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# SITE SERVICING AND STORMWATER MANAGEMENT REPORT

## FOR

# 11021028 & 11073656 CANADA INC.
# 1131 TERON ROAD

CITY OF OTTAWA

PROJECT NO.: 19-1127

NOVEMBER 2019 – REV. 1

**SITE SERVICING AND STORMWATER MANAGEMENT REPORT**
**FOR**
**1131 TERON ROAD**
**11021028 & 11073656 CANADA INC.**

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## 1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained by 11021028 & 11073656 Canada Inc. to prepare a Site Servicing and Stormwater Management Report in support of the application for a Site Plan Control (SPC) at 1131 Teron Road.

The subject property is located within the City of Ottawa urban boundary, in the Kanata North Ward. As illustrated in ***Figure 1***, below, the subject property is located south of the intersection of March Road and Teron Road. Comprised of one parcel, the subject property measures approximately ***0.14 ha*** and is designated residential fifth density zone (R5A[2144]S327).


**Figure 1: Site Location**

The proposed development involves the construction of a three-storey residential building consisting of 30 apartment units and fronting onto Teron Road. The proposed development also includes 6 surface parking spots located within the borders of the subject property, as well as, a temporary surface parking lot located on the neighbouring parcel at 1151 Teron Road. A copy of the ***Site Plan*** is included in ***Drawings/Figures***.

The objective of this report is to support the application for Site Plan Control by providing sufficient detail to demonstrate that the proposed development is supported by existing municipal infrastructure and that the site design conforms to current City of Ottawa design standards.

## 1.1 Existing Conditions

The existing site consists of a single detached house with paved surface parking and landscaping. The elevations range between 90.60 m and 89.77 m, with a grade change of approximate 2.7% from the Southeast to the Northwest side of the property.

Sewer and watermain mapping collected from the City of Ottawa indicate that the following services exist across the property frontages, within the adjacent municipal right-of-ways:

**Teron Road:**

- 610 mm diameter water feedermain;
- 300 mm diameter concrete storm sewer; and
- 525 mm diameter concrete sanitary sewer.

**March Road:**

- 450 mm diameter concrete storm sewer.

**Weeping Willow Lane (formerly Varley Lane):**

- A private 250 mm diameter PVC sanitary sewer.

## 1.2 Required Permits / Approvals

Development of the site is subject to the City of Ottawa Planning and Development Approvals process. The City of Ottawa must approve detailed engineering designs, drawings and reports prepared to support the proposed development plan before the issuing of SPC.

As the proposed site stormwater management system discharges into a ditch and not a storm sewer, OWRA s.53 approval will be required from the Ministry of the Environment, Conservation and Parks (MECP).

## 1.3 Pre-consultation

Pre-Consultation was conducted with interested parties at the City of Ottawa on April 08, 2019. Pre-consultation correspondence, along with the servicing guidelines checklist, is located in ***Appendix A***.

# 2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

## 2.1 Existing Studies, Guidelines, and Reports

The following studies were utilized in the preparation of this report:

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002*, October 2012.
  ***(City Standards)***

  - **Technical Bulletin ISDTB-2014-01**
    City of Ottawa, February 5, 2014.
    ***(ITSB-2014-01)***

  - **Technical Bulletin PIEDTB-2016-01**
    City of Ottawa, September 6, 2016.
    ***(PIEDTB-2016-01)***

  - **Technical Bulletin ISTB-2018-01**
    City of Ottawa, March 21, 2018.
    ***(ISTB-2018-01)***

  - **Technical Bulletin ISTB-2018-04**
    City of Ottawa, June 27, 2018.
    **(ISTB-2018-04)**

- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, July 2010.
  ***(Water Supply Guidelines)***

  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    **(ISD-2010-2)**

  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014.
    **(ISDTB-2014-02)**

  - **Technical Bulletin ISDTB-2018-02**
    City of Ottawa, March 21, 2018.
    ***(ISDTB-2018-02)***

- **Design Guidelines for Sewage Works,**
  Ministry of the Environment, 2008.
  **(*MOE* Design Guidelines)**

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.
  ***(SWMP Design Manual)***

- **Ontario Building Code Compendium**
  Ministry of Municipal Affairs and Housing Building Development Branch, January 1, 2010 Update.
  ***(OBC)***

- **Water Supply for Public Fire Protection**
  Fire Underwriters Survey, 1999.
  ***(FUS)***

# 3.0 WATER SUPPLY SERVICING

## 3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa 2W2C pressure zone. A local 610 mm diameter feedermain exists within the Teron Road right-of-way, as shown by the Pressure Zone map, located in ***Appendix B***.

Refer to ***Table 1,*** below, for estimated existing water demand.

**Table 1**
**Summary of Existing Water Demand**

| Design Parameter | Existing Demand[1] (L/min) |
|---|---|
| Average Daily Demand | 0.6 |
| Max Day | 5.5 |
| Peak Hour | 8.3 |

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.

## 3.2 Water Supply Servicing Design

It is proposed to relocate the existing hydrant and connect a new 150 mm watermain to the existing 150 mm hydrant lead in order to service the proposed development.

***Section 4.3.1*** of the ***Water Design Guidelines*** states***,*** “temporary dead-end watermain connections are permitted to service a maximum of 75 single dwelling units, provided that all watermain pressure and demand objectives are met, and it will be looped by a future phase within 2 years”. A future 200 mm watermain is proposed to be constructed within the Teron Road right-of-way when the adjacent proposed development at 1151 Teron is constructed. The future 200 mm watermain will connect between the proposed 150 mm watermain to the existing 300 mm diameter watermain within Stacie Drive, thus providing a looped network servicing both the properties at 1131 and 1151 Teron Road. Refer to drawing ***SSP-1*** accompanying this report for proposed water servicing layout.

***Table 2,*** below, summarizes the ***Water Supply Guidelines*** employed in the preparation of the preliminary water demand estimate.

**Table 2**
**Water Supply Design Criteria**

| Design Parameter | Value |
|---|---|
| Single Family | 3.4 P/unit |
| Residential 1 Bedroom Apartment | 1.4 P/unit |
| Residential 2 Bedroom Apartment | 2.1 P/unit |
| Residential Average Daily Demand | 280 L/d/P |
| Residential Maximum Daily Demand | 3.6 x Average Daily * |
| Residential Maximum Hourly | 5.4 x Average Daily * |
| Commercial Retail | 2.5 L/m²/d |
| Commercial Office | 75 L/9.3m²/d |
| Restaurant | 125 L/seat/d |
| Commercial Maximum Daily Demand | 1.5 x avg. day |
| Commercial Maximum Hour Demand | 1.8 x max. day |
| Minimum Watermain Size | 150mm diameter |
| Minimum Depth of Cover | 2.4 m from top of watermain to finished grade |
| During normal operating conditions desired operating pressure is within | 350 kPa and 480 kPa |
| During normal operating conditions pressure must not drop below | 275 kPa |
| During normal operating conditions pressure must not exceed | 552 kPa |
| During fire flow operating pressure must not drop below | 140 kPa |

**Daily average based on Appendix 4-A from **Water Supply Guidelines***
*** Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.*
*-Table updated to reflect ISD-2010-2*

***Table 3,*** below, summarizes the proposed water supply demand for the subject property, and boundary conditions for the proposed adjacent development at 1151 Teron Road based on the ***Water Supply Guidelines***.

**Table 3**
**Water Demand and Boundary Conditions**
**Proposed Conditions**

| Design Parameter | Proposed Demand[1] (L/min) | Boundary Condition[2] (m $H_2O$ / kPa) |
|---|---|---|
| Average Daily Demand | 10.5 | 131.7 / 410.1 |
| Fire Flow for 1151 Teron | 11,000 | 126.1 / 355.1 |
| Max Day + Fire Flow | 51.5 + 18,000 | - |
| Peak Hour | 77.7 | 125.9 / 353.2 |

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
2) Boundary conditions supplied by the City of Ottawa for the demands at 1151 Teron Road as indicated in the correspondence; assumed ground elevation 89.9 m. See ***Appendix B.***

The City provided both the anticipated minimum and maximum water pressures, as well as, the estimated water pressure during fire flow demand for the adjacent development's demands at 1151 Teron Road, as indicated in the correspondence located in ***Appendix B.*** Additionally, the City was contacted to obtain updated boundary conditions associated with the estimated water demand for the subject property, however, pressures were not available at the time of submission. Based on pressures provided by the City, the pressures at the average day and peak hour demands for the subject property exceed the minimum required pressures identified in **Table 2**.

Fire flow requirements are to be determined in accordance with City of Ottawa ***Water Supply Guidelines*** and the Ontario Building Code.

Fire flow requirements were estimated per City of Ottawa Technical Bulletin ***ISTB-2018-02***. The following assumptions were obtained from the Architect:

- Type of construction – Wood Frame;
- Occupancy type – Limited Combustibility; and
- Sprinkler Protection – Non-Sprinklered.

The above assumptions result in an estimated fire flow of approximately ***18,000 L/min***, noting that actual building materials selected will affect the estimated flow.

The subject property is in close proximity to several existing hydrants, all of which lie within 305 m of the proposed building, see ***Appendix B*** for a figure showing the location of hydrants. **Table 4,** below, summarizes the maximum available fire flow based on hydrants within 305 m of the subject property, as per ***Table 18.5.4.3*** of the ***ISTB-2018-02.***

**Table 4**
**Total Available Fire Flow from Hydrants**

| Number of Hydrants | Distance from Site (m) | Available Fire Flow per Table 18.5.4.3 of ISTB-2018-02 (L/min) |
|---|---|---|
| 1 | < 76 | 5,678 x 1 |
| 1 | 76 < and < 152 | 3,785 x 1 |
| 4 | 152 < and < 305 | 2,839 x 4 |
| **Total** | | **20,819** |

The available fire flow from the hydrants is ***20,819 L/min*** as per *Table 18.5.4.3* of the ***ISTB-2018-02.***

## 3.3 Water Supply Conclusion

The proposed water demand under proposed conditions was submitted to the City of Ottawa for establishing boundary conditions but the boundary conditions for the subject property were not available at the time of submission.

Boundary conditions for the adjacent property at 1151 Teron Road were provided by the City. As demonstrated by ***Table 3***, based on the City's model, the municipal system is capable of delivering water for the average day and peak hour demands within the ***Water Supply Guidelines*** pressure range.

Fire flow requirements were estimated to be ***18,000 L/min*** per City of Ottawa Technical Bulletin ***ISTB-2018-02***. The available fire flow from existing hydrants within 305 m from the site is ***20,819 L/min*** as per *Table 18.5.4.3* of the ***ISTB-2018-02.*** Pressure during fire flow is to be confirmed once boundary conditions are received from the City.

# 4.0 WASTEWATER SERVICING

## 4.1 Existing Wastewater Services

The subject site lies within the March Ridge Trunk Sewer catchment area, as shown by the City sewer mapping, included in ***Appendix C***. There is an existing 525 mm diameter sanitary sewer within Teron Road, which is located 240 m south of the subject property. Additionally, there is an existing 250 mm diameter private sanitary sewer within Weeping Willow Lane, located south-west of the subject property.

No sanitary services within the municipal right-of-way currently exist adjacent to the subject property. As a part of a previous application, a service lateral from the private sanitary sewer was contemplated as shown in the ***Conceptual Site Servicing Sketch,*** included in ***Appendix C***.

## 4.2 Wastewater Design

The subject property is proposed to connect to the existing private 250 mm diameter sanitary sewer within Weeping Willow Lane, refer to drawing ***SSP-1,*** accompanying this report, for sanitary layout and connection point.

***Table 5,*** below***,*** summarizes the ***City Standards*** employed in the design of the proposed wastewater sewer system.

**Table 5**
**Wastewater Design Criteria**

| Design Parameter | Value |
|---|---|
| Residential 1 Bedroom Apartment | 1.4 P/unit |
| Residential 2 Bedroom Apartment | 2.1 P/unit |
| Average Daily Demand | 280 L/d/per |
| Peaking Factor | Harmon's Peaking Factor. Max 3.8, Min 2.0 |
| Commercial Floor Space | 5 L/m$^2$/d |
| Commercial Office Space | 75 L/9.3m$^2$/d |
| Infiltration and Inflow Allowance | 0.33 L/s/ha |
| Industrial - Light | 35,000 L/gross ha/d |
| Industrial Peaking Factor | 7.0 per City of Ottawa Sewer Design Guidelines Appendix 4B |
| Sanitary sewers are to be sized employing the Manning's Equation | $Q = \frac{1}{n} A R^{2/3} S^{1/2}$ |
| Minimum Sewer Size | 200 mm diameter |
| Minimum Manning's 'n' | 0.013 |
| Minimum Depth of Cover | 2.5 m from crown of sewer to grade |
| Minimum Full Flowing Velocity | 0.6 m/s |
| Maximum Full Flowing Velocity | 3.0 m/s |
| | |
| *Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012.* | |

***Table 6,*** below, demonstrates the proposed peak flow from the proposed development. See ***Appendix C*** for associated calculations.

**Table 6**
**Summary of Estimated Peak Wastewater Flow**

| Design Parameter | Total Flow (L/s) |
|---|---|
| Estimated Average Dry Weather Flow | 0.18 |
| Estimated Peak Dry Weather Flow | 0.65 |
| Estimated Peak Wet Weather Flow | 0.68 |

The estimated peak wet weather sanitary flow based on the ***Site Plan***, provided in ***Drawings/Figures,*** was calculated to be ***0.68 L/s***.

In order to estimate the available capacity, a sanitary analysis was conducted for the sanitary sewers located within the Weeping Willow Lane and Teron Road right-of-ways. The catchment area serviced by the March Ridge Trunk sewer was identified and evaluated by reviewing existing development and zoning within the area. ***City Standards*** were employed to generate a conservative estimate of the existing wastewater flow conditions within the sewer. Refer to the sanitary drainage plan in ***Appendix C***, for the extents of the existing sanitary sewer analysis.

Based on the sanitary analysis, it is estimated that the most restricted leg of local sanitary sewer downstream of the subject site, has an available residual capacity of ***18.04 L/s***, which is sufficient to accommodate the estimated ***0.68 L/s*** peak wastewater flow increase generated by the proposed development. Refer to ***Appendix C*** for detailed calculations.

The analysis above indicates that sufficient capacity is available in the local sewers to accommodate the proposed development.

## 4.3 Wastewater Servicing Conclusions

The site is tributary to the March Ridge Trunk sanitary sewer. Based on the above sanitary analysis, sufficient capacity is available to accommodate the proposed ***0.68 L/s*** peak wet weather flow from the proposed development.

The proposed wastewater design conforms to all relevant ***City Standards***.

# 5.0 STORMWATER MANAGEMENT

## 5.1 Existing Stormwater Services

Stormwater runoff from the subject property is tributary to the City of Ottawa sewer system and is located within the Ottawa West sub-watershed. As such, approvals for proposed development within this area are under the approval authority of the City of Ottawa.

Flows that influence the watershed in which the subject property is located are further reviewed by the principal authority. The subject property is located within the Kizell Drain subwatershed; and is therefore subject to review by Mississippi Valley Conservation Authority (MVCA). The MVCA was contacted for quality controls that may apply to stormwater runoff from the site. Consultation with the MVCA is located in ***Appendix A***.

## 5.2 Post-development Stormwater Management Target

Stormwater management requirements for the proposed development were reviewed with the City of Ottawa and two separate sets of requirements were identified;

***SWM Criteria 1*****:** If the proposed development outlets to a local storm sewer, the proposed development is required to:

- Estimate allowable release rate based on a based on a pre-development Rational Method Coefficient or a maximum equivalent of 0.5, employing the City of Ottawa IDF parameters for a 5-year storm with a time of concentration greater than or equal to 10 minutes.

***SWM Criteria 2*****:** If the proposed development outlets to a municipal ditch, the proposed development is required to:

- Estimate allowable release rates based on a pre-development Rational Method Coefficient or a maximum equivalent of 0.5, employing the City of Ottawa IDF parameters for a 5-year and 100-year storms with a calculated time of concentration greater than or equal to 10 minutes, controlling post-development runoff rates to pre-development conditions. Refer to correspondence with the City included in ***Appendix D.***

The proposed development is also required to meet the following requirements

in both options;

- All storms up to and including the City of Ottawa 100-year design event are to be attenuated on site;
- Based on coordination with the MVCA, enhanced quality level treatment (80% TSS removal) will be required for the proposed development; correspondence with the MVCA is included in ***Appendix A***.

## 5.3 Proposed Stormwater Management System

Existing pre-development drainage areas ***EX-1*** and ***EX-2*** were identified, as shown in the ***Pre-development Drainage Characteristics*** figure, located in ***Drawings/Figures.*** Post-development drainage areas were also identified as shown in ***SWM-1***, accompanying this report. It was determined that drainage area ***A1***, which includes the proposed residential building and landscaping, would be subject to ***SWM Criteria 1.*** However, drainage area ***A2,*** which includes proposed surface parking and the interim parking lot at 1151 Teron Road, is subject to ***SWM Criteria 2.***

### 5.3.1 Drainage Area *A1* Pre-Development Peak Flows

The estimated pre-development peak flows for the 2, 5, and 100-year events for drainage area ***EX-1*** are summarized in ***Table 7,*** below:

**Table 7**
**Summary of Existing Peak Storm Flow Rates for drainage area *EX-1***

| City of Ottawa Design Storm | Estimated Peak Flow Rate (L/s) |
|---|---|
| 2-year | 14.2 |
| 5-year | 19.3 |
| 100-year | 41.4 |

Based on ***SWM Criteria 1***, the allowable release rate for drainage area ***A1*** is ***19.3 L/s***.

### 5.3.2 Drainage Area *A1* SWM Design

It is proposed to service drainage area ***A1*** via a connection to the 300 mm diameter storm sewer within Teron Road right-of-way.

To achieve the allowable post-development stormwater runoff release rate identified in ***section 5.3.1***, it is proposed to employ a combination of roof top flow attenuation and surface storage***.*** An ***80 mm*** diameter inlet control device (ICD) is also proposed to attenuate flow to the allowable release rate. Refer to ***SSP-1,*** accompanying this report, for servicing layout and location of ICD.

***Table 8,*** below, summarizes post-development flow rates for drainage area ***A1***.

**Table 8**
**Drainage Area A1 Stormwater Flow Rate Summary**

| Control Area | 5-Year Release Rate | 5-Year Storage | 100-Year Release Rate | 100-Year Storage |
|---|---|---|---|---|
| | (L/s) | ($m^3$) | (L/s) | ($m^3$) |
| Unattenuated Areas | 0.3 | 0.0 | 0.7 | 0.0 |
| Roof Controls | 4.3 | 6.5 | 5.7 | 15.2 |
| Attenuated Areas | 7.2 | 1.3 | 11.7 | 3.0 |
| **Total** | **11.9** | **7.8** | **18.2** | **18.2** |

It was calculated that ***18.2 $m^3$*** of storage will be required on site to attenuate flow to the release rate of ***18.2 L/s***; storage calculations are contained within ***Appendix D***.

Drainage area ***A1*** consists of landscaped and roof top areas which is considered clean run-off. Therefore, quality controls are not anticipated for this area.

### 5.3.3 Drainage Area *A2* Pre-Development Peak Flows

The estimated pre-development peak flows for the 2, 5, and 100-year events for drainage area ***EX-2*** are summarized in ***Table 9,*** below:

**Table 9**
**Summary of Existing Peak Storm Flow Rates for drainage area *EX-2***

| City of Ottawa Design Storm | Estimated Peak Flow Rate (L/s) |
|---|---|
| 2-year | 47.5 |
| 5-year | 64.2 |
| 100-year | 137.4 |

Based on ***SWM Criteria 2***, the allowable 5-year and 100-year release rates are ***46.9 L/s/ha*** and ***100.4 L/s/ha*** respectively. Therefore, established release rates for drainage area ***A2*** are ***13.2 L/s*** and ***28.2 L/s*** for the 5-year and 100-year storms respectively.

### 5.3.4 Drainage Area *A2* SWM Design

It is proposed to service drainage area ***A2*** via the municipal ditch located at the north corner of the site, located within March Road right-of-way.

To achieve the allowable post-development stormwater runoff release rates identified in ***section 5.3.3***, it is proposed to employ surface storage and utilize a ditch inlet catchbasin with two ICDs, sized with ***115 mm*** diameter and ***120 mm*** diameter orifices. Refer to ***SSP-1,*** accompanying this report, for servicing layout and location of ICD.

***Table 10,*** below, summarizes post-development flow rates for drainage area ***A2***.

**Table 10**
**Drainage Area *A2* Stormwater Flow Rate Summary**

| Control Area | 5-Year Release Rate | 5-Year Storage | 100-Year Release Rate | 100-Year Storage |
|---|---|---|---|---|
| | (L/s) | ($m^3$) | (L/s) | ($m^3$) |
| Unattenutated Areas | 0.7 | 0.0 | 1.5 | 0.0 |
| Attenuated Areas | 12.0 | 21.6 | 26.6 | 44.9 |
| **Total** | **12.7** | **21.6** | **28.1** | **44.9** |

It was calculated that ***44.9 m³*** of storage will be required on site to attenuate the 5-year and 100-year flows to the release rates of ***12.7 L/s*** and ***28.1 L/s*** respectively; storage calculations are contained within ***Appendix D***.

To meet the stormwater quality criteria specified by the ***MVCA***, any runoff from the surface parking area would need to provide an enhanced level of treatment (80% TSS removal). An enhanced grass swale is proposed per the ***LID Guide*** to treat all runoff from the proposed drainage area ***A2***. The enhanced grass swale is approximately 144 m in length and is designed with a longitudinal slope of 0.5%. It is proposed to be located within the neighbouring parcel at 1151 Teron Road. The swale was designed with a maximum design velocity of 0.5 m/s in order to maximize water quality improvement, per the ***LID Guide.*** Refer to ***Appendix D*** for detailed calculations.

## 5.4 Stormwater Servicing Conclusions

Drainage areas were identified as shown in ***SWM-1***, accompanying this report. It was determined that drainage area ***A1***, which includes the proposed residential building and landscaping, would adhere to ***SWM Criteria 1.*** However, drainage area ***A2,*** which includes proposed surface parking and the interim parking lot at 1151 Teron Road, is proposed to adhere to ***SWM Criteria 2.***

The following summarizes stormwater management design for drainage area ***A1***:

- It is proposed to service drainage area ***A1*** via a connection to the 300 mm diameter storm sewer within Teron Road right-of-way;
- It is calculated that ***18.2 m³*** of storage will be required on site to attenuate flow to the allowable release rate of ***19.3 L/s***; and
- No quality controls are required for drainage area ***A1*** since no surface parking is included within the drainage area.

The following summarizes stormwater management design for drainage area ***A2***:

- It is proposed to service drainage area ***A2*** via the municipal ditch located at the north corner of the site within March Road right-of-way;
- It is calculated that ***44.9 m3*** of surface storage will be required on site to attenuate flow to the allowable release rates of ***13.2 L/s*** and ***28.2 L/s*** for the 5-year and 100-year storms, respectively; and

- An enhanced grass swale is proposed to be designed per the ***LID Guide*** to treat all runoff from drainage area ***A2*** to provide quality controls.

The proposed stormwater design conforms to all relevant ***City Standards*** and Policies for approval.

## 6.0 UTILITIES

Gas, Hydro and Bell services currently exist within the Teron Road right-of-way. Utility servicing will be coordinated with the individual utility companies prior to site development.

Special considerations will need to be taken with development within the Hydro corridor. The proposed development will be coordinated and approved by the utility company having jurisdiction.

## 7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. During construction the extent of erosion losses is exaggerated due to the removal of vegetation and the top layer of soil becoming agitated.

Prior to topsoil stripping, earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

Silt fence will be installed around the perimeter of the site and will be cleaned and maintained throughout construction. Silt fence will remain in place until the working areas have been stabilized and re-vegetated.

Catch basins will have SILTSACKs or an approved equivalent installed under the grate during construction to protect from silt entering the storm sewer system.

A mud mat will be installed at the construction access in order to prevent mud tracking onto adjacent roads.

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents:

- Limit extent of exposed soils at any given time;
- Re-vegetate exposed areas as soon as possible;
- Minimize the area to be cleared and grubbed;
- Protect exposed slopes with plastic or synthetic mulches;
- Install silt fence to prevent sediment from entering existing ditches;
- No refueling or cleaning of equipment near existing watercourses;
- Provide sediment traps and basins during dewatering;
- Install filter cloth between catch basins and frames;
- Plan construction at proper time to avoid flooding; and
- Establish material stockpiles away from watercourses, so that barriers and filters may be installed.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not flowing under silt barriers; and
- Clean and change filter cloth at catch basins.

## 8.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained by 11021028 & 11073656 Canada Inc. to prepare a Site Servicing and Stormwater Management Report in support of the application for a Site Plan Control (SPC) at 1131 Teron Road. The preceding report outlines the following:

- Based on boundary conditions provided by the City for the neighboring parcel at 1151 Teron Road, the existing municipal water infrastructure is capable of providing the proposed development with water in the average day and peak hour demand while exceeding the City's minimum required pressures;
- The FUS method for estimating fire flow indicated ***18,000 L/min*** is required for the proposed development, Based on ***Table 18.5.4.3*** *of* the ***ISTB-2018-02,*** the fire flow demands can be supplied through existing hydrants. Pressure during fire flow is to be confirmed once boundary conditions are received from the City.
- The proposed development results in a ***0.68 L/s*** increase in peak wet weather flow. Based on the sanitary analysis conducted, the existing municipal sewer infrastructure has sufficient capacity to support the development;
- It is calculated that ***18.2*** $\boldsymbol{m^3}$ of storage will be required on site to attenuate flow to the allowable release rate of ***19.3 L/s*** for drainage Area ***A1.***
- It is calculated that ***44.9 m3*** of surface storage will be required on site to attenuate flow to the 5-year and 100-year allowable release rates of ***13.2 L/s*** and ***28.2 L/s***, respectively***,*** for drainage area ***A2***.
- No quality controls are required for drainage area ***A1*** since no surface parking is included within the drainage area.
- An enhanced grass swale is proposed to be designed per the ***LID Guide*** to treat all runoff from drainage area ***A2*** to provide quality controls.

Prepared by,
**David Schaeffer Engineering Ltd.**

Per: Amr Salem.

Reviewed by,
**David Schaeffer Engineering Ltd.**


Per: Robert D. Freel, P. Eng.


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# *APPENDIX A*

## *Pre-Consultation*

# DEVELOPMENT SERVICING STUDY CHECKLIST

19-1127 06/11/2019

| 4.1 General Content | | |
|---|---|---|
| ☐ | Executive Summary (for larger reports only). | N/A |
| ☒ | Date and revision number of the report. | Report Cover Sheet |
| ☒ | Location map and plan showing municipal address, boundary, and layout of proposed development. | Drawings/Figures |
| ☒ | Plan showing the site and location of all existing services. | Figure 1 |
| ☒ | Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere. | Section 1.0 |
| ☒ | Summary of Pre-consultation Meetings with City and other approval agencies. | Section 1.3 |
| ☒ | 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. | Section 2.1 |
| ☒ | Statement of objectives and servicing criteria. | Section 1.0 |
| ☒ | Identification of existing and proposed infrastructure available in the immediate area. | Sections 3.1, 4.1, 5.1 |
| ☐ | 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). | N/A |
| ☐ | 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. | N/A |
| ☐ | 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. | N/A |
| ☐ | Proposed phasing of the development, if applicable. | N/A |
| ☐ | Reference to geotechnical studies and recommendations concerning servicing. | N/A |
| ☐ | All preliminary and formal site plan submissions should have the following information:<br>-Metric scale<br>-North arrow (including construction North)<br>-Key plan<br>-Name and contact information of applicant and property owner<br>-Property limits including bearings and dimensions<br>-Existing and proposed structures and parking areas<br>-Easements, road widening and rights-of-way<br>-Adjacent street names | N/A |

| 4.2 Development Servicing Report: Water | | |
|---|---|---|
| ☐ | Confirm consistency with Master Servicing Study, if available | N/A |
| ☒ | Availability of public infrastructure to service proposed development | Section 3.1 |
| ☒ | Identification of system constraints | Section 3.1 |
| ☒ | Identify boundary conditions | Section 3.1, 3.2 |
| ☒ | Confirmation of adequate domestic supply and pressure | Section 3.3 |



*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

| | | |
|---|---|---|
| ☒ | 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. | Section 3.2 |
| ☐ | 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. | N/A |
| ☐ | Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design | N/A |
| ☐ | Address reliability requirements such as appropriate location of shut-off valves | N/A |
| ☐ | Check on the necessity of a pressure zone boundary modification | N/A |
| ☒ | 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 | Section 3.2, 3.3 |
| ☐ | 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. | N/A |
| ☐ | 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. | N/A |
| ☒ | Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines. | Section 3.2 |
| ☐ | Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference. | N/A |

## 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). | Section 4.2 |
| ☐ | Confirm consistency with Master Servicing Study and/or justifications for deviations. | N/A |
| ☐ | 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. | N/A |
| ☒ | Description of existing sanitary sewer available for discharge of wastewater from proposed development. | Section 4.1 |
| ☒ | Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to<br>previously completed Master Servicing Study if applicable) | Section 4.2 |
| ☒ | Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format. | Section 4.2, Appendix C |
| ☒ | Description of proposed sewer network including sewers, pumping stations, and forcemains. | Section 4.2 |
| ☐ | 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). | N/A |



*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

| | | |
|---|---|---|
| ☐ | Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development. | N/A |
| ☐ | Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity. | N/A |
| ☐ | Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding. | N/A |
| ☐ | Special considerations such as contamination, corrosive environment etc. | N/A |

## 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) | Section 5.1 |
| ☐ | Analysis of available capacity in existing public infrastructure. | N/A |
| ☐ | A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern. | N/A |
| ☒ | 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. | Section 5.2 |
| ☒ | Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements. | Section 5.2 |
| ☒ | Description of the stormwater management concept with facility locations and descriptions with references and supporting information | Section 5.3 |
| ☐ | Set-back from private sewage disposal systems. | N/A |
| ☐ | Watercourse and hazard lands setbacks. | N/A |
| ☒ | Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed. | Appendix A |
| ☐ | Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists. | N/A |
| ☒ | Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period). | Section 5.3 |
| ☐ | Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals. | N/A |
| ☒ | 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. | Section 5.1, 5.3 |
| ☐ | Any proposed diversion of drainage catchment areas from one outlet to another. | N/A |
| ☐ | Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities. | N/A |
| ☐ | 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. | N/A |
| ☐ | Identification of potential impacts to receiving watercourses | N/A |
| ☐ | Identification of municipal drains and related approval requirements. | N/A |



*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

| | | |
|---|---|---|
| ☒ | Descriptions of how the conveyance and storage capacity will be achieved for the development. | Section 5.3 |
| ☐ | 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading. | N/A |
| ☐ | Inclusion of hydraulic analysis including hydraulic grade line elevations. | N/A |
| ☐ | Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors. | N/A |
| ☐ | 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. | N/A |
| ☐ | Identification of fill constraints related to floodplain and geotechnical investigation. | N/A |

## 4.5 Approval and Permit Requirements: Checklist

| | | |
|---|---|---|
| ☒ | 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 ct. 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. | Section 1.2 |
| ☐ | Application for Certificate of Approval (CofA) under the Ontario Water Resources Act. | N/A |
| ☐ | Changes to Municipal Drains. | N/A |
| ☐ | Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.) | N/A |

## 4.6 Conclusion Checklist

| | | |
|---|---|---|
| ☒ | Clearly stated conclusions and recommendations | Section 7.0 |
| ☐ | 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 | |



*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

## Amr Salem

**From:** Nader Nakhaei <nnakhaei@mvc.on.ca>
**Sent:** September 11, 2019 2:42 PM
**To:** Amr Salem
**Cc:** Brandon Chow
**Subject:** RE: 1151 Teron Road - MVCA Correspondence

Hi Amr,

Thanks a lot for your email. The quality control requirement for Kizell Drain has been considered as "Enhanced" (80% TSS removal) in the past planning applications and therefore since there is no end of pipe SWM facility for the proposed site, on-site quality control to an enhanced level will be required.
Please let me know if you have any further question or concern.

Sincerely,

Nader Nakhaei, Ph.D., E.I.T. | Water Resources Specialist, Research Fellow | Mississippi Valley Conservation Authority (MVCA)
www.mvc.on.ca | t. 613 253 0006 ext. 259 | f. 613 253 0122 | NNakhaei@mvc.on.ca

Mississippi Valley Conservation Authority



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**From:** Amr Salem [mailto:ASalem@dsel.ca]
**Sent:** 9-Sep-19 4:07 PM
**To:** Nader Nakhaei <nnakhaei@mvc.on.ca>
**Cc:** Brandon Chow <BChow@dsel.ca>
**Subject:** FW: 1151 Teron Road - MVCA Correspondence

Hello  Nader,

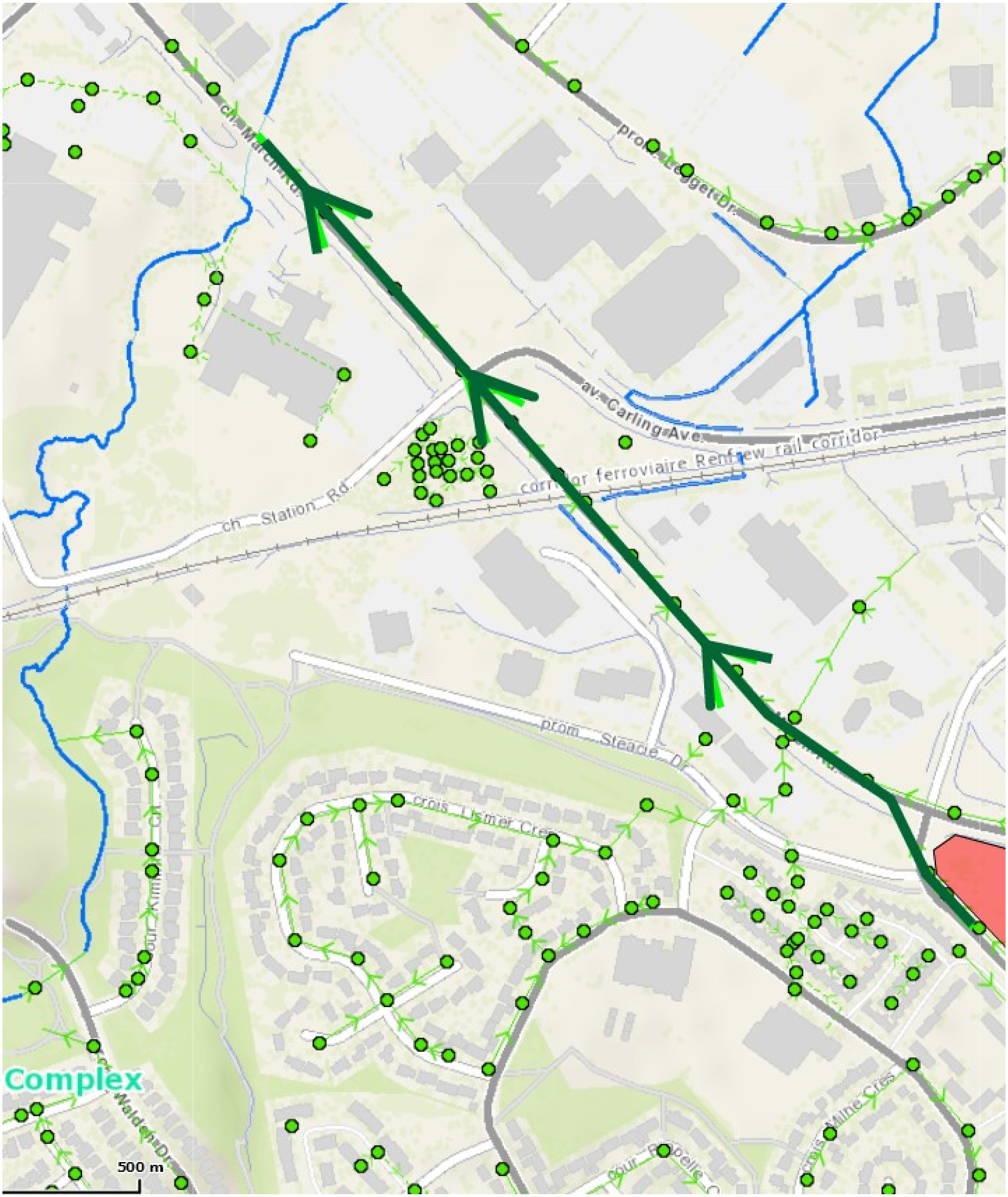
We wanted to consult with you regarding a mixed-use development we are working on located at the 1151 Teron Road.

The existing stormwater runoff from the site outlets to a city owned road side ditch running along the north boundary of the site . The stormwater collected from the site travels approximately 1.1 km through municipal sewer and roadside ditches to a direct outlet into the Kizell Drain.

The development proposes to construct a mixed use 9-storey building (commercial/office/residential) and surface parking lot fronting Teron Road.  Storm water runoff from the contemplated development will primarily be coming from the paved surface parking lot and building rooftop.  See attached conceptual site plan for reference.

At present, the existing site area is an undeveloped area consisting of  grass and a few trees.

Can you please provide your input regarding quality controls that maybe required for the site.




Thank you,

**Amr Salem**
Project Coordinator

## Amr Salem

**From:** Amr Salem
**Sent:** September 13, 2019 12:28 PM
**To:** 'Julie.candow@ottawa.ca'
**Cc:** Brandon Chow
**Subject:** 1151 Teron Road SWM criteria
**Attachments:** 1131 Teron Preconsultation Notes.pdf

Hey Julie,

I wanted to confirm stormwater management criteria for our subject site at 1151 Teron Road. It is my understanding that the criteria previously stated in the pre-consultation notes (*attached for your reference*) are assuming that the proposed development outlets to the local sewer within Teron Road right-of-way.

Should we choose to keep discharging to the existing outlet at the existing ditch located at the north of the subject site, can you please confirm that maintaining pre to post conditions would be acceptable as per the previous AES for the subject site?

Thank you,

**Amr Salem**
Project Coordinator

**DSEL**
**david schaeffer engineering ltd.**

120 Iber Road, Unit 103
Stittsville, ON  K2S 1E9

**phone**: (613) 836-0856 ext. 512
**email**: asalem@DSEL.ca

## Amr Salem

**From:** Candow, Julie <julie.candow@ottawa.ca>
**Sent:** September 16, 2019 10:36 AM
**To:** Amr Salem
**Cc:** Brandon Chow
**Subject:** RE: 1151 Teron Rd - Boundary Conditions Request
**Attachments:** 1151 Teron Road_Boundary Conditions_12Sept2019.docx

Hi Amr,

As per the pre-consultation notes:

***Connections to the existing 610mm feedermain will not be accepted.*** *Proposed water service connections could be looped from the existing hydrant lateral at the south-east corner of the property to a connection off Steacie Drive. Looped connections must be separated by an existing or proposed valve to allow for maintenance of the 610mm feedermain.*

Our Infrastructure Planning department has provided preliminary boundary condition results assuming one connection to the 610mm feedermain, however, connections to local watermains will need to be provided. A minimum of 2 watermain connections will be required assuming the basic day demand remains above 50 m3/day (as per City of Ottawa Water Distribution Guidelines 2010).

In response to your stormwater management inquiry, if stormwater flows were to outlet to an existing ditch, the allocated release rate would be pre to post for all storm events. Please note that a MECP Environmental Compliance Approval (ECA) would be required if stormwater flows were to outlet to an existing ditch.

Regards,

**Julie Candow, P.Eng.**
Project Manager - Infrastructure Approvals

City of Ottawa
Development Review - West Branch
Tel: 613-580-2424 x 13850

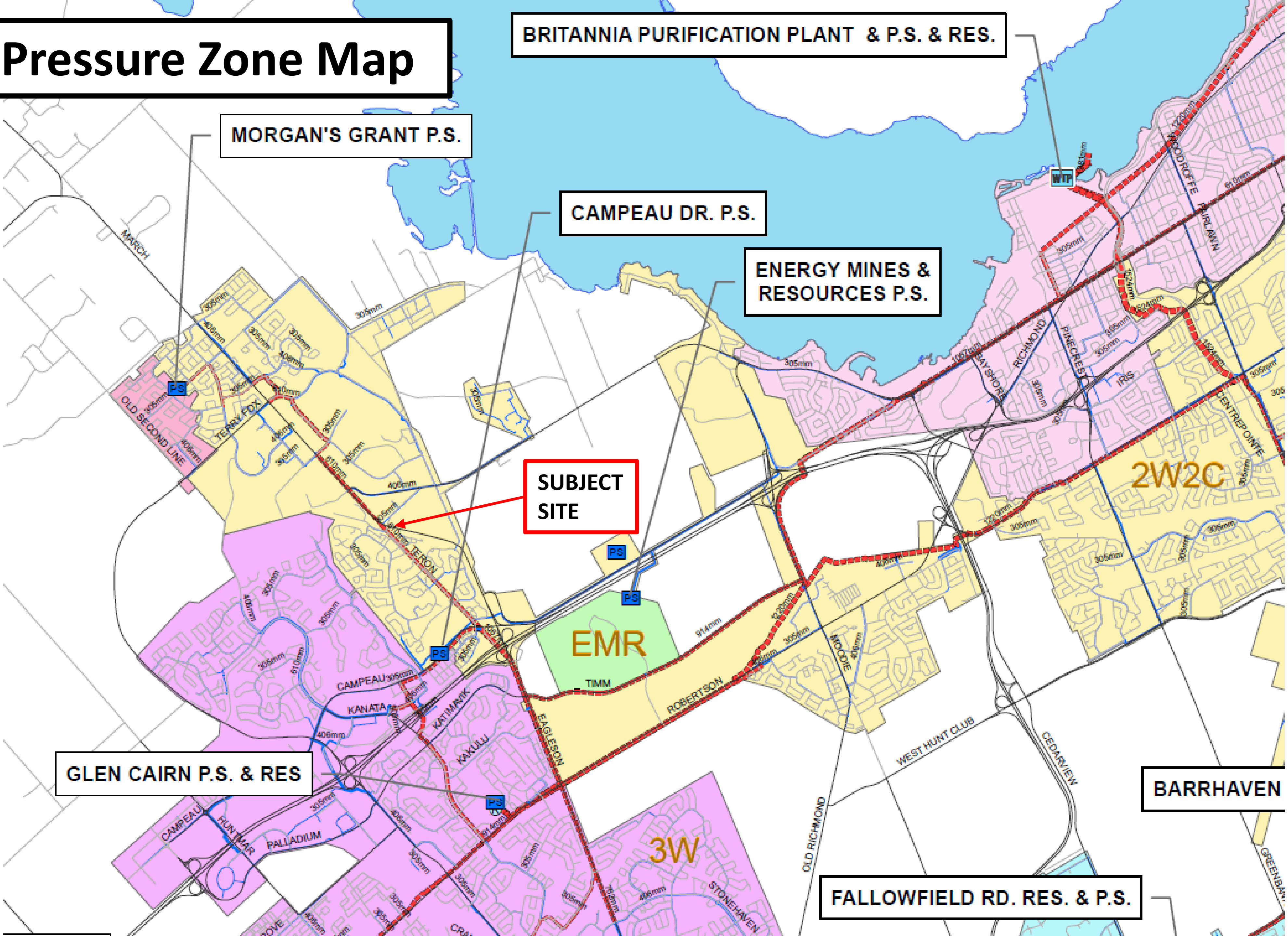
---

**From:** Amr Salem <ASalem@dsel.ca>
**Sent:** September 12, 2019 4:18 PM
**To:** Candow, Julie <julie.candow@ottawa.ca>
**Cc:** Brandon Chow <BChow@dsel.ca>
**Subject:** FW: 1151 Teron Rd - Boundary Conditions Request

# *APPENDIX B*

## *Water Supply*

# Water Pressure Zone Map



**11021028 and 11073 Canada Inc**
**1131 Teron Road**
**Existing Site Conditions**

**Water Demand Design Flows per Unit Count**
**City of Ottawa - Water Distribution Guidelines, July 2010**

**Domestic Demand**

| Type of Housing | Per / Unit | Units | Pop |
|---|---|---|---|
| Single Family | 3.4 | 1 | 3 |
| Semi-detached | 2.7 | - | 0 |
| Townhouse | 2.7 | - | 0 |
| Apartment | | | 0 |
| Bachelor | 1.4 | - | 0 |
| 1 Bedroom | 1.4 | - | 0 |
| 2 Bedroom | 2.1 | - | 0 |
| 3 Bedroom | 3.1 | - | 0 |
| Average | 1.8 | - | 0 |

| | Pop | Avg. Daily | | Max Day | | Peak Hour | |
|---|---|---|---|---|---|---|---|
| | | $m^3/d$ | L/min | $m^3/d$ | L/min | $m^3/d$ | L/min |
| **Total Domestic Demand** | 3 | 0.8 | 0.6 | 8.0 | 5.5 | 12.0 | 8.3 |

**Institutional / Commercial / Industrial Demand**

| Property Type | Unit Rate | | Units | Avg. Daily $m^3/d$ | Avg. Daily L/min | Max Day $m^3/d$ | Max Day L/min | Peak Hour $m^3/d$ | Peak Hour L/min |
|---|---|---|---|---|---|---|---|---|---|
| Commercial floor space | 2.5 | $L/m^2/d$ | - | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Office | 75 | $L/9.3m^2/d$ | - | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Restaurant* | 125 | L/seat/d | - | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Industrial - Light | 35,000 | L/gross ha/d | - | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Industrial - Heavy | 55,000 | L/gross ha/d | - | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total I/CI Demand** | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total Demand** | | | | **0.8** | **0.6** | **8.0** | **5.5** | **12.0** | **8.3** |

* Estimated number of seats at 1seat per $9.3m^2$

**Water Demand Design Flows per Unit Count**
**City of Ottawa - Water Distribution Guidelines, July 2010**

**Domestic Demand**

| Type of Housing | Per / Unit | Units | Pop |
|---|---|---|---|
| Single Family | 3.4 | - | 0 |
| Semi-detached | 2.7 | - | 0 |
| Townhouse | 2.7 | - | 0 |
| Apartment | | | 0 |
| Bachelor | 1.4 | - | 0 |
| 1 Bedroom | 1.4 | - | 0 |
| 2 Bedroom | 2.1 | - | 0 |
| 3 Bedroom | 3.1 | - | 0 |
| Average | 1.8 | 30 | 54 |

| | Pop | Avg. Daily | | Max Day | | Peak Hour | |
|---|---|---|---|---|---|---|---|
| | | $m^3/d$ | L/min | $m^3/d$ | L/min | $m^3/d$ | L/min |
| **Total Domestic Demand** | 54 | 15.1 | 10.5 | 74.1 | 51.5 | 111.9 | 77.7 |

**Institutional / Commercial / Industrial Demand**

| Property Type | Unit Rate | | Units | Avg. Daily $m^3/d$ | Avg. Daily L/min | Max Day $m^3/d$ | Max Day L/min | Peak Hour $m^3/d$ | Peak Hour L/min |
|---|---|---|---|---|---|---|---|---|---|
| Commercial floor space | 2.5 | $L/m^2/d$ | - | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Office | 75 | $L/9.3m^2/d$ | - | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Restaurant* | 125 | L/seat/d | - | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Industrial - Light | 35,000 | L/gross ha/d | - | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Industrial - Heavy | 55,000 | L/gross ha/d | - | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | **Total I/CI Demand** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | **Total Demand** | **15.1** | **10.5** | **74.1** | **51.5** | **111.9** | **77.7** |

* Estimated number of seats at 1 seat per $9.3m^2$

# Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

## Fire Flow Required

### 1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Wood Frame

**C** 1.5 *Type of Construction Coefficient per FUS Part II, Section 1*
**A** 2004.0 $m^2$ *Total floor area based on FUS Part II section 1*

| | | |
|---|---|---|
| **Fire Flow** | 14772.8 L/min | |
| | **15000.0 L/min** | *rounded to the nearest 1,000 L/min* |

## Adjustments

### 2. Reduction for Occupancy Type

Limited Combustible -15%

| | |
|---|---|
| **Fire Flow** | **12750.0 L/min** |

### 3. Reduction for Sprinkler Protection

Non-Sprinklered 0%

| | |
|---|---|
| **Reduction** | **0 L/min** |

### 4. Increase for Separation Distance

| | Cons. of Exposed Wall | S.D | Lw | Ha | LH | EC |
|---|---|---|---|---|---|---|
| **N** | Wood Frame | 10.1m-20m | 35 | 2 | 70 | 14% |
| **S** | Wood Frame | >45m | 35 | 1 | 35 | 0% |
| **E** | Wood Frame | 10.1m-20m | 16 | 2 | 32 | 13% |
| **W** | Wood Frame | 10.1m-20m | 16 | 5 | 80 | 14% |
| | | **% Increase** | | | | **41%** *value not to exceed 75%* |

| | |
|---|---|
| **Increase** | **5227.5 L/min** |

Lw = Length of the Exposed Wall
Ha = number of storeys of the adjacent structure. Max 5 stories
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

## Total Fire Flow

| | | |
|---|---|---|
| **Fire Flow** | 17977.5 L/min | *fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4* |
| | **18000.0 L/min** | *rounded to the nearest 1,000 L/min* |

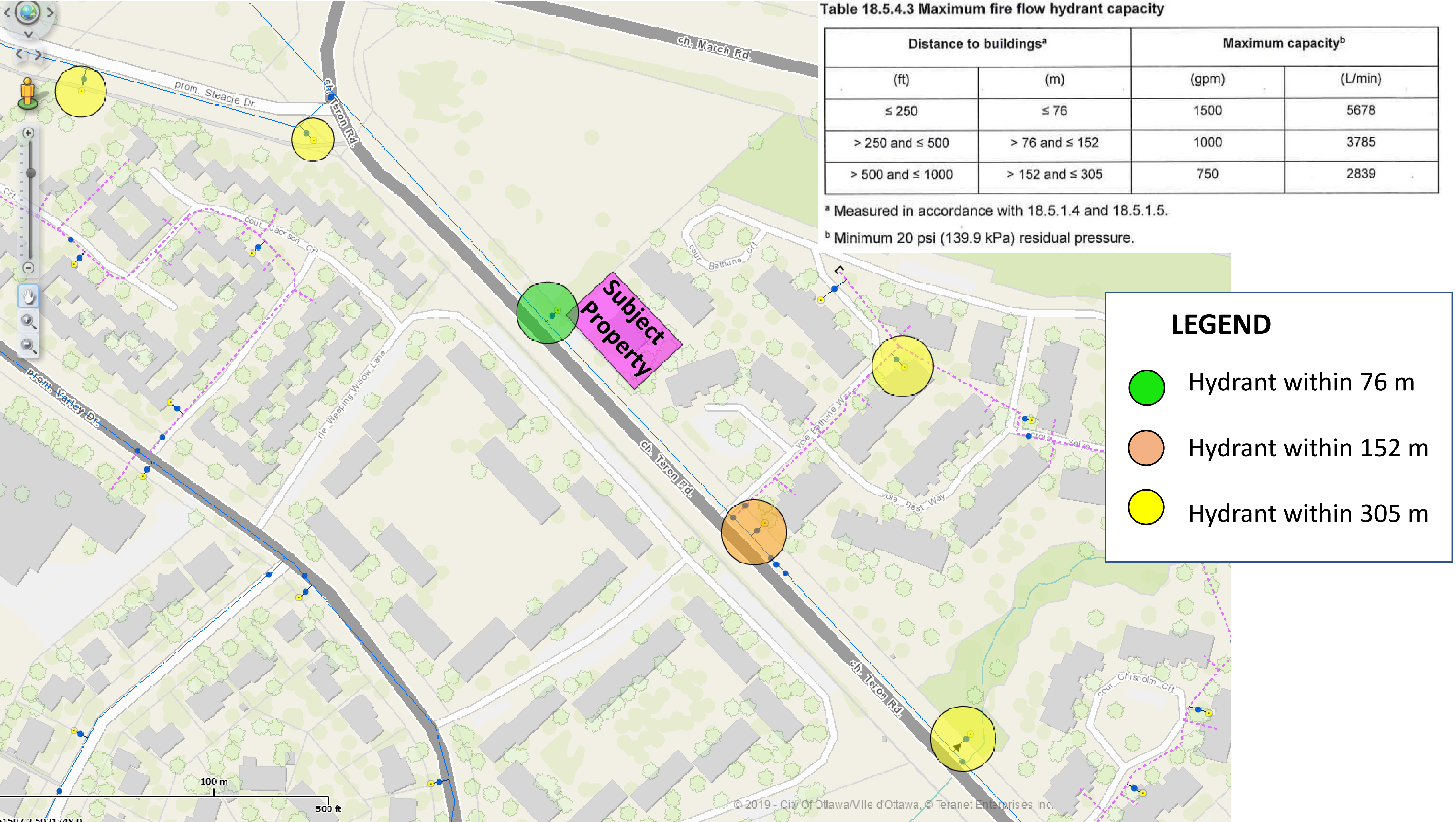
**Notes:**
**-Type of construction, Occupancy Type and Sprinkler Protection information provided by NEUF Architect(e)s.**
**-Calculations based on Fire Underwriters Survey - Part II**

**Table 18.5.4.3 Maximum fire flow hydrant capacity**

| Distance to buildings[a] | | Maximum capacity[b] | |
|---|---|---|---|
| (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 |

[a] Measured in accordance with 18.5.1.4 and 18.5.1.5.

[b] Minimum 20 psi (139.9 kPa) residual pressure.



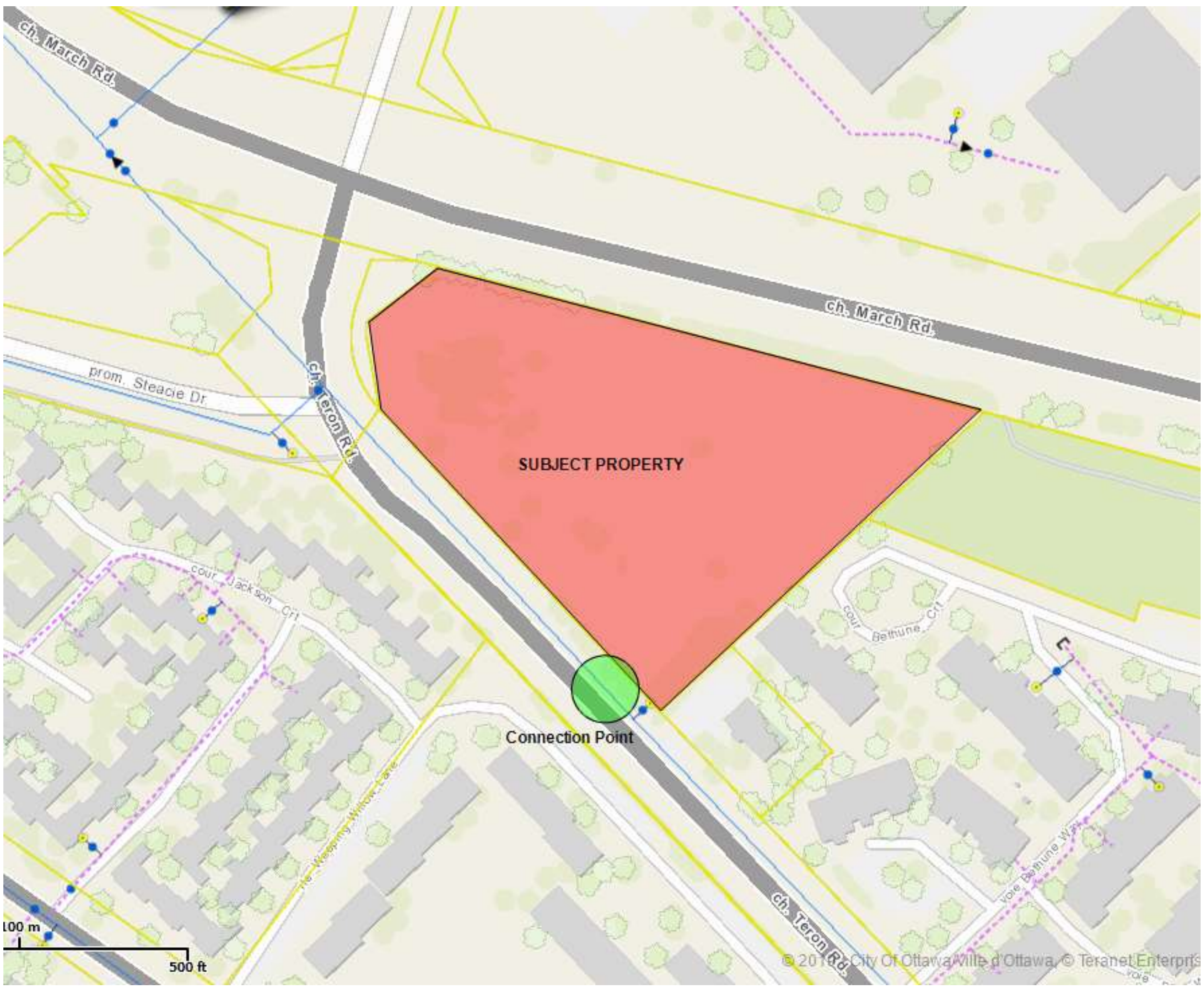
# Boundary Conditions for 1151 Teron Road

**Information Provided:**

Date provided: September 2019

| Scenario | Demand | |
|---|---|---|
| | L/min | L/s |
| Average Daily Demand | 37.2 | 0.62 |
| Maximum Daily Demand | 130.2 | 2.17 |
| Peak Hour | 196.2 | 3.27 |
| Fire Flow Demand #1 | 11000 | 183.33 |

## Location:



## Results:

**Connection 1 - Teron Road**

| Demand Scenario | Head (m) | Pressure[1] (psi) |
|---|---|---|
| Maximum HGL | 131.7 | 59.4 |
| Peak Hour | 125.9 | 51.2 |
| Max Day plus Fire | 126.1 | 51.5 |

[1] Ground Elevation = 89.9m

## Notes:

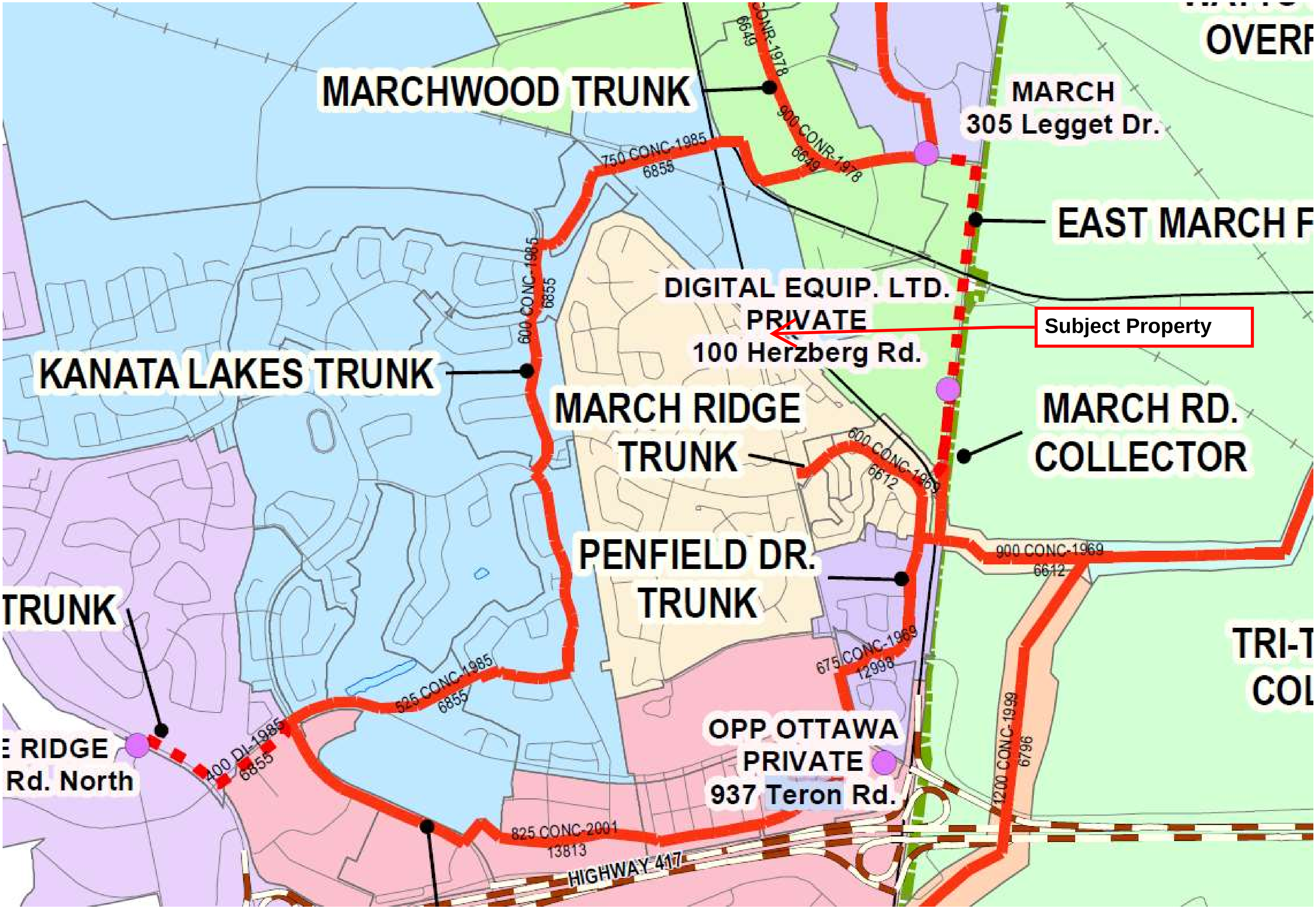
1. A new service connection to the 610mm transmission main is not permitted.
2. The site requires two connections since the number of residential units exceeds 50.

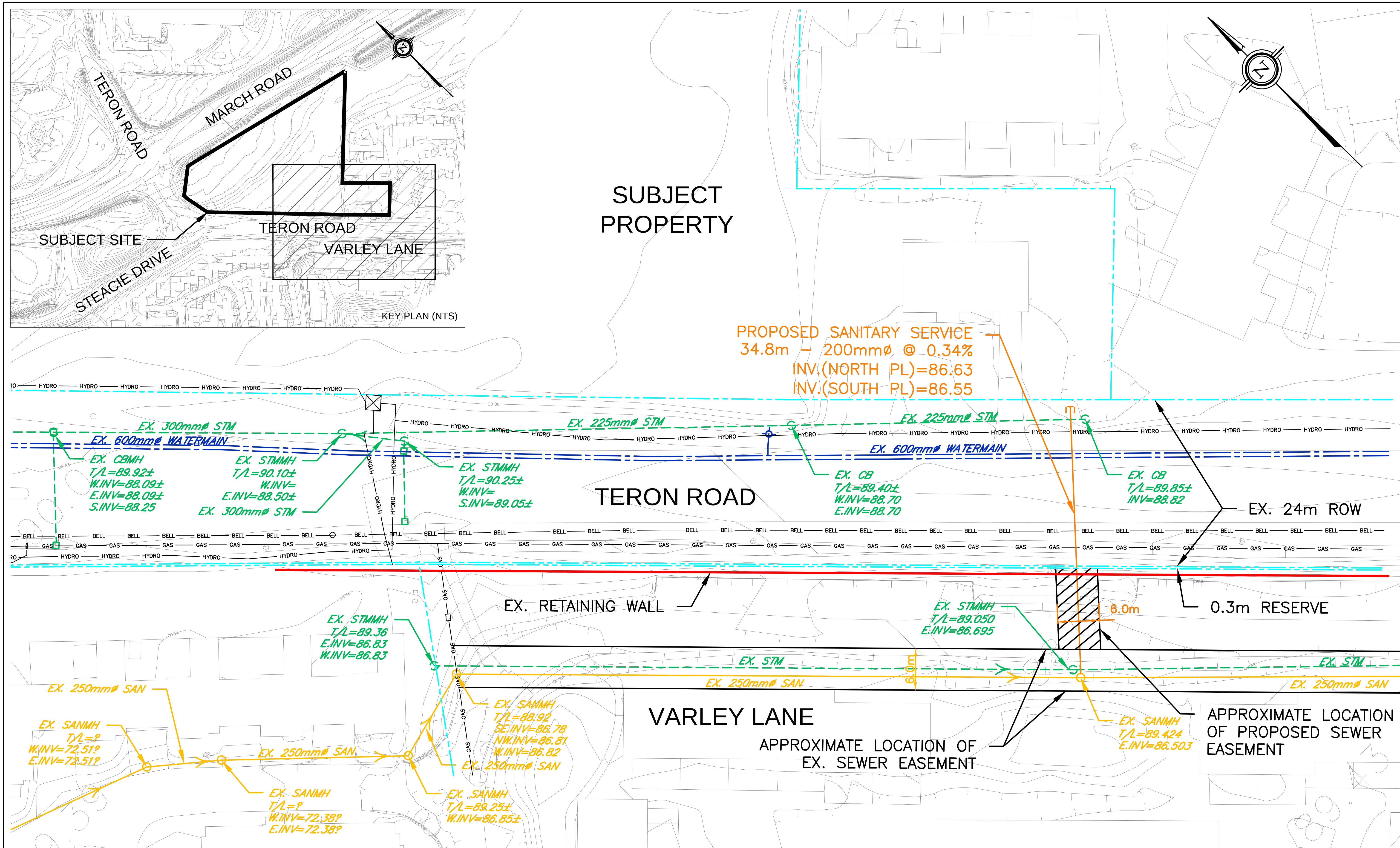
## Disclaimer

*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.*

# *APPENDIX C*

## *Wastewater Collection*


MARCHWOOD TRUNK
MARCH
305 Legget Dr.
OVERF
750 CONC-1985
6855
CONR-1978
6649
900 CONR-1978
6649
EAST MARCH F
DIGITAL EQUIP. LTD.
PRIVATE
100 Herzberg Rd.
Subject Property
600 CONC-1985
6855
KANATA LAKES TRUNK
MARCH RIDGE
TRUNK
MARCH RD.
COLLECTOR
600 CONC-1969
6612
900 CONC-1969
6612
PENFIELD DR.
TRUNK
TRUNK
TRI-T
COL
675 CONC-1969
12998
525 CONC-1985
6855
E RIDGE
Rd. North
400 DI-1985
6855
OPP OTTAWA
PRIVATE
937 Teron Rd.
1200 CONC-1999
6796
825 CONC-2001
13813
HIGHWAY 417




DSEL
david schaeffer engineering ltd
SMART SUBDIVISIONS™


120 Iber Road Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca


| Legend | | |
|---|---|---|
| EXISTING SANITARY SEWER | PROPOSED SANITARY SEWER | PROPERTY LINE |
| EXISTING STORM SEWER | PROPOSED STORM SEWER | |
| EXISTING WATERMAIN | PROPOSED WATERMAIN | |

# 1131 TERON ROAD

| | |
|---|---|
| PROJ NO.: | 11-541 |
| DRAWN BY: | AJT |
| DATE: | 2018-03-26 |
| SCALE: | 1:500 |
| FIGURE NO.: | FIG-1 |

z:\projects\11-541_holzman_1131-teron\b_design\b2_drawings\b2-5_sketches and figures\2018-03-19_sanitary_servicing_rev_ajt\cad\2018-03-26_541_spa_ajt.dwg

**Wastewater Design Flows per Unit Count**
**City of Ottawa Sewer Design Guidelines, 2004**

| | | |
|---|---|---|
| **Site Area** | 0.139 | **ha** |

**Extraneous Flow Allowances**

| | | |
|---|---|---|
| **Infiltration / Inflow (Dry)** | **0.01** | **L/s** |
| **Infiltration / Inflow (Wet)** | **0.04** | **L/s** |
| **Infiltration / Inflow (Total)** | **0.05** | **L/s** |

**Domestic Contributions**

| **Unit Type** | **Unit Rate** | **Units** | **Pop** |
|---|---|---|---|
| Single Family | 3.4 | | 0 |
| Semi-detached and duplex | 2.7 | | 0 |
| Townhouse | 2.7 | | 0 |
| Stacked Townhouse | 2.3 | | 0 |
| Apartment | | | |
| Bachelor | 1.4 | | 0 |
| 1 Bedroom | 1.4 | | 0 |
| 2 Bedroom | 2.1 | | 0 |
| 3 Bedroom | 3.1 | | 0 |
| Average | 1.8 | 30 | 54 |

| | | |
|---|---|---|
| **Total Pop** | **54** | |
| **Average Domestic Flow** | **0.18** | **L/s** |
| **Peaking Factor** | **3.65** | |
| **Peak Domestic Flow** | **0.64** | **L/s** |

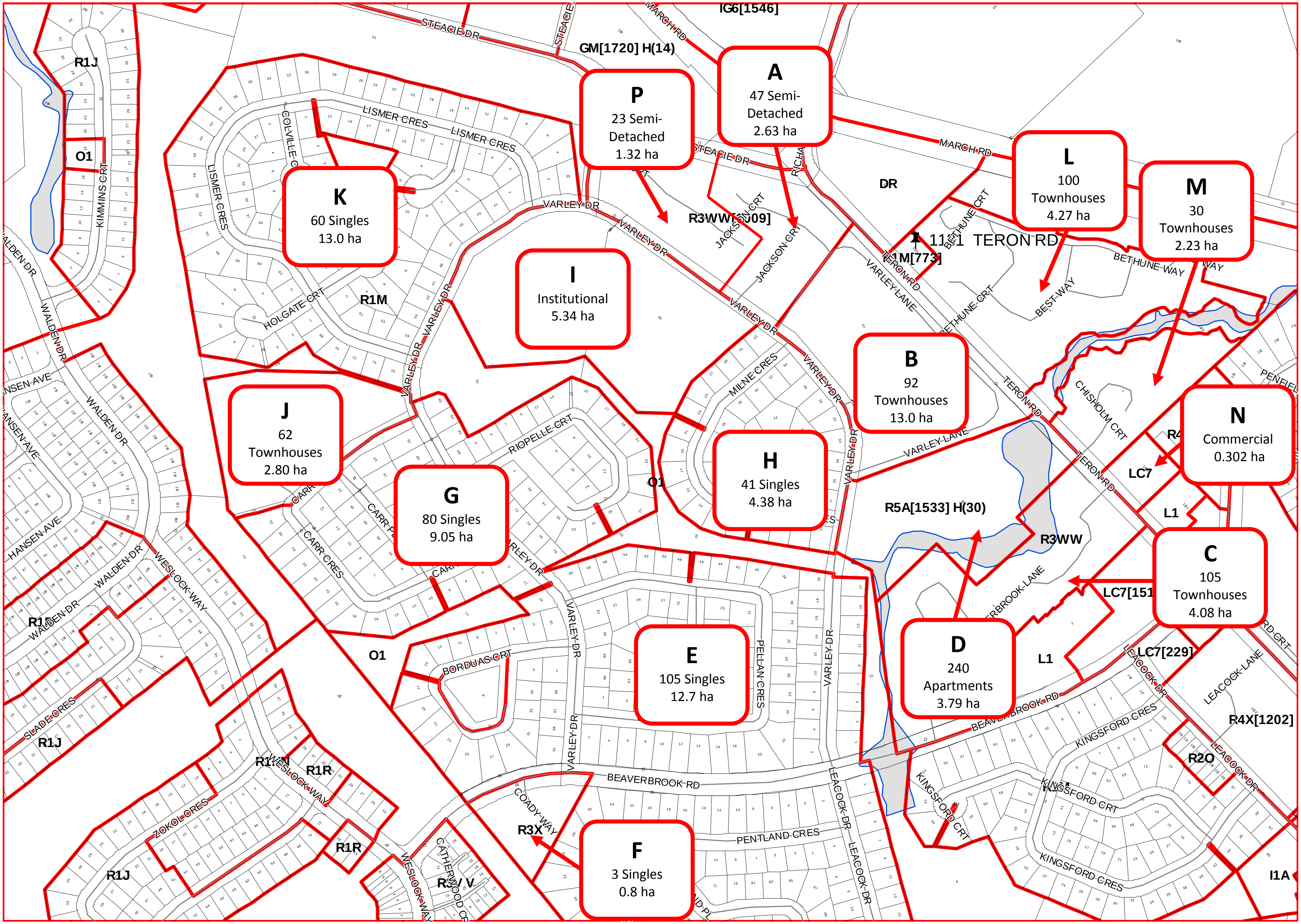
**Institutional / Commercial / Industrial Contributions**

| **Property Type** | **Unit Rate** | | **No. of Units** | **Avg Wastewater (L/s)** |
|---|---|---|---|---|
| Commercial floor space* | 5 | L/m$^2$/d | | 0.00 |
| Hospitals | 900 | L/bed/d | | 0.00 |
| School | 70 | L/student/d | | 0.00 |
| Industrial - Light** | 35,000 | L/gross ha/d | | 0.00 |
| Industrial - Heavy** | 55,000 | L/gross ha/d | | 0.00 |

| | |
|---|---|
| **Average I/C/I Flow** | **0.00** |
| **Peak Institutional / Commercial Flow** | 0.00 |
| **Peak Industrial Flow**** | 0.00 |
| **Peak I/C/I Flow** | **0.00** |

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

| | | |
|---|---|---|
| **Total Estimated Average Dry Weather Flow Rate** | **0.18** | **L/s** |
| **Total Estimated Peak Dry Weather Flow Rate** | **0.65** | **L/s** |
| **Total Estimated Peak Wet Weather Flow Rate** | **0.68** | **L/s** |



A
47 Semi-Detached
2.63 ha
P
23 Semi-Detached
1.32 ha
L
100 Townhouses
4.27 ha
M
30 Townhouses
2.23 ha
K
60 Singles
13.0 ha
I
Institutional
5.34 ha
B
92 Townhouses
13.0 ha
J
62 Townhouses
2.80 ha
N
Commercial
0.302 ha
H
41 Singles
4.38 ha
G
80 Singles
9.05 ha
C
105 Townhouses
4.08 ha
E
105 Singles
12.7 ha
D
240 Apartments
3.79 ha
F
3 Singles
0.8 ha
1131 TERON RD
IG6[1546]
GM[1720] H(14)
R3WW[1009]
R5A[1533] H(30)
R4X[1202]
LC7[229]

## SANITARY SEWER CALCULATION SHEET: Existing Conditions

PROJECT:
LOCATION: **1151 Teron Road**
FILE REF:
DATE: **01-Oct-19**

**DESIGN PARAMETERS**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg. Daily Flow Res. | 280 L/p/d | Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0 | | Infiltration / Inflow | 0.33 L/s/ha | | |
| Avg. Daily Flow Comm | 50,000 L/ha/d | Peak Fact. Comm. | 1.5 | Min. Pipe Velocity | 0.60 m/s full flowing | | |
| Avg. Daily Flow Instit. | 50,000 L/ha/d | Peak Fact. Instit. | 1.5 | Max. Pipe Velocity | 3.00 m/s full flowing | | |
| Avg. Daily Flow Indust | 35,000 L/ha/d | Peak Fact. Indust. per MOE graph | | Mannings N | 0.013 | | |

DSEL

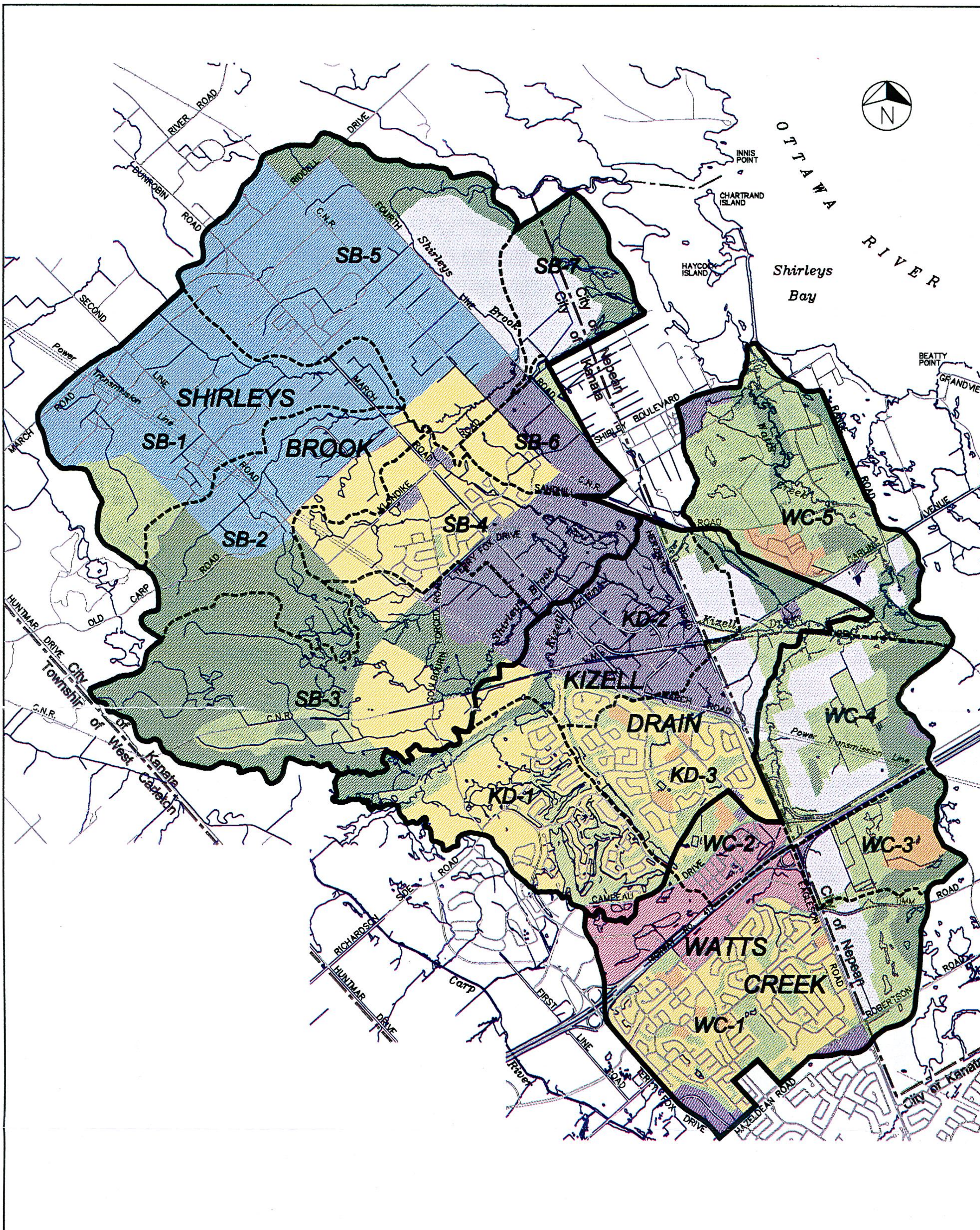
**Existing Condtiotions**

| Location | | | Residential Area and Population | | | | | | | | | | Commercial | | Institutional | | Industrial | | | Infiltration | | | | Pipe Data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area ID | Up | Down | Area | Number of Units by type | | | | Pop. | Cumulative Area | Cumulative Pop. | Peak. Fact. | $Q_{res}$ | Area | Accu. Area | Area | Accu. Area | Area | Accu. Area | $Q_{C+I+I}$ | Total Area | Accu. Area | Infiltration Flow | Total Flow | DIA | Slope | Length | $A_{hydraulic}$ | R | Velocity | $Q_{cap}$ | Q / Q full |
| | | | (ha) | Singles | Semi's | Town's | Apt's | | (ha) | | (-) | (L/s) | (ha) | (ha) | (ha) | (ha) | (ha) | (ha) | (L/s) | (ha) | (ha) | (L/s) | (L/s) | (mm) | (%) | (m) | ($m^2$) | (m) | (m/s) | (L/s) | (-) |
| A | 10 | 9 | 2.63 | | 47 | | | 126.0 | 2.633 | 126.0 | 4.00 | 1.63 | | 0.00 | | 0.00 | | 0.00 | 0.0 | 2.633 | 2.633 | 0.737 | 2.37 | 250 | 0.24 | 92.8 | 0.049 | 0.063 | 0.59 | 29.1 | 0.08 |
| B | 9 | 8 | 3.78 | | | 92 | | 248.0 | 6.413 | 374.0 | 4.00 | 4.85 | | 0.00 | | 0.00 | | 0.00 | 0.0 | 3.780 | 6.413 | 1.796 | 6.64 | 250 | 0.24 | 68.6 | 0.049 | 0.063 | 0.59 | 29.1 | 0.23 |
| L | 8 | 7 | 4.27 | | | 100 | | 270.0 | 10.683 | 644.0 | 3.92 | 8.17 | | 0.00 | | 0.00 | | 0.00 | 0.0 | 4.270 | 10.683 | 2.991 | 11.16 | 250 | 0.24 | 69.3 | 0.049 | 0.063 | 0.59 | 29.1 | 0.38 |
| C | | | 3.79 | | | | 240 | 432.0 | 14.473 | 1076.0 | 3.78 | 13.18 | | 0.00 | | 0.00 | | 0.00 | 0.0 | 3.790 | 3.790 | 1.061 | 14.24 | | | | | | | | |
| P | | | 1.32 | | 23 | | | 63.0 | 15.790 | 1139.0 | 3.76 | 13.89 | | 0.00 | | 0.00 | | 0.00 | 0.0 | 1.317 | 5.107 | 1.430 | 15.32 | | | | | | | | |
| E | | | 10.50 | 105 | | | | 357.0 | 26.290 | 1496.0 | 3.68 | 17.84 | | 0.00 | | 0.00 | | 0.00 | 0.0 | 10.500 | 15.607 | 4.370 | 22.21 | | | | | | | | |
| F | | | 0.80 | 3 | | | | 10.0 | 27.090 | 1506.0 | 3.68 | 17.95 | | 0.00 | | 0.00 | | 0.00 | 0.0 | 0.800 | 16.407 | 4.594 | 22.55 | | | | | | | | |
| G | | | 9.05 | 80 | | | | 272.0 | 36.140 | 1778.0 | 3.62 | 20.89 | | 0.00 | | 0.00 | | 0.00 | 0.0 | 9.050 | 25.457 | 7.128 | 28.02 | | | | | | | | |
| H | | | 4.38 | 41 | | | | 139.0 | 40.520 | 1917.0 | 3.60 | 22.37 | | 0.00 | | 0.00 | | 0.00 | 0.0 | 4.380 | 29.837 | 8.354 | 30.72 | | | | | | | | |
| I | | | 0.00 | | | | | 0.0 | 40.520 | 1917.0 | 3.60 | 22.37 | | 0.00 | 5.34 | 5.34 | | 0.00 | 4.6 | 5.340 | 35.177 | 9.849 | 36.85 | | | | | | | | |
| J | | | 2.80 | | | 62 | | 167.0 | 43.320 | 2084.0 | 3.57 | 24.12 | | 0.00 | | 5.34 | | 0.00 | 4.6 | 2.800 | 37.977 | 10.633 | 39.39 | | | | | | | | |
| K | 6 | 5 | 12.99 | 60 | | | | 204.0 | 56.310 | 2288.0 | 3.54 | 26.25 | | 0.00 | | 5.34 | | 0.00 | 4.6 | 12.990 | 50.967 | 14.271 | 45.15 | 525 | 0.10 | 19.2 | 0.216 | 0.131 | 0.63 | 136.0 | 0.33 |
| | 5 | 4 | 0.00 | | | | | 0.0 | 56.310 | 2288.0 | 3.54 | 26.25 | | 0.00 | | 5.34 | | 0.00 | 4.6 | 0.000 | 50.967 | 14.271 | 45.15 | 525 | 0.10 | 84.2 | 0.216 | 0.131 | 0.63 | 136.0 | 0.33 |
| M | 4 | 3 | 2.23 | | | 30 | | 81.0 | 58.540 | 2369.0 | 3.53 | 27.08 | | 0.00 | | 5.34 | | 0.00 | 4.6 | 2.230 | 53.197 | 14.895 | 46.61 | 525 | 0.10 | 19.3 | 0.216 | 0.131 | 0.63 | 136.0 | 0.34 |
| N | 3 | 2 | 0.00 | | | | | 0.0 | 58.540 | 2369.0 | 3.53 | 27.08 | 0.30 | 0.30 | | 5.34 | | 0.00 | 4.9 | 0.300 | 53.497 | 14.979 | 46.96 | 525 | 0.10 | 56.3 | 0.216 | 0.131 | 0.63 | 136.0 | 0.35 |
| D | 2 | 1 | 4.08 | | | 105 | | 284.0 | 62.620 | 2653.0 | 3.49 | 29.98 | | 0.30 | | 5.34 | | 0.00 | 4.9 | 4.080 | 57.577 | 16.121 | 51.00 | 600 | 0.11 | 109.2 | 0.283 | 0.150 | 0.72 | 203.5 | 0.25 |

Note: Slope for segment between nodes 1-2 from City of Ottawa GIS data. All other slopes assumed minimum values from City of Ottawa Sewer Design Guidline

# *APPENDIX D*

## *Stormwater Management*




| SHIRLEYS BROOK/WATTS CREEK SUBWATERSHED STUDY | REGION OF OTTAWA-CARLTON AND CITY OF KANATA |
|---|---|

**LEGEND**

- Subwatershed Boundary
- Subarea Boundary
- Watercourse/Waterbody
- Roads
- Railway
- Municipal Boundary
- **SB-1** Subarea Number

Land Use

- Urban Residential
- Rural Residential
- Institutional
- Open Space
- Forest/Woodland
- Industrial/Commercial
- Agriculture
- Kanata Town Centre

FUTURE LAND USE

DILLON CONSULTING

| SCALE | FIGURE | PROJECT NO. |
|---|---|---|
| 1 : 40,000 | 5.1 | 97-4771 |

**Estimated Peak Stormwater Flow Rate**
**City of Ottawa Sewer Design Guidelines, 2012**

**Existing Drainage Charateristics From Internal Site at 1131 Teron Rd**

| | | | |
|---|---|---|---|
| **Area ID** | EX-1 | | |
| **Area** | 0.14 | ha | |
| **C** | 0.48 | Rational Method runoff coefficient | |
| **L** | 31 | m | |
| **Up Elev** | 90.6 | m | |
| **Dn Elev** | 89.77 | m | |
| **Slope** | 2.7 | % | |
| **Tc** | 10.0 | min | **Minimum time of concentration = 10 min* |

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

**Estimated Peak Flow**

| | 2-year | 5-year | 100-year | |
|---|---|---|---|---|
| **i** | 76.8 | 104.2 | 178.6 | mm/hr |
| **Q** | 14.2 | 19.3 | 41.4 | L/s |

*Note:*
*C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)*

**Existing Drainage Area Charateristics from External Site at 1151 Teron Rd**

| | | | |
|---|---|---|---|
| **Area ID** | EX-2 | | |
| **Area** | 1.37 | ha | |
| **C** | 0.20 | Rational Method runoff coefficient | |
| $t_c$ | 14.7 | min | ** Min. time of concentrtaion = 10min* |

**Estimated Peak Flow**

| | 2-year | 5-year | 100-year | |
|---|---|---|---|---|
| **i** | 62.5 | 84.5 | 144.6 | mm/hr |
| **Q** | 47.5 | 64.2 | 137.4 | L/s |

* C value calculated as a composite value based on existing site soil conditions and topography.
value derived using Table 5.7 Runoff Coefficients for Various Soil Conditions from the Ottawa Sewer Design Guidelines,

**Drainage Basin Characteristics**

| **Area ID** | |
|---|---|
| **A (ha)** | 1.368 |
| **L (m)** | 93 |
| **Up Elev** | 89.86 |
| **Dn Elev** | 88 |
| **S (%)** | 2.0 |
| **CN (-)** | 61 |
| **Tc (min)** | 14.7 |

**CN value was selected assuming Hydrologic Soil Group B and good conditions (grass covering >75%)*

Time of Concentration per SCS lag equation

$$t_c = \frac{100L^{0.8}\left[\left(\frac{1000}{CN}\right)-9\right]^{0.7}}{1900S^{0.5}}$$

L, length in ft
CN, SCS runoff curve number
S, average watershed slope in (%)

**11021028 and 11073656 Canada Inc.**
**1131 Teron Road**
**Propopsed Conditions**
**Drainage Area A1**

**Stormwater - Proposed Development**
**City of Ottawa Sewer Design Guidelines, 2012**

**Target Flow Rate**

**Area** 0.14 ha
**C** 0.48 Rational Method runoff coefficient
**$t_c$** 10.0 min

**5-year**
**i** 104.2 mm/hr
**Q** 19.3 L/s

**Estimated Post Development Peak Flow from Unattenuated Areas**

**Total Area** 0.01 ha
**C** 0.20 Rational Method runoff coefficient

| | 5-year | | | | | 100-year | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $t_c$ (min) | i (mm/hr) | $Q_{actual}$ (L/s) | $Q_{release}$ (L/s) | $Q_{stored}$ (L/s) | $V_{stored}$ ($m^3$) | i (mm/hr) | $Q_{actual}$* (L/s) | $Q_{release}$ (L/s) | $Q_{stored}$ (L/s) | $V_{stored}$ ($m^3$) |
| 10.0 | 104.2 | 0.3 | 0.3 | 0.0 | 0.0 | 178.6 | 0.7 | 0.7 | 0.0 | 0.0 |

*Note:*
*C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)*

**Estimated Post Development Peak Flow from Attenuated Areas**

**Building ID** A1
**Roof Area** 0.055 ha
**Avail Storage Area** 0.052
**C** 0.90 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*
**$t_c$** 10 min, tc at outlet without restriction

**Estimated Number of Roof Drains**
**Building Length** 50
**Building Width** 50
**Number of Drains** 4
**$m^2$ / Drain** 130.6 max 232.25$m^2$/notch as recommended by Zurn for Ottawa

| Roof Top Rating Curve per Zurn Model Z-105-5 | | | | | | |
|---|---|---|---|---|---|---|
| d (m) | A ($m^2$) | $V_{acc}$ ($m^3$) | $V_{avail}$ ($m^3$) | $Q_{notch}$ (L/s) | $Q_{roof}$ (L/s) | $V_{drawdown}$ (hr) |
| 0.000 | 0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 |
| 0.025 | 32.7 | 0.3 | 0.3 | 0.38 | 1.52 | 0.05 |
| 0.050 | 130.6 | 1.9 | 2.2 | 0.77 | 3.08 | 0.22 |
| 0.075 | 293.9 | 5.2 | 7.3 | 1.14 | 4.56 | 0.54 |
| 0.100 | 522.5 | 10.1 | 17.4 | 1.52 | 6.08 | 1.00 |
| 0.125 | 522.5 | 13.1 | 30.5 | 1.90 | 7.60 | 1.47 |
| 0.150 | 522.5 | 13.1 | 43.5 | 2.28 | 9.12 | 1.87 |

* Assumes one notch opening per drain, assumes maximum slope of 10cm

| | 5-year | | | | | 100-year | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $t_c$ (min) | i (mm/hr) | $Q_{actual}$ (L/s) | $Q_{release}$ (L/s) | $Q_{stored}$ (L/s) | $V_{stored}$ ($m^3$) | i (mm/hr) | $Q_{actual}$ (L/s) | $Q_{release}$ (L/s) | $Q_{stored}$ (L/s) | $V_{stored}$ ($m^3$) |
| 10 | 104.2 | 14.3 | 4.3 | 10.0 | 6.0 | 178.6 | 27.3 | 5.7 | 21.5 | 12.9 |
| 15 | 83.6 | 11.5 | 4.3 | 7.2 | 6.5 | 142.9 | 21.8 | 5.7 | 16.1 | 14.5 |
| 20 | 70.3 | 9.7 | 4.3 | 5.4 | 6.4 | 120.0 | 18.3 | 5.7 | 12.6 | 15.1 |
| 25 | 60.9 | 8.4 | 4.3 | 4.1 | 6.1 | 103.8 | 15.9 | 5.7 | 10.1 | 15.2 |
| 30 | 53.9 | 7.4 | 4.3 | 3.1 | 5.6 | 91.9 | 14.0 | 5.7 | 8.3 | 14.9 |
| 35 | 48.5 | 6.7 | 4.3 | 2.4 | 5.0 | 82.6 | 12.6 | 5.7 | 6.9 | 14.4 |
| 40 | 44.2 | 6.1 | 4.3 | 1.8 | 4.2 | 75.1 | 11.5 | 5.7 | 5.7 | 13.8 |
| 45 | 40.6 | 5.6 | 4.3 | 1.3 | 3.5 | 69.1 | 10.5 | 5.7 | 4.8 | 13.0 |
| 50 | 37.7 | 5.2 | 4.3 | 0.9 | 2.6 | 64.0 | 9.8 | 5.7 | 4.0 | 12.1 |
| 55 | 35.1 | 4.8 | 4.3 | 0.5 | 1.7 | 59.6 | 9.1 | 5.7 | 3.4 | 11.1 |
| 60 | 32.9 | 4.5 | 4.3 | 0.2 | 0.8 | 55.9 | 8.5 | 5.7 | 2.8 | 10.1 |
| 65 | 31.0 | 4.3 | 4.3 | 0.0 | 0.0 | 52.6 | 8.0 | 5.7 | 2.3 | 9.0 |
| 70 | 29.4 | 4.0 | 4.0 | 0.0 | 0.0 | 49.8 | 7.6 | 5.7 | 1.9 | 7.8 |
| 75 | 27.9 | 3.8 | 3.8 | 0.0 | 0.0 | 47.3 | 7.2 | 5.7 | 1.5 | 6.6 |
| 80 | 26.6 | 3.7 | 3.7 | 0.0 | 0.0 | 45.0 | 6.9 | 5.7 | 1.1 | 5.4 |
| 85 | 25.4 | 3.5 | 3.5 | 0.0 | 0.0 | 43.0 | 6.6 | 5.7 | 0.8 | 4.2 |
| 90 | 24.3 | 3.3 | 3.3 | 0.0 | 0.0 | 41.1 | 6.3 | 5.7 | 0.5 | 2.9 |
| 95 | 23.3 | 3.2 | 3.2 | 0.0 | 0.0 | 39.4 | 6.0 | 5.7 | 0.3 | 1.6 |
| 100 | 22.4 | 3.1 | 3.1 | 0.0 | 0.0 | 37.9 | 5.8 | 5.7 | 0.0 | 0.3 |
| 105 | 21.6 | 3.0 | 3.0 | 0.0 | 0.0 | 36.5 | 5.6 | 5.6 | 0.0 | 0.0 |
| 110 | 20.8 | 2.9 | 2.9 | 0.0 | 0.0 | 35.2 | 5.4 | 5.4 | 0.0 | 0.0 |

| | | | |
|---|---|---|---|
| **5-year $Q_{roof}$** | **4.31 L/s** | **100-year $Q_{roof}$** | **5.74 L/s** |
| **5-year Max. Storage Required** | **6.5 $m^3$** | **100-year Max. Storage Required** | **15.2 $m^3$** |
| **5-year Storage Depth** | **0.071 m** | **100-year Storage Depth** | **0.094 m** |
| **5-year Estimated Drawdown Time** | **0.48 hr** | **)0-year Estimated Drawdown Time** | **0.89 hr** |

**1131 Teron Road**
**Propopsed Conditions**
**Drainage Area A1**

**Estimated Post Development Peak Flow from Attenuated Areas**

**Area ID** A1
**Available Sub-surface Storage**
Maintenance Structures

| ID | CB 'L' | CB 'T' | CB 'T' | CB '1A' | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Structure Dia./Area (mm/mm$^2$) | 360 | 360 | 360 | 360 | | | | | |
| T/L* | 89.79 | 89.81 | 89.78 | 89.77 | | | | | |
| INV | 89.20 | 89.18 | 89.14 | 89.06 | | | | | |
| Depth | 0.59 | 0.63 | 0.64 | 0.71 | | | | | |
| $V_{structure}$ (m$^3$) | 0.1 | 0.1 | 0.1 | 0.1 | | | | | |

Sewers

| ID | 250mm | | | | | | | | U/G STORG. |
|---|---|---|---|---|---|---|---|---|---|
| Storage Pipe Dia (mm) | 250 | | | | | | | | |
| L (m) | 78.5 | | | | | | | | |
| $V_{sewer}$ (m$^3$) | 3.9 | | | | | | | | |

*Top of lid or max ponding elevation 89.9

**Total Subsurface Storage (m$^3$)** 4.2

**Stage Attenuated Areas Storage Summary**

| | | Surface Storage | | | Surface and Subsurface Storage | | | |
|---|---|---|---|---|---|---|---|---|
| | **Stage** | **Ponding** | **$h_o$** | **delta d** | **V*** | **$V_{acc}$**** | **$Q_{release}$†** | **$V_{drawdown}$** |
| | **(m)** | **(m$^2$)** | **(m)** | **(m)** | **(m$^3$)** | **(m$^3$)** | **(L/s)** | **(hr)** |
| Orifice INV | 89.06 | | 0.00 | | | 0.0 | 0.0 | 0.00 |
| T/L | 89.77 | | 0.71 | 0.71 | 2.1 | 2.1 | 11.4 | 0.05 |
| Storage Pipe OBV | 89.86 | 23 | 0.80 | 0.09 | 2.8 | 4.9 | 12.1 | 0.11 |
| Max Ponding | 89.90 | 74.0 | 0.84 | 0.04 | 1.8 | 6.7 | 12.4 | 0.15 |

* V=Incremental storage volume
**$V_{acc}$=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

**Orifice Location** **CB1A** **Dia.** 80
**Total Area** 0.06 ha
**C** 0.30 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

| | 5-year | | | | | 100-year | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **$t_c$ (min)** | **i (mm/hr)** | **$Q_{actual}$‡ (L/s)** | **$Q_{release}$ (L/s)** | **$Q_{stored}$ (L/s)** | **$V_{stored}$ (m$^3$)** | **i (mm/hr)** | **$Q_{actual}$‡ (L/s)** | **$Q_{release}$ (L/s)** | **$Q_{stored}$ (L/s)** | **$V_{stored}$ (m$^3$)** |
| 10 | 104.2 | 9.4 | 7.2 | 2.2 | 1.3 | 178.6 | 16.7 | 11.7 | 5.0 | 3.0 |
| 15 | 83.6 | 8.4 | 7.2 | 1.2 | 1.1 | 142.9 | 14.5 | 11.7 | 2.8 | 2.6 |
| 20 | 70.3 | 7.8 | 7.2 | 0.5 | 0.6 | 120.0 | 13.1 | 11.7 | 1.4 | 1.7 |
| 25 | 60.9 | 7.3 | 7.2 | 0.1 | 0.1 | 103.8 | 12.1 | 11.7 | 0.4 | 0.7 |
| 30 | 53.9 | 7.0 | 7.0 | 0.0 | 0.0 | 91.9 | 11.4 | 11.7 | 0.0 | 0.0 |
| 35 | 48.5 | 6.7 | 6.7 | 0.0 | 0.0 | 82.6 | 10.8 | 11.7 | 0.0 | 0.0 |
| 40 | 44.2 | 6.5 | 6.5 | 0.0 | 0.0 | 75.1 | 10.4 | 11.7 | 0.0 | 0.0 |
| 45 | 40.6 | 6.3 | 6.3 | 0.0 | 0.0 | 69.1 | 10.0 | 11.7 | 0.0 | 0.0 |
| 50 | 37.7 | 6.2 | 6.2 | 0.0 | 0.0 | 64.0 | 9.7 | 11.7 | 0.0 | 0.0 |
| 55 | 35.1 | 6.0 | 6.0 | 0.0 | 0.0 | 59.6 | 9.4 | 11.7 | 0.0 | 0.0 |
| 60 | 32.9 | 5.9 | 5.9 | 0.0 | 0.0 | 55.9 | 9.2 | 11.7 | 0.0 | 0.0 |
| 65 | 31.0 | 5.8 | 5.8 | 0.0 | 0.0 | 52.6 | 9.0 | 11.7 | 0.0 | 0.0 |
| 70 | 29.4 | 5.8 | 5.8 | 0.0 | 0.0 | 49.8 | 8.8 | 11.7 | 0.0 | 0.0 |
| 75 | 27.9 | 5.7 | 5.7 | 0.0 | 0.0 | 47.3 | 8.6 | 11.7 | 0.0 | 0.0 |
| 80 | 26.6 | 5.6 | 5.6 | 0.0 | 0.0 | 45.0 | 8.5 | 11.7 | 0.0 | 0.0 |
| 85 | 25.4 | 5.6 | 5.6 | 0.0 | 0.0 | 43.0 | 8.4 | 11.7 | 0.0 | 0.0 |
| 90 | 24.3 | 5.5 | 5.5 | 0.0 | 0.0 | 41.1 | 8.3 | 11.7 | 0.0 | 0.0 |
| 95 | 23.3 | 5.5 | 5.5 | 0.0 | 0.0 | 39.4 | 8.2 | 11.7 | 0.0 | 0.0 |
| 100 | 22.4 | 5.4 | 5.4 | 0.0 | 0.0 | 37.9 | 8.1 | 11.7 | 0.0 | 0.0 |
| 105 | 21.6 | 5.4 | 5.4 | 0.0 | 0.0 | 36.5 | 8.0 | 11.7 | 0.0 | 0.0 |
| 110 | 20.8 | 5.3 | 5.3 | 0.0 | 0.0 | 35.2 | 7.9 | 11.7 | 0.0 | 0.0 |

| | | | |
|---|---|---|---|
| **5-year $Q_{attenuated}$** | **7.23 L/s** | **100-year $Q_{attenuated}$** | **11.68 L/s** |
| **5-year Max. Storage Required** | **1.3 m$^3$** | **100-year Max. Storage Required** | **3.0 m$^3$** |
| **Est. 5-year Storage Elevation** | **89.51 m** | **Est. 100-year Storage Elevation** | **89.80 m** |

**Summary of Release Rates and Storage Volumes**

| Control Area | 5-Year Release Rate (L/s) | 5-Year Required Storage (m$^3$) | 100-Year Release Rate (L/s) | 100-Year Required Storage (m$^3$) | 100-Year Available Storage (m$^3$) |
|---|---|---|---|---|---|
| Unattenuated Areas | 0.3 | 0.0 | 0.7 | 0.0 | 0.0 |
| Roof Controls | 4.3 | 6.5 | 5.7 | 15.2 | 43.5 |
| Attenuated Areas | 7.2 | 1.3 | 11.7 | 3.0 | 6.7 |
| **Total** | **11.9** | **7.8** | **18.2** | **18.2** | **50.2** |

**Stormwater - Proposed Development**
**City of Ottawa Sewer Design Guidelines, 2012**

**Target Flow Rate - Rear Yard**

| | | |
|---|---|---|
| **Area** | 0.28 | ha |
| **C** | 0.20 | Rational Method runoff coefficient |
| **$t_c$** | 14.7 | min |

| | | | | |
|---|---|---|---|---|
| **i** | **5-year** | | **100-year** | |
| **Q** | 84.5 | mm/hr | 144.6 | mm/hr |
| | 13.2 | L/s | 28.2 | L/s |

**Estimated Post Development Peak Flow from Unattenuated Areas**

| | | |
|---|---|---|
| **Area ID** | U2 | |
| **Total Area** | 0.016 | ha |
| **C** | 0.20 | Rational Method runoff coefficient |

| | 5-year | | | | | 100-year | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $t_c$ (min) | i (mm/hr) | $Q_{actual}$ (L/s) | $Q_{release}$ (L/s) | $Q_{stored}$ (L/s) | $V_{stored}$ ($m^3$) | i (mm/hr) | $Q_{actual}$* (L/s) | $Q_{release}$ (L/s) | $Q_{stored}$ (L/s) | $V_{stored}$ ($m^3$) |
| 16.7 | 78.3 | 0.7 | 0.7 | 0.0 | 0.0 | 133.9 | 1.5 | 1.5 | 0.0 | 0.0 |

*Note:*
*C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)*

**Estimated Post Development Peak Flow from Attenuated Areas**

**Area ID** **A2**
**Available Storage**

**Total Subsurface Storage ($m^3$)**

**Stage Attenuated Areas Storage Summary**

| | | Surface Storage | | | | Surface and Subsurface Storage | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Stage (m) | Ponding ($m^2$) | $h_s$ (m) | $h_{100}$ (m) | delta d (m) | V* ($m^3$) | $V_{acc}$** ($m^3$) | $Q_{5-year}$† (L/s) | $Q_{100-year}$† (L/s) | $Q_{total}$† (L/s) |
| 5-year Orifice INV | 88.25 | 125.0 | 0.00 | 0.00 | | | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.10m Ponding | 88.35 | 142.3 | 0.10 | 0.00 | 0.10 | 13.4 | 13.4 | 9.7 | 0.0 | 9.7 |
| 100-Year Orifice INV | 88.42 | 154.8 | 0.17 | 0.00 | 0.07 | 10.4 | 23.8 | 12.6 | 0.0 | 12.6 |
| 0.20m Ponding | 88.45 | 160.0 | 0.20 | 0.03 | 0.03 | 4.7 | 28.5 | 13.7 | 4.9 | 18.5 |
| 0.30m Ponding | 88.55 | 178.7 | 0.30 | 0.13 | 0.10 | 16.9 | 45.4 | 16.7 | 10.1 | 26.9 |
| 0.40m Ponding | 88.65 | 197.6 | 0.40 | 0.23 | 0.10 | 18.8 | 64.2 | 19.3 | 13.5 | 32.8 |
| 0.50m Ponding | 88.75 | 217.3 | 0.50 | 0.33 | 0.10 | 20.7 | 84.9 | 21.6 | 16.1 | 37.7 |
| 0.60m Ponding | 88.85 | 237.8 | 0.60 | 0.43 | 0.10 | 22.7 | 107.7 | 23.7 | 18.4 | 42.1 |

* V=Incremental storage volume
**$V_{acc}$=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **CSP(5-YR)** | | | **CSP(100-YR)** | |
| **Orifice Location** | **DICB 2A** | **Dia** | 120 | | **Dia** | 115 |
| | | **INV** | 88.25 | | **INV** | 88.42 |

**Total Area** 0.265 ha
**C** 0.58 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

| | 5-year | | | | | 100-year | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $t_c$ (min) | i (mm/hr) | $Q_{actual}$‡ (L/s) | $Q_{release}$ (L/s) | $Q_{stored}$ (L/s) | $V_{stored}$ ($m^3$) | i (mm/hr) | $Q_{actual}$‡ (L/s) | $Q_{release}$ (L/s) | $Q_{stored}$ (L/s) | $V_{stored}$ ($m^3$) |
| 10 | 104.2 | 44.5 | 12.0 | 32.5 | 19.5 | 178.6 | 95.3 | 26.6 | 68.7 | 41.2 |
| 15 | 83.6 | 35.7 | 12.0 | 23.7 | 21.3 | 142.9 | 76.3 | 26.6 | 49.7 | 44.7 |
| 20 | 70.3 | 30.0 | 12.0 | 18.0 | 21.6 | 120.0 | 64.0 | 26.6 | 37.4 | 44.9 |
| 25 | 60.9 | 26.0 | 12.0 | 14.0 | 21.0 | 103.8 | 55.4 | 26.6 | 28.8 | 43.2 |
| 30 | 53.9 | 23.0 | 12.0 | 11.0 | 19.9 | 91.9 | 49.0 | 26.6 | 22.4 | 40.4 |
| 35 | 48.5 | 20.7 | 12.0 | 8.7 | 18.3 | 82.6 | 44.1 | 26.6 | 17.5 | 36.7 |
| 40 | 44.2 | 18.9 | 12.0 | 6.9 | 16.5 | 75.1 | 40.1 | 26.6 | 13.5 | 32.4 |
| 45 | 40.6 | 17.3 | 12.0 | 5.4 | 14.5 | 69.1 | 36.9 | 26.6 | 10.2 | 27.7 |
| 50 | 37.7 | 16.1 | 12.0 | 4.1 | 12.3 | 64.0 | 34.1 | 26.6 | 7.5 | 22.6 |
| 55 | 35.1 | 15.0 | 12.0 | 3.0 | 9.9 | 59.6 | 31.8 | 26.6 | 5.2 | 17.2 |
| 60 | 32.9 | 14.1 | 12.0 | 2.1 | 7.5 | 55.9 | 29.8 | 26.6 | 3.2 | 11.6 |
| 65 | 31.0 | 13.3 | 12.0 | 1.3 | 4.9 | 52.6 | 28.1 | 26.6 | 1.5 | 5.8 |
| 70 | 29.4 | 12.5 | 12.0 | 0.5 | 2.3 | 49.8 | 26.6 | 26.6 | 0.0 | 0.0 |
| 75 | 27.9 | 11.9 | 11.9 | 0.0 | 0.0 | 47.3 | 25.2 | 26.6 | 0.0 | 0.0 |
| 80 | 26.6 | 11.3 | 11.3 | 0.0 | 0.0 | 45.0 | 24.0 | 26.6 | 0.0 | 0.0 |
| 85 | 25.4 | 10.8 | 10.8 | 0.0 | 0.0 | 43.0 | 22.9 | 26.6 | 0.0 | 0.0 |
| 90 | 24.3 | 10.4 | 10.4 | 0.0 | 0.0 | 41.1 | 21.9 | 26.6 | 0.0 | 0.0 |
| 95 | 23.3 | 10.0 | 10.0 | 0.0 | 0.0 | 39.4 | 21.0 | 26.6 | 0.0 | 0.0 |
| 100 | 22.4 | 9.6 | 9.6 | 0.0 | 0.0 | 37.9 | 20.2 | 26.6 | 0.0 | 0.0 |
| 105 | 21.6 | 9.2 | 9.2 | 0.0 | 0.0 | 36.5 | 19.5 | 26.6 | 0.0 | 0.0 |
| 110 | 20.8 | 8.9 | 8.9 | 0.0 | 0.0 | 35.2 | 18.8 | 26.6 | 0.0 | 0.0 |

| | | | | | |
|---|---|---|---|---|---|
| **5-year $Q_{attenuated}$** | **11.99** | **L/s** | **100-year $Q_{attenuated}$** | **26.61** | **L/s** |
| **5-year Max. Storage Required** | **21.6** | **$m^3$** | **100-year Max. Storage Required** | **44.9** | **$m^3$** |
| **Est. 5-year Storage Elevation** | **88.41** | **m** | **Est. 100-year Storage Elevation** | **88.55** | **m** |

**Summary of Release Rates and Storage Volumes**

| Control Area | 5-Year Release Rate (L/s) | 5-Year Required Storage ($m^3$) | 100-Year Release Rate (L/s) | 100-Year Required Storage ($m^3$) | 100-Year Available Storage ($m^3$) |
|---|---|---|---|---|---|
| Unattenutated Areas | 0.7 | 0.0 | 1.5 | 0.0 | 0.0 |
| Attenutated Areas | 12.0 | 21.6 | 26.6 | 44.9 | 107.7 |
| **Total** | **12.7** | **21.6** | **28.1** | **44.9** | **107.7** |

| | | | | | | | | | Ditch Data | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Up** | **Down** | **Area** | **C** | **Indiv AxC** | **Acc AxC** | **$T_C$** | **I** | **Q** | **depth** | **Side Slope** | **Bot. Width** | **Mannings** | **Slope** | **Length** | **$A_{flow}$** | **Wet. Per.** | **R** | **Velocity** | **Qcap** | **Time Flow** | **Q / Q full** |
| | | **(ha)** | **(-)** | | | **(min)** | **(mm/hr)** | **(L/s)** | **(mm)** | **(X:1)** | **(m)** | **n** | **(%)** | **(m)** | **($m^2$)** | **(m)** | **(m)** | **(m/s)** | **(L/s)** | **(min)** | **(-)** |
| | | 0.280 | 0.58 | 0.16 | 0.16 | 14.7 | 144.6 | 65.2 | 150 | 3 | 0.5 | 0.03 | 0.50 | 144 | 0.143 | 1.449 | 0.10 | 0.50 | 71.6 | 4.8 | 0.91 |

# ENHANCED GRASS SWALES

CVC/TRCA LOW IMPACT DEVELOPMENT
PLANNING AND DESIGN GUIDE - FACT SHEET






## GENERAL DESCRIPTION

Enhanced grass swales are vegetated open channels designed to convey, treat and attenuate stormwater runoff (also referred to as enhanced vegetated swales). Check dams and vegetation in the swale slows the water to allow sedimentation, filtration through the root zone and soil matrix, evapotranspiration, and infiltration into the underlying native soil. Simple grass channels or ditches have long been used for stormwater conveyance, particularly for roadway drainage. Enhanced grass swales incorporate design features such as modified geometry and check dams that improve the contaminant removal and runoff reduction functions of simple grass channel and roadside ditch designs.

Where development density, topography and depth to water table permit, enhanced grass swales are a preferred alternative to both curb and gutter and storm drains as a stormwater conveyance system. When incorporated into a site design, they can reduce impervious cover, accent the natural landscape, and provide aesthetic benefits.

## DESIGN GUIDANCE

### GEOMETRY AND SITE LAYOUT

- Shape: Should be designed with a trapezoidal or parabolic cross section. Trapezoidal swales will generally evolve into parabolic swales over time, so the initial trapezoidal cross-section design should be checked for capacity and conveyance assuming it is a parabolic cross-section. Swale length between culverts should be 5 metres or greater.
- Bottom Width: Should be designed with a bottom width between 0.75 and 3.0 metres. Should allow for shallow flows and adequate water quality treatment, while preventing flows from concentrating and creating gullies.
- Longitudinal Slope: Slopes should be between 0.5% and 4%. Check dams should be incorporated on slopes greater than 3%.
- Length: When used to convey and treat road runoff, the length simply parallels the road, and therefore should be equal to, or greater than the contributing roadway length.
- Flow Depth: A maximum flow depth of 100 mm is recommended during a 4 hour, 25 mm Chicago storm event.
- Side Slopes: Should be as flat as possible to aid in providing pretreatment for lateral incoming flows and to maximize the swale filtering surface. Steeper side slopes are likely to have erosion gullying from incoming lateral flows. A maximum slope of 2.5:1 (H:V) is recommended and a 4:1 slope is preferred where space permits.

### PRE-TREATMENT

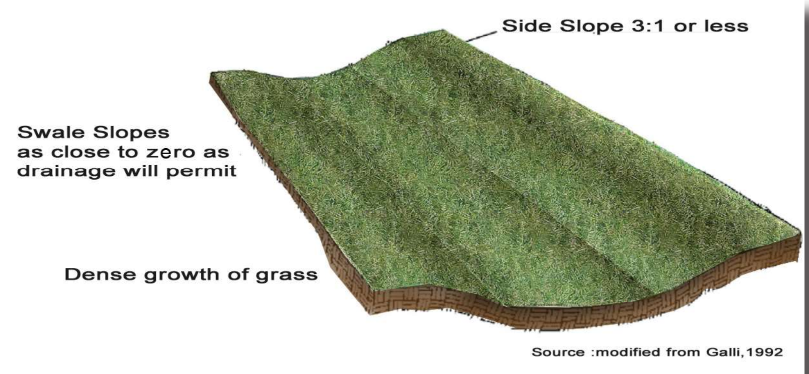
A pea gravel diaphragm located along the top of each bank can be used to provide pretreatment of any runoff entering the swale laterally along its length. Vegetated filter strips or mild side slopes (3:1) also provide pretreatment for any lateral sheet flow entering the swale. Sedimentation forebays at inlets to the swale are also a pretreatment option.

### CONVEYANCE AND OVERFLOW

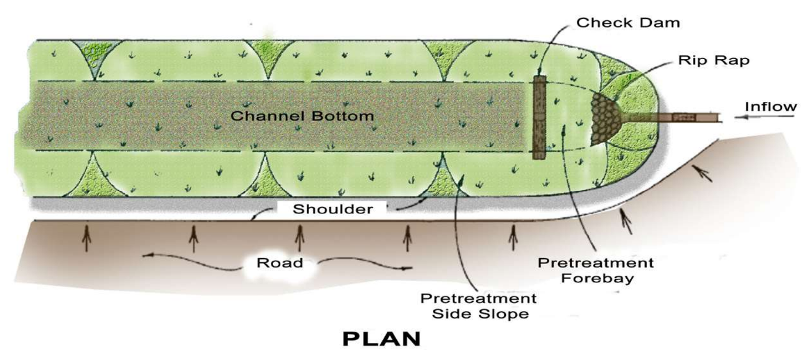
Grass swales must be designed for a maximum velocity of 0.5 m/s or less for the 4 hour 25 mm Chicago storm event. The swale should also convey the locally required design storm (usually the 10 year storm) at non-erosive velocities.

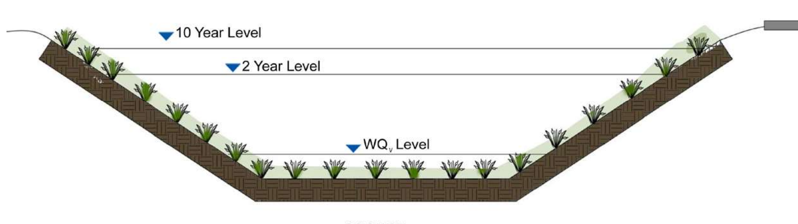
### SOIL AMENDMENTS

If soils along the location of the swale are highly compacted, or of such low fertility that vegetation cannot become established, they should be tilled to a depth of 300 mm and amended with compost to achieve an organic content of 8 to 15% by weight or 30 to 40% by volume.




**PLAN VIEW OF A GRASS SWALE**




**PLAN AND PROFILE VIEWS**

## ABILITY TO MEET SWM OBJECTIVES

| BMP | Water Balance Benefit | Water Quality Improvement | Stream Channel Erosion Control Benefit |
|---|---|---|---|
| Enhanced Grass Swale | Partial - depends on soil infiltration rate | Yes, if design velocity is 0.5 m/s or less for a 4 hour, 25 mm Chicago storm | Partial - depends on soil infiltration rate |

## GENERAL SPECIFICATIONS

| Component | Specification | Quantity |
|---|---|---|
| Check Dams | Constructed of a non-erosive material such as suitably sized aggregate, wood, gabions, riprap, or concrete. All check dams should be underlain with geotextile filter fabric.<br><br>Wood used for check dams should consist of pressure treated logs or timbers, or water-resistant tree species such as cedar, hemlock, swamp oak or locust. | Spacing should be based on the longitudinal slope and desired ponding volume. |
| Gravel Diaphragm | Washed stone between 3 and 10 mm in diameter. | Minimum of 300 mm wide and 600 mm deep. |

## CONSTRUCTION CONSIDERATIONS

Grass swales should be clearly marked before site work begins to avoid disturbance during construction. No vehicular traffic, except that specifically used to construct the facility, should be allowed within the swale site. Any accumulation of sediment that does occur within the swale must be removed during the final stages of grading to achieve the design cross-section. Final grading and planting should not occur until the adjoining areas draining into the swale are stabilized. Flow should not be diverted into the swale until the banks are stabilized.

Preferably, the swale should be planted in the spring so that the vegetation can become established with minimal irrigation. Installation of erosion control matting or blanketing to stabilize soil during establishment of vegetation is highly recommended. If sod is used, it should be placed with staggered ends and secured by rolling the sod. This helps to prevent gullies.

## OPERATION AND MAINTENANCE

Generally, routine maintenance will be the same as for any other landscaped area; weeding, pruning, and litter removal. Grassed swales should be mown at least twice yearly to maintain grass height between 75 and 150 mm. The lightest possible mowing equipment should be used to prevent soil compaction. Routine roadside ditch maintenance practices such as scraping and re-grading should be avoided. Regular watering may be required during the first two years until vegetation is established. Routine inspection is very important to ensure that dense vegetation cover is maintained and inlets and pretreatment devices are free of debris.

For the first two years following construction the swale should be inspected at least quarterly and after every major storm event (> 25 mm). Subsequently, inspections should be conducted in the spring and fall of each year and after major storm events. Inspect for vegetation density (at least 80% coverage), damage by foot or vehicular traffic, accumulation of debris, trash and sediment, and structural damage to pretreatment devices.

Trash and debris should be removed from pretreatment devices and the surface of the swale at least twice annually. Other maintenance activities include weeding, replacing dead vegetation, repairing eroded areas, dethatching and aerating as needed. Remove accumulated sediment on the swale surface when dry and exceeding 25 mm depth.

## SITE CONSIDERATIONS

**Available Space**
Grass swales usually consume about 5 to 15% of their contributing drainage area. A width of at least 2 metres is needed.

**Site Topography**
Site topography constrains the application of grass swales. Longitudinal slopes between 0.5 and 6% are allowable. This prevents ponding while providing residence time and preventing erosion. On slopes steeper than 3%, check dams should be used.

**Drainage Area & Runoff Volume**
The conveyance capacity should match the drainage area. Sheet flow to the grass swale is preferable. If drainage areas are greater than 2 hectares, high discharge through the swale may not allow for filtering and infiltration, and may create erosive conditions. Typical ratios of impervious drainage area to treatment facility area range from 5:1 to 10:1.

**Soil**
Grass swales can be applied on sites with any type of soils.

**Pollution Hot Spot Runoff**
To protect groundwater from possible contamination, source areas where land uses or human activities have the potential to generate highly contaminated runoff (e.g., vehicle fueling, servicing and demolition areas, outdoor storage and handling areas for hazardous materials and some heavy industry sites) should not be treated by grass swales.

**Proximity to Underground Utilities**
Utilities running parallel to the grass swale should be offset from the centerline of the swale. Underground utilities below the bottom of the swale are not a problem.

**Water Table**
The bottom of the swale should be separated from the seasonally high water table or top of bedrock elevation by at least one (1) metre.

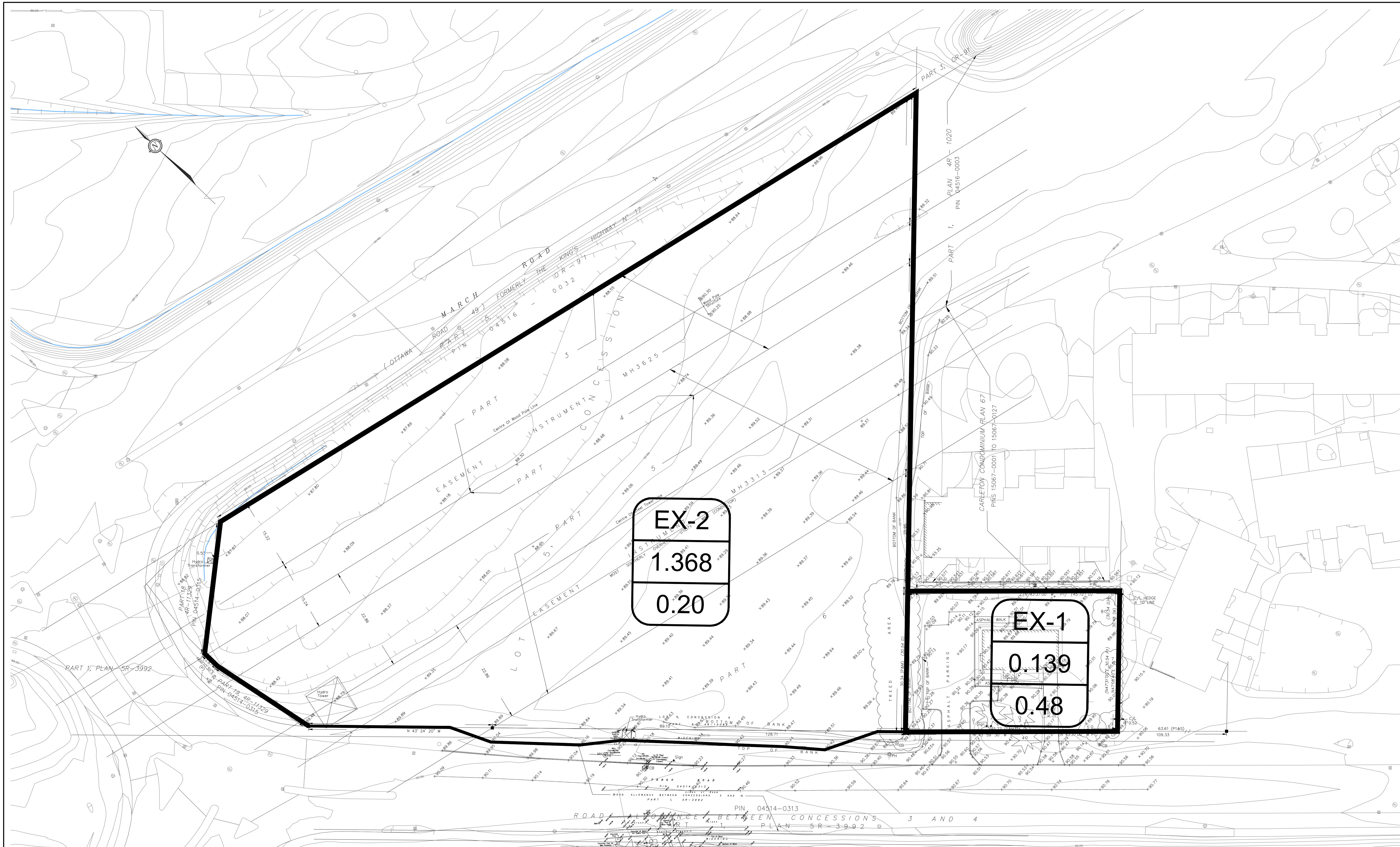
**Setback from Buildings**
Should be located a minimum of four (4) metres from building foundations to prevent water damage.

TORONTO AND REGION Conservation for The Living City

CVC CREDIT VALLEY CONSERVATION

FOR FURTHER DETAILS SEE SECTION 4.8 OF THE CVC/TRCA LID SWM GUIDE

***DRAWINGS / FIGURES***

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# 1131 TERON ROAD
# PRE-DEVELOPMENT DRAINAGE CHARACTERISTICS

| | |
|---|---|
| PROJ NO.: | 19-1127 |
| DRAWN BY: | A.A.S. |
| DATE: | 2019-11-07 |
| SCALE: | 1:750 |
| FIGURE NO.: | FIG-1 |

z:\projects\19-1127_omnipex_1131-teron\b_design\b2_drawings\b2-2_main (dsel)\spa_sub1\2019-11-07_1127_spa_aas.dwg

## SITE PLAN LEGEND

- BUILDING AREA
- SOFT LANDSCAPING. REFER TO LANDSCAPE DRAWINGS
- HARD LANDSCAPING. REFER TO LANDSCAPE DRAWINGS
- ASPHALT. REFER TO LANDSCAPE DRAWINGS
- BUILDING ENTRANCE / EXIT (GROUND FLOOR)
- BUILDING EXIT (GROUND FLOOR)
- TRAFFIC DIRECTION
- R.D. ROOF DRAIN
- 5 200 / 2 600 CAR PARKING
  R3 : RESIDENTIAL 1131 TERON RD
  V3 : VISITOR 1131 TERON RD
- 5 200 / 2 400 BARRIER-FREE PARKING (TYPE B)
- 5 200 / 3 400 BARRIER-FREE PARKING (TYPE A)

**SIGNS**

SIGNS SHALL BE PROVIDED FOR ALL VISITOR PARKINGS, BARRIER FREE PARKINGS & FIRE ROUTES
ALL THE SIGNS SHALL FOLLOW THE SPECIFICATIONS OF THE CITY OF OTTAWA

THE PARKING SIGNS WILL BE LABELED AS:
"VISITOR ONLY"
"RESIDENT ONLY"
"ACCESSIBLE PARKING"
AND REINFORCED: "UNAUTHORIZED VEHICLES TOWED AWAY"

GENERAL NOTE:
WHEN RETAINING WALLS ARE GREATER THAN 1 METER IN HEIGHT THE DESIGN WILL BE DONE BY A STRUCTURAL ENGINEER

PARKING, DRIVEWAY, PATHWAY AND TERRACE LIGHTING TO BE PROVIDED WITH LIGHTING FIXTURES LOCATED ON BUILDINGS

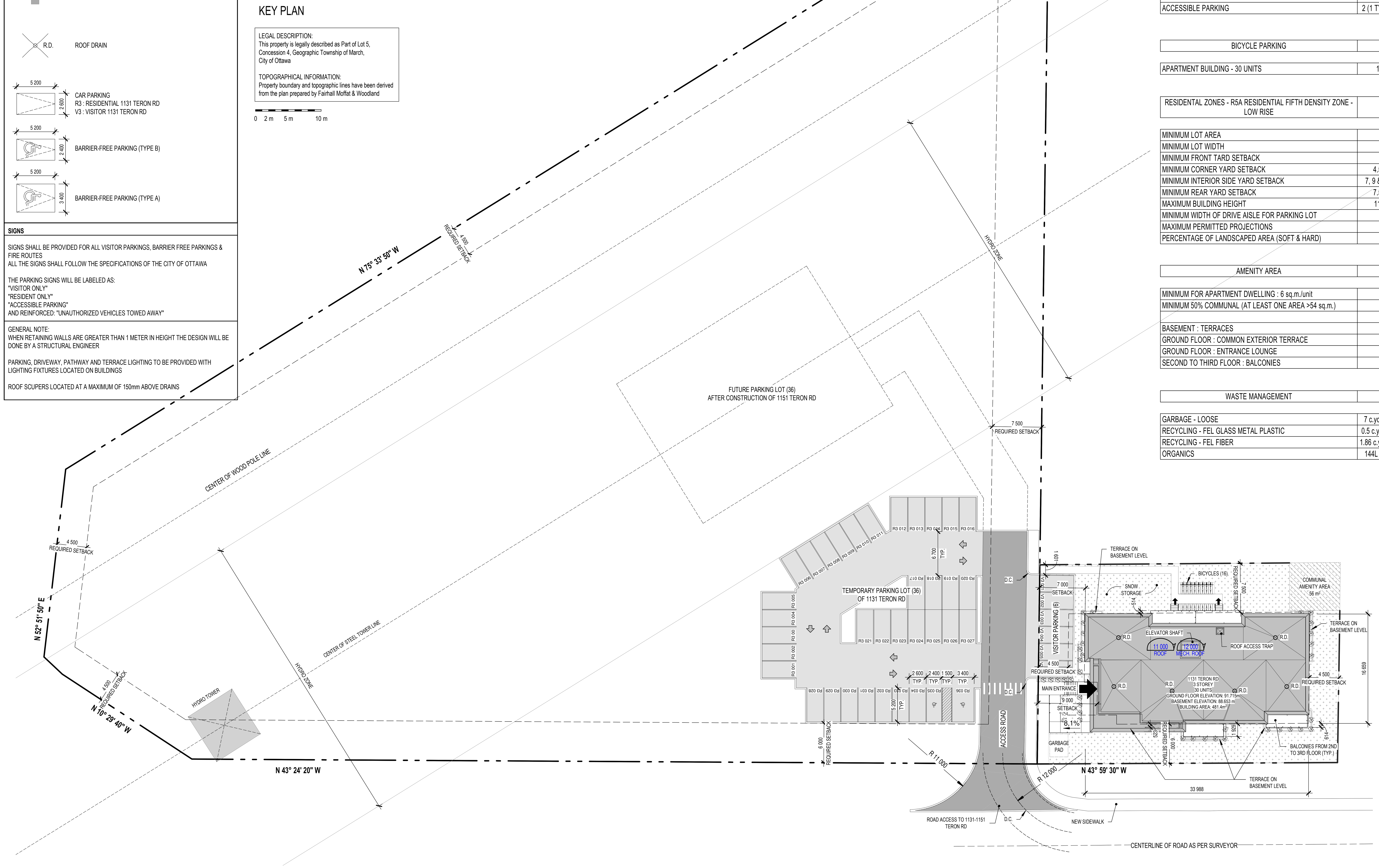
ROOF SCUPERS LOCATED AT A MAXIMUM OF 150mm ABOVE DRAINS


## KEY PLAN

LEGAL DESCRIPTION:
This property is legally described as Part of Lot 5, Concession 4, Geographic Township of March, City of Ottawa

TOPOGRAPHICAL INFORMATION:
Property boundary and topographic lines have been derived from the plan prepared by Fairhall Moffat & Woodland

0 2 m 5 m 10 m




## GENERAL SITE PLAN
1 : 300

2 / A100

| PROJECT STATISTICS | |
|---|---|
| PROPERTY AREA | 1391 sq.m. |
| BUILDING HEIGHT | 11 m |
| GROSS FLOOR AREA | 2 004 sq.m. |

| UNIT STATISTICS | PROVIDED |
|---|---|
| BACHELOR | 4 |
| 1 BEDROOM | 23 |
| 2 BEDROOMS | 3 |

| PARKING | REQUIRED | PROVIDED |
|---|---|---|
| APARTMENT BUILDING - 30 UNITS | 36 (1.2 RATIO) | 36 |
| VISITORS | 6 (0.2 RATIO) | 6 |
| | | |
| TOTAL | 42 | 42 |
| | | |
| ACCESSIBLE PARKING | 2 (1 TYPE A + 1 TYPE B) | 2 |

| BICYCLE PARKING | REQUIRED | PROVIDED |
|---|---|---|
| APARTMENT BUILDING - 30 UNITS | 15 (0.5 RATIO) | 16 |

| RESIDENTAL ZONES - R5A RESIDENTIAL FIFTH DENSITY ZONE - LOW RISE | REQUIRED | PROVIDED |
|---|---|---|
| MINIMUM LOT AREA | 540 sq.m. | 1391 sq.m. |
| MINIMUM LOT WIDTH | 18 m | 34.3 m |
| MINIMUM FRONT TARD SETBACK | 6 m | 6 m |
| MINIMUM CORNER YARD SETBACK | 4.5 m (SCH. 327) | 4.5 m |
| MINIMUM INTERIOR SIDE YARD SETBACK | 7, 9 & 12 m (SCH. 327) | 7, 9 & 12 m |
| MINIMUM REAR YARD SETBACK | 7.5 m (SCH. 327) | 7.5 m |
| MAXIMUM BUILDING HEIGHT | 11 m (SCH. 327) | 11 m |
| MINIMUM WIDTH OF DRIVE AISLE FOR PARKING LOT | 6.7 m | 6.7 m |
| MAXIMUM PERMITTED PROJECTIONS | 2 m | 1.9 m |
| PERCENTAGE OF LANDSCAPED AREA (SOFT & HARD) | 30% | 46.4% (645 / 1391 sq.m.) |

| AMENITY AREA | REQUIRED | PROVIDED |
|---|---|---|
| MINIMUM FOR APARTMENT DWELLING : 6 sq.m./unit | 180 sq.m. | 276 sq.m. |
| MINIMUM 50% COMMUNAL (AT LEAST ONE AREA >54 sq.m.) | 90 sq.m. | 90 sq.m. |
| | | |
| BASEMENT : TERRACES | - | 60 sq.m. |
| GROUND FLOOR : COMMON EXTERIOR TERRACE | - | 56 sq.m. |
| GROUND FLOOR : ENTRANCE LOUNGE | - | 34 sq.m. |
| SECOND TO THIRD FLOOR : BALCONIES | - | 126 sq.m. |

| WASTE MANAGEMENT | REQUIRED | PROVIDED |
|---|---|---|
| GARBAGE - LOOSE | 7 c.yd. (0.231 c.yd./UN.) | 15 x 360 L (7.06 c.yd.) |
| RECYCLING - FEL GLASS METAL PLASTIC | 0.5 c.yd. (0.018 c.yd./UN.) | 2 x 240L (0.63 c.yd.) |
| RECYCLING - FEL FIBER | 1.86 c.yd. (0.062 c.yd./UN.) | 4 x 360 L (1.88 c.yd.) |
| ORGANICS | 144L (240L / 50 UNITS) | 1 x 240L |

GENERAL NOTES Notes générales

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630, René-Lévesque W. Boul. 32e étage, Montréal QC H3B 1S6
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**SCEAU** / Seal

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ARCHITECT(E)S
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CLIENT Client
**11021028 CANADA INC.**
47 Clarence Street Suite 406, Ottawa, ON K1N 9K1

PROJECT Ouvrage
**1131 TERON ROAD**

LOCATION Emplacement: **OTTAWA**
NO PROJET No.: **12003.00**

| NO | REVISION | DATE (yy-mm-dd) |
|---|---|---|
| 1 | ISSUED FOR SITE PLAN CONTROL | 2019.07.05 |
| 2 | ISSUED FOR COMMENTS | 2019.09.11 |
| 3 | ISSUED FOR SITE PLAN CONTROL R1 | 2019.09.18 |
| 4 | ISSUED FOR SITE PLAN CONTROL R2 | 2019.10.16 |
| 5 | ISSUED FOR SITE PLAN CONTROL R3 | 2019.10.21 |
| 6 | ISSUED FOR SITE PLAN CONTROL R4 | 2019.10.23 |

Preliminary
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DRAWN BY Dessiné par: A.CA.
CHECKED BY Vérifié par: Ant.C.
DATE (mm.dd.yy): 18/07/24
SCALE Échelle: Comme indiqué

DRAWING TITLE Titre du dessin
**GENERAL SITE PLAN**

REVISION Révision: 6
DWG NUMBER No. Dessin: A100
X-XXXXX
X-XXXXX

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## SITE PLAN LEGEND

- BUILDING AREA
- SOFT LANDSCAPING. REFER TO LANDSCAPE DRAWINGS
- HARD LANDSCAPING. REFER TO LANDSCAPE DRAWINGS
- ASPHALT. REFER TO LANDSCAPE DRAWINGS
- BUILDING ENTRANCE / EXIT (GROUND FLOOR)
- BUILDING EXIT (GROUND FLOOR)
- TRAFFIC DIRECTION
- R.D. ROOF DRAIN
- 5 200 × 2 600 CAR PARKING
  R3 : RESIDENTIAL 1131 TERON RD
  V3 : VISITOR 1131 TERON RD
- 5 200 × 2 400 BARRIER-FREE PARKING (TYPE B)
- 5 200 × 3 400 BARRIER-FREE PARKING (TYPE A)

**SIGNS**

SIGNS SHALL BE PROVIDED FOR ALL VISITOR PARKINGS, BARRIER FREE PARKINGS & FIRE ROUTES
ALL THE SIGNS SHALL FOLLOW THE SPECIFICATIONS OF THE CITY OF OTTAWA

THE PARKING SIGNS WILL BE LABELED AS:
"VISITOR ONLY"
"RESIDENT ONLY"
"ACCESSIBLE PARKING"
AND REINFORCED: "UNAUTHORIZED VEHICLES TOWED AWAY"

GENERAL NOTE:
WHEN RETAINING WALLS ARE GREATER THAN 1 METER IN HEIGHT THE DESIGN WILL BE DONE BY A STRUCTURAL ENGINEER

PARKING, DRIVEWAY, PATHWAY AND TERRACE LIGHTING TO BE PROVIDED WITH LIGHTING FIXTURES LOCATED ON BUILDINGS

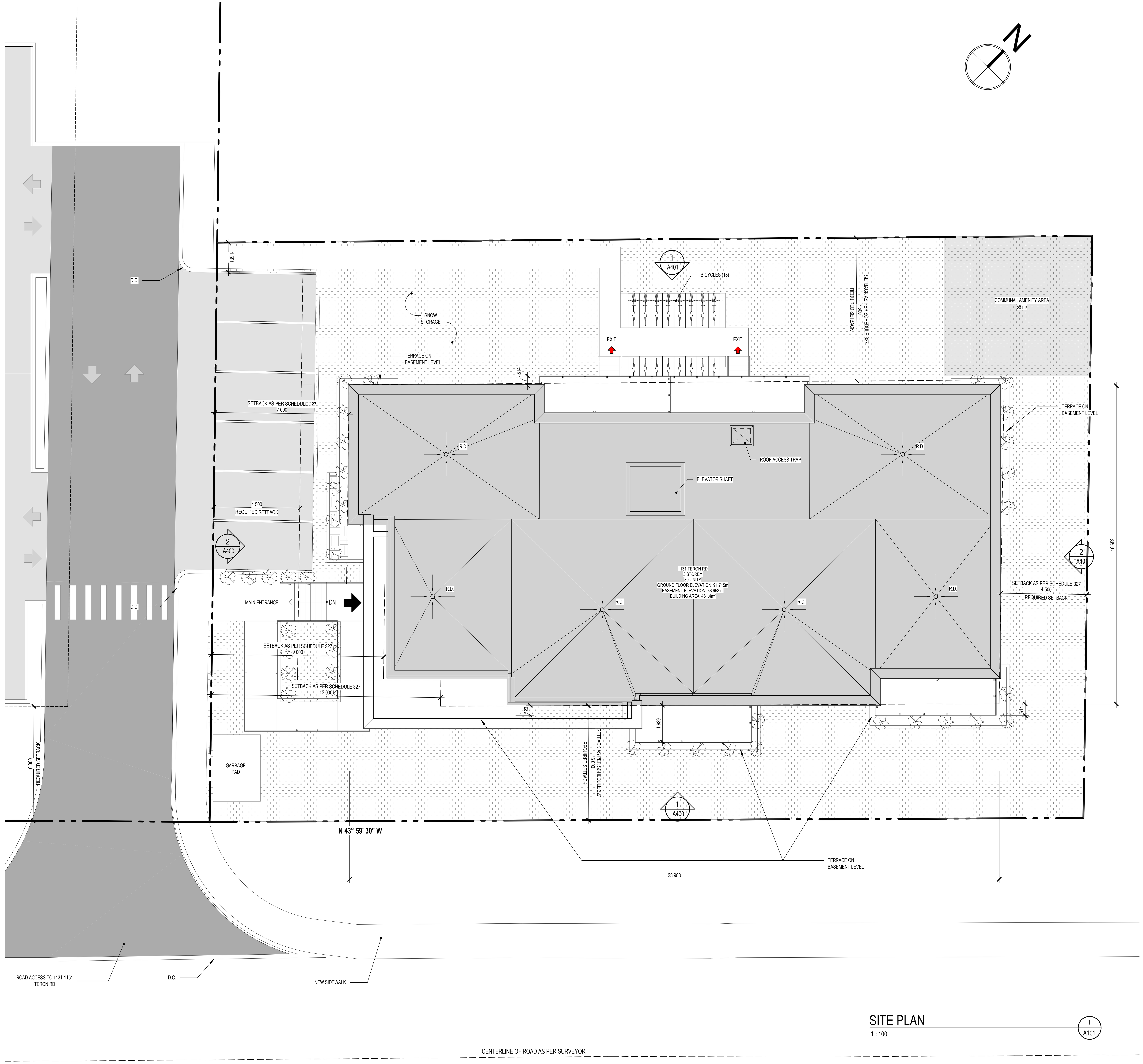
ROOF SCUPERS LOCATED AT A MAXIMUM OF 150mm ABOVE DRAINS

LEGAL DESCRIPTION:
This property is legally described as Part of Lot 5, Concession 4, Geographic Township of March, City of Ottawa

TOPOGRAPHICAL INFORMATION:
Property boundary and topographic lines have been derived from the plan prepared by Fairhall Moffat & Woodland

0 2 m 5 m 10 m


KEY PLAN




SITE PLAN
1 : 100

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DRAWING TITLE Titre du dessin
**SITE PLAN**

REVISION Révision: 5
DWG NUMBER No. Dessin: A101
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