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39 Years

Queensway-Carleton Hospital Overall Campus Part 4 Expansion

Stormwater Management Report

QUEENSWAY CARLETON HOSPITAL
PART 4 EXPANSION
STORMWATER MANAGEMENT REPORT

Prepared by:

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November 28, 2025

Ref: R-2025-085
Novatech File No. 123089

November 28, 2025

Parkin Architects Limited
200 Laurier Avenue West, 3rd floor
Ottawa, Ontario
K1P 6M7

Attention: Derek Judson

Re: Queensway Carleton Hospital: Part 4 Expansion
Stormwater Management Report
3045 Baseline Road, Ottawa, ON
Novatech File No.: 123089

Enclosed is a copy of the Stormwater Management Report prepared for the proposed Queensway Carleton Hospital: Part 4 Expansion located at 3045 Baseline Road. This report addresses the approach to on-site stormwater management and is submitted in support of the Site Plan Control application.

Please contact the undersigned, should you have any questions or require additional information.

NOVATECH

François Thauvette, P. Eng.
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1.0 INTRODUCTION

The Queensway-Carleton Hospital (QCH) is undergoing another facility expansion to meet the growing demands of the Greater Ottawa community. The proposed Part 4 expansion will include new Hospital buildings, building expansions and renovations, the construction of a new multi-storey parking garage, the extension of the Ring Road along the west side of the campus, internal roadway re-alignments as well as parking lot modifications. The QCH has retained Novatech to complete the site servicing, grading, and stormwater management design for this proposed expansion phase. As part of the proposed works, the existing infrastructure systems (i.e., sewers, watermains and utilities) are being reviewed and upgraded to meet the needs of the Part 4 campus expansion, while also considering future Master Plan expansion phases. One of the central objectives is to upgrade the storm sewers and to ensure they will be relocated where they will not be impacted by future development phases. Another important goal is to ensure the overall sequencing of the work will minimize disruptions to Hospital operations during construction. This report addresses the approach to stormwater management (SWM) on the QCH campus and is being submitted in support of the Site Plan Control application.

1.1 Site Location, Description and General Campus History

The Queensway-Carleton Hospital is located at 3045 Baseline Road and situated on a 20.2-hectare property administered by the National Capital Commission (NCC). The site's north-western entrance off Richmond Road and south-eastern entrance off Baseline Road are connected by John Sutherland Drive. Residential properties and Highway 416 border the subject site to the north-east and south-west, respectively. The legal description of the property is designated as Part of Lot 16, Concession 2 (O.F.), Geographic Township of Nepean, City of Ottawa. Refer to **Figure 1** for an aerial view of the QCH campus.

Figure 1 - Aerial View of the Subject Site



Image Source: geoOttawa (City of Ottawa)

First constructed in the mid 1970s, the Hospital campus has undergone several facility expansions, including various building additions and parking lot modifications. A brief overview of the past QCH expansion projects is as follows:

- The 1998 expansion phase included a small Hospital addition and construction of the Ring Road on the west side of the campus as well as the construction of several parking lots. Portions of the existing storm sewer and watermain were also replaced to accommodate the Hospital expansion as well as anticipated future developments. The increased flow was mitigated using controlled flow roof drains and inlet control devices (ICDs) located within the storm sewer system in the parking lots. A Stormceptor STC 4000 was installed to provide water quality control prior to discharging the stormwater runoff into the existing ditch along the west property line.
- In 2003, the expansion phase included the construction of the Emergency building on the east side of the Hospital, a new parking lot in the northwest corner of the campus, and the reconfiguration of some existing parking lots. Similarly, the increased flow was mitigated using controlled flow roof drains and ICDs located within the storm sewer system in the various parking lots. Based on this report, the existing Stormceptor STC 4000 was determined to be at capacity for the campus.
- In 2005, the Operations Room (OR) addition was constructed as well as the removal of some of the existing storm sewers within the loading dock area. The increased flow was to be mitigated using controlled flow roof drains.
- In 2008, the expansion phase included construction of a Power Plan addition, Cancer Centre, multi-level parking structure, and surface parking lots on the north side of the campus. A new on-site sanitary pump station including twin forcemains was also constructed in response to capacity concerns within the Graham Creek Sanitary Sewer, with most campus sanitary flows being re-directed to the Lynwood Sanitary Collector south of Baseline Road. Portions of the existing storm sewer and watermain were also replaced to accommodate the Hospital expansion. Underground super-pipes were constructed within the new paved parking areas to provide storage for stormwater management purposes. Also included in the works was the construction of a new Stormceptor STC 9000 replacing the existing Stormceptor STC 4000.
- The 2012 expansion phase included construction of a Surgical Centre addition, MRI Centre, and Main Entry building, as well as modifications to the alignment of the Ring Road on the west side of the campus. Additionally, portions of the existing storm sewer and watermain were replaced to accommodate the proposed Hospital expansion.
- In 2023, the Mental Health Wing, located within the southwest portion of the campus, was expanded and includes control flow roof drains as part of the overall campus SWM strategy.

1.2 Pre-Consultation Information

A pre-consultation meeting was held with the City of Ottawa on May 23, 2024, at which time the client was advised of the general submission requirements. Subsequent meetings were held with the National Capital Commission (NCC) and City staff to further discuss the project and approach to site servicing, drainage, and stormwater management. Refer to **Appendix A** for a summary of the correspondence related to the proposed development.

The subject site is located within the jurisdiction of the Rideau Valley Conservation Authority (RVCA). Based on feedback from the City of Ottawa, on-site stormwater management, including both quantity and quality control measures, will be required. The proposed development will be required to meet a *'Normal'* Level of treatment for stormwater quality treatment (i.e., 70% long-

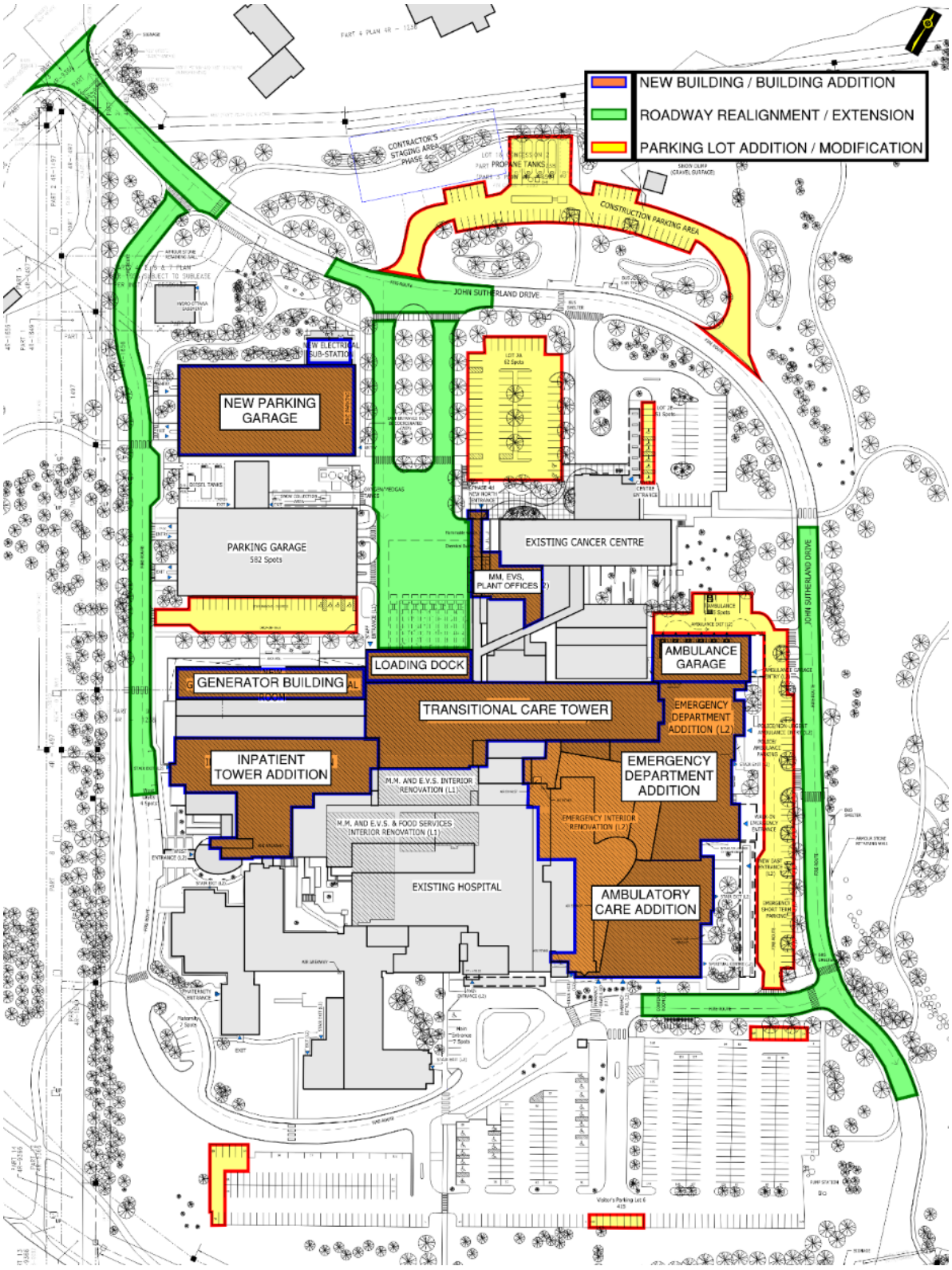
term TSS removal) prior to releasing flows from the developed portion of the campus. An amendment to the existing QCH stormwater management Certificate of Approval (C of A) No. 6601-8B8MMR is also anticipated to be required due to the proposed modifications to the on-site stormwater management system. Refer to **Appendix E** for a copy of the existing C of A.

1.3 Proposed Development

The proposed Part 4 expansion will include new medical facilities and ancillary buildings, including an Ambulance Garage, Generator building, Electrical Sub-Station, Materials Management & Environmental Services (MM & EVS) building, and Loading Dock adjacent to the Materials Management addition. The proposed works will also include building additions and renovations at the Emergency Department, Ambulatory Care, Inpatient Tower and Transitional Care Tower. The increased demand for on-site parking will be provided by the construction of a new Multi-Storey Parking Garage as well as modifications to the various surface parking lots on the QCH campus. Proposed roadwork includes the extension of the west Ring Road as well as the re-alignment of the central loading dock area and portions of John Sutherland Drive.

As part of the proposed storm drainage and stormwater management works, the existing infrastructure (i.e., storm sewers) are being reviewed and upgraded. Portions of the existing private sewer system will be removed and realigned, while new segments will be extended to accommodate the new buildings, roadways and parking lot modifications. New storm sewer works will be required along the west Ring Road extension, within the loading dock area, below the new Emergency building expansion, along the realigned portion of the John Sutherland Drive as well as within the northern portion of the campus. The proposed development will be phased appropriately to ensure minimal disruptions to the Hospital's operations during construction. Refer to **Figure 2** for new building locations and proposed roadworks within the QCH campus.

Figure 2 - New Buildings and Roadway Locations



1.4 Reference Material

The following design guidelines have been used to establish the servicing and stormwater management requirements for the proposed development:

- Ottawa Sewer Design Guidelines (2012) and Technical Bulletins (2010-present).
- Ministry of the Environment Design Guidelines for Sewage Works (2008).
- Ministry of the Environment Design Guidelines for Drinking Water Systems (2008).

The following reports and studies were reviewed and/or prepared as part of the design process:

[1] Queensway-Carleton Hospital Stormwater Management Report, prepared by Novatech Engineering Consultants Ltd., dated October 1998.

[2] Queensway-Carleton Hospital Stormwater Management Report, prepared by Ainley Group, dated May 2003.

[3] Queensway-Carleton Hospital Stormwater Management Report, prepared by IBI Group, dated May 2005.

[4] Queensway-Carleton Hospital Overall Campus – Cancer Centre Addition Stormwater Management Report, prepared by Novatech Engineering Consultants Ltd., dated March 2008.

[5] Queensway-Carleton Hospital Overall Campus – Part 3 Expansion Stormwater Management Report, prepared by Novatech Engineering Consultants Ltd., dated July 2010.

[6] Queensway-Carleton Hospital Part 4 Expansion – Site Servicing Report, prepared by Novatech, dated November 28, 2025.

[7] Geotechnical Investigation – Queensway-Carleton Hospital Expansion, prepared by WSP, dated April 10, 2025.

The details of the proposed QCH Part 4 site servicing design, which will have an impact on the overall SWM design for the campus, are addressed in a separate report entitled: Queensway-Carleton Hospital Part 4 Expansion – Site Servicing Report[6].

2.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

On-site stormwater management, including both water quantity and quality control measures, will be required for the proposed QCH campus expansion. The general approach to stormwater management will be consistent with previously approved QCH SWM Reports[1,2,3,4,5]. The objective of the storm drainage and stormwater management design is to provide proper sewer outlets for the QCH campus while meeting the design criteria established by the City of Ottawa. Refer to the enclosed plans and subsequent sections of the report for further details.

2.1 Existing Conditions

John Sutherland Drive essentially forms the boundary between the developed portion of the campus to the southwest and the largely undeveloped landscaped area to the northeast. The developed portion of the QCH campus, southwest of John Sutherland Drive, consists of existing Hospital buildings, surface parking lots, a multi-level parking structure, access roads and small landscaped areas. The remainder of the campus northeast of John Sutherland Drive, with the exception of the gravel snow dump area and ancillary surface parking lot (which is being

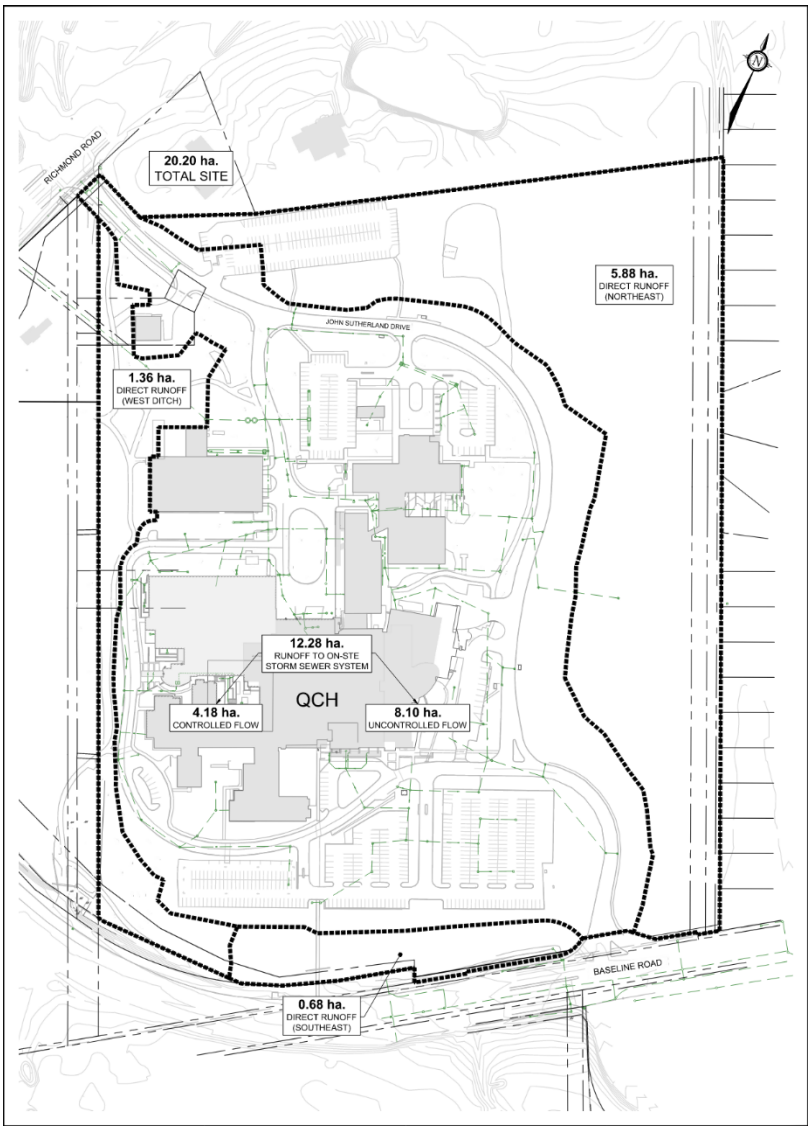
removed as part of the proposed works), is comprised of grass fields, berms, and landscaped areas.

2.1.1 Existing Drainage Patterns

The previous SWM Report[5] divided existing drainage into two drainage areas, however after a detailed review of the existing topography and stormwater infrastructure, the existing drainage areas were slightly revised and are outlined as follows.

Under existing conditions, the 20.20 ha QCH campus generally consists of four drainage areas; A large undeveloped grass/vegetated area (5.88 ha) which currently drains uncontrolled towards the northeast corner of the property, a small grassed area (0.68 ha) along the southern boundary of the campus which currently drains to the storm sewers within Baseline Road, a grassed area with multi-use pathways (1.34 ha) along the western boundary of the campus which drains uncontrolled to the ditch adjacent to Richmond Road, and finally the main campus area (12.28 ha) which drains to the Richmond Road ditch through the on-site storm sewer system and downstream Stormceptor STC 9000 water quality treatment unit. Refer to **Figure 3**: Existing Storm Drainage Areas for details.

Figure 3 - Existing Storm Drainage Areas



A high-level breakdown of the various QCH campus drainage areas is provided in **Table 2.1** below.

Table 2.1: Existing Drainage Conditions

<table>
<tr><th colspan="5">Total Site Area (20.20 ha)</th></tr>
<tr><td rowspan="3">Area Draining to the NE Corner of the QCH campus (5.88 ha)</td><td colspan="3">Area Draining to the Existing Ditch Along Richmond Road (13.64 ha)</td><td rowspan="3">Direct Runoff SE Outlet (0.68 ha)</td></tr>
<tr><td colspan="2">Flow to the Storm Sewer System (12.28 ha)</td><td rowspan="2">Direct Runoff to West Ditch (1.36 ha)</td></tr>
<tr><td>Controlled Flow (4.18 ha)</td><td>Uncontrolled Flow (8.10 ha)</td></tr>
</table>

As described in the previous SWM Reports[1,2,3,4,5], the existing QCH campus stormwater management design includes both controlled and uncontrolled flows. The controlled flows include runoff from the building roofs, the existing parking structure and some of the surface parking lots around the campus; while the uncontrolled flows include direct runoff from the landscaped areas as well as uncontrolled flow directed to the on-site storm sewer system. Stormwater drainage from the campus ultimately discharges into Graham Creek, via the roadside ditch along Richmond Road or via the municipal storm sewer in Baseline Road.

2.1.2 Existing Release Rate

As the existing conditions drainage areas have been revised, existing conditions peak flows have been re-calculated using the rational method to be used as a basis for the allowable release rates from the site. Peak flows for the 5-year and 100-year storm events are outlined in **Table 2.2**. Refer to **Appendix D** for detailed calculations.

Table 2.2: Existing Stormwater Flow Rate

<table>
<tr><th colspan="5">Total Site (L/s)
5-year = 1,303
100-year = 2,384</th></tr>
<tr><td rowspan="3">Direct Runoff to the NE Corner of the QCH campus (L/s)
5-yr = 160
100-yr = 328</td><td colspan="3">Drainage to the Existing Ditch Along Richmond Road (L/s)
5-year = 1,119
100-year = 2,007</td><td rowspan="3">Direct Runoff to SE Outlet (L/s)
5-yr = 24
100-yr = 49</td></tr>
<tr><td colspan="2">Flow to the Storm Sewer System (L/s)
5-year = 1,075
100-year = 1,917</td><td rowspan="2">Direct Runoff to West Ditch (L/s)
5-yr = 44
100-yr = 90</td></tr>
<tr><td>Controlled Flow (L/s)*
5-yr = 230
100-yr = 273</td><td>Uncontrolled Flow (L/s)
5-yr = 845
100-yr = 1,644</td></tr>
</table>

*Information taken directly from previous SWM report[5] and design drawings.

2.1.3 Existing Quality Control Measures

Based on a review of the previous SWM Report[5], the Stormceptor STC 9000 currently provides a *'Normal'* level of protection (i.e. minimum 70% long-term removal of TSS) for the runoff from approximately 11.46 ha (of the 12.28 ha portion of the site) that is currently tributary to the existing storm sewer system which outlets to the west ditch. There is a small area along John Sutherland Drive (0.82 ha of the 12.28 ha portion of the site) at the northwest corner of the campus which is not routed through the water quality unit and outlets directly to the Richmond Road ditch.

Approximately 1.36 ha of undeveloped vegetated area of the total 13.64 ha tributary to the west ditch along Richmond Road, does not require any stormwater quality control measures. Similarly, no stormwater quality control measures are currently being provided for the mainly grass/vegetated areas sheet draining overland towards the northeast corner of the campus (5.88 ha) and towards the southeast outlet (0.68 ha).

2.2 Post-Development Conditions

As described above, the proposed Part 4 QCH Hospital expansion will consist of additional medical facilities, renovations to existing buildings, modifications to internal roadways, the construction of a new parking garage and modifications to existing surface parking lots. Significant upgrades to the on-site storm sewer system will be necessary to accommodate the proposed works and to divert flows, including the removal and realignment of existing sewer segments as well as the construction of new infrastructure. The hospital campus will continue to be serviced by a dual drainage system, including upgrading and expanding the existing storm sewer network (minor system) and by improving the surface storage capacity and major overland flow routes (major system), where possible.

Due to the extent of hard surface areas and limited release rate from the campus, runoff exceeding the existing conditions release rate will be stored on site. Where possible, this will be achieved using controlled flow roof drains on the proposed and existing buildings, by providing surface storage within parking areas with inflows to the storm sewer controlled by ICDs, and by providing storage within over-sized storm sewers and underground tanks. Stormwater runoff from the remainder of the campus, unaffected by the expansion, will generally remain unchanged.

Storm sewer outlets will remain the same, with runoff from most of the campus being routed to the existing storm sewer at the northwest corner of the campus, ultimately discharging to Graham Creek, via the drainage ditch along Richmond Road. The remainder of the campus, northeast of John Sutherland Drive will generally remain undeveloped, except for the new propane tank area parking lot, which will be offset by the removal of the large existing surface parking lot in this area. Stormwater runoff from the landscaped area northeast of John Sutherland Drive and south of the main parking lot along Baseline Road will generally continue to sheet drain towards their respective outlets per existing conditions.

Refer to **Figure 4** for a plan showing the existing storm sewers servicing the QCH Campus and the proposed storm sewer modifications for the Part 4 expansion.

Figure 4 - Storm Sewer Drainage Plan

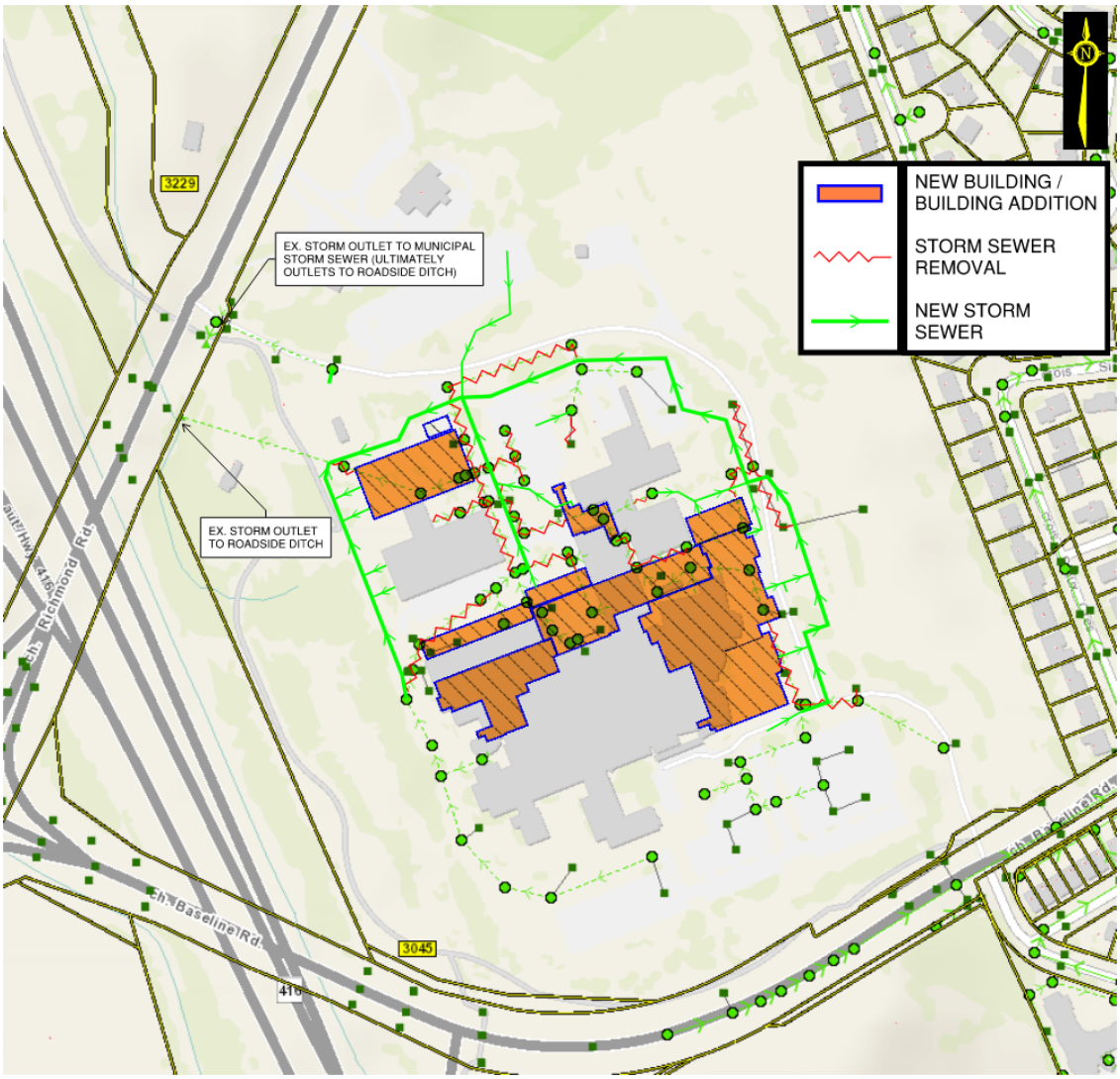


Image Source: geoOttawa (City of Ottawa)

2.2.1 Stormwater Management Criteria and Objectives

The stormwater management (SWM) criteria for the proposed QCH Part 4 expansion have been provided during pre-consultation meetings with the City of Ottawa and are intended to generally follow the approach of the previously approved QCH SWM Reports[1,2,3,4,5]. The SWM criteria and design objectives are as follows:

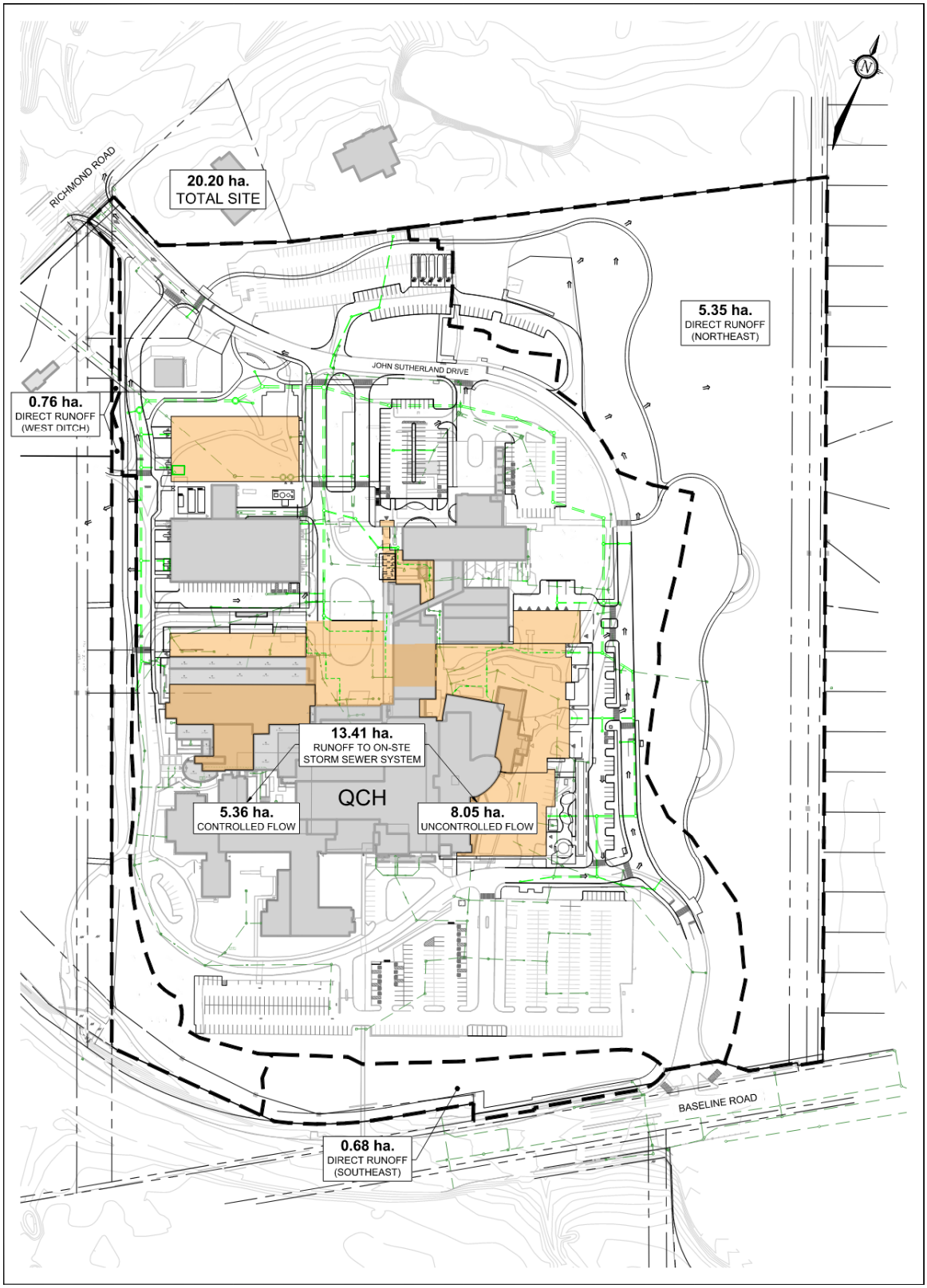
- Provide a dual drainage system (i.e., minor, and major system flows – where possible);
- Provide on-site stormwater quantity control measures, prior to releasing flows into the drainage ditch adjacent to Richmond Road, for all storms up to and including the 100-year design event;
- Ensure that no surface ponding will occur on the paved surfaces (parking lots and drive aisles) during the 2-year storm event;
    - Ensure that no surface ponding will occur on roadways to be used by emergency vehicles during any storm event.

- Provide on-site stormwater quality control equivalent to a *"Normal"* level of protection (minimum 70% long-term TSS removal) prior to releasing flows from the site;
    - Based on the previous SWM Reports, Graham Creek is a Type II Habitat requiring 70% TSS removal, as described in the MOE Stormwater Management Planning and Design Manual.
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion a Sediment Control.

2.2.2 Post-Development Flow

Under post-development conditions, the 20.20 ha QCH campus will still consist of four drainage areas. A large undeveloped grass/vegetated area, approximately 5.35 ha (reduced from 5.88 ha), will continue to drain uncontrolled towards the northeast corner of the property, a small grassed area (0.68 ha, unchanged) south of the main parking lot will continue to drain to the municipal storm sewer within Baseline Road, a grassed area of 0.76 ha (reduced from 1.34 ha) along the western boundary of the campus which drains uncontrolled to the ditch adjacent to Richmond Road, and finally the main campus area of 13.41 ha (increased from 12.28 ha), will continue to drain towards the existing ditch along Richmond Road. The latter area can be further divided into two smaller sub-catchment areas; the undeveloped vegetated area which drains uncontrolled to the ditch and the remainder of the campus, where flows are being directed to the ditch via the on-site storm sewer system and new water quality treatment units. Refer to **Figure 5**: Post-Development Storm Drainage Areas for details.

Figure 5 - Post-Development Storm Drainage Areas



A high-level breakdown of the various QCH campus post-development drainage areas is provided in **Table** 2..

Table 2.3: Proposed Drainage Conditions

<table>
<tr><th colspan="4">Total Site Area (20.20 ha)</th></tr>
<tr><td rowspan="3">Area Draining to the NE Corner (5.35 ha)</td><td colspan="2">Area Draining to the Existing Ditch Along the West Property Line (14.17 ha)</td><td rowspan="3">Direct Runoff to SE Outlet (0.68 ha)</td></tr>
<tr><td colspan="2">Flow to the Storm Sewer System (13.41 ha)</td><td rowspan="2">Direct Runoff to West Ditch (0.76 ha)</td></tr>
<tr><td>Controlled Flow (5.36 ha)</td><td>Uncontrolled Flow (8.05 ha)</td></tr>
</table>

The post-development flow from the QCH campus will include both controlled flow and uncontrolled runoff. The controlled portion will include flow from the various building roofs, the existing parking structure and various parking lots around the campus. The uncontrolled portion will include direct runoff from the landscaped areas as well as uncontrolled flow directed to the on-site storm sewer system.

3.0 Stormwater Management Modeling

The City of Ottawa Sewer Design Guidelines (October 2012) requires hydrologic / hydraulic modeling for all dual drainage systems. The performance of the proposed storm drainage system for the site was evaluated using the PCSWMM hydrologic / hydraulic model.

The PCSWMM model schematics and model output data are provided in **Appendix D**. Digital copies of the modeling files and model output for all storm events are provided as part of the digital submission.

3.1 Design Storms

The hydrologic analysis was completed using the following synthetic design storms:

- 3-hour Chicago storm distribution
- 12-hour SCS Type II storm distribution

The return periods analyzed include the 2,5 & 100-year storm events. The IDF parameters used to generate the design storms were taken from the City of Ottawa Sewer Design Guidelines (October 2012). The 25mm water quality storm event was also run.

The 3-hour Chicago distribution generated the highest peak flows for both the minor and major systems and was determined to be the critical storm distribution for the design of the storm drainage system.

The proposed drainage system was also ‘stress tested’ using a 100-year (+20%) 3-hour Chicago design storm. This design storm has a 20% higher intensity and total volume compared to the 100-year event.

3.2 Model Development

The PCSWMM model represents both the minor and major system flows from the campus. The model further delineates the above-noted four drainage areas for the existing campus and proposed expansion areas. Existing and proposed stormwater management infrastructure including pipes, storage tanks, roof drains, and inlet control devices have been included to determine appropriate sizing to reduce peak flows from the increased impervious area. Model parameters are outlined as follows:

Infiltration

Infiltration losses for all catchment areas were modeled using Horton's infiltration equation, which defines the infiltration capacity of soil over the duration of a precipitation event using a decay function that ranges from an initial maximum infiltration rate to a minimum rate as the storm progresses. The default values as specified in the City of Ottawa Sewer Design Guidelines were used for all catchments.

Horton's Equation: $f(t) = f_c + (f_o - f_c)e^{-k(t)}$

Initial infiltration rate: f_o = 76.2 mm/hr

Final infiltration rate: f_c = 13.2 mm/hr

Decay Coefficient: k = 4.14/hr

Depression Storage

The default values for depression storage in the City of Ottawa were used for all sub-catchments.

- Depression Storage (pervious areas): 4.67 mm
- Depression Storage (impervious areas): 1.57 mm

The rooftops assumed to provide no depression storage (zero-impervious parameter).

Equivalent Width

'Equivalent Width' refers to the width of the sub-catchment flow path. This parameter (Table 5.1) is calculated as described in Section 5.4.5.6 of the City of Ottawa Sewer Design Guidelines.

Impervious Values

Runoff coefficients for each sub-catchment area were determined based on the proposed site plan. Refer to the Stormwater Management Plan (123089-SWM) for details. Percent impervious values were calculated using:

$$\%imp = (C - 0.20) / 0.70$$

Storm Drainage Areas

For modeling purposes, the site has been divided into sub-catchments based on the drainage areas tributary to each inlet of the proposed storm sewer system. The sub-catchment areas are shown on the Stormwater Management Plan (123089-SWM). The hydrologic modeling parameters were developed based on the imperviousness of each sub-catchment. A summary of sub-catchment parameters is provided in **Table 3.1**. An expanded table has been provided in **Appendix D**.

Table 3.1: Sub-catchment Parameters

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
A101	0.157	0.60	57%	0%	20.06	78.28	0.5%
A102	0.202	0.36	23%	0%	36.40	55.49	0.5%
A103	0.190	0.53	47%	0%	20.51	92.66	0.5%
A104	0.195	0.69	70%	0%	32.94	59.19	0.5%
A105	0.082	0.67	67%	0%	24.52	33.44	0.5%
A106	0.027	0.43	33%	0%	18.17	14.86	0.5%
A107	0.079	0.64	63%	0%	15.54	50.85	0.5%
A108	0.087	0.66	66%	0%	19.39	44.86	0.5%
A113	0.792	0.90	100%	0%	106.42	74.42	0.5%
A116a	0.038	0.90	100%	0%	22.08	17.21	0.5%
A116b	0.017	0.90	100%	0%	6.04	28.13	0.5%
A117	0.023	0.90	100%	0%	13.57	16.96	0.5%
A119	0.122	0.64	63%	0%	47.78	25.53	0.5%
A120	0.227	0.55	50%	0%	41.94	54.12	0.5%
A121	0.100	0.80	86%	0%	19.31	51.78	0.5%
A122	0.283	0.38	25%	0%	28.93	97.82	0.5%
A137	0.020	0.74	77%	0%	7.80	25.65	0.5%
B101	0.550	0.48	40%	0%	29.24	188.09	0.5%
B102	0.127	0.71	73%	0%	28.01	45.35	0.5%
B103	0.030	0.55	51%	0%	9.59	31.28	0.5%
B104	0.137	0.73	76%	0%	25.35	54.05	0.5%
B105	0.077	0.63	62%	0%	14.96	51.48	0.5%
B106	0.155	0.74	77%	0%	16.43	94.33	0.5%
B107	0.081	0.52	46%	0%	18.78	43.12	0.5%
B108	0.052	0.87	96%	0%	12.81	40.60	0.5%
B109	0.052	0.64	63%	0%	14.15	36.75	0.5%
B110	0.153	0.51	45%	0%	18.48	82.77	0.5%
B111	0.055	0.90	100%	0%	15.19	36.21	0.5%
B112	0.660	0.43	33%	0%	32.21	204.88	0.5%
B113	0.091	0.20	0%	0%	18.79	48.42	0.5%
B114	0.394	0.77	82%	0%	44.07	89.40	0.5%
B115	0.290	0.81	87%	0%	35.39	81.94	0.5%
B116	0.175	0.27	9%	0%	63.88	27.39	0.5%
B117	0.211	0.60	57%	0%	36.93	57.14	0.5%
B118	0.164	0.32	17%	0%	23.94	68.50	0.5%
B119	0.150	0.44	35%	0%	20.73	72.34	0.5%
B120	0.089	0.69	69%	0%	12.85	69.28	0.5%
B121	0.089	0.62	60%	0%	17.67	50.36	0.5%
B122a	0.179	0.79	85%	0%	37.41	47.85	0.5%
B122a	0.002	0.79	85%	0%	6.34	3.16	0.5%

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
B122b	0.002	0.79	85%	0%	8.46	2.36	0.5%
B123	0.108	0.69	70%	0%	24.99	43.21	0.5%
B124	0.023	0.90	100%	0%	12.78	17.99	0.5%
B125	0.267	0.73	76%	0%	45.79	58.31	0.5%
B126	0.112	0.52	45%	0%	44.96	24.91	0.5%
B127	0.203	0.53	47%	0%	22.86	88.79	0.5%
B128	0.086	0.41	30%	0%	18.33	46.92	0.5%
B129	0.016	0.20	0%	0%	6.66	24.04	0.5%
B130	0.086	0.63	62%	0%	14.28	60.22	0.5%
B131	0.093	0.69	70%	0%	14.33	64.90	0.5%
B132	0.180	0.76	80%	0%	32.63	55.16	0.5%
B133	0.145	0.46	37%	0%	41.43	35.00	0.5%
B134	0.494	0.46	37%	0%	3.14	1575.26	0.5%
B135	0.325	0.60	57%	0%	12.86	252.64	0.5%
EX-A01a	0.423	0.67	66%	0%	29.62	142.80	0.5%
EX-A01b	0.336	0.76	80%	0%	21.12	159.11	0.5%
EX-A02-01	0.028	0.20	0%	0%	16.44	17.04	0.5%
EX-A02-02	0.039	0.20	0%	0%	24.20	16.12	0.5%
EX-A02A	0.400	0.71	73%	0%	30.70	130.29	0.5%
EX-A02B	0.518	0.65	64%	0%	34.34	150.86	0.5%
EX-A03-01	0.080	0.90	100%	0%	18.92	42.28	0.5%
EX-A03-02	0.158	0.90	100%	0%	13.87	113.93	0.5%
EX-A04	0.040	0.90	100%	0%	10.31	38.81	0.5%
EX-R01	0.072	0.90	100%	0%	19.92	36.14	0.5%
EX-R02	0.295	0.90	100%	0%	55.27	53.37	0.5%
EX-R03	0.044	0.90	100%	0%	28.31	15.54	0.5%
P3-01	0.486	0.90	100%	0%	58.73	82.76	0.5%
P3-02	0.017	0.90	100%	0%	11.23	15.14	0.5%
P3-03	0.038	0.90	100%	0%	11.65	32.62	0.5%
P4-01	0.200	0.90	100%	0%	22.83	87.60	0.5%
P4-02	0.294	0.90	100%	0%	28.29	103.93	0.5%
P4-03	0.084	0.90	100%	0%	30.48	27.56	0.5%
P4-04	0.128	0.90	100%	0%	37.20	34.41	0.5%
P4-05	0.341	0.90	100%	0%	50.84	67.08	0.5%
P4-06	0.059	0.90	100%	0%	11.61	50.84	0.5%
P4-07	0.046	0.90	100%	0%	19.42	23.68	0.5%
P4-08	0.288	0.90	100%	0%	67.84	42.45	0.5%
P4-09	0.272	0.90	100%	0%	69.47	39.15	0.5%
P4-	0.721	0.26	8%	0%	288.33	25.01	1.5%

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
DR01a							
P4-DR01b	0.680	0.26	8%	0%	209.29	32.49	1.3%
P4-DR01c	0.038	0.26	8%	0%	76.00	5.00	0.5%
P4-DR02	5.351	0.25	7%	0%	510.00	104.92	2.0%
TOTAL:	**20.20**						

3.3 Model Results

The on-site storage and conveyance system requirements were refined using the PCSWMM model. The model was used to ensure that peak flows are controlled to the allowable release rates.

3.3.1 Storage Requirements

Roof Drains

The existing building roofs contain both uncontrolled and control flow roof drains. Flows from the new and renovated building roofs (excluding the new parking garage) will be attenuated using Watts adjustable 'Accutrol' control flow roof drains (model number RD-100-A-ADJ) prior to being directed to the downstream storm sewer system. Where possible, runoff from some existing roofs will be directed onto the new roofs to optimize on-site storage and reduce peak flows. Peak flows from new roofs are based on the number of control flow roof drains and their individual weir setting (i.e., fully closed, ¼ open, etc.). Storage provided on the new roofs has been estimated based on average end-area method calculations and a maximum ponding depth of 0.15m above the drains. Scuppers will be installed to provide an overflow for storms that exceed the maximum available storage (i.e. for storms greater than the 100-year design event). **Table 3.2** summarizes the roof drainage area ID, number of drains within the roof area, 100-year peak flows and maximum storage available.

Table 3.2: Roof Flows & Storage

Drainage Area ID	Number of Roof Drains	100-Year Peak Flow from Drains (L/s)	Maximum Storage Volume Available (m^3)
A113	-	371.5	-
A116	-	30.3	-
A117	-	11.4	-
P3-1	28	31.6	154.2
P3-2**	2	2.3	4.5
*P3-3**	-	12.1	-
P4-1	5	2.9	75.7
P4-2	7	5.7	92.7
P4-3	2	0.6	33.1

Drainage Area ID	Number of Roof Drains	100-Year Peak Flow from Drains (L/s)	Maximum Storage Volume Available (m^3)
P4-4	3	1.0	44.6
P4-5	12	5.1	146.9
P4-6	2	0.6	29
P4-7	3	1.6	23.8

**Denotes uncontrolled roof drainage*
***Information taken directly from the previous SWM Report[5].*

Refer to **Appendix C** for control flow roof drain information and **Appendix D** for detailed SWM calculations.

Surface Storage (Parking Lots)

Under existing conditions, the southern parking lots (areas EX-A01a, EX-A01b, EX-A02a, EX-A02b) provide some surface storage with flows being controlled by ICDs installed in the various catchbasins. These areas will provide approximately 309 m^3 of storage, per the previous SWM Report[5].

Tank Storage

Two storage tanks adjacent to the new and existing parking garages are to be installed to provide additional storage and peak flow control. Each tank provides approximately 65m^3 of storage. Refer to **Appendix C** for detailed storage tank information.

Oversized Storm Sewers

An existing oversized storm sewer (1500mm) provided within the parking area towards the northeast corner of the site, adjacent to the Cancer Centre provides some underground storage for runoff from the parking area. Flows from this storm sewer are controlled by an ICD located within the downstream manhole. ICD sizes are outlined in the following section.

3.3.2 Orifice Controls

Storm flows from some of the existing paved parking areas are attenuated using inlet control devices (ICDs) located within the outlet pipes of existing storm sewer structures. These ICDs allow for increased surface storage during large storm events (5-year and larger) and reduce the peak flow to the storm sewer system. As a part of the PCSWMM modelling exercise, existing ICDs were assessed to determine if they could be replaced to further reduce peak flows and maximize available surface storage. **Table 3.3** outlines the existing and proposed ICD specifications, peak design flow rates, and anticipated maximum ponding depths.

Table 3.3: Inlet Control Device Parameters

Drainage Area ID	Structure ID	ICD Size	ICD Type	5-Yr Peak Flow (L/s)	100-Yr Peak Flow (L/s)	Max Ponding Depth (m)
Existing						
EX. A1a	EX. CB132	84mm	Plug Type Orifice	20.00	20.99	0.35
EX. A1b	EX. CB	85mm	Plug Type Orifice	20.80	21.38	0.35
EX. A2A	EX. CB	91mm	Plug Type Orifice	23.85	23.87	0.35

Drainage Area ID	Structure ID	ICD Size	ICD Type	5-Yr Peak Flow (L/s)	100-Yr Peak Flow (L/s)	Max Ponding Depth (m)
EX. A2B	EX. CB129	81mm	Plug Type Orifice	20.43	20.95	0.35
Proposed						
B108	CB405	83mm	Slide-in plate	14.49	20.86	
B112	CBMH408	178mm	Slide-in plate	72.13	99.71	-
B114-B115	CBMH 10	178mm	Slide-in plate	68.94	103.30	-
B116,117,118	CBMH412	178mm	Slide-in plate	50.46	99.67	-
B120,127	CB410	178mm	Slide-in plate	51.79	106.59	-
B121	EX. CB01	83mm	Slide-in plate	16.31	22.10	0.35
B123	CBMH 1	83mm	Slide-in plate	16.31	22.10	0.35
B128	CB411	94mm	Slide-in plate	11.47	18.08	-
B129	CB412	83mm	Slide-in plate	0.99	4.66	-
B130	CB413	102mm	Slide-in plate	17.30	34.70	-
B131	CB402	108mm	Slide-in plate	20.38	41.58	-
B132	CB403	152mm	Slide-in plate	43.54	80.53	-
B133	CB404	108mm	Slide-in plate	16.89	35.10	-
B134_1*	CB414	94mm	Slide-in plate	5.77	17.03	-
B135_2*	EX-LD01	152mm	Slide-in plate	14.51	31.05	-
P4-08	Tank 01	225mm	Slide-in plate	55.08	83.31	N/A
P4-09	Tank 02	200mm	Slide-in plate	46.50	64.93	N/A

**Denotes a sub-area from a larger sub-catchment area*

Refer to **Appendix C** for ICD information and to **Appendix D** for detailed SWM calculations and modelling results.

3.3.3 Peak Flows

The following table summarizes the post-development flows for the QCH campus for both the 5-year and 100-year design events:

Table 3.4: Post-Development Flow Summary (L/s)

Design Event	Direct Runoff to Northeast	Direct Runoff to SE Outlet	Flows from Main Campus	Direct Runoff to West Ditch	Total Site Flow	Existing Conditions Peak Flow
5-year	105	19	1,440	20	1,584	*1,303*
100-year	247	48	2,062	50	2,408	*2,384*

**Based on PCSWMM Model Results for a 3-hour Chicago Storm; outfall results account for hydrograph timing.*

As shown in the above table, post-development peak flows are somewhat higher than the calculated existing conditions peak flows. Given the increase in impervious areas on-site and limitations with available on-site storage, some increase in peak flows to the ditch along Richmond Road is to be expected. Overall, the 100-year peak flow is approximately 1% higher. The 5-year peak flow has a larger increase; however, the receiving watercourses (Richmond Road ditch and Graham Creek) have sufficient capacity to convey the increase in peak flows. The main goal of the updated stormwater management strategy for the campus is to improve

upon the existing hospital stormwater infrastructure, which has been achieved through providing an increase in areas with flow controls.

It should also be noted that there are limitations with comparing peak flows calculated using the Rational Method (previous SWM Reports) and those calculated using the PCSWMM model. The Rational Method calculation provides good approximation of peak flows, however the PCSWMM model is generally more accurate as it accounts for more variables (i.e. slopes, storage controls, hydrograph timing etc.) which can result in higher overall peak flows.

Furthermore, we anticipate that future QCH campus expansions phases will continue to improve the stormwater management controls as uncontrolled areas will be replaced with new buildings with control-flow roof drains.

3.3.4 Stormwater Quality Control Unit Sizing

As discussed previously, the existing water quality control unit (Stormceptor STC9000) currently provides a *'Normal'* level of protection (i.e. minimum 70% long-term removal of TSS). Stormwater flows from the developed portion of the campus flowing through the STC9000 are being discharged into the existing roadside ditch along Richmond Road, which is ultimately tributary to Graham Creek.

To accommodate the proposed Part 4 Expansion, the existing STC9000 water quality treatment unit will be removed. Under post-development conditions, the *'Normal'* level of water quality control will be maintained by two (2) new treatment units, which will be installed immediately upstream of the existing 900mm dia. QCH campus storm sewer outlet pipe. Stormwater runoff collected by the on-site storm sewer system (13.41 ha) can be subdivided into three smaller sub catchment areas. Flows from a portion of the existing storm sewer system near the northwest corner of the campus (0.82 ha) will continue to outlet directly into the existing ditch without treatment, while stormwater runoff from the western portion of the campus (2.56 ha) will be treated by the new water quality treatment unit ("OGS #1") and stormwater runoff from the remainder of the campus (10.03 ha) will be treated by second new water quality treatment unit ("OGS #2").

The "PCSWMM for Stormceptor" online tool has been used to size the two new water quality treatment units capable of meeting the TSS removal requirements (*'Normal'* or 70% long-term TSS removal). The model parameters for the TSS removal were based on historical rainfall data for Ottawa from the Ottawa CDA RCS rainfall station. It was determined that a Stormceptor model EF5 for the 2.56 ha drainage area (OGS #1) will exceed the target removal rate, providing a net annual 74% TSS removal. Similarly, it was determined that a Stormceptor Model EF10 for the 10.03 ha drainage area (OGS #2) will exceed the target removal rate, providing a net annual 74% TSS removal. Refer **Appendix C** for detailed sizing information.

Additional stormwater quality treatment will be provided by the on-site catchbasins and storm manhole structures, which will be equipped with sumps to promote additional settling of sediment. It is recommended that the client implement a maintenance and monitoring program for both the on-site storm sewer system and two new water quality treatment units. The storm drainage system should be inspected routinely (at least annually); the ICDs should be inspected to ensure they are free of debris; and the water quality units should be inspected at regular intervals and maintained when necessary to ensure optimal performance.

4.0 SITE GRADING

The existing QCH campus generally slopes in a north-westerly direction, with the approximate elevation dropping from 79.40m at the site entrance off Baseline Road down to approximately 74.20m at the Richmond Road entrance. The finished floor elevations (FFE) of the proposed Part 4 expansion buildings are based on the existing hospital floor elevations, site topography, and elevations of the new internal roadways. The new buildings additions generally match into the existing Level 1 (74.98m) and Level 2 (79.25m) floor elevations, while the new parking garage has been set at an elevation of 77.40m. Overland flow is generally directed outwards towards the West Ring Road extension and John Sutherland Drive, captured by downstream catchbasins. Some existing parking lots provide low-point surface storage above the catchbasins. The grading design will generally match into the existing elevations around the site.

Refer to the enclosed Grading and Erosion & Sediment Control Plans for details.

4.1 Major Overland Flow Route

As discussed above, the QCH campus generally slopes in a north-westerly direction, with the main storm sewer outlet discharging to the roadside ditch along Richmond Road, located near the northwest corner of the site. In the case of a major rainfall event exceeding the design storms provided for, the stormwater located within the parking and landscaped areas will cascade into lower drainage areas along the re-aligned portion of John Sutherland Drive and ultimately spill towards the northeast corner of the campus. Meanwhile, stormwater located within the northwest portion of John Sutherland Drive and west Ring Road will overflow toward the existing naturalized drainage ditch to the west and/or directly towards the roadside ditch along Richmond Road. The major system continues north from these ditches to Graham Creek, which ultimately outlets to the Ottawa River. The major overland flow route within the QCH campus is shown on the enclosed Grading and Erosion & Sediment Control Plans.

The modified loading dock area will continue to be a low point on the QCH campus, therefore there is no major overland flow route for stormwater draining towards this area. All runoff will be directed towards and drained through the new storm sewer system, which has been oversized (within the loading dock area) to account for this existing condition. Furthermore, as part of the proposed storm sewer upgrades, stormwater flows from other parts of the campus will be diverted away from the loading dock area to reduce potential flooding risks. It is recommended that the owner conduct routine inspections of the storm sewers (at least annually) to ensure that the stormwater drainage system is clean and operational.

5.0 EROSION AND SEDIMENT CONTROL

To mitigate erosion and to prevent sediment from entering the storm sewer system and downstream drainage ditch, temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter bags / catch basin inserts (sediment sacks) will be placed under the grates of nearby catchbasins and manholes and will remain in place until vegetation has been established and construction is completed.
- Silt fencing will be placed per OPSS 577 and OPSD 219.110 along the surrounding construction limits.
- Mud mats will be installed at the site entrances.
- Street sweeping and cleaning will be performed, as required, to suppress dust and to provide safe and clean roadways adjacent to the construction site.

- On-site dewatering is to be directed to a sediment trap and/or gravel splash pad and discharged safely to an approved outlet as directed by the engineer.
- Any stockpiled material will be properly managed to prevent those materials from entering the sewer system and/or the downstream ditch or watercourse.

The temporary erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of the erosion control measures will be undertaken.

In addition, the following measure will provide permanent erosion and sediment control on site:

- A Stormceptor EF5 water quality unit will be installed to provide water quality control for the western portion of the campus (2.56 ha).
- A Stormceptor EF10 water quality unit will be installed to provide water quality control for the remainder of the campus (10.03 ha).

6.0 GEOTECHNICAL INVESTIGATIONS

The Geotechnical Investigation – Queensway Carleton Hospital Expansion (CA0033714.1722, dated April 10, 2025) has been prepared by WSP for the QCH Campus Part 4 Expansion. Refer to the Geotechnical Report[7] for subsurface conditions, construction recommendations and geotechnical inspection requirements.

7.0 CONCLUSIONS

This report has been prepared in support of the site plan control application for the proposed Queensway Carleton Hospital Part 4 Expansion, located at 3045 Baseline Road, in Ottawa.

The conclusions are as follows:

- A dual drainage system consisting of storm sewers (minor system) and an overland flow path (major system) has been provided to control and convey peak flows from the hospital campus.
- On-site stormwater quantity control measures have been provided, where possible, using control flow roof drains and ICDs. The total 5-year release rate from the campus, including both controlled flows, uncontrolled flows, and direct runoff was calculated to be 1,584 L/s, while the total 100-year release rate was calculated to be 2,408 L/s.
- Campus flows will continue to be directed into the existing outlets including the drainage ditch adjacent to the Richmond Road entrance, near the northeast corner of the campus, and the southeast outlet to the municipal storm sewer in Baseline Road.
- No surface ponding will occur on the paved surfaces (parking lots and drive aisles) during the 2-year storm event.
    - No surface ponding will occur on roadways to be used by emergency vehicles during any storm event.
- On-site stormwater quality control equivalent to a *"Normal"* level of protection (minimum 70% long-term TSS removal) has been provided via two new water quality treatment units (Stormceptor EF5 and Stormceptor EF10) prior to releasing flows from the site.
- Guidelines have been provided to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion a Sediment Control.

It is recommended that the proposed stormwater management design be approved for implementation.

NOVATECH

Prepared by:



Reviewed by:



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Project Manager | Water Resources

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Senior Project Manager | Land Development

APPENDIX A

Project Correspondence

File No.: PC2024-0148

June 6, 2024

Derek Judson
Parkin
Via email: judson@parkin.ca

Subject: Pre-Consultation: Meeting Feedback
Proposed Site Plan Control Application – 3045 Baseline Road

Please find below information regarding next steps as well as consolidated comments from the above-noted pre-consultation meeting held on May 23, 2024.

Pre-Consultation Preliminary Assessment

1 ☐	**2** ☐	**3** ☒	**4** ☐	**5** ☐

One (1) indicates that considerable major revisions are required while five (5) suggests that the proposal appears to meet the City's key land use policies and guidelines. This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.

Next Steps

1. A review of the proposal and materials submitted for the above-noted pre-consultation has been undertaken. Please proceed to complete a Phase 2 Pre-consultation Application Form and submit it together with the necessary studies and/or plans to planningcirculations@ottawa.ca.

2. In your subsequent pre-consultation submission, please ensure that all comments or issues detailed herein are addressed. A detailed cover letter stating how each issue has been addressed must be included with the submission materials. Please coordinate the numbering of your responses within the cover letter with the comment number(s) herein.

3. Please note, if your development proposal changes significantly in scope, design, or density before the Phase 3 pre-consultation, you may be required to complete or repeat the Phase 2 pre-consultation process.

Supporting Information and Material Requirements

1. The attached **Study and Plan Identification List** outlines the information and material that has been identified, during this phase of pre-consultation, as either required (R) or advised (A) as part of a future complete application submission.

a. The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, as available on Ottawa.ca. These ToR and Guidelines outline the specific requirements that must be met for each plan or study to be deemed adequate.

Consultation with Technical Agencies

1. You are encouraged to consult with technical agencies early in the development process and throughout the development of your project concept. A list of technical agencies and their contact information is enclosed.

Planning

Comments:

1. Site is located in the Greenbelt Transect of the Official Plan

2. Current Zoning: RI[307r] H(20) (Rural Institutional Zone, Urban Exception 307r, height restriction 20) & O1[434r] (Parks and Open Space Zone, Urban Exception 434r)

    a. Additional height proposed will require a Zoning Bylaw Amendment application

3. Site Plan application required

4. Consultation is required with the Ministry of Transportation due to proximity to Highway 417.

    a. We recommend consultation with MTO prior to full application submission

5. There looks to be a residence located at the NW end of John Sutherland Drive that may be impacted by the proposed road connection

    a. Consulttaion with this homeowner will be required

    b. Is this a land lease agreement with the NCC? Not sure as propertie details are not available at this time.

6. Please reach out to the RVCA for consultation prior to application submission

7. The Active Transportation Network traverses the site. The new proposed road alignment causes a disruption to the current routes.

    a. Please consider the bike bath realigment

    b. Please consider pathway connections at the intersection of Richmond Road and John Sutherland Road

c. Please consider pathway realignment at the intersection of Baseline Road and Cedarview Road.

Process Comments

8. Site Plan Control & Zoning By-Law Amendment applications can no longer run concurrently

    a. Pre-Consultation for both applications can be done together

    b. Applications to separate at time of full submission

9. Consultation/ Application process with the NCC

    a. The NCC has a separate and distinct review process for development applications

    b. Recommendation to coordinate submission requirements with the NCC – ideally creating one set of submission requirements to be shared between the City and the NCC

        i. City Staff will wait until further consultation has been done with the NCC before providing a Studies and Plans Identification List (SPIL) so no materials will be duplicated

        ii. Updated survey plan for proper lotting may be required

10. Please reach out to Ted Horton (ted.horton@ncc-ccn.ca) to begin pre-consultation process with the NCC

Urban Design

Comments:

11. Submission requirements:

    a. A Design Brief will be required but will be minimal in terms of requirements. A terms of reference will be provided in the follow-up.

    b. Site plan

    c. Landscape plan

    d. Elevations

12. For new buildings, please avoid blank facades. Incorporating windows, doors and architectural treatments to reduce blank facades from the public realm should be sought. For parking garages, please utilize plantings to hide and screen blank walls with all-season plantings.

13. Please ensure there are clear pedestrian linkages from new structures to entrances.

14. Please provide bicycle parking in close proximity to building entrances. Bicycle parking that is covered would be optimal.

Engineering

General Comments:

15. With the development being spread throughout different parts of the site, the applicant should first ensure that they have reviewed all previous studies and plans developed for the site.

16. Existing public services (main connections) have been listed in these comments. It is the responsibility of the applicant to confirm the existing infrastructure on site and to demonstrate adequate outlets/connections to City infrastructure.

17. During the pre-consultation meeting the applicant asked if an update to the previously developed servicing report report would be acceptable or if a new report would be required for this proposal. Please contact Ryan Brault to further discuss.

Water:

Existing Public Services:

1220mm, SE of site, Baseline Road, Backbone Infrastructure

Boundary Conditions:

18. Request Boundary Conditions prior to first submission. Contact assigned City Infrastructure Project Manager with the following information:

    a. Location of service(s)

    b. Type of development

    c. Fire flow (per FUS method – include FUS calculation sheet with boundary condition request – boundary conditions will not be requested without fire flow calculations)

    d. Average Daily Demand (l/s)

    e. Maximum Hourly Demand (l/s)

    f. Maximum Daily Demand (l/s)

General Comments:

19. Per WDG 4.3.1, where basic demand is greater than 50 m3 /day, there shall be a minimum of two water services, separated by an isolation valve, to avoid creation of vulnerable service area.

20. Per WDG 4.4.7.2, District Meter Area (DMA) Chamber is required for services greater than 150mm in diameter.

SANITARY

Existing Public Services:

525mm (conc.), E boundary of site

245mm (conc.), S of site, S of E-W rail corridor

Existing forcemain to collector sewer

General Comments:

21. Please submit anticipated sanitary demands.

22. Analysis and demonstration that there is sufficient/adequate residual capacity to accommodate any increase in wastewater flows in the receiving and downstream wastewater systems are required to be provided.

STORMWATER

Existing Infrastructure/Systems:

Ditch, NW of site, at Richmond Road

General Comments:

23. Quantity Control:

    a. Allowable runoff coefficient(c): Lesser of pre-development or c=0.5.

    b. Time of Concentration (Tc): pre-development or maximum=10min.

    c. Site should be controlled Post=Pre up to the the 100-year storm event

24. Quality Control:

    a. Normal level of treatment is required: minimum 70% TSS removal

GEOTECHNICAL INVESTIGATION

25. A geotechnical report is required for this development proposal.

GENERAL INFORMATION/OTHER

26. Topographic information and design grades to be tied to proper geodetic benchmark along with proper description of the Geodetic Benchmark used.

27. All submitted report and plan are to be provided in *.pdf documents (documents shall be flattened and unsecured)

REFERENCES AND RESOURCES

28. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).

29. Servicing and site works shall be in accordance with the following documents:

    a. Previous studies/master plans developed for the site

    b. General City of Ottawa guidelines (including technical bulletins)

30. geoOttawa - https://maps.ottawa.ca/geoOttawa/

Feel free to contact Ryan Brault ((613) 580-2424 ext. 32540, ryan.brault@ottawa.ca), Project Manager, for follow-up questions.

Noise

Comments:

31. Noise Impact Studies required for the following:

    a. Road, as the site is within proximity to Highway 417, Richmond Road and Baseline Road.

    b. Rail

    c. Stationary, due to the proximity to neighboring exposed mechanical equipment and/or if there will be any exposed mechanical equipment due to the proximity to neighboring noise sensitive land uses.

Feel free to contact Josiane Gervais, TPM, for follow-up questions.

Transportation

Comments:

32. Follow Transportation Impact Assessment Guidelines:

a. Note that the TIA Guidelines have been updated to align with the new pre-application consultation process. The changes are available on the City's website.

b. A Transportation Impact Assessment is required. Please submit the Scoping report to josiane.gervais@ottawa.ca at your earliest convenience or, at the latest, as part of the Phase 2 pre-con package. Should a Phase 2 pre-con be waived, the applicant is still responsible to submit the Scoping Report and must allow for a 14 day circulation period.

c. The Strategy Report must be submitted for review at the latest with the Phase 3 pre-con package. The applicant is still encouraged to submit the Strategy Repot to the TMP before submission of the Phase 3 pre-con package and allow for a 14 day circulation period.

d. Changes to the Baseline/Cedarview intersection will trigger an RMA. Since an RMA is required to support the proposed development, the functional plan and/or RMA plans must be submitted with the formal submission to deem complete. Request base mapping asap via Engineering Services

e. There are constraints with the existing structure over Hwy 417 that could impact the potential for adding an eastbound left-turn lane.

33. ROW Protection:

a. Ensure that the development proposal complies with the Right-of-Way protection requirements of the Official Plan's Schedule C16.

b. Any requests for exceptions to ROW protection requirements must be discussed with Transportation Planning and concurrence provided by Transportation Planning management.

c. If required, ROW must be unincumbered and conveyed at no cost to the City. Note that conveyance of the ROW/corner triangle will be required prior to registration of the SP agreement. Additional information on the conveyance process can be provided upon request.

34. Transportation Master Plan includes:

a. Transit Priority Corridor (Isolated Measures) (Affordable Network) along Baseline and Richmond Road

b. BRT (2031 Network Concept) along Baseline and Richmond Road

35. Nearby planned construction and infrastructure projects include:

a. road resurfacing along Baseline, planned in 3-5 years; and

b. Transit Priority work planned in 1-2 years (for more information contact PM Chris Ogilvie)

36. There are numerous transit stops along the property frontage and throughout the site. An upgrade to stop #1391 may be required as part of the proposed intersection work. OC Transpo may also wish to adjust service along the new road for more direct access to the expanded inpatient building. Therefore new bus stops may be added onto the road which should be considered.

37. As the proposed site is institutional and for general public use, AODA legislation applies.

    a. Ensure all crosswalks located internally on the site provide a TWSI at the depressed curb, per requirements of the Integrated Accessibility Standards Regulation under the AODA.

    b. Clearly define accessible parking stalls and ensure they meet AODA standards (include an access aisle next to the parking stall and a pedestrian curb ramp at the end of the access aisle, as required).

    c. Please consider using the City's Accessibility Design Standards, which provide a summary of AODA requirements.

38. On site plan:

    a. Ensure site access meets the City's Private Approach Bylaw.

    b. Ensure drive aisle meets Part 4 – Parking, Queueing and Loading Privisions of the Zoning By-law.

    c. Show all details of the roads abutting the site; include such items as pavement markings, accesses and/or sidewalks.

    d. Turning movement diagrams required for all accesses showing the largest vehicle to access/egress the site.

    e. Turning movement diagrams required for internal movements (loading areas, garbage).

    f. Show all curb radii measurements; ensure that all curb radii are reduced as much as possible and fall within TAC guidelines (Figure 8.5.1).

    g. Show dimensions for site elements (i.e. lane/aisle widths, access width and throat length, parking stalls, sidewalks, pedestrian pathways, etc.)

    h. Sidewalk is to be continuous across accesses as per City Specification 7.1.

i. Show details of parking stalls within proposed lots. Parking stalls at the end of dead-end parking aisles require adequate turning around space.

j. Show slope of garage ramps on site plan. Note that underground ramps should be limited to a 12% grade and must contain a subsurface melting device when exceeding 6% if exposed to the elements. Ramp grades greater than 15% can be psychological barriers to some drivers. When parking ramp's break over slope exceeds 8%, a vertical-curve transition or a transition slope of half the ramp slope should be used. Without this transition, bottoming out of vehicles may occur.

k. Note areas that will not be impacted by this application.

Feel free to contact Josiane Gervais, Transportation Project Manager, for follow-up questions.

Environment

Comments:

39. The access road is within an area designated as a Greenbelt Natural Linkage Area, which is a designation that triggers an Environmental Impact Study (EIS) for development. The EIS will need to address all NCC requirements and the City will accept a different format if that is what is required to meet NCC needs. If the road is removed from the area designated Greenbelt Natural Linkage Area, we could support waiving the EIS since there would be no development within that feature/area.

40. The EIS will need to address both Federally and Provincially listed species.

41. Bird-Safe Design Guidelines - Please review and incorporate bird safe design elements. Some of the risk factors include glass and related design traps such as corner glass and fly-through conditions, ventilation grates and open pipes, landscaping, light pollution. More guidance and solutions are available in the guidelines which can be found here: https://documents.ottawa.ca/sites/documents/files/birdsafedesign_guidelines_en.pdf

42. Urban Heat Island - Please add features that reduce the urban heat island effect (see OP 10.3.3) produced by the parking lot and a building footprint. For example, this impact can be reduced by adding large canopy trees, green roofs or vegetation walls, or constructing the parking lot or building differently.

Feel free to contact Matthew Hayley, Environmental Planner, for follow-up questions.

Forestry

Comments:

43. Priority should be given to the retention of trees and softscape areas that could accommodate future tree plantings. Consider altering the design of the connections to John Sutherland Dr. and Baseline Rd to make use of the existing road network on site, rather than converting greenspace to paved surfaces.

44. To mitigate the increase in paved areas, the Landscape Plan should include a tree planting plan that focuses on providing shade to the proposed parking lots, along pedestrian connections, and waiting/drop-off areas.

45. The following Tree Conservation Report (TCR) guidelines have been adapted from the Schedule E of the Tree Protection By-law – for more information on these requirements please contact julian.alvarez-barkham@ottawa.ca

    a. A Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
        i. An approved TCR is a requirement of Site Plan approval.
    b. Any removal of privately-owned trees 10cm or larger in diameter within the urban area, or city-owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
    c. The TCR must contain 2 separate plans:
        i. Plan/Map 1 - show existing conditions with tree cover information.
        ii. Plan/Map 2 - show proposed development with tree cover information.
    d. The TCR must list all trees on site, as well as off-site trees if the CRZ (critical root zone) extends into the developed area, by species, diameter, and health condition.
        i. For ease of review, the Planning Forester suggests that all trees be numbered and referenced in an inventory table.
    e. Please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)
    f. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained.
        i. Compensation may be required for the removal of city owned trees.
    g. The removal of trees on a property line will require the permission of both property owners.
    h. All retained trees must be shown, and all retained trees within the area impacted by the development process must be protected as per City guidelines available on the Tree Protection Specification or by searching Ottawa.ca.
        i. The location of tree protection fencing must be shown on the plan.

ii. Show the critical root zone of the retained trees.

i. The City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.

46. The following Landscape Plan (LP) guidelines have been adapted from Schedule E of the Tree Protection By-law – for more information on these requirements please contact julian.alvarez-barkham@ottawa.ca

a. Please ensure any retained trees are shown on the LP.

b. Minimum Setbacks

i. Maintain 1.5m from sidewalk or MUP/cycle track or water service laterals.

ii. Maintain 2.5m from curb.

iii. Coniferous species require a minimum 4.5m setback from curb, sidewalk, or MUP/cycle track/pathway.

iv. Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing, except where otherwise approved in naturalization / afforestation areas.

v. Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.

b. Tree specifications

i. Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.

ii. Maximize the use of large deciduous species wherever possible to maximize future canopy coverage.

c. Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and if possible, include watering and warranty as described in the specification.

d. No root barriers, dead-man anchor systems, or planters are permitted.

e. No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

f. Hard surface planting

i. If there are hard surface plantings, a planting detail must be provided.

ii. Curb style planter design is highly recommended.

iii. No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.

c. Trees are to be planted at grade.

d. Soil Volume - Please demonstrate as per the **Landscape Plan Terms of Reference** that the available soil volumes for new plantings will meet or exceed the following:

Tree Type/Size	Single Tree Soil Volume (m^3)	Multiple Tree Soil Volume (m^3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

i. It is strongly suggested that the proposed species list include a column listing the available soil volume.

e. Sensitive Marine Clay - Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines.

f. The City requests that consideration be given to planting native species wherever there is a high probability of survival to maturity.

g. Efforts shall be made to provide as much future canopy cover as possible at a site level, through tree planting and tree retention. The Landscape Plan shall show/document that the proposed tree planting and retention will contribute to the City's overall canopy cover over time. **Please provide a projection of the future canopy cover for the site to 40 years.**

Feel free to contact Julian Alvarez-Barkham, Forester, for follow-up questions.

Parkland

Comments: Parkland comments to be provided at a later date.

Other

47. The High Performance Development Standard (HPDS) is a collection of voluntary and required standards that raise the performance of new building projects to achieve sustainable and resilient design. The HPDS was passed by Council on April 13, 2022.

    a. At this time, the HPDS is not in effect and Council has referred the 2023 HPDS Update Report back to staff with direction to bring forward an updated report to Committee with recommendations for revised phasing timelines, resource requirements and associated amendments to the Site Plan Control By-law by no later than Q1 2024.

    b. Please refer to ottawa.ca/HPDS for more information.

Submission Requirements and Fees

1. The attached **Study and Plan Identification List** outlines the information and material that has been identified as either required (R) or advised (A) as part of a future complete application submission.
    a. The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, as available on Ottawa.ca. These ToR and Guidelines outline the specific requirements that must be met for each plan or study to be deemed adequate.
2. All of the above comments or issues should be addressed to ensure the effectiveness of the application submission review.

Should there be any questions, please do not hesitate to contact myself or the contact identified for the above areas / disciplines.

Yours Truly,
Kieran Watson

Encl. List Applicable Information

c.c. Insert contacts to be cc'd

APPENDIX B

Development Servicing Study Checklist

Servicing study guidelines for development applications

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- ☐ Executive Summary (for larger reports only).
- ☒ Date and revision number of the report.
- ☒ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☒ Plan showing the site and location of all existing services.
- ☒ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.
- ☒ Summary of Pre-consultation Meetings with City and other approval agencies.
- ☒ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.
- ☒ Statement of objectives and servicing criteria.
- ☒ Identification of existing and proposed infrastructure available in the immediate area.
- ☒ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).
- ☒ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.
- ☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.
- ☒ Proposed phasing of the development, if applicable.

☒ Reference to geotechnical studies and recommendations concerning servicing.

☒ All preliminary and formal site plan submissions should have the following information:
- Metric scale
- North arrow (including construction North)
- Key plan
- Name and contact information of applicant and property owner
- Property limits including bearings and dimensions
- Existing and proposed structures and parking areas
- Easements, road widening and rights-of-way
- Adjacent street names

4.2 Development Servicing Report: Water

☐ Confirm consistency with Master Servicing Study, if available
☐ Availability of public infrastructure to service proposed development
☐ Identification of system constraints
☐ Identify boundary conditions
☐ Confirmation of adequate domestic supply and pressure
☐ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.
☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.
☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design
☐ Address reliability requirements such as appropriate location of shut-off valves
☐ Check on the necessity of a pressure zone boundary modification.
☐ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

- ☐ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.
- ☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.
- ☐ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- ☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

- ☐ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).
- ☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.
- ☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.
- ☐ Description of existing sanitary sewer available for discharge of wastewater from proposed development.
- ☐ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)
- ☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix ‘C’) format.
- ☐ Description of proposed sewer network including sewers, pumping stations, and forcemains.
- ☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).
- ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.
- ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.
- ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.
- ☐ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

- ☒ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)
- ☐ Analysis of available capacity in existing public infrastructure.
- ☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.
- ☒ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.
- ☒ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.
- ☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.
- ☐ Set-back from private sewage disposal systems.
- ☐ Watercourse and hazard lands setbacks.
- ☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.
- ☒ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.
- ☒ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- ☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- ☒ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.
- ☐ Any proposed diversion of drainage catchment areas from one outlet to another.
- ☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- ☒ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100 year return period storm event.
- ☒ Identification of potential impacts to receiving watercourses
- ☐ Identification of municipal drains and related approval requirements.
- ☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.
- ☐ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

- ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.
- ☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- ☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- ☐ Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

- ☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.
- ☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.
- ☐ Changes to Municipal Drains.
- ☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

- ☒ Clearly stated conclusions and recommendations
- ☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.
- ☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

APPENDIX C

Storm Servicing Background Information

WATTS®	Adjustable Accutrol Weir Tag: _____	Adjustable Flow Control for Roof Drains

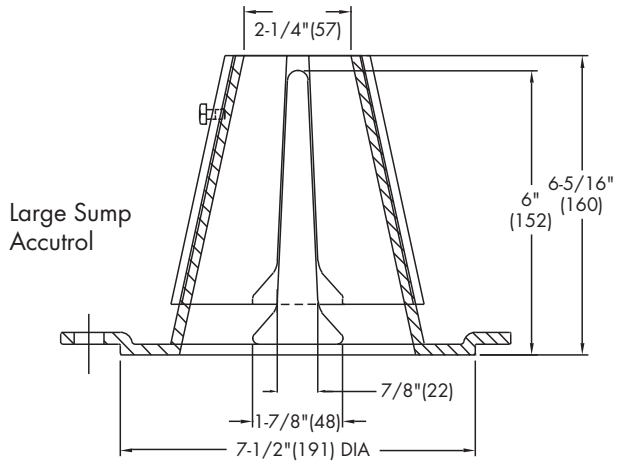
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

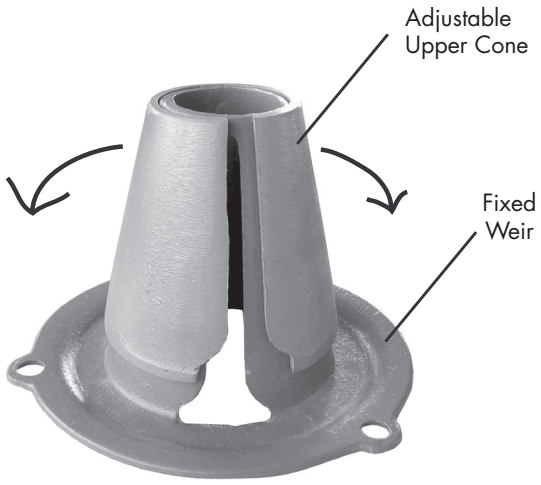
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

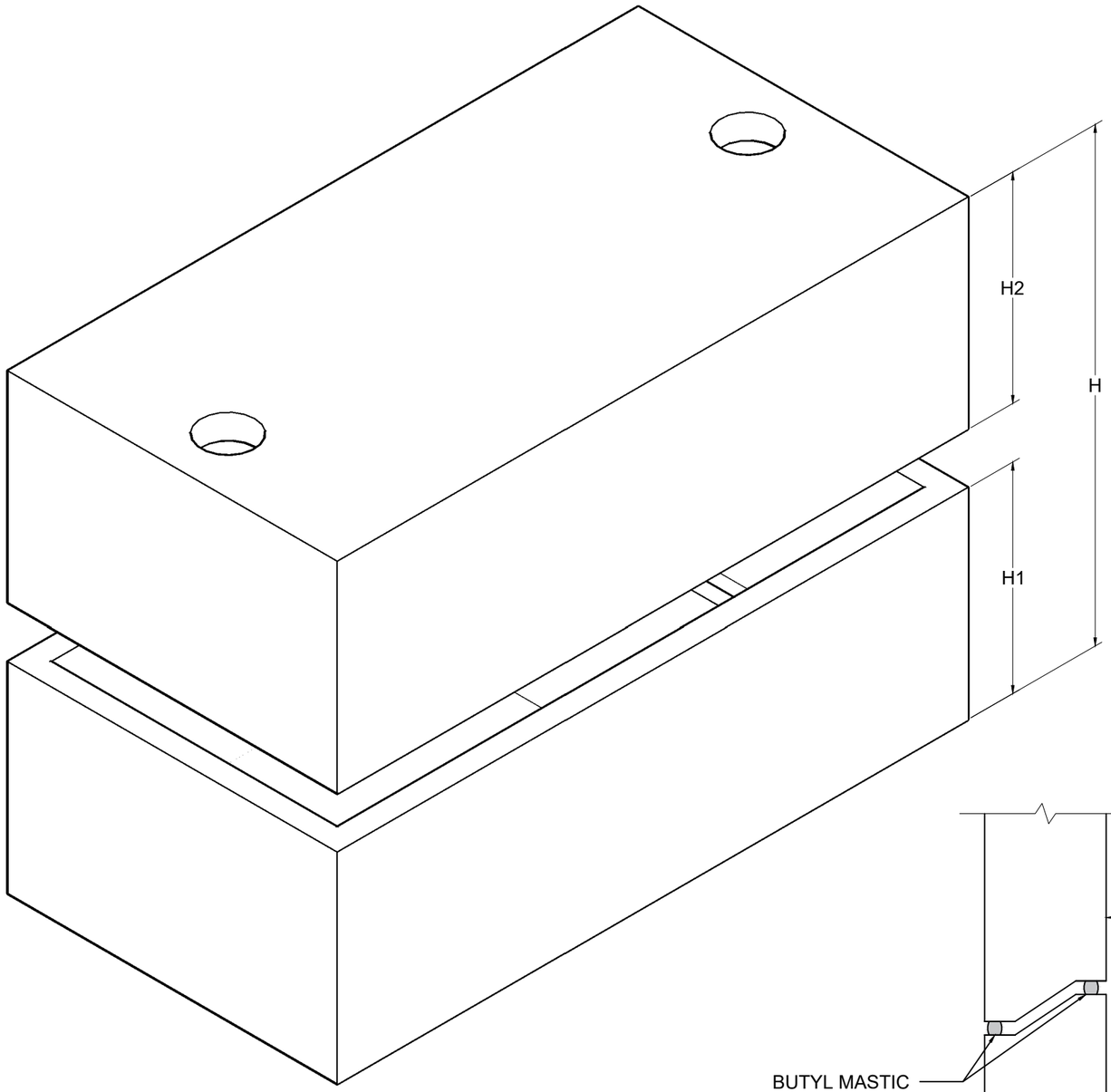
Engineer _____ Representative _____

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

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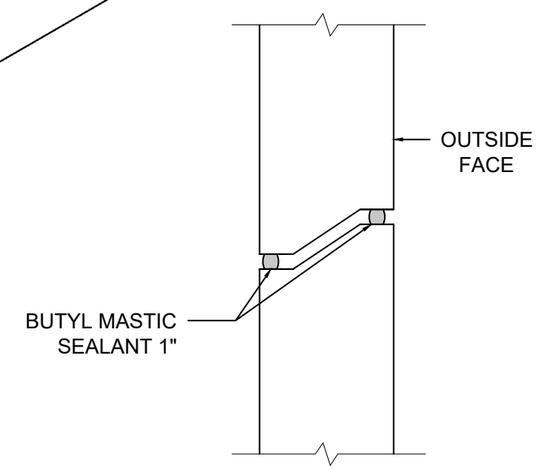
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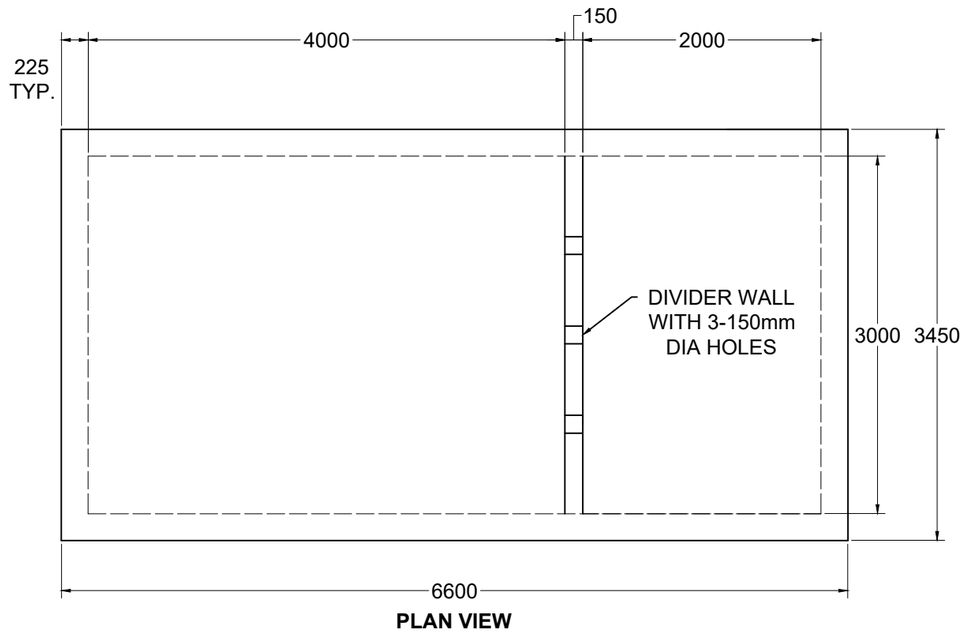
ISOMETRIC VIEW

CAPACITY		H1		H2		H	
LITRE	GALLON	OUTSIDE	INSIDE	OUTSIDE	INSIDE	OUTSIDE	INSIDE
35000	7700	2100	1850	600	350	2700	2200
40000	8800	2100	1850	900	650	3000	2500
45000	9900	2100	1850	1150	900	3250	2750
50000	11000	2100	1850	1350	1100	3450	2950
55000	12100	2100	1850	1650	1400	3750	3250
60000	13200	2100	1850	1850	1600	3950	3450
65000	14300	2100	1850	2100	1850	4200	3700

CAPACITY		WEIGHT (tonne)		
LITRE	GALLON	BASE	TOP	ALL
35000	7700	36	18.3	54.3
40000	8800	36	21.6	57.6
45000	9900	36	24.3	60.3
50000	11000	36	26.4	62.4
55000	12100	36	29.6	65.6
60000	13200	36	31.8	67.8
65000	14300	36	34	70



JOINT DETAIL



PLAN VIEW

NOTES:

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED.

NOT TO SCALE

NON TRAFFIC RATED, TRAFFIC RATED DESIGNS AVAILABLE UPON REQUEST

CUSTOM ACCESS OPENINGS, RISERS, AND HATCHES AVAILABLE UPON REQUEST

MAX DEPTH OF COVER = 1500mm

TYP. SLAB THICKNESS = 250mm

TANK DELIVERED IN TWO PIECES, TO BE ASSEMBLED ON SITE BY OTHERS

ALL LIFTING ANCHORS ARE TO BE DAYTON SUPERIOR OR APPROVED ALTERNATIVE. ALL RIGGING, HOISTING, AND LIFTING TO BE IN STRICT ACCORDANCE WITH DAYTON SUPERIOR MANUAL.

SPECIFICATIONS:
PRODUCT DESIGNED IN ACCORDANCE WITH CSA A23.3

PRODUCTION:
IN ACCORDANCE WITH CSA A23.4

CONCRETE:
IN ACCORDANCE WITH CSA A23.1

REINFORCING:
IN ACCORDANCE WITH WITH CSA G30.18
GRADE 400W

SEPTIC TANK
(35,000L - 65,000L)

DRAWN BY:
JS

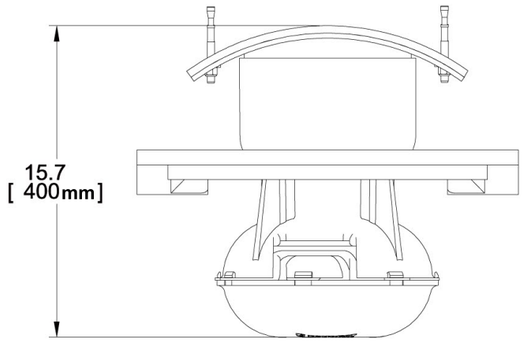
DATE:
AUG 2023

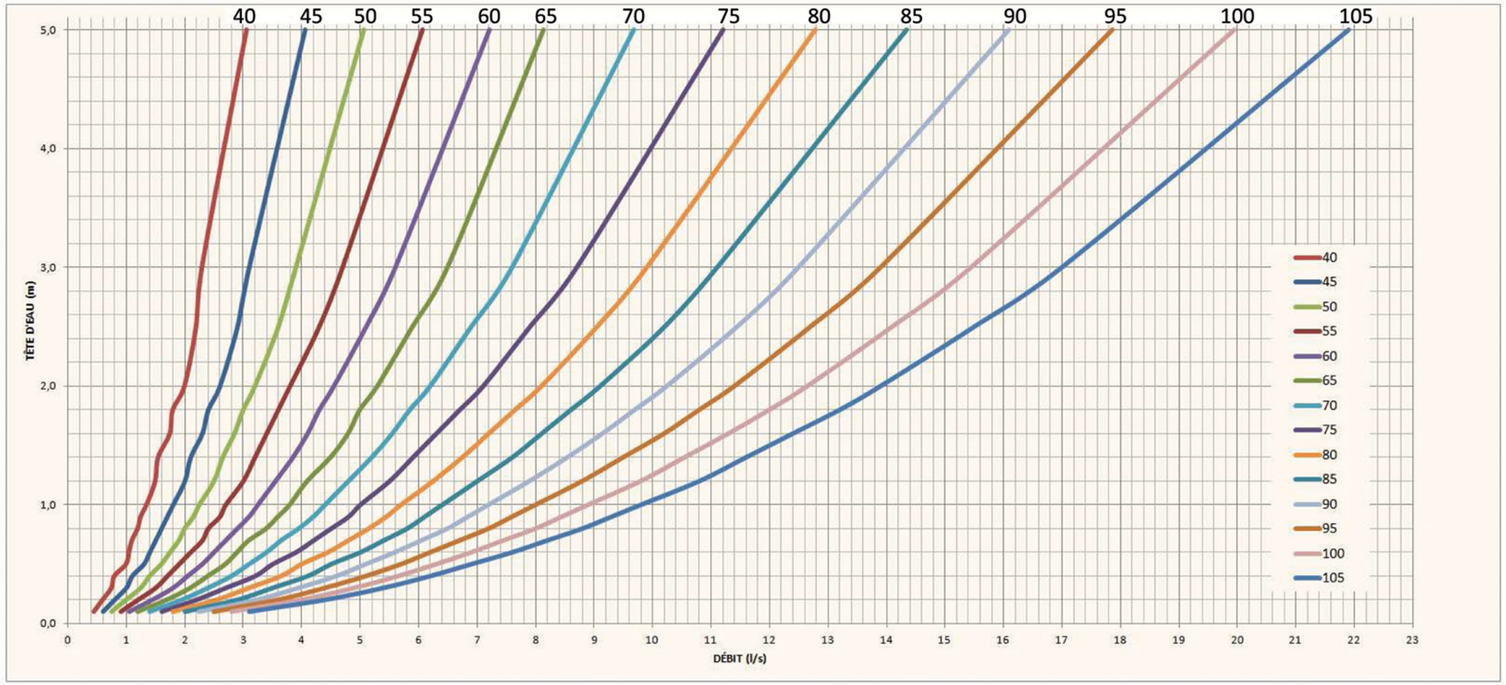
ANCHOR CONCRETE PRODUCTS

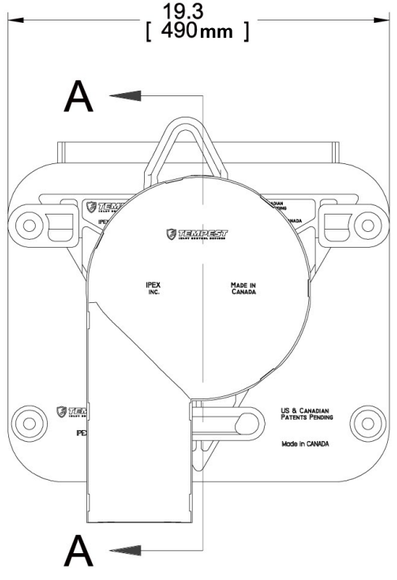
1645 SYDENHAM RD.
KINGSTON, ON

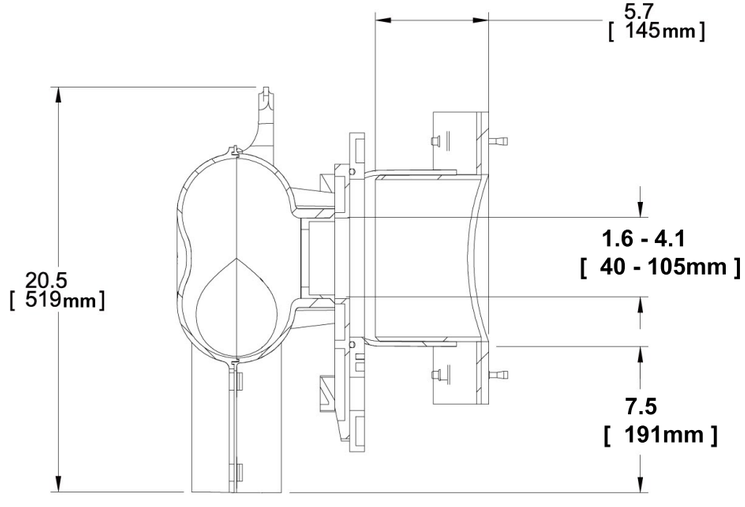
PHONE:
(800) 223-0012
1-613-546-6683

WWW.ANCHORCONCRETE.COM

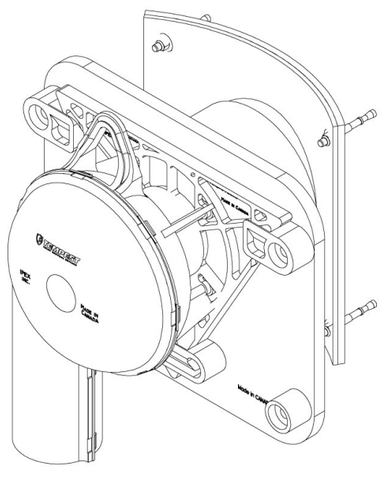








SECTION A-A



IPEX Product development engineering 3 Place du commerce, Suite 101 Île des Soeurs, Montréal, QC, H3E 1H7 Canada Tel 514 769 2200 www.ipexna.com			
PROJECTION	UNITS in [mm]	TITLE Tempest LMF round CB assembly [VORTEX]	SIZE B / SCALE(S) 1/8 / 1-2014

IPEX Tempest™ Inlet Control Devices

Municipal Technical Manual Series

Vol. I, 2nd Edition

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The information contained here within is based on current information and product design at the time of publication and is subject to change without notification. IPEX does not guarantee or warranty the accuracy, suitability for particular applications, or results to be obtained therefrom.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

Our HF, HF Sump and MHF ICD's are designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter or larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 5 preset flow curves, these ICDs have the ability to provide constant flow rates: 9lps (143 gpm) and greater

Product Function



TEMPEST HF (High Flow): designed to manage moderate to higher flows 15 L/s (240 gpm) or greater and prevent the propagation of odour and floatables. With this device, the cross-sectional area of the device is larger than the orifice diameter and has been designed to limit head losses. The HF ICD can also be ordered without flow control when only odour and floatable control is required.



TEMPEST HF (High Flow) Sump: The height of a sewer outlet pipe in a catch basin is not always conveniently located. At times it may be located very close to the catch basin floor, not providing enough sump for one of the other TEMPEST ICDs with universal back plate to be installed. In these applications, the HF Sump is offered. The HF Sump offers the same features and benefits as the HF ICD; however, is designed to raise the outlet in a square or round catch basin structure. When installed, the HF sump is fixed in place and not easily removed. Any required service to the device is performed through a clean-out located in the top of the device which can be often accessed from ground level.



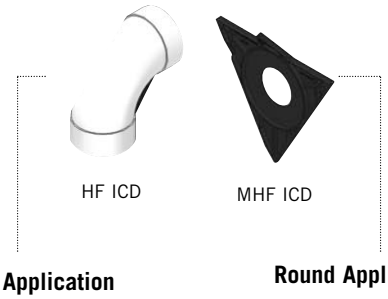
TEMPEST MHF (Medium to High Flow):
The MHF plate or plug is designed to control flow rates 9 L/s (143 gpm) or greater. It is not designed to prevent the propagation of odour and floatables.

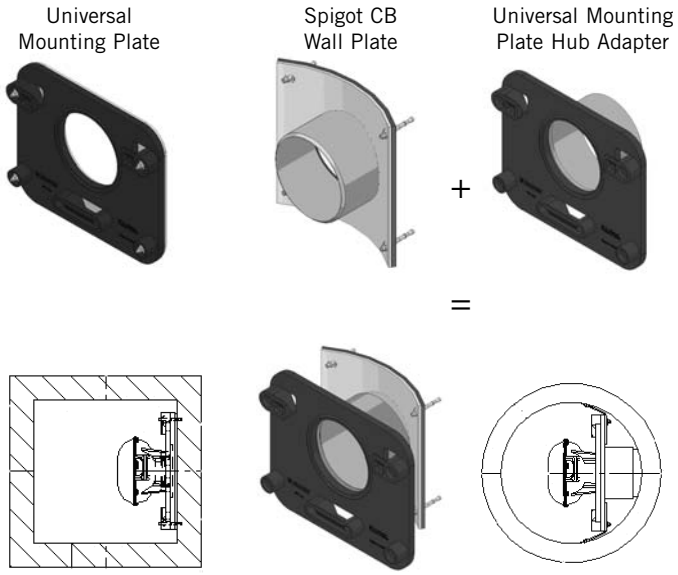
Product Construction

The HF, HF Sump and MHF ICDs are built to be light weight at a maximum weight of 6.8 Kg (14.6 lbs).

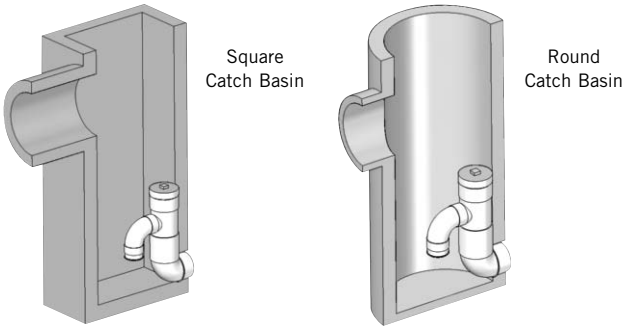
Product Applications

The HF and MHF ICD's are available to accommodate both square and round applications:



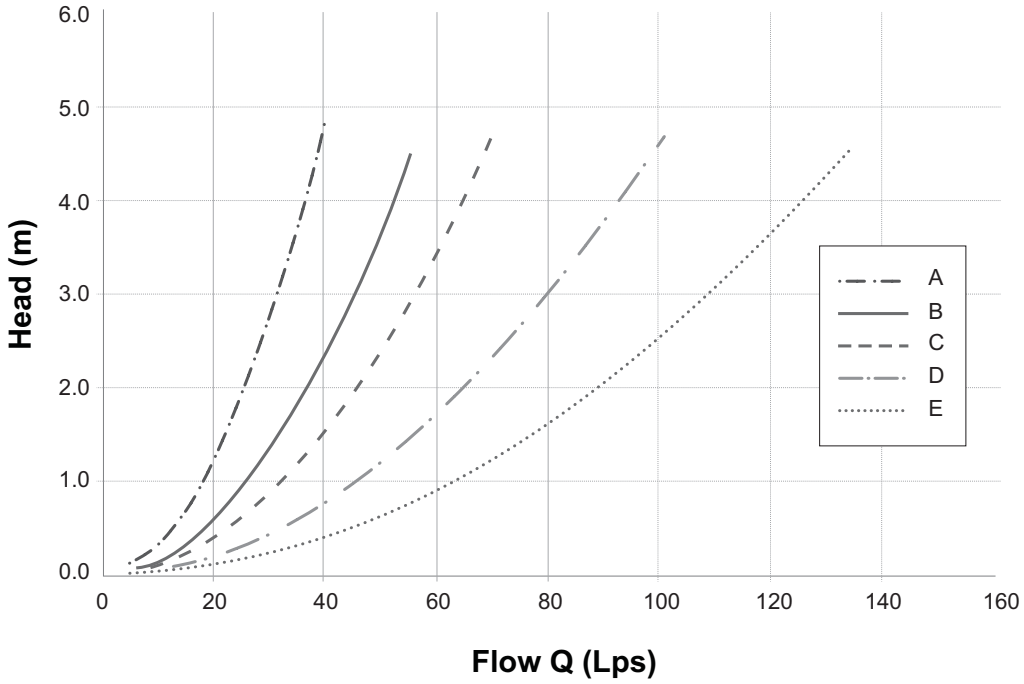


The HF Sump is available to accommodate low to no sump applications in both square and round catch basins:



NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

Chart 3: HF & MHF Preset Flow Curves



NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

PRODUCT INSTALLATION

Instructions to assemble a TEMPEST HF or MHF ICD into a Square Catch Basin:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal wall mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal wall mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST HF or MHF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the round catch basin spigot adaptor to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the spigot CB wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot CB wall plate and the catch basin wall.
6. Put solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

Instructions to assemble a TEMPEST HF Sump into a Square or Round Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, mastic tape and metal strapping
   - Material: (2) concrete anchor 3/8 x 3-1/2, (2) washers, (2) nuts, HF Sump pieces (2).
2. Apply solvent cement to the spigot end of the top half of the sump. Apply solvent cement to the hub of the bottom half of the sump. Insert the spigot of the top half of the sump into the hub of the bottom half of the sump.
3. Install the 8" spigot of the device into the outlet pipe. Use the mastic tape to seal the device spigot into the outlet pipe. You should use a level to be sure that the fitting is standing at the vertical.
4. Use an impact drill with a 3/8" concrete bit to make a series of 2 holes along each side of the body throat. The depth of the hole should be between 1-1/2" to 2-1/2". Clean the concrete dust from the 2 holes.
5. Install the anchors (2) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you hit the anchors. Remove the nuts from the ends of the anchors.
6. Cut the metal strapping to length and connect each end of the strapping to the anchors. Screw the nuts in place with a maximum torque of 40 N.m (30 lbf-ft). The device should be completely flush with the catch basin wall.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

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ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

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The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

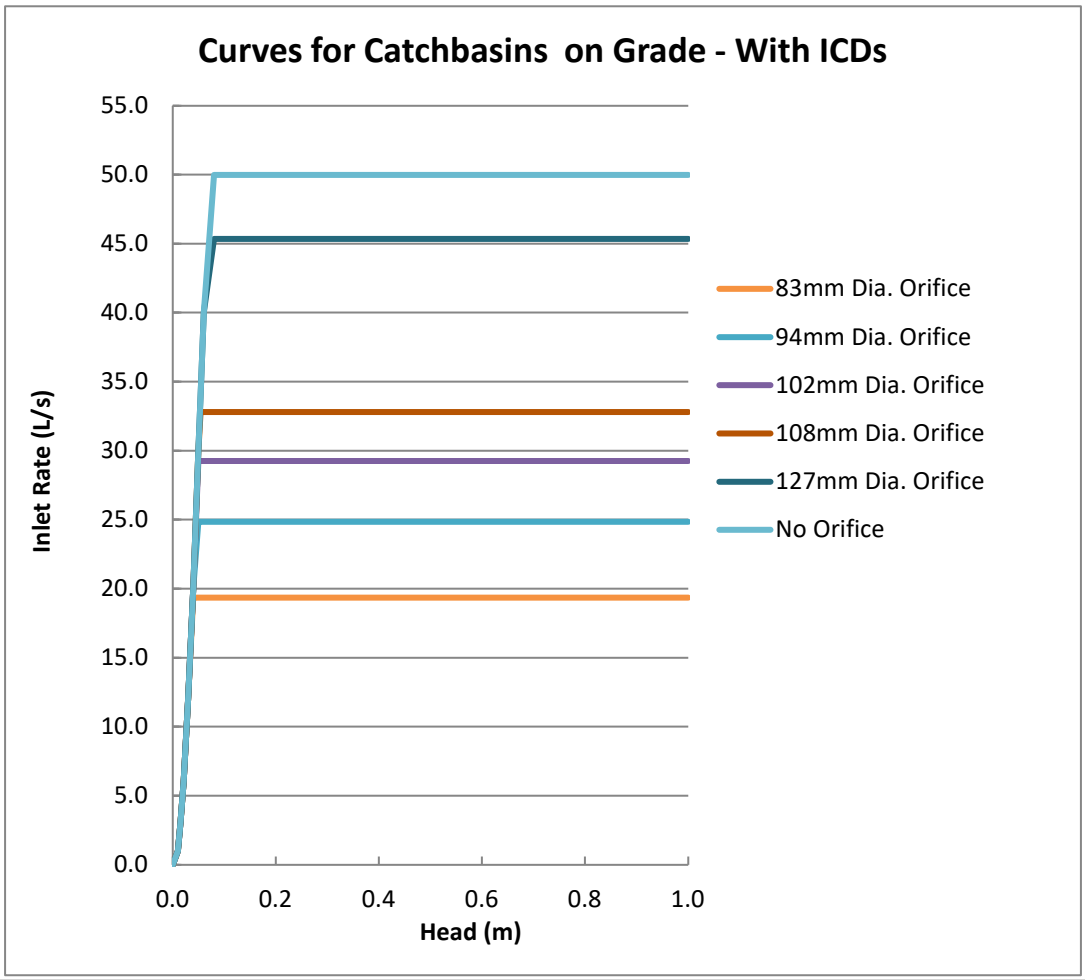
Installation

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NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

Queensway-Carleton Hospital Part 4 Expansion
Catchbasin (On-Grade) with ICD Curves

NOVATECH
Engineers, Planners & Landscape Architects



Curb Inlet Catchbasins on Continuous Grade

Depth vs. Captured Flow Curve

A standard depth vs. captured flow curve for catch basins on a continuous grade was provided to Novatech by City staff for use in a dual-drainage model of an existing residential neighbourhood. This standard curve was derived using the inlet curves in Appendix 7A of the Ottawa Sewer Design Guidelines.

Novatech reviewed the methodology used to create this standard curve (described below) and determined that it was suitable for general use in other dual-drainage models.

- MTO Design Chart 4.04 provides the relationship between the gutter flow rate (Q_t) and flow spread (T) for Barrier Curb.
- MTO Design Chart 4.12 provides the relationship between flow spread (T) and flow depth (D).
- The relationship between the gutter flow rate (Q_t) and flow depth (D) was determined for different road slopes using the above charts and Manning's equation (refer to pages 58-60 of the MTO Drainage Management Manual – Part 2);
- The relationship between approach flow (Q_t) and captured flow (Q_c) was determined for different road slopes using the design chart for Barrier Curb with Gutter (Appendix 7-A.2).
- Using the above information, a family of curves was developed to characterize the relationship between flow depth and captured flow for curb inlet catchbasins on different road slopes. The results of this exercise can be summarized as follows:
    - For a given flow depth, the gutter flow rate (Q_t) increases as the road slope increases.
    - The capture efficiency (Q_c) of curb inlet catchbasins decrease as the road slope increases.
    - The net result is that the relationship between flow depth and capture rate is largely independent of road slope: While approach flow vs. captured flow (Q_t vs. Q_c) varies significantly with road grade, flow depth vs. captured flow (D vs. Q_c) does not.

Since there was very little difference in the flow depth vs. captured flow curves for different road slopes, this family of curves was averaged to create a single standard curve for use in dual-drainage models.

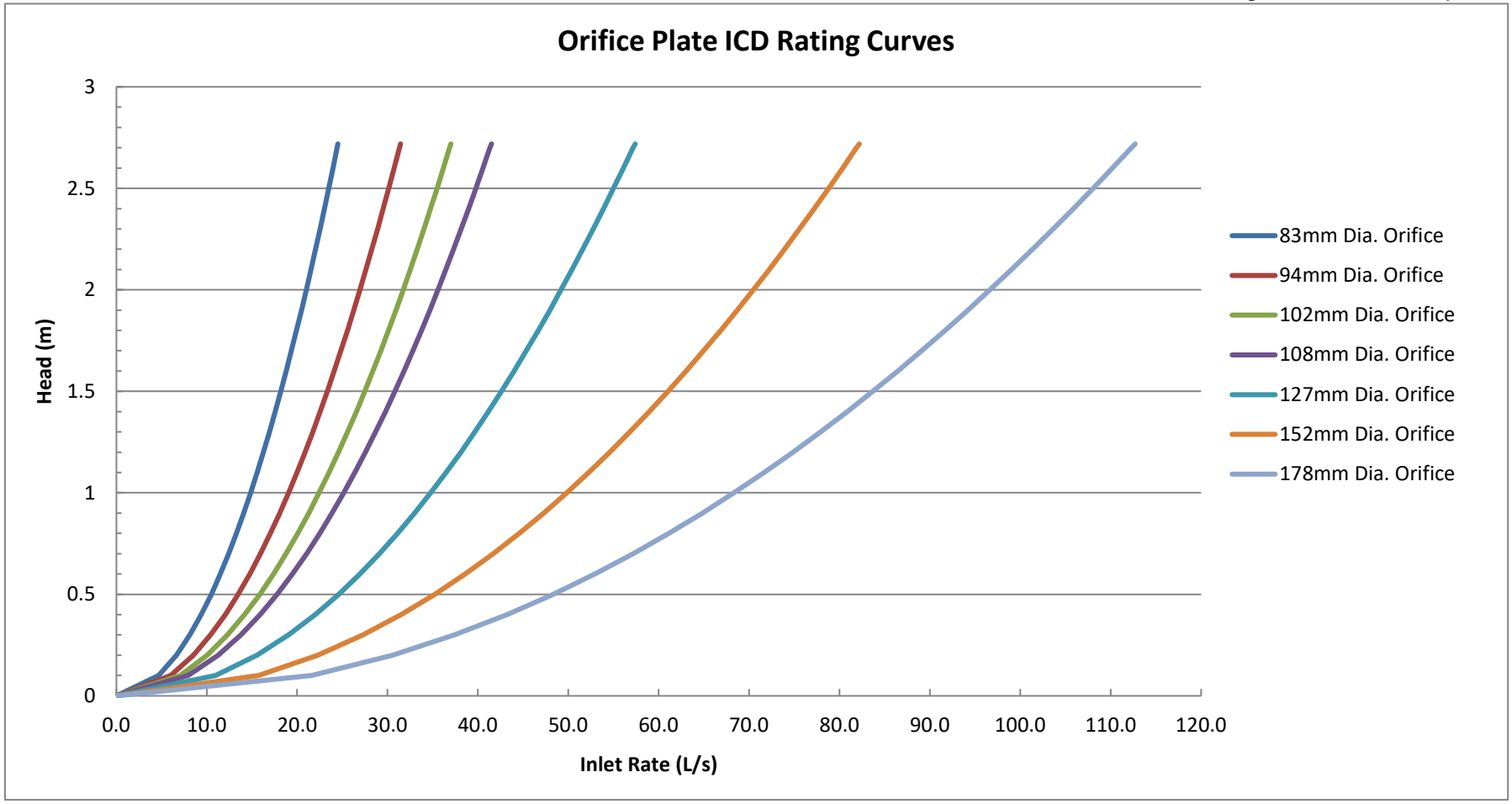
Inlet Control Devices

The standard depth vs. capture flow curve was modified to account for the installation of ICDs in curb inlet catchbasins on continuous grade. Separate inlet curves were created for each standard ICD orifice size by capping the inlet rate on the depth vs. capture flow curve at the maximum flow rate through the ICD at a head of 1.2m (depth from centerline of CB lead to top of CICB frame).

Queensway-Carleton Hospital Part 4 Expansion

ICD Rating Curves

NOVATECH
Engineers, Planners & Landscape Architects



Stormceptor®

Stormceptor® EF Sizing Report

Rinker MATERIALS™

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

11/28/2025

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Project Name:	QCH Part 4 Expansion - OGS1
Project Number:	123089
Designer Name:	Kallie Auld
Designer Company:	Novatech
Designer Email:	k.auld@novatech-eng.com
Designer Phone:	613-254-9643
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Site Name:	OGS 1

Drainage Area (ha):	2.56
% Imperviousness:	70.00

Runoff Coefficient 'c': 0.72

Particle Size Distribution:	Fine
Target TSS Removal (%):	70.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	59.49
Oil / Fuel Spill Risk Site?	No
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	520.00
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	1805
Estimated Average Annual Sediment Volume (L/yr):	1467

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	67
EF5	74
EF6	79
EF8	86
EF10	90
EF12	93

Recommended Stormceptor EF Model: EF5

Estimated Net Annual Sediment (TSS) Load Reduction (%): 74

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

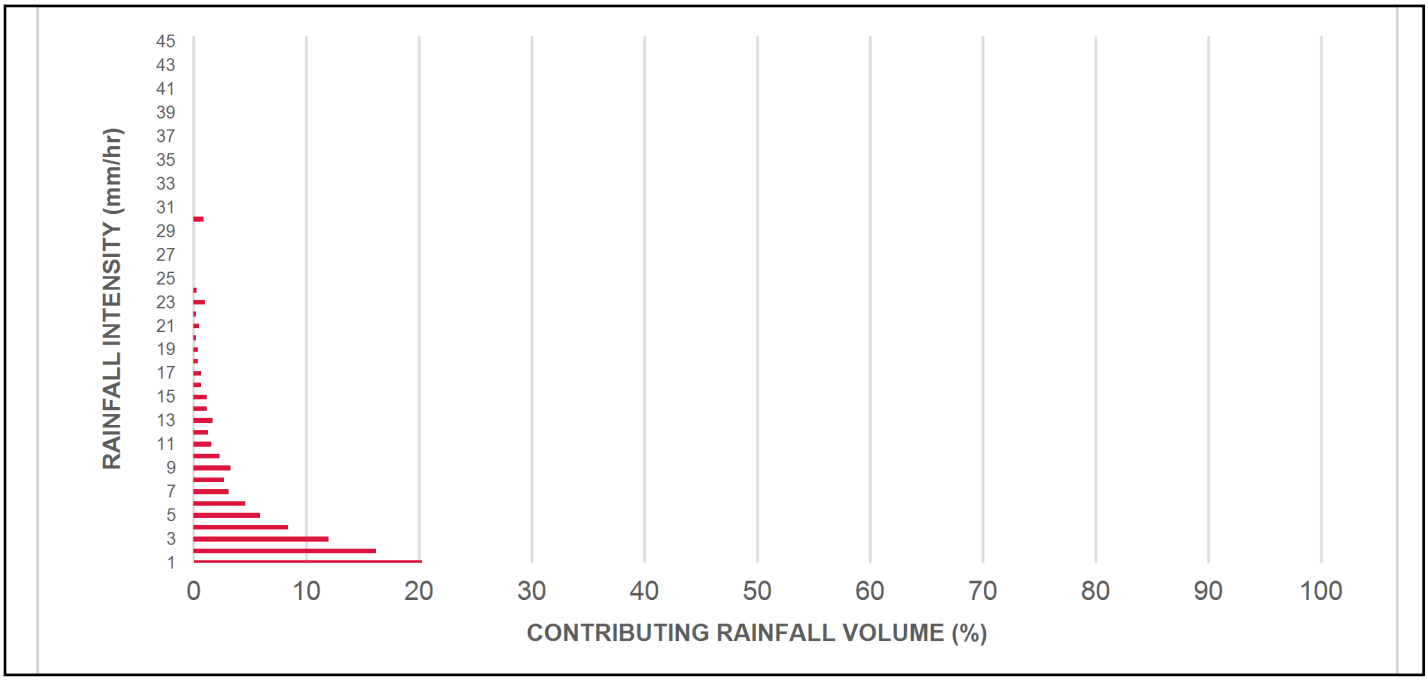
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

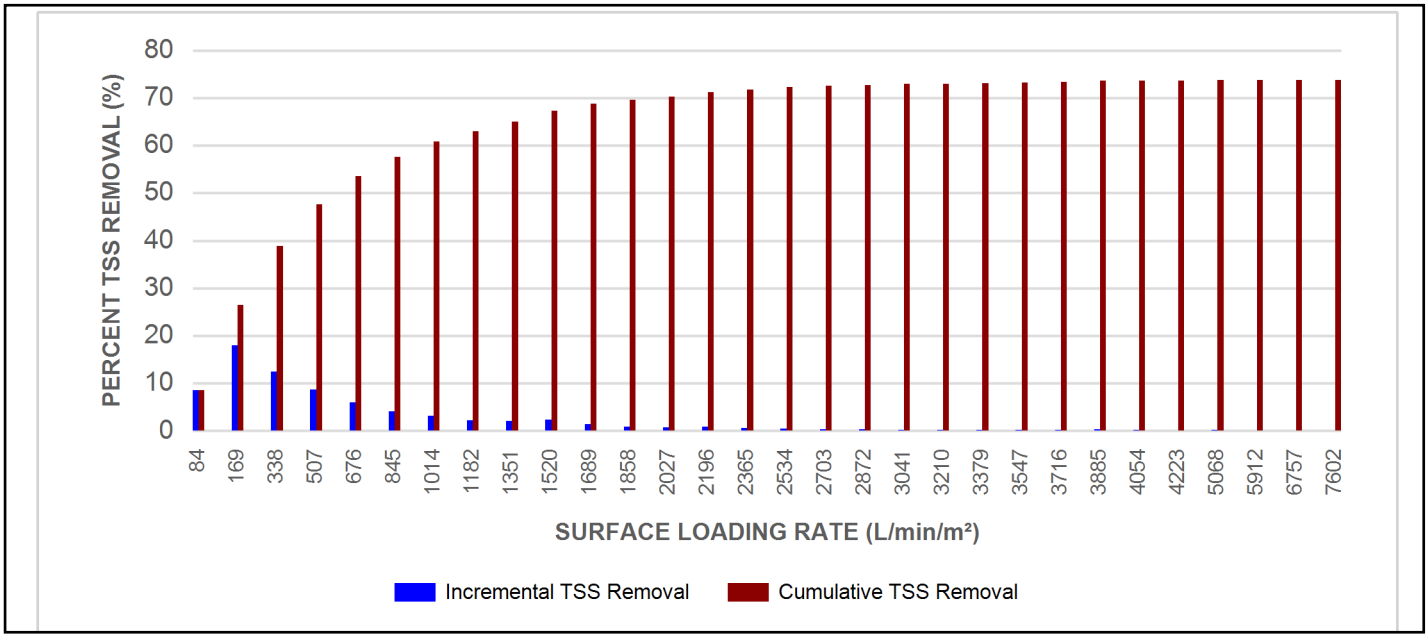
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	2.56	154.0	84.0	98	8.5	8.5
1.00	20.3	29.0	5.12	307.0	169.0	88	17.9	26.4
2.00	16.2	45.2	10.25	615.0	338.0	77	12.5	38.9
3.00	12.0	57.2	15.37	922.0	507.0	72	8.7	47.6
4.00	8.4	65.6	20.50	1230.0	676.0	70	5.9	53.5
5.00	5.9	71.6	25.62	1537.0	845.0	69	4.1	57.6
6.00	4.6	76.2	30.74	1845.0	1014.0	68	3.1	60.8
7.00	3.1	79.3	35.87	2152.0	1182.0	71	2.2	63.0
8.00	2.7	82.0	40.99	2460.0	1351.0	74	2.0	65.0
9.00	3.3	85.3	46.12	2767.0	1520.0	69	2.3	67.3
10.00	2.3	87.6	51.24	3074.0	1689.0	62	1.4	68.7
11.00	1.6	89.2	56.37	3382.0	1858.0	57	0.9	69.6
12.00	1.3	90.5	61.49	3689.0	2027.0	52	0.7	70.3
13.00	1.7	92.2	66.61	3997.0	2196.0	48	0.8	71.2
14.00	1.2	93.5	71.74	4304.0	2365.0	45	0.5	71.7
15.00	1.2	94.6	76.86	4612.0	2534.0	42	0.5	72.2
16.00	0.7	95.3	81.99	4919.0	2703.0	39	0.3	72.5
17.00	0.7	96.1	87.11	5227.0	2872.0	38	0.3	72.7
18.00	0.4	96.5	92.23	5534.0	3041.0	35	0.1	72.9
19.00	0.4	96.9	97.36	5841.0	3210.0	33	0.1	73.0
20.00	0.2	97.1	102.48	6149.0	3379.0	32	0.1	73.1
21.00	0.5	97.5	107.61	6456.0	3547.0	30	0.1	73.2
22.00	0.2	97.8	112.73	6764.0	3716.0	29	0.1	73.3
23.00	1.0	98.8	117.85	7071.0	3885.0	28	0.3	73.6
24.00	0.3	99.1	122.98	7379.0	4054.0	26	0.1	73.6
25.00	0.0	99.1	128.10	7686.0	4223.0	25	0.0	73.6
30.00	0.9	100.0	153.72	9223.0	5068.0	21	0.2	73.8
35.00	0.0	100.0	179.34	10761.0	5912.0	18	0.0	73.8
40.00	0.0	100.0	204.96	12298.0	6757.0	16	0.0	73.8
45.00	0.0	100.0	230.58	13835.0	7602.0	14	0.0	73.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**74 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

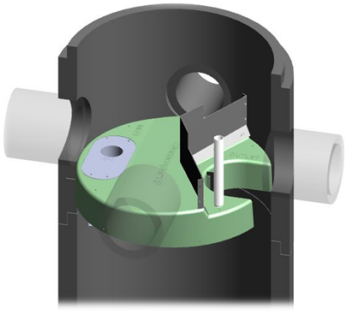
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

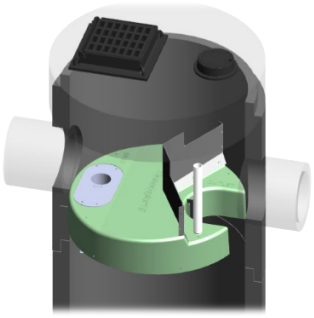
DESIGN FLEXIBILITY

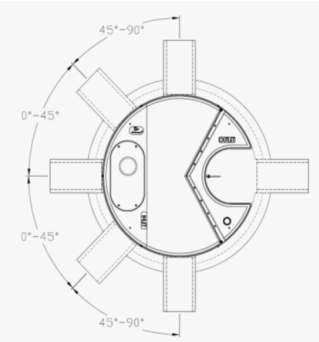
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The **minimum** sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

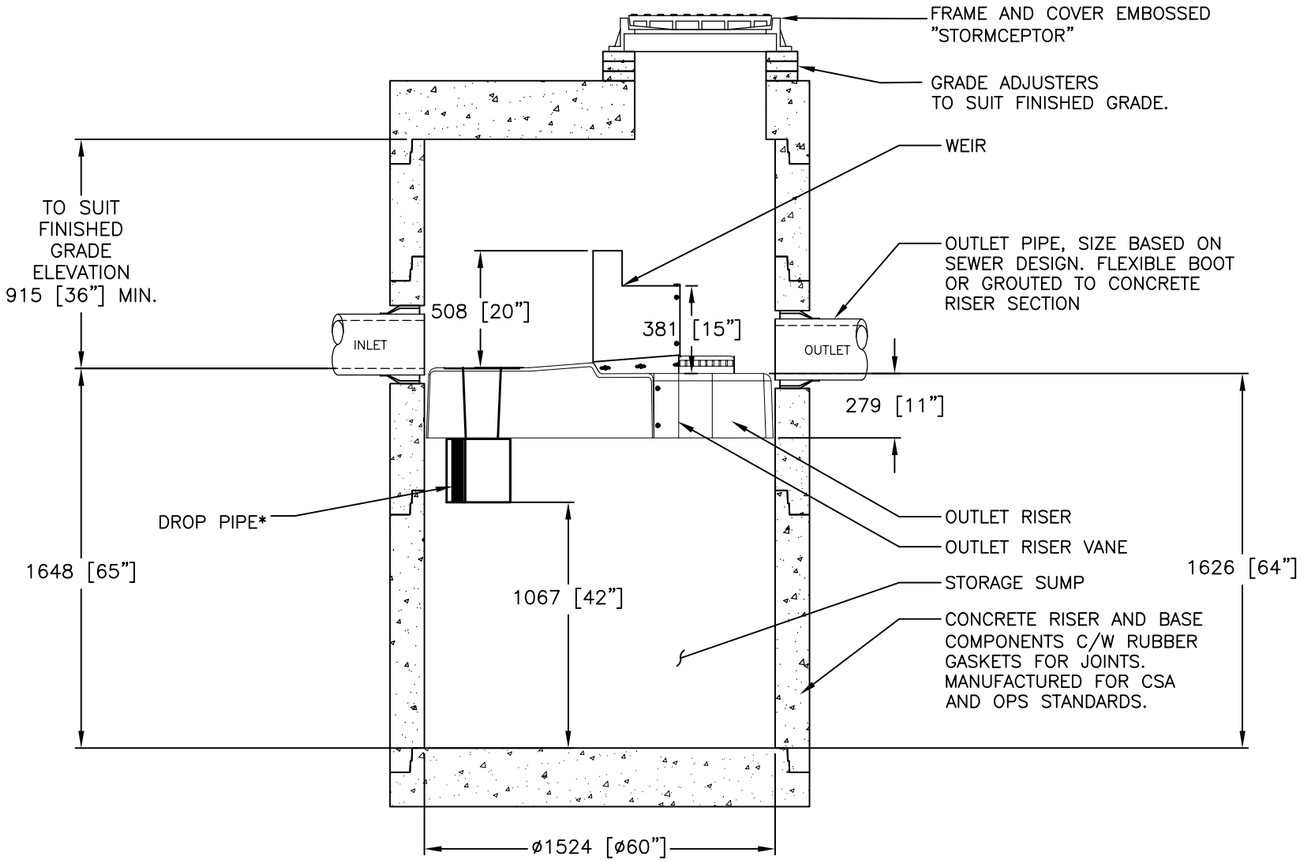
The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

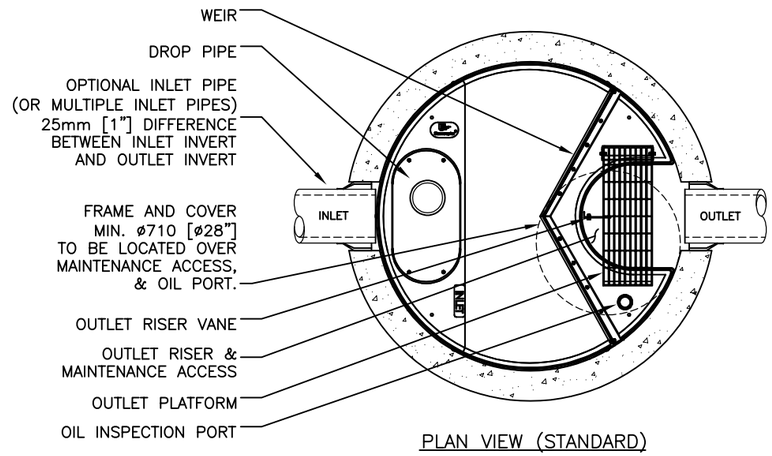
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

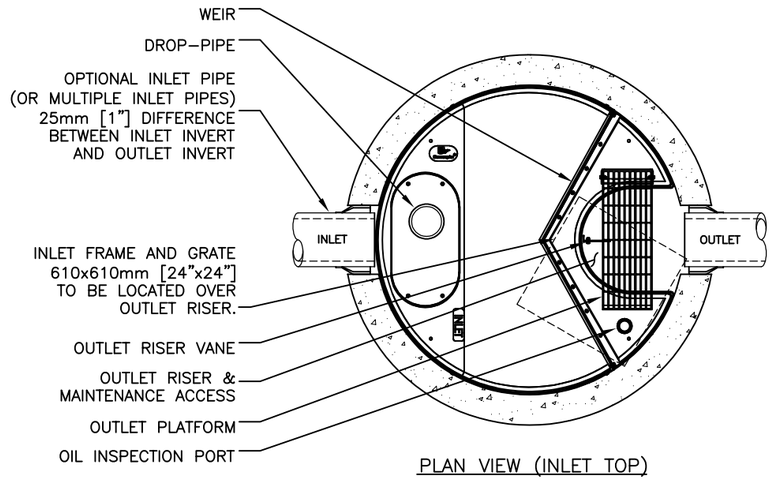
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF5 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO5 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EF5
STRUCTURE ID	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
DRAINAGE AREA (HA)	*
DRAINAGE AREA IMPERVIOUSNESS (%)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Imbrium Systems ("Imbrium"). Unauthorized use of this design, in any form or media, including but not limited to, reproduction or modification of this design in any manner without the prior written consent of Imbrium. Failure to comply is done at the user's own risk and Imbrium expressly disclaims any liability or responsibility in such case.

If discrepancies between the supplied information upon which Imbrium has based its design and actual conditions are encountered as site work progresses, these discrepancies must be reported to Imbrium immediately to allow for review. Imbrium accepts no responsibility or liability for designs based on missing, incomplete or inaccurate information supplied by others.

MARK	DATE	REVISION DESCRIPTION	BY
0	08/22/24	INITIAL RELEASE	EC

Stormceptor® EF

SCALE = NTS

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON L1N 2A9
TF 800-565-4951 CA 416-665-9600 INTL +1-416-665-9600

THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS: Canada Nos. 2,197,585; 2,197,586; 2,296,092; 2,296,093; 2,296,094; 2,394,483; 2,432,623; 2,432,624; 2,512,372; 2,512,374; 2,512,376; 2,538,149; 2,538,150; 2,538,151; 2,538,152; 2,538,153; 2,538,154; 2,538,155; 2,538,156; 2,538,157; 2,538,158; 2,538,159; 2,538,160; 2,538,161; 2,538,162; 2,538,163; 2,538,164; 2,538,165; 2,538,166; 2,538,167; 2,538,168; 2,538,169; 2,538,170; 2,538,171; 2,538,172; 2,538,173; 2,538,174; 2,538,175; 2,538,176; 2,538,177; 2,538,178; 2,538,179; 2,538,180; 2,538,181; 2,538,182; 2,538,183; 2,538,184; 2,538,185; 2,538,186; 2,538,187; 2,538,188;

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

11/28/2025

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	OGS 2

Drainage Area (ha):	10.03
% Imperviousness:	70.00

Runoff Coefficient 'c': 0.72

Particle Size Distribution:	Fine
Target TSS Removal (%):	70.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	233.08
Oil / Fuel Spill Risk Site?	No
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	1300.00
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	7070
Estimated Average Annual Sediment Volume (L/yr):	5748

Project Name:	QCH Part 4 Expansion - OGS2
Project Number:	123089
Designer Name:	Kallie Auld
Designer Company:	Novatech
Designer Email:	k.auld@novatech-eng.com
Designer Phone:	613-254-9643
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	40
EF5	50
EF6	57
EF8	67
EF10	74
EF12	79

Recommended Stormceptor EF Model: EF10

Estimated Net Annual Sediment (TSS) Load Reduction (%): 74

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

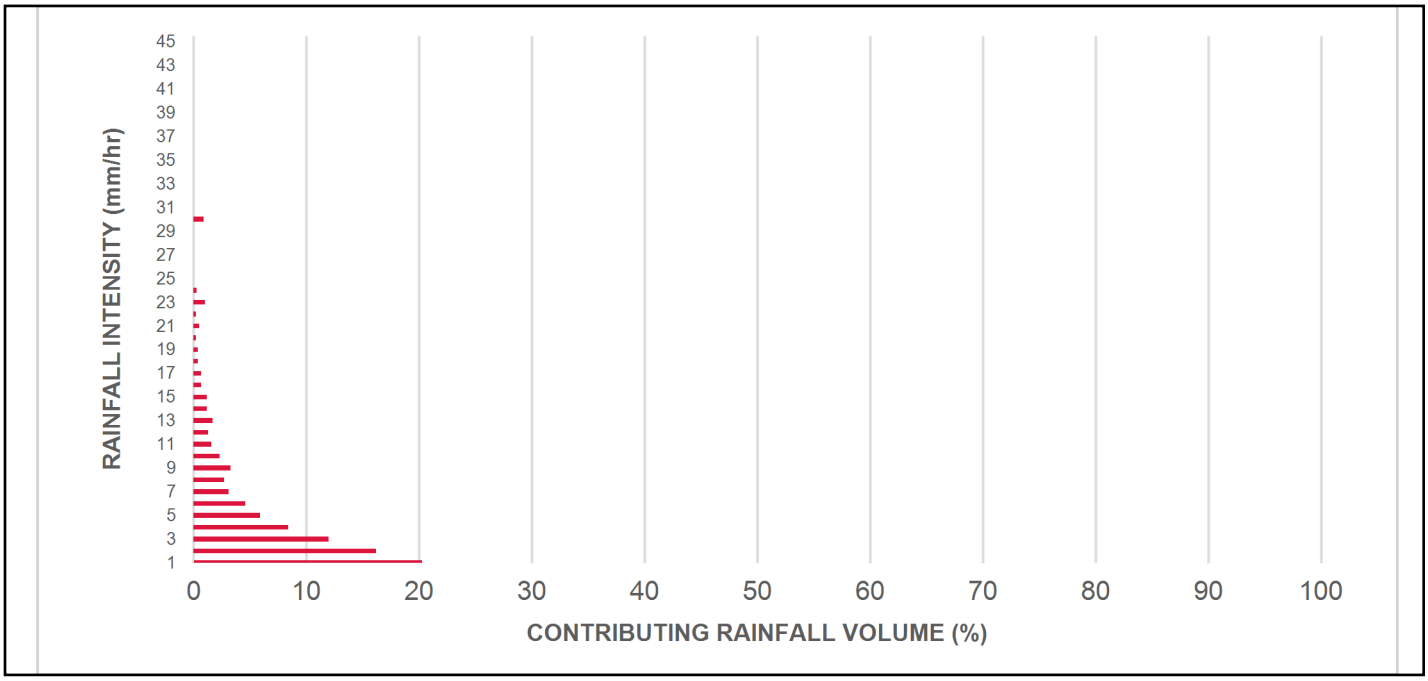
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

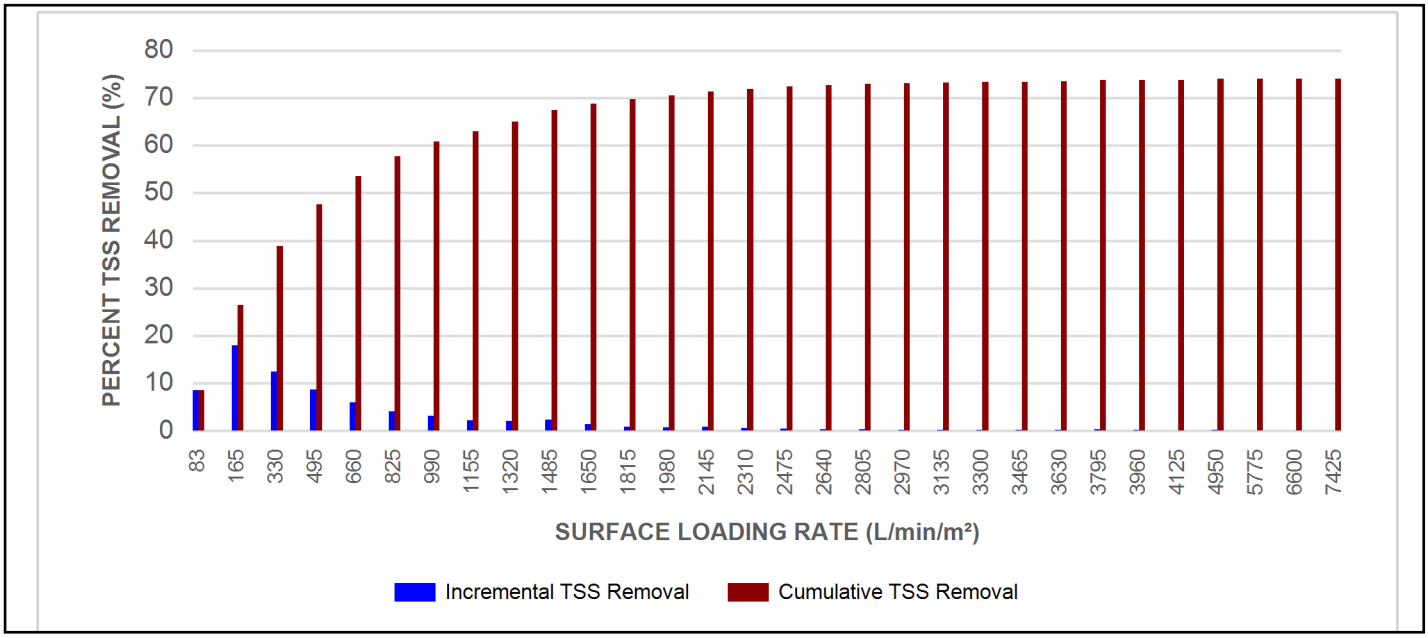
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	10.04	602.0	83.0	98	8.5	8.5
1.00	20.3	29.0	20.08	1205.0	165.0	88	17.9	26.4
2.00	16.2	45.2	40.15	2409.0	330.0	77	12.5	38.9
3.00	12.0	57.2	60.23	3614.0	495.0	72	8.7	47.6
4.00	8.4	65.6	80.30	4818.0	660.0	70	5.9	53.6
5.00	5.9	71.6	100.38	6023.0	825.0	69	4.1	57.7
6.00	4.6	76.2	120.46	7227.0	990.0	68	3.1	60.8
7.00	3.1	79.3	140.53	8432.0	1155.0	71	2.2	63.0
8.00	2.7	82.0	160.61	9637.0	1320.0	74	2.0	65.0
9.00	3.3	85.3	180.68	10841.0	1485.0	71	2.4	67.4
10.00	2.3	87.6	200.76	12046.0	1650.0	64	1.5	68.8
11.00	1.6	89.2	220.84	13250.0	1815.0	58	0.9	69.7
12.00	1.3	90.5	240.91	14455.0	1980.0	53	0.7	70.5
13.00	1.7	92.2	260.99	15659.0	2145.0	49	0.9	71.3
14.00	1.2	93.5	281.06	16864.0	2310.0	46	0.6	71.9
15.00	1.2	94.6	301.14	18068.0	2475.0	43	0.5	72.4
16.00	0.7	95.3	321.22	19273.0	2640.0	41	0.3	72.6
17.00	0.7	96.1	341.29	20478.0	2805.0	38	0.3	72.9
18.00	0.4	96.5	361.37	21682.0	2970.0	36	0.1	73.1
19.00	0.4	96.9	381.44	22887.0	3135.0	34	0.1	73.2
20.00	0.2	97.1	401.52	24091.0	3300.0	32	0.1	73.3
21.00	0.5	97.5	421.60	25296.0	3465.0	31	0.1	73.4
22.00	0.2	97.8	441.67	26500.0	3630.0	29	0.1	73.5
23.00	1.0	98.8	461.75	27705.0	3795.0	29	0.3	73.8
24.00	0.3	99.1	481.83	28910.0	3960.0	27	0.1	73.8
25.00	0.0	99.1	501.90	30114.0	4125.0	26	0.0	73.8
30.00	0.9	100.0	602.28	36137.0	4950.0	22	0.2	74.0
35.00	0.0	100.0	702.66	42160.0	5775.0	19	0.0	74.0
40.00	0.0	100.0	803.04	48183.0	6600.0	16	0.0	74.0
45.00	0.0	100.0	903.42	54205.0	7425.0	14	0.0	74.0
Estimated Net Annual Sediment (TSS) Load Reduction =								**74 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

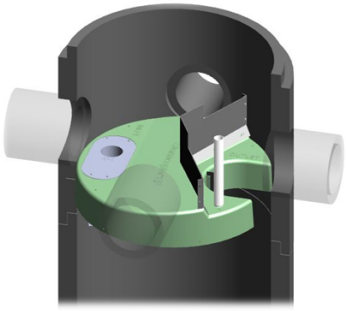
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

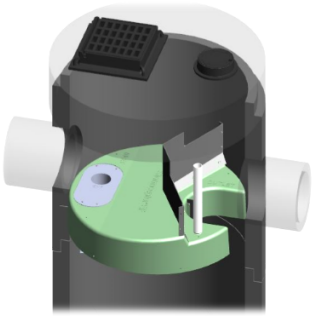
DESIGN FLEXIBILITY

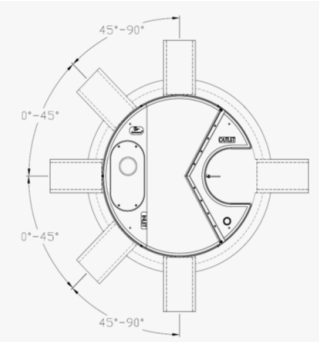
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The **minimum** sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

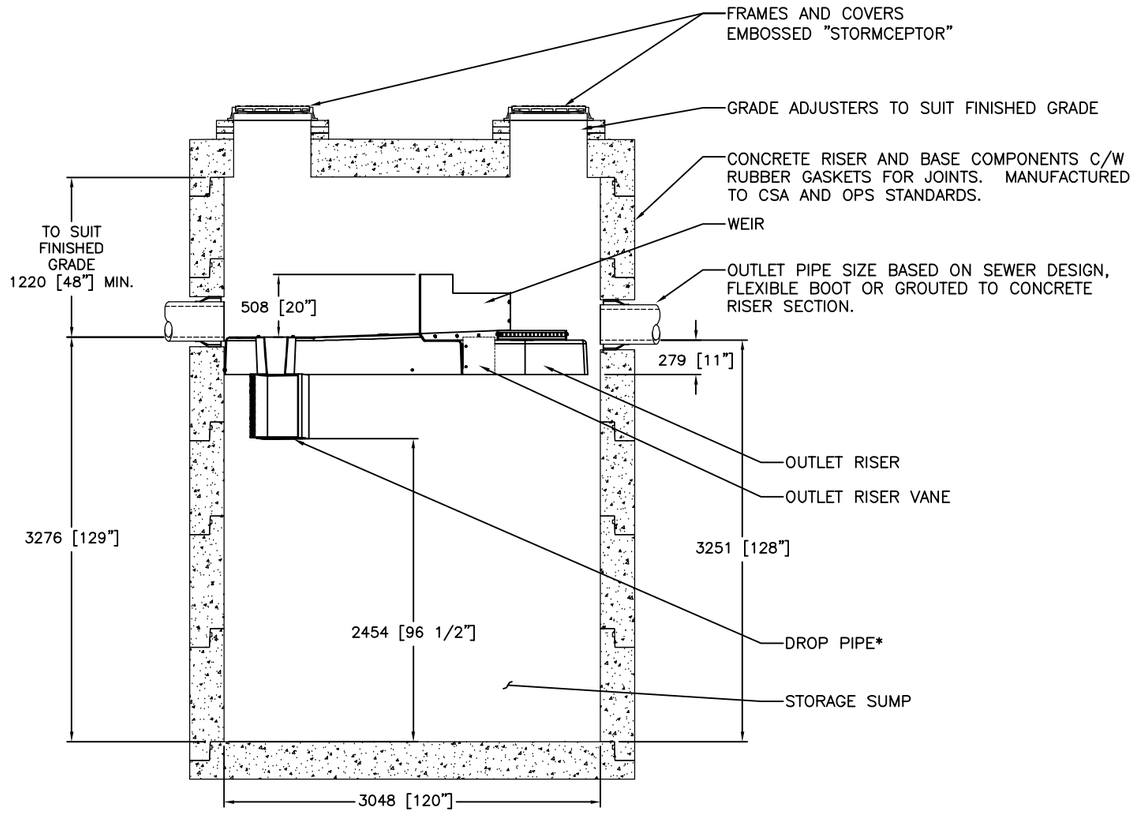
The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

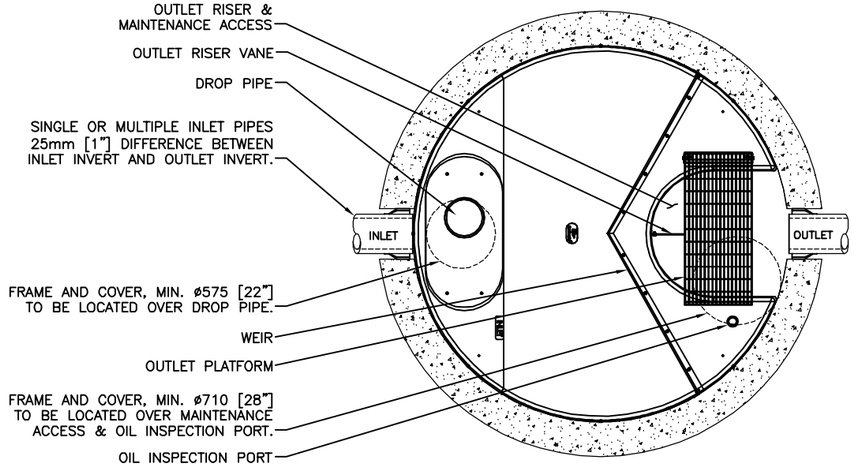
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

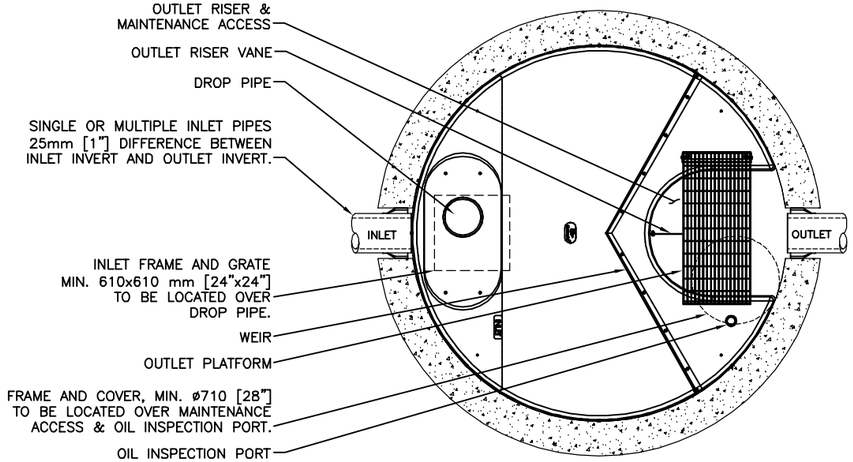
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF10 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO10 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EF10				
STRUCTURE ID					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
1	6/8/18	OUTLET PLATFORM	JSK
0	5/26/17	INITIAL RELEASE	JSK

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Stormceptor® EF

SCALE = NTS

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON L1N 9A9
TF 800-565-4501 CA 416-665-8600 INTL +1-416-665-8600

THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 5,498,323; 5,725,760; 5,753,115; 6,068,765; 6,371,690; 6,511,595; 6,649,048; 6,991,114; 7,186,058; 7,296,692; 7,297,266; 7,390,410; 7,425,262; 7,470,369; 7,563,363; 7,582,211; 7,704,393; 7,905,367; 8,287,728; 8,470,173; 8,673,157; 8,771,511; 8,852,436; 9,032,677; 9,366,035; 9,481,990; 9,546,478; 9,616,357; 9,714,501; 9,764,254; 9,885,188; 9,890,528; 9,938,708; 9,951,505; 10,053,858; 10,132,071; 10,174,496; 10,214,894; 10,227,762; 10,240,329; 10,329,756; 10,329,757; 10,329,758; 10,329,759; 10,329,760; 10,329,761; 10,329,762; 10,329,763; 10,329,764; 10,329,765; 10,329,766; 10,329,767; 10,329,768; 10,329,769; 10,329,770; 10,329,771; 10,329,772; 10,329,773; 10,329,774; 10,329,775; 10,329,776; 10,329,777; 10,329,778; 10,329,779; 10,329,780; 10,329,781; 10,329,782; 10,329,783; 10,329,784; 10,329,785; 10,329,786; 10,329,787; 10,329,788; 10,329,789; 10,329,790; 10,329,791; 10,329,792; 10,329,793; 10,329,794; 10,329,795;

APPENDIX D

Stormwater Management Calculations

Existing Stormwater Flows									
Description	***Area (ha)***	***$A_{impervious}$ (ha)***	***A_{gravel} (ha) C=0.75***	***$A_{pervious}$ (ha) C=0.2***	**Weighted C_{w5}**	**Weighted C_{w100}**	**T_c****	**5-Year Flow (L/s)**	**100-Year Flow (L/s)**
Direct Runoff (Northeast)	5.883	0.399	0.190	5.293	0.27	0.32	51.58	159.7	328.2
Direct Runoff (West Ditch)	1.364	0.159	0.000	1.205	0.28	0.34	43.96	44.1	89.9
Direct Runoff (South Ditch)	0.676	0.039	0.000	0.637	0.24	0.29	31.49	23.5	48.9
Controlled Flow to On-Site Storm Sewer System*	4.176	**N/A**						229.6	272.8
Uncontrolled Flow to On-Site Storm Sewer System	8.102	3.810	0.000	4.293	0.53	0.60	19.70	845.3	1643.8
						Total Site Flows :		**1302.2**	**2383.6**

*Information taken directly from previous SWM report and design drawings.

**T_c for landscaped areas calculated using Airport Formula. T_c for on-site sewer system taken directly from previous SWM report.

Queensway-Carleton Hospital Part 4 Expansion
Overall Model Schematic

NOVATECH
Engineers, Planners & Landscape Architects



Legend

Junctions
- Visible
- Roof Drain Connection
- Outfalls

Storages
- Visible
- OGS Unit
- Storage Tank
- Catchbasin
- Catchbasin MH
- DICB
- Roof Storage

Conduits
- Visible
- Superpipe Storage
- Major System
- Overland Flow

Orifices
- Weirs
- Outlets

Subcatchments
- Visible
- Parking/ Roadways
- External/ Uncontrolled
- Roof
- Roof-NEW
- Green Roof
- Loading Dock
- Landscaped Area

- Background
- Background02

N

150 m

11/28/2025
PREPARED BY: NOVATECH

M:\2023\123089\DATA\Calculations\SWM\123089-ModelParams.xlsx

Queensway-Carleton Hospital Part 4 Expansion
Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

Area ID	Description	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
A101	Ex. Ring Road - Uncontrolled	0.157	0.60	57%	0%	20.06	78.28	0.5%
A102	Ex. Landscaped Area - Uncontrolled	0.202	0.36	23%	0%	36.40	55.49	0.5%
A103	Ex. Ring Road - Uncontrolled	0.190	0.53	47%	0%	20.51	92.66	0.5%
A104	Ex. Ring Road - Uncontrolled	0.195	0.69	70%	0%	32.94	59.19	0.5%
A105	Ex. Landscaped Area - Uncontrolled	0.082	0.67	67%	0%	24.52	33.44	0.5%
A106	Ex. Landscaped Area - Uncontrolled	0.027	0.43	33%	0%	18.17	14.86	0.5%
A107	Ex. Ring Road - Uncontrolled	0.079	0.64	63%	0%	15.54	50.85	0.5%
A108	Modified Ring Road - Uncontrolled	0.087	0.66	66%	0%	19.39	44.86	0.5%
A113	Existing Building Roof - Uncontrolled	0.792	0.90	100%	0%	106.42	74.42	0.5%
A116a	Modified Building Roof - Uncontrolled	0.038	0.90	100%	0%	22.08	17.21	0.5%
A116b	Modified Building Roof - Uncontrolled	0.017	0.90	100%	0%	6.04	28.13	0.5%
A117	Modified Building Roof - Uncontrolled	0.023	0.90	100%	0%	13.57	16.96	0.5%
A119	Modified Paved Parking Area - Uncontrolled	0.122	0.64	63%	0%	47.78	25.53	0.5%
A120	Ex. Ring Road - Uncontrolled	0.227	0.55	50%	0%	41.94	54.12	0.5%
A121	Ex. Ring Road - Uncontrolled	0.100	0.80	86%	0%	19.31	51.78	0.5%
A122	Ex. John Sutherland Drive - Uncontrolled	0.283	0.38	25%	0%	28.93	97.82	0.5%
A137	Ex. Landscaped Area - Uncontrolled	0.020	0.74	77%	0%	7.80	25.65	0.5%
B101	Modified John Sutherland Drive - Uncontrolled	0.550	0.48	40%	0%	29.24	188.09	0.5%
B102	Modified Ring Road - Uncontrolled	0.127	0.71	73%	0%	28.01	45.35	0.5%
B103	Landscaped Area - Uncontrolled	0.030	0.55	51%	0%	9.59	31.28	0.5%
B104	Paved Parking Area - Uncontrolled	0.137	0.73	76%	0%	25.35	54.05	0.5%
B105	Modified John Sutherland Drive - Uncontrolled	0.077	0.63	62%	0%	14.96	51.48	0.5%
B106	Paved Parking Area - Uncontrolled	0.155	0.74	77%	0%	16.43	94.33	0.5%
B107	Modified John Sutherland Drive - Uncontrolled	0.081	0.52	46%	0%	18.78	43.12	0.5%
B108	Modified John Sutherland Drive - Uncontrolled	0.052	0.87	96%	0%	12.81	40.60	0.5%
B109	Paved Parking Area - Uncontrolled	0.052	0.64	63%	0%	14.15	36.75	0.5%
B110	Landscaped Area - Uncontrolled	0.153	0.51	45%	0%	18.48	82.77	0.5%
B111	Paved Parking Area - Uncontrolled	0.055	0.90	100%	0%	15.19	36.21	0.5%
B112	Modified John Sutherland Drive - Uncontrolled	0.660	0.43	33%	0%	32.21	204.88	0.5%
B113	Landscaped Area - Uncontrolled	0.091	0.20	0%	0%	18.79	48.42	0.5%
B114	Modified Paved Parking Area - Controlled (ICD)	0.394	0.77	82%	0%	44.07	89.40	0.5%
B115	Modified Paved Parking Area - Controlled (ICD)	0.290	0.81	87%	0%	35.39	81.94	0.5%
B116	Landscaped Area - Uncontrolled	0.175	0.27	9%	0%	63.88	27.39	0.5%
B117	Paved Parking Area - Uncontrolled	0.211	0.60	57%	0%	36.93	57.14	0.5%
B118	Paved Parking Area - Uncontrolled	0.164	0.32	17%	0%	23.94	68.50	0.5%
B119	Modified John Sutherland Drive - Uncontrolled	0.150	0.44	35%	0%	20.73	72.34	0.5%
B120	Modified John Sutherland Drive - Uncontrolled	0.089	0.69	69%	0%	12.85	69.28	0.5%
B121	Modified Paved Parking Area - Uncontrolled	0.089	0.62	60%	0%	17.67	50.36	0.5%
B122a	Modified Loading Dock Area - Uncontrolled	0.179	0.79	85%	0%	37.41	47.85	0.5%
B122a	Modified Loading Dock Area - Uncontrolled	0.002	0.79	85%	0%	6.34	3.16	0.5%
B122b	Modified Loading Dock Area - Uncontrolled	0.002	0.79	85%	0%	8.46	2.36	0.5%
B123	Modified Paved Parking Area - Controlled (ICD)	0.108	0.69	70%	0%	24.99	43.21	0.5%
B124	Modified Loading Dock Area - Uncontrolled	0.023	0.90	100%	0%	12.78	17.99	0.5%
B125	Loading Dock Access Road - Uncontrolled	0.267	0.73	76%	0%	45.79	58.31	0.5%

Queensway-Carleton Hospital Part 4 Expansion
Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

Area ID	Description	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
B126	Loading Dock Access Road - Uncontrolled	0.112	0.52	45%	0%	44.96	24.91	0.5%
B127	Loading Dock Access Road - Uncontrolled	0.203	0.53	47%	0%	22.86	88.79	0.5%
B128	Landscaped Area - Uncontrolled	0.086	0.41	30%	0%	18.33	46.92	0.5%
B129	Landscaped Area - Uncontrolled	0.016	0.20	0%	0%	6.66	24.04	0.5%
B130	Modified Ring Road - Uncontrolled	0.086	0.63	62%	0%	14.28	60.22	0.5%
B131	Modified Ring Road - Uncontrolled	0.093	0.69	70%	0%	14.33	64.90	0.5%
B132	Modified Ring Road - Uncontrolled	0.180	0.76	80%	0%	32.63	55.16	0.5%
B133	Modified Ring Road - Uncontrolled	0.145	0.46	37%	0%	41.43	35.00	0.5%
B134	Modified John Sutherland Drive - Uncontrolled	0.494	0.46	37%	0%	3.14	1575.26	0.5%
B135	Modified John Sutherland Drive - Uncontrolled	0.325	0.60	57%	0%	12.86	252.64	0.5%
EX-A01a	Modified Paved Parking Area - Controlled (ICD)	0.423	0.67	66%	0%	29.62	142.80	0.5%
EX-A01b	Modified Paved Parking Area - Controlled (ICD)	0.336	0.76	80%	0%	21.12	159.11	0.5%
EX-A02-01	Existing Green Building Roof - Uncontrolled	0.028	0.20	0%	0%	16.44	17.04	0.5%
EX-A02-02	Existing Green Building Roof - Uncontrolled	0.039	0.20	0%	0%	24.20	16.12	0.5%
EX-A02A	Modified Paved Parking Area - Controlled (ICD)	0.400	0.71	73%	0%	30.70	130.29	0.5%
EX-A02B	Modified Paved Parking Area - Controlled (ICD)	0.518	0.65	64%	0%	34.34	150.86	0.5%
EX-A03-01	Existing Bunker Roof - Controlled (Roof Drains)	0.080	0.90	100%	0%	18.92	42.28	0.5%
EX-A03-02	Ex. Cancer Centre Roof - Controlled (Roof Drains)	0.158	0.90	100%	0%	13.87	113.93	0.5%
EX-A04	Modified Building Roof - Controlled (Roof Drains)	0.040	0.90	100%	0%	10.31	38.81	0.5%
EX-R01	Existing Building Roof - Controlled (Roof Drains)	0.072	0.90	100%	0%	19.92	36.14	0.5%
EX-R02	Modified Building Roof - Controlled (Roof Drains)	0.295	0.90	100%	0%	55.27	53.37	0.5%
EX-R03	Existing Building Roof - Controlled (Roof Drains)	0.044	0.90	100%	0%	28.31	15.54	0.5%
P3-01	Modified Building Roof - Controlled (Roof Drains)	0.486	0.90	100%	0%	58.73	82.76	0.5%
P3-02	Existing Building Roof - Controlled (Roof Drains)	0.017	0.90	100%	0%	11.23	15.14	0.5%
P3-03	Existing Building Roof - Uncontrolled	0.038	0.90	100%	0%	11.65	32.62	0.5%
P4-01	Ambulatory Care Addition - Controlled (Roof Drains)	0.200	0.90	100%	0%	22.83	87.60	0.5%
P4-02	Emerg. Dept. Addition - Controlled (Roof Drains)	0.294	0.90	100%	0%	28.29	103.93	0.5%
P4-03	Ambulance Garage - Controlled (Roof Drains)	0.084	0.90	100%	0%	30.48	27.56	0.5%
P4-04	Generator/MEP Room - Controlled (Roof Drains)	0.128	0.90	100%	0%	37.20	34.41	0.5%
P4-05	Transitional Care Tower - Controlled (Roof Drains)	0.341	0.90	100%	0%	50.84	67.08	0.5%
P4-06	Loading Dock Building - Controlled (Roof Drains)	0.059	0.90	100%	0%	11.61	50.84	0.5%
P4-07	M.M. & E.V.S. Building - Controlled (Roof Drains)	0.046	0.90	100%	0%	19.42	23.68	0.5%
P4-08	Ex. Parking Garage - Controlled (UG Tank)	0.288	0.90	100%	0%	67.84	42.45	0.5%
P4-09	New Parking Garage - Controlled (UG Tank)	0.272	0.90	100%	0%	69.47	39.15	0.5%
P4-DR01a	Direct Runoff to West Ditch	0.721	0.26	8%	0%	288.33	25.01	1.5%
P4-DR01b	Direct Runoff to South Ditch	0.680	0.26	8%	0%	209.29	32.49	1.3%
P4-DR01c	Direct Runoff to West Ditch	0.038	0.26	8%	0%	76.00	5.00	0.5%
P4-DR02	Direct Runoff to Northeast Corner of Property	5.351	0.25	7%	0%	510.00	104.92	2.0%

Queensway-Carleton Hospital Part 4 Expansion
Design Storm Time Series Data
3-hour Chicago Design Storms

Engineers, Planners & Landscape Architects

C25mm-3.stm		C2-3.stm		C5-3.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0	0:00	0	0:00	0
0:10	2.21	0:10	2.81	0:10	3.68
0:20	2.75	0:20	3.5	0:20	4.58
0:30	3.68	0:30	4.69	0:30	6.15
0:40	5.73	0:40	7.3	0:40	9.61
0:50	14.29	0:50	18.21	0:50	24.17
1:00	60.28	1:00	76.81	1:00	104.19
1:10	18.9	1:10	24.08	1:10	32.04
1:20	9.7	1:20	12.36	1:20	16.34
1:30	6.53	1:30	8.32	1:30	10.96
1:40	4.94	1:40	6.3	1:40	8.29
1:50	3.99	1:50	5.09	1:50	6.69
2:00	3.37	2:00	4.29	2:00	5.63
2:10	2.92	2:10	3.72	2:10	4.87
2:20	2.58	2:20	3.29	2:20	4.3
2:30	2.32	2:30	2.95	2:30	3.86
2:40	2.1	2:40	2.68	2:40	3.51
2:50	1.93	2:50	2.46	2:50	3.22
3:00	1.79	3:00	2.28	3:00	2.98

Queensway-Carleton Hospital Part 4 Expansion
Design Storm Time Series Data
3-hour Chicago Design Storms

Engineers, Planners & Landscape Architects

C100-3.stm		C100-3+20%.stm	
Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr
0:00	0	0:00	0
0:10	6.05	0:10	6:14
0:20	7.54	0:20	9.05
0:30	10.16	0:30	12.19
0:40	15.97	0:40	19.16
0:50	40.65	0:50	48.78
1:00	178.56	1:00	214.27
1:10	54.05	1:10	64.86
1:20	27.32	1:20	32.78
1:30	18.24	1:30	21.89
1:40	13.74	1:40	16.49
1:50	11.06	1:50	13.27
2:00	9.29	2:00	11.15
2:10	8.02	2:10	9.62
2:20	7.08	2:20	8.5
2:30	6.35	2:30	7.62
2:40	5.76	2:40	6.91
2:50	5.28	2:50	6.34
3:00	4.88	3:00	5.86

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
  ------------------------------------------------------------

  Queensway-Carleton Hospital Part 4 Expansion
  WARNING 03: negative offset ignored for Link 11
  WARNING 03: negative offset ignored for Link 38
  WARNING 04: minimum elevation drop used for Conduit 65
  WARNING 04: minimum elevation drop used for Conduit 66
  WARNING 04: minimum elevation drop used for Conduit 68
  WARNING 04: minimum elevation drop used for Conduit 72
  WARNING 04: minimum elevation drop used for Conduit 73
  WARNING 04: minimum elevation drop used for Conduit 75
  WARNING 03: negative offset ignored for Link 76
  WARNING 04: minimum elevation drop used for Conduit 77
  WARNING 03: negative offset ignored for Link P3-01-STOR_out
  WARNING 03: negative offset ignored for Link P4-06-STOR_out
  WARNING 02: maximum depth increased for Node 1
  WARNING 02: maximum depth increased for Node EX-A3-01&02-STOR
  WARNING 02: maximum depth increased for Node EX-R02-STOR
  WARNING 02: maximum depth increased for Node EX-R03-STOR
  WARNING 02: maximum depth increased for Node EX-R1-STOR
  WARNING 02: maximum depth increased for Node P3-01-STOR
  WARNING 02: maximum depth increased for Node P3-03-STOR
  WARNING 02: maximum depth increased for Node P4-02-STOR
  WARNING 02: maximum depth increased for Node P4-03-STOR
  WARNING 02: maximum depth increased for Node P4-04-STOR
  WARNING 02: maximum depth increased for Node P4-05-stor
  WARNING 02: maximum depth increased for Node P4-06-STOR

  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 86
  Number of nodes ........... 161
  Number of links ........... 209
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                  Data       Recording
  Name                 Data Source                Type       Interval
  ---------------------------------------------------------------------
  Raingage             03-C100yr-3hr              INTENSITY   10 min.


  ********************
  Subcatchment Summary
  ********************
  Name                        Area     Width   %Imperv    %Slope Rain Gage
Outlet
  ----------------------------------------------------------------------------------
--------------------------
```

A101	0.16	78.28	57.00	0.5000	Raingage
EX_CB_XXZ_(STM)					
A102	0.20	55.49	23.00	0.5000	Raingage
EX-CB004					
A103	0.19	92.65	47.00	0.5000	Raingage
EX-CB_XYY					
A104	0.20	59.19	70.00	0.5000	Raingage
EX-CBMH_XYZ					
A105	0.08	33.44	67.00	0.5000	Raingage
EX-CBMH303					
A106	0.03	14.86	33.00	0.5000	Raingage
EX-CBMH303					
A107	0.08	50.85	63.00	0.5000	Raingage
EX-CBMH302					
A108	0.09	44.86	66.00	0.5000	Raingage
EX-CBMH_XXX					
A113	0.79	74.41	100.00	0.5000	Raingage
ROOF-02					
A116a	0.04	17.21	100.00	0.5000	Raingage
ROOF-03					
A116b	0.02	28.13	100.00	0.5000	Raingage
ROOF-03					
A117	0.02	16.96	100.00	0.5000	Raingage
ROOF-03					
A119	0.12	25.53	63.00	0.5000	Raingage
EX-CBMH_XXZ					
A120	0.23	54.12	50.00	0.5000	Raingage
EX-CBMH301					
A121	0.10	51.78	86.00	0.5000	Raingage
EX-CB301					
A122	0.28	97.82	25.00	0.5000	Raingage
EX-CB100-101					
A137	0.02	25.65	77.00	0.5000	Raingage
EX-CBMH008					
B101	0.55	188.08	40.00	0.5000	Raingage
CBMH401-402					
B102	0.13	45.35	73.00	0.5000	Raingage
CB401					
B103	0.03	31.28	51.00	0.5000	Raingage
CBMH403					
B104	0.14	54.05	76.00	0.5000	Raingage
CBMH402					
B105	0.08	51.48	62.00	0.5000	Raingage
CBMH401-404					
B106	0.15	94.33	77.00	0.5000	Raingage
CB403					
B107	0.08	43.12	46.00	0.5000	Raingage
CBMH404-405					
B108	0.05	40.60	96.00	0.5000	Raingage
CB405					
B109	0.05	36.75	63.00	0.5000	Raingage
CBMH406					
B110	0.15	82.77	45.00	0.5000	Raingage
EX-CBMH008					
B111	0.06	36.21	100.00	0.5000	Raingage
TD01					
B112	0.66	204.88	33.00	0.5000	Raingage
CBMH408-406					
B113	0.09	48.42	0.00	0.5000	Raingage
CBMH407					

B114	0.39	89.39	82.00	0.5000	Raingage
EX_CBMH_11_(STM)					
B115	0.29	81.94	87.00	0.5000	Raingage
EX_CBMH_14_(STM)					
B116	0.17	27.39	9.00	0.5000	Raingage
CB409					
B117	0.21	57.14	57.00	0.5000	Raingage
CBMH411					
B118	0.16	68.50	17.00	0.5000	Raingage
CBMH412					
B119	0.15	72.34	35.00	0.5000	Raingage
CBMH413					
B120	0.09	69.28	69.00	0.5000	Raingage
CB410					
B121	0.09	50.36	60.00	0.5000	Raingage
EX_CB_1_(STM)					
B122a	0.18	47.85	85.00	0.5000	Raingage
LD-TD01					
B122b	0.00	3.15	85.00	0.5000	Raingage
LD-TD01					
B122c	0.00	2.36	85.00	0.5000	Raingage
LD-TD01					
B123	0.11	43.21	70.00	0.5000	Raingage
EX-CBMH048					
B124	0.02	17.99	100.00	0.5000	Raingage
LD-TD02					
B125	0.27	58.31	76.00	0.5000	Raingage
CBMH409					
B126	0.11	24.91	45.00	0.5000	Raingage
CB408					
B127	0.20	88.78	47.00	0.5000	Raingage
CB410					
B128	0.09	46.91	30.00	0.5000	Raingage
CB411					
B129	0.02	24.04	0.00	0.5000	Raingage
CB412					
B130	0.09	60.22	62.00	0.5000	Raingage
CB413					
B131	0.09	64.90	70.00	0.5000	Raingage
CB402					
B132	0.18	55.16	80.00	0.5000	Raingage
CICB403					
B133	0.14	35.00	37.00	0.5000	Raingage
CICB404					
B134_1	0.05	146.37	10.00	0.5000	Raingage
CB414					
B134_3	0.25	146.37	37.00	0.5000	Raingage
EX-CB03					
B134_4	0.20	146.37	37.00	0.5000	Raingage
EX-CBMH01					
B135_2	0.07	57.34	57.00	0.5000	Raingage
EX-LD01					
B135_3	0.12	57.34	57.00	0.5000	Raingage
EX-CB02					
B135_4	0.13	57.34	57.00	0.5000	Raingage
EX-CB01					
EX-A01a	0.42	142.81	66.00	0.5000	Raingage
EX-CB_XZY					
EX-A01b	0.34	159.11	80.00	0.5000	Raingage
EX-CB_XZZ					
EX-A02-01	0.03	17.04	0.00	0.5000	Raingage
ROOF-04					
EX-A02-02	0.04	16.12	0.00	0.5000	Raingage
ROOF-04					
EX-A02A	0.40	130.29	73.00	0.5000	Raingage
EX-CB_XYU					
EX-A02B	0.52	150.86	64.00	0.5000	Raingage
EX-CB130					
EX-A03-01	0.08	42.28	100.00	0.5000	Raingage
EX-A3-01&02-STOR					
EX-A03-02	0.16	113.93	100.00	0.5000	Raingage
EX-A3-01&02-STOR					
EX-A04	0.04	38.81	100.00	0.5000	Raingage
EX-A04-STOR					
EX-R01	0.07	36.14	100.00	0.5000	Raingage
EX-R1-STOR					
EX-R02	0.29	53.37	100.00	0.5000	Raingage
EX-R02-STOR					
EX-R03	0.04	15.54	100.00	0.5000	Raingage
EX-R03-STOR					
P3-01	0.49	82.76	100.00	0.5000	Raingage
P3-01-STOR					
P3-02	0.02	15.14	100.00	0.5000	Raingage
P3-02-STOR					
P3-03	0.04	32.62	100.00	0.5000	Raingage
P3-03-STOR					
P4-01	0.20	87.61	100.00	0.5000	Raingage
ROOF-08					
P4-02	0.29	103.93	100.00	0.5000	Raingage
P4-02-STOR					
P4-03	0.08	27.56	100.00	0.5000	Raingage
P4-03-STOR					
P4-04	0.13	34.41	100.00	0.5000	Raingage
P4-04-STOR					
P4-05	0.34	67.08	100.00	0.5000	Raingage
P4-05-stor					
P4-06	0.06	50.84	100.00	0.5000	Raingage
P4-06-STOR					
P4-07	0.05	23.68	100.00	0.5000	Raingage
P4-07-STOR					
P4-08	0.29	42.45	100.00	0.5000	Raingage
TANK01					
P4-09	0.27	39.16	100.00	0.5000	Raingage
TANK02					
P4-DR01a	0.72	25.00	8.00	1.5000	Raingage
DR-WD					
P4-DR01b	0.68	32.50	8.00	1.3000	Raingage
DR-SD					
P4-DR01c	0.04	5.00	8.00	0.5000	Raingage
DR-WD					
P4-DR02	5.35	105.00	6.00	2.0000	Raingage
DR-NW					

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow

1	JUNCTION	79.11	0.35	0.0
10	JUNCTION	78.97	0.35	0.0
11	JUNCTION	78.80	0.35	0.0
12	JUNCTION	78.70	0.35	0.0
13	JUNCTION	78.80	0.35	0.0
14	JUNCTION	80.05	0.35	0.0
15	JUNCTION	78.90	0.35	0.0
16	JUNCTION	79.10	0.35	0.0
17	JUNCTION	79.05	0.35	0.0
18	JUNCTION	79.05	0.35	0.0
19	JUNCTION	77.05	0.35	0.0
2	JUNCTION	78.48	0.35	0.0
20	JUNCTION	77.10	0.35	0.0
21	JUNCTION	75.69	0.35	0.0
22	JUNCTION	77.15	0.35	0.0
3	JUNCTION	78.95	0.35	0.0
4	JUNCTION	78.75	0.35	0.0
5	JUNCTION	78.95	0.35	0.0
6	JUNCTION	79.05	0.35	0.0
7	JUNCTION	78.95	0.35	0.0
8	JUNCTION	78.95	0.35	0.0
9	JUNCTION	78.95	0.35	0.0
ROOF-01	JUNCTION	73.31	10.15	0.0
ROOF-02	JUNCTION	72.85	10.00	0.0
ROOF-03	JUNCTION	72.82	10.15	0.0
ROOF-04	JUNCTION	73.02	10.00	0.0
ROOF-06	JUNCTION	73.43	10.15	0.0
ROOF-07	JUNCTION	74.01	10.00	0.0
ROOF-08	JUNCTION	74.36	10.00	0.0
ROOF-09	JUNCTION	77.37	10.15	0.0
ROOF-10	JUNCTION	77.32	5.15	0.0
ROOF-11	JUNCTION	75.97	10.00	0.0
23	OUTFALL	73.96	0.35	0.0
24	OUTFALL	74.00	0.35	0.0
DR-NW	OUTFALL	0.00	0.00	0.0
DR-SD	OUTFALL	79.21	0.35	0.0
DR-WD	OUTFALL	0.00	0.00	0.0
OUT13772	OUTFALL	71.56	0.91	0.0
OUT16389	OUTFALL	72.90	0.35	0.0
CB401	STORAGE	76.15	2.35	0.0
CB402	STORAGE	74.65	2.45	0.0
CB403	STORAGE	76.30	2.65	0.0
CB405	STORAGE	76.45	2.36	0.0
CB407	STORAGE	76.55	2.20	0.0
CB408	STORAGE	74.40	1.45	0.0
CB409	STORAGE	75.35	2.05	0.0
CB410	STORAGE	75.60	2.65	0.0
CB411	STORAGE	75.50	2.00	0.0
CB412	STORAGE	75.80	2.00	0.0
CB413	STORAGE	75.50	2.65	0.0
CB414	STORAGE	74.98	0.87	0.0
CBMH401-402	STORAGE	75.77	2.38	0.0
CBMH401-404	STORAGE	73.31	5.79	0.0
CBMH402	STORAGE	73.70	5.20	0.0
CBMH403	STORAGE	74.11	4.79	0.0
CBMH404-405	STORAGE	72.95	6.15	0.0
CBMH406	STORAGE	72.88	6.32	0.0
CBMH407	STORAGE	72.72	4.48	0.0
CBMH408-406	STORAGE	75.11	2.54	0.0
CBMH409	STORAGE	72.70	2.35	0.0
CBMH410	STORAGE	72.13	3.92	0.0
CBMH411	STORAGE	74.54	2.91	0.0
CBMH412	STORAGE	74.43	2.92	0.0
CBMH413	STORAGE	74.11	4.19	0.0
CICB403	STORAGE	74.30	2.80	0.0
CICB404	STORAGE	74.70	2.65	0.0
EX._STMMH_1_(STM)	STORAGE	72.95	1.15	0.0
EX_CB_1_(STM)	STORAGE	74.72	2.60	0.0
EX_CB_XXZ_(STM)	STORAGE	76.90	2.12	0.0
EX_CBMH_10_(STM)	STORAGE	75.25	3.33	0.0
EX_CBMH_11_(STM)	STORAGE	75.38	3.34	0.0
EX_CBMH_14_(STM)	STORAGE	76.57	2.17	0.0
EX_CBMH12	STORAGE	76.70	2.07	0.0
EX_STMMH_302_(STM)	STORAGE	72.62	3.70	0.0
EX-A04-STOR	STORAGE	82.82	0.15	0.0
EX-A3-01&02-STOR	STORAGE	83.02	0.25	0.0
EX-CB_XYU	STORAGE	77.20	2.00	0.0
EX-CB_XYY	STORAGE	75.94	2.90	0.0
EX-CB_XZY	STORAGE	76.39	2.03	0.0
EX-CB_XZZ	STORAGE	76.50	1.96	0.0
EX-CB_XZZa	STORAGE	76.23	2.20	0.0
EX-CB004	STORAGE	77.12	1.77	0.0
EX-CB01	STORAGE	74.06	0.35	0.0
EX-CB02	STORAGE	74.02	0.35	0.0
EX-CB03	STORAGE	74.53	2.22	0.0
EX-CB100-101	STORAGE	76.85	1.92	0.0
EX-CB129	STORAGE	75.83	2.52	0.0
EX-CB130	STORAGE	76.39	1.96	0.0
EX-CB132	STORAGE	76.12	2.16	0.0
EX-CB150	STORAGE	75.55	2.68	0.0
EX-CB301	STORAGE	76.30	2.65	0.0
EX-CB304	STORAGE	74.25	3.00	0.0
EX-CB305	STORAGE	74.15	4.18	0.0
EX-CBMH_XXX	STORAGE	74.95	3.89	0.0
EX-CBMH_XXZ	STORAGE	76.06	2.18	0.0
EX-CBMH_XYY	STORAGE	76.59	3.14	0.0
EX-CBMH_XYZ	STORAGE	75.67	3.35	0.0
EX-CBMH_XZY	STORAGE	75.69	2.93	0.0
EX-CBMH_XZZ	STORAGE	75.51	2.77	0.0
EX-CBMH003	STORAGE	77.23	2.08	0.0
EX-CBMH008	STORAGE	74.10	0.59	0.0
EX-CBMH01	STORAGE	74.73	2.11	0.0
EX-CBMH048	STORAGE	74.06	2.95	0.0
EX-CBMH301	STORAGE	77.00	2.10	0.0
EX-CBMH302	STORAGE	75.21	3.04	0.0
EX-CBMH303	STORAGE	76.08	2.40	0.0
EX-DICB001-002	STORAGE	76.82	2.80	0.0
EX-LD01	STORAGE	73.71	0.83	0.0
EX-MH_XXZ	STORAGE	75.89	2.39	0.0
EX-MH_XZY	STORAGE	75.29	3.26	0.0
EX-MH001	STORAGE	76.79	3.11	0.0
EX-MH301	STORAGE	76.90	1.96	0.0
EX-R02-STOR	STORAGE	83.43	0.25	0.0

EX-R03-STOR	STORAGE	82.90	0.25	0.0	
EX-R1-STOR	STORAGE	85.97	0.25	0.0	
EX-STMMH_XXX	STORAGE	74.27	5.32	0.0	
LD-TD01	STORAGE	72.99	1.14	0.0	
LD-TD02	STORAGE	73.20	1.45	0.0	
MH401	STORAGE	75.13	3.53	0.0	
MH402	STORAGE	73.87	4.71	0.0	
MH403	STORAGE	75.32	3.27	0.0	
MH404	STORAGE	73.54	5.04	0.0	
MH405	STORAGE	73.03	5.85	0.0	
MH406	STORAGE	73.51	5.23	0.0	
MH407	STORAGE	72.81	6.00	0.0	
MH410	STORAGE	73.58	5.36	0.0	
MH411	STORAGE	72.65	5.20	0.0	
MH412	STORAGE	72.54	6.00	0.0	
MH413	STORAGE	72.42	6.73	0.0	
MH414	STORAGE	72.35	6.22	0.0	
MH415	STORAGE	72.25	6.09	0.0	
MH416	STORAGE	72.13	6.82	0.0	
MH417	STORAGE	71.80	5.80	0.0	
MH418	STORAGE	72.27	2.59	0.0	
MH419	STORAGE	72.59	2.36	0.0	
MH420	STORAGE	72.18	3.67	0.0	
MH421	STORAGE	72.82	2.28	0.0	
MH422	STORAGE	72.57	2.84	0.0	
MH423	STORAGE	71.73	5.97	0.0	
MH424	STORAGE	71.76	5.49	0.0	
MH425	STORAGE	73.36	5.09	0.0	
MH426	STORAGE	72.64	4.44	0.0	
MH427	STORAGE	72.35	4.60	0.0	
MH428	STORAGE	72.14	4.94	0.0	
OGS_#1_(3600Ø)_(STM)	STORAGE	72.17	4.86	0.0	
OGS_#2_(3600Ø)_(STM)	STORAGE	71.88	6.02	0.0	
P3-01-STOR	STORAGE	83.34	0.26	0.0	
P3-02-STOR	STORAGE	82.82	0.15	0.0	
P3-03-STOR	STORAGE	87.37	0.25	0.0	
P4-01-STOR	STORAGE	84.36	0.15	0.0	
P4-02-STOR	STORAGE	84.01	0.25	0.0	
P4-03-STOR	STORAGE	83.57	0.25	0.0	
P4-04-STOR	STORAGE	83.31	0.25	0.0	
P4-05-stor	STORAGE	82.85	0.25	0.0	
P4-06-STOR	STORAGE	82.82	0.25	0.0	
P4-07-STOR	STORAGE	83.02	0.15	0.0	
Structure_-_(48)_(5)_(STM)	STORAGE	72.36	3.88	0.0	
Structure_-_(68)_(1)_(STM)	STORAGE	74.00	2.18	0.0	
TANK01	STORAGE	73.45	1.00	0.0	
TANK02	STORAGE	73.19	1.00	0.0	
TD01	STORAGE	76.50	2.35	0.0	

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Link Summary
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Name	From Node	To Node	Type	Length	% Slope	Roughness
1	EX._STMMH_1_(STM)	OUT16389	CONDUIT	15.6	0.3206	0.0130
11	EX-CB100-101	DR-SD	CONDUIT	57.3	1.3785	0.0160
12	LD-TD01	MH419	CONDUIT	16.3	0.1231	0.0130
16	EX-CB100-101	CBMH401-402	CONDUIT	53.2	1.1647	0.0160
17	4	CBMH401-402	CONDUIT	37.1	2.5618	0.0160
18	4	CBMH402	CONDUIT	21.6	0.9275	0.0160
19	5	CBMH402	CONDUIT	23.8	1.6834	0.0160
20	3	CBMH401-402	CONDUIT	65.0	1.7681	0.0160
21	5	CB403	CONDUIT	26.3	1.3318	0.0160
22	6	CB403	CONDUIT	29.5	1.5234	0.0160
23	6	CBMH406	CONDUIT	15.1	1.3253	0.0160
24	7	CBMH406	CONDUIT	7.3	1.3644	0.0160
25	7	CB405	CONDUIT	23.0	2.1331	0.0160
26	3	CBMH401-404	CONDUIT	20.8	0.9605	0.0160
27	8	CBMH401-404	CONDUIT	19.6	1.0194	0.0160
28	8	CBMH404-405	CONDUIT	20.3	0.9859	0.0160
29	9	CBMH404-405	CONDUIT	16.0	1.2538	0.0160
30	9	CB405	CONDUIT	24.0	2.0389	0.0160
31	CB405	CBMH408-406	CONDUIT	33.8	3.4352	0.0160
32	2	CBMH408-406	CONDUIT	130.1	0.9070	0.0160
33	2	CB410	CONDUIT	85.9	0.6754	0.0160
34	2	CBMH413	CONDUIT	88.6	0.5980	0.0160
35	CB410	EX-CBMH01	CONDUIT	86.9	1.6221	0.0160
36	CBMH413	EX-CB03	CONDUIT	81.0	1.9151	0.0160
37	EX-CB03	EX-CB02	CONDUIT	75.9	3.1379	0.0160
38	20	21	CONDUIT	68.2	2.0639	0.0130
38_1	EX-CBMH01	21	CONDUIT	25.1	3.1737	0.0160
38_3	21	EX-CB01	CONDUIT	51.4	3.1766	0.0160
39	13	CBMH401-402	CONDUIT	48.2	2.0756	0.0130
40	13	CB401	CONDUIT	28.0	2.3237	0.0130

41	12	CB401	CONDUIT	28.5	1.9311	0.0130
42	12	EX-CB301	CONDUIT	10.5	0.9566	0.0130
43	11	EX-CB301	CONDUIT	13.1	1.5258	0.0130
44	11	EX-CBMH301	CONDUIT	12.3	0.4063	0.0130
45	10	EX-CBMH301	CONDUIT	35.0	0.6293	0.0130
46	10	EX_CB_XXZ_(STM)	CONDUIT	19.8	1.5117	0.0130
47	14	EX_CB_XXZ_(STM)	CONDUIT	44.8	3.0824	0.0130
48	14	EX-CBMH_XYY	CONDUIT	29.0	2.3101	0.0130
49	LD-TD02	CBMH409	CONDUIT	3.6	1.1112	0.0130
49_1	EX-CBMH_XYY	1	CONDUIT	15.5	1.7339	0.0130
49_2	1	EX-CB_XYY	CONDUIT	15.7	1.7313	0.0130
50	20	CICB404	CONDUIT	11.7	0.8581	0.0130
51	19	CICB404	CONDUIT	17.9	0.2801	0.0130
52	19	CICB403	CONDUIT	32.8	0.9139	0.0130
53	22	CICB403	CONDUIT	25.4	1.5769	0.0130
54	22	CB402	CONDUIT	14.8	0.3377	0.0130
55	CB413	CB402	CONDUIT	33.2	2.1106	0.0130
56	18	CB413	CONDUIT	43.0	2.9100	0.0130
57	18	EX-CBMH_XXX	CONDUIT	26.4	0.7966	0.0130
58	17	EX-CBMH_XXX	CONDUIT	11.2	1.8750	0.0130
59	17	EX-CBMH302	CONDUIT	9.7	1.5544	0.0130
60	16	EX-CBMH302	CONDUIT	20.9	0.9552	0.0130
61	16	EX-CBMH_XYZ	CONDUIT	24.1	1.7842	0.0130
62	15	EX-CBMH_XYZ	CONDUIT	32.5	0.7068	0.0130
63	15	EX-CB_XYY	CONDUIT	10.2	0.5911	0.0130
64	EX-CB_XYU	10	CONDUIT	5.0	2.8011	0.0160
65	EX-CB_XZY	EX-CB_XZZ	CONDUIT	5.0	0.0061	0.0160
66	EX-CB_XZZ	EX-CB_XZZa	CONDUIT	25.8	0.0012	0.0160
67	EX-CB_XZZa	CB401	CONDUIT	5.0	4.8055	0.0160
68	EX-CB132	EX-CB_XZY	CONDUIT	5.0	0.0061	0.0160
69	EX-CBMH048	Structure_-_(68)_(1)_(STM)	CONDUIT		11.7	0.5133	0.0130
70	EX_CB_1_(STM)	EX-CBMH048	CONDUIT	5.0	6.2120	0.0130
72	CB407	EX_CBMH_14_(STM)	CONDUIT	5.0	0.0061	0.0160
73	EX_CBMH_14_(STM)	EX_CBMH_10_(STM)	CONDUIT	5.0	0.0061	0.0160
74	EX_CBMH_10_(STM)	2	CONDUIT	5.0	1.4001	0.0160
75	EX_CBMH12	EX_CBMH_11_(STM)	CONDUIT	5.0	0.0061	0.0160
76	EX_CBMH_11_(STM)	EX_CBMH_10_(STM)	CONDUIT	5.0	90.2526	0.0160
77	EX-CB132	EX-CB_XZZa	CONDUIT	5.0	0.0061	0.0160
79	EX-CB02	23	CONDUIT	8.4	0.7154	0.0160
80	EX-CB01	24	CONDUIT	11.1	0.5387	0.0160
81	EX-CBMH008	MH421	CONDUIT	35.9	1.6994	0.0130
Pipe_-_(1)_(1)_(STM)	EX-CB305	MH425	CONDUIT	13.6	0.6627	0.0130
Pipe_-_(1)_(STM)	EX-STMMH_XXX	MH425	CONDUIT	16.9	1.0070	0.0130
Pipe_-_(10)_(1)_(1)_(STM)	EX_CB_XXZ_(STM)	EX-CBMH_XYY	CONDUIT		71.8	0.7794	0.0130
Pipe_-_(10)_(1)_(2)_(_(1)_(1)_(2)_(STM)	ROOF-03	MH419	CONDUIT		2.0	1.0001	0.0130
Pipe_-_(10)_(1)_(2)_(_(1)_(1)_(STM)	MH419	MH418	CONDUIT		8.0	0.2488	0.0130
Pipe_-_(10)_(1)_(2)_(_(2)_(1)_(STM)	ROOF-02	Structure_-_(48)_(5)_(STM)	CONDUIT		20.0	0.7499	0.0130
Pipe_-_(10)_(1)_(2)_(_(2)_(STM)	ROOF-01	EX_STMMH_302_(STM)	CONDUIT		24.7	0.9698	0.0130
Pipe_-_(10)_(1)_(2)_(1)_(STM)	EX-CB004	EX-CBMH003	CONDUIT		18.4	0.9760	0.0130
Pipe_-_(10)_(1)_(2)_(100)_(4)_(STM)	EX_STMMH_302_(STM)	Structure_-_(48)_(5)_(STM)	CONDUIT		14.8	1.0129	0.0130
Pipe_-_(10)_(1)_(2)_(103)_(STM)	MH422	MH420	CONDUIT		18.5	0.4859	0.0130
Pipe_-_(10)_(1)_(2)_(104)_(STM)	Structure_-_(48)_(5)_(STM)	MH418	CONDUIT		10.0	0.2002	0.0130
Pipe_-_(10)_(1)_(2)_(11)_(STM)	EX-CBMH302	EX-CBMH_XXX	CONDUIT		20.7	1.0167	0.0130
Pipe_-_(10)_(1)_(2)_(15)_(STM)	EX-CBMH_XXX	EX-STMMH_XXX	CONDUIT		34.6	1.0969	0.0130
Pipe_-_(10)_(1)_(2)_(16)_(STM)	EX-CB304	EX-CB305	CONDUIT		14.0	0.7150	0.0130
Pipe_-_(10)_(1)_(2)_(2)_(STM)	ROOF-10	EX-CBMH003	CONDUIT		8.5	0.9400	0.0130
Pipe_-_(10)_(1)_(2)_(22)_(STM)	MH426	MH427	CONDUIT		53.0	0.5093	0.0130
Pipe_-_(10)_(1)_(2)_(27)_(STM)	MH428	OGS_#1_(3600Ø)_(STM)	CONDUIT		14.2	0.9868	0.0130
Pipe_-_(10)_(1)_(2)_(28)_(STM)	OGS_#1_(3600Ø)_(STM)	MH424	CONDUIT		7.0	1.0067	0.0130
Pipe_-_(10)_(1)_(2)_(3)_(STM)	EX-CBMH003	EX-MH001	CONDUIT		20.7	0.5805	0.0130

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  Pipe_-_(10)_(1)_(2)_(31)_(STM) MH424            OUT13772         CONDUIT
99.0    0.2021    0.0130
  Pipe_-_(10)_(1)_(2)_(32)_(STM) OGS_#2_(3600Ø)_(STM) MH424            CONDUIT
50.1    0.1397    0.0130
  Pipe_-_(10)_(1)_(2)_(33)_(STM) MH423            OGS_#2_(3600Ø)_(STM) CONDUIT
17.2    0.1742    0.0130
  Pipe_-_(10)_(1)_(2)_(35)_(1)_(STM) CB409            CBMH411          CONDUIT
41.2    0.9952    0.0130
  Pipe_-_(10)_(1)_(2)_(35)_(2)_(STM) CBMH411          CBMH412          CONDUIT
16.4    0.4865    0.0130
  Pipe_-_(10)_(1)_(2)_(35)_(STM) CBMH413          MH417            CONDUIT
19.2    0.9887    0.0130
  Pipe_-_(10)_(1)_(2)_(39)_(STM) EX-CB03          EX-CBMH01        CONDUIT
7.1     1.1265    0.0130
  Pipe_-_(10)_(1)_(2)_(4)_(STM) EX-CBMH_XYY      EX-CB_XYY        CONDUIT
30.8    0.9728    0.0130
  Pipe_-_(10)_(1)_(2)_(40)_(2)_(STM) EX-CBMH01        EX._STMMH_1_(STM) CONDUIT
82.6    2.0945    0.0130
  Pipe_-_(10)_(1)_(2)_(45)_(STM) EX-DICB001-002   EX-CB130         CONDUIT
38.9    1.0022    0.0130
  Pipe_-_(10)_(1)_(2)_(46)_(STM) EX-CB130         EX-CB129         CONDUIT
18.5    2.7623    0.0130
  Pipe_-_(10)_(1)_(2)_(48)_(STM) EX-CB150         EX-CBMH_XZY      CONDUIT
20.7    0.2412    0.0130
  Pipe_-_(10)_(1)_(2)_(49)_(STM) EX-CBMH_XXZ      EX-CB150         CONDUIT
13.8    0.7989    0.0130
  Pipe_-_(10)_(1)_(2)_(5)_(STM) EX-CB_XYY        EX-CBMH_XYZ      CONDUIT
41.8    1.0051    0.0130
  Pipe_-_(10)_(1)_(2)_(50)_(STM) EX-MH_XXZ        EX-CBMH_XXZ      CONDUIT
33.0    0.3631    0.0130
  Pipe_-_(10)_(1)_(2)_(52)_(STM) EX-CB_XZY        EX-CB132         CONDUIT
22.9    1.0022    0.0130
  Pipe_-_(10)_(1)_(2)_(54)_(STM) EX-CB_XZZ        EX-CB_XZZa       CONDUIT
23.0    0.9573    0.0130
  Pipe_-_(10)_(1)_(2)_(55)_(STM) EX-CBMH_XZY      EX-MH_XZY        CONDUIT
11.8    0.1691    0.0130
  Pipe_-_(10)_(1)_(2)_(57)_(STM) EX-CB301         EX-MH_XZY        CONDUIT
8.6     4.7623    0.0130
  Pipe_-_(10)_(1)_(2)_(58)_(STM) EX-MH_XZY        EX-CBMH_XZZ      CONDUIT
44.5    0.1799    0.0130
  Pipe_-_(10)_(1)_(2)_(59)_(STM) EX-CBMH_XZZ      MH401            CONDUIT
15.0    0.1998    0.0130
  Pipe_-_(10)_(1)_(2)_(61)_(STM) EX-CB100-101     MH403            CONDUIT
64.1    0.9981    0.0130
  Pipe_-_(10)_(1)_(2)_(63)_(STM) CBMH401-402      MH403            CONDUIT
19.1    0.5223    0.0130
  Pipe_-_(10)_(1)_(2)_(64)_(STM) MH403            MH402            CONDUIT
14.4    0.4873    0.0130
  Pipe_-_(10)_(1)_(2)_(66)_(STM) CB401            MH401            CONDUIT
19.1    0.9959    0.0130
  Pipe_-_(10)_(1)_(2)_(7)_(STM) EX-CBMH_XYZ      EX-CBMH302       CONDUIT
44.9    1.0244    0.0130
  Pipe_-_(10)_(1)_(2)_(70)_(STM) ROOF-09          EX-MH301         CONDUIT
11.6    1.0354    0.0130
  Pipe_-_(10)_(1)_(2)_(71)_(STM) EX-MH301         EX-CBMH301       CONDUIT
28.0    0.5000    0.0130
  Pipe_-_(10)_(1)_(2)_(72)_(STM) EX-CBMH301       EX-CBMH_XZY      CONDUIT
28.8    2.9880    0.0130
  Pipe_-_(10)_(1)_(2)_(73)_(STM) ROOF-08          CBMH403          CONDUIT
9.5     1.0557    0.0130
  Pipe_-_(10)_(1)_(2)_(74)_(STM) CBMH403          CBMH402          CONDUIT
18.1    0.9922    0.0130
  Pipe_-_(10)_(1)_(2)_(76)_(STM) CB403            MH406            CONDUIT
7.3     0.9528    0.0130
  Pipe_-_(10)_(1)_(2)_(79)_(STM) ROOF-07          MH406            CONDUIT
17.6    1.0244    0.0130
  Pipe_-_(10)_(1)_(2)_(8)_(STM) ROOF-11          EX-CBMH_XYZ      CONDUIT
16.7    1.0161    0.0130
  Pipe_-_(10)_(1)_(2)_(80)_(STM) CBMH406          MH407            CONDUIT
28.3    0.2120    0.0130
  Pipe_-_(10)_(1)_(2)_(82)_(STM) MH406            MH405            CONDUIT
17.8    1.0122    0.0130
  Pipe_-_(10)_(1)_(2)_(89)_(1)_(STM) ROOF-04          MH421            CONDUIT
1.2     0.8489    0.0130
  Pipe_-_(10)_(1)_(2)_(89)_(STM) ROOF-06          CBMH406          CONDUIT
19.7    0.6096    0.0130
  Pipe_-_(10)_(1)_(2)_(94)_(1)_(4)_(STM) MH410            MH407            CONDUIT
26.3    0.3419    0.0130
  Pipe_-_(10)_(1)_(2)_(98)_(STM) MH416            MH417            CONDUIT
38.5    0.2601    0.0130
  Pipe_-_(10)_(1)_(2)_(99)_(STM) CB408            CBMH410          CONDUIT
25.1    0.9947    0.0130
  Pipe_-_(10)_(1)_(2)_(STM) EX-MH001         EX-CBMH_XYY      CONDUIT
13.4    2.6146    0.0130
  Pipe_-_(11)_(STM) MH427            MH428            CONDUIT           18.8
1.0113    0.0130
  Pipe_-_(12)_(STM) MH417            MH423            CONDUIT           35.0
0.1429    0.0130
  Pipe_-_(14)_(1)_(2)_(STM) CBMH410          MH417            CONDUIT
51.0    0.1960    0.0130
  Pipe_-_(14)_(1)_(STM) MH420            CBMH410          CONDUIT           19.4
0.2065    0.0130
  Pipe_-_(15)_(STM) MH418            MH420            CONDUIT           51.8
0.1545    0.0130
  Pipe_-_(16)_(1)_(STM) MH421            CBMH409          CONDUIT           11.2
0.3587    0.0130
  Pipe_-_(16)_(STM) CBMH409          MH422            CONDUIT           20.8
0.4796    0.0130
  Pipe_-_(17)_(1)_(2)_(STM) EX_CBMH_11_(STM) EX_CBMH_10_(STM) CONDUIT
37.9    0.2111    0.0130
  Pipe_-_(17)_(1)_(3)_(3)_(STM) EX_CBMH_14_(STM) EX_CBMH_10_(STM) CONDUIT
25.6    0.3514    0.0130
  Pipe_-_(17)_(1)_(3)_(STM) EX_CBMH12        EX_CBMH_11_(STM) CONDUIT
34.3    0.3503    0.0130
  Pipe_-_(17)_(2)_(STM) CB407            EX_CBMH_14_(STM) CONDUIT           23.4
0.9844    0.0130
  Pipe_-_(17)_(3)_(STM) MH415            MH416            CONDUIT           40.5
0.2467    0.0130
  Pipe_-_(17)_(4)_(STM) MH413            MH414            CONDUIT           23.0
0.2175    0.0130
  Pipe_-_(17)_(STM) MH414            MH415            CONDUIT           32.4
0.2467    0.0130
  Pipe_-_(18)_(STM) MH412            MH413            CONDUIT           39.1
0.2555    0.0130
  Pipe_-_(19)_(STM) MH411            MH412            CONDUIT           30.2
0.2649    0.0130
  Pipe_-_(20)_(4)_(STM) CBMH407          MH411            CONDUIT           14.5
0.2750    0.0130
  Pipe_-_(20)_(STM) MH407            CBMH407          CONDUIT           33.7
0.2376    0.0130
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Pipe_-_(22)_(STM)	CBMH404-405	CBMH406	CONDUIT	20.4	0.1958 0.0130
Pipe_-_(24)_(STM)	MH405	CBMH404-405	CONDUIT	26.4	0.1893 0.0130
Pipe_-_(25)_(STM)	CBMH401-404	MH405	CONDUIT	13.4	0.9674 0.0130
Pipe_-_(26)_(STM)	MH404	CBMH401-404	CONDUIT	42.2	0.4973 0.0130
Pipe_-_(27)_(STM)	CBMH402	MH404	CONDUIT	22.1	0.4982 0.0130
Pipe_-_(28)_(STM)	MH402	CBMH402	CONDUIT	34.9	0.3439 0.0130
Pipe_-_(29)_(STM)	MH401	MH402	CONDUIT	24.5	0.2445 0.0130
Pipe_-_(9)_(1)_(STM)	TD01	MH410	CONDUIT	12.3	0.9719 0.0130
Pipe_-_(9)_(STM)	MH425	MH426	CONDUIT	57.2	0.9969 0.0130
OCB01	EX_CB_1_(STM)	EX_STMMH_302_(STM)	ORIFICE		
OCB0408-406	CBMH408-406	CBMH407	ORIFICE		
OCB10	EX_CBMH_10_(STM)	MH415	ORIFICE		
OCB129	EX-CB129	EX-CB150	ORIFICE		
OCB132	EX-CB132	EX-MH_XXZ	ORIFICE		
OCB303	EX-CBMH303	EX-CBMH302	ORIFICE		
OCB402	CB402	MH426	ORIFICE		
OCB403	CICB403	MH426	ORIFICE		
OCB404	CICB404	OGS_#1_(3600Ø)_(STM)	ORIFICE		
OCB405	CB405	MH407	ORIFICE		
OCB410	CB410	MH417	ORIFICE		
OCB411	CB411	MH423	ORIFICE		
OCB412	CB412	OGS_#2_(3600Ø)_(STM)	ORIFICE		
OCB413	CB413	MH425	ORIFICE		
OCB414	CB414	EX-CBMH01	ORIFICE		
OCBLD01	EX-LD01	EX._STMMH_1_(STM)	ORIFICE		
OCBMH048	Structure_-_(68)_(1)_(STM)	MH418	ORIFICE		
OCBMH412	CBMH412	CBMH413	ORIFICE		
OCBXYU	EX-CB_XYU	EX_CB_XXZ_(STM)	ORIFICE		
OCBXZZa	EX-CB_XZZa	EX-MH_XXZ	ORIFICE		
O-TANK01	TANK01	MH426	ORIFICE		
O-TANK02	TANK02	MH427	ORIFICE		
78	P4-06-STOR	LD-TD01	WEIR		
82	P3-01-STOR	P4-04-STOR	WEIR		
EX-A3-01&02-OVF	EX-A3-01&02-STOR	CBMH409	WEIR		
EX-R02-OVF	EX-R02-STOR	CBMH406	WEIR		
EX-R03-OVF	EX-R03-STOR	P4-05-stor	WEIR		
EX-R1-OVF	EX-R1-STOR	EX-CBMH_XYZ	WEIR		
P3-03-OVF	P3-03-STOR	EX-CBMH301	WEIR		
P4-02-OVF	P4-02-STOR	CB403	WEIR		
P4-03-OVF	P4-03-STOR	TD01	WEIR		
P4-04-OVF	P4-04-STOR	EX_CB_1_(STM)	WEIR		
P4-05-OVF	P4-05-stor	P4-06-STOR	WEIR		
13	EX-CB01	EX._STMMH_1_(STM)	OUTLET		
14	EX-CB02	EX._STMMH_1_(STM)	OUTLET		
EX-A04-STOR_out	EX-A04-STOR	ROOF-03	OUTLET		
EX-A3-01&02-STOR_out	EX-A3-01&02-STOR	ROOF-04	OUTLET		
EX-R02-STOR_out	EX-R02-STOR	ROOF-06	OUTLET		
EX-R03-STOR_out	EX-R03-STOR	ROOF-02	OUTLET		
EX-R1-STOR_out	EX-R1-STOR	ROOF-11	OUTLET		
P3-01-STOR_out	P3-01-STOR	ROOF-01	OUTLET		
P3-02-STOR_out	P3-02-STOR	ROOF-03	OUTLET		
P3-03-STOR_out	P3-03-STOR	ROOF-09	OUTLET		
P4-01-STOR_out	P4-01-STOR	ROOF-08	OUTLET		
P4-02-STOR_out	P4-02-STOR	ROOF-07	OUTLET		
P4-03-STOR_out	P4-03-STOR	MH410	OUTLET		
P4-04-STOR_out	P4-04-STOR	ROOF-01	OUTLET		
P4-05-STOR_out	P4-05-stor	ROOF-02	OUTLET		
P4-06-STOR_out	P4-06-STOR	ROOF-03	OUTLET		
P4-07-STOR_out	P4-07-STOR	ROOF-04	OUTLET		

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1	CIRCULAR	0.35	0.10	0.09	0.35	1	82.60
11	RECT_OPEN	0.35	3.50	0.33	10.00	1	12193.56
12	CIRCULAR	0.30	0.07	0.08	0.30	1	35.45
16	RECT_OPEN	0.35	3.50	0.33	10.00	1	11208.26
17	RECT_OPEN	0.35	3.50	0.33	10.00	1	16622.86
18	RECT_OPEN	0.35	3.50	0.33	10.00	1	10001.84
19	RECT_OPEN	0.35	3.50	0.33	10.00	1	13474.80
20	RECT_OPEN	0.35	3.50	0.33	10.00	1	13809.87
21	RECT_OPEN	0.35	3.50	0.33	10.00	1	11985.45
22	RECT_OPEN	0.35	3.50	0.33	10.00	1	12818.42
23	RECT_OPEN	0.35	3.50	0.33	10.00	1	11956.14
24	RECT_OPEN	0.35	3.50	0.33	10.00	1	12131.06
25	RECT_OPEN	0.35	3.50	0.33	10.00	1	15168.10
26	RECT_OPEN	0.35	3.50	0.33	10.00	1	10178.50
27	RECT_OPEN	0.35	3.50	0.33	10.00	1	10485.94
28	RECT_OPEN	0.35	3.50	0.33	10.00	1	10312.10
29	RECT_OPEN	0.35	3.50	0.33	10.00	1	11628.97
30	RECT_OPEN	0.35	3.50	0.33	10.00	1	14829.43
31	RECT_OPEN	0.35	3.50	0.33	10.00	1	19248.91

32	RECT_OPEN	0.35	3.50	0.33	10.00	1
9890.81						
33	RECT_OPEN	0.35	1.75	0.31	5.00	1
4091.11						
34	RECT_OPEN	0.35	1.75	0.31	5.00	1
3849.59						
35	RECT_OPEN	0.35	1.75	0.31	5.00	1
6340.03						
36	RECT_OPEN	0.35	1.75	0.31	5.00	1
6888.86						
37	RECT_OPEN	0.35	1.75	0.31	5.00	1
8818.06						
38	RECT_OPEN	0.35	3.50	0.33	10.00	1
18363.52						
38_1	RECT_OPEN	0.35	1.75	0.31	5.00	1
8868.26						
38_3	RECT_OPEN	0.35	1.75	0.31	5.00	1
8872.27						
39	RECT_OPEN	0.35	3.50	0.33	10.00	1
18415.34						
40	RECT_OPEN	0.35	3.50	0.33	10.00	1
19484.91						
41	RECT_OPEN	0.35	3.50	0.33	10.00	1
17762.87						
42	RECT_OPEN	0.35	3.50	0.33	10.00	1
12501.89						
43	RECT_OPEN	0.35	3.50	0.33	10.00	1
15789.29						
44	RECT_OPEN	0.35	3.50	0.33	10.00	1
8148.04						
45	RECT_OPEN	0.35	3.50	0.33	10.00	1
10140.27						
46	RECT_OPEN	0.35	3.50	0.33	10.00	1
15716.11						
47	RECT_OPEN	0.35	3.50	0.33	10.00	1
22441.62						
48	RECT_OPEN	0.35	3.50	0.33	10.00	1
19427.68						
49	CIRCULAR	0.25	0.05	0.06	0.25	1
62.69						
49_1	RECT_OPEN	0.35	3.50	0.33	10.00	1
16831.25						
49_2	RECT_OPEN	0.35	3.50	0.33	10.00	1
16818.78						
50	RECT_OPEN	0.35	3.50	0.33	10.00	1
11840.70						
51	RECT_OPEN	0.35	3.50	0.33	10.00	1
6764.52						
52	RECT_OPEN	0.35	3.50	0.33	10.00	1
12219.72						
53	RECT_OPEN	0.35	3.50	0.33	10.00	1
16051.38						
54	RECT_OPEN	0.35	3.50	0.33	10.00	1
7427.79						
55	RECT_OPEN	0.35	3.50	0.33	10.00	1
18569.72						
56	RECT_OPEN	0.35	3.50	0.33	10.00	1
21804.75						
57	RECT_OPEN	0.35	3.50	0.33	10.00	1
11408.44						
58	RECT_OPEN	0.35	3.50	0.33	10.00	1
17502.78						
59	RECT_OPEN	0.35	3.50	0.33	10.00	1
15936.49						
60	RECT_OPEN	0.35	3.50	0.33	10.00	1
12492.33						
61	RECT_OPEN	0.35	3.50	0.33	10.00	1
17073.84						
62	RECT_OPEN	0.35	3.50	0.33	10.00	1
10746.02						
63	RECT_OPEN	0.35	3.50	0.33	10.00	1
9827.25						
64	RECT_OPEN	0.35	1.75	0.31	5.00	1
8331.38						
65	RECT_OPEN	0.35	1.75	0.31	5.00	1
388.67						
66	RECT_OPEN	0.35	1.75	0.31	5.00	1
171.22						
67	RECT_OPEN	0.35	1.75	0.31	5.00	1
10912.50						
68	RECT_OPEN	0.35	1.75	0.31	5.00	1
388.67						
69	CIRCULAR	1.52	1.82	0.38	1.52	1
5283.61						
70	RECT_OPEN	0.35	3.50	0.33	10.00	1
31858.18						
72	RECT_OPEN	0.35	3.50	0.33	10.00	1
810.87						
73	RECT_OPEN	0.35	3.50	0.33	10.00	1
810.87						
74	RECT_OPEN	0.35	3.50	0.33	10.00	1
12288.98						
75	RECT_OPEN	0.35	3.50	0.33	10.00	1
810.87						
76	RECT_OPEN	0.35	3.50	0.33	10.00	1
98664.33						
77	RECT_OPEN	0.35	1.75	0.31	5.00	1
388.67						
79	RECT_OPEN	0.35	1.75	0.31	5.00	1
4210.47						
80	RECT_OPEN	0.35	1.75	0.31	5.00	1
3653.50						
81	CIRCULAR	0.25	0.05	0.06	0.25	1
77.53						
Pipe_-_(1)_(1)_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	
1 50.51						
Pipe_-_(1)_(STM)	CIRCULAR	0.53	0.22	0.13	0.53	1
449.35						
Pipe_-_(10)_(1)_(1)_(STM)	CIRCULAR	0.30	0.07	0.08	0.30	
1 89.23						
Pipe_-_(10)_(1)_(2)_(_(1)_(1)_(2)_(STM)	CIRCULAR	0.30	0.07			
0.08 0.30 1 101.07						
Pipe_-_(10)_(1)_(2)_(_(1)_(1)_(STM)	CIRCULAR	0.53	0.22	0.13		
0.53 1 223.36						
Pipe_-_(10)_(1)_(2)_(_(2)_(1)_(STM)	CIRCULAR	0.38	0.11	0.10		
0.38 1 158.41						
Pipe_-_(10)_(1)_(2)_(_(2)_(STM)	CIRCULAR	0.40	0.13	0.10		
0.40 1 205.10						
Pipe_-_(10)_(1)_(2)_(1)_(STM)	CIRCULAR	0.20	0.03	0.05		
0.20 1 32.40						

Pipe_-_(10)_(1)_(2)_(100)_(4)_(STM) CIRCULAR 0.53 0.22 0.13 0.53 1 450.68
Pipe_-_(10)_(1)_(2)_(103)_(STM) CIRCULAR 0.38 0.11 0.10 0.38 1 127.51
Pipe_-_(10)_(1)_(2)_(104)_(STM) CIRCULAR 0.53 0.22 0.13 0.53 1 200.37
Pipe_-_(10)_(1)_(2)_(11)_(STM) CIRCULAR 0.46 0.16 0.11 0.46 1 299.58
Pipe_-_(10)_(1)_(2)_(15)_(STM) CIRCULAR 0.46 0.16 0.11 0.46 1 311.16
Pipe_-_(10)_(1)_(2)_(16)_(STM) CIRCULAR 0.25 0.05 0.06 0.25 1 52.46
Pipe_-_(10)_(1)_(2)_(2)_(STM) CIRCULAR 0.20 0.03 0.05 0.20 1 31.80
Pipe_-_(10)_(1)_(2)_(22)_(STM) CIRCULAR 0.53 0.22 0.13 0.53 1 319.58
Pipe_-_(10)_(1)_(2)_(27)_(STM) CIRCULAR 0.69 0.37 0.17 0.69 1 871.86
Pipe_-_(10)_(1)_(2)_(28)_(STM) CIRCULAR 0.69 0.37 0.17 0.69 1 880.59
Pipe_-_(10)_(1)_(2)_(3)_(STM) CIRCULAR 0.20 0.03 0.05 0.20 1 24.99
Pipe_-_(10)_(1)_(2)_(31)_(STM) CIRCULAR 0.91 0.66 0.23 0.91 1 847.99
Pipe_-_(10)_(1)_(2)_(32)_(STM) CIRCULAR 0.91 0.66 0.23 0.91 1 705.02
Pipe_-_(10)_(1)_(2)_(33)_(STM) CIRCULAR 0.91 0.66 0.23 0.91 1 787.36
Pipe_-_(10)_(1)_(2)_(35)_(1)_(STM) CIRCULAR 0.20 0.03 0.05 0.20 1 32.72
Pipe_-_(10)_(1)_(2)_(35)_(2)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 70.49
Pipe_-_(10)_(1)_(2)_(35)_(STM) CIRCULAR 0.38 0.11 0.10 0.38 1 181.88
Pipe_-_(10)_(1)_(2)_(39)_(STM) CIRCULAR 0.25 0.05 0.06 0.25 1 65.85
Pipe_-_(10)_(1)_(2)_(4)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 99.68
Pipe_-_(10)_(1)_(2)_(40)_(2)_(STM) CIRCULAR 0.38 0.11 0.10 0.38 1 264.73
Pipe_-_(10)_(1)_(2)_(45)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 101.17
Pipe_-_(10)_(1)_(2)_(46)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 167.97
Pipe_-_(10)_(1)_(2)_(48)_(STM) CIRCULAR 0.46 0.16 0.11 0.46 1 145.92
Pipe_-_(10)_(1)_(2)_(49)_(STM) CIRCULAR 0.38 0.11 0.10 0.38 1 163.49
Pipe_-_(10)_(1)_(2)_(5)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 101.32
Pipe_-_(10)_(1)_(2)_(50)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 60.90
Pipe_-_(10)_(1)_(2)_(52)_(STM) CIRCULAR 0.20 0.03 0.05 0.20 1 32.84
Pipe_-_(10)_(1)_(2)_(54)_(STM) CIRCULAR 0.20 0.03 0.05 0.20 1 32.09
Pipe_-_(10)_(1)_(2)_(55)_(STM) CIRCULAR 0.53 0.22 0.13 0.53 1 184.13
Pipe_-_(10)_(1)_(2)_(57)_(STM) CIRCULAR 0.20 0.03 0.05 0.20 1 71.58
Pipe_-_(10)_(1)_(2)_(58)_(STM) CIRCULAR 0.53 0.22 0.13 0.53 1 189.91
Pipe_-_(10)_(1)_(2)_(59)_(STM) CIRCULAR 0.53 0.22 0.13 0.53 1 200.17
Pipe_-_(10)_(1)_(2)_(61)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 100.97
Pipe_-_(10)_(1)_(2)_(63)_(STM) CIRCULAR 0.25 0.05 0.06 0.25 1 44.84
Pipe_-_(10)_(1)_(2)_(64)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 70.55
Pipe_-_(10)_(1)_(2)_(66)_(STM) CIRCULAR 0.20 0.03 0.05 0.20 1 32.73
Pipe_-_(10)_(1)_(2)_(7)_(STM) CIRCULAR 0.46 0.16 0.11 0.46 1 300.70
Pipe_-_(10)_(1)_(2)_(70)_(STM) CIRCULAR 0.25 0.05 0.06 0.25 1 63.13
Pipe_-_(10)_(1)_(2)_(71)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 71.47
Pipe_-_(10)_(1)_(2)_(72)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 174.70
Pipe_-_(10)_(1)_(2)_(73)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 103.84
Pipe_-_(10)_(1)_(2)_(74)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 100.67
Pipe_-_(10)_(1)_(2)_(76)_(STM) CIRCULAR 0.20 0.03 0.05 0.20 1 32.02
Pipe_-_(10)_(1)_(2)_(79)_(STM) CIRCULAR 0.38 0.11 0.10 0.38 1 185.14
Pipe_-_(10)_(1)_(2)_(8)_(STM) CIRCULAR 0.15 0.02 0.04 0.15 1 15.35
Pipe_-_(10)_(1)_(2)_(80)_(STM) CIRCULAR 0.69 0.37 0.17 0.69 1 404.10
Pipe_-_(10)_(1)_(2)_(82)_(STM) CIRCULAR 0.38 0.11 0.10 0.38 1 184.03
Pipe_-_(10)_(1)_(2)_(89)_(1)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 93.12
Pipe_-_(10)_(1)_(2)_(89)_(STM) CIRCULAR 0.38 0.11 0.10 0.38 1 142.82
Pipe_-_(10)_(1)_(2)_(94)_(1)_(4)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 59.09
Pipe_-_(10)_(1)_(2)_(98)_(STM) CIRCULAR 0.84 0.55 0.21 0.84 1 763.23
Pipe_-_(10)_(1)_(2)_(99)_(STM) CIRCULAR 0.20 0.03 0.05 0.20 1 32.71
Pipe_-_(10)_(1)_(2)_(STM) CIRCULAR 0.20 0.03 0.05 0.20 1 53.04
Pipe_-_(11)_(STM) CIRCULAR 0.69 0.37 0.17 0.69 1 882.63
Pipe_-_(12)_(STM) CIRCULAR 0.91 0.66 0.23 0.91 1 713.02
Pipe_-_(14)_(1)_(2)_(STM) CIRCULAR 0.84 0.55 0.21 0.84 1 662.57
Pipe_-_(14)_(1)_(STM) CIRCULAR 0.76 0.46 0.19 0.76 1 527.74
Pipe_-_(15)_(STM) CIRCULAR 0.76 0.46 0.19 0.76 1 456.53
Pipe_-_(16)_(1)_(STM) CIRCULAR 0.30 0.07 0.08 0.30 1 60.52
Pipe_-_(16)_(STM) CIRCULAR 0.38 0.11 0.10 0.38 1 126.69

```
  Pipe_-_(17)_(1)_(2)_(STM) CIRCULAR             1.52     1.82     0.38     1.52
1  3388.33
  Pipe_-_(17)_(1)_(3)_(3)_(STM) CIRCULAR             0.30     0.07     0.08
0.30       1    59.91
  Pipe_-_(17)_(1)_(3)_(STM) CIRCULAR             0.30     0.07     0.08     0.30
1    59.82
  Pipe_-_(17)_(2)_(STM) CIRCULAR             0.25     0.05     0.06     0.25
1    61.56
  Pipe_-_(17)_(3)_(STM) CIRCULAR             0.84     0.55     0.21     0.84
1   743.29
  Pipe_-_(17)_(4)_(STM) CIRCULAR             0.69     0.37     0.17     0.69
1   409.29
  Pipe_-_(17)_(STM) CIRCULAR             0.76     0.46     0.19     0.76        1
576.86
  Pipe_-_(18)_(STM) CIRCULAR             0.69     0.37     0.17     0.69        1
443.63
  Pipe_-_(19)_(STM) CIRCULAR             0.69     0.37     0.17     0.69        1
451.72
  Pipe_-_(20)_(4)_(STM) CIRCULAR             0.69     0.37     0.17     0.69
1   460.28
  Pipe_-_(20)_(STM) CIRCULAR             0.69     0.37     0.17     0.69        1
427.85
  Pipe_-_(22)_(STM) CIRCULAR             0.69     0.37     0.17     0.69        1
388.40
  Pipe_-_(24)_(STM) CIRCULAR             0.69     0.37     0.17     0.69        1
381.89
  Pipe_-_(25)_(STM) CIRCULAR             0.53     0.22     0.13     0.53        1
440.42
  Pipe_-_(26)_(STM) CIRCULAR             0.53     0.22     0.13     0.53        1
315.78
  Pipe_-_(27)_(STM) CIRCULAR             0.53     0.22     0.13     0.53        1
316.06
  Pipe_-_(28)_(STM) CIRCULAR             0.53     0.22     0.13     0.53        1
262.61
  Pipe_-_(29)_(STM) CIRCULAR             0.53     0.22     0.13     0.53        1
221.42
  Pipe_-_(9)_(1)_(STM) CIRCULAR             0.20     0.03     0.05     0.20
1    32.34
  Pipe_-_(9)_(STM) CIRCULAR             0.53     0.22     0.13     0.53        1
447.09


  ***************
  Analysis Options
  ***************
  Flow Units ..... LPS
  Process Models:
    Rainfall/Runoff ..... YES
    RDII ..... NO
    Snowmelt ..... NO
    Groundwater ..... NO
    Flow Routing ..... YES
    Ponding Allowed ..... NO
    Water Quality ..... NO
  Infiltration Method ..... HORTON
  Flow Routing Method ..... DYNWAVE
  Surcharge Method ..... EXTRAN
  Starting Date ..... 10/03/2025 00:00:00
  Ending Date ..... 10/04/2025 00:00:00
  Antecedent Dry Days ..... 0.0
  Report Time Step ..... 00:01:00
  Wet Time Step ..... 00:01:00
  Dry Time Step ..... 00:01:00
  Routing Time Step ..... 2.00 sec
  Variable Time Step ..... YES
  Maximum Trials ..... 8
  Number of Threads ..... 8
  Head Tolerance ..... 0.001500 m


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         1.449        71.667
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.575        28.436
  Surface Runoff ...........         0.860        42.525
  Final Storage ............         0.015         0.744
  Continuity Error (%) .....        -0.053


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------      ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.860         8.603
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         0.857         8.574
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.002         0.023
  Continuity Error (%) .....         0.082


  ************************
  Highest Continuity Errors
  ************************
  Node EX-CB305 (11.08%)
  Node LD-TD01 (10.10%)
  Node ROOF-09 (7.12%)
  Node ROOF-03 (1.90%)


  **************************
  Time-Step Critical Elements
  **************************
  Link Pipe_-_(10)_(1)_(2)_(89)_(1)_(STM) (42.43%)


  ******************************
  Highest Flow Instability Indexes
  ******************************
```

```
  Link OCB132 (90)
  Link OCB129 (88)
  Link P3-03-STOR_out (30)
  Link EX-R03-STOR_out (12)
  Link Pipe_-_(10)_(1)_(2)_(_(2)_(1)_(STM) (11)


  *********************************
  Most Frequent Nonconverging Nodes
  *********************************
  Node 23 (0.15%)
  Node 24 (0.15%)
  Node DR-NW (0.15%)
  Node DR-SD (0.15%)
  Node DR-WD (0.15%)


  ************************
  Routing Time Step Summary
  ************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     1.45 sec
  Maximum Time Step           :     2.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.11
  % of Steps Not Converging   :     0.15
  Time Step Frequencies       :
      2.000 -  1.516 sec      :    56.60 %
      1.516 -  1.149 sec      :     0.41 %
      1.149 -  0.871 sec      :    18.48 %
      0.871 -  0.660 sec      :     6.87 %
      0.660 -  0.500 sec      :    17.64 %


  ***************************
  Subcatchment Runoff Summary
  ***************************

  ------------------------------------------------------------------------------------
-----------------------------------------------
                             Total      Total      Total      Total     Imperv
Perv      Total       Total     Peak  Runoff
                          Precip      Runon       Evap      Infil     Runoff
Runoff     Runoff      Runoff   Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm
mm         mm    10^6 ltr      LPS
  ------------------------------------------------------------------------------------
-----------------------------------------------
  A101                      71.67       0.00       0.00      19.49      40.01
11.34      51.35        0.08    62.89   0.716
  A102                      71.67       0.00       0.00      37.15      16.15
18.04      34.19        0.07    42.41   0.477
  A103                      71.67       0.00       0.00      24.23      32.99
13.77      46.76        0.09    68.64   0.652
  A104                      71.67       0.00       0.00      13.67      49.11
7.84       56.96        0.11    82.60   0.795
  A105                      71.67       0.00       0.00      14.93      47.02
8.73       55.75        0.05    34.90   0.778
  A106                      71.67       0.00       0.00      30.78      23.17
17.25      40.42        0.01     8.51   0.564
  A107                      71.67       0.00       0.00      16.58      44.22
9.95       54.18        0.04    34.27   0.756
  A108                      71.67       0.00       0.00      15.29      46.32
9.09       55.41        0.05    37.66   0.773
  A113                      71.67       0.00       0.00       0.00      70.12
0.00       70.12        0.56   371.50   0.978
  A116a                     71.67       0.00       0.00       0.00      70.16
0.00       70.16        0.03    18.84   0.979
  A116b                     71.67       0.00       0.00       0.00      70.21
0.00       70.21        0.01     8.43   0.980
  A117                      71.67       0.00       0.00       0.00      70.18
0.00       70.18        0.02    11.41   0.979
  A119                      71.67       0.00       0.00      17.32      44.20
9.20       53.40        0.07    46.04   0.745
  A120                      71.67       0.00       0.00      23.65      35.08
12.19      47.28        0.11    73.98   0.660
  A121                      71.67       0.00       0.00       6.19      60.35
3.85       64.20        0.06    48.22   0.896
  A122                      71.67       0.00       0.00      35.55      17.55
18.21      35.76        0.10    67.35   0.499
  A137                      71.67       0.00       0.00      10.13      54.06
6.38       60.44        0.01     9.55   0.843
  B101                      71.67       0.00       0.00      28.08      28.07
14.93      43.01        0.24   167.69   0.600
  B102                      71.67       0.00       0.00      12.19      51.22
7.17       58.39        0.07    55.99   0.815
  B103                      71.67       0.00       0.00      21.86      35.81
13.28      49.09        0.01    12.75   0.685
  B104                      71.67       0.00       0.00      10.77      53.33
6.44       59.77        0.08    62.18   0.834
  B105                      71.67       0.00       0.00      17.02      43.52
10.23      53.75        0.04    33.31   0.750
  B106                      71.67       0.00       0.00      10.22      54.04
6.28       60.32        0.09    72.48   0.842
  B107                      71.67       0.00       0.00      24.62      32.29
14.09      46.38        0.04    29.48   0.647
  B108                      71.67       0.00       0.00       1.75      67.38
1.12       68.50        0.04    25.65   0.956
  B109                      71.67       0.00       0.00      16.54      44.22
9.99       54.22        0.03    22.77   0.757
  B110                      71.67       0.00       0.00      25.08      31.59
14.35      45.94        0.07    55.28   0.641
  B111                      71.67       0.00       0.00       0.00      70.18
0.00       70.18        0.04    27.28   0.979
  B112                      71.67       0.00       0.00      31.75      23.16
16.28      39.44        0.26   175.50   0.550
  B113                      71.67       0.00       0.00      46.98       0.00
24.70      24.70        0.02    15.38   0.345
  B114                      71.67       0.00       0.00       8.14      57.52
4.77       62.29        0.25   180.06   0.869
  B115                      71.67       0.00       0.00       5.80      61.03
3.53       64.56        0.19   138.27   0.901
  B116                      71.67       0.00       0.00      46.78       6.32
18.44      24.76        0.04    18.44   0.346
  B117                      71.67       0.00       0.00      20.01      39.99
10.81      50.81        0.11    76.90   0.709
  B118                      71.67       0.00       0.00      39.13      11.94
20.37      32.31        0.05    35.91   0.451
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B119			71.67	0.00	0.00	30.00	24.57		
16.60	41.17	0.06	46.71	0.574					
B120			71.67	0.00	0.00	13.79	48.44		
8.45	56.88	0.05	40.61	0.794					
B121			71.67	0.00	0.00	18.02	42.11		
10.66	52.78	0.05	37.21	0.736					
B122a			71.67	0.00	0.00	6.72	59.63		
4.04	63.67	0.11	84.22	0.888					
B122b			71.67	0.00	0.00	6.58	59.68		
4.19	63.87	0.00	0.97	0.891					
B122c			71.67	0.00	0.00	6.59	59.67		
4.18	63.85	0.00	0.97	0.891					
B123			71.67	0.00	0.00	13.54	49.12		
7.97	57.09	0.06	47.00	0.797					
B124			71.67	0.00	0.00	0.00	70.18		
0.00	70.18	0.02	11.41	0.979					
B125			71.67	0.00	0.00	10.98	53.31		
6.23	59.54	0.16	115.80	0.831					
B126			71.67	0.00	0.00	26.30	31.57		
13.12	44.70	0.05	33.46	0.624					
B127			71.67	0.00	0.00	24.35	32.99		
13.65	46.64	0.09	71.70	0.651					
B128			71.67	0.00	0.00	32.24	21.06		
17.95	39.01	0.03	25.96	0.544					
B129			71.67	0.00	0.00	44.98	0.00		
26.73	26.73	0.00	4.95	0.373					
B130			71.67	0.00	0.00	17.00	43.52		
10.25	53.77	0.05	37.39	0.750					
B131			71.67	0.00	0.00	13.36	49.13		
8.16	57.29	0.05	42.34	0.799					
B132			71.67	0.00	0.00	8.99	56.13		
5.35	61.48	0.11	82.60	0.858					
B133			71.67	0.00	0.00	30.24	25.97		
14.92	40.88	0.06	38.65	0.570					
B134_1			71.67	0.00	0.00	39.82	7.01		
24.74	31.76	0.01	18.62	0.443					
B134_3			71.67	0.00	0.00	28.80	25.98		
16.37	42.34	0.11	84.67	0.591					
B134_4			71.67	0.00	0.00	28.54	25.98		
16.63	42.61	0.08	70.20	0.595					
B135_2			71.67	0.00	0.00	19.25	40.02		
11.59	51.60	0.04	31.49	0.720					
B135_3			71.67	0.00	0.00	19.50	40.01		
11.33	51.33	0.06	46.75	0.716					
B135_4			71.67	0.00	0.00	19.60	40.00		
11.23	51.23	0.07	52.45	0.715					
EX-A01a			71.67	0.00	0.00	15.50	46.31		
8.88	55.19	0.23	174.75	0.770					
EX-A01b			71.67	0.00	0.00	8.90	56.14		
5.44	61.58	0.21	157.65	0.859					
EX-A02-01			71.67	0.00	0.00	46.63	0.00		
25.06	25.06	0.01	5.20	0.350					
EX-A02-02			71.67	0.00	0.00	47.75	0.00		
23.94	23.94	0.01	5.45	0.334					
EX-A02A			71.67	0.00	0.00	12.22	51.22		
7.14	58.36	0.23	174.98	0.814					
EX-A02B			71.67	0.00	0.00	16.55	44.90		
9.26	54.16	0.28	206.12	0.756					
EX-A03-01			71.67	0.00	0.00	0.00	70.17		
0.00	70.17	0.06	39.67	0.979					
EX-A03-02			71.67	0.00	0.00	0.00	70.18		
0.00	70.18	0.11	78.37	0.979					
EX-A04			71.67	0.00	0.00	0.00	70.19		
0.00	70.19	0.03	19.84	0.979					
EX-R01			71.67	0.00	0.00	0.00	70.17		
0.00	70.17	0.05	35.71	0.979					
EX-R02			71.67	0.00	0.00	0.00	70.14		
0.00	70.14	0.21	144.68	0.979					
EX-R03			71.67	0.00	0.00	0.00	70.55		
0.00	70.55	0.03	21.80	0.984					
P3-01			71.67	0.00	0.00	0.00	70.13		
0.00	70.13	0.34	237.84	0.979					
P3-02			71.67	0.00	0.00	0.00	70.19		
0.00	70.19	0.01	8.43	0.979					
P3-03			71.67	0.00	0.00	0.00	70.19		
0.00	70.19	0.03	18.85	0.979					
P4-01			71.67	0.00	0.00	0.00	70.16		
0.00	70.16	0.14	99.16	0.979					
P4-02			71.67	0.00	0.00	0.00	70.16		
0.00	70.16	0.21	145.67	0.979					
P4-03			71.67	0.00	0.00	0.00	70.15		
0.00	70.15	0.06	41.60	0.979					
P4-04			71.67	0.00	0.00	0.00	70.15		
0.00	70.15	0.09	63.29	0.979					
P4-05			71.67	0.00	0.00	0.00	70.14		
0.00	70.14	0.24	167.65	0.979					
P4-06			71.67	0.00	0.00	0.00	70.19		
0.00	70.19	0.04	29.26	0.979					
P4-07			71.67	0.00	0.00	0.00	70.17		
0.00	70.17	0.03	22.81	0.979					
P4-08			71.67	0.00	0.00	0.00	70.13		
0.00	70.13	0.20	140.05	0.979					
P4-09			71.67	0.00	0.00	0.00	70.13		
0.00	70.13	0.19	132.10	0.979					
P4-DR01a			71.67	0.00	0.00	52.53	5.61		
13.41	19.02	0.14	46.54	0.265					
P4-DR01b			71.67	0.00	0.00	51.07	5.62		
14.87	20.48	0.14	48.44	0.286					
P4-DR01c			71.67	0.00	0.00	48.18	5.62		
17.76	23.37	0.01	3.48	0.326					
P4-DR02			71.67	0.00	0.00	56.38	4.21		
10.99	15.20	0.81	247.49	0.212					

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Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
1	JUNCTION	0.00	0.00	79.11	0 00:00	0.00
10	JUNCTION	0.00	0.02	78.99	0 01:10	0.02
11	JUNCTION	0.00	0.00	78.80	0 00:00	0.00
12	JUNCTION	0.00	0.00	78.70	0 00:00	0.00
13	JUNCTION	0.00	0.00	78.80	0 00:00	0.00
14	JUNCTION	0.00	0.00	80.05	0 00:00	0.00

15	JUNCTION	0.00	0.00	78.90	0	00:00	0.00
16	JUNCTION	0.00	0.00	79.10	0	00:00	0.00
17	JUNCTION	0.00	0.00	79.05	0	00:00	0.00
18	JUNCTION	0.00	0.00	79.05	0	00:00	0.00
19	JUNCTION	0.00	0.00	77.05	0	00:00	0.00
2	JUNCTION	0.00	0.00	78.48	0	00:00	0.00
20	JUNCTION	0.00	0.00	77.10	0	00:00	0.00
21	JUNCTION	0.00	0.00	75.69	0	00:00	0.00
22	JUNCTION	0.00	0.00	77.15	0	00:00	0.00
3	JUNCTION	0.00	0.00	78.95	0	00:00	0.00
4	JUNCTION	0.00	0.00	78.75	0	00:00	0.00
5	JUNCTION	0.00	0.00	78.95	0	00:00	0.00
6	JUNCTION	0.00	0.00	79.05	0	00:00	0.00
7	JUNCTION	0.00	0.00	78.95	0	00:00	0.00
8	JUNCTION	0.00	0.00	78.95	0	00:00	0.00
9	JUNCTION	0.00	0.00	78.95	0	00:00	0.00
ROOF-01	JUNCTION	0.05	1.16	74.47	0	01:10	1.15
ROOF-02	JUNCTION	0.09	3.23	76.08	0	01:10	3.22
ROOF-03	JUNCTION	0.21	1.39	74.21	0	01:16	1.38
ROOF-04	JUNCTION	0.22	1.91	74.93	0	01:10	1.88
ROOF-06	JUNCTION	0.22	2.02	75.45	0	01:16	2.02
ROOF-07	JUNCTION	0.04	1.62	75.63	0	01:16	1.62
ROOF-08	JUNCTION	0.22	2.21	76.57	0	01:10	2.20
ROOF-09	JUNCTION	0.01	0.25	77.62	0	01:11	0.25
ROOF-10	JUNCTION	0.01	0.74	78.06	0	01:14	0.74
ROOF-11	JUNCTION	0.02	0.05	76.02	0	01:34	0.05
23	OUTFALL	0.00	0.02	73.98	0	01:10	0.02
24	OUTFALL	0.00	0.02	74.02	0	01:10	0.02
DR-NW	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
DR-SD	OUTFALL	0.00	0.00	79.21	0	00:00	0.00
DR-WD	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OUT13772	OUTFALL	0.13	0.79	72.35	0	01:13	0.79
OUT16389	OUTFALL	0.02	0.33	73.23	0	01:10	0.33
CB401	STORAGE	0.02	1.06	77.21	0	01:10	1.04
CB402	STORAGE	0.03	2.37	77.02	0	01:10	2.36
CB403	STORAGE	0.33	1.14	77.44	0	01:10	1.14
CB405	STORAGE	0.04	2.01	78.46	0	01:10	2.01
CB407	STORAGE	0.29	0.92	77.47	0	01:19	0.92
CB408	STORAGE	0.31	0.52	74.92	0	01:10	0.52
CB409	STORAGE	0.02	1.77	77.12	0	01:11	1.77
CB410	STORAGE	0.04	2.30	77.90	0	01:10	2.30
CB411	STORAGE	0.02	1.44	76.94	0	01:10	1.40
CB412	STORAGE	0.00	0.14	75.94	0	01:10	0.14
CB413	STORAGE	0.03	2.23	77.73	0	01:10	2.21
CB414	STORAGE	0.01	0.84	75.82	0	01:10	0.83
CBMH401-402	STORAGE	0.05	2.04	77.81	0	01:11	2.04
CBMH401-404	STORAGE	0.38	2.42	75.73	0	01:16	2.42
CBMH402	STORAGE	0.40	2.76	76.46	0	01:14	2.76
CBMH403	STORAGE	0.34	2.39	76.50	0	01:10	2.37
CBMH404-405	STORAGE	0.42	2.58	75.53	0	01:16	2.57
CBMH406	STORAGE	0.42	2.56	75.44	0	01:16	2.56
CBMH407	STORAGE	0.43	2.52	75.24	0	01:16	2.52
CBMH408-406	STORAGE	0.07	2.22	77.33	0	01:12	2.22
CBMH409	STORAGE	0.36	2.08	74.78	0	01:10	2.05
CBMH410	STORAGE	0.28	2.03	74.16	0	01:12	2.03
CBMH411	STORAGE	0.34	2.50	77.04	0	01:10	2.49
CBMH412	STORAGE	0.34	2.51	76.94	0	01:10	2.51
CBMH413	STORAGE	0.32	0.62	74.73	0	01:10	0.62
CICB403	STORAGE	0.04	2.45	76.75	0	01:10	2.45
CICB404	STORAGE	0.33	2.30	77.00	0	01:10	2.27
EX._STMMH_1_(STM)	STORAGE	0.03	0.62	73.57	0	01:10	0.61
EX_CB_1_(STM)	STORAGE	0.07	2.25	76.97	0	01:10	2.25
EX_CB_XXZ_(STM)	STORAGE	0.33	1.79	78.69	0	01:12	1.79
EX_CBMH_10_(STM)	STORAGE	0.14	2.17	77.42	0	01:19	2.16
EX_CBMH_11_(STM)	STORAGE	0.11	2.04	77.42	0	01:19	2.04
EX_CBMH_14_(STM)	STORAGE	0.04	0.90	77.47	0	01:17	0.90
EX_CBMH12	STORAGE	0.01	0.73	77.43	0	01:19	0.73
EX_STMMH_302_(STM)	STORAGE	0.35	1.84	74.46	0	01:10	1.83
EX-A04-STOR	STORAGE	0.00	0.10	82.92	0	01:10	0.10
EX-A3-01&02-STOR	STORAGE	0.01	0.17	83.19	0	01:21	0.17
EX-CB_XYU	STORAGE	0.29	1.94	79.14	0	01:10	1.94
EX-CB_XYY	STORAGE	0.33	1.33	77.27	0	01:11	1.33
EX-CB_XZY	STORAGE	0.72	2.01	78.40	0	01:11	2.01
EX-CB_XZZ	STORAGE	0.64	1.90	78.40	0	01:10	1.90
EX-CB_XZZa	STORAGE	0.47	2.03	78.26	0	01:43	2.03
EX-CB004	STORAGE	0.31	1.05	78.17	0	01:14	1.05
EX-CB01	STORAGE	0.00	0.02	74.08	0	01:10	0.02
EX-CB02	STORAGE	0.00	0.02	74.04	0	01:10	0.02
EX-CB03	STORAGE	0.31	0.77	75.30	0	01:10	0.77
EX-CB100-101	STORAGE	0.31	0.51	77.36	0	01:10	0.51
EX-CB129	STORAGE	0.73	2.41	78.24	0	01:53	2.41
EX-CB130	STORAGE	0.74	1.90	78.29	0	01:21	1.90
EX-CB132	STORAGE	0.62	2.16	78.28	0	01:40	2.16
EX-CB150	STORAGE	0.37	1.60	77.15	0	01:13	1.60
EX-CB301	STORAGE	0.31	0.82	77.12	0	01:12	0.82
EX-CB304	STORAGE	0.27	0.31	74.56	0	01:13	0.31
EX-CB305	STORAGE	0.28	0.47	74.62	0	01:11	0.46
EX-CBMH_XXX	STORAGE	0.04	0.50	75.45	0	01:10	0.49
EX-CBMH_XXZ	STORAGE	0.06	1.12	77.18	0	01:13	1.12
EX-CBMH_XYY	STORAGE	0.04	1.23	77.82	0	01:13	1.23
EX-CBMH_XYZ	STORAGE	0.03	0.32	75.99	0	01:10	0.32
EX-CBMH_XZY	STORAGE	0.09	1.45	77.14	0	01:13	1.45
EX-CBMH_XZZ	STORAGE	0.09	1.47	76.98	0	01:13	1.47
EX-CBMH003	STORAGE	0.02	0.83	78.06	0	01:14	0.83
EX-CBMH008	STORAGE	0.02	1.35	75.45	0	01:08	1.17
EX-CBMH01	STORAGE	0.01	0.22	74.95	0	01:10	0.22
EX-CBMH048	STORAGE	0.06	1.38	75.44	0	01:15	1.38
EX-CBMH301	STORAGE	0.01	0.60	77.60	0	01:11	0.59
EX-CBMH302	STORAGE	0.04	0.47	75.68	0	01:10	0.44
EX-CBMH303	STORAGE	0.03	1.49	77.57	0	01:10	1.48
EX-DICB001-002	STORAGE	0.59	1.48	78.30	0	01:21	1.48
EX-LD01	STORAGE	0.01	0.46	74.17	0	01:10	0.46
EX-MH_XXZ	STORAGE	0.35	1.32	77.21	0	01:13	1.32
EX-MH_XZY	STORAGE	0.39	1.80	77.09	0	01:13	1.80
EX-MH001	STORAGE	0.31	1.14	77.93	0	01:14	1.14
EX-MH301	STORAGE	0.31	0.71	77.61	0	01:11	0.70
EX-R02-STOR	STORAGE	0.03	0.26	83.69	0	01:22	0.26
EX-R03-STOR	STORAGE	0.01	0.18	83.08	0	01:13	0.18
EX-R1-STOR	STORAGE	0.03	0.17	86.14	0	01:30	0.17
EX-STMMH_XXX	STORAGE	0.25	0.58	74.85	0	01:10	0.58
LD-TD01	STORAGE	0.05	1.96	74.95	0	01:16	1.13
LD-TD02	STORAGE	0.02	1.58	74.78	0	01:10	1.55
MH401	STORAGE	0.39	1.80	76.93	0	01:13	1.80
MH402	STORAGE	0.41	2.95	76.82	0	01:14	2.95

MH403	STORAGE	0.34	1.96	77.28	0	01:14	1.96
MH404	STORAGE	0.39	2.52	76.06	0	01:15	2.52
MH405	STORAGE	0.42	2.59	75.62	0	01:16	2.59
MH406	STORAGE	0.35	2.12	75.63	0	01:16	2.12
MH407	STORAGE	0.43	2.54	75.35	0	01:16	2.54
MH410	STORAGE	0.06	1.78	75.36	0	01:16	1.78
MH411	STORAGE	0.44	2.50	75.15	0	01:15	2.50
MH412	STORAGE	0.43	2.32	74.86	0	01:15	2.32
MH413	STORAGE	0.42	2.12	74.54	0	01:14	2.12
MH414	STORAGE	0.35	2.06	74.41	0	01:14	2.06
MH415	STORAGE	0.28	2.07	74.32	0	01:13	2.07
MH416	STORAGE	0.29	2.09	74.22	0	01:13	2.09
MH417	STORAGE	0.49	2.33	74.13	0	01:13	2.33
MH418	STORAGE	0.34	1.93	74.20	0	01:12	1.93
MH419	STORAGE	0.20	1.62	74.21	0	01:16	1.61
MH420	STORAGE	0.34	2.00	74.18	0	01:12	2.00
MH421	STORAGE	0.36	2.11	74.93	0	01:10	2.08
MH422	STORAGE	0.36	1.90	74.47	0	01:10	1.90
MH423	STORAGE	0.49	2.19	73.92	0	01:13	2.19
MH424	STORAGE	0.18	1.52	73.28	0	01:13	1.52
MH425	STORAGE	0.33	1.26	74.62	0	01:12	1.26
MH426	STORAGE	0.35	1.62	74.26	0	01:12	1.62
MH427	STORAGE	0.34	1.32	73.67	0	01:12	1.32
MH428	STORAGE	0.35	1.46	73.60	0	01:12	1.46
OGS_#1_(3600Ø)_(STM)	STORAGE	0.15	1.28	73.45	0	01:12	1.28
OGS_#2_(3600Ø)_(STM)	STORAGE	0.28	1.77	73.65	0	01:13	1.76
P3-01-STOR	STORAGE	0.02	0.16	83.50	0	01:34	0.16
P3-02-STOR	STORAGE	0.01	0.14	82.96	0	01:20	0.14
P3-03-STOR	STORAGE	0.00	0.22	87.59	0	01:10	0.22
P4-01-STOR	STORAGE	0.00	0.00	84.36	0	00:00	0.00
P4-02-STOR	STORAGE	0.07	0.22	84.23	0	01:43	0.22
P4-03-STOR	STORAGE	0.09	0.19	83.76	0	01:43	0.19
P4-04-STOR	STORAGE	0.08	0.20	83.51	0	01:40	0.20
P4-05-stor	STORAGE	0.07	0.18	83.03	0	02:23	0.18
P4-06-STOR	STORAGE	0.09	0.19	83.01	0	02:42	0.19
P4-07-STOR	STORAGE	0.03	0.13	83.15	0	01:52	0.13
Structure_-_(48)_(5)_(STM)	STORAGE	0.42	2.10	74.46	0	01:10	2.09
Structure_-_(68)_(1)_(STM)	STORAGE	0.07	1.44	75.44	0	01:15	1.44
TANK01	STORAGE	0.04	0.98	74.43	0	01:14	0.98
TANK02	STORAGE	0.04	0.86	74.05	0	01:14	0.86
TD01	STORAGE	0.02	0.19	76.69	0	01:10	0.19

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume	Total Inflow Volume	Flow Balance Error
		LPS	LPS	days hr:min	10^6 ltr	10^6 ltr	Percent
1	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
10	JUNCTION	0.00	157.98	0 01:10	0	0.0816	0.638
11	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
12	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
13	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
14	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
15	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
16	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
17	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
18	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
19	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
2	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
20	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
21	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
22	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
3	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
4	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
5	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
6	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
7	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
8	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
9	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
ROOF-01	JUNCTION	0.00	38.33	0 01:05	0	0.408	0.192
ROOF-02	JUNCTION	371.50	383.10	0 01:10	0.556	0.811	0.137
ROOF-03	JUNCTION	38.68	52.30	0 01:10	0.0548	0.139	1.940
ROOF-04	JUNCTION	10.66	36.72	0 01:10	0.0164	0.215	-0.194
ROOF-06	JUNCTION	0.00	20.10	0 00:49	0	0.183	0.678
ROOF-07	JUNCTION	0.00	27.02	0 01:04	0	0.168	-0.025

ROOF-08	JUNCTION	99.16	99.16	0	01:10	0.14	0.14
0.231							
ROOF-09	JUNCTION	0.00	12.12	0	01:03	0	0.0324
7.669							
ROOF-10	JUNCTION	0.00	2.29	0	01:08	0	0.000259
-11.340							
ROOF-11	JUNCTION	0.00	3.90	0	00:36	0	0.0486
0.078							
23	OUTFALL	0.00	35.26	0	01:10	0	0.0465
0.000							
24	OUTFALL	0.00	37.78	0	01:10	0	0.0507
0.000							
DR-NW	OUTFALL	247.49	247.49	0	01:10	0.814	0.814
0.000							
DR-SD	OUTFALL	48.44	48.44	0	01:10	0.139	0.139
0.000							
DR-WD	OUTFALL	50.02	50.02	0	01:10	0.146	0.146
0.000							
OUT13772	OUTFALL	0.00	1843.35	0	01:13	0	7.1
0.000							
OUT16389	OUTFALL	0.00	218.62	0	01:10	0	0.275
0.000							
CB401	STORAGE	55.99	55.99	0	01:10	0.0742	0.0742
0.602							
CB402	STORAGE	42.34	42.34	0	01:10	0.0533	0.0533
0.003							
CB403	STORAGE	72.48	72.48	0	01:10	0.0936	0.132
0.185							
CB405	STORAGE	25.65	25.65	0	01:10	0.0356	0.0356
-0.114							
CB407	STORAGE	0.00	12.45	0	01:03	0	0.0017
7.812							
CB408	STORAGE	33.46	33.46	0	01:10	0.0501	0.0501
0.485							
CB409	STORAGE	18.44	18.44	0	01:10	0.0433	0.0436
-0.251							
CB410	STORAGE	112.31	112.31	0	01:10	0.145	0.145
-0.435							
CB411	STORAGE	25.96	25.96	0	01:10	0.0336	0.0336
0.003							
CB412	STORAGE	4.95	4.95	0	01:10	0.00428	0.00428
0.008							
CB413	STORAGE	37.39	37.39	0	01:10	0.0463	0.0463
0.003							
CB414	STORAGE	18.62	18.62	0	01:10	0.0146	0.0146
0.007							
CBMH401-402	STORAGE	167.69	167.69	0	01:10	0.237	0.237
-0.156							
CBMH401-404	STORAGE	33.31	470.75	0	01:06	0.0414	1.7
-0.112							
CBMH402	STORAGE	62.18	512.48	0	01:05	0.0819	1.67
0.104							
CBMH403	STORAGE	12.75	111.83	0	01:09	0.0147	0.155
-0.044							
CBMH404-405	STORAGE	29.48	508.83	0	01:10	0.0376	2.04
-0.131							
CBMH406	STORAGE	22.77	528.22	0	01:10	0.0282	2.28
-0.057							
CBMH407	STORAGE	15.38	626.32	0	01:19	0.0225	2.7
0.004							
CBMH408-406	STORAGE	175.50	179.26	0	01:10	0.26	0.261
-0.076							
CBMH409	STORAGE	115.80	215.46	0	01:09	0.159	0.475
0.082							
CBMH410	STORAGE	0.00	586.88	0	01:07	0	2.12
0.036							
CBMH411	STORAGE	76.90	86.39	0	01:10	0.107	0.151
0.178							
CBMH412	STORAGE	35.91	106.11	0	01:10	0.053	0.203
0.007							
CBMH413	STORAGE	46.71	143.92	0	01:10	0.0618	0.265
0.002							
CICB403	STORAGE	82.60	82.60	0	01:10	0.111	0.111
0.006							
CICB404	STORAGE	38.65	38.65	0	01:10	0.0593	0.0593
0.422							
EX._STMMH_1_(STM)	STORAGE	0.00	222.95	0	01:10	0	0.275
-0.065							
EX_CB_1_(STM)	STORAGE	37.21	37.21	0	01:10	0.047	0.0708
-0.035							
EX_CB_XXZ_(STM)	STORAGE	62.89	165.48	0	01:10	0.0807	0.283
-0.055							
EX_CBMH_10_(STM)	STORAGE	0.00	249.72	0	01:09	0	0.431
-0.203							
EX_CBMH_11_(STM)	STORAGE	180.06	180.06	0	01:10	0.246	0.25
0.041							
EX_CBMH_14_(STM)	STORAGE	138.27	138.27	0	01:10	0.187	0.189
0.980							
EX_CBMH12	STORAGE	0.00	37.81	0	01:09	0	0.00402
0.132							
EX_STMMH_302_(STM)	STORAGE	0.00	56.72	0	01:35	0	0.474
-0.022							
EX-A04-STOR	STORAGE	19.84	19.84	0	01:10	0.0281	0.0281
-12.787							
EX-A3-01&02-STOR	STORAGE	118.04	118.04	0	01:10	0.167	0.167
-0.192							
EX-CB_XYU	STORAGE	174.98	174.98	0	01:10	0.234	0.234
0.012							
EX-CB_XYY	STORAGE	68.64	182.82	0	01:10	0.0889	0.441
0.018							
EX-CB_XZY	STORAGE	174.75	174.75	0	01:10	0.234	0.248
0.314							
EX-CB_XZZ	STORAGE	157.65	203.45	0	01:08	0.207	0.213
0.103							
EX-CB_XZZa	STORAGE	0.00	80.61	0	01:11	0	0.2
-0.018							
EX-CB004	STORAGE	42.41	42.41	0	01:10	0.0691	0.0691
0.523							
EX-CB01	STORAGE	52.45	52.45	0	01:10	0.0687	0.0687
-0.039							
EX-CB02	STORAGE	46.75	46.75	0	01:10	0.0601	0.0601
-0.040							
EX-CB03	STORAGE	84.67	84.67	0	01:10	0.107	0.107
0.013							
EX-CB100-101	STORAGE	67.35	67.35	0	01:10	0.101	0.101
0.681							
EX-CB129	STORAGE	0.00	68.59	0	01:11	0	0.281
0.032							
EX-CB130	STORAGE	206.12	206.82	0	01:10	0.281	0.289
0.267							

EX-CB132	STORAGE	0.00	139.25	0	01:11	0	0.242	0.111
EX-CB150	STORAGE	0.00	97.07	0	01:05	0	0.785	0.007
EX-CB301	STORAGE	48.22	48.22	0	01:10	0.0642	0.0642	0.485
EX-CB304	STORAGE	0.00	4.71	0	01:11	0	0.000358	208.364
EX-CB305	STORAGE	0.00	15.21	0	01:11	0	0.00115	12.461
EX-CBMH_XXX	STORAGE	37.66	347.55	0	01:09	0.0482	0.749	-0.012
EX-CBMH_XXZ	STORAGE	46.04	80.81	0	01:06	0.0652	0.505	0.069
EX-CBMH_XYY	STORAGE	0.00	142.56	0	01:09	0	0.351	-0.219
EX-CBMH_XYZ	STORAGE	82.60	248.26	0	01:10	0.111	0.602	0.002
EX-CBMH_XZY	STORAGE	0.00	183.02	0	01:09	0	0.954	-0.096
EX-CBMH_XZZ	STORAGE	0.00	205.04	0	01:05	0	1.02	-0.000
EX-CBMH003	STORAGE	0.00	37.59	0	01:10	0	0.0689	-0.014
EX-CBMH008	STORAGE	64.83	64.83	0	01:10	0.0824	0.0824	0.426
EX-CBMH01	STORAGE	70.20	171.04	0	01:10	0.0836	0.205	-0.011
EX-CBMH048	STORAGE	47.00	61.96	0	01:10	0.0617	0.0658	-0.020
EX-CBMH301	STORAGE	73.98	141.11	0	01:09	0.107	0.171	0.220
EX-CBMH302	STORAGE	34.27	323.42	0	01:10	0.0428	0.701	0.015
EX-CBMH303	STORAGE	43.41	43.41	0	01:10	0.0567	0.0567	0.002
EX-DICB001-002	STORAGE	0.00	27.25	0	01:00	0	0.0081	-3.689
EX-LD01	STORAGE	31.49	31.49	0	01:10	0.0382	0.0382	0.002
EX-MH_XXZ	STORAGE	0.00	42.37	0	01:42	0	0.44	-0.123
EX-MH_XZY	STORAGE	0.00	211.77	0	01:05	0	1.02	-0.028
EX-MH001	STORAGE	0.00	31.34	0	01:07	0	0.0687	0.032
EX-MH301	STORAGE	0.00	30.19	0	01:09	0	0.0307	-0.112
EX-R02-STOR	STORAGE	144.68	144.68	0	01:10	0.207	0.207	-0.415
EX-R03-STOR	STORAGE	21.80	21.80	0	01:10	0.0311	0.0311	-4.934
EX-R1-STOR	STORAGE	35.71	35.71	0	01:10	0.0506	0.0506	-0.073
EX-STMMH_XXX	STORAGE	0.00	342.67	0	01:10	0	0.75	0.001
LD-TD01	STORAGE	86.16	178.82	0	01:10	0.117	0.181	11.234
LD-TD02	STORAGE	11.41	18.91	0	01:08	0.0162	0.0173	-0.037
MH401	STORAGE	0.00	248.81	0	01:05	0	1.09	0.051
MH402	STORAGE	0.00	403.44	0	01:05	0	1.43	-0.071
MH403	STORAGE	0.00	193.31	0	01:07	0	0.337	-0.085
MH404	STORAGE	0.00	473.30	0	01:06	0	1.66	0.097
MH405	STORAGE	0.00	506.23	0	01:07	0	2	-0.013
MH406	STORAGE	0.00	79.77	0	01:05	0	0.3	0.066
MH407	STORAGE	0.00	541.68	0	01:10	0	2.41	-0.033
MH410	STORAGE	0.00	27.91	0	01:10	0	0.0976	0.205
MH411	STORAGE	0.00	628.56	0	01:19	0	2.69	0.014
MH412	STORAGE	0.00	630.64	0	01:19	0	2.69	-0.002
MH413	STORAGE	0.00	633.53	0	01:19	0	2.69	0.024
MH414	STORAGE	0.00	636.56	0	01:19	0	2.69	0.014
MH415	STORAGE	0.00	743.24	0	01:18	0	3.12	-0.005
MH416	STORAGE	0.00	748.67	0	01:18	0	3.12	-0.038
MH417	STORAGE	0.00	1323.69	0	01:10	0	5.66	0.010
MH418	STORAGE	0.00	479.16	0	01:07	0	1.63	0.008
MH419	STORAGE	0.00	139.83	0	01:34	0	0.323	-0.085
MH420	STORAGE	0.00	593.11	0	01:07	0	2.07	-0.090
MH421	STORAGE	0.00	101.39	0	01:10	0	0.298	-0.174
MH422	STORAGE	0.00	196.81	0	01:10	0	0.473	0.057
MH423	STORAGE	0.00	1312.88	0	01:11	0	5.69	-0.018
MH424	STORAGE	0.00	1844.37	0	01:12	0	7.1	0.003
MH425	STORAGE	0.00	377.99	0	01:10	0	0.796	0.161
MH426	STORAGE	0.00	502.02	0	01:09	0	1.16	0.288
MH427	STORAGE	0.00	535.46	0	01:10	0	1.35	-0.187
MH428	STORAGE	0.00	525.50	0	01:11	0	1.35	-0.019
OGS_#1_(3600Ø)_(STM)	STORAGE	0.00	552.97	0	01:11	0	1.41	0.023
OGS_#2_(3600Ø)_(STM)	STORAGE	0.00	1304.62	0	01:11	0	5.69	-0.071
P3-01-STOR	STORAGE	237.84	237.84	0	01:10	0.341	0.342	-0.247
P3-02-STOR	STORAGE	8.43	8.43	0	01:10	0.0119	0.0119	-1.348

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  P3-03-STOR           STORAGE      18.85    18.85     0  01:10       0.0267
0.0267     -23.196
  P4-01-STOR           STORAGE       0.00     0.00     0  00:00            0
0       0.000 ltr
  P4-02-STOR           STORAGE     145.67   145.67     0  01:10        0.206
0.206      -0.010
  P4-03-STOR           STORAGE      41.60    41.60     0  01:10        0.059
0.059       0.001
  P4-04-STOR           STORAGE      63.29    63.29     0  01:10       0.0899
0.0899      -0.003
  P4-05-stor           STORAGE     167.65   167.79     0  01:10        0.239
0.24       -0.006
  P4-06-STOR           STORAGE      29.26    29.26     0  01:10       0.0414
0.0582       0.002
  P4-07-STOR           STORAGE      22.81    22.81     0  01:10       0.0323
0.0323      -0.010
  Structure_-_(48)_(5)_(STM) STORAGE       0.00   427.97     0  01:10           0
1.28       0.051
  Structure_-_(68)_(1)_(STM) STORAGE       0.00    40.20     0  01:09           0
0.0658       0.005
  TANK01               STORAGE     140.05   140.05     0  01:10        0.202
0.202      -0.001
  TANK02               STORAGE     132.10   132.10     0  01:10        0.191
0.191      -0.000
  TD01                 STORAGE      27.28    27.28     0  01:10       0.0386
0.055       0.000


  **********************
  Node Surcharge Summary
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  Surcharging occurs when water rises above the top of the highest conduit.
  -------------------------------------------------------------------------

                                        Max. Height   Min. Depth
                                Hours   Above Crown    Below Rim
  Node                 Type   Surcharged     Meters       Meters
  -------------------------------------------------------------------------
  ROOF-01              JUNCTION      0.45      0.763        8.987
  ROOF-02              JUNCTION      0.64      2.844        6.775
  ROOF-03              JUNCTION      0.54      0.915        8.760
  ROOF-04              JUNCTION      0.56      1.436        8.089
  ROOF-06              JUNCTION      0.56      1.465        8.134
  ROOF-07              JUNCTION      0.49      1.239        8.380
  ROOF-08              JUNCTION      0.51      1.724        7.791
  ROOF-10              JUNCTION      0.24      0.536        4.414
  CBMH409              STORAGE       0.57      1.366        0.274
  EX-CB004             STORAGE       0.26      0.550        0.720
  EX-CBMH008           STORAGE       0.23      1.095        0.000
  EX-R02-STOR          STORAGE       0.11      0.007        0.000
  LD-TD01              STORAGE       0.54      1.654        0.000
  LD-TD02              STORAGE       0.55      1.327        0.000


  **********************
  Node Flooding Summary
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  No nodes were flooded.


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  Storage Volume Summary
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  ------------------------------------------------------------------------------
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                              Average    Avg   Evap  Exfil      Maximum    Max     Time of
Max    Maximum
                               Volume   Pcnt   Pcnt   Pcnt       Volume   Pcnt
Occurrence    Outflow
  Storage Unit            1000 m³   Full   Loss   Loss     1000 m³   Full    days
hr:min        LPS
  ------------------------------------------------------------------------------
---------------
  CB401                        0.000    0.9    0.0    0.0        0.000   45.3       0
01:10      51.96
  CB402                        0.000    1.4    0.0    0.0        0.001   96.9       0
01:10      40.19
  CB403                        0.000   12.3    0.0    0.0        0.000   43.0       0
01:10      72.17
  CB405                        0.000    1.6    0.0    0.0        0.001   85.3       0
01:10      24.66
  CB407                        0.000   13.0    0.0    0.0        0.000   41.7       0
01:19       2.44
  CB408                        0.000   21.1    0.0    0.0        0.000   36.1       0
01:10      32.20
  CB409                        0.000    1.1    0.0    0.0        0.001   86.5       0
01:11      18.35
  CB410                        0.000    1.5    0.0    0.0        0.001   86.8       0
01:10     107.19
  CB411                        0.000    1.1    0.0    0.0        0.001   72.1       0
01:10      22.51
  CB412                        0.000    0.1    0.0    0.0        0.000    7.0       0
01:10       4.66
  CB413                        0.000    1.2    0.0    0.0        0.001   84.0       0
01:10      34.70
  CB414                        0.000    0.9    0.0    0.0        0.000   97.1       0
01:10      17.03
  CBMH401-402                  0.000    2.0    0.0    0.0        0.002   85.6       0
01:11     138.39
  CBMH401-404                  0.001    6.5    0.0    0.0        0.004   41.8       0
01:16     444.70
  CBMH402                      0.001    7.8    0.0    0.0        0.005   53.0       0
01:14     473.30
  CBMH403                      0.000    7.1    0.0    0.0        0.003   49.9       0
01:10     102.83
  CBMH404-405                  0.001    6.8    0.0    0.0        0.005   41.9       0
01:16     486.11
  CBMH406                      0.001    6.6    0.0    0.0        0.005   40.5       0
01:16     501.02
  CBMH407                      0.001    9.6    0.0    0.0        0.004   56.2       0
01:16     628.56
  CBMH408-406                  0.000    2.9    0.0    0.0        0.003   87.3       0
01:12      99.71
  CBMH409                      0.000   15.2    0.0    0.0        0.002   88.4       0
01:10     196.81
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CBMH410	0.000	7.1	0.0	0.0	0.004	51.8	0
01:12 555.32							
CBMH411	0.000	11.5	0.0	0.0	0.003	85.8	0
01:10 71.22							
CBMH412	0.000	11.8	0.0	0.0	0.003	86.1	0
01:10 99.67							
CBMH413	0.000	7.6	0.0	0.0	0.001	14.8	0
01:10 142.65							
CICB403	0.000	1.4	0.0	0.0	0.001	87.5	0
01:10 80.53							
CICB404	0.000	12.4	0.0	0.0	0.001	86.8	0
01:10 35.10							
EX._STMMH_1_(STM)	0.000	2.4	0.0	0.0	0.001	53.9	0
01:10 218.62							
EX_CB_1_(STM)	0.000	2.6	0.0	0.0	0.001	86.7	0
01:10 37.09							
EX_CB_XXZ_(STM)	0.000	15.6	0.0	0.0	0.001	84.3	0
01:12 125.47							
EX_CBMH_10_(STM)	0.000	4.2	0.0	0.0	0.006	65.1	0
01:19 103.30							
EX_CBMH_11_(STM)	0.000	3.3	0.0	0.0	0.006	61.0	0
01:19 150.21							
EX_CBMH_14_(STM)	0.000	1.7	0.0	0.0	0.001	41.3	0
01:17 136.33							
EX_CBMH12	0.000	0.4	0.0	0.0	0.001	35.3	0
01:19 10.30							
EX_STMMH_302_(STM)	0.000	9.6	0.0	0.0	0.002	49.8	0
01:10 73.06							
EX-A04-STOR	0.000	0.6	0.0	0.0	0.005	69.7	0
01:10 11.00							
EX-A3-01&02-STOR	0.005	5.0	0.0	0.0	0.064	67.7	0
01:21 26.05							
EX-CB_XYU	0.003	4.6	0.0	0.0	0.049	70.2	0
01:10 170.19							
EX-CB_XYY	0.000	11.5	0.0	0.0	0.001	45.7	0
01:11 168.82							
EX-CB_XZY	0.005	9.5	0.0	0.0	0.048	88.2	0
01:11 139.25							
EX-CB_XZZ	0.006	6.4	0.0	0.0	0.062	68.5	0
01:10 104.31							
EX-CB_XZZa	0.007	3.7	0.0	0.0	0.047	26.0	0
01:43 22.77							
EX-CB004	0.000	17.6	0.0	0.0	0.000	59.3	0
01:14 37.59							
EX-CB01	0.000	0.4	0.0	0.0	0.000	6.3	0
01:10 51.40							
EX-CB02	0.000	0.3	0.0	0.0	0.000	5.5	0
01:10 45.42							
EX-CB03	0.000	14.1	0.0	0.0	0.001	34.8	0
01:10 83.67							
EX-CB100-101	0.000	16.1	0.0	0.0	0.000	26.7	0
01:10 61.87							
EX-CB129	0.016	9.1	0.0	0.0	0.087	49.1	0
01:53 20.96							
EX-CB130	0.012	10.6	0.0	0.0	0.082	70.9	0
01:21 72.95							
EX-CB132	0.016	17.0	0.0	0.0	0.096	98.8	0
01:40 22.46							
EX-CB150	0.000	13.7	0.0	0.0	0.001	59.8	0
01:13 97.18							
EX-CB301	0.000	11.6	0.0	0.0	0.000	30.9	0
01:12 47.50							
EX-CB304	0.000	9.2	0.0	0.0	0.000	10.2	0
01:13 0.07							
EX-CB305	0.000	6.6	0.0	0.0	0.000	11.2	0
01:11 12.35							
EX-CBMH_XXX	0.000	0.9	0.0	0.0	0.001	12.8	0
01:10 342.67							
EX-CBMH_XXZ	0.000	2.5	0.0	0.0	0.001	51.4	0
01:13 77.87							
EX-CBMH_XYY	0.000	1.1	0.0	0.0	0.001	39.3	0
01:13 136.45							
EX-CBMH_XYZ	0.000	1.0	0.0	0.0	0.000	9.5	0
01:10 249.45							
EX-CBMH_XZY	0.000	3.2	0.0	0.0	0.002	49.6	0
01:13 167.69							
EX-CBMH_XZZ	0.000	3.3	0.0	0.0	0.002	53.2	0
01:13 200.33							
EX-CBMH003	0.000	0.9	0.0	0.0	0.001	39.7	0
01:14 32.38							
EX-CBMH008	0.000	2.4	0.0	0.0	0.001	100.0	0
01:08 64.80							
EX-CBMH01	0.000	0.6	0.0	0.0	0.000	10.7	0
01:10 168.31							
EX-CBMH048	0.000	2.0	0.0	0.0	0.002	46.8	0
01:15 40.20							
EX-CBMH301	0.000	0.7	0.0	0.0	0.001	28.8	0
01:11 132.04							
EX-CBMH302	0.000	1.2	0.0	0.0	0.001	15.5	0
01:10 313.73							
EX-CBMH303	0.000	1.1	0.0	0.0	0.002	62.1	0
01:10 41.58							
EX-DICB001-002	0.001	21.1	0.0	0.0	0.002	53.0	0
01:21 13.96							
EX-LD01	0.000	1.6	0.0	0.0	0.000	55.9	0
01:10 31.05							
EX-MH_XXZ	0.000	14.8	0.0	0.0	0.001	55.3	0
01:13 48.39							
EX-MH_XZY	0.000	11.8	0.0	0.0	0.002	55.2	0
01:13 205.04							
EX-MH001	0.000	9.8	0.0	0.0	0.001	36.7	0
01:14 32.68							
EX-MH301	0.000	15.7	0.0	0.0	0.001	36.3	0
01:11 18.04							
EX-R02-STOR	0.009	10.8	0.0	0.0	0.085	100.0	0
01:20 33.42							
EX-R03-STOR	0.000	2.0	0.0	0.0	0.008	71.5	0
01:13 8.44							
EX-R1-STOR	0.004	11.6	0.0	0.0	0.026	68.5	0
01:30 5.13							
EX-STMMH_XXX	0.000	4.7	0.0	0.0	0.001	10.9	0
01:10 343.56							
LD-TD01	0.001	1.2	0.0	0.0	0.077	100.0	0
01:16 126.70							
LD-TD02	0.000	1.7	0.0	0.0	0.006	100.0	0
01:09 13.20							
MH401	0.000	11.0	0.0	0.0	0.002	50.9	0
01:13 244.58							
MH402	0.001	8.6	0.0	0.0	0.005	62.6	0
01:14 361.31							

MH403	0.000	10.4	0.0	0.0	0.002	59.9	0
01:14 163.36							
MH404	0.001	7.7	0.0	0.0	0.004	50.1	0
01:15 441.35							
MH405	0.001	7.2	0.0	0.0	0.005	44.3	0
01:16 482.74							
MH406	0.000	6.8	0.0	0.0	0.002	40.5	0
01:16 65.89							
MH407	0.001	7.1	0.0	0.0	0.005	42.4	0
01:16 515.62							
MH410	0.000	1.1	0.0	0.0	0.002	33.1	0
01:16 30.21							
MH411	0.001	8.4	0.0	0.0	0.004	48.1	0
01:15 630.64							
MH412	0.001	7.2	0.0	0.0	0.004	38.7	0
01:15 633.53							
MH413	0.001	6.2	0.0	0.0	0.004	31.4	0
01:14 636.56							
MH414	0.001	5.6	0.0	0.0	0.004	33.2	0
01:14 640.03							
MH415	0.000	4.6	0.0	0.0	0.004	33.9	0
01:13 748.67							
MH416	0.001	4.2	0.0	0.0	0.004	30.6	0
01:13 753.83							
MH417	0.001	8.4	0.0	0.0	0.006	40.1	0
01:13 1291.05							
MH418	0.001	13.1	0.0	0.0	0.003	74.7	0
01:12 450.19							
MH419	0.000	8.4	0.0	0.0	0.003	68.5	0
01:16 140.54							
MH420	0.001	9.3	0.0	0.0	0.004	54.6	0
01:12 557.45							
MH421	0.000	15.7	0.0	0.0	0.002	92.5	0
01:10 87.29							
MH422	0.000	12.6	0.0	0.0	0.002	66.8	0
01:10 187.93							
MH423	0.001	8.1	0.0	0.0	0.006	36.8	0
01:13 1300.23							
MH424	0.000	3.2	0.0	0.0	0.004	27.7	0
01:13 1843.35							
MH425	0.000	6.5	0.0	0.0	0.001	24.7	0
01:12 368.33							
MH426	0.001	7.9	0.0	0.0	0.003	36.5	0
01:12 484.34							
MH427	0.001	7.4	0.0	0.0	0.002	28.7	0
01:12 525.50							
MH428	0.001	7.1	0.0	0.0	0.003	29.6	0
01:12 521.64							
OGS_#1_(3600Ø)_(STM)	0.002	3.2	0.0	0.0	0.013	26.4	0
01:12 547.33							
OGS_#2_(3600Ø)_(STM)	0.003	4.6	0.0	0.0	0.018	29.3	0
01:13 1304.22							
P3-01-STOR	0.025	9.3	0.0	0.0	0.163	61.1	0
01:34 31.60							
P3-02-STOR	0.000	6.4	0.0	0.0	0.004	95.3	0
01:20 2.20							
P3-03-STOR	0.000	0.9	0.0	0.0	0.002	86.3	0
01:10 18.80							
P4-01-STOR	0.000	0.0	0.0	0.0	0.000	0.0	0
00:00 0.00							
P4-02-STOR	0.042	27.2	0.0	0.0	0.134	87.0	0
01:43 12.65							
P4-03-STOR	0.020	35.7	0.0	0.0	0.042	75.5	0
01:43 3.66							
P4-04-STOR	0.022	30.1	0.0	0.0	0.060	80.6	0
01:40 6.60							
P4-05-stor	0.073	30.0	0.0	0.0	0.179	73.3	0
02:23 7.47							
P4-06-STOR	0.017	35.4	0.0	0.0	0.036	74.1	0
02:42 3.25							
P4-07-STOR	0.005	22.3	0.0	0.0	0.020	84.0	0
01:52 1.59							
Structure_-_(48)_(5)_(STM)	0.000	10.8	0.0	0.0	0.002	54.1	
0 01:10 416.71							
Structure_-_(68)_(1)_(STM)	0.000	3.3	0.0	0.0	0.002	66.1	
0 01:15 17.89							
TANK01	0.002	3.7	0.0	0.0	0.064	98.4	0
01:14 83.59							
TANK02	0.003	3.9	0.0	0.0	0.056	85.6	0
01:14 64.78							
TD01	0.000	0.7	0.0	0.0	0.001	8.1	0
01:10 27.27							

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
23	28.31	2.99	35.26	0.046
24	28.16	3.34	37.78	0.051
DR-NW	32.82	57.82	247.49	0.814
DR-SD	28.03	11.09	48.44	0.139
DR-WD	28.53	11.57	50.02	0.146
OUT13772	91.85	156.02	1843.35	7.103
OUT16389	32.80	14.97	218.62	0.275
System	38.64	257.81	2356.71	8.574

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	218.62	0 01:10	2.30	2.65	0.97
11	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
12	CONDUIT	126.70	0 01:33	1.73	3.57	1.00
16	CONDUIT	0.00	0 00:00	0.00	0.00	0.01
17	CONDUIT	0.00	0 00:00	0.00	0.00	0.01

18	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
19	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
20	CONDUIT	0.00	0	00:00	0.00	0.00	0.01
21	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
22	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
23	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
24	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
25	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
26	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
27	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
28	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
29	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
30	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
31	CONDUIT	3.79	0	01:10	0.11	0.00	0.04
32	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
33	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
34	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
35	CONDUIT	0.59	0	01:10	0.00	0.00	0.00
36	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
37	CONDUIT	0.00	0	00:00	0.00	0.00	0.03
38	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
38_1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
38_3	CONDUIT	0.00	0	00:00	0.00	0.00	0.03
39	CONDUIT	0.00	0	00:00	0.00	0.00	0.01
40	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
41	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
42	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
43	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
44	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
45	CONDUIT	60.05	0	01:10	0.39	0.01	0.04
46	CONDUIT	93.56	0	01:10	0.59	0.01	0.05
47	CONDUIT	0.00	0	00:00	0.00	0.00	0.03
48	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
49	CONDUIT	13.20	0	01:09	0.62	0.21	1.00
49_1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
49_2	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
50	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
51	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
52	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
53	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
54	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
55	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
56	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
57	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
58	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
59	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
60	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
61	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
62	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
63	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
64	CONDUIT	157.98	0	01:10	1.31	0.02	0.07
65	CONDUIT	48.61	0	01:08	0.27	0.13	0.17
66	CONDUIT	51.63	0	01:11	0.25	0.30	0.12
67	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
68	CONDUIT	107.20	0	01:11	0.45	0.28	0.14
69	CONDUIT	40.20	0	01:09	0.21	0.01	0.93
70	CONDUIT	14.98	0	01:10	0.44	0.00	0.01
72	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
73	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
74	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
75	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
76	CONDUIT	0.00	0	00:00	0.00	0.00	0.50
77	CONDUIT	1.46	0	01:40	0.06	0.00	0.01
79	CONDUIT	35.26	0	01:10	0.39	0.01	0.05
80	CONDUIT	37.78	0	01:10	0.38	0.01	0.06
81	CONDUIT	64.80	0	01:10	1.63	0.84	1.00
Pipe_-_(1)_(1)_(STM)	CONDUIT	15.21	0	01:11	0.44	0.30	0.83
Pipe_-_(1)_(STM)	CONDUIT	343.56	0	01:10	2.18	0.76	0.67
Pipe_-_(10)_(1)_(1)_(STM)	CONDUIT	125.47	0	01:09	1.72	1.41	1.00
Pipe_-_(10)_(1)_(2)_(_(1)_(1)_(2)_(STM)	CONDUIT	54.76	0	01:04	1.38	0.54	1.00
Pipe_-_(10)_(1)_(2)_(_(1)_(1)_(STM)	CONDUIT	140.54	0	01:33	1.05	0.63	1.00
Pipe_-_(10)_(1)_(2)_(_(2)_(1)_(STM)	CONDUIT	383.06	0	01:10	3.36	2.42	1.00
Pipe_-_(10)_(1)_(2)_(_(2)_(STM)	CONDUIT	47.87	0	01:35	1.20	0.23	1.00
Pipe_-_(10)_(1)_(2)_(1)_(STM)	CONDUIT	37.59	0	01:10	1.20	1.16	1.00
Pipe_-_(10)_(1)_(2)_(100)_(4)_(STM)	CONDUIT	73.06	0	01:17	1.19	0.16	1.00
Pipe_-_(10)_(1)_(2)_(103)_(STM)	CONDUIT	187.93	0	01:10	1.65	1.47	1.00
Pipe_-_(10)_(1)_(2)_(104)_(STM)	CONDUIT	416.71	0	01:10	1.87	2.08	1.00
Pipe_-_(10)_(1)_(2)_(11)_(STM)	CONDUIT	313.73	0	01:10	2.06	1.05	0.99
Pipe_-_(10)_(1)_(2)_(15)_(STM)	CONDUIT	342.67	0	01:10	2.17	1.10	0.94
Pipe_-_(10)_(1)_(2)_(16)_(STM)	CONDUIT	4.71	0	01:11	0.23	0.09	0.43
Pipe_-_(10)_(1)_(2)_(2)_(STM)	CONDUIT	2.35	0	01:23	0.15	0.07	1.00
Pipe_-_(10)_(1)_(2)_(22)_(STM)	CONDUIT	484.34	0	01:10	2.17	1.52	1.00
Pipe_-_(10)_(1)_(2)_(27)_(STM)	CONDUIT	521.64	0	01:12	1.42	0.60	1.00
Pipe_-_(10)_(1)_(2)_(28)_(STM)	CONDUIT	547.33	0	01:12	1.57	0.62	1.00
Pipe_-_(10)_(1)_(2)_(3)_(STM)	CONDUIT	31.34	0	01:07	1.04	1.25	1.00
Pipe_-_(10)_(1)_(2)_(31)_(STM)	CONDUIT	1843.35	0	01:13	2.90	2.17	0.93
Pipe_-_(10)_(1)_(2)_(32)_(STM)	CONDUIT	1304.22	0	01:15	1.99	1.85	1.00
Pipe_-_(10)_(1)_(2)_(33)_(STM)	CONDUIT	1300.23	0	01:11	1.98	1.65	1.00
Pipe_-_(10)_(1)_(2)_(35)_(1)_(STM)	CONDUIT	18.35	0	01:14	0.88	0.56	1.00
Pipe_-_(10)_(1)_(2)_(35)_(2)_(STM)	CONDUIT	71.22	0	01:10	0.97	1.01	1.00
Pipe_-_(10)_(1)_(2)_(35)_(STM)	CONDUIT	142.65	0	01:10	1.56	0.78	0.75
Pipe_-_(10)_(1)_(2)_(39)_(STM)	CONDUIT	83.67	0	01:10	1.69	1.27	0.95

Pipe_-_(10)_(1)_(2)_(4)_(STM)	CONDUIT	136.45	0	01:15	1.87	1.37	1.00
Pipe_-_(10)_(1)_(2)_(40)_(2)_(STM)	CONDUIT	168.31	0	01:10	1.73	0.64	0.80
Pipe_-_(10)_(1)_(2)_(45)_(STM)	CONDUIT	27.25	0	01:00	0.37	0.27	1.00
Pipe_-_(10)_(1)_(2)_(46)_(STM)	CONDUIT	68.59	0	01:11	1.13	0.41	1.00
Pipe_-_(10)_(1)_(2)_(48)_(STM)	CONDUIT	97.18	0	01:27	1.05	0.67	1.00
Pipe_-_(10)_(1)_(2)_(49)_(STM)	CONDUIT	77.87	0	01:05	1.16	0.48	1.00
Pipe_-_(10)_(1)_(2)_(5)_(STM)	CONDUIT	168.82	0	01:12	2.33	1.67	0.98
Pipe_-_(10)_(1)_(2)_(50)_(STM)	CONDUIT	48.39	0	01:26	1.00	0.79	1.00
Pipe_-_(10)_(1)_(2)_(52)_(STM)	CONDUIT	35.11	0	01:07	1.12	1.07	1.00
Pipe_-_(10)_(1)_(2)_(54)_(STM)	CONDUIT	29.91	0	01:09	0.95	0.93	1.00
Pipe_-_(10)_(1)_(2)_(55)_(STM)	CONDUIT	167.69	0	01:12	0.84	0.91	1.00
Pipe_-_(10)_(1)_(2)_(57)_(STM)	CONDUIT	47.50	0	01:07	2.39	0.66	1.00
Pipe_-_(10)_(1)_(2)_(58)_(STM)	CONDUIT	205.04	0	01:05	0.92	1.08	1.00
Pipe_-_(10)_(1)_(2)_(59)_(STM)	CONDUIT	200.33	0	01:05	0.92	1.00	1.00
Pipe_-_(10)_(1)_(2)_(61)_(STM)	CONDUIT	61.87	0	01:09	1.35	0.61	0.85
Pipe_-_(10)_(1)_(2)_(63)_(STM)	CONDUIT	138.39	0	01:07	2.73	3.09	1.00
Pipe_-_(10)_(1)_(2)_(64)_(STM)	CONDUIT	163.36	0	01:06	2.24	2.32	1.00
Pipe_-_(10)_(1)_(2)_(66)_(STM)	CONDUIT	51.96	0	01:10	1.65	1.59	1.00
Pipe_-_(10)_(1)_(2)_(7)_(STM)	CONDUIT	249.45	0	01:10	1.82	0.83	0.85
Pipe_-_(10)_(1)_(2)_(70)_(STM)	CONDUIT	16.05	0	01:10	0.96	0.25	1.00
Pipe_-_(10)_(1)_(2)_(71)_(STM)	CONDUIT	18.05	0	01:09	0.67	0.25	1.00
Pipe_-_(10)_(1)_(2)_(72)_(STM)	CONDUIT	123.26	0	01:09	2.12	0.71	1.00
Pipe_-_(10)_(1)_(2)_(73)_(STM)	CONDUIT	99.15	0	01:09	1.54	0.95	1.00
Pipe_-_(10)_(1)_(2)_(74)_(STM)	CONDUIT	102.83	0	01:10	1.41	1.02	1.00
Pipe_-_(10)_(1)_(2)_(76)_(STM)	CONDUIT	72.17	0	01:10	2.30	2.25	1.00
Pipe_-_(10)_(1)_(2)_(79)_(STM)	CONDUIT	21.31	0	01:04	0.75	0.12	1.00
Pipe_-_(10)_(1)_(2)_(8)_(STM)	CONDUIT	4.10	0	01:01	0.72	0.27	0.67
Pipe_-_(10)_(1)_(2)_(80)_(STM)	CONDUIT	501.02	0	01:10	1.36	1.24	1.00
Pipe_-_(10)_(1)_(2)_(82)_(STM)	CONDUIT	65.89	0	01:10	1.16	0.36	1.00
Pipe_-_(10)_(1)_(2)_(89)_(1)_(STM)	CONDUIT	38.04	0	01:11	1.18	0.41	1.00
Pipe_-_(10)_(1)_(2)_(89)_(STM)	CONDUIT	27.66	0	01:39	0.86	0.19	1.00
Pipe_-_(10)_(1)_(2)_(94)_(1)_(4)_(STM)	CONDUIT	30.21	0	01:04	0.68	0.51	1.00
Pipe_-_(10)_(1)_(2)_(98)_(STM)	CONDUIT	753.83	0	01:18	1.37	0.99	1.00
Pipe_-_(10)_(1)_(2)_(99)_(STM)	CONDUIT	32.20	0	01:10	1.10	0.98	0.89
Pipe_-_(10)_(1)_(2)_(STM)	CONDUIT	32.68	0	01:19	1.50	0.62	1.00
Pipe_-_(11)_(STM)	CONDUIT	525.50	0	01:11	1.72	0.60	1.00
Pipe_-_(12)_(STM)	CONDUIT	1291.05	0	01:11	1.97	1.81	1.00
Pipe_-_(14)_(1)_(2)_(STM)	CONDUIT	555.32	0	01:07	1.01	0.84	1.00
Pipe_-_(14)_(1)_(STM)	CONDUIT	557.45	0	01:07	1.29	1.06	1.00
Pipe_-_(15)_(STM)	CONDUIT	450.19	0	01:07	1.02	0.99	1.00
Pipe_-_(16)_(1)_(STM)	CONDUIT	87.29	0	01:10	1.19	1.44	1.00
Pipe_-_(16)_(STM)	CONDUIT	196.81	0	01:10	1.73	1.55	1.00
Pipe_-_(17)_(1)_(2)_(STM)	CONDUIT	127.91	0	01:10	0.51	0.04	1.00
Pipe_-_(17)_(1)_(3)_(3)_(STM)	CONDUIT	136.30	0	01:08	1.88	2.28	1.00
Pipe_-_(17)_(1)_(3)_(STM)	CONDUIT	37.81	0	01:09	0.58	0.63	1.00
Pipe_-_(17)_(2)_(STM)	CONDUIT	12.45	0	01:03	0.34	0.20	1.00
Pipe_-_(17)_(3)_(STM)	CONDUIT	748.67	0	01:18	1.36	1.01	1.00
Pipe_-_(17)_(4)_(STM)	CONDUIT	636.56	0	01:19	1.72	1.56	1.00
Pipe_-_(17)_(STM)	CONDUIT	640.03	0	01:18	1.40	1.11	1.00
Pipe_-_(18)_(STM)	CONDUIT	633.53	0	01:19	1.71	1.43	1.00
Pipe_-_(19)_(STM)	CONDUIT	630.64	0	01:19	1.71	1.40	1.00
Pipe_-_(20)_(4)_(STM)	CONDUIT	628.56	0	01:19	1.70	1.37	1.00
Pipe_-_(20)_(STM)	CONDUIT	515.62	0	01:19	1.40	1.21	1.00
Pipe_-_(22)_(STM)	CONDUIT	486.11	0	01:10	1.32	1.25	1.00
Pipe_-_(24)_(STM)	CONDUIT	482.74	0	01:10	1.31	1.26	1.00
Pipe_-_(25)_(STM)	CONDUIT	444.70	0	01:07	1.99	1.01	1.00
Pipe_-_(26)_(STM)	CONDUIT	441.35	0	01:06	1.98	1.40	1.00
Pipe_-_(27)_(STM)	CONDUIT	473.30	0	01:06	2.12	1.50	1.00
Pipe_-_(28)_(STM)	CONDUIT	361.31	0	01:05	1.62	1.38	1.00
Pipe_-_(29)_(STM)	CONDUIT	244.58	0	01:05	1.24	1.10	1.00
Pipe_-_(9)_(1)_(STM)	CONDUIT	27.27	0	01:10	0.99	0.84	0.83
Pipe_-_(9)_(STM)	CONDUIT	354.51	0	01:12	1.98	0.79	1.00
OCB01	ORIFICE	22.10	0	01:10			1.00
OCB0408-406	ORIFICE	99.71	0	01:12			1.00
OCB10	ORIFICE	103.30	0	01:19			1.00
OCB129	ORIFICE	20.96	0	01:56			1.00
OCB132	ORIFICE	20.99	0	01:41			1.00
OCB303	ORIFICE	41.58	0	01:10			1.00
OCB402	ORIFICE	40.19	0	01:10			1.00
OCB403	ORIFICE	80.53	0	01:09			1.00
OCB404	ORIFICE	35.10	0	01:10			1.00
OCB405	ORIFICE	20.86	0	01:10			1.00
OCB410	ORIFICE	106.59	0	01:10			1.00
OCB411	ORIFICE	22.51	0	01:10			1.00
OCB412	ORIFICE	4.66	0	01:10			1.00
OCB413	ORIFICE	34.70	0	01:10			1.00
OCB414	ORIFICE	17.03	0	01:10			1.00
OCBLD01	ORIFICE	31.05	0	01:10			1.00
OCBMH048	ORIFICE	17.89	0	01:18			1.00

OCBMH412	ORIFICE	99.67	0	01:10	1.00
OCBXYU	ORIFICE	23.85	0	01:37	1.00
OCBXZZa	ORIFICE	21.38	0	01:44	1.00
O-TANK01	ORIFICE	83.59	0	01:24	1.00
O-TANK02	ORIFICE	64.78	0	01:25	1.00
78	WEIR	2.61	0	02:42	0.35
82	WEIR	0.48	0	01:40	0.11
EX-A3-01&02-OVF	WEIR	1.05	0	01:21	0.19
EX-R02-OVF	WEIR	13.32	0	01:22	1.00
EX-R03-OVF	WEIR	1.94	0	01:13	0.29
EX-R1-OVF	WEIR	1.23	0	01:30	0.21
P3-03-OVF	WEIR	6.68	0	01:10	0.66
P4-02-OVF	WEIR	6.94	0	01:43	0.67
P4-03-OVF	WEIR	3.02	0	01:43	0.39
P4-04-OVF	WEIR	4.61	0	01:40	0.51
P4-05-OVF	WEIR	2.37	0	02:20	0.33
13	DUMMY	13.62	0	01:10	
14	DUMMY	10.16	0	01:10	
EX-A04-STOR_out	DUMMY	11.00	0	01:00	
EX-A3-01&02-STOR_out	DUMMY	25.00	0	01:11	
EX-R02-STOR_out	DUMMY	20.10	0	00:49	
EX-R03-STOR_out	DUMMY	6.50	0	00:52	
EX-R1-STOR_out	DUMMY	3.90	0	00:36	
P3-01-STOR_out	DUMMY	31.60	0	00:48	
P3-02-STOR_out	DUMMY	2.20	0	01:20	
P3-03-STOR_out	DUMMY	12.12	0	01:03	
P4-01-STOR_out	DUMMY	0.00	0	00:00	
P4-02-STOR_out	DUMMY	5.71	0	00:31	
P4-03-STOR_out	DUMMY	0.64	0	00:28	
P4-04-STOR_out	DUMMY	1.50	0	00:30	
P4-05-STOR_out	DUMMY	5.10	0	00:32	
P4-06-STOR_out	DUMMY	0.64	0	00:27	
P4-07-STOR_out	DUMMY	1.59	0	00:31	

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
1	1.00	0.02	0.00	0.00	0.97	0.01	0.00	0.00	0.00	0.00
11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	1.00	0.02	0.00	0.00	0.03	0.00	0.00	0.96	0.00	0.00
16	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	1.00	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.95	0.00
32	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	1.00	0.78	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38_1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38_3	1.00	0.77	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	1.00	0.90	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00

46	1.00	0.90	0.00	0.00	0.00	0.00	0.00	0.10	0.00
0.00									
47	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
48	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
49	1.00	0.02	0.00	0.00	0.03	0.00	0.00	0.95	0.00
0.00									
49_1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
49_2	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
50	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
51	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
52	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
53	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
54	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
55	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
56	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
57	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
58	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
59	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
60	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
61	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
62	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
63	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
64	1.00	0.90	0.08	0.00	0.00	0.02	0.00	0.00	0.93
0.00									
65	1.00	0.97	0.00	0.00	0.03	0.00	0.00	0.00	0.00
0.00									
66	1.00	0.97	0.00	0.00	0.00	0.00	0.00	0.03	0.00
0.00									
67	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
68	1.00	0.97	0.00	0.00	0.00	0.00	0.03	0.00	0.00
0.00									
69	1.00	0.02	0.08	0.00	0.90	0.00	0.00	0.00	0.53
0.00									
70	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
72	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
73	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
74	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
75	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
76	1.00	0.02	0.98	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
77	1.00	0.98	0.00	0.00	0.00	0.00	0.00	0.02	0.00
0.00									
79	1.00	0.78	0.00	0.00	0.22	0.00	0.00	0.00	0.00
0.00									
80	1.00	0.77	0.00	0.00	0.23	0.00	0.00	0.00	0.00
0.00									
81	1.00	0.02	0.00	0.00	0.02	0.00	0.00	0.96	0.01
0.00									
Pipe_-_(1)_(1)_(STM)	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00
0.00									
Pipe_-_(1)_(STM)	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00
0.00									
Pipe_-_(10)_(1)_(1)_(STM)	1.00	0.02	0.00	0.00	0.02	0.00	0.00	0.96	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(_(1)_(1)_(2)_(STM)	1.00	0.02	0.00	0.00	0.03	0.00			
0.00 0.95 0.00 0.00									
Pipe_-_(10)_(1)_(2)_(_(1)_(1)_(STM)	1.00	0.02	0.00	0.00	0.03	0.00	0.00		
0.95 0.00 0.00									
Pipe_-_(10)_(1)_(2)_(_(2)_(1)_(STM)	1.00	0.01	0.00	0.00	0.13	0.00	0.00		
0.86 0.07 0.00									
Pipe_-_(10)_(1)_(2)_(_(2)_(STM)	1.00	0.02	0.00	0.00	0.03	0.00	0.00		
0.96 0.00 0.00									
Pipe_-_(10)_(1)_(2)_(1)_(STM)	1.00	0.02	0.00	0.00	0.02	0.02	0.00	0.94	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(100)_(4)_(STM)	1.00	0.02	0.00	0.00	0.05	0.06	0.00		
0.87 0.02 0.00									
Pipe_-_(10)_(1)_(2)_(103)_(STM)	1.00	0.02	0.00	0.00	0.03	0.00	0.00		
0.95 0.00 0.00									
Pipe_-_(10)_(1)_(2)_(104)_(STM)	1.00	0.02	0.00	0.00	0.03	0.00	0.00		
0.95 0.00 0.00									
Pipe_-_(10)_(1)_(2)_(11)_(STM)	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(15)_(STM)	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(16)_(STM)	1.00	0.05	0.91	0.00	0.04	0.00	0.00	0.00	
0.95 0.00									
Pipe_-_(10)_(1)_(2)_(2)_(STM)	1.00	0.88	0.04	0.00	0.07	0.00	0.00	0.00	
0.93 0.00									
Pipe_-_(10)_(1)_(2)_(22)_(STM)	1.00	0.02	0.00	0.00	0.02	0.00	0.00	0.96	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(27)_(STM)	1.00	0.03	0.00	0.00	0.03	0.03	0.00	0.91	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(28)_(STM)	1.00	0.03	0.00	0.00	0.03	0.00	0.00	0.94	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(3)_(STM)	1.00	0.02	0.00	0.00	0.01	0.00	0.00	0.96	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(31)_(STM)	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(32)_(STM)	1.00	0.03	0.00	0.00	0.04	0.00	0.00	0.94	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(33)_(STM)	1.00	0.02	0.00	0.00	0.52	0.03	0.00	0.43	
0.00 0.00									
Pipe_-_(10)_(1)_(2)_(35)_(1)_(STM)	1.00	0.02	0.00	0.00	0.02	0.00	0.00		
0.96 0.01 0.00									
Pipe_-_(10)_(1)_(2)_(35)_(2)_(STM)	1.00	0.02	0.00	0.00	0.06	0.00	0.00		
0.91 0.02 0.00									

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  Pipe_-_(10)_(1)_(2)_(35)_(STM)    1.00   0.02  0.00  0.00  0.00  0.00  0.00  0.98
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(39)_(STM)    1.00   0.02  0.00  0.00  0.00  0.00  0.00  0.98
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(4)_(STM)    1.00   0.02  0.00  0.00  0.02  0.00  0.00  0.96
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(40)_(2)_(STM)    1.00   0.02  0.00  0.00  0.01  0.03  0.00
0.95  0.03  0.00
  Pipe_-_(10)_(1)_(2)_(45)_(STM)    1.00   0.02  0.01  0.00  0.15  0.00  0.00  0.81
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(46)_(STM)    1.00   0.02  0.00  0.00  0.17  0.00  0.00  0.81
0.01  0.00
  Pipe_-_(10)_(1)_(2)_(48)_(STM)    1.00   0.02  0.00  0.00  0.02  0.00  0.00  0.95
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(49)_(STM)    1.00   0.02  0.00  0.00  0.03  0.00  0.00  0.95
0.01  0.00
  Pipe_-_(10)_(1)_(2)_(5)_(STM)    1.00   0.02  0.00  0.00  0.00  0.00  0.00  0.98
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(50)_(STM)    1.00   0.02  0.00  0.00  0.04  0.00  0.00  0.94
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(52)_(STM)    1.00   0.02  0.00  0.00  0.14  0.00  0.00  0.84
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(54)_(STM)    1.00   0.02  0.00  0.00  0.11  0.00  0.00  0.87
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(55)_(STM)    1.00   0.02  0.00  0.00  0.05  0.00  0.00  0.93
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(57)_(STM)    1.00   0.02  0.00  0.00  0.01  0.00  0.00  0.96
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(58)_(STM)    1.00   0.02  0.00  0.00  0.98  0.00  0.00  0.00
0.81  0.00
  Pipe_-_(10)_(1)_(2)_(59)_(STM)    1.00   0.02  0.00  0.00  0.12  0.00  0.00  0.86
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(61)_(STM)    1.00   0.02  0.00  0.00  0.01  0.00  0.00  0.97
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(63)_(STM)    1.00   0.02  0.00  0.00  0.03  0.00  0.00  0.95
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(64)_(STM)    1.00   0.02  0.00  0.00  0.02  0.00  0.00  0.96
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(66)_(STM)    1.00   0.02  0.00  0.00  0.01  0.00  0.00  0.97
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(7)_(STM)    1.00   0.02  0.00  0.00  0.83  0.15  0.00  0.00
0.95  0.00
  Pipe_-_(10)_(1)_(2)_(70)_(STM)    1.00   0.02  0.00  0.00  0.00  0.00  0.00  0.98
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(71)_(STM)    1.00   0.02  0.00  0.00  0.01  0.00  0.00  0.97
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(72)_(STM)    1.00   0.02  0.00  0.00  0.01  0.00  0.00  0.97
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(73)_(STM)    1.00   0.02  0.00  0.00  0.02  0.00  0.00  0.96
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(74)_(STM)    1.00   0.02  0.00  0.00  0.03  0.01  0.00  0.94
0.01  0.00
  Pipe_-_(10)_(1)_(2)_(76)_(STM)    1.00   0.02  0.00  0.00  0.00  0.00  0.00  0.98
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(79)_(STM)    1.00   0.02  0.00  0.00  0.06  0.04  0.00  0.88
0.07  0.00
  Pipe_-_(10)_(1)_(2)_(8)_(STM)    1.00   0.02  0.00  0.00  0.02  0.00  0.00  0.96
0.02  0.00
  Pipe_-_(10)_(1)_(2)_(80)_(STM)    1.00   0.02  0.00  0.00  0.77  0.00  0.00  0.20
0.44  0.00
  Pipe_-_(10)_(1)_(2)_(82)_(STM)    1.00   0.02  0.00  0.00  0.03  0.00  0.00  0.95
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(89)_(1)_(STM)    1.00   0.02  0.00  0.00  0.03  0.01  0.00
0.93  0.00  0.00
  Pipe_-_(10)_(1)_(2)_(89)_(STM)    1.00   0.02  0.00  0.00  0.03  0.00  0.00  0.95
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(94)_(1)_(4)_(STM)    1.00   0.02  0.00  0.00  0.03  0.00
0.00  0.95  0.00  0.00
  Pipe_-_(10)_(1)_(2)_(98)_(STM)    1.00   0.02  0.00  0.00  0.13  0.00  0.00  0.84
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(99)_(STM)    1.00   0.02  0.00  0.00  0.00  0.00  0.00  0.98
0.00  0.00
  Pipe_-_(10)_(1)_(2)_(STM)    1.00   0.03  0.00  0.00  0.01  0.00  0.00  0.96
0.00  0.00
  Pipe_-_(11)_(STM)       1.00   0.02  0.00  0.00  0.02  0.04  0.00  0.91  0.02
0.00
  Pipe_-_(12)_(STM)       1.00   0.02  0.00  0.00  0.52  0.00  0.00  0.46  0.00
0.00
  Pipe_-_(14)_(1)_(2)_(STM)    1.00   0.02  0.00  0.00  0.17  0.00  0.00  0.80
0.06  0.00
  Pipe_-_(14)_(1)_(STM)    1.00   0.02  0.00  0.00  0.06  0.00  0.00  0.92  0.00
0.00
  Pipe_-_(15)_(STM)       1.00   0.02  0.00  0.00  0.73  0.00  0.00  0.25  0.00
0.00
  Pipe_-_(16)_(1)_(STM)    1.00   0.02  0.00  0.00  0.03  0.00  0.00  0.95  0.00
0.00
  Pipe_-_(16)_(STM)       1.00   0.02  0.00  0.00  0.03  0.00  0.00  0.95  0.00
0.00
  Pipe_-_(17)_(1)_(2)_(STM)    1.00   0.02  0.00  0.00  0.11  0.00  0.00  0.87
0.04  0.00
  Pipe_-_(17)_(1)_(3)_(3)_(STM)    1.00   0.02  0.00  0.00  0.02  0.00  0.00  0.96
0.00  0.00
  Pipe_-_(17)_(1)_(3)_(STM)    1.00   0.05  0.00  0.00  0.02  0.00  0.00  0.93
0.00  0.00
  Pipe_-_(17)_(2)_(STM)    1.00   0.89  0.05  0.00  0.06  0.00  0.00  0.00  0.93
0.00
  Pipe_-_(17)_(3)_(STM)    1.00   0.02  0.00  0.00  0.12  0.00  0.00  0.86  0.00
0.00
  Pipe_-_(17)_(4)_(STM)    1.00   0.03  0.00  0.00  0.03  0.00  0.00  0.95  0.00
0.00
  Pipe_-_(17)_(STM)       1.00   0.03  0.00  0.00  0.04  0.00  0.00  0.94  0.00
0.00
  Pipe_-_(18)_(STM)       1.00   0.03  0.00  0.00  0.16  0.00  0.00  0.81  0.00
0.00
  Pipe_-_(19)_(STM)       1.00   0.02  0.00  0.00  0.15  0.00  0.00  0.83  0.00
0.00
  Pipe_-_(20)_(4)_(STM)    1.00   0.02  0.00  0.00  0.15  0.00  0.00  0.83  0.00
0.00
  Pipe_-_(20)_(STM)       1.00   0.02  0.00  0.00  0.77  0.00  0.00  0.20  0.00
0.00
  Pipe_-_(22)_(STM)       1.00   0.02  0.00  0.00  0.12  0.00  0.00  0.86  0.00
0.00
  Pipe_-_(24)_(STM)       1.00   0.02  0.00  0.00  0.15  0.00  0.00  0.83  0.00
0.00
  Pipe_-_(25)_(STM)       1.00   0.02  0.00  0.00  0.03  0.00  0.00  0.95  0.00
0.00
  Pipe_-_(26)_(STM)       1.00   0.02  0.00  0.00  0.03  0.00  0.00  0.95  0.00
0.00
  Pipe_-_(27)_(STM)       1.00   0.02  0.00  0.00  0.02  0.00  0.00  0.95  0.00
0.00
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Pipe_-_(28)_(STM)	1.00	0.02	0.00	0.00	0.06	0.00	0.00	0.92	0.00
0.00									
Pipe_-_(29)_(STM)	1.00	0.02	0.00	0.00	0.02	0.00	0.00	0.96	0.00
0.00									
Pipe_-_(9)_(1)_(STM)	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00
0.00									
Pipe_-_(9)_(STM)	1.00	0.02	0.00	0.00	0.02	0.00	0.00	0.96	0.01
0.00									

****
Conduit Surcharge Summary
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Conduit	Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
1	0.01	0.15	0.01	0.32	0.01
12	0.54	0.54	0.55	0.49	0.27
49	0.55	0.55	0.57	0.01	0.01
81	0.23	0.23	0.47	0.01	0.01
Pipe_-_(1)_(1)_(STM)	0.01	0.01	0.01	0.01	0.01
Pipe_-_(10)_(1)_(1)_(STM)	0.26	0.26	0.33	0.15	0.14
Pipe_-_(10)_(1)_(2)_(_(1)_(1)_(2)_(STM)	0.54	0.54	0.55	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(_(1)_(1)_(STM)	0.55	0.55	0.56	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(_(2)_(1)_(STM)	0.63	0.64	0.67	0.29	
0.36					
Pipe_-_(10)_(1)_(2)_(_(2)_(STM)	0.45	0.45	0.51	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(1)_(STM)	0.26	0.26	0.28	0.05	
0.06					
Pipe_-_(10)_(1)_(2)_(100)_(4)_(STM)	0.51	0.51	0.56	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(103)_(STM)	0.57	0.59	0.58	0.21	
0.29					
Pipe_-_(10)_(1)_(2)_(104)_(STM)	0.58	0.61	0.58	0.31	
0.58					
Pipe_-_(10)_(1)_(2)_(11)_(STM)	0.01	0.01	0.01	0.04	
0.01					
Pipe_-_(10)_(1)_(2)_(15)_(STM)	0.01	0.03	0.01	0.08	
0.01					
Pipe_-_(10)_(1)_(2)_(2)_(STM)	0.24	0.24	0.28	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(22)_(STM)	0.33	0.37	0.35	0.34	
0.28					
Pipe_-_(10)_(1)_(2)_(27)_(STM)	0.38	0.38	0.42	0.01	
0.08					
Pipe_-_(10)_(1)_(2)_(28)_(STM)	0.43	0.45	0.45	0.01	
0.38					
Pipe_-_(10)_(1)_(2)_(3)_(STM)	0.26	0.29	0.26	0.28	
0.26					
Pipe_-_(10)_(1)_(2)_(31)_(STM)	0.01	0.57	0.01	0.71	
0.01					
Pipe_-_(10)_(1)_(2)_(32)_(STM)	0.49	0.57	0.49	0.70	
0.49					
Pipe_-_(10)_(1)_(2)_(33)_(STM)	0.56	0.62	0.56	0.66	
0.56					
Pipe_-_(10)_(1)_(2)_(35)_(1)_(STM)	0.36	0.36	0.50	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(35)_(2)_(STM)	0.50	0.50	0.54	0.02	
0.07					
Pipe_-_(10)_(1)_(2)_(39)_(STM)	0.01	0.14	0.01	0.07	
0.01					
Pipe_-_(10)_(1)_(2)_(4)_(STM)	0.35	0.35	0.39	0.27	
0.27					
Pipe_-_(10)_(1)_(2)_(40)_(2)_(STM)	0.01	0.01	0.10	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(45)_(STM)	3.51	3.51	3.64	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(46)_(STM)	3.66	3.66	3.87	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(48)_(STM)	0.34	0.34	0.35	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(49)_(STM)	0.31	0.31	0.33	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(5)_(STM)	0.01	0.40	0.01	0.42	
0.01					
Pipe_-_(10)_(1)_(2)_(50)_(STM)	0.31	0.31	0.33	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(52)_(STM)	3.19	3.19	3.32	0.10	
0.19					
Pipe_-_(10)_(1)_(2)_(54)_(STM)	2.56	2.56	2.64	0.01	
0.10					
Pipe_-_(10)_(1)_(2)_(55)_(STM)	0.36	0.37	0.36	0.01	
0.36					
Pipe_-_(10)_(1)_(2)_(57)_(STM)	0.21	0.21	0.30	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(58)_(STM)	0.37	0.39	0.38	0.03	
0.20					
Pipe_-_(10)_(1)_(2)_(59)_(STM)	0.37	0.38	0.37	0.01	
0.37					
Pipe_-_(10)_(1)_(2)_(61)_(STM)	0.01	0.01	0.24	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(63)_(STM)	0.47	0.47	0.47	0.48	
0.47					
Pipe_-_(10)_(1)_(2)_(64)_(STM)	0.39	0.47	0.39	0.47	
0.39					
Pipe_-_(10)_(1)_(2)_(66)_(STM)	0.31	0.38	0.33	0.16	
0.08					
Pipe_-_(10)_(1)_(2)_(7)_(STM)	0.01	0.01	0.01	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(70)_(STM)	0.01	0.01	0.05	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(71)_(STM)	0.05	0.05	0.09	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(72)_(STM)	0.11	0.11	0.30	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(73)_(STM)	0.51	0.51	0.53	0.01	
0.01					
Pipe_-_(10)_(1)_(2)_(74)_(STM)	0.53	0.53	0.56	0.06	
0.06					
Pipe_-_(10)_(1)_(2)_(76)_(STM)	0.11	0.23	0.11	0.19	
0.11					
Pipe_-_(10)_(1)_(2)_(79)_(STM)	0.49	0.49	0.53	0.01	
0.01					

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  Pipe_-_(10)_(1)_(2)_(8)_(STM)         0.01      0.01      0.16      0.01
0.01
  Pipe_-_(10)_(1)_(2)_(80)_(STM)         0.59      0.59      0.59      0.49
0.48
  Pipe_-_(10)_(1)_(2)_(82)_(STM)         0.53      0.53      0.57      0.01
0.01
  Pipe_-_(10)_(1)_(2)_(89)_(1)_(STM)         0.56      0.56      0.56      0.01
0.01
  Pipe_-_(10)_(1)_(2)_(89)_(STM)         0.56      0.56      0.59      0.01
0.01
  Pipe_-_(10)_(1)_(2)_(94)_(1)_(4)_(STM)         0.57      0.57      0.59      0.01
0.01
  Pipe_-_(10)_(1)_(2)_(98)_(STM)         0.60      0.60      0.63      0.01
0.20
  Pipe_-_(10)_(1)_(2)_(99)_(STM)         0.01      0.02      0.01      0.01
0.01
  Pipe_-_(10)_(1)_(2)_(STM)         0.27      0.27      0.34      0.01          0.01
  Pipe_-_(11)_(STM)            0.27      0.27      0.37      0.01          0.01
  Pipe_-_(12)_(STM)            0.61      0.63      0.61      0.69          0.61
  Pipe_-_(14)_(1)_(2)_(STM)         0.59      0.59      0.63      0.01          0.01
  Pipe_-_(14)_(1)_(STM)          0.58      0.58      0.59      0.03          0.04
  Pipe_-_(15)_(STM)            0.55      0.55      0.58      0.01          0.01
  Pipe_-_(16)_(1)_(STM)          0.58      0.58      0.58      0.30          0.54
  Pipe_-_(16)_(STM)            0.56      0.58      0.58      0.21          0.28
  Pipe_-_(17)_(1)_(2)_(STM)         0.41      0.41      0.45      0.01          0.01
  Pipe_-_(17)_(1)_(3)_(3)_(STM)         0.44      0.55      0.47      0.19
0.07
  Pipe_-_(17)_(1)_(3)_(STM)         0.37      0.37      0.42      0.01          0.01
  Pipe_-_(17)_(2)_(STM)          0.42      0.42      0.55      0.01          0.01
  Pipe_-_(17)_(3)_(STM)          0.58      0.58      0.60      0.03          0.24
  Pipe_-_(17)_(4)_(STM)          0.56      0.56      0.56      0.63          0.56
  Pipe_-_(17)_(STM)            0.56      0.56      0.57      0.31          0.35
  Pipe_-_(18)_(STM)            0.56      0.59      0.56      0.60          0.56
  Pipe_-_(19)_(STM)            0.58      0.61      0.58      0.58          0.58
  Pipe_-_(20)_(4)_(STM)          0.60      0.60      0.60      0.53          0.60
  Pipe_-_(20)_(STM)            0.59      0.59      0.60      0.49          0.49
  Pipe_-_(22)_(STM)            0.58      0.58      0.58      0.47          0.52
  Pipe_-_(24)_(STM)            0.57      0.57      0.58      0.43          0.48
  Pipe_-_(25)_(STM)            0.56      0.56      0.57      0.04          0.04
  Pipe_-_(26)_(STM)            0.54      0.55      0.56      0.46          0.44
  Pipe_-_(27)_(STM)            0.54      0.56      0.54      0.44          0.53
  Pipe_-_(28)_(STM)            0.55      0.55      0.55      0.45          0.49
  Pipe_-_(29)_(STM)            0.37      0.38      0.37      0.02          0.37
  Pipe_-_(9)_(STM)             0.12      0.12      0.30      0.01          0.01


  Analysis begun on:  Fri Nov 28 09:37:31 2025
  Analysis ended on:  Fri Nov 28 09:37:37 2025
  Total elapsed time: 00:00:06
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APPENDIX E

MOE Amended Certificate of Approval For Existing Storm Sewers & SWM Facilities

RECEIVED DEC 0 6 2010

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDED CERTIFICATE OF APPROVAL
INDUSTRIAL SEWAGE WORKS
NUMBER 6601-8B8MMR
Issue Date: November 30, 2010

Queensway-Carleton Hospital
3045 Baseline Road
Ottawa, Ontario
K2H 8P4

Site Location: 3045 Baseline Road
City of Ottawa,
K2H 8P4

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

Construction of stormwater management Works for the collection, treatment and disposal of stormwater run-off from a proposed Part 3 expansion at the Queensway Carleton Hospital (comprising of the construction of additional medical facilities, renovations to the existing hospital, modifications to the existing parking lots, and re-alignment of the Ring Road along the west side of the hospital campus) to provide a Normal Level of water quality protection and to attenuate post-development peak flows to pre-development levels for all storm events up to and including the 100 year event, discharging to the existing drainage tributary to Graham Creek, consisting of the following:

Area A1 (Existing Surface Vehicle Parking Lot, located south east of main hospital building)

Replacing an existing 103 mm diameter plug type inlet control device (ICD) with a smaller 84 mm diameter plug type orifice in the outlet pipe of the existing south west catchbasin (CB 132) to reduce the controlled flow from the approximately southern half of the existing parking lot identified as A1a, controlling the discharge rate to 20.4 L/s, and providing approximately 100 cu.m. of storage during the 100 year storm event;

Replacing an existing 103 mm diameter plug type ICD with a smaller 85 mm diameter plug type orifice in the outlet pipe of the existing north west catchbasin to reduce the controlled flow from the approximately northern half of the existing parking lot identified as A1b, controlling the discharge rate to 20.4 L/s, and providing approximately 112 cu.m. of storage during the 100 year storm event;

Area A2-A (Existing Surface Vehicle Parking Lot, located south of main hospital building)

Modifying the drainage area by expanding the existing parking lot and regrading the adjacent berm, maintaining the discharge rate at 21 L/s, and maintaining approximately 54 cu.m. of storage during the 100 year storm event with the existing 91 mm diameter plug type ICD in the outlet pipe of the existing catchbasin;

Area A2-B (Existing Surface Vehicle Parking Lot, located south of main hospital building)

Replacing an existing 119 mm diameter plug type ICD with a smaller 81 mm diameter plug type orifice in the outlet pipe of the existing north west catchbasin (CB 129) to reduce the controlled flow from the existing parking lot and the overflow from parking lot A2-A, controlling the discharge rate to 20.5 L/s, and providing approximately 255 cu.m. of storage during the 100 year storm event;

Area P3-1 (New Medical Facility, attached to the north west of the main hospital building)

Providing roof top storage by installing twenty-three (23) roof drains which control the discharge, and another eight (8) uncontrolled roof drains and two (2) uncontrolled catchbasins (CB 302 and CB 303), resulting in a total discharge rate of 49.4 L/s, providing approximately 195 cu.m of storage during the 100 year storm event;

Area P3-2 (MRI Expansion, attached to the north of the main hospital building)

Providing roof top storage by installing two (2) roof drains which control the discharge rate to 1.14 L/s per drain, for a total discharge rate of approximately 2.3 L/s, providing approximately 4.7 cu.m of storage during the 100 year storm event;

resulting in the following pre-development and post-development flows for the 15.51 hectare portion of the Queensway Carleton Hospital campus draining to the existing ditch along the west property line for the 1:5 year and 1:100 year design events:

Design Event	Pre-Development Total Site Flow (L/s)	Post-Development Controlled Site Flow (L/s)	Post-Development Total Site Flow (L/s)
1:5 year	1191.8	220.8	1184.0
1:100 year	1961.0	261.6	1846.8

together with any storm and sanitary sewer installation and removals as noted in the submitted documents, including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Sewage Works dated September 2, 2010 submitted by Peter Thompson, B.ARCH., MBA, Director, Planning & Facility Redevelopment, Queensway Carleton Hospital and forwarded by Richard Buchanan, C.E.T., City of Ottawa via letter dated September 8, 2010 to the Ministry.

2. Report entitled 'Queensway-Carleton Hospital, Overall Campus - Part 3 Expansion, Stormwater Management Report' dated June 26, 2009, amended July 27, 2010, prepared for the Queensway Carleton Hospital by Novatech Engineering Consultants Ltd.

Existing Works approved under Certificate of Approval No. 7898-7DGJUK dated April 18, 2008

Construction of stormwater management Works for the collection, treatment and disposal of stormwater run-off from a proposed expansion at the Queensway Carleton Hospital (comprising of the expansion to the Cancer Centre, a Power Plant addition, additional surface vehicle parking lots, a multilevel parking structure with adjoining Hydro sub-station and generators, access road re-alignment) to provide a Normal Level of water quality protection and to attenuate post-development peak flows to pre-development levels for all storm events up to and including the 100 year event, discharging to the existing drainage ditch tributary to Graham Creek, consisting of the following:

Areas A-3.1 and A-3.2 (Proposed Cancer Centre and adjoining Roof Area)

Roof top storage provided by ten (10) roof drains which control the discharge rate to 1.9 L/s per drain, for a total controlled release rate of 19 L/s, and providing approximately 57.2 cu.m. of storage during the 100 year storm event.

Area A-4 (Proposed Overhead Covered Link)

Roof top storage provided by eleven (11) roof drains which control the discharge rate to 1.0 L/s per drain, for a total controlled release rate of 11 L/s, and providing approximately 6.8 cu.m. of storage during the 100 year storm event.

Area A-5 (Proposed Multilevel Parking Structure)

Construction of an oversized pipe located below grade to provide an approximate storage of 100 cu.m and the installation of a flow restricting orifice located in the outlet pipe from catchbasin (CBMH 1) located immediately downstream of the oversized pipe, controlling the release rate to 24.8 L/s during the 100 year storm event.

Area A-6 (Proposed Surface Vehicle Parking Lot, area north-east of Cancer Centre)

Construction of an oversized pipe located below grade together with surface ponding to provide an approximate storage of 118.1 cu.m and the installation of a flow restricting orifice located in the outlet pipe from catchbasin (CBMH 10) located immediately downstream of the oversized pipe, controlling the release rate to 28.3 L/s during the 100 year storm event.

Area A-7 (Proposed Surface Vehicle Parking Lot, area north-west of Cancer Centre)

Construction of an oversized pipe located below grade together with surface ponding to provide an approximate storage of 98.0 cu.m and the installation of a flow restricting orifice located in the outlet pipe from catchbasin (MH 11) located immediately downstream of the oversized pipe, controlling the release rate to 8.0 L/s during the 100 year storm event.

Oil/Grit Interceptor

An oil/grit interceptor (Stormceptor STC 9000, located north of the multilevel parking structure) sized to provide a normal level of water quality protection, having a sediment capacity of 32.98 cu.m., an oil capacity of 10.56 cu.m., a total holding capacity of 44.36 cu.m., discharging to the existing 900 mm diameter storm sewer and

drainage ditch, eventually discharging to Graham Creek,

together with any storm and sanitary sewer removals as noted in the submitted documents, including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Municipal and Private Sewage Works dated March 8, 2009 submitted by Peter Thompson, B.ARCH., MBA, Director, Planning & Facility Redevelopment, Queensway Carleton Hospital and forwarded by Guy Bourgon, P. Eng., City of Ottawa via letter dated March 27, 2008 to the Ministry.

2. Report entitled 'Queensway Carleton Hospital, Overall Campus - Cancer Centre Expansion, Stormwater Management Report' dated March 10, 2008 prepared for the Queensway Carleton Hospital by Novatech Engineering Consultants Ltd.

Existing Works approved in December 2007

A **stormwater management** system on Queensway-Carleton Hospital property, to control the 100 year storm event to the lesser of the existing or 5 year post development storm event levels as per the Rational Method (the maximum allowable release flowrate is 6.5 L/s), with rooftop storage for expansion of the Operation Room building having an area of about 0.4 ha, and the installation of a post indicator valve for the related Operation Room building loading dock area's storm sewer system, comprising of the following:

Storage Component (for the 100 year storm event)

- **roof top storage** of approximately 7.12 cubic metres for the expanded Operation Room roof top;

Flow Control

- eight (8) **roof drains,** releasing a total maximum flowrate of about 6.5 L/s; for an average depth of about 18 mm for the expanded Operation Room roof top; and

- **post indicator valve** installed about 30 metres north-westerly of the loading dock catchbasin, in the existing outlet storm sewer (300 mm diameter), as part of the Queensway-Carleton Hospital's spill contingency plan, titled 'Chemical Spill and Containment' for the Operation Room Building's loading dock area;

as part of the Queensway-Carleton Hospital Building's expansion project, in the City of Ottawa;

all in accordance with the application dated November 28, 2006 and received on December 5, 2006, signed by R.P. Thompson, Director of Planning and Redevelopment, Queensway-Carleton Hospital, and all supporting documentation and information, including final plans and specifications prepared by The Walter Fedy Partnership.

Existing Works Previously Constructed

1. Storage provided within parking lots and the installation of flow restricting orifice(s) located in the outlet pipe from catchbasin to control the release rate during the 100 year storm event as event as follows:

Drainage Area	Area (ha)	Post-Development Flow 100 year event	Storage Volume Provided
Area A1	0.75	54 L/s	150 cu.m.
Area A2-A	0.29	21 L/s	54 cu.m.
Area A2-B	0.49	36 L/s	94 cu.m.
Area PL2a	0.16	11 L/s	20 cu.m.
Area PL3	0.23	24 L/s	24 cu.m.

2. Roof top storage provided by roof drains which control the discharge rate during the 100 year storm event as follows:

Drainage Area	Area (ha)	Post-Development Flow 100 year event	Storage Volume Provided
Area R1	0.07	3.9 L/s	10 cu.m.
Area R2	0.36	21.1 L/s	51 cu.m.
Area R3	0.40	6.5 L/s	7.1 cu.m.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

"Certificate" means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

"Director" means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

"District Manager" means the District Manager of the Ottawa District Office of the Ministry;

"Ministry" means the Ontario Ministry of the Environment;

"Owner" means Queensway-Carleton Hospital and includes its successors and assignees;

"Works" means the sewage works described in the Owner's application, this Certificate and in the supporting documentation referred to herein, to the extent approved by this Certificate.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL CONDITIONS

1.1 The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Certificate and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

1.2 Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Certificate, the application for approval of the Works and the submitted supporting documents and plans and specifications as listed in this Certificate.

1.3 Where there is a conflict between a provision of any submitted document referred to in this Certificate and the Conditions of this Certificate, the Conditions in this Certificate shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

1.4 Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

1.5 The requirements of this Certificate are severable. If any requirement of this Certificate, or the application of any requirement of this Certificate to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this Certificate shall not be affected thereby.

2. EXPIRY OF APPROVAL

The approval issued by this Certificate will cease to apply to those parts of the Works which have not been constructed within **five (5) years** of the date of this Certificate.

3. CHANGE OF OWNER

The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within **thirty (30) days** of the change occurring:

(a) change of Owner;

(b) change of address of the Owner;

(c) change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the District Manager; and

(d) change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the District Manager.

4. OPERATION AND MAINTENANCE

4.1 The Owner shall ensure that the design storage volumes are maintained at all times.

4.2 The Owner shall inspect the Works regularly and, if necessary, clean and maintain the Works to prevent the excessive build-up of sediments and/or vegetation.

4.3 The Owner shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the site for inspection by the Ministry. The logbook shall include the following:

(a) the name of the Works; and
(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

4.4 The Owner shall design, construct and operate the oil/grit interceptor with the objective that no visible oil sheens occur in the effluent discharged from the oil/grit interceptor.

4.5 The Owner shall carry out and maintain an annual inspection and maintenance program on the operation of the oil/grit interceptor in accordance with the manufacturer's recommendation.

5. RECORD KEEPING

The Owner shall retain for a minimum of **five (5) years** from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this Certificate.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition No.1 is imposed to ensure that the Works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Certificate and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the Owners their responsibility to notify any person they authorized to carry out work pursuant to this Certificate the existence of this Certificate.

2. Condition 2 is included to ensure that, when the Works are constructed, the Works will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to approved Works and to ensure that subsequent owners of the Works are made aware of the Certificate and continue to operate the Works in compliance with it.

4. Condition 4 is included to require that the Works be properly operated and maintained such that the

environment is protected and to ensure that the oil/grit interceptor is operated and maintained without any adverse impact on the environment.

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the Works.

This Certificate of Approval revokes and replaces Certificate(s) of Approval No. 7898-7DGJUK issued on April 18, 2008

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act , R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 30th day of November, 2010

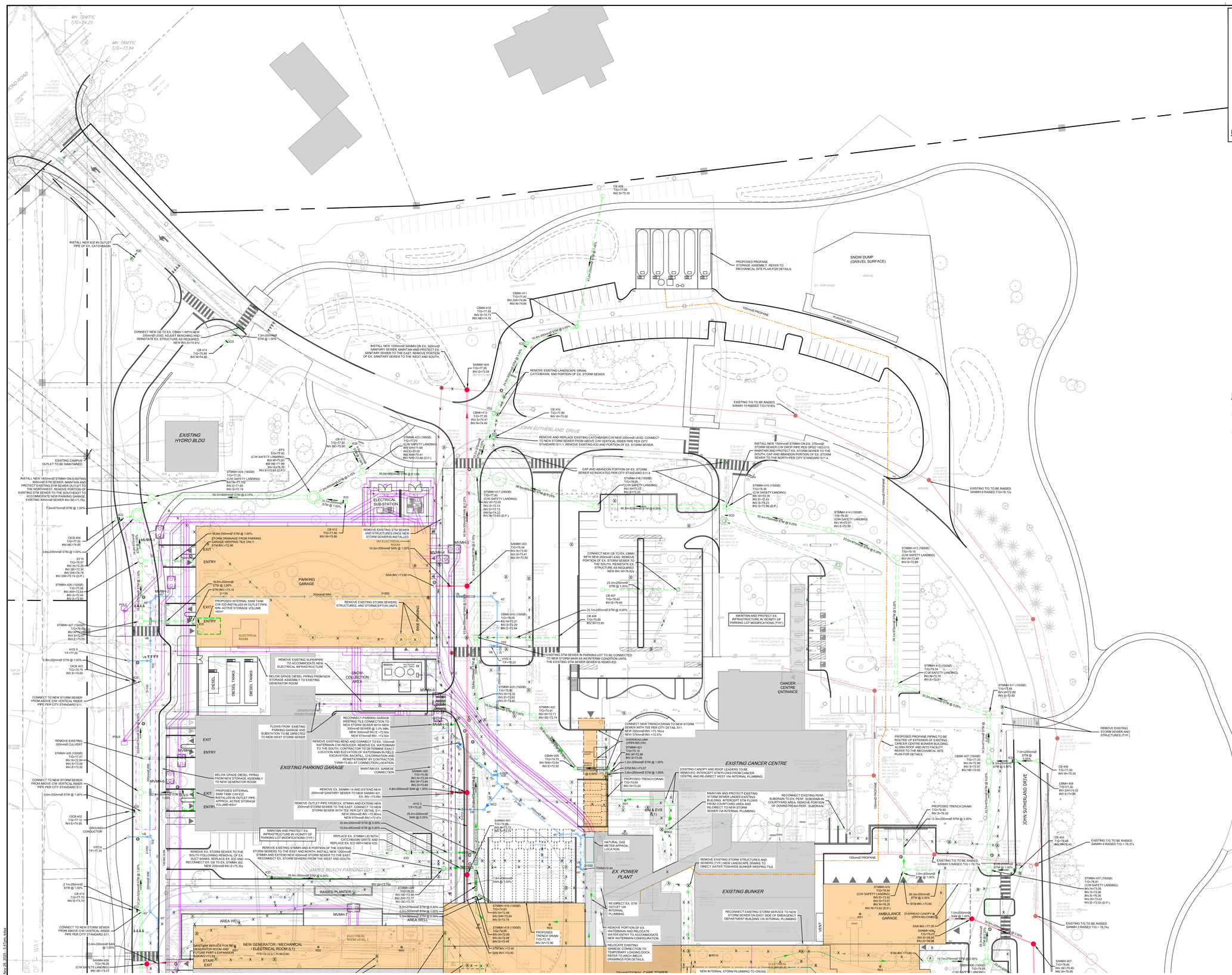
THIS CERTIFICATE WAS MAILED
ON Dec 2, 2010
(Signed)

Ian Parrott, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

DC/
c: District Manager, MOE Ottawa
François Thauvette, P.Eng., Novatech Engineering Consultants Ltd. √

APPENDIX F

Engineering Plans


NORTH
KEY PLAN
N.T.S.
Woodroffe Ave
St. Bodenhurst Rd
St. Castlefrank Rd
QUEENSWAY CARLETON HOSPITAL
JOHN SUTHERLAND DRIVE
EXISTING PARKING GARAGE
EXISTING CANCER CENTRE
EXISTING BUNKER
EX. POWER PLANT
ELECTRICAL SUB-STATION
PARKING GARAGE
CANCER CENTRE ENTRANCE
AMBULANCE GARAGE
SNOW DUMP (GRAVEL SURFACE)
SNOW COLLECTION AREA
JAMES BEACH PARKING LOT
NEW GENERATOR / MECHANICAL / ELECTRICAL ROOM (L1)
EXISTING HYDRO BLDG
PROPOSED PART 4 EXPANSION
EXISTING BUILDING
PROPOSED PROPANE STORAGE ASSEMBLY, REFER TO MECHANICAL SITE PLAN FOR DETAILS.
REMOVE EXISTING LANDSCAPE DRAIN, CATCHBASIN, AND PORTION OF EX. STORM SEWER.
REMOVE AND REPLACE EXISTING CATCHBASIN C/W NEW 200mm∅ LEAD. CONNECT TO NEW STORM SEWER FROM ABOVE C/W VERTICAL RISER PIPE PER CITY STANDARD S11.1. REMOVE EXISTING ICD AND PORTION OF EX. STORM SEWER.
CAP AND ABANDON PORTION OF EX. STORM SEWER AS INDICATED PER CITY STANDARD S11.4.
EXISTING TIG TO BE RAISED, SANMH 10 RAISED TIG=78.80±
EXISTING TIG TO BE RAISED, SANMH 9 RAISED TIG=78.12±
EXISTING TIG TO BE RAISED, SANMH 5 RAISED TIG = 78.70±
EXISTING TIG TO BE RAISED, SANMH 4 RAISED TIG = 78.37±
EXISTING TIG TO BE RAISED, SANMH 3 RAISED TIG = 78.74±
INSTALL NEW 1200mm∅ SANMH ON EX. 300mm∅ SANITARY SEWER, MAINTAIN AND PROTECT EX. SANITARY SEWER TO THE EAST AND SOUTH. REMOVE PORTION OF EX. SANITARY SEWER TO THE WEST AND SOUTH.
INSTALL NEW 1500mm∅ STMMH ON EX. 375mm∅ STORM SEWER C/W DROP PIPE PER OPSD 1003.010. MAINTAIN AND PROTECT EX. STORM SEWER TO THE NORTH. REMOVE PORTION OF EX. STORM SEWER TO THE NORTH PER CITY STANDARD S11.4.
INSTALL NEW 1800mm∅ STMMH ON EXISTING 900mm∅ STM SEWER. MAINTAIN AND PROTECT EXISTING STM SEWER OUTLET TO THE NORTHWEST. REMOVE PORTION OF EXISTING STM SEWER TO THE SOUTHEAST TO ACCOMMODATE NEW PARKING GARAGE. EXISTING 900mm∅ SEWER INV.SE=71.70±
INSTALL NEW ICD IN OUTLET PIPE OF EX. CATCHBASIN.
CONNECT NEW CB TO EX. CBMH 1 WITH NEW 200mm∅ LEAD. ADJUST BENCHING AND REINSTATE EX. STRUCTURE AS REQUIRED. NEW INV.S=74.91±
REMOVE EXISTING STM SEWER AND STRUCTURES ONCE NEW STORM SEWER IS INSTALLED.
REMOVE EXISTING STORM SEWERS, STRUCTURES, AND STORMCEPTOR UNITS.
EXISTING STM SEWER IN PARKING LOT TO BE CONNECTED TO NEW STORM MAN-AS-AN INTERIM CONDITION UNTIL THE EXISTING STM SEWER SEWER IS REMOVED.
MAINTAIN AND PROTECT EX. INFRASTRUCTURE IN VICINITY OF PARKING LOT MODIFICATIONS (TYP.)
CONNECT NEW CB TO EX. CBMH WITH NEW 250mm∅ LEAD. REMOVE PORTION OF EX. STORM SEWER TO THE SOUTH. REINSTATE EX. STRUCTURE AS REQUIRED. NEW INV.W=76.82±
CONNECT NEW TRENCH DRAIN TO NEW STORM SEWER WITH TEE PER CITY DETAIL S11. NEW 250mm∅ INV.=73.16m± NEW 375mm∅ INV.=72.97±
REMOVE EXISTING BEND AND CONNECT TO EX. 150mm∅ WATERMAIN C/W REDUCER. REMOVE EX. WATERMAIN TO THE SOUTH. CONTRACTOR TO DETERMINE EXACT LOCATION AND ELEVATION OF WATERMAIN IN FIELD. EXCAVATION, CUTOFF, CHLORINATION AND REINSTATEMENT BY CONTRACTOR. TWATER=73.65± AT CONNECTION LOCATION.
RECONNECT PARKING GARAGE SUBDRAIN TO EX. PERF. SUBDRAIN IN NEW STORM SEWER WITH NEW 300mm∅ SEWER @ 1.0% MIN. NEW 300mm∅ INV.E =72.90± NEW 675mm∅ INV. =72.50±
REMOVE EX. SANMH 14 AND EXTEND NEW 200mm∅ SANITARY SEWER TO NEW SANMH 401. EX. INV.=73.58±
REMOVE OUTLET PIPE FROM EX. STMMH AND EXTEND NEW 200mm∅ STORM SEWER TO THE EAST. CONNECT TO NEW STORM SEWER WITH TEE PER CITY DETAIL S11. NEW 250mm∅ INV.=72.80m± NEW 675mm∅ INV.=72.47±
REMOVE EX. STORM SEWER TO THE SOUTHEAST AND EX. CATCHBASIN, DUCT BANKS. REPLACE EX. ICD AND RECONNECT EX. CB TO EX. STMMH 302. NEW 200mm∅ INV.E=75.35±
REMOVE EXISTING STMMH AND A PORTION OF THE EXISTING STORM SEWERS TO THE EAST AND NORTH. INSTALL NEW 1200mm∅ STORM AND EXTEND NEW 450mm∅ STORM SEWER TO THE EAST. RECONNECT EX. STORM SEWERS FROM THE WEST AND SOUTH.
REPLACE EX. STMMH LID WITH CATCHBASIN GRATE AND REPLACE EX. ICD WITH NEW ICD.
RECONNECT EXISTING PERF. SUBDRAIN TO EX. PERF. SUBDRAIN IN COURTYARD AREA. REMOVE PORTION OF DOWNSTREAM PERF. SUBDRAIN.
MAINTAIN AND PROTECT EXISTING STORM SEWER AND SUBDRAIN IN BUILDING. INTERCEPT STM FLOWS FROM COURTYARD AREA AND RE-DIRECT TO NEW STORM SEWER VIA INTERNAL PLUMBING.
RECONNECT EXISTING STORM SERVICE TO NEW STORM SEWER ON EAST SIDE OF EMERGENCY DEPARTMENT BUILDING VIA INTERNAL PLUMBING
REMOVE EXISTING STORM STRUCTURES AND SEWERS (TYP.) NEW LANDSCAPE DRAINS TO DIRECT WATER TOWARDS BUNKER WEEPING TILE.
REMOVE PORTION OF EX. WATERMAIN AND RELOCATE WATER ENTRY TO ACCOMMODATE NEW WATERMAIN CONFIGURATION.
RELOCATE EXISTING SIAMESE CONNECTION TO TEMPORARY LOADING DOCK. REFER TO ARCH./MECH. DRAWINGS FOR DETAILS.
NEW INTERNAL STORM PLUMBING TO CROSS
PROPOSED PROPANE PIPING TO BE ROUTED UP EXTERIOR OF EXISTING CANCER CENTRE BUNKER BUILDING, ALONG ROOF AND INTO FACILITY. REFER TO THE MECHANICAL SITE PLAN FOR DETAILS.
REMOVE EXISTING STORM SEWER AND STRUCTURES (TYP.)
REMOVE EXISTING SUPERPIPE TO ACCOMMODATE NEW ELECTRICAL INFRASTRUCTURE
BELOW GRADE DIESEL PIPING FROM NEW STORAGE ASSEMBLY TO EXISTING GENERATOR ROOM
FLOWS FROM EXISTING GARAGE SUBDRAIN SUBSTATION TO BE DIRECTED TO NEW WEST STORM SEWER
BELOW GRADE DIESEL PIPING FROM NEW STORAGE ASSEMBLY TO NEW GENERATOR ROOM
PROPOSED EXTERNAL SWM TANK C/W ICD INSTALLED IN OUTLET PIPE. APPROX. ACTIVE STORAGE VOLUME=45m³
PROPOSED INTERNAL SWM TANK WITH ORIFICE PLATE INSTALLED IN OUTLET PIPE. MIN. ACTIVE STORAGE VOLUME =65m³
SANITARY SERVICE FOR NEW GENERATOR ROOM AND FUTURE PART 5 EXPANSION
EXISTING CAMPUS OUTLET TO BE MAINTAINED
CONNECT TO NEW STORM SEWER FROM ABOVE C/W VERTICAL RISER PIPE PER CITY STANDARD S11.
CONNECT TO NEW STORM SEWER FROM ABOVE C/W VERTICAL RISER PIPE PER CITY STANDARD S11.
REMOVE EXISTING 300mm∅ CULVERT
GROUND CONDUCTOR
CONNECT TO NEW STORM SEWER FROM ABOVE C/W VERTICAL RISER PIPE PER CITY STANDARD S11.
CBMH 411 TG=77.45 INV.SW=74.84 INV.NW=74.94
CBMH 412 TG=77.35 INV.S=74.73 INV.NE=74.76
CBMH 413 TG=77.85 INV.S=74.41 INV.NW=74.49
SANMH 404 TG=77.95 INV.S=73.25 INV.S=72.95
CB 409 TG=77.05 INV.S=75.35
CB 410 TG=77.90 INV.W=75.90
CB 411 TG=77.50 INV.SE=75.35
CB 412 TG=77.80 INV.W=75.80
CB 413 TG=77.70 INV.E=75.70
CB 414 TG=75.85 INV.N=74.98
CICB 404 TG=77.80 INV.NE=74.85
CICB 403 TG=76.76 INV.E=74.60
CICB 402 TG=77.10 INV.E=74.06
STMMH 423 (1800Ø) TG=77.20 (C/W SAFETY LANDING) INV.SW=71.08 INV.E=72.20 INV.NW=71.83 INV.NW=72.68 (D.P.)
STMMH 424 (1800Ø) TG=77.26 (C/W SAFETY LANDING) INV.SW=71.74E INV.E=71.85 INV.S=72.19
STMMH 417 (2400Ø) TG=77.60 (C/W SAFETY LANDING) INV.W=72.05 INV.E=72.13 INV.W=72.13 INV.W=72.63 (D.P.)
STMMH 416 (1500Ø) TG=78.05 (C/W SAFETY LANDING) INV.W=72.20 INV.E=72.25
STMMH 415 (1500Ø) TG=78.34 (C/W SAFETY LANDING) INV.W=72.43 INV.E=72.48 INV.S=78.23 INV.S=72.98 (D.P.)
STMMH 414 (1500Ø) TG=78.00 (C/W SAFETY LANDING) INV.W=72.61 INV.E=72.59
STMMH 413 (1500Ø) TG=78.71 (C/W SAFETY LANDING) INV.W=72.89 INV.S=72.66
STMMH 412 (1500Ø) TG=78.64 (C/W SAFETY LANDING) INV.W=72.78 INV.S=72.61
STMMH 411 (1500Ø) TG=77.85 INV.W=72.69 INV.S=72.62
STMMH 410 (C/W SAFETY LANDING) INV.W=73.52 INV.E=73.52 INV.W=76.25 INV.N=73.80 (D.P.)
STMMH 407 (1500Ø) TG=78.81 (C/W SAFETY LANDING) INV.W=73.06 INV.E=76.96 INV.W=73.43 INV.E=73.53 (D.P.)
STMMH 406 TG=79.07 INV.E=76.95 INV.W=76.96
STMMH 405 TG=79.07 INV.E=76.95 INV.W=76.96
STMMH 403 TG=76.54 INV.N=73.40 INV.S=73.30 INV.W=73.50
STMMH 422 TG=75.41 INV.W=72.71 INV.SE=72.74
STMMH 420 (1500Ø) TG=75.90 INV.N=72.32 INV.E=72.62 INV.S=72.60
STMMH 421 TG=75.96 INV.W=73.06 INV.E=73.06
SANMH 401 TG=77.73 INV.S=73.71
SANMH 402 TG=75.09 INV.W=73.64 INV.S=73.64
SANMH 403 TG=76.54 INV.N=73.40 INV.S=73.30
SANMH 405 (C/W SAFETY LANDING) INV.SE=73.01
SANMH 407 TG=78.95 INV.SE=76.80 INV.W=76.85
CBMH 406 TG=77.30 INV.W=72.86 INV.E=72.82
CBMH 407 (1500Ø) TG=77.20 INV.N=72.97 INV.S=72.97 INV.NE=73.60
CBMH 408 TG=77.20 INV.SW=74.02 INV.E=74.95
CB 405 TG=78.45 INV.W=76.43
CB 406 TG=77.30 INV.W=75.30
DRAINAGE (1500Ø) TG=78.85 (C/W SAFETY LANDING)
HYD 1 T/F=77.00
HYD 2 T/F=78.23
HYD 3 T/F=75.25
HYD 4 T/F=78.23
HYD 5 T/F=77.00
HYD 6 T/F=77.35
MH TRAFFIC T/G=74.25
MH TRAFFIC T/G=73.94
MVMH-1
MVMH-2
MVMH-3
MVMH-4
MVMH-5
MVMH-6
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MVMH-37
MVMH-38
MVMH-39
MVMH-40

REFER TO PLAN 123089-GP1 FOR CONTINUATION

NORTH

KEY PLAN
N.T.S.

LEGEND

- PROPERTY LINE
- EASEMENT BOUNDARY
- PROPOSED SANITARY MANHOLE & SEWER WITH DIRECTION OF FLOW
- PROPOSED STORM MANHOLE & SEWER WITH DIRECTION OF FLOW
- PROPOSED CATCHBASIN AND LEAD
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED STORM OGS UNIT
- ICD — PROPOSED INLET CONTROL DEVICE
- PROPOSED WATERMAIN / WATER SERVICE
- PROPOSED VALVE & VALVE BOX
- PROPOSED HYDRANT C/W VALVE & LEAD
- PROPOSED WATERMAIN BEND & THRUST BLOCK
- RED ▼ PROPOSED WATERMAIN REDUCER
- FDC — PROPOSED FIRE DEPARTMENT CONNECTION
- PROPOSED WATER METER AND REMOTE METER
- X — REMOVALS
- PROPOSED CAP
- (D.P.) PROPOSED DROP PIPE INVERT
- (25) SEWER / HYDRANT LEAD CROSSING IDENTIFIER
- THERMAL INSULATION FOR SHALLOW SEWERS
- PROPOSED PROPANE ALIGNMENT
- PROPOSED ELECTRICAL ALIGNMENT
- PROPOSED ELECTRICAL GROUND CONDUCTOR
- PROPOSED OXYGEN ALIGNMENT
- PROPOSED DIESEL ALIGNMENT
- EXISTING SANITARY MANHOLE & SEWER WITH DIRECTION OF FLOW
- EXISTING STORM MANHOLE & SEWER WITH DIRECTION OF FLOW
- EXISTING CATCHBASIN AND LEAD
- EXISTING CATCHBASIN MANHOLE
- EXISTING STORM OGS UNIT
- EXISTING LANDSCAPE DRAIN
- EXISTING WATERMAIN / WATER SERVICE
- EXISTING VALVE & VALVE BOX
- EXISTING HYDRANT C/W VALVE & LEAD
- EXISTING VEGETATION (TREES)
- EXISTING LIGHT STANDARD
- GAS — EXISTING GAS LINE
- HUG — EXISTING HYDRO UNDERGROUND WIRES
- OH — EXISTING OVERHEAD WIRES

PROPOSED PART 4 EXPANSION BUILDING

EXISTING BUILDING

BENCHMARK NOTES:

1. ELEVATIONS SHOWN ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978).
2. IT IS THE RESPONSIBILITY OF THE USER OF THIS INFORMATION TO VERIFY THAT THE JOB BENCHMARK HAS NOT BEEN ALTERED OR DISTURBED AND THAT IT'S RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION SHOWN ON THIS DRAWING.
3. BENCHMARK WAS PROVIDED ON THE PLAN OF SURVEY OF PART OF LOT 16, CONCESSION 2 (O.F.), GEOGRAPHIC TOWNSHIP OF NEPEAN, CITY OF OTTAWA, SURVEYED BY STANTEC GEOMATICS LTD., DATED NOVEMBER 5, 2024.

REFER TO PLAN 123089-NDT FOR ADDITIONAL NOTES

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

Queensway Carleton Hospital

No.	REVISION	DATE	BY
1.	ISSUED FOR SITE PLAN CONTROL APPROVAL	NOV 28/25	FST

SCALE 1:400

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DESIGN KD
CHECKED FST
DRAWN KD
CHECKED FST
APPROVED FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — F.S. THAUVETTE — 100041299 — November 28, 2025 — PROVINCE OF ONTARIO

NOVATECH
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Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
QUEENSWAY CARLETON HOSPITAL

DRAWING NAME
GENERAL PLAN OF SERVICES
PART 4 EXPANSION

PROJECT No. 123089
REV. REV #1
DRAWING No. 123089-GP2

PLANNED DWG - 123089GP2.DWG

NORTH

KEY PLAN
N.T.S.

LEGEND

- PROPERTY LINE
- 78.90 PROPOSED ELEVATION
- 78.90TC PROPOSED TOP OF CURB ELEVATION
- 78.90SW PROPOSED SWALE ELEVATION
- 78.90DC(-) PROPOSED DEPRESSED CURB ELEVATION
- 79.25 PROPOSED ENTRANCE/EXIT ELEVATION
- MAXIMUM 3:1 SIDESLOPE
- 3.5% GRADE AND DIRECTION
- EMERGENCY OVERLAND FLOW ROUTE
- PROPOSED CHAIN LINK FENCE
- PROPOSED CONCRETE CURB
- DC PROPOSED DEPRESSED CONCRETE CURB
- PROPOSED ARMOUR STONE RETAINING WALL
- SANITARY PROPOSED TWSI
- PROPOSED SANITARY MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED STORM OGS UNIT
- PROPOSED VALVE & VALVE BOX
- PROPOSED HYDRANT
- REMOVALS
- PROPOSED PART 4 EXPANSION BUILDING

- 78.85 × 81.38 EXISTING ELEVATION
- EXISTING OVERHEAD WIRES
- EXISTING CONCRETE CURB
- EXISTING CATCHBASIN AND LEAD
- EXISTING CATCHBASIN MANHOLE
- EXISTING STORM OGS UNIT
- EXISTING STORM DRAIN
- EXISTING VALVE & VALVE BOX
- EXISTING HYDRANT C/W VALVE & LEAD
- EXISTING SANITARY MANHOLE
- EXISTING VEGETATION (TREES)
- EXISTING LIGHT STANDARD
- EXISTING SIGN
- EXISTING HYDRO POLE
- EXISTING BUILDING

BENCHMARK NOTES:

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Erosion and Sediment Control Responsibilities:

				During Construction		After Construction Prior to Final Acceptance		After Final Acceptance	
	ESC Measure	Symbol	Specification	Installation Responsibility	Inspection/Maintenance Responsibility	Inspection Frequency	Approval to Remove	Removal Responsibility	Inspection/Maintenance Responsibility
Temporary Measures	Silt Fence	— — —	OPSD 219.110	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Filter Fabric	Location as Required by ESC Note #2	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Mud Mat	MM	Drawing Details	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Dust Control	Location as Required around Site	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Stabilized Material Stockpiling	Location as Required by Contractor	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Sediment Basin (for flows being pumped out of excavations)	Location as Required by Contractor	- - -	Developer's Contractor	Developer's Contractor	After Every Rainstorm	Developer's Contractor	Developer's Contractor	N/A

REFER TO PLAN 123089-GR2 FOR CONTINUATION

REFER TO PLAN 123089-NDT FOR ADDITIONAL NOTES, DETAILS AND TABLES

NOTE:
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Queensway Carleton Hospital

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1.	ISSUED FOR SITE PLAN CONTROL APPROVAL	NOV 28/25	FST

SCALE 1:400

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0 4 8 12 16

DESIGN KD
CHECKED FST
DRAWN KD
CHECKED FST
APPROVED FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — F.S. THAUVETTE — 100041299 — November 28, 2025 — PROVINCE OF ONTARIO

NOVATECH
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Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
QUEENSWAY CARLETON HOSPITAL

DRAWING NAME
GRADING AND EROSION & SEDIMENT CONTROL PLAN PART 4 EXPANSION

PROJECT No. 123089
REV. REV #1
DRAWING No. 123089-GR1

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REFER TO PLAN 123089-GR1 FOR CONTINUATION

NORTH

KEY PLAN
N.T.S.

LEGEND

- PROPERTY LINE
- PROPOSED ELEVATION
- PROPOSED TOP OF CURB ELEVATION
- PROPOSED SWALE ELEVATION
- PROPOSED DEPRESSED CURB ELEVATION
- PROPOSED ENTRANCE/EXIT ELEVATION
- MAXIMUM 3:1 SIDESLOPE
- GRADE AND DIRECTION
- EMERGENCY OVERLAND FLOW ROUTE
- PROPOSED CHAIN LINK FENCE
- PROPOSED CONCRETE CURB
- PROPOSED DEPRESSED CONCRETE CURB
- PROPOSED ARMOUR STONE RETAINING WALL
- PROPOSED TWSI
- PROPOSED SANITARY MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED STORM OGS UNIT
- PROPOSED VALVE & VALVE BOX
- PROPOSED HYDRANT
- REMOVALS
- PROPOSED PART 4 EXPANSION BUILDING
- EXISTING ELEVATION
- EXISTING OVERHEAD WIRES
- EXISTING CONCRETE CURB
- EXISTING CATCHBASIN AND LEAD
- EXISTING CATCHBASIN MANHOLE
- EXISTING STORM OGS UNIT
- EXISTING STORM DRAIN
- EXISTING VALVE & VALVE BOX
- EXISTING HYDRANT C/W VALVE & LEAD
- EXISTING SANITARY MANHOLE
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- EXISTING SIGN
- EXISTING HYDRO POLE
- EXISTING BUILDING

BENCHMARK NOTES:

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			During Construction			After Construction Prior to Final Acceptance	After Final Acceptance
	ESC Measure	Symbol	Specification	Installation Responsibility	Inspection/Maintenance Responsibility	Inspection Frequency	Approval to Remove	Removal Responsibility	Inspection/Maintenance Responsibility
	Silt Fence	— — —	OPSD 219.110	Developer's Contractor	Developer's Contractor	(as a minimum)	Consultant	Developer's Contractor	N/A
	Filter Fabric	Location as indicated in ESC Note #3	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
Temporary Measures	Mud Mat	[▪▪]	Drawing Details	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Dust Control	Location as Required Around Site	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Stabilized Material Stockpiling	Location as Prepared by Contractor	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Sediment Basin (for flows being pumped out of excavations)	Location as Prepared by Contractor	----	Developer's Contractor	Developer's Contractor	After Every Rainstorm	Developer's Contractor	Developer's Contractor	N/A

REFER TO PLAN 123089-NDT FOR ADDITIONAL NOTES, DETAILS AND TABLES

NOTE:
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Queensway Carleton Hospital

No.	REVISION	DATE	BY
1.	ISSUED FOR SITE PLAN CONTROL APPROVAL	NOV 28/25	FST

SCALE 1:400 (1:400 0 4 8 12 16)

DESIGN KD
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CHECKED FST
APPROVED FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER F.S. THAUVETTE 100041396 November 28, 2025 PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
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Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
QUEENSWAY CARLETON HOSPITAL

DRAWING NAME
GRADING AND EROSION & SEDIMENT CONTROL PLAN PART 4 EXPANSION

PROJECT No. 123089
REV: REV #1
DRAWING No. 123089-GR2

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REFER TO PLAN 123089-NDT FOR ADDITIONAL NOTES, DETAILS AND TABLES

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

Queensway Carleton Hospital

No.	REVISION	DATE	BY
1.	ISSUED FOR SITE PLAN CONTROL APPROVAL	NOV 28/25	FST

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APPROVED FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
K. J. AULD
100187063
NOV 28, 2025
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
F.S. THAUVETTE
100041399
November 28, 2025
PROVINCE OF ONTARIO

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LOCATION
CITY OF OTTAWA
QUEENSWAY CARLETON HOSPITAL

DRAWING NAME
STORMWATER MANAGEMENT PLAN

PROJECT No. 123089
REV. REV #1
DRAWING No. 123089-SWM

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GENERAL NOTES:

1. COORDINATE ALL SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $5,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. COMPLETE ALL WORKS IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS USING THE CURRENT GUIDELINES, BYLAWS AND STANDARDS INCLUDING MATERIALS OF CONSTRUCTION, DISINFECTION AND ALL RELEVANT REFERENCES TO OPSS, OPSD & AWWA GUIDELINES - ALL CURRENT VERSIONS AND 'AS AMENDED'.
6. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA, OWNER, AND ENGINEER.
7. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
8. ALL ELEVATIONS ARE GEODETIC.
9. REFER TO THE GEOTECHNICAL REPORT (CA003314,1722, DATED APRIL 10, 2025), PREPARED BY WSP CANADA INC., FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT SHALL REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
10. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARD SURFACED AREAS AND DIMENSIONS.
11. REFER TO THE 'QCH PART 4 SITE SERVICING REPORT' (R-2025-078) AND TO THE 'QCH PART 4 STORMWATER MANAGEMENT REPORT' (R-2025-085), PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
12. SAW CUT AND KEY' GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10),
13. PROVIDE LINE/PARKING PAINTING.
14. CONTRACTOR TO PROVIDE THE CONSULTANT WITH SERVICING PLANS OF 123089-GP1 & 123089-GP2 INDICATING ALL SERVICING AS-BUILT INFORMATION SHOWN ON THE SERVICING PLAN. AS-BUILT INFORMATION MUST INCLUDE: PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS, VALVE AND HYDRANT LOCATIONS, TWIM ELEVATIONS AND ANY ALIGNMENT CHANGES, ETC.

SEWER NOTES:

1. SUPPLY AND CONSTRUCT ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS - ALL CURRENT VERSIONS AND 'AS AMENDED'.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
CATCHBASIN (600x600mm)	705.010	OPSD
STORM / SANITARY MANHOLE (1200mmØ)	701.010	OPSD
STORM / CATCHBASIN MANHOLE (1500mmØ)	701.011	OPSD
STORM / CATCHBASIN MANHOLE (1800mmØ)	701.012	OPSD
CB, FRAME & COVER	S19.1	CITY OF OTTAWA
SANITARY MH FRAME & COVER	S24	CITY OF OTTAWA
STORM MH / CBMH FRAME & COVER	S24.1	CITY OF OTTAWA
WATERTIGHT MH FRAME AND COVER	401.030	OPSD
SEWER TRENCH	S6	CITY OF OTTAWA
SEWER CONNECTION - RIGID MAIN	S11	CITY OF OTTAWA
SEWER CONNECTION - FLEXIBLE MAIN	S11.1	CITY OF OTTAWA
INSULATION FOR SHALLOW SEWERS	S35	CITY OF OTTAWA
MH DROP STRUCTURES	1003.010	OPSD
SANITARY SEWER	PVC DR 35	
CATCHBASIN LEAD	PVC DR 35	
STORM SEWER (450mm DIAMETER AND UNDER)	PVC DR 35	
STORM SEWER (525mm DIAMETER AND OVER)	CONCRETE 65-D, 100-D, 140-D	

3. ALL STORM AND SANITARY SERVICE LATERALS SHALL BE EQUIPPED WITH A BACKFLOW PREVENTION DEVICE AS PER THE CITY OF OTTAWA STANDARD DETAILS S14 AND S14.1 / S14.2.
4. INSULATE ALL PIPES (SAN/STM) THAT HAVE LESS THAN 1.0m COVER WITH HI-40 INSULATION PER CITY OF OTTAWA STANDARD DETAIL S35, PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
5. SERVICES ARE TO BE CONSTRUCTED TO 1.0m FROM FACE OF BUILDING AT A MINIMUM SLOPE OF 1.0%.
6. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
7. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTING PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL), THE CONCRETE CRADLE FOR THE PIPE CAN BE ELIMINATED.
8. THE OWNER SHALL REQUIRE THAT THE SERVICING CONTRACTOR PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 410.07.16, 410.07.16.04 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF A CERTIFIED PROFESSIONAL ENGINEER WHO SHALL SUBMIT A CERTIFIED COPY OF THE TEST RESULTS.
9. ALL STORM MANHOLES AND CATCHBASIN MANHOLES WITH PIPES LESS THAN 900mm DIAMETER AND UNDER ARE TO HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED. ALL CATCHBASINS ARE TO HAVE 600mm SUMPS UNLESS OTHERWISE INDICATED. MANHOLES WITH PIPES LARGER THAN 900mm DIAMETER TO BE BENCHED WITHOUT A SUMP.
10. ALL CATCHBASINS, MANHOLES AND/OR CATCHBASIN MANHOLES THAT ARE TO HAVE ICD'S INSTALLED WITHIN THEM ARE TO HAVE 600mm SUMPS.
11. ALL WEEPING TILE CONNECTIONS TO BE MADE TO THE PROPOSED STORM SEWER SYSTEM DOWNSTREAM OF ANY INLET CONTROL DEVICES.
12. THE CONTRACTOR IS TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mmØ OR GREATER PRIOR TO BASE COURSE ASPHALT, UPON COMPLETION OF CONTRACT. THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES. PROVIDE A COPY OF ALL CCTV INSPECTION REPORTS TO THE ENGINEER FOR REVIEW.

WATERMAIN NOTES:

1. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARDS AND SPECIFICATIONS - ALL CURRENT VERSIONS AND 'AS AMENDED', EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR, CONNECTIONS AND SHUT-OFFS AT THE MAIN BY CITY OF OTTAWA FORCES. CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY THE CONTRACTOR IN THE PRESENCE CITY OF OTTAWA FORCES.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN TRENCHING	W17	CITY OF OTTAWA
HYDRANT INSTALLATION	W19	CITY OF OTTAWA
THERMAL INSULATION IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
THERMAL INSULATION AT OPEN STRUCTURES	W23	CITY OF OTTAWA
VALVE BOX ASSEMBLY	W24	CITY OF OTTAWA
WATERMAIN CROSSING BELOW SEWER	W25	CITY OF OTTAWA
WATERMAIN CROSSING OVER SEWER	W25.2	CITY OF OTTAWA
WATERMAIN MATERIAL	PVC DR 18	

3. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
4. PROVIDE MINIMUM 0.5m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS, WHERE POSSIBLE UNLESS OTHERWISE INDICATED.
5. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, UNLESS OTHERWISE INDICATED.
6. HYDRANTS SHALL BE ROTATED AT THE FLANGE TO FACE THE ROAD AND ALLOW FIRE SERVICES TO OPERATE THE NUTS.

CRITICAL SEWER PIPE CROSSING TABLE

CROSSING	LOWER PIPE	HIGHER PIPE	CLEARANCE	SURFACE ELEVATION
1	450mmØ STM T/INSUL+73.29	200mmØ SAN INV+73.72	± 0.43m	74.86 m
2	200mmØ STM T/INSUL+73.44	200mmØ SAN INV+73.70	± 0.26m	74.82 m
3 ●	300mmØ SAN T/P+73.80	U/S DUCT BANK C-C+74.07	± 0.25m	75.93 m
4	300mmØ STM T/P+73.24	300mmØ SAN INV+73.50	± 0.26m	75.95 m
5 ●	200mmØ SAN T/P+73.80	U/S DUCT BANK E-E+75.05	± 1.25m	76.80 m
6	900mmØ STM T/P+73.08	300mmØ SAN INV+73.33	± 0.25m	77.60 m
7 ●	300mmØ SAN T/P+73.41	U/S DUCT BANK F-F+76.61	± 3.20m	78.36 m
8	300mmØ SAN T/P+73.29	250mmØ STM INV+74.36	± 1.07m	78.33 m
9	675mmØ STM T/P+73.89	200mmØ SAN INV+76.93	± 3.04m	78.96 m
10	675mmØ STM T/P+74.03	200mmØ SAN INV+76.73	± 2.70m	78.77 m
11	300mmØ SAN T/P+72.56	375mmØ STM INV+73.66	± 1.10m	78.89 m
12	300mmØ SAN T/P+72.54	200mmØ STM INV+76.74	± 4.20m	78.75 m
13	300mmØ SAN T/P+72.35	525mmØ STM U/S+73.81	± 1.46m	78.59 m
14	*450mmØ SAN T/P+71.34x*	250mmØ STM INV+75.69	± 4.35m	78.23 m
15	*333mmØ SAN T/P+71.55x*	525mmØ STM U/S+74.00	± 2.45m	78.72 m
16	*200mmØ SAN T/P+72.61z*	250mmØ STM INV+73.76	± 1.15m	79.01 m
17	*200mmØ SAN T/P+72.57y*	250mmØ STM INV+73.75	± 1.18m	78.91 m
18	*200mmØ SAN T/P+72.40y*	200mmØ STM INV+76.35	± 3.95m	78.75 m
19	*200mmØ SAN T/P+71.97y*	675mmØ STM U/S+72.95	± 0.98m	78.77 m
20 ●	675mmØ STM T/P+73.21	U/S DUCT BANK C-C+73.87	± 0.66m	75.75 m
21	*300mmØ SAN T/P+72.21z*	300mmØ STM INV+74.56	± 1.35m	77.91 m
22 ●	250mmØ STM T/P+74.69	U/S DUCT BANK F-F+76.79	± 2.10m	78.54 m
23 ●	300mmØ STM T/P+73.76	U/S DUCT BANK F-F+75.64	± 1.88m	77.39 m
24 ●	675mmØ STM T/P+73.62	U/S DUCT BANK E-E+75.17	± 1.55m	76.92 m
25 ●	300mmØ STM T/P+73.49	U/S DUCT BANK F-F+75.58	± 2.09m	77.33 m
26 ●	675mmØ STM T/P+73.36	U/S DUCT BANK E-E+75.27	± 1.91m	77.02 m
27 ●	300mmØ STM T/P+73.28	U/S DUCT BANK F-F+75.62	± 2.34m	77.37 m

★ REFER TO ELECTRICAL DRAWINGS PREPARED BY VR ENGINEERING FOR DUCT BANK CROSS-SECTIONS.

CRITICAL HYDRANT LEAD CROSSING TABLE

CROSSING	LOWER PIPE	HIGHER PIPE	CLEARANCE	SURFACE ELEVATION
28	675mmØ STM T/P+73.52	150mmØ WM INV+74.21	± 0.69m	76.76 m
29	525mmØ STM T/P+73.85	150mmØ WM INV+74.56	± 0.71m	77.11 m

GRADING NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED PAVED AREAS AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF GRANULARS.
3. ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUB-EXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.
4. THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 98% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 98% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
5. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
6. MAXIMUM TERRACING GRADE TO BE 3:1 UNLESS OTHERWISE NOTED.
7. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
8. ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).
9. ALL CONCRETE SIDEWALKS SHALL BE CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.4) UNLESS OTHERWISE INDICATED.
10. ALL RETAINING WALLS OF AT LEAST 0.6m IN HEIGHT SHALL HAVE FENCING/RAILING ALONG TOP SURFACE OF WALL PER OBC ARTICLE 9.8.8.1.
11. SEPARATE RETAINING WALL DRAWINGS AND REPORT SHALL BE REQUIRED FOR ALL STRUCTURAL RETAINING WALLS WITH A HEIGHT GREATER THAN 1.0m. THE RETAINING WALL DOCUMENTS SHALL BE STAMPED BY A GEOTECHNICAL OR STRUCTURAL ENGINEER LICENSED IN THE PROVINCE OF ONTARIO PER CITY OF OTTAWA GUIDELINES.
12. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.
13. CONTRACTOR TO PROVIDE THE CONSULTANT WITH GRADING PLANS INDICATING AS-BUILT ELEVATIONS OF ALL DESIGN GRADES SHOWN ON PLANS 123089-GR1 AND 123089-GR2.

EROSION AND SEDIMENT CONTROL NOTES :

1. ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED TO THE SATISFACTION OF THE OWNER, ENGINEER, AND THE CITY OF OTTAWA. THEY ARE TO BE APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION. THESE PRACTICES ARE TO BE IMPLEMENTED IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL AND SHOULD INCLUDE AS A MINIMUM THOSE MEASURES INDICATED ON THE PLAN.
2. EROSION AND SEDIMENT CONTROL MEASURES WILL BE IMPLEMENTED DURING CONSTRUCTION IN ACCORDANCE WITH THE "GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES" (GOVERNMENT OF ONTARIO, MAY 1987). THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEETING ALL REGULATORY AGENCY REQUIREMENTS.
3. TO PREVENT SURFACE EROSION FROM ENTERING ANY STORM SEWER SYSTEM DURING CONSTRUCTION, FILTER BAGS WILL BE PLACED UNDER GRATES OF NEARBY CATCHBASINS AND STRUCTURES. A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED AROUND THE CONSTRUCTION AREA (WHERE APPLICABLE). THESE CONTROL MEASURES WILL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
4. TO LIMIT EROSION: MINIMIZE THE AMOUNT OF EXPOSED SOILS AT ANY GIVEN TIME, RE-VEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE AND PROTECT EXPOSED SLOPES WITH NATURAL OR SYNTHETIC MULCHES.
5. FOR MATERIAL STOCKPILING: MINIMIZE THE AMOUNT OF EXPOSED MATERIALS AT ANY GIVEN TIME; APPLY TEMPORARY SEEDING, TARPS, COMPACTION AND/OR MULCHING AS REQUIRED TO STABILIZE STOCKPILED MATERIALS THAT WILL NOT BE USED WITHIN 14 DAYS.
6. THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE ENGINEER, THE MEASURES ARE NO LONGER REQUIRED. NO CONTROL MEASURES MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE ENGINEER.
7. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO ANY STORM SEWER SYSTEM, APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
8. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
9. ROADWAYS ARE TO BE SWEPT AS REQUIRED OR AS DIRECTED BY THE OWNER AND/OR ENGINEER.
10. THE CONTRACTOR SHALL ENSURE PROPER DUST CONTROL IS PROVIDED WITH THE APPLICATION OF WATER (AND IF REQUIRED, CALCIUM CHLORIDE) DURING DRY PERIODS. MONITOR DUST LEVELS DURING SITE PREPARATION/EXCAVATION, AND CONSTRUCTION ACTIVITIES, AND WHEN DUST LEVELS BECOME VISUALLY APPARENT SPRAY WATER TO MINIMIZE THE RELEASE OF DUST FROM GRAVEL, PAVED AREAS AND EXPOSED SOILS. USE CHEMICAL DUST SUPPRESSANTS ONLY WHERE NECESSARY ON PROBLEM AREAS.

PAVEMENT STRUCTURES:

LIGHT DUTY (PARKING GARAGE - CARS ONLY)
60mm SUPERPAVE 12.5
150mm GRANULAR "A"
300mm GRANULAR "B"
ASPHALT GRADE PG 58-34
*INSTALLED PER GEOTECHNICAL REPORT

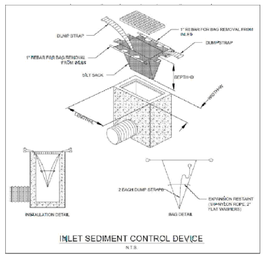
HEAVY DUTY (AMBULANCE PARKING / PARKING GARAGE- TRUCK TRAFFIC)
50mm SUPERPAVE 12.5
60mm SUPERPAVE 19.0
200mm GRANULAR "A"
400mm GRANULAR "B"
ASPHALT GRADE PG 58-34
*INSTALLED PER GEOTECHNICAL REPORT

HEAVY DUTY (NEW ROADWAYS / LOADING DOCK AREA)
60mm SUPERPAVE 12.5
80mm SUPERPAVE 19.0
300mm GRANULAR "A"
400mm GRANULAR "B"
ASPHALT GRADE PG 58-34
*INSTALLED PER GEOTECHNICAL REPORT

RIGID PAVEMENT STRUCTURE (LOADING DOCKS)
150mm PORTLAND LIMESTONE CEMENT CONCRETE OR EQUIVALENT
50mm (MIN.) HIGH-DENSITY RIGID STYROFOAM INSULATION
300mm GRANULAR "A"
400mm GRANULAR "B"
*INSTALLED PER GEOTECHNICAL REPORT

Erosion and Sediment Control Responsibilities:

	ESC Measure	Symbol	Specification	During Construction: Installation Responsibility	During Construction: Inspection/Maintenance Responsibility	During Construction: Inspection Frequency	After Construction Prior to Final Acceptance: Approval to Remove	After Construction Prior to Final Acceptance: Removal Responsibility	After Final Acceptance: Inspection/Maintenance Responsibility
Temporary Measures	Silt Fence / Light Duty	———	OPSD 219.110	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Filter Bags	Location as Indicated or ESC Note #2	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Mud Mat	Location as Required Around Site	Drawing Details	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developers Contractor	Developer's Contractor	N/A
	Dust Control	Location as Required by Contractor	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Stockpile Material Stockpiling	Location as Required by Contractor	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developers Contractor	Developer's Contractor	N/A
	Sediment Basin (for flows being pumped out of excavations)	Location as Required by Contractor	----	Developer's Contractor	Developer's Contractor	After Every Rainstorm	Developers Contractor	Developer's Contractor	N/A



INLET SEDIMENT CONTROL DEVICE
N.T.S.

PROPOSED 200mmØ WATERMAIN TABLE - NORTHWEST EXTENSION

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
2+000.00	78.55	76.15s ★	REMOVAL OF EX. BEND & CONNECTION TO EX. 200mmØ WATERMAIN
2+008.80	78.33	75.93 ★★★	CROSS ABOVE 250mmØ STM [T/P=74.65] (±1.08m CLEARANCE)
2+014.20	78.26	75.86 ★★★	CROSS ABOVE 200mmØ SAN [T/P=73.35] (±2.51m CLEARANCE)
2+024.00	77.98	75.58	45° VERTICAL BEND
2+024.50	77.97	75.08	45° VERTICAL BEND
2+025.00	77.96	75.08 ★★★	CROSS BELOW EX.200mmØ STM [Inv=75.37±] (±0.29m CLEARANCE)
2+025.50	77.94	75.08	45° VERTICAL BEND
2+026.00	77.92	75.52	45° VERTICAL BEND
2+027.80	77.87	75.47	45° HORIZONTAL BEND
2+031.00	77.76	75.36	45° HORIZONTAL BEND
2+033.20	77.67	75.27 ★★★	CROSS BELOW EX. GAS [Inv=76.75±] (±1.48m CLEARANCE)
2+050.00	77.22	74.82	---
2+054.00	77.17	74.77	150mmØ HYDRANT 6 TEE
2+067.90	77.12	★★ 74.72 ★★★	CROSS ABOVE 300mmØ STM [T/P=73.66] (±0.86m CLEARANCE)
2+075.00	77.22	74.82	---
2+093.50	76.89	74.49 ★★★	CROSS BELOW DUCT BANK E-E [U/S=75.14] (±0.65m CLEARANCE)
2+100.00	76.72	74.32	---
2+108.60	76.81	74.41	150mmØ HYDRANT 5 TEE
2+114.80	76.92	74.52	200mmØ VALVE & VALVE BOX
2+120.90	77.01	★★ 74.61 ★★★	CROSS ABOVE 300mmØ STM [T/P=73.37] (±1.04m CLEARANCE)
2+126.70	77.05	74.65	45° HORIZONTAL BEND
2+129.10	77.10	74.70	45° HORIZONTAL BEND
2+132.50	77.17	74.77 ★★★	CROSS BELOW DUCT BANK E-E [U/S=75.42] (±0.65m CLEARANCE)
2+136.70	77.28	74.88 ★★★	CROSS BELOW DUCT BANK F-F [U/S=75.53] (±0.65m CLEARANCE)
2+150.00	77.40	75.00	WM BELOW PARKING GARAGE U/S FOOTING ELEVATION
2+175.00	77.40	75.00	WM BELOW PARKING GARAGE U/S FOOTING ELEVATION
2+200.00	77.40	74.85	WM BELOW PARKING GARAGE U/S FOOTING ELEVATION
2+216.10	76.73	74.33 ★★★	CROSS BELOW DUCT BANK D-D [U/S=74.98] (±0.65m CLEARANCE)
2+219.70	76.68	74.28 ★★★	CROSS BELOW DUCT BANK E-E [U/S=74.93] (±0.65m CLEARANCE)
2+223.40	76.50	★★ 74.21	200mmØ VALVE & VALVE BOX
2+225.40	76.46	★★ 74.17 ★★★	CROSS ABOVE 300mmØ SAN [T/P=73.72] (±0.25m CLEARANCE)
2+228.10	76.43	74.03 ★★★	CROSS ABOVE 825mmØ STM [T/P=73.18] (±0.65m CLEARANCE)
2+232.90	76.56	74.03	45° HORIZONTAL BEND
2+235.30	76.53	74.03	45° HORIZONTAL BEND
2+246.20	76.22	73.82 ★★★	CROSS ABOVE 200mmØ STM [T/P=73.32] (±0.30m CLEARANCE)
2+248.90	76.12	73.72	150mmØ HYDRANT 4 TEE
2+267.10	75.76	★★ 73.64 ★★★	CROSS ABOVE 450mmØ STM [T/P=73.14] (±0.30m CLEARANCE)
2+268.10	75.74	★★ 73.64	45° VERTICAL BEND
2+268.60	75.72	73.14	45° VERTICAL BEND
2+277.20	75.45	73.05 ★★★	CROSS BELOW DUCT BANK E-E [U/S=73.70] (±0.65m CLEARANCE)
2+283.40	75.24	72.84 ★★★	CROSS BELOW DUCT BANK C-C [U/S=73.36] (±0.52m CLEARANCE)
2+288.70	75.09	72.69	200 X 200 X 200 WATER SERVICE TEE (4+000.00)
2+291.20	75.03	72.63	45° HORIZONTAL BEND
2+293.10	74.97	72.57	200 X 200 X 200 HYDRANT LEAD TEE (5+000.00)
2+300.00	74.84	72.44	---
2+316.30	74.64	72.24	45° HORIZONTAL BEND
2+321.30	74.64	72.24	45° HORIZONTAL BEND
2+322.80	74.66	72.26	45° HORIZONTAL BEND
2+331.30	74.83	72.43	200mmØ VALVE & VALVE BOX
2+332.40	74.84	72.44	45° HORIZONTAL BEND
2+332.90	74.84	72.44	45° HORIZONTAL BEND
2+333.40	74.85	72.45	CAP AT FOUNDATION WALL

★ CONNECTION TO EXISTING 200mmØ WATERMAIN. EXACT ELEVATIONS TO BE FIELD DETERMINED.
★★ PROVIDE THERMAL INSULATION AS PER CITY OF OTTAWA DETAILS W22 IN SHALLOW TRENCHES WHERE COVER IS LESS THAN 2.4m AND/OR W23 ADJACENT TO OPEN STRUCTURES.
★★★ PIPE CROSSINGS ARE TO BE IN ACCORDANCE WITH CITY STANDARDS W25 AND W25.2 TO AVOID CONFLICTS. WHERE POSSIBLE, REFER TO ELECTRICAL DRAWINGS PREPARED BY VR ENGINEERING FOR DUCT BANK CROSS-SECTIONS.

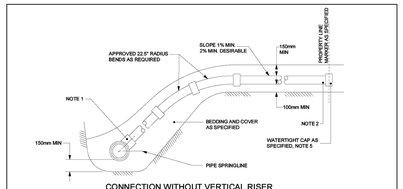
PROPOSED 200mmØ WATERMAIN TABLE - SOUTHEAST EXTENSION

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
3+000.00	78.31	75.91s ★	TEE CONNECTION TO EX 200mmØ WATERMAIN
3+001.50	78.28	75.88	200mmØ VALVE & VALVE BOX
3+003.00	78.25	75.85	45° HORIZONTAL BEND
3+007.90	78.34	75.94	45° HORIZONTAL BEND
3+025.00	78.73	76.33	---
3+046.00	78.71	76.31	45° HORIZONTAL BEND
3+051.20	78.72	76.32 ★★★	CROSS ABOVE 525mmØ STM [T/P=74.77] (±1.35m CLEARANCE)
3+055.70	78.65	76.25	45° HORIZONTAL BEND
3+068.80	78.71	76.25 ★★★	CROSS ABOVE 300mmØ SAN [T/P=71.51] (±4.54m CLEARANCE)
3+073.20	78.66	76.25	150mmØ HYDRANT 1 TEE
3+080.60	78.61	76.21 ★★★	CROSS ABOVE 525mmØ STM [T/P=74.61] (±1.40m CLEARANCE)
3+088.10	78.70	76.30	45° HORIZONTAL BEND
3+100.00	79.01	76.45	---
3+106.60	78.95	76.55	45° HORIZONTAL BEND
3+113.90	78.88	76.48 ★★★	CROSS ABOVE 250mmØ SAN [T/P=72.47] (±3.81m CLEARANCE)
3+125.00	78.77	76.37	---
3+127.30	78.75	76.35 ★★★	CROSS BELOW 200mmØ STM [INV=76.86] (±0.51m CLEARANCE)
3+140.90	78.89	76.49 ★★★	CROSS ABOVE 375mmØ STM [T/P=74.07] (±2.22m CLEARANCE)
3+142.70	78.90	76.49 ★★★	CROSS ABOVE 250mmØ SAN [T/P=72.60] (±3.69m CLEARANCE)
3+144.10	78.91	76.49	45° HORIZONTAL BEND
3+146.10	78.93	76.49	45° HORIZONTAL BEND
3+149.60	78.89	76.49	150mmØ HYDRANT 2 TEE
3+173.40	79.19	76.79	200mmØ VALVE & VALVE BOX
3+174.60	79.21	76.80	CAP 1.0m FROM FOUNDATION WALL

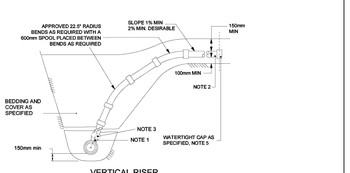
★ CONNECTION TO EXISTING 200mmØ WATERMAIN. EXACT ELEVATIONS TO BE FIELD DETERMINED.
★★ PROVIDE THERMAL INSULATION AS PER CITY OF OTTAWA DETAILS W22 IN SHALLOW TRENCHES WHERE COVER IS LESS THAN 2.4m AND/OR W23 ADJACENT TO OPEN STRUCTURES.
★★★ PIPE CROSSINGS WITH WATERMAINS ARE TO BE IN ACCORDANCE WITH CITY STANDARDS W25 AND W25.2 TO AVOID CONFLICTS, WHERE POSSIBLE.

PROPOSED WATER SERVICE TABLE - EXISTING PARKING GARAGE

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
4+000.00	75.09	72.69	200 X 200 X 200 WATER SERV



CONNECTION WITHOUT VERTICAL RISER

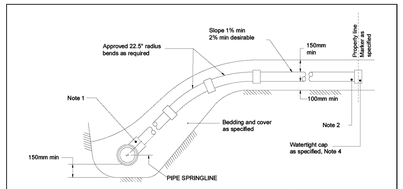


VERTICAL RISER

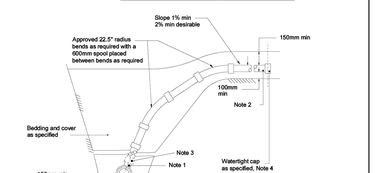
NOTES:

1. DIAMETER OF SERVICE CONNECTIONS SHALL BE NO GREATER THAN 50% OF THE DIAMETER OF THE RIGID SEWER MAIN. DIAMETER. THE CONNECTION SHALL BE MADE USING A BELL END INSERT PER 511.2 OR AN APPROVED RUBBER GASKETED INSERT. INVERT OF SERVICE CONNECTION SHALL BE AT THE SAME ELEVATION OR GREATER THAN THE ELEVATION OF THE SPRINGLINE OF THE SEWER MAIN
2. SANITARY SERVICES TO BE 150mm AND STORM SERVICES TO BE 200mm FOR MAIN RESIDENCES UNLESS SPECIFIED OTHERWISE. SERVICE PIPE AND RADIUS BENDS TO BE APPROVED CSA B182.1, B182.6 PRODUCTS UNLESS SPECIFIED OTHERWISE
3. APPROVED CONTROLLED SETTLEMENT JOINTS OPTIONAL FOR SERVICE CONNECTIONS TO MAIN SEWERS UP TO 5m DEEP. WHERE APPROVED, CONNECTIONS TO SEWERS OVER 5m DEEP REQUIRE APPROVED CONTROLLED SETTLEMENT JOINTS
4. VERTICAL RISER SHALL BE SAME AS SERVICE PIPE UNLESS OTHERWISE SPECIFIED
5. CAP AT THE PROPERTY LINE SHALL BE ADEQUATELY BRACED TO WITHSTAND TESTING PRESSURE
6. FOR NEW CONSTRUCTION, INSERTS MUST BE INSTALLED ON THE MAIN PIPE BEFORE THAT PIPE IS LAID. FOR SERVICES/BRANCHES INSTALLED AT A LATER DATE, SADDLES MUST BE USED
7. APPROVED CUT-IN TOOL MUST BE USED FOR FIELD MADE CONNECTIONS
8. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN
9. RADIUS BENDS GREATER THAN 22.5° ARE NOT ALLOWED

TITLE:	SEWER SERVICE CONNECTIONS FOR RIGID MAIN SEWER PIPE (MODIFIED OPSD-1006.010)	DATE:	MAR 2006
		REV:	MAR 2024
		DWG No:	S11



CONNECTION WITHOUT VERTICAL RISER

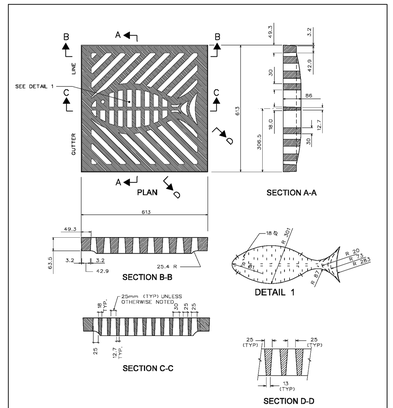


VERTICAL RISER

NOTES:

1. DIAMETER OF SERVICE CONNECTIONS SHALL BE NO GREATER THAN 50% OF THE DIAMETER OF THE FLEXALIR SEWER MAIN. DIAMETER. THE CONNECTION SHALL BE MADE USING AN APPROVED TEE OR WYE FITTINGS. INVERT OF SERVICE CONNECTION SHALL BE AT THE SAME ELEVATION OR GREATER THAN THE ELEVATION OF THE SPRINGLINE OF THE SEWER MAIN
2. SANITARY SERVICES TO BE 150mm AND STORM SERVICES TO BE 200mm FOR MAIN RESIDENCES UNLESS SPECIFIED OTHERWISE. SERVICE PIPE AND RADIUS BENDS TO BE APPROVED CSA B182.2, B2R2R PRODUCTS UNLESS SPECIFIED OTHERWISE
3. APPROVED CONTROLLED SETTLEMENT JOINTS OPTIONAL FOR SERVICE CONNECTIONS TO MAIN SEWERS UP TO 5m DEEP. WHERE APPROVED, CONNECTIONS TO SEWERS OVER 5m DEEP REQUIRE APPROVED CONTROLLED SETTLEMENT JOINTS
4. CAP AT THE PROPERTY LINE SHALL BE ADEQUATELY BRACED TO WITHSTAND TESTING PRESSURE
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN
6. RADIUS BENDS GREATER THAN 22.5° ARE NOT ALLOWED

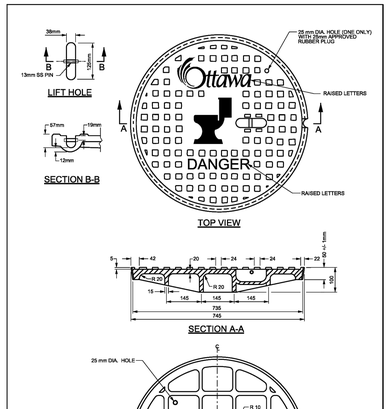
TITLE:	SEWER SERVICE CONNECTIONS FOR FLEXIBLE MAIN SEWER PIPE	DATE:	MAR 2008
		REV:	MAR 2024
		DWG No:	S11.1



NOTES:

1. ALL DIMENSIONS SHOWN ARE FOR FINISHED CASTINGS ONLY. PATTERN MAKERS AND CASTING SHOP SHOULD MAKE ALLOWANCES ACCORDINGLY.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
3. IT IS ESSENTIAL THAT THE COVER BE INSTALLED IN THE DIRECTION OF THE GUTTER LINE AS SHOWN.
4. THE FRAME FOR THIS COVER SHALL BE AS PER OPSD 400.02 WITHOUT THE HINGE SLOT.
5. NOT FOR NEW CONSTRUCTION AFTER 31DEC 05, FOR REPLACEMENT OF BROKEN EXISTING ONLY.

	HEAVY DUTY "FISH" TYPE SQUARE CATCH BASIN COVER	DATE:	MARCH 2005
		REV. DATE:	
		DWG. No.:	S19.1

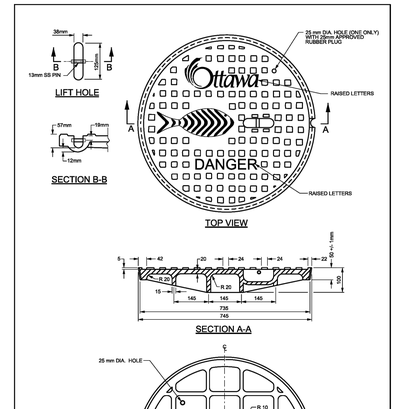


NOTES:

1. PIN TO BE SS.
2. FOR FRAME DETAIL SEE DWG No. S25.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

N.T.S.

	STANDARD CIRCULAR SANITARY & COMBINED MAINTENANCE HOLE COVER	DATE:	MARCH 2008
		REV. DATE:	MARCH 2017
		DWG. No.:	S24

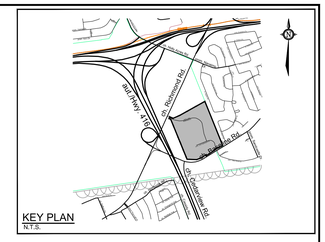


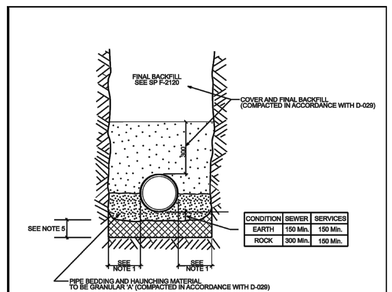
NOTES:

1. PIN TO BE SS.
2. FOR FRAME DETAIL SEE DWG No. S25.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

N.T.S.

	STANDARD CIRCULAR STORM MAINTENANCE HOLE COVER	DATE:	MARCH 2010
		REV. DATE:	MARCH 2017
		DWG. No.:	S24.1





CONDITION	SEWER	SERVICES
EARTH	150 Min.	150 Min.
ROCK	300 Min.	150 Min.

NOTES:

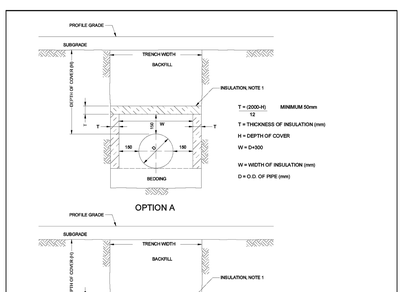
1.

PIPE INSIDE DIAMETER (mm)	CLEARANCE (mm)
900 OR LESS	CONC 450 PVC 450
OVER 900	500

2. FINAL BACKFILL - APPROVED NATIVE MATERIAL OR SELECT SUBGRADE IN ACCORDANCE WITH F-3130.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
4. INITIAL BACKFILL MATERIAL
   - CONCRETE PIPE - GRANULAR 'A', GRANULAR 'B', OR SELECT SUBGRADE MATERIAL WITH 100% PASSING THE 37.5 mm SIEVE AND LESS THAN 5% PASSING THE 75 µm SIEVE
5. WHEN APPROVED BY THE CONTRACT ADMINISTRATOR, POOR SOILS SHALL BE REMOVED TO FORM A FOUNDATION THAT SHALL BE FILLED TO THE BOTTOM OF THE BEDDING WITH GRANULAR 'B'.

N.T.S.

	SINGLE TRENCH (SEWER & SEWER SERVICES)	DATE:	MAY 2001
		REV. DATE:	MARCH 2021
		DWG. No.:	S6

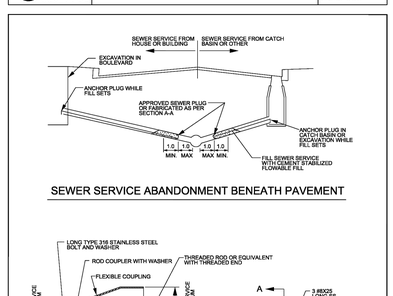


TYPICAL PIPE INSULATION DETAIL

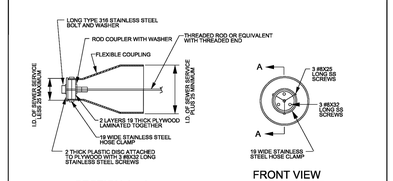
NOTES:

1. THE INSULATION MATERIAL SHALL BE EXTRUDED POLYSTYRENE ACCORDING TO MW-19.15 WITH A MINIMUM COMPRESSIVE STRENGTH OF 275 kPa
2. MINIMUM INSULATION THICKNESS SHALL BE 50mm
3. JOINTS SHALL BE STAGGERED FOR MULTIPLE INSULATION SHEETS
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

TITLE:	INSULATION FOR SHALLOW SEWERS	DATE:	MAY 2001
		REV:	JULY 2024
		DWG No:	S35



SEWER SERVICE ABANDONMENT BENEATH PAVEMENT



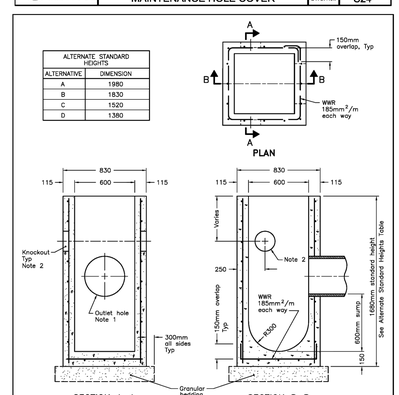
SECTION A - A
FABRICATED SEWER PLUG

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SHOWN.

N.T.S.

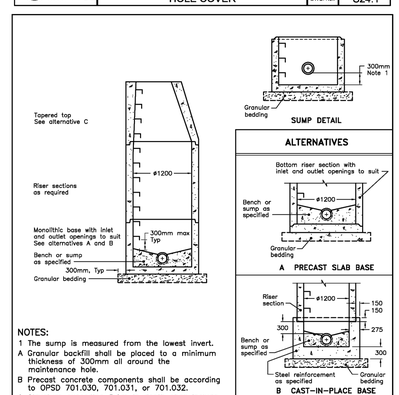
	SEWER SERVICE ABANDONMENT BENEATH PAVEMENT	DATE:	MARCH 2011
		REV. DATE:	
		DWG No.:	S11.4



NOTES:

1 Outlet hole size 525mm diameter maximum, location as required.
2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
A Centre reinforcing in base slab and walls ≥20mm.
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
D Pipe support shall be according to OPSD 708.020.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

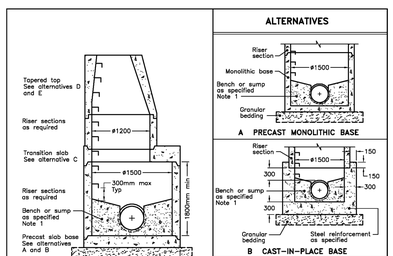
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2019	Rev 4
PRECAST CONCRETE CATCH BASIN 600x600mm		
	OPSD 705.010	



NOTES:

1 The sump is measured from the lowest invert.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, or 701.032.
C Structure exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
D Pipe support according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

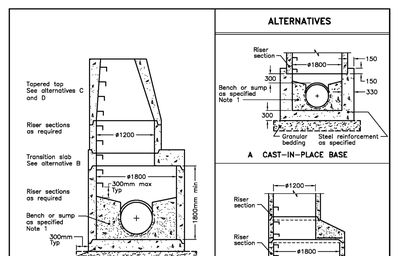
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 5
PRECAST CONCRETE MAINTENANCE HOLE 1200mm DIAMETER		
	OPSD 701.010	



NOTES:

1 For sump detail, see OPSD 701.010.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, 701.040, 701.041, 703.011, 703.021, and 705.010.
C Structures exceeding 5.0m in depth shall include safety platform according to OPSD 404.020 or 404.021.
D Pipe support shall be according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

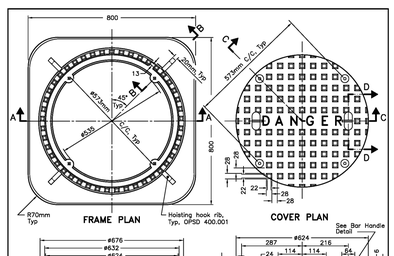
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 5
PRECAST CONCRETE MAINTENANCE HOLE 1500mm DIAMETER		
	OPSD 701.011	



NOTES:

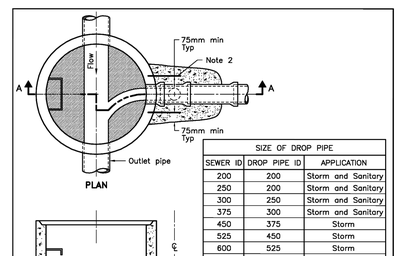
1 For sump detail, see OPSD 701.010.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, 701.050, 701.051, 703.012, 703.022, and 706.020.
C Structures exceeding 5.0m in depth shall include safety platform according to OPSD 404.020 or 404.022.
D Pipe support shall be according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 5
PRECAST CONCRETE MAINTENANCE HOLE 1800mm DIAMETER		
	OPSD 701.012	



NOTE:
A All dimensions are in millimetres unless otherwise shown.

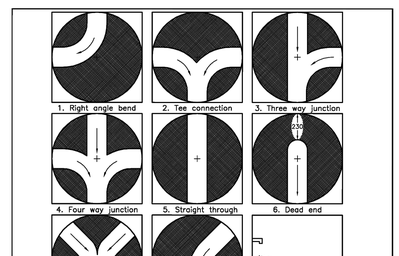
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 4
CAST IRON, SQUARE FRAME WITH CIRCULAR WATERTIGHT COVER FOR MAINTENANCE HOLES		
	OPSD 401.030	



NOTES:

1 Concrete shall be placed to undisturbed ground and the outside face of the maintenance hole, but there shall be a minimum of 150mm of 15MPa concrete around the drop pipe.
2 Concrete shall be secured to the maintenance hole with 450mm long, 13mm diameter threaded rods and drilled expansion anchors down either side of the drop pipe at 300mm centres.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2016	Rev 3
CAST–IN–PLACE MAINTENANCE HOLE DROP STRUCTURE TEE		
	OPSD 1003.010	



MAXIMUM SIZE HOLE IN THE WALL IN PRECAST RISER SECTIONS					
Maintenance Hole Diameter	No. 1–4	No. 5 and 6	No. 8	No. 7	
				Inlet Hole	Outlet Hole
1200	700	860	780	700	860
1500	860	1220	960	860	1170
1800	1220	1485	1220	1220	1485
2400	1485	2020	1760	1485	2020
3000	1930	2450	2300	1930	2450
3600	2470	3085	2730	2470	3085

NOTES:

1 Slopes shall be maintained from the outlet hole opening for top of benching.
A Concrete for benching shall be 30MPa.
B When benching is hand–finished, it shall be given wood float finish, channel shall be given steel trowel finish.
C Benching slope and height shall be as specified.
D When specified, maintenance holes that are 1200mm in diameter with a uniform channel for 200 or 250mm pipe may be prebenched at the manufacturer with standardized benching slope and channel orientation.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 4
MAINTENANCE HOLE BENCHING AND PIPE OPENING ALTERNATIVES		
	OPSD 701.021	

ALL PROJECT NOTES, DETAILS AND SPECIFICATIONS ARE TO MEET THE MOST CURRENT AND AMENDED VERSIONS OF THE CITY OF OTTAWA AND PROVINCIAL STANDARDS

THIS PLAN IS TO BE READ IN CONJUNCTION WITH CIVIL PLANS 123089-GP1, 123089-GP2, 123089-GR1, AND 123089-GR2

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

Queensway Carleton Hospital

No.	REVISION	DATE	BY
1.	ISSUED FOR SITE PLAN CONTROL APPROVAL	NOV 28/25	FST

SCALE: NOT TO SCALE

DESIGN: KD
CHECKED: FST
DRAWN: KD
CHECKED: FST
APPROVED: FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEERS — Lawrence Scott Thauvette — F.S. THAUVETTE — 100041399 — November 28, 2025 — PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

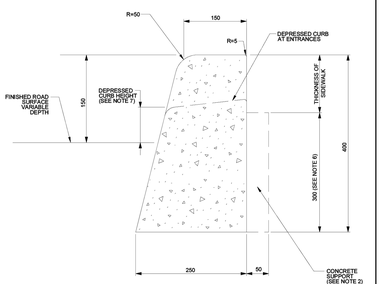
LOCATION
CITY OF OTTAWA
QUEENSWAY CARLETON HOSPITAL

DRAWING NAME
CIVIL DETAILS
PART 4 EXPANSION

PROJECT No. 123089
REV. REV #1
DRAWING No. 123089-DET 1

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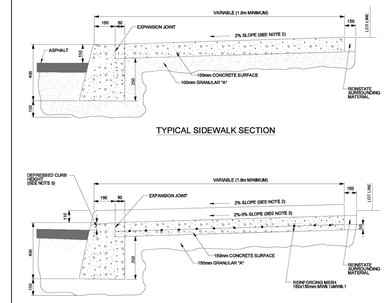


CONCRETE BARRIER CURB

NOTES:

1. THE FULL CURB DEPTH SHALL BE CARRIED THROUGH THE DEPRESSED ACCESS CROSSING
2. A CONCRETE SUPPORT IS REQUIRED WHEN BUILT ADJACENT TO THE SIDEWALK
3. IF AN EXTRUSION CURBING MACHINE IS USED, THE EXPANSION BITUMINOUS MATERIAL AND THE #15 DOWELS ARE TO BE PLACED AT THE END OF THE EXTRUSION
4. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
5. EXPANSION AND DUMMY JOINTS AS PER SC5
6. FOR DEPRESSED CURB AT ENTRANCES USE 250
7. DEPRESSED CURB HEIGHT - FOR PEDESTRIAN CURB RAMPS 0 TO 6 mm AND FOR PRIVATE ENTRANCES 0 TO 13mm

Ottawa	TITLE: CONCRETE BARRIER CURB FOR GRANULAR BASE PAVEMENT (MODIFIED OPSD-600.110)	DATE:	JAN 2003
		REV:	MAR 2025
		DWG No:	SC1.1

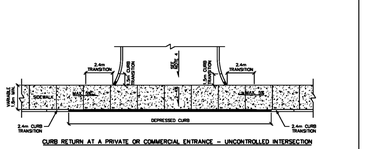


TYPICAL SIDEWALK SECTION

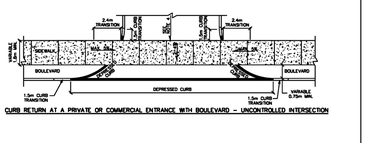
NOTES:

1. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
2. THE MAXIMUM SLOPE IS NOT TO EXCEED 2%
3. FOR CURB RAMPS, SLOPE OF 2% TO 6%, MAXIMUM 8%
4. EXPANSION AND DUMMY JOINTS AS PER SC5
5. DEPRESSED CURB HEIGHT - FOR PEDESTRIAN CURB RAMPS 0 TO 6 mm AND FOR PRIVATE ENTRANCES 0 TO 13mm

Ottawa	TITLE: CONCRETE BARRIER CURB WITH SIDEWALK	DATE:	JAN 2003
		REV:	JULY 2025
		DWG No:	SC1.4



CURB RETURN AT A PRIVATE OR COMMERCIAL ENTRANCE - UNCONTROLLED INTERSECTION

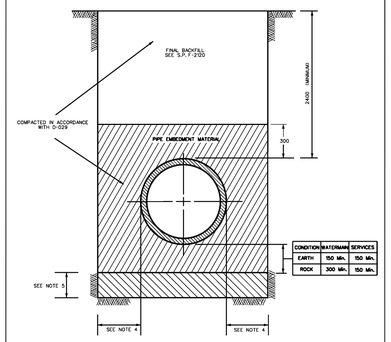


CURB RETURN AT A PRIVATE OR COMMERCIAL ENTRANCE WITH BOULEVARD - UNCONTROLLED INTERSECTION

NOTES:

1. **ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.**
2. **CURB DETAILS SEE SC1.1, SC1.2 AND SC1.3.**
3. **SIDEWALK DETAILS SEE SC2 AND SC3.**
4. **MAXIMUM SLOPE VARIES, SEE PRIVATE APPROACH BYLAW.**
5. **UNCONTROLLED INTERSECTION MEANS AN ENTRANCE NOT LOCATED AT A TRAFFIC SIGNAL OR ALL-WAY STOP CONTROL.**

Ottawa	CURB RETURN ENTRANCES - UNCONTROLLED INTERSECTIONS	DATE:	MARCH 2007
		REV. DATE:	MARCH 2021
		DWG. No.:	SC7.1



CONDITION	WATERMAIN	SERVICES
EARTH	150 MIN.	150 MIN.
ROCK	300 MIN.	150 MIN.

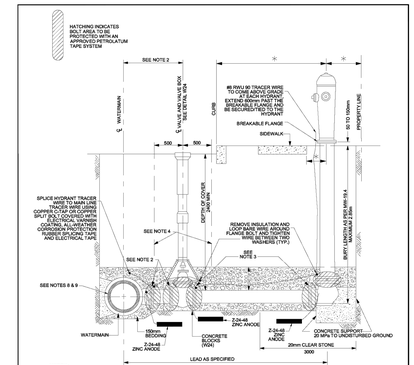
NOTES:

1. PIPE EMBEDMENT MATERIAL - GRANULAR 'A'.
2. FINAL BACKFILL - APPROVED NATIVE MATERIAL OR SELECT SUBGRADE IN ACCORDANCE WITH F-2120
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
4.

PIPE OUTSIDE DIA. (OD)	CLEARANCE (mm)
900 or LESS	450
OVER 900	500

5. WHEN APPROVED BY THE CONTRACT ADMINISTRATOR, POOR SOILS SHALL BE EXCAVATED TO CREATE A FOUNDATION THAT SHALL BE FILLED TO THE BEDDING WITH GRANULAR 'B'.

Ottawa	STANDARD TRENCH DETAIL	DATE:	MAY 2001
		REV. DATE:	MARCH 2016
		DWG. No.:	W17

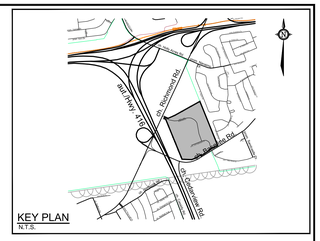


NOTES:

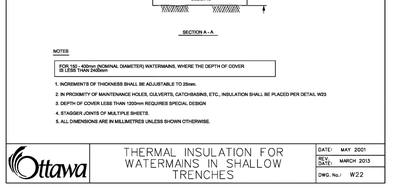
FOR ALL WATERMAINS

1. SEE DETAIL W20 FOR HYDRANTS IN DITCH AREAS
2. FOR WATERMAINS 400mm AND UNDER, LOCATE VALVE WITHIN 1.0m OF CENTRELINE. RETAINING/RESTRAINING DEVICES TO BE UTILIZED. FOR WATERMAINS 600mm AND OVER, BOLT VALVE WITH FLANGED END DIRECTLY TO FLANGED TEE
3. RETAINING/RESTRAINING DEVICES TO BE UTILIZED
4. HYDRANT BREAKABLE FLANGE ELEVATION TO BE ESTABLISHED PRIOR TO INSTALLATION. REFER TO MW-19.4 AND F-4414
5. SEE F-4414 FOR HYDRANT LOCATION REQUIREMENTS
6. SEE F-4414 FOR HYDRANT LOCATION REQUIREMENTS
7. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
8. FOR ALL 300mm WATERMAINS USE A 300 x 150 TANGENTIAL TEE WITH THE 150mm OUTLET ON TOP
9. FOR ALL 400mm WATERMAINS USE A 400 x 150 TANGENTIAL TEE WITH THE 150mm OUTLET ON TOP
10. "DUCTILE IRON ONLY" THERMITE WELD TWO #8 RWU90 CABLES ACROSS EACH PIPE/FITTING JOINT OR CONNECTION TO ENSURE ELECTRICAL CONTINUITY ALONG ALL METALLIC COMPONENTS
11. ALL MATERIALS SHALL BE IN ACCORDANCE WITH MW-19.15
12. TRACER WIRE BOLT CONNECTIONS TO BE COMPLETED PER W55
13. TRACER WIRE SPLICES TO BE COMPLETED PER W47

Ottawa	TITLE: HYDRANT INSTALLATION - NEW CONSTRUCTION	DATE:	MAY 2001
		REV:	MAR 2023
		DWG No:	W19



KEY PLAN
N.T.S.

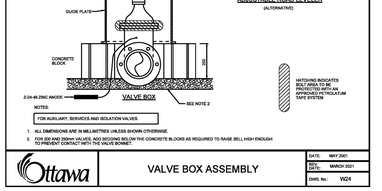


NOTES

FOR 150 - 400mm (NOMINAL DIAMETER) WATERMAINS, WHERE THE DEPTH OF COVER IS LESS THAN 2400mm

1. INCREMENTS OF THICKNESS SHALL BE ADJUSTABLE TO 25mm.
2. IN PROXIMITY OF MAINTENANCE HOLES, CULVERTS, CATCHBASINS, ETC., INSULATION SHALL BE PLACED PER DETAIL W23.
3. DEPTH OF COVER LESS THAN 1200mm REQUIRES SPECIAL DESIGN
4. STAGGER JOINTS OF MULTIPLE SHEETS.
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.

Ottawa	THERMAL INSULATION FOR WATERMAINS IN SHALLOW TRENCHES	DATE:	MAY 2001
		REV. DATE:	MARCH 2013
		DWG. No.:	W22

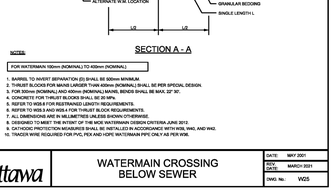


NOTES:

FOR AUXILIARY, SERVICES AND ISOLATION VALVES.

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. FOR 350 AND 350mm VALVES, ADD SECKORD BELOW THE CONCRETE BLOCKS AS REQUIRED TO RAISE BELL HIGH ENOUGH TO PREVENT CONTACT WITH THE VALVE BONNET.

Ottawa	VALVE BOX ASSEMBLY	DATE:	MAY 2001
		REV. DATE:	MARCH 2021
		DWG. No.:	W24

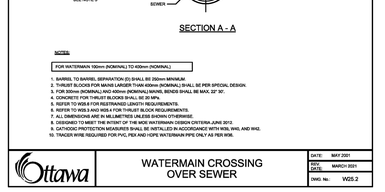


NOTES:

FOR WATERMAIN 100mm (NOMINAL) TO 400mm (NOMINAL)

1. BARREL TO INVERT SEPARATION (S) SHALL BE 500mm MINIMUM
2. THRUST BLOCKS FOR MAINS LARGER THAN 400mm (NOMINAL) SHALL BE PER SPECIAL DESIGN.
3. FOR 300mm (NOMINAL) AND 400mm (NOMINAL) MAINS, BENDS SHALL BE MAX. 22° 30'.
4. CONCRETE FOR THRUST BLOCKS SHALL BE 20 MPa.
5. REFER TO W39.8 FOR RESTRAINED LENGTH REQUIREMENTS.
6. REFER TO W39.3 AND W39.4 FOR THRUST BLOCK REQUIREMENTS.
7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
8. CONCRETE TO BE PLACED AGAINST UNDISTURBED GROUND.
9. CATHODIC PROTECTION MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH W39, W40, AND W42.
10. TRACER WIRE REQUIRED FOR PVC, PEX AND HDPE WATERMAIN PIPE ONLY AS PER W36.

Ottawa	WATERMAIN CROSSING BELOW SEWER	DATE:	MAY 2001
		REV. DATE:	MARCH 2021
		DWG. No.:	W25



NOTES:

FOR WATERMAIN 100mm (NOMINAL) TO 400mm (NOMINAL)

1. BARREL TO INVERT SEPARATION (S) SHALL BE 500mm MINIMUM
2. THRUST BLOCKS FOR MAINS LARGER THAN 400mm (NOMINAL) SHALL BE PER SPECIAL DESIGN.
3. FOR 300mm (NOMINAL) AND 400mm (NOMINAL) MAINS, BENDS SHALL BE MAX. 22° 30'.
4. CONCRETE FOR THRUST BLOCKS SHALL BE 20 MPa.
5. REFER TO W39.8 FOR RESTRAINED LENGTH REQUIREMENTS.
6. REFER TO W39.3 AND W39.4 FOR THRUST BLOCK REQUIREMENTS.
7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
8. CONCRETE TO BE PLACED AGAINST UNDISTURBED GROUND.
9. CATHODIC PROTECTION MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH W39, W40, AND W42.
10. TRACER WIRE REQUIRED FOR PVC, PEX AND HDPE WATERMAIN PIPE ONLY AS PER W36.

Ottawa	WATERMAIN CROSSING OVER SEWER	DATE:	MAY 2001
		REV. DATE:	MARCH 2021
		DWG. No.:	W25.2

ALL PROJECT NOTES, DETAILS AND SPECIFICATIONS ARE TO MEET THE MOST CURRENT AND AMENDED VERSIONS OF THE CITY OF OTTAWA AND PROVINCIAL STANDARDS

THIS PLAN IS TO BE READ IN CONJUNCTION WITH CIVIL PLANS 123089-GP1, 123089-GP2, 123089-GR1, AND 123089-GR2

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

Queensway Carleton Hospital

No.	REVISION	DATE	BY
1.	ISSUED FOR SITE PLAN CONTROL APPROVAL	NOV 28/25	FST

SCALE: NOT TO SCALE

DESIGN: KD
CHECKED: FST
DRAWN: KD
CHECKED: FST
APPROVED: FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER F.S. THAIVETTE 100041399 November 29, 2025 PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
QUEENSWAY CARLETON HOSPITAL

DRAWING NAME
CIVIL DETAILS
PART 4 EXPANSION

PROJECT No.: 123089
REV: REV #1
DRAWING No.: 123089-DET-2

M:\2025\123089\CAD\PLOT\123089-DET.dwg, CIVIL DET 2, Nov 28, 2025 - 5:37pm, kdela