Integrated Liquid Waste and Resource Management

A Liquid Waste Management Plan for the Greater Vancouver Sewerage & Drainage District and Member Municipalities

Appendix A: Metro Vancouver Report
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Goal 1: Protect Public Health and the Environment

Strategy 1.1 Reduce liquid wastes at their source

**Action 1.1.1** – Review and enhance sewer use bylaws to reduce liquid waste at source, including contaminants identified by the *Canadian Environmental Protection Act (2012)*.

Metro Vancouver continues to regulate the discharge of non-domestic liquid waste from industrial, commercial and institutional sources to sewer through the Sewer Use Bylaw No. 299. The Bylaw protects the environment, sewer workers, sewer infrastructure, and taxpayers and is continually being updated to improve the quality of wastewater entering the sewer from non-domestic dischargers.

*Industrial Treatment Fees Amendment*

In 2014, Metro Vancouver amended the Bylaw to incorporate a revised method of calculating industrial treatment fees that is based on peak rather than average discharges (creating incentive to reduce peak discharges) and adjusts unit rates based on the capacity available at the respective treatment plants. The revised method was to be implemented in 2013 after a three year delay period to allow industry sufficient time to make the necessary adjustments in their discharge practices.

**Action 1.1.2** – Develop new regulatory instruments, such as Pollution Prevention Plans to complement existing regulations (2014).

*Amendment to Incorporate Pollution Prevention Plans*

Through the GVS&DD Sewer Use Bylaw, Metro Vancouver regulates the discharge of non-domestic liquid waste from industrial, commercial and institutional sources to sewer, primarily through the issuance of waste discharge permits and sector specific bylaws. *Metro Vancouver's Integrated Liquid Waste and Resource Management Plan* committed Metro Vancouver to develop new regulatory instruments such as Pollution Prevention Plans to complement existing regulations. The Metro Vancouver Board Strategic Plan 2014 includes a liquid waste strategic direction to reduce contaminant loadings through a stronger and expanded source control program. This could include initiating source control bylaw changes to reduce contaminants from industrial and commercial sources.

To meet this commitment, staff amended the Sewer Use Bylaw to allow the use of Pollution Prevention Plans to authorize the discharge to sewer from some of the region’s commercial and institutional sources. The amendment focuses on the requirements of a Pollution Prevention Plan and what is included in the plan. This bylaw amendment is the first stage of this initiative. This first stage consists
of adopting pollution prevention plans as a regulatory tool within the Sewer Use Bylaw. Future stages will include working with specific sectors to implement pollution prevention plans to regulate their discharges. The sectors being considered include:

- hospitals and health care facilities;
- post-secondary and research laboratories;
- medical laboratories

These sectors are being contemplated given the multitude of potentially harmful substances that may be handled at these facilities. These factors combined with a substantial variability in the day-to-day operations at these facilities make it impractical to control sewer discharges from these facilities by code of practice (intended for large numbers of similar facilities) or permit (issued for individual facilities).

### Action 1.1.3 – Increase resources for permitting and inspection to support and enforce sewer use bylaws (2010).

Same as the 2010-2012 reporting period: no changes. Please see Biennial Report 2010-2012 for details.

### Action 1.1.4 – Investigate the implications of the use of domestic food grinders (2012).

As follow up to the investigation conducted in 2012, an in depth technical investigation into the implications of the use of domestic food grinders specifically on Metro Vancouver’s Liquid Waste Utility continued through 2013 and 2014. The study encompassed all five WWTPs and associated collection systems, analyzes the pattern and effect of food grinder use in the past and makes projections for the future. Specific and detailed considerations are given to influent and effluent loadings of total suspended solids, biochemical oxygen demand, fats, oils and grease, production of greenhouse gases and biosolids, water and energy use, risks to WWTP Operational Certificate compliance, and marginalized costs. The report will be completed in 2015.

### Action 1.1.5 – Develop and implement targeted outreach plans to support liquid waste source control programs (Ongoing).

Metro Vancouver’s Integrated Liquid Waste and Resource Management Plan, approved by the Minister of Environment in 2011, as well as the Liquid Waste strategic direction in the 2014 Metro Vancouver Board Strategic Plan, requires the development and implementation of targeted outreach plans to support liquid waste source control programs to protect the environment and human health. In a September 11, 2014 report to the Utilities Committee titled “Development of a Liquid Waste Outreach Strategy”, Metro Vancouver staff advised the Board of plans to develop targeted liquid waste outreach initiatives. These outreach efforts will address the disposal of fats, oils and grease, as well as disposable wipes, into the sewer system. These are the materials that have a significant impact on both Metro
Vancouver and municipal infrastructure, causing damage to equipment, blocked sewers and potential sewage spills into the environment.

A survey of public outreach programs in other jurisdictions suggests that use of traditional mass marketing techniques (pictures of clogged sewers, facts on infrastructure and environmental damage, ads that target the general population) have generally not been successful in addressing these issues. While some cities feel their approach was successful, very few have quantified or measured the results of their programs. This makes it difficult to prove what approaches were effective (if any) or to know which methods may have worked on which segments of the population.

Metro Vancouver is instead using a community-based social marketing approach, which has not yet been tried for these issues. This approach involves identifying the specific groups that are engaging in the problem behaviour and understanding the barriers that hinder change. It then looks at how to overcome those barriers and establish the proper behaviour for disposal to sewer.

Specific strategies are being developed that separately address wipes, grease from residences and grease from commercial kitchens. Since these issues all involve different audiences, barriers and motivations the following approach could include:

- Identifying the segment of the population that is engaging in the problem behaviour;
- Developing a social marketing strategy, including external partnerships, messaging and metrics to measure the strategy's effectiveness;
- Launching pilot programs that will test the strategies;
- Evaluating results and adjusting future programs accordingly;
- Rolling out the program throughout the region, as needed.

**Action 1.1.6** – Develop a template to guide the preparation and implementation of inflow and infiltration management plans as part of broader asset management plans and to support sanitary sewer overflow reduction strategies (2011).

No change since the 2010-2013 report. The template was completed in January 2011 and issued as a working draft as requested by the REAC-LWSC. Copies can be downloaded from Metro Vancouver’s website.

**Action 1.1.7** – Work with the real estate industry and their regulators, and the municipalities to develop and implement a process for the inspection and certification of private sewer laterals being in good condition as a required component of real estate transactions within Metro Vancouver (2011).

Work with the real estate boards examining time of sale requirements has been put on hold pending the a better understanding of the extent of semi-combined sewers in the region (identified through Action
1.1.9). The objectives of this action will be considered as part of a broader consultation on I&I management strategy planned for 2015.

**Action 1.1.8** – Develop and implement inflow and infiltration management plans that identify reduction strategies and timelines to ensure wet weather inflow and infiltration are within targeted levels (2012)

No change from the last 2012 Biennial report.

**Action 1.1.9** – Work with municipalities to review historical data and adjust as necessary the average inflow and infiltration allowance for regional trunk sewers and wastewater treatment plants, and develop associated target allowances for municipal sewer catchments associated with a 1:5 year return frequency storm event for sanitary sewers to a level that ensures environmental economic sustainability (2013)

A review of the inflow and infiltration allowance of 11,200 L/ha·d, established for Metro Vancouver’s sanitary sewers in the 2002 Liquid Waste Management Plan, was completed in July 2014. Building for significant increases to the I&I allowance were determined to be more costly than targeted I&I reduction work by municipalities.

The review, titled *Inflow and Infiltration Allowance Assessment*, was presented to the REAC LWSC who then made recommendations to REAC which included maintaining the current I&I allowance of 11,200 L/ha·d for Metro Vancouver sewers and a request to investigate the role and extents of foundation connections to sanitary sewer laterals. This request is due to a key finding in the review: the identification of semi-combined as sub-group of sanitary sewers.

Semi-combined sewers were widely constructed across Canada prior to the 1990s to receive foundation drainage and have been found to be significant sources of chronic I&I in Ontario. The extents of semi-combined sewers in Metro Vancouver’s oldest sanitary sewer catchments and their contribution to I&I has not yet been determined.

To understand the potential extents of semi-combined sewers in the region, Metro Vancouver initiated in late 2014 work with the City of North Vancouver and the City of Surrey to see if probable semi-combined sewer catchments can be identified using GIS for confirmation by field crews. This study will continue into 2015.

**Action 1.1.10** – Review progress in reducing inflow and infiltration every four years (*every 4 years*).

Estimates of I&I compiled over the last 10 years for municipal I&I management programs are summarized by Figure A-1. It shows that I&I rates vary significantly throughout the region, with some areas close to the current I&I allowance, while others continue to experience significantly higher rates. However, it should also be noted that municipalities have generally targeted catchments suspected of having high I&I when undertaking their I&I management programs.
Figure A-1 Summary of Municipal Estimates of I&I

The I&I allowance for regional sewers is 11,200 L/ha·d. In 2014, as part of its recommendations, the REAC LWSC recommended that municipalities focus on prioritizing the areas with the highest I&I as reductions in these catchments should provide the most benefit.

The implications of current I&I rates as measured at Metro Vancouver’s sewer flow meters and wastewater treatment plants for the Fraser Sewerage Area, the Lulu Island West Sewerage Area and North Shore Sewerage are shown on Figures A-2 to Figure A-5. The combined sewer catchments are excluded from I&I assessments. Annual variations in I&I rates may be due to variations in storm intensity and storm tracking as well as remedial works undertaken by municipalities.

As a note, the discharge of landfill leachate into sanitary sewers can mimic I&I as leachate generation correlates with wet weather. Catchments with significant landfill leachate discharges may have lower I&I rates than indicated on Figure A-2 to Figure A-5.

Municipal I&I management programs and status are reported separately by each member and provide specific municipal I&I management details. Municipal I&I estimates generally provide a better reflection of localized I&I rates due to the smaller catchment scales and the normalization of rainfall return periods.
Figure A-2 Inflow and Infiltration - North Shore Sewerage Area 2012-2013
Figure A-3 Inflow and Infiltration - North Shore Sewerage Area 2013-2014
Fraser and Lulu Island Sewerage, Inflow and Infiltration, 2012-2013

Figure A-4 Inflow and Infiltration - Lulu Island West and Fraser Sewerage Areas 2012-2013
Figure A-5 Inflow and Infiltration - North Shore Sewerage Area 2013-2014
Integrated Liquid Waste and Resource Management

**Action 1.1.11** – Enhance enforcement of sewer use bylaw prohibition against the unauthorized discharge of rainwater and groundwater to sanitary sewers (2010).

Same as the 2010-2012 reporting period: no changes. Please see Biennial Report 2010-2012 for details.

**Action 1.1.12a** – Work with municipalities to facilitate research on watershed-based stormwater management approaches.

Regularly scheduled meetings (typically once every second month) of the Stormwater Interagency Liaison Group (SILG) continued through 2013 and 2014. Through SILG, Metro Vancouver continues to provide technical and policy support to its member municipalities on stormwater management. This supports member municipalities in implementing their ILWRMP actions.

**Action 1.1.12b** – Work with municipalities to identify improvements to stormwater bylaws to include on-site rainwater management requirements.

Working with SILG and external experts starting in 2013, Metro Vancouver explored options that support onsite rainwater management through improved municipal bylaws as part of the region-wide stormwater baseline work under Action 1.1.12d.

Work on bylaw options was stopped in 2014 as the region-wide baseline options which the bylaw improvements are intended to support continued to evolve due to municipal needs and feedback. Follow-up work with SILG to identify appropriate bylaw options will resume once the region-wide baseline for onsite rainwater management has been finalized, and is anticipated in late-2015.

**Action 1.1.12c** – Work with municipalities to develop model utility design standards and options for neighbourhood design guidelines.

Same as the 2010-2012 reporting period: no changes.

This action was completed in 2012. The guidelines are available on the Metro Vancouver website: www.metrovancouver.org/services/liquidwaste/LiquidWastePublications/StormwaterSourceControlDesignGuidelines2012.pdf.

**Action 1.1.12d** – Work with municipalities to establish region wide baseline criteria for on-site rainfall management including variations for localized geology, rainfall and watershed conditions.

Since 2012, Metro Vancouver, in collaboration with SILG and with the aid of external expertise, has been developing options for a region-wide baseline for on-site rainwater management.
While the baseline is intended to set a minimum level of onsite stormwater management across the region, it may not be adequate to provide the needed level of protection for all watersheds. Municipal ISMPs will continue to define additional watershed specific requirements and they may enhance the region-wide baseline to better address local community needs. In 2013, SILG confirmed that the baseline should focus on the development and redevelopment of single-family type residential property as the densification and changes to this land use type can have significant long-term impacts on a watershed’s health. It was concluded that other land use classes are adequately addressed through ongoing ISMP processes.

Through workshops with SILG and municipal staff in 2013 and 2014, Metro Vancouver identified a preferred baseline performance target of retaining 40% of 1:2 year return rainfall onsite.

Options to translate this performance requirement into workable site specific technical options were identified in 2013, followed by consultation with municipal technical staff and option refinement. Two technical workshops were held with municipal staff in 2014 to refine options and address potential administrative and implementation concerns.

Once municipal staff are satisfied on the workability of the proposed technical options, Metro Vancouver will initiate consultation with the public and industry to ensure the proposed baseline is workable and to obtain support. This is to occur mid-2015, with proposed baseline anticipated for finalization later in 2015.

**Action 1.1.12e** – Work with municipalities to establish mechanisms to ensure continued performance of on-site rainwater management systems.

In anticipation of the region-wide baseline for on-site rainwater management now anticipated in late-2015, Metro Vancouver plans to work with its municipal members to explore mechanism to ensure continued performance of on-site rainwater management systems.

The work is anticipated to lead to partnerships with members on onsite rainwater management system performance and may include the development of expanded construction and inspection standards or guidelines.

**Action 1.1.12f** – work with senior government and industry to develop codes of practice, certification, guidelines and standards which support this plan. (2012)

Under Strategy 1.1, to reduce liquid wastes at their source, Metro Vancouver continues to work with its members, senior government, industry and businesses to address source control, sewer use bylaws, inflow and infiltration and stormwater.

In 2013, Metro Vancouver completed an internal process to include the 2012 Stormwater Source Control Design Guidelines as a part of a corporate stormwater design standard.
Action 1.1.13 – Decrease liquid waste volumes through complementary initiatives in the Metro Vancouver Drinking Water Management Plan to reduce potable water consumption (Ongoing).

Metro Vancouver’s Drinking Water Management Plan (DWMP) has action items which support water conservation leading to reduced sewage flows. These continue to be primarily linked to information outreach programs promoting behaviour change and the sustainable use of water. The outreach programs include working with the business sector on water conservation and water reuse initiatives.

Current BC Building Code requirements for high-efficiency toilets in new buildings and renovations are resulting in long-term reductions to per capita indoor water consumption and corresponding wastewater flows as these fixtures and appliances are phased-in.

Together municipalities and Metro Vancouver have progressively increased their water conservation actions resulting in a decline of 27 percent in average day per-capita water use between 1993 and 2014. The downward trend averages about 1.2% per year, which exceeds the regional target.

During 2014, a detailed progress report on the DWMP was prepared in collaboration with member municipalities. In October 2014, the DWMP 2014 progress report was received by the GVWD Board for information and posted to the Metro Vancouver website.

Strategy 1.2 Reduce wet weather overflows

Action 1.2.1 – Prohibit the construction of new combined sewer systems other than those functioning as part of a strategy to reduce combined sewer overflows or to manage stormwater quality (Ongoing).

Metro Vancouver did not construct any new combined sewer systems during 2013 or 2014.

Action 1.2.2 – Address the Canada-wide Strategy for the Management of Municipal Wastewater Effluent (CWS-MMWE) by working with Burnaby, New Westminster and Vancouver to develop and implement: priorities for sewer separation of catchments tributary to combined sewer outfalls; regional and municipal sequence for trunk and collector sewer separation; strategic use of existing combined sewers to manage rainwater quality runoff; and strategy to separate combined sewer connections from private properties (2014).

Working with the Cities of Burnaby and New Westminster, Metro Vancouver completed the conceptual plan for the separation of the Glenbrook Combined Trunk Sewer in 2014. The Glenbrook Combined Sewer Catchment serves approximately 31,000 people and drains approximately 500 ha. Initial estimates require a sewer separation budget of around $50 million and propose the project to start in
2018 with design. Final separation would follow around 2025. The separation of the Glenbrook Combined Trunk Sewer will reduce the frequency of combined sewer overflows to the Fraser River.

To prepare for combined sewer separation planning in Vancouver, the hydraulic sewer model for the Vancouver Sewerage Area is being updated. Data collection for model calibration started in 2014 with an updated model expected by the end of 2015. As a result, combined sewer separation planning originally scheduled for 2014 for the Cassiar-Hastings Catchments has been postponed until late-2015 since the separation planning will benefit from an updated sewer model.

**Action 1.2.3** – Replace combined regional trunk sewers with separated sanitary and storm sewers as determined by the plans developed in 1.2.2 *(Ongoing).*

No change from the last 2012 Biennial report.

**Action 1.2.4** – Work with municipalities to develop and implement municipal –regional sanitary overflow management plans which will: prevent sanitary overflows resulting from heaving rain and snowmelt occurring less than once every five years (for a 24 hour duration event); reduce emergency overflows due to power outages; and identify locations and schedules for appropriate system capacity improvements, wet weather containment, and point treatment and discharge to receiving waters of chronic overflows, including Cloverdale Pump Station, Katzie Pump Station, Lynn Pump Station *(2013).*

Three priority locations for SSO (Sanitary Sewer Overflows) management planning are the Cloverdale Pump Station, Katzie Pump Station and Lynn Branch Siphon. Continuation of municipal sewer asset management programs and I&I reduction from sewer laterals remain key long-term strategies to reduce the occurrence of SSOs from wet weather.

**North Shore Interceptor - Lynn Branch Siphon**

The District of North Vancouver continues its work to reduce inflow and infiltration from private laterals in the Lynn Valley area. Metro Vancouver receives updates on the District’s progress through the REAC LWSC and sewerage area technical meetings.

The wet weather SSO occurred at Lynn Branch Siphon on November 3, 2014 and was due to a storm with a 1:10 year return intensity which is greater than the 1:5 year return event criterion given under this ILWRM action.

**North Surrey Interceptor – Maple Ridge Section**

The City of Maple Ridge continues with its I&I reduction work. The City supports Metro Vancouver sewer operations by allowing overflow of excess wet weather flows at their 225th Pump Station when overflows to Katzie Slough from Metro Vancouver facilities appear imminent. The 225th Pump Station
overflows directly into the Fraser River at a location that is relatively less environmentally sensitive than Katzie Slough.

To reduce the likelihood of these SSOs reoccurring, Metro Vancouver initiated in 2014 the design of a 20,000 m³ SSO containment and flow equalization tank near the Katzie Pump Station. This containment tank is anticipated to be constructed by the end of 2017 within the total project budget of around $30 million.

**South Surrey Interceptor – Cloverdale Pump Station**

Construction of capacity improvements to the South Surrey Interceptor has prevented SSOs at the Cloverdale Pump Station from occurring in 2013 and 2014.

Long-term municipal I&I reductions are key to ensuring that SSOs do not reoccur in this area. Metro Vancouver initiated an evaluation with the City of Surrey to determine whether the practice of building semi-combined sewers (intentional connections of foundation drains to sanitary sewers which is common in most of Canada) might be a factor in high I&I rates. Findings are anticipated in 2015 and will inform the broader I&I strategy with the five member municipalities (Delta, Langley City, Langley Township, Surrey and White Rock) tributary to the South Surrey Interceptor.

**Strategy 1.3 Reduce environmental impacts from liquid waste management to a minimum**

<table>
<thead>
<tr>
<th>Action 1.3.1 – Develop and implement operational plans for sewerage and wastewater treatment facilities to ensure infrastructure reliability and optimal performance <em>(Ongoing).</em></th>
</tr>
</thead>
</table>

Operational data is analyzed for changes in performance and alarm logic is developed where feasible to allow intervention before failures occur. For example, alarms are based on run times, flow rate and/or vibration that alert operators to potential pump ragging.

**Table A-1 List of Operational Plans from 2013-2014**

<table>
<thead>
<tr>
<th>Title</th>
<th>Work Performed</th>
<th>Date Completed</th>
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</thead>
<tbody>
<tr>
<td>Chilco Pump Station</td>
<td>Revised station logic to ensure pump redundancy</td>
<td>2014</td>
</tr>
<tr>
<td>Westridge Pump Station</td>
<td>Revised logic to improve station reliability</td>
<td>2014</td>
</tr>
<tr>
<td>Baynes Pump Station</td>
<td>Retrofitted pumps with equipment to reduce clogging</td>
<td>2013</td>
</tr>
</tbody>
</table>
Action 1.3.2 – Maintain trunk sanitary sewer capacity for dry weather sewerage conveyance levels plus the Metro Vancouver target inflow and infiltration allowance; as necessary upgrade trunk sewer systems to maintain hydraulic grade lines and safe operating levels which have been established based on measured flow (Ongoing).

This work is on-going. Refer to the 2012 Biennial report.

Action 1.3.3 – Work with municipalities to develop and implement emergency sanitary sewer overflow plans including contingency plans to minimize impacts of unavoidable sanitary sewer overflows resulting from extreme weather, system failures or unusual events (Ongoing).

Working with the REAC LWSC, a preliminary inventory of municipal and regional emergency sewer overflow locations was drafted in 2014. Existing overflow management protocols will be assessed with municipal staff to determine whether new protocols or arrangements may be required or need review.

See Figure A-6.

Action 1.3.4 – Operate wastewater treatment plants which have secondary level treatment (Annacis Island, Lulu Island, North West Langley wastewater treatment plants) to meet requirements specified in each facility’s Operational Certificate and the Canada-wide Strategy for the Management of Municipal Wastewater Effluent (CWS-MMWE) National Performance Standards for wastewater effluent, including: (a) monthly average maximum Carbonaceous Biochemical Oxygen Demand (CBOD$_5$): 25mg/L; and (b) monthly average maximum Total Suspended Solids (TSS): 25mg/L (Ongoing).

Metro Vancouver will continue to operate to the OC requirements, which are currently 45 mg/L TSS and 45 mg/L CBOD daily maximum, and work with the Ministry of Environment on the revision of the OCs to meet the WSER 25 mg/L TSS and 25 mg/L CBOD monthly average criteria as well (except for NW Langley WWTP which is a quarterly average). See Table A-2 to Table A-5.
Figure A-6 Inventory of Regional Emergency Sewer Relief Points - 2014

Table A-2 Total WWTP Permit Exceedences per Year – All Parameters

<table>
<thead>
<tr>
<th>WWTP</th>
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<th>2014</th>
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<tr>
<td>Iona</td>
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<tr>
<td>Lions Gate</td>
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</tr>
<tr>
<td>Lulu</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>NW Langley</td>
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<td>3</td>
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</table>
### Table A-3 WWTP Permit Exceedences per Year – CBOD/BOD

<table>
<thead>
<tr>
<th>WWTP</th>
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<th>2014</th>
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<td>NW Langley</td>
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### Table A-4 WWTP Permit Exceedences per Year – TSS

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<thead>
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<th>WWTP</th>
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<td>0</td>
</tr>
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<td>Lulu</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NW Langley</td>
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</tbody>
</table>

### Table A-5 WWTP Permit Exceedences per Year – Coliform

<table>
<thead>
<tr>
<th>WWTP</th>
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<th>2014</th>
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<td>0</td>
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<td>Lion Gate</td>
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<td>0</td>
</tr>
<tr>
<td>Lulu</td>
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</tr>
</tbody>
</table>

**Action 1.3.5 -** Upgrade or replace Lions Gate (North Shore Sewerage Area) and Iona Island (Vancouver Sewerage Area) wastewater treatment plants to secondary level treatment to meet Canada-wide Strategy for the Management of Municipal Wastewater Effluent (CWS-MMWE) requirements and timelines.

**Lions Gate WWTP/New North Shore WWTP**

In the initial Project Definition phase, the GVS&DD Board endorsed the Indicative Design Summary Report in 2013. The final Project Definition Report (PDR) was submitted in February 2014. The PDR includes the project scope, indicative design, and establishes the project budget. In addition, Metro Vancouver conducted a project procurement options analysis and value for money assessment on alternative procurement methods. The GVS&DD Board has endorsed a Design-Build-Finance (DBF) procurement approach. The procurement approach was presented in a workshop held with Partnerships BC (PBC). PBC agrees with the general DBF premise, but recommended that the finance component be increased from the initial 10% up to 35% short term construction financing. Metro Vancouver has agreed with this change to the financing component. Metro Vancouver is commencing the Design and Construction Phase based on the DBF procurement method. Metro Vancouver has received proposals for project team consultants (Owners Engineer, Legal, and Financial and Commercial)
who will prepare the procurement documents for the DBF competition. The procurement process for the DBF competition will run from September 2015 to an anticipated contract award date in February 2017. The third phase will involve the de-commissioning of the existing treatment plant in 2021.

The following reports are available on Metro Vancouver’s website: www.metrovancouver.org/services/liquid-waste/consultations/lions-gate-wwtp/Pages/default.aspx

- Indicative Design Summary Report
- Project Definition Report
- Project Procurement Options Analysis and Value for Money Report
- Community Values and Interests for the Design of the Lions Gate Secondary Wastewater Treatment Plant.

**Iona Island WWTP**

A draft project initiation report was started in 2014 and is planned to be completed and presented to the Metro Vancouver Utility Committee in 2015.

**Action 1.3.6** – Maintain interim maximum daily concentration limits for wastewater effluent of 130mg/L BOD$_5$ at both Lions Gate and Iona Island plants and 130mg/L TSS at Lions Gate and 100mg/L TSS at Iona Island until such a time as secondary treatment is operational, and operate the plants to meet requirements specified in each facility’s Operational Certificate (Ongoing).

Metro Vancouver will continue to operate per the OCs which cite 130 mg/L BOD daily maxima for both Iona Island and Lions Gate WWTPs and 130 mg/L TSS and 100 mg/L TSS daily maxima respectively at Lions Gate and Iona Island WWTPs. Metro Vancouver will comply with the Transitional Authorization requirements of WSER established for each plant: 105 mg/L cBOD monthly and 71 mg/L TSS monthly maxima for Iona Island and 115 mg/L cBOD monthly and 76 mg/L TSS monthly maxima for the Lions Gate WWTP.

Chemically Enhanced Primary Treatment (CEPT) has been implemented at the Iona Island WWTP and at the Lions Gate WWTP. These systems will assist with achieving interim compliance at both WWTP’s.

**Action 1.3.7** – Assess environmental monitoring results (see Strategy 3.3) to determine whether any actions are required to meet Ministry of Environment/Canada-wide Strategy for the Management of Municipal Wastewater Effluent (CWS-MMWE) requirements (Ongoing).

Metro Vancouver is developing Effluent Discharge Objectives (EDOs) in concert with major wastewater treatment plant upgrades. The associated risk assessments for development of EDOs have been initiated for the upgrade of the Lions Gate and Annacis Island WWTP’s. These assessments are being conducted in accordance with the CCME Canada-wide Strategy for the Management of Municipal Wastewater Effluent and have developed a list of potential EDOs for the upgraded, secondary Lions Gate WWTP, and Stage 5 upgrade for the Annacis Island WWTP.
The Lions Gate assessment identified substances that required additional monitoring in influent and effluent to determine if the proposed EDOs can be accommodated, or alternatively eliminated from the list. In some instances, historical monitoring has not included a particular substance, or the analytical detection limit used for its quantification was inadequate to eliminate it from further consideration. To assess its compliance with the Ministry of Environment CCME Strategy in 2013, the EDOs for the new North Shore WWTP plant were updated to reflect this new information. A similar approach was taken with Annacis Island WWTP Stage 5 upgrade that also required additional monitoring as noted above for Lions Gate (plus deltamethrin, methoprene, hexachloro-1,3 butadiene), where EDOs were identified/developed in 2014.

**Action 1.3.8** – Continue odour control programs at wastewater treatment plants and implement odour control programs for targeted facilities in the regional sewer system and for relevant energy and material recovery processes, see Action 3.3.4 (Ongoing).

Metro Vancouver’s Operations and Maintenance developed a team intranet site for odour-related issues. It contains links to records of odour complaints and actions taken, ongoing odour monitoring results, odour control technology, as well as studies that address corrosion and odour generation. Figure A-7 shows existing odour control facilities and proposed locations and a map of odour complaints in the wastewater collections system. Odour modeling, assessment studies and mitigation work have been conducted at the wastewater treatment plants. In upcoming years, Metro Vancouver anticipates expanding the odour monitoring, modeling and mitigation program. Various odour mitigation trials will continue to assess the long term viability of the options. The wastewater plants continue to work on energy recovery initiatives and resource recovery, primarily in the areas of cogeneration with various upgrades being initiated, electrical usage reduction and water reuse in the plants.

**Action 1.3.9** – Develop and implement air emissions management programs for standby power generators and biogas production, including assessment of desirability of retrofit and accelerated asset replacement where appropriate (2014).

Although standby generators produce diesel particulate matter when they are operating, they are required to run infrequently and for short duration. Therefore they are relatively insignificant sources of air emissions in our region. Nonetheless, Metro Vancouver’s “Integrated Air Quality and Greenhouse Gas Management Plan” identifies the need to reduce exposure to diesel particulate matter (Strategy 1.1).

Currently, when new diesel equipment is procured it must meet certain air emissions standards as outlined in Metro Vancouver’s “Sustainable Procurement & Green Procurement Procedures”, and these requirements must be included in any Competitive Selection Process and/or contract for the purchase of that equipment. Specifically, the “Specifications for New Diesel Powered Vehicles & Equipment” states that: “All non-road diesel engines and equipment must have engines that meet U.S. EPA Tier 4 non-road emission standards for particulate matter (PM), if available, or meet the current Tier non-road emission
standards and be equipped with best available emission control technology verified to reduce diesel PM emissions from non-road engines.”

Biogas produced in a wastewater treatment plants is normally used as a bio-fuel in boilers and cogeneration engines within the facility, and any excess is combusted in enclosed flares to avoid methane emissions.

**Action 1.3.10**- Develop and implement programs to reduce greenhouse gas emissions from the regional liquid waste management systems to help achieve federal, provincial and Metro Vancouver greenhouse gas targets, see Action 3.3.4 (2015).

Greenhouse gas (GHG) emissions are directly and indirectly produced by the regional waste management system. Direct GHG emissions are from natural gas and digester gas combustion in boilers and engines at the wastewater treatment plants. Indirect emissions are associated with the electricity used in the liquid waste system (e.g. for pumping) and at the wastewater treatment plants. GHG emissions from vehicle activity associated with the waste management system are included in the corporate fleet emissions, rather than allocated to the different utilities.

Steps taken previous to 2013 guided efforts on this action, including Board signing of the Climate Action Charter (2007) and Board approval of a Corporate Climate Action Plan (2010), both of which committed Metro Vancouver to taking action to reduce greenhouse gas emissions. Energy efficiency, energy recovery, and other greenhouse gas reduction projects were identified in 2013 and 2014 to contribute to these commitments. In 2014, the Board also approved a sewer heat policy to enable municipalities and businesses to access this renewable energy source for nearby buildings and developments, and approved a corporate energy management policy.

Projects which have been identified include beneficially using extra biogas generated at wastewater treatment plants, either for co-generation, or by cleaning and injecting the cleaned biomethane into natural gas pipelines, studying the possibility of extracting heat from effluent at Iona Island WWTP for use at nearby businesses and municipalities, including the Vancouver Airport Authority, and studying the possibility of extracting heat from effluent at Lulu Island WWTP for similar purposes.

The management and treatment of liquid waste in the region produces approximately 1,350 tonnes of GHGs per year, not including GHGs from vehicle fuel for biosolids hauling. This is approximately one third of Metro Vancouver’s corporate emissions inventory as reported to the Province as part of the Climate Action Revenue Incentive Program (CARIP).
Figure A-7 Sewer Odour Controls and Complaints
Goal 2: Use Liquid Waste as a Resource

Strategy 2.1: Pursue liquid waste resource recovery in an integrated resource recovery context

**Action 2.1.1**
Assess each sewerage area using an integrated resource recovery business case model that: (a) evaluates opportunities to expand the recovery of energy, nutrients and water from the liquid waste system, specifically: Energy from biogas at wastewater treatment plants including investigating new sludge and wastewater treatment technologies and the co-digestion of other organic wastes such as organics in municipal solid waste, oils and greases, Heat energy from new pump stations, sewer replacement and rehabilitation and major wastewater treatment plant projects, Biodiesel from trucked liquid waste, waste grease and sewer grease, Energy from biosolids and sludge, Nutrients, such as phosphorous from liquid waste and biosolids, Alternatives to potable water for non-drinking purposes, such as rainwater harvesting, greywater reuse and reclaimed treated wastewater, (b) identifies linkages between liquid waste resource recovery opportunities and other systems (solid waste, drinking water, land use/buildings, parks, air quality, energy), (c) develops and evaluates business cases for integrated resource recovery/use opportunities (2012).

*Integrated Resource Recovery*

Integrated Resource Recovery (IRR) approaches focus on accessing value and benefit from resources that would otherwise remain undervalued or unused. In 2013, Metro Vancouver, Vancouver, Burnaby, Richmond, and participating agencies including the Vancouver Airport Authority and the University Endowment Lands completed an IRR study for the Vancouver Sewerage Area, which explored opportunities which could come from the integrated management of solid and liquid wastes, such as district heating and enhanced biomethane production.

Study recommendations included:

1. Continue to establish district energy service areas.
2. Develop concepts for processing organics and locations for facilities to handle increased source-separated organics and wood waste.
3. Pilot test potential resource recovery technologies that could be deployed in the future at the upgraded Iona Island WWTP.
4. Develop a plan to eliminate biosolids production through the upgrade of the Iona Island WWTP; new technologies should be investigated and tested.
5. Design flexibility into the future Iona Island WWTP to enable incorporation of tomorrow’s technologies.
6. Continue collaborative work with municipal members and utility providers to conduct resource planning work.

An IRR study is planned for the Lulu Sewerage Area in 2015. Conceptual design planning was undertaken for the new North Shore Wastewater Treatment Plant. Concepts identified in the North Shore Integrated Resource Recovery study were evaluated using business casing techniques. Those with appropriate business cases have been incorporated into the indicative design including beneficial use of biogas, heat recovered from effluent, reclaimed water within the facility and provisions for future phosphorus recovery when the business case improves.

**Co-digestion of Trucked Liquid Waste**

During 2013 and 2014, testing continued using waste received from private firms at the full-scale co-digestion pilot facility at the Annacis Island WWTP. The facility receives high strength organic wastes such as fats, oils and grease which are combined and fed directly into anaerobic digesters. This redirects these organic waste streams from the liquid treatment process to the solids treatment process to maximize treatment efficiency and substantially increase renewable biogas production. The co-digestion facility, together with the pending upgrades to increase combined heat and power capacity at the Annacis Island WWTP are steps toward greater levels of resource recovery, energy self-sufficiency, and more efficient operations.

During 2013 and 2014, a project was initiated to extract biomethane from biogas at the Lulu Island Wastewater Treatment Plant, and to sell the biomethane to FortisBC as part of their renewable natural gas program. A contract with FortisBC was established for this purpose. The project is expected to begin design in 2015, and to be commissioned in approximately 2017. The project will be the first to recover liquid waste energy resources for the benefit of the region.

During 2013 and 2014, as part of the indicative design process for the new North Shore Wastewater Treatment Plant, a conceptual design was developed for an onsite Energy Centre to extract up to 5 Mega Watts of energy from treated effluent using heat pumps for distribution to third-party district energy system(s). In 2014, the Utility Research and Innovation Group reviewed and updated the cash-flow models and concluded that one nearby load opportunity was viable and worth more detailed study. A Request for Qualifications (RFQ) was issued in October 2014 to identify parties to enter into discussions regarding potential development of energy recovery infrastructure and purchase of heat recovered from effluent supplied by the North Shore WWTP. Lonsdale Energy Corporation was the sole qualified respondent. The next step is to engage consultants to refine the conceptual design and cost estimate of a heat pump at the new plant and associated high temperature pipe loop. Metro Vancouver has drafted a scope of work and reviewed it with the Lonsdale Energy Corporation (LEC), and are currently waiting for agreement from LEC on final details before issuing an RFP for this study.

**Sewer Heat Policy**

Sewer heat is a viable, low-carbon source of energy that can be used to provide hot water heating, space heating and cooling in buildings, help reduce GHG emissions, and contribute to GVRD Board...
strategic directives. Technical reviews and studies initiated by staff indicated that there is sufficient amount of recoverable heat from Metro Vancouver’s sewer collection systems to heat approximately 700 high rise buildings without negatively impacting treatment processes at the wastewater treatment plants. However, there was no policy or set of rules for municipalities and private sector companies wishing to gain access to Metro’s sewer heat sources. The lack of a policy / framework or approval criteria that addressed allocation of sewage heat for such projects was identified by staff as an issue that could potentially result in missed opportunities. An Interim Strategy for Addressing Sewage Heat Opportunities was proposed to the Utilities Committee and approved by the Board in 2012 while staff worked on the development of a Sewer Heat Policy.

Municipalities were consulted throughout the process of developing both the GVS&DD Board-approved Interim Strategy in 2012 and the new Sewer Heat Policy. Both the Regional Engineering Advisory Climate Protection and Liquid Waste Sub-Committees were also consulted during the process of developing the Policy. The Sewer Heat Policy was reviewed and endorsed by the Regional Engineering Advisory Committee in June 2014.

The objectives of the Sewer Heat Policy are to enable expedient access to sewer for heat recovery where technically and financially feasible, which will contribute to reductions in regional greenhouse gas emissions and to Goal 2 of the Integrated Liquid Waste and Resource Management Plan of using liquid waste as a resource, while maintaining Metro Vancouver’s ability to convey and treat wastewater. The Policy, which is the first of its kind in North America, was formally adopted by the Board in October 2014.

Sewer and Effluent Heat Projects

The Sewer Heat Policy enables municipalities and businesses to evaluate using sewer heat, and provides a clear implementation path for promising situations. Opportunities at many locations have been assessed, including Gilbert Trunk, Sapperton Sewage Pump Station, Brentwood Town Centre, Burnaby Lake North Interceptor, Cambie and Marine, Fraser Mills, Marshend Pump Station, Poplar Landing, and South Burrard. As expected, some projects won’t proceed, due to technical or economic challenges. At the end of 2014, projects at two locations appear to be promising: Gilbert Trunk and Sapperton Sewage Pump Station.

Metro Vancouver conducted a feasibility study of servicing a new high-density, mixed-use development in Richmond using sewer heat from the Gilbert Trunk sewer in 2012. Staff are working with the City of Richmond to schedule and implement the ‘Oval Village District Energy Utility’ (This is a new local district energy utility, which will (likely) be owned by City of Richmond). The name reflects the neighbourhood which will provide the required 4MW of renewable heating by 2024.

Sapperton Sewage Pump Station is Metro Vancouver’s largest pump station. Heat recovery has been examined for nearby developments. Most recently, the City of New Westminster (CNW) plans to build a city-wide District Energy System fueled by a low-carbon source of energy and sewage heat is a promising potential source. Approximately 5.5 MW of sewage heat would be required for this project and staff are
working with the CNW to coordinate with the construction of a planned grit chamber in the vicinity, if CNW chooses to proceed with sewer heat as an energy source.

**Energy Recovery**

Biogas is created through anaerobic digestion processes at the four principal wastewater treatment plants in the region. Some portion of the biogas is beneficially used at all of the plants. The Iona Island and Annacis Island WWTPs co-generate heat and electricity. The Lulu Island and North Shore WWTPs generate heat for plant uses. In all cases, the generated energy allows the plants to meet nearly all of the plants’ heating needs, avoiding the use of natural gas and consequent greenhouse gas emissions.

The generated electricity reduces the need for additional electricity generation by BC Hydro, providing a complementary green and renewable electricity source. Existing levels of recovered energy are shown in Table A-6.

**Table A-6 Energy Recovered for all 5 Wastewater Treatment Plants 2013-2014**

<table>
<thead>
<tr>
<th>Wastewater Treatment Plants</th>
<th>Biomethane Used</th>
<th>Electricity Self-generated</th>
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<tr>
<td></td>
<td>GJ</td>
<td>kWh</td>
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<tr>
<td>2013</td>
<td>424,109</td>
<td>40,106,181</td>
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<tr>
<td>2014</td>
<td>477,732</td>
<td>41,317,709</td>
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</tbody>
</table>

**Research**

The Annacis Research Centre, located next to the Annacis Island Wastewater Treatment Plant, exists to support liquid waste research, training, conferences, and education. Research projects active during 2013 and 2014 included a fourth generation struvite (phosphate) recovery process and testing technology to remove ammonia in liquid waste, all part of waste treatment processes. Research plans were also developed for 2015, including hydrogen sulfide mitigation, yeast assay testing techniques, high efficiency aeration techniques, and microwave oxidation of wastewater to improve digestion processes and biogas production.

**Biosolids**

Metro Vancouver’s biosolids are high in nutrients and organic matter that can improve soil health, water retention capability, and increase vegetation growth. In 2013 and 2014 Metro Vancouver’s biosolids were used to:

- reclaim mine sites and four decommissioned Ministry of Transportation and Infrastructure gravel pits through provision of nutrients and organic matter to rebuild soil and re-introduce vegetation;
- fertilize rangeland and forests in the BC interior;
• make a fabricated topsoil for landfill capping and growing of willow trees, which remediate leachate and reduce greenhouse gases produced by the Ecowaste Landfill in Richmond BC.

Approximately 80 percent of the Organic Matter Recycling Regulation (OMRR) compliant material produced at Metro Vancouver Wastewater Treatment Plants in 2013 and 2014 was used for nutrient recovery beneficial use projects. The remainder was disposed in a secure landfill facility. The following Figure A-9 provides a breakdown of end uses.

Metro Vancouver supported and participated in the organization of the 2014 Canadian Biosolids & Residuals Conference (CBRC), held in Vancouver June 5-6 2014.

**Energy from Biosolids**

Metro Vancouver conducted a biosolids drying pilot at the Annacis Research Centre June 19-27, 2014 to demonstrate the suitability of dried biosolids as an alternative fuel for cement kilns, and collect data to inform design and operation of a full scale facility. The pilot facility dried dewatered biosolids cake from the Annacis Island and Lulu Island Wastewater Treatment Plants, and information was collected on moisture content, vapour and condensate properties, energy value, and compatibility with cement kiln requirements.
The recovery of waste heat energy from the Annacis Island Wastewater Treatment Plant was investigated for potential use of dry biosolids, aligning with Metro Vancouver’s sustainability framework targets for energy and greenhouse gas emissions. Sources of waste heat investigated included effluent heat from the WWTP outfall and from the cogeneration system.

**Phosphorous Recovery**

During the best practice review of other plants with nuisance struvite issues, Metro Vancouver also looked at the potential for phosphorus recovery at Annacis Island WWTP. All plants which installed phosphorus recovery as struvite technologies (such as Ostara’s Pearl Process) had stringent nitrogen and phosphorus limits on their effluent. Most were designed as biological nutrient removal (BNR) plants for this reason, and had much more significant nuisance struvite issues than AIWWTP. This is because BNR plants direct phosphorus to the solids stream rather than allowing it to exit the system in effluent.

Their costs for the use of conventional methods to meet stringent phosphorus in effluent limits were very high and were greatly reduced by the installation of a phosphorus recovery technology and the sale of the resulting fertilizer. Most of them were still using chemicals, acids or carbon dioxide injection to mitigate nuisance struvite because the recovery technology did not fully resolve the issue. AIWWTP does not have a significant nuisance struvite issue, does not have phosphorus limits on effluent, and does not use high cost chemicals for phosphorus removal. For these reasons, it does not make operational or economic sense to further explore phosphorus recovery as a struvite fertilizer at this time.

**Action 2.1.2**  Implement appropriate business cases based on the results of 2.1.1 *(Ongoing).*

IRR were undertaken for two areas, refer to 2.1.1. Conceptual design planning was undertaken for the new North Shore Wastewater Treatment Plant. Concepts identified in the North Shore Integrated Resource Recovery study were evaluated using business casing techniques. Those with appropriate business cases have been incorporated into the indicative design including beneficial use of biogas, heat recovered from effluent, reclaimed water within the facility and provisions for future phosphorus recovery, when the business case improves.

In 2013, Metro Vancouver, Vancouver, Burnaby, Richmond, and participating agencies including the Vancouver Airport Authority and the University Endowment Lands completed an IRR study for the Vancouver Sewerage Area, which explored opportunities which could come from the integrated management of solid and liquid wastes. In coordination with municipal partners in the sewerage area, 21 key tasks were identified as next, concrete steps toward realizing these possibilities, including projects meriting further evaluation and potential implementation. Those with appropriate business cases will be implemented.
Action 2.1.3 - Work with municipalities to adapt plans and infrastructure for long term needs based on the results of 2.1.1 (Ongoing).

In 2013, Metro Vancouver, Vancouver, Burnaby, Richmond, and participating agencies including the Vancouver Airport Authority and the University Endowment Lands completed an IRR study for the Vancouver Sewerage Area, which explored opportunities which could come from the integrated management of solid and liquid wastes, such as district heating and enhanced biomethane production.

In coordination with municipal partners in the sewerage area, 21 key tasks were identified as next, concrete steps toward realizing these possibilities, including projects meriting further evaluation and potential implementation. These included tasks for Metro Vancouver and tasks for municipalities. Conceptual design planning was undertaken for the new North Shore Wastewater Treatment Plant. Concepts identified in the North Shore Integrated Resource Recovery study were evaluated using business casing techniques. Those with appropriate business cases were incorporated into the conceptual design, including beneficial use of biogas, heat recovered from effluent, and phosphorus recovery.
Goal 3: Effective, affordable and collaborative management

Strategy 3.1: Manage assets and optimize existing sanitary sewerage operations

**Action 3.1.1** - Assess the performance and condition of regional sewerage systems by: (a) inspecting regional sanitary sewers on a twenty year cycle and, (b) maintaining current maps of sewerage inspection, condition, and repairs *(Ongoing).*

Metro Vancouver has an ongoing program to inspect and maintain its wastewater collection and treatment systems under the Operations and Maintenance Department.

Metro Vancouver targets sewer video inspections for at least 5% of the total length of Metro Vancouver’s sewer system annually, to achieve a 20 year cycle time to completely inspect its sewer. Actual sewers inspected in 2013 and 2014 were 4.1% and 4.3% of the system respectively. Condition data obtained from the video inspections is summarised and added to our GIS mapping system to provide visual representation of the collections piping system.

Annual cathodic protection surveys are being performed to ensure system performance and repairs and upgrades are done annually to maintain service levels. Sanitary sewer condition Inspection mapping will not be readily available until mid-2015. For previous mapping, please refer to the 2012 Biennial report.

**Action 3.1.2** - Create incentives to reduce inflow and infiltration by adjusting Tier 1 sewerage cost allocation formulae within each sewerage area from an average dry weather flow basis (25th percentile) to average wet weather flow (75th percentile) with appropriate adjustments for combined sewerage areas. Tier 2 cost allocation would remain unchanged *(2010).*

Since 2011, when REAC asked Metro Vancouver to suspend its work on this action to allow RAAC time to recommend to the Utilities Committee Tier 1 and Tier 2 cost allocation options, Metro Vancouver’s Utilities Committee and Board considered and clarified their policies on cost allocation options in November 2013. However, the objectives of this ILWRM action were not part of this policy clarification.

Since then, discussions with REAC LWSC and REAC on Tier 1 cost allocation have yet to resume.

**Action 3.1.3** - In consultation with municipalities, review Metro Vancouver’s safe operating head for regional sewers *(2011).*

No change from the last 2012 Biennial report. Work is on-going.
Action 3.1.4 - Develop and implement asset management plans targeting a 100 year replacement or rehabilitation cycle for regional sewerage infrastructure (2013 for plans).

Asset management was one area of focus for the recent organizational restructuring at Metro Vancouver. With the new Liquid Waste Services and Water Services departments, alignment of asset management processes and responsibilities is significantly improved. Metro Vancouver has been managing the regional liquid waste infrastructure using various asset management approaches for several years. Within the new structure, the utility will be working towards formalizing these work processes consistent with ISO 55000/1/2 standards and guidelines for asset management.

As noted in the previous update, replacing infrastructure on a 100-year age-based cycle without understanding the risk to “Levels of Service” is not necessarily the most cost effective or best asset management strategy. Many complex, often competing factors such as capacity (growth), condition, performance, and reliability influence decisions.

Consistent with this, Metro Vancouver has improved the capital planning decision processes used to quantify risks and benefits to services for all four investment drivers: 1) maintaining existing services with existing assets, 2) accommodating population growth, 3) enhancing services to meet new regulatory or other requirements and 4) improving the assets resiliency to major events (such as seismic). Liquid Waste Services is also continuing to collect condition information on the assets and are working to prepare utility-level asset management plans. Refer to Figure A-10.

Action 3.1.5 - Update and implement asset management plans for wastewater treatment plants which address risks, including climate change and seismic events, and maintain performance in wet weather (2013).

Metro Vancouver considers risks to the regional WWTPs in its design and facility planning. As an example, through the Project Definition Phase, the new North Shore WWTP will be designed to adapt to the sea level rise due to climate change, and constructed in accordance with the National Building Code of Canada to address risks associated with seismic events. Plant capacity will be sufficient to treat 2 times the average dry weather flow through secondary treatment components and convey excess flows through primary treatment. The design flows incorporate future reduction in inflow and infiltration by member municipalities.

The risks for the Iona Island WWTP secondary treatment upgrade will be addressed once the Project Definition Phase of the project commences.

Other projects such as the Annacis Stage 5 Expansion, and Northwest Langley Expansion will meet Post-Disaster requirements per the 2010 National Building Code of Canada and will be capable of withstanding the 1 in 200 design flood event. Projects to improve the reliability of treatment processes including the Annacis Island Cogeneration Backup Power upgrade and Iona Island Minimum Import removal are also being implemented.
Figure A-9 Age of Metro Vancouver Sewers
Strategy 3.2: Use innovative approaches and technologies

**Action 3.2.1** - With financial support from provincial and federal governments and the University of British Columbia, develop the Annacis Island Sustainability Academy to support innovative research and demonstration projects in liquid waste management (*Facility by 2011*).

The Annacis Research Centre (renamed from the Academy since the writing of the Plan), which is located next to the Annacis Island Wastewater Treatment Plant, completed construction in 2011. It exists to support liquid waste research, training, conferences, and education. Research projects active during 2013 and 2014 included fourth generation struvite (phosphate) recovery processes, a biosolids drying trial, and technology and testing means to short circuit the removal of ammonia from concentrated liquid waste streams in the waste treatment process. Research plans were also developed for 2015, including hydrogen sulfide mitigation, yeast assay testing techniques, high efficiency aeration techniques, and microwave oxidation of wastewater to improve digestion processes and biogas production.

**Action 3.2.2** - Collaborate with local and senior governments, academic institutions and industry in research on wastewater treatment technology and stormwater management and associated demonstration projects, training and development of educational toolkits (*Ongoing*).

Metro Vancouver is also engaged in identifying relevant wastewater research, and partnering with outside collaborators capable of innovating in those areas. These initiatives are described below.

In 2014, MV completed Phase 1A Microalgal Wastewater Treatment research in collaboration with Queen’s University and the federal government support. The lab research positively determined the potential of select microalgae species to outcompete naturally-occurring biota and remove excess nutrients (ammonium and phosphate) from effluent. The media, for cultivating the microalgae, was synthesized using secondary effluent and centrate from the Annacis Island WWTP. A subsequent Phase 1B is planned for completion in 2015 and will focus on determining optimal operating parameters such as CO2 injection rates, hydraulic retention times, photoperiod light/dark cycles and ambient temperatures. Both Phases of research is supported by federal grants through the *Natural Sciences and Engineering Research Council (NSERC) Engage Program*.

Initiated in the fall of 2014, MV and the University of British Columbia (Okanagan) collaborated on Phase 1 research to identify the potential benefits of dual digestion where solids are anaerobically treated, followed by aerobic treatment. Dual digestion could be a cost-effective option for reducing toxicity risks, particularly in light of un-ionized ammonia limits specified under the recently promulgated federal
Wastewater Systems Effluent Regulation. This collaborative work is supported by federal grants through NSERC Engage.

In 2013 and 2014, Metro Vancouver completed an assessment of the risk of struvite formation within the Annacis Island WWTP post-digestion piping and infrastructure. This included sample collection and analysis at several points within the system to allow for the calculation of the super saturation ratio (the indicator for struvite formation risk) at specific points downstream of digestion, including after dewatering in the recycle stream. In parallel with the risk assessment, Metro Vancouver conducted a best practice review of how other wastewater treatment plants have addressed nuisance struvite. Bench scale tests were also conducted on commercially available struvite dissolving agents. Some viable short and long-term technologies and approaches were identified. However, the risk assessment and a subsequent visual inspection indicated that formation risk under current plant conditions is low. The conclusions of this operational research were shared with plant operations staff. If plant conditions change and formation risk increases, it may be appropriate to conduct trials on viable preventative technologies such as carbon dioxide injection and Waste Activated Sludge Stripping to Remove Internal Phosphorus (WASSTRIP), in the future.

**Action 3.2.3** - Undertake an annual internal audit of the best practices of one regional liquid waste management sub program and environmental management system to identify opportunities for innovation and improvements *(Annually).*

The internal audit report for 2013-2014 was focused on the Liquid Waste Services Department’s data collection process for flow monitoring sites (sewer and stream flow) and rainfall. Its objectives are to identify challenges and opportunities for process improvements to further improve efficiency and effectiveness of operations. This project is expected to be completed in 2015.

During this period, the internal audit staff gathered relevant information and interviewed key process owners from several divisions to understand the Liquid Waste Services flow meter network and developed the project scope for the data collection process review in consultation with stakeholders. Staff also reviewed various applicable procedure manuals, historical records and information, conducted site visits to observe the current process, and performed substantive testing. Opportunities for continuous improvement are currently being explored.
Strategy 3.3: Monitor the performance of the liquid waste system and impacts on the receiving environment

**Action 3.3.1** - Continue to monitor the ambient environment conditions of relevant water bodies in the region in conformance with the Canada-wide Strategy for the Management of Municipal Wastewater Effluent (CWS-MMWE) requirements, and work with the Ministry of Environment in developing Environmental Quality Objectives (*Ongoing*).

In 2013 and 2014, Metro Vancouver conducted ambient environment monitoring in water bodies in the region that may be influenced by our discharges (see Ambient Environment Monitoring under Ministerial Condition 6 for details). The results of these monitoring programs were shared with the BC Ministry of Environment and with other members of Metro Vancouver’s Environmental Monitoring Committee on an ongoing basis. The information that may be pertinent for development of environmental quality objectives is made available to the regulatory agencies mandated with development of Provincial environmental quality objectives.

**Action 3.3.2** - Continue to monitor the quality and characteristics of Metro Vancouver’s liquid waste point discharge to the environment in conformance with the Canada-wide Strategy for the Management of Municipal Wastewater Effluent (CWS-MMWE) requirements to meet Environmental Discharge Objectives (*Ongoing*).

No change from the last 2012 Biennial report.

**Action 3.3.3** - Continue to operate its regional data collection network for sewers, rainfall and streams and use that data to assess the effectiveness of actions taken under this plan (*Ongoing*).

The location of Metro Vancouver’s sewer flow meters, stream gauges and rain gauges are shown on Figure A-11 to Figure A-16.
Integrated Liquid Waste and Resource Management

Figure A-10 Sewer and Drainage Monitoring Sites – Metro Vancouver Rain Gauge Network

Appendix A: Metro Vancouver Report
Figure A-11 Sewer and Drainage Monitoring Sites - North Shore
Figure A-12 Sewer and Drainage Monitoring Sites – North Fraser
Figure A-13 Sewer and Drainage Monitoring Sites – South Fraser

Appendix A: Metro Vancouver Report
Figure A-14 Sewer and Drainage Monitoring Sites - Vancouver
Figure A-15 Sewer and Drainage Monitoring Sites – Lulu Island
**Action 3.3.4** - In collaboration with municipalities, estimate and document the greenhouse gas emissions and odours associated with the operation of the municipal and regional liquid waste management systems, see Actions 1.3.8, 1.3.10, 1.3.15, and 1.3.17 (2012).

In 2013 and 2014, an Energy and Greenhouse Gas Tracking System was implemented at Metro Vancouver. It estimates and documents the greenhouse gas emissions associated with all Metro Vancouver operations, including liquid waste management. EGTS will be a resource for establishing future greenhouse gas reduction targets and for identifying priority areas and projects for greenhouse gas emission reduction. It will also provide clear summaries of the effects of these efforts by visualizing data on energy use and greenhouse gas emissions. Liquid Waste management-related greenhouse gas emissions and energy use in 2013 and 2014 are shown in Table A-7 and Table A-8, respectively..

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<thead>
<tr>
<th>Location</th>
<th>2013</th>
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<tr>
<td>Annacis Island WWTP</td>
<td>572</td>
<td>492</td>
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<tr>
<td>Iona Island WWTP</td>
<td>202</td>
<td>153</td>
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<td>Lulu Island WWTP</td>
<td>227</td>
<td>197</td>
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<td>Lions Gate WWTP</td>
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<td>Northwest Langley WWTP</td>
<td>52</td>
<td>38</td>
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<tr>
<td>Other Operations</td>
<td>323</td>
<td>239</td>
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<td><strong>TOTAL</strong></td>
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<table>
<thead>
<tr>
<th>Location</th>
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<tr>
<td></td>
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<td><strong>TOTAL</strong></td>
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**Action 3.3.5** - Estimate and report on the frequency, location and volume of sewerage overflows from regional combined and sanitary sewers, and where feasible identify and address the probable causes *(Ongoing).*
An incident on July 22, 2011 associated with pump clogging at Chilco Pump Station was reviewed and station logic modified to provide a 3rd redundant pump and an alarm for Operations staff to respond.

Previous chronic clogging of the Baynes Road pump station has been significantly reduced by installing an assembly on the front of the pumps to chop flushable materials. Metro Vancouver is developing public awareness materials and participating in a national initiative to control the production of pump clogging, flushable materials.

Between 2013 and 2014, there were 32 wet weather related SSOs and 18 dry weather SSOs. Total SSOs by year: 2013, 25 events, and 2014, 25 events. Locations and details for the overflows are provided in the Performance Measures section of the Biennial Report’s Summary Report.

Strategy 3.4: Provide resilient infrastructure to address risk and long-term needs

Action 3.4.1 - Design and adapt infrastructure and operations to address identified risks and long-term needs, including risks associated with climate change (Ongoing).

A study evaluating Metro Vancouver wastewater collection and treatment system for seismic resiliency and post-disaster performance was started in 2014 and is expected to be completed in 2015. Its objective is to better define levels of post-disaster service to inform future facility planning and design and builds upon earlier seismic assessment work.

There was no new climate change adaptation research undertaken for the liquid waste system in 2013 or 2014. Current climate change impacts and adaptation work is summarized in the previous ILWRM 2012 Biennial report.

Action 3.4.2 - In collaboration with municipalities and the Integrated Partnership for Regional Emergency Management (IPREM), develop emergency management strategies and response plans for municipal and regional wastewater collection and treatment systems, including identifying and maintaining a system of emergency wastewater overflow locations (2015).

Metro Vancouver participated in two table top emergency response simulations with IPREM in 2014. REAC has directed the REAC LWSC to develop, starting in 2015, municipal emergency response and recovery protocols. This work is expected to complement Metro Vancouver’s work with IPREM as both processes evolve over the next several years.

IPREM has developed, and conducted a trial with area CAOs, a Concept of Operations (COO) for inter-municipal coordination during a regional emergency at the strategic level. This is expected to be finalized and adopted as the Regional COO in 2015.
REAC Water Subcommittee Working Group is currently working on an operational level communications and decision making concept to facilitate collaborative decision making and coordination at the Water Services departmental level. This will be presented to REAC in 2015. It is anticipated that this concept will also be applicable to operations in Liquid Waste and Solid Waste Services.

**Action 3.4.3** - Ensure liquid waste infrastructure and services are provided in accordance with the Regional Growth Strategy and coordinated with municipal Official Community Plans (Ongoing).

*Metro Vancouver 2040: Shaping our Future (Metro 2040)*, the Regional Growth Strategy, was adopted by the Metro Vancouver Board as Bylaw 1136 on July 29, 2011 following unanimous approval by members. Under *Metro 2040* Strategy 1.1, contain urban development within the urban containment boundary, *Metro 2040* policy is to not extend regional sewerage services into the designated Rural, Agricultural or Conservation and Recreation areas unless particular public health or environmental exceptions are met. Procedural guidelines have been established for Metro Vancouver departments to coordinate the review of sewerage extension applications. This aligns the ILWRM and GVS&DD servicing with *Metro 2040*. Refer to Figure A-17.

**Strategy 3.5: Use collaborative management to address evolving needs**

**Action 3.5.1** - Establish a new overarching committee, the Integrated Utility Management Advisory Committee (IUMAC), to advise Metro Vancouver on plan implementation, particularly from the perspectives of integrated planning and resource recovery across utility systems (2010).

IUMAC’s Terms of Reference were developed by Metro Vancouver and approved by the Ministry of the Environment in April 2012. IUMAC’s first regular meeting was held February 27, 2013. The committee met subsequently two more times in 2013, and did not meet in 2014.

Given the ambitious scope and complex objectives of this action with respect to integrated planning and resource recovery across utility systems, Metro Vancouver is working with the Ministry of Environment to determine an alternate, more effective approach to address this action.
Action 3.5.2 - Continue to receive advice from the Environmental Monitoring Committee (EMC) and Stormwater Interagency Liaison Group (SILG) as subcommittees under IUMAC (Ongoing).

The Environmental Monitoring Committee (EMC) and the Stormwater Interagency Liaison Group (SILG) continued to meet regularly in 2013 and 2014. Major activities included an ongoing review of the established ambient and receiving environment monitoring programs, the Recreational Water Quality Monitoring Program, monitoring of dissolved oxygen levels in the Lower Fraser River, development of an environmental management system for the Liquid Waste Services Utility, the EDOs associated with upgrade of the Annacis WWTP, impacts of the Wastewater Systems Effluent Regulation on Metro Vancouver, new North Shore WWTP, SSO monitoring and risk assessment, Monitoring and Adaptive Management Framework for Stormwater, etc.

Regarding the Stormwater Interagency Liaison Group (SILG), major activities for this reporting period included development of the Monitoring and Adaptive Management Framework for Stormwater, which was approved by the Ministry of Environment in December 2014, on-going exchange of municipal experience regarding stormwater best practices and source control, development of a region-wide baseline for on-site rainwater management and associated by-laws and municipal implementation of ISMPs.

Action 3.5.3 - Use the Burrard Inlet Environmental Action Program and the Fraser River Estuary Management Program Management Committee (BIEAP-FREMP) as the senior level forum for discussion of policy and assessment of the scientific work related to the plan, and for resolving toxicity concerns and any disputes among its members related to implementing the Plan (Ongoing).

As of March 31st 2013, BIEAP-FREMP ceased operation. At the time, the partners indicated their intent to continue the partnership through a new model based on renewed cooperation and ongoing collaboration. While the partner agencies explore a new model of integrated management, all applications for coordinated project review are accepted by Port Metro Vancouver.

Former members of BIEAP-FREMP, Port Metro Vancouver and BC Ministry of Environment also sit on Metro Vancouver’s Environmental Monitoring Committee, where Metro Vancouver’s liquid waste related environmental programs are reviewed. This continues to provide a means for these agencies’ inputs to Metro Vancouver’s environmental initiatives, and an opportunity to discuss collaboration on regional issues of environmental concern.
**Action 3.5.4** - Biennially produce a progress report on plan implementation for the distribution to the Ministry of Environment that: (a) summarizes progress from the previous two years on plan implementation, for all Metro Vancouver actions, including the status of performance measures, (b) includes summaries and budget estimates for proposed LWMP implementation programs for the subsequent two calendar years (*By July 1st biennially*)

The first biennial report under the new LWMP, the ILWRM, covered the three year period 2010-2012 to address the transition from the previous LWMP. This biennial report is the second under the ILWRM and covers the period 2013-2014.

A total of four biennial reports were produced under the previous LWMP.

**Action 3.5.5** - Hold a public accountability session based on the biennial reports (Actions 3.5.4 and 3.5.8) by making the report available through Metro Vancouver’s website and by holding a special meeting of the Metro Vancouver Waste Management Committee to receive public comments and input on the report (*Biennially*).

A public accountability session was held following the submission of the last biennial report – there were no registered speakers or any delegates who wished to provide comments to the Metro Vancouver Utilities Committee, the successor committee to the Waste Management Committee, regarding the report. Another public accountability session will be scheduled with the Metro Vancouver Utilities Committee. Details of public session location and date will be posted on the Metro Vancouver website once they have been determined.

**Action 3.5.6** - Report directly to the Ministry of Environment annual progress on integrated stormwater management plan implementation and all occurrences of sanitary sewer overflows (*By March 1st annually*).

The second annual report under the IWLRM was submitted to the Ministry of Environment on February 28, 2014 as the Interim Report: 2013. It included a figure showing locations and volumes of all wet weather sanitary sewer overflows and municipal ISMP progress for 2013. Annual reporting for 2014 is included in this biennial report.

**Action 3.5.7** – In collaboration with members and the Ministry of Environment, undertake a comprehensive review and update of the Plan on an eight year cycle (*Every eight years*).

Review of the LWMP was completed with the approval of the IWLRM by the Minister of Environment in 2011. Review of the ILWRM is to be done every eight years.
Ministerial Conditions

Ministerial Condition 1 – The ministry supports upgrading to secondary level treatment the Lions Gate Wastewater Treatment Plant by 2020 and Iona Island Wastewater Treatment Plant as soon as possible, but no later than 2030 and not contingent on the availability of senior government funding. The Ministry of Environment is not a funding agency. While I understand the cost of the upgrades is significant, they are necessary to meet current environmental standards. The Ministry will support Metro Vancouver pursuing senior government and alternative funding options, but cannot guarantee any provincial commitment in that regard, nor compromise the Ministry’s mandate to protect the environment.

A full cost estimate for the Lions Gate Upgrade has been developed during the Project Definition Phase. The estimated cost for the program is $700 M, with $620 allocated for the new treatment plant, $60 M for conveyance works and $20 M for decommissioning the existing wastewater treatment plant. During the past two years, as part of the overall work plan for the Lions Gate upgrade, Metro Vancouver through a resolution of the GVS&DD Board has adopted an internal cost allocation formula for the regional portion of the wastewater treatment plant costs, and has been actively pursuing grant funding from senior governments.

The Lions Gate funding advocacy strategy is largely framed around the federal government’s New Building Canada Plan which was announced by the federal government in the 2013 Budget and released in March 2013. A formal application has been submitted to the Province and the Government of Canada. As of April 22, 2015 the project has not been identified by the Province as a provincial priority under the New Building Canada Plan nor has alternative grant funding been identified.

A formal value-for-money analysis has been completed and business case developed in accordance to the procedures and requirements of Partnerships BC and Public Private Partnership (P3) Canada. The value-for-money analysis identified the P3 Procurement approach of Design-Build-Finance (DBF) as the preferred implementation methodology.

Ministerial Condition 4 - Metro Vancouver must use receiving environmental and effluent monitoring data from combined sewer overflow (CSO) and sanitary sewer overflow (SSO) in the regional system to interpret the overall status of CSOs and SSOs. Metro Vancouver will continue the fate and effects studies on CSOs with the Clark Drive location and other significant sites as determined by the Environmental Management Committee. Metro Vancouver will establish similar studies representative of significant SSO locations, in particular the Cloverdale, Katzie and Lynn locations. The interpretation and assessment should demonstrate whether there has been any improvement or degradation along with any measures taken to address such discharges. Metro Vancouver will report out in the Quality Control Annual Report.
Sanitary Sewer Overflows

Auto-sampling monitoring kiosks were installed between 2010 and 2012 at the Cloverdale Pump Station, Katzie Pump Station, 225th Street Pump Station, and Lynn Branch Siphon, Serpentine River, MacKay Outfall and Braid Street SSO outfalls. In 2014 an auto-sampling monitoring kiosk was installed at the Bellevue and 15th Street SSO site. To obtain sanitary sewer characterization data at these locations, the initial trigger levels for automatic sampling were set to capture wet weather events, but were below actual overflow levels at all locations. Therefore, not all samples collected are associated with an actual SSO occurrence. Once a statistically significant amount of data has been collected, trigger levels were raised to be closer to overflow levels.

Table A-9 lists the location and date of installation of auto-sampler kiosks, the number of samples collected from each kiosk and the number of samples associated with an SSO occurrence in 2013 and 2014.

<table>
<thead>
<tr>
<th>SSO Location</th>
<th>Initiation Date for Autosampler Kiosk</th>
<th>2013</th>
<th>2014</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloverdale SSO Tank Influent</td>
<td>September 15, 2010</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Cloverdale SSO Tank Effluent</td>
<td>September 15, 2010</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Serpentine River*</td>
<td>February 18, 2011</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Katzie Pump Station</td>
<td>September 9, 2010</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>225th Street Pump Station</td>
<td>October 25, 2010</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Lynn Branch Siphon</td>
<td>September 8, 2010</td>
<td>3</td>
<td>6</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Mackay Outfall</td>
<td>February 8, 2012</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Braid Street Outfall</td>
<td>August 23, 2012</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Bellevue and 15th</td>
<td>June 3, 2014</td>
<td>N/A</td>
<td>7</td>
<td>N/A</td>
<td>0</td>
</tr>
</tbody>
</table>

* There are no SSO discharges to the Serpentine River
N/A - not applicable

A screening level human health and ecological risk assessment of potential management options for SSOs at Cloverdale, Katzie, 225th Street Pump Station and Lynn Branch was completed in 2013 using data collected between September of 2010 and January of 2012. The results of this study were submitted to the MOE and SSO strategies for the three chronic sites (Lynn, Cloverdale, Katzie) were agreed upon with the MOE at the April 23, 2014 MV-MOE quarterly meeting. System improvements for population growth have resulted in additional in-line storage which has helped to reduce the number and volume of SSOs, particularly at Cloverdale. MV continues to work with the District of North Vancouver and City of Surrey to reduce inflow and infiltration at Lynn and Cloverdale respectively. A sitting study is underway for an SSO storage tank for Katzie/225th Street as an interim measure until system capacity issues can be addressed through capital projects. In late 2014, a consultant was retained to update the screening
level risk assessment completed in 2013 using the higher trigger level data collected between January of 2012 and May 2014. The update will be completed in 2015.

**Combined Sewer Overflows**

In 2014, Metro Vancouver initiated receiving environment effects surveys for the Balaclava, Cassiar and Manitoba CSOs. The surveys include sediment sampling and chemical analyses and benthic invertebrate community structure assessments. Metro Vancouver’s CSO monitoring and characterization work is discussed under Ministerial Condition 6.

**Ministerial Condition 5** — Metro Vancouver is encouraged to continue to build upon previous studies associated with studying endocrine-disrupting chemicals, persistent organic pollutants and other micro-contaminants found in the wastewater by developing source control initiatives through education (for example, target outreach), regulation and inspection programs.

No new initiatives for the 2013 -2014 reporting period.

**Ministerial Condition 6** — Metro Vancouver will continue the receiving and ambient monitoring programs specified in the approved 2002 LWMP, including, but not limited to, recreational water quality (beach monitoring); monitoring near the outfalls for all five wastewater treatment plants, including the extensive deep sea monitoring near the Iona Island plant; and CSO effluent quality and monitoring of small urban streams relating to impacts from urbanization and stormwater.

**Monitoring Programs**

Metro Vancouver conducts receiving and ambient environment monitoring programs in areas where water quality has the potential to be affected by wastewater and stormwater discharges. The information and data collected from the monitoring work is used to determine whether the discharges meet water quality guidelines and site-specific objectives, as well as to provide baseline environmental quality data, develop indicators of environmental change, characterize changes in environmental quality, and evaluate trends within the monitoring areas over time.

Ambient environment monitoring programs exist for the southern portion of the Strait of Georgia, lower Fraser River, Burrard Inlet and Boundary Bay. Programs for monitoring the receiving environment include recreational water quality, monitoring in the vicinity of wastewater treatment plant outfalls, and characterizing the discharge quality of combined and sanitary sewer overflows.

**Ambient Environment Monitoring**

Ambient environment monitoring programs operate on a five year cycle. The Strait of Georgia ambient environment monitoring program was initiated in 2004. Due to the programs vast scope and
complexity, the first 10 years of the program were conducted in partnership with the Department of Fisheries and Oceans, *Institute of Ocean Sciences (IOS)*. Upon conclusion of the collaboration with IOS in 2013, MV has since continued the monitoring program with the UBC Department of Earth, Ocean and Atmospheric Sciences. The program’s objective has been to understand the pathways, cycling and variability of organic material and contaminants, and the scale of Metro Vancouver’s Iona WWTP marine outfalls’ footprint and its relative significance in the functioning of the Strait of Georgia.

The Fraser River, Burrard Inlet, and Boundary Bay ambient environment monitoring programs are intended to evaluate the effects of point and non-point source discharges to receiving water bodies. Each program consists of water column sampling every year, sediment sampling on a 3 to 5 year cycle and biota sampling on a 5 year cycle. Overall program review is carried out on a five year cycle. Monitoring results are compared to applicable environmental criteria. The plans and results of all monitoring programs are regularly discussed in the Environmental Monitoring Committee. Table A-10 outlines the work completed in 2013 and 2014 for these ambient monitoring programs.

### Table A-10 Environmental Monitoring Program

<table>
<thead>
<tr>
<th>Program</th>
<th>Program Initiation</th>
<th>Ambient Environment Monitoring Programs (component conducted in each year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strait of Georgia</td>
<td>2004</td>
<td>water Contaminant Dispersion and Removal report</td>
</tr>
<tr>
<td></td>
<td></td>
<td>water sediment Contaminant Dispersion and Removal Report - in progress</td>
</tr>
<tr>
<td>Fraser River</td>
<td>2003</td>
<td>water</td>
</tr>
<tr>
<td></td>
<td></td>
<td>water - in progress Program review- initiated</td>
</tr>
<tr>
<td>Burrard Inlet</td>
<td>2007</td>
<td>water report - in progress</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sediment report - in progress</td>
</tr>
<tr>
<td>Boundary Bay</td>
<td>2009</td>
<td>water Sediment - initiated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biota - initiated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>water - in progress Sediment - in progress Biota-in progress</td>
</tr>
</tbody>
</table>

### Strait of Georgia Ambient Monitoring

In 2013 and 2014, monitoring was conducted to better understand how conditions in the water column (circulation, mixing, biological productivity, turbidity) are affecting the dispersal and removal of critical contaminants. Long term trends in water properties (temperature, salinity, dissolved oxygen, and surface chlorophyll) of the Strait of Georgia have been established using archival data. Observed long term changes are small compared to seasonal and inter-annual variability.

Field methods were developed for accurately determining water column concentrations of two organic substance groups (PCBs and PBDEs) and two trace metals (silver and cadmium), in both particulate and
dissolved form. The water column particulate PBDE measurements have been combined with measurement of $^{234}$Th (An isotope of a chemical element Thallium) to estimate their removal rate from the water column with sinking particles. In addition, sediment cores from three locations (tidal flat of Sturgeon Bank, south of the Iona outfall and near the Iona diffusers) were analyzed for silver (Ag), cadmium (Cd) and lead (Pb). The 2014 monitoring program is under review.

**Fraser River Ambient Monitoring**

Water quality is monitored within 1 meter below surface at 7 sites within the geographic region of Metro Vancouver, once a week for 5 consecutive weeks during the annual low flow period (February-March). In 2013 concentrations of all measured water quality parameters met the applicable Fraser River Water Quality Objectives or BC Water Quality Guidelines. No trends in water quality were observed over the 11 years of ambient water quality monitoring. The 2014 program results are under review.

**Burrard Inlet Ambient Monitoring**

Water quality is monitored near surface and near bottom at seven sites of Burrard Inlet. Sampling is done weekly for five consecutive weeks in October-November. In 2014, the 2012 biota (fish survey) and 2012 water column monitoring reports were completed, in addition, water column monitoring and the overall program review were initiated. The findings of the 2013 water column and sediment monitoring programs are under review.

**2012 Fish Survey results:**

**Health Indicators**

English sole from Outer Harbour, Inner Harbour and Indian Arm North had better overall health than fish from Central Harbour, Port Moody Arm and Indian Arm South, particularly with respect to body burdens of organic substances. Fish from Central Harbour, Port Moody Arm and Indian Arm South displayed negative health responses with higher production of Cytochrome P450 1A (CYP1A) by both genders, vitellogenin production by males and higher parasite burdens. Other health indicators including condition and gonadosomatic index were not significantly affected. The observed lower fish health in the Central Harbour, Port Moody Arm and/or Indian Arm South appears to be associated with the presence of organic substances in sediments.

**Spatial Patterns and Temporal Trends**

Arsenic concentrations in fish was generally higher at south and north Indian Arm sites than at other sites. Cadmium and mercury concentrations were highest in fish from the Outer Harbour. PCB concentrations were lowest in fish from the Outer Harbour and highest in fish at Indian Arm south, the Central Harbour and Port Moody Arm. Brominated flame retardants (PBDEs) were highest in fish from the Inner Harbour and Central Harbour. DDT was highest in fish from Indian Arm. Dioxin and furan concentrations were highest in fish from Port Moody Arm.

There appears to be a decrease in lead since 1999 in English Sole in the central and eastern parts of Burrard Inlet.
Comparison to Objectives and Guidelines

Fish tissue chemistry results (muscle and whole fish) were compared to the Burrard Inlet Objectives and British Columbia or Federal guidelines. All concentrations of metals and organic substances in English Sole muscle met the applicable guidelines, with the exception of PeBDE -99 in the Inner Harbour. In whole fish, guidelines for protection of wildlife were exceeded for dioxins and furans, PCBs, PBDEs and DDT.

2012 Water Column results:

The water quality and chemistry results for the 2012 Burrard Inlet water column samples were compared with applicable water quality objectives. Results mostly met the 23 applicable receiving water quality objectives or guidelines, with the exceptions of DO (in some surface and most bottom water samples), phenols, Boron, and total Mercury. The analytical method measures both naturally occurring and anthropogenic sources of phenols. The levels measured are consistent throughout Burrard Inlet including Indian Arm North, indicating that measured levels are likely associated with naturally occurring phenols. Boron exceeded the applicable guideline at all sites; however, concentrations measured are typical for coastal marine waters. Total Mercury exceeded the 30-day average objective in near surface waters at the North Outer Harbour site. One sample, a suspected outlier, with a high concentration of total mercury caused the exceedance.

Boundary Bay Ambient Environment Monitoring

In 2013 and 2014 water quality was monitored two times per year, once during the summer dry season and once during the fall wet season. The analytical results for the 2013 Boundary Bay marine water column samples were compared with the Boundary Bay Water Quality Objectives and BC MOE Water Quality Guidelines. Results generally met the applicable water quality objectives or guidelines, for most parameters. The main exception was boron that exceeded the BC Water Quality Guidelines, as has been the case in all previous years of this study. All boron results were consistent with typical boron concentrations in Canadian coastal marine waters. In addition, measured levels of cadmium, copper and dissolved oxygen in marine waters did not meet the applicable guidelines or objectives on several occasions at several sites. The findings of the 2014 monitoring program are under review.

Recreational Water Quality Monitoring Program

Metro Vancouver monitors the bacteriological quality of recreational waters on a weekly basis starting in April and throughout the bathing season from May to September. Both bathing (swimming) and non-bathing beaches are monitored. The number of sampling sites and beach locations increased from 100 sampling sites at 38 locations to 117 sampling sites and 41 locations (Figure A-18). *Escherichia coli* bacteria are used as an indicator of fecal contamination to determine the safety of recreational waters for both primary and secondary contact recreational activities such as swimming, windsurfing, waterskiing, boating and fishing. The weekly results are forwarded to the Health Authorities and Beach Operators. The Health Authorities make the decision regarding the safety of recreational water in the region and the need to post a beach use advisory at a given beach.
The bacteriological quality for primary-contact recreation was not met for all bathing beaches in 2013 and 2014 (Table 3, p 17 Summary Report), while for non-bathing beach areas, the monitoring data indicated that False Creek and Gary Point met the working guideline limit for secondary or incidental-contact activities in 2013, but not in 2014 which it was exceeded at all False Creek locations.

**Monitoring Programs Associated with Wastewater Treatment Plant Discharges**

Monitoring and assessment programs associated with discharges from Metro Vancouver’s wastewater treatment plants include: Iona Deep-Sea Outfall Receiving Environment; Lions Gate Outfall Receiving Environment; and the Receiving Environment for Metro Vancouver’s Fraser River Wastewater Treatment Plant Outfalls.

**Figure A-17 Metro Vancouver Recreational Water Quality Monitoring Locations (2013-2014)**
Iona Deep-Sea Outfall Receiving Environment Monitoring Program

The receiving environment monitoring program for the Iona Deep-Sea Outfall includes annual water column and sediment effects monitoring.

Metro Vancouver continued with its annual water-column monitoring of the regulatory initial dilution zone (IDZ) boundary as a component of the overall environmental monitoring program for the Iona Deep-Sea Outfall. The purpose of the monitoring program is to establish compliance with water quality guidelines at the boundary of the IDZ. Currently, there are no site-specific objectives available for the Strait of Georgia, and the BC Water Quality Guidelines apply.

In the summer, water samples are collected from within the effluent plume at the boundary of the IDZ as well as a reference station far removed from the influence of the Iona plume. In 2013 and 2014, results indicated that all IDZ samples met applicable receiving water quality guidelines, except for dissolved oxygen and boron. For dissolved oxygen, the measured concentrations were a reflection of lower oxygen in deep water rather than as a result of an effect of the Iona effluent discharge. Total boron concentrations at both the IDZ boundary and the reference area were greater than the guideline, whereas the concentration was less than the guideline in the corresponding effluent discharge. The observed boron concentrations are a result of natural background conditions in the marine environment.

The monitoring program for sediment effects includes sediment and bottom-water quality evaluation studies relative to chemistry, bacteriology, and a comprehensive benthic infaunal community structure evaluation. The study area consists of 16 sampling stations located on a north-south transect on the 80-meter depth contour and covers a distance from Steveston Jetty to Point Grey.

In 2013 and 2014, water quality near the sediment surface (bottom-water) was within average ranges for coastal marine environments. Sediment biotic indicators of organic enrichment have shown some changes at the near-field stations. Further monitoring of the area will provide additional information to help determine their significance and if they are solely outfall related, are due to short- or long-term changes in oceanographic conditions, or are due to a combination of these or other factors.

Lions Gate Outfall Receiving Environment Monitoring Program

The receiving environment monitoring program for Lions Gate includes annual water column and sediment effects monitoring.

Metro Vancouver continued with its annual water-column monitoring of the regulatory initial dilution zone (IDZ) boundary as a component of the overall environmental monitoring program for the Lions Gate Outfall. The purpose of the monitoring program is to establish compliance with water quality objectives and guidelines at the boundary of the IDZ.

In the fall, water samples are collected from within the effluent plume at the boundary of the IDZ as well as two reference stations. In 2013 and 2014, results met applicable receiving water quality objectives or guidelines, except for dissolved oxygen and boron. For dissolved oxygen, the concentrations at the IDZ
boundary were similar to concentrations measured at the reference areas. For boron, the guideline was not met at any of the reference locations, and its concentration in the effluent discharge was less than the guideline. Observed boron concentrations are a result of natural background conditions in the marine environment.

In 2013 and 2014, water quality within the Lions Gate study area was within average ranges expected for urban coastal marine environments. The Lions Gate receiving environment, however, is seriously confounded by multiple anthropogenic sources, and the complex and unpredictable hydrographic mixing and currents in the area have made it difficult to find evidence of the zone of influence of the outfall.

The monitoring program for sediment effects includes sediment and bottom-water quality evaluation studies relative to chemistry, bacteriology, and a comprehensive benthic infaunal community structure evaluation. The study area consists of 16 sampling stations located in inner and outer Burrard Inlet and outside Burrard Inlet.

Similar to findings observed in the Iona monitoring area, sediment biotic indicators of organic enrichment have shown some small and subtle changes. Further monitoring of the area will provide additional information to help determine their significance and if they are outfall related, or due to long-term fluctuations in oceanographic conditions, or are due to a combination of these and/or confounding factors present in Burrard Inlet.

**Receiving Environment Monitoring Program for Metro Vancouver’s Fraser River Wastewater Treatment Plants**

Metro Vancouver continued with its annual water-column monitoring of the regulatory IDZ boundary as a component of the receiving environment monitoring program for Metro Vancouver’s secondary wastewater treatment plants discharging into the lower Fraser River. The objective of this monitoring is to assess compliance with applicable water quality guidelines and site-specific objectives.

Monitoring is focused at the Annacis Island WWTP outfall, as the effluent plume can be sampled with a relatively high success rate, compared to the highly transient plumes associated with Lulu Island and NW Langley WWTP outfall discharges. The Annacis effluent discharge rate is substantially greater than at either the Lulu Island or Northwest Langley WWTPs; consequently, indicators of potential effects, if present, would likely be detected first in the Annacis Island WWTP receiving environment. However, the Ministerial Condition 6 of the approval of the ILWRMP refers to monitoring the receiving environment associated with all five WWTPs. As such, in 2014 a study to assess the feasibility of this requirement was initiated for the larger discharger, the Lulu Island Outfall, to determine if previously identified conditions have changed. Results of this study will be shared with Metro Vancouver’s Environmental Monitoring Committee, and in consultation with the EMC the framework for receiving environment monitoring of the Fraser River WWTP discharges will be modified, if required. Results for the current monitoring efforts at the Annacis Island Outfall receiving environment are summarized below.
In the winter during low river flows, water samples are collected from within the Annacis WWTP effluent plume at the boundary of the IDZ as well as three reference stations upstream of the Fraser River trifurcation near the SkyTrain Bridge in New Westminster. In 2013 and 2014, monitoring was also conducted in the summer to assess the attainment of effluent disinfection. All parameters at the IDZ boundary met the applicable Fraser River objectives. Similarly all guidelines were met with a few exceptions as follows: 1) in both 2013 and 2014, provincial guidelines for 17α-ethinyl-estradiol, delemethrin, PCB-169 and total PCBs could not be validly compared with the applicable guidelines, because the variable detection limits for 17α-ethinyl-estradiol, delemethrin and PCB-169 were higher than the guidelines, while for total PCBs concentrations in the travel blank and field blank were near or above the guideline, 2) in 2013 cadmium was equal to the guideline within the limits of analytical precision for most IDZ boundary samples and almost all reference samples suggesting Annacis is not the primary contributor, 3) in 2013 unionized ammonia concentrations met the CCME guideline throughout the winter survey, but in the summer survey un-ionized ammonia concentrations in several samples collected from the IDZ boundary on two of the five sampling events were above the guideline. There were no upward or downward temporal trends in water quality at the IDZ boundary of the Annacis Island Outfall.

Combined Sewer Overflow Monitoring Program

Metro Vancouver monitors for the occurrence, duration and volume of combined sewer overflows at each of its 19 CSO sites at 15 locations, including the addition of the New Westminster CSO Storage Tank’s overflow (see Table A-12). Water quality is monitored at 14 of the 15 CSO locations over a five-year cycle. In 2013 and 2014, Metro Vancouver characterized the discharge quality of selected CSOs to Burrard Inlet and the Fraser River.

Table A-11 Number of Samples Collected at each CSO Location 2013-2014

<table>
<thead>
<tr>
<th>CSO Location</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Westridge</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Chilco / Brockton</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>English Bay</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Macdonald</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Clark Drive #2</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Willingdon</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Manitoba</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Glenbrook</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>
Volumetric estimates of CSOs are not indicative of the quantity of sanitary sewage in the overflow, as the overflow volume is primarily stormwater. Metro Vancouver maintains a database on its CSO discharge quality. Targeted parameters include fecal coliform bacteria, conventional parameters, metals, and selected trace organics as well as periodic toxicity testing. Of the samples examined for acute toxicity testing with Rainbow Trout, one sample in 2013 from Willingdon was found to be acutely toxic. Upon discovery of toxicity, this sample was submitted for toxicity identification evaluation where 100% of the fish survived, so the probable cause could not be determined other than to suggest it was a substance that may have volatilized within 24 hours. Subsequently, another Willingdon sample was submitted for testing where 100% fish survival was observed.

**Ministerial Condition 7** – Member municipalities will, with MV planning and coordination, and to the satisfaction of the Regional Manager, develop a coordinated program to monitor stormwater and assess and report the implementation and effectiveness of Integrated Stormwater Management Plans (ISMPs). The program will use a weight-of-evidence performance measurement approach and will report out in the Biennial Report. The Regional Manager may extend the deadline for completion of ISMP by municipalities from 2014 to 2016 if satisfied that the assessment program could result in improvement of ISMP and protect stream health.
In order to facilitate development of a cost-effective, coordinated and consistent approach that will address the regulatory requirement to comply with Ministerial Condition 7, Metro Vancouver formed a technical working group in 2012. The group comprised staff from municipalities, Metro Vancouver, Ministry of Environment and members of the Stormwater Interagency Liaison Group and the Environmental Monitoring Committee. Over the past two years, input on the development of the Monitoring and Adaptive Management Framework (the Framework) was received from member municipalities, Ministry of Environment, Environmental Monitoring Committee, Stormwater Interagency Liaison Group, consultants and other parties on several occasions. A special consultation workshop with a broader audience of municipal engineering, planning, development and environmental staff, as well as consulting engineers, scientists, and planners, was held in November 2013. Ultimately, this group produced a document that provides the municipalities with a number of options and full flexibility with respect to monitoring and reporting on implementation and effectiveness of their ISMPs.

The Framework covers five major areas: (1) the monitoring framework, (2) data collection methodology, (3) data analysis and assessment, (4) adaptive management actions and (5) supporting information. To account for natural variable conditions and to focus monitoring efforts on the expected impacts, distinct monitoring programs based on chemical, hydrological and/or biological indicators have been recommended for three stream types: lower gradient streams; higher gradient streams; and piped systems.

The Framework was endorsed by the Stormwater Interagency Liaison Group in the fall of 2014. Subsequently it was presented to and received by the Regional Engineers Advisory Committee on October 3, 2014, and by the Utilities Committee on November 13, 2014.

On December 17, 2014, this document was submitted to the Regional Director of the Environmental Protection Division at the Ministry of Environment for approval. Subsequently, on December 30, 2014, the Ministry of Environment accepted the Monitoring and Adaptive Management Framework submission, and as such, extended the deadline for completion of ISMPs by municipalities from 2014 to 2016.

**Ministerial Condition 8** – Bypass conditions that occur at wastewater treatment plants will be reported out in the annual quality control report. The report on each activity will include a description of the event, cause, environmental effect and monitoring that occurred and any mitigation measures undertaken to prevent reoccurrence and remediate detrimental environmental effect.

This report will be presented to the Metro Vancouver Utilities Committee in July 2015.
Ministerial Condition 9 – The ILWRM has a goal of protecting public health and the environment. In keeping with this goal and to ensure alignment with other national, provincial and regional initiatives, Metro Vancouver and member municipalities are encouraged to: (a) Have local land use planning consider the direction provided by the ISMPs, (b) Consider how the degree, type and location of land development within a drainage can affect the long-term health of the watershed, (c) Consider how to protect the stream, including the riparian areas that exert an influence on the stream, from long-term cumulative impacts; and (d) Use scenarios and forecasting to systematically consider environmental consequences/benefits of different land use approaches prior to build-out (for example, Alternative Future type approaches).

Metro Vancouver GVS&DD members continue to develop and implement their ISMPs. The objective of the ISMPs is to create a plan that addresses community needs and expectations with respect to ecology, discharge and land use for urban and semi-urban watersheds. Effective ISMPs take into consideration land use interactions, land development opportunities, riparian setbacks, and alternative strategies, and require effective multi-departmental collaboration. This is reinforced through Action 3.2.7 of the Regional Growth Strategy Bylaw, where Metro Vancouver members are required to consider watershed and ecosystem planning and/or ISMPs in the development of municipal plans.

The Monitoring and Adaptive Management Framework referenced above (Ministerial Condition 7) provides an effective tool for municipal actions to adopt regional approaches to protect the Region’s valuable watersheds. It also provides a land use planning and ecological management tool. The Framework is designed to help local governments prioritize and make informed decisions on where to focus resources and gain the most effective and measureable improvements in watershed health.

In 2013 and 2014 Metro Vancouver continued to facilitate the SILG and RPAC forums where member municipalities explore options on shared policy and technical issues such as land use planning interactions and ISMPs.

Ministerial Condition 10 – Metro Vancouver will continue to consult with First Nations during the implementation of the Plan – in particular, engaging, as appropriate, with First Nations likely to be impacted by the secondary upgrades.

Metro Vancouver’s Communications and Engagement Process with First Nations

Metro Vancouver utilizes a communications process for engaging First Nations to ensure that staff applies a consistent approach with respect to projects that fall under the Crown Regulatory Process (e.g. those projects requiring Crown permits, approvals, etc.).

Before starting a project (e.g. construction), Metro Vancouver staff is advised to check the Province’s Remote Access to Archaeological Data (RAAD) system, a computerized inventory and mapping system of known archaeological sites. A professional archaeological consultant is then hired to provide specific advice. The archaeological consultant may undertake an Archaeological Overview Assessment. In
addition a determination is made regarding whether, how and in what way the project triggers a Constitutional duty upon the Crown to consult and accommodate First Nations respecting existing Aboriginal rights and title that are potentially affected by the project.

In general, the Crown’s duty to consult and accommodate First Nations rights or title may be triggered where:

- the project involves a proposed use of federal or provincial land, water or other resources;
- the project will require some kind of a decision, determination or approval from the Crown, or
- the project will receive funding from the provincial or federal Crown.

Any of those kinds of examples or scenarios fall under the Crown Regulatory Process.

**Stage 1:**

In Stage 1 of this approach involves Preliminary Project design. At this stage, First Nations are engaged if an Archaeological Impact Assessment is required or if the project requires a Crown permit.

Federal permits such as those for environmental assessment, fisheries, port authority and provincial permits such as the *Heritage Conservation Act*, *Water Act*, and statutory rights-of-way trigger a Crown (though not municipal) duty to consult.

**Stage 2:**

In Stage 2, staff seeks advice from within the Metro Vancouver organization. A list of potentially affected First Nations is provided by Aboriginal Relations staff following a review of the province’s First Nations Consultative Areas Data Base. Aboriginal Relations staff also maintain and update a First Nations contact data base and provide it to the requesting department for the preparation of correspondence.

**Stage 3:**

During Stage 3, Metro Vancouver utilizes an October 2008 Board-approved three-step process, which involves:

1. Letters sent to First Nations describing the project, providing contact information, and including statements about non-payment policy for consultations as well as deadlines for responses, giving First Nations 45 calendar days to respond, which is substantially more than the 30-day minimum suggested by the Province.
2. Follow-up phone calls to all First Nations that may have traditional territories or known interests in and around the project site.
3. A follow-up second letter sent closer to the deadline for responses.
4. Tracking of attempts made and comments or requests received from First Nations as well as Metro Vancouver actions and responses to those enquiries. The Tracking Document is made available to the provincial Ministry, federal Department, or Crown Agency issuing the permits or responsible for approval of the projects.
Stage 4:

In Stage 4 of the process, the project moves into the Detailed Design stage. At this point, if required, consultants complete the Archaeological Impact Assessment to determine with more certainty whether there are artifacts. The object of this stage is to ensure that there is sufficient time included in the project schedule to permit removal of the artifacts before construction begins.

As responses are received from First Nations, Metro Vancouver utilizes a number of successive steps such as:

1. responding to any technical or policy-related questions;
2. meeting with First Nations to discuss any concerns and, if requested, providing a presentation;
3. following up on additional requests from First Nations, as requested;
4. providing a summary report on First Nations engagement efforts to the appropriate Crown agencies;
5. proceeding with the project after the established deadline for responses has passed;
6. closing the response tracker following completion of the project or phases of the project; and,
7. continuing to update and to follow up on requests from interested parties.

If no responses are received from First Nations, then Metro Vancouver staff:

1. provide a summary report on First Nations’ engagement to the Crown and monitor any further interests, responses or engagement needs;
2. prepare for the mobilization of the project, such as the start of the project or new phase of the project;
3. close the response tracker following completion of the project or phase of the project or phase of the project and file the information for reference purposes.

If, on the other hand, projects are determined not to trigger any Crown duty to consult with First Nations then, for these projects, Metro Vancouver is guided by its own policies, procedures, and practices, and communicates with neighbours of the project, in a way that is respectful of First Nations’ history, culture and interests.

Following the preliminary and detailed design, this process involves:

1. determining whether First Nations were engaged during the Regulatory Process;
2. reviewing the rationale assessment internally with Aboriginal Relations staff for any First Nation sensitivities;
3. determining whether to communicate with First Nations based on a review of the rationale assessment.

If communication with First Nations proceeds, then Metro Vancouver staff identify the scope of the communication, and send an initial project identification letter.
As responses are received from First Nations, then, as with the Crown Regulatory Process, the Policy Process outlines several successive steps to take to address any issues, concerns or needs, including:

1. Identifying which First Nations may be impacted by the project (again, the information is sourced by using the province’s Consultative Areas Data Base).
2. Sending out an initial project notification letter to those First Nations;
3. Following up on additional requests from First Nations and responding to any technical enquiries (this could include some accommodation measures such as possible redesign of the project route, additional archaeological work at or near the project site, or other measures that may benefit the First Nations.

At this point, the project proceeds and Metro Vancouver continues to update interested parties when beginning new phases of the project or upon project completion. There is also ongoing follow up to any enquiries and then closing of the tracker information.

If no responses are received from First Nations, then staff monitors any further interests, responses and engagement needs and proceeds with the project.

In addition, a corporate approach (i.e. protocol and process) has been established for the review of correspondence to First Nations involving the Metro Vancouver department undertaking the project, Aboriginal Relations staff, and the CAO’s Office.

**Lions Gate Wastewater Treatment Plant**

The site of the proposed new Lions Gate WWTP is within the traditional territories of 31 First Nations, Tribal Councils and Treaty Groups/Associations. According to the province’s Consultative Areas Data, Metro Vancouver will need to engage with nine Aboriginal organizations. Squamish Nation and Tsleil-Waututh Nation will have specific interests, and their claims are the strongest of the overlapping claims. The other seven First Nation organizations include: Musqueam Indian Band, Sto:lo Tribal Council, Sto:lo Nation, Skawahlook First Nation, Shxw’owhamel First Nation, Soowahlie First Nation, and Seabird Island Band. Metro Vancouver corresponded with all potentially affected First Nations, advising of the project and engagement opportunities.

Specifically, Squamish Nation has been represented on the Lions Gate Intergovernmental Advisory Committee, along with the North Shore municipalities and the provincial and federal governments. The committee provides input to the numerous technical matters for undertaking the work to complete the Project Definition Report. In addition, the Squamish Nation Service Agreement Committee has participated with Metro Vancouver on the relocation of the Lions Gate Secondary Wastewater Treatment Plant. These are monthly meetings between senior representatives of the Squamish Nation, Metro Vancouver, West Vancouver, the District of North Vancouver and North Vancouver City regarding the Lions Gate WWTP. In addition ongoing engagement meetings which have taken place with the Squamish Nation on a monthly basis in 2014, have continued into 2015. At those meetings Squamish Nation and Metro Vancouver discuss shared interests within the project area (such as negotiation of
rights-of-way and geotechnical and environmental issues) and to advise the First Nation of the project milestones and engagement opportunities.

Tsleil-Waututh Nation also sat on the Lions Gate Intergovernmental Advisory Committee. A technical meeting with Tsleil-Waututh Nation representatives to discuss this project took place in 2013. Correspondence has also been exchanged with the First Nation regarding technical matters requiring explanations.

Metro Vancouver has corresponded with all of the other First Nations, Tribal Councils and Treaty Groups/Associations that have traditional territories that lie within, overlap with, or have shared interests within the project area, advising them of the project milestones and engagement opportunities.

Metro Vancouver continues to work with the Province regarding funding support, and has requested that the Lions Gate project be included on the list of priority projects for recommendation to the New Building Canada Plan. Support letters for the project from Squamish Nation have also been sent to the Premier and the Prime Minister.

As soon as the Lions Gate Secondary Waste Water Treatment Plant is in the design and construction phase, the Project Definition will commence for the Iona Island Secondary Waste Water Treatment Plant project, which is required to be completed by 2030.

**Iona Island Wastewater Treatment Plant and Highbury Interceptor**

In December 2009, an emergency SSO occurred on Musqueam Indian Reserve No. 2 caused by a power failure at the Iona Island WWTP.

The Musqueam Indian Band has outlined its health and operational concerns to Metro Vancouver regarding this matter. Three meetings took place in 2012 between Metro Vancouver and Musqueam to arrive at a better mutual understanding of the causes of the incident and discuss ways for preventing similar occurrences in the future as well as related issues. Those issues include servicing/maintenance of the Highbury Sewage Interceptor located on Musqueam Indian Reserve No. 2 and associated odour control/air quality issues.

The parties continued to meet in 2013 and 2014 but decided that technical matters dealing with the spill and resulting mitigation efforts would be dealt with through the establishment of a joint technical advisory committee which will report out to the main committee consisting of Musqueam’s Band Manager, Musqueam senior staff, the GVS&DD Commissioner, and Metro Vancouver senior staff. The first joint technical advisory committee meeting took place in October 2014. Quarterly meetings have been scheduled in 2015.

Previous meetings have featured Metro Vancouver presentations and discussions with Musqueam representatives on the:

- Highbury Air Management Facility;
• Odour data/management at IIWWTP;
• meetings with representatives from the Vancouver Coastal Health Authority who have reviewed the health effects of the proposed facility (Vancouver Coastal Health has provided a letter expressing its support for the proposed Highbury Interceptor Air Management Facility Project indicating that there is no health risk associated with the project);
• reconstruction of the Highbury Interceptor Chamber;
• Iona Island WWTP Solids Handling Project.

Currently, work on the wastewater and air quality issues continues at a technical level.

The upgrade of the Iona Island Wastewater Treatment Plant to secondary treatment by 2030 and any possible capacity expansion may also require additional land.

According to the province’s Consultative Areas Data Base, a total of 16 First Nations, Tribal Councils and Treaty Groups/Associations will need to be engaged on this project. In addition to the Musqueam Indian Band, these include: Squamish Nation, Tsleil-Waututh Nation, Shxw’owhamel First Nation, Sto:lo Tribal Council, Sto:lo Nation, Skawahlook First Nation, Soowahlie First Nation, Seabird Island Band, Lyackson First Nation, Penelakut Tribe, Hul’qumi’num Treaty Group, Stz’uminus First Nation, Cowichan Tribes, Halalt First Nation, and Lake Cowichan First Nation.
References

_Inflow and Infiltration Management_

Metro Vancouver, 2014, Inflow and Infiltration Allowance Assessment, Liquid Waste Services Department, Policy Planning and Analysis Division, Burnaby, BC

_Stormwater Management_

Metro Vancouver, 2014, Monitoring and Adaptive Management Framework for Stormwater, Liquid Waste Services Department, Environmental Monitoring and Quality Control Division, Burnaby, BC

_Combined Sewer Separation_


_Burrard Inlet Ambient Monitoring_


_Boundary Bay Ambient Monitoring_


_Fraser River Ambient Monitoring_


_Strait of Georgia Ambient Monitoring_


_Recreational Water Quality Monitoring_


**Wastewater Treatment Plants Receiving Environment Monitoring**


**Sewer Overflow Monitoring**


Tetra Tech. 2013. Sanitary Sewer Overflow Risk Assessment Of Interim Management Options For Lynn Branch Siphon, Katzie Pump Station And Cloverdale Pump Station. Prepared for Metro Vancouver by Tetra Tech, Vancouver BC.
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