KELVIN GROVE
Wastewater Treatment Plant

2020 ANNUAL REPORT

JAN 2020 Naizam Jaffer, Public Works Manager

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INTRODUCTION

The upper and lower Kelvin Grove neighbourhoods in the Village of Lions Bay are serviced by a sanitary sewer network that culminates in a wastewater treatment plant (WWTP) that was constructed in 1981 on the waterfront of Howe Sound, at the Kelvin Grove Beach Park. A total of 86 single family dwellings are connected to the WWTP through a network of 2,173 meters of 200mm PVC sanitary sewer pipes, manholes, and property connections or service laterals; at present, another 10 undeveloped residential lots have the ability to connect. An overview of the Kelvin Grove sanitary sewer system is depicted in a map in Appendix 1.

On February 4, 2019, routine inspections identified a complete mechanical failure at the WWTP. The plant is a fixed media treatment system consisting of a series of rotating biological contactor (RBC) media packs or disks that provide aerobic and anaerobic treatment along the RBC process chain. Typically, an RBC plant has a life expectancy of approximately 45 years and the Kelvin Grove RBC was expected to last until approximately 2025. Unfortunately, internal corrosion of a support member for the primary media pack caused the support member to fail and resulted in significant mechanical and structural damage to the first stage of the treatment process. This failure was reported electronically to the Ministry of Environment and Climate Change (MECC) via a non-compliance report. In conjunction with MECC staff, effluent sampling frequency was altered from quarterly to weekly beginning on February 5, 2019.

Discussion with MECC staff resulted in a path forward that consisted of removing the damaged sections of the stage one media pack and repairing the motor and chain drive to facilitate the treatment of effluent, albeit at a reduced capacity. Parts were manufactured and delivered shortly after the middle of February and the plant was put into partial operation. By February 27, 2019, effluent quality returned to within Permit requirements and MECC staff permitted the resumption of quarterly samples.

The February 2019 failure prompted discussions with Municipal Council around the overall condition of the RBC plant and the need for its replacement versus the costs of significant repairs. Over the course of 2019, Council implemented a plan for the replacement of the treatment plant in 2020. During the summer of 2019, an engineering firm was contracted to work with the MECC towards approval of a replacement RBC plant and obtaining a bypass authorization for the duration of the planned construction of a new plant. In mid-December of 2019, MECC staff authorized the bypass procedure and Municipal staff then issued a request for proposal (RFP) in early February of 2020 for the replacement of the Kelvin Grove WWTP.

RBC TREATMENT PROCESS OVERVIEW

Through discussions with MECC, the Municipality elected to replace the fixed film RBC treatment plant with like for like technology. The Kelvin Grove WWTP is a fixed-film treatment process that consists of three distinct process phases:

- Primary Sedimentation,
- Biological Treatment, and
- Secondary Sedimentation.

Upon passing through each of these phases, the treated wastewater passes through a flow measurement device consisting of a weir and level transducer mounted within a metering chamber. Once through the flow meter, the wastewater is released into Howe Sound via an ocean outfall pipe 85 meters beyond the high tide mark and at a depth of 60 metres. The New RBC plant was to be based upon the same process, but with newer technology and full supervisory control and data acquisition (SCADA).

KELVIN GROVE WWTP OPERATING PERMIT

The authority to discharge wastewater into the waters of Howe Sound is governed by the provincial *Environmental Management Act*. The Kelvin Grove WWTP operates under permit number 5188 (the "Permit") which regulates the quantity and quality of the plant's discharge. The parameters stipulated in the Permit are as follows:

Parameter	**Permit Value**
Volume (m^3/day)	340
BOD_5 (mg/L)	45
TSS (mg/L)	60

KELVIN GROVE WWTP REPLACEMENT

Bypass Authorization

In preparation for the issuance of the RFP to replace the Kelvin Grove WWTP, the Municipality's engineer prepared a bypass methodology and process for the uninterrupted treatment of residential effluent during the construction of the new plant (Appendix 2). In essence, a Temporary RBC treatment plant would receive the diverted wastewater from the Kelvin Grove neighbourhood while the new plant was being constructed. Bypass Authorization was granted in December of 2019 (Appendix 3). A tender for the replacement of the Kelvin Grove WWTP was issued shortly thereafter and the contract for the replacement of the RBC plant was awarded in early February of 2020.

Temporary RBC Plant

On May 8, 2002, the Temporary RBC treatment plant was installed and soon began receiving raw effluent from the Kelvin Grove neighbourhood. In accordance with the bypass methodology, wastewater from the temporary unit was then diverted into the old unit before being discharged via the marine outfall.

By early June, the Temporary RBC had achieved sufficient bacteriological growth to treat the effluent without

Temporary RBC being craned into place.

needing to be recirculated through the old plant and in early July the prime contractor was able to disconnect the Old RBC in order to begin demolition. Prior to demolition, the Old RBC needed to be emptied and the supernatant liquid from the Old RBC was pumped into the Temporary RBC for treatment before being discharged via the marine outfall. The sludge was pumped into trucks and hauled to the Iona Treatment Plant in Richmond, BC for further treatment and ultimate disposal.

Construction and Covid-19 Impacts

Initial project schedules were developed with planned fabrication of the new plant beginning at the end of May 2020 and being completed and installed by the end of July 2020. Unfortunately, the Covid-19 Pandemic dramatically impacted the supply and fabrication chains and caused a delay in the scheduled completion of the project. Revised timelines pushed the completion of the project to the middle of October 2020.

Project Finalization

By the end of September 2020, the new plant was operational, and the temporary treatment plant had been removed. Unfortunately, in early October, the Bonfiglioli planetary gearbox that drives the main axle in the New RBC failed. The plant was shut down and the gearbox removed and sent away for repairs. During that time, the treatment process continued to function even without the main axle spinning and providing aeration to the effluent.

The repaired gearbox was reinstalled in the treatment plant by the third week in October and the quality of effluent did not suffer as a result of this mechanical issue. A new gearbox was ordered to replace the 'repaired' unit. Again, due to manufacturing and shipping delays, the estimated time of arrival for this new gearbox is within the first week of February 2021 and will be installed before the end of the month. Notwithstanding the reinstallation of the repaired gearbox pending delivery of the new replacement gearbox, the plant is fully functional and operating as designed. Formal completion of the project will not take place until after the new gearbox has been installed.

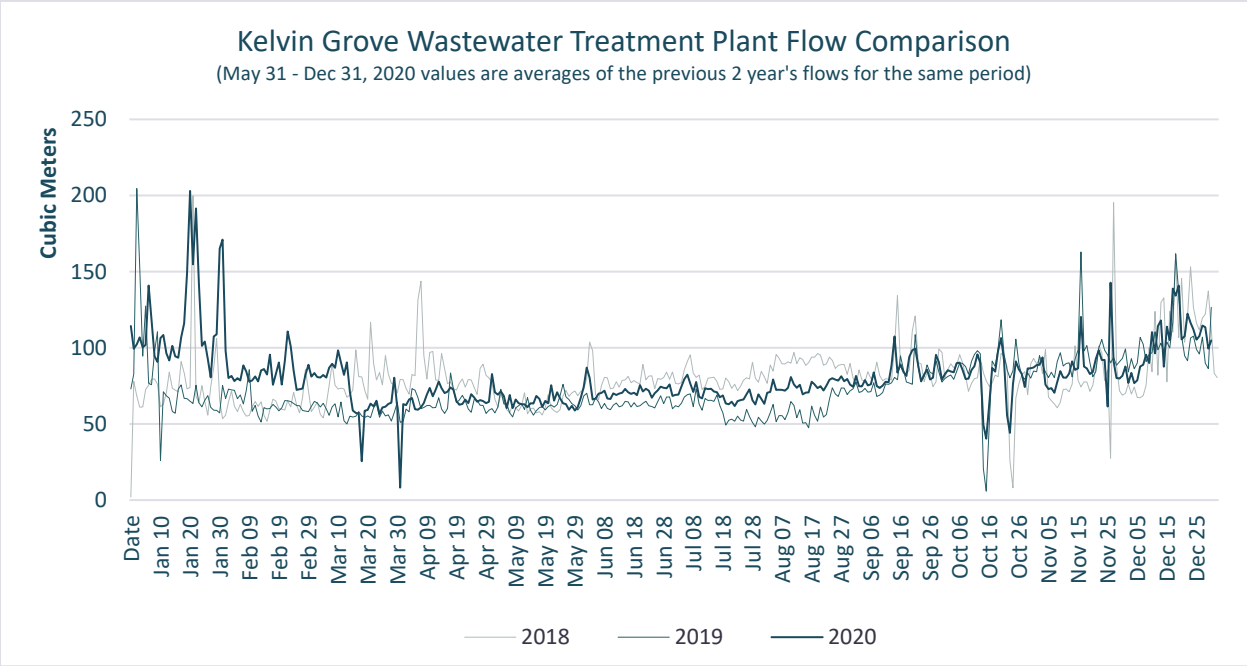
WATER QUALITY

Typically, reporting requirements consist of continual flow measurement followed by quarterly sampling of treated wastewater for five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS). However, during the replacement of the Old RBC, there were two primary variations when compared to typical reporting:

1. The Temporary RBC unit that would treat the wastewater from the Kelvin Grove neighbourhood did not have the capability to measure flow; therefore, with approval from MECC, the Municipality estimated flows for the period where the Temporary RBC was being used.
2. Due to the phasing processes outlined in the Bypass Authorization, the frequency of reporting was increased at periods to account for changes in the processes, bypass phases, or with issues to treatment.

Effluent Flows

The following graph indicates daily wastewater discharge volumes for 2020 in comparison to the previous two years – note that flow rates beyond May 31, 2020 were averaged from the previous two years. Detailed daily flow tables for 2020 are contained in Appendix 4.



Effluent Sampling Results

As previously discussed, the replacement of the Kelvin Grove WWTP occurred in a phased approach which consisted of 4 phases:

1. Phase 1 – the Temporary RBC was seeded with bacteria from the Old RBC. Raw wastewater from the Kelvin Grove neighbourhood was then diverted into the Temporary RBC and once treated, was fed back into the Old RBC before being discharged via the marine outfall. This ensured the effluent met permit requirements until the Temporary RBC was able to stand on its own.

Bacterial growth on media pack of Temporary RBC

2. Phase 2 – upon adequate build up of bacteria within the temporary treatment plant, the outlet was moved from the Old RBC and connected directly to the marine outfall thereby bypassing the Old RBC entirely. At this stage, demolition of the Old RBC could begin.

3. Phase 3 – the New RBC plant was seeded with bacteria from the Temporary RBC and the outlet for the Temporary RBC was then moved from the marine outfall and connected to the New RBC. Raw effluent was first treated by the Temporary RBC, then by the New RBC before being discharged via the marine outfall.
4. Phase 4 – the Temporary RBC was disconnected, and the new plant received all the raw wastewater from the Kelvin Grove neighbourhood.

PHASE 1

As indicated by the sample results, the Temporary RBC was very effective almost immediately following its seeding by bacterial from the Old RBC plant. As indicated, during this phase, wastewater was treated by the Temporary RBC and then fed into the Old RBC.

Sample Location	**ALS REF. #**	**SAMPLE DATE**	**TSS mg/l**	**BOD_5 mg/l**
Temporary RBC	20A6895	22-May-20	9.3	11.2
Old RBC	20A7423	1-Jun-20	5.7	11.6
Temporary RBC	20A7799	5-Jun-20	19.3	12.3
Old RBC	20A7799	5-Jun-20	2.9	5.9
Temporary RBC	20A7921	9-Jun-20	10.7	11.9
Old RBC	20A7921	9-Jun-20	4.3	4.3
Temporary RBC	20A8287	12-Jun-20	11.9	13.0
Old RBC	20A8287	12-Jun-20	6.9	9.0

PHASE 2

During this phase of the process, wastewater was treated by the Temporary RBC alone. As you can see, there are two instances (blue and red boxes) where results exceed the Permit allowance of 45 mg/l BOD5 and 60 TSS mg/l. A non-compliance report was issued for these anomalies. At the time of the first anomaly occurred the week of July 3, 2020 – at this stage the liquid supernatant from the Old RBC was being pumped into the Temporary RBC for treatment before being discharged via the marine outfall. The RBC supplier believed that some solids were also pumped into the Temporary RBC and this resulted in an overloading of the system. A pumper truck was engaged to pump out the solids from the Temporary RBC and within a few days, effluent readings dropped to normal.

The second anomaly occurred on July 24, 2020 – it is believed that the operator, confused by the piping on site, sampled a line containing stagnant wastewater from the pump out of the Old RBC.

Sample Location	**ALS REF. #**	**SAMPLE DATE**	**TSS mg/l**	**BOD_5 mg/l**
Temporary RBC	20A8706	19-Jun-20	11.0	17.8
Temporary RBC	A9301-001	26-Jun-20	47.0	39.7
Temporary RBC	20A9658	3-Jul-20	99.4	85.3
Temporary RBC	20B0132	10-Jul-20	70.5	85.3
Temporary RBC	20B0416	15-Jul-20	12.5	35.5
Temporary RBC	20B1140	24-Jul-20	121	102
Temporary RBC	20B1702	31-Jul-20	21.5	29.8

Temporary RBC	20B1887	5-Aug-20	20.4	17.3
Temporary RBC	20B2150	7-Aug-20	53.3	40.2
Temporary RBC	20B2323	11-Aug-20	11.9	16.5
Temporary RBC	20B2550	13-Aug-20	18.5	11.5
Temporary RBC	20B2918	18-Aug-20	13.3	25.2
Temporary RBC	20B3647	26-Aug-20	17.1	27.1
Temporary RBC	20B4114	1-Sep-20	22.6	29.2
Temporary RBC	20B4725	9-Sep-20	18.1	27.6

PHASE 3

During this phase of the process, the New RBC was seeded with bacteria from the Temporary RBC and then the outlet of the Temporary RBC was fed into the New RBC.

Sample Location	**ALS REF. #**	**SAMPLE DATE**	**TSS mg/l**	**BOD_5 mg/l**
Temporary RBC	20B5622	18-Sep-20	24.8	27.8
New RBC	20B5622	18-Sep-20	45.0	37.1
Temporary RBC	20B6040	23-Sep-20	22.2	32.2
Temporary RBC	20B6784	30-Sep-20	15.3	29.1
Temporary RBC	20B7116	2-Oct-20	21	45.7
New RBC	20B7116	2-Oct-20	25.0	22.9
Temporary RBC	20B7366	6-Oct-20	73.3	107
New RBC	20B7366	6-Oct-20	7.9	6.9
Temporary RBC	20B7764	9-Oct-20	14.1	25.5
New RBC	20B7764	9-Oct-20	18.1	36.8
Temporary RBC	20B8042	14-Oct-20	9.4	26.3
New RBC	20B8042	14-Oct-20	23.0	32.9
Temporary RBC	20B8323	16-Oct-20	11.2	18.9
New RBC	20B8323	16-Oct-20	22.0	34.0

PHASE 4

During this final phase, the Temporary RBC was disconnected and raw effluent from the Kelvin Grove neighbourhood was fed through the new plant. At this point, the New RBC was fully functional

Sample Location	**ALS REF. #**	**SAMPLE DATE**	**TSS mg/l**	**BOD_5 mg/l**
New RBC	20B8972	23-Oct-20	17.3	12.8
New RBC	20B9212	27-Oct-20	12.7	19.6
New RBC	20B9609	30-Oct-20	16.0	14.9
New RBC	20C0442	10-Nov-20	7.1	11.3
New RBC	20C1113	18-Nov-20	8.5	17.1
New RBC	20C2601	4-Dec-20	10.4	14.4
New RBC	20C3773	18-Dec-20	17.8	21.9
New RBC	20C4004	22-Dec-20	7.6	16.1
New RBC	VA21A0354-1	8-Jan-21	15.3	23.0

MAINTENANCE

In accordance with the Permit, regular inspection and maintenance activities are conducted to keep the facility in good working order. Biweekly inspections are performed to check for vandalism, damage to the media disks, misalignment or excessive shaft deflection, motor torque loading (excessive heat), and for clogging of weirs or orifice areas. At the time of inspection, grease fittings and bearings are lubricated. During the construction process, the operations and maintenance of the system (Old RBC, Temporary Plant, and New Plant) were being managed by the prime contractor. Full transfer of operations and maintenance will occur when the contract is completed. At the present time, this is expected to occur before the end of February 2021.

New plant installed within the existing concrete wet-well.

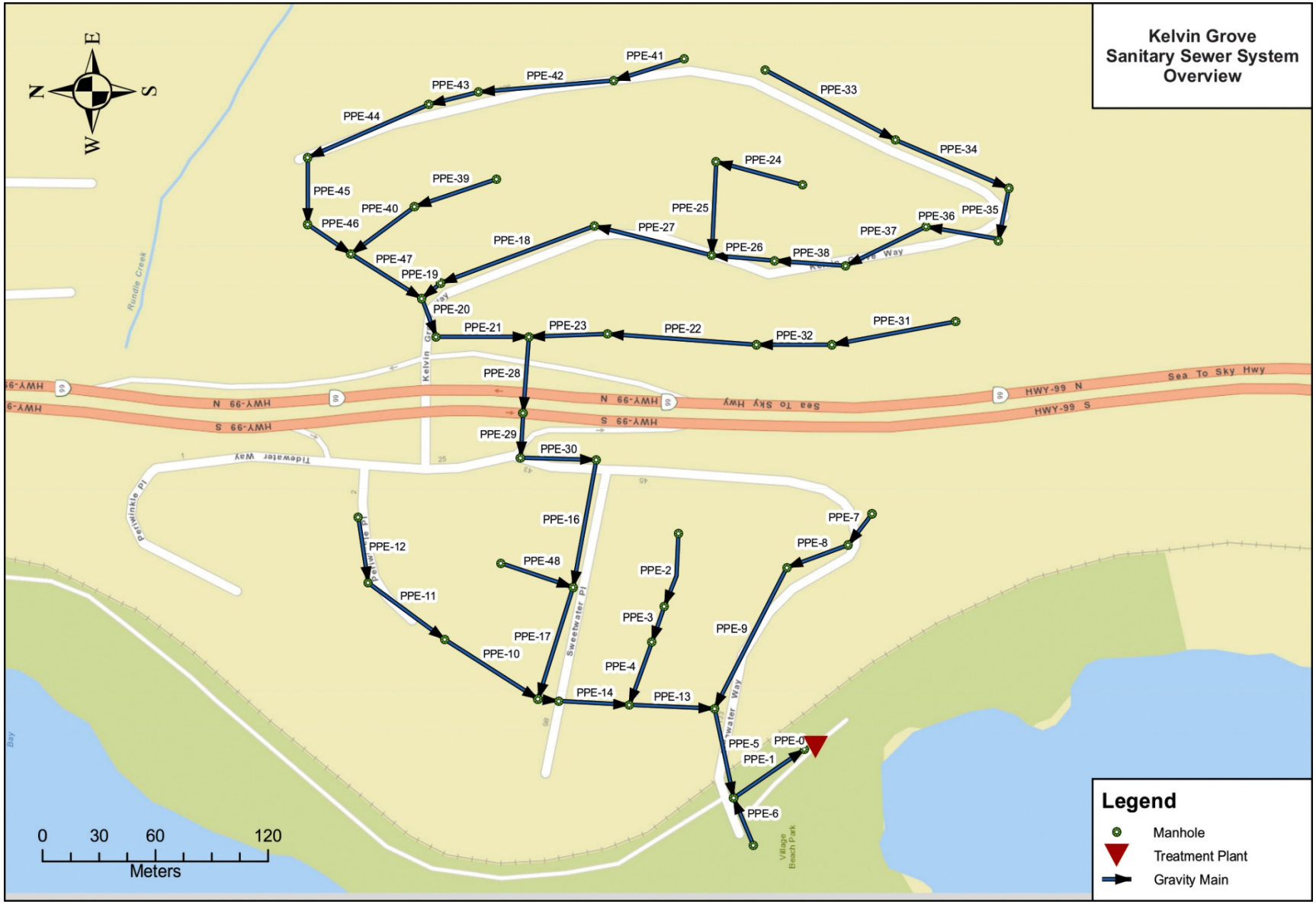
Annual Dewatering

Typically, RBC treatment plants require the removal of sludge buildup to ensure the bacteriological process continues to be effective. With the Old RBC, a single annual dewatering was required. Due to the delays in the construction of the New RBC plant, pump out or dewater is not expected to occur until later in 2021. Given that this is a newer, more effective RBC technology, we expect the pump out to be different than with the old plant. When the New RBC plant is transferred over to the Municipality, the manufacturer will provide education and training along with the operations and maintenance manuals for the plant.

Facility Classification and Operator Certification

The old Kelvin Grove WWTP was evaluated as a Small Wastewater System (Lagoon) by the Environmental Operators Certification Program Society (EOCP). The Municipality has one operator certified as a Small Wastewater System Operator and Wastewater Treatment Operator. Once commissioned, the New RBC will be re-evaluated and certified by the EOCP in 2021 and it is likely that the facility classification will not change.

APPENDIX 1 – SANITARY SYSTEM OVERVIEW


Kelvin Grove
Sanitary Sewer System
Overview
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PPE-41
PPE-42
PPE-43
PPE-44
PPE-45
PPE-46
PPE-47
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PPE-13
PPE-9
PPE-8
PPE-7
PPE-5
PPE-0
PPE-1
PPE-6
HWY-99 N
HWY-99 S
Sea To Sky Hwy
Rundle Creek
Tidewater Way
Periwinkle Pl
Sweetwater Pl
Village Beach Park
0
30
60
120
Meters
Legend
Manhole
Treatment Plant
Gravity Main

APPENDIX 2 – BYPASS METHODOLOGY

23rd October 2019

EHD Engineering Ltd
Unit 202
1139 12th Street
Kamloops
V2B 7Z2
250-434-4529

Bryan Vroom
Section Head
Municipal Liquid Waste
Ministry of Environment and Climate Change Strategy
Nanaimo

Kelvin Grove Wastewater Treatment Plant, Village of Lions Bay
Authorisation Number: 5188
Site Reference Number E100978

PROPOSED BYPASS WORKS TO REPLACE EXISTING ROTATION BIOLOGICAL CONTACTOR PLANT.

Dear Sir,

As requested, please find enclosed the details of the proposed Bypass to enable replacement of the existing Rotating Biological Contactor(RBC) unit at Kelvin Grove Wastewater Treatment Plant (Photos 1 and 2). The implementation of the methodology will enable wastewater to be treated to the permitted effluent parameters of 45 mg/l BOD5 and 60mg/l TSS Permit for discharge throughout the Bypass period shown in the Schedule, page 9,

Phase 1 : Refer to Figure 1, page 4 ,:-Preliminary Works to Activate Bypass. In Phase 1, the existing RBC unit continues to operate until 45/60 effluent is achieved on the rental unit. Testing will be required to confirm. Wastewater and effluent flow is shown in Red. The rental unit supplier recommends 3 weeks for development of the media pack.

Phase 2 : Refer to Figure 2, page 5 :- Bypass Active.

Commencement of the diversion flow itself would be through the existing pipe overflow/bypass, which is currently closed by a gate valve. The date at which the Bypass would be active is February 1st.

In Figure 2, the Rental unit is 'live' and treating the current flows of up to 100m3/day to an effluent quality of 45/60, with bi-weekly testing. The diverted, treated, effluent flow is shown in Red. The new RBC unit will be constructed onto the existing concrete tank during this period.

Phase 3: Referring to Figure 3, page 6. After reconstruction of the new RBC plant, treated effluent from the Rental unit will flow through the rental unit and the new plant. The rental unit would be decommissioned when effluent quality from the new RBC is 45/60, tested independently from the rental unit, as sampled from the existing chamber downstream of the permanent RBC works.

Phase 3A, Figure 4, page 7, illustrates recirculation of wastewater to enable development of the new RBC plant's media pack and to provide a means for verification of the media pack's performance for the new RBC, independent from performance of the Rental unit.

Phase 4: Figure 5, page 8, illustrates decommissioning of the Rental RBC and the completion of the Bypass.

Proposed Schedule

It is envisaged that the entire Bypass and new RBC commissioning operation would commence in February and would be complete by the end of June, a shown in the schedule, page 9. Referring to the Schedule, a 7 month Bypass period from the 1st January 2020 to August 1st 2020 is therefore recommended, to allow for variation in contract award, rental unit commissioning, new RBC delivery, construction and media pack growth.

Any proposed variation in the methodology or schedule would be notified to the Ministry for review and approval prior to implementation.

In the event of effluent non-compliance, after notification to the Ministry of non-compliance and any alternative proposed corrective actions, emergency contingency would be provided by sludge pump out and removal from site, should this be required.

Please do not hesitate to contact the undersigned, should you have questions.

Yours faithfully,

Ian Chadwick P.Eng
For EHD Engineering

Photo 1:- View of Existing RBC with broken Media Pack 1.

Photo 2: View Of Broken Media Pack.

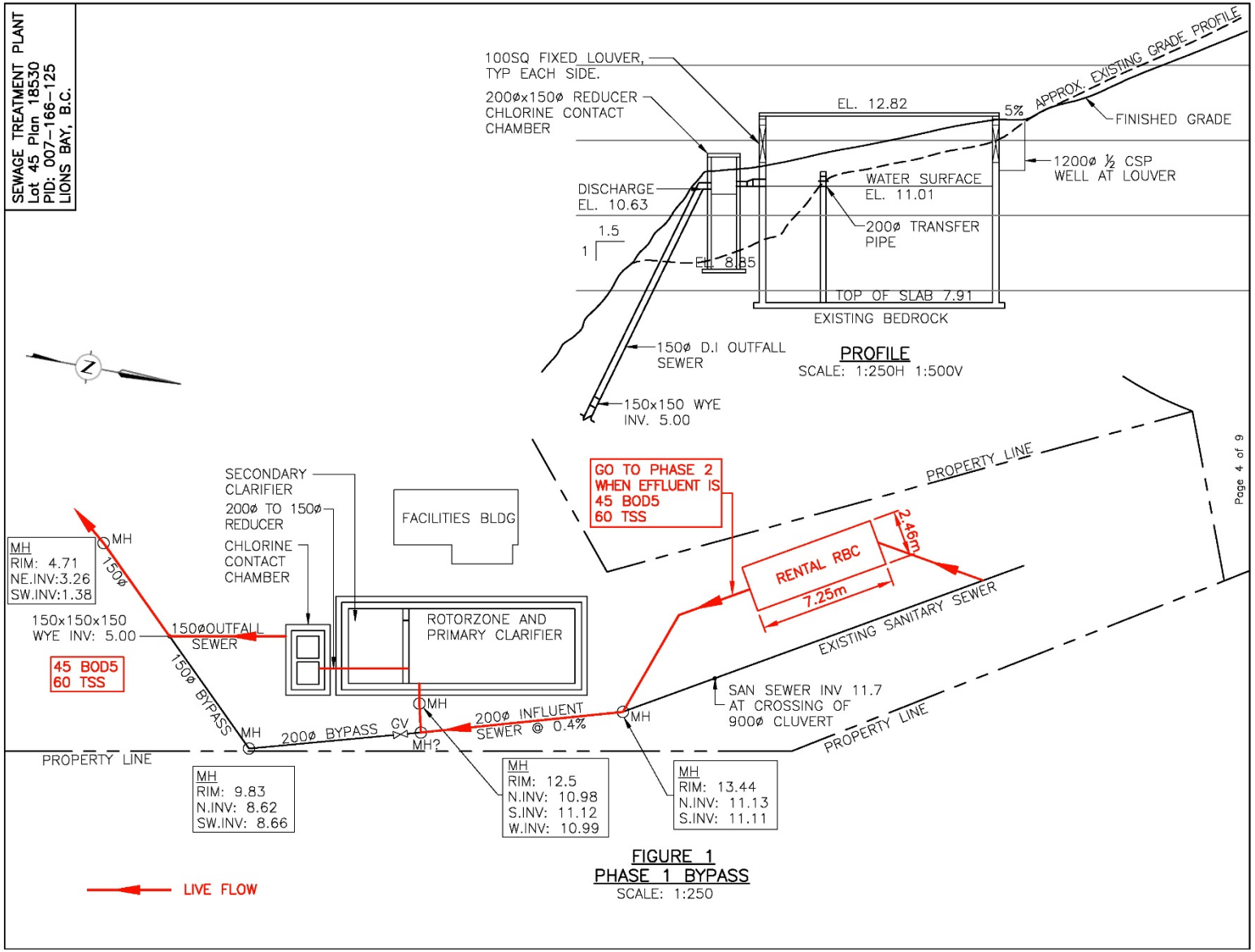


FIGURE 1
PHASE 1 BYPASS
SCALE: 1:250

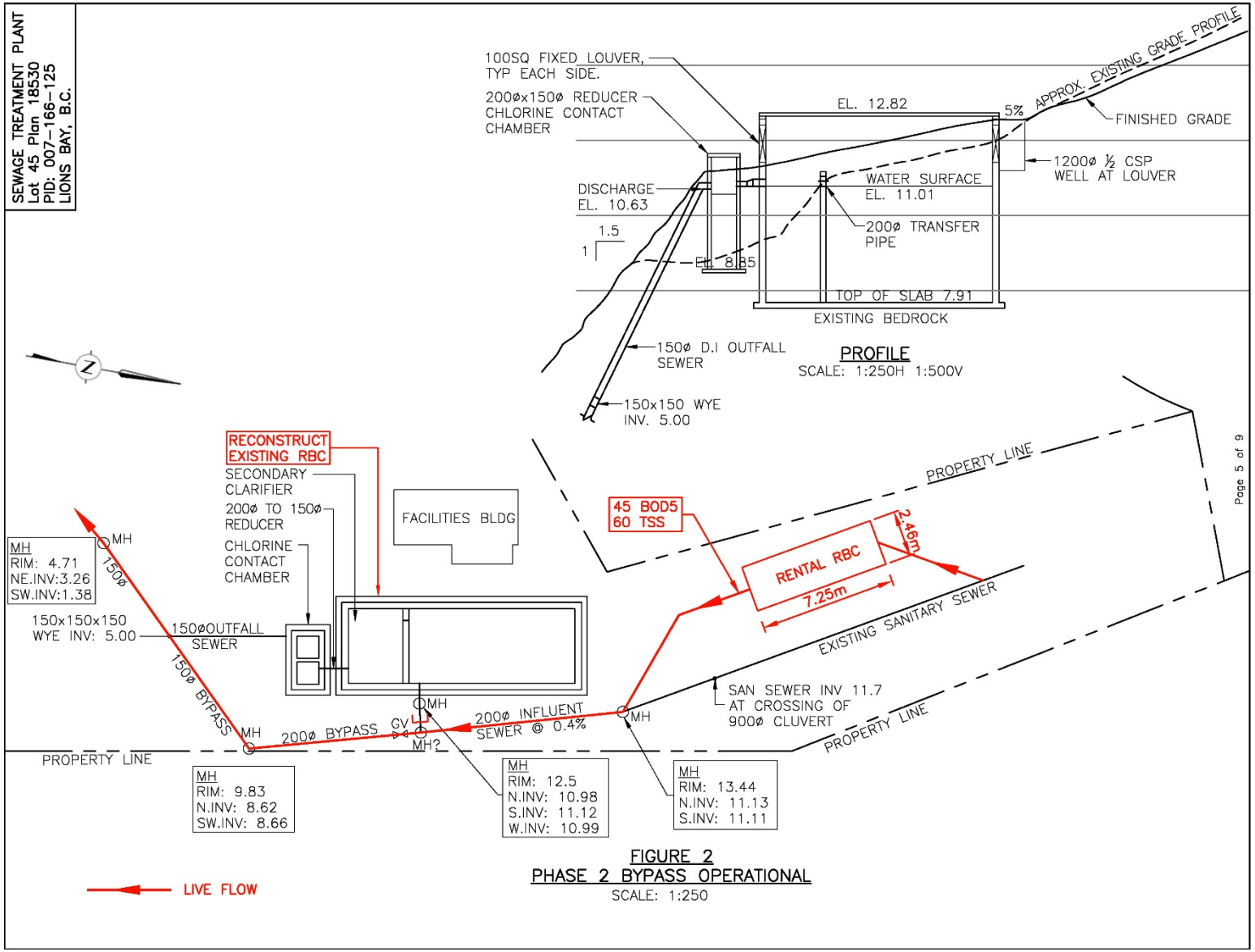


FIGURE 2
PHASE 2 BYPASS OPERATIONAL
SCALE: 1:250

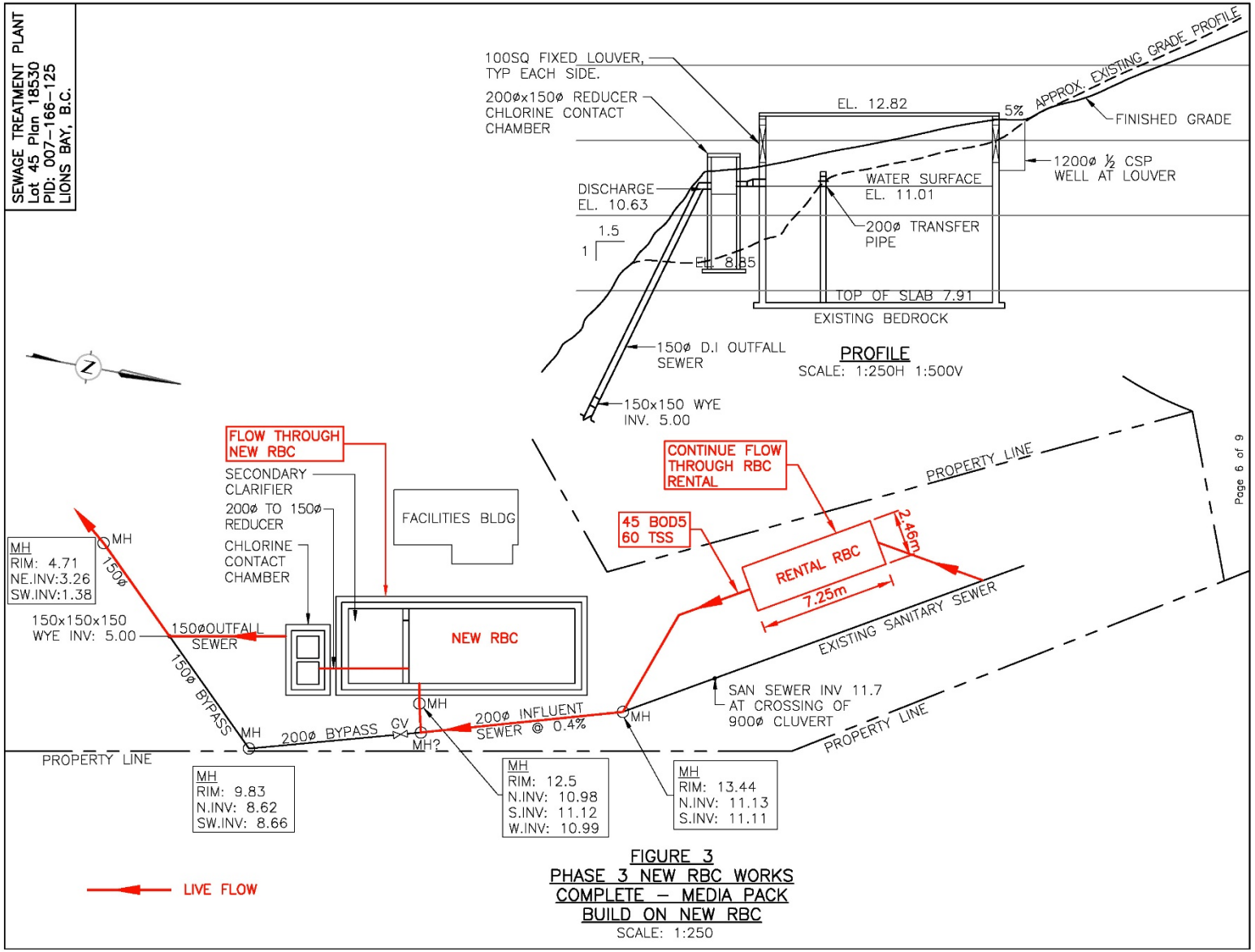


FIGURE 3
PHASE 3 NEW RBC WORKS
COMPLETE – MEDIA PACK
BUILD ON NEW RBC
SCALE: 1:250

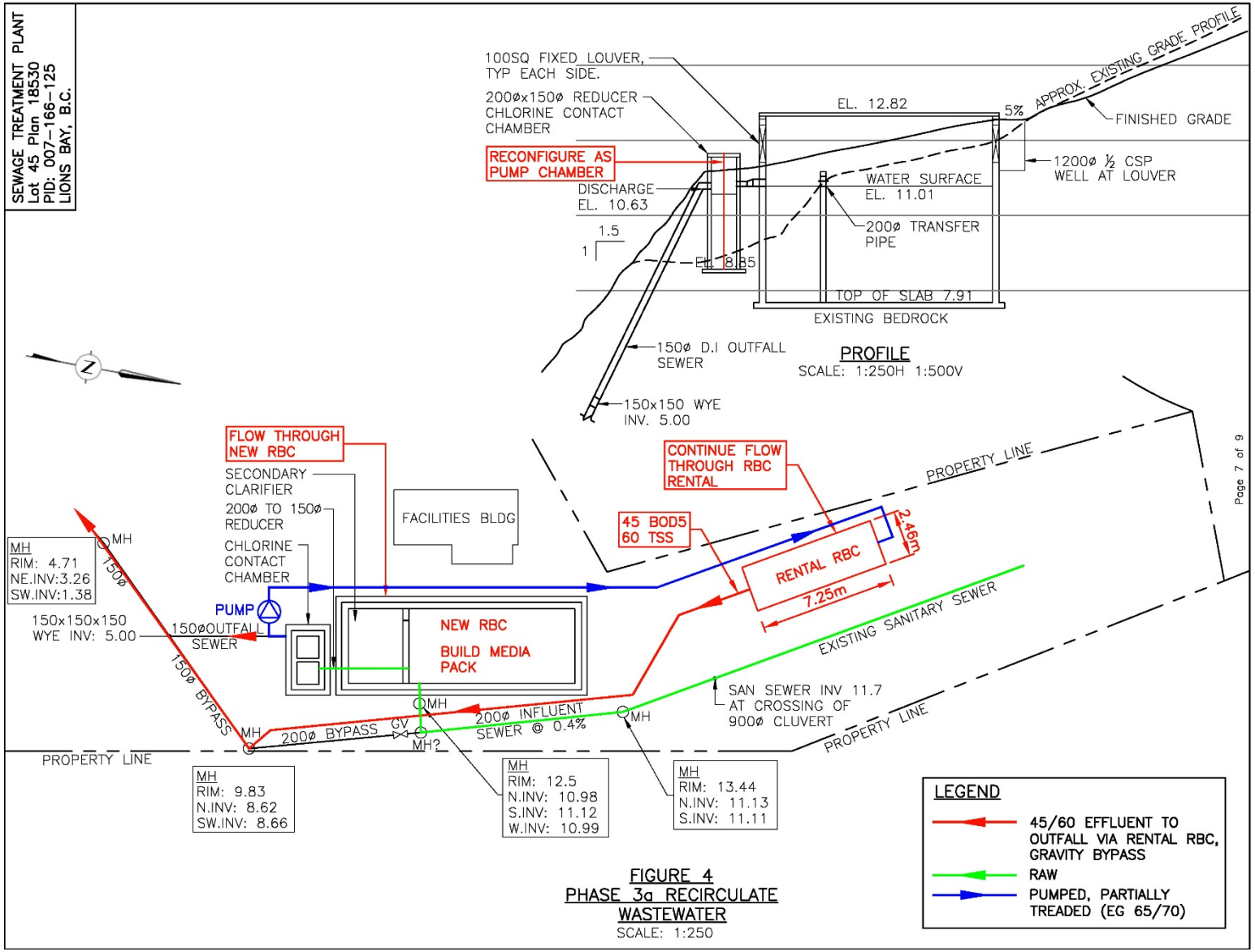


FIGURE 4
PHASE 3a RECIRCULATE WASTEWATER
SCALE: 1:250

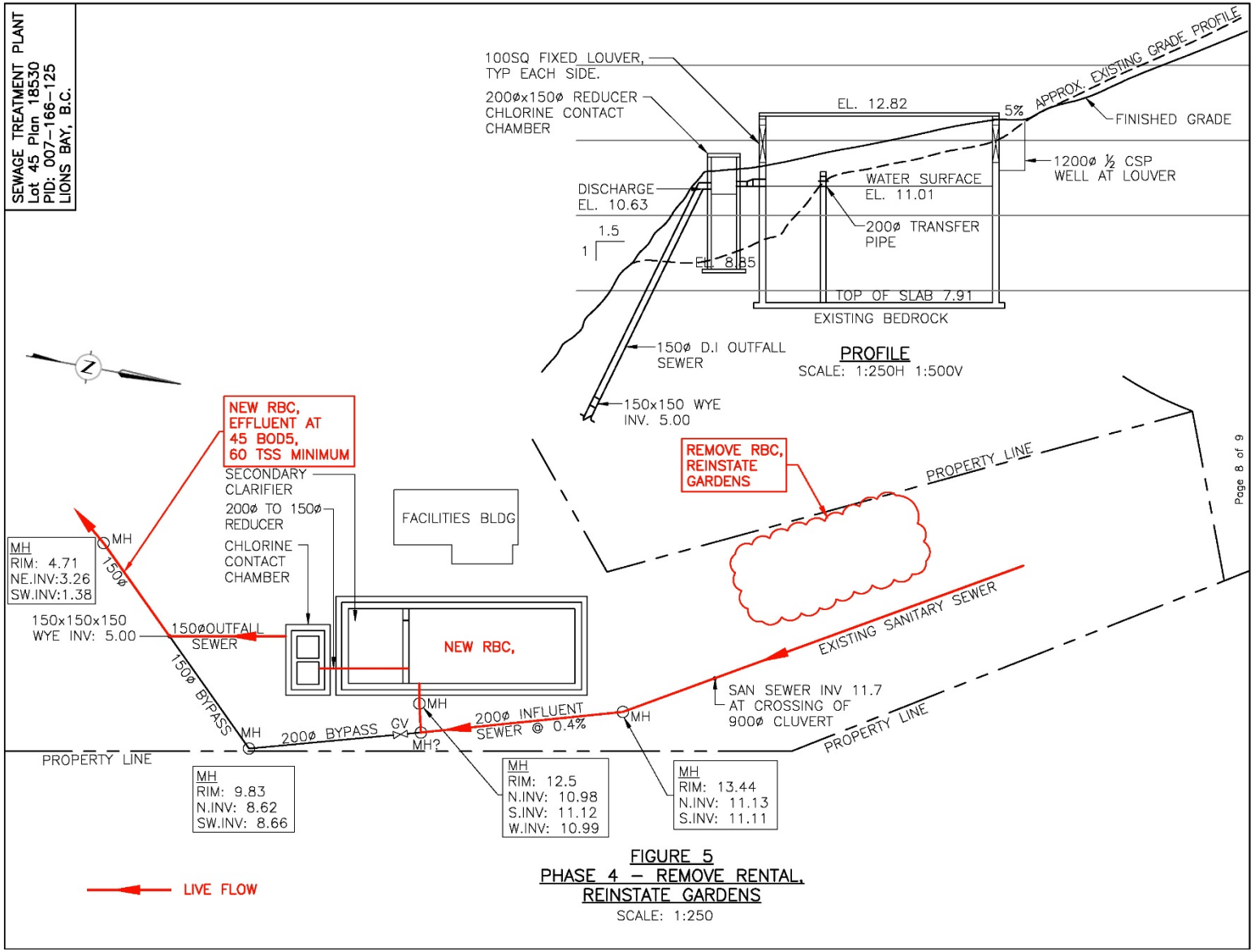
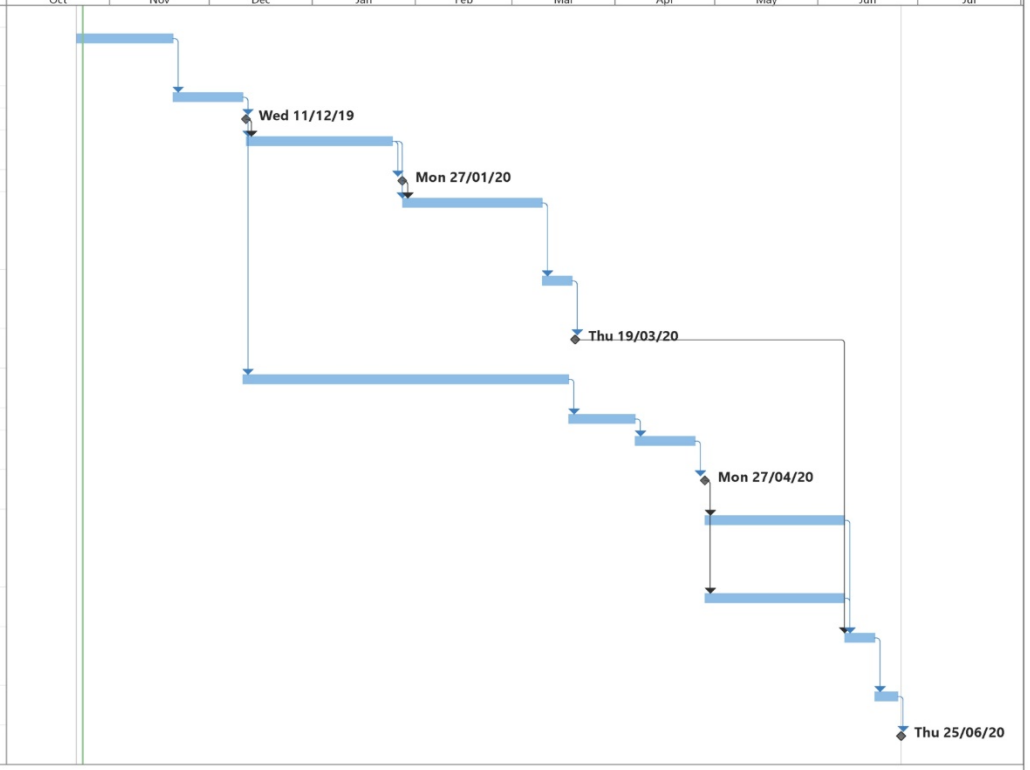


FIGURE 5
PHASE 4 – REMOVE RENTAL, REINSTATE GARDENS
SCALE: 1:250

KELVIN GROVE RBC BYPASS PROGRAMME

ID	Task Mode	Task Name	Duration	Start	Finish
1					
2		Design Build Tender Process for new RBC	21 days	Tue 22/10/19	Tue 19/11/19
3		Review Tenders	15 days	Wed 20/11/19	Tue 10/12/19
4		Contract Awarded	1 day?	Wed 11/12/19	Wed 11/12/19
5		Order and Install Rental Unit	32 days	Thu 12/12/19	Fri 24/01/20
6		**Phase 1**	1 day?	Mon 27/01/20	Mon 27/01/20
7		Build Media Pack on Rental Unit, Continue Discharge through Existing	30 days	Tue 28/01/20	Mon 09/03/20
8		Rental Unit Discharges Effluent to 45/60	7 days	Tue 10/03/20	Wed 18/03/20
9		**Phase 2 - Bypass Goes Live**	1 day	Thu 19/03/20	Thu 19/03/20
10		New RBC Plant Manufactured	70 days	Wed 11/12/19	Tue 17/03/20
11		New RBC Delivery	14 days	Wed 18/03/20	Mon 06/04/20
12		Installation of new RBC Plant	14 days	Tue 07/04/20	Fri 24/04/20
13		**Phase 3 Commences**	**1 day?**	**Mon 27/04/20**	**Mon 27/04/20**
14		Rental Unit Continues Discharges of Effluent to 45/60	30 days	Tue 28/04/20	Mon 08/06/20
15		Recirculation of raw Wastewater	30 days	Tue 28/04/20	Mon 08/06/20
16		New RBC Media Pack discharges at 45/60	7 days	Tue 09/06/20	Wed 17/06/20
17		**Phase 4 - Remove Bypass**	5 days	Thu 18/06/20	Wed 24/06/20
18		Confirm Completion to MoE	1 day	Thu 25/06/20	Thu 25/06/20



Project: Project1 Sequential
Date: Thu 24/10/19

Task	Project Summary	Manual Task	Start-only	Deadline	
Split	Inactive Task	Duration-only	Finish-only	Progress	
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress	
Summary	Inactive Summary	Manual Summary	External Milestone		

APPENDIX 3 – BYPASS APPROVAL LETTER

December 12, 2019

File: PE- 05188

The Municipality of the Village of Lions Bay
Box 141 Lions Bay, BC
V0N 2E0

VIA EMAIL:Naizam (Nai) Jaffer, Public Works Manager: works@lionsbay.ca
cc: Ian Chadwick, EHD Engineering: ehdconsulting@shaw.ca

Re: Request for Temporary Bypass of Authorized Works at Village of Lions Bay's Kelvin Grove Sewage Treatment Facility, Permit PE-5188

Dear Mr. Jaffer,

This letter acknowledges the Ministry of Environment and Climate Change Strategy's (ENV's) receipt of a request,prepared by EHD Consulting Ltd. (EHD) on behalf of the Municipality of the Village of Lions Bay (LB), for approval to temporarily bypass the authorized Kelvin Grove wastewater treatment facility and discharge treated sewage effluent from a rented Rotating Biological Contactor (RBC) to marine waters.

This letter alao acknowledges the letters dated September 12, 2019 and October 23, 2019, that were submitted by EHD in support of this bypass request.

Based on the information provided in letters, I understand that LB plans to take the sewage treatment facility, located at Lot 45 Tidewater Way, Kelvin Grove Estates, off-line, in order to address maintenance issues relating to the 40-year age of the existing RBC as well as any other maintenance issues that were identified during an October 15, 2019 visual inspection of the tank walls and the equipment below the water line.

The proposed maintenance works include:

- Replacement of the existing. RBC "like- for-like" with a new RBC plant to replace the existing 40 year old plant RBC; and,
- To address any other maintenance issues that have been identified.

As such, LB has requested approval from ENV to temporarily allow influent to bypass the Rotating Biological Contactor (RBC) treatment plant and be treated by a rental RBC for a period of up to 7 months.

EHD's, October 23, 2019, letter provides a detailed methodology and schedule for this bypass, which is to be followed. The influent (untreated wastewater) will initially be treated using the existing RBC and treatment works until the rental RBC has the biomass growth etc. to meet the exisitng permit (PE-05188) requirements of 45 mg/L for 5-Day Biochemical Oxygen Demand (BOD_5) and 60mg/L Total Suspended Solids (TSS) (45/60 mg/L).

Once it has been determined that the rental RBC can treat the influent to 45/60 mg/L, the influent flow will be diverted to the rental RBC for treatment, and the treated effluent will be discharged to marine waters via the existing authorized outfall. After the new RBC plant is constructed, recirculation of treated wastewater from the rental RBC to the new RBC will occur, to enable development of the media pack and to provide a means for verification of the new media pack performance, independent from the performance of the rental unit.

In accordance with Section 2.2 of Permit No. PE-05188, a bypass of the authorized works is approved subject to the following conditions:

1. One bypass event of a maximum duration of 7 continuous months is authorized to take place **from January 1, 2020 through July 31, 2020**. During which time the untreated influent may bypass the authorized treatment works and be diverted to a rental RBC, by using an existing closed gate valve in the exisitng sanitary sewer line, and then flow from the rental RBC back to the existing outfall for discharge to marine waters, as the current authorized discharge does.

2. The detailed methodology and schedule described in EHD's October 23, 2019 letter must be followed (with the exception that testing of the effluent will be twice weekly rather than bi-weekly) and and every reasonable effort made to adhere to the schedule provided in that letter.

3. The maximum volume of effluent that may bypass the authorized works, as described in item 2 above, is a total of 100 cubic meters per day with an effluent quality of 45 mg/L BOD_5 and 60mg/L (45/60 mg/L), with twice weekly testing.

4. Biomass regrowth will be required on the proposed new RBC. Once the regrowth is deemed adequate and the new RBC is commissioned such that the permitted effluent parameters of 45/60mg/L are consistently met when tested independently from the rental unit, the rental unit can be decommissioned and the bypass can be considered complete.

5. Any wastewater, effluent, sludge and/or waste removed from the rental RBC during the bypass event shall be managed in an authorized manner.

6. LB must notifiy the Vancouver Coastal Health Authority, in writing, in advance of

this bypass event commencing.

7. In the event of any proposed variation in the methodology or schedule, provided in EHD's October 23, 2019 letter, LB must notify the ENV regional office immediately, in writing, for review and approval prior to implementation.

8. LB must notify the ENV regional office in writing immediately before the bypass event is to commence, and immediately after the bypass event has terminated.

9. In the event of any effluent non-compliance or failures, LB must immediately notify ENV, and adopt any alternative corrective actions proposed by the project engineer, or ENV, including the emergency contingencies noted in EHD's Ocotber 23, 2019 letter.

LB is expected to respond to any comments received from anyone who expresses concerns regarding this bypass event. It may be necessary for LB to have a qualified professional respond and resolve concerns.

If you have any questions or would like to discuss the contents of this letter further, please contact Environmental Protection Officer, Roger Cavadini at Roger.Cavadini@gov.bc.ca.

Yours truly,

Bryan Vroom
for director, *Environmental Management Act*

APPENDIX 4 – DAILY FLOW READINGS

Date	Day Total (L)	Max. DF (L/sec.)	Min. DF (L/sec.)
01-Jan-20	114,327.14	1.95	0.93
02-Jan-20	99,399.06	1.93	0.52
03-Jan-20	102,313.46	2.02	0.71
04-Jan-20	106,850.58	2.20	0.74
05-Jan-20	100,268.56	1.81	0.61
06-Jan-20	101,833.44	1.97	0.60
07-Jan-20	140,887.26	2.31	0.94
08-Jan-20	118,427.40	2.04	0.95
09-Jan-20	94,445.70	1.91	0.58
10-Jan-20	90,793.75	1.64	0.55
11-Jan-20	106,440.99	2.17	0.72
12-Jan-20	108,442.49	2.33	0.59
13-Jan-20	96,346.16	1.91	0.62
14-Jan-20	91,678.74	1.73	0.55
15-Jan-20	101,267.14	1.78	0.53
16-Jan-20	94,469.80	1.61	0.52
17-Jan-20	93,445.43	1.60	0.55
18-Jan-20	106,728.38	2.16	0.50
19-Jan-20	116,067.48	2.81	0.56
20-Jan-20	148,969.25	2.48	0.96
21-Jan-20	202,999.03	4.53	1.04
22-Jan-20	154,842.41	2.42	1.40
23-Jan-20	191,504.83	3.61	1.34
24-Jan-20	142,457.99	2.41	1.08
25-Jan-20	101,258.26	1.91	0.70
26-Jan-20	104,083.12	2.05	0.60
27-Jan-20	92,513.28	2.14	0.53
28-Jan-20	80,579.72	1.73	0.55
29-Jan-20	107,438.32	2.16	0.53
30-Jan-20	108,814.85	2.10	0.88
31-Jan-20	165,176.16	3.38	0.84

Date	Day Total (L)	Max. DF (L/sec.)	Min. DF (L/sec.)
01-Feb-20	170,982.52	3.32	1.29
02-Feb-20	97,993.68	2.14	0.68
03-Feb-20	80,117.72	1.67	0.50
04-Feb-20	81,468.85	1.77	0.44
05-Feb-20	78,191.82	2.00	0.39
06-Feb-20	80,013.78	1.43	0.48
07-Feb-20	78,586.90	1.43	0.53
08-Feb-20	88,435.58	1.73	0.54
09-Feb-20	84,465.79	1.63	0.44
10-Feb-20	77,688.10	1.55	0.43
11-Feb-20	78,605.33	1.53	0.42
12-Feb-20	81,192.40	1.70	0.46
13-Feb-20	77,970.42	1.71	0.44
14-Feb-20	85,222.10	1.78	0.48
15-Feb-20	85,977.66	1.86	0.43
16-Feb-20	82,476.60	1.57	0.42
17-Feb-20	95,484.24	1.94	0.40
18-Feb-20	75,692.68	1.55	0.40
19-Feb-20	82,768.88	1.94	0.39
20-Feb-20	90,343.20	1.92	0.66
21-Feb-20	75,848.09	1.48	0.41
22-Feb-20	91,116.87	2.10	0.58
23-Feb-20	110,704.19	2.32	0.47
24-Feb-20	100,943.93	2.04	0.68
25-Feb-20	85,150.41	1.65	0.54
26-Feb-20	72,406.51	1.68	0.34
27-Feb-20	72,750.22	1.53	0.34
28-Feb-20	73,183.24	1.61	0.37
29-Feb-20	82,356.86	1.54	0.43

Date	Day Total (L)	Max. DF (L/sec.)	Min. DF (L/sec.)
01-Mar-20	88,856.29	1.94	0.50
02-Mar-20	81,084.45	1.84	0.42
03-Mar-20	83,377.63	1.63	0.46
04-Mar-20	80,755.64	1.69	0.46
05-Mar-20	80,496.05	1.57	0.46
06-Mar-20	82,121.06	1.88	0.42
07-Mar-20	80,460.21	1.44	0.42
08-Mar-20	86,891.86	1.80	0.42
09-Mar-20	89,526.29	2.05	0.43
10-Mar-20	86,911.06	1.86	0.45
11-Mar-20	98,349.58	2.07	0.51
12-Mar-20	90,326.11	2.20	0.63
13-Mar-20	82,204.87	1.94	0.43
14-Mar-20	90,468.20	2.67	0.41
15-Mar-20	70,853.35	1.67	0.31
16-Mar-20	58,812.03	1.84	0.19
17-Mar-20	57,269.25	1.69	0.20
18-Mar-20	56,833.92	1.62	0.18
19-Mar-20	25,451.17	1.35	0.21
20-Mar-20	58,609.57	1.97	0.20
21-Mar-20	59,276.48	1.65	0.20
22-Mar-20	63,324.69	1.56	0.23
23-Mar-20	61,530.21	1.45	0.18
24-Mar-20	65,250.65	1.69	0.20
25-Mar-20	56,455.97	1.51	0.21
26-Mar-20	60,822.27	1.57	0.19
27-Mar-20	61,342.64	1.48	0.19
28-Mar-20	63,081.59	1.44	0.22
29-Mar-20	63,935.50	1.53	0.25
30-Mar-20	80,394.44	1.60	0.34
31-Mar-20	60,677.42	1.35	0.25

Date	Day Total (L)	Max. DF (L/sec.)	Min. DF (L/sec.)
01-Apr-20	8,157.66	0.88	0.2
02-Apr-20	63,049.74	1.69	0.18
03-Apr-20	62,378.07	1.58	0.19
04-Apr-20	66,045.73	2.55	0.21
05-Apr-20	66,991.56	1.4	0.23
06-Apr-20	59,654.36	1.31	0.21
07-Apr-20	59,344.05	1.79	0.21
08-Apr-20	60,906.18	1.51	0.2
09-Apr-20	63,745.96	1.52	0.25
10-Apr-20	69,281.88	1.55	0.27
11-Apr-20	73,654.90	1.85	0.25
12-Apr-20	68,131.29	1.59	0.23
13-Apr-20	72,489.87	2.62	0.23
14-Apr-20	77,829.45	1.86	0.26
15-Apr-20	73,460.18	1.73	0.29
16-Apr-20	70,240.43	1.55	0.24
17-Apr-20	71,224.66	1.6	0.29
18-Apr-20	73,889.15	1.68	0.3
19-Apr-20	72,460.93	1.81	0.29
20-Apr-20	64,908.20	1.39	0.28
21-Apr-20	62,600.72	1.47	0.25
22-Apr-20	63,066.73	1.5	0.24
23-Apr-20	65,985.12	1.52	0.25
24-Apr-20	63,592.94	1.42	0.24
25-Apr-20	69,540.68	1.57	0.27
26-Apr-20	67,272.47	1.52	0.27
27-Apr-20	64,613.29	1.68	0.09
28-Apr-20	65,650.83	1.49	0.24
29-Apr-20	64,990.13	1.89	0.22
30-Apr-20	63,628.26	1.65	0.23

Date	Day Total (L)	Max. DF (L/sec.)	Min. DF (L/sec.)
01-May-20	64,618.48	1.31	0.27
02-May-20	82,753.70	1.99	0.27
03-May-20	70,802.85	1.75	0.32
04-May-20	69,164.91	1.51	0.31
05-May-20	71,463.02	1.84	0.28
06-May-20	68,391.66	2.09	0.3
07-May-20	60,374.25	1.3	0.06
08-May-20	69,044.68	1.3	0.28
09-May-20	60,409.24	1.08	0.23
10-May-20	66,023.87	1.07	0.23
11-May-20	63,604.31	1	0.25
12-May-20	62,952.50	0.97	0.29
13-May-20	62,878.81	0.99	0.27
14-May-20	60,977.63	1.12	0.27
15-May-20	63,491.09	0.95	0.25
16-May-20	63,406.29	0.98	0.26
17-May-20	68,333.89	0.96	0.3
18-May-20	66,453.46	1.11	0.27
19-May-20	61,075.91	0.98	0.26
20-May-20	65,066.22	0.95	0.29
21-May-20	63,531.17	0.97	0.28
22-May-20	75,361.56	1	0.47
23-May-20	65,268.66	0.97	0.25
24-May-20	70,751.39	1.56	0.31
25-May-20	66,884.31	0.98	0.33
26-May-20	63,571.24	0.95	0.28
27-May-20	62,971.73	1.01	0.28
28-May-20	59,324.31	0.94	0.25
29-May-20	61,880.41	1.09	0.26
30-May-20	58,789.49	0.94	0.26
31-May-20	61,138.05	0.95	0.24

Averaged Daily Flow Readings (2018/2019)

Date	Day Total (L)	Date	Day Total (L)	Date	Day Total (L)	Date	Day Total (L)
01-Jun-20	67,215.43	01-Jul-20	75,886.04	01-Aug-20	66,513.12	01-Sep-20	74,407.74
02-Jun-20	74,111.42	02-Jul-20	68,325.55	02-Aug-20	63,254.16	02-Sep-20	81,496.84
03-Jun-20	86,936.06	03-Jul-20	69,095.69	03-Aug-20	70,490.83	03-Sep-20	74,759.16
04-Jun-20	80,346.14	04-Jul-20	69,214.82	04-Aug-20	71,012.45	04-Sep-20	74,626.62
05-Jun-20	66,010.18	05-Jul-20	74,550.11	05-Aug-20	79,221.67	05-Sep-20	78,723.74
06-Jun-20	66,569.18	06-Jul-20	79,372.70	06-Aug-20	72,321.48	06-Sep-20	75,323.75
07-Jun-20	69,846.22	07-Jul-20	82,313.14	07-Aug-20	72,503.52	07-Sep-20	76,081.28
08-Jun-20	70,347.28	08-Jul-20	76,545.75	08-Aug-20	72,404.16	08-Sep-20	83,812.88
09-Jun-20	71,859.38	09-Jul-20	70,970.63	09-Aug-20	71,793.14	09-Sep-20	74,923.06
10-Jun-20	66,652.29	10-Jul-20	77,557.39	10-Aug-20	73,753.67	10-Sep-20	73,623.97
11-Jun-20	66,409.12	11-Jul-20	67,785.84	11-Aug-20	80,789.90	11-Sep-20	75,156.51
12-Jun-20	69,996.85	12-Jul-20	66,739.40	12-Aug-20	75,895.46	12-Sep-20	77,770.28
13-Jun-20	68,953.29	13-Jul-20	73,377.44	13-Aug-20	73,761.75	13-Sep-20	77,442.08
14-Jun-20	69,921.97	14-Jul-20	72,853.76	14-Aug-20	75,753.12	14-Sep-20	88,399.74
15-Jun-20	70,422.61	15-Jul-20	73,129.50	15-Aug-20	69,465.56	15-Sep-20	107,472.30
16-Jun-20	72,968.64	16-Jul-20	71,316.66	16-Aug-20	70,524.74	16-Sep-20	83,663.56
17-Jun-20	70,752.13	17-Jul-20	70,817.66	17-Aug-20	70,658.05	17-Sep-20	89,027.40
18-Jun-20	69,757.49	18-Jul-20	67,527.39	18-Aug-20	77,761.34	18-Sep-20	84,433.31
19-Jun-20	70,495.49	19-Jul-20	68,693.35	19-Aug-20	75,944.42	19-Sep-20	81,477.68
20-Jun-20	68,892.47	20-Jul-20	63,454.96	20-Aug-20	73,474.32	20-Sep-20	94,015.75
21-Jun-20	75,487.33	21-Jul-20	62,905.23	21-Aug-20	74,788.37	21-Sep-20	98,458.64
22-Jun-20	71,270.18	22-Jul-20	64,616.45	22-Aug-20	71,956.99	22-Sep-20	99,433.68
23-Jun-20	73,124.92	23-Jul-20	61,791.89	23-Aug-20	75,066.34	23-Sep-20	88,289.27
24-Jun-20	71,795.23	24-Jul-20	65,002.71	24-Aug-20	78,943.02	24-Sep-20	77,948.13
25-Jun-20	67,260.23	25-Jul-20	65,593.00	25-Aug-20	80,078.74	25-Sep-20	82,407.74
26-Jun-20	70,125.99	26-Jul-20	66,069.22	26-Aug-20	79,051.83	26-Sep-20	85,706.25
27-Jun-20	71,998.02	27-Jul-20	69,530.57	27-Aug-20	78,476.72	27-Sep-20	79,158.45
28-Jun-20	74,479.10	28-Jul-20	72,708.50	28-Aug-20	81,339.79	28-Sep-20	80,321.56
29-Jun-20	73,684.32	29-Jul-20	65,516.20	29-Aug-20	78,006.07	29-Sep-20	95,324.10
30-Jun-20	73,442.00	30-Jul-20	62,774.62	30-Aug-20	79,508.84	30-Sep-20	90,553.00
		31-Jul-20	69,432.96	31-Aug-20	75,843.74		

Date	Day Total (L)	Date	Day Total (L)	Date	Day Total (L)
01-Oct-20	79,010.62	01-Nov-20	87,115.46	01-Dec-20	81,565.63
02-Oct-20	82,705.50	02-Nov-20	88,638.09	02-Dec-20	87,666.28
03-Oct-20	85,334.36	03-Nov-20	88,888.78	03-Dec-20	76,899.38
04-Oct-20	84,493.44	04-Nov-20	93,733.43	04-Dec-20	83,458.83
05-Oct-20	83,970.68	05-Nov-20	75,868.22	05-Dec-20	76,798.56
06-Oct-20	89,954.74	06-Nov-20	72,886.96	06-Dec-20	78,620.30
07-Oct-20	90,195.95	07-Nov-20	73,486.35	07-Dec-20	87,716.13
08-Oct-20	85,472.85	08-Nov-20	70,472.97	08-Dec-20	88,874.95
09-Oct-20	79,554.66	09-Nov-20	77,613.35	09-Dec-20	95,428.39
10-Oct-20	79,691.18	10-Nov-20	84,672.54	10-Dec-20	89,970.79
11-Oct-20	85,403.56	11-Nov-20	80,427.99	11-Dec-20	110,286.18
12-Oct-20	87,939.28	12-Nov-20	80,370.86	12-Dec-20	96,272.04
13-Oct-20	95,731.83	13-Nov-20	83,112.64	13-Dec-20	114,277.52
14-Oct-20	89,873.12	14-Nov-20	91,074.24	14-Dec-20	117,911.70
15-Oct-20	49,495.04	15-Nov-20	85,523.96	15-Dec-20	87,564.18
16-Oct-20	40,281.78	16-Nov-20	86,451.71	16-Dec-20	113,831.86
17-Oct-20	63,233.18	17-Nov-20	120,253.26	17-Dec-20	105,067.01
18-Oct-20	86,704.18	18-Nov-20	87,736.80	18-Dec-20	138,919.36
19-Oct-20	84,376.70	19-Nov-20	86,440.91	19-Dec-20	134,226.76
20-Oct-20	98,025.08	20-Nov-20	82,756.07	20-Dec-20	140,837.51
21-Oct-20	106,438.09	21-Nov-20	84,120.96	21-Dec-20	105,585.18
22-Oct-20	91,873.60	22-Nov-20	92,789.91	22-Dec-20	107,645.62
23-Oct-20	55,757.37	23-Nov-20	98,302.96	23-Dec-20	122,326.02
24-Oct-20	44,144.25	24-Nov-20	91,966.20	24-Dec-20	116,413.69
25-Oct-20	75,998.99	25-Nov-20	91,994.31	25-Dec-20	111,954.23
26-Oct-20	91,024.98	26-Nov-20	61,405.68	26-Dec-20	105,317.50
27-Oct-20	85,815.64	27-Nov-20	142,712.18	27-Dec-20	107,711.62
28-Oct-20	83,011.13	28-Nov-20	91,173.27	28-Dec-20	114,546.64
29-Oct-20	74,247.87	29-Nov-20	80,129.42	29-Dec-20	113,594.06
30-Oct-20	86,473.81	30-Nov-20	79,826.85	30-Dec-20	99,483.73
31-Oct-20	86,553.64			31-Dec-20	104,865.78