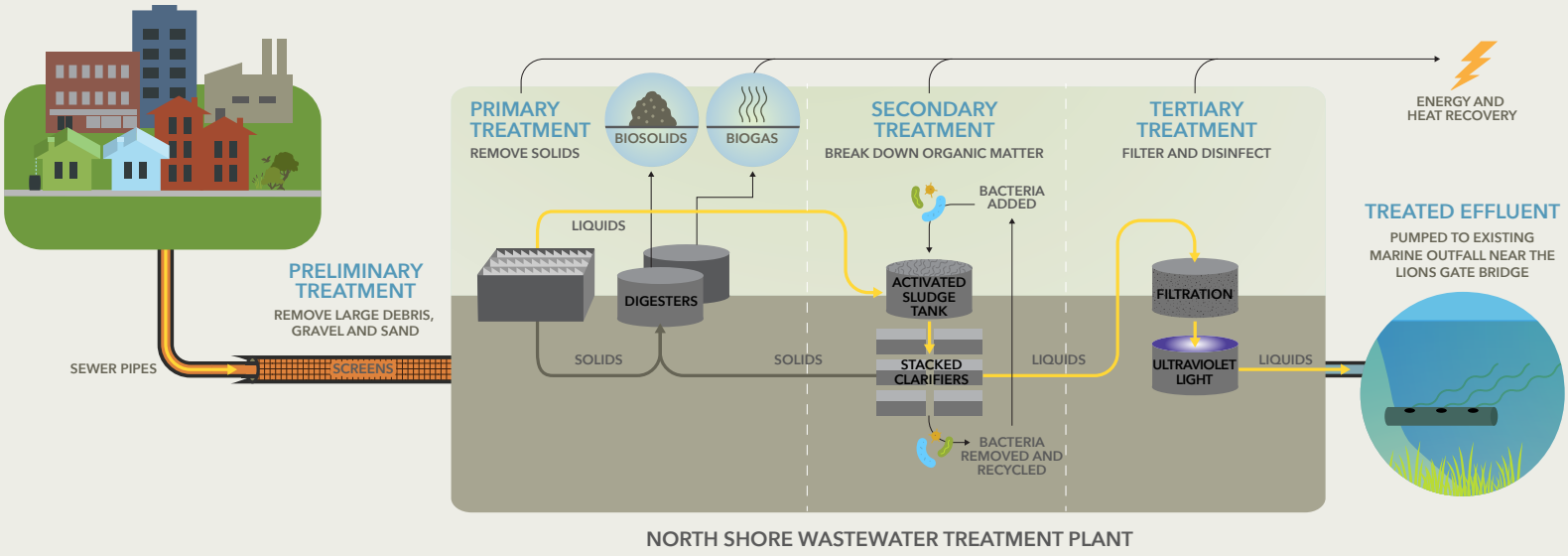
Building the new North Shore Wastewater Treatment Plant is an opportunity to upgrade an essential service, protect the local environment, and contribute to the development of the North Shore.

The North Shore Wastewater Treatment Plant Project is made up of these key components and features:

- Preliminary and primary treatment
- Secondary treatment
- Tertiary filtration and disinfection
- Solids treatment
- Odour control
- Seismic and climate resilience
- Sustainability features
- District energy system
- Operations and maintenance building
- Public spaces and community integration



Key components of the North Shore Wastewater Treatment Plant



Representation of North Shore Wastewater Treatment Plant treatment processes

Preliminary and Primary Treatment

Preliminary treatment includes the screening and pumping of raw untreated wastewater followed by removal of the debris and grit that enters the wastewater treatment plant from the sewer system. The materials removed by the screening process will be washed and trucked to the Metro Vancouver Waste-to-Energy facility and the grit will either be processed for beneficial reuse on-site or hauled to a landfill.

Flow from the preliminary treatment system next enters the primary treatment system, which will be based on lamella clarifier technology. The purpose of primary treatment is to remove suspended solids. Lamella clarifiers employ inclined plates to dramatically increase the surface settling area of the tanks, significantly reducing plant footprint requirements. The primary effluent collected from the lamella clarifiers will flow to the secondary treatment process and primary sludge will be pumped to a thickening process.

Secondary Treatment

The role of secondary treatment is to remove materials that pass through the lamella clarifiers. Secondary treatment includes both physical and biological processes that remove more than 90 per cent of biological oxygen demand and total suspended solids, significantly reducing contaminants in the effluent released into the local environment.

Pressurized air is added to the secondary treatment system to enable bacteria and other microorganisms in the tanks to grow and break down organic matter. The bacteria and other microorganisms are referred to as "activated sludge." Activated sludge then flows to stacked secondary clarifiers, which settle the activated sludge and produce a separate clear effluent (secondary effluent) that will flow to the tertiary filtration and disinfection process.

Architectural rendering of North Shore Wastewater Treatment Plant from the south, looking northeast

Tertiary Filtration and Disinfection

Tertiary treatment involves advanced wastewater treatment processes used to improve effluent quality beyond that achieved by secondary treatment.

The type of tertiary treatment used at a treatment plant depends primarily on the receiving water characteristics and the corresponding specific objectives for that plant. At the North Shore Wastewater Treatment Plant, tertiary filtration will reduce the release of potentially harmful contaminants into the sensitive marine environment of the Burrard Inlet and Salish Sea, protecting orcas, salmon, and other species and ecosystems. After tertiary filtration, the wastewater effluent will be disinfected using ultraviolet (UV) treatment before being discharged through the existing outfall.

The decision to provide full tertiary filtration, surpassing regulatory requirements for secondary treatment, was based on extensive feedback and input from the public, First Nations, and member jurisdictions, and reflects Metro Vancouver's commitment to protect the environment and strengthen the quality of life in our region for current and future residents.

Providing tertiary filtration at the new plant will also mitigate and future-proof the plant against subsequent regulatory changes, which will reduce future costs because incorporating tertiary technology now is more affordable than adding it at a later date.

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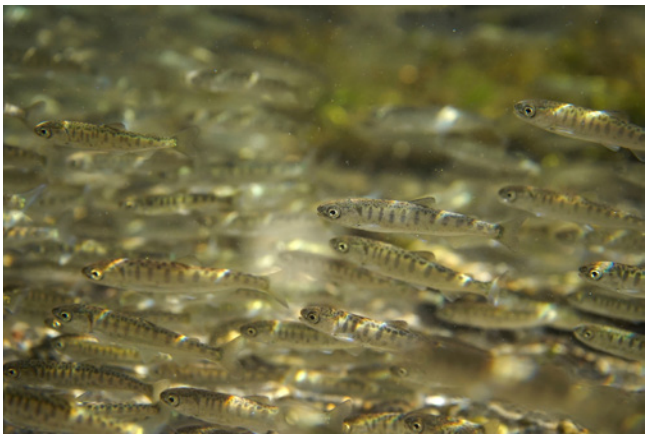

Coho salmon fry

Solids Treatment

Wastewater plants include treatment of both the liquid wastewater and the treatment of the solids removed from the wastewater, to allow for beneficial reuse and disposal.

A thickening process will remove water from the primary and secondary sludge streams to reduce their volume and minimize the size and footprint of solids treatment processes. After thickening, the sludge streams will be blended, pre-heated, and pumped to the digester tanks. Microorganisms in the digester tanks break down the sludge streams and produce a "biogas," which will be collected at the top of the digester tanks. The biogas contains 50 to 60 per cent methane, which will be recovered and used to produce electricity and heat for the digestion process and space heating within the plant.

The product of the digestion process will be in liquid form and will be pumped to a dewatering process to remove excess water, which will significantly reduce the volume of the final product and give it the consistency of a solid material. These final dewatered biosolids will be loaded to trucks and incorporated into Metro Vancouver's biosolids program, to be used as fertilizer for land application and as a renewable alternative fuel for the region's industries.

Odour Control

The treatment plant's design prevents the release of odour as wastewater is treated and biogas is produced. All potential sources of odour will be contained, and this trapped air will be discharged to a two-stage odour treatment system. The treated air will then be released through a stack and dispersed into the atmosphere, preserving air quality and mitigating odours at the property line to prevent impacts to the surrounding community.

Seismic and Climate Resilience

The new plant site has undergone extensive ground improvements to withstand a major earthquake, and the facility itself is being designed to meet the latest seismic standards. To mitigate natural hazards, including sea level rise from climate change, the plant design considers projected 100-year sea levels.

Contaminants of Emerging Concern

The existing primary treatment process at the Lions Gate Wastewater Treatment Plant removes minimal persistent organic compounds, such as contaminants of emerging concern (CECs). These are particularly concerning because of their potential impacts on the receiving environment. Secondary treatment processes lead to an overall wastewater treatment plant removal of 40 to 60 per cent for some CECs.

Sustainability Features

The new treatment plant will be constructed to Leadership in Energy and Environmental Design (LEED) Gold and ENVISION Gold certification standards. It will provide energy efficiency and recover the energy-rich resources in wastewater, including use of biogas for in-plant heating and electricity, reclaimed water for in-plant and external use, and the production of biosolids for nutrient recovery.

Architectural rendering of public spaces at the North Shore Wastewater Treatment Plant

Operations and Maintenance Building

Located at the east end of the site near Pemberton Avenue, this building will be the public face of the plant, housing education programs and meeting spaces on the ground floor, a rooftop interpretive space, as well as a laboratory, offices, and other facilities needed for plant operations. The public functions of the Operations and Maintenance building are intended to integrate with the activities in the surrounding public spaces of the neighbourhood.

Public Spaces and Community Integration

The new plant is located next to the Norgate residential community and businesses, and near high-profile transportation infrastructure such as West 1st Street, the Philip Avenue Overpass, and the Spirit Trail (a key regional east-west bike and pedestrian route). Because of this proximity, we received clear input during engagement that it was vital for the plant to be well integrated into the community and provide public amenities.

The plant's community-facing features were developed through extensive engagement and include a public plaza at the south end of Pemberton Avenue and improvements to West 1st Street, including a greenway with bike paths and enhanced lighting.

Early Works, Detailed Design, and Construction Completion

Since termination of the design-build-finance contract with Acciona, Metro Vancouver has been working with PCL as the construction manager, and AECOM as the design consultant, to progress the project.

Early works construction included new construction in specific areas of the plant, as well as concrete repairs.

Advancing the design was another key focus of early works, and AECOM completed the Issued for Construction design package in late 2024.

With early works now complete, PCL has expanded its construction program and is proceeding with completing construction of the treatment plant.

Example of concrete requiring repair

PCL construction progress: concrete foundation for the operations & maintenance building (L), digester roof concrete pours (R)

8.0 Glossary

Biogas — A mixture of gases, primarily consisting of methane and carbon dioxide, produced from raw materials such as agricultural waste, manure, municipal waste, plant material, sewage, green waste, or food waste. It is a renewable energy source.

Biological oxygen demand (BOD) — The amount of oxygen consumed by organic materials in water as they biodegrade.

Biological wastewater treatment process — A treatment process that harnesses the action of bacteria and other microorganisms to clean water. Biological treatments rely on bacteria, nematodes, or other small organisms to break down organic wastes using normal cellular processes.

Biosolids — Nutrient-rich organic fertilizer and soil conditioner produced from the solids (food and poop) removed in wastewater treatment. Composting takes food and garden waste and through natural biological processes converts these materials into a soil amendment (a material added to a soil to improve its physical properties), or a nutrient rich soil conditioner.

Chemically enhanced wastewater treatment process — The process of using external chemical addition to increase particle capture within primary wastewater treatment. At the Lions Gate Wastewater Treatment Plant, alum and polymer are added to the primary influent to enhance the settling of solids to further reduce total suspended solids and biological oxygen demand levels.

Contaminants of emerging concern (CECs) — A term used by water quality professionals to describe pollutants that have been detected in water bodies that may cause ecological or human health impacts and typically are not regulated under current environmental laws. Sources of these pollutants include agriculture, urban runoff, ordinary household products (such as soaps and disinfectants), and pharmaceuticals that are disposed to sewage treatment plants and subsequently discharged to surface waters.

Detailed design — The phase where the design is refined and plans, specifications, and estimates are finalized.

Effluent — Treated wastewater discharged into a river or the sea.

Greater Vancouver Sewerage & Drainage District (GVS&DD) — One of Metro Vancouver's four corporate entities, responsible for the planning and management of the region's wastewater collection and treatment, including wastewater treatment plant upgrades and expansions.

Indicative design — Establishes a design basis for the project and a plan for how it will be implemented. The indicative design is an outcome of the project definition and is documented in the project definition report.

Influent — Untreated wastewater flowing into a wastewater treatment plant to be processed.

Major infrastructure project — Major infrastructure projects are by definition very large and costly critical infrastructure investments (typically $1 billion or more), and may be found in all infrastructure sectors. They are usually complex, and almost always involve multiple stakeholders.

Preliminary design — Further advances the design

following approval of the project definition report. Preliminary design is followed by detailed design.

Primary treatment — Wastewater treatment that uses physical processes such as screening to remove solid material that will either float or readily settle out by gravity. Primary treatment removes about 50 to 60 per cent of total suspended solids and about 30 to 50 per cent of biochemical oxygen demand.

Project definition report (PDR) — The report delivered at the end of the project definition phase that includes an indicative design together with a project schedule, budget, and recommended delivery strategy.

Secondary treatment — Wastewater treatment that includes both physical and biological processes that remove more than 90 per cent of biological oxygen demand and total suspended solids, significantly reducing contaminants in the effluent released into the local environment.

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Together we make our region strong