City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	February 24, 2017
From:	John Irving, P.Eng. MPA Director, Engineering	**File:**	10-6060-03-01/2017-Vol 01
Re:	**2017 Liquid Waste Management Plan Biennial Report**		

Staff Recommendation

That the the staff report titled "2017 Liquid Waste Management Plan Biennial Report," dated February 24, 2017, from the Director, Engineering be submitted to Metro Vancouver.

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

REPORT CONCURRENCE		
ROUTED TO:	**CONCURRENCE**	**CONCURRENCE OF GENERAL MANAGER**
Sewerage & Drainage	☑	
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 (ILWRMP) 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 ILWRMP, subject to conditions identified in his letter, dated May 30, 2011.

The ILWRMP requires member municipalities to report progress on 27 municipal commitments on a biennial basis. The ILWRMP 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 reviews the City's progress on the ILWRMP municipal actions and presents the 2017 Liquid Waste Management Plan Biennial Report (2017 Biennial Report) (Attachment 1) to Council for information and consideration.

Analysis

The ILWRMP includes a municipal commitment to report progress on a biennial basis. The 2017 Biennial Report covers the 2015 to 2016 reporting period. Richmond has previously submitted six biennial reports over the last 14 years based on reporting requirements in the current and previous Liquid Waste Management Plans.

The 2017 Biennial Report includes 27 narratives, several tables and graphics attachments that report on the 27 municipal commitments included in the ILWRMP. The City is meeting or exceeding all of the requirements of the ILWRMP. The following are highlights of Richmond's 2017 Biennial Report:

Inflow and Infiltration (I&I)

ILWRMP action 1.1.18 requires municipalities to develop and implement I&I management plans that ensure I&I levels are within Metro Vancouver allowances, as measured at Metro Vancouver's flow metering stations.

The City's maximum I&I rate for the 2015-2016 period was 6,600 L/ha/day as measured at the Lulu Island Wastewater Treatment Plant. This level of I&I is significantly below the Metro Vancouver allowance of 11,200 L/ha/day. This is a result of the City's continued efforts in eliminating storm tie-ins to the City's sanitary system to minimize inflows, and a successful sanitary sewer assessment and rehabilitation program to manage infiltration. Metro Vancouver targets to inspect regional sanitary sewers on a twenty year cycle. Richmond began CCTV inspections of its gravity sanitary sewers in 2002. As of 2015, CCTV inspections have been

completed for 100% of Richmond's gravity sewers, seven years ahead of Metro Vancouver's target. 98.3% of mains surveyed in this reporting period were found to be in good condition. Rehabilitation of damaged mains identified is incorporated into the City's five-year capital program.

Staff continue to monitor I&I levels at the City's sanitary pump stations, identifying any catchments that may have higher I&I rates for subsequent study and remediation if required.

Asset Management Plan

ILWRMP 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 has both an Ageing Infrastructure Management Plan and a Growth Related Infrastructure Management Plan. 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

ILWRMP 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 chronic 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, separated sewer systems and low I&I rates.

Stormwater Management Plan

ILWRMP 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, 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. In addition, Richmond's Ecological Network Management Strategy was adopted in 2014 and contains extensive actions and initiatives on the integration of rainwater management Best Management Practices tailored to various land uses within the City.

Water Metering

Ministerial Condition 2 for approval of the ILWRMP 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 has comprehensive water meter programs for both residential and commercial properties. All industrial, commercial, institutional and farm properties in Richmond are metered. The City is universally metering all single-family properties, with a target completion in 2017, and multi-family complexes can volunteer for water meters through a subsidized program. By the end of 2016, 93% of single-family properties and 40% of multi-family properties are metered in Richmond.

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. At the end of 2016, 6,422 toilet rebates, 1307 rain barrels, and 474 clothes washer rebates have been issued to Richmond residents.

Financial Impact

None.

Conclusion

The 2010 ILWRMP includes a municipal commitment to report progress on ILWRMP actions on a biennial basis. The attached 2017 Biennial Report summarizes Richmond's progress on municipal actions for the 2015 to 2016 reporting period. The City of Richmond is meeting or exceeding all of the requirements of the ILWRMP and staff will continue work on municipal actions identified in the ILWRMP.

Lloyd Bie, P.Eng.
Manager, Engineering Planning
(4075)

Beata Ng, P.Eng.
Project Engineer
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LB:bn

Att. 1: City of Richmond 2017 Liquid Waste Management Plan Biennial Report

2017 Liquid Waste Management Plan Biennial Report

Reporting Period: 2015 – 2016

Municipal Submission Section

To be completed by: March 3, 2017

Municipal Contact Information			
Name	**Email**	**Phone**	**Responsible For ILWMP Action #'s**
Lloyd Bie	LBie@Richmond.ca	604-276-4075	
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Kimberley Armour	KArmour@Richmond.ca	604-276-4230	1.1.16, 1.1.17, 3.4.7, Ministerial Condition 9

List of Content

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 greenhouse gas emissions reduction initiatives for municipal liquid waste services.*

☒ 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 & probably 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:

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 2015-2016
- GIS shape files of the locations where sewer separation occurred in 2015-2016 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 2013-2014 reporting). If already provided, please indicated so.

☒ Attachment 4:

- 2015-2016 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 2015-2016 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 2015-2016 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 2015-2016.
- Completed annual PSAP 3150 reporting on asset values for 2015-2016.
- 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 2015-2016 (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 2015-2016.

☒ 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 2015-2016 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*	2015-2016 Changes**
Drainage, Dyke and Sanitary Sewer System Bylaw No. 7551	Updated best management practices regarding the control of fats, oils, and grease discharge from food sector establishments.
Public Health Protection Bylaw No. 6989	No changes
Pollution Prevention and Clean-Up Bylaw No. 8475	No changes

**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*** – limits the release of polluting substance into the receiving environment, and requires that no discharge from dewatering may enter the City's drainage system or watercourse without an agreement with the City. Such agreements require a Qualified Environmental Professional (QEP) to design a treatment system to satisfy water quality guidelines or approval requirements for discharge from a Provincial or Federal Authority. ***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 watercourse 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	**2015-2016 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	Info Bulletin 23 – Riparian Management Areas has been

with the bylaw (e.g. annual resources dedicated to maintaining compliance).	updated for Riparian Area Regulation (RAR) subject sites to guide development pertaining to works in and about a stream.
Discuss effectiveness of bylaw/bylaws and current approach to prevent inputs of sediment to the storm system and receiving environment.	No changes

**For bylaws unchanged since 2013-2014, summarize any changes 2015-2016 (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

N/A

Table 3 Types and Number of Liquid Waste Related Permits Issued 2015-2016

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 2015-2016.

Adopted in 2009, Richmond's Enhanced Pesticide Management Program (EPMP) reduces the exposure of Richmond residents to unnecessary pesticide use. This 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 2015-2016 updates to outreach plans for supporting liquid waste source control programs (e.g. stormwater, sewer use, sewer maintenance, I&I management, cross connections etc.).

Green Cart Program

The Green Cart Program started in 2013, and in 2015, was expanded to residents in multi-family buildings. The added food scraps recycling service was provided to 489 sites, reaching 26,295 residential units. Through this expansion, the City hosted over 400 information sessions to talk about food scraps recycling, providing an alternative to garburator use. Through the Green Cart program, 18,495 tonnes of food scraps and yard trimmings were collected in 2015 and 21,477 tonnes were collected in 2016. This program reduces the amount of waste that would otherwise be discharged to the sanitary sewer through garburators. 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. New 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

Richmond Community Bylaws 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.

The City maintains a Grease Management Program, which included active inspection and enforcement of food sector establishments. In 2015 and 2016, assertive enforcement efforts involved 1129 Grease Inspections and 82 violations resulting in $24,400 in revenue.

Grease education and communication is delivered to residents through utility bill inserts, information pamphlets in English and Chinese, social media, and public events such as the City's Public Works Open House and Metro Vancouver's Lulu Island Wastewater Treatment Plant Halloween event.

In 2016, the City supported Metro Vancouver's "Wipe it, Green Bin it" pilot campaign, an eight-week campaign program in Richmond focused on reducing grease entering the sanitary system from residents and businesses through various outreach activities and the distribution of creative material. The City is measuring grease-build up in four pump stations to assess and monitor the impacts of the campaign. The results of this pilot campaign are intended to assist Metro Vancouver in facilitating a regional campaign to be launched in 2017.

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.

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 $200 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 meters all commercial and industrial properties. Single-family dwellings will be universally metered by 2017, and multi-family complexes are eligible to volunteer for meters. Water metering encourages water conservation which, in turn, reduces waste volume.

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 2015-2016. If no work was initiated or undertaken for 2015-2016, then indicate "Same as the 2013-2014 reporting period: no changes".

Richmond's overall maximum I&I rate for the reporting period is 6,600 L/ha/d, attributed to a two-year 24 hour duration event based on flows recorded at the Lulu Island Wastewater Treatment Plant. This rate is of I&I is significantly below the regional allocation of 11,200L/ha/d.

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. As of 2015, CCTV inspections have been completed for 100% of Richmond's gravity sewers. In the 2015-2016 reporting period, Richmond completed CCTV inspection and condition assessment for the final 22.2 km of sanitary sewer mains within the City's sanitary network. 98.3% of mains surveyed were found in good condition, with only one section of main was found to be fractured and three mains exhibiting signs of infiltration. Rehabilitation of these mains is incorporated into the City's five-year capital program.

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 2015-2016. If no changes, then enter "Same as the 2013-2014 reporting period: no changes".

Same as the 2013-2014 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 2015-2016*
Drainage, Dyke and Sanitary Sewer System Bylaw No. 7551	Effective Date – January 1, 2003	No changes with respect to unauthorized discharge of rainwater and groundwater to sanitary sewers.

**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 2015-2016. If no changes, indicate "Same as the 2013-2014 reporting period: no changes".

Same as the 2013-2014 reporting period: no changes.

Table 6 Bylaws Related to On-site Stormwater Management

Related Stormwater Bylaws	Changes to On-Site Stormwater Management Target/Objectives (2015-2016)*
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	No changes

**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 2015-2016 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 2013-2014 reporting period: no changes".

The City's Integrated Rainwater Resource Management Strategy includes initiatives to enable and encourage on-site rainwater management, including the strategic detention of stormwater, rainwater harvesting and re-use and improved water quality treatment and sediment control.

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

Name of Standard, Guideline or Policy	Changes for 2015-2016
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 public engagement.
City of Richmond Ecological Network Management Strategy	Adopted by Council (2015)

**If identified unchanged since 2013-2014, briefly summarize any changes 2013-2014 (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 2015-2016. Highlight any specific examples. If no new plans developed, then indicate "Same as the 2013-2014 reporting period: no changes".

Same as the 2013-2014 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 2015-2016.

Not applicable as there are no combined sewers in Richmond.

Attachment 2:

a) Mapping showing where sewer separation work occurred in 2015-2016

b) GIS shape files of the locations where sewer separation occurred in 2015-2016 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 2015-2016 that address risks (i.e. regular maintenance, SCADA, monitoring, protocols, identified redundancies/contingencies). If these are the same as the previous reporting period 2013-2014, then indicate "Same as the 2013-2014 reporting period: no changes", or if only minor changes, enter appropriate text similar to "Same as the 2013-2014 reporting period except for..."

In addition to the approaches and strategies outlined for the 2013-2014 reporting period, Richmond has installed temperature sensors at select pump stations and flow meters at all new pump stations better monitor infrastructure performance. Redundancy equipment including backup power generators have been added to inventory, and replacement mobile generators have been acquired.

Furthermore, in 2016, the City introduced a Sanitary Forcemain Valve Installation program aimed at installing line valves on sanitary forcemains to allow isolation and control of forcemains in the event of a break or a need for tie-ins. This allows for a smaller catchment to be impacted by the necessary shut-downs when such work is required, thereby reducing impacts to residential and commercial customers.

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 2015-2016. If these are the same as the previous reporting period 2013-2014, then indicate "Same as the 2013-2014 reporting period: no changes", or if only minor changes, enter appropriate text similar to "Same as the 2013-2014 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, and maintains an overall I&I rate below the regional design allowance. As such, 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 2013-2014 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 2013-2014 reporting). If already provided, please indicated so.

N/A

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 2013-2014 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 2015-2016. If these are the same as the previous reporting period 2013-2014, then indicate "Same as the 2013-2014 reporting period: no changes".

Same as the 2013-2014 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 2015-2016. If these are the same as the previous reporting period 2013-2014, then indicate "Same as the 2013-2014 reporting period: no changes", or if only minor changes, enter appropriate text similar to "Same as the 2013-2014 reporting period except for..."

Same as the 2013-2014 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 caused by Harvest Power, agriculture, and rotting vegetation near dikes and tidal areas and are typically unrelated to the sanitary system.

Attachment 4:

a) 2015-2016 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 2013-2014, then indicate "Same as the 2013-2014 reporting period: no changes", or if only minor changes, enter appropriate text similar to "Same as the 2013-2014 reporting period except for..." This action is not due until 2016.

***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).*

In addition to items described in previous reporting periods, the City is purchasing new portable diesel standby generators with more stringent air emissions management to fully replace existing inventory.

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 greenhouse gas emissions reduction initiatives for municipal liquid waste services. If these are the same as the previous reporting period 2010-2012, then indicate "Same as the 2013-2014 reporting period: no changes", or if only minor changes, enter appropriate text similar to "Same as the 2013-2014 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, 1,413,107 ft² (131,282 m²) of residential floor space is connected to the system, with an estimated 5,522,702 ft² (513,075 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, there will be an estimated 2600 tonnes CO2e GHG emissions reduction.

The City has also begun 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 would provide heating and/or cooling for a smaller-scale stand-alone development, 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. This is 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 2015-2016. If these are no changes since the previous reporting period 2013-2014, then indicate "Same as the 2013-2014 reporting period: no changes".

The City completed CCTV inspections for the remaining 10% of its sanitary sewer gravity system in 2015, with CCTV assessment for the City's sanitary system now 100% complete.

Attachment 5:

a) A map showing sewerage system CCTV inspection for 2015-2016 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 2015-2016 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 2015-2016.

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 2015 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 2015-2016.*

Ageing Infrastructure Planning 2015 Update (John Irving, P.Eng., MPA, June 26, 2015, Ageing Infrastructure Planning, REDMS 4582509)

Engineering & Public Works – Monthly Construction Update to Mayor and Council, (Eric Sparolin, P.Eng., REDMS 5042679)

5-Year Capital Program – Sanitary and Water Capital Program (Jason Ho, P.Eng., REDMS 3247757)

b) *Completed annual PSAP 3150 reporting on asset values for 2015-2016.*

2015 Annual Report: http://www.richmond.ca/cityhall/finance/reporting/reports.htm
More information on Richmond's non-financial assets is available at:
http://www.cscd.gov.bc.ca/lgd/infra/municipal_stats/municipal_stats2015.htm

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 2015-2016. If no changes, please indicate so and the mapping prepared for the 2010-2015 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 2015, Richmond conducted a review 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 2015 due to electricity use at sanitary pump stations and sanitary fleet fuel use for operational tasks is 151.1 tonnes of 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 2015-2016. If no changes since 2013-2014, then indicate "Same as the 2013-2014 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).

Richmond did not have any dry or wet weather SSOs during 2015 and 2016. There are no combined sewers in Richmond.

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).

N/A

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.

N/A

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 2015-2016 (if no changes, then indicate "Same as the 2013-2014 reporting period: no changes").

Richmond maintains wet-well level monitoring sensors and pressure sensors installed at all 153 sanitary pump stations. The City monitors flows through the utilization of pump run times at sanitary pump stations using data loggers as well as pump discharge monitors that provide discharge information. Flow meters are installed at all new pump stations.

In the 2015-2016 reporting period, the City has dedicated $435,000 in capital funding to the improvement of its SCADA system, including the rehabilitation and upgrade of computers, instruments and electrical installations throughout the SCADA network. The program aims to improve system functionality and data processing to improve sanitary system operations. Additional flow monitors and temperature sensors have been added to the sewer level monitoring network.

Attachment 8:

a) Map and GIS coordinates showing locations of active municipal sewer flow/level monitors for the reporting period 2015-2016 (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.*

In addition to the initiatives described in the 2013-2014 reporting period, the City is also maintaining 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.

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 2013-2014, then indicate, "Same as the 2013-2014 reporting period: no changes".

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 Council bi-annually on the status of the program which includes current infrastructure status, long term funding requirements and funding gaps if they exist. The 2015 program identified a long-term sustainable capital requirement of $6.8M and a budget of $5.3M. Richmond has an on-going 5-year sanitary replacement capital program that includes gravity sewers, forcemains and pump station replacements.

The City continues to complete upgrades to its sanitary sewer system based on anticipated demographic growth to meet long-term needs through development requirements and the City's Development Cost Charges (DCC) program. In 2015 and 2016, the City upgraded 557 m of gravity sewers as part of its capital infrastructure program in order to accommodate anticipated demographic growth as identified in the City's 2041 Official Community Plan. In 2016, the City updated its 2016-2041 City-Wide DCC

Capital Programs and City-Wide DCC Rates to better reflect anticipated development activities. Key projects that form part of this program include new sanitary pump stations in the Lansdowne and Hamilton areas, as well as gravity main upgrades in the City Centre area.

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 2015-2016.

***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 January/February 2014 for the Interim Report: 2013 for the Integrated Liquid Waste and Resource Management Plan. See: http://www.metrovancouver.org/about/publications/Publications/2014InterimReport-SSOsISMPs.pdf*

Richmond's ISMP, the Integrated Rainwater Resource Management Strategy (IRRMS), was endorsed by council for public consultation. In 2016, the City has hosted two stakeholder workshops to present and receive feedback on the City's strategy. The IRRMS is a watershed level 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.

The IRRMS is highly integrated with the green infrastructure initiatives identified in Richmond's Ecological Network Management Strategy (ENMS). The ENMS and the IRRMS identifies issues such as water and habitat quality, impervious surfaces, riparian ecology and bank erosion, and provides

comprehensive actions and initiatives to address these issues through green infrastructure enhancement opportunities to increase ecosystem services. A key initiative developed under the ENMS is the Bath Slough Revitalization Initiative which includes the planting of a 2.6 acre pollinator pasture with native plants used not only to enhance native pollinator habitat but to retain stormwater and ameliorate water quality before it reaches Bath Slough. Native planting along the City-owned Railway corridor also retains and filters stormwater run-off, providing important ecosystem services.

Attachment 10:

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 Interim Report 2013: http://www.metrovancouver.org/about/publications/Publications/2014InterimReport-SSOsISMPs.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			
		2015	2016	2017	2018
Sanitary Sewer Capital Program	Includes pump station replacement, gravity sewer and forcemain replacement, and sanitary rehabilitation works	7.6M	5.5M	8.2M	5.6M*
Development Projects (Servicing Agreements)		3.1M	1.0M	*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: 2013 was submitted to the Ministry of Environment in February 2014.*

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 industrial, commercial, and farm properties in Richmond are metered. In 2014, Richmond started implementing universal water metering for all single-family properties, with a target completion in 2017. Multi-family complexes can volunteer for water meters, with the City providing a maximum subsidy of $100,000 per complex. By the end of 2016, 93% of single-family properties and 40% 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. Based on the successes of the trial and the significant benefits and efficiencies, the Fixed Base Network will be deployed universally as part of the City's 2017 capital program.

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 2016, 6422 toilet rebates, 1307 rain barrels, and 474 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 2015-2016 that address this action. If no changes, then indicate, "Same as the 2013-2014 reporting period: no changes".

Same as the 2013-2014 reporting period: 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 2016.

Richmond's Integrated Rainwater Resource Management Strategy (IRRMS) addresses Richmond's needs for water quality treatment and monitoring. Due to Richmond's unique water quality conditions, the Monitoring and Adaptive Management Framework (MAMF) parameters developed by Metro Vancouver do not adequately reflect the effectiveness of Richmond's stormwater management plan. Richmond is utilizing a modified MAMF that is more appropriate for lowland development systems and wetlands such as Richmond. Measurements according to Richmond's IRRMS and modified MAMF will occur in 2017.

Attachment 11:

a) If initiated, 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 2015-2016 and provide examples. If there are no changes since 2013-2014, then indicate: "Same as the 2013-2014 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. 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.

Actions under the ENMS related to Ministerial condition 9 in this reporting period include:

- Enhanced riparian protection measures for development within and adjacent to the City's Riparian Management Areas (RMA) that are protected under the Riparian Area Regulation as described in info-bulletin 23, and review of the City's RMA approach to inform 2017 compliance updates.
- Continued encouragement of riparian enhancement through development and redevelopment of previously disturbed sites.
- Introduce an avoid, mitigate, compensate approach following a net gain objective to dyke master planning to support a multi-barrier approach to dike upgrades that incorporates green infrastructure where possible.
- Incorporate tidal flushing mechanisms (actuated valve) into new pump stations designs to draw nutrient rich water off of the Fraser River, promote exchange natural between the Fraser River and inland water systems and improve inland water quality.
- Map aquatic and invasive species within riparian setbacks as associated watercourses to inform 2017 treatment priorities to maintain riparian and aquatic integrity.
- 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.

Attachment 12:

a) *Map showing any 2015-2016 changes to protected riparian areas & possible stream classifications. If no changes, then this figure is not required.*

No changes.

Municipal Progress Summary Table

The summary table is the same format at pervious Biennial Report. The columns (Dec 2014 + Additions/Changes) should add to equal the Dec 2016 Total.

Table 10 Summary of Municipal Progress 2013-2014

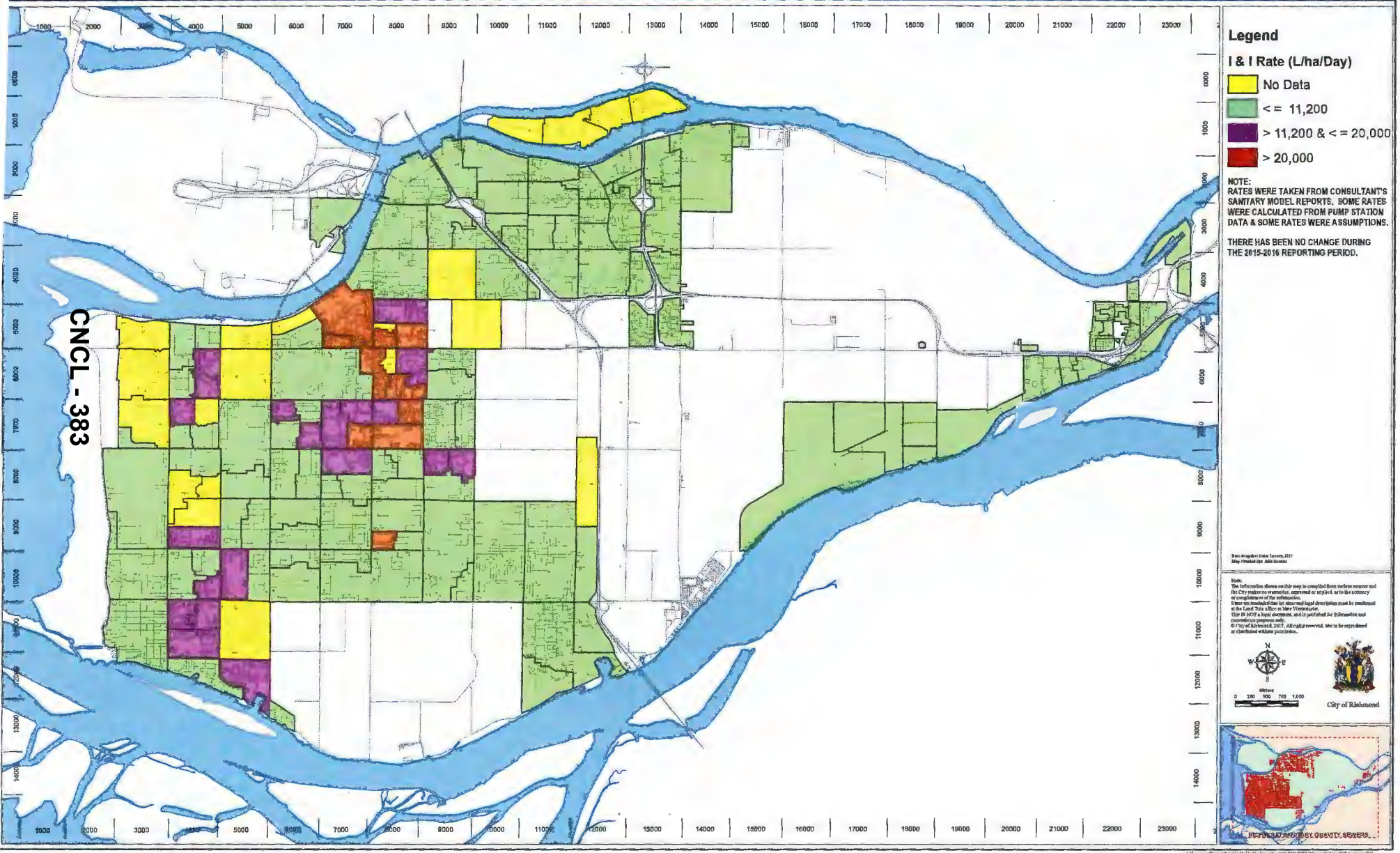
Description	Unit	Total as of Dec 31st, 2014	Additions & Changes	Total as of Dec 31st, 2016
1. Municipal Sewer System Inventory				
a. Sanitary Gravity Sewers	m	464,456	4,044	468,500
b. Sanitary Services (Connections)	ea.	31,520	45	31,565
c. Sanitary Forcemains	m	101,010	190	101,200
2. Combined Sewer System Inventory				
a. Total Combined Sewers	m	0	0	0
b. Combined Services (Connections)	ea.	0	0	0
c. Combined Sewers Separated	m	0	0	0
d. Percentage of total system separated	%	0	0	0
3. Sanitary Sewer System Evaluation Program				
a. Sanitary Sewers Video Inspected	m	413,300	22,188	435,488
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	%	89.7%	10.3%	100%
d. Percentage of Entire Municipal Sewer System Structurally Rated	%	89.7%	10.3%	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	11,340	3,424	147,64
c. Total Number of Service Laterals Rehabilitated	ea.	40	5	45
d. Number of Structurally Repaired Manholes/Cleanouts	ea.	2,779	107	2,886
e. Number of Cross-Connections Corrected	ea.	7	4	11
5. Sanitary Sewer Overflows				
a. Total Number of Reported Dry Weather SSOs	ea.	0	0	0

Description	Unit	Total as of Dec 31st, 2014	Additions & Changes	Total as of Dec 31st, 2016
b. Total Number of Reported Wet Weather SSOs	ea.	0	0	0
c. Number of Breakdowns from Failures	ea.	126	10	136
6. Greenhouse Gas Emissions				
a. CO_2 emission reduction from sewer system	kg CO_2			
7. Summary of Costs		**2015**	**2016**	**Total**
a. Sanitary Sewer Condition Evaluation Program		0.2M	0M	0.2M
b. Combined Sewer Separation Program		0	0	0
c. Sewer System Rehabilitation Program		4.05M	4.72M	8.77M
d. CO_2 Reduction Program		0	0	0
e. ISMP Implementation		0	0	0
f. Total Cost for the Biennial Period		4.25M*	4.72M*	8.97M*

**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.*

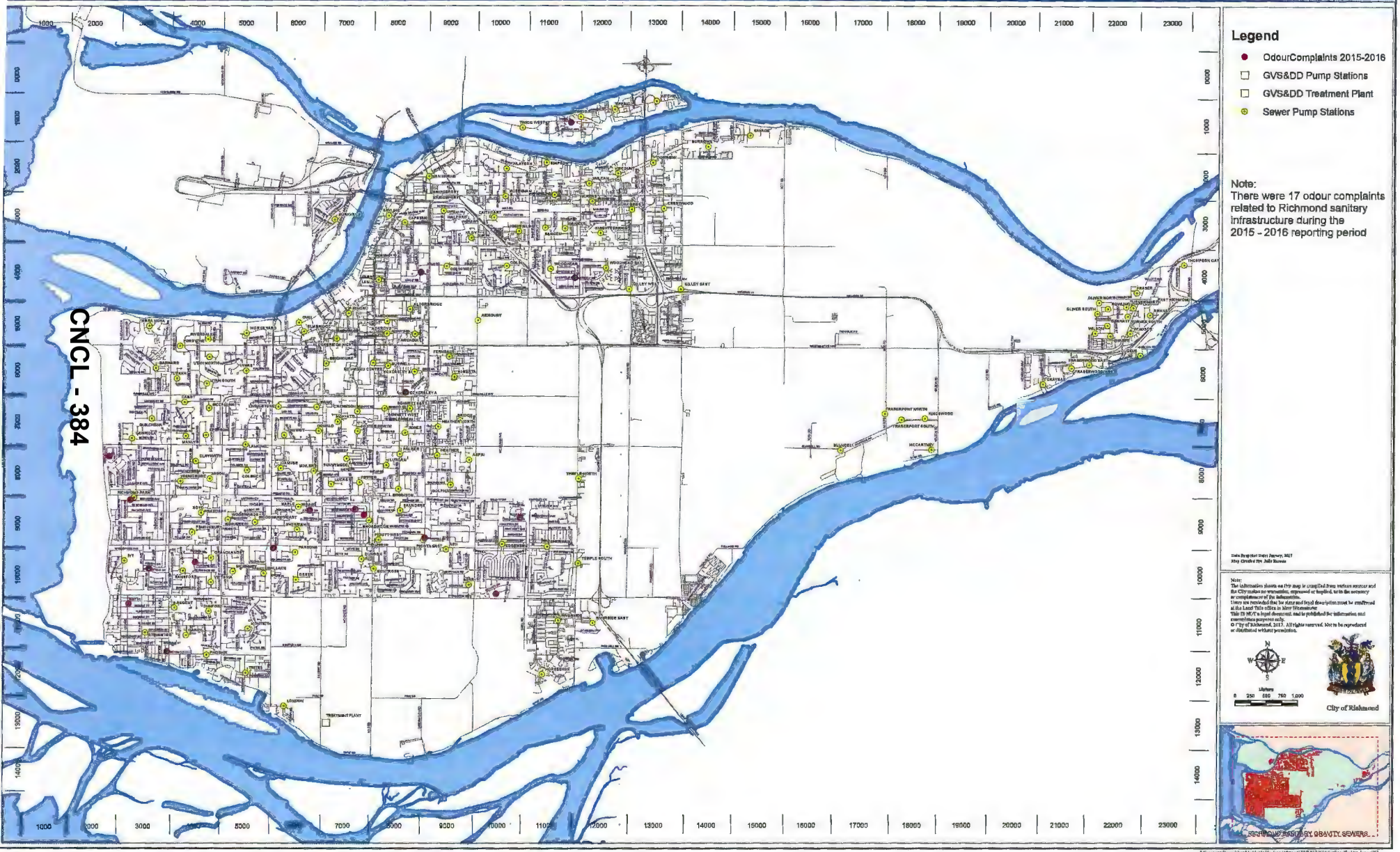
ATTACHMENT 1

City of Richmond Modelled Sanitary Catchment I&I Rates - January 2017



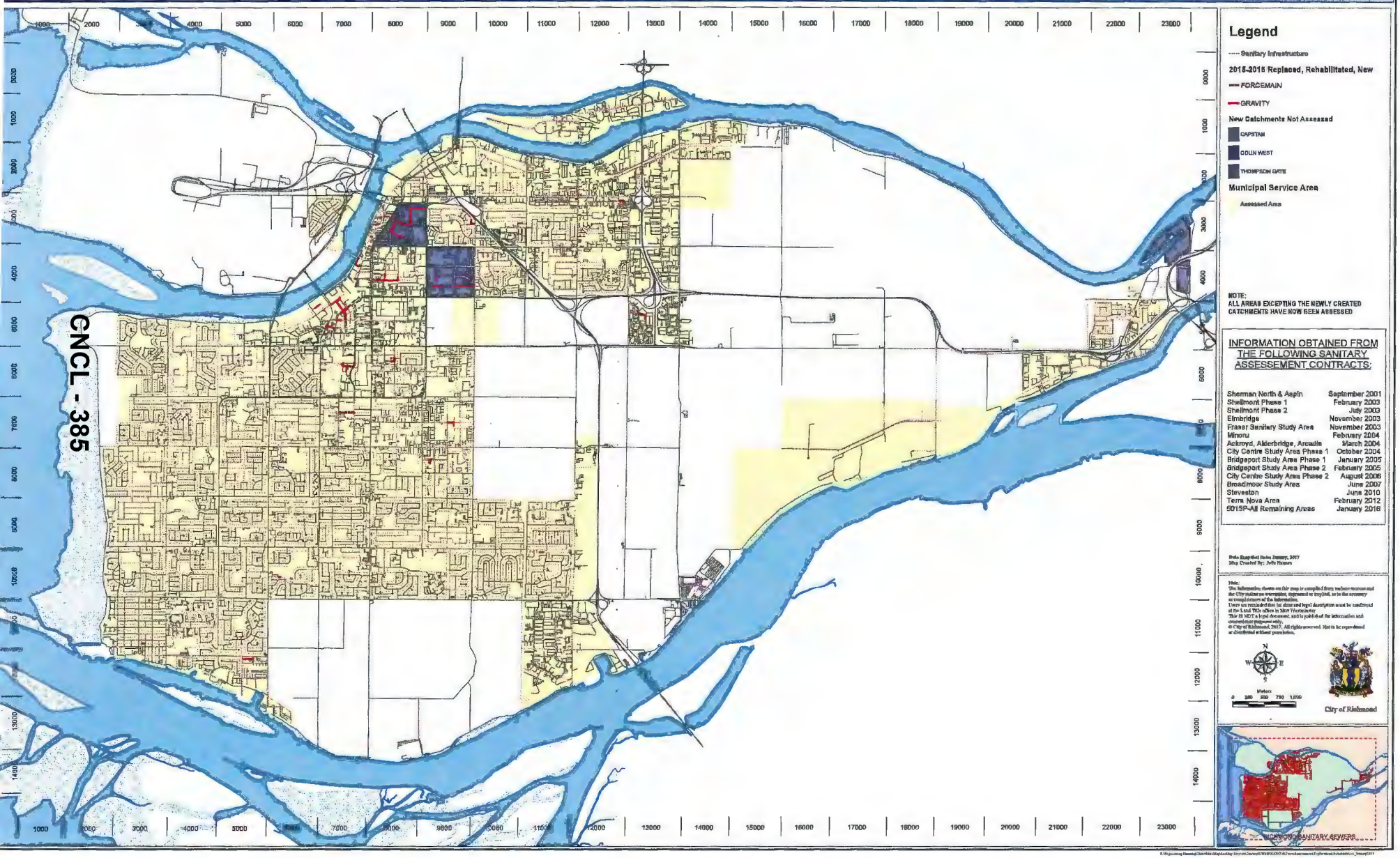
ATTACHMENT 4

City of Richmond Odour Control Facilities At Sanitary Pump Stations - January 2017



ATTACHMENT 5

City of Richmond Sanitary Sewer Assessement, Replacement & Rehabilitation January 2017



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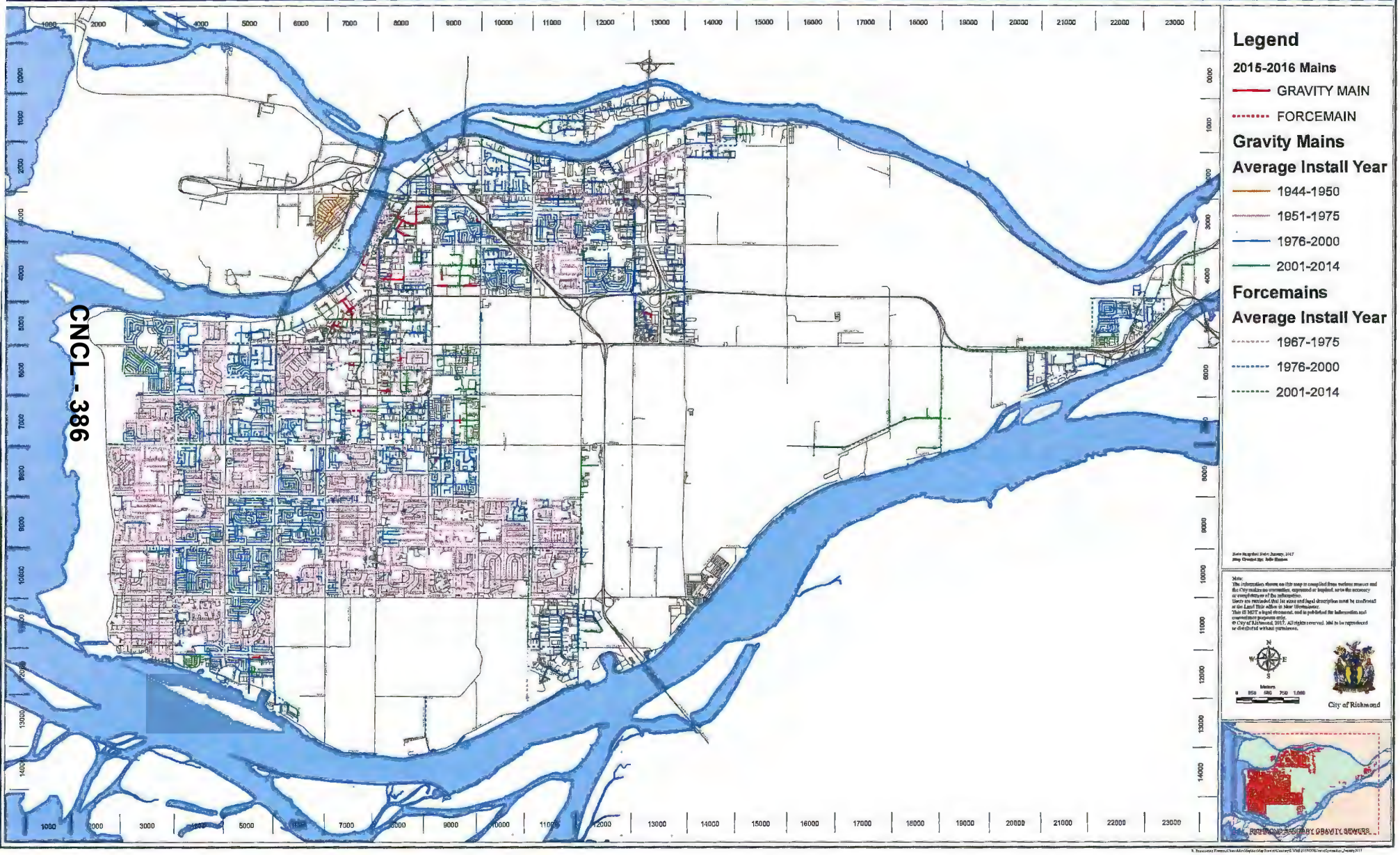
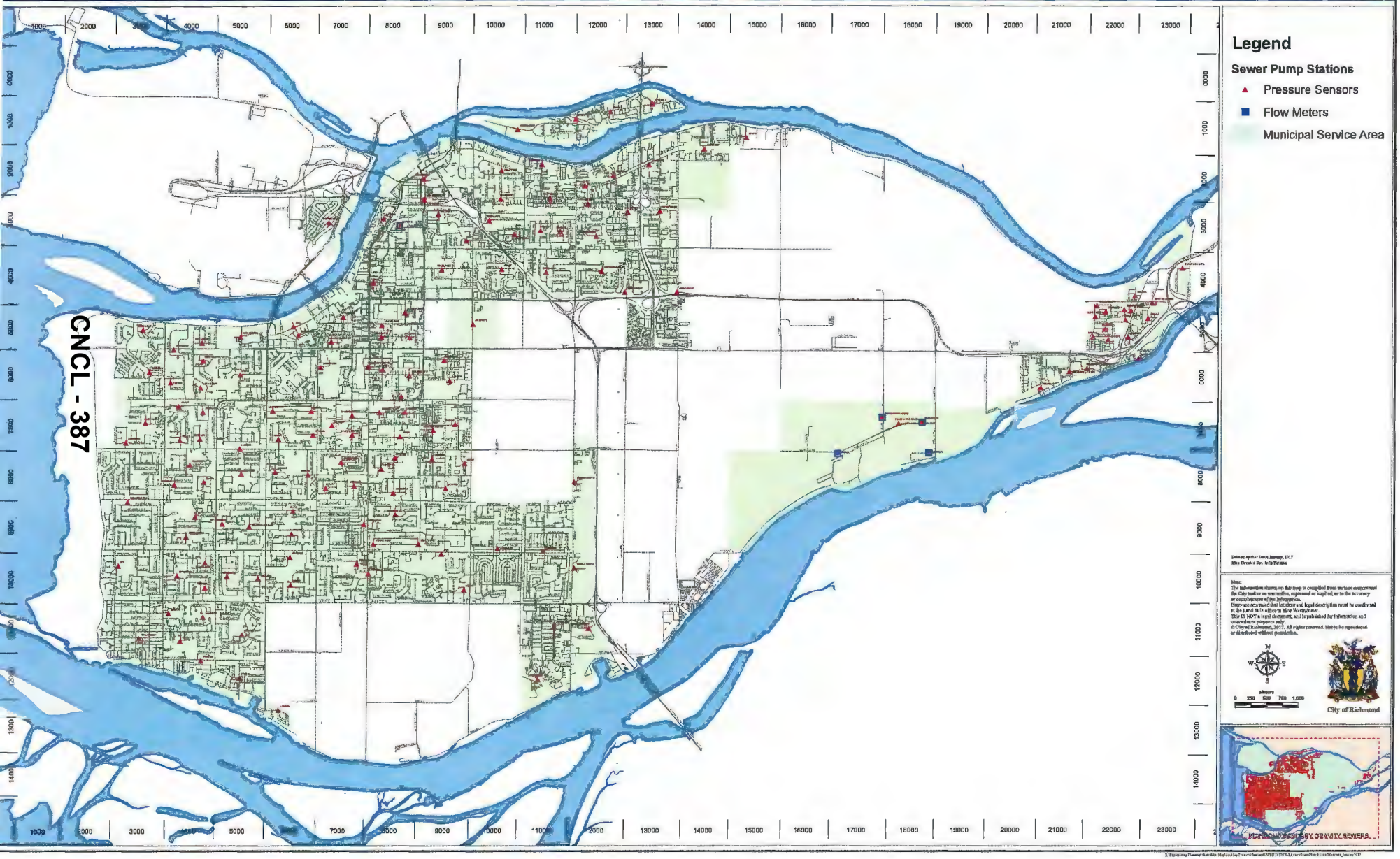
ATTACHMENT 6

City of Richmond Sanitary System Age - January 2017



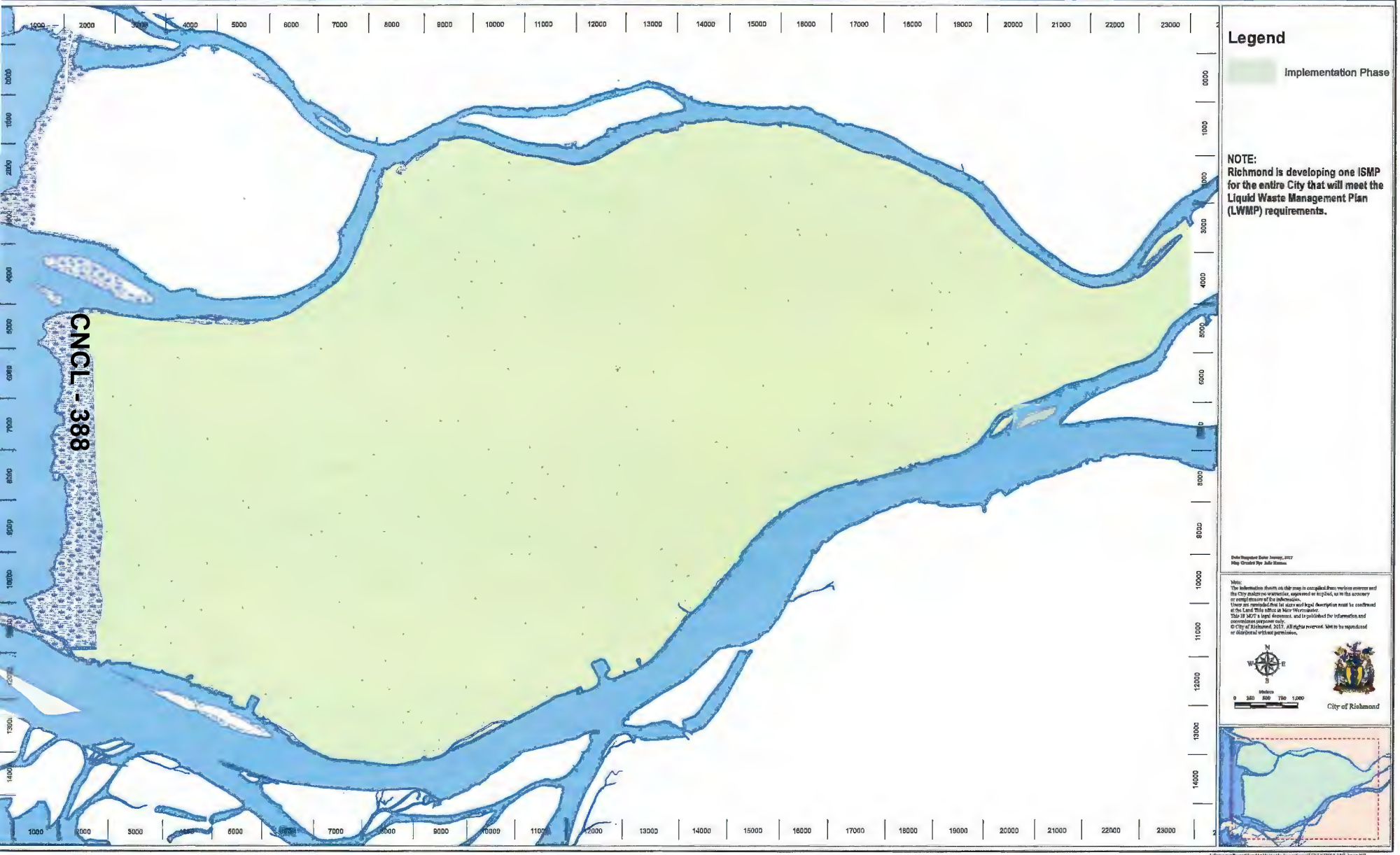
ATTACHMENT 8

City of Richmond Active Sewer Flow & Level Monitors - January 2017



ATTACHMENT 10

Richmond Integrated Stormwater Management Plan (ISMP) Status Map - January 2017



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