david schaeffer engineering ltd

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

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

MATTAMY HOMES
WATERIDGE VILLAGE – BLOCK 15

CITY OF OTTAWA

PROJECT NO.: 17-946

FEBRUARY 2019 – REV. 1

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FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT FOR MATTAMY HOMES WATERIDGE VILLAGE – BLOCK 15 FEBRUARY 2019 – REV. 1

CITY OF OTTAWA

PROJECT NO.: 17-946

1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained by Mattamy Homes to prepare a Functional Servicing and Stormwater Management report to amend the previously approved Site Plan Control Application (SPC) dated March 2018 for Block 15. Subject lands are within the former CFB Rockcliffe lands, which are currently under re-development by the Canada Lands Company.

The subject property is located within the City of Ottawa urban boundary, in the Rideau-Rockcliffe area. As illustrated in ***Figure 1***, below, the subject property is encompassed by Hemlock Road, Mikinak Road and Moses Tennisco Street, all of which are currently under construction. Comprised of a single parcel, the subject property measures approximately ***1.96 ha*** and is zoned Residential Fourth Density Zone (R4Y[2311]).

Figure 1: Site Location

The proposed development by Mattamy Homes involves the construction of 124 Stacked Townhomes and 68 Back-to-Back Townhomes. Of the Back-to-Back Townhomes, 34 units are proposed to have laneway access directly to Squadron Crescent. These 34 units will require Part Lot Control. The previously approved ***FSR-Block15*** contemplated 124 rear lane townhomes, the amendment proposes overall 68 additional townhouse style units than the previous submission.

The objective of this report is to provide sufficient detail with respect to the availability of site services, to support the application for site plan control.

1.1 Existing Conditions

The construction of the surrounding road network and underground services are currently underway at the time of this publication, while the existing lands encompassing the subject property remain vacant. Historically, the lands were part of the Canadian Forces Base Rockcliffe (CFB Rockcliffe).

A geotechnical investigation was completed by Paterson Group Inc. in August 2017. Per the geotechnical report, the subject site consists of a layer of existing fill from the previous land use, underlain by stiff to very stiff brown silty clay. Practical refusal was encountered between 9.1m and 24.1m below existing grade.

Supplemental information from Paterson Group Inc. was also received regarding the anticipated infiltration rates. An infiltration rate of 140 mm/day was estimated for Block 15, correspondence saved in ***Appendix A***.

The Canada Lands Company will be delivering the site to a pre-grade condition in accordance with Mattamy Homes requirements.

Existing infrastructure, outlined below, was garnered from design drawings, not As-Built drawings. The design drawings are as per the ***Wateridge Village at Rockcliffe, Phase 1B,*** drawing set, prepared by IBI Group, and dated, September 15, 2017:

Squadron Crescent

- 200 mm diameter PVC watermain;
- 2400 mm diameter storm sewer; and
- 300 mm diameter sanitary sewer.

Mikinak Road

- 300 mm diameter watermain;
- 900 mm diameter storm sewer; and
- 250 mm diameter sanitary sewer.

The servicing received from IBI Group September 15, 2017 was updated by IBI Group to provide stubs to the proposed property and to confirmed storm and sanitary capacity within the external system at these new connection points.

1.2 Required Permits / Approvals

The proposed development is subject to the site plan control approval process. The City of Ottawa must approve the engineering design drawings and reports prior to the issuance of site plan control. Lots fronting Squadron Crescent require Part Lot Control.

1.3 Pre-consultation

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 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)

- **Low Impact Development Stormwater Management Planning and Design Guide**
  Credit Valley Conservation & Toronto and Region Conservation, 2010.
  (LID Guide)

- **Former CFB Rockcliffe Master Servicing Study**
  IBI Group, August 2015.
  (MSS)

- **Low Impact Development (LID) Demonstration Project**
  Aquafor Beech Ltd., August 2015.
  (LID Demonstration Project)

- **Design Brief Wateridge Village at Rockcliffe Phase 1A**
  IBI Group., April 2016.
  (Design Brief Phase 1A)

- **Design Brief Wateridge Village at Rockcliffe Phase 1B**
  IBI Group., June 2017.
  (Design Brief Phase 1B)

- **Functional Servicing and Stormwater Management Report – Wateridge Village Block 15**
  DSEL, March 2018.
  (FSR-Block15)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa MONT pressure zone, as shown by the Pressure Zone map in ***Appendix B***. A local 200 mm diameter watermain is currently being constructed within the Squadron Crescent right-of-way to service the subject site.

The water servicing for the subject site was accounted for in the design of the water distribution system outlined in the ***Design Brief Phase 1B***, water demand for the subject property is summarized below:

Table 1
Summary of Water Demand per *Design Brief Phase 1B*

Design Parameter	Total Demand (L/min)
Average Day	185.9
Peak Hour	709.8
Max Day + Fire Flow	13,000 + 322.7

3.2 Water Supply Servicing Design

It is proposed to provide two connections plus individual connections to the 200 mm watermain within Squadron Crescent. The site is serviced by surrounding fire hydrants on Squadron Crescent, Mikinak Road, and internal hydrants proposed on-site.

Individual units cannot be serviced horizontally through an adjacent unit, unless that service is acceptable, see ***OBC*** section 7.1.5.4 (4) for detail. The proposed units could not be developed to accommodate the requirements of ***OBC*** section 7.1.5.4 (4) therefore, individual services are proposed for the back-to-back townhomes. Refer to ***SSP-1,*** accompanying this report***,*** for servicing layout. Due to the limiting distance from the properly line to the townhomes, it is proposed to provide a sanitary sewer and watermain along the north property line with a separation of 1.5 m between both. The water and sanitary sewers are designed in accordance with *Procedures to Govern Separation of Sewers and Watermains (Procedure F-6-1)* prepared by the Ministry of the Environment.

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

Table 2
Water Supply Design Criteria

Design Parameter	Value
Townhouse	2.7 P/unit
Residential Average Daily Demand	280 L/d/P
Residential Maximum Daily Demand	2.5 x avg. day *
Residential Maximum Hourly	5.5 x max. day *
Minimum Watermain Size	150 mm 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 anticipated water supply demand and boundary conditions for the subject site, extracted from the ***Design Brief Phase 1B*** for the nodes closest to the proposed connection points on Squadron Crescent.

Table 3
Water Demand and Boundary Conditions
Proposed Conditions

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Condition[2] Connection 1 (m H_2O / kPa)		Boundary Condition[2] Connection 2 (m H_2O / kPa)	
Average Daily Demand	100.9	53.5	525.0	52.9	519.1
Peak Hour	555.0	52.1	511.1	51.5	505.0
Max Day + Fire Flow	19,000 + 252.3	33.8	331.1	31.1	305.4

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
2) Boundary conditions per the ***Design Brief Phase 1B*** Connection 1 is to Squadron close to Mikanik Road (J54 from Brief), Connection 2 is to Squadron Crescent (Node J60 per Brief)

The ***Design Brief Phase 1B*** describes the Average Daily Demand, Peak Hour and Max Day + Fire Flow scenarios. The above pressures are assuming the future hydraulic grade line (HGL). As per the ***Design Brief Phase 1B***, future development will reduce the HGL when compared to the existing condition. There may be slightly higher pressures observed during the existing condition, a pressure check is recommended during installation to determine if pressure reducing valves are required.

Boundary conditions have been requested from the ***City of Ottawa***, however are not available at the time of this report. Correspondence with the ***City of Ottawa*** is included in ***Appendix A***.

The required fire flow (RFF) was estimated in accordance with City of Ottawa Technical Bulletin ***ISTB-2018-02***. Parameters used in calculating the RFF were received from Q4 Architects Incorporated and are included in ***Appendix A*** and summarized below:

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

The maximum estimated fire flow is ***19,000 L/min*** at Blocks 2 and 3; actual building materials selected will affect the estimated flow; see ***Appendix B*** for detailed calculations.

Table 4, below, summarizes the fire flow requirement calculated for each block, per the above assumptions and the available fire flow per ***Table 18.5.4.3*** of the ***ISTB-2018-02***.

Table 4
Estimated Fire Flow Demand

Block and Townhome Type	Estimated Fire Demand (L/min)	Available Fire Flow per Table 18.5.4.3 of ISTB-2018-02 (L/min)
Block 1 (Stacked)	18,000	32,147
Block 2 (Stacked)	19,000	32,174
Block 3 (Stacked)	19,000	33,120
Block 4 (Stacked)	18,000	33,120
Block 5 (Stacked)	16,000	36,906
Block 6 (Stacked)	16,000	35,013
Block 7 (Stacked)	16,000	35,013
Block 8 (Back-to-Back)	12,000	35,013
Block 9 (Back-to-Back)	13,000	35,013
Block 10 (Back-to-Back)	11,000	33,121
Block 11 (Back-to-Back)	10,000	32,228
Block 12 (Back-to-Back)	10,000	32,174
Block 13 (Back-to-Back)	12,000	32,174
Block 14 (Back-to-Back)	12,000	32,174

The property has eight (8) adjacent hydrants used to calculate the available fire flow:

- Four (4) hydrants are located along the south side of Mikinak Road, one east of the property, one west of the property and two north of the property; and
- Four (4) hydrants are located on Squadron Crescent, one west of the property, one east of the property and two south of the property.

The anticipated water demand based on the proposed site plan in the Average Day and Peak Hour scenario are less than contemplated in the ***Design Brief Phase 1B***, however, the required fire flow for the proposed development on ***19,000 L/min*** is higher than that contemplated in ***Design Brief Phase 1B*** of ***13,000 L/min***. According to ***Table 18.5.4.3*** of ***ISTB-2018-02***, the existing hydrants are able to meet the required fire flow demands of the proposed development. Adequate pressure during the fire flow scenario will need to be confirmed upon receiving boundary conditions.

3.3 Water Supply Conclusion

The boundary conditions at the site were determined from the ***Design Brief Phase 1B***. The proposed demands for average day, maximum daily flow and peak hourly flow were below those contemplated in ***Design Brief Phase 1B.*** However, the required fire flow for the development is higher than that anticipated in the ***Design Brief Phase 1B.***

It is anticipated that existing hydrants within Mikinak Road and Squadron Crescent will be able to supply the required fire flow to the development based on ***Table 18.5.4.3*** of ***ISTB-2018-02***, however, pressure will need to be confirmed upon the receipt of boundary conditions.

The proposed water supply design conforms to all relevant City Guidelines and Policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The sanitary flow from the subject property was considered in the wastewater design for the Wateridge Subdivision. Block 15 was contemplated to drain to the 300 mm sanitary sewer within Squadron Crescent. The total wastewater flow from the ***Design Brief Phase 1B*** is summarized in ***Table 6,*** below.

Table 5
Wastewater Flow per Design Brief Phase 1B – Total Site Area

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	1.97
Estimated Peak Dry Weather Flow	7.85
Estimated Peak Wet Weather Flow	8.40

The total flow summarized in ***Table 6***, above, is from the drainage areas from Block 15. Please refer to ***Appendix C*** for reduced copies of the IBI sanitary design calculations and drainage area map.

4.2 Wastewater Design

It is proposed that the development will connect to the 300 mm diameter sewer within the Squadron Crescent right-of-way as contemplated in the ***Design Brief Phase 1B***. Individual services laterals are proposed to service the back to back townhomes directly from Squadron Crescent. ***Table 7***, below, summarizes the ***City Standards*** employed in the design of the proposed wastewater sewer system.

Table 6
Wastewater Design Criteria

Design Parameter	Value
Townhouse	2.7 P/unit
Average Daily Demand	280 L/d/per
Peaking Factor	Harmon's Peaking Factor. Max 3.8, Min 2.0 Harmon's Corrector Factor 0.8
Infiltration and Inflow Allowance	0.05 L/s/ha (Dry Weather) 0.28 L/s/ha (Wet Weather) 0.33 L/s/ha (Total)
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 8, below, demonstrates the anticipated peak flow from the proposed development compared to the estimated sanitary flow proposed in ***FSR-Block 15***. See ***Appendix C*** for associated calculations.

Table 7
Summary of Total Estimated Peak Wastewater Flow

Design Parameter	Total Flow per *FSR-Block15* (L/s)	Total Flow (L/s)
Estimated Average Dry Weather Flow	1.37	1.78
Estimated Peak Dry Weather Flow	5.48	6.22
Estimated Peak Wet Weather Flow	6.03	7.52

The estimated total sanitary flow discharged to the existing sanitary sewers within Squadron Crescent, based on the site plan provided in ***Drawings/Figures,*** anticipates a peak wet weather flow of ***7.52 L/s***.

The proposed sanitary flow entering the sanitary sewer system within Squadron Crescent result in an overall decrease of ***0.88 L/s*** from the contemplated sanitary flow in the ***Design Brief Phase 1B***, therefore, no negative impact is anticipated to the existing downstream sanitary sewer network.

4.3 Wastewater Servicing Conclusions

The sanitary flow from the subject property has been considered in the wastewater design for the Wateridge Subdivision, outlined in the ***Design Brief Phase 1B***.

The proposed development results in an overall decrease in wastewater flow than contemplated in the ***Design Brief Phase 1B***, therefore, no negative impact is anticipated to the existing downstream sanitary network.

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

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Minor and major flow from the subject site were accounted for in the Wateridge Subdivision. The subject site was contemplated in the ***Design Brief Phase 1B*** to be conveyed to the Eastern SWM Facility. Major flow was proposed to be directed to a dry pond to the south of Mikinak Road for quantity control and will eventually discharge through the minor system to the Easter SWM Facility.

The ***Design Brief Phase 1B*** contemplated minor and major system drainage from Block 15 to be directed to Squadron Crescent. Refer to ***Appendix D*** for reduced copy of the storm design sheet and drainage area figures prepared by IBI for the Wateridge Subdivision.

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 Ottawa River watershed, and is therefore subject to review by the Rideau Valley Conservation Authority (RVCA).

5.2 Post-development Stormwater Management Target

Stormwater management requirements for the proposed development were reviewed with the City of Ottawa and CLC, where the proposed development is required to:

- Follow quantity and quality controls outlined in the ***Design Brief Phase 1B;*** and
- Incorporate Low Impact Development measures in accordance with the ***Design Brief Phase 1B*** and ***LID Demonstration Project.***

5.3 Proposed Stormwater Management System

It is proposed that the stormwater from the development will be directed to the 2400 mm storm sewer within Michael Stoqua Street.

As discussed in ***Section 5.1***, the quantity controls for Block 15 will be provided by the dry pond south of the subject site and through the Eastern SWM Facility outlined in the ***Design Brief Phase 1B***.

The subject site was also accounted for in the design of the permanent pool of the Eastern SWM Facility which provides 80% TSS removal for the subdivision.

A storm design sheet was prepared to support the capacity of the internal storm sewers, refer to ***Appendix D*** for the calculation sheet and ***SWM-1,*** accompanying this report, for the drainage area figure. Each catch basin has been equipped with an inlet control device (ICD) to ensure only the 5-year flow will enter the proposed minor system equal to ***282 L/s***. The overall Runoff Coefficient from the site is equal to what was allocated in the

Design Brief Phase 1B and therefore, no additional quantity or quality controls are required.

Major flow on-site has been modeled using SWMHYMO. The analysis of different storm events resulted in the 24 Hour Chicago storm distribution resulting in the highest flows on-site. Major overland flow was determined based on the capture rate of the catch basins and minor system. It was determined that the depth of flow will be contained within the access lane at both critical sections during the simulated 100-year storm event. A maximum depth of flow in the 100-year storm event upstream of the intersection of Rabaska Private and Squadron Crescent resulted in 0.08 m depth of flow, contained within the access lane. Please refer to ***Appendix D*** for input and output summary of the SWMHYMO analysis.

5.4 Low Impact Development (LID) Practices

LID measures are proposed in accordance with the ***Design Brief Phase 1B*** and ***LID Demonstration Project***. It is proposed that flow from rooftops, sidewalks, landscaped areas and access lanes be directed to bioretention cells located throughout the property. Refer to drawing ***SSP-1*** for bioretention cell locations. The granular base below the overflow elevation has been sized in accordance with the ***LID Design Guide*** and based on infiltration rates, to ensure a maximum drawdown time of 48 hours. Based on correspondence with Paterson Group, included in ***Appendix A***, an infiltration rate of ***140 mm/day*** was estimated for the soil in Block 15.

The bioretention cells are designed with a 75 mm layer of mulch/riverstone; underlain by 600 mm deep layer of filter media (3 parts sand, 2 parts topsoil, 1 part organic soil components and additives); a 100 mm layer of pea gravel; and a 525 mm layer of clear stone equipped with a perforated pipe. When the perforated pipe and clearstone is saturated an overflow is provided which directs flow to the minor system. An overflow is provided by an area drain at the surface of the bioretention unit that conveys flow to the perforated pipe and overflow during events that pond greater than 5 cm.

Details of the bioretention cells are shown on drawing ***DS-2***, accompanying this report.

All LID measures are designed to infiltrate or detain an equivalent of the 4 mm event over the site area and each LID measure must treat the minimum of the 15 mm event. A total infiltration requirement of 4 mm or ***78.4 m^3*** and a total treatment volume of the 15 mm event, or ***181.7 m^3*** is required per the ***LID Demonstration Project***. The bioretention cells provide ***82.6 m^3*** of volume being retained within the perforated pipe and clear stone below the overflow to the minor system. The filter media, clear stone, perforated pipe and ponding volume results in a treatment volume of ***188.7 m^3,*** exceeding the 15 mm volume described above.

5.5 Stormwater Servicing Conclusions

Minor and major system flow from Block 15 were accounted for in the subdivision design. Quantity and quality controls are provided through a dry stormwater pond to the south and the Eastern SWM Facility to the north.

LID practices in the form bioretention cells are proposed for treatment, storage and infiltration of roof, landscaped and road runoff from the site, in accordance with the ***LID Demonstration Project.***

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

6.0 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:

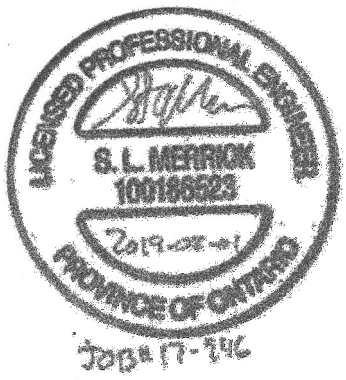
- Verification that water is not flowing under silt barriers; and
- Clean and change filter cloth at catch basins.

7.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained to prepare a Functional Servicing and Stormwater Management for the proposed development for Block 15 of the former CFB Rockcliffe lands, which are currently under re-development. The preceding report outlines the following:

- Based on boundary conditions from the ***Design Brief Phase 1B***, sufficient pressure exists to support average day flow, maximum daily flow and peak hourly flow requirements of the proposed development;
- Based on estimated fire flow per the ***ISTB-2018-02***, existing hydrants have the capacity to supply the required fire flow as per ***Table 18.5.4.3*** of ***ISTB-2018-02***, pressure will need to be confirmed upon the receipt of boundary conditions;
- The proposed development is anticipated to have a peak wet weather flow of ***7.52 L/s***, a reduction in flow compared to the ***Design Brief Phase 1B***;
- The quantity and quality controls are provided for the site through a dry pond to the south of the site and the Eastern SWM Facility outlined in the ***Design Brief Phase 1B***; and
- LID practices in the form of bioretention cells are proposed to treat, storage and infiltrate roof, landscaped and road runoff from the site, in accordance with the ***LID Demonstration Project.***

Prepared by,
David Schaeffer Engineering Ltd.



Per: Steven L. Merrick, P.Eng

Prepared by,
David Schaeffer Engineering Ltd.

Per: Genavieve Melatti

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

17-948 08/08/2017

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.	Section 1.4
☒	All preliminary and formal site plan submissions should have the following information: -Metric scale -North arrow (including construction North) -Key plan -Name and contact information of applicant and property owner -Property limits including bearings and dimensions -Existing and proposed structures and parking areas -Easements, road widening and rights-of-way -Adjacent street names	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 1.1
☒	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 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.	Section 5.1, Appendix D
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Drawings/Figures
☒	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

Genavieve Melatti

From: Genavieve Melatti
Sent: Wednesday, January 30, 2019 1:46 PM
To: 'Buchanan, Richard'
Subject: RE: Wateridge Block 15 - Boundary Conditions Request
Attachments: Block_location.jpg

Hey Richard,

I have attached a figure showing the location of the different blocks as well as their connection points. The demand for each Block is included below.

Block 19:

Design Parameter	Anticipated Demand[1] (L/min)
Average Daily Demand	128.5
Peak Hour	697.1
Max Day + Fire Flow	15,000 + 317.8

Block 22:

Design Parameter	Anticipated Demand[1] (L/min)
Average Daily Demand	33.5
Peak Hour	248.2
Max Day + Fire Flow	11,000 + 164.4

Block 24:

Design Parameter	Anticipated Demand[1] (L/min)
Average Daily Demand	82.2
Peak Hour	369.7
Max Day + Fire Flow	12,000 + 246.5

Please let me know if there is any more information that you would be needing. Do you know how soon it would be possible it would be to get the boundary conditions back?

Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

From: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Sent: Wednesday, January 30, 2019 1:00 PM
To: Genavieve Melatti <GMelatti@dsel.ca>
Subject: FW: Wateridge Block 15 - Boundary Conditions Request

Hi Genavieve;

You will need to also include demands from other Phases of this development. You must provide these demands and where to assign those demands.

We will run the interim and the ultimate. Important to consider under utilization and the need for Chlorine contact time.

Thanks

Richard Buchanan, CET

Project Manager, Development Approvals
Planning, Infrastructure and Economic Development Department
Planning & Growth Management Branch
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27801
ottawa.ca/planning / ottawa.ca/urbanisme

From: Genavieve Melatti <GMelatti@dsel.ca>
Sent: Wednesday, January 23, 2019 9:58 AM
To: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Cc: Steve Merrick <SMerrick@dsel.ca>
Subject: Wateridge Block 15 - Boundary Conditions Request

Good morning Richard,

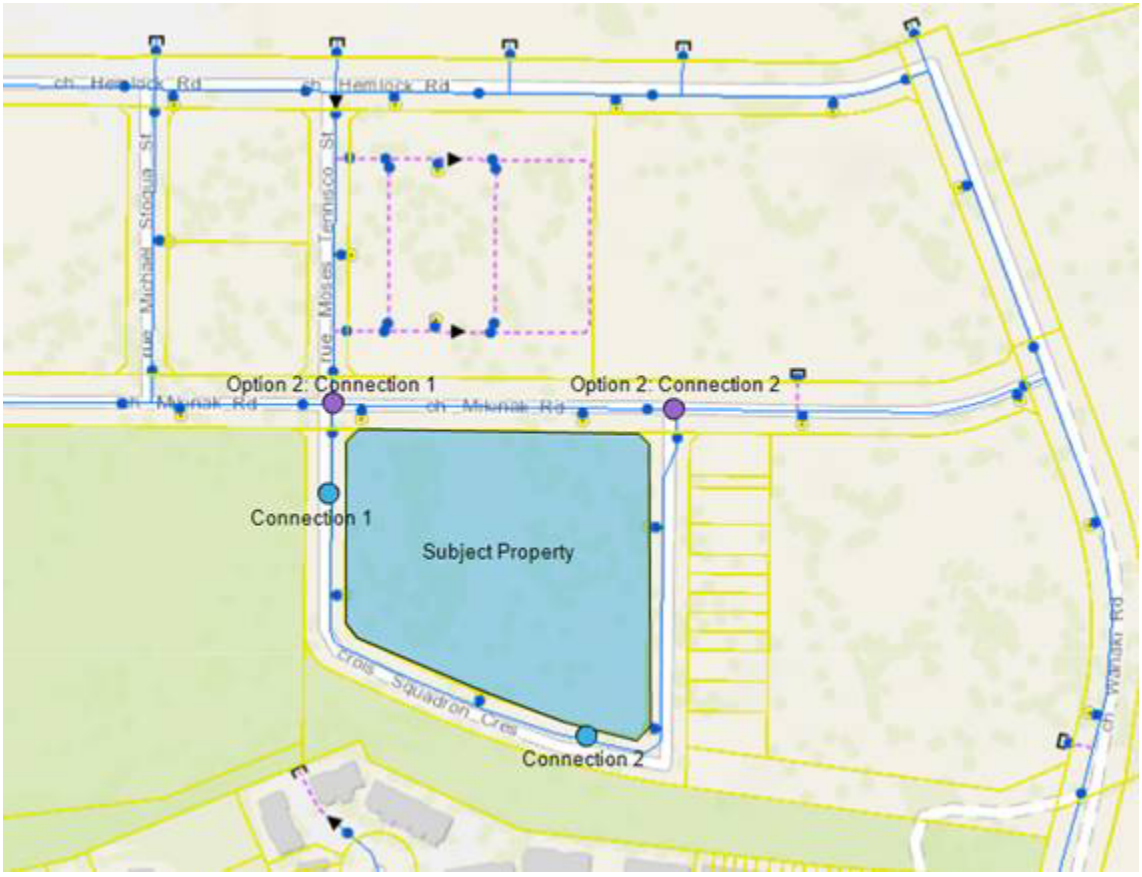
Would we be able to request boundary conditions for Wateridge Block 15:

1. Location of Service / Street Number: Block 15 - the property is bound by Mikinak Road to the north and Squadron Crescent to the west, south and east

2. Type of development and the fire flow required for the proposed development:

- The proposed development is residential and would consist of 124 stacked townhomes and 68 back-to-back townhomes.
- We are proposing to two connections to the 200 mm diameter watermain within Squadron Crescent.

- The maximum fire flow demand for the proposed development is 19,000 L/min at Blocks 2 and 3. The calculations and parameters used in these calculations are in the attached FUS calculation sheet.
- We are looking for the boundary conditions at the proposed connection point shown below in blue. We were hoping that these point were available in the City model, however, if not, would it be possible to have the boundary conditions for the points labeled as option 2 in purple on the sketch where both ends of Squadron Crescent meet Mikinak Road.



3.

	L/min	L/s
Avg. Daily	100.9	1.68
Max Day	252.3	4.20
Peak Hour	555.0	9.25

If you have any questions please feel free to contact me.

Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

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Genavieve Melatti

From: Sabrina Castellanos <scastellanos@q4architects.com>
Sent: Tuesday, January 22, 2019 11:02 AM
To: Genavieve Melatti
Cc: Steve Merrick; Conor Sutherland; Jillian Normand; Daniel Sousa
Subject: RE: Wateridge Block 15 FUS Information

Hi Genavieve,

Please see my answers in red below

Regards,

Sabrina Castellanos
Project Manager, B.Arch

Q4 Architects Inc.
2171 Avenue Road, Suite 302, Toronto, Ontario M5M 4B4
T: 416-322-6334 x256 F: 416-322-7294
www.q4architects.com

From: Genavieve Melatti <GMelatti@dsel.ca>
Sent: January 17, 2019 10:08 AM
To: Sabrina Castellanos <scastellanos@q4architects.com>
Cc: Steve Merrick <SMerrick@dsel.ca>
Subject: RE: Wateridge Block 15 FUS Information

Hey Sabrina,

As mentioned below we are looking for the following information:

- Confirmation that these blocks will not have a sprinkler system installed? They are not sprinkler – Part 9 of the OBC
- The ISO class for the for each Block style. All the blocks will be Wood frame construction – Class 1

I have included the ISO Guide in which sections 1, 2 and 3 on pages 3 to 10 provides definitions to clarify as well as the section from the City's technical bulletin. Note that ISO refers only to fire-resistive for fire ratings not less than 1-hour.

A. *Determine the type of construction.*

- Coefficient *C* in the FUS method is equivalent to coefficient *F* in the ISO method:

Correspondence between FUS and ISO construction coefficients

FUS type of construction	ISO class of construction	Coefficient *C*
Fire-resistive construction	Class 6 (fire resistive)	0.6
	Class 5 (modified fire resistive)	0.6
Non-combustible construction	Class 4 (masonry non-combustible)	0.8
	Class 3 (non-combustible)	0.8
Ordinary construction	Class 2 (joisted masonry)	1.0
Wood frame construction	Class 1 (frame)	1.5

However, the FUS definition of fire-resistive construction is more restrictive than those of ISO construction classes 5 and 6 (modified fire resistive and fire resistive). FUS requires structural members and floors in buildings of fire-resistive construction to have a fire-resistance rating of 3 hours or longer.

- With the exception of fire-resistive construction that is defined differently by FUS and ISO, practitioners can refer to the definitions of the ISO construction classes (and the supporting definitions of the types of materials and assemblies that make up the ISO construction classes) found in the current ISO guide [4] (see Annex i) to help select coefficient *C*.
- To identify the most appropriate type of construction for buildings of mixed construction, the rules included in the current ISO guide [4] can be followed (see Annex i). For a building to be assigned a given classification, the rules require ⅔ (67%) or more of the total wall area and ⅔ (67%) or more of the total floor and roof area of the building to be constructed according to the given construction class or a higher class.
- New residential developments (less than 4 storeys) are predominantly of wood frame construction ($C = 1.5$) or ordinary construction ($C = 1.0$) if exterior walls are of brick or masonry. Residential buildings with exterior walls of brick or masonry veneer and those with less than ⅔ (67%) of their exterior walls made of brick or masonry are considered wood frame construction ($C = 1.5$).

If you need any more information please let me know.

Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

From: Conor Sutherland <Conor.Sutherland@mattamycorp.com>
Sent: Thursday, January 17, 2019 10:04 AM

To: Genavieve Melatti <GMelatti@dsel.ca>
Cc: Steve Merrick <SMerrick@dsel.ca>; Jillian Normand <Jillian.Normand@mattamycorp.com>; Sabrina Castellanos <scastellanos@q4architects.com>
Subject: RE: Wateridge Block 15 FUS Information

Hi Genavieve,

Please find Sabrina's contact information below. She is also cc'd in this email.

scastellanos@q4architects.com

Sabrina if you could please work with DSEL to assist them in the design of Block 15 it would be greatly appreciated!

Thank you,
Conor

Conor Sutherland, B.Eng.
Land Development Coordinator
T (613) 831-3548 (direct). **F** (613) 831-9060
Conor.Sutherland@mattamycorp.com
Ottawa Office: 50 Hines Road, Suite 100, Ottawa, ON Canada K2K 2M5

From: Genavieve Melatti <GMelatti@dsel.ca>
Sent: Thursday, January 17, 2019 9:55 AM
To: Conor Sutherland <Conor.Sutherland@mattamycorp.com>
Cc: Steve Merrick <SMerrick@dsel.ca>
Subject: Wateridge Block 15 FUS Information

Good morning Conor,

I was wondering if you could let me know who from Q4 I should contact for some information we will need for FUS calculations.

We will be needing the following information:

- We assume that as these are townhomes there will not be sprinkler systems installed. I would need this to please be confirmed.
- We will need the the ISO class for each Block style.

If you are able to let me know who I should contact with regards to this that would be great.

Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103

Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

patersongroup **memorandum**

consulting engineers

re:	**Infiltration Rates** **Proposed Residential Development** - **Block 15** **Wateridge Village - Ottawa**
cc:	David Shaeffer Engineering Ltd. - **Mr. Steve Merrick** - smerrick@dsel.ca
date:	January 21, 2019
file:	PG4064-MEMO.09

Further to your request, Paterson Group (Paterson) carried out a review of available information obtained from a geotechnical program at a location adjacent to Block 15 of the proposed Wateridge Development.

Background

The purpose of this review was to provide a range of theoretical infiltration rates to be encountered within the subsoils below the proposed infiltration system at the aforementioned site.

The subsurface profile encountered at the test hole locations in Block 15 of the proposed development generally consisted of an overlaying fill extending to a maximum depth of 1.8 m below existing grade, underlain by a very stiff to stiff brown silty clay, which in turn is onderlain by a stiff to firm grey silty clay.

Geotechnical Commentary

The field saturated hydraulic conductivity (K_{fs}) values were slected using Engineering Technologies Canada (ETC) Ltd and based on a clay. Reference tables provided in the most recent ETC Pasl Permeameter User Guide. The infiltration rates were determined using Appendix C of the Low Impact Development Stormwater Managment Planning and Design Guide (CVC 2011). It should be noted that a safety correction factor of 3.5 was used when calculating the infiltration rate to account for any variations in the soil.

Based on the theoretical calculations, the infiltration rate of the subsoils below the proposed infiltration system for Block 15 will be approximately **140 to 200 mm/d**.

Please note that the values in this memorandum report are strictly theoretical and based on values obtained in similar materials during previous investigations in the surrounding area. It should also be noted that it was assumed the infiltration system will be installed within the silty clay layer of the subsurface.

We trust that this information is satisfactory for your immediate requirements.

Paterson Group Inc.

January 21, 2019

Nick Giamberardino, E.I.T. . David J. Gilbert, P.Eng.

Steve Merrick

From: Winston Yang <Winston.Yang@ibigroup.com>
Sent: Wednesday, August 16, 2017 11:50 AM
To: Adam Fobert; Jean Lachance
Cc: Jillian Normand; Jim Moffatt
Subject: RE: 918 Mattamy - Wateridge: IBI Servicing Review

Hi Adam and Jean,

I have reviewed the impact as per DSEL design for Block 15, 22 and 24.

Upon review of the proposed grading plans for Blocks 15, 22, and 24, we found the leave grades provided by DSEL to be reasonable.
We do not have a conceptual plan for Block 19 yet. The leave grades for that block seem low for a typical basement development. However they might be fine if underground parking is planned.

For the Servicing side, the storm and sanitary outlets location for each block were changed compared to the MSS and Design Brief.
Then we have implemented the changes DSEL made into our sewer design and have examined the capacity for each downstream sewers.
The result shows that the downstream sewers for storm and sanitary have the capacity to convey the flow for all new outlets for blocks, 15, 22 and 24.

In order to minimize the impact and cost, we are going to shift some manholes to accommodate the new outlets base on DSEL design.
For Block 22, MH210 and MH210A can be shifted to the south to replace the STM101 and SAN1 along Michael Stoqua Street.
For Block 24, MH213 and MH213A can be shifted to the south to replace the STM101 and SAN1 along Moses Tenisco Street. At the same time, MH212 and MH212A will be shifted to the south in order to reduce the length of the sewers.
For Block 15, there is no choice, the manhole STM101 and SAN1 are required for Squadron Crescent.
Since the typical 1200mm Dia. Manholes have been already ordered by the contractor.
We will contact the contractor to find out any further impacts will be caused by shifting the manholes.

For the storm section below. DSEL met the IBI criteria for the proposed lots.
In regards to Block 19, the drainage areas should be corresponded to IBI Lot141, Lot 167 in Phase 1A and Lot208B, Lot209 in Phase 1B.
And the IBI 100 year capture rate is 475l/s (283l/s+63l/s+46l/s+83l/s). Please considered in your design later on.

Should you have any questions please do not hesitate to contact either Jim or me.

Yours truly,

Winston Yang P.Eng.

email Winston.Yang@ibigroup.com web www.ibigroup.com

IBI GROUP
Suite 400, 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel +1 613 225 1311 fax +1 613 225 9868

From: Adam Fobert [mailto:AFobert@dsel.ca]
Sent: Tuesday, August 15, 2017 5:27 PM
To: Winston Yang <Winston.Yang@ibigroup.com>; Jim Moffatt <jmoffatt@IBIGroup.com>
Cc: Jean Lachance <JLachance@clc.ca>; Jillian Normand <Jillian.Normand@mattamycorp.com>
Subject: 918 Mattamy - Wateridge: IBI Servicing Review

Hello Jim and Winston,

How is your review of our site servicing is coming along? I have reviewed your Design Brief's for Phase 1A and 1B and have compared the analysis contained within to our proposed design.

I offer the following considerations based on my review:

General:
DSEL proposed one storm and one sanitary connection to each block. The City indicated that this was their expectation during our pre-consultation as it is their standard practice for multi-block parcels.

Block 15: The servicing brief shows three connections to Squadron Crescent. DSEL are proposing one connection downstream of the contemplated connections.

Block 22: The surrounding grades slope from east to west. The servicing brief shows a drainage divide mid-block, where half the site drains to Moses Tenisco and the other to Michael Stoqua . Moses Tenisco is 1.14m higher than Michael Stoqua at the proposed road connection points. As such, to avoid fighting grades DSEL proposed storm and sanitary connections to Michael Stoqua only.

Block 24: Moses Tenisco slopes from north to south 1.1m from Hemlock to Mikinak. The servicing brief shows a drainage divide mid-block with connections to Moses Tenisco and Mikinak. DSEL proposed a storm and sanitary outlet at the southern road connection on Moses Tenisco based on Mattamy's proposed site. This avoids fighting grades internally.

Wastewater:
Block 15:

IBI Servicing Brief = 487.3p
Mattamy Proposal = 335p

Proposed connections are downstream of IBI contemplated connections. Population is less than included in servicing brief. Therefore, we do not expect servicing issues with Block 15.

Block 22:

IBI Servicing Brief ~ 105p (note that I am interpolating since half of Block 22 is included in northern half of Block 24.)

Mattamy Proposal = 52p

IBI servicing brief assumed 52.5p tributary to Moses Tenisco. Therefore, we do not expect capacity issues.

Block 24:

IBI Servicing Brief ~284.4p (note that I am interpolating based on the population shown on phase 1A southern half of block 24).

Mattamy Proposal = 364p

DSEL reviewed the available capacity in the receiving sewers and did not see any capacity issues.

Note: Mattamy's proposed servicing eliminates the need for 63.8m of sanitary sewer on Moses Tennisco from MH213A to MH212A. Savings to CLC.

Stormwater:

I have reviewed Appendix E of the servicing briefs to compare our calculations to the assumptions used in the model.

Review of the Summary of DDSWMM Parameters

Block 15:

IBI Servicing brief: No storage assumed. 5 and 100 year capture 396L/s

Mattamy's proposal: 275m3 of storage provided. DSEL's estimated 5-year peak 357.4L/s

Block 19:

IBI Servicing brief: No storage assumed. 194 + 57 (note that Lot 209 and 208B are missing from chart).

Mattamy's proposal: TBD.

Block 22:

IBI Servicing brief: No storage assumed. 5 and 100 year (46 + 46) 92L/s

Mattamy's proposal: 46.5m3 of storage provided. DSEL's estimated 5-year peak 87L/s.

Block 24:

IBI Servicing brief: No Storage. 5 and 100 year capture (162 +162) 324L/s.

Mattamy's proposal: 27.3m3 of storage provided. DSEL's estimated 5-year peak 325.7L/s.

Let me know if you have any comments or questions. Thank you for your time.

Adam Fobert, P.Eng.
Manager of Site Plan Design

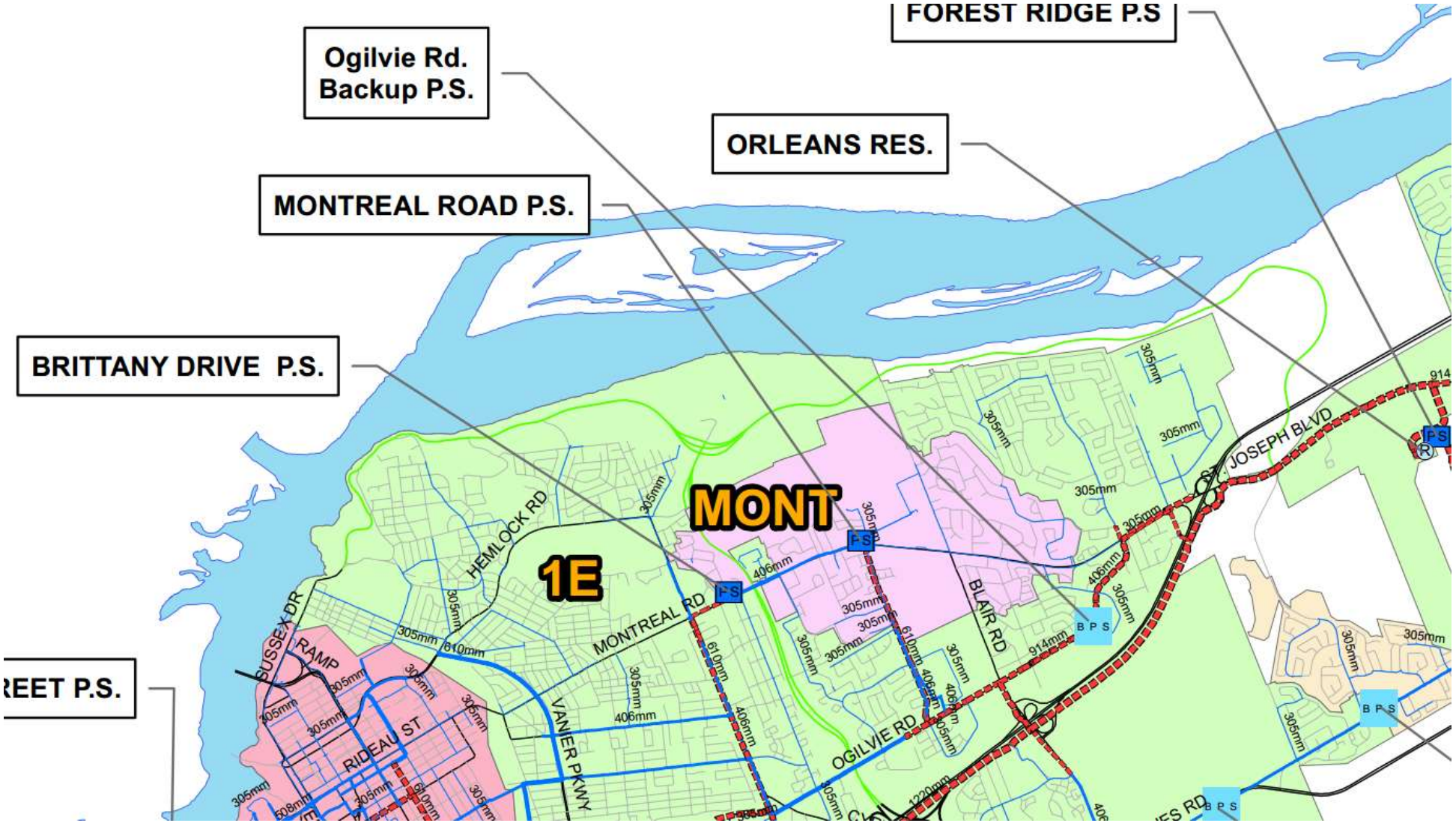
DSEL
david schaeffer engineering ltd.

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

office: (613) 836-0856
direct: (613) 836-0626
cell: (613) 222-9493
email: afobert@DSEL.ca

APPENDIX B

Water Supply


FOREST RIDGE P.S
Ogilvie Rd.
Backup P.S.
ORLEANS RES.
MONTREAL ROAD P.S.
BRITTANY DRIVE P.S.
REET P.S.
MONT
1E
HEMLOCK RD
MONTREAL RD
SUSSEX DR
RAMP
RIDEAU ST
VANIER PKWY
OGILVIE RD
BLAIR RD
ST. JOSEPH BLVD
305mm
406mm
610mm
914mm
1220mm
508mm
P S
B P S

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	192	519
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	519	145.3	100.9	363.3	252.3	799.3	555.0

Institutional / Commercial / Industrial Demand

			Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**	**Units**	m^3/d	L/min	m^3/d	L/min	m^3/d	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			**145.3**	**100.9**	**363.3**	**252.3**	**799.3**	**555.0**

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	2033.4	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	14880.8	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	30.1m-45m	32	3	96	5%	
S	Wood Frame	20.1m-30m	32	3	96	10%	
E	Wood Frame	3.1m-10m	16	3	48	18%	
W	Wood Frame	30.1m-45m	16	3	48	5%	
		% Increase				**38%**	*value not to exceed 75%*

Increase	**4845.0**	**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	17595.0	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 Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	2022.3	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	14840.2	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	30.1m-45m	32	3	96	5%
S	Wood Frame	20.1m-30m	32	3	96	10%
E	Wood Frame	3.1m-10m	16	3	48	18%
W	Wood Frame	3.1m-10m	16	3	48	18%
		% Increase				**51%** *value not to exceed 75%*

Increase	**6502.5**	**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	19252.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	19000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	2022.3	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	14840.2	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	30.1m-45m	32	3	96	5%	
S	Wood Frame	20.1m-30m	32	3	96	10%	
E	Wood Frame	3.1m-10m	16	3	48	18%	
W	Wood Frame	3.1m-10m	16	3	48	18%	
		% Increase				**51%**	*value not to exceed 75%*

Increase	**6502.5**	**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	19252.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	19000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	2033.4	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	14880.8	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	30.1m-45m	32	3	96	5%
S	Wood Frame	20.1m-30m	32	3	96	10%
E	Wood Frame	30.1m-45m	16	3	48	5%
W	Wood Frame	3.1m-10m	16	3	48	18%
		% Increase				**38%** *value not to exceed 75%*

Increase	**4845.0**	**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	17595.0	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 Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	1622.7	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	13293.4	L/min	
	13000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%	
Fire Flow	**11050.0**	**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	20.1m-30m	18	3	54	8%	
S	Wood Frame	10.1m-20m	18	3	54	13%	
E	Wood Frame	20.1m-30m	26	3	78	9%	
W	Wood Frame	10.1m-20m	26	3	78	14%	
		% Increase				**44%**	*value not to exceed 75%*

Increase	**4862.0**	**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	15912.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	16000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	1622.7	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	13293.4	L/min	
	13000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%	
Fire Flow	**11050.0**	**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	20.1m-30m	18	3	54	8%	
S	Wood Frame	3.1m-10m	18	3	54	18%	
E	Wood Frame	20.1m-30m	26	3	78	9%	
W	Wood Frame	10.1m-20m	26	3	78	14%	
		% Increase				**49%**	*value not to exceed 75%*

Increase	**5414.5**	**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	16464.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	16000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	1222.9	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	11540.1	L/min	
	12000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%	
Fire Flow	**10200.0**	**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	3.1m-10m	18	3	54	18%	
S	Wood Frame	10.1m-20m	18	3	54	13%	
E	Wood Frame	10.1m-20m	26	3	78	14%	
W	Wood Frame	20.1m-30m	26	3	78	9%	
		% Increase				**54%**	*value not to exceed 75%*

Increase	**5508.0**	**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	15708.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	16000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	745.3	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	9008.9	L/min
	9000.0	**L/min** *rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible -15%

Fire Flow	**7650.0**	**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	20.1m-30m	24	3	72	9%	
S	Wood Frame	3.1m-10m	24	3	72	19%	
E	Wood Frame	10.1m-20m	33	3	99	15%	
W	Wood Frame	10.1m-20m	33	3	99	15%	
		% Increase				**58%**	*value not to exceed 75%*

Increase	**4437.0**	**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	12087.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	12000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	758.4	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	9087.7	L/min
	9000.0	**L/min** *rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible -15%

Fire Flow	**7650.0 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	3.1m-10m	24	3	72	19%	
S	Wood Frame	3.1m-10m	24	3	72	19%	
E	Wood Frame	10.1m-20m	33	3	99	15%	
W	Wood Frame	10.1m-20m	33	3	99	15%	
		% Increase				**68%**	*value not to exceed 75%*

Increase	**5202.0 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	12852.0	L/min *fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section*
	13000.0	**L/min** *rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	744.5	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	9004.3	L/min
	9000.0	**L/min** *rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible -15%

Fire Flow	**7650.0**	**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	3.1m-10m	24	3	72	19%	
S	Wood Frame	>45m	24	3	72	0%	
E	Wood Frame	10.1m-20m	33	3	99	15%	
W	Wood Frame	10.1m-20m	33	3	99	15%	
		% Increase				**49%**	*value not to exceed 75%*

Increase	**3748.5**	**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	11398.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section*
	11000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	617.8	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	8202.4	L/min	
	8000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%	
Fire Flow	**6800.0**	**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	26	3	78	14%	
S	Wood Frame	>45m	26	3	78	0%	
E	Wood Frame	10.1m-20m	24	3	72	14%	
W	Wood Frame	3.1m-10m	24	3	72	19%	
		% Increase				**47%**	*value not to exceed 75%*

Increase	**3196.0**	**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	9996.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	10000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	617.8	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	8202.4	L/min	
	8000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible -15%

Fire Flow	**6800.0**	**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	26	3	78	14%	
S	Wood Frame	>45m	26	3	78	0%	
E	Wood Frame	3.1m-10m	24	3	72	19%	
W	Wood Frame	3.1m-10m	24	3	72	19%	
		% Increase				**52%**	*value not to exceed 75%*

Increase	**3536.0**	**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	10336.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	10000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	745.3	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	9008.9	L/min	
	9000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible -15%

Fire Flow	**7650.0**	**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	33	3	99	15%	
S	Wood Frame	>45m	33	3	99	0%	
E	Wood Frame	3.1m-10m	24	3	72	19%	
W	Wood Frame	3.1m-10m	24	3	72	19%	
		% Increase				**53%**	*value not to exceed 75%*

Increase	**4054.5**	**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	11704.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section*
	12000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

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	904.5	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	9924.7	L/min	
	10000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%	
Fire Flow	**8500.0**	**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	20.1m-30m	24	3	72	9%
S	Wood Frame	3.1m-10m	24	3	72	19%
E	Wood Frame	10.1m-20m	39	3	117	15%
W	Wood Frame	>45m	39	3	117	0%
		% Increase				**43%** *value not to exceed 75%*

Increase	**3655.0**	**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	12155.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section*
	12000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Q4 Architects Incorporated, dated January 22nd, 2019.
-Calculations based on Fire Underwriters Survey - Part II

APPENDIX C

Wastewater Collection

IBI GROUP
400-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

SANITARY SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED FLOW	TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA	UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW			CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
														INSTITUTIONAL		COMMERCIAL		INDUSTRIAL													
STREET	AREA ID	FROM MH	TO MH	Phase 1B (Ha)	SF	SD	TH	APT	EXTERNAL (Ha)	IND	CUM	FACTOR	FLOW (L/s)	IND	CUM	IND	CUM	IND	CUM	FLOW (L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
Phase 1B																																
Hemlock Road	201A	MH201A	MH202A	0.31						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.31	0.31	0.09	0.00	0.09	50.02	87.06	250	0.65	0.987	49.93	99.83%
Future Street No. 6	EX202A	BULK202AN	MH202A						2.08	358.5	358.5	4.00	5.81		0.00		0.00		0.00	0.00	2.08	2.08	0.58	0.00	6.39	31.02	21.00	250	0.25	0.612	24.63	79.40%
Hemlock Road	202A	MH202A	MH203A	0.21						0.0	358.5	4.00	5.81		0.00		0.00		0.00	0.00	0.21	2.60	0.73	0.00	6.54	75.98	86.00	250	1.50	1.500	69.44	91.40%
Future Street No. 5	EX203A	BULK203AN	MH203A						1.40	160.5	160.5	4.00	2.60		0.00		0.00		0.00	0.00	1.40	1.40	0.39	0.00	2.99	83.23	21.00	250	1.80	1.643	80.24	96.40%
Hemlock Road	203A, EXPARK2	MH203A	MH204A	0.20					0.44	0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.64	0.64	0.18	0.00	0.18	82.07	86.00	250	1.75	1.620	81.89	99.78%
rue Moses Tennisco Street	EX204A	BULK204AN	MH204A						1.39	153.5	153.5	4.00	2.49		0.00		0.00		0.00	0.00	1.39	1.39	0.39	0.00	2.88	83.23	21.00	250	1.80	1.643	80.36	96.54%
Hemlock Road	204A	MH204A	MH205A	0.21						0.0	153.5	4.00	2.49		0.00		0.00		0.00	0.00	0.21	1.60	0.45	0.00	2.94	67.96	90.00	250	1.20	1.341	65.02	95.68%
rue Michael Stoqua Street	EX205A	BULK205AN	MH205A						1.38	241.5	241.5	4.00	3.91		0.00		0.00		0.00	0.00	1.38	1.38	0.39	0.00	4.30	67.96	21.00	250	1.20	1.341	63.66	93.67%
Hemlock Road	205A	MH205A	MH206A	0.25						0.0	395.0	4.00	6.40		0.00		0.00		0.00	0.00	0.25	3.23	0.90	0.00	7.30	31.02	112.00	250	0.25	0.612	23.71	76.45%
rue Bareille-Snow Street	EX206A-B	BULK206AN	MH206A						9.61	1755.0	1755.0	3.63	25.80		0.00		0.00		0.00	0.00	9.61	9.61	2.69	0.00	28.49	87.74	21.00	250	2.00	1.731	59.24	67.52%
Hemlock Road	206A	MH206A	MH207A	0.20						0.0	2150.0	3.56	31.02		0.00		0.00		0.00	0.00	0.20	13.04	3.65	0.00	34.67	55.26	89.33	300	0.30	0.757	20.59	37.26%
Block 20	PARK1	MH207AN	MH207A	0.32						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.32	0.32	0.09	0.00	0.09	39.24	14.00	250	0.40	0.774	39.15	99.77%
Hemlock Road	PARK1, 207A	MH207A	*BULK176AE*	0.12						0.0	2150.0	3.56	31.02		0.00		0.00		0.00	0.00	0.12	13.48	3.77	0.00	34.79	65.38	33.16	300	0.42	0.896	30.59	46.79%
Phase 1A																																
Hemlock Road		*BULK176AE*	*MH176A*							0.0	2150.0	3.56	31.02		0.00		0.00		0.00	0.00	0.00	13.48	3.77	0.00	34.79	65.38	*21.97*	*300*	*0.42*	0.896	30.59	46.79%
Phase 1B																																
chemin Wanaki Road	200A, COM1	MH200A	MH214A	0.25						0.0	0.0	4.00	0.00		0.00	0.90	0.90		0.00	0.78	1.15	1.15	0.32	0.00	1.10	73.41	98.28	250	1.40	1.449	72.30	98.50%
chemin Wanaki Road	214A, COM2	MH214A	*BULK153AN*	0.16						0.0	0.0	4.00	0.00		0.00	0.65	1.55		0.00	1.35	0.81	1.96	0.55	0.00	1.89	51.91	44.22	250	0.70	1.024	50.01	96.35%
Phase 1B																																
chemin Wanaki Road	143B	BULK143AE	MH143A	0.31						104.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.31	0.31	0.09	0.00	1.77	43.87	21.50	250	0.50	0.866	42.10	95.96%
chemin Wanaki Road	143A	MH143A	MH144A	0.27						0.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.27	0.58	0.16	0.00	1.85	87.74	47.73	250	2.00	1.731	85.89	97.89%
chemin Wanaki Road	144A, 144B	MH144A	MH145A	0.72						0.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.72	1.30	0.36	0.00	2.05	87.74	40.57	250	2.00	1.731	85.69	97.66%
chemin Wanaki Road	145A, 145B, 145C	MH145A	MH146A	2.77						835.6	939.6	3.82	14.53		0.00		0.00		0.00	0.00	2.77	4.07	1.14	0.00	15.67	107.45	53.01	250	3.00	2.121	91.79	85.42%
chemin Wanaki Road	146A	MH146A	MH147A	0.14						0.0	939.6	3.82	14.53		0.00		0.00		0.00	0.00	0.14	4.21	1.18	0.00	15.71	43.54	37.48	250	1.00	1.224	27.83	63.92%
chemin Wanaki Road	PARK2	BLK147AE	MH147A	0.55						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.55	0.55	0.15	0.00	0.15	39.24	17.66	250	0.40	0.774	39.08	99.61%
chemin Wanaki Road	147C	BLK147AW	MH147A	0.10						33.6	33.6	4.00	0.54		0.00		0.00		0.00	0.00	0.10	0.10	0.03	0.00	0.57	43.87	17.33	250	0.50	0.866	43.30	98.70%
chemin Wanaki Road	147A	MH147A	MH170A	0.03						0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.03	4.89	1.37	0.00	16.38	31.02	10.23	250	0.25	0.612	14.64	47.19%
chemin Wanaki Road	147B	MH107A	MH147C	0.16						0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.16	5.05	1.41	0.00	16.42	31.02	39.00	250	0.25	0.612	14.59	47.05%
chemin Wanaki Road		MH147C	*BLK148AW*							0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.00	5.05	1.41	0.00	16.42	31.02	11.77	250	0.25	0.612	14.59	47.05%
Phase 1B																																
Block 9	154A	*MH158A*	MH217A	0.19						0.0	973.2	3.81	15.01		2.62		3.83		0.00	5.60	0.19	12.94	3.62	0.00	24.23	53.37	171.95	250	0.74	1.053	29.13	54.59%
croissant Squadron Crescent	215Aa-b	MH215A	MH216A	0.79	3	4				117.8	117.8	4.00	1.91		0.00		0.00		0.00	0.00	0.79	0.79	0.22	0.00	2.13	50.02	80.00	250	0.65	0.987	47.89	95.74%
croissant Squadron Crescent	216Aa-b	MH216A	MH217A	0.67	2	6				94.5	212.3	4.00	3.44		0.00		0.00		0.00	0.00	0.67	1.46	0.41	0.00	3.85	50.02	71.19	250	0.65	0.987	46.17	92.30%
croissant Squadron Crescent	217A	MH217A	MH218A	0.02						0.0	1185.5	3.75	18.01		2.62		3.83		0.00	5.60	0.02	14.42	4.04	0.00	27.65	36.70	10.52	250	0.35	0.724	9.05	24.66%
croissant Squadron Crescent	218A	MH218A	MH218B	0.02						0.0	1185.5	3.75	18.01		2.62		3.83		0.00	5.60	0.02	14.44	4.04	0.00	27.66	36.70	12.49	250	0.35	0.724	9.05	24.65%
	THORN1	*EX SANMH*	MH218B						5.55	1574.0	1574.0	3.66	23.36		0.00		0.00		0.00	0.00	5.55	5.55	1.55	0.00	24.92	74.13	46.02	300	0.54	1.016	49.21	66.39%
croissant Squadron Crescent	218B	MH218B	MH219A	0.07						0.0	2759.5	3.47	38.82		2.62		3.83		0.00	5.60	0.07	20.06	5.62	0.00	50.04	59.68	37.08	300	0.35	0.818	9.64	16.16%
croissant Squadron Crescent	219A	MH219A	MH220A	0.15						0.0	2759.5	3.47	38.82		2.62		3.83		0.00	5.60	0.15	20.21	5.66	0.00	50.08	59.68	72.49	300	0.35	0.818	9.60	16.09%
croissant Squadron Crescent	220A, 220B	MH220A	MH221A	1.46						319.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	1.46	21.67	6.07	0.00	54.48	59.68	43.77	300	0.35	0.818	5.21	8.72%
croissant Squadron Crescent	221A	MH221A	MH222A	0.02						0.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	0.02	21.69	6.07	0.00	54.48	59.68	8.66	300	0.35	0.818	5.20	8.71%
croissant Squadron Crescent	222A	MH222A	*MH169A*	0.22						0.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	0.22	21.91	6.13	0.00	54.54	59.68	89.42	300	0.35	0.818	5.14	8.61%

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.4	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.7	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Other	60	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+P^0.5))
where P = population in thousands

Designed: WY

Checked: JIM

Dwg. Reference: 38298-501

No.	Revision	Date
1.	City submission No. 1	7/8/2016
2.	City submission No. 2	11/4/2016
3.	City submission No. 3	1/25/2017

File Reference:	Date:	Sheet No:
38298.5.7.1	7/8/2016	1 of 2

IBI GROUP
400-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

SANITARY SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED FLOW	TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA	UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW			CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	Phase 1B (Ha)	SF	SD	TH	APT	EXTERNAL (Ha)	IND	CUM	FACTOR	FLOW (L/s)	INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	FLOW (L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
Phase 1A																																
croissant Squadron Crescent		*MH169A*	*MH165A*							0.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	0.00	21.91	6.13	0.00	54.54	63.80	*27.00*	*300*	*0.40*	0.874	9.26	14.51%
Phase 1B																																
rue Moses Tennisco Street	212A	MH212A	MH213A	1.20						252.0	252.0	4.00	4.08		0.00		0.00		0.00	0.00	1.20	1.20	0.34	0.00	4.42	50.02	63.80	250	0.65	0.987	45.60	91.16%
rue Moses Tennisco Street	213A	MH213A	*BULK165AN*	0.35						52.5	304.5	4.00	4.93		0.00		0.00		0.00	0.00	0.35	1.55	0.43	0.00	5.37	39.24	50.79	250	0.40	0.774	33.87	86.32%
Phase 1A																																
rue Moses Tennisco Street		*BULK165AN*	*MH165A*							0.0	304.5	4.00	4.93		0.00		0.00		0.00	0.00	0.00	1.55	0.43	0.00	5.37	39.24	*22.50*	*250*	*0.40*	0.774	33.87	86.32%
Phase 1B																																
rue Michael Stoqua Street	210A	MH210A	MH211A	0.40						52.5	52.5	4.00	0.85		0.00		0.00		0.00	0.00	0.40	0.40	0.11	0.00	0.96	50.02	64.80	250	0.65	0.987	49.05	98.08%
rue Michael Stoqua Street	211A	MH211A	MH166B	0.35						52.5	105.0	4.00	1.70		0.00		0.00		0.00	0.00	0.35	0.75	0.21	0.00	1.91	50.02	52.19	250	0.65	0.987	48.11	96.18%
Phase 1A																																
rue Michael Stoqua Street		MH166B	*MH166A*							0.0	105.0	4.00	1.70		0.00		0.00		0.00	0.00	0.00	0.75	0.21	0.00	1.91	39.24	*21.10*	*250*	*0.40*	0.774	37.33	95.13%
Phase 1B																																
rue Bareille-Snow Street	208A	MH208A	MH209A	1.01						207.4	207.4	4.00	3.36		0.00		0.00		0.00	0.00	1.01	1.01	0.28	0.00	3.64	50.02	64.85	250	0.65	0.987	46.37	92.72%
rue Bareille-Snow Street	209A	MH209A	MH167B	0.35						52.6	260.0	4.00	4.21		0.00		0.00		0.00	0.00	0.35	1.36	0.38	0.00	4.59	50.02	52.87	250	0.65	0.987	45.42	90.82%
Phase 1A																																
rue Bareille-Snow Street		MH167B	*MH167A*							0.0	260.0	4.00	4.21		0.00		0.00		0.00	0.00	0.00	1.36	0.38	0.00	4.59	63.80	*20.43*	*300*	*0.40*	0.874	59.21	92.80%
Phase 1B																																
Codd's Road	230A	BLK231AN	MH231A						0.87	85.7	85.7	4.00	1.39		0.00		0.00		0.00	0.00	0.87	0.87	0.24	0.00	1.63	75.98	3.00	250	1.50	1.500	74.35	97.85%
Codd's Road	231A, EXPARK1	MH231A	*BULK176AN*						0.76	43.3	129.0	4.00	2.09		0.00		0.00		0.00	0.00	0.76	1.63	0.46	0.00	2.55	87.74	50.22	250	2.00	1.731	85.19	97.10%
Phase 1A																																
Codd's Road		*BULK176AN*	*MH176A*							0.0	129.0	4.00	2.09		0.00		0.00		0.00	0.00	0.00	1.63	0.46	0.00	2.55	55.49	*23.23*	*250*	*0.80*	1.095	52.94	95.41%

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	COM	50,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
				17000	L/Ha/day	

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: WY

Checked: JIM

Dwg. Reference: 38298-501

No.	Revision	Date
1.	City submission No. 1	7/8/2016
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File Reference:	Date:	Sheet No:
38298.5.7.1	7/8/2016	2 of 2

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

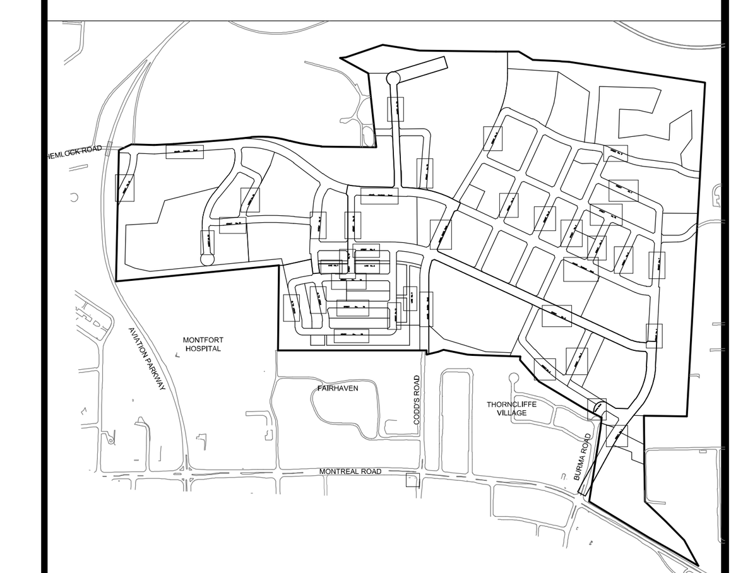
Signed ______________________

Date ______________________ 2017

Plan Number ______________________

LEGEND :

S168 — AREA NUMBER
2.01 — AREA IN HECTARES
0.80 — RUNOFF COEFFICIENT
POTENTIAL DRAINAGE DIRECTION



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA
30 Metcalfe Street Suite 601
Ottawa, On K1P 5L4
613 998 7777

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE

PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
17/06/07
PROVINCE OF ONTARIO

N

Drawing Title

SANITARY DRAINAGE AREA PLAN

Scale: 1 : 2000

Design	Date
J.I.M.	MAY 2016
Drawn	**Checked**
M.M.	J.I.M.
Project No.	**Drawing No.**
38298	501A

D07-16-15-0003

#17063

Wateridge Block 15
Wastewater Flow per MSS

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 1.960 **ha**

Extraneous Flow Allowances

Infiltration / Inflow	**0.55**	**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		487
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		

Total Pop	**487**	
Average Domestic Flow	**1.97**	**L/s**
Peaking Factor	**3.98**	
Peak Domestic Flow	**7.85**	**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	**1.97**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**7.85**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**8.40**	**L/s**

Wateridge Block 15
Proposed Site Conditions

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 1.960 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.10 L/s**
Infiltration / Inflow (Wet)	**0.55 L/s**
Infiltration / Inflow (Total)	**0.65 L/s**

Extraneous Flow Allowances

Infiltration / Inflow **0.65 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	192	519
			0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop **519**

Average Domestic Flow **1.68 L/s**

Peaking Factor **3.37**

Peak Domestic Flow **5.67 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Dining room	125 L/seat/d		0.00
Commercial floor space	28,000.0 L/ha/d		0.00
Water Closets**	150 L/hr		0.00
Laundry Facility	1,200 L/unit/d		0.00

Average I/C/I Flow **0.00**

Peak Institutional / Commercial Flow 0.00
Peak I/C/I Flow **0.00**

Total Estimated Average Dry Weather Flow Rate	**1.78 L/s**
Total Estimated Peak Dry Weather Flow Rate	**6.22 L/s**
Total Estimated Peak Wet Weather Flow Rate	**7.52 L/s**

** Water closets demand of 150 L/hour from Appendix 4-A of the Sewer design guidelines, assuming a 12 hour operation

Mattamy Homes
Wateridge Block 15
Proposed Development - Internal Sanitary Flow

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area* 1.560 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.08 L/s**
Infiltration / Inflow (Wet)	**0.44 L/s**
Infiltration / Inflow (Total)	**0.51 L/s**

Extraneous Flow Allowances

Infiltration / Inflow	**0.51 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	158	427
			0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**427**
Average Domestic Flow	**1.38 L/s**
Peaking Factor	**3.41**
Peak Domestic Flow	**4.71 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Dining room	125 L/seat/d		0.00
Commercial floor space	28,000.0 L/ha/d		0.00
Water Closets**	150 L/hr		0.00
Laundry Facility	1,200 L/unit/d		0.00

Average I/C/I Flow	**0.00**
Peak Institutional / Commercial Flow	0.00
Peak I/C/I Flow	**0.00**

Total Estimated Average Dry Weather Flow Rate	**1.46 L/s**
Total Estimated Peak Dry Weather Flow Rate	**5.15 L/s**
Total Estimated Peak Wet Weather Flow Rate	**6.18 L/s**

*Consists only of areas and units tributary to the proposed internal sewer network and does not include areas for units discharging to the existing sewer within Squadron Crescent.

** Water closets demand of 150 L/hour from Appendix 4-A of the Sewer design guidelines, assuming a 12 hour operation

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION					PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Kichi Sibi Private																												
Contribution From Kiniw Private, Pipe 101A - 102A						0.06	11				0.00		0.00		0.00		0.06	0.06										
	102A	103A	0.12		17	0.18	28	3.5	0.32		0.00		0.00		0.00	0.00	0.12	0.18	0.05	0.37	48.5	200	0.40	20.74	0.02	0.66	0.25
	103A	104A	0.11		17	0.29	45	3.5	0.50		0.00		0.00		0.00	0.00	0.11	0.29	0.08	0.59	42.1	200	0.40	20.74	0.03	0.66	0.29
	104A	105A	0.04		6	0.33	51	3.5	0.57		0.00		0.00		0.00	0.00	0.04	0.33	0.09	0.66	7.2	200	0.40	20.74	0.03	0.66	0.30
	105A	115A	0.12		36	0.45	87	3.4	0.96		0.00		0.00		0.00	0.00	0.12	0.45	0.13	1.09	40.8	200	0.40	20.74	0.05	0.66	0.35
To Rabaska Private, Pipe 115A - 116A						0.45	87				0.00		0.00		0.00			0.45									
Mikinak Road (Rear Yard Service)																												
	111A	113A	0.13		81	0.13	81	3.4	0.90		0.00		0.00		0.00	0.00	0.13	0.13	0.04	0.93	104.4	200	0.93	31.63	0.03	1.01	0.44
To Servicing Between Block 1 and 2, Pipe 113A - 114A						0.13	81				0.00		0.00		0.00			0.13									
	112A	113A	0.05		27	0.05	27	3.5	0.31		0.00		0.00		0.00	0.00	0.05	0.05	0.01	0.32	34.9	200	0.65	26.44	0.01	0.84	0.28
To Servicing Between Block 1 and 2, Pipe 113A - 114A						0.05	27				0.00		0.00		0.00			0.05									
Servicing Between Block 1 and 2																												
Contribution From Mikinak Road (Rear Yard Service), Pipe 111A - 113A						0.13	81				0.00		0.00		0.00		0.13	0.13									
Contribution From Mikinak Road (Rear Yard Service), Pipe 112A - 113A						0.05	27				0.00		0.00		0.00		0.05	0.18									
	113A	114A				0.18	108	3.4	1.19		0.00		0.00		0.00	0.00	0.00	0.18	0.05	1.24	34.5	200	0.40	20.74	0.06	0.66	0.36
To Rabaska Private, Pipe 114A - 115A						0.18	108				0.00		0.00		0.00			0.18									
Oshawa Private																												
	103A	110A	0.21		60	0.21	60	3.4	0.67		0.00		0.00		0.00	0.00	0.21	0.21	0.06	0.73	56.2	200	0.65	26.44	0.03	0.84	0.36
To Rabaska Private1, Pipe 110A - 114A						0.21	60				0.00		0.00		0.00			0.21									
Kiniw Private																												
	101A	102A	0.06		11	0.06	11	3.5	0.13		0.00		0.00		0.00	0.00	0.06	0.06	0.02	0.14	30.1	200	0.65	26.44	0.01	0.84	0.22
To Kichi Sibi Private, Pipe 102A - 103A						0.06	11				0.00		0.00		0.00			0.06									
	102A	108A	0.27		68	0.27	68	3.4	0.76		0.00		0.00		0.00	0.00	0.27	0.27	0.08	0.83	74.5	200	0.65	26.44	0.03	0.84	0.38
To Rabaska Private, Pipe 108A - 110A						0.27	68				0.00		0.00		0.00			0.27									
Rabaska Private																												
	107A	108A	0.09		22	0.09	22	3.5	0.25		0.00		0.00		0.00	0.00	0.09	0.09	0.03	0.28	26.6	200	0.65	26.44	0.01	0.84	0.27
Contribution From Kiniw Private, Pipe 102A - 108A						0.27	68				0.00		0.00		0.00		0.27	0.36									
	108A	110A	0.15		38	0.51	128	3.4	1.40		0.00		0.00		0.00	0.00	0.15	0.51	0.15	1.54	45.9	200	0.40	20.74	0.07	0.66	0.38
Contribution From Oshawa Private, Pipe 103A - 110A						0.21	60				0.00		0.00		0.00		0.21	0.72									
	110A	114A	0.10		22	0.82	210	3.3	2.25		0.00		0.00		0.00	0.00	0.10	0.82	0.23	2.49	33.1	200	0.85	30.24	0.08	0.96	0.57
Contribution From Servicing Between Block 1 and 2, Pipe 113A - 114A						0.18	108				0.00		0.00		0.00		0.18	1.00									
	114A	115A	0.03		6	1.03	324	3.3	3.41		0.00		0.00		0.00	0.00	0.03	1.03	0.29	3.71	9.5	200	0.40	20.74	0.18	0.66	0.50
Contribution From Kichi Sibi Private, Pipe 105A - 115A						0.45	87				0.00		0.00		0.00		0.45	1.48									
	115A	116A	0.08		22	1.56	433	3.2	4.50		0.00		0.00		0.00	0.00	0.08	1.56	0.45	4.94	30.2	200	0.40	20.74	0.24	0.66	0.54
	116A	117A				1.56	433	3.2	4.50		0.00		0.00		0.00	0.00	0.00	1.56	0.45	4.94	11.0	200	0.40	20.74	0.24	0.66	0.54

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha				
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.286	L/s/ha	
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600	m/s	
Max Res. Peak Factor =	4.00				Manning's n = (Conc)	0.013	(Pvc)	0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=	2.7		
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4		

Designed: G.G.G.

Checked: S.L.M

Dwg. Reference:

Sanitary Drainage Plan, Dwgs. No.

PROJECT: Mattamy Homes Wateridge Village Block 15

LOCATION: Wateridge Village Block 15

City of Ottawa

File Ref: 17-946

Date: **29 Jan 2019**

Sheet No. 1

of 1

946_SAN.xlsx

APPENDIX D

Stormwater Management

IBI GROUP
400-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

STORM SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Name of Client/Developer

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW												SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.30	C= 0.45	C= 0.50	C= 0.56	C= 0.60	C= 0.65	C= 0.70	C= 0.73	C= 0.80	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
Phase 1B																																		
Hemlock Road	S201A-B, EX201	MH201	MH202								0.31		0.56	1.85	1.85	10.00	1.17	11.17	104.19	122.14	178.56	192.62				192.62	210.32	90.18	450			0.50	1.281	17.70	8.41%
Future Street No. 6	EX202A	BULK202N	MH202										0.90	2.00	2.00	12.23	0.27	12.50	93.72	109.82	160.45	187.60				187.60	286.47	16.00	600			0.20	0.982	98.87	34.51%
Hemlock Road	S202A, EX202B-C	MH202	MH203								0.10		0.55	1.42	5.27	12.50	0.53	13.03	92.61	108.50	158.52	487.86				487.86	784.52	86.00	600			1.50	2.688	296.66	37.81%
Future Street No. 5	S203B, EX203	BULK203N	203								0.09		0.73	1.80	1.80	10.88	0.12	11.00	99.76	116.92	170.90	179.44				179.44	351.93	16.00	450			1.40	2.144	172.49	49.01%
Hemlock Road	S203A, EXP203	MH203	MH204		0.44						0.16			0.68	7.75	13.03	0.49	13.53	90.49	106.01	154.87	700.89				700.89	847.38	86.00	600			1.75	2.903	146.49	17.29%
rue Moses Tennisco Street	S204B, EX204A	BULK204N	MH204								0.08		0.72	1.76	1.76	10.89	0.11	11.00	99.72	116.87	170.81	175.20				175.20	399.05	16.00	450			1.80	2.431	223.85	56.10%
Hemlock Road	S204A, EX204B	MH204	MH205								0.14		0.47	1.32	10.82	13.53	0.54	14.07	88.63	103.82	151.66	958.99				958.99	1,272.26	90.00	750			1.20	2.790	313.27	24.62%
rue Michael Stoqua Street	S205A, EX205A	BULK205N	MH205								0.08		0.81	1.96	1.96	11.15	0.15	11.30	98.49	115.42	168.69	192.75				192.75	297.43	16.01	450			1.00	1.812	104.68	35.20%
Hemlock Road	S205B-C, EX205B	MH205	MH206								0.17		0.63	1.73	14.51	14.07	1.20	15.26	86.70	101.55	148.32	1,257.92				1,257.92	1,818.95	112.01	1200			0.20	1.558	561.03	30.84%
Temp Ditch	FUTURE PHASE	DI 10	BULK206N		7.68									6.41	6.41	59.66	0.16	59.82	33.08	38.61	56.13	211.89				211.89	297.43	17.03	450			1.00	1.812	85.54	28.76%
rue Bareille-Snow Street	S206A, EX206A	BULK206N	MH206								0.06		1.02	2.39	2.39	10.85	0.15	11.00	99.91	117.09	171.14	238.30				238.30	448.66	17.50	525			1.00	2.008	210.35	46.89%
Hemlock Road	S206B, EX206B	MH206	MH207								0.03		0.46	1.08	17.98	15.26	0.78	16.04	82.71	96.86	141.44	1,486.80				1,486.80	2,227.75	89.33	1200			0.30	1.908	740.96	33.26%
Block 20	P207	CBMH207N	MH207		0.32									0.27	0.27	10.00	0.27	10.27	104.19	122.14	178.56	27.81				27.81	63.80	14.00	300			0.40	0.874	36.00	56.42%
Hemlock Road	S207	MH207	*BULK176E*								0.22			0.43	18.67	16.04	0.37	16.42	80.33	94.05	137.32	1,499.75				1,499.75	2,156.55	32.62	1350			0.15	1.460	656.80	30.46%
Phase 1A																																		
Ex. Hemlock Road	S176C	*BULK176E*	*MH176*								0.02			0.04	18.71	16.42	0.27	16.69	79.24	92.78	135.45	1,482.57				1,482.57	2,156.55	*24.06*	*1350*			*0.15*	1.460	673.98	31.25%
Phase 1B																																		
Codd's Road	S230, LOT230A-B	230	231								0.16		0.70	1.87	1.87	10.00	0.63	10.63	104.19	122.14	178.56	194.65				194.65	364.28	84.30	450			1.50	2.219	169.63	46.57%
Codd's Road	S231, LOT231	231	*BULK176N*								0.12		0.30	0.90	2.77	10.63	0.36	11.00	100.96	118.34	172.97	279.55				279.55	549.49	53.76	525			1.50	2.459	269.94	49.12%
Phase 1A																																		
Ex. Codd's Road	---	*BULK176N*	*MH176*											0.00	2.95	11.77	0.29	12.06	95.69	112.12	163.84	281.96				281.96	339.63	*18.21*	*525*			*1.50*	0.919	57.67	16.98%
Phase 1B																																		
chemin Wanaki Road	S200, LOT200	MH200	MH214								0.20		0.91	2.41	2.41	10.00	0.78	10.78	104.19	122.14	178.56	251.42				251.42	351.93	99.75	450			1.40	2.144	100.51	28.56%
chemin Wanaki Road	S214, LOT214	MH214	*BULK152N*								0.19		0.84	2.24	4.65	10.78	0.42	11.20	100.27	117.52	171.77	466.34				466.34	535.93	46.51	600			0.70	1.836	69.59	12.99%
Phase 1B																																		
chemin Wanaki Road	EX143	BULK143E	MH143										0.33	0.73	0.73	10.00	0.29	10.29	104.19	122.14	178.56	76.47				76.47	129.34	20.00	375			0.50	1.134	52.87	40.88%
chemin Wanaki Road		MH143	MH144											0.00	0.73	10.29	0.37	10.66	102.67	120.34	175.92	75.35				75.35	258.68	50.50	375			2.00	2.269	183.33	70.87%
chemin Wanaki Road	S144, EX144	MH144	MH145		0.55						0.18			0.81	1.54	10.66	0.30	10.97	100.81	118.15	172.70	155.54				155.54	258.68	41.15	375			2.00	2.269	103.14	39.87%
chemin Wanaki Road	S145, EX145	MH145	MH146								0.15		2.74	6.39	7.93	10.97	0.28	11.24	99.35	116.44	170.18	787.69				787.69	1,324.21	48.01	750			1.30	2.904	536.53	40.52%
chemin Wanaki Road		MH146	MH147											0.00	7.93	11.24	0.25	11.49	98.06	114.92	167.95	777.46				777.46	2,296.77	38.53	1050			0.65	2.570	1519.32	66.15%
chemin Wanaki Road	S147C	BULK147E	MH147		0.40									0.33	0.33	10.00	0.28	10.28	104.19	122.14	178.56	34.76				34.76	71.33	16.51	300			0.50	0.978	36.58	51.27%
chemin Wanaki Road	EX147	BULK 147W	MH147	0.16										0.09	0.09	12.00	0.32	12.32	94.70	110.96	162.13	8.42				8.42	71.33	18.72	300			0.50	0.978	62.91	88.19%
chemin Wanaki Road		MH147	MH170											0.00	8.35	12.32	0.09	12.41	93.35	109.38	159.81	779.62				779.62	2,296.77	13.96	1050			0.65	2.570	1517.16	66.06%
chemin Wanaki Road	S147A	MH170	BOX CULVERT								0.14			0.27	8.62	12.41	0.10	12.51	92.98	108.94	159.17	801.83				801.83	2,296.77	15.00	1050			0.65	2.570	1494.94	65.09%
Phase 1B																																		
rue Moses Tennisco Street	S212, LOT212A-B	MH212	MH213								0.15		1.03	2.58	2.58	10.00	0.66	10.66	104.19	122.14	178.56	269.09				269.09	361.72	63.80	525			0.65	1.619	92.63	25.61%
rue Moses Tennisco Street	S213, LOT213	MH213	*BULK165N*								0.21		0.23	0.92	3.50	10.66	0.82	11.47	100.85	118.20	172.77	353.25				353.25	519.40	55.71	750			0.20	1.139	166.15	31.99%
Temp Ditch	BLOCK 24	DI 1	MH165N		1.60									1.33	1.33	26.41	0.25	26.66	58.73	68.69	100.13	78.37				78.37	129.34	17.03	375			0.50	1.134	50.96	39.40%
Phase 1A																																		
Ex. Street No. 3	---	*BULK165N*	*MH165*											0.00	3.50	11.47	0.24	11.71	97.01	113.68	166.14	339.81				339.81	519.40	*16.10*	*750*			*0.20*	1.139	179.59	34.58%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: WY
Checked: JIM
Dwg. Reference: 38298-500

No.	Revision	Date
1.	City submission No. 1	7/8/2016
2.	City submission No. 2	11/4/2016
3.	City submission No. 3	1/25/2017

File Reference: 38298.5.7.1
Date: 7/8/2016
Sheet No: 1 of 2

IBI GROUP
400-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

STORM SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Name of Client/Developer

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW												SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.25	C= 0.40	C= 0.50	C= 0.56	C= 0.60	C= 0.65	C= 0.70	C= 0.73	C= 0.80	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
Phase 1B																																		
Block 9	---	*MH157*	MH217											0.00	12.28	13.26	0.93	14.19	89.63	105.00	153.38	1,100.86				1,100.86	2,337.95	168.50	975			1.00	3.034	1237.09	52.91%
croissant Squadron Crescent	S215, R215	MH215	MH216					0.14				0.38		0.99	0.99	10.00	0.94	10.94	104.19	122.14	178.56	103.06				103.06	317.25	79.94	525			0.50	1.420	214.19	67.51%
croissant Squadron Crescent	S216, R216A-B	MH216	MH217					0.20				0.28		0.88	1.87	10.94	0.86	11.80	99.48	116.60	170.41	185.91				185.91	429.70	75.99	600			0.45	1.472	243.79	56.74%
croissant Squadron Crescent	---	MH217	MH218											0.00	14.15	14.19	0.10	14.29	86.28	101.05	147.59	1,220.93				1,220.93	1,911.03	12.94	1050			0.45	2.138	690.10	36.11%
croissant Squadron Crescent	S218	MH218	MH219								0.17			0.33	14.48	14.29	0.51	14.80	85.93	100.64	146.99	1,244.42				1,244.42	1,424.40	49.00	1050			0.25	1.594	179.98	12.64%
croissant Squadron Crescent	---	MH219	MH220											0.00	14.48	14.80	0.90	15.70	84.21	98.62	144.02	1,219.47				1,219.47	1,575.26	73.09	1200			0.15	1.349	355.79	22.59%
croissant Squadron Crescent	S220, LOT220	MH220	MH221								0.18		1.96	4.71	19.19	15.70	0.54	16.24	81.35	95.26	139.09	1,561.24				1,561.24	1,575.26	43.47	1200			0.15	1.349	14.02	0.89%
														FIXED OUTLET FLOW FROM SWM FACILITY = 6660 L/s																				
croissant Squadron Crescent	---	MH221	MH222											0.00	19.19	16.24	0.11	16.35	79.75	93.38	136.33	1,530.55			6,660.00	8,190.55	8,565.43	11.97	2400			0.11	1.834	374.88	4.38%
croissant Squadron Crescent	S222A-B	MH222	*BULK165S*								0.26			0.51	19.70	16.35	0.86	17.21	79.44	93.01	135.79	1,564.69			6,660.00	8,224.69	8,565.43	94.49	2400			0.11	1.834	340.74	3.98%
Phase 1A																																		
croissant Squadron Crescent	---	*BULK165S*	*MH165*											0.00	19.70	17.21	0.23	17.43	77.04	90.19	131.66	1,517.52			6,660.00	8,177.52	8,565.43	*24.90*	*2400*			*0.11*	1.834	387.92	4.53%
Temp Ditch	BLOCK 15	DI 4	MH165S		1.96									1.63	1.63	50.88	0.17	51.05	37.18	43.41	63.14	60.73				60.73	182.91	16.50	375			1.00	1.604	122.18	66.80%
Phase 1B																																		
rue Michael Stoqua Street	S210, LOT210	MH210	MH211								0.20		0.23	0.90	0.90	10.00	0.83	10.83	104.19	122.14	178.56	93.85				93.85	147.47	64.80	375			0.65	1.293	53.62	36.36%
Temp Ditch	BLOCK 22	DI 12	MH211N		0.46									0.38	0.38	19.39	0.33	19.72	71.62	83.82	122.31	27.44				27.44	43.87	17.38	250			0.50	0.866	16.43	37.45%
Temp Ditch	BLOCK 23	DI 13	MH166N		0.46									0.38	0.38	22.34	0.34	22.68	65.50	76.63	111.77	25.06				25.06	43.87	17.50	250			0.50	0.866	18.81	42.88%
rue Michael Stoqua Street	S211, LOT211	MH211	*BULK166N*								0.17		0.23	0.84	1.74	10.83	1.09	11.93	99.98	117.18	171.27	174.27				174.27	248.09	55.70	600			0.15	0.850	73.82	29.75%
Phase 1A																																		
rue Michael Stoqua Street	---	*BULK166N*	*MH166*											0.00	1.74	11.93	0.32	12.24	95.01	111.33	162.67	165.61				165.61	248.09	*16.10*	*600*			*0.15*	0.850	82.48	33.25%
Phase 1B																																		
rue Bareille-Snow Street	S208, LOT208A-B	MH208	MH209								0.19		0.81	2.17	2.17	10.00	0.76	10.76	104.19	122.14	178.56	226.22				226.22	317.25	64.85	525			0.50	1.420	91.03	28.69%
rue Bareille-Snow Street	S209, LOT209	MH209	*BULK167N*								0.20		0.20	0.83	3.01	10.76	1.01	11.77	100.34	117.60	171.89	301.53				301.53	339.63	55.70	675			0.15	0.919	38.10	11.22%
Temp Ditch	BLOCK 21	DI 11	MH167N		1.22									1.02	1.02	35.74	0.21	35.95	47.82	55.88	81.38	48.58				48.58	100.88	17.52	300			1.00	1.383	52.30	51.84%
Phase 1A																																		
rue Bareille-Snow Street	---	*BULK167N*	*MH167*											0.00	3.01	11.77	0.29	12.06	95.69	112.12	163.84	287.55				287.55	339.63	*16.10*	*675*			*0.15*	0.919	52.08	15.34%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: WY
Checked: JIM
Dwg. Reference: 38298-500

No.	Revision	Date
1.	City submission No. 1	7/8/2016
2.	City submission No. 2	11/4/2016
3.	City submission No. 3	1/25/2017

File Reference: 38298.5.7.1
Date: 7/8/2016
Sheet No: 1 of 2

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________ 2017

Plan Number ____________________

LEGEND :

S168 — AREA NUMBER
2.01 0.80 — RUNOFF COEFFICIENT
AREA IN HECTARES
POTENTIAL DRAINAGE DIRECTION

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA
30 Metcalfe Street Suite 601
Ottawa, On K1P 5L4
613 998 7777

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
17/06/07
PROVINCE OF ONTARIO

N

Drawing Title

STORM DRAINAGE AREA PLAN

Scale
1 : 2000

Design	Date
J.I.M.	MAY 2016
Drawn	Checked
M.M.	J.I.M.
Project No.	Drawing No.
38298	500A

D07-16-15-0003

#17063

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha)																FLOW						SEWER DATA							
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
Kichi Sibi Private																																
	101	102			0.00	0.00	0.20	0.80	0.44	0.44			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	46	300	300	PVC	0.53	34.2	70.3992	0.9959	0.5723	0.658
	102	103			0.00	0.00	0.24	0.80	0.53	0.98			0.00	0.00			0.00	0.00	10.57	74.68	101.26	118.69	173.49	99	375	375	PVC	1.30	39.2	199.9071	1.8100	0.3605	0.496
	103	104			0.00	0.00			0.00	0.98			0.00	0.00			0.00	0.00	10.93	73.40	99.51	116.63	170.46	97	375	375	PVC	1.17	6.5	189.6485	1.7171	0.0631	0.513
	104	108			0.00	0.00	0.10	0.80	0.22	1.20			0.00	0.00			0.00	0.00	11.00	73.18	99.21	116.27	169.94	119	450	450	CONC	0.48	41.6	197.5273	1.2420	0.5576	0.603
To Rabaska Private, Pipe 108 - 109						0.00				1.20				0.00				0.00	11.55														
Oshawa Private																																
	102	107			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	300	300	PVC	0.55	60.2	71.7152	1.0146	0.9881	0.000
To Rabaska Private, Pipe 107 - 108						0.00				0.00				0.00				0.00	10.99														
Rabaska Private																																
					0.00	0.00	0.11	0.80	0.24	0.24			0.00	0.00			0.00	0.00														
	105	107			0.00	0.00	0.23	0.80	0.51	0.76			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	79	300	300	PVC	1.04	72.5	98.6158	1.3951	0.8661	0.799
Contribution From Oshawa Private, Pipe 102 - 107						0.00				0.00				0.00				0.00	10.99														
	107	108			0.00	0.00	0.22	0.80	0.49	1.25			0.00	0.00			0.00	0.00	10.99	73.21	99.25	116.32	170.00	124	375	375	PVC	1.26	39.7	196.8076	1.7819	0.3709	0.628
Contribution From Kichi Sibi Private, Pipe 104 - 108						0.00				1.20				0.00				0.00	11.55														
	108	109			0.00	0.00	0.21	0.80	0.47	2.91			0.00	0.00			0.00	0.00	11.55	71.31	96.65	113.25	165.50	282	525	525	CONC	0.84	30.4	394.1586	1.8208	0.2778	0.714
	109	110			0.00	0.00			0.00	2.91			0.00	0.00			0.00	0.00	11.83	70.42	95.42	111.81	163.39	278	525	525	CONC	1.69	13.8	559.0810	2.5827	0.0891	0.497

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: G.G.M.
Checked: S.L.M.
Dwg. Reference:

PROJECT: **Mattamy Homes Wateridge Village Block 15**
LOCATION: Wateridge Village Block 15
City of Ottawa
File Ref: 17-946
Date: 29 Jan 2019
Sheet No. SHEET 1 OF 1

STORAGE SUMMARY
BLOCK 15
STORAGE VOLUME AVAILABLE BELOW OVERFLOW (CLEARSTONE AND SUBDRAIN)

Total Site			
Rainfall (mm)	**Drainage Area (sq.m)**	**Volume Required (cu.m)**	**Total Provided (cu.m)**
4	19588	78.352	82.55

Area ID	**Drainage Area (sq.m)**	**Volume Req. (cu.m) (4mm Storm)**	**Clear Stone Area (525mm Depth) (sq.m)***	**Volume in Clear Stone (cu.m)****	**Subdrain Length (m)**	**Subdrain Size (mm)**	**Subdrain Volume (cu.m)**	**Total Volume (cu.m)**
101	1993	8.0	63	13.23	13.6	200	0.43	13.66
102	2442	9.8	101.8	21.378	21.4	200	0.67	22.05
105A	2324	9.3	35	7.35	25.4	200	0.80	8.15
105B	1090	4.4	43.6	9.156	31.6	200	0.99	10.15
107	2175	8.7	43.4	9.114	31.7	200	1.00	10.11
108	2090	8.4	84	17.64	25.4	200	0.80	18.44
Total	**4435**	**48.5**	**370.8**	**77.9**	**149.1**		**4.7**	**82.55**

* Refer to Drawing DS-2 for Bioretention Cross Section

** Volume calculation assumes 40% Void Ratio for Clear Stone

STORAGE SUMMARY
BLOCK 15
TOTAL LID TREATMENT VOLUME

Area ID	Drainage Area (sq.m)	Volume Req. (cu.m) (15mm Storm)	Area of Filter Media & Mulch (675mm Depth) (sq.m)*	Volume in Filter Media & Mulch (cu.m)**	Volume Below Overflow (Clear Stone and Subdrain)	Ponding Depth (cm)	Ponding Volume (cu.m)	Total Volume (cu.m)
101	1993	29.9	63	14.88	13.66	5.00	3.15	31.69
102	2442	36.6	101.8	24.05	22.05	5.00	5.09	51.19
105A	2324	34.9	35	8.27	8.15	5.00	1.75	18.17
105B	1090	16.4	43.6	10.30	10.15	5.00	2.18	22.63
107	2175	32.6	43.4	10.25	10.11	5.00	2.17	22.53
108	2090	31.4	84	19.85	18.44	5.00	4.20	42.48
Total	**12114**	**181.7**	**370.8**	**87.6**	**82.6**		**18.5**	**188.69**

* Refer to Drawing DS-2 for Bioretention Cross Section
** Volume calculation assumes 35% Void Ratio for the Filter Media

Stormwater - ICD Sizing Sheet

Control Flow to Minor System 5-Year Flow

STM101 to STM102
CB101
Inlet Control Device 150 mm

	Stage (m)	h_o (m)	Ctrl Flow (L/s)
Orifice INV	89.86	0.00	0
Max Ponding	90.62	0.76	39.5

* Includes 0.08m of Flow Depth per SWMHYMO Overland Flow Analysis by DSEL (January 2019)

5-Year Flow	46.0	L/s	Per Design Sheet prepared by DSEL January 2019
Ctrl Flow	39.5	L/s	

STM102 to STM103
CB102
Inlet Control Device 120 mm

	Stage (m)	h_o (m)	Ctrl Flow (L/s)
Orifice INV	88.52	0.00	0
Max Ponding	90.25	1.73	39.5

* Includes 0.08m of Flow Depth per SWMHYMO Overland Flow Analysis by DSEL (January 2019)

5-Year Flow	99.0	L/s	Per Design Sheet prepared by DSEL January 2019
Ctrl Flow	79.0	L/s	Includes Area 101

STM104 to STM108
CB104
Inlet Control Device 100 mm

	Stage (m)	h_o (m)	Ctrl Flow (L/s)
Orifice INV	88.26	0.00	0
Max Ponding	89.84	1.58	26.2

* Includes 0.08m of Flow Depth per SWMHYMO Overland Flow Analysis by DSEL (January 2019)

5-Year Flow	119.0	L/s	Per Design Sheet prepared by DSEL January 2019
Ctrl Flow	105.3	L/s	Includes Area 101 & 102

STM105 to STM 107
CB105A
Inlet Control Device 120 mm

	Stage (m)	h_o (m)	Ctrl Flow (L/s)
Orifice INV	88.89	0.00	0
Max Ponding	90.60	1.71	39.3

* Includes 0.08m of Flow Depth per SWMHYMO Overland Flow Analysis by DSEL (January 2019)

CB105B
Inlet Control Device 120 mm

	Stage (m)	h_o (m)	Ctrl Flow (L/s)
Orifice INV	88.54	0.00	0
Max Ponding	90.17	1.63	38.3

* Includes 0.08m of Flow Depth per SWMHYMO Overland Flow Analysis by DSEL (January 2019)

5-Year Flow	79.0 L/s	Per Design Sheet prepared by DSEL January 2019
Ctrl Flow	77.5 L/s	

STM107 to STM108
CB107
Inlet Control Device 120 mm

	Stage (m)	h_o (m)	Ctrl Flow (L/s)
Orifice INV	88.14	0.00	0
Max Ponding	89.77	1.63	38.3

5-Year Flow	124.0 L/s	Per Design Sheet prepared by DSEL January 2019
Ctrl Flow	115.8 L/s	Includes Area 105

STM108 to STM109
CB108
Inlet Control Device 120 mm

	Stage (m)	h_o (m)	Ctrl Flow (L/s)
Orifice INV	89.12	0.00	0
Max Ponding	90.72	1.60	37.9

* Includes 0.08m of Flow Depth per SWMHYMO Overland Flow Analysis by DSEL (January 2019)

5-Year Flow	282.0 L/s	Per Design Sheet prepared by DSEL January 2019
Ctrl Flow	259.0 L/s	Includes All Areas

```
00001> 2     Metric units
00002> *#*************************************************************************
00003> *#  Project Name: []    Project Number: [18-946]
00004> *#  Date        : 2019-01-30
00005> *#  Modeller    : [slm]
00006> *#  Company     : David Schaeffer Engineering Ltd.
00007> *#  License #   :  4488477
00008> *#*************************************************************************
00009> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
00010>                     ["C:\SWM_PRG\STMFILES\005YC24H.stm"]
00011> *%-----------------|---------------------------------------------------------|
00012> READ STORM          STORM_FILENAME=["STORM.001"]
00013> *%-----------------|---------------------------------------------------------|
00014> ***************************************************************************
00015> * Post-Development Model - Wateridge Block 15
00016> ***************************************************************************
00017> ***************************************************************************
00018> * Drainage to Rear Lane
00019> ***************************************************************************
00020> CALIB STANDHYD      ID=[1] NHYD=["RL1"], DT=[1](min), AREA=[0.5441](ha),
00021>                     XIMP=[0.86], TIMP=[0.86], DWF=[0](cms), LOSS=[1],
00022>                     Horton: Fo=[76.2](mm/hr), Fc=[13.2](mm/hr),
00023>                             DCAY=[4.14](/hr), F=[0](mm),
00024>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[2.0](%),
00025>                                          LGP=[10](m), MNP=[0.25], SCP=[0](min),
00026>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
00027>                                          LGI=[250](m), MNI=[0.013], SCI=[0](min)
00028>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00029>
00030> *%-----------------|---------------------------------------------------------|
00031> * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
00032> COMPUTE DUALHYD     IDin=[1], CINLET=[0.119](cms), NINLET=[1],
00033>                     MAJID=[2], MajNHYD=["MAJOR"],
00034>                     MINID=[4], MinNHYD=["MINOR"],
00035>                     TMJSTO=[0](cu-m)
00036> *%-----------------|---------------------------------------------------------|
00037> * Rear Lane Cross Section
00038> ROUTE CHANNEL       IDout=[3], NHYD=["LANE"], IDin=[2],
00039>                     RDT=[1](min),
00040>                     CHLGTH=[20](m),  CHSLOPE=[0.5](%),
00041>                                        FPSLOPE=[0.5](%),
00042>                     SECNUM=[15.1],      NSEG=[1]
00043>                     ( SEGROUGH, SEGDIST (m))=[0.013, 11.51] NSEG times
00044>                     ( DISTANCE (m), ELEVATION (m))=[0    , 100.00]
00045>                                                    [0.01  , 99.85]
00046>                                                    [6.5 , 99.77]
00047>                                                    [6.51  , 99.85]
00048>                                                    [11.51  , 100.17]
00049>
00050> ***************************************************************************
00051> * Remaining Drainage Area to Squadron Cres.
00052> ***************************************************************************
00053> CALIB STANDHYD      ID=[1] NHYD=["A1"], DT=[1](min), AREA=[0.7677](ha),
00054>                     XIMP=[0.86], TIMP=[0.86], DWF=[0](cms), LOSS=[1],
00055>                     Horton: Fo=[76.2](mm/hr), Fc=[13.2](mm/hr),
00056>                             DCAY=[4.14](/hr), F=[0](mm),
00057>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[2.0](%),
00058>                                          LGP=[10](m), MNP=[0.25], SCP=[0](min),
00059>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
00060>                                          LGI=[150](m), MNI=[0.013], SCI=[0](min)
00061>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00062> *%-----------------|---------------------------------------------------------|
00063> * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
00064> COMPUTE DUALHYD     IDin=[1], CINLET=[0.163](cms), NINLET=[1],
00065>                     MAJID=[2], MajNHYD=["MAJOR"],
00066>                     MINID=[4], MinNHYD=["MINOR"],
00067>                     TMJSTO=[0](cu-m)
00068> *%-----------------|---------------------------------------------------------|
00069> ADD HYD             IDsum=[1], NHYD=["Total"], IDs to add=[2+3]
00070> *%-----------------|---------------------------------------------------------|
00071> * Cross Section at Site Entrance (Squadron Cres.)
00072> ROUTE CHANNEL       IDout=[3], NHYD=["ROAD"], IDin=[1],
00073>                     RDT=[1](min),
00074>                     CHLGTH=[10](m),  CHSLOPE=[2](%),
00075>                                        FPSLOPE=[2](%),
00076>                     SECNUM=[15.2],      NSEG=[1]
00077>                     ( SEGROUGH, SEGDIST (m))=[0.013, 6.51] NSEG times
00078>                     ( DISTANCE (m), ELEVATION (m))=[0    , 100.00]
00079>                                                    [0.01  , 99.85]
00080>                                                    [6.5 , 99.77]
00081>                                                    [6.51  , 99.92]
00082>
00083> ***************************************************************************
00084> ***************************************************************************
00085> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
00086>                     ["C:\SWM_PRG\STMFILES\100YC24H.stm"]
00087> *%-----------------|---------------------------------------------------------|
00088> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
00089>                     ["C:\SWM_PRG\STMFILES\CH4H100x.stm"]
00090> *%-----------------|---------------------------------------------------------|
00091> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
00092>                     ["C:\SWM_PRG\STMFILES\CH6H100x.stm"]
00093> *%-----------------|---------------------------------------------------------|
00094> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
00095>                     ["C:\SWM_PRG\STMFILES\100YC12H.stm"]
00096> *%-----------------|---------------------------------------------------------|
00097> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
00098>                     ["C:\SWM_PRG\STMFILES\19790701.stm"]
00099> *%-----------------|---------------------------------------------------------|
00100> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
00101>                     ["C:\SWM_PRG\STMFILES\19880804.stm"]
00102> *%-----------------|---------------------------------------------------------|
00103> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[8]
00104>                     ["C:\SWM_PRG\STMFILES\19960808.stm"]
00105> *%-----------------|---------------------------------------------------------|
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00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W  M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO          9      9   =========
00008>                                                        9   9  9   9   # 4488477
00009>          StormWater Management HYdrologic Model         999    999    =========
00010>
00011>  ********************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  ********************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                  OTTHYMO-83 and OTTHYMO-89.                 *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.           *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021>  ********************************************************************************
00022>
00023>  ********************************************************************************
00024>  ********* Licensed user: David Schaeffer Engineering Ltd.              *********
00025>  *********                  Stittsville          SERIAL#:4488477       *********
00026>  ********************************************************************************
00027>
00028>  ********************************************************************************
00029>  *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********           Maximum value for ID numbers  :     10             *********
00031>  *********           Max. number of rainfall points: 105408             *********
00032>  *********           Max. number of flow points    : 105408             *********
00033>  ********************************************************************************
00034>
00035>
00036>  **********************  D E T A I L E D   O U T P U T  **********************
00037>  ********************************************************************************
00038>  *         DATE: 2019-01-30     TIME: 16:07:59     RUN COUNTER: 000588          *
00039>  ********************************************************************************
00040>  * Input   filename: C:\SWM_PRG\17-918\Block15\post.DAT                          *
00041>  * Output  filename: C:\SWM_PRG\17-918\Block15\post.out                          *
00042>  * Summary filename: C:\SWM_PRG\17-918\Block15\post.sum                          *
00043>  * User comments:                                                               *
00044>  * 1:_____________________________________________________________________     *
00045>  * 2:_____________________________________________________________________     *
00046>  * 3:_____________________________________________________________________     *
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001----------------------------------------------------------------------
00051> *#*****************************************************************************
00052> *#  Project Name: []    Project Number: [18-946]
00053> *#  Date        : 2019-01-30
00054> *#  Modeller    : [slm]
00055> *#  Company     : David Schaeffer Engineering Ltd.
00056> *#  License #   :  4488477
00057> *#*****************************************************************************
00058> ---------------------
00059> | START            |  Project  dir.: C:\SWM_PRG\17-918\Block15\
00060> ---------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block15\
00061>     TZERO =   .00 hrs on       0
00062>     METOUT=   2 (output = METRIC)
00063>     NRUN  = 001
00064>     NSTORM=   1
00065>               #  1=C:\SWM_PRG\STMFILES\005YC24H.stm
00066> --------------------------------------------------------------------------------
00067> 001:0002----------------------------------------------------------------------
00068> ---------------------
00069> | READ STORM       |    Filename: 5-Year 24-Hour Chicago Storm, 10 min Tim
00070> | Ptotal=  64.13 mm|    Comments: 5-Year 24-Hour Chicago Storm, 10 min Tim
00071> ---------------------
00072>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00073>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00074>               .17    .520 |   6.17   1.780 |  12.17   1.570 |  18.17    .740
00075>               .33    .530 |   6.33   1.940 |  12.33   1.510 |  18.33    .730
00076>               .50    .540 |   6.50   2.130 |  12.50   1.470 |  18.50    .720
00077>               .67    .550 |   6.67   2.370 |  12.67   1.420 |  18.67    .710
00078>               .83    .560 |   6.83   2.680 |  12.83   1.380 |  18.83    .700
00079>              1.00    .570 |   7.00   3.100 |  13.00   1.340 |  19.00    .690
00080>              1.17    .580 |   7.17   3.680 |  13.17   1.300 |  19.17    .680
00081>              1.33    .590 |   7.33   4.580 |  13.33   1.270 |  19.33    .670
00082>              1.50    .600 |   7.50   6.150 |  13.50   1.240 |  19.50    .660
00083>              1.67    .620 |   7.67   9.610 |  13.67   1.200 |  19.67    .660
00084>              1.83    .630 |   7.83  24.170 |  13.83   1.170 |  19.83    .650
00085>              2.00    .640 |   8.00 104.190 |  14.00   1.150 |  20.00    .640
00086>              2.17    .660 |   8.17  32.040 |  14.17   1.120 |  20.17    .630
00087>              2.33    .680 |   8.33  16.340 |  14.33   1.100 |  20.33    .630
00088>              2.50    .690 |   8.50  10.960 |  14.50   1.070 |  20.50    .620
00089>              2.67    .710 |   8.67   8.290 |  14.67   1.050 |  20.67    .610
00090>              2.83    .730 |   8.83   6.690 |  14.83   1.030 |  20.83    .610
00091>              3.00    .750 |   9.00   5.630 |  15.00   1.010 |  21.00    .600
00092>              3.17    .770 |   9.17   4.870 |  15.17    .990 |  21.17    .590
00093>              3.33    .800 |   9.33   4.300 |  15.33    .970 |  21.33    .590
00094>              3.50    .820 |   9.50   3.860 |  15.50    .950 |  21.50    .580
00095>              3.67    .850 |   9.67   3.510 |  15.67    .930 |  21.67    .580
00096>              3.83    .880 |   9.83   3.220 |  15.83    .920 |  21.83    .570
00097>              4.00    .910 |  10.00   2.980 |  16.00    .900 |  22.00    .560
00098>              4.17    .940 |  10.17   2.770 |  16.17    .880 |  22.17    .560
00099>              4.33    .980 |  10.33   2.600 |  16.33    .870 |  22.33    .550
00100>              4.50   1.020 |  10.50   2.440 |  16.50    .860 |  22.50    .550
00101>              4.67   1.060 |  10.67   2.310 |  16.67    .840 |  22.67    .540
00102>              4.83   1.110 |  10.83   2.190 |  16.83    .830 |  22.83    .540
00103>              5.00   1.160 |  11.00   2.080 |  17.00    .820 |  23.00    .530
00104>              5.17   1.220 |  11.17   1.990 |  17.17    .800 |  23.17    .530
00105>              5.33   1.280 |  11.33   1.900 |  17.33    .790 |  23.33    .520
00106>              5.50   1.360 |  11.50   1.820 |  17.50    .780 |  23.50    .520
00107>              5.67   1.440 |  11.67   1.750 |  17.67    .770 |  23.67    .510
00108>              5.83   1.540 |  11.83   1.680 |  17.83    .760 |  23.83    .510
00109>              6.00   1.650 |  12.00   1.620 |  18.00    .750 |  24.00    .510
00110>
00111> --------------------------------------------------------------------------------
00112> 001:0003----------------------------------------------------------------------
00113> ********************************************************************************
00114> * Post-Development Model - Wateridge Block 15
00115> ********************************************************************************
00116> ********************************************************************************
00117> * Drainage to Rear Lane
00118> ********************************************************************************
00119> ----------------------
00120> | CALIB STANDHYD     |   Area    (ha)=     .54
00121> | 01:RL1    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
00122> ----------------------
00123>                              IMPERVIOUS    PERVIOUS (i)
00124>      Surface Area     (ha)=        .47          .08
00125>      Dep. Storage     (mm)=       1.57         4.67
00126>      Average Slope     (%)=        .50         2.00
00127>      Length            (m)=     250.00        10.00
00128>      Mannings n             =      .013         .250
00129>
00130>      Max.eff.Inten.(mm/hr)=     104.19        70.88
00131>                over (min)        5.00         9.00
00132>      Storage Coeff.  (min)=       5.36 (ii)    8.89 (ii)
00133>      Unit Hyd. Tpeak (min)=       5.00         9.00
00134>      Unit Hyd. peak  (cms)=        .22          .13
00135>                                                          *TOTALS*
00136>      PEAK FLOW       (cms)=        .11          .01          .119 (iii)
00137>      TIME TO PEAK    (hrs)=       8.02         8.08         8.017
00138>      RUNOFF VOLUME    (mm)=      62.55        13.08        55.630
00139>      TOTAL RAINFALL   (mm)=      64.13        64.13        64.127
00140>      RUNOFF COEFFICIENT   =        .98          .20          .867
00141>
00142>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
00143>             Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
00144>             Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
00145>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00146>            THAN THE STORAGE COEFFICIENT.
00147>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00148>
00149> --------------------------------------------------------------------------------
00150> 001:0004----------------------------------------------------------------------
00151> * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
00152> ----------------------
00153> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .119  (cms)
00154> | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =      1
00155> ----------------------   Total minor system capacity        =    .119  (cms)
00156>                          Total major system storage [TMJSTO] =       0.(cu.m.)
00157>
00158>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
00159>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
00160>      TOTAL HYD.    01:RL1           .54      .119     8.017   55.630      .000
00161>      ==========================================================================
00162>      MAJOR SYST    02:MAJOR         .00      .000      .000     .000      .000
00163>      MINOR SYST    04:MINOR         .54      .119     8.017   55.630      .000
00164>
00165>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00166>
00167> --------------------------------------------------------------------------------
00168> 001:0005----------------------------------------------------------------------
00169> * Rear Lane Cross Section
00170> ----------------------
00171> | ROUTE CHANNEL      |     Routing time step (min) =  1.00
00172> |  IN> 02:MAJOR      |     Number of SEGMENTS =  1
00173> | OUT< 03:LANE       |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
00174> ----------------------                    LENGTH =   20.00    (m)
00175>
00176>                <------ DATA FOR SECTION (  15.1) ------>
00177>                Distance      Elevation       Manning
00178>                     .00         100.00         .0130
00179>                     .01          99.85         .0130
00180>                    6.50          99.77         .0130
00181>                    6.51          99.85         .0130
00182>                   11.51         100.17         .0130
00183>
00184>    <---------------------------- TRAVEL TIME TABLE ---------------------------->
00185>     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME    D x V
00186>       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)    (m2/s)
00187>      .012   99.782  .119E+00  .720E-02       .001      .179       1.86      .002
00188>      .024   99.794  .476E+00  .576E-01       .007      .285       1.17      .007
00189>      .036   99.806  .107E+01  .194E+00       .020      .373        .89      .014
00190>      .048   99.818  .190E+01  .461E+00       .043      .452        .74      .022
00191>      .061   99.831  .297E+01  .900E+00       .078      .524        .64      .032
00192>      .073   99.843  .428E+01  .156E+01       .127      .592        .56      .043
00193>      .085   99.855  .582E+01  .246E+01       .196      .675        .49      .057
00194>      .097   99.867  .743E+01  .360E+01       .289      .779        .43      .075
00195>      .109   99.879  .909E+01  .495E+01*      .397      .874        .38      .095
00196>      .121   99.891  .108E+02  .653E+01*      .519      .962        .35      .116
00197>      .133   99.903  .125E+02  .835E+01*      .655     1.045        .32      .139
00198>      .145   99.915  .143E+02  .104E+02*      .805     1.122        .30      .163
00199>      .157   99.927  .162E+02  .127E+02*      .968     1.195        .28      .188
00200>      .169   99.939  .181E+02  .153E+02*     1.144     1.265        .26      .214
00201>      .182   99.952  .200E+02  .182E+02*     1.333     1.332        .25      .242
00202>      .194   99.964  .220E+02  .213E+02*     1.535     1.396        .24      .270
00203>      .206   99.976  .240E+02  .247E+02*     1.750     1.457        .23      .300
00204>      .218   99.988  .261E+02  .284E+02*     1.979     1.516        .22      .330
00205>      .230  100.000  .282E+02  .324E+02*     2.220     1.573        .21      .362
00206>
00207>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
00208>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
00209>  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.
00210>
00211>
00212>       *** WARNING: Inflow hydrograph is dry!  Routing not done!
00213>
00214> --------------------------------------------------------------------------------
00215> 001:0006----------------------------------------------------------------------
00216> ********************************************************************************
00217> * Remaining Drainage Area to Squadron Cres.
00218> ********************************************************************************
00219> ----------------------
00220> | CALIB STANDHYD     |   Area    (ha)=     .77
00221> | 01:A1     DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
00222> ----------------------
00223>                              IMPERVIOUS    PERVIOUS (i)
00224>      Surface Area     (ha)=        .66          .11
00225>      Dep. Storage     (mm)=       1.57         4.67
00226>      Average Slope     (%)=        .50         2.00
00227>      Length            (m)=     150.00        10.00
00228>      Mannings n             =      .013         .250
00229>
00230>      Max.eff.Inten.(mm/hr)=     104.19        72.34
00231>                over (min)        4.00         7.00
00232>      Storage Coeff.  (min)=       3.95 (ii)    7.44 (ii)
00233>      Unit Hyd. Tpeak (min)=       4.00         7.00
00234>      Unit Hyd. peak  (cms)=        .28          .16
00235>                                                          *TOTALS*
00236>      PEAK FLOW       (cms)=        .17          .01          .184 (iii)
00237>      TIME TO PEAK    (hrs)=       8.00         8.05         8.000
00238>      RUNOFF VOLUME    (mm)=      62.55        13.08        55.630
00239>      TOTAL RAINFALL   (mm)=      64.13        64.13        64.127
00240>      RUNOFF COEFFICIENT   =        .98          .20          .867
00241>
00242>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
00243>             Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
00244>             Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
00245>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00246>            THAN THE STORAGE COEFFICIENT.
00247>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00248>
00249> --------------------------------------------------------------------------------
00250> 001:0007----------------------------------------------------------------------
00251> * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
00252> ----------------------
00253> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .163  (cms)
00254> | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =      1
00255> ----------------------   Total minor system capacity        =    .163  (cms)
00256>                          Total major system storage [TMJSTO] =       0.(cu.m.)
00257>
00258>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
```

```
                                      (ha)      (cms)      (hrs)      (mm)     (cms)
      TOTAL HYD.   01:A1               .77       .184      8.000    55.630      .000
      ======================================================================
      MAJOR SYST   02:MAJOR            .01       .021      8.000    55.630      .000
      MINOR SYST   04:MINOR            .76       .163      7.967    55.630      .000

      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 --------------------------------------------------------------------------------
 001:0008------------------------------------------------------------------------
 ------------------------
 | ADD HYD (Total     ) | ID: NHYD         AREA      QPEAK   TPEAK   R.V.     DWF
 ------------------------                  (ha)      (cms)   (hrs)   (mm)    (cms)
                      ID1 02:MAJOR          .01       .021    8.00  55.63     .000
                     +ID2 03:LANE           .00       .000     .00    .00     .000
                      ===========================================================
                      SUM 01:Total          .01       .021    8.00  55.63     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 --------------------------------------------------------------------------------
 001:0009------------------------------------------------------------------------
 * Cross Section at Site Entrance (Squadron Cres.)
 --------------------
 | ROUTE CHANNEL    |     Routing time step (min) =  1.00
 |  IN> 01:Total    |     Number of SEGMENTS =  1
 | OUT< 03:ROAD     |     Slopes (%), CHANNEL=2.00   FLOODPLAIN=2.00
 --------------------                 LENGTH =   10.00    (m)

               <------ DATA FOR SECTION (  15.2) ------>
               Distance      Elevation       Manning
                    .00        100.00          .0130
                    .01         99.85          .0130
                   6.50         99.77          .0130
                   6.51         99.92          .0130

    <---------------------------- TRAVEL TIME TABLE --------------------------->
     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)       (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)  (m2/s)
      .008   99.778  .253E-01  .500E-03      .001      .270        .62    .002
      .016   99.786  .101E+00  .400E-02      .004      .428        .39    .007
      .024   99.794  .228E+00  .135E-01      .013      .561        .30    .013
      .032   99.802  .405E+00  .320E-01      .028      .680        .25    .021
      .039   99.809  .633E+00  .625E-01      .050      .789        .21    .031
      .047   99.817  .911E+00  .108E+00      .081      .891        .19    .042
      .055   99.825  .124E+01  .171E+00      .122      .987        .17    .055
      .063   99.833  .162E+01  .256E+00      .175     1.079        .15    .068
      .071   99.841  .205E+01  .364E+00      .239     1.167        .14    .083
      .079   99.849  .253E+01  .500E+00      .317     1.252        .13    .099
      .087   99.857  .304E+01  .661E+00      .427     1.401        .12    .122
      .095   99.865  .356E+01  .843E+00      .552     1.552        .11    .147
      .103   99.873  .407E+01  .104E+01      .690     1.695        .10    .174
      .111   99.881  .458E+01  .127E+01      .840     1.832        .09    .203
      .118   99.888  .510E+01  .151E+01     1.001     1.963        .08    .233
      .126   99.896  .561E+01  .177E+01     1.173     2.090        .08    .264
      .134   99.904  .612E+01  .206E+01     1.355     2.212        .08    .297
      .142   99.912  .664E+01  .236E+01     1.547     2.330        .07    .331
      .150   99.920  .715E+01  .268E+01     1.749     2.445        .07    .367

  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                         <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)      (m)       (m/s)
    INFLOW : ID= 1:Total        .01     .021    8.00 55.630      .028       .621
    OUTFLOW: ID= 3:ROAD         .01     .021    8.02 55.630      .028       .624


 --------------------------------------------------------------------------------
 001:0010------------------------------------------------------------------------
 *******************************************************************************
 ********************************************************************************
   ** END OF RUN :   1

 ********************************************************************************





 --------------------
 | START            |  Project  dir.: C:\SWM_PRG\17-918\Block15\
 --------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block15\
     TZERO =   .00 hrs on        0
     METOUT=   2 (output = METRIC)
     NRUN  = 002
     NSTORM=   1
           #  1=C:\SWM_PRG\STMFILES\100YC24H.stm
 --------------------------------------------------------------------------------
 002:0002------------------------------------------------------------------------
 *#******************************************************************************
 *#  Project Name: []    Project Number: [18-946]
 *#  Date         : 2019-01-30
 *#  Modeller     : [slm]
 *#  Company      : David Schaeffer Engineering Ltd.
 *#  License #    :  4488477
 *#******************************************************************************
 --------------------------------------------------------------------------------
 002:0002------------------------------------------------------------------------
 --------------------
 | READ STORM       |    Filename: 100-Year 24-Hour Chicago Storm, 10 min T
 | Ptotal= 106.74 mm|    Comments: 100-Year 24-Hour Chicago Storm, 10 min T
 --------------------
                 TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                  hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                  .17    .830 |   6.17   2.900 |  12.17   2.550 |  18.17   1.190
                  .33    .850 |   6.33   3.160 |  12.33   2.460 |  18.33   1.170
                  .50    .860 |   6.50   3.480 |  12.50   2.380 |  18.50   1.160
                  .67    .880 |   6.67   3.880 |  12.67   2.310 |  18.67   1.140
                  .83    .900 |   6.83   4.390 |  12.83   2.240 |  18.83   1.130
                 1.00    .910 |   7.00   5.070 |  13.00   2.180 |  19.00   1.110
                 1.17    .930 |   7.17   6.050 |  13.17   2.120 |  19.17   1.100
                 1.33    .950 |   7.33   7.540 |  13.33   2.060 |  19.33   1.090
                 1.50    .970 |   7.50  10.160 |  13.50   2.010 |  19.50   1.070
                 1.67    .990 |   7.67  15.970 |  13.67   1.960 |  19.67   1.060
                 1.83   1.020 |   7.83  40.650 |  13.83   1.910 |  19.83   1.050
                 2.00   1.040 |   8.00 178.560 |  14.00   1.860 |  20.00   1.040
                 2.17   1.070 |   8.17  54.050 |  14.17   1.820 |  20.17   1.020
                 2.33   1.090 |   8.33  27.320 |  14.33   1.780 |  20.33   1.010
                 2.50   1.120 |   8.50  18.240 |  14.50   1.740 |  20.50   1.000
                 2.67   1.150 |   8.67  13.740 |  14.67   1.700 |  20.67    .990
                 2.83   1.180 |   8.83  11.060 |  14.83   1.670 |  20.83    .980
                 3.00   1.210 |   9.00   9.290 |  15.00   1.630 |  21.00    .970
                 3.17   1.250 |   9.17   8.020 |  15.17   1.600 |  21.17    .960
                 3.33   1.290 |   9.33   7.080 |  15.33   1.570 |  21.33    .950
                 3.50   1.330 |   9.50   6.350 |  15.50   1.540 |  21.50    .940
                 3.67   1.370 |   9.67   5.760 |  15.67   1.510 |  21.67    .930
                 3.83   1.420 |   9.83   5.280 |  15.83   1.480 |  21.83    .920
                 4.00   1.470 |  10.00   4.880 |  16.00   1.460 |  22.00    .910
                 4.17   1.520 |  10.17   4.540 |  16.17   1.430 |  22.17    .900
                 4.33   1.580 |  10.33   4.250 |  16.33   1.410 |  22.33    .890
                 4.50   1.650 |  10.50   3.990 |  16.50   1.390 |  22.50    .880
                 4.67   1.720 |  10.67   3.770 |  16.67   1.360 |  22.67    .880
                 4.83   1.800 |  10.83   3.570 |  16.83   1.340 |  22.83    .870
                 5.00   1.880 |  11.00   3.400 |  17.00   1.320 |  23.00    .860
                 5.17   1.980 |  11.17   3.240 |  17.17   1.300 |  23.17    .850
                 5.33   2.090 |  11.33   3.100 |  17.33   1.280 |  23.33    .840
                 5.50   2.210 |  11.50   2.970 |  17.50   1.260 |  23.50    .840
                 5.67   2.340 |  11.67   2.850 |  17.67   1.240 |  23.67    .830
                 5.83   2.500 |  11.83   2.740 |  17.83   1.230 |  23.83    .820
                 6.00   2.690 |  12.00   2.640 |  18.00   1.210 |  24.00    .810

 --------------------------------------------------------------------------------
 002:0003------------------------------------------------------------------------
 *******************************************************************************
 * Post-Development Model - Wateridge Block 15
 *******************************************************************************
 *******************************************************************************
 * Drainage to Rear Lane
 *******************************************************************************
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=     .54
 | 01:RL1     DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
 ----------------------
                             IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .47          .08
      Dep. Storage     (mm)=       1.57         4.67
      Average Slope     (%)=        .50         2.00
      Length            (m)=     250.00        10.00
      Mannings n           =       .013         .250

      Max.eff.Inten.(mm/hr)=     178.56       158.66
                 over (min)        4.00         7.00
      Storage Coeff.  (min)=       4.32 (ii)    6.88 (ii)
      Unit Hyd. Tpeak (min)=       4.00         7.00
      Unit Hyd. peak  (cms)=        .27          .16
                                                           *TOTALS*
      PEAK FLOW       (cms)=        .20          .02          .226 (iii)
      TIME TO PEAK    (hrs)=       8.00         8.05         8.017
      RUNOFF VOLUME    (mm)=     105.16        37.31        95.671
      TOTAL RAINFALL   (mm)=     106.74       106.74       106.742
      RUNOFF COEFFICIENT   =        .99          .35          .896

        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
             Fo    (mm/hr)= 76.20           K  (1/hr)=  4.14
             Fc    (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 --------------------------------------------------------------------------------
 002:0004------------------------------------------------------------------------
 * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .119  (cms)
 | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity         =    .119  (cms)
                          Total major system storage [TMJSTO] =       0.(cu.m.)

                    ID: NHYD        AREA      QPEAK      TPEAK      R.V.      DWF
                                    (ha)      (cms)      (hrs)      (mm)     (cms)
      TOTAL HYD.   01:RL1            .54       .226      8.017    95.671      .000
      ======================================================================
      MAJOR SYST   02:MAJOR          .06       .107      8.017    95.671      .000
      MINOR SYST   04:MINOR          .49       .119      7.900    95.671      .000

      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 --------------------------------------------------------------------------------
 002:0005------------------------------------------------------------------------
 * Rear Lane Cross Section
 --------------------
 | ROUTE CHANNEL    |     Routing time step (min) =  1.00
 |  IN> 02:MAJOR    |     Number of SEGMENTS =  1
 | OUT< 03:LANE     |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
 --------------------                 LENGTH =   20.00    (m)

               <------ DATA FOR SECTION (  15.1) ------>
               Distance      Elevation       Manning
                    .00        100.00          .0130
                    .01         99.85          .0130
                   6.50         99.77          .0130
                   6.51         99.85          .0130
                  11.51        100.17          .0130

    <---------------------------- TRAVEL TIME TABLE --------------------------->
     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)       (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)  (m2/s)
      .012   99.782  .119E+00  .720E-02      .001      .179       1.86    .002
      .024   99.794  .476E+00  .576E-01      .007      .285       1.17    .007
      .036   99.806  .107E+01  .194E+00      .020      .373        .89    .014
      .048   99.818  .190E+01  .461E+00      .043      .452        .74    .022
      .061   99.831  .297E+01  .900E+00      .078      .524        .64    .032
      .073   99.843  .428E+01  .156E+01      .127      .592        .56    .043
      .085   99.855  .582E+01  .246E+01      .196      .675        .49    .057
      .097   99.867  .743E+01  .360E+01      .289      .779        .43    .075
      .109   99.879  .909E+01  .495E+01*     .397      .874        .38    .095
      .121   99.891  .108E+02  .653E+01*     .519      .962        .35    .116
      .133   99.903  .125E+02  .835E+01*     .655     1.045        .32    .139
      .145   99.915  .143E+02  .104E+02*     .805     1.122        .30    .163
      .157   99.927  .162E+02  .127E+02*     .968     1.195        .28    .188
      .169   99.939  .181E+02  .153E+02*    1.144     1.265        .26    .214
      .182   99.952  .200E+02  .182E+02*    1.333     1.332        .25    .242
      .194   99.964  .220E+02  .213E+02*    1.535     1.396        .24    .270
      .206   99.976  .240E+02  .247E+02*    1.750     1.457        .23    .300
      .218   99.988  .261E+02  .284E+02*    1.979     1.516        .22    .330
      .230  100.000  .282E+02  .324E+02*    2.220     1.573        .21    .362

  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.

                                         <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)      (m)       (m/s)
    INFLOW : ID= 2:MAJOR        .06     .107    8.02 95.671      .068       .563
    OUTFLOW: ID= 3:LANE         .06     .107    8.02 95.671      .068       .563


 --------------------------------------------------------------------------------
 002:0006------------------------------------------------------------------------
 *******************************************************************************
 * Remaining Drainage Area to Squadron Cres.
 *******************************************************************************
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=     .77
 | 01:A1      DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
```

```
----------------------
                              IMPERVIOUS   PERVIOUS (i)
     Surface Area     (ha)=        .66          .11
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .50         2.00
     Length            (m)=     150.00        10.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     178.56       158.91
                over (min)        3.00         6.00
     Storage Coeff.  (min)=       3.18 (ii)    5.73 (ii)
     Unit Hyd. Tpeak (min)=       3.00         6.00
     Unit Hyd. peak  (cms)=        .36          .19
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .31          .04          .345 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.03         8.000
     RUNOFF VOLUME    (mm)=     105.16        37.31        95.671
     TOTAL RAINFALL   (mm)=     106.74       106.74       106.742
     RUNOFF COEFFICIENT   =        .99          .35          .896

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
002:0007-----------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet Pipe Capacity
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .163  (cms)
| TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
----------------------   Total minor system capacity         =    .163  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                   ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                   (ha)     (cms)     (hrs)     (mm)     (cms)
     TOTAL HYD.   01:A1             .77      .345     8.000   95.671     .000
     ====================================================================
     MAJOR SYST   02:MAJOR          .09      .182     8.000   95.671     .000
     MINOR SYST   04:MINOR          .67      .163     7.883   95.671     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
002:0008-----------------------------------------------------------------------
------------------------
| ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 02:MAJOR          .09      .182    8.00  95.67    .000
                    +ID2 03:LANE           .06      .107    8.02  95.67    .000
                     ==========================================================
                     SUM 01:Total          .15      .285    8.00  95.67    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
002:0009-----------------------------------------------------------------------
* Cross Section at Site Entrance (Squadron Cres.)
--------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 01:Total    |     Number of SEGMENTS =  1
| OUT< 03:ROAD     |     Slopes (%), CHANNEL=2.00   FLOODPLAIN=2.00
--------------------                 LENGTH =   10.00    (m)

               <------ DATA FOR SECTION (  15.2) ------>
               Distance      Elevation       Manning
                    .00        100.00         .0130
                    .01         99.85         .0130
                   6.50         99.77         .0130
                   6.51         99.92         .0130

    <--------------------------- TRAVEL TIME TABLE -------------------------->
     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)       (m)   (cu.m.)   (cu.m.)     (cms)     (m/s)      (min)   (m2/s)
     .008   99.778  .253E-01  .500E-03      .001      .270        .62     .002
     .016   99.786  .101E+00  .400E-02      .004      .428        .39     .007
     .024   99.794  .228E+00  .135E-01      .013      .561        .30     .013
     .032   99.802  .405E+00  .320E-01      .028      .680        .25     .021
     .039   99.809  .633E+00  .625E-01      .050      .789        .21     .031
     .047   99.817  .911E+00  .108E+00      .081      .891        .19     .042
     .055   99.825  .124E+01  .171E+00      .122      .987        .17     .055
     .063   99.833  .162E+01  .256E+00      .175     1.079        .15     .068
     .071   99.841  .205E+01  .364E+00      .239     1.167        .14     .083
     .079   99.849  .253E+01  .500E+00      .317     1.252        .13     .099
     .087   99.857  .304E+01  .661E+00      .427     1.401        .12     .122
     .095   99.865  .356E+01  .843E+00      .552     1.552        .11     .147
     .103   99.873  .407E+01  .104E+01      .690     1.695        .10     .174
     .111   99.881  .458E+01  .127E+01      .840     1.832        .09     .203
     .118   99.888  .510E+01  .151E+01     1.001     1.963        .08     .233
     .126   99.896  .561E+01  .177E+01     1.173     2.090        .08     .264
     .134   99.904  .612E+01  .206E+01     1.355     2.212        .08     .297
     .142   99.912  .664E+01  .236E+01     1.547     2.330        .07     .331
     .150   99.920  .715E+01  .268E+01     1.749     2.445        .07     .367

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                      <---- hydrograph ---->   <-pipe / channel->
                                 AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                 (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 1:Total           .15     .285    8.00 95.671      .076     1.215
   OUTFLOW: ID= 3:ROAD            .15     .283    8.00 95.671      .075     1.213


-------------------------------------------------------------------------------
002:0010-----------------------------------------------------------------------
******************************************************************************
*******************************************************************************
-------------------------------------------------------------------------------
002:0002-----------------------------------------------------------------------
  ** END OF RUN :   2

*******************************************************************************





--------------------
| START            |  Project  dir.: C:\SWM_PRG\17-918\Block15\
--------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block15\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
           #  1=C:\SWM_PRG\STMFILES\CH4H100x.stm
-------------------------------------------------------------------------------
003:0002-----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: []    Project Number: [18-946]
*#  Date         : 2019-01-30
*#  Modeller     : [slm]
*#  Company      : David Schaeffer Engineering Ltd.
*#  License #    :  4488477
*#*****************************************************************************
-------------------------------------------------------------------------------
003:0002-----------------------------------------------------------------------
--------------------
| READ STORM       |    Filename:  100 years Chicago Storm 4 Hours step 10
| Ptotal=  76.00 mm|    Comments:  100 years Chicago Storm 4 Hours step 10
--------------------
               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                .17   4.390 |   1.17  40.670 |   2.17  11.050 |   3.17   5.280
                .33   5.080 |   1.33 178.560 |   2.33   9.280 |   3.33   4.880
                .50   6.050 |   1.50  54.040 |   2.50   8.020 |   3.50   4.540
                .67   7.550 |   1.67  27.310 |   2.67   7.080 |   3.67   4.240
                .83  10.170 |   1.83  18.230 |   2.83   6.340 |   3.83   3.990
               1.00  15.980 |   2.00  13.730 |   3.00   5.760 |   4.00   3.770

-------------------------------------------------------------------------------
003:0003-----------------------------------------------------------------------
******************************************************************************
* Post-Development Model - Wateridge Block 15
******************************************************************************
******************************************************************************
* Drainage to Rear Lane
******************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .54
| 01:RL1    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
----------------------
                              IMPERVIOUS   PERVIOUS (i)
     Surface Area     (ha)=        .47          .08
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .50         2.00
     Length            (m)=     250.00        10.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     178.56       145.93
                over (min)        4.00         7.00
     Storage Coeff.  (min)=       4.32 (ii)    6.96 (ii)
     Unit Hyd. Tpeak (min)=       4.00         7.00
     Unit Hyd. peak  (cms)=        .27          .16
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .20          .02          .223 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.38         1.350
     RUNOFF VOLUME    (mm)=      74.43        30.74        68.312
     TOTAL RAINFALL   (mm)=      76.00        76.00        75.998
     RUNOFF COEFFICIENT   =        .98          .40          .899

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
003:0004-----------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet Pipe Capacity
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .119  (cms)
| TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
----------------------   Total minor system capacity         =    .119  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                   ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                   (ha)     (cms)     (hrs)     (mm)     (cms)
     TOTAL HYD.   01:RL1            .54      .223     1.350   68.312     .000
     ====================================================================
     MAJOR SYST   02:MAJOR          .08      .104     1.350   68.312     .000
     MINOR SYST   04:MINOR          .47      .119     1.233   68.312     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
003:0005-----------------------------------------------------------------------
* Rear Lane Cross Section
--------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 02:MAJOR    |     Number of SEGMENTS =  1
| OUT< 03:LANE     |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
--------------------                 LENGTH =   20.00    (m)

               <------ DATA FOR SECTION (  15.1) ------>
               Distance      Elevation       Manning
                    .00        100.00         .0130
                    .01         99.85         .0130
                   6.50         99.77         .0130
                   6.51         99.85         .0130
                  11.51        100.17         .0130

    <--------------------------- TRAVEL TIME TABLE -------------------------->
     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)       (m)   (cu.m.)   (cu.m.)     (cms)     (m/s)      (min)   (m2/s)
     .012   99.782  .119E+00  .720E-02      .001      .179       1.86     .002
     .024   99.794  .476E+00  .576E-01      .007      .285       1.17     .007
     .036   99.806  .107E+01  .194E+00      .020      .373        .89     .014
     .048   99.818  .190E+01  .461E+00      .043      .452        .74     .022
     .061   99.831  .297E+01  .900E+00      .078      .524        .64     .032
     .073   99.843  .428E+01  .156E+01      .127      .592        .56     .043
     .085   99.855  .582E+01  .246E+01      .196      .675        .49     .057
     .097   99.867  .743E+01  .360E+01      .289      .779        .43     .075
     .109   99.879  .909E+01  .495E+01*     .397      .874        .38     .095
     .121   99.891  .108E+02  .653E+01*     .519      .962        .35     .116
     .133   99.903  .125E+02  .835E+01*     .655     1.045        .32     .139
     .145   99.915  .143E+02  .104E+02*     .805     1.122        .30     .163
     .157   99.927  .162E+02  .127E+02*     .968     1.195        .28     .188
     .169   99.939  .181E+02  .153E+02*    1.144     1.265        .26     .214
     .182   99.952  .200E+02  .182E+02*    1.333     1.332        .25     .242
     .194   99.964  .220E+02  .213E+02*    1.535     1.396        .24     .270
     .206   99.976  .240E+02  .247E+02*    1.750     1.457        .23     .300
     .218   99.988  .261E+02  .284E+02*    1.979     1.516        .22     .330
     .230  100.000  .282E+02  .324E+02*    2.220     1.573        .21     .362

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
 (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.

                                      <---- hydrograph ---->   <-pipe / channel->
                                 AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                 (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2:MAJOR           .08     .104    1.35 68.312      .067      .559
   OUTFLOW: ID= 3:LANE            .08     .104    1.35 68.312      .067      .559
```

```

 ------------------------------------------------------------------------------
 003:0006----------------------------------------------------------------------
 ******************************************************************************
 * Remaining Drainage Area to Squadron Cres.
 ******************************************************************************
 ----------------------
 | CALIB STANDHYD      |   Area    (ha)=     .77
 | 01:A1     DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
 ----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .66          .11
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .50         2.00
     Length            (m)=     150.00        10.00
     Mannings n          =       .013         .250

     Max.eff.Inten.(mm/hr)=     178.56       146.64
                over (min)        3.00         6.00
     Storage Coeff.  (min)=       3.18 (ii)    5.82 (ii)
     Unit Hyd. Tpeak (min)=       3.00         6.00
     Unit Hyd. peak  (cms)=        .36          .19
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .31          .03            .341 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.37           1.333
     RUNOFF VOLUME    (mm)=      74.43        30.74          68.312
     TOTAL RAINFALL   (mm)=      76.00        76.00          75.998
     RUNOFF COEFFICIENT   =        .98          .40            .899

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 003:0007----------------------------------------------------------------------
 * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
 ----------------------
 | COMPUTE DUALHYD     |   Average inlet capacities   [CINLET] =    .163  (cms)
 | TotalHyd 01:A1      |   Number of inlets in system [NINLET] =       1
 ----------------------    Total minor system capacity         =    .163  (cms)
                           Total major system storage [TMJSTO] =       0.(cu.m.)

                  ID: NHYD        AREA     QPEAK     TPEAK      R.V.      DWF
                                  (ha)     (cms)     (hrs)      (mm)     (cms)
     TOTAL HYD.   01:A1            .77      .341     1.333    68.312      .000
     ========================================================================
     MAJOR SYST   02:MAJOR         .13      .178     1.333    68.312      .000
     MINOR SYST   04:MINOR         .64      .163     1.217    68.312      .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 003:0008----------------------------------------------------------------------
 ------------------------
 | ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
 ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 02:MAJOR           .13      .178    1.33  68.31    .000
                    +ID2 03:LANE            .08      .104    1.35  68.31    .000
                     ==========================================================
                     SUM 01:Total           .20      .277    1.33  68.31    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 003:0009----------------------------------------------------------------------
 * Cross Section at Site Entrance (Squadron Cres.)
 --------------------
 | ROUTE CHANNEL      |     Routing time step (min) =  1.00
 |  IN> 01:Total      |     Number of SEGMENTS =  1
 | OUT< 03:ROAD       |     Slopes (%), CHANNEL=2.00   FLOODPLAIN=2.00
 --------------------                  LENGTH =   10.00     (m)

                 <------ DATA FOR SECTION (  15.2) ------>
                 Distance      Elevation       Manning
                      .00         100.00         .0130
                      .01          99.85         .0130
                     6.50          99.77         .0130
                     6.51          99.92         .0130

    <---------------------------- TRAVEL TIME TABLE --------------------------->
     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)  (m2/s)
      .008   99.778  .253E-01  .500E-03       .001      .270        .62    .002
      .016   99.786  .101E+00  .400E-02       .004      .428        .39    .007
      .024   99.794  .228E+00  .135E-01       .013      .561        .30    .013
      .032   99.802  .405E+00  .320E-01       .028      .680        .25    .021
      .039   99.809  .633E+00  .625E-01       .050      .789        .21    .031
      .047   99.817  .911E+00  .108E+00       .081      .891        .19    .042
      .055   99.825  .124E+01  .171E+00       .122      .987        .17    .055
      .063   99.833  .162E+01  .256E+00       .175     1.079        .15    .068
      .071   99.841  .205E+01  .364E+00       .239     1.167        .14    .083
      .079   99.849  .253E+01  .500E+00       .317     1.252        .13    .099
      .087   99.857  .304E+01  .661E+00       .427     1.401        .12    .122
      .095   99.865  .356E+01  .843E+00       .552     1.552        .11    .147
      .103   99.873  .407E+01  .104E+01       .690     1.695        .10    .174
      .111   99.881  .458E+01  .127E+01       .840     1.832        .09    .203
      .118   99.888  .510E+01  .151E+01      1.001     1.963        .08    .233
      .126   99.896  .561E+01  .177E+01      1.173     2.090        .08    .264
      .134   99.904  .612E+01  .206E+01      1.355     2.212        .08    .297
      .142   99.912  .664E+01  .236E+01      1.547     2.330        .07    .331
      .150   99.920  .715E+01  .268E+01      1.749     2.445        .07    .367

  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                          <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 1:Total        .20     .277    1.33 68.312      .075     1.207
   OUTFLOW: ID= 3:ROAD         .20     .275    1.33 68.312      .075     1.205


 ------------------------------------------------------------------------------
 003:0010----------------------------------------------------------------------
 *****************************************************************************
 ******************************************************************************
 ------------------------------------------------------------------------------
 003:0002----------------------------------------------------------------------
 ------------------------------------------------------------------------------
 003:0002----------------------------------------------------------------------
   ** END OF RUN :    3

 ******************************************************************************



```

```


 --------------------
 | START              |  Project  dir.: C:\SWM_PRG\17-918\Block15\
 --------------------    Rainfall dir.: C:\SWM_PRG\17-918\Block15\
     TZERO =   .00 hrs on        0
     METOUT=   2 (output = METRIC)
     NRUN  = 004
     NSTORM=   1
             #  1=C:\SWM_PRG\STMFILES\CH6H100x.stm
 ------------------------------------------------------------------------------
 004:0002----------------------------------------------------------------------
 *#****************************************************************************
 *#  Project Name: []    Project Number: [18-946]
 *#  Date        : 2019-01-30
 *#  Modeller    : [slm]
 *#  Company     : David Schaeffer Engineering Ltd.
 *#  License #   :  4488477
 *#****************************************************************************
 ------------------------------------------------------------------------------
 004:0002----------------------------------------------------------------------
 --------------------
 | READ STORM         |    Filename: 100 years Chicago Storm 6 Hours step 10
 | Ptotal=  82.34 mm|    Comments: 100 years Chicago Storm 6 Hours step 10
 --------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   2.910 |   1.67  15.980 |   3.17   8.020 |   4.67   3.770
               .33   3.170 |   1.83  40.670 |   3.33   7.080 |   4.83   3.570
               .50   3.480 |   2.00 178.650 |   3.50   6.340 |   5.00   3.400
               .67   3.880 |   2.17  54.040 |   3.67   5.760 |   5.17   3.240
               .83   4.390 |   2.33  27.310 |   3.83   5.280 |   5.33   3.100
              1.00   5.080 |   2.50  18.230 |   4.00   4.880 |   5.50   2.970
              1.17   6.050 |   2.67  13.730 |   4.17   4.540 |   5.67   2.850
              1.33   7.550 |   2.83  11.050 |   4.33   4.250 |   5.83   2.740
              1.50  10.170 |   3.00   9.280 |   4.50   3.990 |   6.00   2.640

 ------------------------------------------------------------------------------
 004:0003----------------------------------------------------------------------
 *****************************************************************************
 * Post-Development Model - Wateridge Block 15
 *****************************************************************************
 *****************************************************************************
 * Drainage to Rear Lane
 *****************************************************************************
 ----------------------
 | CALIB STANDHYD      |   Area    (ha)=     .54
 | 01:RL1    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
 ----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .47          .08
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .50         2.00
     Length            (m)=     250.00        10.00
     Mannings n          =       .013         .250

     Max.eff.Inten.(mm/hr)=     178.65       150.06
                over (min)        4.00         7.00
     Storage Coeff.  (min)=       4.32 (ii)    6.93 (ii)
     Unit Hyd. Tpeak (min)=       4.00         7.00
     Unit Hyd. peak  (cms)=        .27          .16
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .20          .02            .224 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.05           2.017
     RUNOFF VOLUME    (mm)=      80.77        32.23          73.975
     TOTAL RAINFALL   (mm)=      82.34        82.34          82.340
     RUNOFF COEFFICIENT   =        .98          .39            .898

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 004:0004----------------------------------------------------------------------
 * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
 ----------------------
 | COMPUTE DUALHYD     |   Average inlet capacities   [CINLET] =    .119  (cms)
 | TotalHyd 01:RL1     |   Number of inlets in system [NINLET] =       1
 ----------------------    Total minor system capacity         =    .119  (cms)
                           Total major system storage [TMJSTO] =       0.(cu.m.)

                  ID: NHYD        AREA     QPEAK     TPEAK      R.V.      DWF
                                  (ha)     (cms)     (hrs)      (mm)     (cms)
     TOTAL HYD.   01:RL1           .54      .224     2.017    73.975      .000
     ========================================================================
     MAJOR SYST   02:MAJOR         .07      .105     2.017    73.975      .000
     MINOR SYST   04:MINOR         .47      .119     1.900    73.975      .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 004:0005----------------------------------------------------------------------
 * Rear Lane Cross Section
 --------------------
 | ROUTE CHANNEL      |     Routing time step (min) =  1.00
 |  IN> 02:MAJOR      |     Number of SEGMENTS =  1
 | OUT< 03:LANE       |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
 --------------------                  LENGTH =   20.00     (m)

                 <------ DATA FOR SECTION (  15.1) ------>
                 Distance      Elevation       Manning
                      .00         100.00         .0130
                      .01          99.85         .0130
                     6.50          99.77         .0130
                     6.51          99.85         .0130
                    11.51         100.17         .0130

    <---------------------------- TRAVEL TIME TABLE --------------------------->
     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)  (m2/s)
      .012   99.782  .119E+00  .720E-02       .001      .179       1.86    .002
      .024   99.794  .476E+00  .576E-01       .007      .285       1.17    .007
      .036   99.806  .107E+01  .194E+00       .020      .373        .89    .014
      .048   99.818  .190E+01  .461E+00       .043      .452        .74    .022
      .061   99.831  .297E+01  .900E+00       .078      .524        .64    .032
      .073   99.843  .428E+01  .156E+01       .127      .592        .56    .043
      .085   99.855  .582E+01  .246E+01       .196      .675        .49    .057
      .097   99.867  .743E+01  .360E+01       .289      .779        .43    .075
      .109   99.879  .909E+01  .495E+01*      .397      .874        .38    .095
      .121   99.891  .108E+02  .653E+01*      .519      .962        .35    .116
      .133   99.903  .125E+02  .835E+01*      .655     1.045        .32    .139
      .145   99.915  .143E+02  .104E+02*      .805     1.122        .30    .163
      .157   99.927  .162E+02  .127E+02*      .968     1.195        .28    .188
      .169   99.939  .181E+02  .153E+02*     1.144     1.265        .26    .214
      .182   99.952  .200E+02  .182E+02*     1.333     1.332        .25    .242
      .194   99.964  .220E+02  .213E+02*     1.535     1.396        .24    .270
```

```
01033>      .206   99.976  .240E+02  .247E+02*     1.750     1.457       .23      .300
01034>      .218   99.988  .261E+02  .284E+02*     1.979     1.516       .22      .330
01035>      .230  100.000  .282E+02  .324E+02*     2.220     1.573       .21      .362
01036>
01037>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
01038>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
01039>  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.
01040>
01041>                                    <---- hydrograph ---->   <-pipe / channel->
01042>                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
01043>                               (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
01044>    INFLOW : ID= 2:MAJOR        .07     .105    2.02 73.975      .067      .560
01045>    OUTFLOW: ID= 3:LANE         .07     .105    2.02 73.975      .067      .560
01046>
01047>
01048> ------------------------------------------------------------------------------
01049> 004:0006------------------------------------------------------------------------
01050> ******************************************************************************
01051> * Remaining Drainage Area to Squadron Cres.
01052> ******************************************************************************
01053>  ---------------------
01054> | CALIB STANDHYD     |   Area    (ha)=     .77
01055> | 01:A1      DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
01056>  ---------------------
01057>                                IMPERVIOUS    PERVIOUS (i)
01058>      Surface Area      (ha)=        .66          .11
01059>      Dep. Storage      (mm)=       1.57         4.67
01060>      Average Slope      (%)=        .50         2.00
01061>      Length             (m)=     150.00        10.00
01062>      Mannings n             =       .013         .250
01063>
01064>      Max.eff.Inten.(mm/hr)=     178.65       150.62
01065>                  over (min)        3.00         6.00
01066>      Storage Coeff.  (min)=       3.18 (ii)    5.79 (ii)
01067>      Unit Hyd. Tpeak (min)=       3.00         6.00
01068>      Unit Hyd. peak  (cms)=        .36          .19
01069>                                                        *TOTALS*
01070>      PEAK FLOW       (cms)=        .31          .03          .342 (iii)
01071>      TIME TO PEAK    (hrs)=       2.00         2.03         2.000
01072>      RUNOFF VOLUME    (mm)=      80.77        32.23        73.975
01073>      TOTAL RAINFALL   (mm)=      82.34        82.34        82.340
01074>      RUNOFF COEFFICIENT   =        .98          .39          .898
01075>
01076>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
01077>             Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
01078>             Fc   (mm/hr)= 13.20    Cum.Inf.   (mm)=   .00
01079>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01080>            THAN THE STORAGE COEFFICIENT.
01081>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01082>
01083> ------------------------------------------------------------------------------
01084> 004:0007------------------------------------------------------------------------
01085> * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
01086>  ----------------------
01087> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .163  (cms)
01088> | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
01089>  ----------------------  Total minor system capacity          =    .163  (cms)
01090>                          Total major system storage [TMJSTO] =       0.(cu.m.)
01091>
01092>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
01093>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
01094>      TOTAL HYD.   01:A1            .77      .342     2.000   73.975      .000
01095>      ==========================================================================
01096>      MAJOR SYST   02:MAJOR         .12      .179     2.000   73.975      .000
01097>      MINOR SYST   04:MINOR         .65      .163     1.883   73.975      .000
01098>
01099>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01100>
01101> ------------------------------------------------------------------------------
01102> 004:0008------------------------------------------------------------------------
01103>  ----------------------
01104> | ADD HYD (Total     ) | ID: NHYD          AREA     QPEAK   TPEAK   R.V.    DWF
01105>  ----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
01106>                          ID1 02:MAJOR        .12      .179    2.00  73.97    .000
01107>                        +ID2 03:LANE          .07      .105    2.02  73.97    .000
01108>                         ==========================================================
01109>                         SUM 01:Total          .19      .279    2.00  73.97    .000
01110>
01111>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01112>
01113> ------------------------------------------------------------------------------
01114> 004:0009------------------------------------------------------------------------
01115> * Cross Section at Site Entrance (Squadron Cres.)
01116>  --------------------
01117> | ROUTE CHANNEL    |     Routing time step (min) =  1.00
01118> |  IN> 01:Total    |     Number of SEGMENTS =  1
01119> | OUT< 03:ROAD     |     Slopes (%), CHANNEL=2.00   FLOODPLAIN=2.00
01120>  --------------------                  LENGTH =   10.00    (m)
01121>
01122>                <------ DATA FOR SECTION (  15.2) ------>
01123>                Distance      Elevation       Manning
01124>                     .00         100.00         .0130
01125>                     .01          99.85         .0130
01126>                    6.50          99.77         .0130
01127>                    6.51          99.92         .0130
01128>
01129>    <---------------------------- TRAVEL TIME TABLE ---------------------------->
01130>     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
01131>       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)     (min)    (m2/s)
01132>      .008   99.778  .253E-01  .500E-03       .001      .270       .62      .002
01133>      .016   99.786  .101E+00  .400E-02       .004      .428       .39      .007
01134>      .024   99.794  .228E+00  .135E-01       .013      .561       .30      .013
01135>      .032   99.802  .405E+00  .320E-01       .028      .680       .25      .021
01136>      .039   99.809  .633E+00  .625E-01       .050      .789       .21      .031
01137>      .047   99.817  .911E+00  .108E+00       .081      .891       .19      .042
01138>      .055   99.825  .124E+01  .171E+00       .122      .987       .17      .055
01139>      .063   99.833  .162E+01  .256E+00       .175     1.079       .15      .068
01140>      .071   99.841  .205E+01  .364E+00       .239     1.167       .14      .083
01141>      .079   99.849  .253E+01  .500E+00       .317     1.252       .13      .099
01142>      .087   99.857  .304E+01  .661E+00       .427     1.401       .12      .122
01143>      .095   99.865  .356E+01  .843E+00       .552     1.552       .11      .147
01144>      .103   99.873  .407E+01  .104E+01       .690     1.695       .10      .174
01145>      .111   99.881  .458E+01  .127E+01       .840     1.832       .09      .203
01146>      .118   99.888  .510E+01  .151E+01      1.001     1.963       .08      .233
01147>      .126   99.896  .561E+01  .177E+01      1.173     2.090       .08      .264
01148>      .134   99.904  .612E+01  .206E+01      1.355     2.212       .08      .297
01149>      .142   99.912  .664E+01  .236E+01      1.547     2.330       .07      .331
01150>      .150   99.920  .715E+01  .268E+01      1.749     2.445       .07      .367
01151>
01152>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
01153>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
01154>
01155>                                    <---- hydrograph ---->   <-pipe / channel->
01156>                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
01157>                               (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
01158>    INFLOW : ID= 1:Total        .19     .279    2.00 73.975      .075     1.209
01159>    OUTFLOW: ID= 3:ROAD         .19     .277    2.00 73.975      .075     1.207
01160>
01161>

01162> ------------------------------------------------------------------------------
01163> 004:0010------------------------------------------------------------------------
01164> ******************************************************************************
01165> ******************************************************************************
01166> ------------------------------------------------------------------------------
01167> 004:0002------------------------------------------------------------------------
01168> ------------------------------------------------------------------------------
01169> 004:0002------------------------------------------------------------------------
01170> ------------------------------------------------------------------------------
01171> 004:0002------------------------------------------------------------------------
01172>   ** END OF RUN :   4
01173>
01174> ******************************************************************************
01175>
01176>
01177>
01178>
01179>
01180>  ----------------------
01181> | START              |  Project  dir.: C:\SWM_PRG\17-918\Block15\
01182>  ----------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block15\
01183>     TZERO =   .00 hrs on      0
01184>     METOUT=   2 (output = METRIC)
01185>     NRUN  = 005
01186>     NSTORM=   1
01187>              #  1=C:\SWM_PRG\STMFILES\100YC12H.stm
01188> ------------------------------------------------------------------------------
01189> 005:0002------------------------------------------------------------------------
01190> *#############################################################################
01191> *#  Project Name: []    Project Number: [18-946]
01192> *#  Date        : 2019-01-30
01193> *#  Modeller    : [slm]
01194> *#  Company     : David Schaeffer Engineering Ltd.
01195> *#  License #   :  4488477
01196> *#############################################################################
01197> ------------------------------------------------------------------------------
01198> 005:0002------------------------------------------------------------------------
01199>  ----------------------
01200> | READ STORM       |    Filename: 100-Year 12-Hour Chicago Storm, 10 min T
01201> | Ptotal=  93.91 mm|    Comments: 100-Year 12-Hour Chicago Storm, 10 min T
01202>  ----------------------
01203>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01204>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01205>               .17   1.520 |   3.17   6.050 |   6.17   4.540 |   9.17   2.120
01206>               .33   1.580 |   3.33   7.540 |   6.33   4.250 |   9.33   2.060
01207>               .50   1.650 |   3.50  10.160 |   6.50   3.990 |   9.50   2.010
01208>               .67   1.720 |   3.67  15.970 |   6.67   3.770 |   9.67   1.960
01209>               .83   1.800 |   3.83  40.650 |   6.83   3.570 |   9.83   1.910
01210>              1.00   1.880 |   4.00 178.560 |   7.00   3.400 |  10.00   1.860
01211>              1.17   1.980 |   4.17  54.050 |   7.17   3.240 |  10.17   1.820
01212>              1.33   2.090 |   4.33  27.320 |   7.33   3.100 |  10.33   1.780
01213>              1.50   2.210 |   4.50  18.240 |   7.50   2.970 |  10.50   1.740
01214>              1.67   2.340 |   4.67  13.740 |   7.67   2.850 |  10.67   1.700
01215>              1.83   2.500 |   4.83  11.060 |   7.83   2.740 |  10.83   1.670
01216>              2.00   2.690 |   5.00   9.290 |   8.00   2.640 |  11.00   1.630
01217>              2.17   2.900 |   5.17   8.020 |   8.17   2.550 |  11.17   1.600
01218>              2.33   3.160 |   5.33   7.080 |   8.33   2.460 |  11.33   1.570
01219>              2.50   3.480 |   5.50   6.350 |   8.50   2.380 |  11.50   1.540
01220>              2.67   3.880 |   5.67   5.760 |   8.67   2.310 |  11.67   1.510
01221>              2.83   4.390 |   5.83   5.280 |   8.83   2.240 |  11.83   1.480
01222>              3.00   5.070 |   6.00   4.880 |   9.00   2.180 |  12.00   1.460
01223>
01224> ------------------------------------------------------------------------------
01225> 005:0003------------------------------------------------------------------------
01226> ******************************************************************************
01227> * Post-Development Model - Wateridge Block 15
01228> ******************************************************************************
01229> ******************************************************************************
01230> * Drainage to Rear Lane
01231> ******************************************************************************
01232>  ----------------------
01233> | CALIB STANDHYD     |   Area    (ha)=     .54
01234> | 01:RL1     DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
01235>  ----------------------
01236>                                IMPERVIOUS    PERVIOUS (i)
01237>      Surface Area      (ha)=        .47          .08
01238>      Dep. Storage      (mm)=       1.57         4.67
01239>      Average Slope      (%)=        .50         2.00
01240>      Length             (m)=     250.00        10.00
01241>      Mannings n             =       .013         .250
01242>
01243>      Max.eff.Inten.(mm/hr)=     178.56       153.85
01244>                  over (min)        4.00         7.00
01245>      Storage Coeff.  (min)=       4.32 (ii)    6.91 (ii)
01246>      Unit Hyd. Tpeak (min)=       4.00         7.00
01247>      Unit Hyd. peak  (cms)=        .27          .16
01248>                                                        *TOTALS*
01249>      PEAK FLOW       (cms)=        .20          .02          .225 (iii)
01250>      TIME TO PEAK    (hrs)=       4.00         4.05         4.017
01251>      RUNOFF VOLUME    (mm)=      92.33        34.06        84.178
01252>      TOTAL RAINFALL   (mm)=      93.91        93.91        93.907
01253>      RUNOFF COEFFICIENT   =        .98          .36          .896
01254>
01255>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
01256>             Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
01257>             Fc   (mm/hr)= 13.20    Cum.Inf.   (mm)=   .00
01258>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01259>            THAN THE STORAGE COEFFICIENT.
01260>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01261>
01262> ------------------------------------------------------------------------------
01263> 005:0004------------------------------------------------------------------------
01264> * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
01265>  ----------------------
01266> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .119  (cms)
01267> | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
01268>  ----------------------  Total minor system capacity          =    .119  (cms)
01269>                          Total major system storage [TMJSTO] =       0.(cu.m.)
01270>
01271>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
01272>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
01273>      TOTAL HYD.   01:RL1            .54      .225     4.017   84.178      .000
01274>      ==========================================================================
01275>      MAJOR SYST   02:MAJOR          .06      .106     4.017   84.178      .000
01276>      MINOR SYST   04:MINOR          .48      .119     3.900   84.178      .000
01277>
01278>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01279>
01280> ------------------------------------------------------------------------------
01281> 005:0005------------------------------------------------------------------------
01282> * Rear Lane Cross Section
01283>  ----------------------
01284> | ROUTE CHANNEL    |     Routing time step (min) =  1.00
01285> |  IN> 02:MAJOR    |     Number of SEGMENTS =  1
01286> | OUT< 03:LANE     |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
01287>  ----------------------                  LENGTH =   20.00    (m)
01288>
01289>                <------ DATA FOR SECTION (  15.1) ------>
01290>                Distance      Elevation       Manning
```

```
                        .00       100.00         .0130
                        .01        99.85         .0130
                       6.50        99.77         .0130
                       6.51        99.85         .0130
                      11.51       100.17         .0130

   <--------------------------- TRAVEL TIME TABLE --------------------------->
    DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
     (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)   (m2/s)
    .012   99.782  .119E+00  .720E-02      .001      .179       1.86     .002
    .024   99.794  .476E+00  .576E-01      .007      .285       1.17     .007
    .036   99.806  .107E+01  .194E+00      .020      .373        .89     .014
    .048   99.818  .190E+01  .461E+00      .043      .452        .74     .022
    .061   99.831  .297E+01  .900E+00      .078      .524        .64     .032
    .073   99.843  .428E+01  .156E+01      .127      .592        .56     .043
    .085   99.855  .582E+01  .246E+01      .196      .675        .49     .057
    .097   99.867  .743E+01  .360E+01      .289      .779        .43     .075
    .109   99.879  .909E+01  .495E+01*     .397      .874        .38     .095
    .121   99.891  .108E+02  .653E+01*     .519      .962        .35     .116
    .133   99.903  .125E+02  .835E+01*     .655     1.045        .32     .139
    .145   99.915  .143E+02  .104E+02*     .805     1.122        .30     .163
    .157   99.927  .162E+02  .127E+02*     .968     1.195        .28     .188
    .169   99.939  .181E+02  .153E+02*    1.144     1.265        .26     .214
    .182   99.952  .200E+02  .182E+02*    1.333     1.332        .25     .242
    .194   99.964  .220E+02  .213E+02*    1.535     1.396        .24     .270
    .206   99.976  .240E+02  .247E+02*    1.750     1.457        .23     .300
    .218   99.988  .261E+02  .284E+02*    1.979     1.516        .22     .330
    .230  100.000  .282E+02  .324E+02*    2.220     1.573        .21     .362

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
 (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.

                                       <---- hydrograph ---->  <-pipe / channel->
                                 AREA    QPEAK   TPEAK   R.V.  MAX DEPTH  MAX VEL
                                 (ha)    (cms)   (hrs)   (mm)     (m)      (m/s)
   INFLOW : ID= 2:MAJOR           .06     .106    4.02 84.178     .067      .561
   OUTFLOW: ID= 3:LANE            .06     .106    4.02 84.178     .067      .561


 -----------------------------------------------------------------------------
 005:0006--------------------------------------------------------------------
 ****************************************************************************
 * Remaining Drainage Area to Squadron Cres.
 ****************************************************************************
 ---------------------
 | CALIB STANDHYD     |   Area    (ha)=     .77
 | 01:A1    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .66          .11
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .50         2.00
     Length            (m)=     150.00        10.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     178.56       154.27
               over (min)        3.00         6.00
     Storage Coeff.  (min)=      3.18 (ii)    5.76 (ii)
     Unit Hyd. Tpeak (min)=      3.00         6.00
     Unit Hyd. peak  (cms)=       .36          .19
                                                           *TOTALS*
     PEAK FLOW       (cms)=       .31          .03           .343 (iii)
     TIME TO PEAK    (hrs)=      4.00         4.03          4.000
     RUNOFF VOLUME    (mm)=     92.33        34.06         84.178
     TOTAL RAINFALL   (mm)=     93.91        93.91         93.907
     RUNOFF COEFFICIENT   =       .98          .36           .896

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 -----------------------------------------------------------------------------
 005:0007--------------------------------------------------------------------
 * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
 ---------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .163  (cms)
 | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
 ---------------------    Total minor system capacity          =    .163  (cms)
                          Total major system storage [TMJSTO] =       0.(cu.m.)

                   ID: NHYD        AREA      QPEAK      TPEAK      R.V.      DWF
                                   (ha)      (cms)      (hrs)      (mm)    (cms)
     TOTAL HYD.    01:A1            .77       .343      4.000    84.178     .000
     ======================================================================
     MAJOR SYST    02:MAJOR         .11       .180      4.000    84.178     .000
     MINOR SYST    04:MINOR         .66       .163      3.883    84.178     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -----------------------------------------------------------------------------
 005:0008--------------------------------------------------------------------
 -----------------------
 | ADD HYD (Total     ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
 -----------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 02:MAJOR           .11      .180    4.00  84.18    .000
                   +ID2 03:LANE            .06      .106    4.02  84.18    .000
                    ==========================================================
                    SUM 01:Total           .17      .281    4.00  84.18    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -----------------------------------------------------------------------------
 005:0009--------------------------------------------------------------------
 * Cross Section at Site Entrance (Squadron Cres.)
 --------------------
 | ROUTE CHANNEL    |     Routing time step (min) =  1.00
 |  IN> 01:Total    |     Number of SEGMENTS =  1
 | OUT< 03:ROAD     |     Slopes (%), CHANNEL=2.00   FLOODPLAIN=2.00
 --------------------                 LENGTH =   10.00    (m)

                <------ DATA FOR SECTION (  15.2) ------>
                Distance      Elevation       Manning
                     .00        100.00         .0130
                     .01         99.85         .0130
                    6.50         99.77         .0130
                    6.51         99.92         .0130

   <--------------------------- TRAVEL TIME TABLE --------------------------->
    DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
     (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)   (m2/s)
    .008   99.778  .253E-01  .500E-03      .001      .270        .62     .002
    .016   99.786  .101E+00  .400E-02      .004      .428        .39     .007
    .024   99.794  .228E+00  .135E-01      .013      .561        .30     .013
    .032   99.802  .405E+00  .320E-01      .028      .680        .25     .021
    .039   99.809  .633E+00  .625E-01      .050      .789        .21     .031
    .047   99.817  .911E+00  .108E+00      .081      .891        .19     .042
    .055   99.825  .124E+01  .171E+00      .122      .987        .17     .055
    .063   99.833  .162E+01  .256E+00      .175     1.079        .15     .068
    .071   99.841  .205E+01  .364E+00      .239     1.167        .14     .083
    .079   99.849  .253E+01  .500E+00      .317     1.252        .13     .099
    .087   99.857  .304E+01  .661E+00      .427     1.401        .12     .122
    .095   99.865  .356E+01  .843E+00      .552     1.552        .11     .147
    .103   99.873  .407E+01  .104E+01      .690     1.695        .10     .174
    .111   99.881  .458E+01  .127E+01      .840     1.832        .09     .203
    .118   99.888  .510E+01  .151E+01     1.001     1.963        .08     .233
    .126   99.896  .561E+01  .177E+01     1.173     2.090        .08     .264
    .134   99.904  .612E+01  .206E+01     1.355     2.212        .08     .297
    .142   99.912  .664E+01  .236E+01     1.547     2.330        .07     .331
    .150   99.920  .715E+01  .268E+01     1.749     2.445        .07     .367

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                       <---- hydrograph ---->  <-pipe / channel->
                                 AREA    QPEAK   TPEAK   R.V.  MAX DEPTH  MAX VEL
                                 (ha)    (cms)   (hrs)   (mm)     (m)      (m/s)
   INFLOW : ID= 1:Total           .17     .281    4.00 84.178     .075     1.211
   OUTFLOW: ID= 3:ROAD            .17     .279    4.00 84.178     .075     1.209


 -----------------------------------------------------------------------------
 005:0010--------------------------------------------------------------------
 ***************************************************************************
 ****************************************************************************
 -----------------------------------------------------------------------------
 005:0002--------------------------------------------------------------------
 -----------------------------------------------------------------------------
 005:0002--------------------------------------------------------------------
 -----------------------------------------------------------------------------
 005:0002--------------------------------------------------------------------
 -----------------------------------------------------------------------------
 005:0002--------------------------------------------------------------------
   ** END OF RUN :   5

 ****************************************************************************






 --------------------
 | START            |  Project  dir.: C:\SWM_PRG\17-918\Block15\
 --------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block15\
     TZERO =   .00 hrs on        0
     METOUT=   2 (output = METRIC)
     NRUN  = 006
     NSTORM=   1
            #  1=C:\SWM_PRG\STMFILES\19790701.stm
 -----------------------------------------------------------------------------
 006:0002--------------------------------------------------------------------
 *#**************************************************************************
 *#  Project Name: []   Project Number: [18-946]
 *#  Date        : 2019-01-30
 *#  Modeller    : [slm]
 *#  Company     : David Schaeffer Engineering Ltd.
 *#  License #   :  4488477
 *#**************************************************************************
 -----------------------------------------------------------------------------
 006:0002--------------------------------------------------------------------
 --------------------
 | READ STORM       |    Filename: City of Ottawa July 1, 1979 Storm - 5min
 | Ptotal=  83.99 mm|    Comments: City of Ottawa July 1, 1979 Storm - 5min
 --------------------
                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                 .08   2.300 |    .83  38.100 |   1.58  71.100 |   2.33   3.800
                 .17   2.300 |    .92  38.100 |   1.67  71.100 |   2.42   3.800
                 .25   8.890 |   1.00  38.100 |   1.75  30.500 |   2.50   3.800
                 .33   8.890 |   1.08  38.100 |   1.83  30.500 |   2.58   3.800
                 .42   8.890 |   1.17  50.800 |   1.92  30.500 |   2.67   3.800
                 .50   8.890 |   1.25  50.800 |   2.00  30.500 |   2.75   3.800
                 .58  38.100 |   1.33  76.200 |   2.08   3.800 |   2.83   3.800
                 .67  38.100 |   1.42 106.700 |   2.17   3.800 |   2.92   3.800
                 .75  38.100 |   1.50 106.700 |   2.25   3.800 |   3.00   3.800

 -----------------------------------------------------------------------------
 006:0003--------------------------------------------------------------------
 ****************************************************************************
 * Post-Development Model - Wateridge Block 15
 ****************************************************************************
 ****************************************************************************
 * Drainage to Rear Lane
 ****************************************************************************
 ---------------------
 | CALIB STANDHYD     |   Area    (ha)=     .54
 | 01:RL1   DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .47          .08
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .50         2.00
     Length            (m)=     250.00        10.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     106.70        91.22
               over (min)        5.00         8.00
     Storage Coeff.  (min)=      5.31 (ii)    8.50 (ii)
     Unit Hyd. Tpeak (min)=      5.00         8.00
     Unit Hyd. peak  (cms)=       .22          .14
                                                           *TOTALS*
     PEAK FLOW       (cms)=       .13          .02           .141 (iii)
     TIME TO PEAK    (hrs)=      1.52         1.58          1.517
     RUNOFF VOLUME    (mm)=     82.42        42.29         76.801
     TOTAL RAINFALL   (mm)=     83.99        83.99         83.988
     RUNOFF COEFFICIENT   =       .98          .50           .914

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 -----------------------------------------------------------------------------
 006:0004--------------------------------------------------------------------
 * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
 ---------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .119  (cms)
 | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
 ---------------------    Total minor system capacity          =    .119  (cms)
                          Total major system storage [TMJSTO] =       0.(cu.m.)

                   ID: NHYD        AREA      QPEAK      TPEAK      R.V.      DWF
                                   (ha)      (cms)      (hrs)      (mm)    (cms)
```

```
01549>      TOTAL HYD.   01:RL1          .54      .141     1.517   76.801     .000
01550>      ==========================================================================
01551>      MAJOR SYST   02:MAJOR        .01      .022     1.517   76.801     .000
01552>      MINOR SYST   04:MINOR        .53      .119     1.433   76.801     .000
01553>
01554>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01555>
01556> ------------------------------------------------------------------------------
01557> 006:0005------------------------------------------------------------------------
01558> * Rear Lane Cross Section
01559> ---------------------
01560> | ROUTE CHANNEL    |     Routing time step (min) =  1.00
01561> |  IN> 02:MAJOR    |     Number of SEGMENTS =  1
01562> | OUT< 03:LANE     |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
01563> ---------------------                  LENGTH =   20.00    (m)
01564>
01565>                <------ DATA FOR SECTION (  15.1) ------>
01566>                Distance      Elevation       Manning
01567>                     .00         100.00         .0130
01568>                     .01          99.85         .0130
01569>                    6.50          99.77         .0130
01570>                    6.51          99.85         .0130
01571>                   11.51         100.17         .0130
01572>
01573>    <------------------------------ TRAVEL TIME TABLE ------------------------------>
01574>     DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME    D x V
01575>       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)     (min)   (m2/s)
01576>      .012   99.782  .119E+00  .720E-02       .001      .179      1.86     .002
01577>      .024   99.794  .476E+00  .576E-01       .007      .285      1.17     .007
01578>      .036   99.806  .107E+01  .194E+00       .020      .373       .89     .014
01579>      .048   99.818  .190E+01  .461E+00       .043      .452       .74     .022
01580>      .061   99.831  .297E+01  .900E+00       .078      .524       .64     .032
01581>      .073   99.843  .428E+01  .156E+01       .127      .592       .56     .043
01582>      .085   99.855  .582E+01  .246E+01       .196      .675       .49     .057
01583>      .097   99.867  .743E+01  .360E+01       .289      .779       .43     .075
01584>      .109   99.879  .909E+01  .495E+01*      .397      .874       .38     .095
01585>      .121   99.891  .108E+02  .653E+01*      .519      .962       .35     .116
01586>      .133   99.903  .125E+02  .835E+01*      .655     1.045       .32     .139
01587>      .145   99.915  .143E+02  .104E+02*      .805     1.122       .30     .163
01588>      .157   99.927  .162E+02  .127E+02*      .968     1.195       .28     .188
01589>      .169   99.939  .181E+02  .153E+02*     1.144     1.265       .26     .214
01590>      .182   99.952  .200E+02  .182E+02*     1.333     1.332       .25     .242
01591>      .194   99.964  .220E+02  .213E+02*     1.535     1.396       .24     .270
01592>      .206   99.976  .240E+02  .247E+02*     1.750     1.457       .23     .300
01593>      .218   99.988  .261E+02  .284E+02*     1.979     1.516       .22     .330
01594>      .230  100.000  .282E+02  .324E+02*     2.220     1.573       .21     .362
01595>
01596>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
01597>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
01598>  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.
01599>
01600>                                        <---- hydrograph ---->   <-pipe / channel->
01601>                                  AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
01602>                                  (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
01603>    INFLOW : ID= 2:MAJOR          .01     .022    1.52 76.801      .037      .379
01604>    OUTFLOW: ID= 3:LANE           .01     .022    1.53 76.801      .037      .379
01605>
01606>
01607> ------------------------------------------------------------------------------
01608> 006:0006------------------------------------------------------------------------
01609> ******************************************************************************
01610> * Remaining Drainage Area to Squadron Cres.
01611> ******************************************************************************
01612> ----------------------
01613> | CALIB STANDHYD     |   Area    (ha)=     .77
01614> | 01:A1     DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
01615> ----------------------
01616>                              IMPERVIOUS    PERVIOUS (i)
01617>      Surface Area     (ha)=        .66          .11
01618>      Dep. Storage     (mm)=       1.57         4.67
01619>      Average Slope     (%)=        .50         2.00
01620>      Length            (m)=     150.00        10.00
01621>      Mannings n            =       .013         .250
01622>
01623>      Max.eff.Inten.(mm/hr)=     106.70        91.30
01624>            over (min)           4.00         7.00
01625>      Storage Coeff.  (min)=       3.91 (ii)    7.09 (ii)
01626>      Unit Hyd. Tpeak (min)=       4.00         7.00
01627>      Unit Hyd. peak  (cms)=        .29          .16
01628>                                                      *TOTALS*
01629>      PEAK FLOW        (cms)=       .19          .02          .208 (iii)
01630>      TIME TO PEAK     (hrs)=      1.50         1.55         1.500
01631>      RUNOFF VOLUME     (mm)=     82.42        42.29        76.801
01632>      TOTAL RAINFALL    (mm)=     83.99        83.99        83.988
01633>      RUNOFF COEFFICIENT   =       .98          .50          .914
01634>
01635>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
01636>            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
01637>            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
01638>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01639>            THAN THE STORAGE COEFFICIENT.
01640>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01641>
01642> ------------------------------------------------------------------------------
01643> 006:0007------------------------------------------------------------------------
01644> * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
01645> ----------------------
01646> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .163  (cms)
01647> | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =      1
01648> ----------------------   Total minor system capacity        =    .163  (cms)
01649>                          Total major system storage [TMJSTO] =      0.(cu.m.)
01650>
01651>                   ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
01652>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
01653>      TOTAL HYD.   01:A1            .77      .208     1.500   76.801     .000
01654>      ==========================================================================
01655>      MAJOR SYST   02:MAJOR         .03      .045     1.500   76.801     .000
01656>      MINOR SYST   04:MINOR         .74      .163     1.400   76.801     .000
01657>
01658>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01659>
01660> ------------------------------------------------------------------------------
01661> 006:0008------------------------------------------------------------------------
01662> ------------------------
01663> | ADD HYD (Total     ) | ID: NHYD          AREA     QPEAK   TPEAK   R.V.    DWF
01664> ------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
01665>                         ID1 02:MAJOR         .03     .045    1.50   76.80    .000
01666>                        +ID2 03:LANE          .01     .022    1.53   76.80    .000
01667>                         ==========================================================
01668>                         SUM 01:Total         .04     .066    1.52   76.80    .000
01669>
01670>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01671>
01672> ------------------------------------------------------------------------------
01673> 006:0009------------------------------------------------------------------------
01674> * Cross Section at Site Entrance (Squadron Cres.)
01675> ----------------------
01676> | ROUTE CHANNEL    |     Routing time step (min) =  1.00
01677> |  IN> 01:Total    |     Number of SEGMENTS =  1
01678> | OUT< 03:ROAD     |     Slopes (%), CHANNEL=2.00   FLOODPLAIN=2.00
01679> ----------------------                  LENGTH =   10.00    (m)
01680>
01681>                <------ DATA FOR SECTION (  15.2) ------>
01682>                Distance      Elevation       Manning
01683>                     .00         100.00         .0130
01684>                     .01          99.85         .0130
01685>                    6.50          99.77         .0130
01686>                    6.51          99.92         .0130
01687>
01688>    <------------------------------ TRAVEL TIME TABLE ------------------------------>
01689>     DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME    D x V
01690>       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)     (min)   (m2/s)
01691>      .008   99.778  .253E-01  .500E-03       .001      .270       .62     .002
01692>      .016   99.786  .101E+00  .400E-02       .004      .428       .39     .007
01693>      .024   99.794  .228E+00  .135E-01       .013      .561       .30     .013
01694>      .032   99.802  .405E+00  .320E-01       .028      .680       .25     .021
01695>      .039   99.809  .633E+00  .625E-01       .050      .789       .21     .031
01696>      .047   99.817  .911E+00  .108E+00       .081      .891       .19     .042
01697>      .055   99.825  .124E+01  .171E+00       .122      .987       .17     .055
01698>      .063   99.833  .162E+01  .256E+00       .175     1.079       .15     .068
01699>      .071   99.841  .205E+01  .364E+00       .239     1.167       .14     .083
01700>      .079   99.849  .253E+01  .500E+00       .317     1.252       .13     .099
01701>      .087   99.857  .304E+01  .661E+00       .427     1.401       .12     .122
01702>      .095   99.865  .356E+01  .843E+00       .552     1.552       .11     .147
01703>      .103   99.873  .407E+01  .104E+01       .690     1.695       .10     .174
01704>      .111   99.881  .458E+01  .127E+01       .840     1.832       .09     .203
01705>      .118   99.888  .510E+01  .151E+01      1.001     1.963       .08     .233
01706>      .126   99.896  .561E+01  .177E+01      1.173     2.090       .08     .264
01707>      .134   99.904  .612E+01  .206E+01      1.355     2.212       .08     .297
01708>      .142   99.912  .664E+01  .236E+01      1.547     2.330       .07     .331
01709>      .150   99.920  .715E+01  .268E+01      1.749     2.445       .07     .367
01710>
01711>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
01712>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
01713>
01714>                                        <---- hydrograph ---->   <-pipe / channel->
01715>                                  AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
01716>                                  (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
01717>    INFLOW : ID= 1:Total          .04     .066    1.52 76.801      .044      .839
01718>    OUTFLOW: ID= 3:ROAD           .04     .066    1.52 76.801      .044      .838
01719>
01720>
01721> ------------------------------------------------------------------------------
01722> 006:0010------------------------------------------------------------------------
01723> ******************************************************************************
01724> ******************************************************************************
01725> ------------------------------------------------------------------------------
01726> 006:0002------------------------------------------------------------------------
01727> ------------------------------------------------------------------------------
01728> 006:0002------------------------------------------------------------------------
01729> ------------------------------------------------------------------------------
01730> 006:0002------------------------------------------------------------------------
01731> ------------------------------------------------------------------------------
01732> 006:0002------------------------------------------------------------------------
01733> ------------------------------------------------------------------------------
01734> 006:0002------------------------------------------------------------------------
01735>  ** END OF RUN :   6
01736>
01737> ******************************************************************************
01738>
01739>
01740>
01741>
01742>
01743> ----------------------
01744> | START              |  Project  dir.: C:\SWM_PRG\17-918\Block15\
01745> ----------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block15\
01746>     TZERO =   .00 hrs on        0
01747>     METOUT=   2 (output = METRIC)
01748>     NRUN  = 007
01749>     NSTORM=   1
01750>               #  1=C:\SWM_PRG\STMFILES\19880804.stm
01751> ------------------------------------------------------------------------------
01752> 007:0002------------------------------------------------------------------------
01753> *#############################################################################
01754> *#  Project Name: []    Project Number: [18-946]
01755> *#  Date        : 2019-01-30
01756> *#  Modeller    : [slm]
01757> *#  Company     : David Schaeffer Engineering Ltd.
01758> *#  License #   :  4488477
01759> *#############################################################################
01760> ------------------------------------------------------------------------------
01761> 007:0002------------------------------------------------------------------------
01762> --------------------
01763> | READ STORM       |    Filename: City of Ottawa August 4, 1988 Storm - 5m
01764> | Ptotal=  80.59 mm|    Comments: City of Ottawa August 4, 1988 Storm - 5m
01765> --------------------
01766>                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01767>                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01768>                 .08    .100 |   1.50 104.400 |   2.92    .200 |   4.33    .200
01769>                 .17    .100 |   1.58  27.500 |   3.00  12.800 |   4.42    .200
01770>                 .25    .000 |   1.67  62.500 |   3.08  14.000 |   4.50    .200
01771>                 .33   3.700 |   1.75  31.800 |   3.17  22.200 |   4.58    .200
01772>                 .42   6.200 |   1.83  79.800 |   3.25  21.800 |   4.67    .200
01773>                 .50 101.500 |   1.92  67.500 |   3.33   1.400 |   4.75    .200
01774>                 .58  15.500 |   2.00 156.200 |   3.42    .200 |   4.83    .200
01775>                 .67  29.300 |   2.08   5.100 |   3.50    .200 |   4.92    .200
01776>                 .75  19.800 |   2.17    .200 |   3.58    .200 |   5.00   2.900
01777>                 .83   1.500 |   2.25    .200 |   3.67    .200 |   5.08   7.800
01778>                 .92   1.700 |   2.33    .200 |   3.75    .200 |   5.17  10.000
01779>                1.00   5.400 |   2.42    .200 |   3.83    .200 |   5.25   6.300
01780>                1.08  24.600 |   2.50    .200 |   3.92    .200 |   5.33   5.100
01781>                1.17  26.500 |   2.58    .200 |   4.00    .200 |   5.42   9.800
01782>                1.25  34.900 |   2.67    .200 |   4.08    .200 |   5.50   2.600
01783>                1.33  10.200 |   2.75    .200 |   4.17    .200 |   5.58   1.700
01784>                1.42  27.100 |   2.83    .200 |   4.25    .200 |
01785>
01786> ------------------------------------------------------------------------------
01787> 007:0003------------------------------------------------------------------------
01788> ******************************************************************************
01789> * Post-Development Model - Wateridge Block 15
01790> ******************************************************************************
01791> ******************************************************************************
01792> * Drainage to Rear Lane
01793> ******************************************************************************
01794> ----------------------
01795> | CALIB STANDHYD     |   Area    (ha)=     .54
01796> | 01:RL1    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
01797> ----------------------
01798>                              IMPERVIOUS    PERVIOUS (i)
01799>      Surface Area     (ha)=        .47          .08
01800>      Dep. Storage     (mm)=       1.57         4.67
01801>      Average Slope     (%)=        .50         2.00
01802>      Length            (m)=     250.00        10.00
01803>      Mannings n            =       .013         .250
01804>
01805>      Max.eff.Inten.(mm/hr)=     156.20       116.61
01806>            over (min)           5.00         7.00
```

```
01807>      Storage Coeff.  (min)=       4.56 (ii)    7.45 (ii)
01808>      Unit Hyd. Tpeak (min)=       5.00         7.00
01809>      Unit Hyd. peak  (cms)=        .24          .16
01810>                                                      *TOTALS*
01811>      PEAK FLOW       (cms)=        .14          .02          .160 (iii)
01812>      TIME TO PEAK    (hrs)=       2.02         2.05         2.033
01813>      RUNOFF VOLUME    (mm)=      79.02        37.60        73.223
01814>      TOTAL RAINFALL   (mm)=      80.59        80.59        80.591
01815>      RUNOFF COEFFICIENT   =        .98          .47          .909
01816>
01817>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
01818>            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
01819>            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
01820>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01821>            THAN THE STORAGE COEFFICIENT.
01822>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01823>
01824> ------------------------------------------------------------------------------
01825> 007:0004------------------------------------------------------------------------
01826> * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
01827> ----------------------
01828> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .119  (cms)
01829> | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =      1
01830> ----------------------   Total minor system capacity        =    .119  (cms)
01831>                          Total major system storage [TMJSTO] =      0.(cu.m.)
01832>
01833>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
01834>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
01835>      TOTAL HYD.   01:RL1           .54      .160     2.033   73.223      .000
01836>      ================================================================
01837>      MAJOR SYST   02:MAJOR         .01      .041     2.033   73.223      .000
01838>      MINOR SYST   04:MINOR         .53      .119     1.983   73.223      .000
01839>
01840>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01841>
01842> ------------------------------------------------------------------------------
01843> 007:0005------------------------------------------------------------------------
01844> * Rear Lane Cross Section
01845> ----------------------
01846> | ROUTE CHANNEL    |     Routing time step (min) =  1.00
01847> |  IN> 02:MAJOR    |     Number of SEGMENTS =  1
01848> | OUT< 03:LANE     |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
01849> ----------------------                  LENGTH =   20.00    (m)
01850>
01851>                <------ DATA FOR SECTION (  15.1) ------>
01852>                Distance      Elevation       Manning
01853>                     .00         100.00          .0130
01854>                     .01          99.85          .0130
01855>                    6.50          99.77          .0130
01856>                    6.51          99.85          .0130
01857>                   11.51         100.17          .0130
01858>
01859>    <---------------------------- TRAVEL TIME TABLE ---------------------------->
01860>     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
01861>       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)     (min)   (m2/s)
01862>      .012   99.782  .119E+00  .720E-02       .001      .179      1.86     .002
01863>      .024   99.794  .476E+00  .576E-01       .007      .285      1.17     .007
01864>      .036   99.806  .107E+01  .194E+00       .020      .373       .89     .014
01865>      .048   99.818  .190E+01  .461E+00       .043      .452       .74     .022
01866>      .061   99.831  .297E+01  .900E+00       .078      .524       .64     .032
01867>      .073   99.843  .428E+01  .156E+01       .127      .592       .56     .043
01868>      .085   99.855  .582E+01  .246E+01       .196      .675       .49     .057
01869>      .097   99.867  .743E+01  .360E+01       .289      .779       .43     .075
01870>      .109   99.879  .909E+01  .495E+01*      .397      .874       .38     .095
01871>      .121   99.891  .108E+02  .653E+01*      .519      .962       .35     .116
01872>      .133   99.903  .125E+02  .835E+01*      .655     1.045       .32     .139
01873>      .145   99.915  .143E+02  .104E+02*      .805     1.122       .30     .163
01874>      .157   99.927  .162E+02  .127E+02*      .968     1.195       .28     .188
01875>      .169   99.939  .181E+02  .153E+02*     1.144     1.265       .26     .214
01876>      .182   99.952  .200E+02  .182E+02*     1.333     1.332       .25     .242
01877>      .194   99.964  .220E+02  .213E+02*     1.535     1.396       .24     .270
01878>      .206   99.976  .240E+02  .247E+02*     1.750     1.457       .23     .300
01879>      .218   99.988  .261E+02  .284E+02*     1.979     1.516       .22     .330
01880>      .230  100.000  .282E+02  .324E+02*     2.220     1.573       .21     .362
01881>
01882>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
01883>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
01884>  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.
01885>
01886>                                    <---- hydrograph ---->   <-pipe / channel->
01887>                                AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
01888>                                (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
01889>    INFLOW : ID= 2:MAJOR         .01     .041    2.03 73.223      .047      .443
01890>    OUTFLOW: ID= 3:LANE          .01     .041    2.03 73.223      .047      .441
01891>
01892>
01893> ------------------------------------------------------------------------------
01894> 007:0006------------------------------------------------------------------------
01895> ******************************************************************************
01896> * Remaining Drainage Area to Squadron Cres.
01897> ******************************************************************************
01898> ----------------------
01899> | CALIB STANDHYD     |   Area    (ha)=      .77
01900> | 01:A1      DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
01901> ----------------------
01902>                          IMPERVIOUS    PERVIOUS (i)
01903>      Surface Area     (ha)=       .66          .11
01904>      Dep. Storage     (mm)=      1.57         4.67
01905>      Average Slope     (%)=       .50         2.00
01906>      Length            (m)=    150.00        10.00
01907>      Mannings n            =      .013         .250
01908>
01909>      Max.eff.Inten.(mm/hr)=    156.20       127.20
01910>                over (min)        3.00         6.00
01911>      Storage Coeff.  (min)=       3.36 (ii)    6.15 (ii)
01912>      Unit Hyd. Tpeak (min)=       3.00         6.00
01913>      Unit Hyd. peak  (cms)=        .35          .19
01914>                                                      *TOTALS*
01915>      PEAK FLOW       (cms)=        .23          .03          .256 (iii)
01916>      TIME TO PEAK    (hrs)=       2.00         2.03         2.000
01917>      RUNOFF VOLUME    (mm)=      79.02        37.60        73.223
01918>      TOTAL RAINFALL   (mm)=      80.59        80.59        80.591
01919>      RUNOFF COEFFICIENT   =        .98          .47          .909
01920>
01921>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
01922>            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
01923>            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
01924>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01925>            THAN THE STORAGE COEFFICIENT.
01926>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01927>
01928> ------------------------------------------------------------------------------
01929> 007:0007------------------------------------------------------------------------
01930> * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
01931> ----------------------
01932> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .163  (cms)
01933> | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =      1
01934> ----------------------   Total minor system capacity        =    .163  (cms)
01935>                          Total major system storage [TMJSTO] =      0.(cu.m.)
01936>
01937>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
01938>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
01939>      TOTAL HYD.   01:A1            .77      .256     2.000   73.223      .000
01940>      ================================================================
01941>      MAJOR SYST   02:MAJOR         .03      .093     2.000   73.223      .000
01942>      MINOR SYST   04:MINOR         .74      .163     1.950   73.223      .000
01943>
01944>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01945>
01946> ------------------------------------------------------------------------------
01947> 007:0008------------------------------------------------------------------------
01948> ----------------------
01949> | ADD HYD (Total     ) | ID: NHYD          AREA     QPEAK   TPEAK   R.V.    DWF
01950> ----------------------                     (ha)     (cms)   (hrs)   (mm)   (cms)
01951>                         ID1 02:MAJOR         .03      .093    2.00  73.22    .000
01952>                        +ID2 03:LANE          .01      .041    2.03  73.22    .000
01953>                         ================================================================
01954>                         SUM 01:Total         .05      .125    2.02  73.22    .000
01955>
01956>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01957>
01958> ------------------------------------------------------------------------------
01959> 007:0009------------------------------------------------------------------------
01960> * Cross Section at Site Entrance (Squadron Cres.)
01961> ----------------------
01962> | ROUTE CHANNEL    |     Routing time step (min) =  1.00
01963> |  IN> 01:Total    |     Number of SEGMENTS =  1
01964> | OUT< 03:ROAD     |     Slopes (%), CHANNEL=2.00   FLOODPLAIN=2.00
01965> ----------------------                  LENGTH =   10.00    (m)
01966>
01967>                <------ DATA FOR SECTION (  15.2) ------>
01968>                Distance      Elevation       Manning
01969>                     .00         100.00          .0130
01970>                     .01          99.85          .0130
01971>                    6.50          99.77          .0130
01972>                    6.51          99.92          .0130
01973>
01974>    <---------------------------- TRAVEL TIME TABLE ---------------------------->
01975>     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
01976>       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)     (min)   (m2/s)
01977>      .008   99.778  .253E-01  .500E-03       .001      .270       .62     .002
01978>      .016   99.786  .101E+00  .400E-02       .004      .428       .39     .007
01979>      .024   99.794  .228E+00  .135E-01       .013      .561       .30     .013
01980>      .032   99.802  .405E+00  .320E-01       .028      .680       .25     .021
01981>      .039   99.809  .633E+00  .625E-01       .050      .789       .21     .031
01982>      .047   99.817  .911E+00  .108E+00       .081      .891       .19     .042
01983>      .055   99.825  .124E+01  .171E+00       .122      .987       .17     .055
01984>      .063   99.833  .162E+01  .256E+00       .175     1.079       .15     .068
01985>      .071   99.841  .205E+01  .364E+00       .239     1.167       .14     .083
01986>      .079   99.849  .253E+01  .500E+00       .317     1.252       .13     .099
01987>      .087   99.857  .304E+01  .661E+00       .427     1.401       .12     .122
01988>      .095   99.865  .356E+01  .843E+00       .552     1.552       .11     .147
01989>      .103   99.873  .407E+01  .104E+01       .690     1.695       .10     .174
01990>      .111   99.881  .458E+01  .127E+01       .840     1.832       .09     .203
01991>      .118   99.888  .510E+01  .151E+01      1.001     1.963       .08     .233
01992>      .126   99.896  .561E+01  .177E+01      1.173     2.090       .08     .264
01993>      .134   99.904  .612E+01  .206E+01      1.355     2.212       .08     .297
01994>      .142   99.912  .664E+01  .236E+01      1.547     2.330       .07     .331
01995>      .150   99.920  .715E+01  .268E+01      1.749     2.445       .07     .367
01996>
01997>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
01998>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
01999>
02000>                                    <---- hydrograph ---->   <-pipe / channel->
02001>                                AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
02002>                                (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
02003>    INFLOW : ID= 1:Total         .05     .125    2.02 73.223      .056      .991
02004>    OUTFLOW: ID= 3:ROAD          .05     .126    2.02 73.223      .056      .992
02005>
02006>
02007> ------------------------------------------------------------------------------
02008> 007:0010------------------------------------------------------------------------
02009> ******************************************************************************
02010> ******************************************************************************
02011> ------------------------------------------------------------------------------
02012> 007:0002------------------------------------------------------------------------
02013> ------------------------------------------------------------------------------
02014> 007:0002------------------------------------------------------------------------
02015> ------------------------------------------------------------------------------
02016> 007:0002------------------------------------------------------------------------
02017> ------------------------------------------------------------------------------
02018> 007:0002------------------------------------------------------------------------
02019> ------------------------------------------------------------------------------
02020> 007:0002------------------------------------------------------------------------
02021> ------------------------------------------------------------------------------
02022> 007:0002------------------------------------------------------------------------
02023>   ** END OF RUN :   7
02024>
02025> ******************************************************************************
02026>
02027>
02028>
02029>
02030>
02031> ----------------------
02032> | START              |  Project  dir.: C:\SWM_PRG\17-918\Block15\
02033> ---------------------- Rainfall dir.: C:\SWM_PRG\17-918\Block15\
02034>    TZERO =   .00 hrs on      0
02035>    METOUT=   2 (output = METRIC)
02036>    NRUN  = 008
02037>    NSTORM=   1
02038>            #  1=C:\SWM_PRG\STMFILES\19960808.stm
02039> ------------------------------------------------------------------------------
02040> 008:0002------------------------------------------------------------------------
02041> *#############################################################################
02042> *#  Project Name: []    Project Number: [18-946]
02043> *#  Date        : 2019-01-30
02044> *#  Modeller    : [slm]
02045> *#  Company     : David Schaeffer Engineering Ltd.
02046> *#  License #   :  4488477
02047> *#############################################################################
02048> ------------------------------------------------------------------------------
02049> 008:0002------------------------------------------------------------------------
02050> ----------------------
02051> | READ STORM        |    Filename: City of Ottawa August 8, 1996 Storm - 5m
02052> | Ptotal=  73.90 mm|    Comments: City of Ottawa August 8, 1996 Storm - 5m
02053> ----------------------
02054>                 TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
02055>                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
02056>                 .08   4.000 |   1.58   9.300 |   3.08  63.700 |   4.58   1.300
02057>                 .17  11.900 |   1.67   8.000 |   3.17  58.400 |   4.67   1.300
02058>                 .25  26.500 |   1.75   4.000 |   3.25  47.800 |   4.75    .000
02059>                 .33  13.300 |   1.83    .000 |   3.33  15.900 |   4.83    .000
02060>                 .42    .000 |   1.92   2.700 |   3.42  13.300 |   4.92    .000
02061>                 .50   2.700 |   2.00    .000 |   3.50   8.000 |   5.00    .000
02062>                 .58    .000 |   2.08    .000 |   3.58   5.300 |   5.08   2.700
02063>                 .67   8.000 |   2.17    .000 |   3.67   6.600 |   5.17    .000
02064>                 .75  18.600 |   2.25   5.300 |   3.75   2.700 |   5.25    .000
```

```
                .83  10.600 |   2.33    .000 |   3.83   4.000 |   5.33    .000
                .92  21.200 |   2.42    .000 |   3.92   2.700 |   5.42    .000
               1.00   2.700 |   2.50    .000 |   4.00   4.000 |   5.50    .000
               1.08   2.700 |   2.58    .000 |   4.08   2.700 |   5.58    .000
               1.17  15.900 |   2.67    .000 |   4.17   5.300 |   5.67    .000
               1.25  66.300 |   2.75    .000 |   4.25   4.000 |   5.75   1.300
               1.33  55.700 |   2.83   4.000 |   4.33   2.700 |
               1.42 122.000 |   2.92  53.100 |   4.42   4.000 |
               1.50  88.900 |   3.00  69.000 |   4.50   2.700 |

 -----------------------------------------------------------------------------
 008:0003---------------------------------------------------------------------
 ****************************************************************************
 * Post-Development Model - Wateridge Block 15
 ****************************************************************************
 ****************************************************************************
 * Drainage to Rear Lane
 ****************************************************************************
 ----------------------
 | CALIB STANDHYD      |   Area    (ha)=     .54
 | 01:RL1    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
 ----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .47          .08
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=         .50         2.00
     Length            (m)=      250.00        10.00
     Mannings n          =         .013         .250

     Max.eff.Inten.(mm/hr)=      122.00        80.61
                over (min)         5.00         8.00
     Storage Coeff.  (min)=        5.03 (ii)    8.38 (ii)
     Unit Hyd. Tpeak (min)=        5.00         8.00
     Unit Hyd. peak  (cms)=         .23          .14
                                                            *TOTALS*
     PEAK FLOW       (cms)=         .12          .01           .132 (iii)
     TIME TO PEAK    (hrs)=        1.48         1.53          1.483
     RUNOFF VOLUME    (mm)=       72.33        33.77         66.931
     TOTAL RAINFALL   (mm)=       73.90        73.90         73.900
     RUNOFF COEFFICIENT   =         .98          .46           .906

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo    (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc    (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 -----------------------------------------------------------------------------
 008:0004---------------------------------------------------------------------
 * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
 ----------------------
 | COMPUTE DUALHYD     |   Average inlet capacities   [CINLET] =    .119  (cms)
 | TotalHyd 01:RL1     |   Number of inlets in system [NINLET] =      1
 ----------------------   Total minor system capacity          =    .119  (cms)
                          Total major system storage [TMJSTO] =       0.(cu.m.)

                   ID: NHYD        AREA     QPEAK     TPEAK      R.V.      DWF
                                   (ha)     (cms)     (hrs)      (mm)     (cms)
     TOTAL HYD.   01:RL1            .54      .132     1.483    66.931      .000
     ======================================================================
     MAJOR SYST   02:MAJOR          .00      .013     1.483    66.931      .000
     MINOR SYST   04:MINOR          .54      .119     1.450    66.931      .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -----------------------------------------------------------------------------
 008:0005---------------------------------------------------------------------
 * Rear Lane Cross Section
 --------------------
 | ROUTE CHANNEL     |     Routing time step (min) =  1.00
 |  IN> 02:MAJOR     |     Number of SEGMENTS =  1
 | OUT< 03:LANE      |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
 --------------------                  LENGTH =   20.00     (m)

                  <------ DATA FOR SECTION (  15.1) ------>
                  Distance       Elevation        Manning
                       .00         100.00          .0130
                       .01          99.85          .0130
                      6.50          99.77          .0130
                      6.51          99.85          .0130
                     11.51         100.17          .0130

   <---------------------------- TRAVEL TIME TABLE --------------------------->
    DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
     (m)       (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)  (m2/s)
     .012   99.782  .119E+00  .720E-02       .001      .179       1.86     .002
     .024   99.794  .476E+00  .576E-01       .007      .285       1.17     .007
     .036   99.806  .107E+01  .194E+00       .020      .373        .89     .014
     .048   99.818  .190E+01  .461E+00       .043      .452        .74     .022
     .061   99.831  .297E+01  .900E+00       .078      .524        .64     .032
     .073   99.843  .428E+01  .156E+01       .127      .592        .56     .043
     .085   99.855  .582E+01  .246E+01       .196      .675        .49     .057
     .097   99.867  .743E+01  .360E+01       .289      .779        .43     .075
     .109   99.879  .909E+01  .495E+01*      .397      .874        .38     .095
     .121   99.891  .108E+02  .653E+01*      .519      .962        .35     .116
     .133   99.903  .125E+02  .835E+01*      .655     1.045        .32     .139
     .145   99.915  .143E+02  .104E+02*      .805     1.122        .30     .163
     .157   99.927  .162E+02  .127E+02*      .968     1.195        .28     .188
     .169   99.939  .181E+02  .153E+02*     1.144     1.265        .26     .214
     .182   99.952  .200E+02  .182E+02*     1.333     1.332        .25     .242
     .194   99.964  .220E+02  .213E+02*     1.535     1.396        .24     .270
     .206   99.976  .240E+02  .247E+02*     1.750     1.457        .23     .300
     .218   99.988  .261E+02  .284E+02*     1.979     1.516        .22     .330
     .230  100.000  .282E+02  .324E+02*     2.220     1.573        .21     .362

  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.

                                       <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2:MAJOR        .00     .013    1.48 66.931      .030      .319
   OUTFLOW: ID= 3:LANE         .00     .012    1.50 66.931      .029      .314


 -----------------------------------------------------------------------------
 008:0006---------------------------------------------------------------------
 ****************************************************************************
 * Remaining Drainage Area to Squadron Cres.
 ****************************************************************************
 ----------------------
 | CALIB STANDHYD      |   Area    (ha)=     .77
 | 01:A1     DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
 ----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .66          .11
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=         .50         2.00
     Length            (m)=      150.00        10.00
     Mannings n          =         .013         .250

     Max.eff.Inten.(mm/hr)=      122.00        83.06
                over (min)         4.00         7.00
     Storage Coeff.  (min)=        3.70 (ii)    7.01 (ii)
     Unit Hyd. Tpeak (min)=        4.00         7.00
     Unit Hyd. peak  (cms)=         .30          .16
                                                            *TOTALS*
     PEAK FLOW       (cms)=         .18          .02           .198 (iii)
     TIME TO PEAK    (hrs)=        1.45         1.52          1.467
     RUNOFF VOLUME    (mm)=       72.33        33.77         66.931
     TOTAL RAINFALL   (mm)=       73.90        73.90         73.900
     RUNOFF COEFFICIENT   =         .98          .46           .906

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo    (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc    (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 -----------------------------------------------------------------------------
 008:0007---------------------------------------------------------------------
 * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
 ----------------------
 | COMPUTE DUALHYD     |   Average inlet capacities   [CINLET] =    .163  (cms)
 | TotalHyd 01:A1      |   Number of inlets in system [NINLET] =      1
 ----------------------   Total minor system capacity          =    .163  (cms)
                          Total major system storage [TMJSTO] =       0.(cu.m.)

                   ID: NHYD        AREA     QPEAK     TPEAK      R.V.      DWF
                                   (ha)     (cms)     (hrs)      (mm)     (cms)
     TOTAL HYD.   01:A1             .77      .198     1.467    66.931      .000
     ======================================================================
     MAJOR SYST   02:MAJOR          .02      .035     1.467    66.931      .000
     MINOR SYST   04:MINOR          .75      .163     1.417    66.931      .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -----------------------------------------------------------------------------
 008:0008---------------------------------------------------------------------
 ------------------------
 | ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
 ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:MAJOR          .02      .035    1.47  66.93    .000
                     +ID2 03:LANE           .00      .012    1.50  66.93    .000
                      =======================================================
                      SUM 01:Total          .02      .042    1.48  66.93    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -----------------------------------------------------------------------------
 008:0009---------------------------------------------------------------------
 * Cross Section at Site Entrance (Squadron Cres.)
 --------------------
 | ROUTE CHANNEL     |     Routing time step (min) =  1.00
 |  IN> 01:Total     |     Number of SEGMENTS =  1
 | OUT< 03:ROAD      |     Slopes (%), CHANNEL=2.00   FLOODPLAIN=2.00
 --------------------                  LENGTH =   10.00     (m)

                  <------ DATA FOR SECTION (  15.2) ------>
                  Distance       Elevation        Manning
                       .00         100.00          .0130
                       .01          99.85          .0130
                      6.50          99.77          .0130
                      6.51          99.92          .0130

   <---------------------------- TRAVEL TIME TABLE --------------------------->
    DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
     (m)       (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)  (m2/s)
     .008   99.778  .253E-01  .500E-03       .001      .270        .62     .002
     .016   99.786  .101E+00  .400E-02       .004      .428        .39     .007
     .024   99.794  .228E+00  .135E-01       .013      .561        .30     .013
     .032   99.802  .405E+00  .320E-01       .028      .680        .25     .021
     .039   99.809  .633E+00  .625E-01       .050      .789        .21     .031
     .047   99.817  .911E+00  .108E+00       .081      .891        .19     .042
     .055   99.825  .124E+01  .171E+00       .122      .987        .17     .055
     .063   99.833  .162E+01  .256E+00       .175     1.079        .15     .068
     .071   99.841  .205E+01  .364E+00       .239     1.167        .14     .083
     .079   99.849  .253E+01  .500E+00       .317     1.252        .13     .099
     .087   99.857  .304E+01  .661E+00       .427     1.401        .12     .122
     .095   99.865  .356E+01  .843E+00       .552     1.552        .11     .147
     .103   99.873  .407E+01  .104E+01       .690     1.695        .10     .174
     .111   99.881  .458E+01  .127E+01       .840     1.832        .09     .203
     .118   99.888  .510E+01  .151E+01      1.001     1.963        .08     .233
     .126   99.896  .561E+01  .177E+01      1.173     2.090        .08     .264
     .134   99.904  .612E+01  .206E+01      1.355     2.212        .08     .297
     .142   99.912  .664E+01  .236E+01      1.547     2.330        .07     .331
     .150   99.920  .715E+01  .268E+01      1.749     2.445        .07     .367

  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                       <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 1:Total        .02     .042    1.48 66.931      .037      .746
   OUTFLOW: ID= 3:ROAD         .02     .042    1.48 66.931      .037      .748


 -----------------------------------------------------------------------------
 008:0010---------------------------------------------------------------------
 ****************************************************************************
 *****************************************************************************
 -----------------------------------------------------------------------------
 008:0002---------------------------------------------------------------------
 -----------------------------------------------------------------------------
 008:0002---------------------------------------------------------------------
 -----------------------------------------------------------------------------
 008:0002---------------------------------------------------------------------
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 008:0002---------------------------------------------------------------------
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 008:0002---------------------------------------------------------------------
 -----------------------------------------------------------------------------
 008:0002---------------------------------------------------------------------
 -----------------------------------------------------------------------------
 008:0002---------------------------------------------------------------------
       FINISH
 -----------------------------------------------------------------------------
 *****************************************************************************
      WARNINGS / ERRORS / NOTES
      -------------------------
  001:0005 ROUTE CHANNEL   ->
       *** WARNING: Inflow hydrograph is dry!  Routing not done!
    Simulation ended on 2019-01-30     at 16:08:00
 =============================================================================
```

02323>
02324>

DRAWINGS / FIGURES

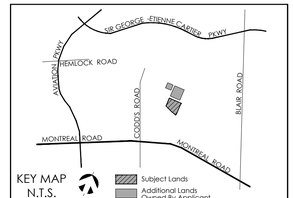
SITE STATISTICS AND DEVELOPMENT DATA

SITE AREA	19,588.25m² (1.96 ha)
PAVED AREA	4,862.66m² (25%)
LANDSCAPED AREA	7,589.74m² (39%)
TOTAL BUILDING COVERAGE	7,134.60m² (36%)
TOTAL GROSS FLOOR AREA	25,755.96m²
STACKED TOWNS TYPE A UPPER MODEL (34@114m²)	3,876m²
STACKED TOWNS TYPE B LOWER MODEL (34@85m²)	2,890m²
STACKED TOWNS TYPE C UPPER MODEL (24@116.93m²)	2,806.32m²
STACKED TOWNS TYPE D LOWER MODEL (24@87.26m²)	2,094.24m²
STACKED TOWNS TYPE E UPPER MODEL (4@117.20m²)	468.80m²
STACKED TOWNS TYPE F LOWER MODEL (4@89.97m²)	359.88m²
B2B TOWNHOUSE TYPE A MODEL (20@126.72m²)	5,534.40m²
B2B TOWNHOUSE TYPE B MODEL (6@139.82m²)	838.92m²
B2B TOWNHOUSE TYPE C MODEL (14@159.24m²)	2,229.36m²
B2B TOWNHOUSE TYPE D MODEL (2@172.06m²)	344.12m²
B2B TOWNHOUSE TYPE E MODEL (26@165.92m²)	4,313.92m²
HYDRO VAULT (1)	86m²
DENSITY (UPH)	98
ZONE CATEGORY	R4Y[2456]

DWELLING BLOCK	DWELLING TYPE	GROUND FLOOR AREA (m2)	UNITS
BLOCK 1	STACKED TOWNS	503.62	20
BLOCK 2	STACKED TOWNS	499.59	20
BLOCK 3	STACKED TOWNS	499.59	20
BLOCK 4	STACKED TOWNS	503.62	20
BLOCK 5	STACKED TOWNS	400.82	16
BLOCK 6	STACKED TOWNS	400.82	16
BLOCK 7	STACKED TOWNS	301.24	12
BLOCK 8	BACK TO BACK TOWNHOUSES	571.92	10
BLOCK 9	BACK TO BACK TOWNHOUSES	582.88	10
BLOCK 10	BACK TO BACK TOWNHOUSES	579.16	10
BLOCK 11	BACK TO BACK TOWNHOUSES	471.02	8
BLOCK 12	BACK TO BACK TOWNHOUSES	471.02	8
BLOCK 13	BACK TO BACK TOWNHOUSES	571.92	10
BLOCK 14	BACK TO BACK TOWNHOUSES	691.38	12
	TOTAL	7,048.60	192

SECTION	ZONE PROVISION - PLANNED UNIT DEVELOPMENT	REQUIRED	PROPOSED
162A (Table)	MIN. LOT WIDTH (m)	N/A	N/A
162A (Table)	MIN. LOT AREA (m²)	1,400m²	19,588m²
162A (Table)	MAX. BUILDING HEIGHT (m)	11.0m	10.08m
2018-124	MIN. FRONT YARD SETBACK (m)	3.09m	3.50m
2018-124	MIN. CORNER SIDE YARD SETBACK (m)	0.50m	1.90m
2018-124	MIN. REAR YARD SETBACK (m)	3.09m	3.50m
162A (Table)	MIN. INTERIOR YARD SETBACK (m)	1.20m	N/A
101 (Table)	RESIDENT PARKING - B2B TOWNS (68)	51 (@0.75/unit)	136 (@2/unit)
	STACKED (124)	62 (@0.5/unit)	124 (@1/unit)
2018-124	VISITOR PARKING	0	0
2018-124	MIN. WIDTH OF PRIVATE WAY (m)	6.00m	6.50m
2018-124	SETBACK OF ANY WALL OF A RESIDENTIAL BUILDING TO A PRIVATE WAY (m)	0.20m	2.91m
2018-124	MIN. SETBACK OF GARAGE DOOR TO PRIVATE WAY (m)	1.0m	5.17m
2018-124	SEPARATION DISTANCE BETWEEN BUILDINGS WITHIN A PLANNED UNIT DEVELOPMENT (m)	2.4m	3.0m

SECTION	ADDITIONAL PROVISIONS	REQUIRED	PROPOSED
65 (6)	PERMITTED PROJECTIONS INTO YARDS: COVERED OR UNCOVERED BALCONY, PORCH, DECK (m)	2.0m (Max) >1.0m to lot line	1.30m 1.02m
65 (5)	FIRE ESCAPES, OPEN STAIRWAYS, STOOP (m)	>0.6m to lot line	1.41m
106(1)	MIN. PERPENDICULAR PARKING SPACE SIZE (m)	2.6m x 5.2m	2.6m x 5.2m
107 (2)	MIN. DRIVEWAY WIDTH TO GARAGE (m)	2.60m	3.20m
109 (3)(b)	MAX. WALKWAY WIDTH PERMITTED IN YARD (m)	1.80m	2.40m
2018-124	MAX. PROJECTION HEIGHT (m)	3.20m	0.96m
91	UTILITY INSTALLATION MIN. CORNER SIDE YARD SETBACK (m)	0.5m	1.79m



SCALE 1:400 (0 4 8 12 16 20 24)

LEGEND

- BACK TO BACK TOWNHOUSE
- STACKED TOWNHOUSE
- PATHWAY
- WALKWAY TO ENTRY
- CROSSWALK
- ASPHALT DRIVEWAY
- CURB (0.2m)
- MOUNTABLE CURB
- DEPRESSED CURB
- PORCH
- PROJECTION (STAIRS)
- WINDOW WELL
- S.S SNOW STORAGE AREA
- L/A LANDSCAPED AREA
- PROPOSED LOT BOUNDARY
- BLOCK BOUNDARY
- ENTRANCE
- # UNIT NUMBER
- BENCH
- RWL RAIN WATER LEADER
- HYD FIRE HYDRANT
- CMB CANADA POST MAIL BOX
- TREEGRATE
- RA—1 STOP SIGN

DATE (D-M-Y)	REVISION	BY
31/01/19	Issue for Site Plan Amendment Application	SP

GENERAL NOTES

1. DO NOT SCALE DRAWINGS FOR PRINT.
2. THIS DRAWING IS THE EXCLUSIVE PROPERTY OF KORSIAK URBAN PLANNING AND MATTAMY HOMES. COPYRIGHT RESERVED.
3. SITE PLAN PREPARED IN ACCORDANCE WITH PLAN 4M-1581AND PLAN 4R-30196, PREPARED BY ANNIS O'SULLIVAN, VOLLEBEKK LTD.
4. TOWNHOUSE DWELLING UNITS ARE DESIGNED TO ACCOMMODATE CURBSIDE GARBAGE PICK-UP.
5. MEWS ARE INTENDED FOR PUBLIC ACCESS.
6. WALKWAYS AND CURBS TO BE TIED INTO PUBLIC ROW WHERE APPLICABLE.
7. REFERENCES CITY OF OTTAWA T.W.S.I. DETAIL SC7.3

PROJECT TEAM

SITE PLAN DESIGN: KORSIAK Urban Planning
LANDSCAPE ARCHITECTURE: NAK design strategies
MECHANICAL/ ELECTRICAL: LRJ
PLANNING: Stantec
TRANSPORTATION: NOVATECH Engineers, Planners & Landscape Architects
ARCHITECTURE: Q4A
NOISE: VALCOUSTICS Canada Ltd.
ENVIRONMENTAL: KILGOUR & Associates
CIVIL ENGINEER: DSEL
GEOTECHNICAL & STRUCTURAL: paterson group

mattamyHOMES

WATERIDGE VILLAGE: PHASE 1B
245 SQUADRON CRES.
BLOCK 15
PART OF LOT 22
CONCESSION 1 (OTTAWA FRONT)
GEOGRAPHIC TOWNSHIP OF GLOUCESTER
REGISTERED PLAN 4M-1559
CITY OF OTTAWA

TITLE: BLOCK 15 SITE PLAN

DATE:	DRAWN BY: / CHECKED BY:	DRAWING NO.
January 31, 2019	SP / CR	A1
FILE NO.: D07-12-17-0111		
JOB NO.: Mattamy - Wateridge		

D07-12-17-0111

DWG #17691

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