HATCH



Report for

# City of Hamilton

## CSO Facilities O&M Plan – MECP Order Item 6

January 31, 2019




City of Hamilton
CSO Facilities O&M Plan -
MECP Order Item 6

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| | | | HATCH | |

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## 1. Introduction and Background

On August 2, 2018, the Ministry of Environment, Conservation and Parks (MECP) issued Provincial Officer's Order #1-J25YB (hereinafter referred to as the Order) to the City in relation to the discharge of untreated wastewater to the environment.

The Facilities Assessment Report dated November 31, 2018 prepared by Hatch provided in response to MECP Order Items 4, 7, 8 and 9 (Hatch CSO Facilities Assessment Report, 2018) discussed the findings of the Combined Sewer Overflow (CSO) facility inspections and evaluation of the need for modifications to improve the monitoring, performance and reliability of each facility to minimize the potential for unapproved bypasses/overflows/spills from the facilities (Order Items 4, 7 and 8); and provided recommendations as required by Order Item 9.

Item 4 required the City to inspect all CSO facilities and inventory all critical valves (bypass gates) and control points (overflows) which can be a source of discharge to the natural environment and which would not be captured by existing flow monitoring equipment, including confirmation of manual and SCADA valve position correlation and local or remote control.

Item 7 required the City to evaluate the need for modification(s) to the Main/King CSO Facility, to improve monitoring, performance, reliability and to minimize bypasses/overflows/spills into the 2400 mm storm outfall from the (CSO tank) overflow trough and inlet chamber bypass.

Item 8 required the City to evaluate the need for modification(s) similar to those required by Item 7 above for all other CSO facilities within the Hamilton Wastewater Collection System to minimize bypasses/overflows/spills.

Item 9 required the City to prepare a written report which sets out the evaluation required by the Items 7 and 8 above, along with recommendations and timelines to implement these recommendations.

This current report addresses the requirements of Order Item 6, which requires the City to: using the information obtained from Item 4, and if applicable, Item 5 (updated CSO map), review and update drawings, Process Control Narratives (PCNs) and develop a written Operation and Maintenance Plan (O&M Plan) for each of the City's CSO facilities that identifies critical equipment and environmental discharge points, and shall include, but not be limited to: annual manual valve position checks of critical valves; monthly visual inspections of overflow structures at the CSO facilities equipped with station by-pass structures that discharge directly to the natural environment; and annual flow meter calibration.

The Hatch CSO Facilities Assessment Report (2018) already addressed the first requirement of Item 6, identifying critical equipment and potential environmental discharge points, and providing a number of recommendations to minimize the potential for such discharges in the future, including improved monitoring, control and inspection of the City's CSO facilities.

This report builds upon the information presented in the Hatch CSO Facilities Assessment Report (2018), providing a written O&M Plan for each of the City's CSO facilities and addressing whether updates are required to drawings and PCNs.

## 2. Discussion

The basis of the City's O&M Plan for each of the CSO facilities is their Standard Operating Procedure (SOP). The SOPs detail procedures for the safe and efficient operation of each facility, including the responsibilities of all levels of City staff involved in the operations and maintenance of the City's wastewater system, and in particular the CSO facilities; relevant safety notes and

procedures; procedures for the confined space entry into the underground CSO tanks and valve/gate chambers for the purposes of routine maintenance and inspection; an overview of the O&M process and equipment at each site; and specific procedures to be followed by City staff to safely operate and maintain each facility under all flow conditions, including annual and monthly inspection requirements.

The remaining components of the O&M Plan for each CSO facility include:

- The Process Control Narrative (PCN) for the facility, which describes how the facility is monitored and controlled by the City's Supervisory Control and Data Acquisition (SCADA) system
- Equipment Operation and Maintenance Manuals, which are typically provided by the Consultants and/or Contractors responsible for the construction and/or subsequent upgrades of each facility
- As-Built Drawings of each facility
- Additional formal procedures developed and employed by the City to operate and maintain the CSO facilities, including procedures for Confined Space Entry, Equipment Lock Out/Tagging, CSO Overflow Notification, and CSO Facility Inspection

This report summarizes the O&M Plan for each of the City's CSO facilities, including a brief description of the facility and any Critical Control Points (CCPs), an inventory of the key components of the plan, including the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings; and appendices including the current updated SOPs and PCNs.

Copies of the updated SOPs can be found in Appendix A, and a copy of the updated PCN for the Main/King CSO Tank (HCS04) can be found in in Appendix B. Copies of the remaining unchanged PCNs, equipment O&M manuals and as-built drawings are not provided here due their volume, but can be made available to the MECP.

The remainder of this report is broken down facility by facility, including a separate section for each of the City's existing CSO facilities, including the following locations:

1) Greenhill CSO Tank #1 (HCS01)
2) Bayfront Park CSO Tank (HCS02)
3) James Street CSO Tank (HCS03), including Ferrie-Mary CSO Regulator Gate (HCG03)
4) Main/King CSO Tank (HCS04)
5) Eastwood Park CSO Tank (HCS05), including Burlington-Ferguson and Ferrie-Ferguson CSO Regulator Gates (HCG06 and HCG07)
6) Greenhill CSO Tank #2 (HCS06)
7) Red Hill Storage Facility (HCS07), including Lawrence Road, Queenston Road and Barton Street Gates (HCS7A, HCS7B and HCS7C) and Lawrence/King CSO Gate (HCG05)
8) Royal Avenue CSO Tank (HCS08)
9) McMaster/Ewen CSO Tank (HCS09)
10) Wentworth/Rosemary CSO Gate (HCG03)
11) Brampton/Strathearne CSO Gate (HCG04)
12) Wellington/Burlington CSO Gate (HCG14)
13) Parkdale Burlington Wastewater Collection Station (HC001)

Additional details on each of the CSO facilities can be found in the Hatch CSO Facilities Assessment Report (2018), including a brief narrative description of each facility and its purpose; drawings/figures showing the location of the CCPs at each facility, and also indicating the potential for possible unapproved sewage discharges to the environment, colour coded to indicate criticality; and tables providing an inventory of all the CCPs at each facility, including their name; SCADA tag name (where applicable); size/capacity; whether they are manually operated or motorized; their purpose in terms of flow control; their default position (as per the facility's PCN and/or SOP); their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/ spills into adjacent receiving waters.
The following sections of this current report provide a brief narrative description of each of the above CSO facilities and their purpose, and provide a summary of the key components of the O&M Plan for each facility, including a table providing an inventory of the key components of the plan, including the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings; and appendices including the current updated SOPs and PCNs.

As noted above, additional details on each CSO facility can be found in the respective section of the Hatch CSO Facilities Assessment Report (2018). For the sake of brevity, the drawings/figures and tables presented in the Hatch CSO Facilities Assessment Report (2018) are not reproduced here in this report, but are referenced where applicable below.

## 2.1 Greenhill CSO Tank #1 (HCS01)

The original Greenhill CSO Tank (HCS01) is an underground reinforced concrete structure that provides approximately 83,500 $m^3$ of CSO storage capacity, and was designed to capture the runoff from a 15 mm design storm. The storage volume is provided within a circular tank, which is approximately 54 m in diameter and 9 m deep, and includes two separate storage cells. The first cell provides approximately 13,900 $m^3$ of storage, and if the first cell fills, the second cell provides approximately 69,600 $m^3$ of additional storage.

Originally, HCS01 received sewage inflows directly from the combined trunk sewer running east along Greenhill Avenue, but with the addition of Greenhill CSO Tank #2 (HCS06), the original CSO tank now receives the overflows from the new CSO Tank #2 (HSC06). The combined operation of the two CSO tanks is discussed in more detail below in Section 2.6.

HCS01 is filled by gravity from the overflow from HCS06, and drained by motorized flow control gates over the discharges from the two storage cells, into the Red Hill Creek Sanitary Interceptor Sewer (RHCSI), which conveys flows to the Woodward Avenue Wastewater Treatment Plant (WWTP). The gates can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Manual, with operation directed by Operators at the WWTP. A water spray nozzle system is provided to clean the floor of Cell 2.

Level transmitters are provided to monitor the level of sewage stored in each storage cell, and in the CSO tank outlet channel; and a flowmeter is provided to measure the rate and volume of any CSOs exiting the facility.

The facility is monitored and controlled via SCADA by Operators at the WWTP. The SCADA system includes a security system to advise of any unauthorized entries into the pumping station.

Figures 1A and 1B of the Hatch CSO Facilities Assessment Report (2018) showed the location of the CCPs at this facility, as well as potential for possible sewage discharges to the environment from each CCP, colour coded to indicate criticality; and Table 1 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 1 provided below summarizes the key components of the O&M Plan for HCS01, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

The SOP has been updated as part of this report (Issue #5, Jan 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs, and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and therefore no changes have been made to the current version of the PCN (Version 2.4, Apr 2016). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings. These would be updated in the future, if and when any upgrades are completed. For example, the Hatch CSO Facilities Assessment Report (2018) recommended conducting an engineering study to determine the feasibility of adding redundant gate position sensors on the Cell 1 and 2 Drain Gates themselves, to back up the existing sensors on the gate stems; and the City has plans to investigate and possibly upgrade the performance of the existing tank cleaning system.

**Table 1: Summary of O&M Plan for Greenhill CSO Tank #1 (HCS01)**

| O&M Plan Component | Name of Document | Prepared By | Version # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Greenhill CSO Tank #1 (HCS01) | Hamilton Water<br>Hatch Ltd. | Issue #5 | Jan 2019 |
| Equipment O&M Manual | Operation and Maintenance Manual – Contract RHW-86-10 (S) – HCS01 | UMA Engineering Ltd. | N/A | 1986 |
| Equipment O&M Manual | Operation and Maintenance Manual for Odour Control System – HCS01 | McCullough Gibson Construction Ltd | N/A | Nov 1997 |
| Process Control Narrative (PCN) | Process Control Narrative – Greenhill Sewage Overflow Facility (HCS01) | Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 2.4 | Apr 2016 |
| As-Built Drawings | Greenhill Avenue Storage Facility – Contract No. RHW-86-01 | UMA Engineering Ltd. | Dwg No. 807-13 | Dec 1985 |

## 2.2 Bayfront Park CSO Tank (HCS02)

The Bayfront Park CSO Tank (HCS02) covers an area of approximately 3,200 $m^2$, and is over 6 m deep, providing approximately 21,000 $m^3$ of CSO storage capacity in two equally sized storage cells. A 4.0 m x 1.5 m box sewer (which later changes to 2,250 mm diameter) intercepts CSOs from the former Queen and Hess Street CSO outfalls and conveys them to the CSO tank. Flow into the tank is regulated by static CSO regulators at Queen/Barton, Stuart/Hess, and Stuart/Caroline, and by the Strachan Street Sewage Pumping Station (HC003). A flow regulating chamber is also provided upstream of the tank (near the CSO tank outfall), which includes three gates that can be operated to convey all flows into the CSO tank (in their default positions) or to provide a maintenance bypass of the tank (in their alternate positions). The operation of the gates is explained in more detail in the Hatch CSO Facilities Assessment Report (2018), and in the updated SOP found in Appendix A. The two Maintenance Bypass Gates are locked in the Fully Closed position to ensure all incoming sewage flows are conveyed into the CSO storage tank and eliminate the possibility of any dry weather sewage discharges to Hamilton Harbour at this location.

During Dry Weather Flow (DWF) conditions, all flow is directed to the WWTP via the CSO regulators and the three (3) dry pit pumps in the pumping station (3 x 180 L/s).

During Wet Weather Flow (WWF) conditions, excess flows from the three static CSO regulators overflow into the CSO tank. Cell 1 will fill first, and if it fills completely, will overflow into Cell 2. If Cell 2 also fills, CSOs are discharged to Hamilton Harbour via the outfall sewer that exits the north-west corner of the tank. Stainless steel underflow baffles are employed above the tank overflow in Cell 2 to retain floatable materials within the tank. If the tank fills completely, CSOs are conveyed via a 5,000 mm x 2,000 mm box sewer to the outfall that enters the Harbour at the east end of the inlet between the park and the railway lands.

Combined sewage retained in the tank during wet weather is subsequently returned to the Western Sanitary Interceptor (WSI) and conveyed to the WWTP for treatment during dry weather, when the plant can deal with the additional flow. The tank is drained by two (2) 200 L/s submersible pumps located in Cell 1. A flap gate between Cell 1 and Cell 2 allows the two cells to be emptied at the same time. The pumps discharge into a forcemain that connects to the WSI near Strachan and MacNab Streets. The rate of pumping from the tank can be controlled by Operators at the WWTP, based upon the current inflows at the WWTP. The pumps can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Manual, with operation directed by Operators at the WWTP. Ten (10) sediment flushing tanks (SFTs) are provided to clean the floor of the two tank cells (5 STFs in each cell).

Level transmitters are provided to monitor the level of sewage stored in each storage cell; a flowmeter is provided to measure the rate and volume of any CSOs exiting the facility; and two (2) automatic samplers are provided to collect grab and composite samples of both the influent and effluent (overflow) water quality.

The entire facility is monitored and controlled via SCADA by Operators at the WWTP. The SCADA system includes a security system to advise of any unauthorized entries into the pumping station. Stand-by power is provided for the sewage pumping station by a diesel power generator.

Figures 2A to 2C of the Hatch CSO Facilities Assessment Report (2018) showed the location of the CCPs at this facility, as well as potential for possible sewage discharges to the environment from each CCP, colour coded to indicate criticality; and Table 2 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 2 provided below summarizes the key components of the O&M Plan for HCS02, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

The SOP has been updated as part of this report (Issue #3, January 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs; to note that the two Maintenance Bypass Gates have been locked in the Fully Closed position in December 2018; and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and therefore no changes have been made to the current version of the PCN (Version 1.3, April 2016). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings. These would be updated in the future, if and when any upgrades are completed.

**Table 2: Summary of O&M Plan for Bayfront Park CSO Tank (HCS02)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Bayfront CSO Tank (HCS02) | Hamilton Water<br>Hatch Ltd. | Issue #3 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – CSO Facility HCS02 / Wastewater PS HC003 | Hamilton Water<br>Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 1.3 | Apr 2016 |
| Equipment O&M Manual | Operation and Maintenance Manual – Strachan Storage Tank – HCS02 | Matthews Contracting Inc. (General Contractor)<br>Priestep Electric Limited (Electrical Contractor) | N/A | Mar 1993 |
| As-Built Drawings | Strachan Street (Bayfront Park) Storage Tank | Regional Municipality of Hamilton-Wentworth | Dwg No. 92-S-14 | Feb 1992 |

## 2.3 James Street CSO Facility (HCS03 and HCG08)

The James Street CSO Storage Facility (HCS03) incorporates both off-line and in-line storage components, which provide a total CSO storage capacity of approximately 3,200 $m^3$.

The off-line storage tank is an underground, reinforced concrete structure, which resides beneath the parking lot of the Royal Hamilton Yacht Club, located at the north end of James Street. The rectangular tank covers an area of approximately 900 $m^2$, and is 0.8 to 2.1 m deep, providing approximately 1,400 $m^3$ of CSO storage capacity.

The off-line storage capacity is augmented by 1,800 $m^3$ of in-line storage, which is provided within the 1,400 mm diameter combined sewer downstream of the CSO tank. The additional in-line storage is created by the Ferrie-Mary CSO Regulator Gates (HCG08). The HCG08 sluice gates control the rate of flow from the James Street combined sewer system into the WSI at Ferrie and Mary Streets. These gates can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Manual, with operation directed by Operators at the WWTP.

During DWF conditions, the gates are set to allow all flow to enter the WSI. During WWF conditions, the gates can be partially or completely closed to throttle the flow of combined sewage into the WSI, and begin filling the storage facilities. The rate of filling is determined by the position of the gates. The in-line storage pipe will fill first, and as levels in this pipe increase, the off-line storage tank will also begin to fill. If the tank fills completely, CSOs are discharged to Hamilton Harbour via the pre-existing 1,200 mm x 900 mm CSO outfall at the north end of the tank. Stainless steel underflow baffles are employed above the tank overflow to retain floatable materials within the tank.

Combined sewage retained in the tank during wet weather is subsequently returned to the WSI and conveyed to the WWTP for treatment during dry weather, when the plant can deal with the additional flow. The tank is drained by gravity as the in-line storage pipe empties. The rate of drainage from the in-line storage pipe and the off-line storage tank is determined by the position of the HCG08 gates, which can be controlled by Operators at the WWTP, based upon the current inflows at the WWTP. A water spray nozzle system is provided to clean the floor of the tank.

Level transmitters are provided to monitor the level of sewage stored in the off-line storage tank, and in the CSO tank overflow channel; and a flowmeter is provided to measure the rate and volume of any CSOs exiting the facility.

The facilities are monitored and controlled via SCADA by Operators at the WWTP.

Figures 3A to 3D of the Hatch CSO Facilities Assessment Report (2018) showed the location of the CCPs at this facility, as well as potential for possible sewage discharges to the environment from each CCP, colour coded to indicate criticality; and Table 3 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 3 provided below summarizes the key components of the O&M Plan for HCS03, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

The SOP has been updated as part of this report (Issue #4, January 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs, and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and therefore no changes have been made to the current version of the PCN (Version 2.5, April 2016). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings. These would be updated in the future, if and when any upgrades are completed. For example, the Hatch CSO Facilities Assessment Report (2018) recommended conducting an engineering study to determine the feasibility of adding redundant gate position sensors on the HCG08 sluice gates themselves, to back up the existing sensors on the gate stems.

**Table 3: Summary of O&M Plan for James Street CSO Facility (HCS03/HCG08)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – James Street CSO Tank (HCS03), Ferrie/Mary Sluice Gates (HCG08) | Hamilton Water<br>Hatch Ltd. | Issue #4 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – James Street CSO Facility HCS03, Ferrie/Mary Sluice Gates (HCG08) | Hamilton Water<br>Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 2.5 | Apr 2016 |
| As-Built Drawings | James Street North Storage Tank – Contract RHW 92-78 (ST) | Regional Municipality of Hamilton-Wentworth | Dwg No. 92-S-45 | Sep 1992 |

## 2.4 Main/King CSO Tank (HCS04)

The Main/King CSO Tank (HCS04) covers an area of approximately 9,500 $m^2$, and is over 8 m deep, providing approximately 77,100 $m^3$ of CSO storage capacity in two separate storage cells. The first cell provides approximately 23,300 $m^3$ of storage, and the second provides a further 53,800 $m^3$ of storage. The Main/King CSO Tank operates off-line, with combined sewage entering the tank during larger CSO events. Flow into the tank is regulated by three WWTP-controlled CSO regulators that were constructed in conjunction with the CSO tank. The Glen Road CSO Outfall, which is located at the east end of Glen Road on the west side of Hwy 403, was effectively eliminated by installing a new WWTP-controlled CSO regulator gate at Glen/Macklin (Chamber 1) and constructing a new 1,350 mm diameter sewer to convey CSOs underneath Hwy 403 and into the CSO tank. The former McKittrick CSO Outfall, which previously diverted CSOs from the 1,980 mm diameter combined sewer that conveys flows to the WSI, was eliminated by constructing a new WWTP-controlled CSO regulator (Chamber 4) to divert CSOs into the new tank. Flow from the 2,100 mm x 2,250 mm box sewer which runs along the south side of Main Street was diverted into the new tank by a bulkhead placed in the sewer and a new WWTP-controlled CSO regulator located at the south-east corner of the tank (Chamber 5). Downstream of the bulkhead, this sewer is used to convey the overflows which will still occur from the tank when its design capacity is exceeded.

During DWF conditions, flow is directed to the WWTP via the WSI. The gate in Chamber 4 (King Street Sewer) is set to be Fully Open; the gate in Chamber 5 (Interceptor Sewer) is set to 30% Open; and the gate in Chamber 1 (Glen Road Sewer) is always set at 35%. The Main Street Overflow Sewer, which maintains a base flow during dry weather due mainly to infiltration, is directed to the CSO tank's wet well and pumped into the interceptor sewer. The gate in Chamber 4 is currently without power or communications, and it is currently manually set to convey wet weather flow mainly to the CSO tank.

During WWF conditions, the pumps are taken out of auto mode and turned off; the opening of Gate 4 is reduced to 7%; and the opening of Gate 5 is reduced to 2%. Excess flow from the three regulators enters the pumping station wet well, which is located beneath the control building at the south-east corner of the facility. During dry weather and small storm events, the CSO tank's pumping station acts as a normal sewage pumping station. During larger storm events, two motorized sluice gates are opened to permit flow from the wet-well to enter the CSO tank. Cell 1 will fill first, and if it fills completely, will overflow into Cell 2. If Cell 2 also fills, CSOs are discharged into Chedoke Creek near the Main Street overpass, via the original 2,100 mm x 2,250 mm box sewer outfall. Stainless steel underflow baffles are employed above the tank overflow in Cell 2 to retain floatable materials within the tank.

The CSO tank's wet well includes an Influent Well Overflow Gate (CSO Maintenance Bypass Gate) that can be operated to convey all flows into the CSO tank and pumping station (when Closed) or to provide a maintenance bypass of the tank (when Open). Prior to November 2018, the PCN for HCS04 incorrectly indicated that during DWF conditions this gate should be 5% open, and during WWF conditions this gate should be 100% open. The default settings for the gate should actually be Fully Closed during both DWF and WWF conditions and the PCN was updated in November 2018 to reflect this.

Combined sewage retained in the tank during wet weather is subsequently returned to the Combined Sewer System (CSS) and conveyed by the WSI to the WWTP for treatment during dry weather, when the plant can deal with the additional flow. The tank is drained by three (3) 375 L/s submersible pumps located in the pumping station wet well. A flap gate between Cell 1 and Cell 2 allows the cells to be emptied at the same time. The pumps discharge into a forcemain that connects to the original 1,980 mm sewer, which in turn discharges into the WSI near Hunt Street. The rate of pumping from the tank can be controlled by Operators at the WWTP, based upon the current inflows at the WWTP. Thirty (30) sediment flushing tanks (SFTs) are provided to clean the floor of the two tank cells (10 in Cell 1 and 20 in Cell 2).

Level transmitters are provided to monitor the level of sewage stored in each storage cell; a flowmeter is provided to measure the rate and volume of any CSOs exiting the facility; and two (2) automatic samplers are provided to collect grab and composite samples of both the influent and effluent (overflow) water quality.

The facilities are all monitored and controlled via SCADA by Operators at the WWTP. The motorized gates and pumps can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Manual, with operation directed by Operators at the WWTP. The SCADA system includes a security system to advise of any unauthorized entries into the control building.

Figures 4A to 4C of the Hatch CSO Facilities Assessment Report (2018) showed the location of the CCPs at this facility, as well as potential for possible sewage discharges to the environment from each CCP, colour coded to indicate criticality; and Table 4 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 4 provided below summarizes the key components of the O&M Plan for HCS04, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

The SOP has been updated as part of this report (Issue #4, January 2019) to reflect recent changes to the operation of HCS04. These included padlocking the Influent Well Overflow Gate (CSO Maintenance Bypass Gate) in the Fully Closed position, and removing access to this gate for control purposes from the SCADA system; and setting the position of the Chamber 1 sluice gate at Glen Road to 35% Open for all flow conditions. These changes are described further in the updated SOP. Other updates to SOP included clarifying the description of the facilities; to provide consistency of format with all the other CSO facility SOPs, and adding a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6.

The previous version of the PCN has been recently updated (Version 3.5, November 2018) to reflect the operational gate changes described above and incorporated in the updated SOP, and a copy of the updated SOP is included in Appendix B.

No significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings. These would be updated in the future, if and when any upgrades are completed. For example, the Hatch CSO Facilities Assessment Report (2018) recommended conducting an engineering study to determine the feasibility of adding redundant gate position sensors on all the sluice gates associated with the facility, on the gates themselves, to back up the existing sensors on the gate stems; and to consider simplifying the operation of the sluice gates in Chamber 4 and 5. The City is evaluating options to investigate the feasibility of moving the existing flowmeter and automatic sampler on the CSO tank overflow, to a location downstream of the above-mentioned Influent Well Overflow Gate (CSO Maintenance Bypass Gate), to also capture any possible future flows through this gate; to relocate the CSO tank influent sampler to a better location not prone to high flows damaging the unit; and to investigate and upgrade portions of the existing tank cleaning system.

**Table 4: Summary of O&M Plan for Main/King CSO Tank (HCS04)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Main/King CSO Tank (HCS04) | Hamilton Water<br>Hatch Ltd. | Issue #4 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – Wastewater PS / Main/King CSO Tank HCS04 | Hamilton Water<br>Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 3.5 | Nov 2018 |
| Equipment O&M Manual | Electrical O&M Manual – Contract RHW-94-75 (COIW) - HCS04 | Selectra Inc. (Electrical Contractor)<br>Kenaidan Contracting Ltd (General Contractor)<br>R.V. Anderson Associates (Consultant) | Shelf D-3,<br>Doc No. 0000301 | 1998 |
| Equipment O&M Manual | Installation, Operating & Maintenance Manuals – Contract RHW-94-75 (COIW) – HCS04 | Bennett Mechanical Installations (Mech Contractor)<br>Kenaidan Contracting Ltd (General Contractor)<br>R.V. Anderson Associates (Consultant) | Shelf D-3,<br>Doc No. 0000302 | 1998 |
| Equipment O&M Manual | Operations/Maintenance Manuals – Contract RHW-94-75 (COIW) – HCS04 | Kenaidan Contracting Ltd (General Contractor)<br>R.V. Anderson Associates (Consultant) | Shelf D-3,<br>Doc No. 0000520 | 1998 |
| Equipment O&M Manual | Electrical/I&C Instruction Manual J936 | Bristol Babcock (I&C Contractor)<br>Kenaidan Contracting Ltd (General Contractor)<br>R.V. Anderson Associates (Consultant) | Shelf D-3,<br>Doc No. 0000521 | 1998 |
| As-Built Drawings | Main/King CSO Tank – Contract RHW-94-75 (COIW) – HCS04 | R.V. Anderson Associates Limited | Dwg No. 95-S-32 | 1998 |

## 2.5 Eastwood Park CSO Tank (HCS05, HCG06 and HCG07)

The Eastwood Park CSO Tank (HCS05) covers an area of approximately 4,000 $m^2$, and is over 6 m deep, providing approximately 27,350 $m^3$ of CSO storage capacity in two separate storage cells. The first cell provides approximately 14,700 $m^3$ of storage, and the second provides a further 12,650 $m^3$ of storage. A sewer along Dock Service Road intercepts the CSOs from the two outfalls and conveys them to the CSO tank. The original Catharine Street (1,050 mm) and Ferguson Avenue (1,500 mm) CSO outfalls were left in place and are used to carry the overflow from the CSO tank on the infrequent occasions when the design capacity of the tank is exceeded. A flow splitter diverts the overflow from the tank between the two previously existing outfall sewers.

The Eastwood Park CSO Tank operates off-line, with combined sewage entering the tank only during larger CSO events. Flow into the tank is regulated by static CSO regulators at Catharine/Brock, Picton/Ferguson and MacAulay/Ferguson and by the two WWTP-controlled CSO regulators at Burlington/Ferguson and Ferrie/Ferguson.

During DWF conditions, the Burlington/Ferguson (HCG06) and Ferguson/Ferrie Streets (HCG07) sluice gates normally remain open, directing all flow to the WSI sewer and on to the WWTP.

During WWF conditions, excess flows from the Catharine/Brock CSO regulator and the two CSO regulators along Ferguson Avenue overflow into the tank. When rainfall occurs, the station is placed into Storm Mode and the pumps in the CSO tank are Off, and the HCG06 and HCG07 gates are fully closed, eliminating flow into the WSI at these locations. Cell 1 will fill first, and if it fills completely, will overflow into Cell 2. If Cell 2 also fills, CSOs are discharged to Hamilton Harbour through the Catharine Street and Ferguson Avenue CSO outfalls. Stainless steel underflow baffles are employed above the tank overflow in Cell 2 to retain floatable materials within the tank.

The CSO tank inlet chamber at the north-east corner of the tank includes three gates that can be operated to convey all flows into the CSO tank (in their default positions, with the CSO tank inlet gate open and the two CSO tank maintenance gates closed) or to provide a maintenance bypass of the tank (in their alternate positions). The operation of the gates is explained in more detail in the Hatch CSO Facilities Assessment Report (2018), and in the updated SOP found in Appendix A. The two Maintenance Bypass Gates are locked in the Fully Closed position to ensure all incoming sewage flows are conveyed into the CSO storage tank and eliminate the possibility of any dry weather sewage discharges to Hamilton Harbour at this location.

Combined sewage retained in the tank during wet weather is subsequently returned to the WSI and conveyed to the WWTP for treatment during dry weather, when the plant can deal with the additional flow. The tank is drained by two (2) 289 L/sec submersible pumps located in Cell 1. One pump is used as a duty pump and the other as a stand-by pump. A flap gate between Cell 1 and Cell 2 allows the cells to be emptied at the same time. The pumps discharge into a forcemain that connects to the 900 mm portion of the WSI downstream of HCG06. The rate of pumping from the tank can be controlled by Operators at the WWTP, based upon the current inflows at the WWTP. Fifteen (15) sediment flushing tanks (SFTs) are provided to clean the floor of the two tank cells (8 in Cell 1 and 7 in Cell 2).

Level transmitters are provided to monitor the level of sewage stored in each storage cell; a flowmeter is provided to measure the rate and volume of any CSOs exiting the facility; and two (2) automatic samplers are provided to collect grab and composite samples of both the influent and effluent (overflow) water quality.

The facilities are monitored and controlled via SCADA by Operators at the WWTP. The motorized gates and pumps can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Manual, with operation directed by Operators at the WWTP. The SCADA system includes a security system to advise of unauthorized entries to the control building.

Figures 5A to 5D of the Hatch CSO Facilities Assessment Report (2018) showed the location of the CCPs at this facility, as well as potential for possible sewage discharges to the environment from each CCP, colour coded to indicate criticality; and Table 5 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 5 provided below summarizes the key components of the O&M Plan for HCS05, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

The SOP has been updated as part of this report (Issue #5, January 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs; to note that the two Maintenance Bypass Gates have been locked in the Fully Closed position in December 2018; and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and therefore no changes have been made to the current version of the PCN (Version 2.2, April 2016). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings of the tank. These would be updated in the future, if and when any upgrades are completed. For example, the Hatch CSO Facilities Assessment Report (2018) recommended conducting an engineering study to determine the feasibility of adding redundant gate position sensors on the CSO Tank Inlet Gate and the HCG06 (Burlington/Ferguson) and HCG07 (Ferrie/Ferguson) sluice gates, on the gates themselves, to back up the existing sensors on the gate stems.

**Table 5: Summary of O&M Plan for Eastwood Park CSO Tank (HCS05), Burlington/Ferguson Sluice Gate (HCG06) and Ferrie/Ferguson Sluice Gate (HCG07)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Eastwood Park CSO Tank (HCS05), Burlington/Ferguson Sluice Gate (HCG06) and Ferrie/Ferguson Sluice Gate (HCG07) | Hamilton Water<br>Hatch Ltd. | Issue #5 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – Eastwood Park CSO Facility HCS05 | Hamilton Water<br>Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 2.2 | Apr 2016 |
| Equipment O&M Manual | Electrical Maintenance Manuals – Contract RHW-96-03 (S) – HCS05 | Metric (Electrical Contractor)<br>Granville (General Contractor)<br>Thorburn Penny (Consultant) | Shelf D-3,<br>Doc No. 0000303 | 1998 |
| Equipment O&M Manual | Operation and Maintenance Manuals – Contract RHW-96-03 (S) – HCS05 | Granville (General Contractor)<br>Thorburn Penny Consulting Limited (Consultant) | Shelf D-3,<br>Doc No. 0000307 | 1998 |
| Equipment O&M Manual | Operations Manual – Contract C13-09-12 – HCG06 and HCG07 | Stantec (Consultant)<br>Newman Bros. Ltd (General Contractor) | Shelf D-5,<br>Doc No. 0000639 | Sep 2012 |
| As-Built Drawings | Eastwood Park CSO Facility – Contract RHW-96-03 (S) – HCS05 | Thorburn Penny Consulting Limited | Dwg No. 96-S-29 | Oct 1995 |

## 2.6 Greenhill CSO Tank #2 (HCS06)

The second Greenhill CSO Tank (HCS06) is an underground reinforced concrete structure that was installed to augment the storage provided by the original Greenhill CSO Tank (HCS01). The rectangular tank covers an area of approximately 8,400 $m^2$, and is 7.5 to 8.3 m deep, providing approximately 66,750 $m^3$ of CSO storage capacity in two equally sized storage cells. The new facility increased the combined CSO storage volume at the Greenhill site to approximately 150,250 $m^3$.

HCS06 operates as an off-line facility, with combined sewage entering the tank only during larger CSO events. Flow into the storage tank is regulated by a WWTP-controlled CSO regulator located upstream of the tank. Cell 1 will fill first, and if it fills completely, excess flows overflow into Cell 2. If Cell 2 also fills, overflows will be conveyed into HCS01. Stainless steel underflow baffles are employed above the tank overflow in Cell 2 to retain floatable materials within the new tank and prevent them from entering HCS01.

HCS06 is drained by gravity into the RHCSI via a 1,200 mm diameter sewer. The rate of drainage is regulated by a WWTP-controlled gate, based upon the current inflows at the WWTP.

The facility includes a bypass chamber between HCS06 and HCS01 that can be used to isolate HCS01 for maintenance purposes. To operate this bypass, the manual stop gate in the chamber has to be physically removed from its default position and inserted in the alternate position across the overflow channel from HCSO6 to HCS01 (thereby diverting flow to Red Hill Creek). Only one stop log is provided, making it impossible to block the flow of both sewers at the same time. Twenty (20) sediment flushing tanks (SFTs) are provided to clean the floor of the two tank cells (10 in each cell).

Level transmitters are provided to monitor the level of sewage stored in each storage cell; and a flowmeter is provided (at HCS01) to measure the rate and volume of any CSOs exiting the facility.

The facility is monitored and controlled via SCADA by Operators at the WWTP. The motorized gates can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Manual, with operation directed by Operators at the WWTP. The SCADA system includes a security system to advise of any unauthorized entries into the control building.

HCS06 is also equipped with a biofilter odour control system to reduce the presence of unpleasant odours associated with the tank (possible when the tank is filling with sewage and air is being displaced from the tank).

Figures 6A to 6E of the Hatch CSO Facilities Assessment Report (2018) showed the location of the CCPs at this facility, as well as potential for possible sewage discharges to the environment from each CCP, colour coded to indicate criticality; and Table 6 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 6 provided below summarizes the key components of the O&M Plan for HCS06, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

The SOP has been updated as part of this report (Issue #3, January 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs, and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and therefore no changes have been made to the current version of the PCN (Version 2.4, April 2016). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings. These would be updated in the future, if and when any upgrades are completed. For example, the Hatch CSO Facilities Assessment Report (2018) recommended conducting an engineering study to determine the feasibility of adding redundant gate position sensors on the Dry Flow Control Gate and CSO Drain Gate, on the gates themselves, to back up the existing sensors on the gate stems.

**Table 6: Summary of O&M Plan for Greenhill CSO Tank #2 (HCS06)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Greenhill CSO Tank #2 (HCS06) | Hamilton Water<br>Hatch Ltd. | Issue #3 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – Greenhill #2 CSO Tank HCS06 | Hamilton Water<br>Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 2.4 | Apr 2016 |
| Equipment O&M Manual | Operating and Maintenance Manuals – Contract TOE-02-05 (CSO) – HCS06 | Bennett Contracting Millgrove Ltd General Contractor) | Shelf D-3,<br>Doc No. 0000299 | N/A |
| As-Built Drawings | Greenhill CSO Tank #2 – Contract TOE-02-05 (CSO) – HCS06 | City of Hamilton | Dwg No. 01-S-23 | Jan 2002 |

## 2.7 Red Hill Valley CSO Pipe Facility (HCS07)

The Red Hill Valley CSO Pipe Facility (HCS07) captures and stores CSOs from the former Lawrence, Queenston and Melvin CSO outfalls to Red Hill Creek. The facility stores the CSO in an oversized pipe running parallel to the existing RHCSI and along the Red Hill Parkway. The oversized storage pipe ranges in size from 2,000 to 2,250 mm in diameter, and a series of four (4) motorized sluice gates are used to convey flows into and create temporary storage within the pipe during WWF conditions, and also to control the subsequent drainage of the facility to the WWTP for treatment during DWF conditions.

HCS07 comprises three (3) flow control structures: HCS7A at Lawrence Road; HCS7B at Queenston Road; and HCS7C at Barton Street; creating two (2) storage pipe cells providing a total storage volume of approximately 14,200 $m^3$. Cell 1 consists of a 2,250 mm diameter pipe running between HCS7A and HCS7B; and Cell 2 consists of a 2,000 mm diameter pipe running between HCS7B and HCS7C. HCS7C includes an 1,800 mm diameter sanitary sewer to drain the storage facility, and a 2,250 mm diameter overflow sewer to Red Hill Creek that only becomes active if the design capacity of the facility is exceeded. The stored flow behind the gates can also be used to flush any sediments that may have settled at the bottom of the storage pipe cells during storage periods.

Level transmitters are provided to monitor the level of sewage at HCS7A/B/C (also giving the level of sewage stored in Cell 1 and 2); a flowmeter is provided at HCS7C at Barton Street to measure the rate and volume of any CSOs exiting the facility; and an automatic sampler is provided to collect grab and composite samples of effluent (overflow) water quality from the HCS7C overflow.

The facilities are all monitored and controlled via SCADA by Operators at the WWTP. The motorized gates can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Manual, with operation directed by Operators at the WWTP. The SCADA system includes a security system to advise of any unauthorized entries into the control buildings.

Figures 7A to 7E of the Hatch CSO Facilities Assessment Report (2018) showed the location of the CCPs at this facility, as well as potential for possible sewage discharges to the environment from each CCP, colour coded to indicate criticality; and Table 7 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 7 provided below summarizes the key components of the O&M Plan for HCS07, including current versions of the SOP, PCN, Equipment O&M Manuals, and drawings.

The SOP has been updated as part of this report (Issue #2, January 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs, and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and therefore no changes have been to the current version of the HCS7A/B/C PCNs (Version 2.3, April 2016). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and drawings. These would be updated in the future, if and when any upgrades are completed. For example, the Hatch CSO Facilities Assessment Report (2018) recommended conducting an engineering study to determine the feasibility of adding redundant gate position sensors on all sluice gates associated with this facility, on the gates themselves, to back up the existing sensors on the gate stems.

**Table 7: Summary of O&M Plan for Red Hill CSO Pipe Facility (HCS07, HCS7A/B/C)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Red Hill CSO Pipe Facility (HCS07) | Hamilton Water<br>Hatch Ltd. | Issue #2 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – Red Hill Valley CSO Pipe Facility HCS7A | Hamilton Water<br>Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 2.3 | Apr 2016 |
| Process Control Narrative (PCN) | Process Control Narrative – Red Hill Valley CSO Pipe Facility HCS7B | | Version 2.3 | Apr 2016 |
| Process Control Narrative (PCN) | Process Control Narrative – Red Hill Valley CSO Pipe Facility HCS7C | | Version 2.3 | Apr 2016 |
| Equipment O&M Manual | SCADA Operations Manual – Contract PW-04-239/241 (RHV) – HCS07 | Hatch Mott MacDonald (SCADA Consultant)<br>Dufferin Construction Company (General Contractor) | Shelf D-2,<br>Doc No. 0000570 | Feb 2009 |
| Equipment O&M Manual | Civil & Mechanical O&M Manual – Contract PW-04-239/241 (RHV) – HCS07 | Dufferin Construction Company (General Contractor) | Shelf D-2,<br>Doc No. 0000571 | Feb 2009 |
| Equipment O&M Manual | PLC & WAN Panel O&M Manual – Contract PW-04-239/241 (RHV) – HCS07 | Hatch Mott MacDonald (SCADA Consultant)<br>Dufferin Construction Company (General Contractor) | Shelf D-2,<br>Doc No. 0000572 | Oct 2009 |
| Drawings | Red Hill Valley CSO Pipe Facility – Contract PW-04-239 (RHV) – HCS07 | AWS Engineers & Planners | Dwg No. 04-H-67 | Jul 2003 |

## 2.8 Royal Avenue CSO Tank (HCS08)

The Royal Avenue CSO Tank (HCS08) is an underground reinforced concrete structure that provides approximately 15,000 $m^3$ of CSO storage capacity. The storage volume is provided within a rectangular tank, which is approximately 41 m long x 37 m wide x 10 m deep.

The site originally included a CSO Regulator chamber that employed a motorized sluice gate to dynamically control the rate of flow conveyed to the Woodward Avenue WWTP. This sluice gate was removed, and control of the flow conveyed to the WWTP and the CSO tank is accomplished passively by a 525 mm diameter drop pipe located in the diversion chamber at the east end of Royal Avenue. During dry weather and small storm events, the 525 mm drop pipe conveys all flow into the downstream 900 mm sanitary sewer and on to the WWTP. During larger storm events, the 525 mm drop pipe will fill to capacity and excess flows will be diverted to the CSO tank after passing through a coarse bar screen included in the CSO Tank Inlet Chamber. Filling of the CSO Tank occurs passively without any actions having to be initiated by the Operators at the WWTP.

CSOs are conveyed to the storage tank by a 2,400 mm x 2,400 mm step sewer. The inlet sewer is designed to operate under surcharge, dependent upon the level of the sewage in the CSO storage tank, which provides some additional storage volume.

The inlet chamber also includes provision to isolate the CSO storage tank in emergencies and during special maintenance activities, and a 2,400 mm wide x 2,000 mm deep box culvert is provided to divert flow to Chedoke Creek for those activities. The chamber includes two sets of guides for alternate placement of a single stop log to control the direction of flow. Under normal operation, the stop log will be inserted in the guides over the upstream end of the emergency bypass sewer, sending all excess WWF into the CSO tank. To operate the bypass, the stop log has to be physically removed from its default position and inserted in the alternate position over the upstream end of the CSO tank inlet sewer. Only one stop log is provided, making it impossible to block the flow of both sewers at the same time. A removable stainless-steel bar screen is provided at the upstream end of the CSO tank inlet sewer to capture debris to protect the sewage pumps in the storage tank.

Inside the storage tank, a stainless-steel baffle is provided along the length of the overflow weir, suspended from the roof of the tank, to retain floatables and oils inside the tank, so they can be subsequently pumped from the tank and conveyed to the Woodward WWTP for treatment. A 5,400 mm wide x 1,800 mm deep box culvert is provided at the northeast corner of the site to convey any overflows from the facility into Chedoke Creek.

Three (3) submersible pumps are provided to pump the contents of the storage tank back into the Combined Sewer System (CSS) in dry weather, for subsequent conveyance to the Woodward WWTP. The contents of the CSO tank will be drained and conveyed to the WWTP only during dry weather, when the capacity is available to treat these flows. Three (3) 250 L/s pumps are provided, but only one pump will run at any given time. The other 2 pumps are provided for redundancy, ensuring an extra pump is available even if one pump is out for maintenance or repairs. The flow from the pumps will be conveyed south via three (3) 400 mm diameter ductile iron forcemains into the relocated 900 mm sanitary sewer running east along the south wall of the tank. The pumps can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Manual, with operation directed by Operators at the WWTP. Six (6) sediment flushing tanks (SFTs) are provided to clean the floor of the tank following each storm event.

Two (2) level transmitters are provided to monitor the level of sewage stored in the tank; and a flowmeter is provided to measure the rate and volume of any CSOs exiting the facility.

The facility is monitored and controlled via SCADA by Operators at the WWTP. The SCADA system includes a security system to advise of any unauthorized entries into the control building.

Figures 8A to 8C of the Hatch CSO Facilities Assessment Report (2018) showed the location of the CCPs at this facility, as well as potential for possible sewage discharges to the environment from each CCP, colour coded to indicate criticality; and Table 8 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 8 provided below summarizes the key components of the O&M Plan for HCS08, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

The SOP has been updated as part of this report (Issue #3, January 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs, and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and therefore no changes have been made to the current version of the PCN (Version 1.3, April 2016). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings. These would be updated in the future, if and when any upgrades are completed.

**Table 8: Summary of O&M Plan for Royal Avenue CSO Tank (HCS08)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Royal Avenue CSO Tank (HCS08) | Hamilton Water<br>Hatch Ltd. | Issue #3 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – Royal Avenue CSO Tank HCS08 | Hamilton Water<br>Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 1.3 | Apr 2016 |
| Equipment O&M Manual | SCADA O&M Manual – Contract PW-05-06 (CSO) – HCS08 | Hatch Mott MacDonald (Consultant)<br>Genivar (General Contractor) | Shelf D-3,<br>Doc No. 0000308 | Nov 2007 |
| As-Built Drawings | Royal Avenue CSO Storage Tank – Contract PW-05-06 (CSO) – HCS08 | Hatch Mott MacDonald / J&M Structural | Dwg No. 05-S-13 | Jan 2008 |

## 2.9 McMaster CSO Tank (HCS09)

The McMaster CSO Tank (HCS09) is an underground reinforced concrete structure that provides approximately 5,935 $m^3$ of CSO storage capacity. The storage volume is provided within a rectangular tank, which is approximately 50 m long x 18 m wide x 6.6 m deep. When the tank is full, some additional CSO storage volume is provided within the upstream CSO tank inlet sewer.

A maintenance bypass is provided at the southwest corner of the storage tank, where the CSO inflow sewer enters the tank, to provide a means to bypass flows around the storage tank, to permit future isolation of the CSO storage tank in emergencies and during special maintenance activities.

Under normal operation, the CSO Tank Inlet Gate is Fully Open (it has been padlocked in this position) and the stop log over the end of the CSO tank overflow sewer is removed (sitting in guides above the end of the CSO tank overflow sewer), to allow all incoming flow to enter the tank, and the Operator does not have to do anything to allow the storage tank to fill. To operate the CSO tank bypass, in order to fully isolate the CSO tank from the CSO outfall pipe, the CSO Tank Inlet Gate must be fully closed and the stop log removed from its default position and inserted in the alternate guides provided over the end of the CSO tank overflow sewer. The CSO Tank Inlet Gate has recently been padlocked in the Fully Open position to ensure all incoming sewage flows are conveyed into the CSO storage tank and eliminate the possibility of any dry weather sewage discharges to Ancaster Creek.

Inside the storage tank, a stainless-steel underflow baffle is provided along the length of the overflow weir, suspended from the roof of the tank, to retain floatables and oils inside the CSO storage tank, so they can be subsequently pumped from the tank and conveyed to the WWTP for treatment. A 2,400 mm wide x 1,000 mm (sloped) overflow trough is provided at the northwest corner of the tank to safely convey any overflows from the facility into the 1,800 mm overflow sewer discharging to Lower Ancaster Creek.

Three (3) 137 L/s submersible pumps are provided to pump the contents of the storage tank back into the CSS in dry weather, for subsequent conveyance to the Woodward WWTP. The contents of the CSO tank will be drained and conveyed to the WWTP only during DWF conditions, when capacity is available to treat these flows. Three pumps are provided, but only one pump will run at any given time. The other 2 pumps are provided for redundancy, ensuring an extra pump is available even if one pump is out for maintenance or repairs. The flow from the pumps is lifted via three (3) 200 mm diameter, ductile iron forcemains, which feed a single 350 mm diameter forcemain running around the east and south walls of the storage tank, then south through the City's easement within the Hydro One corridor, and finally east through the City's right-of-way at the west end of Sanders Boulevard, to connect to the gravity operated CSS along Sanders Boulevard. Three (3) sediment flushing tanks (SFTs) are provided to clean the floor of the tank following each storm event.

Two (2) level transmitters are provided to monitor the level of sewage stored in the tank; and a flowmeter is provided to measure the rate and volume of any CSOs exiting the facility.

The facility is monitored and controlled via SCADA by Operators at the WWTP. The motorized CSO tank inlet gate and the pumps can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Manual, with operation directed by Operators at the WWTP. The SCADA system includes a security system to advise of any unauthorized entries into the control building.

Figures 9A and 9B of the Hatch CSO Facilities Assessment Report (2018) showed the location of the CCPs at this facility, as well as potential for possible sewage discharges to the environment from each CCP, colour coded to indicate criticality; and Table 9 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 9 provided below summarizes the key components of the O&M Plan for HCS09, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

A new SOP has been created for this facility as part of this report (Issue #1, January 2019) to: provide a description of the facilities; to provide consistency of format with all the other CSO facility SOPs, and include a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and no therefore no changes have been made to the current version of the PCN (Version 1.4, April 2016). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings. These would be updated in the future, if and when any upgrades are completed.

**Table 9: Summary of O&M Plan for McMaster CSO Tank (HCS09)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – McMaster CSO Tank (HCS09) | Hamilton Water<br>Hatch Ltd. | Issue #1 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – McMaster CSO Tank HCS09 | Hamilton Water<br>Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 1.4 | Apr 2016 |
| Equipment O&M Manual | Electrical O&M Manual – Contract PW-08-13 (CSO) – HCS09 | Varcon (General Contractor)<br>Selectra (Electrical Contractor)<br>Hatch Mott MacDonald (Consultant) | Shelf D-3,<br>Doc No. 0000528 | 2010 |
| Equipment O&M Manual | Mechanical O&M Manuals – Contract PW-08-13 (CSO) – HCS09 | Varcon (General Contractor)<br>Hatch Mott MacDonald (Consultant) | Shelf D-3,<br>Doc No. 0000603 | 2010 |
| As-Built Drawings | McMaster CSO Storage Tank – Contract PW-08-13 (CSO) – HCS09 | Hatch Mott MacDonald / J&M Structural | Dwg No. 08-S-38 | Sep 2010 |

## 2.10 Wentworth/Rosemary CSO Gate (HCG03)

HCG03 regulates the flow of combined sewage from a 266 ha drainage area served by a 1,220 mm x 1,525 mm combined sewer running north along Wentworth Street North. The gate is located in an underground chamber on the northeast corner of Wentworth Street North and Rosemary Avenue, near the entrance to the City's offices at 330 Wentworth Street North.

HCG03 is used to direct DWF and some WWF to the Burlington/Hillyard area where the flows enter the WSI North branch (WSIN) and are conveyed to the Woodward Avenue WWTP for treatment. The regulator also has the ability to isolate flows from the WSIN, where the gate is normally open but can be closed to direct flow to the Wentworth CSO outfall when the WSIN is surcharged.

During DWF conditions and small storms, a static overflow weir captures all flows and conveys them through the open gate in HCG03, into a 1,200 mm x 1,500 mm combined sewer which connects to the WSIN at the intersection of Hillyard Avenue and Burlington Street, and the WSIN conveys the flows east to the Woodward Avenue WWTP for treatment.

During larger storms, when the weir is overtopped, excess WWF is diverted to the Wentworth CSO Outfall via a 2,500 mm x 2,400 mm combined sewer on Wentworth Avenue.

During very large storms, every attempt is made to maximize the conveyance of combined sewage to the WWTP for treatment, however there will be circumstances where the Operator may need to close HCG03 to bypass combined sewage through the Wentworth CSO Outfall to protect the Influent Pump Station and biological treatment processes at the WWTP.

The gate can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Auto, with operation directed by the Real Time Control (RTC) system, to maximize flow to the WWTP.

The Process Automation Controller (PAC), network equipment and gate actuator are powered by an Uninterruptable Power Supply (UPS). On a power failure, the gate is set to 30% Open.

The facility is monitored and controlled via SCADA by Operators at the WWTP. The SCADA system includes a security system to advise of any unauthorized entries into the control building.

Figure 10A of the Hatch CSO Facilities Assessment Report (2018) showed the location of the gate, as well as the potential for possible sewage discharges to the environment, colour coded to indicate criticality, and Table 10 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 10 provided below summarizes the key components of the O&M Plan for HCG03, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

The SOP has been updated as part of this report (Issue #4, January 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs, and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and therefore no changes have been made to the current version of the PCN (Version 3.3, June 2012). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings. These would be updated in the future, if and when any upgrades are completed. For example, the Hatch CSO Facilities Assessment Report (2018) recommended conducting an engineering study to determine the feasibility of adding redundant gate position sensors on the gate itself, to back up the existing sensor on the gate stem.

**Table 10: Summary of O&M Plan for Wentworth/Rosemary CSO Gate (HCG03)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Wentworth/Rosemary CSO Gate (HCG03) | Hamilton Water<br>Hatch Ltd. | Issue #4 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – 330 Wentworth St North Wastewater Regulator HCG03 | Hamilton Water<br>BPR<br>Eramosa Engineering<br>Stantec | Version 3.3 | Jun 2012 |
| Equipment O&M Manual | Operations Manual – Contract C13-09-12 – HCG03 | Stantec (Consultant)<br>Newman Bros. Ltd (General Contractor) | Shelf D-5,<br>Doc No. 0000635 | 2010 |
| As-Built Drawings | Rosemary/Wentworth Regulator Upgrades – Contract C13-09-12 – HCG03 | Stantec | Not Provided | Jan 2013 |

## 2.11 Brampton/Strathearne CSO Gate (HCG04)

HCG04 regulates the flow of combined sewage from a 210 ha drainage area served by a 2,134 mm x 2,286 mm combined sewer running north along Strathearne Avenue. The gate is located in an underground chamber behind the Arcelor Mittal security guard house located just south of Brampton Street.

During DWF conditions and small storms, a static overflow weir captures all flows and conveys them through the open gate in HCG04, into a 1,050 mm combined sewer on Strathearne Avenue, which connects to the WSI at the intersection of Strathearne Avenue and Burlington Street, and the WSI conveys the flows east to the Woodward Avenue WWTP for treatment.

During larger storms, when the weir is overtopped, excess WWF is diverted to the Strathearne CSO Outfall via a second, 2,100 mm x 2,250 mm combined sewer on Strathearne Avenue.

During very large storms, every attempt is made to maximize the conveyance of combined sewage to the WWTP for treatment, however there will be circumstances where the Operator may need to close HCG04 to bypass combined sewage through the Strathearne CSO Outfall to protect the Influent Pump Station and biological treatment processes at the WWTP.

The gate can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Manual, with operation directed by Operators at the WWTP, to maximize flow to the WWTP.

The facility is monitored and controlled via SCADA by Operators at the WWTP. The SCADA system includes a security system to advise of any unauthorized entries into the control building.

Figure 11A of the Hatch CSO Facilities Assessment Report (2018) showed the location of the gate, as well as the potential for possible sewage discharges to the environment, colour coded as described in the report to indicate criticality; and Table 11 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 11 provided below summarizes the key components of the O&M Plan for HCG04, including current versions of the SOP, PCN, Equipment O&M Manuals, and drawings.

The SOP has been updated as part of this report (Issue #4, January 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs; and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and therefore no changes have been made to the current version of the PCN (Version 1.2, April 2016). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and drawings. These would be updated in the future, if and when any upgrades are completed. For example, the Hatch CSO Facilities Assessment Report (2018) recommended conducting an engineering study to determine the feasibility of adding redundant gate position sensors on the gate itself, to back up the existing sensor on the gate stem.

**Table 11: Summary of O&M Plan for Brampton/Strathearne CSO Gate (HCG04)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Brampton/Strathearne CSO Gate (HCG04) | Hamilton Water<br>Hatch Ltd. | Issue #4 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – Brampton/Strathearne Regulator HCG04 | Hamilton Water<br>Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 1.2 | Apr 2016 |
| Equipment O&M Manual | Operating and Maintenance Manuals – Contract C11-85-07 – HCG04 | Procon (General Contractor)<br>Hydromantis, Inc. (Consultant) | Shelf D-5,<br>Doc No. 0000635 | 2010 |
| Drawings | Strathearne/Brampton CSO Gate Replacement – Contract C11-85-07 – HCG04 | Hydromantis, Inc. | Not Provided | Mar 2007 |

## 2.12 Wellington/Burlington CSO Gate (HCG14)

HCG14 is located at the intersection of Wellington Street North and Burlington Street East, where the Wellington CSO Outfall sewer crosses the WSIN. The purpose of HCG14 is to capture and divert combined sewage from the Wellington CSO Outfall sewer into the WSIN for conveyance to the Woodward Avenue WWTP for treatment.

HCG14 is equipped with a modulation slide gate and back-up isolation slide gate, which are operated automatically by the City's Real Time Control (RTC) system based on level measurements on the receiving WSIN, the Wellington CSO Outfall sewer, and the regulator chamber itself. The modulation gate controls the flow into the WSIN and the isolation gate facilitates maintenance of the modulation gate (when required) and provides redundancy for the modulation gate to control flow into the WSIN. Two passive flap gates are also located just downstream of the flow diversion channel to the regulator to prevent water from Hamilton Harbour from flowing back into the sewer system.

During DWF conditions, the modulation gate remains fully closed and the isolation gate remains fully open. During WWF conditions, upon detection of a threshold flow depth in either the Wellington CSO Outfall sewer or in the WSI North Branch, the site is automatically switched to wet conditions strategy operation, which causes the isolation gate to remain open and the modulation gate to be placed in a partially open position according to the output from a proportional-integral-derivative (PID) controller. The PID controller will then cause the gate to modulate with the objective of attaining and then maintaining the flow level in the WSIN at a specified setpoint. Once the flow levels in the WSIN and the Wellington CSO Outfall sewer fall below the wet conditions strategy trigger levels, the site operation will revert back to the dry conditions strategy. A number of fail-safe and degraded operation conditions features are built into the process control logic in order to ensure the robust and safe operation of the site in the event of a variety of equipment failures (e.g. gate motors, level sensors, etc), all of which are detailed further within the PCN for the site.

The gates can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode is SCADA Auto, with operation directed by the RTC system, to maximize flow to the WWTP.

The facility is monitored and controlled via SCADA by Operators at the WWTP. The SCADA system includes a security system to advise of any unauthorized entries into the control building.

Figure 12A of the Hatch CSO Facilities Assessment Report (2018) showed the location of the gates, as well as the potential for possible sewage discharges to the environment, colour coded to indicate criticality; and Table 12 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 12 provided below summarizes the key components of the O&M Plan for HCG14, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

The SOP has been updated as part of this report (Issue #2, January 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs, and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No recent changes have been made, or are required, to the operation of the facility via SCADA, and therefore no changes have been made to the current version of the PCN (Version 1.7, January 2012). Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings. These would be updated in the future, if and when any upgrades are completed. For example, the Hatch CSO Facilities Assessment Report (2018) recommended conducting an engineering study to determine the feasibility of adding redundant gate position sensors on the gates themselves, to back up the existing sensors on the gate stems.

**Table 12: Summary of O&M Plan for Wellington/Burlington CSO Gate (HCG14)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Wellington/Burlington CSO Gate (HCG14) | Hamilton Water<br>Hatch Ltd. | Issue #2 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – Wastewater Regulator (221 Burlington St.) HCG14 | Hamilton Water<br>BPR<br>Eramosa Engineering<br>Stantec | Version 1.7 | Jan 2012 |
| Equipment O&M Manual | Operations Manual, Volume 1 of 2 – Contract C13-09-12 – HCG14 | Stantec (Consultant)<br>Newman Bros. Ltd (General Contractor) | Shelf D-5,<br>Doc No. 0000637 | Sep 2012 |
| Equipment O&M Manual | Operations and Maintenance Manual, Volume 2 of 2 – Contract C13-09-12 – HCG14 | Newman Bros. Ltd (General Contractor)<br>Stantec (Consultant) | Shelf D-5,<br>Doc No. 0000638 | Sep 2012 |
| As-Built Drawings | Wellington/Burlington Regulator Upgrades – Contract C13-09-12 – HCG14 | Stantec | Not Provided | Mar 2013 |

## 2.13 Parkdale Burlington Wastewater Collection Station (HC001)

Wastewater Pumping Station HC001 is located on the northwest corner of the intersection of Parkdale Avenue and Burlington Street East. The purpose of the station is to lift CSOs from the combined sewer coming from Leaside Road and Woodward Avenue (and separate stormwater from the storm sewer on the north side of Burlington Street between Strathearne Avenue and Parkdale Avenue), which are too deep to be conveyed by gravity to the Parkdale CSO Outfall at the north end of Parkdale Avenue.

The station is equipped with five (5) active pumps, with two (2) 150 L/s pumps employed to handle normal flow conditions, and three (3) more 600 L/s pumps employed to handle high flow conditions. There is also a diesel engine driven pump, but it is currently out of service and not available for operation.

The pumps can be operated in either full Manual, SCADA Manual, or SCADA Auto modes. The default mode of operation involves monitoring of the wet well level via SCADA by Operators at the WWTP, with operation of the pumps in SCADA Auto mode, and only required when the Leaside/Woodward combined sewer and/or Burlington storm sewer are active. The SCADA system includes a security system to advise of any unauthorized entries into the control building.

Figure 13A of the Hatch CSO Facilities Assessment Report (2018) showed the location of the pumps, as well as the potential for possible sewage discharges to the environment, colour coded to indicate criticality; and Table 13 of the same report provided an inventory of all the CCPs at this facility, including the details described above; their potential for discharge to the environment under different flow conditions; and recommendations for improving the monitoring, performance, reliability of operation and minimizing the potential for unapproved bypasses/overflows/spills into adjacent receiving waters.

Table 13 provided below summarizes the key components of the O&M Plan for HC001, including current versions of the SOP, PCN, Equipment O&M Manuals, and As-Built Drawings.

The SOP has been updated as part of this report (Issue #5, January 2019) to make the following changes: to clarify the description of the facilities; to provide consistency of format with all the other CSO facility SOPs, and to add a section on procedures for regular Inspection and Maintenance of the facility addressing the requirements of Order Item 6. No formal changes have been made to the operation of the facility via SCADA, and therefore no changes have been made to the current version of the PCN (Version 2.4, June 2015), although as noted in the SOP, some possible changes are being reviewed. Similarly, no significant upgrades have been completed recently at this station, so there has also been no need to update the existing Equipment O&M Manuals and As-Built Drawings. These would be updated in the future, if and when any upgrades are completed.

**Table 13: Summary of O&M Plan for Parkdale Burlington Wastewater Collection Station (HC001)**

| O&M Plan Component | Name of Document | Prepared By | Reference # | Issue Date |
|---|---|---|---|---|
| Standard Operating Procedure (SOP) | Detailed Sewer System Operation – Parkdale Wastewater Collection Station (HC001) | Hamilton Water<br>Hatch Ltd. | Issue #5 | Jan 2019 |
| Process Control Narrative (PCN) | Process Control Narrative – Parkdale/Burlington Wastewater PS HC001 | Hamilton Water<br>Eramosa Engineering Inc.<br>Westin Engineering Inc.<br>XCG Consultants Ltd.<br>R.E. Poisson Engineering Inc. | Version 2.4 | Jun 2015 |
| As-Built Drawings | Parkdale Sewage Pumping Station – HC001 | City of Hamilton | Plan No. P-138 | 1955 |

## 3. References

Hatch Corporation (2018). Report – CSO Facilities Assessment – MECP Order Items 4, 7, 8 and 9. Report prepared for the City of Hamilton, November 2018.