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39 Years

Queensway-Carleton Hospital Overall Campus Part 4 Expansion

Site Servicing Report

QUEENSWAY-CARLETON HOSPITAL
PART 4 EXPANSION

SITE SERVICING REPORT

Prepared by:

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November 28, 2025
Revised September 25, 2026

Ref: R-2025-078
Novatech File No. 123089

NOVATECH
Engineers, Planners & Landscape Architects

September 25, 2026

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

Attention: Derek Judson

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

Enclosed is a copy of the revised Site Servicing Report prepared for the proposed Queensway Carleton Hospital: Part 4 Expansion located at 3045 Baseline Road. This report addresses the approach to site servicing 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

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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 the proposed expansion phase. As part of the proposed works, the existing infrastructure systems (i.e., sewers, watermains and utilities) are being reviewed, including upgrades to portions of these systems 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 sewers and watermains 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 the QCH campus site servicing 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.
- 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.
- In 2005, the Operations Room addition was constructed as well as the removal of some of the existing storm sewers within the loading dock area.
- 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.
- 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.

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.

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.

Refer to **Appendix A** for a summary of the correspondence related to the proposed development.

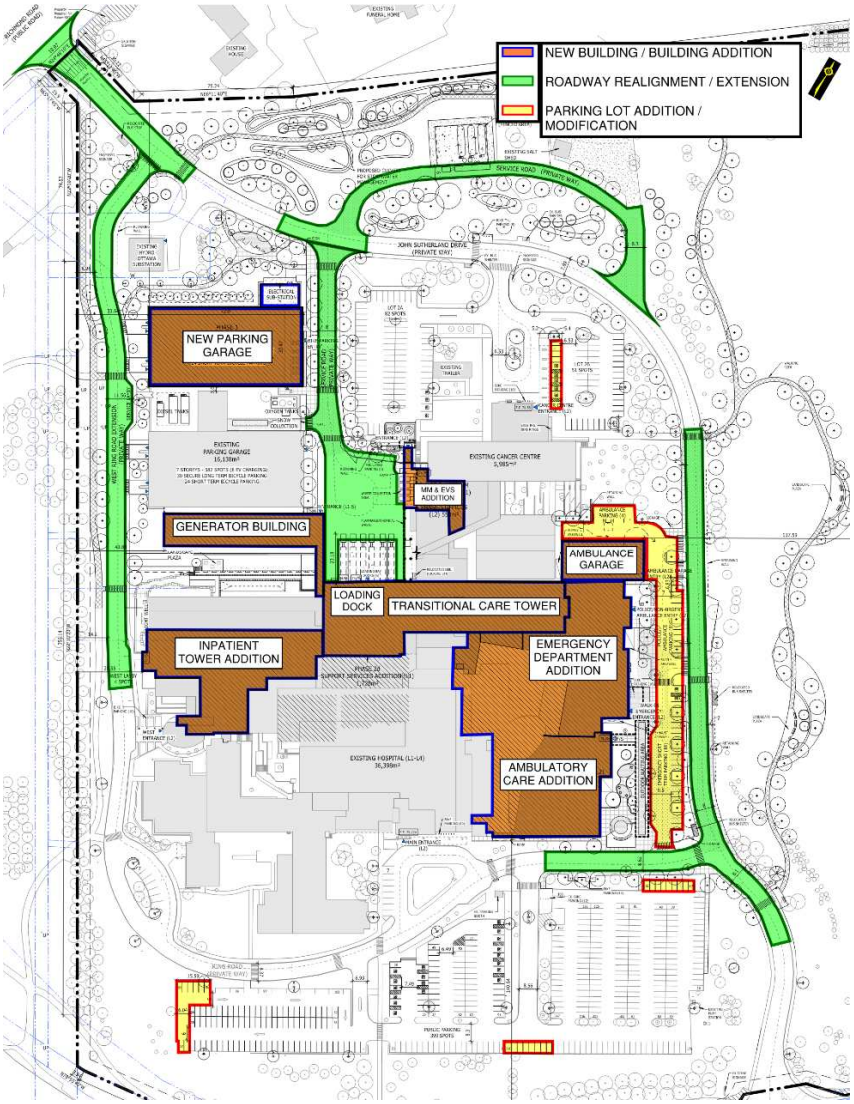
1.3 Proposed Development

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 Part 4 expansion works, the existing infrastructure systems (i.e., sanitary sewage, domestic water and storm drainage) are being reviewed and upgraded. Portions of the existing sewer systems and watermain will be removed and realigned, while new segments will be extended adjacent to the proposed development. 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 Roadworks 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 (2025)
- Ottawa Water Distribution Design Guidelines (2025) and Technical Bulletins (2026-present)
- Ministry of the Environment Design Guidelines for Sewage Works (2008)
- Ministry of the Environment Stormwater Management Planning and Design Manual (2003)
- Ministry of the Environment Design Guidelines for Drinking Water Systems (2008)
- Fire Underwriters Survey (FUS) Water Supply for Public Fire protection (2020)

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

[1] Queensway-Carleton Hospital Cancer Centre – Sanitary Pump Station Design Brief, prepared by Novatech Engineering Consultants Ltd., dated June 2008.

[2] Queensway-Carleton Hospital Cancer Centre – Hydraulic Network Analysis, prepared by Novatech Engineering Consultants Ltd., dated May 29, 2007.

[3] Queensway-Carleton Hospital Part 3 Expansion Servicing Design Brief, prepared by Novatech Engineering Consultants Ltd., dated July 16, 2010.

[4] Queensway-Carleton Hospital Part 4 Expansion – Stormwater Management Report, prepared by Novatech, dated September 25, 2026.

[5] Geotechnical Investigation – Queensway-Carleton Hospital Expansion, prepared by WSP, dated September 03, 2026.

The details of the proposed QCH Part 4 stormwater management (SWM) design will be addressed in a separate report entitled: Queensway Carleton Hospital Part 4 Expansion – Stormwater Management Report[4].

2.0 SITE SERVICING

The objective of the site servicing design is to provide proper sewage outlets, a suitable domestic water supply and to ensure that appropriate fire protection is provided for the QCH campus. The servicing criteria, the expected sewage flows, and water demands are to conform to the requirements of the City of Ottawa municipal design guidelines for sewer and water distribution systems. Refer to the enclosed plans and subsequent sections of the report for further details.

The City of Ottawa Servicing Study Guidelines for Development Applications requires that a Development Servicing Study Checklist be included to confirm that each applicable item is deemed complete and ready for review by City of Ottawa Infrastructure Approvals. A completed checklist is enclosed in **Appendix B** of the report.

2.1 Sanitary Sewage

Sanitary flows from the QCH campus are currently being directed towards two distinct outlets. Sewage flows from the northern portion of the campus, including the Cancer Centre, Bunkers, and multi-level parking structure are being directed towards the Graham Creek sanitary trunk sewer located along the east property line; while sewage flows from the remainder of the campus are currently being directed towards the Lynwood sanitary collector sewer, located south of Baseline Road. The on-site sanitary pump station was constructed as part of the 2008 Cancer Centre expansion phase to alleviate capacity constraints within the Graham Creek sanitary trunk (the original Hospital sanitary sewer outlet). As described in the QCH Sanitary Pump Station Design Brief[1], the original hospital sanitary outlet to the Graham Creek sanitary trunk sewer on the east side of EX. SAN MH 19 was repurposed to provide emergency sanitary overflow for the pump station. Furthermore, future QCH expansion flows should generally be directed to the Lynwood sanitary collector sewer. The sanitary pump station and twin forcemains have been sized to convey the anticipated future peak flows of **76 L/s** and potentially an ultimate flow of **100 L/s** from the southern portion of the QCH campus. Refer to **Appendix F** for excerpts from the previously approved 'Sanitary Pump Station Design Brief[1].

Table 1 identifies the existing design peak flows for the QCH campus based on information taken directly from the previously approved Sanitary Pump Station Design Brief[1].

Table 1: Existing Campus Design Peak Sanitary Flows

Site	Peak Flow (L/s)*
Sanitary Flows to Graham Creek Trunk Sanitary Sewer	
Existing Cancer Centre Flows	*22.70*
Existing Parking Garage Flows	*n/a*
Sub-Total	***22.70***
Sanitary Flows to Lynwood Collector Sanitary Sewer (via Pump Station)	
Existing Part 1 Campus Flows	*23.80*
Existing Part 2 Campus Flows	*21.90*
Existing Part 3 Campus Flows	*8.10*
Sub-Total	***53.80***

*Existing campus flows taken directly from the previously approved 'Sanitary Pump Station Design Brief' (R-2007-095)[1], which are based on conservative values using fixture units.

Under post-development conditions, the campus sanitary sewage flows will continue to be divided between the two sewer outlets described above. In order to accommodate the proposed Part 4 development, portions of the gravity sanitary sewer systems will need to be removed, re-aligned or extended.

Sewage flows from the new multi-level parking structure, Materials Management and Loading Dock buildings will be directed to the north sewer system flowing to the Graham Creek sanitary trunk. The negligible additional flows (from floor drains) should have minimal to no impact on the downstream sewer system.

Sewage flows from the remainder of the campus will be directed to the sanitary pump station and thus the Lynwood sanitary collector sewer. An extension of the sanitary sewer system within the re-aligned portion of John Sutherland Drive will service the proposed Emergency Department Addition, Ambulance Garage and Transitional Care Tower on the east side of the campus. Similarly, a short sanitary sewer extension along the west Ring Road will be necessary to service the new Generator Building and to accommodate the anticipated future Part 5 Expansion. The Inpatient Tower (vertical building expansion) will be serviced via the existing James Beach building service(s). All new sanitary service laterals will be equipped with a backflow preventer. Refer to **Figure 3** for details of the on-site sanitary sewer drainage plan.

Figure 3: Sanitary Sewer Drainage Plan

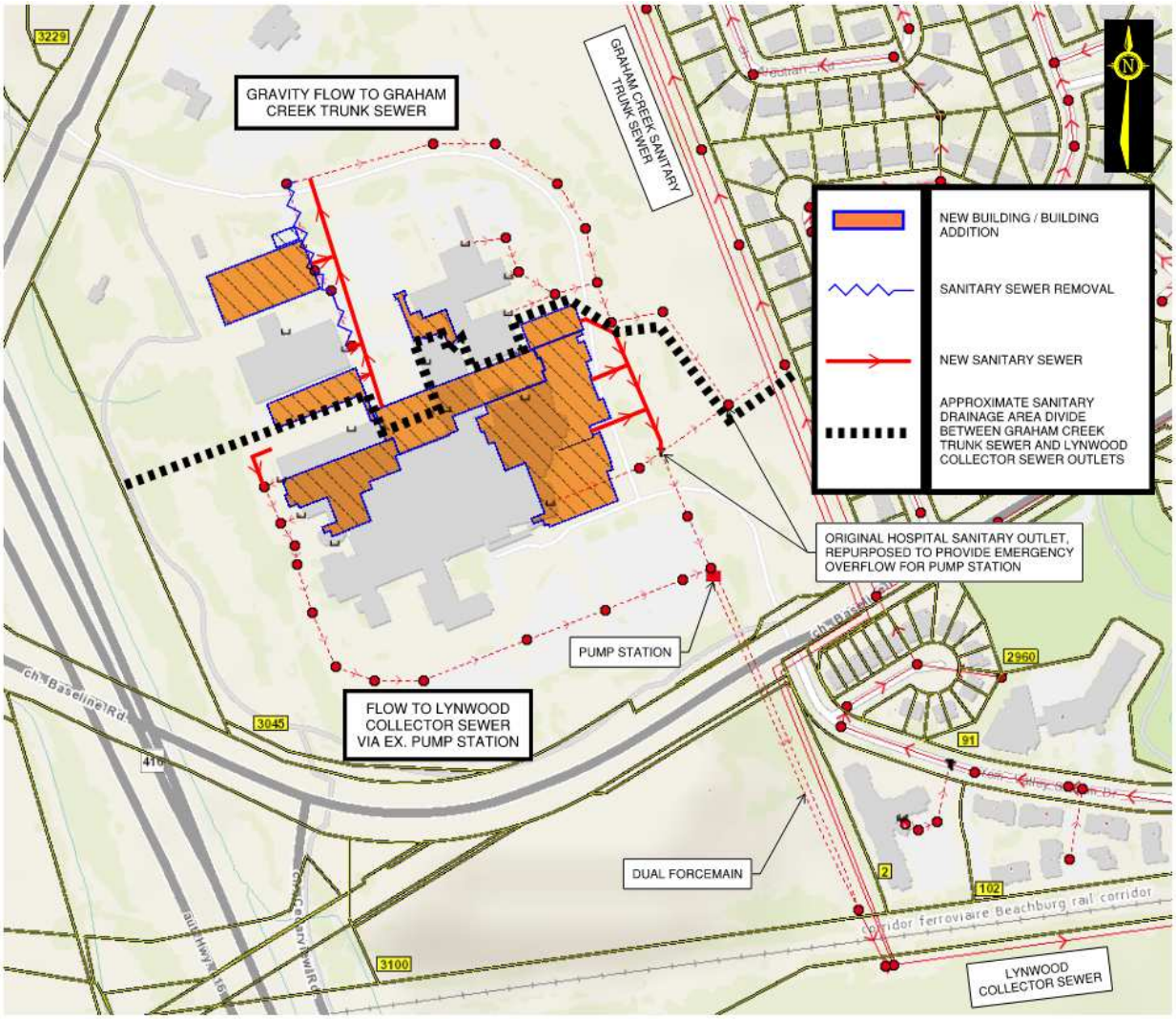


Image Source: geoOttawa (City of Ottawa)

2.1.1 Post-Development Sanitary Flows

The City of Ottawa design criteria were used to calculate the theoretical sanitary flows for the proposed QCH Part 4 campus expansion. The following design criteria were taken from the City of Ottawa Sewer Design Guidelines, Appendix 4-A:

QCH Campus – Institutional Use

- Average Daily Sewage Flow (Hospital Beds): 900 L/bed/day
- Average Daily Sewage Flow (Patient Visits): 25 L/c/day
- Average Daily Sewage Flow (Medical Staff): 275 L/c/day
- Average Daily Sewage Flow (General Staff): 75 L/c/day
- Average Daily Sewage Flow (Hand-wash Ambulances): 200 L/car/day
- Institutional Peaking Factor = 1.5
- Infiltration Allowance: 0.33 L/s/ha

Peak sanitary sewage flows for the Hospital are identified below as a combination of existing flows and additional Part 4 expansion flows. To avoid recalculating existing flows, existing values have been taken directly from the previously approved QCH Sanitary Pump Station Design Brief[1]. New Part 4 expansion flows were established using design populations in accordance with the City of Ottawa Sewer Design Guidelines.

The design populations for the proposed Part 4 expansion are based on the following staff and patient numbers provided by the architect:

- Design Population (Hospital Beds): 61 Inpatient, 112 Transitional Care, 20 Emergency
- Design Population (Daily Visits): 91 Inpatient, 185 Transitional Care, 52 Emergency
- Design Population (Medical Staff): 77 Inpatient, 70 Transitional Care, 37 Emergency
- Design Population (General Staff): 13 MM & EVS, 25 Loading Dock, 11 Food Services

Table 1.1 identifies the theoretical peak flows for the QCH campus, including the proposed Part 4 expansion, based on the design criteria listed above.

Table 1.1: Theoretical Post-Development Sanitary Flows

Site	Use	Design Population /Area**	Average Flow (L/s)***	Peaking Factor	Peak Flow Incl. Infiltration (L/s)
Sanitary Flows to Graham Creek Trunk Sanitary Sewer					
*Existing Cancer Centre Flows**	-	-	-	-	*22.70*
*Existing Parking Garage Flows**	-	*0.29 ha.*	-	-	*0.10*
New Parking Garage	-	0.27 ha.	-	-	0.09
MM & EVS Addition	Storage	0.04 ha.	-	-	0.01
Loading Dock Building	Storage	0.15 ha.	-	-	0.05
Generator Building	M&E Rooms	0.13 ha.	-	-	0.04
Sub-Total	**-**	**-**	**-**	**1.5**	**22.99**
Sanitary Flows to Lynwood Collector Sanitary Sewer (via Pump Station)					
*Existing Part 1 Campus Flows**	-	-	-	-	*23.80*

*Existing Part 2 Campus Flows**	-	-	-	-	*21.90*
*Existing Part 3 Campus Flows**	-	-	-	-	*8.10*
Inpatient Tower Addition	Beds	61	0.91	1.5	1.36
	Patient Visits	91			
	Med. Staff	77			
Ambulance Garage	Hand-wash Ambulances	6	0.01	1.5	0.04
		0.07 ha.	-	-	
Transitional Care Tower Addition	Beds	112	1.44	1.5	2.16
	Patient Visits	185			
	Med. Staff	70			
Emergency Department Addition & Ambulatory Care	Beds	20	0.34	1.5	0.65
	Patient Visits	52			
	Med. Staff	37			
	-	0.41 ha.	-	-	
Food Services – Interior Renovation	Gen. Staff	11	<0.01	1.5	0.01
Sub-Total	-	**-**	**2.71**	1.5	**58.03**

*Existing campus flows taken directly from the previously approved 'Sanitary Pump Station Design Brief' (R-2007-095)[1], which are based on conservative values using fixture units. Existing parking garage flows were noted as "n/a" within the Pump Station Design Brief but have since been calculated at the request of the City of Ottawa, accounting for infiltration only.
**Part 4 Design populations are based on staff and patient numbers provided by the architect.
***Total average flow rate does not include existing campus average sanitary flows.

Table 1.2 compares the existing and post-development peak sanitary flows to the Graham Creek Trunk Sewer and Lynwood Collector Sewer.

Table 1.2: Sanitary Flows Comparison Table

Outlet	Existing Design Peak Flow (L/s)*	Post-Development Peak Flow (L/s)	Increase in Flow (L/s or %)
Sanitary Flows to Graham Creek Trunk Sanitary Sewer	*22.70*	22.99	0.29 or ~1%
Sanitary Flows to Lynwood Collector Sanitary Sewer (via Pump Station and Forcemains) - Designed for Future Peak Flow of 76 L/s and Ultimate Peak Flow of 100 L/s	*53.80*	58.03	4.23 or ~8%

*Existing campus flows, future peak flows, and ultimate peak flows taken directly from the previously approved 'Sanitary Pump Station Design Brief' (R-2007-095)[1].

As indicated above, the peak sanitary flows being directed to the Graham Creek Trunk Sewer are anticipated to increase by 0.29 L/s, or ~1% when compared to existing peak flows. This increase is deemed negligible and should have minimal to no impact on the downstream sewer system.

The peak sanitary flows directed to the Lynwood Collector are generally consistent with the anticipated peak flows presented in the QCH Sanitary Pump Station Design Brief[1] and demonstrate that there is still a lot of capacity remaining within the sanitary pump station and twin forcemains to accommodate future QCH campus expansion phases, up to the future peak flow of 76 L/s and ultimate peak flow of 100 L/s. Furthermore, the existing hospital flows were previously established using fixture units; therefore, the existing flow rates are conservative values that typically exceed flows calculated based on design populations.

Refer to **Appendix C** for detailed calculations.

2.2 Water for Domestic Use and Fire Protection

The QCH campus is located within the City of Ottawa 2W2C watermain pressure zone. The Hospital buildings are currently being supplied by a private looped 200mm-300mm dia. watermain network fed off the 1200mm dia. feedermain in Baseline Road. Two (2) bulk water meter chambers located on the two incoming water supplies, constructed as part of the 2008 Cancer Centre expansion phase, currently monitor the water consumption for the entire QCH campus. Refer to **Appendix G** for the as-built plan showing the two bulk water meter chambers.

Based on a review of the QCH Hydraulic Network Analysis Report[2], the looped watermain network currently provides adequate system pressures for the campus during both Maximum Day + Fire Flow and Peak Hour conditions. Refer to **Figure 4** for a plan showing the existing watermain infrastructure currently servicing the QCH Campus and the proposed watermain modifications under the Part 4 expansion.

Figure 4: Existing and Proposed Watermain Infrastructure

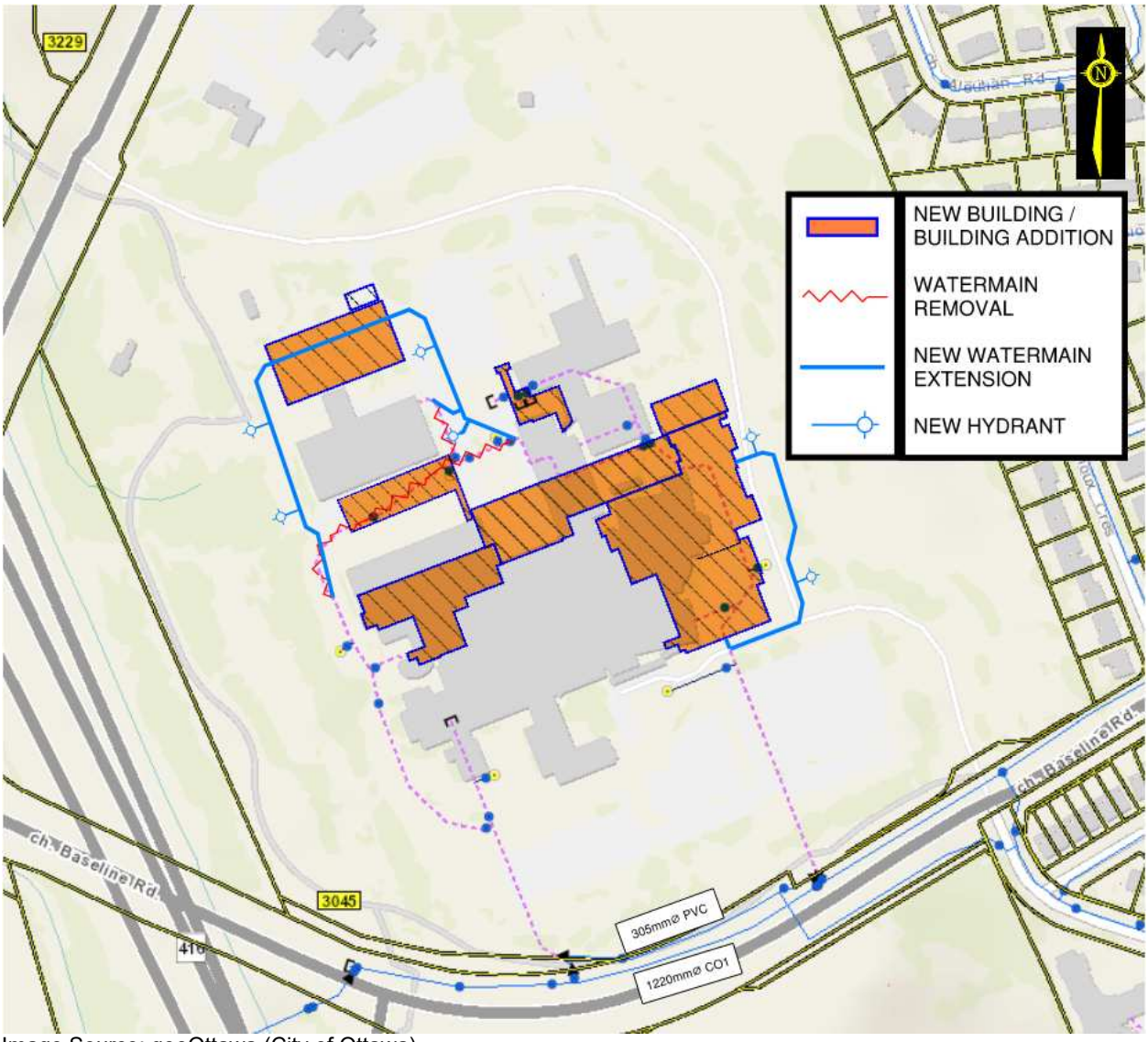


Image Source: geoOttawa (City of Ottawa)

Under post-development conditions, the QCH campus, including the Part 4 expansion (new buildings) will continue to be fed by the private looped watermain network. In order to accommodate the proposed Part 4 development, portions of the private watermain will need to be removed, re-aligned or extended, including pipes along the new West Ring Road, within the loading dock area and along the realigned portion of John Sutherland Drive on the east side of the campus. Certain buildings will be fed via new building services, while other buildings will be fed by extending internal plumbing from adjacent buildings. Due to the proposed watermain modifications, the location and spacing of the on-site hydrants has been reviewed to ensure adequate coverage is provided for all buildings (existing and new). The proposed buildings, excluding the new multi-level parking structure, will be fully sprinklered with their respective fire department (siamese) connections located within 45m of a nearby fire hydrant.

2.2.1 Water Demands and Watermain Analysis

The City of Ottawa design criteria were used to calculate theoretical water demands for the proposed QCH Part 4 campus expansion. The Fire Underwriters Survey (FUS) method was used to calculate the fire flow requirements for the new buildings based on information provided by the architect (i.e., building materials, occupancy hazards, etc.). The following design criteria were taken from the City of Ottawa Water Distribution Guidelines:

QCH Campus – Institutional Uses

- Average Daily Water Demands (Hospital Beds): 900 L/bed/day
- Average Daily Water Demands (Daily Patient Visits): 25 L/bed/day
- Average Daily Water Demands (Medical Staff): 275 L/c/day
- Average Daily Water Demands (Employees): 75 L/c/day
- Average Daily Water Demand (Hand-wash Ambulances): 200 L/car/day
- Maximum Day Demand Peaking Factor = 1.5 x Avg. Day Demand (City Water Table 4.2)
- Peak Hour Demand Peaking Factor = 1.8 x Max. Day Demand (City Water Table 4.2)

The design populations for the QCH campus, including the Part 4 expansion, are based on the following staff and patient numbers provided by the architect, which have been divided based on the water entry points to the hospital:

- Design Population (Hospital Beds): 228 Main Hospital, 252 James Beach Centre
- Design Population (Daily Patient Visits): 782 Main Hospital, 192 James Beach Centre
- Design Population (Medical Staff): 727 Main Hospital, 116 James Beach Centre
- Design Population (General Staff): 415 Main Hospital

As noted in Section 2.1.1. above, the existing hospital sanitary flows were established using fixture units which yield conservative values that exceed flows established using design populations. The theoretical domestic water demands for the QCH campus and Part 4 expansion are based on design populations and will therefore yield lower values when compared to the existing sanitary flows.

Table 2 identifies the theoretical domestic water demands for the QCH campus and Part 4 expansion based on the above design criteria.

Table 2: **Theoretical Water Demand for Proposed Part 4 Expansion**

Building ID	Use	Design Population*	Avg. Day Demand (L/s)	Max. Day Demand (L/s)	Peak Hour Demand (L/s)
Water Supplied by (Looped) Watermain in West Ring Road and John Sutherland Drive					
Main Hospital Water Supply: Ex. Hospital, Cancer Centre, and New Part 4 Building Additions (excluding James Beach Centre with Inpatient Tower Addition)	Beds	228	2.38	3.56	6.41
	Patient Visits	782	0.23	0.34	0.61
	Medical Staff	727	2.32	3.47	6.25
	General Staff	415	0.36	0.54	0.97
	Hand-Wash Ambulances	6	0.01	0.02	0.04

Existing Parking Garage New Parking Garage	Not included in calculations				
Sub-Total	**-**	**-**	**5.3**	**7.9**	**14.3**
Water Supplied by (Looped) Watermain in West Ring Road					
Existing James Beach Centre with New Inpatient Tower Addition	Beds	252	2.63	3.94	7.09
	Patient Visits	190	0.05	0.08	0.15
	Medical Staff	116	0.37	0.55	0.99
Sub-Total	**-**	**-**	**3.0**	**4.6**	**8.2**
Total	**-**	**-**	**8.3**	**12.5**	**22.5**

**Existing Hospital and Part 4 Design populations are based on staff and patient numbers provided by the architect.

The following design criteria were taken from Section 4.2.2 – 'Watermain Pressure and Demand Objectives' of the City of Ottawa Water Distribution Design Guidelines:

- Normal operating pressures are to range between 345 kPa (50 psi) and 483 kPa (70 psi) under Max Day demands.
- Minimum system pressures are to be 276 kPa (40 psi) under Peak Hour demands.
- Minimum system pressures are to be 140 kPa (20 psi) under Max Day + Fire Flow demands.

Preliminary domestic water demands, and fire flow requirements were provided to the City of Ottawa to obtain municipal watermain boundary conditions. **Table 2.1** summarize preliminary hydraulic analysis results based on municipal watermain boundary conditions provided by the City of Ottawa.

Table 2.1: Hydraulic Boundary Conditions Provided by the City

Municipal Watermain Boundary Condition	Boundary Condition	Normal Operating Pressure Range (psi)	Anticipated WM Pressure (psi)*
Connection #1 – 200/300mm dia. WM fed off 1200mm WM in Baseline Rd. R.O.W.			
Minimum HGL (Peak Hour Demand)	127.3 m	40 psi (min.)	~ 66 psi
Maximum HGL (Max Day Demand)	131.9 m	50 - 70 psi	~ 72 psi
HGL Max Day + Fire Flow (50-183 L/s)	127.8 m to 127.4 m	20 psi (min.)	~ 66 psi
Connection #2 - 200/300mm dia. WM fed off 1200mm WM in Baseline Rd. R.O.W.			
Minimum HGL (Peak Hour Demand)	127.3 m	40 psi (min.)	~ 68 psi
Maximum HGL (Max Day Demand)	131.9 m	50 - 70 psi	~ 75 psi
HGL Max Day + Fire Flow (50-183 L/s)	127.8 m to 127.3 m	20 psi (min.)	~ 68 psi

*Based on approximate watermain elevations of 80.8m at service connection location #1 (Baseline Rd. R.O.W.) and 78.8 m at connection location #2 (Baseline Rd. R.O.W.). Design pressure = (HGL – watermain elevation) x 1.42197 PSI/m.

The hydraulic model EPANET was used to analyze the performance of the proposed watermain configuration for the following three (3) theoretical conditions:

- Maximum Day + Fire Flow Demand (various locations)
- Peak Hour Demand
- Maximum HGL

Tables 2.2, **2.3** and **2.4** summarize the hydraulic model results under the various theoretical conditions.

Table 2.2: Maximum Day + Fire Flow Demand (Various Locations)

Operating Condition	Minimum System Pressure	Maximum System Pressure
Max Day Demands: 7.90 L/s at J11 (Main Hospital Water Supply), 4.60 L/s at J30 (James Beach Centre) **Fire Flow Demand 167 L/s (New Parking Garage):** 84 L/s at J21 and J23 (New Hydrants 4 and 5)	Minimum system pressure of 41.0 psi is available at Node J18 (New Hydrant 5)	Maximum system pressure of 69.3 psi is available at Node J01 (Ex. reducer north of Connection #2)
Max Day Demands: 7.90 L/s at J11 (Main Hospital Water Supply), 4.60 L/s at J30 (James Beach Centre) **Fire Flow Demand 67 L/s (Generator/MEP Rooms):** 67 L/s at J25 (New Hyd. 6)	Minimum system pressure of 67.1 psi is available at Nodes J35 and J36 (Ex. Hydrant north of Connection #1)	Maximum system pressure of 74.2 psi is available at Node J14 (New watermain in loading dock area)
Max Day Demands: 7.90 L/s at J11 (Main Hospital Water Supply), 4.60 L/s at J30 (James Beach Centre) **Fire Flow Demand 50 L/s (M.M., E.V.S., and Plant Offices Building):** 50 L/s at J15 (New Hyd. 3)	Minimum system pressure of 67.1 psi is available at Nodes J35 and J36 (Ex. Hydrant north of Connection #1)	Maximum system pressure of 74.5 psi is available at Node J17 (New watermain in loading dock area)

Max Day Demands: 7.90 L/s at J11 (Main Hospital Water Supply), 4.60 L/s at J30 (James Beach Centre) **Fire Flow Demand 183 L/s (Ex. James Beach Centre with New Inpatient Tower Addition):** 92 L/s at J25 and J28 (New Hydrant 6 and Ex. Hydrant)	Minimum system pressure of 37.0 psi is available at Node J28 (Ex. Hydrant west of James Beach Centre)	Maximum system pressure of 69.2 psi is available at Node J01 (Ex. reducer north of Connection #2)
Max Day Demands: 7.90 L/s at J11 (Main Hospital Water Supply), 4.60 L/s at J30 (James Beach Centre) **Fire Flow Demand 183 L/s (New Transitional Care Tower Addition to Ex. Main Hospital):** 61 L/s at J09 and J15 (New Hydrants 2 and 3)	Minimum system pressure of 37.6 psi is available at Node J09 (New Hydrant 2)	Maximum system pressure of 69.2 psi is available at Node J34 (Ex. reducer north of Connection #1)
Max Day Demands: 7.90 L/s at J11 (Main Hospital Water Supply), 4.60 L/s at J30 (James Beach Centre) **Fire Flow Demand 100 L/s (Emergency Department Addition & Outpatient Ambulatory Care Centre):** 50 L/s at J07 and J09 (New Hydrants 1 and 2)	Minimum system pressure of 61.5 psi is available at Node J09 (New Hydrant 2)	Maximum system pressure of 71.0 psi is available at Nodes J31, J32, and J33 (Ex. Hydrant south of Maternity Ward)
Max Day Demands: 7.90 L/s at J11 (Main Hospital Water Supply), 4.60 L/s at J30 (James Beach Centre) **Fire Flow Demand 50 L/s (Ambulance Garage):** 50 L/s at J09 (New Hyd. 2)	Minimum system pressure of 67.1 psi is available at Nodes J35 and J36 (Ex. Hydrant north of Connection #1)	Maximum system pressure of 76.1 psi is available at Node J17 (New watermain in loading dock area)

Table 2.3: Peak Hour Demand

Operating Condition	Minimum System Pressure	Maximum System Pressure
Peak Hour Demands: 14.30 L/s at J11 (Main Hospital Water Supply), 8.20 L/s at J30 (James Beach Centre)	Minimum system pressure of 66.4 psi is available at Nodes J35 and J36 (Ex. Hydrant north of Connection #1)	Maximum system pressure of 78.2 psi is available at Node J17 (New watermain in loading dock area)

Table 2.4: Maximum HGL

Operating Condition	Minimum System Pressure	Maximum System Pressure
Max Day Demands: 7.90 L/s at J11 (Main Hospital Water Supply), 4.60 L/s at J30 (James Beach Centre)	Minimum system pressure of 72.9 psi is available at Nodes J35 and J36 (Ex. Hydrant north of Connection #1)	Maximum system pressure of 85.1 psi is available at Node J17 (New watermain in loading dock area)

The modelling results indicate that the looped watermain will provide adequate system flows and pressures during all conditions (i.e., Max Day + Fire Flow, Peak Hour and Max HGL). Pressure reducing valves will be required as system pressures are expected to exceed 80 psi as indicated in the table above.

Booster pump(s) are anticipated to be required to provide adequate water pressure to the upper floors of the Part 4 expansion buildings. Refer to **Appendix D** for City of Ottawa boundary conditions, the hydraulic modeling schematics, modeling results and correspondence from the City of Ottawa.

As indicated in the model, a multi-hydrant approach to firefighting will be required to supply adequate fire flow to the proposed development using new and existing private on-site hydrants fed off the looped watermain network. Based on the City of Ottawa Water Distribution Design Guidelines, Appendix I, Class AA (blue bonnet) hydrants within 75m of a building have a maximum capacity 95 L/s while hydrants between 75m and 150m of a building have a maximum capacity of 63 L/s (at a pressure of 20 PSI). The combined maximum flow from the nearby hydrants will provide the Max Day + Fire Flow requirement for the Part 4 expansion buildings assuming a looped system. **Table 2.5** summarizes the total theoretical combined fire flow available from the nearby private fire hydrants and compares it to the fire flow demands based on FUS calculations assuming a looped system.

Table 2.5: **Theoretical Fire Protection Summary Table**

Building I.D.	Fire Flow Demand (L/s)	Fire Hydrant(s) within 75m (~ 95 L/s each)	Fire Hydrant(s) within 150m (~ 63 L/s each)	Theoretical Combined Available Fire Flow (L/s)
Water Supplied by Existing and New Private Hydrants				
New Parking Garage	167	3	1	>167
Generator Building	67	4	1	>67
M.M. & E.V.S. Addition	50	1	1	>50
Existing James Beach Centre with New Inpatient Tower Addition	183	3	2	>183
New Transitional Care Tower Addition to Ex. Main Hospital	183	1	3	>183
Emergency Department Addition and Outpatient Ambulatory Care Centre	100	3	0	>100
Ambulance Garage	50	1	1	>50

Refer to **Appendix D** for City of Ottawa boundary conditions, hydrant coverage figure, hydraulic modeling schematics, modeling results, letter from Architect to support FUS calculations and correspondence from the City of Ottawa.

3.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

The details of the proposed QCH campus stormwater management (SWM) design will be addressed in a separate report entitled Queensway Carleton Hospital Part 4 Expansion – Stormwater Management Report[4]. Refer to **Figure 6** for a plan showing the existing storm sewers servicing the QCH Campus and the proposed storm sewer modifications for the Part 4 expansion.

Figure 6: Storm Sewer Drainage Plan

Image Source: geoOttawa (City of Ottawa)

4.0 GEOTECHNICAL INVESTIGATIONS

The Geotechnical Investigation – Queensway Carleton Hospital Expansion (CA0033714.1722, dated September 03, 2026) has been prepared by WSP for the QCH Campus Part 4 Expansion. Refer to the Geotechnical Report[5] for subsurface conditions, construction recommendations and geotechnical inspection requirements.

5.0 CONCLUSION

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:

- Sanitary sewage flows will continue to be divided between the two sewer outlets (Graham Creek Trunk Sewer and Lynwood Collector Sewer via on-site Pump Station). Portions of the gravity sanitary sewer systems will need to be removed, re-aligned or extended to accommodate the Part 4 Expansion.
    - The peak sanitary flows to the Graham Creek Trunk Sewer will increase from 22.70 L/s to 22.99 L/s. This represents a 0.29 L/s (~1%) increase in peak flows which is deemed negligible and should have minimal to no impact on the downstream sewer system.
    - The peak sanitary flows to the Lynwood Collector Sewer will increase from 53.80 L/s to 58.03 L/s. The calculations demonstrate that there is still a lot of capacity remaining within the on-site sanitary pump station and twin forcemains to accommodate the 4.23 L/s (~8%) increase in peak flows for the proposed Part 4 expansion, as well as future QCH campus expansion phases up to the future peak flow of 76 L/s and ultimate peak flow of 100 L/s.
- Water supply for domestic and fire flow purposes will continue to be supplied by the private looped watermain network. Portions of the existing private watermain will need to be removed, realigned, or extended to accommodate the Part 4 Expansion. Adequate water and system pressures will exist throughout the watermain network under the specified “Max Day + Fire Flow” and “Peak Hour” conditions as indicated by the hydraulic modelling results.
- The proposed Part 4 expansion buildings, excluding the new multi-level parking structure, will be fully sprinklered.

It is recommended that the proposed site servicing design be approved for implementation.

NOVATECH

Prepared by:

Kynan D’sa, B.A.Sc.
CAD Designer | Land Development

Reviewed by:

François Thauvette, P. Eng.
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

Sanitary Sewage Calculations

Queensway Carleton Hospital - Part 4 Expansion
3045 Baseline Road
SANITARY SEWAGE ANALYSIS -SUMMARY

Peak Sanitary Flows Directed to Graham Creek Trunk Sewer		
*Existing Cancer Centre Flows**	*22.70*	L/s
*Existing Parking Garage**	*0.10*	L/s
New Parking Garage	0.09	L/s
MM & EVS Addition	0.01	L/s
Loading Dock Building	0.05	L/s
Generator Building	0.04	L/s
Total Peak San. Flow to Graham Creek Trunk Sewer	**22.99**	**L/s**

Peak Sanitary Flows Directed to Lynwood Collector (via Pump Station)		
*Existing Part 1 Campus Flows**	*23.80*	L/s
*Existing Part 2 Campus Flows**	*21.90*	L/s
*Existing Part 3 Campus Flows**	*8.10*	L/s
Inpatient Tower Addition	1.36	L/s
Ambulance Garage	0.04	L/s
Transitional Care Tower	2.16	L/s
Emergency Department & Ambulatory Care Addition	0.65	L/s
Food Services - Interior Renovation	0.01	L/s
Total Peak San. Flow to Lynwood Collector (via Pump Station)	**58.03**	**L/s**

*Existing campus flows taken directly from the previously approved 'Sanitary Pump Station Design Brief' (R-2007-095), which are based on conservative values using fixture units. Existing parking garage flows were noted as "n/a" within the Pump Station Design Brief but have been calculated at the request of the City of Ottawa.

***Design populations are based on a staff & volumes estimate that was provided by the architect.

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Queensway Carleton Hospital - Part 4 Expansion
Existing Parking Garage
SANITARY SEWAGE ANALYSIS

Extraneous Flow		
Area	0.288	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flows	**0.10**	L/s
Total Peak Sanitary Flow	**0.10**	**L/s**

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Queensway Carleton Hospital - Part 4 Expansion
New Parking Garage
SANITARY SEWAGE ANALYSIS

Extraneous Flow		
Area	0.272	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flows	**0.09**	L/s
Total Peak Sanitary Flow	**0.09**	**L/s**

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Queensway Carleton Hospital - Part 4 Expansion
MM & EVS Addition
SANITARY SEWAGE ANALYSIS

Extraneous Flow		
Area	0.039	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flows	0.01	L/s
Total Peak Sanitary Flow	**0.01**	**L/s**

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Queensway Carleton Hospital - Part 4 Expansion
Loading Dock Building
SANITARY SEWAGE ANALYSIS

Extraneous Flow		
Area	0.154	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flows	0.05	L/s
Total Peak Sanitary Flow	**0.05**	**L/s**

Queensway Carleton Hospital - Part 4 Expansion
Generator Building
SANITARY SEWAGE ANALYSIS

Extraneous Flow		
Area	0.125	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flows	**0.04**	L/s
Total Peak Sanitary Flow	**0.04**	**L/s**

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Queensway Carleton Hospital - Part 4 Expansion
Inpatient Tower Addition
SANITARY SEWAGE ANALYSIS

Peak Sanitary Flow - Hospital Beds		
Number of Beds	61	Beds
Average Daily Sanitary Flows	900	L/bed/day
Peaking Factor	1.50	
Peak Hospital Bed Flows	**0.95**	L/s
Peak Sanitary Flow - Patients		
Anticipated Average Daily Patient Visits	91	Patients
Average Daily Sanitary Flows	25	L/c/day
Peaking Factor	1.50	
Peak Patient Flows	**0.04**	L/s
Peak Sanitary Flow - Medical Staff		
Medical Staff Design Population	77	Staff
Average Daily Sanitary Flows	275	L/c/day
Peaking Factor	1.50	
Peak Medical Staff Flows	**0.37**	L/s
Extraneous Flow		
N/A - Vertical Addition Only		
Total Peak Sanitary Flow	**1.36**	**L/s**

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Queensway Carleton Hospital - Part 4 Expansion
Ambulance Garage
SANITARY SEWAGE ANALYSIS

Peak Sanitary Flow		
Number of Ambulance Bays	6	Vehicles
Average Daily Sanitary Flows (Hand-wash)	200	L/car/day
Peaking Factor	1.50	
Peak General Staff Flows	**0.02**	L/s
Extraneous Flow		
Area	0.071	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flows	0.02	L/s
Total Peak Sanitary Flow	**0.04**	**L/s**

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Queensway Carleton Hospital - Part 4 Expansion
Transitional Care Tower
SANITARY SEWAGE ANALYSIS

Peak Sanitary Flow - Institutional Use (Hospital)		
Number of Beds	112	Beds
Average Daily Sanitary Flows	900	L/bed/day
Peaking Factor	1.50	
Peak Institutional Use Flows	**1.75**	L/s
Peak Sanitary Flow - Patients		
Anticipated Average Daily Patient Visits	185	Patients
Average Daily Sanitary Flows	25	L/c/day
Peaking Factor	1.50	
Peak Patient Flows	**0.08**	L/s
Peak Sanitary Flow - Medical Staff		
Medical Staff Design Population	70	Staff
Average Daily Sanitary Flows	275	L/c/day
Peaking Factor	1.50	
Peak Medical Staff Flows	**0.33**	L/s
Extraneous Flow		
N/A - Vertical Addition Only		
Total Peak Sanitary Flow	**2.16**	**L/s**

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Queensway Carleton Hospital - Part 4 Expansion
Emergency Department & Ambulatory Care Addition
SANITARY SEWAGE ANALYSIS

Peak Sanitary Flow - Institutional Use (Hospital)		
Number of Beds	20	Beds
Average Daily Sanitary Flows	900	L/bed/day
Peaking Factor	1.50	
Peak Institutional Use Flows	**0.31**	L/s
Peak Sanitary Flow - Patients		
Anticipated Average Daily Patient Visits	52	Patients
Average Daily Sanitary Flows	25	L/c/day
Peaking Factor	1.50	
Peak Patient Flows	**0.02**	L/s
Peak Sanitary Flow - Medical Staff		
Medical Staff Design Population	37	Staff
Average Daily Sanitary Flows	275	L/c/day
Peaking Factor	1.50	
Peak Medical Staff Flows	**0.18**	L/s
Extraneous Flow		
Area	0.407	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flows	0.13	L/s
Total Peak Sanitary Flow	**0.65**	**L/s**

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Queensway Carleton Hospital - Part 4 Expansion
Food Services - Interior Renovation
SANITARY SEWAGE ANALYSIS

Peak Sanitary Flow		
General Staff Design Population	11	Staff
Average Daily Sanitary Flows	75	L/c/day
Peaking Factor	1.50	
Peak General Staff Flows	**0.01**	L/s
Extraneous Flow		
N/A - Interior Renovation Only		
Total Peak Sanitary Flow	**0.01**	**L/s**

APPENDIX D

Water Demands, FUS Calculations, Watermain Boundary Conditions, Hydrant Coverage Figure, Schematic of the Hydraulic Model, Modeling Results, Correspondence from Architect to support FUS Calculations

Queensway Carleton Hospital - Part 4 Expansion
Summary
POST-DEVELOPMENT WATER DEMANDS

DOMESTIC WATER DEMANDS

Existing Hospital and New Building Additions	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Main Hospital Water Supply: Existing Hospital / Cancer Centre and New Part 4 Expansions (Excluding James Beach Centre & Inpatient Tower Addition)	5.3	7.9	14.3
Existing James Beach Centre & New Inpatient Tower Addition	3.0	4.6	8.2
Total	**8.3**	**12.5**	**22.5**

BOUNDARY CONDITIONS - CONNECTION #1 (WEST) - 305mm dia. WM IN BASELINE ROAD

Minimum HGL (Peak Hour) =	**127.3**	**m**
Maximum HGL =	**131.9**	**m**
Max Day + Fire Flow (183.0 L/s) =	**127.4**	**m**

BOUNDARY CONDITIONS - CONNECTION #2 (EAST) - 305mm dia. WM IN BASELINE ROAD

Minimum HGL (Peak Hour) =	**127.3**	**m**
Maximum HGL =	**131.9**	**m**
Max Day + Fire Flow (183.0 L/s) =	**127.3**	**m**

PRESSURE TESTS

	CONNECTION #1	CONNECTION #2	UNITS
Existing watermain elevation at connection	**80.8**	**78.8**	**m**

Low Pressure Pressure =(Min. HGL - (Existing Ground Elevation - Watermain Elevation)) x 1.42 PSI/m (should be > 40 PSI)	**66.0**	**68.0**	**PSI**
High Pressure Pressure = (Max HGL - (Existing Ground Elevation - Watermain Elevation)) x 1.42 PSI/m (should be between 50- 70 PSI)	**72.0**	**75.0**	**PSI**
Max Day + Fire Flow Pressure = (Max Day + Fire Flow - (Existing Ground Elevation -Watermain Elevation)) x 1.42 PSI/m (should be > 20 PSI)	**66.0**	**68.0**	**PSI**

To convert Head(m) to PSI: multiply by 1.42

PSI	m OF HEAD
1.42197	1

Queensway Carleton Hospital - Part 4 Expansion

Main Hospital Water Supply: Existing Hospital / Cancer Centre and New Part 4 Expansions (Excluding James Beach Centre & Inpatient Tower Addition)

POST-DEVELOPMENT WATER DEMANDS

DOMESTIC WATER DEMAND

Institutional Use (Hospital)	**Post-Development**	
Number of Beds	228	Beds
Average Day Demand (900 L/bed/day)	**2.38**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**3.56**	**L/s**
Peak Hour Demand (1.8 x max. day)	**6.41**	**L/s**
Patient Water Demands		
Anticipated Average Daily Patient Visits	782	Patients
Average Day Demand (25 L/c/day)	**0.23**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**0.34**	**L/s**
Peak Hour Demand (1.8 x max. day)	**0.61**	**L/s**
Medical Staff Water Demands		
Anticipated Max. Medical Staff per daytime shift	727	Staff
Average Day Demand (275 L/c/day)	**2.32**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**3.47**	**L/s**
Peak Hour Demand (1.8 x max. day)	**6.25**	**L/s**
General Staff Water Demands		
Anticipated Max. General Staff per daytime shift	415	Staff
Average Day Demand (75 L/c/day)	**0.36**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**0.54**	**L/s**
Peak Hour Demand (1.8 x max. day)	**0.97**	**L/s**
Ambulance Garage Water Demands		
Number of Ambulance Bays	6	Vehicles
Average Day Demand (200 L/v/day)	**0.01**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**0.02**	**L/s**
Peak Hour Demand (1.8 x max. day)	**0.04**	**L/s**
TOTALS		
Average Day Demand	**5.3**	**L/s**
Maximum Day Demand	**7.9**	**L/s**
Peak Hour Demand	**14.3**	**L/s**

Queensway Carleton Hospital - Part 4 Expansion
Existing James Beach Centre & New Inpatient Tower Addition
POST-DEVELOPMENT WATER DEMANDS

DOMESTIC WATER DEMAND

Institutional Use (Hospital)	Post-Development	
Number of Beds	252	Beds
Average Day Demand (900 L/bed/day)	**2.63**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**3.94**	**L/s**
Peak Hour Demand (1.8 x max. day)	**7.09**	**L/s**
Patient Water Demands		
Anticipated Average Daily Patient Visits	190	Patients
Average Day Demand (25 L/c/day)	**0.05**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**0.08**	**L/s**
Peak Hour Demand (1.8 x max. day)	**0.15**	**L/s**
Staff Water Demands		
Max. Medical Staff per daytime shift	116	Staff
Average Day Demand (275 L/c/day)	**0.37**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**0.55**	**L/s**
Peak Hour Demand (1.8 x max. day)	**0.99**	**L/s**
TOTALS		
Average Day Demand	**3.0**	**L/s**
Maximum Day Demand	**4.6**	**L/s**
Peak Hour Demand	**8.2**	**L/s**

FUS - Fire Flow Calculations

Engineers, Planners & Landscape Architects

Novatech Project #: 123089
Project Name: QCH Part 4 Expansion
Date: 9/10/2025
Input By: K. D'sa
Reviewed By: François Thauvette

Legend: Input by User / No Input Required
Reference: Fire Underwriter's Survey Guideline (2020) Formula Method

Building Description: 7-Storey Open Air Parking Garage
Type II - Non-combustible construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Type V - Wood frame		1.5	0.8	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction	Yes	0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	2720			
		Number of Floors/Storeys	1			
		Protected Openings (1 hr) if C<1.0	No			
		Area of structure considered (m^2)			**2,720**	
	F	**Base fire flow without reductions**				**9,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**9,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)		-30%		**0**
		Standard Water Supply		-10%		
		Fully Supervised System		-10%		
				Cumulative Sub-Total	**0%**	
		Area of Sprinklered Coverage (m^2)		0%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge**		**FUS Table 6**		**Surcharge**	
	(3)	North Side	10.1 - 20 m		3%	**1,260**
		East Side	>30m		0%	
		South Side	0 - 3 m		11%	
		West Side	>30m		0%	
				Cumulative Total	**14%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**10,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**167**
				or	USGPM	2,642

FUS - Fire Flow Calculations

Engineers, Planners & Landscape Architects

Novatech Project #: 123089
Project Name: QCH Part 4 Expansion
Date: 9/1/2026
Input By: K. D'sa
Reviewed By: François Thauvette

Legend: Input by User
No Input Required
Reference: Fire Underwriter's Survey Guideline (2020)
Formula Method

Building Description: 1-Storey Generator Building
Type II - Non-combustible construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Type V - Wood frame		1.5	0.8	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction	Yes	0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1253			
		Number of Floors/Storeys	1			
		Protected Openings (1 hr) if C<1.0	No			
		Area of structure considered (m^2)			**1,253**	
	F	**Base fire flow without reductions**				**6,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**6,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-3,000**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m^2)	1,253	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 6**		**Surcharge**	
	(3)	North Side	0 - 3 m		15%	**1,140**
		East Side	2Hr Firewall		0%	
		South Side	20.1 - 30 m		4%	
		West Side	>30m		0%	
				Cumulative Total	**19%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**4,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**67**
				or	USGPM	1,057

FUS - Fire Flow Calculations

Engineers, Planners & Landscape Architects

Novatech Project #: 123089
Project Name: QCH Part 4 Expansion
Date: 9/10/2025
Input By: K. D'sa
Reviewed By: François Thauvette

Legend: Input by User / No Input Required
Reference: Fire Underwriter's Survey Guideline (2020) Formula Method

Building Description: 2-Storey M.M., E.V.S., and Plant Offices Building
Type II - Non-combustible construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Type V - Wood frame		1.5	0.8	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction	Yes	0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	592			
		Number of Floors/Storeys	2			
		Protected Openings (1 hr) if C<1.0	No			
		Area of structure considered (m^2)			**1,184**	
	F	**Base fire flow without reductions**				**6,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**6,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-3,000**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m^2)	1,184	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	2Hr Firewall		0%	**0**
		East Side	2Hr Firewall		0%	
		South Side	2Hr Firewall		0%	
		West Side	>30m		0%	
				Cumulative Total	**0%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**3,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**50**
				or	USGPM	793

FUS - Fire Flow Calculations

Engineers, Planners & Landscape Architects

Novatech Project #: 123089
Project Name: QCH Part 4 Expansion
Date: 9/10/2025
Input By: K. D'sa
Reviewed By: François Thauvette

Legend: Input by User / No Input Required
Reference: Fire Underwriter's Survey Guideline (2020) Formula Method

Building Description: 4-Storey Existing James Beach Centre with 3-Storey Inpatient Tower Addition
Type II - Non-combustible construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Type V - Wood frame		1.5	0.8	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction	Yes	0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Podium Level Footprint (m^2)	4532			
		Total Floors/Storeys (Podium)	4			
		Tower Footprint (m^2)	2526			
		Total Floors/Storeys (Tower)	3			
		Protected Openings (1 hr)	No			
		A, Total Effective Floor Area (m^2)			**17,385**	
	F	**Base fire flow without reductions**				**23,000**
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**19,550**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-9,775**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m^2)	25,706	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge per**		**FUS Table 6**		**Surcharge**	
	(3)	North Side	2Hr Firewall		0%	**1,369**
		East Side	2Hr Firewall		0%	
		South Side	3.1 - 10 m		7%	
		West Side	>30m		0%	
				Cumulative Total	**7%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**11,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**183**
				or	USGPM	2,906

FUS - Fire Flow Calculations

Engineers, Planners & Landscape Architects

Novatech Project #: 123089
Project Name: QCH Part 4 Expansion
Date: 9/10/2025
Input By: K. D'sa
Reviewed By: François Thauvette

Legend: Input by User
No Input Required
Reference: Fire Underwriter's Survey Guideline (2020)
Formula Method

Building Description: 5-Storey Transitional Care Tower Addition to Ex. 2-Storey Hospital
Type II - Non-combustible construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Type V - Wood frame		1.5	0.8	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction	Yes	0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	3346			
		Number of Floors/Storeys	7			
		Protected Openings (1 hr) if C<1.0	No			
		Area of structure considered (m^2)			**15,057**	
	F	**Base fire flow without reductions**				**22,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**22,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-11,000**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m^2)	23,422	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	2Hr Firewall		0%	**0**
		East Side	2Hr Firewall		0%	
		South Side	2Hr Firewall		0%	
		West Side	2Hr Firewall		0%	
				Cumulative Total	**0%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**11,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**183**
				or	USGPM	2,906

FUS - Fire Flow Calculations

Engineers, Planners & Landscape Architects

Novatech Project #: 123089
Project Name: QCH Part 4 Expansion
Date: 11/10/2025
Input By: K. D'sa
Reviewed By: François Thauvette

Legend: Input by User / No Input Required
Reference: Fire Underwriter's Survey Guideline (2020) Formula Method

Building Description: 1-Storey Emergency Department and Ambulatory Care Addition
Type II - Non-combustible construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Type V - Wood frame		1.5	0.8	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction	Yes	0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	7236			
		Number of Floors/Storeys	1			
		Protected Openings (1 hr) if C<1.0	No			
		Area of structure considered (m^2)			**7,236**	
	F	**Base fire flow without reductions**				**15,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**12,750**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-6,375**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m^2)	7,236	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	2Hr Firewall		0%	**0**
		East Side	>30m		0%	
		South Side	>30m		0%	
		West Side	2Hr Firewall		0%	
				Cumulative Total	**0%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**6,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**100**
				or	USGPM	1,585

FUS - Fire Flow Calculations

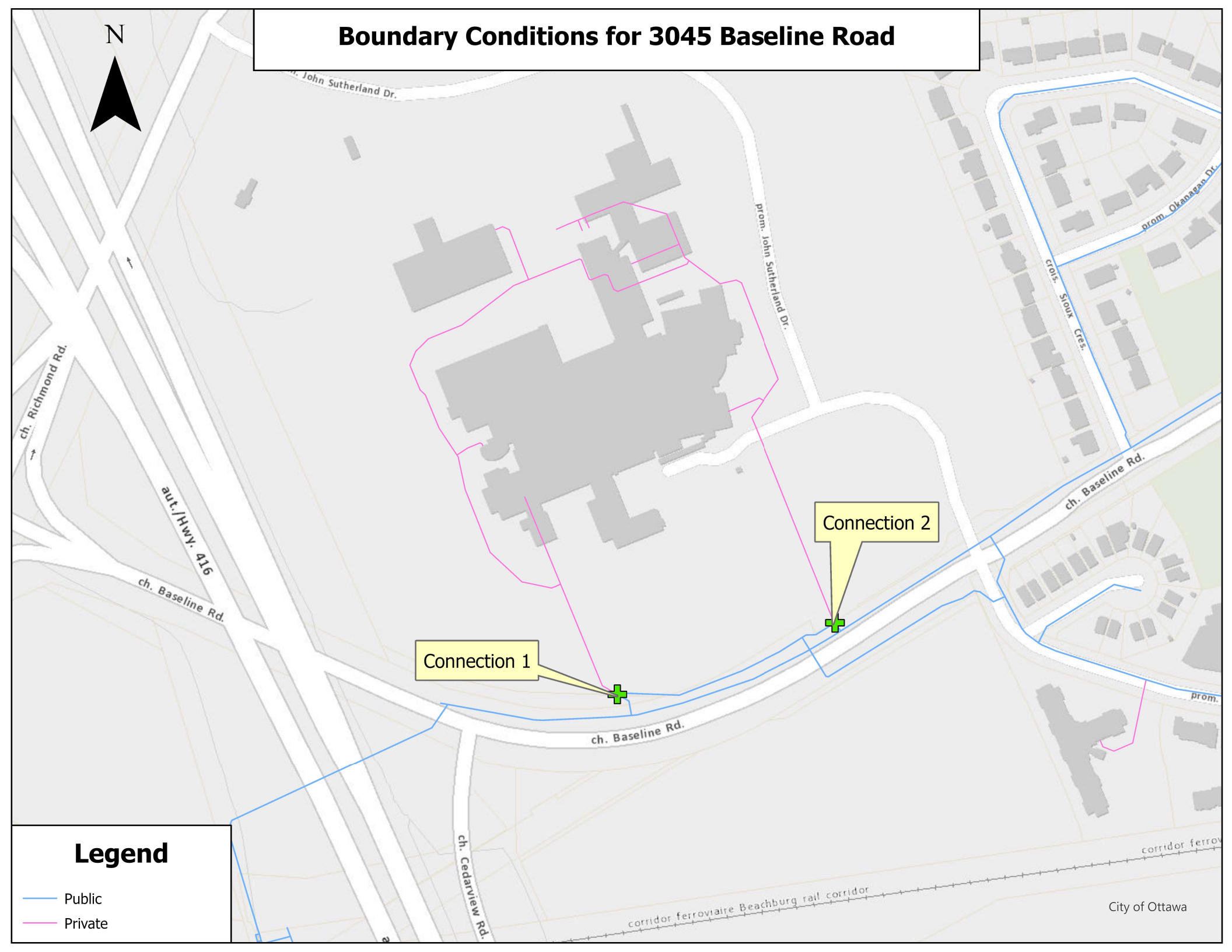
Engineers, Planners & Landscape Architects

Novatech Project #: 123089
Project Name: QCH Part 4 Expansion
Date: 9/10/2025
Input By: K. D'sa
Reviewed By: François Thauvette

Legend: Input by User / No Input Required
Reference: Fire Underwriter's Survey Guideline (2020) Formula Method

Building Description: 1-Storey Ambulance Garage
Type II - Non-combustible construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Type V - Wood frame		1.5	0.8	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction	Yes	0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	741			
		Number of Floors/Storeys	1			
		Protected Openings (1 hr) if C<1.0	No			
		Area of structure considered (m^2)			**741**	
	F	**Base fire flow without reductions**				**5,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**5,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-2,500**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m^2)	741	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 6**		**Surcharge**	
	(3)	North Side	20.1 - 30 m		0%	**500**
		East Side	>30m		0%	
		South Side	2Hr Firewall		0%	
		West Side	0 - 3 m		10%	
				Cumulative Total	**10%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**3,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**50**
				or	USGPM	793


Boundary Conditions for 3045 Baseline Road
N
Connection 1
Connection 2
Legend
Public
Private
ch. Baseline Rd.
prom. John Sutherland Dr.
ch. Richmond Rd.
aut./Hwy. 416
ch. Cedarview Rd.
corridor ferroviaire Beachburg rail corridor
City of Ottawa

Kynan Dsa

From: Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>
Sent: Thursday, September 18, 2025 10:32 AM
To: Francois Thauvette
Cc: Kynan Dsa
Subject: RE: 3045 Baseline Road - QCH Part 4 Expansion - Request for Municipal WM Boundary Conditions (123089)
Attachments: 3045 Baseline Road September 2025.pdf

Hi Francois,

The following are boundary conditions, HGL, for hydraulic analysis at 3045 Baseline Road (zone 2W2C) assumed to be connected via two (2) connections to the 305mm watermain on Baseline Road and looped internally. (see attached PDF for location).

Connection 1 – Baseline Road (west):
Minimum HGL = 127.3 m
Maximum HGL = 131.9 m
Max Day + Fire Flow (50.0 L/s) = 127.8 m
Max Day + Fire Flow (100.0 L/s) = 127.7 m
Max Day + Fire Flow (167.0 L/s) = 127.4 m
Max Day + Fire Flow (183.0 L/s) = 127.4 m

Connection 2 – Baseline Road (east):
Minimum HGL = 127.3 m
Maximum HGL = 131.9 m
Max Day + Fire Flow (50.0 L/s) = 127.8 m
Max Day + Fire Flow (100.0 L/s) = 127.7 m
Max Day + Fire Flow (167.0 L/s) = 127.4 m
Max Day + Fire Flow (183.0 L/s) = 127.3 m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. "The IWSD has recently updated their water modelling software. Any significant difference between previously received BC results and newly received BC results could be attributed to this update."

Best Regards,

Mohammed Fawzi, P.Eng.
Senior Project Manager (A), Infrastructure Projects
Development Review – West Branch
Planning, Development and Building Services Department (PDBS)| Direction générale des services de la planification, de l'aménagement et du bâtiment (DGSPAB)
City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West | 110 Avenue Laurier Ouest
Ottawa, ON K1P 1J1
613.580.2424 ext./poste 70120, Mohammed.Fawzi@ottawa.ca

Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Fawzi, Mohammed
Sent: September 12, 2025 9:33 AM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Cc: Kynan Dsa <k.dsa@novatech-eng.com>
Subject: RE: 3045 Baseline Road - QCH Part 4 Expansion - Request for Municipal WM Boundary Conditions (123089)

Thanks for confirming Francois.

This is to confirm your request for boundary conditions is in the queue. Could you also send me the proposed sanitary peak flow? I'll also verify if there are concerns regarding capacity, even though the difference in flow will likely be very small.

Best Regards,

Mohammed Fawzi, P.Eng.
Senior Project Manager (A), Infrastructure Projects
Development Review – West Branch
Planning, Development and Building Services Department (PDBS)| Direction générale des services de la planification, de l'aménagement et du bâtiment (DGSPAB)
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West | 110 Avenue Laurier Ouest
Ottawa, ON K1P 1J1
613.580.2424 ext./poste 70120, Mohammed.Fawzi@ottawa.ca

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: September 12, 2025 8:17 AM
To: Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>
Cc: Kynan Dsa <k.dsa@novatech-eng.com>
Subject: RE: 3045 Baseline Road - QCH Part 4 Expansion - Request for Municipal WM Boundary Conditions (123089)

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Hi Mohammed,

Please refer to **Open Parking Garages** section of the attached 2020 FUS Guidelines (on page 23).

Correspondence from the architect confirming all the parameters used in the FUS calculations will be included in the report.

Regards,

François Thauvette, P. Eng., Sr. Project Manager | Land Development & Public-Sector Engineering
NOVATECH
Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | T: 613.254.9643 Ext: 219 | C: 613.276.0310
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>
Sent: Friday, September 12, 2025 8:05 AM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Cc: Kynan Dsa <k.dsa@novatech-eng.com>
Subject: RE: 3045 Baseline Road - QCH Part 4 Expansion - Request for Municipal WM Boundary Conditions (123089)

Hi Francois,

Thank you for your email. Can you please confirm why only 1-storey was considered for the 7-storey open air parking garage? Please also note that during Site Plan Review, we will require an email or letter from the architect confirming all the parameters used in the FUS calculations. These parameters would include, firewalls, sprinkler reductions, and coefficient values.

Thanks Francois.

Best Regards,

Mohammed Fawzi, P.Eng.
Senior Project Manager (A), Infrastructure Projects
Development Review – West Branch
Planning, Development and Building Services Department (PDBS)| Direction générale des services de la planification, de l'aménagement et du bâtiment (DGSPAB)
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West | 110 Avenue Laurier Ouest
Ottawa, ON K1P 1J1
613.580.2424 ext./poste 70120, Mohammed.Fawzi@ottawa.ca

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: September 11, 2025 3:15 PM
To: Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>
Cc: Kynan Dsa <k.dsa@novatech-eng.com>
Subject: FW: 3045 Baseline Road - QCH Part 4 Expansion - Request for Municipal WM Boundary Conditions (123089)

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Hi Mohammed,

We are sending this e-mail to request municipal watermain boundary conditions for the proposed Part 4 campus expansion at the Queensway Carleton Hospital. Please see e-mail below and attachments for details.

Let us know if you require any clarifications.

Regards,

François Thauvette, P. Eng., Sr. Project Manager | Land Development & Public-Sector Engineering
NOVATECH
Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | T: 613.254.9643 Ext: 219 | C: 613.276.0310
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Kynan Dsa <k.dsa@novatech-eng.com>
Sent: Wednesday, September 10, 2025 4:04 PM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Subject: 3045 Baseline Road - QCH Part 4 Expansion - Request for Municipal WM Boundary Conditions (123089)

Hi François,

As discussed, please forward the e-mail below to the City of Ottawa to request municipal watermain boundary conditions for the QCH Part 4 Expansion project.

We are sending this e-mail to request municipal watermain boundary conditions to complete a hydraulic network analysis for the Queensway Carleton Hospital (QCH) Part 4 Expansion. The proposed development includes building additions to the existing hospital, a new open-air parking garage, and interior renovations to the existing hospital building.

The existing hospital is currently serviced by a private 203mm dia. looped watermain network, which has two connections to the existing 305mm dia. municipal watermain fed off the 1200mm dia. feedermain in Baseline Road (per geoOttawa). No modifications or new connections to municipal watermain infrastructure are proposed, however modifications to the private looped watermain network will be

required to accommodate the proposed development. The sizing of the modified portions of the private looped watermain and spacing of the on-site hydrants will be based on the fire flow requirements (calculated per FUS guidelines) and modelling results. We assume that City hydraulic modelling already accounts for fire flow demands for the existing hospital buildings, therefore the fire flow calculations are based on the new buildings and building additions only. The total Part 4 Expansion post-development water demands for the entire campus are as follows:

- Average Day Demand = 8.0 L/s
- Maximum Day Demand = 12.0 L/s
- Peak Hour Demand = 21.7 L/s
- Maximum Fire Flow Demand Range (New Buildings / Building Additions only) = 50-183 L/s

Refer to the attached domestic water demand and FUS fire flow calculation sheets and accompanying marked-up Site Plan for further details.

Please review and let us know if you have any questions or concerns.

Thanks,

Kynan D'sa, B.A.Sc. (Engineering) (He/Him)
NOVATECH
Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6
Tel: 613.254.9643 Ext. 276 | Cell: 705.821.2278
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LEGEND

- PROPERTY LINE
- PROPOSED HYDRANT C/W VALVE & LEAD
- PROPOSED WATERMAIN / WATER SERVICE
- *EXISTING HYDRANT C/W VALVE & LEAD*
- *EXISTING WATERMAIN / WATER SERVICE*
- X — REMOVALS

RICHMOND ROAD

JOHN SUTHERLAND DRIVE

NEW PARKING GARAGE
HYD 3 = ~60m
HYD 4 = ~20m
HYD 5 = ~22m
HYD 6 = ~60m

HYD 4

HYD 5

HYD 6

HYD 3

GENERATOR BUILDING
HYD 3 = ~10m
HYD 4 = ~67m
HYD 5 = ~73m
HYD 6 = ~28m
EX HYD = ~90m

MM & EVS ADDITION
HYD 3 = ~45m
HYD 4 = ~80m

NEW AMBULANCE GARAGE
HYD 1 = ~145m
HYD 2 = ~55m

TRANSITIONAL CARE TOWER ADDITION
HYD 2 = ~80m
HYD 3 = ~45m
HYD 4 = ~98m
HYD 6 = 130m

HYD 2

EX. JAMES BEACH CENTRE & INPATIENT TOWER ADDITION
HYD 3 = ~60m
HYD 5 = ~110m
HYD 6 = ~50m
EX HYD = ~20m
EX HYD = ~140m

EX HYD

EMERGENCY DEPARTMENT ADDITION & AMBULATORY CARE CENTRE
HYD 1 = ~35m
HYD 2 = ~20m
EX HYD = ~30m

HYD 1

EX HYD

EX HYD

BASELINE ROAD

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

CITY OF OTTAWA
QUEENSWAY CARLETON HOSPITAL
3045 BASELINE ROAD

HYDRANT COVERAGE

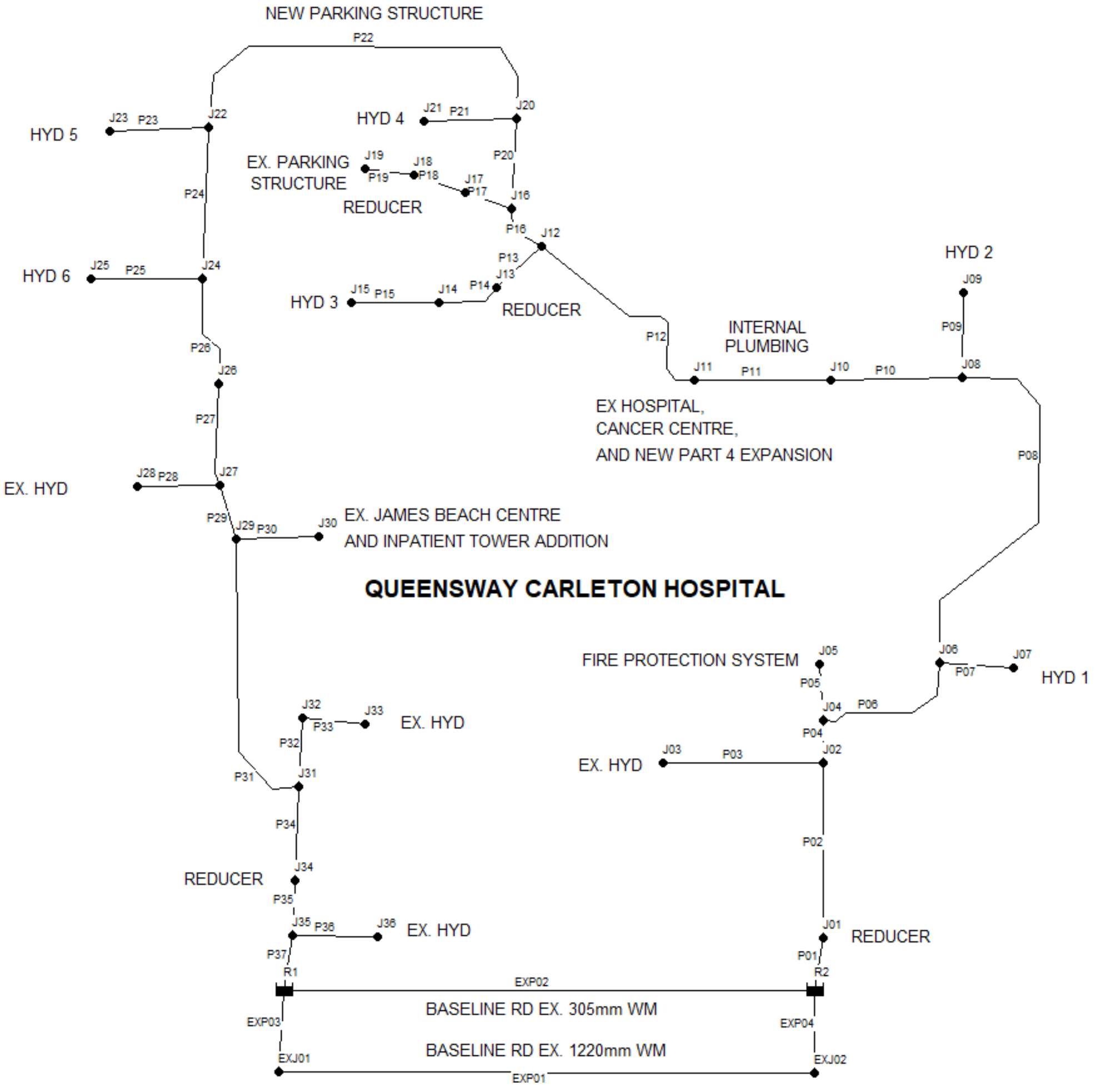
SCALE 1 : 2000 (0, 20, 40, 60, 80)

DATE SEP 2026 | JOB 123089 | FIGURE HYD

SHT11X17.DWG - 279mmX432mm

M:\2023\123089\CAD\CIVIL\FIGURES\SERVICING\123089-HYD COVERAGE.DWG 9/1/2026 1:28 PM - KDSA

HYDRAULIC MODEL SCHEMATIC



3045 Baseline Road - Queensway Carleton Hospital Part 4 Expansion
Water Model Results

Max Day + Fire Flow Demand (New Parking Garage)
Network Table - Nodes

Node ID	Elevation	Demand	Head	Pressure	Pressure	Pressure
	m	L/s	m	m	kPa	psi
Junc J01	78.60	0.00	127.37	48.77	478.43	69.39
Junc J02	76.05	0.00	121.80	45.75	448.81	65.09
Junc J03	76.10	0.00	121.80	45.70	448.32	65.02
Junc J04	75.91	0.00	121.46	45.55	446.85	64.81
Junc J05	76.33	0.00	121.46	45.13	442.73	64.21
Junc J06	76.25	0.00	118.34	42.09	412.90	59.89
Junc J07	76.30	0.00	118.34	42.04	412.41	59.82
Junc J08	76.49	0.00	115.09	38.60	378.67	54.92
Junc J09	76.55	0.00	115.09	38.54	378.08	54.84
Junc J10	76.80	0.00	114.03	37.23	365.23	52.97
Junc J11	72.45	7.90	107.70	35.25	345.80	50.15
Junc J12	72.57	0.00	106.29	33.72	330.79	47.98
Junc J13	72.49	0.00	106.29	33.80	331.58	48.09
Junc J14	71.93	0.00	106.29	34.36	337.07	48.89
Junc J15	72.50	0.00	106.29	33.79	331.48	48.08
Junc J16	72.69	0.00	106.13	33.44	328.05	47.58
Junc J17	71.91	0.00	106.13	34.22	335.70	48.69
Junc J18	73.35	0.00	106.13	32.78	321.57	46.64
Junc J19	73.45	0.00	106.13	32.68	320.59	46.50
Junc J20	73.72	0.00	104.70	30.98	303.91	44.08
Junc J21	73.72	84.00	104.26	30.54	299.60	43.45
Junc J22	74.41	0.00	104.86	30.45	298.71	43.32
Junc J23	74.45	84.00	103.31	28.86	283.12	41.06
Junc J24	74.77	0.00	107.99	33.22	325.89	47.27
Junc J25	74.80	0.00	107.99	33.19	325.59	47.22
Junc J26	76.15	0.00	111.11	34.96	342.96	49.74
Junc J27	76.49	0.00	112.73	36.24	355.51	51.56
Junc J28	76.50	0.00	112.73	36.23	355.42	51.55
Junc J29	76.50	0.00	113.83	37.33	366.21	53.11
Junc J30	76.75	4.60	113.83	37.08	363.75	52.76
Junc J31	76.60	0.00	121.41	44.81	439.59	63.76
Junc J32	76.60	0.00	121.41	44.81	439.59	63.76
Junc J33	76.60	0.00	121.41	44.81	439.59	63.76
Junc J34	78.60	0.00	127.21	48.61	476.86	69.16
Junc J35	80.60	0.00	127.30	46.70	458.13	66.45
Junc J36	80.60	0.00	127.30	46.70	458.13	66.45
Resvr R1	127.40	-100.63	127.40	0.00	0.00	0.00
Resvr R2	127.40	-79.87	127.40	0.00	0.00	0.00
					Min=	41.06
					Max=	69.39

Max Day + Fire Flow Demand (New Parking Garage)
Network Table - Links

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
	m	mm		L/s	m/s	m/km
Pipe P01	6	300	120	-80.5	1.14	4.98
Pipe P02	132	200	110	80.5	2.56	42.21
Pipe P03	49	150	100	0.0	0.00	0.00
Pipe P04	8	200	110	80.5	2.56	42.21
Pipe P05	4.8	200	110	0.0	0.00	0.00
Pipe P06	74	200	110	80.5	2.56	42.21
Pipe P07	4	150	100	0.0	0.00	0.00
Pipe P08	77	200	110	80.5	2.56	42.21
Pipe P09	5	150	100	0.0	0.00	0.00
Pipe P10	25	200	110	80.5	2.56	42.21
Pipe P11	150	200	110	80.5	2.56	42.21
Pipe P12	40.5	200	110	72.6	2.31	34.86
Pipe P13	8	200	110	0.0	0.00	0.00
Pipe P14	2.6	150	100	0.0	0.00	0.00
Pipe P15	4.8	150	100	0.0	0.00	0.00
Pipe P16	4.5	200	110	72.6	2.31	34.86
Pipe P17	8.5	200	110	0.0	0.00	0.00
Pipe P18	7.4	200	110	0.0	0.00	0.00
Pipe P19	8.2	150	100	0.0	0.00	0.00
Pipe P20	41	200	110	72.6	2.31	34.86
Pipe P21	2	150	100	84.0	4.75	221.34
Pipe P22	139	200	110	-11.4	0.36	1.13
Pipe P23	7	150	100	84.0	4.75	221.34
Pipe P24	54	200	110	-95.4	3.04	57.86
Pipe P25	7	150	100	0.0	0.00	0.00
Pipe P26	54	200	110	-95.4	3.04	57.86
Pipe P27	28	200	110	-95.4	3.04	57.86
Pipe P28	9	150	100	0.0	0.00	0.00
Pipe P29	19	200	110	-95.4	3.04	57.86
Pipe P30	20	200	110	4.6	0.15	0.21
Pipe P31	120	200	110	-100.0	3.18	63.13
Pipe P32	27	200	110	0.0	0.00	0.00
Pipe P33	16	150	100	0.0	0.00	0.00
Pipe P34	92	200	110	-100.0	3.18	63.13
Pipe P35	12	300	120	-100.0	1.42	7.46
Pipe P36	7	150	100	0.0	0.00	0.00
Pipe P37	13	300	120	100.0	1.42	7.46

3045 Baseline Road - Queensway Carleton Hospital Part 4 Expansion
Water Model Results

Max Day + Fire Flow Demand (Generator / MEP Room)
Network Table - Nodes

Node ID	Elevation	Demand	Head	Pressure	Pressure	Pressure
	m	L/s	m	m	kPa	psi
Junc J01	78.60	0.00	127.79	49.19	482.55	69.99
Junc J02	76.05	0.00	126.80	50.75	497.86	72.21
Junc J03	76.10	0.00	126.80	50.7	497.37	72.14
Junc J04	75.91	0.00	126.73	50.82	498.54	72.31
Junc J05	76.33	0.00	126.73	50.4	494.42	71.71
Junc J06	76.25	0.00	126.17	49.92	489.72	71.03
Junc J07	76.30	0.00	126.17	49.87	489.22	70.96
Junc J08	76.49	0.00	125.59	49.1	481.67	69.86
Junc J09	76.55	0.00	125.59	49.04	481.08	69.78
Junc J10	76.80	0.00	125.40	48.6	476.77	69.15
Junc J11	72.45	7.90	124.27	51.82	508.35	73.73
Junc J12	72.57	0.00	124.09	51.52	505.41	73.30
Junc J13	72.49	0.00	124.09	51.6	506.20	73.42
Junc J14	71.93	0.00	124.09	52.16	511.69	74.21
Junc J15	72.50	0.00	124.09	51.59	506.10	73.40
Junc J16	72.69	0.00	124.07	51.38	504.04	73.10
Junc J17	71.91	0.00	124.07	52.16	511.69	74.21
Junc J18	73.35	0.00	124.07	50.72	497.56	72.17
Junc J19	73.45	0.00	124.07	50.62	496.58	72.02
Junc J20	73.72	0.00	123.88	50.16	492.07	71.37
Junc J21	73.72	0.00	123.88	50.16	492.07	71.37
Junc J22	74.41	0.00	123.26	48.85	479.22	69.50
Junc J23	74.45	0.00	123.26	48.81	478.83	69.45
Junc J24	74.77	0.00	123.02	48.25	473.33	68.65
Junc J25	74.80	67.00	122.00	47.2	463.03	67.16
Junc J26	76.15	0.00	123.74	47.59	466.86	67.71
Junc J27	76.49	0.00	124.11	47.62	467.15	67.75
Junc J28	76.50	0.00	124.11	47.61	467.05	67.74
Junc J29	76.50	0.00	124.36	47.86	469.51	68.10
Junc J30	76.75	4.60	124.36	47.61	467.05	67.74
Junc J31	76.60	0.00	126.28	49.68	487.36	70.69
Junc J32	76.60	0.00	126.28	49.68	487.36	70.69
Junc J33	76.60	0.00	126.28	49.68	487.36	70.69
Junc J34	78.60	0.00	127.75	49.15	482.16	69.93
Junc J35	80.60	0.00	127.78	47.18	462.84	67.13
Junc J36	80.60	0.00	127.78	47.18	462.84	67.13
Resvr R1	127.80	-47.80	127.80	0	0.00	0.00
Resvr R2	127.80	-31.70	127.80	0	0.00	0.00
				Min=		67.13
				Max=		74.21

Max Day + Fire Flow Demand (Generator / MEP Room)
Network Table - Links

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
	m	mm		L/s	m/s	m/km
Pipe P01	6	300	120	-31.8	0.45	0.89
Pipe P02	132	200	110	31.8	1.01	7.57
Pipe P03	49	150	100	0.0	0.00	0.00
Pipe P04	8	200	110	31.8	1.01	7.57
Pipe P05	4.8	200	110	0.0	0.00	0.00
Pipe P06	74	200	110	31.8	1.01	7.57
Pipe P07	4	150	100	0.0	0.00	0.00
Pipe P08	77	200	110	31.8	1.01	7.57
Pipe P09	5	150	100	0.0	0.00	0.00
Pipe P10	25	200	110	31.8	1.01	7.57
Pipe P11	150	200	110	31.8	1.01	7.57
Pipe P12	40.5	200	110	23.9	0.76	4.46
Pipe P13	8	200	110	0.0	0.00	0.00
Pipe P14	2.6	150	100	0.0	0.00	0.00
Pipe P15	4.8	150	100	0.0	0.00	0.00
Pipe P16	4.5	200	110	23.9	0.76	4.46
Pipe P17	8.5	200	110	0.0	0.00	0.00
Pipe P18	7.4	200	110	0.0	0.00	0.00
Pipe P19	8.2	150	100	0.0	0.00	0.00
Pipe P20	41	200	110	23.9	0.76	4.46
Pipe P21	2	150	100	0.0	0.00	0.00
Pipe P22	139	200	110	23.9	0.76	4.46
Pipe P23	7	150	100	0.0	0.00	0.00
Pipe P24	54	200	110	23.9	0.76	4.46
Pipe P25	7	150	100	67.0	3.79	145.61
Pipe P26	54	200	110	-43.1	1.37	13.26
Pipe P27	28	200	110	-43.1	1.37	13.26
Pipe P28	9	150	100	0.0	0.00	0.00
Pipe P29	19	200	110	-43.1	1.37	13.26
Pipe P30	20	200	110	4.6	0.15	0.21
Pipe P31	120	200	110	-47.7	1.52	16.00
Pipe P32	27	200	110	0.0	0.00	0.00
Pipe P33	16	150	100	0.0	0.00	0.00
Pipe P34	92	200	110	-47.7	1.52	16.00
Pipe P35	12	300	120	-47.7	0.67	1.89
Pipe P36	7	150	100	0.0	0.00	0.00
Pipe P37	13	300	120	47.7	0.67	1.89

3045 Baseline Road - Queensway Carleton Hospital Part 4 Expansion
Water Model Results

Max Day + Fire Flow Demand (M.M., E.V.S., and Plant Offices Building)
Network Table - Nodes

Node ID	Elevation	Demand	Head	Pressure	Pressure	Pressure
	m	L/s	m	m	kPa	psi
Junc J01	78.60	0.00	127.79	49.19	482.55	69.99
Junc J02	76.05	0.00	126.85	50.80	498.35	72.28
Junc J03	76.10	0.00	126.85	50.75	497.86	72.21
Junc J04	75.91	0.00	126.79	50.88	499.13	72.39
Junc J05	76.33	0.00	126.79	50.46	495.01	71.80
Junc J06	76.25	0.00	126.26	50.01	490.60	71.16
Junc J07	76.30	0.00	126.26	49.96	490.11	71.08
Junc J08	76.49	0.00	125.71	49.22	482.85	70.03
Junc J09	76.55	0.00	125.71	49.16	482.26	69.95
Junc J10	76.80	0.00	125.53	48.73	478.04	69.33
Junc J11	72.45	7.90	124.46	52.01	510.22	74.00
Junc J12	72.57	0.00	124.29	51.72	507.37	73.59
Junc J13	72.49	0.00	124.15	51.66	506.78	73.50
Junc J14	71.93	0.00	123.93	52.00	510.12	73.99
Junc J15	72.50	50.00	123.53	51.03	500.60	72.61
Junc J16	72.69	0.00	124.32	51.63	506.49	73.46
Junc J17	71.91	0.00	124.32	52.41	514.14	74.57
Junc J18	73.35	0.00	124.32	50.97	500.02	72.52
Junc J19	73.45	0.00	124.32	50.87	499.03	72.38
Junc J20	73.72	0.00	124.55	50.83	498.64	72.32
Junc J21	73.72	0.00	124.55	50.83	498.64	72.32
Junc J22	74.41	0.00	125.32	50.91	499.43	72.44
Junc J23	74.45	0.00	125.32	50.87	499.03	72.38
Junc J24	74.77	0.00	125.63	50.86	498.94	72.36
Junc J25	74.80	0.00	125.63	50.83	498.64	72.32
Junc J26	76.15	0.00	125.93	49.78	488.34	70.83
Junc J27	76.49	0.00	126.08	49.59	486.48	70.56
Junc J28	76.50	0.00	126.08	49.58	486.38	70.54
Junc J29	76.50	0.00	126.19	49.69	487.46	70.70
Junc J30	76.75	4.60	126.19	49.44	485.01	70.34
Junc J31	76.60	0.00	127.09	50.49	495.31	71.84
Junc J32	76.60	0.00	127.09	50.49	495.31	71.84
Junc J33	76.60	0.00	127.09	50.49	495.31	71.84
Junc J34	78.60	0.00	127.78	49.18	482.46	69.97
Junc J35	80.60	0.00	127.79	47.19	462.93	67.14
Junc J36	80.60	0.00	127.79	47.19	462.93	67.14
Resvr R1	127.80	-31.76	127.80	0.00	0.00	0.00
Resvr R2	127.80	-30.74	127.80	0.00	0.00	0.00
					Min=	67.14
					Max=	74.57

Max Day + Fire Flow Demand (M.M., E.V.S., and Plant Offices Building)
Network Table - Links

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
	m	mm		L/s	m/s	m/km
Pipe P01	6	300	120	-30.9	0.44	0.85
Pipe P02	132	200	110	30.9	0.98	7.16
Pipe P03	49	150	100	0.0	0.00	0.00
Pipe P04	8	200	110	30.9	0.98	7.16
Pipe P05	4.8	200	110	0.0	0.00	0.00
Pipe P06	74	200	110	30.9	0.98	7.16
Pipe P07	4	150	100	0.0	0.00	0.00
Pipe P08	77	200	110	30.9	0.98	7.16
Pipe P09	5	150	100	0.0	0.00	0.00
Pipe P10	25	200	110	30.9	0.98	7.16
Pipe P11	150	200	110	30.9	0.98	7.16
Pipe P12	40.5	200	110	23.0	0.73	4.14
Pipe P13	8	200	110	50.0	1.59	17.48
Pipe P14	2.6	150	100	50.0	2.83	84.68
Pipe P15	4.8	150	100	50.0	2.83	84.68
Pipe P16	4.5	200	110	-27.0	0.86	5.59
Pipe P17	8.5	200	110	0.0	0.00	0.00
Pipe P18	7.4	200	110	0.0	0.00	0.00
Pipe P19	8.2	150	100	0.0	0.00	0.00
Pipe P20	41	200	110	-27.0	0.86	5.59
Pipe P21	2	150	100	0.0	0.00	0.00
Pipe P22	139	200	110	-27.0	0.86	5.59
Pipe P23	7	150	100	0.0	0.00	0.00
Pipe P24	54	200	110	-27.0	0.86	5.59
Pipe P25	7	150	100	0.0	0.00	0.00
Pipe P26	54	200	110	-27.0	0.86	5.59
Pipe P27	28	200	110	-27.0	0.86	5.59
Pipe P28	9	150	100	0.0	0.00	0.00
Pipe P29	19	200	110	-27.0	0.86	5.59
Pipe P30	20	200	110	4.6	0.15	0.21
Pipe P31	120	200	110	-31.6	1.01	7.48
Pipe P32	27	200	110	0.0	0.00	0.00
Pipe P33	16	150	100	0.0	0.00	0.00
Pipe P34	92	200	110	-31.6	1.01	7.48
Pipe P35	12	300	120	-31.6	0.45	0.88
Pipe P36	7	150	100	0.0	0.00	0.00
Pipe P37	13	300	120	31.6	0.45	0.88

3045 Baseline Road - Queensway Carleton Hospital Part 4 Expansion
Water Model Results

Max Day + Fire Flow Demand (M.M., E.V.S., and Plant Offices Building)
Network Table - Nodes

Node ID	Elevation	Demand	Head	Pressure	Pressure	Pressure
	m	L/s	m	m	kPa	psi
Junc J01	78.60	0.00	127.79	49.19	482.55	69.99
Junc J02	76.05	0.00	126.85	50.80	498.35	72.28
Junc J03	76.10	0.00	126.85	50.75	497.86	72.21
Junc J04	75.91	0.00	126.79	50.88	499.13	72.39
Junc J05	76.33	0.00	126.79	50.46	495.01	71.80
Junc J06	76.25	0.00	126.26	50.01	490.60	71.16
Junc J07	76.30	0.00	126.26	49.96	490.11	71.08
Junc J08	76.49	0.00	125.71	49.22	482.85	70.03
Junc J09	76.55	0.00	125.71	49.16	482.26	69.95
Junc J10	76.80	0.00	125.53	48.73	478.04	69.33
Junc J11	72.45	7.90	124.46	52.01	510.22	74.00
Junc J12	72.57	0.00	124.29	51.72	507.37	73.59
Junc J13	72.49	0.00	124.15	51.66	506.78	73.50
Junc J14	71.93	0.00	123.93	52.00	510.12	73.99
Junc J15	72.50	50.00	123.53	51.03	500.60	72.61
Junc J16	72.69	0.00	124.32	51.63	506.49	73.46
Junc J17	71.91	0.00	124.32	52.41	514.14	74.57
Junc J18	73.35	0.00	124.32	50.97	500.02	72.52
Junc J19	73.45	0.00	124.32	50.87	499.03	72.38
Junc J20	73.72	0.00	124.55	50.83	498.64	72.32
Junc J21	73.72	0.00	124.55	50.83	498.64	72.32
Junc J22	74.41	0.00	125.32	50.91	499.43	72.44
Junc J23	74.45	0.00	125.32	50.87	499.03	72.38
Junc J24	74.77	0.00	125.63	50.86	498.94	72.36
Junc J25	74.80	0.00	125.63	50.83	498.64	72.32
Junc J26	76.15	0.00	125.93	49.78	488.34	70.83
Junc J27	76.49	0.00	126.08	49.59	486.48	70.56
Junc J28	76.50	0.00	126.08	49.58	486.38	70.54
Junc J29	76.50	0.00	126.19	49.69	487.46	70.70
Junc J30	76.75	4.60	126.19	49.44	485.01	70.34
Junc J31	76.60	0.00	127.09	50.49	495.31	71.84
Junc J32	76.60	0.00	127.09	50.49	495.31	71.84
Junc J33	76.60	0.00	127.09	50.49	495.31	71.84
Junc J34	78.60	0.00	127.78	49.18	482.46	69.97
Junc J35	80.60	0.00	127.79	47.19	462.93	67.14
Junc J36	80.60	0.00	127.79	47.19	462.93	67.14
Resvr R1	127.80	-31.76	127.80	0.00	0.00	0.00
Resvr R2	127.80	-30.74	127.80	0.00	0.00	0.00
					Min=	67.14
					Max=	74.57

Max Day + Fire Flow Demand (M.M., E.V.S., and Plant Offices Building)
Network Table - Links

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
	m	mm		L/s	m/s	m/km
Pipe P01	6	300	120	-30.9	0.44	0.85
Pipe P02	132	200	110	30.9	0.98	7.16
Pipe P03	49	150	100	0.0	0.00	0.00
Pipe P04	8	200	110	30.9	0.98	7.16
Pipe P05	4.8	200	110	0.0	0.00	0.00
Pipe P06	74	200	110	30.9	0.98	7.16
Pipe P07	4	150	100	0.0	0.00	0.00
Pipe P08	77	200	110	30.9	0.98	7.16
Pipe P09	5	150	100	0.0	0.00	0.00
Pipe P10	25	200	110	30.9	0.98	7.16
Pipe P11	150	200	110	30.9	0.98	7.16
Pipe P12	40.5	200	110	23.0	0.73	4.14
Pipe P13	8	200	110	50.0	1.59	17.48
Pipe P14	2.6	150	100	50.0	2.83	84.68
Pipe P15	4.8	150	100	50.0	2.83	84.68
Pipe P16	4.5	200	110	-27.0	0.86	5.59
Pipe P17	8.5	200	110	0.0	0.00	0.00
Pipe P18	7.4	200	110	0.0	0.00	0.00
Pipe P19	8.2	150	100	0.0	0.00	0.00
Pipe P20	41	200	110	-27.0	0.86	5.59
Pipe P21	2	150	100	0.0	0.00	0.00
Pipe P22	139	200	110	-27.0	0.86	5.59
Pipe P23	7	150	100	0.0	0.00	0.00
Pipe P24	54	200	110	-27.0	0.86	5.59
Pipe P25	7	150	100	0.0	0.00	0.00
Pipe P26	54	200	110	-27.0	0.86	5.59
Pipe P27	28	200	110	-27.0	0.86	5.59
Pipe P28	9	150	100	0.0	0.00	0.00
Pipe P29	19	200	110	-27.0	0.86	5.59
Pipe P30	20	200	110	4.6	0.15	0.21
Pipe P31	120	200	110	-31.6	1.01	7.48
Pipe P32	27	200	110	0.0	0.00	0.00
Pipe P33	16	150	100	0.0	0.00	0.00
Pipe P34	92	200	110	-31.6	1.01	7.48
Pipe P35	12	300	120	-31.6	0.45	0.88
Pipe P36	7	150	100	0.0	0.00	0.00
Pipe P37	13	300	120	31.6	0.45	0.88

3045 Baseline Road - Queensway Carleton Hospital Part 4 Expansion
Water Model Results

Max Day + Fire Flow Demand (Ex. James Beach Centre & New Inpatient Tower Addition)
Network Table - Nodes

Node ID	Elevation	Demand	Head	Pressure	Pressure	Pressure
	m	L/s	m	m	kPa	psi
Junc J01	78.60	0.00	127.28	48.68	477.55	69.26
Junc J02	76.05	0.00	122.90	46.85	459.60	66.66
Junc J03	76.10	0.00	122.90	46.80	459.11	66.59
Junc J04	75.91	0.00	122.63	46.72	458.32	66.47
Junc J05	76.33	0.00	122.63	46.30	454.20	65.88
Junc J06	76.25	0.00	120.18	43.93	430.95	62.50
Junc J07	76.30	0.00	120.18	43.88	430.46	62.43
Junc J08	76.49	0.00	117.63	41.14	403.58	58.53
Junc J09	76.55	0.00	117.63	41.08	402.99	58.45
Junc J10	76.80	0.00	116.80	40.00	392.40	56.91
Junc J11	72.45	7.90	111.82	39.37	386.22	56.02
Junc J12	72.57	0.00	110.74	38.17	374.45	54.31
Junc J13	72.49	0.00	110.74	38.25	375.23	54.42
Junc J14	71.93	0.00	110.74	38.81	380.73	55.22
Junc J15	72.50	0.00	110.74	38.24	375.13	54.41
Junc J16	72.69	0.00	110.62	37.93	372.09	53.97
Junc J17	71.91	0.00	110.62	38.71	379.75	55.08
Junc J18	73.35	0.00	110.62	37.27	365.62	53.03
Junc J19	73.45	0.00	110.62	37.17	364.64	52.89
Junc J20	73.72	0.00	109.53	35.81	351.30	50.95
Junc J21	73.72	0.00	109.53	35.81	351.30	50.95
Junc J22	74.41	0.00	105.83	31.42	308.23	44.70
Junc J23	74.45	0.00	105.83	31.38	307.84	44.65
Junc J24	74.77	0.00	104.39	29.62	290.57	42.14
Junc J25	74.80	92.00	102.56	27.76	272.33	39.50
Junc J26	76.15	0.00	104.74	28.59	280.47	40.68
Junc J27	76.49	0.00	104.92	28.43	278.90	40.45
Junc J28	76.50	92.00	102.57	26.07	255.75	37.09
Junc J29	76.50	0.00	106.64	30.14	295.67	42.88
Junc J30	76.75	4.60	106.63	29.88	293.12	42.51
Junc J31	76.60	0.00	118.23	41.63	408.39	59.23
Junc J32	76.60	0.00	118.23	41.63	408.39	59.23
Junc J33	76.60	0.00	118.23	41.63	408.39	59.23
Junc J34	78.60	0.00	127.11	48.51	475.88	69.02
Junc J35	80.60	0.00	127.25	46.65	457.64	66.37
Junc J36	80.60	0.00	127.25	46.65	457.64	66.37
Resvr R1	127.40	-225.97	127.40	0.00	0.00	0.00
Resvr R2	127.30	29.47	127.30	0.00	0.00	0.00
					Min=	37.09
					Max=	69.26

Max Day + Fire Flow Demand (Ex. James Beach Centre & New Inpatient Tower Addition)
Network Table - Links

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
	m	mm		L/s	m/s	m/km
Pipe P01	6	300	120	-70.7	1.00	3.92
Pipe P02	132	200	110	70.7	2.25	33.16
Pipe P03	49	150	100	0.0	0.00	0.00
Pipe P04	8	200	110	70.7	2.25	33.16
Pipe P05	4.8	200	110	0.0	0.00	0.00
Pipe P06	74	200	110	70.7	2.25	33.16
Pipe P07	4	150	100	0.0	0.00	0.00
Pipe P08	77	200	110	70.7	2.25	33.16
Pipe P09	5	150	100	0.0	0.00	0.00
Pipe P10	25	200	110	70.7	2.25	33.16
Pipe P11	150	200	110	70.7	2.25	33.16
Pipe P12	40.5	200	110	62.8	2.00	26.63
Pipe P13	8	200	110	0.0	0.00	0.00
Pipe P14	2.6	150	100	0.0	0.00	0.00
Pipe P15	4.8	150	100	0.0	0.00	0.00
Pipe P16	4.5	200	110	62.8	2.00	26.63
Pipe P17	8.5	200	110	0.0	0.00	0.00
Pipe P18	7.4	200	110	0.0	0.00	0.00
Pipe P19	8.2	150	100	0.0	0.00	0.00
Pipe P20	41	200	110	62.8	2.00	26.63
Pipe P21	2	150	100	0.0	0.00	0.00
Pipe P22	139	200	110	62.8	2.00	26.63
Pipe P23	7	150	100	0.0	0.00	0.00
Pipe P24	54	200	110	62.8	2.00	26.63
Pipe P25	7	150	100	92.0	5.21	261.95
Pipe P26	54	200	110	-29.2	0.93	6.47
Pipe P27	28	200	110	-29.2	0.93	6.47
Pipe P28	9	150	100	92.0	5.21	261.96
Pipe P29	19	200	110	-121.2	3.86	90.16
Pipe P30	20	200	110	4.6	0.15	0.21
Pipe P31	120	200	110	-125.8	4.01	96.59
Pipe P32	27	200	110	0.0	0.00	0.00
Pipe P33	16	150	100	0.0	0.00	0.00
Pipe P34	92	200	110	-125.8	4.01	96.59
Pipe P35	12	300	120	-125.8	1.78	11.41
Pipe P36	7	150	100	0.0	0.00	0.00
Pipe P37	13	300	120	125.8	1.78	11.41

3045 Baseline Road - Queensway Carleton Hospital Part 4 Expansion
Water Model Results

Max Day + Fire Flow Demand (Transitional Care Tower Addition to Ex. Hospital)
Network Table - Nodes

Node ID	Elevation	Demand	Head	Pressure	Pressure	Pressure
	m	L/s	m	m	kPa	psi
Junc J01	78.60	0.00	127.24	48.64	477.16	69.21
Junc J02	76.05	0.00	116.86	40.81	400.35	58.07
Junc J03	76.10	0.00	116.86	40.76	399.86	57.99
Junc J04	75.91	0.00	116.23	40.32	395.54	57.37
Junc J05	76.33	0.00	116.23	39.90	391.42	56.77
Junc J06	76.25	0.00	110.40	34.15	335.01	48.59
Junc J07	76.30	0.00	110.40	34.10	334.52	48.52
Junc J08	76.49	0.00	104.34	27.85	273.21	39.63
Junc J09	76.55	92.00	103.03	26.48	259.77	37.68
Junc J10	76.80	0.00	104.26	27.46	269.38	39.07
Junc J11	72.45	7.90	103.75	31.30	307.05	44.53
Junc J12	72.57	0.00	103.69	31.12	305.29	44.28
Junc J13	72.49	0.00	103.26	30.77	301.85	43.78
Junc J14	71.93	0.00	102.58	30.65	300.68	43.61
Junc J15	72.50	92.00	101.32	28.82	282.72	41.01
Junc J16	72.69	0.00	103.88	31.19	305.97	44.38
Junc J17	71.91	0.00	103.88	31.97	313.63	45.49
Junc J18	73.35	0.00	103.88	30.53	299.50	43.44
Junc J19	73.45	0.00	103.88	30.43	298.52	43.30
Junc J20	73.72	0.00	105.56	31.84	312.35	45.30
Junc J21	73.72	0.00	105.56	31.84	312.35	45.30
Junc J22	74.41	0.00	111.26	36.85	361.50	52.43
Junc J23	74.45	0.00	111.26	36.81	361.11	52.37
Junc J24	74.77	0.00	113.47	38.70	379.65	55.06
Junc J25	74.80	0.00	113.47	38.67	379.35	55.02
Junc J26	76.15	0.00	115.69	39.54	387.89	56.26
Junc J27	76.49	0.00	116.83	40.34	395.74	57.40
Junc J28	76.50	0.00	116.83	40.33	395.64	57.38
Junc J29	76.50	0.00	117.61	41.11	403.29	58.49
Junc J30	76.75	4.60	117.61	40.86	400.84	58.14
Junc J31	76.60	0.00	123.08	46.48	455.97	66.13
Junc J32	76.60	0.00	123.08	46.48	455.97	66.13
Junc J33	76.60	0.00	123.08	46.48	455.97	66.13
Junc J34	78.60	0.00	127.27	48.67	477.45	69.25
Junc J35	80.60	0.00	127.33	46.73	458.42	66.49
Junc J36	80.60	0.00	127.33	46.73	458.42	66.49
Resvr R1	127.40	-183.96	127.40	0.00	0.00	0.00
Resvr R2	127.30	-12.54	127.30	0.00	0.00	0.00
				Min=		37.68
				Max=		69.25

Max Day + Fire Flow Demand (Transitional Care Tower Addition to Ex. Hospital)
Network Table - Links

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
	m	mm		L/s	m/s	m/km
Pipe P01	6	300	120	-112.7	1.59	9.29
Pipe P02	132	200	110	112.7	3.59	78.70
Pipe P03	49	150	100	0.0	0.00	0.00
Pipe P04	8	200	110	112.7	3.59	78.70
Pipe P05	4.8	200	110	0.0	0.00	0.00
Pipe P06	74	200	110	112.7	3.59	78.70
Pipe P07	4	150	100	0.0	0.00	0.00
Pipe P08	77	200	110	112.7	3.59	78.70
Pipe P09	5	150	100	92.0	5.21	261.95
Pipe P10	25	200	110	20.7	0.66	3.40
Pipe P11	150	200	110	20.7	0.66	3.40
Pipe P12	40.5	200	110	12.8	0.41	1.39
Pipe P13	8	200	110	92.0	2.93	54.07
Pipe P14	2.6	150	100	92.0	5.21	261.95
Pipe P15	4.8	150	100	92.0	5.21	261.95
Pipe P16	4.5	200	110	-79.2	2.52	41.01
Pipe P17	8.5	200	110	0.0	0.00	0.00
Pipe P18	7.4	200	110	0.0	0.00	0.00
Pipe P19	8.2	150	100	0.0	0.00	0.00
Pipe P20	41	200	110	-79.2	2.52	41.01
Pipe P21	2	150	100	0.0	0.00	0.00
Pipe P22	139	200	110	-79.2	2.52	41.01
Pipe P23	7	150	100	0.0	0.00	0.00
Pipe P24	54	200	110	-79.2	2.52	41.01
Pipe P25	7	150	100	0.0	0.00	0.00
Pipe P26	54	200	110	-79.2	2.52	41.01
Pipe P27	28	200	110	-79.2	2.52	41.01
Pipe P28	9	150	100	0.0	0.00	0.00
Pipe P29	19	200	110	-79.2	2.52	41.01
Pipe P30	20	200	110	4.6	0.15	0.21
Pipe P31	120	200	110	-83.8	2.67	45.53
Pipe P32	27	200	110	0.0	0.00	0.00
Pipe P33	16	150	100	0.0	0.00	0.00
Pipe P34	92	200	110	-83.8	2.67	45.53
Pipe P35	12	300	120	-83.8	1.19	5.38
Pipe P36	7	150	100	0.0	0.00	0.00
Pipe P37	13	300	120	83.8	1.19	5.38

3045 Baseline Road - Queensway Carleton Hospital Part 4 Expansion
Water Model Results

Max Day + Fire Flow Demand (Emergency Department Addition & Outpatient Ambulatory Care Centre)
Network Table - Nodes

Node ID	Elevation	Demand	Head	Pressure	Pressure	Pressure
	m	L/s	m	m	kPa	psi
Junc J01	78.60	0.00	127.68	49.08	481.47	69.83
Junc J02	76.05	0.00	123.24	47.19	462.93	67.14
Junc J03	76.10	0.00	123.24	47.14	462.44	67.07
Junc J04	75.91	0.00	122.97	47.06	461.66	66.96
Junc J05	76.33	0.00	122.97	46.64	457.54	66.36
Junc J06	76.25	0.00	120.48	44.23	433.90	62.93
Junc J07	76.30	50.00	120.14	43.84	430.07	62.38
Junc J08	76.49	0.00	120.21	43.72	428.89	62.21
Junc J09	76.55	50.00	119.78	43.23	424.09	61.51
Junc J10	76.80	0.00	120.36	43.56	427.32	61.98
Junc J11	72.45	7.90	121.31	48.86	479.32	69.52
Junc J12	72.57	0.00	121.71	49.14	482.06	69.92
Junc J13	72.49	0.00	121.71	49.22	482.85	70.03
Junc J14	71.93	0.00	121.71	49.78	488.34	70.83
Junc J15	72.50	0.00	121.71	49.21	482.75	70.02
Junc J16	72.69	0.00	121.75	49.06	481.28	69.80
Junc J17	71.91	0.00	121.75	49.84	488.93	70.91
Junc J18	73.35	0.00	121.75	48.40	474.80	68.86
Junc J19	73.45	0.00	121.75	48.30	473.82	68.72
Junc J20	73.72	0.00	122.16	48.44	475.20	68.92
Junc J21	73.72	0.00	122.16	48.44	475.20	68.92
Junc J22	74.41	0.00	123.53	49.12	481.87	69.89
Junc J23	74.45	0.00	123.53	49.08	481.47	69.83
Junc J24	74.77	0.00	124.06	49.29	483.53	70.13
Junc J25	74.80	0.00	124.06	49.26	483.24	70.09
Junc J26	76.15	0.00	124.60	48.45	475.29	68.94
Junc J27	76.49	0.00	124.87	48.38	474.61	68.84
Junc J28	76.50	0.00	124.87	48.37	474.51	68.82
Junc J29	76.50	0.00	125.06	48.56	476.37	69.09
Junc J30	76.75	4.60	125.06	48.31	473.92	68.74
Junc J31	76.60	0.00	126.53	49.93	489.81	71.04
Junc J32	76.60	0.00	126.53	49.93	489.81	71.04
Junc J33	76.60	0.00	126.53	49.93	489.81	71.04
Junc J34	78.60	0.00	127.66	49.06	481.28	69.80
Junc J35	80.60	0.00	127.68	47.08	461.85	66.99
Junc J36	80.60	0.00	127.68	47.08	461.85	66.99
Resvr R1	127.70	-41.60	127.70	0.00	0.00	0.00
Resvr R2	127.70	-70.90	127.70	0.00	0.00	0.00
				Min=		61.51
				Max=		71.04

Max Day + Fire Flow Demand (Emergency Department Addition & Outpatient Ambulatory Care Centre)
Network Table - Links

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
	m	mm		L/s	m/s	m/km
Pipe P01	6	300	120	-71.2	1.01	3.97
Pipe P02	132	200	110	71.2	2.27	33.62
Pipe P03	49	150	100	0.0	0.00	0.00
Pipe P04	8	200	110	71.2	2.27	33.62
Pipe P05	4.8	200	110	0.0	0.00	0.00
Pipe P06	74	200	110	71.2	2.27	33.62
Pipe P07	4	150	100	50.0	2.83	84.68
Pipe P08	77	200	110	21.2	0.67	3.56
Pipe P09	5	150	100	50.0	2.83	84.68
Pipe P10	25	200	110	-28.8	0.92	6.30
Pipe P11	150	200	110	-28.8	0.92	6.30
Pipe P12	40.5	200	110	-36.7	1.17	9.87
Pipe P13	8	200	110	0.0	0.00	0.00
Pipe P14	2.6	150	100	0.0	0.00	0.00
Pipe P15	4.8	150	100	0.0	0.00	0.00
Pipe P16	4.5	200	110	-36.7	1.17	9.87
Pipe P17	8.5	200	110	0.0	0.00	0.00
Pipe P18	7.4	200	110	0.0	0.00	0.00
Pipe P19	8.2	150	100	0.0	0.00	0.00
Pipe P20	41	200	110	-36.7	1.17	9.87
Pipe P21	2	150	100	0.0	0.00	0.00
Pipe P22	139	200	110	-36.7	1.17	9.87
Pipe P23	7	150	100	0.0	0.00	0.00
Pipe P24	54	200	110	-36.7	1.17	9.87
Pipe P25	7	150	100	0.0	0.00	0.00
Pipe P26	54	200	110	-36.7	1.17	9.87
Pipe P27	28	200	110	-36.7	1.17	9.87
Pipe P28	9	150	100	0.0	0.00	0.00
Pipe P29	19	200	110	-36.7	1.17	9.87
Pipe P30	20	200	110	4.6	0.15	0.21
Pipe P31	120	200	110	-41.3	1.32	12.28
Pipe P32	27	200	110	0.0	0.00	0.00
Pipe P33	16	150	100	0.0	0.00	0.00
Pipe P34	92	200	110	-41.3	1.32	12.28
Pipe P35	12	300	120	-41.3	0.58	1.45
Pipe P36	7	150	100	0.0	0.00	0.00
Pipe P37	13	300	120	41.3	0.58	1.45

3045 Baseline Road - Queensway Carleton Hospital Part 4 Expansion
Water Model Results

Max Day + Fire Flow Demand (Ambulance Garage)
Network Table - Nodes

Node ID	Elevation	Demand	Head	Pressure	Pressure	Pressure
	m	L/s	m	m	kPa	psi
Junc J01	78.60	0.00	127.79	49.19	482.55	69.99
Junc J02	76.05	0.00	126.52	50.47	495.11	71.81
Junc J03	76.10	0.00	126.52	50.42	494.62	71.74
Junc J04	75.91	0.00	126.44	50.53	495.70	71.90
Junc J05	76.33	0.00	126.44	50.11	491.58	71.30
Junc J06	76.25	0.00	125.73	49.48	485.40	70.40
Junc J07	76.30	0.00	125.73	49.43	484.91	70.33
Junc J08	76.49	0.00	124.98	48.49	475.69	68.99
Junc J09	76.55	50.00	124.56	48.01	470.98	68.31
Junc J10	76.80	0.00	125.02	48.22	473.04	68.61
Junc J11	72.45	7.90	125.26	52.81	518.07	75.14
Junc J12	72.57	0.00	125.41	52.84	518.36	75.18
Junc J13	72.49	0.00	125.41	52.92	519.15	75.30
Junc J14	71.93	0.00	125.41	53.48	524.64	76.09
Junc J15	72.50	0.00	125.41	52.91	519.05	75.28
Junc J16	72.69	0.00	125.43	52.74	517.38	75.04
Junc J17	71.91	0.00	125.43	53.52	525.03	76.15
Junc J18	73.35	0.00	125.43	52.08	510.90	74.10
Junc J19	73.45	0.00	125.43	51.98	509.92	73.96
Junc J20	73.72	0.00	125.58	51.86	508.75	73.79
Junc J21	73.72	0.00	125.58	51.86	508.75	73.79
Junc J22	74.41	0.00	126.09	51.68	506.98	73.53
Junc J23	74.45	0.00	126.09	51.64	506.59	73.47
Junc J24	74.77	0.00	126.29	51.52	505.41	73.30
Junc J25	74.80	0.00	126.29	51.49	505.12	73.26
Junc J26	76.15	0.00	126.49	50.34	493.84	71.62
Junc J27	76.49	0.00	126.59	50.10	491.48	71.28
Junc J28	76.50	0.00	126.59	50.09	491.38	71.27
Junc J29	76.50	0.00	126.66	50.16	492.07	71.37
Junc J30	76.75	4.60	126.66	49.91	489.62	71.01
Junc J31	76.60	0.00	127.30	50.70	497.37	72.14
Junc J32	76.60	0.00	127.30	50.70	497.37	72.14
Junc J33	76.60	0.00	127.30	50.70	497.37	72.14
Junc J34	78.60	0.00	127.78	49.18	482.46	69.97
Junc J35	80.60	0.00	127.79	47.19	462.93	67.14
Junc J36	80.60	0.00	127.79	47.19	462.93	67.14
Resvr R1	127.80	-26.33	127.80	0.00	0.00	0.00
Resvr R2	127.80	-36.17	127.80	0.00	0.00	0.00
					Min=	67.14
					Max=	76.15

Max Day + Fire Flow Demand (Ambulance Garage)
Network Table - Links

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
	m	mm		L/s	m/s	m/km
Pipe P01	6	300	120	-36.3	0.51	1.14
Pipe P02	132	200	110	36.3	1.16	9.66
Pipe P03	49	150	100	0.0	0.00	0.00
Pipe P04	8	200	110	36.3	1.16	9.66
Pipe P05	4.8	200	110	0.0	0.00	0.00
Pipe P06	74	200	110	36.3	1.16	9.66
Pipe P07	4	150	100	0.0	0.00	0.00
Pipe P08	77	200	110	36.3	1.16	9.66
Pipe P09	5	150	100	50.0	2.83	84.68
Pipe P10	25	200	110	-13.7	0.44	1.59
Pipe P11	150	200	110	-13.7	0.44	1.59
Pipe P12	40.5	200	110	-21.6	0.69	3.69
Pipe P13	8	200	110	0.0	0.00	0.00
Pipe P14	2.6	150	100	0.0	0.00	0.00
Pipe P15	4.8	150	100	0.0	0.00	0.00
Pipe P16	4.5	200	110	-21.6	0.69	3.70
Pipe P17	8.5	200	110	0.0	0.00	0.00
Pipe P18	7.4	200	110	0.0	0.00	0.00
Pipe P19	8.2	150	100	0.0	0.00	0.00
Pipe P20	41	200	110	-21.6	0.69	3.69
Pipe P21	2	150	100	0.0	0.00	0.00
Pipe P22	139	200	110	-21.6	0.69	3.69
Pipe P23	7	150	100	0.0	0.00	0.00
Pipe P24	54	200	110	-21.6	0.69	3.69
Pipe P25	7	150	100	0.0	0.00	0.00
Pipe P26	54	200	110	-21.6	0.69	3.69
Pipe P27	28	200	110	-21.6	0.69	3.69
Pipe P28	9	150	100	0.0	0.00	0.00
Pipe P29	19	200	110	-21.6	0.69	3.69
Pipe P30	20	200	110	4.6	0.15	0.21
Pipe P31	120	200	110	-26.2	0.83	5.28
Pipe P32	27	200	110	0.0	0.00	0.00
Pipe P33	16	150	100	0.0	0.00	0.00
Pipe P34	92	200	110	-26.2	0.83	5.28
Pipe P35	12	300	120	-26.2	0.37	0.62
Pipe P36	7	150	100	0.0	0.00	0.00
Pipe P37	13	300	120	26.2	0.37	0.62

3045 Baseline Road - Queensway Carleton Hospital Part 4 Expansion
Water Model Results

Peak Hour Demand
Network Table - Nodes

Node ID	Elevation	Demand	Head	Pressure	Pressure	Pressure
	m	L/s	m	m	kPa	psi
Junc J01	78.60	0.00	127.30	48.70	477.75	69.29
Junc J02	76.05	0.00	127.19	51.14	501.68	72.76
Junc J03	76.10	0.00	127.19	51.09	501.19	72.69
Junc J04	75.91	0.00	127.18	51.27	502.96	72.95
Junc J05	76.33	0.00	127.18	50.85	498.84	72.35
Junc J06	76.25	0.00	127.12	50.87	499.03	72.38
Junc J07	76.30	0.00	127.12	50.82	498.54	72.31
Junc J08	76.49	0.00	127.06	50.57	496.09	71.95
Junc J09	76.55	0.00	127.06	50.51	495.50	71.87
Junc J10	76.80	0.00	127.04	50.24	492.85	71.48
Junc J11	72.45	14.30	126.91	54.46	534.25	77.49
Junc J12	72.57	0.00	126.92	54.35	533.17	77.33
Junc J13	72.49	0.00	126.92	54.43	533.96	77.44
Junc J14	71.93	0.00	126.92	54.99	539.45	78.24
Junc J15	72.50	0.00	126.92	54.42	533.86	77.43
Junc J16	72.69	0.00	126.92	54.23	532.00	77.16
Junc J17	71.91	0.00	126.92	55.01	539.65	78.27
Junc J18	73.35	0.00	126.92	53.57	525.52	76.22
Junc J19	73.45	0.00	126.92	53.47	524.54	76.08
Junc J20	73.72	0.00	126.93	53.21	521.99	75.71
Junc J21	73.72	0.00	126.93	53.21	521.99	75.71
Junc J22	74.41	0.00	126.96	52.55	515.52	74.77
Junc J23	74.45	0.00	126.96	52.51	515.12	74.71
Junc J24	74.77	0.00	126.97	52.20	512.08	74.27
Junc J25	74.80	0.00	126.97	52.17	511.79	74.23
Junc J26	76.15	0.00	126.99	50.84	498.74	72.34
Junc J27	76.49	0.00	126.99	50.50	495.41	71.85
Junc J28	76.50	0.00	126.99	50.49	495.31	71.84
Junc J29	76.50	0.00	127.00	50.50	495.41	71.85
Junc J30	76.75	8.20	126.98	50.23	492.76	71.47
Junc J31	76.60	0.00	127.17	50.57	496.09	71.95
Junc J32	76.60	0.00	127.17	50.57	496.09	71.95
Junc J33	76.60	0.00	127.17	50.57	496.09	71.95
Junc J34	78.60	0.00	127.30	48.70	477.75	69.29
Junc J35	80.60	0.00	127.30	46.70	458.13	66.45
Junc J36	80.60	0.00	127.30	46.70	458.13	66.45
Resvr R1	127.30	-12.93	127.30	0.00	0.00	0.00
Resvr R2	127.30	-9.57	127.30	0.00	0.00	0.00
					Min=	66.45
					Max=	78.27

Peak Hour Demand
Network Table - Links

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
	m	mm		L/s	m/s	m/km
Pipe P01	6	300	120	-9.6	0.14	0.10
Pipe P02	132	200	110	9.6	0.31	0.83
Pipe P03	49	150	100	0.0	0.00	0.00
Pipe P04	8	200	110	9.6	0.31	0.83
Pipe P05	4.8	200	110	0.0	0.00	0.00
Pipe P06	74	200	110	9.6	0.31	0.83
Pipe P07	4	150	100	0.0	0.00	0.00
Pipe P08	77	200	110	9.6	0.31	0.83
Pipe P09	5	150	100	0.0	0.00	0.00
Pipe P10	25	200	110	9.6	0.31	0.83
Pipe P11	150	200	110	9.6	0.31	0.83
Pipe P12	40.5	200	110	-4.7	0.15	0.22
Pipe P13	8	200	110	0.0	0.00	0.00
Pipe P14	2.6	150	100	0.0	0.00	0.00
Pipe P15	4.8	150	100	0.0	0.00	0.00
Pipe P16	4.5	200	110	-4.7	0.15	0.22
Pipe P17	8.5	200	110	0.0	0.00	0.00
Pipe P18	7.4	200	110	0.0	0.00	0.00
Pipe P19	8.2	150	100	0.0	0.00	0.00
Pipe P20	41	200	110	-4.7	0.15	0.22
Pipe P21	2	150	100	0.0	0.00	0.00
Pipe P22	139	200	110	-4.7	0.15	0.22
Pipe P23	7	150	100	0.0	0.00	0.00
Pipe P24	54	200	110	-4.7	0.15	0.22
Pipe P25	7	150	100	0.0	0.00	0.00
Pipe P26	54	200	110	-4.7	0.15	0.22
Pipe P27	28	200	110	-4.7	0.15	0.22
Pipe P28	9	150	100	0.0	0.00	0.00
Pipe P29	19	200	110	-4.7	0.15	0.22
Pipe P30	20	200	110	8.2	0.26	0.61
Pipe P31	120	200	110	-12.9	0.41	1.42
Pipe P32	27	200	110	0.0	0.00	0.00
Pipe P33	16	150	100	0.0	0.00	0.00
Pipe P34	92	200	110	-12.9	0.41	1.42
Pipe P35	12	300	120	-12.9	0.18	0.17
Pipe P36	7	150	100	0.0	0.00	0.00
Pipe P37	13	300	120	12.9	0.18	0.17

3045 Baseline Road - Queensway Carleton Hospital Part 4 Expansion
Water Model Results

Max HGL
Network Table - Nodes

Node ID	Elevation	Demand	Head	Pressure	Pressure	Pressure
	m	L/s	m	m	kPa	psi
Junc J01	78.60	0.00	131.90	53.30	522.87	75.84
Junc J02	76.05	0.00	131.86	55.81	547.50	79.41
Junc J03	76.10	0.00	131.86	55.76	547.01	79.34
Junc J04	75.91	0.00	131.86	55.95	548.87	79.61
Junc J05	76.33	0.00	131.86	55.53	544.75	79.01
Junc J06	76.25	0.00	131.84	55.59	545.34	79.09
Junc J07	76.30	0.00	131.84	55.54	544.85	79.02
Junc J08	76.49	0.00	131.82	55.33	542.79	78.72
Junc J09	76.55	0.00	131.82	55.27	542.20	78.64
Junc J10	76.80	0.00	131.81	55.01	539.65	78.27
Junc J11	72.45	7.90	131.77	59.32	581.93	84.40
Junc J12	72.57	0.00	131.77	59.20	580.75	84.23
Junc J13	72.49	0.00	131.77	59.28	581.54	84.34
Junc J14	71.93	0.00	131.77	59.84	587.03	85.14
Junc J15	72.50	0.00	131.77	59.27	581.44	84.33
Junc J16	72.69	0.00	131.77	59.08	579.57	84.06
Junc J17	71.91	0.00	131.77	59.86	587.23	85.17
Junc J18	73.35	0.00	131.77	58.42	573.10	83.12
Junc J19	73.45	0.00	131.77	58.32	572.12	82.98
Junc J20	73.72	0.00	131.78	58.06	569.57	82.61
Junc J21	73.72	0.00	131.78	58.06	569.57	82.61
Junc J22	74.41	0.00	131.79	57.38	562.90	81.64
Junc J23	74.45	0.00	131.79	57.34	562.51	81.58
Junc J24	74.77	0.00	131.79	57.02	559.37	81.13
Junc J25	74.80	0.00	131.79	56.99	559.07	81.09
Junc J26	76.15	0.00	131.79	55.64	545.83	79.17
Junc J27	76.49	0.00	131.80	55.31	542.59	78.70
Junc J28	76.50	0.00	131.80	55.30	542.49	78.68
Junc J29	76.50	0.00	131.80	55.30	542.49	78.68
Junc J30	76.75	4.60	131.79	55.04	539.94	78.31
Junc J31	76.60	0.00	131.85	55.25	542.00	78.61
Junc J32	76.60	0.00	131.85	55.25	542.00	78.61
Junc J33	76.60	0.00	131.85	55.25	542.00	78.61
Junc J34	78.60	0.00	131.90	53.30	522.87	75.84
Junc J35	80.60	0.00	131.90	51.30	503.25	72.99
Junc J36	80.60	0.00	131.90	51.30	503.25	72.99
Resvr R1	131.90	-7.19	131.90	0.00	0.00	0.00
Resvr R2	131.90	-5.31	131.90	0.00	0.00	0.00
					Min=	72.99
					Max=	85.17

Max HGL
Network Table - Links

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
	m	mm		L/s	m/s	m/km
Pipe P01	6	300	120	-5.3	0.08	0.03
Pipe P02	132	200	110	5.3	0.17	0.28
Pipe P03	49	150	100	0.0	0.00	0.00
Pipe P04	8	200	110	5.3	0.17	0.28
Pipe P05	4.8	200	110	0.0	0.00	0.00
Pipe P06	74	200	110	5.3	0.17	0.28
Pipe P07	4	150	100	0.0	0.00	0.00
Pipe P08	77	200	110	5.3	0.17	0.28
Pipe P09	5	150	100	0.0	0.00	0.00
Pipe P10	25	200	110	5.3	0.17	0.28
Pipe P11	150	200	110	5.3	0.17	0.28
Pipe P12	40.5	200	110	-2.6	0.08	0.07
Pipe P13	8	200	110	0.0	0.00	0.00
Pipe P14	2.6	150	100	0.0	0.00	0.00
Pipe P15	4.8	150	100	0.0	0.00	0.00
Pipe P16	4.5	200	110	-2.6	0.08	0.07
Pipe P17	8.5	200	110	0.0	0.00	0.00
Pipe P18	7.4	200	110	0.0	0.00	0.00
Pipe P19	8.2	150	100	0.0	0.00	0.00
Pipe P20	41	200	110	-2.6	0.08	0.07
Pipe P21	2	150	100	0.0	0.00	0.00
Pipe P22	139	200	110	-2.6	0.08	0.07
Pipe P23	7	150	100	0.0	0.00	0.00
Pipe P24	54	200	110	-2.6	0.08	0.07
Pipe P25	7	150	100	0.0	0.00	0.00
Pipe P26	54	200	110	-2.6	0.08	0.07
Pipe P27	28	200	110	-2.6	0.08	0.07
Pipe P28	9	150	100	0.0	0.00	0.00
Pipe P29	19	200	110	-2.6	0.08	0.07
Pipe P30	20	200	110	4.6	0.15	0.21
Pipe P31	120	200	110	-7.2	0.23	0.48
Pipe P32	27	200	110	0.0	0.00	0.00
Pipe P33	16	150	100	0.0	0.00	0.00
Pipe P34	92	200	110	-7.2	0.23	0.48
Pipe P35	12	300	120	-7.2	0.10	0.06
Pipe P36	7	150	100	0.0	0.00	0.00
Pipe P37	13	300	120	7.2	0.10	0.06

PARKIN Designed with care.

Amanda Davidson 2026-08-26
Planner II (T)
Development Review West
Planning, Development and Building Services
City of Ottawa
110 Laurier Avenue West, Ottawa

Project: Queensway Carleton Hospital Part 4 Expansion
Project No.: 9915-96
Site Plan Control Application: D07-12-25-0163
Subject: Confirmation of FUS Fire Flow Design Parameters

This memorandum provides formal confirmation of the architectural design parameters used in the Fire Underwriters Survey, FUS 2020, required fire flow calculations prepared for the proposed buildings and additions forming part of the Queensway Carleton Hospital Part 4 Expansion.

The proposed buildings and additions will be designed and constructed in accordance with the following parameters:

- Construction type: Type II non-combustible construction, using a construction coefficient of 0.8.
- Sprinkler protection: All proposed buildings and additions will be fully sprinklered, with sprinkler systems designed in accordance with NFPA 13, except for the new open-air parking garage.
- Structural fire-resistance: Structural elements will have a minimum fire-resistance rating of 2 hours.
- Firewalls: Firewalls located between proposed buildings or additions and adjacent existing buildings will have a minimum fire-resistance rating of 2 hours.
- Exposure protection: The firewalls identified in the exposure surcharge calculations will be vertical firewalls having a fire-resistance rating of not less than 2 hours. Openings within these firewalls will be protected as required by the National Building Code of Canada and will therefore be treated as protected exposures with no exposure charge.

These parameters are to be maintained through the detailed design and construction documentation for the project and form the basis of the applicable FUS required fire flow calculations.

Please refer to the accompanying FUS fire flow calculation sheets for building-specific calculation inputs and required fire flow results.

Should you require any additional information, please contact the undersigned.

Sincerely,

Derek Judson

ASSOCIATE
OAA

C/
Stream Shen, City of Ottawa
Francois Thauvette, Novatech
Kynan Dsa, Novatech

APPENDIX E

Watermain Casing Spacer System Information

Garlock

Ranger II®

A Non-Metallic Casing Spacer System

Leaders in Sealing Integrity

Go big with Ranger II® Casing Spacers

NEW - RANGER II® GKO-XL

Segments can support outside diameters up to 98.43". All Ranger II® casing spacers including Ranger II® GKO-XL are cost effective, completely non-metallic, being made entirely of polypropylene and can isolate the carrier pipe for a variety of applications. This includes being able to design Ranger II® casing spacers into a cathodic protection system.

APPLICATION

Road crossing with casing pipe Carbon Steel and FRP, carrier pipe pre-insulated Carbon Steel and FRP.

TECHNICAL DESCRIPTION

Carrier Pipe: Carbon Steel, FRP

Size of Carrier Pipe: DN 1200mm CS pipe - DN 750mm FRP pipe (pre-insulated)

Casing Pipe: FRP

Size of Casing Pipe: FRP casing pipe I.D. 1520mm, FRP casing pipe size I.D.

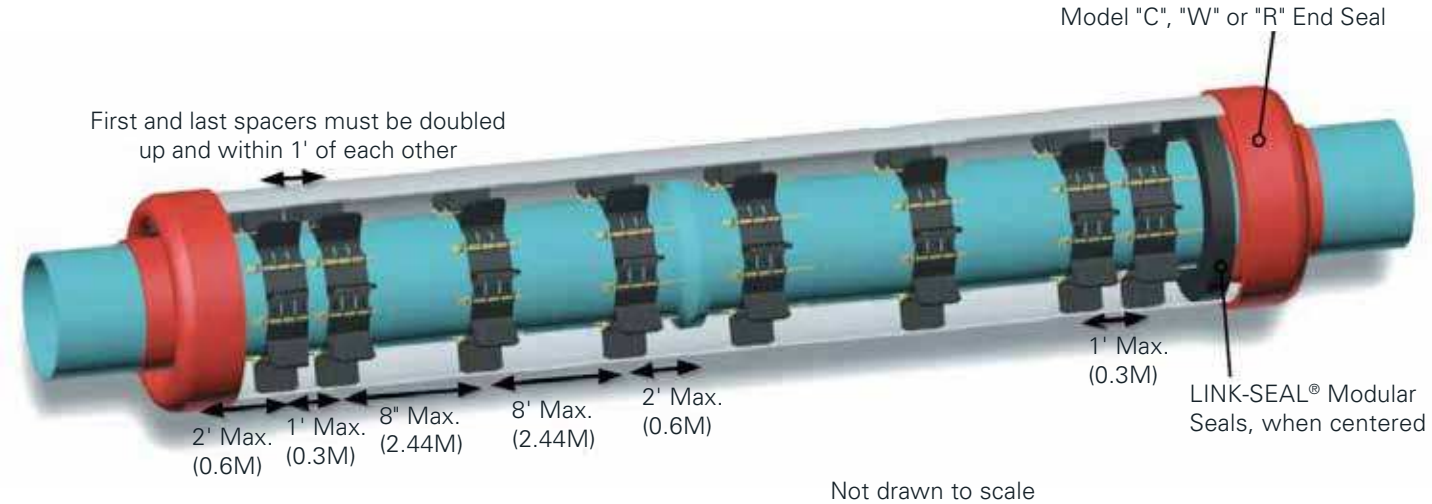
FEATURES

- All non-metallic, made entirely of polypropylene which means, no nuts, bolts, washers or any other metal parts to corrode or degrade over time.
- Designed for carrier pipe diameters from 0.91" (23mm) to 98.43" (2,500mm) in diameter.
- Segmented pieces - small inventory may be used to accommodate a large variety of pipe styles, types and diameters. No extra trips from job site to warehouse for additional parts.
- Easy assembly. Simply slide the segments together and cinch tight with the patented Slide-Lock connecting system.
- Wide variety of runner heights to allow numerous options for pipe positioning within the casing.
- Runner variations may be used to adjust for grade.
- Will accommodate small conduit attachment for communications or electrical cable.
- Medi-L and GKO-XL segments, 2 molded runners per segment.
- Segment band and runners molded as one piece.
- Manufactured from UV resistant polypropylene.
- High impact strength, 1.8 ft. lbs./inch (0.96 joules/cm)
- Excellent compressive strength, 4,000 psi (281 kg/square cm)
- 635 Volts/Mil. Dielectric Strength.
- Wide temperature range, -22˚ to +212˚ F. (-30˚ to +100˚C.)
- Eliminates sand or grout fill.
- No special tools required for installation.
- Low coefficient of friction for ease of installation.

Weight Comparison 9.05" x 17.25" CR Application	
Ranger II® Non-Metallic 2.79 lbs.	Model S8G-2 Stainless Steel 15 lbs.
Ranger II® Advantage Installer and Shipping Costs	

TYPICAL INSTALLATION

Based on 20' (6.1M) carrier pipe segments in a casing of not more than 400' (121.9M). Consult Garlock for longer casings and for concrete pipe. Use 2 spacers/length of pipe for 13' (4.0M) sewer pipe segments.



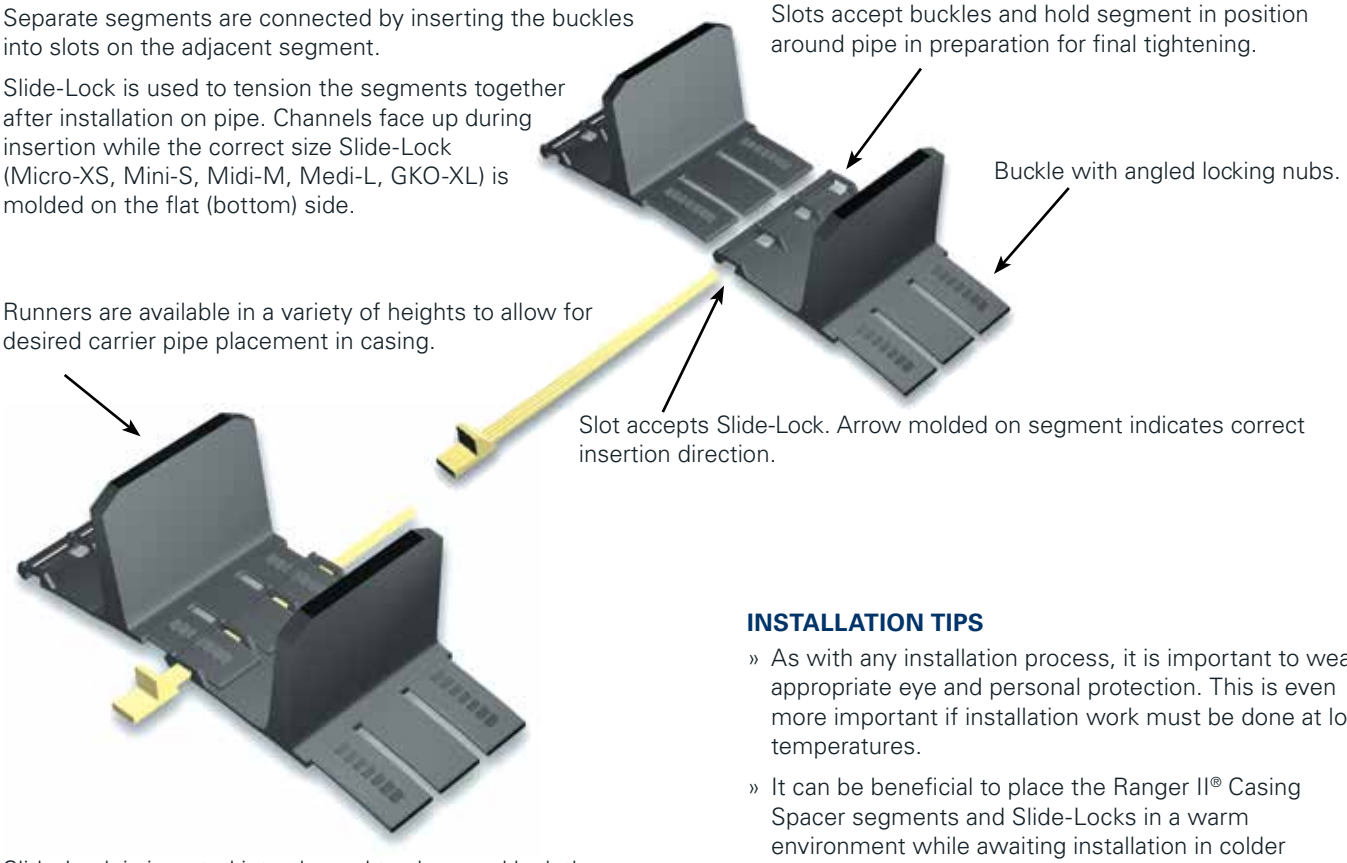
Not drawn to scale

For sizing application to exactly center or for use with LINK-SEAL® Modular Seals please contact Garlock at 1-800-423-2410 or visit www.garlock.com

COMPONENT PARTS - INSTALLATION

Separate segments are connected by inserting the buckles into slots on the adjacent segment.

Slide-Lock is used to tension the segments together after installation on pipe. Channels face up during insertion while the correct size Slide-Lock (Micro-XS, Mini-S, Midi-M, Medi-L, GKO-XL) is molded on the flat (bottom) side.



Slide-Lock is inserted into channel to close and lock the segments together. Slide-Lock removal and re-insertion will cinch the segments together for final tightening against carrier pipe.

INSTALLATION TIPS

- As with any installation process, it is important to wear appropriate eye and personal protection. This is even more important if installation work must be done at low temperatures.
- It can be beneficial to place the Ranger II® Casing Spacer segments and Slide-Locks in a warm environment while awaiting installation in colder climates.
- During the installation process, no matter what the temperature, it is essential that the Slide-Locks be supported by the carrier pipe to eliminate the possibility of bending the Slide-Locks during insertion.
- Under hot installation conditions, it is better to allow the product to age a couple of hours at ambient temperature prior to assembly.

WEIGHT AND SPACING GUIDELINES

Ranger II® Casing Spacers Skid Height Spacing: (Maximum Distance Between Casing Spacer)		
Skid Height	0.65" (16.5mm) to 1.97" (50mm)	8' (feet)
Skid Height	2.56" (65mm) to 3.54" (90mm)	6' (feet)
Skid Height	3.94" (100mm) and up	5' (feet)

INSTALLED ON VARIOUS TYPES:

- PVC Water
- PVC Sewer
- HDPE
- Steel
- Ductile Iron

RANGER II® CASING SPACERS SKID HEIGHT MAX LOAD PER SPACER

Ranger II® Casing Spacers Skid Height Spacing: (Maximum Distance Between Casing Spacer)		Micro-XS	Mini-S	Midi-M	Medi-L	GKO-XL
Skid Height	0.65" (16.5mm) to 1.97" (50mm)	175 lb.	700 lb.	1,700 lb.	5,000 lb.	10,000 lb.
Skid Height	2.56" (65mm) to 2.95" (75mm)	135 lb.	600 lb.	1,600 lb.	4,750 lb.	8,000 lb.
Skid Height	3.54" (90mm) to 3.94" (100mm)	120 lb.	500 lb.	1,500 lb.	4,500 lb.	7,000 lb.
Skid Height	4.33" (110mm) to 5.91" (150mm)		400 lb.	1,400 lb.	4,000 lb.	5,000 lb.
Skid Height	6.89" (175mm)			1,300 lb.	3,500 lb.	

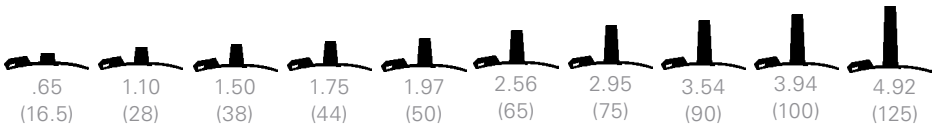
RANGER II® - MICRO-XS FOR 0.91 - 3.07" (23 - 78MM) DIAMETER CARRIER PIPE BAND WIDTH = 2.13" (54MM)

Carrier Pipe O.D. Range Inches (mm)	Number of Segments	Runner Height Options Inches (mm)
0.91 - 1.21 (23 - 31)	3	
1.21 - 1.54 (31 - 39)	4	
1.54 - 1.85 (39 - 47)	5	
1.85 - 2.24 (47 - 57)	6	
2.24 - 2.48 (57 - 63)	7	
2.48 - 3.07 (63 - 78)	8	

Verify that Slide-Locks match segment size by checking to ensure the segment name (Mini) matches the name molded on bottom of the Slide-Lock. **Note: Micro & Mini segments both use the Mini Slide-Lock.**

RANGER II® - MINI-S FOR 2.61 - 5.51" (66 - 140MM) DIAMETER CARRIER PIPE BAND WIDTH = 3.15" (80MM)

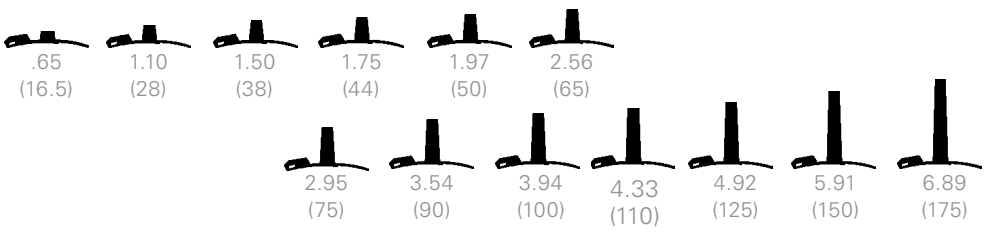
Carrier Pipe O.D. Range Inches (mm)	Number of Segments	Runner Height Options Inches (mm)
2.61 - 3.26 (66 - 83)	4	
3.26 - 3.93 (83 - 100)	5	
3.93 - 4.57 (100 - 116)	6	
4.57 - 5.51 (116 - 140)	7	



Verify that Slide-Locks match segment size by checking to ensure the segment name (Mini) matches the name molded on bottom of the Slide-Lock. **Note: Micro & Mini segments both use the Mini Slide-Lock.**

RANGER II® - MIDI-M FOR 5.51 - 16.65" (140 - 423MM) DIAMETER CARRIER PIPE BAND WIDTH = 5.12" (130MM)

Carrier Pipe O.D. Range Inches (mm)	Number of Segments	Runner Height Options Inches (mm)
5.51 - 6.89 (140 - 175)	4	
6.89 - 8.3 (175 - 211)	5	
8.3 - 9.68 (211 - 246)	6	
9.68 - 11.05 (246 - 281)	7	
11.05 - 12.45 (281 - 316)	8	
12.45 - 13.78 (316 - 350)	9	
13.78 - 16.65 (350 - 423)	10	



Verify that Slide-Locks match segment size by checking to ensure the segment name (Midi) matches the name molded on bottom of the Slide-Lock.

RANGER II® - MEDI-L FOR 16.77 - 25.98" (426 - 660MM) DIAMETER CARRIER PIPE BAND WIDTH = 6.87" (174MM)

Carrier Pipe O.D. Range Inches (mm)	Number of Segments	Runner Height Options Inches (mm)
16.77 - 20.00 (426 - 508)	4	
20.00 - 25.98 (508 - 660)	5	

1.10 (28) | 1.50 (38) | 1.97 (50) | 2.56 (65) | 2.95 (75) | 3.54 (90) | 3.94 (100) | 4.92 (125) | 5.91 (150) | 6.89 (175)

Verify that Slide-Locks match segment size by checking to ensure the segment name (Medi) matches the name molded on bottom of the Slide-Lock.

RANGER II® - GKO-XL FOR 25.98 - 98.43" (660 - 2500MM) DIAMETER CARRIER PIPE BAND WIDTH = 8.86" (225MM)

Carrier Pipe O.D. Range Inches (mm)	Number of Segments	Runner Height Options Inches (mm)
25.98 - 29.49 (660 - 749)	6	
29.49-33.62 (749-854)	7	
33.62-37.76 (854-959)	8	
37.76-42.01 (959-1067)	9	
42.01-47.20 (1067-1199)	10	
47.20-52.36 (1199-1330)	11	
52.36-56.69 (1330-1440)	12	
56.69-60.63 (1440-1540)	13	
60.63-65.35 (1540-1660)	14	
65.35-70.87 (1660-1800)	15	
70.87-75.20 (1800-1910)	16	
75.20-80.39 (1910-2042)	17	
80.39-84.65 (2042-2150)	18	
84.65-89.37 (2150-2270)	19	
89.37-94.49 (2270-2400)	20	
94.49-98.43 (2400-2500)	21	

1.42 (36) | 1.97 (50) | 2.56 (65) | 2.95 (75) | 3.54 (90) | 4.33 (110) | 4.92 (125)

Verify that Slide-Locks match segment size by checking to ensure the segment name (GKO-XL) matches the name molded on bottom of the Slide-Lock.

SIZE YOUR INSTALLATION APPLICATION

All Ranger II® Casing Spacers require more than one segment to complete a spacer. In addition, all Ranger II® Casing Spacers are available with a number of different runner height options which are used to guarantee clearance of the mechanical joint, provide for options in carrier pipe positioning within the casing or to compensate for grade elevation adjustments. Following are examples on how to size Ranger II® Casing Spacers for various applications. **Detailed Ranger II® casing spacers weight & spacing guidelines on page 5. For exact centering and adjusting for grade elevation changes contact GPT.**

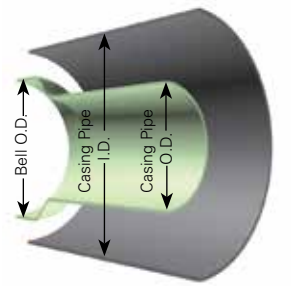
EXAMPLE - CENTERED & RESTRAINED WITH EQUAL LENGTH RUNNERS

20" Ductile Iron pipe (21.60" O.D. barrel & 28.63" O.D. bell) inside a 36" casing with a 0.375" wall thickness.

A. Find carrier pipe O.D. (21.60") from adjacent chart and choose the proper size and number of segments.

One spacer would require 5 - Medi-L segments.

B. Determine maximum runner height with equal length runners.



Casing I.D.	35.25"
Less Carrier Pipe O.D.	-21.60"
	13.65"
Less Space Allowance	-1.00"
	12.65"

Divide this number (12.65") by 2 to obtain the total maximum runner height = 6.325"

C. Choose a runner height of this value or less.

Solution: Use 5 - Medi-L (150) segments with runner heights of 5.91".

NOTE: This combination will restrain the pipe from flotation within the casing pipe by allowing only about 1.8" of clearance between the top runners and the casing I.D. This will center the carrier pipe within approximately 0.9" of exact center.

EXAMPLE - TO CLEAR THE BELL

(suggested minimum clearance is at least 0.8" (0.4" on both sides)

20" Ductile Iron pipe (21.60" O.D. barrel & 28.63" O.D. bell) inside a 36" casing with a 0.375" wall thickness.

Determine runner height. **(Clear Bell)**

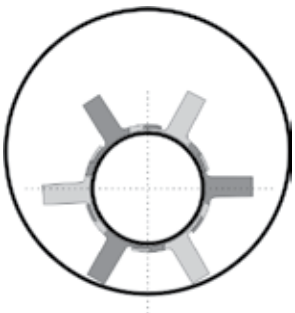
Bell O.D.	28.63"
Add 0.8" Clearance	+0.8"
	29.43"
Less Barrel O.D.	-21.60"
	7.83"

Divide this number (7.83") by 2 to obtain the minimum runner height to clear the bell = 3.92"

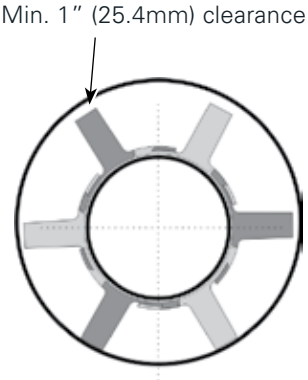
Choose a runner height between 3.92" and the maximum allowable runner height (6.32") determined in the above example.

Solution: Use 5 - Medi-L (100) segments with runner heights of 3.94".

Ordering Codes: See Back Page for Ordering Code Sequence.



Standard To Clear Bell



Centered / Restrained

For sizing application to exactly center or for use with LINK-SEAL® Modular Seals please contact Garlock at 1-800-423-2410 or visit www.garlock.com

NON-METALLIC CASING SPACER & END SEAL SPECIFICATIONS FOR CARRIER PIPE UP TO 98.43" O.D.

Molded non-metallic technology enables Ranger II® casing spacers to replace existing specified stainless steel casing spacers.

A. Casing Spacers

Upon installation of the steel pipe encasement, the contractor shall furnish and install a Ranger II® boltless casing spacer on the carrier pipe as described below. Casing spacers shall be spaced a maximum of eight (8)* feet apart along the length of the carrier pipe. Casing Spacers shall be used within two (2) feet of each end of the casing. For Bell Joints & other compression couplings, two additional spacers may be required per pipe joint. One spacer is required on either side of the pipe joint not to exceed 2ft from the joint itself. Wood skids are not an acceptable method of supporting the carrier pipe.

*Maximum spacing determined by skid height, reference table on page 4 for maximum spacing per skid height

1. Casing spacers shall be all non-metallic polypropylene, molded in segments for field assembly without any special tools. Spacer segments shall be secured around carrier pipe by insertion of a Slide-Lock. The casing spacer polymer shall contain ultraviolet inhibitors and shall have a minimum compressive strength of 4,000 psi, 635 Volts/mil dielectric strength and impact strength of 1.8 ft-lbs./inch. Each casing spacer shall have full length, integrally molded skids extending beyond the bell or mechanical joint of the carrier pipe.

2. Spacers shall be at least as wide as listed below:

CARRIER PIPE DIAMETER INCHES (MM)	RANGER II® MODEL	WIDTH INCHES (MM)
0.91 to 3.07" (23 to 78)	Micro-XS	2.13" (54)
2.61 to 5.51" (66 to 140)	Mini-S	3.15" (80)
5.51 to 16.65" (140 to 423)	Midi-M	5.12" (130)
16.00 to 25.98" (406 to 660)	Medi-L	6.87" (174)
25.98 to 98.43" (660 to 2500)	GKO-XL	8.86" (225)

3. The casing spacers shall be the boltless/all non-metallic GPT Ranger II® Casing Spacers as manufactured by Garlock.

SPECIFIC MATERIAL CHART:

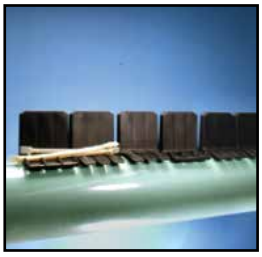
BAND/RUNNER SEGMENT UV RESISTANT POLYPROPYLENE	
SPECIFICATIONS Compressive Strength	**VALUE** 4,000 psi (281 kg/sq. cm)
Temperature	-22˚F to 212˚F (-30˚C to 100˚C)
Impact strength	1.8 ft. lb./in. (0.96 joules/cm)
Dielectric strength	635 volts/mil. min.
Color	Black
Liner	None

B. End Seals

After insertion of the carrier pipe into the casing, the ends of the casing shall be closed by installing 1/8" thick synthetic rubber end seals equal to the Garlock Model C, W or R end seal as manufactured by Garlock.

BASIC INSTALLATION PROCEDURE

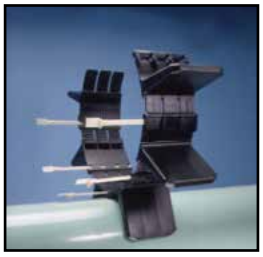
Always wear protective safety glasses, especially in low temperatures.



1. Size the Ranger II® casing spacer to make sure you have all the segments and Slide-Locks.

2. Take the segments and align the buckles. Insert the buckles 1/4 of the way into the slots. For GKO-XL position of the buckles (wedges) per element can be located in the table on following page.

3. Locate the directional arrows on the segment and insert Slide-Lock until the tip exits the end of the segment.



4. Continue the process from the previous step until all segments are put together. You're now ready to wrap the Ranger II® around the pipe.

5. Align the buckles and lock into place. Take the final Slide-Lock and slide into place.

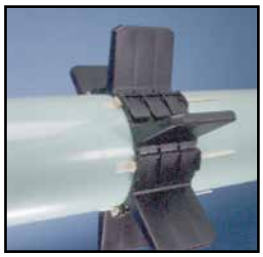
NOTE: Make sure buckles are uniformly aligned and inserted into slots.

6. Insert all Slide-Locks as far as possible by hand. Complete tightening by tapping each Slide-Lock with a light rubber headed hammer.

7. To tighten Ranger II® securely to carrier pipe, back Slide-Lock completely out of the slot. If needed, push segments together by hand.

8. Re-insert Slide-Locks completely into segments by lightly tapping Slide-Lock back into position.

NOTE: Make sure buckles are uniformly aligned and inserted into slots.



9. Repeat steps 7 and 8 until Ranger II® is secure against the carrier pipe and unable to move.

NOTE: Properly installed slide-locks will rarely be driven all the way in. To secure a tight fit drive as far as possible, but if all are driven completely, (bottomed out) it may not be tight enough. Verify Ranger II® casing spacer cannot slide on carrier pipe.

RANGER II® GKO-XL WEDGE POSITIONING

PIPE OD		GKO-XL NUMBER OF SEGMENTS PER SPACER	POSITION OF WEDGES IN CONNECTING SECTION			
FROM	TO		P1	P2	P3	P4
25.98	26.18	6			3	3
27.99	28.19	6		5	1	
29.06	29.45	6	4	2		
30.00	30.20	7			2	5
31.34	31.57	7			7	
32.01	32.24	7		3	4	
33.15	33.54	7	1	6		
34.02	34.25	8			1	7
35.98	36.22	8		1	7	
37.20	37.60	8		6	2	
40.00	40.24	9			7	2
41.26	41.65	9		4	5	
41.61	41.85	9		6	3	
44.02	44.29	10			6	4
47.99	48.27	11			6	5
52.01	52.28	11	1	10		
55.98	56.30	12		9	3	
60.00	60.31	13		7	6	
64.02	64.33	14		5	9	
67.99	68.35	15		3	12	
72.01	72.36	16		1	15	
75.98	76.34	17			16	1
80.00	80.35	17		16	1	
84.02	84.41	18		14	4	
87.99	88.39	19		12	7	
92.01	92.40	20		10	10	
95.98	96.38	21		8	13	

The recommendation position of GKO-XL wedges are suggestions only and can differ according to outside temperature.

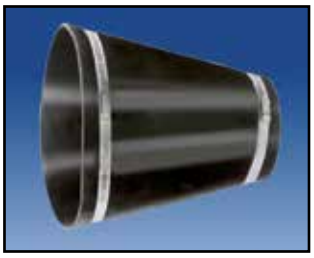
GKO-XL WEDGE POSITION EXAMPLE

For a pipe O.D. of 30" put 2 wedges in position 3 and 5 wedges in position 2.

END SEALS

Model "C" Custom Pull-on

Individually designed to accommodate custom carrier casing combinations. Made of 1/8" thick, specially compounded synthetic rubber for long life and easy installation.

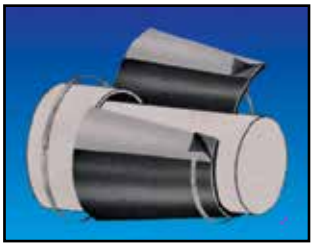


Model "S" Standard Pull-on

Made of special synthetic rubber for long life and easy installation, the highly flexible "S"-shaped seal is available for ANSI steel pipe specifications. Band locating ribs are on the outside, with special sealing ribs on the inside under the band to prevent leakage.

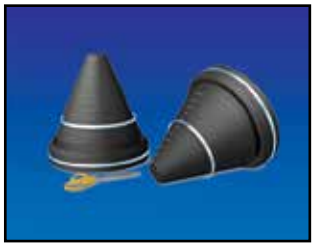
Model "W" Wrap Around

Specifically designed for existing installations. Simply remove plastic backing from self-curing rubber and press exposed surfaces together. Available for all carrier/casing differential.



Model "R" End Seal

Specifically designed for new installations, Model R end seals are available in 5 sizes to accommodate a wide range of carrier/casing diameter combinations. A unique "cone" design, with molded-in dimensions, are easily cut to size for a correct fit on the carrier pipe.



LINK-SEAL® Modular Seals

For a water tight seal (up to 20 psig [40 feet of head]) when the carrier pipe is already centered inside a casing. For added protection a model "C" end seal may be used in conjunction with LINK-SEAL® Modular Seals.

TO ORDER RANGER II® CASING SPACERS PLEASE INDICATE:

1. Total Quantity of Spacers
2. Model No. (Ranger II®)
3. Carrier Pipe O.D.
4. Casing Pipe I.D.
5. Bell O.D.
6. Runner Configuration
   S = Standard Bell Clearance Only
   CR = Centered/Restrained
7. Segment Size (Micro-XS, Mini-S, Midi-M, Medi-L or GKO-XL)
8. Runner Lengths
9. Number of Segments/Spacer
10. Contact your local distributor or Garlock

ISO 9001 Registration

Each casing spacer and end seal shall be manufactured at a facility that has a Registered ISO 9001 Quality Management System. Copy of current ISO 9001. Registration shall be provided with material submittal.

Warranty:

All products are warranted against failure caused by manufacturing defects for a period of one year. Any product found to be so defective and returned within one year from date of shipment will be replaced without charge. The above warranty is made in lieu of, and we disclaim, any and all other warranties, expressed or implied, including the warranties of merchantability and fitness for a particular purpose, and buyer agrees to accept the products without any such warranties. We hereby disclaim any obligation or liability for consequential damages, labor costs or any other claims or liabilities of any kind whatsoever.

PSI 1-21_08.2023

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Garlock

APPENDIX F

QCH Sanitary Pump Station Design Brief Excerpts

QUEENSWAY CARLETON HOSPITAL
CANCER CENTRE
3045 BASELINE ROAD
SANITARY PUMP STATION
DESIGN BRIEF

Prepared for:

QUEENSWAY-CARLETON HOSPITAL

Prepared by:

NOVATECH ENGINEERING CONSULTANTS LTD.
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

September, 2007
Revised, November 2007
Revised, June 2008

Ref: R-2007-095
Novatech File No. 105197-1