

2458 Cleroux Crescent, Ottawa  
Assessment of Adequacy of Public Services  
& Stormwater Management Report



Project # CW-02-21

City Application # D07-12-22-0144

Prepared for:

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## 1. Introduction

The subject property is located at 2458 Cleroux Crescent Ottawa. The proposed work comprises of a 3-storey+underground garage stacked dwelling building with total of 17 stacked dwellings and a garage for 24 vehicles at the parking level (basement). For the purpose of this report the site is considered to run north-south. Cleroux Crescent is extending east-west along the property's north edge.

Currently the property is used as a residential with a single house with backyard and two utility sheds.

Existing services locations are known and they will be disconnected before the demolition and will be recorded in the construction diary. The area is serviced by:

- Sanitary: 250mm Concrete
- Storm: A 375 mm PVC Storm sewer ( 2000)
- Water: A 203 mm Ductile Iron.

The sidewalk in front of the property is at elevation between 82.41 and 82.43 m a.s.l.



2458 Cleroux Cres, Ottawa: Location

## 2. Public Services Capacity

This section of the report will analyze existing municipal services and the potential impact of the proposed building at 2458 Cleroux Cres. on the existing service capacity.

## 2.1 Water Supply

Existing building is supplied from DI 203 mm pipe and calculated current consumption is **0.20 l/sec** for the peak period.

| Design Parameter   | Value  |
|--|--|
| Residential Average Per Unit   | 1.8 P/unit                                   |
| Residential Average Daily Demand   | 280 L/d/P                                    |
| Residential Maximum Daily Demand   | 9.5 x Average Daily *                        |
| Residential Maximum Hourly   | 1.5 x Maximum Daily *                        |
| Commercial Demand  | 2.5 L / m <sup>2</sup> /d                    |
| Commercial Maximum Daily Demand  | 1.5 x Average Daily                          |
| Commercial Maximum Hourly  | 1.8 x Maximum Daily                          |
| Minimum Watermain Size   | 150mm diameter                               |
| Minimum Depth of Cover   | 2.4m from top of watermain to finished grade |
| During Peak Hourly Demand operating pressure must remain within  | 275kPa and 552kPa                            |
| During fire flow operating pressure must not drop below  | 140kPa                                       |
| * Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons. |  |

**Table 1: Water Supply Design Criteria**

<sup>1</sup>The following are boundary conditions, HGL, for hydraulic analysis at Cleroux Cres. (zone R4) assumed to be connected to the 203 mm watermain on Cleroux Crescent (see attached PDF for location).

| Scenario             | Demand |      |
|----------------------|--------|------|
|                      | L/min  | L/s  |
| Average Daily Demand | 6.81   | 0.11 |
| Max Day Demand       | 64.56  | 1.08 |
| Peak Hour            | 96.98  | 1.62 |
| Fire Flow Demand #1  | 6,300  | 105  |

Required fire flow is available at residual pressure of 31.3 psi (215.8 Kpa) and with ground elevation of 83.3 m.

<sup>1</sup> City of Ottawa boundary condition information is based on current operation of the city water distribution system (also see Appendix A for complete correspondence information)

| Design Parameter     | Anticipated Demand <sup>1</sup> (L/sec) | Boundary Condition <sup>2</sup> (kPa) |
|----------------------|---|---------------------------------------|
| Average Daily Demand | 0.11                                    | 467.9                                 |
| Max Day + Fire Flow  | 106.08                                  | 212.9                                 |
| Peak Hour            | 1.62                                    | 428.7                                 |

Ground Elevation = 83.3 m

Proposed building height is 12.1 m so the residual pressure at the top of the building will be 10.0 Kpa.

The consumption is expected to be **1.62 l/sec** for peak period.

Using Darcy-Weisbach calculation, as shown below, it was determined that 50 mm lateral would provide a flow of 1.75 l/sec at 0.89 m/s velocity and the pressure loss at the building of 0.14 bar. For calculation estimated length of the lateral is 80 m.

**Calculation output**

Flow medium: Water 20 °C / liquid  
Volume flow: 1.75 l/s  
Weight density: 998.206 kg/m<sup>3</sup>  
Dynamic Viscosity: 1001.61 10<sup>-6</sup> kg/ms  
Element of pipe: circular  
Dimensions of element: Diameter of pipe D: 50 mm  
Length of pipe L: 80 m

Velocity of flow: 0.89 m/s  
Reynolds number: 44412  
Velocity of flow 2: -  
Reynolds number 2: -  
Flow: turbulent  
Absolute roughness: 0.0015 mm  
Pipe friction number: 0.02  
Resistance coefficient: 34.49  
Resist. coeff. branching pipe: -  
Press. drop branch. pipe: -  
Pressure drop: 136.74 mbar  
0.14 bar

Note: The pressure drop was calculated by the online calculator of [www.pressure-drop.com](http://www.pressure-drop.com). We can not w

Important notice: The new version of the Online-Calculator is available: [www.pressure-drop.online](http://www.pressure-drop.online)

Do you know our software SF Pressure Drop 10.x for Excel?  
Information: [www.pressure-drop.com](http://www.pressure-drop.com)

### 2.2.1 Fire Flow

The FUS fire flow calculation will be used as the flow demand is higher than 9,000 l/min.

As the building is a 3-storey height, the sprinkler system is not required.

Fire protection will be provided from the nearest hydrant (Class AA) at 41.3 m distance. The second nearest hydrant (Class AA) is located south from the property at 114.1 m distance and a third hydrant (Class AA) is at distance of 195.8 m.

In accordance with Table 18.5.4.3 of ISTB-2018-02 they have combined capacity of 12,302 l/min which is sufficient for the fire protection of the proposed building.

**Table 18.5.4.3 Maximum fire flow hydrant capacity**

| Distance to buildings <sup>a</sup> |                 | Maximum capacity <sup>b</sup> |         |
|------------------------------------|-----------------|-------------------------------|---------|
| (ft)                               | (m)             | (gpm)                         | (L/min) |
| ≤ 250                              | ≤ 76            | 1500                          | 5678    |
| > 250 and ≤ 500                    | > 76 and ≤ 152  | 1000                          | 3785    |
| > 500 and ≤ 1000                   | > 152 and ≤ 305 | 750                           | 2839    |



**2458 Cleroux Cres, Ottawa: Hydrants location and distance**

## 2.2 Sanitary Sewer

Sanitary sewer outflow for the current buildings is 0.096 l/sec (wet weather peak flow).

| Design Parameter  | Value                                     |
|---|---|
| Residential Average Stacked dwelling  | 1.8 P/unit                                |
| Average Daily Demand  | 280 L/cap/day                             |
| Peaking Factor  | Harmon's Peaking Factor, Max 4.0, Min 2.0 |
| Correction Factor (City of Ottawa Tech.Bulletin ISTB-2018-01)   | 0.8                                       |
| Commercial Space  | 28,000 L/ha/day                           |
| Infiltration and Inflow Allowance   | 0.33L/s/ha                                |
| Sanitary sewers are to be sized employing the Manning's Equation  | $Q = (1/n)AR^{2/3}S^{1/2}$                |
| Minimum Sewer Size  | 200mm diameter                            |
| Minimum Manning's 'n'   | 0.013                                     |
| Minimum Depth of Cover  | 2.5m from crown of sewer to grade         |
| Minimum Full Flowing Velocity   | 0.6m/s                                    |
| Maximum Full Flowing Velocity   | 3.0m/s                                    |
| <i>Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, November 2012 &amp; Infrastructure Technical Bulletins 2018</i> |   |

**Table 2: Wastewater Design Criteria**

The estimated outflow for the new building is **0.46 l/sec** (peak flow + wet weather). Existing municipal sewer 250 mm has a capacity of 41.77 l/sec for 0.44% slope and 80% full.

### Inputs:

|   |          |         |
|---|----------|---------|
| Pipe Diameter, $d_o$  | 250.0000 | mm      |
| Manning Roughness, $n$  | 0.0130   |         |
| Pressure slope (possibly equal to pipe slope), $S_o$            | 0.4400   | % slope |
| Percent of (or ratio to) full depth (100% or 1 if flowing full) | 80.0000  | %       |

### Results:

|                       |         |                |
|-----------------------|---------|----------------|
| Flow, $Q$             | 38.5574 | l/s            |
| Velocity, $v$         | 0.9159  | m/s            |
| Velocity head, $h_v$  | 0.0428  | m              |
| Flow Area, $A$        | 0.0421  | m <sup>2</sup> |
| Wetted Perimeter, $P$ | 0.5536  | m              |

|                                       |        |                  |
|---------------------------------------|--------|------------------|
| Hydraulic Radius                      | 0.0760 | m                |
| Top Width, T                          | 0.2000 | m                |
| Froude Number, F                      | 0.64   |                  |
| Shear Stress (tractive force), $\tau$ | 8.6293 | N/m <sup>2</sup> |

Current residual capacity of 250 mm municipal sanitary pipe is not known however, as significant area upstream is conveyed to this pipe it was assumed that at least 45% of the pipe is full (below spring line) in front of the property.

**Inputs:**

|  |          |         |
|--|----------|---------|
| Pipe Diameter, $d_o$   | 250.0000 | mm      |
| <u>Manning Roughness, n</u>  | 0.0130   |         |
| <u>Pressure slope (possibly equal to pipe slope), <math>S_o</math></u> | 0.4400   | % slope |
| Percent of (or ratio to) full depth (100% or 1 if flowing full)        | 45.0000  | %       |

**Results:**

|                                       |         |                  |
|---------------------------------------|---------|------------------|
| Flow, Q                               | 16.4305 | l/s              |
| Velocity, v                           | 0.7669  | m/s              |
| Velocity head, hv                     | 0.0300  | m                |
| Flow Area, A                          | 0.0214  | m <sup>2</sup>   |
| Wetted Perimeter, P                   | 0.3677  | m                |
| Hydraulic Radius                      | 0.0583  | m                |
| Top Width, T                          | 0.2487  | m                |
| Froude Number, F                      | 0.83    |                  |
| Shear Stress (tractive force), $\tau$ | 4.8540  | N/m <sup>2</sup> |

Increase for 0.46 l/sec would add 0.8% of depth in the receiving pipe so it is considered as minor increase with no potential adverse effect (back flow) and it assumed to be below the spring line.

**Inputs:**

|  |          |         |
|--|----------|---------|
| Pipe Diameter, $d_o$   | 250.0000 | mm      |
| <u>Manning Roughness, n</u>  | 0.0130   |         |
| <u>Pressure slope (possibly equal to pipe slope), <math>S_o</math></u> | 0.4400   | % slope |
| Percent of (or ratio to) full depth (100% or 1 if flowing full)        | 45.8000  | %       |

**Results:**

|                   |         |     |
|-------------------|---------|-----|
| Flow, Q           | 16.9486 | l/s |
| Velocity, v       | 0.7731  | m/s |
| Velocity head, hv | 0.0305  | m   |

|                                       |        |                  |
|---------------------------------------|--------|------------------|
| Flow Area, A                          | 0.0219 | m <sup>2</sup>   |
| Wetted Perimeter, P                   | 0.3717 | m                |
| Hydraulic Radius                      | 0.0590 | m                |
| Top Width, T                          | 0.2491 | m                |
| Froude Number, F                      | 0.83   |                  |
| Shear Stress (tractive force), $\tau$ | 4.9403 | N/m <sup>2</sup> |

The Manning formula was also used to assess the sewer lateral's size.. For given outflow and maximum achievable slope of 3.5% slope, the velocity in 150 mm lateral is 0.6m/sec.

**Inputs: Sanitary lateral**

|   |          |         |
|---|----------|---------|
| Pipe Diameter, d <sub>o</sub>                                   | 150.0000 | mm      |
| Manning Roughness, n  | 0.0130   |         |
| Pressure slope (possibly equal to pipe slope), S <sub>o</sub>   | 3.5000   | % slope |
| Percent of (or ratio to) full depth (100% or 1 if flowing full) | 8.9000   | %       |

**Results:**

|                                       |        |                  |
|---------------------------------------|--------|------------------|
| Flow, Q                               | 0.4654 | l/s              |
| Velocity, v                           | 0.6006 | m/s              |
| Velocity head, h <sub>v</sub>         | 0.0184 | m                |
| Flow Area, A                          | 0.0008 | m <sup>2</sup>   |
| Wetted Perimeter, P                   | 0.0909 | m                |
| Hydraulic Radius                      | 0.0085 | m                |
| Top Width, T                          | 0.0854 | m                |
| Froude Number, F                      | 2.01   |                  |
| Shear Stress (tractive force), $\tau$ | 4.5819 | N/m <sup>2</sup> |

Detailed calculation of water and sanitary flow is presented in Appendix A.

### 2.3 Site Stormwater Services

Current building and the rest of surface of the lot at 2458 Cleroux Crescent represent a typical urban site. All stormwater runoff is under uncontrolled condition for the entire site. For the purpose of protecting the municipal sewer system the City of Ottawa requires that the newly developed site must store certain amount of water on site and release it to the system under the 2-year predevelopment conditions.

Proposed stormwater retention will prevent increase of stormwater inflow into the system. The stormwater storage is proposed on the new building's flat roof. Total storage required for the 100 year event is 14.21 m<sup>3</sup>.

In comparison to the predevelopment runoff to the front (stormwater system on Cleroux Cres.), the post-development runoff will be reduced as shown below:

| Predevelopment Runoff Distribution  |      |       | Post-development Runoff Distribution |      |       |
|-------------------------------------|------|-------|--------------------------------------|------|-------|
| <b>Uncontrolled Runoff to Front</b> |      |       | <b>Uncontrolled Runoff to Front</b>  |      |       |
| 2-year                              | 3.36 | l/sec | 2-year                               | 2.42 | l/sec |
| 100-year                            | 9.77 | l/sec | **100-year                           | 7.04 | l/sec |

\*\*Comment: runoff coefficient increase 25% (climate change allowance)

The post-development runoff to the rear is also reduced for 2-year storm in comparison to the predevelopment. The 100-year runoff is increased as a result of additional 25% (climate change impact correction) however, the south side (rear yard) is facing forested area where no development is planned.

| Predevelopment Runoff Distribution |       |       | Post-development Runoff Distribution  |       |       |
|------------------------------------|-------|-------|---|-------|-------|
| <b>Uncontrolled Runoff to Rear</b> |       |       | <b>Uncontrolled Runoff to Rear</b>  |       |       |
| 2-year                             | 7.61  | l/sec | 2-year  | 7.38  | l/sec |
| 100-year                           | 17.70 | l/sec | **100-year  | 21.45 | l/sec |
|                                    |       |       | ** <b>Comment:</b> runoff coefficient increase 25% (climate change allowance) |       |       |

The City of Ottawa allows the 2-year total runoff less the uncontrolled 100-year post development runoff to the front (into the stormwater minor system) which will be 6.66 l/sec over two roof drains, each of 3.33 l/sec maximum capacity. The storm lateral 200 mm provides this flow at 27.5% full.

The proposed side yards and grading will direct water toward the ravine on south.

**Inputs: storm lateral**

|   |          |         |
|---|----------|---------|
| Pipe Diameter, $d_o$  | 200.0000 | mm      |
| Manning Roughness, $n$  | 0.0130   |         |
| Pressure slope (possibly equal to pipe slope), $S_o$            | 1.5000   | % slope |
| Percent of (or ratio to) full depth (100% or 1 if flowing full) | 27.5000  | %       |

**Results:**

|                                       |        |                  |
|---------------------------------------|--------|------------------|
| Flow, Q                               | 6.6399 | l/s              |
| Velocity, v                           | 0.9456 | m/s              |
| Velocity head, hv                     | 0.0456 | m                |
| Flow Area, A                          | 0.0070 | m <sup>2</sup>   |
| Wetted Perimeter, P                   | 0.2208 | m                |
| Hydraulic Radius                      | 0.0318 | m                |
| Top Width, T                          | 0.1786 | m                |
| Froude Number, F                      | 1.52   |                  |
| Shear Stress (tractive force), $\tau$ | 8.0900 | N/m <sup>2</sup> |

Detailed calculation is provided in Appendix A.

### 3. Conclusion and Recommendation

#### 3.1 Water Supply

The consumption is expected to be **1.62 l/sec** for peak period.

Fire protection will be provided from the nearest hydrant (Class AA) at 41.3 m distance. The second nearest hydrant (Class AA) is located south from the property at 114.1 m distance and a third hydrant (Class AA) is at distance of 195.8 m.

In accordance with Table 18.5.4.3 of ISTB-2018-02 they have combined capacity of 12,302 l/min which is sufficient for the fire protection of the proposed building.

#### 3.2 Sanitary Sewer

The estimated outflow for the new building is **0.46 l/sec** (peak flow + wet weather). Increase for 0.46 l/sec would add 0.8% of depth in the receiving pipe so it is considered as minor increase with no potential adverse effect (back flow) and it is still below the spring line.

For given outflow and minimum achievable slope of 3.5%, the velocity in 150 mm lateral is 0.6 m/sec.

#### 3.3 Stormwater

For the purpose of protecting the municipal sewer system the City of Ottawa requires that the newly developed site must store water and release it to the system under the 2-year predevelopment conditions.

Proposed stormwater retention will prevent increase of stormwater inflow into the system. The stormwater storage is proposed on the new building's flat roof. Total storage required for the 100 year event is 14.21 m<sup>3</sup>.

The City of Ottawa allows the 2-year total runoff less the uncontrolled 100-year post development runoff to the front (into the stormwater minor system) which will be 6.66 l/sec over two roof drains, each of 3.33 l/sec maximum capacity. The storm lateral 200 mm provides this flow at 27.5% full.

The proposed side yards and grading will direct water toward the ravine on south.

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February 16, 2026



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Appendix A: Calculations

**Water Supply Design Criteria**

| Design Parameter   | Value  |
|--|--|
| Residential Average Apartment  | 1.8 P/unit                                   |
| Residential Average Daily Demand   | 350 L/d/P                                    |
| Residential Maximum Daily Demand   | 9.5 x Average Daily *                        |
| Residential Maximum Hourly   | 1.5 x Maximum Daily *                        |
| Commercial Demand  | 2.5 L / m <sup>2</sup> /d                    |
| Commercial Maximum Daily Demand  | 1.5 x Average Daily                          |
| Commercial Maximum Hourly  | 1.8 x Maximum Daily                          |
| Minimum Watermain Size   | 150mm diameter                               |
| Minimum Depth of Cover   | 2.4m from top of watermain to finished grade |
| must remain within   | 275kPa and 552kPa (40-80 psi; 28-56m)        |
| During fire flow operating pressure must not drop below  | 140kPa (20 psi; 14 m)                        |
| * Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons. |  |

**Domestic Demand**

| Type of Housing | Per / Unit | Units | Pop |
|-----------------|------------|-------|-----|
| Single Family   | 3.4        | 0     | 0   |
| Semi-detached   | 2.7        |       | 0   |
| Townhouse       | 2.7        |       | 0   |
| Apartment       |            |       | 0   |
| Bachelor        | 1.4        | 3     | 4   |
| 1 Bedroom       | 1.4        | 16    | 22  |
| 2 Bedroom       | 2.1        | 4     | 8   |
| 3 Bedroom       | 3.1        |       | 0   |
| 4 Bedroom       | 4.2        | 0     | 0   |

|                              | Pop | Avg. Daily        |       | Max Day           |       | Peak Hour         |       |
|------------------------------|-----|-------------------|-------|-------------------|-------|-------------------|-------|
|                              |     | m <sup>3</sup> /d | L/sec | m <sup>3</sup> /d | L/sec | m <sup>3</sup> /d | L/sec |
| <b>Total Domestic Demand</b> | 35  | 9.80              | 0.11  | 93.10             | 1.08  | 139.65            | 1.62  |

**Institutional / Commercial / Industrial Demand**

| Property Type             | Unit Rate |                        | Units | Avg. Daily        |       | Max Day           |        | Peak Hour         |        |
|---------------------------|-----------|------------------------|-------|-------------------|-------|-------------------|--------|-------------------|--------|
|                           |           |                        |       | m <sup>3</sup> /d | L/sec | m <sup>3</sup> /d | L/sec  | m <sup>3</sup> /d | L/sec  |
| Garage                    | 2.5       | L/m <sup>2</sup> /d    | 0     | 0.00              | 0.00  | 0.00              | 0.00   | 0.00              | 0.00   |
| Office                    | 75.0      | L/9.3m <sup>2</sup> /d | 0.0   | 0.00              | 0.000 | 0.00              | 0.0000 | 0.00              | 0.0000 |
| Restaurant*               | 125.0     | L/seat/d               |       |                   |       |                   |        |                   |        |
| Industrial -Light         | 35,000.0  | L/gross ha/d           |       |                   |       |                   |        |                   |        |
| Industrial -Heavy         | 55,000.0  | L/gross ha/d           |       |                   |       |                   |        |                   |        |
| <b>Total I/C/I Demand</b> |           |                        |       | 0.00              | 0.00  | 0.00              | 0.00   | 0.00              | 0.00   |

|                     |      |      |       |      |        |       |
|---------------------|------|------|-------|------|--------|-------|
| <b>Total Demand</b> | 9.80 | 0.11 | 93.10 | 1.08 | 139.65 | 1.616 |
|---------------------|------|------|-------|------|--------|-------|

\* Estimated number of seats at 1seat per 9.3m<sup>2</sup>

**Water Demand and Boundary Conditions**

**Proposed Conditions**

| Design Parameter     | Anticipated Demand <sup>1</sup><br>(L/sec) | Boundary Condition <sup>2</sup><br>(kPa) |
|----------------------|--|--|
| Average Daily Demand | 0.11                                       | 467.9                                    |
| Max Day + Fire Flow  | 6,301.08                                   | 212.9                                    |
| Peak Hour            | 1.62                                       | 428.7                                    |

<sup>1</sup>) Water demand calculation per Water Supply Guidelines. See Appendix B for detailed calculations.

<sup>2</sup>) Boundary conditions supplied by the City of Ottawa. See Appendix B for correspondence with the City.

<sup>3</sup>) estimated ground elevation **83.3 m**

**Wastewater Design Criteria**

| Design Parameter   | Value                                     |
|--|---|
| Residential Average Apartment  | 1.8 P/unit                                |
| Average Daily Demand   | 280 L/cap/day                             |
| Peaking Factor   | Harmon's Peaking Factor. Max 4.0, Min 2.0 |
| Correction Factor (City of Ottawa Tech.Bulletin ISTB-2018-0  | 0.8                                       |
| Commercial Space   | 28,000 L/ha/day                           |
| Infiltration and Inflow Allowance  | 0.28L/s/ha                                |
| Sanitary sewers are to be sized employing the Manning's Equation                                     | $Q = (1/n)AR^{2/3}S^{1/2}$                |
| Minimum Sewer Size   | 200mm diameter                            |
| Minimum Manning's 'n'  | 0.013                                     |
| Minimum Depth of Cover   | 2.5m from crown of sewer to grade         |
| Minimum Full Flowing Velocity  | 0.6m/s                                    |
| Maximum Full Flowing Velocity  | 3.0m/s                                    |
| <i>Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, November 2012.</i> |   |

Sanitary Sewer Post Development Outflow

|                                   |                    |
|-----------------------------------|--------------------|
| <b>Site Area</b>                  | <b>0.138 ha</b>    |
| <b>Extraneous Flow Allowances</b> |                    |
| <b>Infiltration / Inflow</b>      | <b>0.04558 L/s</b> |

**Domestic Contributions**

| Unit Type                    | Unit Rate | Units | Pop             |
|------------------------------|-----------|-------|-----------------|
| Single Family                | 3.4       | 0     | 0               |
| Semi-detached and duplex     | 2.7       |       | 0               |
| Duplex                       | 2.3       |       | 0               |
| Townhouse                    | 2.7       |       | 0               |
| Apartment                    |           |       |                 |
| Bachelor                     | 1.4       | 3     | 4.2             |
| 1 Bedroom                    | 1.4       | 16    | 22.4            |
| 2 Bedroom                    | 2.1       | 4     | 8.4             |
| 3 Bedroom                    | 3.1       | 0     | 0               |
| 4 Bedroom                    | 4.2       | 0     | 0               |
| <b>Total Population</b>      |           |       | <b>35</b>       |
| <b>Average Domestic Flow</b> |           |       | <b>0.11 L/s</b> |
| <b>Peaking Factor</b>        |           |       | <b>3.7</b>      |
| <b>Peak Domestic Flow</b>    |           |       | <b>0.42 L/s</b> |

**Institutional / Commercial / Industrial Contributions**

| Property Type                                | Unit Rate                 | No. of Units | Avg Wastewater (L/s) |
|--|---------------------------|--------------|----------------------|
| Commercial                                   | 28,000 L/gross ha/d       | 0            | 0.0000               |
| Office                                       | 75 L/9.3m <sup>2</sup> /d | 0            | 0.0000               |
| Parking (Covered)*                           | 6 l/park.space/d          | 0            | 0.0000               |
| Institutional                                | 28,000 L/gross ha/d       | 0            | 0.00                 |
| Industrial - Light                           | 35,000 L/gross ha/d       | 0            | 0.00                 |
| Industrial - Heavy                           | 55,000 L/gross ha/d       | 0            | 0.00                 |
| <b>Average I/C/I Flow</b>                    |                           |              | <b>0.0000</b>        |
| <b>Peak Institutional / Commercial Flow*</b> |                           |              | <b>0.0000</b>        |
| <b>Peak Industrial Flow**</b>                |                           |              | <b>0.0000</b>        |
| <b>Peak I/C/I Flow</b>                       |                           |              | <b>0.0000</b>        |

|  |               |
|--|---------------|
| <b>Total Estimated Average Dry Weather Flow Rate</b> | <b>0.1134</b> |
| <b>Total Estimated Peak Dry Weather Flow Rate</b>    | <b>0.4168</b> |
| <b>Total Estimated Peak Wet Weather Flow Rate</b>    | <b>0.4624</b> |

\* Ottawa Sewer Design Guidelines 2012, Appendix 4-A.5

Ottawa TechBulletin ISTB-2018-01 Section 4.4.1 Page 4.5

\*\*Use Appendix 4B diagram

### FUS Fire Flow Calculations

Project: 2458 Cleroux Cres., Ottawa

Calculations Based on 1999 Publication "Water Supply for Public

Fire Protection " by Fire Underwriters' Survey (FUS)

Fire Flow Calculation #: 1

Date: **2026-02-16**

Building Type/Description/Name: Apartment building

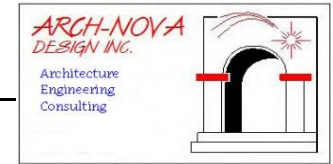
Data input by: Zoran Mrdja, P.Eng.

| Table A: Fire Underwriters Survey Determination of Required Fire Flow - Long Method |  |  |   |                                   |                       |            |                            |                         |      |       |
|---|--|--|---|-----------------------------------|-----------------------|------------|----------------------------|-------------------------|------|-------|
| Step  | Task   | Term   | Options                                 | Multiplier Associated with Option | Choose:               | Value Used | Unit                       | Total Fire Flow (L/min) |      |       |
| 1   | Choose Frame Used for Construction of Unit                         | Framing Material   |   |                                   |                       |            |                            |                         | 1.00 |       |
|   |  | Coefficient related to type of construction (C)  | Wood Frame                              | 1.50                              | Ordinary Construction |            |                            |                         |      |       |
|   |  |  | Ordinary construction                   | 1.00                              |                       |            |                            |                         |      |       |
|   |  |  | Non-combustible construction            | 0.80                              |                       |            |                            |                         |      |       |
|   |  |  | Fire resistive construction (< 2 hrs)   | 0.70                              |                       |            |                            |                         |      |       |
| Fire resistive construction (> 2 hrs)   | 0.60   |  |   |                                   |                       |            |                            |                         |      |       |
| 2   | Choose Type of Housing (if TH, Enter Number of Units Per TH Block) | Floor Space Area   |   |                                   |                       |            |                            |                         | 1    | Units |
|   |  | Type of Housing  | Single Family                           | 1                                 | Other (Comm, ind)     |            |                            |                         |      |       |
|   |  |  | Townhouse - indicate # of units         | 1                                 |                       |            |                            |                         |      |       |
|   |  |  | Other (Comm, Ind, etc.)                 | 1                                 |                       |            |                            |                         |      |       |
| 2.2   | # of Storeys   | Number of Floors/ Storeys in the Unit (do not include basement):   |   |                                   | 3                     | 3          | Storeys                    |                         |      |       |
| 3   | Enter Ground Floor Area of One Unit                                | Enter Ground Floor Area (A) of One Unit Only :   |   |                                   | 0                     | 1650       | Area in Square Meters (m2) |                         |      |       |
|   |  | Measurement Units  | Square Feet (ft2)                       | 0.093                             | Square Metres (m2)    |            |                            |                         |      |       |
|   |  |  | Square Metres (m2)                      | 550                               |                       |            |                            |                         |      |       |
| Hectares (ha)   | 10000  |  |   |                                   |                       |            |                            |                         |      |       |
| 4   | Obtain Required Fire Flow without Reductions                       | Required Fire Flow( without reductions or increases per FUS) ( $F = 220 * C * \sqrt{A}$ ) Round to nearest 1000L/min |   |                                   |                       |            |                            | 8,936                   |      |       |
| 5   | Apply Factors Affecting Burning                                    | Reductions/Increases Due to Factors Affecting Burning  |   |                                   |                       |            |                            |                         |      |       |
| 5.1   | Choose Combustibility of Building Contents                         | Occupancy content hazard reduction or surcharge  | Non-combustible                         | -0.25                             | Non-combustible       |            | N/A                        |                         |      |       |
|   |  |  | Limited combustible                     | -0.15                             |                       |            |                            |                         |      |       |
|   |  |  | Combustible                             | 0.00                              |                       |            |                            |                         |      |       |
|   |  |  | Free burning                            | 0.15                              |                       |            |                            |                         |      |       |
|   |  |  | Rapid burning                           | 0.25                              |                       |            |                            |                         |      |       |
| 5.2   | Choose Reduction Due to Presence of Sprinklers                     | Sprinkler reduction  | Complete Automatic Sprinkler Protection | -0.3                              | None                  | 0.00       | N/A                        | 0                       |      |       |
|   | None   | 0  |   |                                   |                       |            |                            |                         |      |       |
| 5.3   | Choose Separation Distance Between Units                           | Exposure Distance Between Units  | North Side                              | 10.1-20 m                         | 0.15                  | 0.65       | m                          | 5,809                   |      |       |
|   |  |  | East Side                               | 0-3 m                             | 0.25                  |            |                            |                         |      |       |
|   |  |  | South Side                              | 30.1-45 m                         | 0.05                  |            |                            |                         |      |       |
|   |  |  | West Side                               | 3.1-10 m                          | 0.20                  |            |                            |                         |      |       |
| 6   | Obtain Required Fire Flow, Duration & Volume                       | Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:                                |   |                                   |                       |            |                            | 12,000                  |      |       |
|   |  | Total Required Fire Flow (above) in L/s:   |   |                                   |                       |            |                            | 200                     |      |       |
|   |  | Required Duration of Fire Flow (hrs)   |   |                                   |                       |            |                            | 2.00                    |      |       |
|   |  | Required Volume of Fire Flow (m³)  |   |                                   |                       |            |                            | 1440                    |      |       |

Note: The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline

| Legend |   |
|--------|---|
|        | Drop down menu - choose option, or enter value. |
|        | No Information, No input required.              |

**Note:**  
 The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline. Fire protection will be provided from the nearest hydrant (Class AA) at 41.3 m distance. The second nearest hydrant (Class AA) is located south from the property at 114.1 m distance and a third hydrant (Class AA) is at distance of 195.8 m.  
 In accordance with Table 18.5.4.3 of ISTB-2018-02 they have combined capacity of **12,302 l/min**



**PRE-DEVELOPMENT (all uncontrolled)**

The pre-development time of concentration is **10** minutes

where:

$$I_2 = 732.951 / (Tc + 6.199)^{0.810}$$

$$I_2 = \mathbf{76.8 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

| Surface Type        | ID  | Area (ha)     | Percent of total Area | C    | A X C (ha)   |
|---------------------|-----|---------------|-----------------------|------|--------------|
| Vegetation area     | A1  | 0.0360        | 25.8%                 | 0.30 | 0.011        |
| Green space         | A2  | 0.0640        | 45.9%                 | 0.40 | 0.026        |
| Shed                | A3  | 0.0035        | 2.5%                  | 0.90 | 0.003        |
| Shed2               | A4  | 0.0008        | 0.6%                  | 0.90 | 0.001        |
| House               | A5  | 0.0142        | 10.2%                 | 0.90 | 0.013        |
| Porch               | A6  | 0.0030        | 2.2%                  | 0.90 | 0.003        |
| Green space         | A7  | 0.0010        | 0.7%                  | 0.40 | 0.000        |
| Green space         | A8  | 0.0110        | 7.9%                  | 0.40 | 0.004        |
| Driveway            | A9  | 0.0040        | 2.9%                  | 0.80 | 0.003        |
| Wood ramp           | A10 | 0.0020        | 1.4%                  | 0.50 | 0.001        |
| <b>TOTAL</b>        |     | <b>0.1395</b> | <b>100.0%</b>         |      | <b>0.065</b> |
| <b>Weighted C =</b> |     |               |                       |      | <b>0.46</b>  |

$$Q_{2pre} = (2.78) * (C) * (I_2) * (A)$$

$$Q_{2pre} = 2.78 \times 0.46 \times 76.8 \times 0.1395$$

$$Q_{2pre} = \mathbf{13.70 \text{ L/s}}$$

$$Q_{100pre} = (2.78) * (C) * (I_{100}) * (A)$$

$$Q_{100pre} = 2.78 \times 0.58 \times 178.6 \times 0.1395$$

$$Q_{100pre} = \mathbf{39.83 \text{ L/s}}$$

**0.46 Actual C factor**

C=0.5 for predevelopment (City of Ottawa)

**POST-DEVELOPMENT (UNCONTROLLED RUNOFF)**

The post-development time of concentration is **10** minutes

where:

$$I_2 = 732.951 / (Tc + 6.199)^{0.810}$$

$$I_2 = \mathbf{76.8 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

| Surface Type        | ID | Area (ha)     | Percent of total Area | C    | A X C (ha)   |
|---------------------|----|---------------|-----------------------|------|--------------|
| Landscape A2        |    | 0.072000      | 85.7%                 | 0.45 | 0.032        |
| Landscape A3        |    | 0.012000      | 14.3%                 | 0.70 | 0.008        |
|                     |    |               |                       |      |              |
|                     |    |               |                       |      |              |
|                     |    |               |                       |      |              |
|                     |    |               |                       |      |              |
|                     |    |               |                       |      |              |
|                     |    |               |                       |      |              |
|                     |    |               |                       |      |              |
| <b>TOTAL</b>        |    | <b>0.0840</b> | <b>100.0%</b>         |      | <b>0.041</b> |
| <b>Weighted C =</b> |    |               |                       |      | <b>0.49</b>  |

$$Q_{2post} = (2.78) * (C) * (I_2) * (A)$$

$$Q_{2post} = 2.78 \times 0.49 \times 76.8 \times 0.0840$$

$$Q_{2post} = \mathbf{8.79 \text{ L/s}}$$

$$Q_{100post} = (2.78) * (C) * (I_{100}) * (A)$$

$$Q_{100post} = 2.78 \times 0.61 \times 178.6 \times 0.0840$$

$$Q_{100post} = \mathbf{25.55 \text{ L/s}}$$

**0.49 Actual C factor**

Post-development 100-year C factor increased for 25%



**PRE-DEVELOPMENT CONTROLLED RUNOFF**

The pre-development time of concentration is **10** minutes

where:

$$I_2 = 732.951 / (Tc + 6.199)^{0.810}$$

$$I_2 = \mathbf{76.8 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

| Surface Type        | ID | Area (ha) | Percent of total Area | C    | A X C (ha) |
|---------------------|----|-----------|-----------------------|------|------------|
| Bus Stop            | A1 | 0.00000   | 0.0%                  | 0.95 | 0.000      |
| Parking             | A2 | 0.00000   | 0.0%                  | 0.95 | 0.000      |
| Green area          | A3 | 0.00000   | 0.0%                  | 0.70 | 0.000      |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
| <b>TOTAL</b>        |    | 0.0000    | 0.0%                  |      | 0.000      |
| <b>Weighted C =</b> |    |           |                       |      | 0.00       |

$$Q_{2pre} = (2.78) \cdot (C) \cdot (I_2) \cdot (A)$$

$$Q_{2pre} = 2.78 \times 0.00 \times 76.8 \times 0.0000$$

$$Q_{2pre} = 0.00 \text{ L/s}$$

$$Q_{100pre} = (2.78) \cdot (C) \cdot (I_{100}) \cdot (A)$$

$$Q_{100pre} = 2.78 \times 0.00 \times 178.6 \times 0.0000$$

$$Q_{100pre} = 0.00 \text{ L/s}$$

C=0.6 used for predevelopment calculation (City of Ottawa requirement)

**POST-DEVELOPMENT (CONTROLLED RUNOFF)**

The post-development time of concentration is **10** minutes

where:

$$I_2 = 732.951 / (Tc + 6.199)^{0.810}$$

$$I_2 = \mathbf{76.8 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

| Surface Type        | ID | Area (ha) | Percent of total Area | C    | A X C (ha) |
|---------------------|----|-----------|-----------------------|------|------------|
| Building            | A1 | 0.05550   | 0.0%                  | 0.95 | 0.053      |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
| <b>TOTAL</b>        |    | 0.05550   | 0.0%                  |      | 0.053      |
| <b>Weighted C =</b> |    |           |                       |      | 0.95       |

$$Q_{2post} = (2.78) \cdot (C) \cdot (I_2) \cdot (A)$$

$$Q_{2post} = 2.78 \times 0.95 \times 76.8 \times 0.0555$$

$$Q_{2post} = 11.26 \text{ L/s}$$

$$Q_{100post} = (2.78) \cdot (C) \cdot (I_{100}) \cdot (A)$$

$$Q_{100post} = 2.78 \times 1.00 \times 178.6 \times 0.0555$$

$$Q_{100post} = 27.56 \text{ L/s}$$

Post-development 100-year C factor increased for 25%

Project Number: CW-02-21

2458 Cleroux Cres. Ottawa

**PREDEVELOPMENT RUNOFF DISTRIBUTION**

**UNCONTROLLED TO REAR**

The pre-development time of concentration is **10** minutes

where:

$$I_2 = 732.951 / (T_c + 6.199)^{0.810}$$

$$I_2 = \mathbf{76.8 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (T_c + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

| Surface Type        | ID | Area (ha) | Percent of total Area | C    | A X C (ha) |
|---------------------|----|-----------|-----------------------|------|------------|
| Vegetation area     | A1 | 0.0360    | 32.3%                 | 0.25 | 0.009      |
| Green space         | A2 | 0.0640    | 57.5%                 | 0.25 | 0.016      |
| Shed                | A3 | 0.0035    | 3.1%                  | 0.90 | 0.003      |
| Shed2               | A4 | 0.0008    | 0.7%                  | 0.90 | 0.001      |
| House               | A5 | 0.0071    | 6.4%                  | 0.90 | 0.006      |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
| <b>TOTAL</b>        |    | 0.11140   | 100.0%                |      | 0.035      |
| <b>Weighted C =</b> |    |           |                       |      | 0.32       |

$$Q_{2pre} = (2.78) \cdot (C) \cdot (I_2) \cdot (A)$$

$$Q_{2pre} = 2.78 \times 0.32 \times 76.8 \times 0.1114$$

$$Q_{2pre} = \mathbf{7.61 \text{ L/s}}$$

$$Q_{100pre} = (2.78) \cdot (C) \cdot (I_{100}) \cdot (A)$$

$$Q_{100pre} = 2.78 \times 0.32 \times 178.6 \times 0.1114$$

$$Q_{100pre} = \mathbf{17.70 \text{ L/s}}$$

**0.32 Actual C factor**

Note: Maximum C=0.5 for predevelopment (City of Ottawa) \* house's 1/2 of the roof drains to the rear yard

**UNCONTROLLED TO FRONT**

The pre-development time of concentration is **10** minutes

where:

$$I_2 = 732.951 / (T_c + 6.199)^{0.810}$$

$$I_2 = \mathbf{76.8 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (T_c + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

| Surface Type        | ID  | Area (ha) | Percent of total Area | C    | A X C (ha) |
|---------------------|-----|-----------|-----------------------|------|------------|
| House*              | A5  | 0.0071    | 6.4%                  | 0.90 | 0.006      |
| Porch               | A6  | 0.0030    | 2.7%                  | 0.75 | 0.002      |
| Green space         | A7  | 0.0010    | 0.9%                  | 0.25 | 0.000      |
| Green space         | A8  | 0.0110    | 9.9%                  | 0.25 | 0.003      |
| Driveway            | A9  | 0.0040    | 3.6%                  | 0.80 | 0.003      |
| Wood ramp           | A10 | 0.0020    | 1.8%                  | 0.40 | 0.001      |
|                     |     |           |                       |      |            |
|                     |     |           |                       |      |            |
|                     |     |           |                       |      |            |
|                     |     |           |                       |      |            |
|                     |     |           |                       |      |            |
|                     |     |           |                       |      |            |
|                     |     |           |                       |      |            |
| <b>TOTAL</b>        |     | 0.0281    | 25.2%                 |      | 0.016      |
| <b>Weighted C =</b> |     |           |                       |      | 0.56       |

$$Q_{2pre} = (2.78) \cdot (C) \cdot (I_2) \cdot (A)$$

$$Q_{2pre} = 2.78 \times 0.56 \times 76.8 \times 0.0281$$

$$Q_{2pre} = \mathbf{3.36 \text{ L/s}}$$

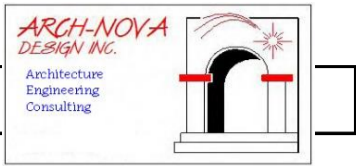
$$Q_{100pre} = (2.78) \cdot (C) \cdot (I_{100}) \cdot (A)$$

$$Q_{100pre} = 2.78 \times 0.70 \times 178.6 \times 0.0281$$

$$Q_{100pre} = \mathbf{9.77 \text{ L/s}}$$

**0.56 Actual C factor**

Note: \* house's 1/2 of the roof drains toward the street



Project Number: CW-02-21

2458 Cleroux Cres. Ottawa

**POST-DEVELOPMENT RUNOFF DISTRIBUTION**

**UNCONTROLLED TO REAR**

The post-development time of concentration is **10** minutes

where:

$$I_2 = 732.951 / (Tc + 6.199)^{0.810}$$

$$I_2 = \mathbf{76.8 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

| Surface Type        | ID | Area (ha) | Percent of total Area | C    | A X C (ha) |
|---------------------|----|-----------|-----------------------|------|------------|
| Landscape 1         | A2 | 0.036000  | 50.0%                 | 0.25 | 0.009      |
| Landscape 1         | A2 | 0.036000  | 50.0%                 | 0.70 | 0.025      |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
| <b>TOTAL</b>        |    | 0.0720    | 100.0%                |      | 0.034      |
| <b>Weighted C =</b> |    |           |                       |      | 0.48       |

$$Q_{2post} = (2.78) \cdot (C) \cdot (I_2) \cdot (A)$$

$$Q_{2post} = 2.78 \times 0.48 \times 76.8 \times 0.0720$$

$$Q_{2post} = \mathbf{7.38 \text{ L/s}}$$

$$Q_{100post} = (2.78) \cdot (C) \cdot (I_{100}) \cdot (A)$$

$$Q_{100post} = 2.78 \times 0.60 \times 178.6 \times 0.0720$$

$$Q_{100post} = \mathbf{21.45 \text{ L/s}}$$

**0.48 Actual C factor**

Post-development 100-year C factor increased for 25%

**UNCONTROLLED TO FRONT**

The post-development time of concentration is **10** minutes

where:

$$I_2 = 732.951 / (Tc + 6.199)^{0.810}$$

$$I_2 = \mathbf{76.8 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

| Surface Type        | ID | Area (ha) | Percent of total Area | C    | A X C (ha) |
|---------------------|----|-----------|-----------------------|------|------------|
| Landscape 2         |    | 0.016200  | 22.5%                 | 0.70 | 0.011      |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
|                     |    |           |                       |      |            |
| <b>TOTAL</b>        |    | 0.0162    | 22.5%                 |      | 0.011      |
| <b>Weighted C =</b> |    |           |                       |      | 0.70       |

$$Q_{2post} = (2.78) \cdot (C) \cdot (I_2) \cdot (A)$$

$$Q_{2post} = 2.78 \times 0.70 \times 76.8 \times 0.0162$$

$$Q_{2post} = \mathbf{2.42 \text{ L/s}}$$

$$Q_{100post} = (2.78) \cdot (C) \cdot (I_{100}) \cdot (A)$$

$$Q_{100post} = 2.78 \times 0.88 \times 178.6 \times 0.0162$$

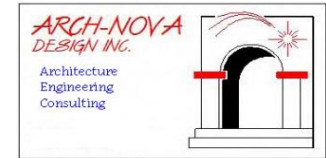
$$Q_{100post} = \mathbf{7.04 \text{ L/s}}$$

**0.70 Actual C factor**

Post-development 100-year C factor increased for 25%

**ALLOWABLE RUNOFF SUMMARY**

| Predevelopment Runoff:   | Predevelopment Runoff Distribution  | Post-development Runoff Distribution                                  | Comments                         |
|--|-------------------------------------|---|----------------------------------|
| <b>Uncontrolled Runoff</b>   | <b>Uncontrolled Runoff to Rear</b>  | <b>Uncontrolled Runoff to Rear</b>                                    |                                  |
| 2-year 13.70 l/sec   | 2-year 7.61 l/sec                   | 2-year 7.38 l/sec   | Runoff reduced                   |
| 100-year 39.83 l/sec   | 100-year 17.70 l/sec                | **100-year 21.45 l/sec  | Runoff increased (see Comment**) |
| <b>Controlled Runoff:</b>  | <b>Uncontrolled Runoff to Front</b> | <b>Uncontrolled Runoff to Front</b>                                   |                                  |
| 2-year 0.00 l/sec  | 2-year 3.36 l/sec                   | 2-year 2.42 l/sec   | Runoff reduced                   |
| 100-year 0.00 l/sec  | 100-year 9.77 l/sec                 | **100-year 7.04 l/sec   | Runoff increased (see Comment**) |
| <b>Postdevelopment Runoff:</b>   |                                     | **Comment: runoff coefficient increase 25% (climate change allowance) |                                  |
| <b>Uncontrolled Runoff</b>   |                                     |   |                                  |
| 2-year 8.79 l/sec  |                                     |   |                                  |
| 100-year 25.55 l/sec   |                                     |   |                                  |
| <b>Controlled Runoff:</b>  |                                     |   |                                  |
| 2-year 11.26 l/sec   |                                     |   |                                  |
| 100-year 27.56 l/sec   |                                     |   |                                  |
| <b>Controlled allowable runoff</b>   |                                     |   |                                  |
| <b>Allowable Runoff:</b>   |                                     |   |                                  |
| 100-year* 6.66 l/sec   |                                     |   |                                  |
| <p>*Comment: City allows 2 year pre-development total runoff less uncontrolled 100 year postdevelopment runoff to the front.</p> |                                     |   |                                  |



### Storage Volumes (2-Year Storm)

2458 Cleroux Cres. Ottawa

Tc = 10 (mins)  
 C<sub>AVG</sub> = 1.00 (dimensionless)  
 Area = 0.056 (hectares)  
 Storm = 2 (year)  
 Release Rate = 6.66 (L/sec)  
 Time Interval = 5 (mins)

| Duration (min) | Rainfall Intensity (mm/hr) | Peak Flow (L/sec) | Release Rate (L/sec) | Storage Rate (L/sec) | Storage (m <sup>3</sup> ) |
|----------------|----------------------------|-------------------|----------------------|----------------------|---------------------------|
| 1              | 148                        | 2.3               | 6.66                 |                      |                           |
| 6              | 97                         | 8.9               | 6.66                 | 2.28                 | 0.82                      |
| 11             | 73                         | 11.3              | 6.66                 | 4.63                 | 3.05                      |
| 16             | 60                         | 9.2               | 6.66                 | 2.52                 | 2.42                      |
| 21             | 50                         | 7.8               | 6.66                 | 1.13                 | 1.42                      |
| 26             | 44                         | 6.8               | 6.66                 | 0.13                 | 0.20                      |
| 31             | 39                         | 6.0               | 6.66                 | -0.62                | -1.15                     |
| 36             | 35                         | 5.5               | 6.66                 | -1.21                | -2.60                     |
| 41             | 32                         | 5.0               | 6.66                 | -1.68                | -4.13                     |
| 46             | 30                         | 4.6               | 6.66                 | -2.07                | -5.71                     |
| 51             | 28                         | 4.3               | 6.66                 | -2.40                | -7.34                     |
| 56             | 26                         | 4.0               | 6.66                 | -2.68                | -9.00                     |
| 61             | 24                         | 3.7               | 6.66                 | -2.92                | -10.68                    |
| 66             | 23                         | 3.5               | 6.66                 | -3.13                | -12.40                    |
| 71             | 22                         | 3.3               | 6.66                 | -3.32                | -14.13                    |
| 76             | 21                         | 3.2               | 6.66                 | -3.48                | -15.88                    |
| 81             | 20                         | 3.0               | 6.66                 | -3.63                | -17.65                    |
| 86             | 19                         | 2.9               | 6.66                 | -3.77                | -19.43                    |
| 91             | 18                         | 2.8               | 6.66                 | -3.89                | -21.22                    |
| 96             | 17                         | 2.7               | 6.66                 | -4.00                | -23.02                    |
| 101            | 17                         | 2.6               | 6.66                 | -4.10                | -24.84                    |
| 106            | 16                         | 2.5               | 6.66                 | -4.19                | -26.66                    |
| 111            | 15                         | 2.4               | 6.66                 | -4.28                | -28.48                    |
| 116            | 15                         | 2.3               | 6.66                 | -4.36                | -30.32                    |
| 121            | 14                         | 2.2               | 6.66                 | -4.43                | -32.16                    |
| 126            | 14                         | 2.2               | 6.66                 | -4.50                | -34.01                    |
| 131            | 14                         | 2.1               | 6.66                 | -4.56                | -35.86                    |
| 136            | 13.2                       | 2.0               | 6.66                 | -4.62                | -37.72                    |

#### Notes

- 1) For a storm duration that is less than the time of concentration the peak flow is equal to the product of 2.78CIA and the ratio of the storm duration to the time of concentration.
- 2) Rainfall Intensity, I = 732.951 / (Tc + 6.199)<sup>0.810</sup> (2 year, City of Ottawa)
- 3) Peak Flow = Duration/Tc x 2.78 x C x I x A (Duration < Tc)
- 4) Peak Flow = 2.78 x C x I x A (Duration > Tc)
- 5) Storage = Duration x Storage Rate

### Storage Volumes (100-Year Storm)

Tc = 10 (mins)  
 C<sub>AVG</sub> = 1.00 (dimensionless)  
 Area = 0.056 (hectares)  
 Storm = 100 (year)  
 Release Rate = 6.66 (L/sec)  
 Time Interval = 5 (mins)

| Duration (min) | Rainfall Intensity (mm/hr) | Peak Flow (L/sec) | Release Rate (L/sec) | Storage Rate (L/sec) | Storage (m <sup>3</sup> ) |
|----------------|----------------------------|-------------------|----------------------|----------------------|---------------------------|
| 1              | 351                        | 5.4               | 6.66                 |                      |                           |
| 6              | 226                        | 20.9              | 6.66                 | 14.26                | 5.13                      |
| 11             | 170                        | 26.2              | 6.66                 | 19.55                | 12.90                     |
| 16             | 138                        | 21.2              | 6.66                 | 14.56                | 13.98                     |
| 21             | 116                        | 17.9              | 6.66                 | 11.28                | 14.21                     |
| 26             | 101                        | 15.6              | 6.66                 | 8.95                 | 13.96                     |
| 31             | 90                         | 13.9              | 6.66                 | 7.20                 | 13.39                     |
| 36             | 81                         | 12.5              | 6.66                 | 5.83                 | 12.59                     |
| 41             | 74                         | 11.4              | 6.66                 | 4.73                 | 11.63                     |
| 46             | 68                         | 10.5              | 6.66                 | 3.82                 | 10.55                     |
| 51             | 63                         | 9.7               | 6.66                 | 3.06                 | 9.37                      |
| 56             | 59                         | 9.1               | 6.66                 | 2.41                 | 8.11                      |
| 61             | 55                         | 8.5               | 6.66                 | 1.86                 | 6.79                      |
| 66             | 52                         | 8.0               | 6.66                 | 1.37                 | 5.42                      |
| 71             | 49                         | 7.6               | 6.66                 | 0.94                 | 3.99                      |
| 76             | 47                         | 7.2               | 6.66                 | 0.56                 | 2.53                      |
| 81             | 45                         | 6.9               | 6.66                 | 0.21                 | 1.04                      |
| 86             | 43                         | 6.6               | 6.66                 | -0.09                | -0.49                     |
| 91             | 41                         | 6.3               | 6.66                 | -0.37                | -2.04                     |
| 96             | 39                         | 6.0               | 6.66                 | -0.63                | -3.61                     |
| 101            | 38                         | 5.8               | 6.66                 | -0.86                | -5.21                     |
| 106            | 36                         | 5.6               | 6.66                 | -1.07                | -6.82                     |
| 111            | 35                         | 5.4               | 6.66                 | -1.27                | -8.45                     |
| 116            | 34                         | 5.2               | 6.66                 | -1.45                | -10.10                    |
| 121            | 33                         | 5.0               | 6.66                 | -1.62                | -11.76                    |
| 126            | 32                         | 4.9               | 6.66                 | -1.78                | -13.44                    |
| 131            | 31                         | 4.7               | 6.66                 | -1.92                | -15.12                    |
| 136            | 30                         | 4.6               | 6.66                 | -2.06                | -16.82                    |

#### Notes

- 1) For a storm duration that is less than the time of concentration the peak flow is equal to the product of 2.78CIA and the ratio of the storm duration to the time of concentration.
- 2) Rainfall Intensity, I = 1735.688 / (Tc + 6.014)<sup>0.820</sup> (100 year, City of Ottawa)
- 3) Peak Flow = Duration/Tc x 2.78 x C x I x A (Duration < Tc)
- 4) Peak Flow = 2.78 x C x I x A (Duration > Tc)
- 5) Storage = Duration x Storage Rate



### Storage Requirements

2-year **3.05 m<sup>3</sup>**  
 100-year **14.21 m<sup>3</sup>**

| Surface Type | ID | Area (ha) | Percent of total Area | Required Storage 2 year | Required Storage 100 year | Max Allowed Drain Outflow l/s | Max Allowed Drain Outflow GPM |
|--------------|----|-----------|-----------------------|-------------------------|---------------------------|-------------------------------|-------------------------------|
| Roof         | A1 | 0.0278    | 50.0%                 | 1.53                    | 7.11                      | 3.33                          | 52.80                         |
| Roof         | A2 | 0.0278    | 50.0%                 | 1.53                    | 7.11                      | 3.33                          | 52.80                         |
| <b>TOTAL</b> |    | 0.0555    | 100.0%                | 3.05                    | 14.21                     | 6.66                          | 105.60                        |

### Stage-Storage

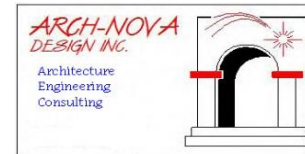
| Roof A1 (Drain 1) |                        |                          | Roof A2 (Drain 2) |                        |                          |
|-------------------|------------------------|--------------------------|-------------------|------------------------|--------------------------|
| Depth<br>m        | Area<br>m <sup>2</sup> | Volume<br>m <sup>3</sup> | Depth<br>m        | Area<br>m <sup>2</sup> | Volume<br>m <sup>3</sup> |
| 0.030             | 55.00                  | 0.55                     | 0.030             | 55.00                  | 0.55                     |
| 0.040             | 70.00                  | 0.93                     | 0.040             | 70.00                  | 0.93                     |
| <b>0.05</b>       | <b>90.00</b>           | <b>1.50</b>              | <b>0.05</b>       | <b>90.00</b>           | <b>1.50</b>              |
| <b>0.077</b>      | <b>277.00</b>          | <b>7.11</b>              | <b>0.077</b>      | <b>277.00</b>          | <b>7.11</b>              |

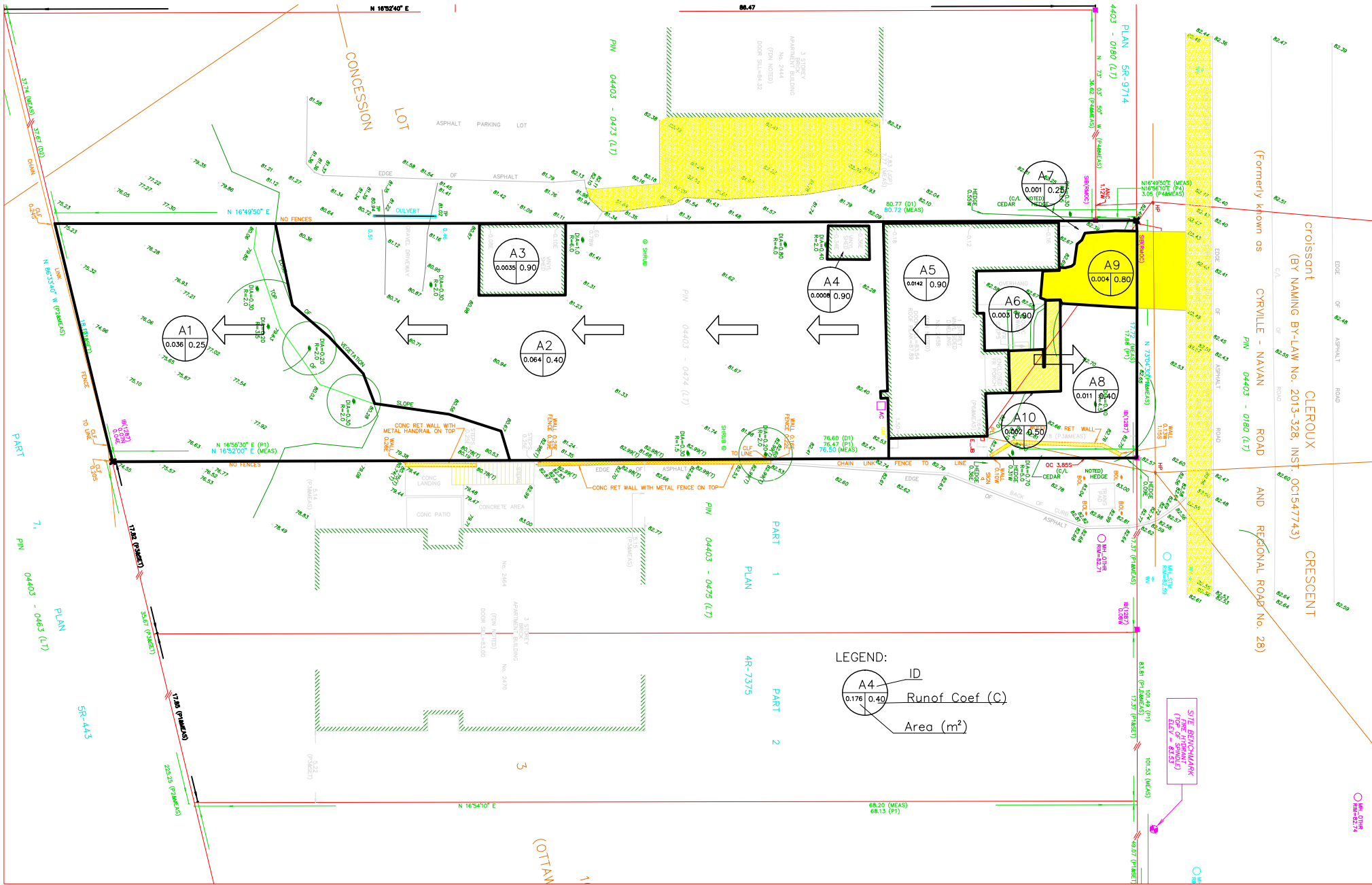
Legend:

|                         |  |
|-------------------------|--|
| data for 2-year event   |  |
| data for 100-year event |  |

### Notes:

Roof drains with controlled flow to be specified by manufacturer using the allowable flow rates presented in this chart

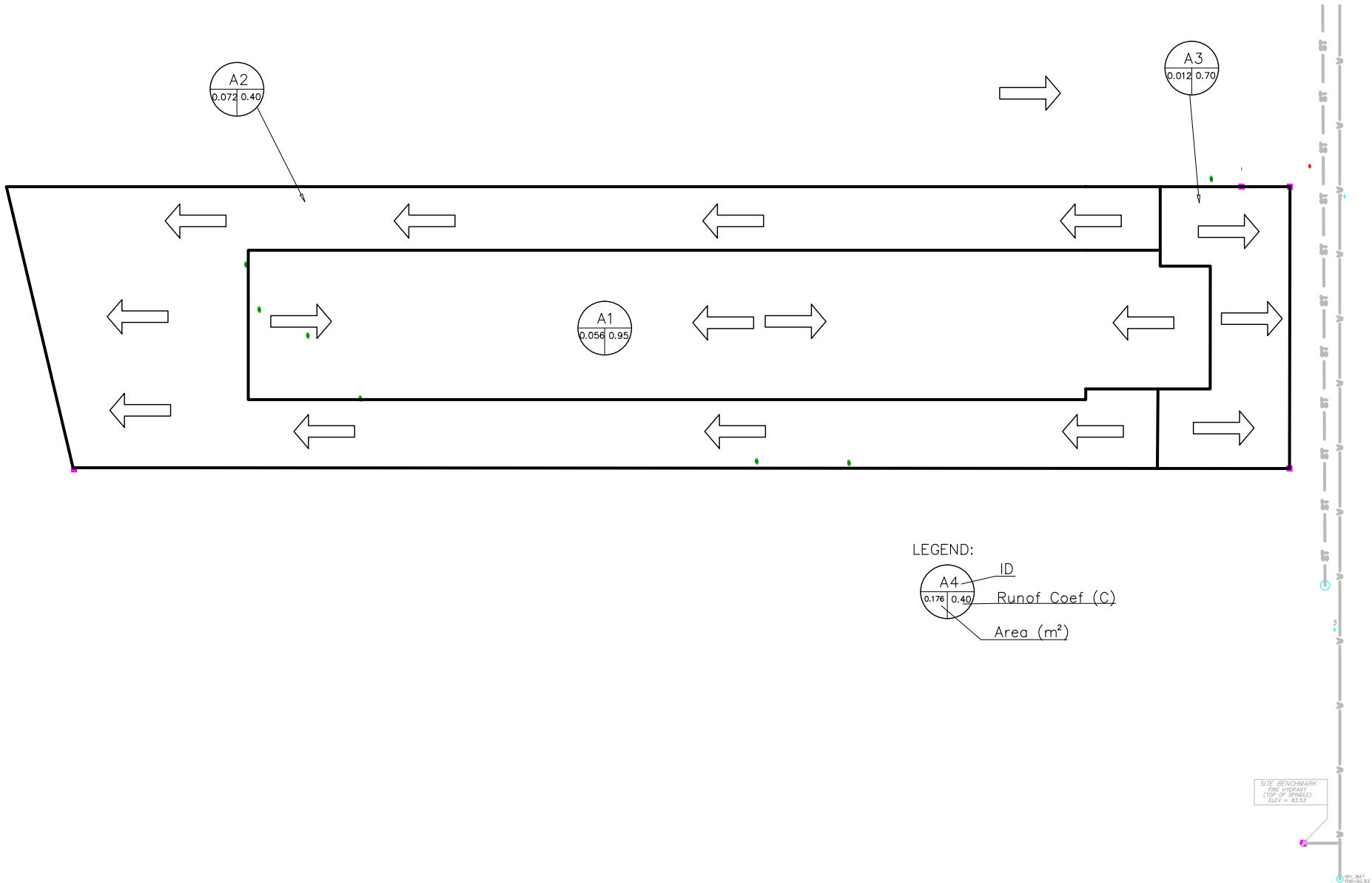




2458 CLEROUX CRES  
SWM PREDEVELOPMENT

*ARCH-NOVA Design Inc.*

45 Banner Road NEPEAN ON K2H 8X5  
613-702-3403 contact@archnova.ca



2458 CLEROUX CRES  
SWM POSTDEVELOPMENT

*ARCH-NOVA Design Inc.*

45 Banner Road NEPEAN ON K2H 8X5  
613-702-3403 contact@archnova.ca

## Manning Formula Uniform Pipe Flow at Given Slope and Depth

2458 Cleroux Cres, Ottawa

**Inputs: sanitary lateral**

|   |          |         |
|---|----------|---------|
| Pipe Diameter, $d_o$  | 150.0000 | mm      |
| Manning Roughness, $n$  | 0.0130   |         |
| Pressure slope (possibly equal to pipe slope), $S_o$            | 3.5000   | % slope |
| Percent of (or ratio to) full depth (100% or 1 if flowing full) | 8.9000   | %       |

**Results:**

|                                       |        |                  |
|---------------------------------------|--------|------------------|
| Flow, $Q$                             | 0.4654 | l/s              |
| Velocity, $v$                         | 0.6006 | m/s              |
| Velocity head, $h_v$                  | 0.0184 | m                |
| Flow Area, $A$                        | 0.0008 | m <sup>2</sup>   |
| Wetted Perimeter, $P$                 | 0.0909 | m                |
| Hydraulic Radius                      | 0.0085 | m                |
| Top Width, $T$                        | 0.0854 | m                |
| Froude Number, $F$                    | 2.01   |                  |
| Shear Stress (tractive force), $\tau$ | 4.5819 | N/m <sup>2</sup> |

## Manning Formula Uniform Pipe Flow at Given Slope and Depth

2458 Cleroux Cres, Ottawa

**Inputs: storm lateral**

|   |          |         |
|---|----------|---------|
| Pipe Diameter, $d_o$  | 200.0000 | mm      |
| Manning Roughness, $n$  | 0.0130   |         |
| Pressure slope (possibly equal to pipe slope), $S_o$            | 1.5000   | % slope |
| Percent of (or ratio to) full depth (100% or 1 if flowing full) | 27.5000  | %       |

**Results:**

|                                       |        |                  |
|---------------------------------------|--------|------------------|
| Flow, $Q$                             | 6.6399 | l/s              |
| Velocity, $v$                         | 0.9456 | m/s              |
| Velocity head, $h_v$                  | 0.0456 | m                |
| Flow Area, $A$                        | 0.0070 | m <sup>2</sup>   |
| Wetted Perimeter, $P$                 | 0.2208 | m                |
| Hydraulic Radius                      | 0.0318 | m                |
| Top Width, $T$                        | 0.1786 | m                |
| Froude Number, $F$                    | 1.52   |                  |
| Shear Stress (tractive force), $\tau$ | 8.0900 | N/m <sup>2</sup> |

## Site Plan Pre- Application Consultation Notes

**Date:** Monday, March 18, 2021

**Site Location:** 2458 Cleroux Croissant

**Type of Development:**  Residential ( townhomes,  stacked,  singles,  apartments),  Office Space,  Commercial,  Retail,  Institutional,  Industrial, Other: N/A

### Infrastructure

#### Water

Existing public services:

- Cleroux Crossiant – 203 mm Ductile Iron



Watermain Frontage Fees to be paid (\$190.00 per metre) on Woodroffe Avenue  Yes  No

#### Boundary conditions:

Civil consultant must request boundary conditions from the City's assigned Project Manager prior to first submission.

- Water boundary condition requests must include the location of the service(s) and the expected loads required by the proposed developments. Please provide all the following information:
  - Location of service(s)
  - Type of development and the amount of fire flow required (as per FUS, 1999)
  - Average daily demand: \_\_\_ L/s
  - Maximum daily demand: \_\_\_ L/s
  - Maximum hourly daily demand: \_\_\_ L/s
- Fire protection (Fire demand, Hydrant Locations)
- Please submit sanitary demands with the water boundary conditions to identify any capacity constraints at the local pumping station

#### General comments

- Service areas with a basic demand greater than 50 m<sup>3</sup>/day shall be connected with a minimum of two water services, separated by an isolation valve, to avoid creation of vulnerable service area.
- A District Metering Area Chamber (DMA) is required for services 150mm or greater in diameter.

## Sanitary Sewer

---

Existing public services:

- Cleroux Crossiant – 250mm Concrete



Is a monitoring manhole required on private property?  Yes

No

### General comments

- Please submit sanitary demands with the water boundary conditions to identify any capacity constraints at the local pumping station.
- For concrete sewer pipe, maintenance holes shall be installed when the service is greater than 50% of the diameter of the mainline concrete pipe.

## Storm Sewer

---

Existing public services:

- Cleroux Crossiant – 375mm PVC



### General comments

- Ensure that the proposed drive ramp entrance to the underground parking garage is protected from the major overland flow route.
  - A minimum freeboard elevation of 350mm from highpoint of the ramp to the street spill elevation.
  - A minimum freeboard elevation of 300mm from the invert of the ramp drain to the 100 year HGL of the storm sewer.
  - In general conformity of City of Ottawa Standard S17.
- A separate storm service connection is required for the ramp drain and the foundation drain

### Stormwater Management

---

#### Quality Control:

- Rideau Valley Conservation Authority to confirm quality control requirements.

#### Quantity Control:

- Site is located within the Mud (Green's) Creek Area Subwatershed Study Area draining to the Ottawa River
- Time of concentration (Tc): Tc = pre-development; maximum Tc = 10 min
- Allowable run-off coefficient C = 0.5
- Allowable flowrate: Allowable flowrate: Control the 100-year storm events to the 2-year storm event.

### General Service Design Comments

---

- During the pre-consultation meeting there was a discussion about the servicing the units through a common corridor. Building Code Services is responsible for plumbing within the building and should be consulted for plumbing and fire suppression inquiries. BuildingPermits@ottawa.ca
- Existing sewer or watermain that are not reused must be decommissioned as per City Standards.
- The City of Ottawa Standard Detail Drawings should be referenced where possible for all work within the Public Right-of-Way.

### Other

---

Capital Works Projects within proximity to application?  Yes  No

### References and Resources

---

- As per section 53 of the Professional Engineers Act, O. Reg 941/40, R.S.O. 1990, all documents prepared by engineers must be signed and dated on the seal.
- All required plans & reports are to be provided in \*.pdf format (at application submission and for any, and all, re-submissions)
- Please find relevant City of Ottawa Links to Preparing Studies and Plans below:  
<https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#standards-policies-and-guidelines>
- To request City of Ottawa plan(s) or report information please contact the City of Ottawa Information Centre:  
[InformationCentre@ottawa.ca](mailto:InformationCentre@ottawa.ca)<mailto:InformationCentre@ottawa.ca>  
(613) 580-2424 ext. 44455
- geoOttawa  
<http://maps.ottawa.ca/geoOttawa/>

**SITE PLAN APPLICATION – Municipal servicing**

For information on preparing required studies and plans refer to:

<http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans>

| S/A | Number of copies | ENGINEERING  |   | S/A | Number of copies |
|-----|------------------|--|---|-----|------------------|
| S   |                  | 1. Site Servicing Plan   | 2. Site Servicing Brief                       | S   |                  |
| S   |                  | 3. Grade Control and Drainage Plan   | 4. Geotechnical Study                         | S   |                  |
|     |                  | 5. Composite Utility Plan  | 6. Groundwater Impact Study                   |     |                  |
|     |                  | 7. Servicing Options Report  | 8. Wellhead Protection Study                  |     |                  |
|     |                  | 9. Community Transportation Study and/or Transportation Impact Study / Brief | 10. Erosion and Sediment Control Plan / Brief | S   |                  |
| S   |                  | 11. Storm water Management Brief   | 12. Hydro-geological and Terrain Analysis     |     |                  |
|     |                  | 13. Water main Analysis  | 14. Noise / Vibration Study                   | S   |                  |
|     |                  | 15. Roadway Modification Design Plan   | 16. Confederation Line Proximity Study        |     |                  |

*It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, City Planning will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City’s standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the City.*

**Notes:**

- 4. Geotechnical Study / Slope Stability Study – required as per Official Plan section 4.8.3. All site plan applications need to demonstrate the soils are suitable for development. A Slope Stability Study may be required with unique circumstances (Schedule K or topography may define slope stability concerns).
- 10. Erosion and Sediment Control Plan – required with all site plan applications as per Official Plan section 4.7.3.
- 11. Stormwater Management Report/Brief - required with all site plan applications as per Official Plan section 4.7.6.

**zoran@archnova.ca**

---

**From:** Rasool, Rubina <Rubina.Rasool@ottawa.ca>  
**Sent:** August 20, 2021 3:36 PM  
**To:** zoran@archnova.ca  
**Subject:** RE: 2458 Cleroux Cres: Boundary Codnitions  
**Attachments:** 2458 Cleroux Cres\_20August2021.docx

Good afternoon,

Please find attached the water boundary conditions for the proposed development.

Have a good weekend.

**Rubina**

-----  
**Rubina Rasool, E.I.T.**

Project Manager

Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique

Development Review – East Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue Laurier Ouest. Ottawa (Ontario) K1P 1J1 [rubina.rasool@ottawa.ca](mailto:rubina.rasool@ottawa.ca)

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**From:** zoran@archnova.ca <zoran@archnova.ca>  
**Sent:** August 03, 2021 7:41 PM  
**To:** Rasool, Rubina <Rubina.Rasool@ottawa.ca>  
**Subject:** 2458 Cleroux Cres: Boundary Codnitions

**CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.**

**ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.**

Could you please provide the boundary conditions for the location of 2458 Cleroux Cres., Ottawa?

Following are the initial information:

1. Type of development: 3storey+covered garage, 20 units building.
2. Fire flow required: 217 l/sec (FUS); 163.98 (OBC); nearest hydrant distance 38.4 m
3. Average Daily Demand: 0.12 l/sec
4. Maximum Hourly Demand: 1.75 l/Sec
5. Maximum Daily Demand: 1.16 l/sec

Attached are calculation sheets, image of nearest hydrant distance (from GeoOttawa) and the site plan of proposed development.

Regards,

Zoran Mrdja, P.Eng., FEC

DufkQryd Ghvjg Iqfi

613-818-3884

'

This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

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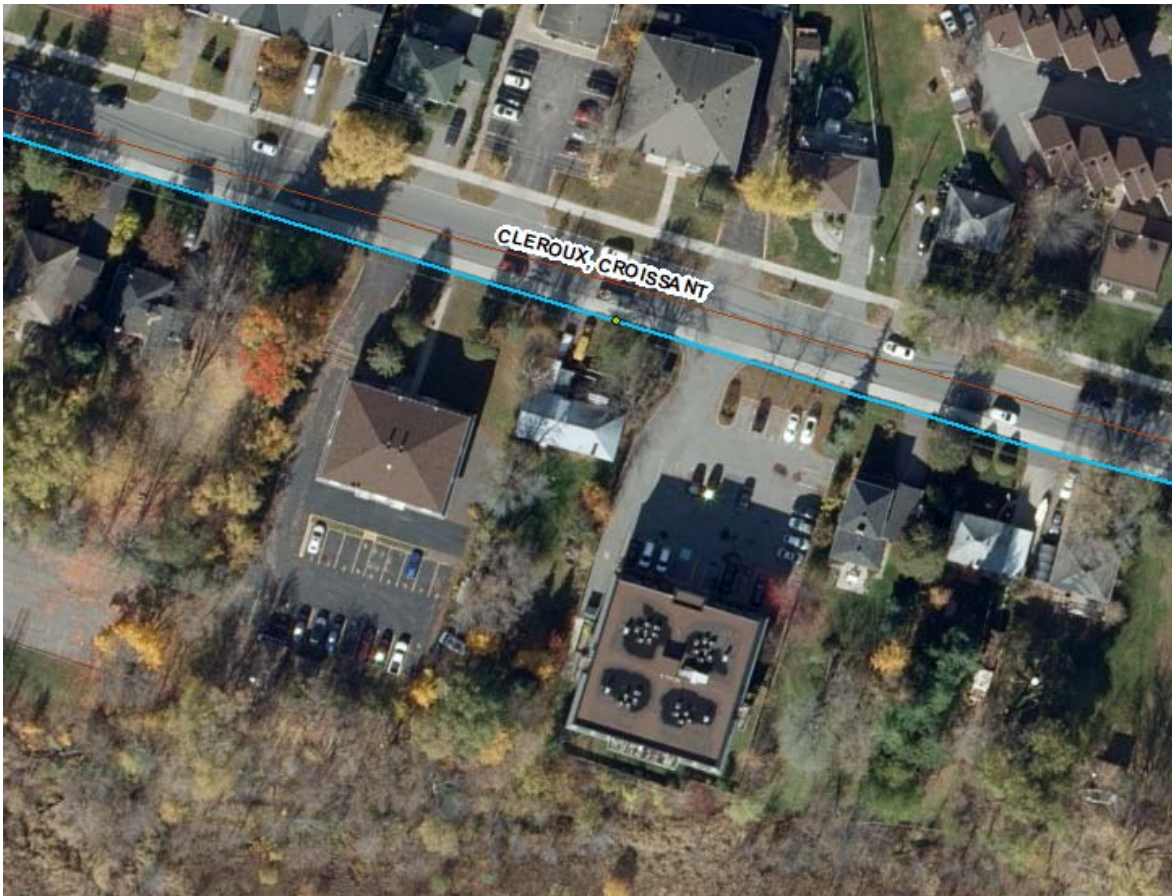
'

## Boundary Conditions 2458 Cleroux Crescent

### Provided Information

| Scenario             | Demand |        |
|----------------------|--------|--------|
|                      | L/min  | L/s    |
| Average Daily Demand | 7      | 0.12   |
| Maximum Daily Demand | 70     | 1.16   |
| Peak Hour            | 105    | 1.75   |
| Fire Flow Demand #1  | 13,000 | 216.67 |

### Location



### Results

#### Connection 1 – Cleroux Cres.

| Demand Scenario     | Head (m) | Pressure <sup>1</sup> (psi) |
|---------------------|----------|-----------------------------|
| Maximum HGL         | 131.0    | 67.7                        |
| Peak Hour           | 127.0    | 62.1                        |
| Max Day plus Fire 1 | 105.3    | 31.3                        |

Ground Elevation = 83.3 m

## **Notes**

1. A second connection to the watermain is recommended to decrease vulnerability of the water system in case of breaks.

## **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. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.*