



City of Richmond

Report to Committee

To: Public Works and Transportation Committee **Date:** January 25, 2019
From: John Irving, P.Eng. MPA **File:** 10-6060-01/2019-Vol
 Director, Engineering 01
Re: 2019 Liquid Waste Management Plan Biennial Report

Staff Recommendation

That the staff report titled "2019 Liquid Waste Management Plan Biennial Report," dated January 25, 2019, from the Director, Engineering, be submitted to Metro Vancouver.

John Irving, P.Eng. MPA
 Director, Engineering
 (604-276-4140)

Att. 1

REPORT CONCURRENCE		
ROUTED TO:	CONCURRENCE	CONCURRENCE OF GENERAL MANAGER
Sewerage & Drainage	<input checked="" type="checkbox"/>	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS: 	APPROVED BY CAO

Staff Report

Origin

The Greater Vancouver Sewerage and Drainage District (GVS&DD) Board adopted the Integrated Liquid Waste and Resource Management Plan (the “Liquid Waste Plan”) in May 2010. Subsequently, at the September 27, 2010 City of Richmond Regular Council Meeting, Council adopted the following motion:

“That the municipal commitments in the Metro Vancouver 2010 Integrated Liquid Waste and Resource Management Plan be endorsed.”

The Minister of Environment approved the Liquid Waste Plan, subject to conditions identified in his letter, dated May 30, 2011.

The Liquid Waste Plan requires member municipalities to report progress on 27 municipal commitments on a biennial basis. The Liquid Waste Plan Biennial Report will be compiled by Metro Vancouver and submitted to the Minister of Environment once it is approved by the GVS&DD Board.

This staff report summarizes the City’s progress on the Liquid Waste Plan municipal actions and presents the 2019 Liquid Waste Management Plan Biennial Report (the “2019 Biennial Report”) (Attachment 1) for Council’s endorsement for submission to Metro Vancouver for incorporation into the Liquid Waste Plan Biennial Report.

Analysis

The Liquid Waste Plan includes a municipal commitment to report progress on a biennial basis. The 2019 Biennial Report covers the 2017 to 2018 reporting period. Richmond has previously submitted seven biennial reports over the last 16 years based on reporting requirements in the current and previous Liquid Waste Management Plans.

The 2019 Biennial Report includes 27 narratives, several tables and graphics attachments that report on the 27 municipal commitments included in the Liquid Waste Plan. The following are highlights of Richmond’s 2019 Biennial Report:

Inflow and Infiltration

Inflow and infiltration of stormwater into the sanitary sewer system are typically caused by cross-connections or defects in the infrastructure and place additional demands on the sanitary system. Liquid Waste Plan action 1.1.18 requires municipalities to develop and implement inflow and infiltration management plans that ensure inflow and infiltration levels are within Metro Vancouver allowances. Richmond does not have combined sewers and does not permit unregulated groundwater discharge into the sanitary sewer system. The City continues to manage inflow and infiltration through managing defects through its sanitary sewer assessment and rehabilitation program.

Metro Vancouver targets to inspect regional sanitary sewers on a twenty year cycle. Richmond began CCTV inspections of its gravity sanitary sewers in 2002 and was completed by 2015, seven years ahead of Metro Vancouver's target. Rehabilitation of damaged mains identified through inspection are brought forward through the annual capital program.

Staff continue to monitor inflow and infiltration levels at the City's sanitary pump stations, identifying any catchments that may have higher inflow and infiltration rates for subsequent study and remediation if required. Richmond is currently a leader within the region in managing and reducing inflow and infiltration in its sanitary sewer system.

Asset Management Plan

Liquid Waste Plan action 3.1.8 requires municipalities to develop and implement asset management plans and to provide copies of those plans to Metro Vancouver by 2014. Richmond maintains both an Ageing Infrastructure Management Plan and a Growth Related Infrastructure Management Plan that are reviewed and updated regularly. Both of these have been in place for a number of years and were submitted ahead of Metro Vancouver's target date.

Sanitary Sewer Overflows

Liquid Waste Plan action 3.3.7 requires municipalities to report on the frequency and location of sewerage overflows from municipal sanitary sewers. The City does not have sanitary sewer overflow issues and there were zero overflows for the reporting period. This is largely due to Richmond's successful capital and maintenance programs and separated sewer systems.

Stormwater Management Plan

Liquid Waste Plan action 3.4.7 requires municipalities to develop and implement stormwater management plans that integrate with land use. Richmond has developed an Integrated Rainwater Resource Management Strategy (IRRMS), a strategic approach to manage stormwater within the City's floodplain ecosystem. It identifies strategies to detain stormwater, improve water quality, control sediments, harvest and re-use rainwater, and protect and enhance green infrastructure. Richmond's Ecological Network Management Strategy (ENMS) contains extensive actions and initiatives on the integration of rainwater management Best Management Practices tailored to various land uses within the City.

Key programs aligned with the IRRMS include:

- Stormwater detention pond constructed in the Garden City Lands, and other planned water storage bodies for future phases;
- Updated and new Bulletins with specific information for development adjacent to RMA's for single-family and multifamily residential, commercial and industrial development;
- City's Rain Barrel Program to encourage residents to collect and store water for outdoor re-use; and
- Implementation of stormwater sampling and monitoring program.

Water Metering

Ministerial Condition 2 for approval of the Liquid Waste Plan strongly encourages municipalities to business case and/or implement residential water metering programs and to consider municipal rebate programs for water efficient fixtures and appliances to reduce water use.

The City is a regional leader in water metering and has a comprehensive water meter program for both residential and commercial properties. All single-family, industrial, commercial, institutional and farm properties in Richmond are metered. Multi-family complexes can volunteer for water meters through a subsidized program comprised of a meter installation subsidy complemented by a five-year guarantee that allows residents to adjust water use habits without financial risk. By the end of 2018, 46% of multi-family properties are metered in Richmond and approximately 94% of those customers saved money compared to the flat rate.

Water metering provides customers increased rate equity compared to the flat rate and a tool to manage their costs while consumption monitoring allows staff to identify system inefficiencies. Since 2003, the City has managed to reduce total water consumption despite an 18% population increase. By reducing water consumption, the City achieved a cost reduction of over \$9 million in Metro Vancouver water purchase costs in 2017 alone. This is a strong indication that water metering efforts to date are having a positive impact on water conservation and minimizing the need for costly infrastructure upgrades by managing increases in demands.

Universal deployment of the fixed base water meter reading network throughout the City was previously endorsed by Council and will be completed in 2019. The fixed base network will facilitate automated data collection to reduce costs associated with reading water meters, allow staff to gather real-time consumption data, assist in helping customers identify causes of leaks and water consumption habits, and enhance revenue forecasting which will inform the utility budget process.

To further promote reduced water use, the City provides metered customers with water conservation kits, which include low flow showerheads, faucet aerators, toilet fill cycle diverters, toilet leak detection tablets, and educational water conservation tools. In addition, the City has successful programs for toilet rebates, rain barrels, and clothes washer rebates. To the end of 2018, 7372 toilet rebates, 1727 rain barrels, and 914 clothes washer rebates have been issued to Richmond residents.

Odour Control

Following the odour issues related to Harvest Power, the City took a lead role in coordinating residents, businesses, Metro Vancouver and the Province in addressing the matter. One of the outcomes resulted in the City writing to the Province and Metro Vancouver to request that measurable odour limits be included in the Provincial Environmental Management Act and Organic Matter Recycling Regulation and in the Metro Vancouver Air Quality Management Bylaw in order to manage these issues in the future. Metro Vancouver and the Province have not added odour measurement to their regulations. In 2019 the City will pursue this matter further with Metro Vancouver and the Province so that odours can be measured and regulated.

Regional Asset Management

Through this initiative staff will be requesting that Metro Vancouver address the potential impacts of climate change to the regional liquid waste system. There are significant investments in new regional liquid waste infrastructure funded through municipal sewer utility rates. It is not clear through this process how the regional liquid waste system is being adapted given the latest science on climate change.

Financial Impact

None.

Conclusion

The 2010 Liquid Waste Plan includes a municipal commitment to report progress on Liquid Waste Plan actions on a biennial basis. The attached 2019 Biennial Report summarizes Richmond's progress on municipal actions for the 2017 to 2018 reporting period. Staff will continue to work on municipal actions identified in the Liquid Waste Plan to ensure the City of Richmond is meeting all of the requirements.



Eric Sparolin, P.Eng.
Acting Manager, Engineering Planning
(604-247-4915)

ES:al

Att. 1: City of Richmond 2019 Liquid Waste Management Plan Biennial Report

2019 Liquid Waste Management Plan Biennial Report

Reporting Period: 2017 – 2018

Municipal Submission Section

To be completed by: March 15, 2019

Municipal Contact Information			
Name	Email	Phone	Responsible For ILWMP Action #'s
Eric Sparolin	ESparolin@Richmond.ca	(604) 247-4915	
Peter Russell	PRussell2@Richmond.ca	(604) 276-4130	1.1.16, 1.1.17, 1.3.15, 3.4.7, Ministerial Conditions (7,9)
CNCL - 451			

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- 2. Municipal Reporting Submission1

Submission Checklist

Narratives:

- Narrative 1: *Summarize ongoing permitting & inspection programs*
- Narrative 2: *Summarize approach to regulating pesticides and lawn care products*
- Narrative 3: *Summarize updates to outreach plans for supporting liquid waste source control programs (e.g. stormwater, sewer use, sewer maintenance, I&I management, cross connections etc.) during the reporting period*
- Narrative 4: *Summarize I&I management plans & list key actions resulting from plans*
- Narrative 5: *Summarize enforcement enhancements and process efforts during reporting period*
- Narrative 6: *Highlight and summarize bylaw changes relating to stormwater management*
- Narrative 7: *Highlight and summarize changes to utility design standards and neighbourhood design guidelines in relation to on-site rainwater management*
- Narrative 8: *Summarize development of municipal sanitary overflow management plans. Highlight specific examples.*
- Narrative 9: *Highlight & summarize progress on the prevention of CSOs and the separation of combined sewers*
- Narrative 10: *List approaches and strategies that address risks (ie: regular maintenance, SCADA, monitoring, protocols, identified redundancies/contingencies)*
- Narrative 11: *Describe regulations and status of applications*
- Narrative 12: *Summarize existing municipal odour control programs and the implementation of new programs for targeted municipal sewer facilities*
- Narrative 13: *Summarize air emissions management programs for standby power generators at municipal sewer pump stations*

- Narrative 14: *Summarize air emissions management programs for standby power generators at municipal sewer pump stations.*
- Narrative 15: *Summarize key progress on the assessment and condition of municipal sewerage system*
- Narrative 16: *Summarize key progress or accomplishments on the development of asset management plans for municipal sewerage infrastructure*
- Narrative 17: *Summarize key findings from the tri-annual internal audit (first due in 2015)*
- Narrative 18: *Summarize the estimate of greenhouse gas emissions and odours associated with the operation of municipal and regional liquid waste management systems*
- Narrative 19: *Summarize and highlight any important details and action plans relating to wet weather SSOs & probable causes of CSOs*
- Narrative 20: *Summarize and highlight any changes to the existing municipal sewer flow & sewer level monitoring network*
- Narrative 21: *Summarize progress on the development of emergency management strategies and response plans for municipal & regional wastewater collection and treatment systems*
- Narrative 22: *Summarize key initiatives that support the adaptation of infrastructure & operations to address risks and long term needs*
- Narrative 23: *Summarize and highlight key initiatives relating to the development and implementation of the integrated management plans*
- Narrative 24: *Discuss water metering & rebate programs relating to water fixtures and appliances*
- Narrative 25: *Summarize whether any new municipal water metering policies or programs were introduced in 2015-2016 that address this action. If no changes, then indicate, "Same as the 2013-2014 reporting period: no changes".*
- Narrative 26: *Quote relevant OCP sections addressing stormwater, stream health and their consideration of ISMPs*

Tables:

- Table 1: *List core sewer use bylaws and summarize any changes*
- Table 2: *Summarize Status of Bylaws Related to Controlling Sediment Transport & Erosion*
- Table 3: *Types and Number of Liquid Waste Related Permits Issued 2017-2018*
- Table 4: *Products Regulated to Protect Stormwater Runoff Quality*
- Table 5: *Bylaws Regulating Discharges of Groundwater and Rainwater to Sanitary Sewers*
- Table 6: *List standards and guidelines and where applied*
- Table 7: *List references*
- Table 8: *Bylaws and Regulations Requiring Pleasure Craft Pump-out Facilities at Marinas*
- Table 9: *Summary of LWMP Implementation Budgets and Forecasts*
- Table 10: *Summary of Municipal Progress 2017-2018*

Graphics & GIS Data:

Attachment 1:

- I&I Mapping showing I&I rates for neighbourhoods where studies have been completed with before and after I&I (L/ha-d). Objectives to Illustrates catchment areas covered by I&I studies.
- Transmit an electronic copy of GIS shape files for study catchment boundaries to Metro Vancouver

Attachment 2:

- Mapping showing where sewer separation work occurred in 2017-2018
- GIS shape files of the locations where sewer separation occurred in 2017-2018 for composite mapping
- GIS shape files of catchments of remaining combined sewer catchments as of December 31, 2016 (if separated catchments discharge to combined sewers, code the separated catchments as "separated").

Attachment 3:

- Map and GIS data showing location of emergency municipal overflows (this information should have already been provided through a separate request through the REAC LWSC as well as the 2015-2016 reporting). If already provided, please indicated so.

Attachment 4:

- 2017-2018 map showing odour control facilities & locations of complaints (different than facility)
- GIS shape files for the odour facility and complaint mapping to allow for development of composite mapping

Attachment 5:

- A map showing sewerage system CCTV inspection for 2017-2018 and the other areas of CCTV inspection work in a different colour over the previous 18 years (1996-2014).
- A map showing any sewer replacement /rehabilitation work for 2017-2018 as part of either asset management or capacity upgrades. Indicate whether the work is for upgrades or maintenance.

Attachment 6:

- Titles of any completed asset [replacement] management plans (author, date, title, and publisher) for 2017-2018.
- Completed annual PSAP 3150 reporting on asset values for 2017-2018.
- Colour coded map showing age of the sewerage system (i.e.: <1900, 1901-1925, 1926-1950, 1951-1975, 1976-2000, >2001) updated to show any changes made in 2013-2014. If no changes, please indicate so and the mapping prepared for the 2010-2013 reporting period will be used.

Attachment 7:

- Provide (if not already provided) GIS shape files which have the locations of the CSO outfalls for purposes of summary mapping (should already be reported under WSER).
- Provide GIS shape files or coordinates for the locations of wet & dry weather SSOs for each year (indicate which is dry/wet and year). Include SSO dates and estimated volume

Attachment 8:

- Map and GIS coordinates showing locations of active municipal sewer flow/level monitors for the reporting period 2017-2018 (indicate whether permanent or temporary)

Attachment 9:

- If not already provided, provide updated GIS shape files of the municipal sanitary sewer network, including manholes, pump stations, pipe diameters for the municipal sewer system as of the end of 2016. Please indicate what changes have been made for 2017-2018.

Attachment 10:

- GIS shape files showing the ISMP boundaries and their status: Development Phase= Yellow; Implementation Phase = Light Green; Completed Phase = Dark Green. Add ISMPs still to start development as outlined only).

Attachment 11:

- If initiated, results per watershed (as per ISMP Adaptive Management Framework)
- If undertaken, a map plus GIS shape files/coordinates showing location of monitoring.

Attachment 12:

- Map showing any 2017-2018 changes to protected riparian areas & possible stream classifications. If no changes, then this figure is not required.

City of Richmond

Action 1.1.14 – Review and enhance sewer use bylaws to reduce liquid waste at source, including contaminants identified by the *Canadian Environmental Protection Act (2012)*.

Table 1 Core Sewer Use Bylaws

Sewer Use Bylaws*	2017-2018 Changes**
Drainage, Dyke and Sanitary Sewer System Bylaw No. 7551	While it has always been standard practice for the City to restrict the discharge of groundwater in to the City’s drainage system, in 2017, the bylaw was amended to explicitly prohibit the discharge of groundwater into the City’s drainage system.
Public Health Protection Bylaw No. 6989	No changes with respect to liquid waste
Pollution Prevention and Clean-Up Bylaw No. 8475	Amended to include a new non-stormwater discharge permitting process that includes: <ul style="list-style-type: none"> • Update dewatering discharge standards; • Requirement for a Qualified Environmental Professional to certify the quality of discharge into the City’s storm system; • Include a new permit fee to enable cost recovery for the City for processing such applications.

*Re-list existing core sewer use bylaws and list all new bylaws

**Summarize any changes (if no changes, enter “No changes”)

Table 2 Summarize Status of Bylaws Related to Controlling Sediment Transport & Erosion

Name of Bylaw*
(related to controlling sediment release from land clearing and construction phase of development)
Drainage, Dyke and Sanitary Sewer System Bylaw No. 7551 – requires that connections to the City’s drainage system are disconnected and capped prior to demolition of buildings to prevent sediment entering the drainage system.
Pollution Prevention and Clean-Up Bylaw No. 8475 – prohibits the release of polluting substances into the receiving environment, and restricts non-stormwater discharges in the City’s drainage system or watercourse without a Permit. Permit applications require a Qualified Environmental Professional to provide a Water Quality Monitoring Response Plan and a signed and sealed declaration confirming the discharge water will meet minimum standards listed in the Bylaw.
Boulevard and Roadway Protection and Regulation Bylaw No. 6366 – requires that anyone using a boulevard for construction to ensure that the roadway is cleared of sediment producing material during the activity.
Boulevard Maintenance Bylaw No. 7174 – Requires that a property owner not discard any materials fronting their property.
Watercourse Protection and Crossing Bylaw No. 8441 – limits the obstruction of flow, and requires that watercourse crossing design, construction and maintenance are approved by the City so as to protect water quality and the functioning of the City’s drainage system or any City land.
City of Richmond Engineering Design Specifications – requires that catch basins and inspection chambers be

installed on all drainage service pipes to prevent sediment discharging into the City’s drainage system. It also requires that a Sediment Control Plan be submitted to the City to identify the type and location of sediment control best management practices that will be used during construction.	
Bylaw Details	2017-2018 Changes*
Summarize monitoring requirements	No changes
How data is assessed under the bylaw?	No changes
How is assessment used to initiate corrective actions?	No changes
Summarize approaches used to maintain compliance with the bylaw (e.g. annual resources dedicated to maintaining compliance).	Bylaw 8475 was amended to include a non-stormwater discharge permit fee. Funds generated are allocated to field monitoring and verification of discharge compliance. Additionally, the bylaw was strengthened to allow greater ability to recover remediation costs in the event of a pollution event.
Discuss effectiveness of bylaw/bylaws and current approach to prevent inputs of sediment to the storm system and receiving environment.	Sediment meets the definition of a “polluting substance” under Bylaw No. 8475 and is banned from being introduced to the environment. The bylaw is used to recover remediation costs caused by sediment inputs, and additionally serves to promote owner –lead preventative measures to avoid these costs.

*For bylaws unchanged since 2015-2016, summarize any changes 2017-2018 (if no changes, enter “No changes”). Otherwise, describe the new bylaw.

Action 1.1.15* – Continue existing programs of permitting and inspection to support and enforce sewer use bylaws (Ongoing, *City of Vancouver Only).

Narrative 1: Summarize ongoing permitting & inspection programs

Insert Narrative Text Here

Table 3 Types and Number of Liquid Waste Related Permits Issued 2017-2018

Permit Type/Name*	Number of Permits*	Referenced Bylaw*

*City of Vancouver Only

Action 1.1.16 – Identify and regulate pesticides and lawn care products which negatively affect rainwater runoff quality and urban stream health (2014).

Narrative 2: Summarize approach to regulating pesticides & lawn care products for 2017-2018.

Adopted in 2009, Richmond’s Enhanced Pesticide Management Program (EPMP) reduces the exposure of Richmond residents to unnecessary pesticide use. The program includes a regulation restricting the use of pesticides for cosmetic purpose, as well as resources to empower community members to make the switch to pesticide-free practices. In December of 2015, the City adopted the Invasive Species Action Plan (ISAP), intended to build upon the

accomplishments of the EPMP. ISAP includes strategies to reduce the economic and environmental risks of invasive species management by implementing monitoring and control procedures and increasing awareness of invasive species within the community. ISAP delivers the City’s early detection and rapid response program for public and private lands in order to ensure that pesticides and lawn-care products are deployed minimally and in a highly controlled fashion.

The City’s Pesticide Use Control Bylaw No. 8514 restricts the cosmetic use of pesticides on residential and municipally-owned lands, allowing only low-toxicity products listed under the BC Integrated Pest Management (IPM) Regulation Schedule 2 and Schedule 5. In addition to bylaw enforcement, the City provides an expanded Education and Community

Partnerships Program to inform the community about pesticide restrictions and to promote natural gardening and pest solutions. This includes a series of natural gardening workshops, a phone line to help residents learn proper plant care and sustainable pest solutions, and information sheets available through the City’s website. In 2016, the list of permitted pesticides that serve as safer alternatives to conventional pesticides were reviewed and updated within Bylaw No. 8514.

Table 4 Products Regulated to Protect Stormwater Runoff Quality

Regulated Products	Type of Regulation (Sales Ban, Use Ban, Permit, Limited Users, etc.)	Additional Information (Referenced Bylaw & Policy Numbers)
Pesticide	Limited users	Pesticide Use Control Bylaw No. 8514 – Amendment Bylaw 9574.

Action 1.1.17 – Continue outreach plans to support liquid waste source control programs (Ongoing).

Narrative 3: Summarize 2017-2018 updates to outreach plans for supporting liquid waste source control programs (e.g. stormwater, sewer use, sewer maintenance, l&l management, cross connections etc.).

Green Cart Program

Richmond residents have access to food scraps recycling services with the Green Cart Program since 2013. The Green Cart Program reduces the amount of waste that would otherwise be discharged to the sanitary sewer through garburators. Through the Green Cart program, 20,500 tonnes of food scraps and yard trimmings were collected in 2018. To facilitate grease reduction in the sanitary system, Richmond conducts the following activities:

- Provide Green Cart Program literature, which includes information on the impact of grease on the sewer system as well as proper grease disposal techniques, noting that small amounts of grease and oil that can be absorbed by newspaper or paper towel should be recycled in the Green Cart.
- Cooking oil and animal fat continue to be accepted at the City’s Recycling Depot.
- Promote proper disposal of cooking oil and grease through the annual collection calendar/recycling guide, Green Cart brochure, annual report and community outreach which includes recycling workshops , booths at community events and recycling information sessions in multi-family buildings.
- Discourage the use of garburators as part of the Green Cart Program.

- Carry out the Green Cart and Recycling Depot programs, which allow residents to recycle food scraps and solid grease. Signage at the depot for oil and grease recycling simplifies the drop off process for residents.

Metro Vancouver Waste Water Discharge Permit Process

The City continues to participate in the Metro Vancouver sanitary sewer source control program by supporting the Metro Vancouver Waste Water Discharge Permit process.

Fat, Oil and Grease Reduction Programs

The City maintains a Grease Management Program which includes grease source control, sanitary sewer system monitoring and inspection, an on-going maintenance work. Bylaw enforcement staff continued to work with representatives from Metro Vancouver, stakeholder groups, industry associations, pumping operators and grease trap vendors to mitigate the impact of fats, oils and grease on the region's sanitary sewer system. In 2017, the City expanded its grease management enforcement program to include a full time grease inspector. The following additional services have been introduced through this expanded program:

- **Improved Education and Assistance:** The bylaw officer's services have been expanded to include assisting food establishment owners by providing the necessary tools and information to enable them to meet the requirements of the City's Bylaw No. 7551. This has resulted in a decrease in grease-related violations to the bylaw.
- **Increased Inspection Efforts:** In 2017 and 2018, assertive enforcement efforts involved 2181 Grease Inspections and 71 violations.
- **Integrated Inspection and Outreach Program:** The grease inspection program has been enhanced to become integrated with the sanitary sewer maintenance program to collaboratively trace the source of significant grease discharge within the City. The integrated approach to target problem areas has increased the effectiveness of sanitary maintenance and inspection efforts. Previous efforts have been largely focused on food sector establishments. The stronger coordination with Public Works has facilitated identification of grease issues in residential areas.

Rainwater Best Management Practices

Richmond's Official Community Plan Bylaw No. 9000 – Schedule 1, Section 14.2.10, Development Permit Guidelines – Green Buildings and Sustainable Infrastructure, provides general direction in regards to the voluntary undertaking, where feasible, of green building and sustainable infrastructure to support City of Richmond sustainability objectives and help reduce the demand for energy and resources. Developers are encouraged to incorporate green roofs, bio-swales, infiltration and other best management practices throughout the building site to store rainwater, mitigate urban heat island effect, reduce heating and cooling loads and reduce the impact on City drainage systems.

Richmond's Integrated Rainwater Resource Management Strategy contains initiatives to strategically implement stormwater detention and rainwater re-use measures and encourage stormwater detention on private properties in order to reduce stormwater runoff. In addition, the strategy works to strengthen erosion and sediment control and encourage water quality improvements.

Richmond's Ecological Network Management Strategy (ENMS) was adopted in 2014 and provides the ecological blueprint for the City to protect, connect and enhance the natural and green spaces throughout Richmond and beyond.

It is an opportunistic approach for managing and guiding decisions regarding the city-wide system of natural areas and the ecosystem services they provide. It is designed to complement existing development processes and regulations in order to integrate ecological connectivity and health into all neighbourhoods and land-uses. The ENMS contains extensive actions and initiatives on the integration of rainwater management Best Management Practices tailored to various land uses within the city. These include green infrastructure (e.g. rain gardens, swales, harvesting) development in parks and through planning processes, riparian corridor enhancements, and the review and update of bylaws.

In November 2018, the City hosted a Mitchell Island Environmental Management Collaboration Meeting. The purpose of the meeting was to define strategies to deal with the prevention of pollution on Mitchell Island. Storm water health was a primary topic of the meeting and provincial, regional, and city regulators were present.

Rain Barrel Program

The City offers rain barrels to Richmond residents at subsidized prices.

Low-Flow Toilet Rebate Program

The City offers a \$100 rebate to residents for replacing old toilets with new low-flush toilets to reduce waste volume through water conservation.

High-Efficiency Clothes Washer Rebate Program

The City partnered with BC Hydro to offer a maximum \$100 rebate to residents for replacing old clothes washers with new energy- and water- efficient models, in order to reduce GHGs through energy conservation as well as waste volume through water conservation.

Water Meter Programs

The City maintains an advanced water metering program to encourage water conservation. All commercial and industrial water use is metered. The Universal Water Metering program for all single-family properties was completed by the end of 2017. The City continues to maintain a volunteer water metering program for multi-family properties that includes mandatory metering of new multi-family complexes, subsidizing installation costs for existing multi-family complexes (up to the greater of \$1,200 per unit or \$100,000 per complex for the actual installation cost), and a five-year guarantee that allows residents to adjust water use habits without financial risk. Currently 46% of the multi-family units in Richmond have been metered for water and approximately 94% of metered multi-family complexes saved money compared to the flat rate.

Water metering provides customers increased rate equity compared to the flat rate and a tool to manage their costs while consumption monitoring allows staff to identify leaks and system inefficiencies to minimize wastage. Since 2003, the City has managed to reduce total water consumption despite an 18% population increase. By reducing water consumption, the City achieved a cost reduction of over \$9M in Metro Vancouver water purchase costs in 2017 alone. This is a strong indication that water conservation efforts to date are have been effective in reducing water use and sewerage discharge correspondingly to minimize capital replacement needs.

The City continues to leverage its water meter infrastructure to further enhance customer service and water conservation strategies by deploying a fixed based network. This advanced metering infrastructure will provide staff with real-time consumption data that can help customers identify leaks, inform water consumption habits, and enhance revenue forecasting.

Action 1.1.18 – Develop and implement inflow and infiltration management plans, using the Metro Vancouver template as a guide, to ensure wet weather inflow and infiltration volumes are within Metro Vancouver’s allowances as measured at Metro Vancouver’s flow metering stations (2012).

Narrative 4: Summarize I&I management plans & list key actions resulting from plans in 2017-2018. If no work was initiated or undertaken for 2017-2018, then indicate “Same as the 2015-2016 reporting period: no changes”.

Richmond monitors I&I at the catchment level through pump runtimes at sanitary pump stations. Detailed pump runtimes are captured in data loggers that are manually downloaded to spreadsheets and subsequently converted to sanitary flow rates.

Richmond has installed pressure sensors at sanitary pump stations in order to improve the accuracy of pump runtime analysis. Utilizing pressure information and pump curves will improve the accuracy of the flow information generated by the City’s monitoring program. In addition, the City continues to install magnetic flow meters at new sanitary pump stations. Automated pump runtime data collection has also been set up through the SCADA network, and the City is moving towards utilizing FlowWorks to further analyze the data collected.

Catchment level data is being utilized to identify catchments with excessive I&I for further study. This study will include a review of sanitary system response to rainfall events in order to determine the relative levels of I&I. This information will be subsequently utilized to identify appropriate inspection techniques for further catchment review.

Richmond began CCTV inspections of its gravity sanitary sewers in 2002. By 2015, CCTV inspections have been completed for 100% of Richmond’s gravity sewers. A dynamic GIS layer was introduced in 2018 linking CCTV inspection videos to the asset management system enhancing access and documentation of inspection results and asset condition assessments.

Attachment 1:

- a) I&I Mapping showing I&I rates for neighbourhoods where studies have been completed with before and after I&I (L/ha-d). Objectives to Illustrates catchment areas covered by I&I studies.*
- b) Transmit an electronic copy of GIS shape files for study catchment boundaries to Metro Vancouver.*

Action 1.1.19 – Enhance enforcement of sewer use bylaw prohibition against the unauthorized discharge of rainwater and groundwater to sanitary sewers (2010).

Narrative 5: Summarize enforcement enhancements and process effort changes during 2017-2018. If no changes, then enter “Same as the 2015-2016 reporting period: no changes”.

Same as the 2015-2016 reporting period: no changes.

Table 5 Bylaws Regulating Discharges of Groundwater and Rainwater to Sanitary Sewers

Regulation or Bylaw No.	Date	Summary of Any Changes 2017-2018*
Drainage, Dyke and Sanitary Sewer System Bylaw No. 7551	Effective Date –	In 2017, the bylaw was amended to explicitly prohibit the discharge of groundwater into the City’s drainage system.

	January 1, 2003	
Pollution Prevention and Clean-Up Bylaw No. 8475	Effective Date- October 13, 2009	Amended to update the discharge criteria and include a permit fee. Funds generated are allocated to field monitoring and verification of discharge compliance. The bylaw was further strengthened to allow greater ability for the City to recover remediation costs in the event of a pollution event.

*if no changes, enter "no changes" in table.

Action 1.1.20 – Update municipal bylaws to require on-site rainwater management sufficient to meet criteria established in municipal integrated stormwater plans or baseline region-wide criteria (2014).

Narrative 6: Highlight and summarize any bylaw changes or development effort relating to stormwater management for 2017-2018. If no changes, indicate "Same as the 2015-2016 reporting period: no changes".

The region wide baseline has been approved by the Board for use by Municipalities and ISMP's should be in implementation phase. Please list below the bylaws requiring on-site stormwater management per this action.

Bylaw provisions have been strengthened to allow greater ability to recover remediation costs in the event of a pollution event.

Table 6 Bylaws Related to On-site Stormwater Management

Related Stormwater Bylaws	Changes to On-Site Stormwater Management Target/Objectives (2017-2018)*
Green Roofs & Other Options Involving Industrial & Office Buildings Outside the City Centre Bylaw No. 8385	No changes
Official Community Plan Bylaw No. 9000	No changes regarding on-site stormwater management
Pollution Prevention and Clean-Up Bylaw No. 8475	Amended to include a non-stormwater discharge permit fee. Funds generated are allocated to field monitoring and verification of discharge compliance. Additionally, the bylaw was strengthened to allow greater ability to recover remediation costs in the event of a pollution event.

*if no changes, enter "no changes" in table.

Action 1.1.21 – Update municipal utility design standards and neighbourhood design guidelines to enable and encourage on-site rainwater management (2014).

Narrative 7: Highlight and summarize changes for 2017-2018 to utility design standards and neighbourhood design guidelines in relation to on-site rainwater management. If no changes were made or processes initiated, then indicate "Same as the 2015-2016 reporting period: no changes".

- In 2017 at the Garden City Lands a pond was constructed to serve both as irrigation storage for farm fields within the lands and stormwater detention. Several other water storage bodies are planned for future phases. Additionally, the Bog located on the eastern half of the site serves both as a site for restoration of sensitive ecological habitat as well as a large stormwater detention measure.
- The City has updated Bulletin Information-23 to include specific information for development adjacent to RMA’s for multifamily residential, commercial and industrial development. A new standalone Bulletin Information-44 has been developed to inform single family residential development adjacent to the RMA.
- Since 2005 the City’s Rain Barrel Program invites Richmond residents to purchase rain barrels at a subsidized rate. Rain barrels are used by residents to collect and store water for outdoor usage such as watering gardens and washing vehicles.
- The iRRMS sampling program for water quality parameters was implemented in 2018. Nine pump stations sample locations were selected to be representative of the majority of Richmond storm water discharge flow volume. To date five samples were collected within 30 days in both the wet and dry seasons and analyzed for general water quality parameters, bacteria (fecal coliform and E.coli) nutrients (nitrate) and select metals. Analytical results are expected by early 2019.

The City’s drainage system is designed to accommodate a 10-year return period rainfall event. In recent years, there has been an increase in the occurrences and intensities of significant storms, with multiple storms exceeding a 10-year return period intensity in a given year. Staff analysis of recent storms events and recent trends has led to an update of the Intensity Duration Frequency design standards for drainage systems within Richmond. These updated standards will provide Richmond with more robust infrastructure to meet future needs.

Table 7 Municipal Standards, Guidelines and Policy Changes Related to On-site Stormwater Management

Name of Standard, Guideline or Policy	Changes for 2017-2018
City of Richmond Engineering Design Specifications	No changes with respect to rainwater management.
City of Richmond Integrated Rainwater Resource Management Strategy	Endorsed by Council for implementation (2018).
City of Richmond Ecological Network Management Strategy	No changes with respect to rainwater management.

**If identified unchanged since 2015-2017, briefly summarize any changes 2015-2017 (if no changes, enter “No changes”). Otherwise, briefly summarize if a new bylaw.*

Action 1.2.5 – Work with Metro Vancouver to develop and implement municipal-regional sanitary overflow management plans as set out in 1.2.4 (2013).

Narrative 8: Summarize development of any municipal sanitary overflow management plans for 2017-2018. Highlight any specific examples. If no new plans developed, then indicate “Same as the 2015-2016 reporting period: no changes”.

Action 1.2.6 – Burnaby, New Westminster and Vancouver will work with Metro Vancouver to give effect to 1.2.2 and, specifically, implement plans to prevent combined sewer overflows by 2050 for the Vancouver Sewerage Area and 2075 for the Fraser Sewerage Area and separate combined sewers at an average rate of 1% and 1.5% of the system per year in the Vancouver Sewerage Area and Fraser Sewerage Area respectively (Ongoing).

Narrative 9: Highlight and summarize progress on the prevention of CSOs and the separation of combined sewers for 2017-2018.

Not applicable as there are no combined sewers in Richmond.

Attachment 2:

- a) *Mapping showing where sewer separation work occurred in 2017-2018*
- b) *GIS shape files of the locations where sewer separation occurred in 2017-2018 for composite mapping*
- c) *GIS shape files of catchments of remaining combined sewer catchments as of December 31, 2015 (if separated catchments discharge to combined sewers, code the separated catchments as “separated”).*

N/A

Action 1.3.11 – Develop and implement operational plans for municipal sewerage facilities to ensure infrastructure reliability and optimal performance (Ongoing).

Narrative 10: Discuss approaches and strategies applied in 2017-2018 that address risks (i.e. regular maintenance, SCADA, monitoring, protocols, identified redundancies/contingencies). If these are the same as the previous reporting period 2015-2016, then indicate “Same as the 2015-2016 reporting period: no changes”, or if only minor changes, enter appropriate text similar to “Same as the 2015-2016 reporting period except for...”

Same as the 2015-2016 reporting period except the City has initiated pilot projects for grease management within the sanitary system that facilitates the removal or breakdown of grease buildup in pump station wet wells. The projects are currently underway and results are expected in 2019 for review.

Action 1.3.12 – Work with Metro Vancouver 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*).

Narrative 8: Identify any emergency procedures & protocols developed for 2017-2018. If these are the same as the previous reporting period 2015-2016, then indicate “Same as the 2015-2016 reporting period: no changes”, or if only minor changes, enter appropriate text similar to “Same as the 2015-2016 reporting period except for...”

Richmond’s municipal sanitary system did not experience any sanitary sewer overflows during the reporting period. Richmond does not have any combined sewer systems. Richmond does not have chronic sanitary sewer overflow issues due to weather or rainfall. There have been no changes to the emergency management plan, procedures, and protocols outlined for the 2017-2018 reporting period.

Attachment 3:

Map and GIS data showing location of emergency municipal overflows (this information should have already been provided through a separate request through the REAC LWSC as well as the 2015-2016 reporting). If already provided, please indicated so.

Action 1.3.13 – Work with private marina operators, Ministry of Environment and Environment Canada to develop and implement regulations to ensure all new marinas and marinas where planned renovations exceed 50% of the assessed existing improvements value have pleasure craft pump-out facilities (*Ongoing*).

Table 8 Bylaws and Regulations Requiring Pleasure Craft Pump-out Facilities at Marinas

Regulation Process or Bylaw*	Date*
Public Health Protection Bylaw No. 6989, Subdivision Two – Marina Health and Safety Regulation	Effective Date – March 13, 2000

* This may be repeated from the 2015-2016 reporting period

Action 1.3.14 – Require all pleasure craft pump-out facilities to connect to a municipal sanitary sewerage system or a provincially permitted on-site treatment and disposal system or have established enforceable protocols for transporting liquid waste for disposal at a permitted liquid waste management facility (*Ongoing*).

Narrative 11: Describe any additional regulations and the number of on-site treatment systems required/installed during the reporting period 2016-2017. If these are the same as the previous reporting period 2015-2016, then indicate “Same as the 2015-2016 reporting period: no changes”.

Same as the 2017-2018 reporting period: no changes.

Action 1.3.15 – Continue existing municipal odour control programs and implement new programs for targeted municipal sewer facilities (*Ongoing, see Action 3.3.4*).

Narrative 12: Summarize existing municipal odour control programs and the implementation of new programs for targeted municipal sewer facilities for the reporting period 2017-2018. If these are the same as the previous reporting period 2015-2016 then indicate “Same as the 2015-2016 reporting period: no changes”, or if only minor changes, enter appropriate text similar to “Same as the 2015-2016 reporting period except for...”

Same as the 2015-2016 reporting period: no changes – odour complaints have been investigated by City operation crews to confirm that sources of odour are not attributed to malfunctioning sewer systems. Odour complaints have been identified to be largely caused by agriculture, soils and rotting vegetation near dikes and tidal areas and are typically unrelated to the sanitary system.

Following the odour issues related to Harvest Power, the City took a lead role in coordinating residents, businesses, Metro Vancouver and the Province in addressing the matter. One of the outcomes resulted in the City writing to the Province and Metro Vancouver to request that measurable odour limits be included in the Provincial Environmental Management Act and Organic Matter Recycling Regulation and in the Metro Vancouver Air Quality Management Bylaw in order to manage these issues in the future. Metro Vancouver and the Province have not added odour measurement to their regulations. In 2019 the City will pursue this matter further with Metro Vancouver and the Province so that odours can be measured and regulated.

Attachment 4:

- a) *2017-2018 map showing odour control facilities & locations of complaints (different than facility)*
- b) *GIS shape files for the odour facility and complaint mapping to allow for development of composite mapping*

Action 1.3.16 – Develop and implement air emissions management programs for standby power generators at municipal sewer pump stations (*2016*).

Narrative 13: Summarize air emissions management programs for standby power generators at municipal sewer pump stations. If these are the same as the previous reporting period 2015-2016, then indicate “Same as the 2015-2016 reporting period: no changes”, or if only minor changes, enter appropriate text similar to “Same as the 2015-2016 reporting period except for...” This action should be complete by now.

Notes: *Metro Vancouver has developed “Specifications for New Diesel Powered Vehicles & Equipment” as part of its green procurement process (details were shared with the REAC-LWS at an earlier meeting and are available from MV).*

Same as the 2015-2016 reporting period except for all new generators procured by the City must meet tier 4 emission standards per Metro Vancouver specifications.

Action 1.3.17 – Develop and implement programs to reduce greenhouse gas emissions from municipal liquid waste management systems to help achieve federal, provincial and municipal greenhouse gas targets (Ongoing, see Action 3.1.5).

Narrative 14: Summarize air emissions management programs for standby power generators at municipal sewer pump stations. If these are the same as the previous reporting period 2015-2016, then indicate “Same as the 2015-2016 reporting period: no changes”, or if only minor changes, enter appropriate text similar to “Same as the 2015-2016 reporting period except for...”

Richmond’s 2041 OCP includes targets to reduce the community’s energy use by 10 per cent by 2020, and to reduce community greenhouse gas (GHG) emissions by 33 per cent by 2020 and 80 per cent by 2050. In January 2014, City Council approved Richmond’s Community Energy and Emissions Plan (CEEP). The CEEP includes:

- Strategy 9: Continue Advancement of Neighbourhood District Energy Systems;
- Strategy 10: Utilize Local Energy Sources; and
- Strategy 11: Maximize Use of Waste, including liquid waste.

Richmond is continuing to work with Metro Vancouver to implement a sewer heat recovery system on the Gilbert Trunk Sewer as part of the Oval Village District Energy Utility (formerly the River Green District Energy Utility). During the reporting period, Lulu Island Energy Company Inc. (LIEC), a City-owned corporation that manages district energy initiatives, in partnership with Corix Utilities Inc. continue to provide thermal energy services to developments with the Oval Village service area. To date, 1,892,024 ft² (175,775 m²) of residential floor space is connected to the system, with an estimated 6,391,517 ft² (593,792 m²) at full build out. The implementation of the sewer heat recovery energy source for this project is targeted for 2024. At full build-out, this project will result in an estimated annual reduction of 8,900 tonnes of CO₂e GHG emissions.

The City has also completed a project to identify potential locations within the municipality’s own sanitary sewer system for the cost-effective implementation of smaller-scale energy recovery facilities. Such “micro” sewer heat recovery plants could provide heating and/or cooling for a smaller-scale stand-alone developments, or act as an ancillary heating input to the City’s large District Energy networks.

Richmond continues to secure commitments from new developments in the City Centre Area to be “District Energy Ready” as part of rezoning and development permitting, while also completing the planning and due diligence process for the development of a City Centre district energy system. As part of the due diligence process, several scenarios which utilize liquid waste as an energy source are being analyzed. These initiatives are all part of a medium- to long-term strategy to develop district energy utilities in the City Centre.

Action 3.1.6 – Assess the performance and condition of municipal sewerage systems by: (a) inspecting municipal sanitary sewers on a twenty year cycle, (b) maintaining current maps of sewerage inspection, condition and repairs, and (c) using the Metro Vancouver “Sewer Condition Report, November 2002” as a guide to ensure a consistent approach to sewer system evaluation and reporting (Ongoing).

Narrative 15: Summarize key progress on the assessment and condition of municipal sewerage system for 2017-2018. If these are no changes since the previous reporting period 2015-2016, then indicate “Same as the 2015-2016 reporting period: no changes”.

Attachment 5:

- a) *A map showing sewerage system CCTV inspection for 2016-2017 and the other areas of CCTV inspection work in a different colour over the previous 18 years (1994-2012).*
- b) *A map showing any sewer replacement /rehabilitation work for 2017-2018 as part of either asset management or capacity upgrades. Indicate whether the work is for upgrades or maintenance.*

Action 3.1.8 – Develop and implement asset management plans targeting a 100 year replacement of rehabilitation cycle for municipal sewerage infrastructure and provide copies of such plans to Metro Vancouver (2014).

Narrative 16: Summarize key progress or accomplishments on the development of asset management plans for municipal sewerage infrastructure for 2017-2018.

Richmond has an ongoing Ageing Infrastructure Replacement Program with dedicated funding from the Sanitary Sewer Utility that maintains the sanitary system in an appropriate operating condition. Staff report to City Council bi-annually on the status of the program, including current infrastructure status, long-term funding requirements and funding gaps if they exist. The 2017 program update identified a long-term, sustainable capital requirement of \$6.8M and a current annual budget of \$5.3M. City Council and staff have made significant progress in closing the funding gap and will continue to close the gap in subsequent utility rate setting cycles. The sanitary system is relatively young and the bulk of replacement funding is predicted to be required between 2041 and 2061. As such, the incremental approach to closing the funding gap is appropriate for the City of Richmond.

Attachment 6:

- a) *Titles of any completed asset [replacement] management plans (author, date, title, and publisher) for 2017-2018.*

John Irving, P.Eng. MPA, June 23, 2017, Ageing Utilities Infrastructure Planning – 2017 Update, CoR (REDMS 5333959)

Corrine Haer, P.Eng., 5-Year Capital Program – Sanitary Capital Program, CoR (REDMS 5843820)

Eric Sparolin, P.Eng., Jan Engineering & Public Works – Monthly Construction Update to Mayor and Council, CoR (REDMS 5283388)

- b) *Completed annual PSAP 3150 reporting on asset values for 2017-2018.*

2017 Annual Report: <https://www.richmond.ca/cityhall/finance/reporting/reports.htm>

More information on Richmond's non-financial assets is available at:

<https://www2.gov.bc.ca/gov/content/governments/local-governments/facts-framework/statistics/statistics>

- c) Colour coded map showing age of the sewerage system (i.e.: <1900, 1901-1925, 1926-1950, 1951-1975, 1976-2000, >2001) updated to show any changes made in 2017-2018. If no changes, please indicate so and the mapping prepared for the 2015-2017 reporting period will be used.

Action 3.2.4 – Undertake a tri-annual internal audit of best practices of one municipal liquid waste management sub-program in each municipality to identify opportunities for innovation and improvements (Triennially).

Narrative 17: Summarize key findings from the tri-annual internal audit (first due for 2013, the next in 2016).

Ageing Infrastructure Planning Program

In 2017, Richmond conducted an update of the Ageing Infrastructure Planning Program, which included reconciling current inventory, reviewing the evolving theory on infrastructure service life, and updating infrastructure replacement pricing.

This audit identified the following key findings:

- Infrastructure replacement costs continue to increase due to inflation, environmental requirements and sanitary pump station complexity.
- Development facilitates significant infrastructure replacement, having a positive impact on the City's overall ageing infrastructure picture. However, development is subject to external factors, such as the economy, and does not always coincide with infrastructure that is beyond its useful life. Therefore, development is not considered a sustainable resource for ageing infrastructure replacement.
- The long-term, sustainable capital requirement is \$6.8M for the sanitary utility. The current budget is \$5.3M. Closing the funding gap is achievable within the next decade or sooner through the annual budgeting process.

Action 3.3.6 – In collaboration with Metro Vancouver, estimate and document the greenhouse gas emissions and odours associated with the operation of the municipal and regional liquid waste management systems (2014).

Narrative 18: Summarize the estimate of greenhouse gas emissions associated with the operation of municipal and regional liquid waste management systems. Odour control and mapping are being reported under Action 1.3.15.

The estimated total emission in 2017 due to electricity use at sanitary pump stations and sanitary fleet fuel use for operational tasks is 157.1 tCO₂e.

Action 3.3.7 – Estimate and report on the frequency, location and volume of sewerage overflows from municipal combined and sanitary sewers, and where feasible identify and address the probable causes (Ongoing).

Narrative 19: Summarize and highlight any important details and/or action plans relating to managing wet weather SSOs, CSOs and dry & wet weather SSOs during the period 2017-2018. If no changes since 2015-2016, then indicate "Same as the 2015-2016 reporting period: no changes".

For each CSO location, in a table indicated estimated volumes & number of occurrences (this will have been prepared for EC WSER reporting but is also required by the LWMP).

Same as the 2015-2016 reporting period: no changes.

Attachment 7:

- a) *Provide (if not already provided) GIS shape files which have the locations of the CSO outfalls for purposes of summary mapping (should already be reported under WSER).*
- b) *Provide GIS shape files or coordinates for the locations of wet & dry weather SSOs for each year (indicate which is dry/wet and year). Include SSO dates and estimated volume.*

Action 3.3.8 – Maintain and, if necessary, expand the existing municipal sewer flow and sewer level monitoring network (Ongoing).

Narrative 20: Summarize and highlight any changes to the existing municipal sewer flow & sewer level monitoring network for 2017-2018 (if no changes, then indicate “Same as the 2015-2016 reporting period: no changes”).

Same as the 2015-2016 reporting period: no changes.

Attachment 8:

- a) *Map and GIS coordinates showing locations of active municipal sewer flow/level monitors for the reporting period 2017-2018 (indicate whether permanent or temporary)*

Action 3.4.4 – In collaboration with Metro Vancouver 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 (2015).

Narrative 21: Summarize any progress on the development of emergency management strategies and response plans for municipal & regional wastewater collection and treatment systems.

Note: *This action is being addressed through direction by REAC to REAC LWSC and REAC WSC to undertake in 2015.*

The City maintains an inventory of portable diesel standby power generators on trailers. These generators are intended to provide back-up power for sanitary and drainage pump stations in the event of emergency power failures and is the primary response plan for stations that do not have built-in generators. Built-in backup generators are incorporated into new or upgraded stations constructed within City Centre where possible.

In 2017, the City began investigating resilience systems for sanitary pump stations focused on long duration energy availability comprised of onsite energy generation and storage reducing reliance on diesel generators for back-up power. This project is ongoing and currently in its planning stages.

Action 3.4.5 – Adapt infrastructure and operations to address risks and long-term needs (Ongoing).

Narrative 22: Summarize any key initiatives that support the adaptation of infrastructure & operations to address risks and long term needs (e.g. climate change, sea level rise, seismic risk, demographic growth, etc...). If no change from 2015-2016, then indicate, "Same as the 2015-2016 reporting period: no changes".

Richmond's Flood Protection Management Strategy identifies climate change issues and provides high level guidance on the City's flood mitigation improvements. A key component of the Flood Protection Management Strategy is the Dike Master Plan, which guides the City's dike raising efforts. The plan is being completed in multiple phases, each identifying dike upgrade options and recommendations for different areas throughout the City. These recommendations address long term risks such as climate change-induced sea level rise, higher intensity storms, and spring snow melt. These risks are mitigated by the City's proactive and extensive flood protection efforts.

Action 3.4.6 – Ensure liquid waste infrastructure and services are provided in accordance with the Regional Growth Strategy and coordinated with municipal Official Community Plans (Ongoing).

Attachment 9:

- a) *If not already provided, provide updated GIS shape files of the municipal sanitary sewer network, including manholes, pump stations, pipe diameters for the municipal sewer system as of the end of 2016. Please indicate what changes have been made for 2017-2018.*

NOTE: *This information is part of the routine information provided to Metro Vancouver every two years in response to municipal obligations under the GVS&DD Act. This information will be used to update Metro Vancouver's GIS data base and to create a composite map showing alignment and discrepancies with the RGS.*

Action 3.4.7 – Develop and implement integrated stormwater management plans at the watershed scale that integrate with land use to manage rainwater runoff (2014).

*Narrative 23: Summarize and highlight key initiatives relating to the development and implementation of the integrated stormwater management plans **for each watershed/ISMP area.***

NOTE: *Format and content should be similar to the reporting provided in February 2018 for the Interim Report: for the Integrated Liquid Waste and Resource Management Plan. See: <http://www.metrovancouver.org/services/liquid-waste/LiquidWastePublications/IntegratedLiquidWasteResourceManagementPlanInterimReport2017.pdf>*

The City of Richmond is comprised of a series of islands in the delta of the Fraser River, with the majority of the land mass located on Lulu Island. Lulu Island this characterized by a relatively flat topography with an average elevation of one meter above mean sea level. The island forms a single watershed with carefully engineered drainage catchments that include channelized watercourses, sloughs and ditches that serve drainage, irrigation and habitat functions. In 2018, Richmond's ISMP, the Integrated Rainwater Resource Management Strategy, was endorsed by Council for implementation. Sampling was completed in wet and dry seasons.

- a) GIS shape files showing the ISMP boundaries and their status: Development Phase= Yellow; Implementation Phase = Light Green; Completed Phase = Dark Green. Add ISMPs still to start development as outlined only).

NOTE: The ISMPs will be summarized and mapped similar to the February 2018 Interim Report:

<http://www.metrovancouver.org/services/liquid-waste/LiquidWastePublications/IntegratedLiquidWasteResourceManagementPlanInterimReport2017.pdf>

Action 3.5.8 – Biennially produce a progress report on plan implementation for distribution to the Ministry of the Environment that: (a) summarizes progress from the previous two years on plan implementation for all municipal actions, including the status of the performance measures, (b) includes summaries and budget estimates for proposed LWMP implementation programs for the subsequent two calendar years (July 1st biennially).

List budget estimates for the LWMP implementation programs and subsequent two years beyond biennial report (from 5 yr plan)

Table 9 Summary of LWMP Implementation Budgets and Forecasts

LWMP Implementation Action	Details/Notes	Budget			
		2017	2018	2019*	2020*
Sanitary Sewer Capital Program	Includes pump station replacement, gravity sewer and forcemain replacement, and sanitary rehabilitation works	1.2M	4.9M	0.8M	9.1M
Development Projects (Servicing Agreements)		0.6M	0.2M	Unknown	Unknown

* Subject to council approval

Action 3.5.9 – This reporting is an annual requirement. In the year of the biennial report, this action is covered off by municipal reporting on 3.4.7 & 3.3.7. In other years this addressed through the Interim Report. This municipal reporting is summarized regionally by Metro Vancouver under its Action 3.5.6.

Note: The Interim Report: 2018 was submitted to the Ministry of Environment in February 2018.

Ministerial Condition 2 – Member municipalities are strongly encouraged to business case and/or implement residential water metering programs and to consider municipal rebate programs for water efficient fixtures and appliances to reduce potable water use.

Narrative 24: Discuss initiatives that evaluate/support water metering and rebate programs to water fixtures and appliances

Richmond has comprehensive water meter programs for both residential and commercial properties. All single-family, industrial, commercial, and farm properties in Richmond are metered. In 2017, Richmond completed implementation of universal water metering for all single-family properties. Multi-family complexes can volunteer for water meters, with the City providing a maximum subsidy of \$100,000 per complex. By the end of 2018, 46% of multi-family properties are metered in Richmond.

In 2014, Richmond also introduced a pilot project for Fixed Base Meter Reading that facilitates the continuous reading of meters through radio towers. The program provides real time consumption data which allows staff to better help residents identify causes of leaks and water consumption habits. Deployment of a universal Fixed Base Network is currently underway with a target completion in 2019.

To complement these water meter programs, Richmond provides metered customers with free water conservation kits, which include low flow showerheads, faucet aerators, toilet fill cycle diverters, toilet leak detection tablets, and educational water conservation tools. In addition, Richmond offers a \$100 rebate to residents for replacing old toilets with new low-flush toilets, and subsidized rain barrels to collect and store water for outdoor use. Richmond also partnered with BC Hydro to offer a \$100-200 rebate for high-efficiency clothes washer replacements. At the end of 2018, 7976 toilet rebates, 1727 rain barrels, and 914 clothes washer rebates have been issued to Richmond residents.

Ministerial Condition 3 – Metro Vancouver, in partnership with member municipalities, is encouraged to pursue a region-wide water conservation program targeting the industrial, commercial, institutional and agricultural sectors as part of its new Drinking Water Management Plan. Remaining municipalities in the region that have not implemented metering for these sectors are encouraged to do so.

Narrative 25: Summarize whether any new municipal water metering policies or programs were introduced in 2017-2018 that address this action. If no changes, then indicate, "Same as the 2015-2016 reporting period: no changes".

ICI sector is fully metered, no changes.

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 Storm Water 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.

Narrative 26: Quote relevant OCP sections addressing stormwater, stream health and their consideration of ISMPs.

Given the ISMP deadline requirement, please indicate in as a list any ISMPs not developed by the end of 2018.

Richmond's Integrated Rainwater Resource Management Strategy (IRRMS) addresses Richmond's needs for water quality treatment and monitoring plan. This plan was endorsed by Richmond Council in April 2016. In 2018, the IRRMS sampling program for water quality parameters was implemented. Nine pump stations sample locations were selected to be representative of the majority of Richmond storm water discharge flow volume.

Five samples were collected within 30 days in both the wet and dry seasons and analyzed for general water quality parameters, bacteria (fecal coliform and E.coli) nutrients (nitrate) and select metals. Analytical results are expected by early 2019.

Attachment 11:

- a) *Monitoring results per watershed (as per ISMP Adaptive Management Framework)*

Not available at this time

- b) *If undertaken, a map plus GIS shape files/coordinates showing location of monitoring*

Not available at this time

Ministerial Condition 9 – The ILWRMP 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 a local land use planning consider the direction provided by the ISMPs, (b) Consider how the degree, type and location of 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).

Narrative 27: Please describe any changes to how you have used proactive planning processes as listed in Ministerial Condition 9 for 2017-2018 and provide examples. If there are no changes since 2015-2016, then indicate: "Same as the 2015-2016 reporting period: no changes".

The strategies identified in the IRRMS are consistent with actions identified within the City's Ecological Network Management Strategy (ENMS), adopted by Council in 2014, and submitted in the 2015-2016 reporting period. Through the ENMS the City has identified an interconnected network of natural and semi-natural areas across Richmond's landscape to protect, connect and restore. These natural areas include green infrastructure that provides essential ecosystems services related to stormwater management. Additional Actions under the ENMS related to Ministerial condition 9 in this reporting period include:

- The City's Riparian Management Area (RMA) setbacks for minor (5m) and major (15m) designated streams were formally introduced into the City's Zoning Bylaw 8500 in 2018, meeting the requirements mandated under the Riparian Areas Regulation. The City has bolstered the Watercourse Protection and Crossing Bylaw 8441 to include provisions for further protecting RMA's from non-compliant development activity, while encouraging enhancement of these areas. The City has updated Bulletin Information-23 to include specific information for

development adjacent to RMA's for multifamily residential, commercial and industrial development. A new standalone Bulletin Information-44 has been developed to inform single family residential development adjacent to the RMA.

- In November 2018, the City established the ENMS Working Group to develop cross-departmental approaches to promote the ENMS in daily project work and build tools to track the City's annual progress. The ENMS Working Group includes representatives from eight City departments who will work together throughout 2019 to advance a management approach for the ENMS.
- In November 2018, the City hosted a Mitchell Island Environmental Management Collaboration Meeting. The purpose of the meeting was to define strategies to deal with the regulation of pollution on Mitchell Island. Storm water health was a primary topic of the meeting and provincial, regional, and city regulators were present.
- In December 2018, the City amended the Pollution Prevention Bylaw 8475 to allow for greater ease in cost recovery mechanisms in response to spills to the environment and implement changes to improve the management and field monitoring of permitted non-storm water discharges to the storm system.
- Continue to support and strengthen the pollinator pasture and the Bath Slough Revitalization Initiative as well as initiate pollinator pasture projects on suitable sites throughout the city.
 - Initiated the City's second Pollinator Meadow within Terra Nova Rural Park.
- ENMS 2018 update report
<https://www.richmond.ca/shared/assets/2018enmsupdatereport52187.pdf>

Attachment 12:

- a) *Map showing any 2017-2018 changes to protected riparian areas & possible stream classifications. If no changes, then this figure is not required.*

Municipal Progress Summary Table

The summary table is the same format at pervious Biennial Report. The columns (Dec 2016 + Additions/Changes) should add to equal the Dec 2018 Total.

Table 10 Summary of Municipal Progress 2017-2018

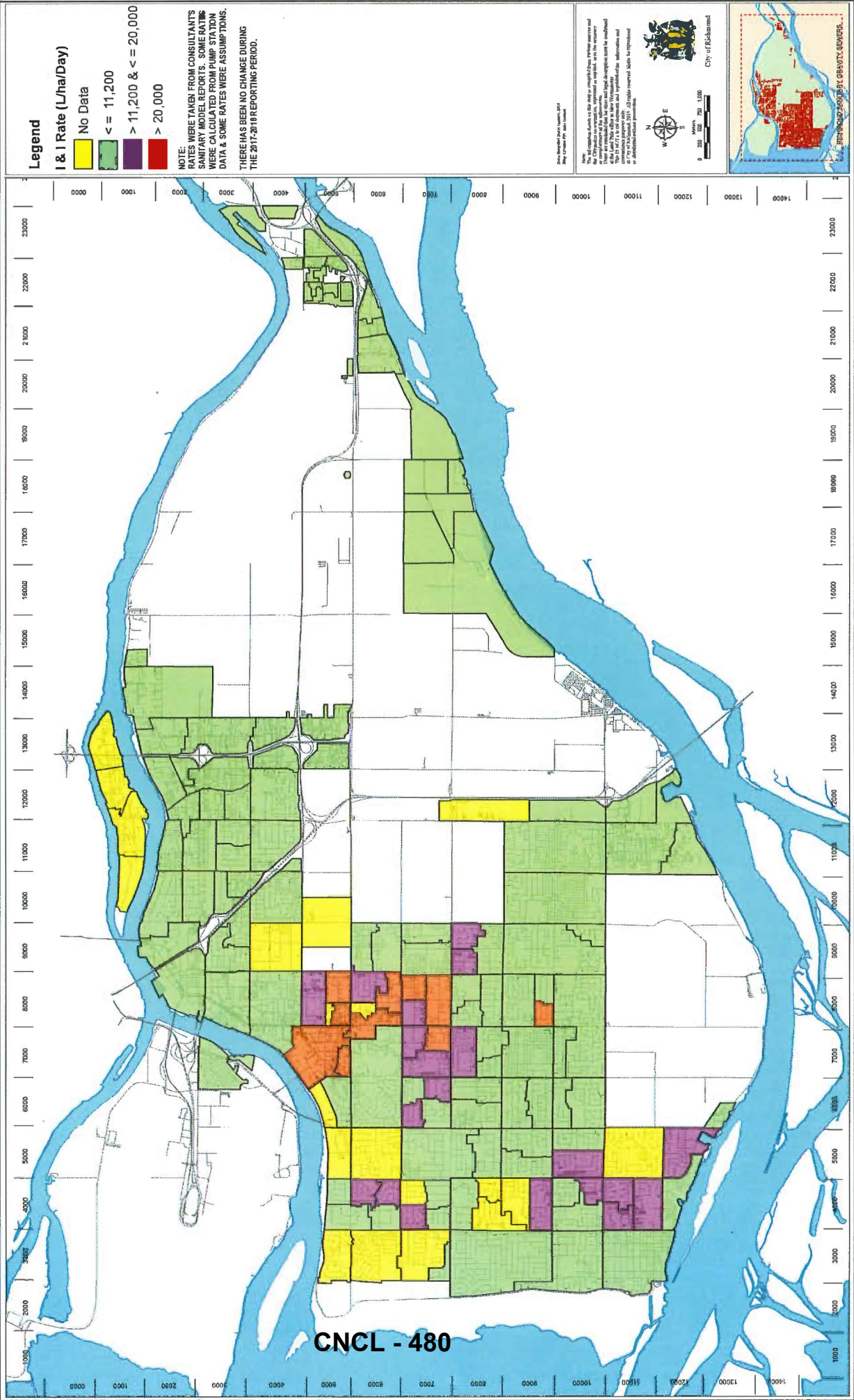
Description	Unit	Total as of Dec 31 st , 2016	Additions & Changes	Total as of Dec 31 st , 2018
1. Municipal Sewer System Inventory				
a. Sanitary Gravity Sewers	m	468,500	800	469,300
b. Sanitary Services (Connections)	ea.	31,565	-36	31,529
c. Sanitary Force mains	m	101,200	0	101,200
2. Combined Sewer System Inventory				
a. Total Combined Sewers	m	n/a	n/a	n/a
b. Combined Services (Connections)	ea.	n/a	n/a	n/a
c. Combined Sewers Separated	m	n/a	n/a	n/a
d. Percentage of total system separated	%	n/a	n/a	n/a
3. Sanitary Sewer System Evaluation Program				
a. Sanitary Sewers Video Inspected	m	435,488	13,399	448,887
b. Percentage of Entire Municipal Sewer System Dye & Smoke Tested	%	0.7%	n/a	0.7%
c. Percentage of Entire Municipal Sewer System Video Inspected	%	100%	0	100%
d. Percentage of Entire Municipal Sewer System Structurally Rated	%	100%	0	100%
4. Sewer System Rehabilitation				
a. Total Length of Sewers Rehabilitated	m	2,584	0	2,584
b. Total Length of Sewers Replaced/Capacity Upgraded	m	14,764	1,361	16,125
c. Total Number of Service Laterals Rehabilitated	ea.	45	5	50
d. Number of Structurally Repaired Manholes/Cleanouts	ea.	2,886	1,416	4,302
e. Number of Cross-Connections Corrected	ea.	11	0	11
5. Sanitary Sewer Overflows				
a. Total Number of Reported Dry Weather SSOs	ea.	0	0	0
b. Total Number of Reported Wet Weather SSOs	ea.	0	0	0
c. Number of Breakdowns from Failures	ea.	136	148**	284

Description	Unit	Total as of Dec 31 st , 2016	Additions & Changes	Total as of Dec 31 st , 2018
6. Greenhouse Gas Emissions				
a. CO ₂ emission reduction from sewer system	kg CO ₂			
7. Summary of Costs		2017	2018	Total
a. Sanitary Sewer Condition Evaluation Program		1.0M	1.05M	2.05M
b. Combined Sewer Separation Program		n/a	n/a	n/a
c. Sewer System Rehabilitation Program		0.45M	0.35M	0.80M
d. CO ₂ Reduction Program		0	0	0
e. ISMP Implementation		0	0	0
f. Total Cost for the Biennial Period		*1.45M	*1.40M	*2.85M

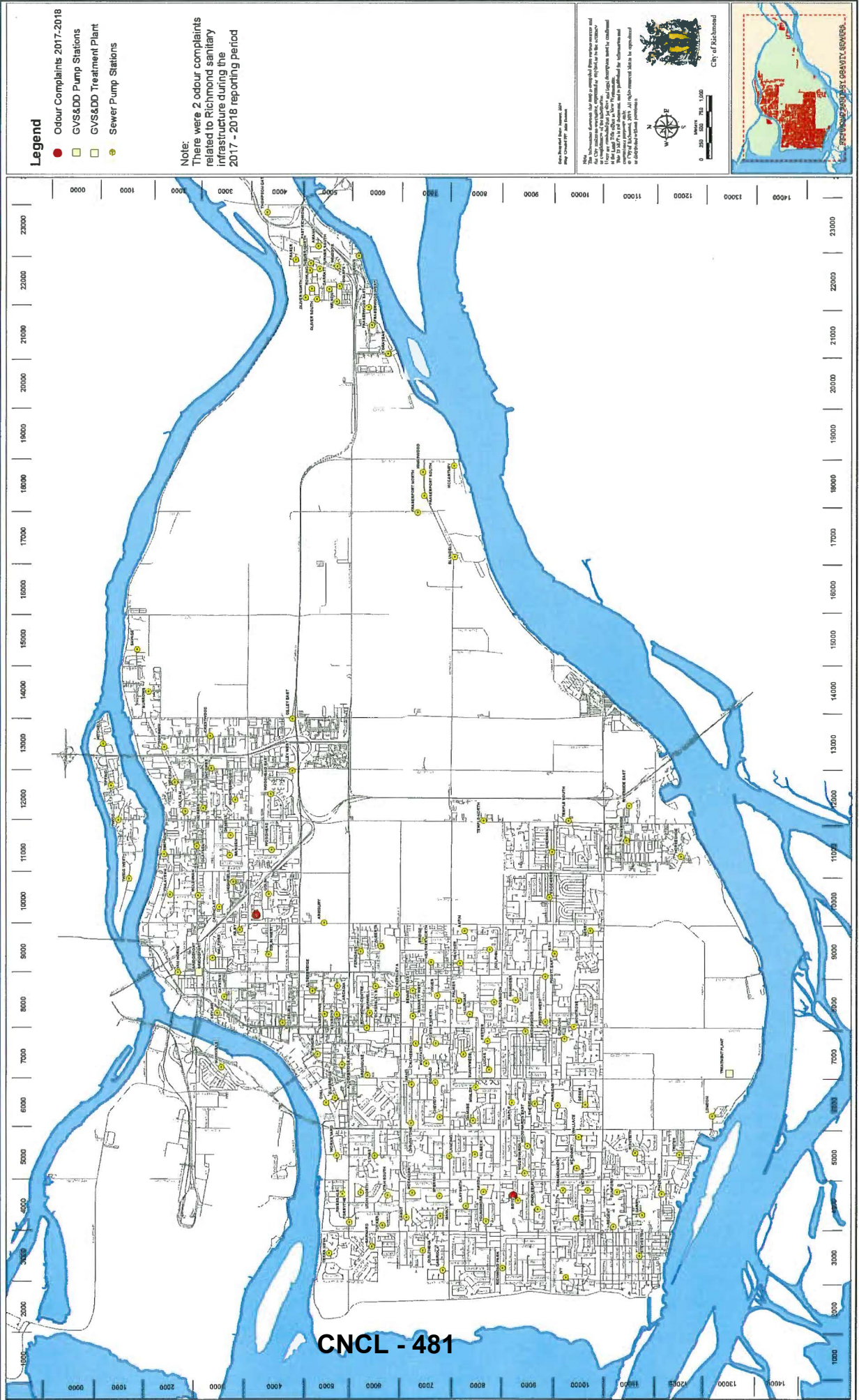
*Cost associated with items listed under 7-a to 7-e only. Capital investments associated with other aspects of sanitary system management are not included.

** Breakdowns include all Mainline, Manhole, & IC Blockages

City of Richmond Modelled Sanitary Catchment I&I Rates - January 2019

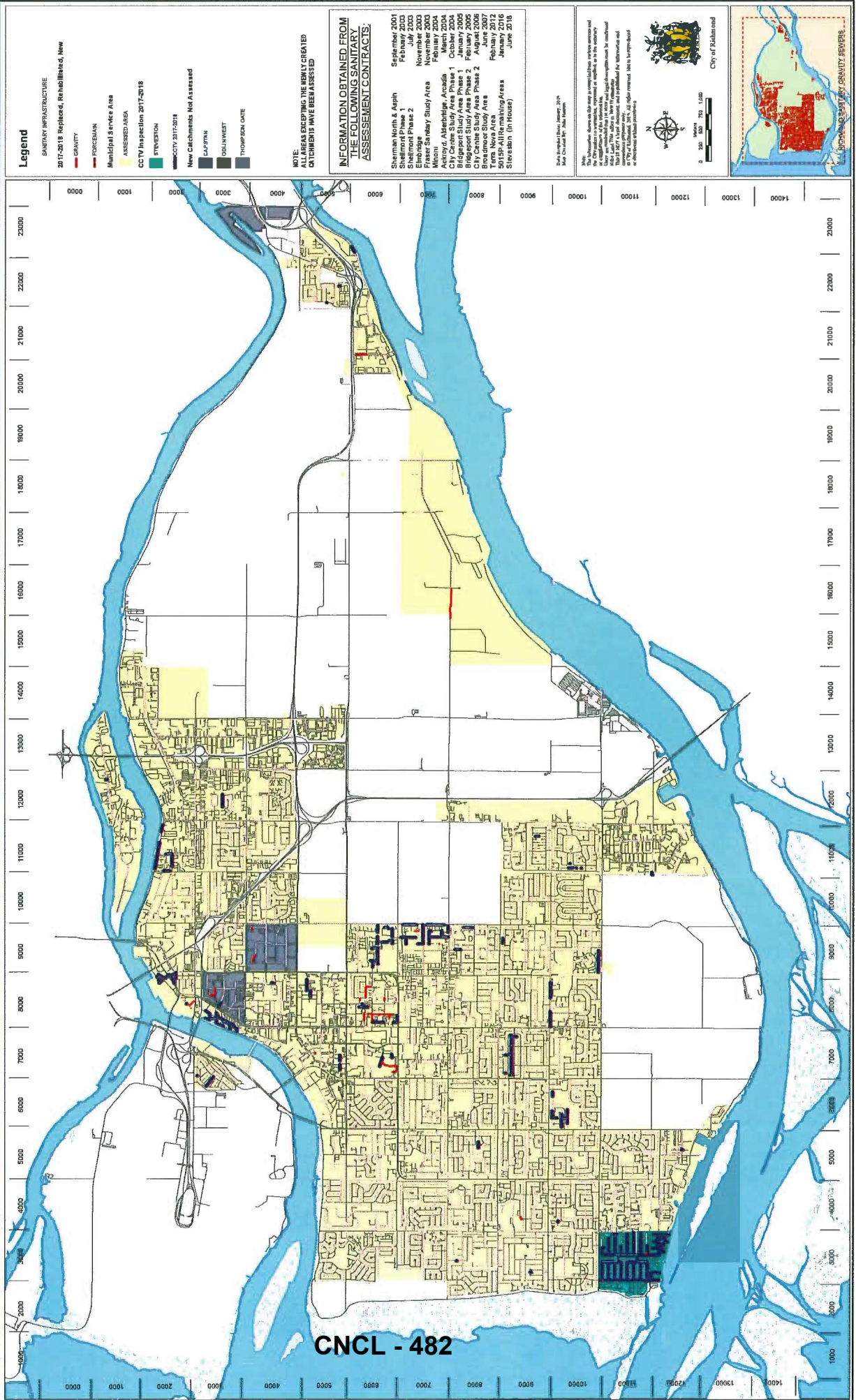


City of Richmond Odour Control Facilities At Sanitary Pump Stations - January 2019



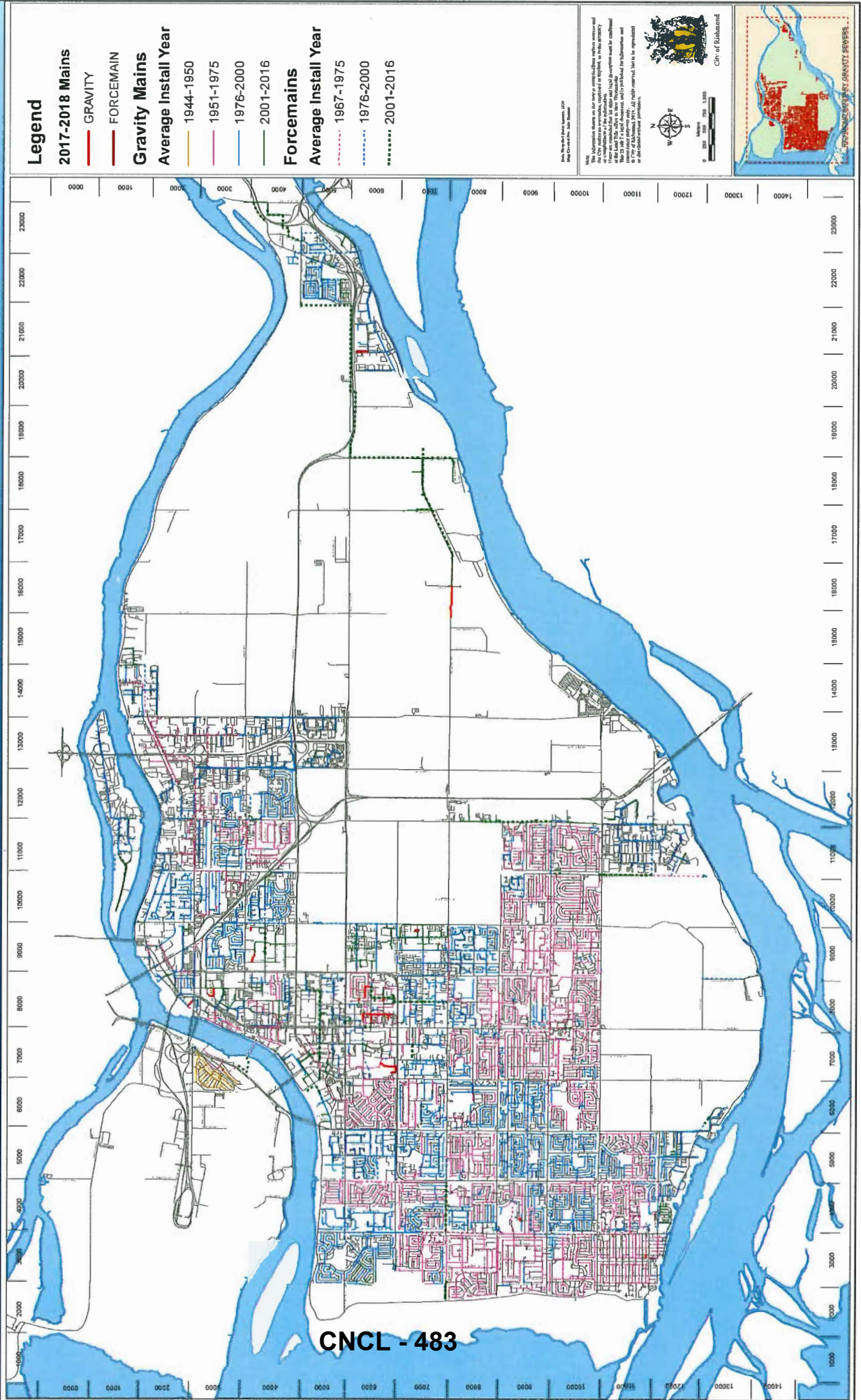
CNCL - 481

City of Richmond Sanitary Sewer Assessment, Replacement & Rehabilitation January 2019



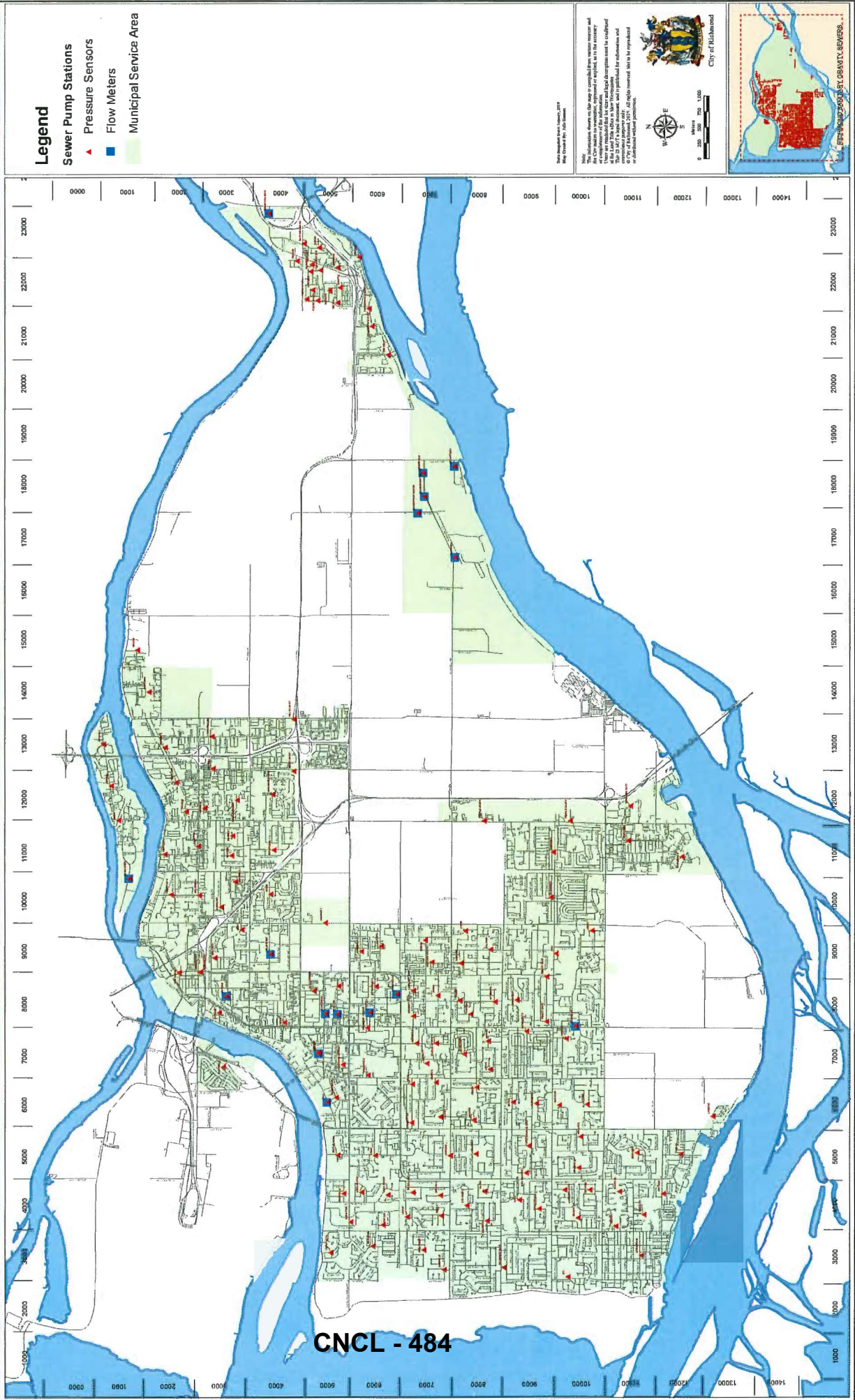
City of Richmond - Sanitary Sewer Assessment, Replacement & Rehabilitation January 2019

City of Richmond Sanitary System Age - January 2019



CNCL - 483

City of Richmond Active Sewer Flow & Level Monitors - January 2019



CNCL - 484

Richmond Integrated Stormwater Management Plan (ISMP) Status Map - January 2019

